Calendar of Conferences/CSI Executive Committee

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Prevalence of Metabolic Syndrome in Coronary Artery Disease
Jyotirmoy Pal, N Sarkar, J D Mukherjee, A Talukdar, PS Karmakar, M Chatterjee, K Nanda
Institute of Post Graduate Medical Education and Research and SSKM Medical College, Kolkata

Incidence of coronary artery disease (CAD) is increasing in Asian countries; 15%–16% of global mortality due to CAD is contributed by India. Traditional risk factors such as age, sex, dyslipidemia, diabetes mellitus (DM) and hypertension (HTN) cannot explain such high incidence of vascular atherosclerosis. So the world today is in search of new risk factors. Metabolic syndrome/insulin resistance syndrome (IRS) may be one of them. To observe the incidence of metabolic syndrome in CAD patients, we conducted this study on 60 patients of CAD and 38 controls. Each patient under study had undergone anthropometric measurements, fasting blood sugar (FBS), fasting insulin and lipid profile estimation. Insulin resistance was estimated by HOMA model. Study revealed that incidence of each component of the IRS in cases is much higher than control (32% vs 8.5%). There is also a definite rural-urban difference (32% vs. 19%). Same is true for higher socio-economic group (33% vs 23%). Prevalence of each component of IRS is higher in CAD patients particularly in urban and upper class population. This explains why urban upper class people suffer from more complications of atherosclerotic diseases. Clustering of components (DM, HTN, dyslipidemia) increases the incidence of insulin resistance which may cause the pro-inflammatory state of vessel wall. Possibly IRS causes common soil for development of both DM and CAD. So, future target for primary and secondary prevention of CAD and its complications should be to control insulin resistance state apart from controlling HTN, DM and dyslipidemia.

Correlation between Socio-Economic Class, Body Mass Index and Lipid Levels in Indian Patients with Coronary Artery Disease
R Sethi, A Puri, K Behal, N Gupta, A Jain, A Singhal, A Ahuja, S Mukherjee, SK Dwivedi, VS Narain, RK Saran, VK Puri
King George Medical University, Lucknow

Traditionally it is believed that coronary artery disease (CAD) and dyslipidemia are more prevalent in affluent societies. However, epidemiology of CAD has many confounding factors in Indian context. So the present study was undertaken to ascertain the correlation between socio-economic class, body mass index (BMI) and lipid levels in Indian patients presenting to a tertiary care hospital with acute coronary syndrome (ACS). A total of 414 patients admitted with ACS were screened for their baseline lipid levels (within 24 hours of their symptom onset), BMI and socio-economic class. Based upon their BMI, the patients were divided into either normal (BMI <25 kg/m²) or overweight/obese (BMI ≥25 kg/m²). The patients were classified into upper, middle and lower socio-economic classes based upon modified Kuppuswami index which includes education, profession, and income of the patient. The mean low-density lipoprotein (LDL) levels were 97.3±17.2 mg/dl, 104±18.1 mg/dl and 94±15.9 mg/dl. Mean triglyceride (TG) levels were 166.1±24.5 mg/dl, 158.5±24.1 mg/dl and 133.8±19.0 mg/dl in upper, middle and lower socio-economic class, respectively. LDL levels were not significantly different between the three socio-economic classes; however, TG levels were significantly higher in upper socio-economic class as compared to the lower socio-economic class (p<0.05). Overall, 25% patients were overweight/obese and the prevalence of such patients in upper, middle and lower socio-economic class was 18.1%, 32% and 18.2%, respectively. LDL levels in patients with normal BMI versus overweight/obese patients were 94.1±15.7 mg/dl and 104±16.3 mg/dl, respectively (p=0.1) while TG levels were significantly higher in overweight/obese patients compared to patients with normal BMI (198±22.4 mg/dl vs 144±20.1 mg/dl, p=0.001). On the basis of our data, LDL levels did not correlate with either the socio-economic class or the BMI in patients with CAD. However, TG levels were significantly higher in patients of upper socio-economic class as compared to lower socio-economic class and also significantly higher in obese or overweight patients as compared to patients with normal BMI. It was also noted that the prevalence of overweight and obesity was significantly higher in middle socio-economic class as compared to both upper and lower socio-economic classes.

Comprehensive Lipid Tetrad Index and Lipoprotein(a) as a Marker for Coronary Artery Disease
Ramanand P Sinha, Satyendra Tewari, Sudeep Kumar, Aditya Kapoor, Naveen Garg, PK Goel, Nakul Sinha
Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow

The comprehensive lipid tetrad index reflects the total burden of dyslipidemias and magnifies the subtle abnormality of individual lipids. Lipoprotein(a) [Lp(a)] levels are related to both atherogenesis and thrombogenesis and may be a key link between lipid and coronary artery disease (CAD). Elevated Lp(a) leads to CAD with more prematurity and severity. We studied 285 randomly selected patients hospitalized for coronary angiogram during January 2003 to December 2004. There were 206 angiographically proven CAD patients with a mean age of 54.8±9.4 years (range: 34-73 years) (male: 137, females: 69) and 154 subjects with normal coronaries with a mean age of 55.2±8.3 years (range: 34-72 years) (male: 104, female: 50). In study group overall 41.2% patients had Lp(a) >30 mg/dl. Of the patients who had CAD, 54.5% had Lp(a)
Is Homocysteine a "Premature" Marker of Proven Coronary Artery Disease in Indian Patients

Umesh Agrawal, Aditya Kapoor, Sudeep Kumar, Satyendra Tewari, Naveen Garg, PK Goel, Nakul Sinha
Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow

We studied the clinical profile and homocysteine level in angiographically proven coronary artery disease (CAD) in 128 patients with a mean age of 56.4±9.1 years (116 males, 12 females). There were 36 (28%) diabetic, 46 (36%) hypertensive, 30 (23%) smoker and 16 (13%), with a positive family history of CAD. The mean triglyceride, total cholesterol, high-density lipoprotein (HDL), low-density lipoprotein (LDL) and very low-density lipoprotein (VLDL) values were 114±63, 156±30, 34±14, 92±22 and 31±17 mg/dl, respectively. Clinical presentation of these patients were stable angina in 41 (32%), unstable angina in 22 (23%) and myocardial infarction (MI) in 58 (45%). Coronary angiogram was done in all and it showed single vessel disease (SVD) in 18 (33%), double vessel disease (DVD) in 20 (36%), triple vessel disease (TVD) in 42 (71%). The mean homocysteine level of the study group was 29.5±20.8 µmol/L. We conclude that homocysteine level is well correlated with CAD and is a powerful independent risk factor for atherosclerosis and comprehensive lipid tetrad index providing better explanation for severity and extent of CAD.

Clinical and Anthropometric Correlation of Normal Coronary Artery Dimensions

C Elangoon, V Jaganathan, R Alagesan, M Annamalai, S Shannugasundaram, Geetha Subramaniyam, A Balaguru, G Gnanavelu, S Venkatesan, G Karthikeyan, G Justin Paul, C Morthoy
Madras Medical College and Government General Hospital, Chennai

Diameter of coronary artery is an important predictor of outcome after coronary artery bypass graft (CABG) surgery and percutaneous coronary intervention (PCI). Only limited literature is available about coronary artery dimensions in Indian population. In this study we correlated coronary dimensions with clinical and anthropometric data in our population. Normal coronary angiograms identified asto have smooth lumen free of atheroma of 75 patients (male: 51, female: 24) aged between 20 to 64 years (mean: 45 years) were analyzed by quantitative coronary angiography. Diameters were measured at defined segments in diastole. Patients of various etiology including post-infarct recanalized arteries, valvular heart disease – pre-operative evaluation, chest pain evaluation, dilated cardiomyopathy (DCM) and others were analyzed. Correlations were made with various anthropometric measurements, etiology, left ventricular (LV) mass by echocardiography, age, sex, and risk factors.

<table>
<thead>
<tr>
<th>Territory</th>
<th>LMCA</th>
<th>LAD-P</th>
<th>LAD-M</th>
<th>LAD-D</th>
<th>LCx-P</th>
<th>LCx-D</th>
<th>ND</th>
<th>DO</th>
<th>D-DO</th>
<th>D-ND</th>
<th>OM</th>
<th>PDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
<td>4.71</td>
<td>3.64</td>
<td>3.08</td>
<td>2.4</td>
<td>3.14</td>
<td>3.31</td>
<td>3.0</td>
<td>2.7</td>
<td>2.14</td>
<td>3.6</td>
<td>2.64</td>
<td>3.12</td>
</tr>
<tr>
<td>DIA/BSA</td>
<td>2.88</td>
<td>2.20</td>
<td>1.88</td>
<td>1.77</td>
<td>1.46</td>
<td>1.22</td>
<td>1.39</td>
<td>1.23</td>
<td>1.3</td>
<td>1.36</td>
<td>1.2</td>
<td>2.1</td>
</tr>
<tr>
<td>All</td>
<td>2.59</td>
<td>3.18</td>
<td>3.26</td>
<td>1.84</td>
<td>2.11</td>
<td>2.22</td>
<td>1.98</td>
<td>1.3</td>
<td>1.2</td>
<td>1.36</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Coronary artery dimensions were positively correlated with left ventricular (LV) mass, body surface area (BSA), body mass index (BMI). Females had significantly smaller dimensions compared to males even after correction for lower BSA. Patients with severe aortic valve disease had significantly larger left coronary system and those with severe mitral stenosis had larger right coronary system reflecting respective chamber hypertrophy. No correlations were present between coronary dimensions and age, waist/hip ratio, diabetes and systemic hypertension.
Prevalence of Conventional Cardiovascular Risk Factors in Patients with Coronary Artery Disease in India - Current Status: Results from 1000 Consecutive CABG Patients

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Over the last few decades, incidence and prevalence of coronary artery disease (CAD) in India have increased significantly. Changing lifestyle due to rapid urbanization and epidemiologic shift has been the major reason. The lifestyle changes are assumed to have resulted in altered prevalence of obesity, diabetes, hypertension, dyslipidemia and other cardiovascular risk factors (CVRFs) though the current status is not known. We enrolled 1000 consecutive patients who were undergoing coronary artery bypass surgery (CABG) at our centre between June 2004 and September 2004. Clinical examination (including detailed history) and lab investigations (fasting and 2-hour post-prandial blood sugar, fasting lipid profile) were done to ascertain prevalence of various conventional CVRFs. Mean age of the patients was 59.73±9.5 years; 88.4% patients were males. Hypertension was present in 70.9% and diabetes in 47.5%. 9.2% patients were current smokers and 30.4% patients had history of smoking in recent past. Low-density lipoprotein (LDL) cholesterol >130 mg/dl was seen in 6.2% patients, high-density lipoprotein (HDL) <40 mg/dl in 69% and triglycerides ≥150 mg/dl in 37% patients. At least one of these lipid abnormalities was seen in 59.3%; 19.9% patients had family history of premature CAD (parents 9.4%, sibling 14.6%) but 54.5% patients had at least one first-degree relative having CAD. Only 4.4% patients were free of all five major CVRFs (i.e. hypertension, diabetes, smoking, dyslipidemia and family history of premature CAD). 16.2% patients had one CVRF, 32.4% had two, 33.6% had three and 11.6% patients had four CVRFs; 1.8% patients had all the five major CVRFs. The present study reveals a very high prevalence of most of the conventional CVRFs particularly diabetes mellitus in patients undergoing CABG. The fact that 95.6% patients had at least one major CVRF underscores continued importance of these risk factors in cardiovascular risk assessment and absence of all these CVRFs in a person can be used as a marker of very low likelihood of having CAD.

High Sensitive C-Reactive Protein: A Prognostic Marker in Acute Coronary Syndrome

C.K. Mishra, A Mishra, SN Routray, D Das, HN Mishra, M Behera
SCB Medical College, Cuttack

This study compared the strength of correlation between high-sensitive C-reactive protein (hsCRP) within 6 hours of onset of acute coronary syndrome (ACS) and in-hospital mortality and morbidity. Our study group comprised of 80 patients (60 males, 20 females) with mean age of 54.5 years. Fifty (62.5%) patients had acute myocardial infarction (MI), 18 (22.5%) had non-Q MI and 12 (15%) had unstable angina. Left ventricular (LV) function was assessed by two-dimensional echocardiography (2D echo) and hsCRP was measured by turbidometry. Severe LV dysfunction (ejection fraction (EF) <30%) was present in 30% of patients with high hsCRP (>0.31 mg/dl), none in patients with low hsCRP (<0.31 mg/dl) (p=0.001). Positive correlation was seen in acute MI patients between hsCRP and regional wall motion abnormality (RWMA) (r=0.0001), No correlation was seen between hsCRP and RWMA (p=0.53), left ventricular ejection fraction (LVEF) (p=0.35) in unstable angina patients. High hsCRP levels were noted in patients who had cardiac rupture [(1.6%)] and those who died (n=8, 10%) (mean value was 2.12±0.2 mg/dl) and left ventricular function (LVF) [n=16 (20%)]. To conclude, elevated hsCRP early after acute MI (<6 hours) signifies underlying increased inflammation and hence, more extensive damage and complications. Hence elevated hsCRP prognosticates poor LV function and in-hospital adverse cardiac outcome in ACS.

Use of Streptokinase in Management of Acute Myocardial Infarction - An Experience in District-Level Hospital of Bangladesh

Triptish Chandra Ghose, Tawfiqul Islam, Md Tariqul Matin
CD Path and Hospital, Comilla, Bangladesh

The objective of this study was to assess the safety of thrombolytic therapy with streptokinase in patients with acute myocardial infarction (MI) in a district-level hospital of Bangladesh where ICU or monitoring facility is not available. It was a retrospective review of 200 cases of acute MI treated with streptokinase along with other adjunctive therapy within 6 hours of onset of symptoms in our hospital from January to December 2003. Total period of stay in hospital was 5 to 10 days. Out of these 200 patients, 180 were suffering from acute ST elevation MI and 20 patients presented with left bundle branch block (LBBB), with no contraindication to thrombolysis. Among them, 80% patients were men with the mean age of 62 years. From the history and investigations it was revealed that 55% patients were suffering from hypertension, 46% were diabetics, 42% had dyslipidemia and 62% patients were smoker. After analysis it was revealed that one (0.5%) patient died from intracerebral hemorrhage, 2% patients developed minor hemorrhagic complication, 2.5% patients had arrhythmias and 6% patients had developed hypotension and rest of the 89% patients did not develop any significant complication. With these results, it can be concluded that use of streptokinase in treatment of acute MI specially within 6 hours of onset of symptoms, is relatively safe and showed greater clinical benefit in district-level hospital where neither primary percutaneous coronary intervention (PCI) nor even
Significance of ST Segment Elevation in lead aVR during Treadmill Testing and Angiographic Correlation

V M ubarack, Syam kumar, SV Praveen, Vinay Kumar, Sunitha viswanathan, K Venugopal
Medical College, Calicut

Significance of ST segment elevation in lead aVR in acute coronary syndrome is well known. But the significance of ST segment elevation in lead aVR during exercise treadmill test (TMT) in patients with coronary artery disease (CAD) is not well studied. The aim of the study was to see whether ST segment elevation in lead aVR during TMT in patients with CAD has any localizing value and also to study its correlation with coronary angiography. Out of a total of 800 consecutive patients who underwent TMT for known or suspected CAD, 500 patients with positive TMT were randomly selected. They were divided into two groups. Group 1 consisted of patients with ST segment elevation in lead aVR and Group 2 patients were those without ST segment elevation in lead aVR. Their baseline clinical characteristics, TMT, and angiographic profile were compared. Patients with positive TMT with ST elevation in lead aVR had more involvement of left system than those without ST elevation. Left main coronary artery (LMCA) involvement was equal in both groups. Those with ST elevation had significantly more involvement of proximal left anterior descending artery (LAD) than those without. There was no significant difference with regard to involvement of right coronary artery (RCA) or left circumflex (LCx). In patients with positive TMT with ST segment elevation in lead aVR there is some localizing value. There is statistically significant involvement of proximal LAD in these patients.

Ventricular Septal Rupture following Acute Myocardial Infarction

GS Gill, Naveen garg, Sudeep Kumar, Satyendra Tewari, Aditya Kapoor, PK God, Nakul Sinha
Sanjay Gandhi post graduate Institute of Medical Sciences, Lucknow

Ventricular septal rupture after acute myocardial infarction (MI) is a rare but well known potentially catastrophic complication. Mortality without surgery is almost 100%. We present our experience with post-MI ventricular septal defect (VSD) at our institute from January 2004 to May 2005. A total of 9 patients were admitted to our institute with this diagnosis – 7 males and 2 females. Mean age was 56±10 years (range: 41-66 years). Two (23%) patients were diabetic, 4 (46%) hypertensive and 1 patient was smoker. VSD appeared on day 3 onward in all patients. None had any history of angina or MI. Eight (90%) patients had anterior wall MI (2 patients were thrombolysed) and had apical muscular VSD (size varying from 8–15 mm). One patient had inferior wall MI and had basal septum VSD. Mean left ventricular ejection fraction (LVEF) was 38±7%. Coronary angiography performed in 6 patients revealed single vessel disease in 4 and triple vessel disease in other 2 patients. Surgical management was considered in all patients after short initial medical stabilization. All patients were put on intra-aortic balloon pump (IABP) support. Two patients could not be stabilized and died of cardiogenic shock soon after the admission. Out of the remaining 7 patients, 2 left against the medical advice. Patch closure of VSD was done in 5 patients. Two patients died after surgery. One continued to be in cardiogenic shock and died of multiorgan failure. Another patient improved after surgery and died later on because of ventricular arrhythmia. To conclude, septal rupture is more common after anterior wall MI. Although it is associated with high mortality, its early recognition, management with IABP support followed by early surgery can yield better outcome and should be the treatment of choice.
Effect of Intravenous Nicorandil on In-Hospital Outcomes of Acute Myocardial Infarction in Comparison with Conventional Treatment
Sarita Yadav, K Roshan Rao, RPS Bhardwaj, M Ahmed, R K Bansal, CM Verma, R Thakur
LPS Institute of Cardiology, Kanpur

Numerous studies have demonstrated that virtue of its dual mechanism of action as a coronary and peripheral vasodilator and its action on K-ATPase (myocardial preconditioning), nicorandil improves tissue perfusion, enhances the recovery of cardiac function and reduces the hospital complications of acute myocardial infarction (MI). There is hardly any study which compares the efficacy of combination therapy (intravenous (IV) nicorandil ± IV nitroglycerine (NTG)) with IV NTG alone. In the present study 64 patients with acute MI (<12 hours from onset of pain) were randomized into 3 groups. Group I (n=10)-IV NTG alone; Group II (n=23)- IV NTG+IV nicorandil; Group III (n=31)- IV nicorandil alone. Dosage schedules were as follows: IV nicorandil 2 mg bolus then 2-4 mg/hour for 48 hours / IV NTG -5 µg/kg titrated according to response. All patients were given aspirin, clopidogrel, low-dose statins-beta-blockers, and angiotensin-converting enzyme (ACE) inhibitors (if hemodynamic parameters permitted). Patients were followed up on day 2 and day 7 of hospital stay by means of hemodynamic parameters [systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR)] and echocardiographic variables [left ventricular internal diameter systolic (LVIDS), left ventricular internal diameter diastolic (LVIDD), ejection fraction (EF) and regional wall motion abnormality (RWMA)]. Statistical analysis was done which showed no significant difference between the IV NTG versus the IV nicorandil group. However, the trend was toward a more favorable outcome with nicorandil. A significant difference in favor of combination therapy was noted (p<0.05) when compared with conventional treatment alone (improvement in LVEF and LVIDS was noted). The table compares the conventional treatment with combination treatment and changes in left ventricular (LV) function at discharge (% change).

<table>
<thead>
<tr>
<th></th>
<th>NTG</th>
<th>NTG+nicorandil</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF</td>
<td>0.1±2.2</td>
<td>2.15±1.6</td>
<td>&lt;0.05 (S)</td>
</tr>
<tr>
<td>RWMA</td>
<td>0.9±0.99</td>
<td>1.55±1.2</td>
<td>NS</td>
</tr>
<tr>
<td>LVIDS</td>
<td>0.02±0.09</td>
<td>0.7±0.1</td>
<td>&lt;0.03 (S)</td>
</tr>
<tr>
<td>LVIDD</td>
<td>0.03±0.04</td>
<td>0.065±0.08</td>
<td>NS</td>
</tr>
</tbody>
</table>

NTG: nitroglycerine, EF: ejection fraction, RWMA: region wall motion abnormality; LVIDS: left ventricular internal diameter systolic; LVIDD: left ventricular internal diameter diastolic.

Nicorandil was therefore found to be useful as combination therapy with conventional treatment for acute MI.

Transradial Coronary Angiography in Unselected Population
PK Pali, Paul V George, Sunil Chandy, Jacob V Jose, Bobby John, P Mariappan, R David
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Transradial coronary angiography has gone through the transformation from a highly specialized, technically demanding procedure available to a selected population to a simplified alternative to transfemoral route. After an initial 400 transradial catheterizations in a group of selected patients, we decided to do the same in an unselected population. Sixty patients seen in outpatient department and sent for angiography were accepted but seen for the first time by the operator in the catheterization lab. In all the cases, the procedure was performed after confirming a positive Allen’s test. None were excluded even though their radial were barely palpable. Forty-eight (80%) were male. The mean age was 54 years (range 37-74 years). The mean weight was 65 kg (range: 43 to 98 kg). Radial artery was cannulated using 20G Jelco and 5 F sheath. Tiger (brachial type) coronary diagnostic catheter was used for coronary angiography. The mean fluoroscopic time was 4 min (range: 1-15 min) and the mean procedure time 14 min (range 7-30 min). The procedure was successful in 57 (95%) patients. In remaining 3 (patients with barely palpable radial), the procedure was completed after changing over to transulnar route in two and to transfemoral in one because of unsuitable anatomy. Eighty percent of the patients had significant coronary artery disease and rest had minor plaque or normal epicardial coronaries. There were no complications. Routine transradial approach is a safe alternative to transfemoral approach in unselected population undergoing coronary angiography.

Coital Cephalgia and Coronary Artery Ectasia: Case Report of a Rare Association
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Rabindranath Tagore International Institute of Cardiac Sciences, Kolkata and BS Medical College, Bankura (WB)

Coital cephalgia is a headache felt at the base of skull in relation to coitus and is present mainly among males. Coronary artery ectasia is irregular dilation of coronary arteries and is detected in 0.3% to 5.39% of angiographic studies. Both the phenomenon probably occur due to abnormalities in vascular pressor mechanism. We report the case of a young man who had both of these diseases. To the best of our knowledge, this is the first such case to be reported. A 42-year old young male from Bangladesh presented to us with complaints of class II angina. He was hypertensive, euglycemic, hyperlipidemic and a smoker. He also had bouts of severe, abrupt headache lasting for about 15-20 min during every coitus. His electrocardiogram (ECG), echocardiography, electroencephalography...
(EEG) and computerized tomographic (CT) scan were normal. Treadmill test (TMT) was mildly positive. Coronary angiogram revealed ectatic left anterior descending artery (LAD), left circumflex (LCx) and right coronary artery (RCA). Neurologist’s opinion was taken, who diagnosed him as orgasmic coital cephalgia. The patient was reassured and discharged on beta-blocker, aspirin, statin and alprazolam.

Does the Choice of Coronary Revascularization Depend on Risk Factor Profile?

G Venkatesh, M Ramanathan, C J Reddy, KN Reddy
Vijaya Heart Foundation, Chennai

We have concrete evidence to show that more the number of risk factors, more the chances of coronary artery disease (CAD). However, it is not clear whether the number of risk factors influence the choice of revascularization therapy in Indian population. Hence we analyzed 100 consecutive patients who underwent percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG) with mean age of 55.3 years for PCI and 57.9 years for CABG group. Males contributed 83% of study population. The results of our analysis are shown in Tables.

### Risk factor profile (in%) in PCI and CABG groups

<table>
<thead>
<tr>
<th></th>
<th>Age&gt;60</th>
<th>DM</th>
<th>HTN</th>
<th>Dyslipidemia</th>
<th>FH of CAD</th>
<th>Smoking</th>
<th>BMI &gt; 25 kg/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PCI</strong></td>
<td>28</td>
<td>62</td>
<td>58</td>
<td>38</td>
<td>16</td>
<td>22</td>
<td>40</td>
</tr>
<tr>
<td><strong>CABG</strong></td>
<td>40</td>
<td>62</td>
<td>64</td>
<td>62</td>
<td>30</td>
<td>26</td>
<td>24</td>
</tr>
</tbody>
</table>

### Number of risk factors and type of revascularization (n=100)

<table>
<thead>
<tr>
<th>No of risk factors</th>
<th>0 (n=0)</th>
<th>1 (n=19)</th>
<th>2 (n=33)</th>
<th>≥3 (n=45)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PCI</strong></td>
<td>3 (100)</td>
<td>15 (79)</td>
<td>18 (54.5)</td>
<td>14 (31.1)</td>
</tr>
<tr>
<td><strong>CABG</strong></td>
<td>0 (0)</td>
<td>4 (21)</td>
<td>16 (45.5)</td>
<td>31 (68.9)</td>
</tr>
</tbody>
</table>

PCI: percutaneous coronary intervention; CABG: coronary artery bypass graft; DM: diabetes mellitus; HTN: hypertension; FH: family history; CAD: coronary artery disease; BMI: body mass index. Values in parentheses show percentage.

In patients with ≥ 3 risk factors, 69% underwent CABG and 31% underwent PCI. In patients with ≤ 1 risk factor, 81.8% underwent PCI whereas 18.2% underwent CABG. To conclude, higher the number of risk factors, more severe the disease and the need for surgical revascularization.

### Clinical and Angiographic Profile of Patients with Combined Anterior and Inferior ST Segment Elevation during Acute Myocardial Infarction

N Ganesan, V Jaganathan, R Alagesan, M Annamalai, S Shunmugasundram, Geetha Subramanian, A Balaguru, G Gnanavelu, S Venkatesan, PS Mohanamurugan, KM Meenakshi
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Combined ST segment elevation in the precordial and inferior leads is a rare electrogram (EGG) finding in patients with acute myocardial infarction (MI) and its clinical implications have been rarely reported. We evaluated the significance of combined anterior and inferior ST segment elevation on the initial ECG in patients with acute MI and correlated it with clinical findings Killip class, left ventricular (LV) function, mortality and angiographic profile. Out of a total of 456 patients, 26 consecutive patients with combined ST elevation in anterior and inferior leads formed the study group. Five (17.8%) patients died during early post-MI period prior to coronary angiography (CAG). Twenty-one patients who underwent CAG were classified into two groups angiographically. Angiographic data showed left anterior descending artery (LAD) supplying more than one-fourth of inferior wall (wrapped LAD) with the site of occlusion distal to D1 in Group 1 patients. None of the Group 1 patients had any significant disease of other vessels. Remaining 9 patients formed group 2 who had two- or three-vessel disease, with acute occlusion of right coronary artery (RCA) and chronic total occlusion of LAD in 5 (55.5%) patients and acute occlusion of LAD with chronic total occlusion of RCA in 4 (45.5%) patients. Electrocardiographically, Group 1 patients had ST elevation in inferior leads <2 mm while Group 2 patients had ST elevation >2 mm. Group 2 patients had significantly higher incidences of impaired LV function (EF < 40%; 57.1% v. 16.6%, respectively; p=0.05), cardiogenic shock (57.1% v. 0%, p=0.004), pulmonary edema (42.8% v. 0%, p=0.02), and cardiac death (35.7% v. 0%, respectively, p=0.03) than did Group 1 patients. All the patients who died prior to CAG had ECC changes similar to Group 2. To conclude, acute MI with combined ST segment elevation in precordial and inferior leads can be caused by either a wrapped LAD occlusion or a non-wrapped LAD occlusion. ST elevation >2 mm in inferior leads combined with anterior ST elevation predicts adverse clinical outcomes.
Enhanced External Counter Pulsation
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Enhanced external counter pulsation (EECP) is a novel treatment modality being investigated for intractable angina not amenable to revascularization. The aim of our study was to examine the improvement in coronary perfusion by rest nuclear perfusion study in patients who have undergone EECP treatment. A total of 36 cases (27 males were included in the study. All cases had undergone coronary angiography (CAG) for angina and were found to be unsuitable for revascularization in view of diffuse disease. The age ranged from 42 to 73 years and 72% were diabetics. Ejection fraction (EF) ranged from 15% to 62%. All patients underwent 35 hours (1 hour/day) of EECP. Rest thallium perfusion scan and echocardiography were done before and at the end of therapy. Ejection fraction EF increased by 10 to 32% ± 3.2% in the study population. Left ventricular (LV) volumes regressed by an average of 28.9 ml. Angina as assessed by Canadian Cardiovascular Society functional classification came down from 3.6 to 1.2. Perfusion assessed by rest thallium scan showed moderate improvement in nearly all cases. Quality of life as assessed by an institutionally prepared questionnaire showed very good improvement. We conclude that EECP is a viable modality of therapy in patients with severe symptoms, who are not amenable to conventional revascularization.

High Sensitivity C-Reactive Protein in Coronary Artery Disease and its Angiographic Correlation
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Role of high sensitivity C-reactive protein (hs-CRP) in coronary artery disease (CAD) is well established. The aim of our study was to find out whether there is any correlation between the level of hs-CRP and the severity of CAD as confirmed by coronary angiogram. The level of hs-CRP in 100 consecutive patients who underwent coronary angiogram in our hospital were studied. The indication for coronary angiogram was chronic stable angina in 66 patients and acute coronary syndrome (ACS) (unstable angina and post-myocardial infarction (MI) evaluation) in 34 patients. The level of hs-CRP was found to be significantly elevated in patients with ACS when compared to patients with stable angina. Eighty percent of the patients with ACS had elevated hs-CRP irrespective of the number of vessels involved. In patients with chronic stable angina hs-CRP was significantly elevated only in triple vessel disease. This was more so when there was diffuse involvement of the vessels.

Clinical and Coronary Angiographic Association with Quantitative High Sensitivity C-Reactive Protein Values in Patients Admitted with Acute Coronary Syndrome
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Recently, the American Heart Association and the Center for Disease Control released new recommendations on the testing of C-reactive protein (CRP) levels. Previous data showed that in patients with coronary artery disease, elevated CRP measurement indicates more than “moderate” risk of development of ST elevation myocardial infarction (MI). We studied 96 patients admitted with coronary insufficiency presenting with varying clinical and angiographic severity. Age range was 20-80 years (mean: 57.96 years±14.9 years). There were 79 males (82.3%) and 17 females (17.7%). CRP values ranged from 0.3 to 10.96 µmol/L (mean 1.29±1.79 µmol/L). Coronary angiography was done in 42/96 (43.8%) patients. Normal hs-CRP values were observed in 57/96 (59.4%) patients, mildly elevated in 24/96 (25.0%) and significantly elevated in 15/96 (15.6%) patients. No association of hs-CRP values was observed with age (p=0.05). Statistically significant correlation (p<0.05) was observed between duration of symptoms and CRP values; maximum values were seen with symptoms of >48 hours duration. Significant correlation (p<0.05) was observed between severity of hypertension and CRP values. There was no statistically significant correlation (p>0.01) between CRP values with patients with non-ST elevation MI, ST elevation M1 and unstable angina. No association was seen (p>0.01) between CRP values and severity of coronary artery involvement on coronary angiography. A normally high hs-CRP values were observed in 40.6% patients admitted with acute coronary syndrome. No statistically significant association of hs-CRP values were observed with age, severity of clinical presentation and findings on coronary angiography.

Clinical Profile, Coronary Angiography and Thallium Perfusion Study Patterns in Young Myocardial Infarction Patients of Age 40 Years or below
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In this ongoing study, patients (n=25 to date) of acute myocardial infarction (MI) of age 40 years and below admitted
in our hospital, from December 2001 onward were studied, with special reference to their coronary risk factors, clinical profile, coronary angiographic patterns and correlation with myocardial perfusion. The main findings are outlined here.

(i) Even in patients of MI at younger age, there is striking increase in the incidence of disease as age advances and it is predominantly a male disease, being less common in young menstruating women. (ii) Cigarette smoking and hypercholesterolemia are the two most important, independent modifiable major risk factors for MI at younger age. (iii) Positive family history of ischemic heart disease is also found to be one of the important risk factors in present study. (iv) Diabetes mellitus and hypertension are less important risk factors for young infants but they appear to play a role in the older age group i.e. 36-40 years specially in association with hypercholesterolemia. (v) Smoking hyper-cholesterolemia and positive family history are associated with multivessel disease. (vi) The commonest symptom was chest pain (92%); majority were in Killip class I (84%) and anterior MI was seen in 52%. (vii) The commonest vessel involved in young MI was left anterior descending artery. (viii) Older patients in this group (36-40 years) had more risk factors, and higher incidence of multivessel disease. (ix) Patients <35 years of age had less severe coronary artery disease (CAD); in patients with significant disease in this group, single vessel disease predominates, left anterior descending artery being major culprit artery. (x) Sensitivity and specificity of myocardial perfusion scan to detect myocardial perfusion defects was 81% and 80.3% and stress-induced reversible ischemia was 65.3% and 87.6% respectively.

Hyperhomocysteinemia as a Risk Factor for Recurrent Coronary Events and Heart Failure

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Thirty proven patients (24 males, mean age 52.9 ± 1.1 years) of acute coronary syndrome (ACS) and hyperhomocysteinemia (Group I) (estimated by chemiluminiscent enzyme immunoassay technique) were followed up for a period of 6 months, and compared with 24 (19 males, mean age 56.9 ± 9.2 years) patients (Group II) of ACS who had no evidence of hyperhomocysteinemia. Both group of patients had similar conventional risk factors. Mean homocystine in Group I was 28.6 ± 13.8 µmol/L and 10.4 ± 1.6 µmol/L in Group II. Both groups had comparable patterns of ACS and received only standard treatment of ACS. At 6 months follow up, Group I patients had a total of 28 episodes of recurrent ACS, compared to 11 episodes in group II. Ejection fraction estimated by transthoracic echocardiogram (TTE) at 6 months was 35.1 ± 8.42% in Group I and 48.2 ± 6.52 in Group II, which was statistically significant (p<0.05). Thus, hyperhomocysteinemia has a positive predictive value of 72% and negative predictive value of 86% for recurrent ACS, and also has a good correlation with left ventricular (LV) dysfunction. However, larger studies are required.

Ideal Hardware for Selective Coronary Cannulation Using Transradial Approach

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Transradial approach is increasingly used for coronary diagnosis and intervention. This study consisted of the analysis of prospectively collected data on transradial coronary angiography and coronary interventions, performed mostly via the right radial approach by a single operator over a period of one and half years. The only contraindication was the absence of perfusion from the ulnar artery when the radial artery was occluded by pressure as assessed by Allen’s test. The study was carried out systematically by the operator. Of 765 patients who underwent radial approaches, a total of 643 patients underwent transradial coronary angiography from December 2003 to April 2005. Number of males were 490 (76.2%) and females were 153 (23.8%). Single catheter was used for engaging both left and right coronary artery in 437 patients. Terumo brachial type was used as single catheter in 327 (47.8%) patients, left Amplatz was used as single catheter in 76 (17.3%) patients, Judkins left 3.5 was used as single catheter in 33 (7.5%) patients. Multipurpose as single catheter was used in one (0.23%) patient. Two catheters were used in 201 patients. Judkins left and right were used in 110 (54.7%) patients. Amplatz and Judkins were used in 63 (31.3%) patients, AL1 and AL2 in 23 (11.4%) patients, Terumo and multipurpose in 2 patients, while Terumo and Amplatz in 3 patients. Three catheters (Judkins/Amplatz left/Terumo) were required in 5 patients. 4 F catheters were used in 13 patients and 5 F catheters were used in 630 patients. The transradial angiography is possible with single catheter in majority of patients (60.6%). The Terumo brachial type was the most frequently used single catheter and is the catheter of choice followed by left Amplatz catheter. The other catheters include Judkins left and Multipurpose.

Vascular Anatomic Challenges Encountered during Transradial Approach for Coronary Diagnosis and Intervention

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Transradial approach is increasingly used for coronary diagnosis and intervention. This study consisted of the analysis
of prospectively collected data on transradial coronary angiography and coronary interventions, performed mostly via the right radial approach by a single operator over a period of one year. The only contraindication was the absence of perfusion from the ulnar artery when the radial artery was occluded by pressure as assessed by Allen’s test carried out systematically by the operator. The data regarding vascular challenges such as loops, tortuositities etc. were collected prospectively. A total of 765 patients underwent transradial catheterization from December 2003 to April 2005 of which 593 (77.5%) were males and 168 (22.5%) were females. Two patients had anomalous radial origin and had to be punctured close to the anatomical snuff box. Seven patients had moderate to severe forearm loops which were successfully crossed using 0.025” Terumo wire and 0.014” coronary guidewire and one patient had a loop in the arm. Six patients had high take off radial artery from the arm. Four patients had moderate to severe subclavian loops which was successfully crossed. Mild subclavian tortuosity and abnormal subclavian take offs were seen in 144 (18.8%) patients and successfully crossed The retroesophageal right subclavian artery (arteria lusoria) is the most common congenital aortic arch anomaly with an incidence of one percent in our study. The anomalous origin of the right subclavian from the descending aorta renders difficulty to the completion of angiography by the right radial approach. This anatomical anomaly was negotiated using a Terumo wire and the aortic root was reached from the descending aorta to complete the angiogram in all except one case. Judkins catheter was the most successful catheter for selective coronary cannulation. The incidence of forearm loops (1%) and subclavian tortuosity is significant and not a limitation for radial approach. The incidence of Arteria Lusoria is one percent. Transradially, coronary angiogram is possible in these subsets also. This preliminary study revealed that the interventionalist should be ready to recognize these anomalies so that radial approach coronary angiography is still possible by adopting instant strategic planning.

**Expression of Interleukin-1 Alpha Gene and Circulating Levels of Interleukin-6 and Plasminogen Activator Inhibitor-1: Preliminary Findings of the Indian Atherosclerosis Research Study**

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Heritability of age- and sex-adjusted body mass index (BMI) was observed in 125 families having 431 parents and offspring (H2 = 0.27; SE = 0.09; p = 0.001). Interleukin-6 (IL-6) C-reactive protein (CRP) and plasminogen activator inhibitor-1 (PAI-1) (ELISA) increased across the quintiles of BMI (p = 0.0001; one-way ANOVA). At the levels of IL-6 and PAI-1 were shown to be controlled by IL-1 alpha gene, among others, in certain cell types, the aim of the study was to evaluate the expression of IL-1 alpha in patients of coronary artery disease (CAD) and controls having the lowest or highest quintiles of BMI, and correlate gene expression with circulating levels of IL-6, CRP and PAI-1. Twenty CAD patients referred for coronary artery bypass grafting (CABG), 13 of them on statin medication and 19 unaffected family members and one on statin, were included. Total RNA was extracted from baseline samples of peripheral blood and the level of IL-1 alpha expression quantified by one-step reverse transcription PCR using beta-actin as the control gene and evaluated on agarose gels as the ratio of IL-1 alpha to control gene band intensity. The CAD patients had a higher level of IL-1 alpha expression relative to controls (mean ± SD, 0.78 ± 0.24 vs. 0.63 ± 0.12; p = 0.016). This difference was more pronounced in the top quintile of BMI (0.91 ± 0.22 for patients versus 0.61 ± 0.09 for controls; p = 0.001). The expression of IL-1 alpha was...
Coronary Risk Factors in Relation to Regional Origins of Asian Indians: Indian Atherosclerosis Research Study

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Most of the conventional coronary risk factors are multifactorial with genetic and non-genetic etiology. In view of the restricted population admixture among Indians of varied regional origin due to prevailing socio-cultural conditions, and the distinctive regional cuisine, the aim of this study was to evaluate for the first time any difference in the prevalence of coronary risk factors among Indians having their origins in the east, west, north or south of the country. One thousand one hundred and sixty one coronary artery disease (CAD)-affected and unaffected members from 229 families, 187 enrolled in Bangalore and 41 in Mumbai were included in the analysis. The mean age of onset of CAD was 47.7 ± 7.2 years, 50.1 ± 10.9 years, 47.0 ± 13.2 years and 51.6 ± 9.7 years, respectively for patients from the east, west, north and southern parts of the country. The prevalence of hypertension was 30%, 29%, 21% and 23% in the east, west, north and south, respectively. The proportion of vegetarians was 3%, 83%, 64% and 42% among people hailing from the east, west, north or south of the country, respectively. Of all those included, 54% from the east 50% from the west, 48% from north and 50% from south were overweight (body mass index (BMI) > 25 kg/m²). The proportion of patients with triple-vessel disease was 50% each from the east and western regions, 38% from north and 36% from south. Triglyceride (p=0.009) and high-density lipoprotein (HDL)-cholesterol (p<0.0001) among males, and lipoprotein(a) (p=0.025) among females exhibited a significant region-wise variation. The mean level of HDL-cholesterol was lowest in males and females of the eastern region. This study demonstrated for the first time a variation in coronary risk factors in the Indian population based on their region of origin.

Heritability may be defined as the proportion of phenotype variance attributable to genetic variance. The aim of the study was to determine heritability of quantitative phenotypes associated with risk of coronary artery disease (CAD). Parents and offspring (n=365) wherein at least one parent had CAD (Group 1) and 69 parents and offspring wherein neither any parent nor offspring had CAD (Group 2) were evaluated. Lipid, lipoproteins and apolipoproteins were estimated by standard enzymatic and immunoturbidimetric methods. Markers of coagulation and fibrinolysis were estimated by clot-based method or antigenic assay. The pro-inflammatory and cell adhesion molecules were measured by ELISA. The anthropometric markers consisted of body mass index (BMI), and waist-hip ratio (WHR). Heritability was estimated by variance components analysis using the SOLAR program with covariate adjustment for age and sex. In the combined groups 1 and 2, quantitative phenotypes that exhibited significant heritability (SE) were as follows: (i) total cholesterol: 0.57 (0.08), p=6.0E-10; (ii) high-density lipoprotein-cholesterol (HDL-c): 0.49 (0.09), p=3.2E-8. (iii) low-density lipoprotein cholesterol (LDL-c): 0.56 (0.09), p=3.2E-9; (iv) triglyceride: 0.58 (0.07), p=4.2E-14; (v) apolipoprotein A1: 0.80 (0.05), p=1.8 E-13; (vi) lipoprotein(a): 0.92 (0.10), p=6.9 E-9; (vii) fibrinogen: 0.43 (0.09), p=1.7 E-6; (viii) FVIII.c : 0.76 (0.07), p=4.8E-20; (ix) plasminogen activator inhibitor-1 (PAI-1), 0.52 (0.12) p=7.9E-6; (x) interleukin 6: 0.60 (0.14), p=4.9 E-6; (xi) C-reactive protein: 0.34 (0.14), p=0.0005; (xii) soluble p-selectin: 0.46 (0.14), p=0.0002; (xiii) soluble ICAM-1: 0.81 (0.08), p=2.8 E-16; (xiv) body mass index (BMI): 0.27 (0.09) p=0.001; (xv) WHR: 0.36 (0.10), p=3.0 E-6. Of the phenotypes that exhibited strong heritability in Group 1 but weak or no heritability in group 2 included (i) HDL-c 0.48 (0.09), p=1.0 E=7; (ii) soluble p-selectin, 0.43 (0.12) p=0.00054; (iii) lipoprotein(a): 3.0, p=3.0 E-7; (iv) PAI-1: 0.41 (0.13), p=0.0008; (v) BMI: 0.30 (0.10) p=0.001. This study demonstrate for the first time heritability of a number of phenotypes in families where at least one parent was affected with CAD.
ApoC 111-Sac 1 Gene Polymorphism in Asian Indians with Early Onset Coronary Artery Disease - Association and Linkage Studies: Indian Atherosclerosis Research Study

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The apolipoprotein (Apo) C111 gene located on chromosome 11q23-24 is a part of the Apo A1-C111-A1V-AV gene cluster. The Sac-1 polymorphism and its S1 variant minor allele resulting from a C>G substitution in the 3' untranslated region of the Apo C111 gene has been shown to influence plasma triglyceride (TG) levels. Elevated TG level is an important risk factor for coronary artery disease (CAD). The aim of this study was to determine the heritability of TG and to evaluate its relationship with Sac-1 genotype and linkage with CAD in a family-based study and in an independent case-control cohort. The study group comprised of 125 families with 668 individuals recruited from Bangalore and 252 CAD cases and as many age sex-matched controls from Mumbai. Heritability of log TG was 0.58 (SE=0.07; p=4.15; E-14) after covariate adjustment, for age, sex and age by sex using the SOLAR program. The TG levels increased from S2S2 (135.9±6.0) through S1S2 (151.1±10.2) and S1S1 (166.7±16.6) genotypes in the affected and unaffected family members, the difference being statistically significant in the latter (p=0). The observed proportion of 2-, 1-, 0- allele sharing among 76 affected sib-pair (0.40, 0.54 and 0.06) deviated significantly from the expected proportions (0.25, 0.50, 0.25) (χ²=34.82; df=2; p=<0.0001). The S1 allelic frequency in the affected individuals (0.37) differed from that in the controls (0.30) in the case-control study. Also the percentage of individuals with S1S1 and S1S2 genotypes was 61% for cases and 51% for controls [odds ratio (OR) and 95% confidence interval (CI): 1.48 (1.04-2.10; p=0.03)]. Thus for the first time, this study demonstrates a genotype-disease relationship in the Indian population and a probable linkage of the Apo C111 locus with CAD.

A Rare Cause of Acute Coronary Syndrome Resulting from Polycythemia

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A 42-year-old male without any history of diabetes mellitus, smoking, hypertension, dyslipidemia or any other obvious coronary risk factors presented to our emergency department with acute onset retrosternal chest discomfort of 30 min duration. The serial electrocardiograms (ECGs) revealed T inversion in V1-V5 without any ST depression or new Q waves. After one hour of hospitalization the patient became pain-free with low molecular weight heparin (LMWH) and other antianginals. The patient remained hemodynamically stable. His serial troponin (Trop I) values were elevated (Trop I at 6 hours 2.48 mcg/dl and after 12 hours 3.4 mcg/dl). On clinical examination, there was mild conjunctival congestion. His hemoglobin was 18.6 gm/dl with PCV of 58% at the time of admission. His echocardiographic study (Echo) revealed hypokinesia of apical interventricular septum (IVS), apex and partly anterior wall with left ventricular ejection fraction (LVEF) of 50%. He was subjected to coronary angiography which revealed no significant coronary artery disease (CAD) or thrombus with TIMI III coronary flow. There was hypokinesia of anterolateral and apical segment in LV angiogram in right anterior oblique (RAO) view. His three subsequent serial hemoglobin levels were >18 gm/dl and all the PCV values were >55%. In further hematological evaluation he was found to have polycythemia. We reviewed the literature which revealed few case reports of polycythemia with various spectrum of acute coronary syndrome including ST elevation myocardial infarction (MI). To conclude, polycythemia could be a rare cause of acute coronary syndrome. Therefore hemoglobin and PCV assessment should be a routine investigation in all cases of ACS particularly in young patients with ACS without any obvious conventional coronary risk factor.

Clinical Profile of Patients of Angina with Slow Flow and Normal Coronary Angiogram

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We analyzed the angiograms of patients who had come with classical history of chest pain and had slow flow in the coronary arteries. Patients with structural heart disease were excluded from this study. We defined the slow flow as corrected TIMI frame count (CTFC) ≥ mean of 13 at a frame rate of 12.5/ s, that is, >2 standard deviations of mean CTFC (9.0±1.4) calculated for the 100 Indian patients with normal coronaries and normal flow (TIMI grade III) performed at our laboratory. Clinical profile of the 45 patients showing slow flow in the
A Coronary Heart Disease

Indian Heart J 2005; 57: 381–425

Coronary Syndrome in a Tertiary Care Centre

Angiographic Profile of Patients with Acute Coronary Syndrome in a Tertiary Care Centre

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We conclude that slow flow is more common in female patients. Females were younger than males by a decade in our study. Hypertension, diabetes mellitus, and dyslipidemia are more commonly associated in both females and males. Smoking is the commonest association in male patients. All females were pre-menopausal.

Angiographic Profile of Patients with Acute Coronary Syndrome in a Tertiary Care Centre

Total number of admissions over a period of six months with a diagnosis of unstable angina/non-ST elevation myocardial infarction (NSTEMI) were 502 patients. Of this, 317 patients were treated as unstable angina and 185 patients as NSTEMI, based on the troponin I values. Among the NSTEMI patients, 40 underwent coronary angiogram. Only one patient had normal coronary arteries. Majority (60%) had triple vessel disease. More patients were having left ventricular (LV) dysfunction, compared to unstable angina cohort. Of the 317 patients, the diagnosis of unstable angina, with electrocardiographic (ECG) changes and typical symptoms, 270 (54%) had 3-vessel disease involving 270 (54%) diabetics and 48 (24%) non-diabetics. Diabetic cohort had significantly higher 3-vessel disease involving 270 (54%) versus 24 (12%) in non-diabetics. Single vessel disease involvement correspondingly in diabetics and non-diabetics was 107 (21.4%) and 84 (42%), respectively (p<0.001). Diffuse lesions were observed in 235 (47%) diabetics and 48 (24%) non-diabetics. Diabetic cohort had significantly higher 3-vessel disease involving 270 (54%) versus 24 (12%) in non-diabetics. Single vessel disease involvement correspondingly in diabetics and non-diabetics was 107 (21.4%) and 84 (42%) whereas 2-vessel disease occurred in 120 (24%) and 62 (31%). Left main coronary artery (LMCA) involvement was higher in diabetic cohort – 185 (37%) versus 42 (21%) (p<0.001) patients. Bifurcation lesions were higher in diabetics – 215 (43%) versus 24 (12%); calcified lesions were observed in 348 (68%) diabetics versus 76 non-diabetics (38%).

We conclude that slow flow is more common in female patients. Females were younger than males by a decade in our study. Hypertension, diabetes mellitus, and dyslipidemia are more commonly associated in both females and males. Smoking is the commonest association in male patients. All females were pre-menopausal.

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Role of 64-Slice Spiral-Computed Tomographic Angiography in the Evaluation of Coronary Artery Disease

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Coronary angiography (CAG) is the gold standard for evaluation of the luminal narrowing of coronary arteries. An accurate non-invasive technology for the diagnosis of coronary artery disease (CAD) will be advantageous. Impressive image quality and non-invasive nature of multislice computed tomography angiography (CTA) makes it a powerful tool in the evaluation of CAD. In addition, cardiac CTA also evaluates the vessel wall. With the current generation scanners, the correlative accuracy has improved markedly. This study sought to investigate the accuracy of 64-slice CT in the evaluation of significant CAD as compared to coronary angiography. Thirty-one consecutive patients (mean age 50.9±8.8 years) who had undergone CAG for evaluation of CAD were included in the study. The study population also included one post-coronary artery bypass grafting (CABG) and 4 post-stent patients. All the patients were subsequently subjected to imaging by 64-slice CT angiogram by the standard protocol after adequate beta-blockade. Patients with a high calcium score >400 were excluded. Both CAG and multislice CT were analyzed by two independent investigators. All vessels >1.5 mm were considered for assessment of significant coronary artery stenosis (diameter reduction >50%). The coronary arteries were segmented according to the guidelines of the American Heart Association. One patient was excluded because of high calcium scores. Of the 360 segments studied, 97% segments had satisfactory image quality. Out of four patients with stented segments, the lumen could be adequately imaged in 3 patients. The sensitivity, specificity, positive predictive value and negative predictive value in our study were 92%, 98%, 90% and 99%, respectively. CTA correctly identified all 4 patients having no significant stenosis on invasive angiography. Multislice CT provides high diagnostic accuracy in assessing coronary artery stenosis.

Non-Invasive Coronary Angiography with High-Resolution Multidetector Row-Computed Tomography: Single Centre Experience

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A new generation of multidetector row-computed tomography (MDCT) (Brilliance 40, Philips Medical Systems) scanners allow complete coronary coverage using electrocardiographic (ECG) gating and 1 mm slices. We present our preliminary experience of the potential of high resolution MDCT angiography with ECG gating for detection of coronary artery stenosis. A total of 10 patients underwent both MDCT and conventional coronary angiography. After intravenous injection of a non-ionic contrast medium the entire heart was scanned within a single breath hold using 1 mm slices. All MDCT data sets were reconstructed with retrospective gating at 20% to 80% in increments of 10% relative to the cardiac cycle. Two reviewers analyzed image quality for segments 1-4 right coronary artery (RCA), 5-10 left main coronary artery (LMCA), and left anterior descending (LAD), and 11-12 left circumflex (LCx) artery. These segments were evaluated for the presence or absence of significant (50%) stenosis. The results were compared with those of invasive coronary angiography. Out of a total of 120 segments analyzed by MDCT coronary angiography, 97 were found normal, 23 had significant lesions. These 10 patients underwent coronary angiography within two weeks of MDCT angiogram. Compared with conventional angiography, 2 lesions [1 each in posterior descending (PDA) and RCA] were missed by MDCT, 1 lesion (acute marginal) was overdiagnosed and in 2 lesions severity was significantly underestimated. For all other segments and lesions, results of both conventional and MDCT coronary angiography were concordant. The study is ongoing and final results will be presented. High-resolution MDCT angiography with ECG gating permits the non-invasive detection of coronary artery stenosis with high accuracy if image quality is optimized for each of the three major coronary arteries.

One-Year Follow-up of Patients with Triple Vessel Disease (Recommended CABG) on Intense Medical Management

Aashish Contractor, Pradnya Salgaonkar, Jigar Shah, Sangeetha Subramanium, Siddhartha Angadi, Ramakanta Panda
Asian Heart Institute, Mumbai

Forty-eight patients who were diagnosed with triple vessel coronary heart disease (CHD), and advised coronary artery bypass graft (CABG) surgery by their interventional cardiologist, consulted our cardiovascular surgeon. On reviewing the angiography, the surgeon opined that surgery could be deferred, and recommended intense medical management, for which the patients were enrolled in the cardiac rehabilitation program. Their risk factors were aggressively controlled both pharmacologically and with lifestyle modification, according to international guidelines: blood pressure (BP) below 120/80 mmHg; total cholesterol <200 mg/dl; triglycerides <150 mg/dl; low-density lipoprotein (LDL) cholesterol <100 mg/dl; high-density lipoprotein (HDL) cholesterol >40 mg/dl. Other goals included smoking cessation, tight blood glucose control in diabetics, daily physical activity of at least 30 min, and a diet low in saturated fat and high in complex carbohydrates, fruits and vegetables. Patients
were followed-up thrice a week for an average duration of 33 sessions (~3 months). They were made to exercise under telemetry supervision for duration of 45-60 min at an intensity of 60-80% of maximal heart rate. Their diets were analyzed through a 3-day food recall and appropriate recommendations made, to keep their total fat intake <30%, and saturated fat intake <7%. Their BP was evaluated at each visit, both at rest and during exercise. Diabetics had their blood sugar measured before and after exercise. Their anti-diabetic medications were titrated according to their responses. Lipid profiles were measured every 3 months. To achieve these risk reduction targets, medication changes were made in conjunction with the patient's cardiologist. At the time of reporting all 48 patients were stable and had not experienced a cardiac event, including myocardial infarction (MI) or coronary intervention. Of these, 18 patients had completed one year from the time of their initial angiography. With aggressive medical management and lifestyle modification, coronary intervention can be avoided in selected cases of patients with triple vessel CHD.

Prognostic Value of TIMI Score in ST Elevation Myocardial Infarction in Indian Patients
Cherian George, F Sushmita, B Isaac, M J Santhosh, GG Shetty, K Varghese, CB Patil, SS Iyengar
St John's Medical College, Bangalore

Considerable variability in short-term mortality risk exists among patients with ST-elevation myocardial infarction (STEMI). Risk assessment of these patients helps in triage and therapeutic decisions. This study reports the assessment of risk among 74 consecutive patients who presented with STEMI to our hospital between August 2004 and April 2005. The TIMI risk score was used to calculate the risk of these patients so that each patient obtained a score between 0 and 14. The mean age of the patients was 58.42±12.28 years and 16% were females. Hypertension and diabetes were present in 42% each, 51% had dyslipidemia and 23% were smokers. Anterior or lateral wall infarction was present in 58% of the patients while rest had inferior wall infarction; 65% of these patients were thrombolysed, 47% received streptokinase and the rest 18% received tissue plasminogen activation (tpa). Fourteen percent patients underwent primary percutaneous transluminal coronary angioplasty (PTCA) and rest 21% were not thrombolysed due to late presentation. The number of patients with risk scores of 0, 1, 2, 3, 4, 5, 6, 7, 8 and >8 were 0, 7, 4, 13, 16, 7, 10, 5, 6 and 8, respectively. The 30-day mortality rates of patients with each score were 0%, 0%, 0%, 7.69%, 12.5%, 14.2%, 20%, 20%, 33.33% and 33.33% as against 0.8%, 1.6%, 2.2%, 4.4%, 7.3%, 12.4%, 16.1%, 23.4%, 26.8% and 35.9% in the original study (TIME II trial). The similarity of the mortality rates between the study groups indicates the usefulness of the TIMI score in patients with STEMI in risk assessment.

Coronary Artery Disease in Young: Risk Factors and Angiographic Analysis
SN Routray, CK Mishra, S Rout, A Mishra, HN Mishra, M Behera
SCB Medical College, Cuttack

The prevalence of coronary artery disease (CAD) in young (<40 years of age) is rapidly increasing in developing countries like India. This study was undertaken with the aim of identification and determination of the relative role of coronary risk factors in premature CAD, and to assess the pattern and severity of coronary artery lesions in this subgroup with a view to correlate them with the risk factors in patients from this part of the country. Ninety-six patients of 40 years or less who had undergone coronary angiography during the period from January 2003 to May 2005 were included in this study. The mean age was 36.3 years (range: 12-40 years) and 94% were male. Acute myocardial infarction (MI), chronic stable angina (CSA), unstable angina (UA) and atypical chest pain were present in 63, 14, 6 and 13 patients, respectively. Normal left ventricular (LV) function (ejection fraction (EF) > 50%) was present in 47%, mild LV dysfunction (EF 35 - 49%) in 45% and severe LV dysfunction (EF < 35%) was present in 8% of patients. Dyslipidemia, smoking and hypertension were present in 88%, 40% and 30% of cases, respectively. Coronary angiography revealed no significant disease in 21% and single vessel disease (SVD), double vessel disease (DVD) and triple vessel disease (TVD) in 47%, 17% and 16% of patients, respectively. Five patients had additional left main disease. It was observed that dyslipidemia and smoking are the major risk factors associated with CAD in young and SVD involvement particularly that of left anterior descending artery (LAD) was common.

Coronary Angiographic Profile in Diabetics and Non-Diabetics: A Comparative Study
Girish K Sonwalkar, KS Somashekar
SDM College of Medical Sciences, Dharwad (MS)

Coronary angiography (CAG) is presently the gold standard investigation in the evaluation of coronary artery disease (CAD). This study is a retrospective analysis of the angiographic
profile of 1425 patients who underwent CAG in our institution between 1996 and 2004. The clinical indications for CAG were stable angina, unstable angina and post-myocardial infarction (MI) angina. Consecutive patients (n=1425) were subjected to cardiac catheterization for evaluation of suspected ischemic heart disease (IHD); 1420 patients through femoral artery and 5 through brachial artery. CAD was defined as >50% diameter stenosis in one of the vessels. Out of 1425 patients, 1078 had significant CAD, and 415 (30%) were diabetic. Out of 1078 patients, 404 (38%) had single vessel disease (SVD), 300 (27%) had double vessel disease (DVD) and 374 (35%) had triple vessel disease (TVD). Out of 374 TVD cases, 68% were diabetic and only 32% were non-diabetic. Individual coronaries involved were left anterior descending (LAD): 943 (63%), right coronary artery (RCA): 614 (43%), left circumflex (LCx): 507 (36%), diagonal and obtuse marginal (OM): 268 (18%) each, posterior descending artery (PDA): 57 (4%) and left main coronary artery (LMCA): 48 (3%). LAD was the commonest vessel involved. TVD was significantly common in diabetics. LMCA disease involvement in diabetics was common when compared with non-diabetics i.e. 59% in diabetics.

**A Comparison of Two Loading Dose Strategies of Clopidogrel in Thrombolyzed Patients of ST Elevation Myocardial Infarction**

Sudhir Varma, Haripreet Singh, Madanjit Singh, Tapan Ghoshe, Arun Chopra, Balbir Singh, Upendra Kaul
Sadbhavna Medical and Heart Institute, Patiala

Clopidogrel, a thienopyridine adenosine diphosphate (ADP) platelet receptor blocker, is in focus for its concomitant use with thrombolytics in ST elevation myocardial infarction (STEMI) and with encouraging results. This study evaluated two loading dose strategies (Group A: 300 mg, Group B: 600 mg) of clopidogrel in STEMI. Consecutive eligible patients admitted and thrombolysed in our CCU, from January 2003 onward were included. These two subsets (Group A, n=131) and (Group B, n=122) were studied for demographic profile, risk factors and 30-day outcome. Both groups also received usual drugs post-thrombolysis including aspirin, nitrates, beta-blockers, angiotensin-converting enzyme (ACE) inhibitors, calcium blockers, antiagulants etc. There were more current smokers (16.8% v. 12.3%) in group A and more patients in Killip class >1 in Group B (34.3% v. 41.0%). In Group B, there was significantly lower mortality (9.1% v. 5.7%, p<0.01) in patients receiving higher loading dose of clopidogrel, fewer events of cardiogenic shock (9.9% v. 5.7%) and heart failure (13.7% v. 9.0%) and more major bleeding episodes (4.1%). Clopidogrel in higher loading dose may favorably alter the short-term outcome in thrombolysed STEMI patients.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Group A (n=131)</th>
<th>Group B (n=122)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>57.06±11.0</td>
<td>55.6±10.2</td>
</tr>
<tr>
<td>Males</td>
<td>96 (73.28%)</td>
<td>98 (80.32%)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>68 (51.90%)</td>
<td>59 (48.36%)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>179</td>
<td>176</td>
</tr>
<tr>
<td>Current smokers</td>
<td>37 (28.24%)</td>
<td>37 (30.32%)</td>
</tr>
<tr>
<td>Killip class &gt;1</td>
<td>22 (16.79%)</td>
<td>15 (12.30%)</td>
</tr>
<tr>
<td>Mortality</td>
<td>45 (34.35%)</td>
<td>50 (40.98%)*</td>
</tr>
<tr>
<td>Recurrent ischemia</td>
<td>12 (9.16%)</td>
<td>7 (5.73%)*</td>
</tr>
<tr>
<td>Stroke</td>
<td>2 (1.52%)</td>
<td>1 (0.81%)</td>
</tr>
<tr>
<td>Life-threatening arrhythmia</td>
<td>12 (9.16%)</td>
<td>8 (6.55%)</td>
</tr>
<tr>
<td>Cardiogenic shock</td>
<td>13 (9.92%)</td>
<td>7 (5.73%)*</td>
</tr>
<tr>
<td>Revascularization</td>
<td>6 (4.58%)</td>
<td>6 (4.91%)</td>
</tr>
<tr>
<td>Heart failure</td>
<td>18 (13.74%)</td>
<td>11 (9.01%)*</td>
</tr>
<tr>
<td>Major bleeding</td>
<td>2 (1.52%)</td>
<td>5 (4.09%)*</td>
</tr>
</tbody>
</table>

*p<0.05; Group A loading dose: 300 mg, Group B loading dose: 600 mg

**Aspirin versus Clopidogrel plus Aspirin in Patients with ST Elevation Myocardial Infarction Treated with Thrombolytic Therapy**

V V Radhakrishnan, M Athew Iype, K Sivaprasad, P Nini Gupta, A George Koshy, S Tennyson, K Suresh, CG Bahuleyan
Medical College Hospital, Thiruvananthapuram

This study was conducted to assess whether the addition of clopidogrel to aspirin in patients with acute STEMI treated with thrombolytic therapy reduce the incidence of primary end points like death, re-infarction, recurrent ischemia, need for target vessel revascularization (TVR) and bleeding manifestations. This a randomized open labeled case control study. Patients admitted to intensive coronary care unit (ICCU) with acute STEMI were randomized to aspirin (Group A) or aspirin plus 300 mg of clopidogrel followed by 75 mg of clopidogrel (Group B) before thrombolytic therapy with streptokinase. These patients were followed for in-hospital events like death, re-infarction, recurrent ischemic events, need for TVR and for safety aspects of bleeding manifestation. At one month, these patients were assessed for incidence of secondary end points like death, myocardial infarction (MI), recurrent ischemic events and need for revascularization. A total of 80 patients were enrolled in this study. In Group A, out of 38 patients, 29 (76%) were males and 9 (24%) females. In Group B, out of 42 patients 35 (83%) were males and 7 (17%) females. The mean age in Group A was 56 years and in Group B, 55 years. 23 patients in Group A (60%) had anterior wall myocardial infarction (AWMI) and 15 (40%) had non-AWMI, whereas in Group B, 20 (47%) had AWMI and 22 (53%) had non-AWMI.
One month follow-up data was available for 25 patients of which 1 patient in group A had recurrent ischemic events. This study shows that the addition of loading dose of clopidogrel.

**Risk factor profile**

<table>
<thead>
<tr>
<th>Group</th>
<th>HTN</th>
<th>DM</th>
<th>Dyslipidemia</th>
<th>Smoking</th>
<th>PVD</th>
<th>Post-menopausal</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>16</td>
<td>9</td>
<td>31</td>
<td>26</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>B</td>
<td>18</td>
<td>14</td>
<td>38</td>
<td>30</td>
<td>4</td>
<td>7</td>
</tr>
</tbody>
</table>

**Primary endpoints**

<table>
<thead>
<tr>
<th>Group</th>
<th>Death</th>
<th>Re-infarction</th>
<th>Recurrent ischemia</th>
<th>Need for TVR</th>
<th>Bleeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3 (7.8%)</td>
<td>3 (7.9%)</td>
<td>10 (26.3%)</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>0 (0%)</td>
<td>1 (2.3%)</td>
<td>0</td>
<td>1</td>
<td>2 (4.7%)</td>
</tr>
</tbody>
</table>

HTN: hypertension; DM: diabetes mellitus; PVD: peripheral vascular disease; TVR: target vessel revascularization

Risk stratification of patients with acute myocardial infarction (MI) is based on clinical evaluation, electrocardiogram (EKG), biochemical markers and various risk assessment scores. There is emerging evidence that N-terminal pro brain natriuretic peptide (NT-proBNP) possess several characteristics of an ideal biomarker. In this study we looked into the role of NT-proBNP in risk stratification and prediction of short-term events including mortality in patients presenting with acute MI and having preserved left ventricular (LV) functions as assessed by ejection fraction (EF) on echocardiography. A total of 100 consecutive patients admitted with a diagnosis of acute STE elevation myocardial infarction (STEMI) were enrolled. Serum NT-proBNP was measured using electro electromechanical assay (Roche Diagnostics) on the Elecsys 2010 system. On two-dimensional (2D) echocardiography, modified Simpson’s technique was used to measure the EF and 42 patients were found to have EF >50% (22 with anterior MI and 20 with inferior MI). Other demographic variables, echocardiographic parameters and risk scores were also assessed. Follow-up at day 30 included a 2D echocardiography evaluation and assessment for worsening heart failure, recurrent ischemia, and repeat hospitalization. Death due to cardiovascular cause by 30 days was also noted. The mean value of NT-proBNP for the whole cohort was 2307±2287 pg/ml. For those having EF>50%, mean NT-proBNP was 1542.38±4649.12 pg/ml. For the purpose of comparative analysis the median value was determined (907.5 pg/ml). In patients having NT-proBNP above median the Killip class was higher 1.62 ±0.21 versus 1, the TIMI acute MI scores were worse 4.77±1.56 versus 2.71±1.11 while EF was similar 59.72±8.8% versus 58.76±6.9% (p<0.05) At 30 days follow-up, there was a further decline in Killips class and EF in those having NT-proBNP above median, and clinical outcomes (recurrent ischemia, heart failure and repeat hospitalization) were worse in this group (p<0.05). Thus NT-proBNP emerged as a strong prognostic tool across the spectrum of acute MI and had the strong predictive value for short-term adverse outcomes even among patients presenting with preserved LV functions as assessed by EF.

**Multi Markers Approach for Risk Stratification of Patients with Acute Coronary Syndromes**

Aniket Puri, Amit Jain, Nishant Gupta, Sandeep Kumar, SK Dwivedi, VS Narian, RK Saran, VK Puri

King George Medical University, Lucknow

In patients with acute coronary syndromes (ACS), troponin-T (TnT), high sensitive C-reactive protein (hsCRP), and B-type natriuretic peptide (NT-proBNP) each predict adverse cardiac events. In the West, it has also been seen that a multi marker approach incorporating all these three markers is beneficial in proper risk assessment in patients of ACS, but little is known about the utility of these biomarkers in combination in the Indian population, who have a different demographic and risk profile. We studied 72 patients of ACS, who had survived the first two days of hospitalization at our centre. Baseline estimation of TnT, hsCRP, and NT-proBNP were done in all the patients apart from the routine biochemical and a detailed echocardiographic study of regional wall motion abnormality (RWMA) score and ejection fraction (EF) calculated by modified Simpson’s method. TnT estimation was done by electrochemiluminescence’s immunoassay technique while hsCRP estimation was done by turbidimetric immunoassay using the QUANTA hsCRP reagent kit. NT-pro BNP was measured on all fasting samples using the Elecsys 2010 on pro BNP electrochemiluminescence's sandwich assay kit, provided by Roche. Of the total 72 patients, 58 had non-ST elevation myocardial infarction (NSTEMI), while 14 had unstable angina (USA). In the NSTEMI group, 34 patients had an elevation of all the three biomarkers, while 18 and 6 in this group had an elevation of two and single biomarkers, respectively. Out of 14 patients in the USA group, 10 had elevated NT-proBNP and hsCRP both, while 4 patients had an elevation in either of the two. When all the patients were categorized according to the elevation in the number of biomarkers, it was seen that end-systolic volume was higher while EF and deceleration time were significantly lower (p<0.01) in the patients having elevation of all the three biomarkers. The RWMA score also showed similar and significant co-relation (p<0.01) with an increase in the number of biomarkers. There was an increased incidence of recurrent ischemia, myocardial infarction, and congestive heart failure, recurrent ischemia, and congestive heart failure, recurrent ischemia, and congestive heart failure, recurrent ischemia, and congestive heart failure, recurrent ischemia, and congestive heart failure.
heart failure at 30 days of follow-up in the group having an elevation of all the three biomarkers. There were 4 deaths in the NSTE MI group. NT-proBNP in this group had a mean of 6330±3334 pg/ml whereas CRP was 6.2±3.1 mg/dl and TnT mean was 2.8±1.3 ng/ml. Thus, TnT, hsCRP, and NT-proBNP each provided unique prognostic information in patients with ACS. A simple multi marker strategy that categorizes patients based on the number of elevated biomarkers at presentation allows risk stratification in the Indian population as well.

Profile and Prevalence of Aspirin Resistance in Patients with Stable Coronary Artery Disease and in Patients with Established Coronary Artery Disease on Daily Aspirin Presenting with Acute Coronary Syndrome

Sandeep Kumar, Aniket Puri, Amit Jain, Nishant Gupta, SK Dwivedi, VS Narain, RS Saran, VK Puri
King George Medical University, Lucknow

Antiplatelet effect of aspirin is not uniform in patients of coronary artery disease (CAD), resulting in breakthrough coronary events despite being on this drug. This study was initiated to prospectively evaluate the prevalence of aspirin resistance in patients with stable CAD and in patients with established CAD presenting with acute coronary syndrome (ACS) despite daily regular aspirin, and further clarify the clinical predictors of aspirin resistance. Blood sample of 48 patients with stable CAD and 52 patients of known CAD presenting with ACS who were receiving aspirin (150 mg/day for>7 days) but no other non-steroidal antiinflammatory/antiplatelet drugs were analyzed for aspirin resistance by optical aggregation using adenosine diphosphate (ADP) and arachidonic acid (AA). Aspirin resistance was defined as a mean aggregation of > 70% with 10 µmole ADP and mean aggregation of > 20% with 0.5 mg/ml of AA. A aspirin semiresponders were defined as meeting one but not both of the above criteria. In the stable CAD group, 1 (2.09%) patient was found to have aspirin resistance; 19 (39.58%) semi responders and 28 (58.33%) were aspirin-responsive. In the established CAD patients regularly on aspirin presenting with ACS group, 3 (5.76%) were aspirin-resistant, 25 (48.07%) were semi responders and 24 (46.17%) were aspirin responders. There was a trend for females to be semi responsive (p=0.08). All other parameters tested i.e. age, smoking, diabetes, hypertension, obesity, lipids, hemoglobin, platelet count, ejection fraction and concomitant drug intake did not show any statistically significant difference between responders and semi-responders of either group. To conclude, a significant 41.66% patients in stable CAD and 53.88% in known CAD with ACS despite regular daily aspirin showed inadequate response to aspirin therapy, which could not be predicted by other clinical predictors for this condition. This may have clinical and therapeutic implications in the current era of newer antiplatelet drugs.

Clinical Profile and Follow-up of Patients with Two-Vessel Coronary Artery Disease Not Involving Left Anterior Descending Artery

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We studied the clinical profile, and followed up patients with two-vessel disease not involving left anterior descending (LAD) artery. Ninety-eight patients with angiographic diagnosis of circumflex and right coronary disease between 1997 and 2003 were followed up. Mean age was 54.7 years (range: 35 - 76 years), 86 patients were males and 12 were females; 35.7% of patients had diabetes mellitus. 59.2% had systemic hypertension, 65.3% patients were smokers, 40% patients had total cholesterol > 180 mg% or low-density lipoprotein (LDL) >130 mg%, 70% patients had high-density lipoprotein (HDL) <40 mg%, 84.7% patients were in NYHA functional class II at the time of angiogram. Seven patients were asymptomatic; 26.5% had stable angina, 17.3% had unstable angina, 63.3% patients suffered from myocardial infarction (MI); 60.2% patients had inferior wall MI, 9.2% had lateral wall MI and 51% had right ventricular infarction; 49% had positive exercise stress test, 52% patients had pathological Q wave, 33.7% had T wave inversion in leads without Q waves, 8.2% patients had left ventricular systolic dysfunction, 50% had some degree of mitral regurgitation (MR), while 6.1% had significant MR defined as grade 3. Non-elective mitral valve replacement; 40.8% had disease involving proximal circumflex, 37.8% had distal circumflex disease, 46.9% had disease of major obtuse marginal. Proximal, mid and distal right coronary disease was found in 45.9%, 48% and 18.4% patients, respectively. 40.8% patients had revascularization; 36.7% underwent successful percutaneous coronary intervention (PCI), 61.6% had coronary artery bypass grafting (CABG). Revascularization correlated with presence of circumflex disease, but not with right coronary disease. Significant MR did not correlate with ventricular dysfunction and lesion location but with lateral wall infarction. Follow-up ranged between 1 to 7 years. Five patients had unstable angina and two had MI during follow-up; 13 patients had repeat angiogram and 4 patients had instant restenosis. Three patients developed complete heart block during follow-up requiring permanent pacemaker implantation.
Diagnostic Accuracy of Multi Slice CT Coronary Angiography in Patients Presenting with Chest Pain

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Escorts Heart Institute and Research Centre, New Delhi

Non-invasive coronary angiography with 16-slice multislice computed tomography (MSCT) has shown potential in detecting significant coronary stenosis. The aim of this prospective clinical trial was to assess the diagnostic accuracy and clinical relevance of MSCT coronary angiography in patients presenting with acute chest pain. Forty-six patients (mean age 55±18 years, 91.3% male) presenting to hospital with acute chest pain, underwent coronary MSCT angiography followed by a conventional angiography. Patients with definite acute coronary syndrome, prior coronary artery bypass grafting (CABG) and patients requiring immediate catheterization were excluded. Further major exclusion criteria were atrial fibrillation and renal impairment. Coronary MSCT was acquired with a 16-slice CT using retrospective electrocardiographic (ECG) gating. Blinded visual assessment of coronary MSCT was performed on a 11-segment model after image quality assessment. The accuracy of coronary MSCT was compared with conventional coronary angiography (CCA) to detect significant stenosis (>50%); 46 patients underwent both MSCT coronary angiography and CCA. Risk factor analysis revealed 41.3% diabetic, 56.5% hypertensive, 13% smoker and 43.4% with positive family history of coronary artery disease (CAD); 32% patients had ≥2 major risk factors. Prevalence of significant CAD was 54.3%; 506 segments were assessed by MSCT of which 7.1% were non-analyzable. Mean calcium score was 348.16 and 16.6% patients had coronary calcification score >800. The overall ability of coronary MSCT to detect the presence of significant stenosis in all native segments had a sensitivity of 80.0% and specificity 98.9%, a positive predictive value (PPV) 90.9% and negative predictive value (NPV) of 97.4%, with accuracy of 96.8%. On exclusion of patients with significant lesion calcification, MSCT had a sensitivity of 85.3%, specificity of 98.7%, PPV of 89.7% and NPV of 95.6%. The ability of MSCT to detect the presence of at least one significant coronary stenosis in all native segments had a sensitivity of 87.5% and specificity of 100%. In a patient cohort presenting with chest pain and multiple risk factors, MSCT is an accurate modality to rule out significant coronary stenosis.

A New Subset of Ventricular Septal Rupture following Acute Myocardial Infarction

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Kerala Institute of Medical Sciences, Thiruvananthapuram

Ventricular septal rupture (VSR) is a rare (incidence: 1-2%) but lethal complication following myocardial infarction (MI). The incidence is less following thrombolytic therapy (0.2%). Here we report two cases of VSR following percutaneous transluminal coronary angioplasty (PTCA) and stenting to the infarct-related artery. The first case involved a 65-year-old female who was not thrombolyzed following anterior wall MI, had PTCA and stenting to proximal left anterior descending (LAD) on day 5 of MI and developed apical muscular VSR 36 hours after the procedure. The second case was of a 56-year-old female who was thrombolyzed for anterior wall MI. PTCA was done to LAD and was noted to have apical muscular VSR immediately after PTCA. Although the prognosis of patients who develop VSR is supposed to be grave without immediate surgical repair, both of our patients remained hemodynamically stable at discharge and during follow-up. The development of VSR following MI in patients who are revascularized is rare and found to be associated with a relatively favorable outcome. This subset of patients with VSR may become more commonly recognized in future.

Impact of Diabetes Mellitus on Outcome of Patients with Acute Coronary Syndrome

Niraj Gupta, Govind Goyal, Pankaj Gupta, M anohar Shinde, M anish Bansal, Ravi R Kadiwal
Escorts Heart Institute and Research Centre, New Delhi

Diabetes mellitus is known to have adverse impact on the clinical course and prognosis of patients presenting with acute coronary syndrome (ACS). For devising better treatment strategies for these patients, we retrospectively studied clinical parameters, treatment given and in-hospital events of diabetics in ACS. Consecutive patients of ACS (n=600) admitted to our institute from January 2005 to March 2005 were enrolled. In-hospital and discharge management and in-hospital outcomes data were collected and analyzed. Out of 600 patients, 170 were diabetic at the time of admission and 25 were diagnosed to have diabetes during hospital stay. 195/600 (32.5%) had diabetes mellitus as risk factor. Diabetic patients were older (mean age 60.2 years v. 56.8 years), more frequently men (64.6% v. 59.2%). Diabetic patients had unfavorable clinical presentation compared to non-diabetics, 17.9% were in Killip class III/IV as compared to 9.1% among non-diabetics. Diabetics were treated less often with beta-blockers both during hospitalization (66.1% v. 78.0%) and at discharge (68.2% v. 81.4%). Both in-hospital and at discharge,
The importance of electrocardiography (ECG) in predicting prognosis as early as 40 min and 120 min from the start of thrombolysis is not completely understood. This was a descriptive study conducted in 100 patients with first episode of acute myocardial infarction (MI) with ST segment elevation who were admitted in intensive coronary care unit (ICCU) within the window period. All patients underwent thrombolytic therapy with streptokinase. Three electrocardiograms (ECGs) are taken at onset, at 40 min and at 120 min. ST resolution was calculated. These patients were followed up for 24 hours and one month. The parameters noted were death, recurrent ischemia and heart failure. Echocardiographic evaluation was also done. Adverse cardiac events were noted in 27 patients at 24 hours and 36 patients at 1 month. Among the 27 patients, 19 had <30% ST resolution at 40 min ($\chi^2=6.33$, $p=0.04711$). Among the 36 patients 30 had <30% ST resolution at 40 min ($\chi^2=7.86$, $p=0.0050$). OR=4.41, confidence limit =1.48 – 13.73). Out of 27 patients, 26 had <70% ST resolution at 40 min (Fisher’s exact test, $p=0.6706$). Among 36 patients, all had <70% ST resolution at 40 min (Fisher’s exact test, $p=0.04711$).

27 patients who developed adverse cardiac events at 24 hours, 11 had ST resolution of <30% at 120 min ($\chi^2=2.65$, $p=0.1033$). Out of 36 patients who had adverse cardiac events at 1 month, 18 had <30% ST resolution ($\chi^2=13.33$, $p=0.00026$) at 120 min. Among 27 patients, 23 had <70% ST resolution at 120 min <30% ($\chi^2=2$, $p=0.1569$). All the 36 patients had <70% ST resolution at 120 min (Fisher’s exact test, $p=0.04711$). All the patients who developed adverse cardiac events viz. death, MI, recurrent ischemia or heart failure had ST resolution ≤70% both at 40 min and 120 min. This study points out that an ECG taken as early as during thrombolysis i.e. 40 min from the start of streptokinase is a useful predictor of patients who are at risk of developing adverse cardiac events. It also helps to predict the need for rescue angioplasty as early as 40 min during thrombolysis.

**Fraxiparine versus Unfractionated Heparin in Unstable Angina or Non-ST Elevation Myocardial Infarction**

Biswarup Sarkar, AK Khan, AK Satpati, BK Chatterjee
Calcutta National Medical College and Hospital, Kolkata

This study aimed to assess the benefit of short-term low molecular weight heparin, fraxiparine compared with unfractionated heparin (UFH) in unstable angina (UA) or non-ST elevation myocardial infarction (NSTEMI). It was a prospective, randomized study conducted between December 2004 and June 2005. A total of 150 patients of UA or NSTEMI were enrolled in the study. They were randomized to receive fraxiparine or UFH. The UFH group received an intravenous bolus of UFH 5000 IU followed by an activated partial thromboplastin time (APTT)-adjusted infusion of UFH for 5 days. The fraxiparine group received 0.8 ml subcutaneously twice daily for 5 days (5700 anti-Xa activity). Primary end point [composite of death and non-fatal myocardial infarction (MI)] was assessed at the end of 30 days after randomization. The secondary end point was composite of all-cause mortality, non-fatal MI, stroke or recurrent ischemia, urgent target vessel revascularization. Primary outcome occurred in 4.7% (14/300) patients assigned to fraxiparine group and 22.2% (19/85) of patients assigned to UFH group. No statistically significant differences were observed ($p=0.24$). Furthermore there were no statistically significant inter group differences (fraxiparine: 23% v. UFH: 22% at 30 days, $p=0.50$) regarding secondary outcome. No increased risk of bleeding was observed in fraxiparine group. Treatment with fraxiparine provides efficacy and safety similar to treatment with UFH, for same period in the management of UA or NSTEMI. One added advantage is that we do not need APTT measurement during fraxiparine treatment.
N-Terminal Pro-Brain Natriuretic Peptide as Prognostic Marker in Acute Coronary Syndrome
Biswaup Sarkar, AK Khan, AK Satpal, BKR Chattherjee
Calcutta National Medical College and Hospital, Kolkata

This study aimed to assess the prognostic significance of N-terminal probrain natriuretic peptide (BNP) in patients with acute coronary syndrome (ACS). We measured N-terminal proBNP in plasma specimen of 96 patients who were admitted in our intensive coronary care unit (ICCU) from September 2004 to June 2005 with ACS (excluding patients with ST elevation myocardial infarction (STEMI)). N-terminal proBNP was measured at the time of admission along with CK-MB and troponin T (TnT) and after 45 hours. The end point was composite of death, myocardial infarction (MI), recurrent angina, left ventricular failure (LVF), urgent revascularization assessed at the end of 30 days. There were 64 males and 32 females. Mean age was 62.20 years. Diabetes mellitus was present in 32 patients and hypertension was present in 40 patients. N terminal proBNP > 300 pg/ml was associated with increase in composite end points (66% vs 5.5%, p = 0.001). The influence of N-terminal proBNP on composite end points was independent of other factors. We conclude that measurement of N-terminal Pro-BNP in ACS [unstable angina (UA)/non-STEMI] has significant prognostic value.

Effect of Nebivolol on Exercise Testing and Effort Tolerance in Patients with Chronic Stable Angina
Vinod Thomas, Krishnakumar Nair, JMT Thirakan, VK Ajithkumar, Thomas Titus, T Anees, K Remash, D Pradeepkumar
Sree Chitra Tirunal Institute of Medical Sciences and Technology, Thiruvananthapuram

The aim of the study was to evaluate the clinical efficacy and safety of the beta-blocker nebivolol in chronic stable angina. Patients with chronic stable angina were evaluated clinically and by exercise stress testing with treadmill test (Bruce protocol) basally and after six weeks of treatment with nebivolol 5 mg daily. Out of 27 patients evaluated (mean age 52.56±7.5 years), 21 (77.8%) were males. There was no significant change in NYHA functional class. The basal walking distance was 1.86±0.9 km which increased significantly to 2.38±0.7 km following 6 weeks of treatment with nebivolol (p = 0.0001). The basal exercise time of 7.8±1.9 min increased to 8.7±1.5 min (p = 0.001). Total metabolic equivalents (METS) basally was 9.25±1.9 METS which increased to 10.05±1.4 METS (p = 0.002). The time to ST segment depression in any lead during exercise tolerance test decreased from 0.95±0.9 to 0.73±0.72 with p value nearing significance (0.075). The total number of leads showing ST segment depression decreased from 3.37±2.34 to 2.6±2.04 with p value nearing significance (0.65). The Duke’s score increased from 3.5±5.5 to 5.1±4.5 (p = 0.002). The rate-pressure product was 22216±5642 post-nebivolol which was significantly lower than the basal rate-pressure product of 24851±6465 (p = 0.002) despite significant increase in exercise time and metabolic equivalents achieved. The time to offset ST segment depression in the recovery phase was also significantly lesser post-nebivolol (pre: 3.59±3.2, post: 2.34±2.83, p = 0.038). No patient had any significant side effects. It may be concluded that in patients with chronic stable angina, treatment with nebivolol over a short period helps to improve effort tolerance with a lesser increase in rate-pressure product. It also improves the Duke’s score which correlates with the ischemic burden. The drug has no significant short-term adverse effects.

Prognostic Value of Myocardial Performance Index in Unstable Angina
SG Garg, RS Joshi, S Banerjee, J Naik
Rabindranath Tagore International Institute of Cardiac Sciences, Kolkata

A assessment of global myocardial performance index (MPI) has been suggested as an appealing parameter to assess systolic and diastolic left ventricular (LV) function. We sought to test the prognostic value of MPI in comparison to other biochemical parameters in patients with unstable angina. 315 consecutive patients with unstable angina were assessed within 24 hours of hospital admission. Doppler echocardiographic measures of systolic, diastolic and global myocardial performance were assessed. In addition ST changes, left ventricular ejection fraction (LVEF), C-reactive protein (CRP), troponion-T (TnT), along with clinical characteristics were assessed. This was followed by coronary angiography. The end point of the study at 7 days was recurrent angina, infarction, heart failure and severity of coronary artery disease (CAD) on angiography. Multivariate analysis identified age (OR 1.02, CI 1.03 to 1.64), ST changes (OR, 3.80, CI 2.45-5.1) TnT (OR 2.19, CI 1.45-3.1) and MPI (OR 2.11, CI 6.18-6.40) as independent predictor of adverse events. MPI along with TnT, ST changes and CRP is indicator of poor prognosis in patients with unstable angina.
Coronary Angiography
Radial Artery as a Route for Diagnostic Coronary Angiography
S Banerjee, BP Chatterjee, D Roy, P Sahoo
Rabindranath Tagore International Institute of Cardiac Sciences, Kolkata

Fifty-eight consecutive patients underwent transradial coronary angiography; their mean age was 58±2.5 years and maximum age 78 years. In two patients, radial artery could not be accessed (unsuccessful puncture in one case and inadequate flow in the other case). Eight patients had morbid obesity. In one case, occlusion in radial artery in mid forearm (confirmed by antegrade injection) was noted. 5 F diagnostic sheath was used in all cases. Single 5 F Tiger catheter (Terumo Inc.) was used for both left and right coronary artery cannulation in 52 cases. LV angiography was done with 5 F pigtail catheter (as Tiger catheter produced myocardial staining). For right coronary artery (RCA) cannulation, separate catheter was used in 6 patients (Multipurpose-3, AL 1-2, AL 2-1). Mean fluoroscopy time was 8.65± 1.8 min (2 min higher than transfemoral route). The maximum amount of dye used was 90 ml. Transient burning sensation was observed during injection of pre-medication. Three patients developed hypotension during procedure, which normalized after infusion of volume (nitroglycerine injection-induced). Three patients had left main (LM) equivalent disease. Transient disappearance of radial artery pulsation (<10 hours) was noted in 4 cases. On interrogation, 5 patients complained of mild discomfort over forearm. No other side effect was noted in these cases. The remaining 6 patients were discharged on the same day. To summarize, transradial coronary artery angiogram is feasible in most of the patients. Early hospital discharge and minimum local complication are important advantages over the transfemoral route.

Relationship Between Smoking and Coronary Plaque Morphology in Patients with Acute Myocardial Infarction after Failed Thrombolysis: An Angioscopic Study
Binayak Deb, Peter Crean, Michael Walsh
Rabindranath Tagore International Institute of Cardiac Sciences, Kolkata and St James' Hospital, Dublin, Ireland

The aim of this study was to observe the coronary plaque morphology in patients with acute myocardial infarction (MI) who had failed thrombolysis, and if a relationship existed between the plaque morphology and smoking status in these groups of patients. A total of 254 patients with acute MI received thrombolysis between October 1991 and June 1992. 39/254 (15%) patients had failed thrombolysis. The definition for failed thrombolysis being, recurrent chest pain and/or persistent ST elevation on the electrocardiogram (ECG). This subset of patients were subjected to coronary angiography, prior to urgent coronary angiogram and further revascularization process. Smoking status of this group of patients were recorded. The results were analyzed by logistical regression analysis. Angioscopic findings: 74% (29/39) patients had white thrombus, 17% (7/39) patients had mixed thrombus and 9% (3/39) patients had red thrombus. The analysis of smoking status in patients having failed thrombolysis revealed that 84% (33/39) patients were smokers while 16% (6/39) were non-smokers. The white thrombus group had 19 smokers compared to 2 non-smokers. The mixed thrombus group had 13 smokers compared to 2 non-smokers. The red thrombus group had 1 smoker compared to 2 non-smokers. The mixed thrombus group had predominantly white thrombus or combination type. The odds ratio were 0.39 for smokers (95% CI 0.28 - 0.52). This study shows that smokers who suffer acute MI have a greater relative risk (RR) of having platelet-rich white thrombus. This could be one of the reasons for failed thrombolysis, as the routine thrombolytic agents which are used are predominantly fibrinolytic, i.e. having ability to dissolve fibrin-rich red thrombus.

Acute Myocardial Infarction: A Study of Ferminal Vector (Vector III) in Acute Myocardial Infarction
M Subair, Solly, Ajith, Sajan, Tennyson
Medical College Hospital, Thiruvananthapuram

We undertook a comparative study of the Vector III in 100 subjects each of normal adult population, anterior wall myocardial infarction (AWMI) and inferior wall myocardial infarction (IWMI). The representative deflections for vector III were selected from $V_v$, $V_f$, $V_l$, aVR and L1 in surface electrocardiogram (ECG). Patients with conduction abnormalities (bundle branch block, fascicular block), abnormal axis, posterior wall myocardial infarction and extensive AWMI (changes up to $V_v$) were excluded. Overall, the infarction patients have significant absence of vector III than control population (59% v. 22%). Among infarction, the loss of vector III forces were more common in acute IWMI compared to AWMI (69%, v. 48%). A sub group analysis of acute IWMI showed that loss of vector III is associated more with right ventricular myocardial infarction compared to isolated IWMI (75% v. 65%).

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M Subair, Solly, Ajith, Sajan, Tennyson
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Streptokinase is the most commonly used fibrinolytic agent in patients with ST elevation myocardial infarction (STEMI) in India. Streptokinase re-use between 5 days to two years of its prior use is considered as relative contraindication because of its uncertain efficacy and risk of allergy. Management of re-infarction in patients who have received SK in the recent past is an important clinical problem in our country. It requires treatment with other fibrinolytic agents or percutaneous coronary intervention (PCI) which is not available in most parts of India. The effectiveness of fibrinolysis was assessed by standard electrocardiographic (ECG) criteria. 26 consecutive patients with STEMI eligible for thrombolysis but who had prior SK use were taken up for the study. None had allergy during prior administration (Group 1). 240 patients with STEMI who received streptokinase for the first time were considered as controls (Group 2). All the patients were closely observed for angiographic edema, hypotension, anaphylaxis, serum adverse reactions (fever, itching, rash, bronchospasm, etc.). A rise in systolic pressure to < 90 mmHg during infusion is considered as an absolute fall in BP (hypotension). A fall in systolic pressure of >15% when compared to baseline value is defined as hypotension. The results are summarized in the table.

<table>
<thead>
<tr>
<th>Complications:</th>
<th>Group 1 (n=26)</th>
<th>Group 2 (n=240)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>56.8 (35–62)</td>
<td>54.2 (27–65)</td>
<td>-</td>
</tr>
<tr>
<td>Males</td>
<td>24 (92.3%)</td>
<td>190 (79.2%)</td>
<td>-</td>
</tr>
<tr>
<td>Females</td>
<td>2 (7.7%)</td>
<td>50 (20.8%)</td>
<td>-</td>
</tr>
<tr>
<td>Window period (hours)</td>
<td>7.4 (1.5–10)</td>
<td>7.2 (2-12)</td>
<td>NS</td>
</tr>
<tr>
<td>Successful thrombolysis</td>
<td>18 (73%)</td>
<td>172 (71%)</td>
<td>NS</td>
</tr>
</tbody>
</table>

Minor allergy in the form of itching and rash developed in few patients which was managed with antihistaminics and steroids. No patient developed anaphylaxis. We conclude that streptokinase can be readministered safely without reduction in its efficacy.

<table>
<thead>
<tr>
<th>Complications:</th>
<th>Group 1 (n=26)</th>
<th>Group 2 (n=240)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypotension</td>
<td>2 (7.7%)</td>
<td>20 (3%)</td>
<td>NS</td>
</tr>
<tr>
<td>Itching &amp; rash</td>
<td>1 (3.8%)</td>
<td>4 (1.7%)</td>
<td>NS</td>
</tr>
<tr>
<td>Interval between thrombolysis</td>
<td>122 (8–630 days)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Control of Diabetes Mellitus and Thrombolysis Outcome

Patients with hyperglycemia have an adverse prognosis after ST elevation myocardial infarction (STEMI). Hyperglycemia reduces myocardial reperfusion during primary percutaneous coronary intervention (PCI) for STEMI.
Our aim in this study was to find out the outcome of thrombolysis in relation to the glycemic control. Clinical, biochemical and echocardiography data of diabetic patients with acute inferior wall STEMI (n=20) and diabetic patients with acute inferior wall STEMI (n=20) thrombolized with streptokinase in our referral teaching institute were prospectively collected for the study. The study population was matched for age, gender, time of presentation and other risk factors. The control of diabetes was assessed by glycated hemoglobin levels. The success of thrombolysis was assessed clinically and by electrocardiographic criteria as adopted by ACC/AHA guidelines. Thrombolytic therapy was successful in 22 patients (anterial wall myocardial infarction (AWMI): 10, inferior wall myocardial infarction (IWMI): 12). Successful thrombolysis correlated well with glycemic control. (HbA1c <6 % - successful thrombolysis, HbA1c 6-10% - partial success, HbA1c > 10% - failed thrombolysis). To conclude, diabetic patients with good glycemic control had successful thrombolysis, compared to diabetic patients with poor glycemic control.

Prevalence of Syndrome X in Patients of Acute Coronary Syndrome

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GSVM Medical College, Kanpur

Diabetes mellitus is an equivalent of coronary heart disease (CHD). Diabetic patients often have abnormal lipid profile-diabetic dyslipidemia. Hypertension frequently accompanies it. This study analyzed the prevalence of the triad of hypertension, diabetes and dyslipidemia in patients with acute coronary syndrome (ACS) in Kanpur. We studied 300 patients with acute coronary syndrome presenting at our hospitals. All patients had a fasting lipid profile and blood sugar estimation. Dyslipidemia was present if triglyceride level was > 150 mg/dl or high density lipoprotein-cholesterol (HDL-c) was < 40 mg/dl in male or <50 mg/dl in females. In our study, of 300 patients with acute coronary syndrome, 22% patients were diabetic, 33% patients were hypertensive and 38% cases were dyslipidemic. Triad of hypertension, diabetes and dyslipidemia was present in 10% patients. Since the etiology of CHD is multifactorial, the approach to prevent should also be multifactorial, aimed at modifying the above risk factors which have a very high association with CHD (10% prevalence of the triad in this study group). Primordial prevention by modifying lifestyle and eating patterns can achieve substantial reduction in the incidence of coronary heart disease.

Reciprocal ST Elevation in Unstable Angina

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Madras Medical College, Chennai

Even after 100 years of electrocardiography (ECG), the electrophysiological mechanism of ST elevation in myocardial infarction (STEMI) and ST depression in unstable angina (UA) is still in the hypothetical stages. One popular theory says that the current of injury was seen as ST segment elevation in surface ECG is actually an illusion. It is apparently due to constant negative current pushing down the rest of ECG segments. While conflicts continue to confront the basic electrophysiological concepts in the genesis of primary ST segment elevation, paradoxically the concept of reciprocal ST depression in patients with STEMI is considered a settled issue. We hypothesized that if ST depression occurs as a response to ST elevation it is logical to expect strong ST depressive forces should possibly elevate the ST segments in the reciprocal leads.

In fact we have seen this phenomenon in three distinct clinical situations. (i) ST elevation in anterior leads: Patients who present with ST depression in V1, V2, V3, and ST elevation in posterior leads. These patients were initially thought to have isolated posterior myocardial infarction (MI), later the cardiac enzymes were found to be normal indicating no myocardial necrosis. Echocardiographic evaluation revealed wall motion defects in anterior segments rather than in posterior segments. Coronary angiography (CAG) revealed critical left anterior descending (LAD) disease. This we believe is a pure reciprocal ST elevation in the posterior leads to ST depressive forces in anterior leads. (ii) Inferior ST elevation with ST depression in V4-V6: Few patients who presented like inferior STEMI failed to evolve into inferior Q MI but as lateral non-STEMI (NSTEMI). The initial ST elevation in inferior leads was transient and disappeared much earlier, while the ST depression in lateral leads persisted. This probably indicates, the ST elevation in inferior leads as a secondary response. (iii) ST elevation in aVR in high risk unstable angina: As reported in the literature, we have also seen ST elevation in aVR in patients with high risk UA. This was more often observed when there is >3 mm ST depression in V1, V2, V3. The aVR ST elevation possibly represents the reciprocal response. We conclude, ST elevation in certain specific lead in some patients with UA could be a pure reciprocal electrical phenomenon to dominant ST depressive forces in opposite leads. Hence we believe ST elevation in the surface ECG during early hours of acute coronary syndrome should be interpreted more cautiously. The sanctity associated with ST segment elevation needs further scrutiny.
Acute myocardial infarction (MI) has 7-10% in-hospital mortality. Progressive negative remodeling of left ventricular (LV) accounts for further significant morbidity and mortality at 1 year. Inferior MI, if associated with right ventricular (RV) myocardial infarction (MI) has adverse outcome. There is little data on long-term effects of RVMI on RV function. Typically, ST elevation myocardial infarction (STEMI) involving the LV (LV MI) evolves with Q waves. It is not clear whether RVMI behavior is different from LVMI. There is little data regarding the evolution pattern of the electrocardiogram (ECG) in RVMI. In this context we analyzed the lead V4R for appearance of Q waves in patients with the RVMI. The study population consisted of 36 patients with inferior wall (IW) MI and RVMI. It was a retrospective observational study. All were documented to have classical IWMI and RVMI by standard criteria. The mean age was 45 years (range: 28-74 years). Male-female ratio was 4:1. All received thrombolysis. ECG and echocardiographic analyses were done on admission, at 1 month and at 6 months. RV wall motion defects were looked in during the follow-up. RVMI was said to be present if at least one of the following was present: hypokinetic RV free wall, diaphragmatic surface, or apex. The ECG, echocardiographic features are reported.

None of the 36 patients in our study developed Q waves in V4R following RVMI at 6 months. No residual wall motion abnormality was detected in any of the patients during follow-up. It is concluded that RVMI does not evolve with Q waves unlike LVMI. Progressive RV dysfunction and adverse RV remodeling following RVMI could be a very rare or non-existent phenomenon.

Metabolic Syndrome and Markers of Subclinical Atherosclerosis as Predictors of Coronary Artery Disease
RR Kasiwali, S Agrawal, M Bansal
Escorts Heart Institute and Research Centre, New Delhi

Metabolic syndrome (MS), carotid intima-media thickness (CIMT), brachial artery flow-mediated vasodilation (BaFMD) and vascular elasticity have recently emerged as markers for identification of individuals who are at high risk of having cardiovascular (CV) disease. The present study was conducted to assess their relative importance in prediction of coronary artery disease (CAD). 165 individuals seeking outpatient cardiac consultation for various indications were included; 42 of these (25.45%) had documented CAD. All patients underwent evaluation for presence of various conventional CV risk factors, presence of MS and assessment of CIMT, BaFMD and small vessel elasticity (SVE) (measured using automated instrument - CV Profilor®). CIMT (common carotid IMT) and BaFMD were measured using 7.5 MHz linear, phased array transducer attached to Sonos 7500 ultrasound machine. 60 (36.36%) patients were found to be having MS (ATP III criteria). CAD patients had significantly higher prevalence of male gender (90.5% v. 76.4%; p=0.049), diabetes mellitus (40.5% v. 24.2%; p=0.044), smoking (42.9% v. 25%; p=0.029) and MS (50% v. 31.7%; p=0.033) and had significantly lower levels of HDL (38.89±3.3 v. 43.72±3.9 mg/dl; p=0.008), LDL (96.38±37.1 v. 120.20±36.7 mg/dl; p=0.001), and total cholesterol (168.06±57.8 v. 195.98±49.7 mg/dl; p=0.006) possibly the effect of lipid lowering therapy. CIMT was significantly increased (0.796±0.16 v. 0.711±0.16 mm; p=0.003) and BaFMD significantly impaired (5.34±3.13 v. 11.19±5.99%; p<0.001) in patients with CAD. SVE was not different in the two groups (5.34±2.9 v. 5.199±2.5 ml/mmHg×100; p=0.791). There was significant inverse correlation between CIMT and BaFMD (Pearson’s correlation coefficient: 0.436, p<0.001).

On multivariate analysis, only BaFMD was found to be an independent predictor of CAD. CIMT proved to be an independent predictor only when BaFMD was not included in the analysis. Endothelial dysfunction, as assessed by BaFMD, appears to be the most important independent predictor of CAD. CIMT has significant inverse correlation with BaFMD but does not have independent predictive value when simultaneous BaFMD is being performed. Presence of MS and SVE do not have independent predictive value over BaFMD and CIMT.
Metabolic Syndrome Predicts Coronary Artery Disease Better and Earlier than Diabetes

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The Kuopio Heart Disease Risk Factor Study, after studying over 1200 men from Finland, found that those who had metabolic syndrome (MS) have 3 to 4 times higher mortality from cardiovascular disease during the follow-up period than those who did not have MS. MS is now widely defined based on the criteria given by the Adult Treatment Panel III (ATP III) of the National Cholesterol Education Program (NCEP). Insulin resistance (IR) is the common pathogenic factor for the individual components of the MS, and explains the trait cluster. This study sought to assess the prevalence of MS and IR in the high-risk subset of our population and establish the relationship between MS/IR and coronary artery disease (CAD). In this prospective study, 226 men and women aged 20-80 years, admitted between 2002-2005 for coronary angiography (CAG) because of clinical suspicion of CAD in our Institute, were included. Plasma insulin assay (µIU/ml), fasting plasma glucose (mg/dl) and fasting serum lipid profile as well as CAG were done for all the patients. MS was defined based on the NCEP-ATP III guidelines and IR was calculated by homeostatic model assessment of insulin resistance (HOMA-IR). Patients were divided into high IR and low IR groups using the 50th percentile of our study population (2.7) as the cutoff value. Among the 226 patients studied, 144 met the criteria for MS, 161 had CAD, 126 were diabetics, 103 were smokers. 83% cases with MS had CAD versus 51% in cases without MS (p<0.0001) and 76% of the CAD positive MS cases had multi vessel disease versus 64% in CAD positive but MS negative cases (p<0.0001). IR values of MS cases were 4.25±3.3 versus 2.72±2.7 in MS negative cases (p=0.0001). Prevalence of CAD in euglycemic-MS cases (84%) was similar to CAD in diabetic-MS cases (88%) (p=0.7). MS was present in 74% of CAD patients versus 38% in CAD negative cases (p<0.0001). In CAD positive cases IR values were 4.03±3.45 versus 2.89±2.17 in CAD negative cases (p=0.003); 81% of high IR cases met criteria for MS versus 46% in low IR group. MS showed an odds ratio of 3.13 for CAD, which was higher than that of diabetes (2.26). Similarly MS showed an odds ratio of 3.13 for high IR, which was much higher than that of diabetes (2.1). ROC curve analysis showed 2.52 as the ideal cutoff value of HOMA-IR in identifying MS (with a sensitivity of 71% and specificity of 70%) in a high-risk South Indian population. Metabolic syndrome is a better and earlier predictor of CAD than diabetes, that too of a more severe form of the disease. The prevalence of both MS and IR in the high-risk subset of our population is very high. IR is dependent more on the presence of MS than on diabetes.

Vibrational Spectroscopic Studies of Endarterectomy Specimens

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In patients with diffuse coronary artery disease (CAD), endarterectomy is often performed to remove atherosclerotic plaques, which improves distal run off and allows complete vascularization. Endarterectomy specimens removed during coronary artery bypass surgery (CABG) were subjected to Fourier Transform Infrared Spectroscopy and Fourier Transform (FT) Raman analysis with the aim of analyzing the components and genesis of calcium deposition. It reveals the presence of calcium phosphate with characteristic P-O vibrational bands. Proteins were identified by amides I and II bands and CH stretching vibrations. FT Raman analysis also reveals the existence of phosphate by the presence of band at 962 cm⁻¹ P-O stretching vibration. Temperature-dependent infrared spectra were also performed and compared with calcified (at 980K) samples spectra. Spectral data were also compared with various specimens with different age groups. Photoelectron spectroscopy revealed the presence of Ca, P, O, C and N in the specimens. In addition to PO₄ carbonate is also present in the sample. TGA studies reveal the weight loss due to depletion of H₂O and protein decomposition. Thus, FT-IR and FT Raman analyses reveal the presence of calcium phosphate and proteins. Vibrational studies provide valuable information on the composition and genesis of calcified atheromatous plaques in patients with diffuse coronary artery disease.

Carotid Intimal Medial Thickness—A Newer Marker of Coronary Artery Disease and its Correlation with its Severity

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Carotid artery intimal media thickness (IMT) is a simple, non-invasive and reproducible clinical tool to evaluate atherosclerosis and predict coronary artery disease (CAD) in humans. We studied 296 randomly selected patients hospitalized for coronary angiogram during January 2001 to December 2004. There were 179 angiographically proven CAD patients with a mean age of 56.8±13.74 years (range: 31-71 years) (males 71%, females 29%) and 117 subjects with normal coronaries with a mean age of 54.28±12.38 years (range: 33-70 years) (males 72%, females 28%). The mean carotidIMT of CAD patients (0.86 ±0.16 mm) are significantly higher than non-CAD patients (0.54 ±0.11 mm) (p<0.001). Sixty-eight percent (n=122) of CAD patients had carotid IMT > 0.80 mm and 32% (n=57) had carotid IMT < 0.80 mm,
while most (91%, n=106) of subjects with normal coronaries had carotid IMT < 0.80 mm (p<0.001). Diabetics were having significantly higher carotid IMT (0.82±0.17 mm) than non-diabetics (0.70±0.16 mm) (p<0.001). Diabetics with CAD had higher carotid IMT (0.93±0.14 mm) than diabetic patients with normal coronaries (0.60±0.15 mm) and non-diabetic CAD patients had higher carotid IMT (0.81±0.16 mm) in comparison to non-diabetic with normal coronaries (0.51±0.10 mm) (p<0.001). The mean carotid IMT of triple vessel, double vessel and single vessel disease was 0.95±0.16 mm, 0.83±0.17 mm and 0.79±0.14 mm, respectively, while with normal coronaries, these values were 0.54±0.11 mm. We conclude that there is a strong correlation between carotid atherosclerosis and coronary atherosclerosis and carotid IMT is a good predictor of presence and extent of CAD.

### Ankle Brachial Pressure Index and Brachial Ankle Pulse Wave Velocity as a Predictor of Coronary Artery Disease in Young Patients undergoing Coronary Angiography

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Resting ankle brachial pressure index (ABI) and brachial ankle pulse wave velocity (baPWV) are non-invasive indices to assess the patency of peripheral arterial system and its role has been intensively evaluated in predicting coronary artery disease (CAD). Present study aimed to examine relationship between ABI, baPWV and presence of CAD in young patients undergoing coronary angiography. Seventy-two patients of <40 years of age who had undergone coronary angiography were studied. Major cardiovascular risk factors including body mass index, blood pressure (BP), fasting blood sugar (FBS), and lipid profile were measured. ABI and baPWV were measured non-invasively using VP1000 (Colin Corporation) automatic analyzer. Patients with established peripheral vascular disease (PVD) were excluded from study. Average of right and left ABI and baPWV were used for analysis. Normal ABI was defined as between 0.9 to 1.3 and normal baPWV as <1400 cm/s. Of 72 patients, 43 (59.7%) were male and 29 (40.27%) were female with mean age of 36.9 years. 56 patients had baPWV>1400 cm/s of which 54 had angiographically proven CAD. Of the 16 patients with normal baPWV, 6 had angiographic CAD. Of the 49 patients with ABI < 0.9, 48 had angiographically proven CAD while 23 had normal ABI of which 12 had angiographic CAD. Number of false positive and false negative case and using ABI and baPWV as a marker for CAD were 1 & 2 and 2 & 6, respectively. Sensitivity and specificity of ABI as marker of CAD was 80% and 91.6%, respectively while that of baPWV was 90% and 83.3%, respectively. To conclude, ABI and baPWV are simple non-invasive indices which can be used as marker for CAD with reasonable specificity and sensitivity in young patients though larger sample studies are required to recommend its routine clinical use.

### Renal Artery Involvement in Patients of Coronary Artery Disease undergoing Coronary Angiography

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The prevalence of renal artery stenosis (RAS) in patients of coronary artery disease (CAD) has not been studied well in Indian population. We conducted this study to establish the prevalence and clinical predictors of RAS in patients undergoing coronary angiography. We did selective renal angiography of consecutive 100 patients (males: 85 and females: 15) with a mean age of 53 years (range: 30-76 years), who underwent coronary angiography for suspected CAD. Of the total cohort, 11 (11%) patients had RAS, of which 4 (4%) had mild stenosis (<50%) while significant RAS (>50%) was identified in 7 (7%) patients. Three patients had bilateral involvement. All lesions were focal and occurred in the ostium or within the proximal third of the renal arteries except in the two which were in the middle part of renal artery. Systemic hypertension was present in 44 (44%) patients, smoking in 29 (29%), diabetes mellitus in 26 (26%), dyslipidemia in 41 (41%), family history of CAD in 25 (25%), and renal insufficiency (serum creatinine >1.5 mg%) was noted in 4 (4%) patients. We did not find any statistically significant relationship of RAS with any of these risk factors. However, there was a trend toward increased prevalence of RAS in patients of hypertension, renal insufficiency and patients with >2 risk factors. 85% of the patients of RAS had significant CAD. The presence of normal coronary angiography has a high negative predictive value for RAS. Triple vessel disease was significantly more common in patients of RAS than those without it. In conclusion, renal angiography should be considered at the time of coronary angiography if the patient has evidence of extensive atherosclerosis in the form of triple vessel disease, in hypertensives, and in patients with multiple risk factors.

### Correlation of High Sensitivity C-Reactive Protein and Angiographic Coronary Artery Disease

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Coronary artery disease (CAD) has inflammatory pathophysiology, so inflammatory markers specially high sensitivity C-reactive protein (hsCRP) are increasingly...
interrogated in its causation. In various studies from the Western population, hsCRP has been variably correlated with angiographic severity of CAD and has been shown to be a marker of acute coronary events on long-term follow-up, but there is little data correlating hsCRP with angiographic CAD in the Indian population, who are known to have a different demographic and risk profile. We studied 100 patients, 50 each of chronic stable angina (CSA) and acute coronary syndrome (ACS), unstable angina and non-ST elevation myocardial infarction (NSTEMI). All the patients underwent detailed clinical evaluation, routine bio-chemical profile and coronary angiogram. In addition, the patients were subjected to hsCRP estimation by turbidimetric immunoassay using the QUANTIA hsCRP reagent kit. Patients enrolled were stratified by levels of hsCRP into tertiles of <1 mg/L, 1-3 mg/L and >3 mg/L. 30% of the patients were diabetic, 56% were hypertensive and only 15% had dyslipidemia as per NCEP ATP III guidelines. In patients with CSA, there was no correlation between hsCRP levels and angiographically determined severity of CAD (p>0.05), whereas in patients with ACS, there was a significant correlation between the two (p<0.05). Significantly greater number of patients with hsCRP levels > 3 mg/L had double and triple vessel disease. On 30 days follow-up, patients of both CSA and ACS having hsCRP levels > 3 mg/L had major adverse cardiac events (MACE) (death, non-fatal MI and stroke) significantly higher than patients with hsCRP levels < 3 mg/L (10.0% vs 3.0%, p<0.05). To conclude, hsCRP levels correlate significantly with angiographic severity of CAD especially in patients with ACS and predict 30 days MACE in both CSA and ACS.

**Prevalence of First Time Detected Diabetes Mellitus and Outcome in Acute Coronary Syndrome**

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The objective of this study was to evaluate the prevalence and outcome of first time detected diabetes mellitus (DM) in group of patients hospitalized with acute coronary syndrome (ACS). 168 patients of ACS were hospitalized from January 2004 to May 2005 in our intensive care unit (ICU). Fifty-one patients, who were known diabetics were excluded. We evaluated others for the detection of DM. The ACS profile, management and outcome of patients clinically detected as DM for the first time were studied. This group of patients was matched with non-diabetics with ACS. Outcome during the hospital stay and at the end of one month will be discussed.

Thirty-six (30%) patients had new onset DM; 25 (69%) had unstable angina, 4 (11%) had non-ST segment elevation (NSTEMI) and 7 (20%) had ST segment elevation myocardial infarction (STEMI). Two (5.5%) deaths occurred in the study group: 5 (13%) had proteinuria and 2 (5.5%) had retinopathy at the time of diagnosis of DM. There were 3 (2.5%) deaths in non-diabetic group. It is concluded that diabetes mellitus imparts a worse prognosis and higher complications in ACS. Patients first time detected to have DM in ACS are young, and women are affected as often as men. Also, mortality is more than double that among non-diabetics.

**Angiographic Comparison between Stable Angina and Acute Coronary Syndrome Regarding Number of Unstable Plaque**

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Prospective analysis of consecutive patients who underwent coronary angiography between November 2004 to January 2005 for evaluation of stable angina or acute coronary syndrome (ACS) was done. Coronary lesions were classified into stable plaque or unstable plaque by previously established criteria. Risk factors, treatment plan and angiograms of 150 patients were assessed. Mean age was 57 years (range 26-79 years); 130 patients were males and 20 were females. 51% were diabetics, 60.8% had systemic hypertension, 18.7% had low-density lipoprotein (LDL) >130 mg%, 54.9% had high-density lipoprotein (HDL) <40 mg% and 58.5% were smokers. 39.2% had stable angina, 60.8% had ACS, 54.5% had unstable angina and 30.8% were post-myocardial infarction (MI). 25.9% had post-infarction angina. 25.9% patients had MI in the past; 67.8% patients had at least one unstable plaque. 73.4% had at least one stable plaque. 40.6% patients had single unstable plaque, 20.3% had 2 unstable plaque and 7% had 3 or more unstable plaque. 46.9% had unstable plaque in left anterior descending artery (LAD), 20.3% had in left circumflex (LCx) and 25.9% had in right coronary artery (RCA). Distribution of stable plaque were LAD: 43.4%, LCx: 33.1% and RCA: 43.4%. There is a strong correlation between unstable plaque and ACS. All patients with ≥3 unstable plaque, 24 of 29 patients with 2 unstable plaques and 47 of 58 patients with single unstable plaque developed ACS. 87 patients with ACS had 131 unstable plaques (1.58 plaque per patient) and 75 stable plaques (0.88 per patient). 63 patients with stable angina had 161 stable plaques and 21 unstable plaques (0.33 per patient). 16 patients with stable angina had angiographic unstable plaque. No correlation was found between the presence of unstable plaque and presence of conventional coronary risk factors of diabetes mellitus, systemic hypertension, smoking habit and elevated LDL levels. Highly significant correlation was noted between presence of unstable plaque and post-infarction angina. 82.5% patients underwent revascularization, 32.9% underwent percutaneous coronary intervention and 48.3% underwent bypass grafting.
Effects of Early Angiotensin-Converting Enzyme Inhibitor Therapy on QT Dispersion in ST Elevation Myocardial Infarction

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Early in ST elevation myocardial infarction (STEMI) setting, the dispersion of ventricular repolarization is increased, predisposing to reentry and ventricular tachyarrhythmias. Angiotensin-converting enzyme inhibitors (ACEI) started early in this setting reduce the total mortality, including sudden cardiac death (SCD). We studied the effect of very early ACEI therapy on QT dispersion (QTd) in STEMI setting. From June 2004 to February 2005, a total of 100 patients with STEMI were studied prospectively. All of them received thrombolytic therapy with intravenous streptokinase and were on aspirin and beta-blocker therapy. Male-female ratio was 2.1:1; 56% patients had anterior wall infarction, 36% had inferior wall infarction, 6% had high lateral infarction, 2% had global infarction. The mean age of the patients was 46 years. 48 patients were diabetics, 26 were hypertensives. 65 patients were started on oral enalapril, within 6 hours of presentation, at a minimum dose of 2.5 mg twice daily, stepped up according to the blood pressure (BP) response. Thirty-five patients did not receive ACEI, as either their initial systolic BP was <90 mmHg due to prolongation of QTc max in both groups. Six patients in ACEI group, 5 patients in non-ACEI group had primary ventricular fibrillation from which they were successfully resuscitated. One patient in ACEI group developed reinfarction (male, diabetic, with anterior wall infarction) and was rethrombolyzed. There was no mortality in either group. In our study, ACEI started very early in STEMI decreased the QTd as early as 24 hours. The effect was maintained throughout the hospital course, even though these patients had lower ejection fraction (EF). Our results suggest that ACEI may have a primary antiarrhythmic role in STEMI setting, by reducing the QTd thereby reducing the electrical instability. ACEI started very early in STEMI setting and reduces the QT dispersion. Its impact on in-hospital mortality and SCD needs to be studied in larger number of patients.

Prognostic Value of Wall Motion Abnormalities in Patients with Unstable Angina and Non-ST Elevation Myocardial Infarction

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Current ACC/AHA risk stratification of unstable angina/non-ST elevation myocardial infarction (UA/NSTEMI) is based on various clinical, electrocardiographic, biochemical and angiographic features. There is no adequate data on the role of echocardiography in the early risk assessment of patients with UA/NSTEMI. Echocardiographic regional wall motion abnormality (RWMA) is a recognized feature in patients with UA/NSTEMI. We analyzed whether these RWMA can be used in risk stratification of patients with UA/NSTEMI. The study included 214 eligible patients diagnosed to have UA/NSTEMI. Patients with prior infarctions and RWMA were excluded from the study. All patients underwent echocardiographic evaluation as early as possible but within 24 hours after admission. Patients were divided into two groups: Group A - those with RWMA, and Group B - those without RWMA. Both groups were followed up to 1 month after admission. The results are summarized in the table.

<table>
<thead>
<tr>
<th>Event</th>
<th>Group A (no RWMA)</th>
<th>Group B (RWMA +)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n = 172)</td>
<td>(n = 42)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recurrent ischemia</td>
<td>14 (8.1%)</td>
<td>6 (14.2%)</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Clinical LV failure</td>
<td>8 (4.7%)</td>
<td>4 (9.5%)</td>
<td>&lt; 0.02</td>
</tr>
<tr>
<td>Duration of hospital stay (days)</td>
<td>7.2</td>
<td>9.6</td>
<td>NS</td>
</tr>
<tr>
<td>Development of STEMI</td>
<td>4 (2.3%)</td>
<td>3 (7.1%)</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Cardiac death at 1 month</td>
<td>6 (3.4%)</td>
<td>3 (7.1%)</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>

More number of patients with wall motion abnormalities had recurrent ischemic symptoms and clinical left ventricular (LV) failure during the hospital stay which is longer than the patients without wall motion abnormalities. Development of STEMI and cardiac death at 1 month were also significantly higher in patients with RWMA. Echocardiographic RWMA is observed in 20% of the patients with UA/NSTEMI and had adverse outcome. Echocardiographic detection of RWMA can be a useful modality in the initial assessment and risk stratification of patients with UA/NSTEMI.
Coronary Heart Disease

TIMI Risk Score — A Useful Quantitative Tool for Risk Stratifying Right Ventricular Myocardial Infarction


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Right ventricular myocardial infarction (RVMI) is associated with increased in-hospital morbidity and mortality but risk factors for the same are poorly defined. TIMI risk score has proved its utility in risk-stratifying acute coronary syndromes (ACS). Little work to date has attempted to clinically stratify risk among patients with RVMI. The objective of this study was to evaluate the clinical utility of TIMI risk score in patients with RVMI. Fifty patients with confirmed RVMI from consecutive patients admitted to the coronary care unit (CCU) with acute myocardial infarction (MI) were included in the study. TIMI risk score was calculated as per the originally published criteria. RVMI was defined acute MI with ST segment elevation > 1 mm in V3R or V4R. In-hospital events were defined as cardiac arrest, heart failure, cardiogenic shock, ventricular arrhythmias, mechanical complications, atrioventricular (AV) blocks and death. Patients whose TIMI risk score was ≥ 4 were 30% (n=15) and those with TIMI risk score < 4 were 70% (n=35). In-hospital morbidity and mortality was higher in patients with TIMI risk score ≥ 4 (57%, n=8), than in patients with timi risk score < 4 (23%, n=8), p<0.01. TIMI risk scores helpful in prognosticating in-hospital morbidity and mortality in RVMI. It is an accurate and powerful tool which should be helpful to clinicians treating patients with RVMI.

Clinical and Coronary Angiographic Findings in Pre-Menopausal Women with Acute Coronary Syndrome

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The prevalence of coronary artery disease (CAD) has alarmingly increased in young women in recent years in our population. In this context, we analyzed the clinical parameters and angiographic severity of CAD in pre-menopausal women. The study cohort consisted of 36 pre-menopausal women who were admitted for acute coronary syndrome (ACS) in our coronary care unit. 24 (66%) had ST elevation myocardial infarction (STEMI) [anterior wall myocardial infarction (AWMI):15, inferior wall myocardial infarction (IWMI):8 and 12 (34%) presented with unstable angina (UA)/non-STEMI]. The mean age was 36 years (range: 30-48 years). Those with familial hyperlipidemia, connective tissue disorders and antiphospholipid antibody syndrome were excluded. The clinical parameters, risk factor profile, demographic data were studied. Diabetes mellitus was present in 60%, hypertension in 45%, obesity [body mass index (BMI) >30 kg/m²] was observed in 35%, Central obesity (waist circumference >85 cm) was seen in 30%, dyslipidemia in 25%, family history of CAD in 10%. None of our patients had history of smoking or oral contraceptive use. All patients were managed as per ACC/AHA guidelines. Among the acute MI group, 70% received thrombolysis. In-hospital mortality was 3/36 (8%) - acute MI: 1, unstable angina: 2; 33 patients underwent coronary angiogram within two weeks of admission. Out of 33 patients, 40% had single vessel disease, 26% two vessel disease and 30% had triple vessel disease. Remaining 10% showed normal coronaries. The mean lesion diameter was 94% (range: 70-100%). We conclude that pre-menopausal women with ACS have advanced form of CAD as evidenced by high incidence of triple vessel disease and critical lesions. They were found to have adverse clinical outcome. This suggests that aggressive management strategies will be required in this population.
Prevalence of Coronary Artery Disease in Pre-Menopausal Women in South India

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The purpose of this study was to assess the prevalence and association of risk factors with coronary artery disease (CAD) in pre-menopausal women. Out of 789 consecutive females who underwent coronary angiography between January 2001 and December 2004, 153 were pre-menopausal and formed the cohort. 87 (56%) had angiographic evidence of CAD (> 50% diameter stenosis) (Group A) and 66 (43%) had no significant CAD (Group B). The mean age in Group A was 48±5 years and 45±6 years in Group B (p=0.002). Diabetes mellitus (DM) was present in 35 (40%), in Group A and 12 in (18%) in Group B (p=0.003). Systemic hypertension (SHT) in 48 (55%) in Group A and 25 (38%) in Group B (p=0.034). Dyslipidemia (DLP) in 32 (37%) in Group A and 3 (4%) in Group B (p=0.000). Mean total cholesterol (TC) in Group A was 197.52±33.31 mg% and 151.67±25.46 mg% in Group B (p=0.000). Mean low-density lipoprotein (LDL) was 127±28 mg% in Group A and 78±16 mg% in Group B (p=0.006). Mean high-density lipoprotein (HDL) was 42.48±6.40 mg% in Group A and 44.21±7.29 mg% in Group B (p=0.256). The mean triglyceride level (TGL) in Group A was 153.74±62.38 mg% and 130.36±57.74 mg% in Group B (p=0.134). 40 (46%) had single vessel disease (SVD), 22 (25%) had double vessel disease (DVD), 25 (28%) had triple vessel disease (TVD) and 5 (6%) had left main coronary artery disease (LMCD). On univariate analysis, age, DM, SHT, DLP had significant association with CAD (p=0.005). On multivariate analysis, DLP showed stronger association with CAD. More than half of pre-menopausal women who underwent CAG, had evidence of CAD. SVD was seen more frequently. Those with CAD were relatively older and dyslipidemia was found to have significant association with CAD.

Clinical and Angiographic Profile of Coronary Ectasia

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With the increase in availability of procedures to analyze coronary bloodflow and quantify perfusion, the initial concept of coronary ectasia as a benign disorder has changed. Out of a total number of 6,121 patients who underwent coronary angiography due to suspicion of coronary artery disease (CAD) in our institute from May 2002 to January 2005, 182 (3%) patients were found to have coronary ectasia. 95 (52%) among them were diabetics, 86 (47%) hypertensives, 47 (26%) smokers and 102 (56%) were dyslipidemic. 155 (85%) cases had abnormal rest electrocardiogram (ECG) and 52 (29%) had positive exercise ECG. 118 (65%) among the 182 cases had obstructive lesions (males: 116, females: 2, mean age: 57.8±7.5 years) and 64 (35%) had non-obstructive lesions (males: 58, females: 6; mean age 55.4±9.3 years). 36 (31%) patients with obstructive lesions and 15 (23%) patients with non-obstructive lesions had prior history of acute coronary syndrome (ACS). Most commonly affected vessel with coronary ectasia was right coronary artery (RCA) (62%) followed by left anterior descending (LAD) artery (52%), left circumflex artery (LCx) (47%) and left main coronary artery (LMCA) (6%). Commonest type of ectasia was diffuse (46%) followed by proximal (35%) and multipulegment (19%). 24 patients with associated triple vessel disease underwent bypass grafting and 11 patients underwent percutaneous transluminal coronary angioplasty (PTCA). One patient with a tight left main disease expired immediately after the angiography even after getting intra-aortic balloon counter pulsation. All symptomatic patients were started on oral anti-coagulation. To conclude, the incidence of coronary ectasia among patients undergoing coronary angiography in our institute was 3% and contrary to belief, coronary ectasia is not always benign. It can cause ACS even in the absence of flow limiting CAD and there is a strong association between coronary ectasia and coronary atherosclerosis. It may be a variant in the pathology of CAD.

Distal Coronary Artery Disease

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Atherosclerosis is typically prone to occur in the proximal segments of coronary arteries. The clinical implications of proximal coronary artery disease (CAD) are well known. The real prevalence of distal CAD is largely unreported. The aim of this study was to find out the prevalence rate of isolated distal CAD and its angiographic features. Distal CAD was diagnosed when it occurred distal to second septal or diagonal in left anterior descending (LAD), or in the D1 or S1 if it was 20 mm away from its origin. In left circumflex (LCx) and right coronary artery (RCA), distal CAD was diagnosed when the lesions were beyond obtuse marginal (OM) or right ventricular (RV) branches, respectively. All posterior descending artery (PDA) and posterior left ventricular (PLV) lesions were considered distal. All lesions with > 20% diameter stenosis were included (since the aim was to detect atherosclerosis and not the obstructive CAD). 360 angiograms from our laboratory were reviewed sequentially. Clinical diagnosis was chronic stable angina (CSA): 45%, unstable angina (UA): 35%, acute myocardial infarction (MI): 20%, rheumatic heart disease
Indian Heart J 2005; 57: 381–425

Coronary Heart Disease

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D Rajasekhar, G Subramanyam, V Vanaja, Latheef,
Coronary Angiographic Vessel Severity

Patients with >1 proximal lesions were excluded. Isolated distal CAD occurred in 68 (19%) cases. It was most commonly seen in the clinical subset of CSA, and double vessel distal CAD was the most common subset (52%). Triple vessel distal CAD was seen in 30%. The prevalent combinations were distal, PDA/OM/D2, PDA/D1/OM, LAD/PDA/OM. Single vessel distal CAD was the least common (18%). Among single vessel disease (SVD), PDA lesion was the commonest, LAD was least common. The mean length of distal CAD was 5 mm (range: 2-14 mm). The mean severity of lesion was 50% (range: 20-100%). Total occlusion in distal segments was a rarity (3/68). Eccentric lesions occurred in 10%. Intra-coronary thrombosis and calcification was not seen in any. Luminal irregularity in distal segments was seen in about one-third of all patients. We conclude that isolated distal CAD occurs in significant population among CAD. It is most common in PDA followed by LCx and its branches, diagonals, and least common in the main LAD. The lesions generally are shorter and less severe. Even though atherosclerosis has a predilection for proximal coronary arteries, our observations reveal that a significant burden of atherosclerosis occurs exclusively in the distal coronary vascular bed. It could have important therapeutic implications in selecting the modality of interventions.

Correlation of Serum Nitric Oxide with Coronary Angiographic Vessel Severity

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Sri Venkateswara Institute of Medical Sciences, Tirupathi

The objective of this study was to investigate the association of serum nitric oxide with vessel severity. We enrolled 51 patients who were admitted for coronary angiography in our institute. Non-fasting blood samples were drawn from all the subjects. Serum was separated and assayed for serum nitric oxide using Greiss method. A higher level of serum nitric oxide was observed in patients with one vessel (39.37 and 19.36 nm/l) followed by three vessel (34.72 and 27.20 nm/l), normal coronaries (32.76 and 31.28 nm/l) and two vessel disease (29.84 and 19.51 nm/l). No mean difference was observed with reference to vessel severity when examined with one-way analysis of variance (ANOVA). No correlation was observed between serum nitric oxide and vessel severity. Results of the present study show that endogenous nitric oxide may not be associated with vessel severity.

Troponin-T Levels and its Correlation with Mechanical Complications in Patients of Acute Myocardial Infarction

NN Khanna, A Lalchandani, SK Saxena, RPS Bharadwaj,
M Ahmed, CM Verma, P Neelam, A Agarwal, V Agarwal,
P Sondhi, G Preethi
GSVM Medical College and Escorts Heart Centre, Kanpur

This study was done to evaluate the clinical utility of troponin-T (TnT) and echocardiography to predict adverse cardiac events in patients of acute myocardial infarction (MI). The temporal relation of TnT levels with various cardiac events was also studied. A prospective study was done on 200 patients of acute MI selected from our cardiac clinics. TnT was done in all the patients at admission and serially every 6 hours for 24 hours. Patients were divided into three groups on the basis of troponin levels. Serial echocardiography was also done in all these patients to assess various hemodynamic changes and mechanical complications. TnT level was found to be < 0.4 ng/ml in 30% cases, 0.4-0.5 ng/ml in 56% cases, while 14% patients showed values exceeding 0.5 ng/ml. Group 1 (TnT < 0.4 ng/ml) patients showed no mechanical complications. In Group 2 (TnT: 0.4-0.5 ng/ml), 20% showed mild to moderate mitral regurgitation (MR), 4% showed free wall rupture and 2% showed ventricular septal defect (VSD). In group 3 (TnT >0.5 ng/ml), 6% patients expired due to free wall rupture and severe MR. In conclusion, increased level of TnT is associated with increased incidence of mechanical complications, thus it is a prognostic indicator in patients of acute MI. TnT can be used to guide the treatment and course of rehabilitation, so as to make the test cost-effective.

Blood Levels of Myeloperoxidase, C-Reactive Protein and Troponin I as Prognostic Markers in Acute Coronary Syndrome

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NN Khanna, RPS Bharadwaj, M Ahmed, CM Verma,
A Agarwal, V Agarwal, M Shameem
GSVM Medical College, LPS Institute of Cardiology and Escorts Heart Centre, Kanpur

Due to the irreversibility of most acute cardiac events there is always an interest in searching for simple tests to single out patients with bad prognosis so that timely revascularization is planned or they are put on intensive conservative regimes. In this study, three biochemical markers were used with this aim. Forty-eight patients of diagnosed acute coronary syndrome (ASC) [acute myocardial infarction (AMI): 28 and unstable angina: 20] were selected for the study. After a thorough history and physical examination, complete hemogram, lipid profile, electrocardiogram (ECG) and echocardiography (echo) was done. At 6 hours of onset of chest pain, all patients were subjected to C-reactive protein (CRP), myeloperoxidase (MPO)
and troponin-I (Trop-I) levels estimation in blood. Out of 9 patients having Trop-I >5 ng/ml, 6 (66.6%) had significant cardiac events and 4 (44.4%) died because of MI. Out of those with CRP levels >24 mg/L, 7 (58.3%) had cardiac events and 4 (33.3%) died of MI. Out of those with MPO level >394 pm, 7 (70%) had a cardiac event and 4 (40%) died because of MI. Higher levels of Trop-I, MPO and CRP were associated with greater number of cardiac events and greater mortality outcomes. After large scale studies for determination of their accuracy, cost effectiveness and practicality, these tests may be used in future for prognostication and management of ACS patients.

Relationship among Antibody against Cytomegalovirus, Plasma Interleukin 6 and Coronary Artery Disease: Preliminary findings of Indian Atherosclerosis Research Study
VV Kakkar, VS Rao, B Natesha, S Kanjilal, SS Iyengar, M Mukherjee
Narayan Hrudayalaya Hospital, Bangalore and Thrombosis Research Institute, London

Certain viral/bacterial pathogens have been implicated in the activation of inflammatory mediators through immune response, cross reactivity with 'self' antigens or upregulation of cytokines, all of which culminate in progression of atherosclerosis. The aim of the study was to examine if levels of antibodies against cytomegalovirus (CMV) were raised in patients with coronary artery disease (CAD), and if this was associated with a rise in markers of inflammation. None of the patients or controls had concomitant infection. Serum IgG antibodies against CMV, and levels of interleukin-6 (IL-6), C-reactive protein (CRP), soluble P-selectin and ICAM-1 were estimated by ELISA. At first, antibodies against CMV were measured in 235 patients aged 51.1±11.2 years consisting of 89% males schedules for coronary artery bypass grafting (CABG) and 86 unrelated controls aged 55.4±9.2 years consisting of 86% males. The median level (interquartile range) of CMV antibody was 7.1 IU/ml (4.6 IU/ml-27.8 IU/ml) for controls and 12.1 IU/ml (8.3 IU/ml-67.3 IU/ml) for patients (2-tailed p=0.0001 - Mann-Whitney test). Next, the levels of antibody and circulating markers were estimated in a separate group of 85 patients related to the controls aged 56.4±9.1 years and 84% males, scheduled for CABG/percutaneous transluminal coronary angioplasty (PTCA). 34 patients and 1 control were on medication with statins. The median CMV antibody level of the patients was 32.1 IU/ml (6.4-44.5 IU/ml; p=0.002 relative to controls). The median IL-6 levels of controls and patients were 2.4 pg/ml (1.4-3.3 pg/ml) and 3.6 pg/ml (2.2-4.9 pg/ml), respectively (p=0.005). The other markers were comparable between cases and controls probably offset by statin medication. Despite this, the rise in CMV antibody levels in patients occurring concordantly with IL-6 supports the activation of inflammatory response in CAD probably triggered by past sub-clinical infection.

Relationship between Serum Cardiac Markers according to Type of Myocardial Infarction
S Basu, B Mitra, D Kumar, S Mondal, M Panja
Institute of Post Graduate Medical Education and Research and SSKM Hospital, Kolkata

The use of newer biochemical markers for diagnosing myocardial infarction (MI) is rapidly increasing and cardiac troponin has established itself as most reliable in this regard. The ACC have redefined the diagnostic criteria for acute MI to include measurement of cardiac troponin. This recommendation has led to increased availability of troponin assay, and impact on patient management and epidemiology. However, in our country troponin assay is not available in all places except tertiary level hospitals. Hence we tried to find relationship between the old (CPK) and newer [troponin-T (Trop-T)] myocardial injury markers. Categorized according to electrocardiography changes, risk factors (diabetes and smoking) and peak CK level to find out if an estimate of Trop-T level from a known CPK value can be made and if it can provide some guidance on equivalence between the two tests. Study included 400 patients (80% male; mean age 56 years, range: 35-76) admitted to our Hospital with acute MI over 4-month period of study. Electrocardiographic (ECG) diagnosis, thrombolysis status and peak serum CK and Trop-T (6-24 hours following admission) concentration were recorded. The study populations were divided into groups according to ECG diagnosis of Q and non-Q MI and also according to peak level of CK twice the upper limit of normal. WHO biochemical criteria of acute MI. The value of 400 IU/L was our laboratory reference of two times the normal. This CPK group was subdivided into peak CPK level >400 IU/L, 400-1200 IU/L, 1200-2000 IU/L, >2000 IU/L. The defences in level of serum markers between the subgroups were compared using student t test for unpaired sample. Values of Trop-T and CPK were correlated using Pearson's correlation method. Simple linear regression was used to derive a equation to facilitate the prediction of Trop-T level from peak CPK level. To allow the prediction of Trop-T level from measurement of peak CPK level, the regression equation Trop-T = 0.0056 (peak CPK) + 1.13 was obtained. Our study provides the physician with the ready benchmark for assessment of Trop-T level from peak CPK level. Follow-up of patients is currently underway for further exploring the data to see what independent correlation, if any, Trop-T level has in predicting future cardiac events in post-acute MI patients.
Anemia as an Independent Variable in Prognosis of Patient with Acute Myocardial Infarction and without Percutaneous Coronary Intervention

B M Majumdar, SD Singh, S Basu, M Itra, M Panja
Institute of Post Graduate Medical Education and Research and SSKM Hospital, Kolkata

Prognosis after acute myocardial infarction (MI) is largely determined by left ventricular function and residual ischemia after reperfusion. We sought to investigate the impact of anemia in patients after acute MI. The patients were subdivided into those who received delayed percutaneous coronary intervention (PCI) and those who were managed on conservative treatment. 600 patients presenting with Q wave MI were studied (male: 480, female: 120, age range 35-75 years). Anemia (defined according to WHO criteria <39% in male, <36% in female) was present in 216 (36%) male: 144, female: 72. Out of 600 patients, 236 (male: 200, female: 36) underwent PCI subsequently for recurrence of chest pain during index hospitalization. Patients with anemia had a higher rate of hemorrhagic complication compared to those without (5% vs 1.6%, p<0.001). The mortality rate at 30 days was increased in those with anemia compared to those with normal hematocrit (6% vs. 3%, p<0.001). In the PCI group mortality was higher (5.6% vs. 2.4%). Male patients with anemia showed more adverse outcome than women. Thus, anemia at presentation in patients with acute MI managed conservatively as well as those with intervention is strongly associated with adverse outcome and increased mortality. Follow-up of patients to see if the differences persist over long term is underway.

Values of $V_{4R}$, $V_{1}$ and $aVL$ Lead during Exercise Treadmill Test in Predicting Coronary Artery Disease and Pointer to Vessel Involved

B Sreenivasa, U Ajay, M ahajan, C Prabhakar Koregol
Lokamanya Tilak Municipal Medical College and General Hospital, Mumbai

The computerized stress test (treadmill exercise) findings of 75 patients who underwent test with $V_{4R}$ lead and also underwent coronary angiography within 3 months between January 2005 to March 2005 were analyzed. A significant ST elevation in $V_{4R}$ or $V_{1}$ lead was defined as >0.5 mm of ST segment deviation 80 ms from J point. Out of 75 patients, 70 had >50% narrowing of one or more coronary arteries. Twenty-one patients had single vessel disease, 24 had double-vessel disease and 25 had triple-vessel disease. Sensitivity for diagnosis of single-vessel, two-vessel and three-vessel disease was 75%, 91% and 94%, respectively. 39 patients had above 50% diameter narrowing of right coronary artery (RCA) of which 20 had 0.5 mm ST elevation in $V_{4R}$ lead. The sensitivity of $V_{4R}$ lead for the diagnosis of RCA was 48% with a specificity of 66%. With proximal RCA involvement alone, sensitivity was 62% and specificity 67%. 49 patients had >50% left anterior descending (LAD) stenosis; 16 patients had isolated involvement of LAD of which 11 were proximal LAD stenosis. Sensitivity of $V_{1}$ lead for detection of isolated proximal LAD involvement was 60% and specificity of 93%. ST elevation in aVL was seen in 21 patients and all these patients had coronary artery disease (CAD). Our study shows that $V_{4R}$ lead is useful in the detection of proximal RCA lesion. ST elevation in $V_{1}$ is fairly sensitive for detection of proximal LAD stenosis and >1 mm elevation is highly specific for detection of proximal LAD lesion. ST elevation in aVL is highly specific for detection of CAD. It is not useful in the localization of coronary artery lesion.

Correlation of Braunwald's Clinical Classification of Unstable Angina Pectoris with Angiographic Extent of Disease and Intra Luminal Thrombus

B Sreenivasa, Prabhakar C Koregol, AU M ahajan
Lokamanya Tilak Municipal Medical College and General Hospital, Mumbai

Between June 2004 to May 2005, 150 patients (male: 93, female: 57) of unstable angina who underwent coronary angiography were analyzed. Patients were divided according to Braunwald's clinical classification. Patients with secondary unstable angina were excluded. 20% had class I angina, 48% had class II angina, 32% had class III unstable angina. 24% patients had post-infarct unstable angina (class C) and 76% had primary unstable angina (class B). ST-T changes on electrocardiogram (ECG) were present in 66% patient. On coronary angiography, 26 (17.5%) patients had normal coronaries, 33 (22%) patients had single vessel disease, 42 (28%) patients had double vessel disease and 49 (32.5%) patients had triple vessel disease. Correlation with Braunwald's clinical classification showed single vessel disease to be higher in class I compared to class II (40% v. 19.8%, p=0.014) and class III (40% v. 15.6%, p=0.01). Single vessel disease was found to be higher in class C than in class B (47% v. 20%, p=0.01). The analysis with respect to intraluminal thrombus according to Braunwald's classification showed that 4 (6.6%) patients in class I had thrombus, while 31 (22%) in class II and 14 patients (29%) in class III had intraluminal thrombus. Our data suggest that in patients with primary unstable angina, Braunwald classification correlates well with severity of coronary artery disease and the probability of coronary thrombosis increases as class increases, suggesting a need for aggressive therapy.
Do Q Waves on Electrocardiogram Predict Non-viable Myocardium after Acute Myocardial Infarction
B Sreenivasa, Ajay U Mahajan, Prabhakar C Koregol
Lokamanya Tilak Municipal Medical College, and General Hospital, Mumbai

Controversy exists regarding the significance of pathological Q waves on electrocardiogram (ECG) after established acute myocardial infarction (MI) in predicting non-viable myocardium. Dobutamine stress echocardiography (DSE) is now widely used to access viable myocardium after acute MI. We undertook study to ascertain the credibility of Q wave on the ECG to predict myocardial viability after acute MI. Fifty patients who underwent both ECG and DSE, at a mean of 7 days post-acute MI were assessed. Non-viability on ECG is defined as the presence of pathological Q waves in at least 4 out of 6 pre-cordial leads or Q waves in all 3 of the inferior leads. Non-viability on DSE is defined as absence of contractile response in 7 out of the 9 antero-septal segments or in 3 of the 4 inferior region segments. Of the 50 patients, 35 (70%) presented with anterior and 15 (30%) with inferior wall myocardial infarction (IWMI). Relationship between viability detected by ECG and that by DSE is shown in the table.

<table>
<thead>
<tr>
<th>ECG viability</th>
<th>DSE viability</th>
<th>DSE non-viability</th>
</tr>
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<tbody>
<tr>
<td>25</td>
<td>25</td>
<td>13</td>
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<td>10</td>
<td>10</td>
<td>02</td>
</tr>
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</table>

The positive and negative predictive values of Q waves on ECG to predict non-viable myocardium have been 17% and 66% respectively. In conclusion, the presence of Q wave does not predict non-viable myocardium. However, the absence of Q waves predict the presence of viable myocardium.

Prediction of Left Ventricular Systolic Dysfunction in Acute Anterior Myocardial Infarction by the Ischemia Grading on Admission Electrocardiogram
Mohammad Shafiqur Rahman Patwary
National Institute of Cardovascular Disease, Dhaka, Bangladesh

This prospective study was carried out during the period April 2002 to December 2002 to find out the relation of ischemia grading on admission electrocardiogram (ECG) with left ventricular (LV) systolic function. A total of 200 patients with acute ST-segment elevation anterior myocardial infarction (AMI) were included in this study. All the patients were categorized into grade-2 and grade-3 ischemia on the basis of changes in QRS complex and ST-segment on admission ECG. Patients were followed up clinically, electrocardiographically, and left ventriculographically. Among them, 70% had grade-2 and 30% had grade-3 ischemia. CK-MB was more elevated in grade-3 than in grade-2 (p<0.05). Systolic blood pressure was lower in grade-3 than in grade-2 (p<0.05). Large infarct size evident from electrocardiography i.e. extensive anterior MI, number of leads with ST elevation, sum of ST elevation and Selbester score was more in grade-3 patients than grade-2 patients (p<0.05). LV dysfunction determined by echocardiographic or left ventriculographic ejection fraction was more prevalent in grade-3 than in grade-2 patients, and EF <45% was significantly more in grade-3 than in grade-2 patients, indicating it to be directly related to LV dysfunction. The study concludes that grade-3 ischemia is related to more left ventricular systolic dysfunction than in grade-2 ischemia. Grade-3 ischemia is predictive of more extensive myocardial involvement. Patients of grade-3 ischemia had worse clinical outcome than those of grade-2 ischemia.

Oral Folic Acid, Serum Homocysteine and Morbidity of Patients with Chronic Stable Angina
Farzad Jalali, K Hajian, M R Niaki
Babol University of Medical Sciences, Babol, Iran

In addition to traditional cardiovascular risk factors, high levels of plasma homocysteine may be the other risk for atherosclerotic diseases. The probable mechanism is endothelium dysfunction. Ten percent of population had hyperhomocysteinemia. Folic acid is a potent factor in lowering plasma homocysteine. The purpose of this study was, evaluation of the effect of folic acid on plasma homocysteine level and morbidity in patients of stable coronary artery disease (CAD). In 52 stable CAD patients, the plasma levels of homocysteine, folic acid and vitamin B12 were measured and morbidity-related indices (the number of sublingual per week, typical anginal chest pain per week, frequency of hospitalization due to cardiovascular disorders in three months, functional class and electrocardiographic changes) determined. All patients received 2 mg oral folic acid daily for 3 months. At the end of follow-up, the levels of homocysteine and morbidity were determined again. Folic acid supplementation for 3 months was associated with decrease in homocysteine level by 44% (p=0.001). Non-significant decrease in serum folic acid level was observed (p=0.193). There was significant decline in all morbidity-related indices (TNG consumption and chest pain, MB was more elevated in grade-3 than in grade-2, MB was more elevated in grade-3 than in grade-2 (p<0.05). Large infarct size evident from electrocardiography of left ventriculographic ejection fraction was more prevalent in grade-3 than in grade-2 patients, and EF <45% was significantly more in grade-3 than in grade-2 patients, indicating it to be directly related to LV dysfunction. The study concludes that grade-3 ischemia is related to more left ventricular systolic dysfunction than in grade-2 ischemia. Grade-3 ischemia is predictive of more extensive myocardial involvement. Patients of grade-3 ischemia had worse clinical outcome than those of grade-2 ischemia.

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Use of Orlistat in Coronary Patients

AW Leung, KW Chan, YS Fung, HF Hung, PT Tsui, HK Chu, YW Chan
Princess Margaret Hospital, Hong Kong SAR, China

Both obesity and hypercholesterolemia are common cardiovascular (CV) risk factors. Orlistat is effective in reducing weight and improving lipid profiles. We have few data on the use of orlistat in patients with coronary artery disease (CAD). This study shows the effect of orlistat on weight and lipid profiles in Chinese patients with CAD and overweight/obesity. This is an open-label uncontrolled study. Thirty Chinese patients with CAD, body mass index (BMI) ≥25 kg/m² and low-density lipoprotein-cholesterol (LDL-c) ≥2.6 and <4.1 mmol/L were enrolled. They were put on weight-reducing diet for 12 weeks. Afterwards, those with BMI ≥25 kg/m² received orlistat 120 mg thrice daily for 24 weeks. The body weight (BW) and lipid profiles before and after diet and orlistat treatment were compared using non-parametric statistical test. Thirty patients were enrolled; 29 received orlistat; 1 patient defaulted and another withdrew from the trial because of acute myocardial infarction (MI). Patient compliance to orlistat was high and side effects were tolerable.

<table>
<thead>
<tr>
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<th>After %</th>
<th>p value</th>
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<tbody>
<tr>
<td>BW (kg)</td>
<td>76.6±8.0</td>
<td>75.5±8.5</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>28.6±3.4</td>
<td>28.1±3.5</td>
</tr>
<tr>
<td>TC (mmol/L)</td>
<td>5.32±0.76</td>
<td>5.16±0.68</td>
</tr>
<tr>
<td>TG (mmol/L)</td>
<td>2.10±0.19</td>
<td>1.86±0.86</td>
</tr>
<tr>
<td>HDL-c (mmol/L)</td>
<td>1.03±0.17</td>
<td>1.04±0.17</td>
</tr>
<tr>
<td>LDL-c (mmol/L)</td>
<td>3.33±0.62</td>
<td>3.27±0.50</td>
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12 weeks diet therapy produced a small but significant reduction in BW (1.6%) and BMI (1.7%). Addition of 24 weeks of orlistat produced a higher reduction in BW (4.6%) and BMI (4.5%), both significant. Dual therapy reduced total cholesterol (7.7%) and LDL-c (8.7%) significantly. Orlistat, together with diet therapy, significantly reduced weight and BMI, and improved total cholesterol and LDL-c in Chinese patients with CAD and overweight/obesity.

Non-Traumatic Coronary Artery Dissection in Acute Coronary Syndromes: Is it Just a Plaque Rupture?

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Sterling Hospital, Ahmedabad

Spontaneous coronary artery dissection (SCAD) is relatively rare and usually associated with Marfan’s syndrome or pregnancy. Traumatic coronary dissection occurring secondary to catheter tip, balloon or stent injury is seen more frequently than SCAD in the interventional era. We present 15 consecutive cases of spontaneously occurring non-traumatic coronary artery dissection in acute coronary syndrome (ACS) presenting in our centre from 2004–2005. All patients were men and the mean age was 54.8±11 years (range: 40–74 years). Mean height of patients was 163.7±15.8 cm. Twelve (80%) patients were hypertensive while diabetes mellitus was present in 13 (86.6%) and dyslipidemia in 9 (60%) patients. Coexisting obstructive atherosclerotic coronary artery disease (CAD) was observed in 11 (73.3%) patients, while other 4 had no angiographic evidence of atherosclerotic CAD but they had coronary risk factors. Eleven (73.3%) patients presented with acute myocardial infarction (MI) and rest with unstable angina. The mean left ventricular ejection fraction (LVEF) was 38.6±17.5% of MI, left ventricular ejection fraction (LVEF), and duration of hospitalization was calculated. QTd (maximal minus minimal QT interval) was calculated in standard 12-lead electrocardiogram. Mean QTd in all cases was 74±9 ms. In 6 patients who died during six months follow-up, the mean of QTd was 103±11 ms and was significantly higher than survivors (QTd mean: 74±8 ms) (p<0.05). The mean of QTd with complicated acute MI was 81±10 ms, and had no significant difference from non-complicated group (QTd mean: 72±8 ms) (p<0.05). We divided complicated patients in four groups: bradyarrhythmia and conductive disturbance in 14 cases (QTd mean: 79±9 ms), atrial tachyarrhythmia in 7 cases (QTd mean: 73±14 ms), ventricular arrhythmia in 16 cases (QTd mean: 86±11 ms) and acute heart failure and cardiogenic shock in 9 cases (QTd mean: 92±3 ms). We found no significant difference between these four groups by using one way ANOVA test (p=0.05). In our study there was no significant relation between QTd and LVEF (Pearson’s coefficient correlation, r=0.78, p=0.16). QTd can be used as a simple and easily available criterion for prediction of short-term mortality after MI. In this study there was no definite relation between QTd with other complications or LVEF after MI.

An Independent Risk Factor for Prediction of Mortality and Mortality in Acute Myocardial Infarction: QT Dispersion

Farzad Jalali, K. Hajian
Babol University of Medical Sciences, Babol

Many investigators consider QT dispersion (QTd) to reflect heterogeneity of ventricular repolarization and its predictive power in arrhythmias and sudden cardiac death, after myocardial infarction (MI). We studied the relation between QTd – as an independent factor – and hospital morbidity and post-discharge mortality in patients with acute MI. The study included 200 patients with acute MI admitted in our hospital. Information about age, sex, medical history, location and type of MI, left ventricular ejection fraction (LVEF), and duration of hospitalization was collected. QTd (maximal minus minimal QT interval) was calculated in standard 12-lead electrocardiogram. Mean QTd in all cases was 74±9 ms. In 6 patients who died during six months follow-up, the mean of QTd was 103±11 ms and was significantly higher than survivors (QTd mean: 74±8 ms) (p<0.05). The mean of QTd with complicated acute MI was 81±10 ms, and had no significant difference from non-complicated group (QTd mean: 72±8 ms) (p<0.05). We divided complicated patients in four groups: bradyarrhythmia and conductive disturbance in 14 cases (QTd mean: 79±9 ms), atrial tachyarrhythmia in 7 cases (QTd mean: 73±14 ms), ventricular arrhythmia in 16 cases (QTd mean: 86±11 ms) and acute heart failure and cardiogenic shock in 9 cases (QTd mean: 92±3 ms). We found no significant difference between these four groups by using one way ANOVA test (p=0.05). In our study there was no significant relation between QTd and LVEF (Pearson’s coefficient correlation, r=0.78, p=0.16). QTd can be used as a simple and easily available criterion for prediction of short-term mortality after MI. In this study there was no definite relation between QTd with other complications or LVEF after MI.

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>12 weeks diet therapy (p value)</th>
<th>24 weeks diet+orlistat % (p value)</th>
<th>24 weeks diet+orlistat % (p value)</th>
</tr>
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<tbody>
<tr>
<td>BW (kg)</td>
<td>76.6±8.0</td>
<td>75.5±8.5</td>
<td>1.6 (&lt;0.001)</td>
<td>73.3±9.2</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>28.6±3.4</td>
<td>28.1±3.5</td>
<td>–1.7 (0.001)</td>
<td>27.3±3.7</td>
</tr>
<tr>
<td>TC (mmol/L)</td>
<td>5.32±0.76</td>
<td>5.16±0.68</td>
<td>–3.0 (0.121)</td>
<td>4.89±0.69</td>
</tr>
<tr>
<td>TG (mmol/L)</td>
<td>2.10±0.19</td>
<td>1.86±0.86</td>
<td>–11.4 (0.084)</td>
<td>1.93±1.03</td>
</tr>
<tr>
<td>HDL-c (mmol/L)</td>
<td>1.03±0.17</td>
<td>1.04±0.17</td>
<td>+1.0 (0.990)</td>
<td>1.02±0.18</td>
</tr>
<tr>
<td>LDL-c (mmol/L)</td>
<td>3.33±0.62</td>
<td>3.27±0.50</td>
<td>–1.6 (0.405)</td>
<td>3.05±0.44</td>
</tr>
</tbody>
</table>
(range: 25-60%). Angiography demonstrated 19 dissected vessels in total (range: 1-2); the vessels involved were left anterior descending (LAD) in 13 cases, circumflex (LCx) in two cases and right coronary artery (RCA) in four cases. The incidence of single and double vessel involvement was observed in 11 and 4 patients, respectively. No dissection involved left main coronary artery and aorta. Flow rates in the dissected vessels were TIMI 0–1 in 2 vessels, TIMI 2 in 7 vessels, and TIMI 3 in 10 vessels. Mean dissection length was 19.5 ± 6.2 mm. Coronary bypass grafting (CABG) was carried out in 2 (14.2%) patients and 12 underwent percutaneous interventions. One patient who had dissection of non-dominant RCA was managed medically. Fourteen stents were deployed (8 drug-eluting stents) at mean pressure of 10.2 ± 2.4 atm. Mean stent diameter was 3.4 ± 0.5 mm and length was 24.9 ± 9.1 mm. In our study, SCAD shows an exclusively male preponderance with ACS as exclusive presentation. The clinical scenario and the extent of dissection determine the course of management. No patient in our study had traditional risk factor for SCAD. Majority of patients had evidence of atherosclerotic CAD and were having risk profile of CAD. As all of these patients presented with ACS, these dissections were possibly secondary to plaque rupture.

**Waist to Hip Ratio and Body Height in Patients with Myocardial Infarction**

F Jalali, K Hajian, M R Niaki
Babol University of Medical Sciences, Iran

Now-a-days, investigators study about independent risk factors of myocardial infarction (MI). These factors, without relation to other risk factors can cause coronary artery disease (CAD) and MI. Waist-to-hip ratio (WHR) and height have been considered to be correlated with MI. The aim of this study was to show the independent association of WHR and height with MI. This was an observational case-control study in which, to show the independent association of WHR and height with MI. The present study was performed to determine the frequency and outcome of CAD in patients with DN. Patients with chronic renal failure (CRF) with DN entered the study.

**Outcome of Coronary Artery Disease in Patients with Diabetic Nephropathy**

Behzad Heidari, Parham Heidari
Shaheed Beheshti Hospital, Babol University of Medical Sciences, and Azad University, Karaj, Iran

Microvascular and macrovascular diseases are frequently seen in diabetic patients in particular those with proteinuria. Patients with diabetic nephropathy (DN) are at increased risk of vascular involvement including coronary artery disease (CAD). The present study was performed to determine the frequency and outcome of CAD in patients with DN. Patients with chronic renal failure (CRF) with DN entered the study. Diabetes was confirmed according to history and determination of fasting blood glucose. Diagnosis of DN was confirmed on the basis of 24 hours urinary protein excretion of ≥ 500 mg and exclusion of other diseases with proteinuria. CAD was confirmed by taking history, clinical examination, and review of medical records. 38 patients (18 males, 20 females) with CRF attending for routine clinical follow-up examination were studied. The mean age was 58 ± 11 years and the mean duration of diabetes was 14.8 ± 4.0 years. The median urinary protein excretion was 2500 mg/day (range: 500-8500 mg). Protein excretion in range of nephrotic syndrome was observed in 13 (34.2%) patients. Hypertension was detected in 35 (92%) patients and diabetic retinopathy was found in 28 (73.6%) patients. CAD was observed in 22 (58%) patients (females 65%, males 50%, p=NS). During median follow-up duration of 12.5 months (range 5-38 months), 18 patients expired. Causes of death in 10 out of 18 patients were congestive heart failure and acute coronary syndrome. Compared to patients without CAD, the mean age of nephropathic patients with CAD was higher (60 ± 8.7 years v. 51.6 ± 8.8 years, P<0.01) and the average age at onset of diabetes was significantly higher. The findings of this study indicate that a significant proportion of patients with DN have CAD, which is the major cause of death in this population.

**Relationship of Poor R Wave Progression in Electrocardiograms and Anterior Wall Motion Abnormalities on Echocardiography**

P Jaishankar, V Jaganathan, R Alagesan, M Annamalai, S Shanmugasundaram, Geetha Subramaniam, S Balaguru, G Anuradha, S Venkatesan, G Gnanavelu
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Poor R wave progression (PRWP) is a common electrocardiographic (ECG) abnormality encountered in day-to-day cardiology practice. But its value in diagnosing anterior wall myocardial infarction (AWMI) is not clear. In this context we analyzed the accuracy of PRWP in diagnosing AWMI. Electrocardiogram (ECG) was recorded with proper lead positioning. Fifty patients with PRWP were evaluated for anterior wall motion abnormalities as an evidence of AWMI. Patients with chronic obstruction of pulmonary disease
Coronary artery disease (CAD) is one of the common health problems being faced by the world. Hyperlipoproteinemia (HLP) has significant role in its generation. The present study was undertaken for analyzing the lipid profile in acute myocardial infarction (AMI). This prospective study was conducted on 279 patients (194 male) with AMI in the age range of 30-70 years, admitted in our hospital. AMI was confirmed by typical chest pain, electrocardiogram (ECG) changes and raised levels of cardiac enzymes. The control group consisted of 505 people (277 male) with ages between 36-65 years without any symptoms or signs of CAD. The patients and controls were subdivided in two groups, over and under 50 years old. Serum lipids were measured at admission and two months after MI. The lipid profile included serum triglyceride (TG), total cholesterol (TC), high-density lipoprotein cholesterol (HDL-c), low-density lipoprotein cholesterol (LDL-c), LDL-HDL ratio and TC-HDL ratio. The patients under 50 years had higher mean TC (p<0.03), LDL-c/HDL-c (p<0.02) and TC/HDL-c (p<0.01) compared to control groups but serum levels of HDL-c (p<0.01), and TG (p<0.05) were lower than control group. In cases over 50 years, the mean levels of LDL-c/HDL-c (p<0.01) and TC/HDL-c (p=0.004) were higher than TG and HDL-c (p<0.001) were lower than in control group. There were no significant differences in TC and LDL-c in this group. In our study, higher ratio of LDL-c/HDL-c, TC/HDL-c and also low HDL are significant predictors of CAD.

### Serum Lipid Profile in Patients with Acute Myocardial Infarction

M R Niaki, M T Salehi Orman, F Jalali, M Rahmani
Shahid Beheshti Hospital, Babol University of Medical Sciences, Iran

Coronary artery disease (CAD) is one of the common health problems being faced by the world. Hyperlipoproteinemia (HLP) has significant role in its generation. The present study was undertaken for analyzing the lipid profile in acute myocardial infarction (AMI). This prospective study was conducted on 279 patients (194 male) with AMI in the age range of 30-70 years, admitted in our hospital. AMI was confirmed by typical chest pain, electrocardiogram (ECG) changes and raised levels of cardiac enzymes. The control group consisted of 505 people (277 male) with ages between 36-65 years without any symptoms or signs of CAD. The patients and controls were subdivided in two groups, over and under 50 years old. Serum lipids were measured at admission and two months after MI. The lipid profile included serum triglyceride (TG), total cholesterol (TC), high-density lipoprotein cholesterol (HDL-c), low-density lipoprotein cholesterol (LDL-c), LDL-HDL ratio and TC-HDL ratio. The patients under 50 years had higher mean TC (p<0.03), LDL-c/HDL-c (p<0.02) and TC/HDL-c (p<0.01) compared to control groups but serum levels of HDL-c (p<0.01), and TG (p<0.05) were lower than control group. In cases over 50 years, the mean levels of LDL-c/HDL-c (p<0.01) and TC/HDL-c (p=0.004) were higher than TG and HDL-c (p<0.001) were lower than in control group. There were no significant differences in TC and LDL-c in this group. In our study, higher ratio of LDL-c/HDL-c, TC/HDL-c and also low HDL are significant predictors of CAD.

### Endothelial Dysfunction in Young First Degree Relatives of Patients with Coronary Artery Disease

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Endothelial dysfunction (ED) is considered to be the precursor of atherosclerosis. Atherosclerosis often starts at an early age of 15 years and gets accelerated in those who have family history of premature cardiovascular disease (CVD) and/ or smoking. Increased carotid intima media thickness (CIMT), diminished flow-mediated dilation (FMD), altered ankle brachial index (ABI), increased C-reactive protein (CRP) are said to be the clinical markers for ED. To test the above hypothesis we studied 40 documented patients of coronary artery disease (CAD) ≤ 60 years and 40 of their progeny/siblings aged ≤35 years. Another 25 healthy age- and sex-matched controls and 25 of their progeny/siblings were also studied. Each subject was assessed in detail regarding smoking, hypertension (JNC-VII), diabetes (ADA, 2003), body mass index (BMI), waist-hip ratio (WHR), lipid profile [low-density lipoprotein-cholesterol (LDL-c), high-density lipoprotein-cholesterol (HDL-c), triglycerides (TG)], C-reactive protein (CRP), CIMT, FMD, ABI and response to cold pressor test (CPT). The salient observation are shown in the table.
Should Statins Form Part of Therapy in Unstable Angina?  
V K Katyal, SB Siwach, S Singh, N Chadha, Jagdish  
Post Graduate Institute of Medical Sciences, Rohtak  

Unstable angina is associated with increased risk of major adverse coronary events (MACE) and half of these events occur in first 6 months after onset of instability in coronary arteries. Despite various medical versus interventional strategies of treatment, the incidence of MACE remains high. Newer options viz. addition of statins in acute phase hold promise in reducing these events. We designed this study in which 20 mg of simvastatin was administered to alternate patient of unstable angina (UA) / non-ST elevation myocardial infarction (NSTEMI). They were divided into two groups of 50 patients each - Group A receiving statin and Group B not given statin in addition to usual line of treatment. MACE occurring during hospital admission and at 30-day were studied. Primary end points included death, non-fatal myocardial infarction (MI), or recurrent angina at the end of 48 hours and secondary end points of death, non-fatal MI or recurrent angina at discharge and 30-day follow-up after acute onset. Demographic characteristics of two groups in relation to age, sex, severity of UA, risk factor profile including risk stratification of UA, hemodynamics, transaminase levels and lipid profile were comparable. Recurrent angina (13.3 v. 3.3%) and left ventricular failure (LVF) (10 v. 3%) occurred more frequently in patients not receiving statins during hospital stay. However, on further risk stratification of UA, MACE occurred more frequently in high risk patients (31 v. 6%, RR 0.28, 95% CI 0.13-0.59) if the patient was deprived of statin therapy during acute stage (hospital stay). There was no difference in other primary events during hospital stay in 2 groups. At the end of 30 days, recurrent ischemia was noted in 23% versus 16.6% patients not given statin. There was no difference in other events at the end of 30-day follow-up. All fractions of lipids fell significantly in simvastatin group at the end of 30-days (p<0.001). Statins have "pleiotropic" effects apart from long-term effects on lipids and atherosclerosis which has prompted its use in acute phase of coronary instability. Such effects are modulation of endothelial dysfunction, local inflammatory response and exaggerated thrombogenic tendency. These effects are likely reasons of benefit of statin therapy in high risk patients in our study.

Adjunctive Coenzyme Q-10 Therapy in Cases of Acute Coronary Syndrome  
Adarsh Kumar, R.K. Sharma, Pushpa Devi, Varun Mohan  
Government Medical College/GND Hospital, Amritsar  

Acutecoronary syndrome (ACS) has a bad prognosis. Some of the recent studies have shown beneficial effect of coenzyme (Co) Q-10 in the acute MI (STEMI). However, it has not been tried in ACS. CoQ-10, by improving cellular bioenergetics and its antioxidant effects may slow progression of atherosclerosis with plaque stabilization effect. As most of the patients of ACS are also on statins which, by blocking the mevalonate pathway reduce CoQ-10 levels. Supplementing CoQ10 with statins may be helpful and reduce their undesirable effects. To evaluate the effect of addition of CoQ-I0 to conventional treatment of ACS (nitrates, antiplatelets, low molecular weight heparins and statins etc.) (Group I) as compared to conventional treatment alone (Group II). 217 cases of ACS diagnosed by clinical examination, ECG, cardiac enzymes and echocardiography for regional wall motion abnormality (RWMA) admitted in coronary care unit (CCU) were studied. Group I consisted of 116 ACS cases (males: 67%, females: 33%; age range: 38.3-76.4 years, mean of 58.7 years) and were given 150 mg oral CoQ10 per day in addition to the standard treatment for 6 months. Group II had 101 ACS cases (males: 63.3%, females: 36.7% age range: 33.4-79.3 years, mean 60.7 years) were given standard treatment alone. The follow-up period was 6.1-12.3 months mean of 6.8 months. Comparison of end points in treatment group I and control group II is shown in the Table.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Gp I (with CoQ10)</th>
<th>Gp II (standard therapy)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptomatic improvement</td>
<td>75/116</td>
<td>48/101</td>
<td>&lt;0.05 (S)</td>
</tr>
<tr>
<td>on anginal scoring system</td>
<td>64.6%</td>
<td>47.52%</td>
<td></td>
</tr>
<tr>
<td>Development of significant LV dysfunction at 6 months follow-up</td>
<td>6/116</td>
<td>10/101</td>
<td>&lt;0.05 (S)</td>
</tr>
<tr>
<td>Need for revascularization by PTCA/CABG</td>
<td>26/116</td>
<td>37/101</td>
<td>&lt;0.001 (S)</td>
</tr>
<tr>
<td>Mortality at months</td>
<td>6/116</td>
<td>7/101</td>
<td>0.05 (NS)</td>
</tr>
</tbody>
</table>

To conclude, adjunctive CoQ-I treatment in ACS is beneficial on short to medium-term basis. Although the mortality reduction is also there, this is not statistically significant.

A Clinical Trial of Intravenous followed by Oral Nicorandil to Evaluate its Safety and Efficacy in Patients with Unstable Angina and Non-ST Elevation Myocardial Infarction, in Comparison with Intravenous followed by Oral Nitrates  
Soumitra Kumar, Kumar Sankar Poddar, Subir Ghose  
Vivekananda Institute of Medical Sciences, Kolkata  

The purpose of this study was to find out the efficacy, safety and benefit, if any, in short-term mortality and morbidity of intravenous (IV) and oral nicorandil in comparison to IV and oral nitrates in patients with unstable angina and non-ST
elevation myocardial infarction (NSTEMI). Thirty patients (between 35 to 70 years) with acute coronary syndrome (ACS) [unstable angina (UA) and NSTEMI] selected as per ACC/AHA-2002 Guidelines for UA were randomly divided into two equal study groups. One group received IV nicorandil (2-6 mg/hour) and other group IV nitroglycerine (5-10 µg/min) followed by oral nicorandil (5-10 mg twice daily) and nitrates (20 mg twice daily), respectively along with other conventional antianginal treatment. Each patient had serial electrocardiogram (ECG), cardiac enzymes (CPK-MB and troponin-T), echocardiography and routine laboratory investigations. Concomitant medication administered was recorded and patients were followed-up for recurrence of chest pain, progression to STEMI, need for revascularization and death up to 1 month after admission. Twenty-three patients till date (11 in the nicorandil group and 12 in the nitroglycerine group) have completed the trial. Symptomatic relief from chest pain has been observed in 63% in the nicorandil group and 58% in the nitrate group while 18% in the nicorandil group had recurrent angina compared to 25% in the nitrate group. The results that are available in this ongoing study show that nicorandil (IV followed by oral) is comparable to nitroglycerine in terms of short-term safety and efficacy.

In conclusion, in intensive care units, it is not rare to find patients with ECG showing various changes simulating infarction pattern without actually having suffered an AMI.

Prognostic Value of Pre-Discharge Electrocardiographic Measurement of Infarct Size after Thrombolysis
Prabhakar C Koregol, AU Mahajan, BS Sreenivasa, G Rajyadaksha, ME Yeolekar
Lokamanya Tilak Municipal Medical College and General Hospital, Mumbai

In the era of exponentially growing coronary artery disease (CAD) and equally rapidly expanding investigations for risk stratification and treatment, electrocardiogram (ECG) still holds a very strong position at every stage of decision-making. We assessed the ECG myocardial infarction (MI) sizing score (Selvester QRS Score) at hospital discharge as a predictor of outcome. We included the patients admitted to our hospital between January 2004 - December 2004 and whose 6th month/until death follow-up data was available. A total of 186 patients were included. The patients were classified into those with score of 0-9 and those with score ≥10. The end points were 30-day and 6-month major adverse cardiac events (MACE). There was no statistically significant demographic difference between two groups. ECGs were scored independently by 3 interpreters. Patients with QRS score ≥10 had significantly higher mortality at 30 days than those with QRS score 0-9 (16.3% v. 4.1% p<0.001) and also higher mortality at 6 months (21% v. 7%). There was no significant difference in chest pain or hospitalization for acute coronary syndrome between two groups (29% v. 18% p=0.07) at 6 months and (33% v. 39%, p=0.06) at 30 days. Utilization of coronary angiography did not differ significantly between 2 groups (37.8% v. 39.2, p=0.69). Readmission for acute left ventricular failure was higher for the group with score ≥10 (15.9% v. 10.6%, p=0.03) but there were no significant difference at 6 months. Our study shows that stratification of patient after acute MI with widely available ECG score can predict short - and intermediate-term prognosis specially with regard to mortality.

Study of ST Elevations in Electrocardiogram in Absence of ST Elevation Myocardial Infarction in Cardiac ICU Setting
Prabhakar C Koregol, BS Sreenivasa, ME Yeolekar, AU Mahajan
Lokamanya Tilak Municipal Medical College and General Hospital, Mumbai

Though the electrocardiogram (ECG) is used as first line diagnostic test in patients with acute coronary syndrome (ACS), significant number of patients have normal ECG despite ACS and converse is also true. We undertook this study to look at the incidence of ECG suggestive of ST elevation myocardial infarction (STEMI) in patients without actually having suffered an acute myocardial infarction (AMI). We studied 400 patients admitted in ICU with symptoms suggestive of ACS and ST segment elevation in ECG, from June 2004 to June 2005. Serial ECGs, serial cardiac enzymes (CK-MB, troponin-T) and two-dimensional echocardiography echo (2D) were done in all patients. Those patients who did not show evolution of ECG changes over time, nor significant changes in enzyme levels, no regional wall motion abnormality (RWMA) on echocardiography were evaluated for other alternative diagnoses for ST segment elevation. In our study, 32 (8%) patients had ST segment elevations secondary to other conditions as follows:

- LVH/LBBB: 12
- Early repolarization pattern: 10
- Acute pericarditis: 6
- Myocarditis: 1
- Acute pulmonary thromboembolism: 1
- Hyperkalemia: 1
- Post-MI ventricular aneurysm: 1

In conclusion, in intensive care units, it is not rare to find patients with ECG showing various changes simulating infarction pattern without actually having suffered an AMI.
Incidence of coronary artery disease (CAD) is increasing in younger individuals in India as compared to developed nations. However, it is not known what risk factors are specifically associated with CAD at young age. We studied 1000 consecutive patients undergoing coronary artery bypass surgery (CABG) at our center between June 2004 and September 2004. Complete information regarding their clinical characteristics and conventional cardiovascular risk factors was obtained. Of the 1000 patients studied, 939 (93.9%) were ≥45 years of age (mean age 60.98±8.37 years) and only 61 (6.1%) were <45 years (mean age: 40.57±3.65 years). The two groups were not different with respect to male gender, body mass index (BMI) and history of smoking.

In the present study, CAD at young age was found to be significantly associated with family history of premature CAD. The proportion of young patients undergoing CABG in the present study is not a true reflection of the prevalence of premature CAD in the community, which needs to be elucidated by further studies.

In patients with ST elevation myocardial infarction (STEMI), diastolic dysfunction assessed by Doppler echocardiography provides additional prognostic value. Doppler variables are affected by multiple factors and may change rapidly. In contrast, left atrial (LA) volume is less influenced by acute changes and reflects subacute diastolic function. This may be of importance when one assesses risk in patients with STEMI. This study aimed to evaluate the prognostic value of LA volume in acute STEMI. Sixty patients admitted in our hospital with acute STEMI during March to April 2005 constituted the study population. Mean age of the patients was 48 years. Male-female ratio was 3:1. They were evaluated with echocardiography within 48 hours after admission for left
ventricular (LV) systolic and diastolic function and LA volume index. LA volume was calculated by using ellipsoid method, using the formula \((4/3 \times 22/7 \times L/2 \times D_1/2 \times D_2/2)\). LA volume was corrected to body surface area. The LA volume was considered to be normal if it was <26 ml. Patients were divided into two groups based on LA volume (Group A >32 ml/m², Group B <32 ml/m²). Patients were followed for one month. The prevalence of systemic hypertension was equal in both groups. The difference in mortality between the two groups was significant independent of site of infarction.

We conclude that in patients with STEMI, increased LA volume, determined within the first 48 hours of admission, is an independent predictor of short-term mortality and provides additional prognostic information.

### TIMI Score for Risk Assessment in Unstable Angina/Non-ST Elevation Myocardial Infarction - An Observational Study

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St John’s Medical College, Bangalore

Risk stratification of patients with unstable angina (UA) and non-ST elevation myocardial infarction (NSTEMI) is useful in assessment of prognosis and delivery of optimal medical care. The current study reports the application of thrombolysis in myocardial infarction (TIMI) risk score in 59 consecutive patients admitted with UA/NSTEMI to our hospital. (The TIMI risk score to obtain a score of 0-7). The mean age of the patients was 61±9.9 years and 34% were women. Hypertension (73%), diabetes mellitus (61%) and dyslipidemia (64%) were the common risk factors present; 19% were smokers and 25% had family history of premature coronary artery disease (CAD); 31% had elevated serum cardiac markers and were diagnosed to have NSTEMI. Ischemic electrocardiographic (ECG) changes were present in 52%. The number of patients with risk score of 0/1, 2, 3, 4, 5 and 6/7 was 4, 15, 15, 19, 4 and 2 respectively. No patient with risk score of 0/1 had NSTEMI while 50% of patients with scores more than 5 had the same. The severity of CAD also showed an increasing trend as the risk score increased. No end points - death, MI or urgent revascularization were present in patients with scores 0-3. Out of the 3 deaths, one patient had a score of 6/7 and two patients had score of 4. A trend toward increasing events was obtained as the score increased. We conclude that the TIMI risk score is a useful tool for predicting the outcome of patients with UA/NSTEMI though larger studies are required to calculate the exact numerical risk associated with each score.

### Day Care Angiography

Yogendra Singh, R. Chakraborty, Aftab Khan, Suvo Banerjee, Debashis Ghosh, Prakash C Mondal, Arunangshu Ganguly
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Diagnostic coronary angiography (CAG) has very small but definite mortality which can go up in a subgroup of high risk patients, that is why it is done as an in-patient procedure which makes it a bit inconvenient for the patients. CAG is one of costliest investigation in private care setting. To bring down the cost of the procedure and make it more convenient and acceptable to the patients we introduced a concept of day care angiography. We did 126 day care angiograms from February 2005 to May 2005. Mean age of patients was 50±12 years (male 112, female 14). Thirty-two (25.4%) patients had history of myocardial infarction (MI), 2 (2.3%) were post coronary artery bypass grafting (CABG). CAG was done by various routes depending on physician’s preference, right radial 38 (30.2%), left radial 6 (4.7%), right ulnar 2 (1.6%), left brachial 3 (2.4%), femoral 77 (61.1%). All patients received 2500 U unfractionated heparin before the procedure. There was no mortality. One patient had to be admitted because of left ventricular failure (LVF) after CAG. 4 (3.2%) patients had small hematoma but all were discharged the same day after the cardiologist’s visit. CAG was done with 4 F system in 32 (25.3%) patients and 5 F system in 103 (81.7%) patients as per physician’s preference. In one patient we had to change the sheath from 4 F to 5 F due to inadequate visualization of coronary arteries. Day care option was chosen by patients without any consideration of the risk profile which is clearly evident from risk profile findings and recommendation; 29 (23%) patients had triple vessel disease, 22 (17.4%) double vessel disease, 37 (29.4%) single vessel disease, 35 (27.8%) had normal coronaries, 3 (2.4%) minor coronary artery disease (CAD) and 33 (26.2%) got advice of CABG, 51 (40.5%) PTCA, 42 (33.3%) medical management. Our day care is primarily being managed by trained nursing staff with on-call cardiologist. This study shows that day care angiogram can be done like any other outpatient investigation with acceptable mortality, morbidity and at lower cost.

### Risk Factor Assessment in Patients with Myocardial Infarction at a Young Age

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All India Institute of Medical Sciences, New Delhi

Coronary artery disease (CAD) is known to occur at a younger age in Indians leading to a major loss of potentially productive person-years. Early onset CAD usually occurs in the absence of traditional risk factors and its cause remains largely unknown. All consecutive consenting patients of acute myocardial infarction (MI) presenting within 24 hours of chest
Thrombolytic Window and Clinical Outcome in Patients with ST Elevation Myocardial Infarction

G Jayakumar, V Amuthan, S Palanchamy, S M urugan, RA Janarthanan, S Balasubramanian, M shamad S Naina, S Balashankar, G Prathapkumar, P Kannan, M Anandhan

Government Rajaji Hospital, Madurai Medical College, Madurai

The aim of the study was to assess the clinical outcome in patients with ST elevation myocardial infarction (STEMI) in relation to thrombolytic window. Patients admitted with acute STEMI in our ICU between November 2004 to May 2005 who were thrombolysed were included in this study to find out the relation of thrombolytic time window with ejection fraction (EF), functional capacity and anatomical lesions. There were 100 patients who were divided into 4 groups depending on the time window (time of onset of chest pain to thrombolysis): 1-3 hours, 3-6 hours, 6-12 hours, 12-24 hours. Thrombolysis was done using standard protocol with 15 lakh units of streptokinase in 100 ml of normal saline over 60 min. Echocardiographic study was done in all patients on day 4 and left ventricular ejection fraction (LVEF) was calculated by modified Simpson’s technique. Pre-discharge symptom limited treadmill test (TMT) was done in 47 (47%) of patients. All who underwent TMT were subjected to coronary angiogram. The results are shown in table.

<table>
<thead>
<tr>
<th>Thrombolysis Wind. No. of cases</th>
<th>50% ST resolution</th>
<th>EF</th>
<th>METS</th>
<th>IRA &amp; % of occlusion</th>
<th>Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>9</td>
<td>5/9</td>
<td>52±3.5</td>
<td>7.1±0.9</td>
<td>66±3.5(4)</td>
</tr>
<tr>
<td>3-6</td>
<td>19</td>
<td>7/19</td>
<td>50.05±22.2</td>
<td>6.5±0.7</td>
<td>69.5±3.5(8)</td>
</tr>
<tr>
<td>6-12</td>
<td>62</td>
<td>12/62</td>
<td>47.2±21.1</td>
<td>5.1±0.9</td>
<td>72±5.5(30)</td>
</tr>
<tr>
<td>12-24</td>
<td>10</td>
<td>2/10</td>
<td>41±3.5</td>
<td>4.2±0.3</td>
<td>85±4.5(5)</td>
</tr>
</tbody>
</table>

IRA: Infarct-related artery; EF: ejection fraction

We conclude that patients who were thrombolysed within 6 hours of onset of chest pain have good EF and moderately good functional capacity and lesser residual anatomical obstructions. Patients who were thrombolysed later had poor EF, functional capacity and higher percentage of anatomical obstruction. So patients’ education and physicians’ awareness is important for early thrombolysis in myocardial infarction patients for better outcome.

Safety and Utility of Left Transradial Coronary Angiography in a Mobile Cardiac Catheterization Laboratory

Sanjay K Chugh, RB Panwar, RR Kasiwal, Gaurav M inocha, Vivek Tandon, Naresh Trehan
Escorts Heart Institute and Research Centre, New Delhi

The mandatory bed-rest following manual compression after femoral access for coronary angiography limits turnover of patients in a busy facility. The aim of this study was to assess the safety and utility of left radial access for coronary angiograms in a mobile cardiac catheterization laboratory (MCCL) (GE systems) in a 14-bedded facility at a Medical College Hospital in Bikaner, Rajasthan. Patients with acute myocardial infarction, heart failure, hemodynamic instability and rest angina in the preceding 72 hours were excluded. Radial artery (RA) diameter (color Doppler ultrasound) was measured. Catheters with radial curves were not available. Judkin’s catheters were used. Amplatz catheters were used only as an alternative if Judkin’s did not fit. Procedure time was recorded (RA puncture to end of angiogram). Hemostatic compression bandage was removed at 0.5 hours unless bleeding persisted. No patient was kept in-hospital beyond 4.5 hours unless clinically necessary. Mean age was 50.2±8.6 years. Judkin’s catheters were used in 95.3% of 178 (males: 161, females: 17) consecutive transradial coronary angiograms (TRCA) through left radial access (LRA). RA diameter was 2.2±0.4 mm. In 6% (n=11) >1 catheter exchange was done. Catheter manipulation was difficult in 2 cases with subclavian artery (SA) tortuosity (1.1%). Significant RA spasm occurred in 2.2% (n=4). Average daily procedure volume increased by 35% from 13 (12-14) to 20 (19-21); each TRCA requiring an average of 15±5.5 min. 96% patients were discharged home 3.9 hours after procedure. There were no major complications. In a MCCL facility in semi-
rural India, left TRCA is safe. Because procedures are shorter and patients can be discharged home earlier, more procedures can be accommodated per day. Incidence of SA tortuosity and RAS is also low with this approach.

Clinical, Biochemical and Angiographic Profile of Young (≤40 Years) Patients with Acute Myocardial Infarction
A Shah, S Sreenivasan, H Shah, C Lanjewar, A Nbar, P Nyayadhish, P Nathani, P Kerkar
King Edward VII Memorial Hospital, Mumbai

When compared to older patients, young adults (≤40 years old) with acute myocardial infarction (AMI) may have different risk factor and clinical profile as well as a different prognosis. Besides studying the clinical and angiographic profile of young patients with AMI, we investigated the serum levels of certain moieties of lipoproteins and amino acids, which might contribute to the occurrence of acute coronary event early in life. Among 73 patients (mean age: 32.5 ± 3 years, 67 males) studied over a period of 18 months the youngest individual was 22 years old. The incidence of smoking (52%) and positive family history of atherosclerotic affection of coronary/cerebral/ peripheral vessels at young age was low. Other conventional risk factors, diabetes (10%) and hypertension (11%) were also less common in these young patients. Anterior wall (73%) was the commonest site affected. More than mild hyperhomocysteinemia (>30 mg/dl) and elevated lipoprotein (a) levels (>30 mg/dl) were found in 71% and 36% of the patients, respectively. Markers of thrombophilia and vasculitis (anti-phospholipid antibodies, HBsAg, ANA, dsDNA) are rare causes of myocardial infarction in young patients. Single-vessel disease (54%) was common and left anterior descending artery (84%) was the most common culprit vessel. On elective coronary angiography, the culprit vessel was found to be recanalized in the majority (70%). A large number of young patients (85%) with AMI have well preserved left ventricular (LV) function.

Clinical Utility of Troponin-T Levels and Wall Motion Abnormality in Acute Coronary Syndrome
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Echocardiography is a useful non-invasive imaging technique for the assessment of ischemic heart disease. Ischemia leads to wall motion abnormality which can be detected by echocardiography. Our study aimed at assessing the combined utility of troponin-T (Trop-T) levels and wall motion abnormality detected by echocardiography as a predictor of adverse cardiac events. Serial Trop-T levels and echocardiographic images were evaluated in 100 patients with chest discomfort. Trop-T was done at presentation and subsequently at 6 hourly interval for 24 hours. Echocardiography was done to detect wall motion abnormality in the same patients. Of the 100 patients (males: 60, female: 40), Trop-T was increased 23 patients with acute myocardial infarction (MI) and 15 of 41 patients with unstable angina. None of the patients with stable angina had an increased Trop-T levels. 19 of the 23 patients with acute MI had wall motion abnormality detected by echocardiography and 10 of 41 patients with unstable angina had wall motion abnormality. The combination of Trop-T levels with echocardiography gave a positive predictive value of 84% for adverse cardiac events and a negative predictive value of 90% in the follow-up period. The combined result of Trop-T and echocardiographic imaging is a more powerful predictor of adverse cardiac outcome than isolated results.

Endothelial Dysfunction and Intima-Media Thickening in Coronary Artery Disease
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Risk stratification for predicting future cardiovascular events and diagnosis of occult vascular disease is a complex process. Concomitant non-invasive measurement of arterial endothelial dysfunction and intima-media thickness (IMT) would help a long way to assess the functional and structural status of the vasculature. This study was structured to assess the diagnostic utility of endothelial function assessment by brachial artery flow-mediated dilation (FMD) technique using high resolution ultrasound and compare it with carotid and femoral arterial IMT in coronary artery disease (CAD). In this prospective study, 75 men and women aged 18-75 years participated. Subjects were classified into two groups. Fifty consecutive patients who had significant CAD in coronary angiography (>50% lesion at least in 1 major vessel) were included in the study group. 25 healthy, age and sex-matched subjects who had no history, symptoms or known risk factors of CAD, negative stress test and normal echocardiogram were enrolled in the control group. The non-invasive determination of endothelial function was performed with brachial artery FMD technique. The brachial artery diameter was measured at rest, during reactive hyperemia i.e. post-cuff occlusion (endothelium-dependent vasodilation), and after the sublingual administration of nitroglycerine (endothelium-independent vasodilation). Vessel diameters after reactive hyperemia (FMD) and nitroglycerine administration (NMD) were compared with the resting diameters and expressed as a percentage of the lumen diameter at rest. All subjects underwent IMT assessment of carotid (average of 12 IMT...
the comparison of radial immediate ambulation. The purpose of our study was to assess site complications and improved patient comfort due to radial approach. Results are given in the table.

Vipin Talwar
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Femoral Angiography
Catheter with Conventional Percutaneous Coronary Angiography by Single Tiger Comparison of Percutaneous Radial Femoral Angiography

To conclude, there is very highly significant difference (p<0.0001) in FMD%, FMD/NMD ratio and carotid and femoral IMT between established CAD patients and normal age- and sex-matched control population. Hence, these parameters are worth measuring in patients going for coronary angiography, specially if one of the screening tests is negative. Further the abnormal endothelial function observed by FMD could point toward a generalized impact on the arterial tree by multiple risk factors and the extensive nature of the vascular disease and its implications.

Comparison of Conventional Coronary Angiography with Non-invasive Multislice Spiral Computed Tomography for Detection of Coronary Artery Stenosis

Transradial cardiac catheterization promises fewer access site complications and improved patient comfort due to immediate ambulation. The purpose of our study was to assess the comparison of radial versus femoral approach for coronary angiography with respect to feasibility, safety, quality, procedure time and cost effectiveness. This study showed high success rate with both procedures (radial 98%, femoral 100%). The duration of procedure was longer when radial approach was used compared to femoral (radial 15.5±2 min, femoral 11±1.2 min). The cannulation time with radial approach was longer as compared to femoral (radial 67±8 s, femoral 45±5 s). The radiation exposure was also longer with radial approach (5.6±8 min) as compared to femoral approach (4.2±3 min).

The high success rate in our study of radial approach as compared to other studies was due to use of cocktail regimen (nitroglycerine + diltiazem). The high success rate in our study of radial approach as compared to other studies was due to use of cocktail regimen (nitroglycerine + diltiazem). The amount of dye used in radial approach was higher as compared to femoral approach (151 ml compared to 131 ml, respectively). The total time required in radial approach were 1.6 s as compared to femoral approach which required 3.2 catheter. Common complication in radial approach were pain in arm in 7% and loss of radial pulses in 15%. The common complications with femoral approach was local hematoma seen in 18% of cases. One of the main advantages of radial approach was rapid mobilization, less hospital stay (3.4 hr vs. 8.30 hrs). Radial approach was more cost effective. The average cost of radial approach was Rs. 2,500/- per examination and of femoral approach was Rs. 4,000/- per examination. The transradial approach is attractive because of lesser complications, early mobility and lower cost.
4 in diagonals, 2 in RCA, 1 each in PLV and PDA. One of the two significant left main segment lesion was not undetected by MSCT coronary angiogram. We conclude that MSCT is highly efficacious for detecting significant coronary artery lesion with a sensitivity of 85%, specificity of 98%, positive predictive value of 87% and negative predictive value of 97%. It is a promising tools to screen for coronary artery disease.

Measurement of Cardiac Troponin-I and Troponin-T in Patients with Acute Myocardial Infarction
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Acute myocardial infarction (AMI) is one of the most common diseases today. This study was undertaken to determine the level of two important biochemical markers of AMI, that is, cardiac troponin-I and troponin-T. This study was a descriptive-analytic study, which was performed on 100 patients in whom, according to criteria of World Health Organisation diagnosis of AMI was definite. On second day of admission in coronary care unit (CCU), cardiac markers including troponin-I using qualitative immunochromatography assay and cardiac troponin-T (cTnT) using third generation cTnT detection assay (CARDIAC) and also total creatine kinase (CK) was measured and recorded. This information were recorded in a special data sheet and then analyzed by using SPSS, chi square and t test.

Measurement of Lipoprotein(a) in Patients with Acute Coronary Syndromes and Control Group
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Hyperlipidemia is one of risk factors for atherosclerosis. Treatment of hyperlipidemia decreases the incidence of cardiovascular disease. The purpose of this study was the determination of lipoprotein(a) [Lp(a)] level in patients with cardiovascular disease and control group. In a case-control cross-sectional study, the level of Lp(a) was measured with method of ELISA in 100 patients with acute coronary syndrome (ACS) and 100 healthy people matched for sex and age. Then samples were analyzed using SPSS and t test.
Intra-Aortic Balloon Pump Supported Angioplasty

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Intra-aortic balloon pump (IABP) supported angioplasty for hypertensive, unstable patients with left ventricular (LV) dysfunction is a well-established entity. We present our data of IABP-supported angioplasty (n=21) from January 2002 to 30 June 2005. Of the 21 patients, 15 had recent myocardial infarction (MI) (within one week), while 6 had unstable angina. Their average age was 61.3±9.6 years, 18 were males. Diabetes was present in 12 (57%), hypertension in 6 (19%), family history was positive for premature coronary artery disease (CAD) in 1 (4%), while 8 (38%) were smokers. The echocardiographic ejection fraction (EF) was 23.3±8.8%. Single vessel disease (SVD) was present in 10, double vessel disease (DVD) in 8 and triple vessel disease (TVD) in 3 patients. Of the 21 patients, 20 underwent successful stenting, while one patient underwent coronary artery bypass grafting (CABG). Left anterior descending artery (LAD) was stented in 14, right coronary artery (RCA) in 4, left circumflex (LCx) in 1 and Ramus in 1. In one patient, percutaneous transluminal coronary angioplasty (PTCA) and stenting to LAD with plain optimal balloon angioplasty (POBA) to Ramus was done. The median duration for IABP support was 14 hours (range: 6-32 hours). No death occurred during, or within first 24 hours after procedure. In-hospital mortality was 3/21 (15.4%), due to renal failure in one, ventricular fibrillation (VF) and septicemia in one each. One patient required recurrent admission due to LV dysfunction and recurrent ventricular tachycardia (VT), and died 20 days after procedure. At a mean follow-up of 13±6 months in 14 patients, all were asymptomatic with no evidence of restenosis clinically. We conclude that angioplasty with IABP support can be conducted safely in a high-risk group of patients with a good acute and intermediate success rate.

Does Gender Bias Truly Exist in Post-Angioplasty Results

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We analyzed our data of a total of 356 females who underwent coronary angioplasty from January 2002 to December 2004. Their mean age was 52.8±10.4 years (range: 34-75 years). One-hundred sixty-four (46%) patients were diabetic, 196 (55%) were hypertensive. Fourty-one (11%) were pre-menopausal females. In 426 target vessels, 457 stents were deployed. The target vessel was left anterior descending artery (LAD) in 256 (60.2%), Ramus in 9 (2.2%) left circumflex (LCx) and obtuse marginal (OM) in 72 (16.9%), right coronary artery (RCA) in 88 (20.5%) and graft percutaneous transluminal coronary angioplasty (PTCA) was done in 1 patient. Multi-vessel stenting was done in 70 (19.66%) patients. Of a total 346 patients who were stented, 33 (9.5%) had small coronary arteries (≤2.5 mm). Drug-eluting stents were deployed in 244 (53%) lesions and non-drug-eluting stents were deployed in 223 (47%) lesions. Glycoprotein IIb/IIIa receptor antagonist was administered in 94 patients (abciximab: 61, eptifibatide: 33). At a mean follow-up of 20.8±10.4 months, 3 patients developed acute in-stent thrombosis (within 48 hours of procedure) which were tackled with re-angioplasty with abciximab cover; 2 patients developed subacute stent thrombosis which was successfully treated with angioplasty. Twenty-eight (7.6%) patients had in-stent restenosis out of which 27 patients were successfully treated with repeat angioplasty and one underwent coronary artery bypass grafting (CABG). Our data shows that PTCA and stenting in females has good immediate, short-term and intermediate results.

Immediate and Long-Term Results of Direct Stenting of Lesions less than 95% with Cypher Stents

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The objective of this study was to see if polymer-coated rapamycin stent was affected by friction in direct stenting at long-term i.e. at ≥ 2 years. Three hundred patients (females: 120) with stenosis ranging between 75% and 95% with evidence of reversible ischemia underwent direct stenting with Cypher stents in 2.5 mm to 3.5 mm diameter vessels; 50% of the patients had diabetes, 30% had hypertension, 40% had dyslipidemia, 40% were smokers and 20% had positive family history of ischemic heart disease (IHD). Glycoprotein IIb/IIIa inhibitors were used in less than 5% of patients. Procedural success was 100% including calcified coronary arteries where full deployment of stents was done successfully, as assessed by symmetrical inflation of balloon within lesion. There was no death or myocardial infarction (MI). All the patients were followed up for 3 years with treadmill test (TMT) and 185 patients had check coronary angiography (because of positive TMT). Check angiography revealed 100% patency of all stents. Although direct stenting requires skill, it has many advantages: (i) it is a safe procedure with excellent immediate- and long-term results and excludes the trauma and dissection of predilation with balloon where stenting becomes similar to a bail out situation in terms of pathophysiology; (ii) it is time saving; and (iii) there has been 100% long-term success in our patient group.
Intracoronary Glycoprotein IIb/IIIa Inhibitors in Acute Coronary Syndrome

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In patients with acute coronary syndrome (ACS) undergoing percutaneous coronary intervention (PCI), glycoprotein (Gp) IIb/IIIa inhibitors reduce major adverse cardiac events. Reports of intracoronary (IC) use of Gp IIb/IIIa inhibitors in humans are limited to a small number of patients with angiographically visible thrombus in coronary arteries and saphenous vein grafts. This did reveal rapid reduction of thrombus load. Most of the trials had intravenous (IV) administration of Gp IIb/IIIa inhibitors in PCI. Intracoronary bolus of Gp IIb/IIIa inhibitors administration may cause high local drug concentration and may be more effective than IV bolus. In our centre IC Gp IIb/IIIa inhibitors were used randomly as per operator’s discretion. We retrospectively analyzed 30 such patients. Mean age was 55±12 years with 28 (93.3%) males. Twenty (66.7%) had unstable angina, 6 (20%) had non-ST segment elevation myocardial infarction (NSTEMI) while 4 (13.3%) had ST elevation myocardial infarction (STEMI). Target vessels were 38 in 30 patients. The profile was left anterior descending (LAD): 18 (60%), left circumflex (LCx): 6 (20%), right coronary (RCA): 11 (37.7%), ramus: 1 (3%), left main: 1 (3%), and venous graft: 1 (3%). Thirteen (43%) received IC bolus of abciximab, 8 (27%) eptifibatide and 9 (30%) tirofiban. Twenty-nine patients received coronary stents. Of them 23 (77%) had metal stents. One patient underwent bypass surgery due to unfavorable anatomy. All patients received IV heparin (70U/ kg) during the procedure and IV infusion of respective Gp IIb/IIIa inhibitors for 24 hours. None of our patient had slow flow at the end of the procedure. There was no in-hospital complication or any mortality. No major adverse cardiac event was observed during first 3 months of follow-up. This study shows satisfactory results of IC bolus administration of Gp IIb/IIIa inhibitors in acute PCI with no adverse event. Multicentric randomized trials with IV bolus as a control arm may prove the superiority of IC bolus administration of Gp IIb/IIIa inhibitors in ACS.

Coronary Angioplasty in Patients of Chronic Renal Failure: Is it Really a Thing of Past?

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From January 2002 to 30 June 2005, a total of 73 patients with chronic renal failure (CRF) underwent coronary angioplasty at our center. The mean age was 55±13.6 years, 59 were male, 49 (67%) were hypertensive, 28 (38%) diabetic, 30 (41%) smokers, and positive family history for premature CAD was present in 5 (7%) cases. The average cholesterol level was 154.3±38.2 mg%, triglyceride 163.3±61.2 mg/dl, high-density lipoprotein (HDL): 28.9±8.2 mg/dl, low-density lipoprotein (LDL): 101.9±24.6 mg/dl, serum creatinine 4.0±2.4 mg, BUN: 42.8±22.3 and Hb: 9.8±2.7. The etiology for CRF was diabetes mellitus (DM) nephropathy in 23 (31%), contrast-induced nephropathy (CIN) in 10 (14%), chronic glomerulonephritis (CGN) 8 (11%), ADPKD 6 (8%), renal calculus in 5 (7%) and unknown in 21 (29%) cases. The indication for coronary angiography was chronic stable angina in 38 (52%), unstable angina in 16 (21%), and post-myocardial infarction (MI) angina in 6 (8%), and pre-transplant evaluation in rest. Twelve patients had prior history of MI, 2 had coronary artery bypass grafting (CABG), and one had percutaneous transluminal coronary angioplasty (PTCA). On coronary angiogram, 9 patients had significant double vessel disease, rest had single vessel disease. A total of 82 vessels and 93 lesions were tackled among which left anterior descendig artery (LAD) angioplasty was done in 38, right coronary artery (RCA) in 21, left circumflex (LCx) in 15, diagonal (Dx) in 4, obtuse marginal (OM) in 3, Ramus in 2 and one sapheous vein graft (SVG). Follow-up treadmill test (TMT) at mean duration of 11±7 months was available in 49 patients, of these 3 had strongly positive, 6 had mildly positive and remaining had negative TMT for inducible ischaemia. Four patients died during follow-up, 2 due to congestive heart failure (CHF), one during transplant and one due to non-cardiac cause. From these observations we can conclude that PTCA in CRF is having similar risk and prognosis as in non-renal failure patients.

Combined use of Thrombectomy Devices and Glycoprotein IIb/IIIa Receptor Antagonist in Primary Angioplasty: Impact on Procedural and Short-Term Outcome

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Plaque rupture with superimposed thrombosis is the major pathogenetic mechanism of acute myocardial infarction (MI). Coronary intervention in thrombus-containing lesions is a challenging task. Reduction of the thrombus burden with subsequent reduction of chance of distal embolization is the key to successful outcome. Thrombus disruption and embolization to microcirculation cannot be prevented fully by use of glycoprotein (Gp) IIb/IIIa receptor antagonist although these agents are highly efficacious to improve TIMI flow in epicardial coronary arteries and to prevent rethrombosis. We present our experience of use of thrombectomy devices (X-sizer- Edicor in 18 patients and Rescue-Boston Scientific in 2 patients) along with abciximab in 20 patients (Group 1) and
only abciximab in 30 patients (Group 2) during primary angioplasty during myocardial infarction (PAMI) between November 2003 to April 2005. All the infarct-related vessels were stented. TIMI 3 flow was achieved in all 20 patients in Group 1 but slow flow was noted in 2 patients in Group 2 which improved after giving intracoronary nicorandil and nitroglycerine. During hospital stay, no major adverse coronary event was noted in either group but 3 patients of Group 2 had significant further peaking of CPK-MB and had clinical cardiac failure. In conclusion, combined adjunctive use of thrombectomy devices and Gp Iib/IIIa receptor antagonist, gives the best outcome in percutaneous coronary intervention in thrombus-containing lesions in acute MI situations.

### Transradial Coronary Angioplasty in Indian Patients – Single Operator Experience

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The aim of this study was to evaluate the single operator’s experience and safety of transradial percutaneous coronary intervention (PCI). Transradial access has several advantages over transfemoral approach. The radial artery is easily compressible, hence hemorrhagic complications are reduced significantly. Moreover, there are no major vessels or nerves near the artery hence the risk of injury to these structures is minimized. From December 2003 to April 2005, 92 patients (100 vessels) underwent PCI by transradial approach. The average age of the patients was 56.5 years. The crossover to femoral was 3 patients (3.26%). A total of 118 stents were used for the 100 vessels of which 90 were drug-eluting stents; 24 patients required glycoprotein Iib/IIIa antagonists. The percutaneous transluminal coronary angioplasty (PTCA)s included complex lesions including kissing balloon inflations for bifurcations, ostial lesions, use of cutting balloons, etc. The majority of the patients underwent angioplasty for left anterior descending artery (LAD) territory followed by right coronary artery (RCA) and circumflex (Cx) artery. One patient had lusoria (retroesophageal right subclavian arising from the descending aorta) and the PTCA was completed by maneuvering through the loops. The guiding catheters used were extra back up in 68 patients, Left Judkins for 24 patients, Left Amplatz 2 for 5 patients and Extra back up in 68 patients, Left Judkins for 1 patient, Left Amplatz 1 for 2 patients, Left Amplatz 2 for 5 patients and Right Judkins for 24 patients. We conclude that transradial coronary angioplasties are feasible with negligible complications in the Indian scenario. The use of glycoprotein Iib/IIIa antagonists were associated with nil local complications. Complex angioplasties including kissing balloon and cutting balloon angioplasty are feasible using transradial approach. The guiding catheters used were similar to that used in femoral approach. Amplatz left was found to be the guiding catheter of choice in complex right coronary lesions.

### Efficacy of Downstream Enoxaparin with High-dose Tirofiban during Percutaneous Coronary Intervention in Acute Coronary Syndromes

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Enoxaparin and tirofiban have demonstrable advantages over unfractionated heparin in patients with unstable angina (UA)/non-ST elevation myocardial infarction (NSTEMI) who are treated conservatively. We sought to determine the safety and efficacy of synergizing enoxaparin with high-dose tirofiban (HDT) during percutaneous coronary intervention (PCI) in patients of acute coronary syndromes (ACS). A total of 106 patients (mean age: 57.7±11.1 years, 82 males (77%), 37 diabetics (35%), left ventricular ejection fraction (LVEF): 45.6±10%, body mass index (BMI): 26.1±4.1 kg/m²; pre-treated with aspirin and clopidogrel, undergoing high risk PCI were administered intravenous enoxaparin (0.75 mg/kg) along with HDT (25 µg/kg/min then 0.15 µg/kg/min for minimum 18 hours) in the catheterization laboratory. They were followed for a median duration of 204 days (range: 60-333 days) for MACE (death, myocardial infarction (MI), and target vessel revascularization (TVR)). The indications of PCI included STEMI (n=45), unstable angina/NSTEMI (n=51), post-MI angina (n=10). Nineteen patients (18%) had prior MI, 24 (23%) had LVEF <35%, and 54 (51%) had multivessel (MV) disease. The reference vessel diameter was 2.5±0.25 mm. Single vessel-PCI was performed in 75 and MV-PCI in 31 patients [vessels: left anterior descending artery (LAD) 56, right coronary artery (RCA) 52, and left circumflex (LCx) 32]. A total of 79 bare metal stents and 90 drug-eluting stents were deployed in 176 lesions (36 Type A/B1, 140 Type B2/C) at a mean of 14.7±2.8 stents. The mean stent diameter and length were 2.85±0.4 mm and 22.6±6.8 mm, respectively. The mean percent diameter stenosis decreased from 86.5±11% to 5.4±16.1%. Multiple overlapping stents were used in 17, direct stenting in 19, and thrombectomy in 11 patients. TIMI myocardial blush grade 3 (TIMI-3) was achieved in 103, and TIMI-2 in 3 patients. Thirteen (12%) patients (12 STEMI; 1 UA) had periprocedural rise of CPK-MB from 55.5 to 188.5 u/L. There was 1 death at day 7 (stent thrombosis), and 2 patients underwent TVR at 2.5 months (coronary artery bypass grafting (CABG) and (PCI)). At 6 months MACE seen in 3.8%. Two patients had major bleeding (GIT, groin) requiring blood transfusion; 11 (10%) had minor groin bleed with pseudoaneurysm formation in two. Three patients had asymptomatic fall of hemoglobin (Hb) >3 gm/dl. The median fall in platelet count and Hb was 22,500/mm³ and 1.35 gm/dl, respectively. This study demonstrates the safety and efficacy of coadministering enoxaparin with HDT in patients of ACS undergoing coronary stenting.
Complete Myocardial Revascularization in the Setting of Primary Percutaneous Coronary Intervention for Acute ST Elevation Myocardial Infarction

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The goal of primary percutaneous coronary intervention (PCI) is to restore flow in the infarct-related artery. The optimal management of severe stenoses in other major coronary artery distributions is not clear. We retrospectively evaluated patients undergoing primary PCI for ST elevation myocardial infarction (STEMI) between January 1999 and January 2004. Percutaneous transluminal coronary angioplasty (PTCA) and coronary artery bypass grafting (CABG) were performed for complete revascularization. The study population consisted of 290 patients who underwent a PCI on the culprit lesion [these included left anterior descending artery (LAD) lesions in 144 patients, left circumflex (LCx) in 70 and right coronary artery (RCA) in 76 patients]. All patients were divided into three groups based on their coronary anatomy and the strategy of further PCI- patients with primary PCI in whom PCI of other significant stenosis was performed as a staged procedure (group A, n=230), patients in whom CABG of other significant stenosis was performed in the index period (group B, n=42), and patients in whom no CABG/PCI was performed (group C, n=18). In group A patients, who had a staged PCI procedure, the median interval between the two PCIs was 4 days. In group B, who had CABG procedure, the median interval between the PCI and CABG was 6 days. The patients in group A had a higher cumulative survival compared to patients in group B and C: 94.8% versus 87.3% versus 71.2% at 18 months, respectively. Likewise, when groups A and B were combined into a group with more complete revascularization, the survival was higher compared to group C (less complete revascularization): 91.5% versus 71.2% at 2 years. For patients undergoing primary PCI, treatment of non-infarct related artery stenosis was associated with improved survival. Complete myocardial revascularization should be the strategy.

Long-Term Results of Coronary Angioplasty in Patients with Severe Left Ventricular Dysfunction

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Severe coronary artery disease (CAD) in patients with a markedly depressed left ventricular (LV) function is associated with a poor prognosis. Even though percutaneous coronary intervention (PCI) has been offered as an alternative to bypass surgery, the role of PCI in the treatment of patients with severe LV dysfunction (LVD) has not been well defined. The aim of the present study was to evaluate the intermediate-term results in patients with severe LVD [LV ejection fraction (LVEF) < 30%], who underwent PCI. Retrospective analysis of angiographic, echocardiographic and clinical records of patients with severe LVD, who underwent PCI from January 2003 to May 2004, was undertaken. Eighty-eight patients aged 61 ± 11 years (92%) men, all with significant CAD and impaired LV function (LVEF 21.7 ± 7.35%) were identified. LVEF < 10% was present in 25 (28.4%) cases and 47 (53.4%) patients presented with acute coronary syndrome (ACS). Patients’ data before and after PCI were analyzed. All patients underwent the procedure from transradial route and transfemoral access was used only when intra-aortic balloon pump (IABP) support was necessary. Angiographic success was 97.7% (n = 86). Sixty-nine (78.4%) patients had multivessel PCI and 19 (21.6%) patients required single vessel PCI. Left anterior descending artery (LAD) was the commonest vessel requiring intervention (87.5%) followed by right coronary and left circumflex arteries. IABP was used in 37% of the procedures. Major vascular complications were absent; in-hospital MACE was observed in 5 (5.7%) cases, which included 2 (2.3%) in-hospital deaths. Follow-up is available in 76 (88.4%) patients. Long-term (>18 months) follow-up is available in 49/86 (57%) patients and > 12 months follow-up is available in 27 patients. Ten patients were lost to follow-up. Patients were followed up for a mean duration of 14.5 ± 6.9 months. Four (5.3%) patients died during this period all due to sudden cardiac reasons. Two (2.6%) patients underwent coronary artery bypass grafting (CABG) due to restenosis; the LVEF has increased to 28 ± 9.7%. Fifty-one (67.1%) showed increase in EF, 18 (23.7%) showed no significant improvement in EF and in 3 (3.9%) EF has further decreased. Improvement in LVEF was more marked in patients who presented with ACS. Change in at least one class of cardiac functional status was observed in 53 (69.7%) patients. Rest of patients (n = 17; 22.4%) did not experience significant change in their symptoms. Overall survival was 94.7%. To conclude, in patients with severe LVD, continued symptomatic improvement can be achieved with successful PCI. Long-term results in this high risk group are encouraging and benefits are more marked in patients presenting with ACS.

Transcatheter Closure of Coronary Cameral Fistulae by Different Techniques

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Coronary arteriovenous fistula is an uncommon anomaly, and large fistulous tracts require closure because of the risk of myocardial ischemia, endocarditis, rupture and rarely,
aneurysm formation. Transcatheter therapy has now become the mainstay of treatment for various intracardiac shunts and, encouraged by these results, attempts were made to close coronary arteriovenous fistulae. Ten patients with coronary arteriovenous fistulae who were either symptomatic (NYHA class III/IV) or had echocardiographic evidence of left-to-right shunt >2:1, chamber enlargement, or reversal of flow in the descending aorta underwent transcatheter occlusion. Fistulae originating from multiple coronary arteries were excluded. The age range was 2-55 years. There were 8 male and 2 female patients. Nine had congenital, and 1 had an iatrogenic fistula originating from the left anterior descending (LAD) artery to the right ventricle, which developed during balloon angioplasty with a cutting balloon. The congenital fistulae originated from the right coronary artery (RCA) in 4, LAD artery in 2, left circumflex artery (LCx) in 1, and left main coronary artery (LMCA) in 2 patients. The drainage site was the right ventricle (n=6), right atrium (n=2), and pulmonary artery (n=2). There were two openings in 1 patient having a large fistula from the LMCA to the right atrium. One patient had associated tetralogy of Fallot. All the patients underwent successful closure using detachable Cook® coils in 5, non-conventional coils in 2 (floppy tips of used intracoronary guidewires), and Amplatz occluder in 3 cases. Two Amplatz duct occluders were used in 1 patient having more than one opening. Complete occlusion was achieved in 8 (80%), and there were no complications. A residual shunt was seen in 2 patients, of which one closed spontaneously within 24 hours, and the other required closure with an Amplatz device. A follow-up of 3-42 months showed no residual shunting and late complications. Transcatheter occlusion in coronary arteriovenous fistula requires the availability of different embolization materials because of variable morphology. Whenever custom-designed devices/coils cannot be deployed due to extreme tortuosity of the feeding vessel, use of floppy tips of percutaneous transluminal coronary angioplasty (PTCA) wires can be considered as an alternative.

Small Vessel Stenting

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We analyzed our data of small coronary vessel (<2.5 mm) stenting. Out of total 286 coronary stenting procedures performed between May 2003 to April 2005, 56 patients underwent small vessel stenting. Of these 44 (80%) were male and 12 (20%) were female. Diabetes was present in 28 (50%) patients, hypertension in 30 (55%) patients, 22 (40%) were smokers and 6 (10%) patients were having positive family history of premature coronary artery disease. Indication of angioplasty included chronic stable angina in 11 (20%), unstable angina 19 (35%) and myocardial infarction in 26 (45%). Left anterior descending (LAD) was stented in 23 (41%) cases, diagonal in 3 (6%) cases, Ramus in 1 (2%) case, left circumflex (LCx) in 16 (28%) cases and right coronary artery (RCA) in 13 (25%) cases. Glycoprotein (Gp) IIb/IIIa antagonists were administered in 7 (15%) patients. All received aspirin and clopidogrel (or ticlopidine) of which 34 (60%) cases received loading dose of clopidogrel during procedure and it was continued for at least 6 months. Total 60 stents were deployed (Cypher 26, Microdriver 20, Bx velocity 14). Elective stenting was done in 23 (40.5%) cases. Complications included subacute stent thrombosis in 5 (9.2%) cases, dissection following plain old balloon angioplasty (POBA) in 11 (19.4%) and instant restenosis occurring in 6 (12%) in drug-eluting stent (DES) and 23 (40.5%) in bare metal stent at mean follow-up period of 5.2 ± 1.6 months. All instant restenoses were successfully treated with balloon angioplasty in 34 (60%) cases and stenting inside stent in 23 (40%) cases. We conclude that small vessel stenting is safe and has good short- and intermediate-term results with drug-eluting stent.

Safety and Efficacy of High Loading Dose Clopidogrel in Percutaneous Coronary Intervention

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Clopidogrel is a potent inhibitor of platelet aggregation in a dose-dependent manner. In the background of percutaneous intervention, loading dose of clopidogrel has been used at 150 mg to 900 mg in different studies. The objective of this study was to assess the clinical outcome, bleeding or vascular complications in higher loading dose clopidogrel. In our study, 128 patients (85 male, 43 female) received 600 mg clopidogrel 3 to 7 hours before percutaneous intervention. Patients were administered heparin and glycoprotein (Gp) IIb/IIIa inhibitor as considered appropriate. Previous 124 patients who were given 300 mg clopidogrel were taken as control group. Parameters taken for comparison were local access site complication, bleeding, ischemic chest pain and acute or subacute stent thrombosis. Baseline characteristics, body weight, age, diabetic level were similar in both the groups with no statistically significant difference. Incidence of major bleeding was 4.8% in control group compared to 4.1% in treatment group. Vascular access site complications were also similar in both groups i.e. 2.9% in control versus 2.1% in treatment group. Episodes of angina and ECG changes during hospital stay and six-month follow-up were significantly higher in control group compared to high-dose clopidogrel group (21.2% vs. 6.2%). One patient in treatment group and three patients in control group developed in-stent thrombosis. High-dose clopidogrel for loading is safe and has similar rate of complication rates as lower-dose clopidogrel for percutaneous
coronary intervention. While early clinical outcomes appear superior, bigger study is needed for providing further information regarding clinical outcome.

**Transradial Approach in Treating Very Long Coronary Lesions with Drug-Eluting Stents**

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Drug-eluting stents are fast becoming substitute for coronary artery bypass graft surgery (CABG) in long segment coronary lesions. The experience of treating such lesions by transradial approach (TRA) is limited. Between January 2004 to December 2004, we performed 16 percutaneous coronary interventions (PCIs) through TRA where we deployed long coronary stents (all sirolimus-eluting Pronova stents) either measuring 33 mm or 38 mm. Majority of the lesions treated were left anterior descending (LAD): 12 (75%), followed by right coronary artery (RCA): 2 (12.5%), left main coronary artery (LMCA) > LAD: 1 (6.25%), and left circumflex (LCx): 1(6.25%). All patients were males. Twelve of them were diabetics. Diameters of the stents were between 2.75-3.50 mm. Mean stent length was 35 mm (6 stents were 33 mm long and 4 were 38 mm long). Direct stenting was done in 12 (75%) patients. Indications in treated vessels for long stents were: chronic stable angina in 9 (56%) followed by unstable angina in 3 (18%), post-myocardial infarction (MI) in 3 (18%), in-stent restenosis in 1 (6.25%). Patients were clinically followed up for 3 to 15 months. One (6.25%) patient died with sub-acute stent thrombosis while another patient (6.25%) with diabetes had a long segment in-stent restenosis. All other patients are doing well on clinical follow-up varying from 4 to 14 months. From this limited experience we conclude that it is feasible to deploy long stents through TRA with gratifying results and high success rate.

**Safety and Efficacy of Primary Facilitated Angioplasty following Acute ST Elevation Myocardial Infarction**

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Percutaneous coronary intervention (PCI) has become the preferred approach in the management of acute ST elevation myocardial infarction (STEMI) if done in a center doing primary PCI. Most of the patients, however, report to the centers without any facilities for PCI. Fibrinolytic therapy therefore appears to be a logical choice in patients with STEMI in these centers. We adopted a protocol in agreement with 10 primary hospitals or nursing homes who thereby used the following medical regime in patients of STEMI before shifting them to our institute for primary PCI. Patients received half the dose of fibrinolytic therapy with either streptokinase or TPA combined with full doses of glycoprotein (Gp) IIb/IIIa inhibitor. Enoxaparin, aspirin, clopidogrel along with other routine medications were also given before being shifted for PCI to our institute (facilitated primary PCI group). We found that this group of patients showed significantly higher TIMI flow in their infarct-related artery (IRA) during their coronary angiogram in comparison to patients who directly reported to our emergency department with STEMI and did not receive the above mentioned regime before being shifted to catheterization laboratory for primary PCI (p=0.005). There were also no increases in major bleeding incidences in patients receiving this regime (p=NS). Similar improvements were seen in the left ventricular (LV) functions of both the groups at 30 days. Thus, primary facilitated PCI following STEMI helps in achieving results comparable to patients reporting directly to centers with facilities for primary PCI.

**Long-Term Follow-up of Hybrid Stenting for Multivessel Percutaneous Coronary Interventions via Transradial Approach**

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Drug-eluting stents (DES) have significantly reduced the rate of restenosis and clinical events. For multivessel stenting, “all DES” implantation have cost restraints in the real world. To reduce the cost of multivessel percutaneous coronary intervention (PCI), hybrid stenting [a combination of DES and, bare metal stent (BMS)] was done in 42 patients through transradial (TR) approach from February 2003 to December 2004 at our centre. DES was used for proximal left anterior descending (LAD), small vessels, long lesions and vessel supplying large area of viable territory, while BMS was used for large vessels, discrete lesions, non-LAD lesions and vessels supplying small area of viable territory. The mean age of patients was 59±10.7 years; 78.6% (n=33) were men, 47.6% (n=20) were diabetic, 45.2% (n=19) were hypertensive, 23.8% (n=10) had dyslipidemia and 26.2% (n=11) were smokers. The indications for stenting were unstable angina in 47.6% (n=20), myocardial infarction (MI) in 37.1% (n=16) and 14.3% (n=6) had chronic stable angina. A total of 84 vessels were intervened, including LAD in all, the right coronary artery (RCA) in 50 (59.5%), and left circumflex (LCx) in 34 (40.5%) patients. A total of 91 stents (46, 50.5% DES) were implanted, representing an average of 2.17 stents per patient. The procedure time was 25.4±17.4 min, fluoroscopic time was 13.3±9.8 min and contrast dye use was 126±53 ml. Average DES diameter was 2.72±0.44 mm and DES length was 22.22±7.39 mm. Average BMS diameter was 3.14±0.45 mm.
and BMS length was 16.22±7.39 mm. DES ≥ 18 mm were deployed in 26 (56.5%) vessels while 23 (50%) DES were deployed in small vessels (≤2.5 mm). Deployment pressure was 13.4 ± 3.43 atm (range 10-24 atm). There was no significant radial artery spasm despite multiple exchanges of catheters. In-hospital MACE [subacute thrombosis, urgent coronary artery bypass grafting (CABG), death] occurred in none. Follow-up is available in 40 (95.2%) patients. Mean follow-up duration was 21.7±2.9 months (range: 18–28 months). MACE at long-term follow-up was 7.5% (n=3). One (2.5%) patient died from refractory heart failure after 4 months of PCI. Two (5%) patients had recurrence of angina. One (2.5%) of them had CABG and another patient (2.5%) had repeat PCI due to restenosis. To conclude, hybrid stenting for multivessel PCI is safe and feasible via TR approach with good acute and long-term results.

Interval Stenting in Acute Thrombus-Containing Lesions: A New Treatment Strategy
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In the current era of percutaneous coronary intervention (PCI), managing a coronary thrombus still remains a major problem. Stents, thrombolitics, antiplatelet agents, distal protection devices and thrombectomy devices have been advised. The specialized devices are not freely available and stenting of lesions with a high thrombus load is often associated with no or slow flow phenomenon. The study included 25 patients of acute coronary syndrome (ACS) with thrombus demonstrable on angiography and who had established TIMI 3 flow following percutaneous transluminal coronary angioplasty (PTCA) were included. Patients with flow limiting dissection following PTCA were excluded. The mean age of the patients was 48 ± 8 years and 20 were males. Eight patients had acute ST elevation myocardial infarction (MI) and were undergoing primary angioplasty. Remaining 17 patients had unstable angina (UA) or NSTEMI. In all the patients, angiography was followed by balloon angioplasty and thrombectomy, if required. All the patients had TIMI 3 flow. Ten patients received glycoprotein (Gp)/IIb/IIIa receptor antagonist. The patients were kept on low molecular weight heparin (1 mg/kg of enoxaparin) for 7 - 14 days and a repeat angiography was performed. All the patients had TIMI 3 flow in the index artery. Eleven patients had < 50% lesions and were not stented. Only 14 patients had a residual lesion > 50% and required stents. There were no deaths, major bleeding complications, or recurrent ischemia during the intervening period. Three patients had no/slow flow phenomenon on stenting. A strategy of thrombectomy followed by intense...
Cardiac Troponin-T Estimation Post-Elective Stent implantation and Prediction of Early and Late Outcomes

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Some studies have found that CK elevation after a procedure reflects the severity and extent of atherosclerotic disease, others have found that it is related to specific identifiable complications like distal embolization or branch occlusion. We studied the effect of troponin-T (Trop-T) in predicting the outcomes after elective percutaneous interventions. We studied 100 consecutive patients who underwent elective percutaneous interventions (PCI). We excluded patients who had a myocardial infarction (MI) within 3 weeks and patients with significant hepatic or renal failure. Patients were stratified by measurement of serial CK and Trop-T post-procedure. Baseline characteristics included 13% females. Mean age of patients was 59.1 ± 11 years; 28% were smokers, 36% hypertensives, 28% diabetics, 52% had unstable angina, 31% post-MI, 17% with chronic stable angina. No patient had significant CK elevation. Of 15 patients who had Trop-T elevation, 5 had clinical restenosis, 2 required coronary artery bypass grafting (CABG) and 3 underwent repeat percutaneous transluminal coronary angioplasty (PTCA). We had only one in-hospital mortality due to acute hepatic failure. 86% of patients had 1 year follow-up. Outcomes in the Trop-T positive group were statistically significant with p values < 0.05. CKP had no correlation with outcomes. Cardiac Trop-T predicts poorer clinical outcomes. Trop-T is a better predictor than CKP. Large scale studies are required to correlate graded Trop-T elevations with outcomes.

Percutaneous Transluminal Coronary Angioplasty and Stenting with Drug-Eluting Stent and Follow-up: Single Centre Experience of Pronova Sirolimus-Eluting Stent

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Restenosis is the major concern of percutaneous transluminal coronary angioplasty (PTCA) and drug-eluting stent (DES) has been able to reduce it to a significant extent. We reviewed 77 consecutive cases of PTCA with stenting using Pronova DES and immediate as well as 6 months follow-up results were analyzed. There were 63 (81.8%) males and 14 (18.2%) females with mean age of 55 ± 9 years. Risk factors analysis revealed hypertension in 37 (48%), diabetes 23 (29.8%), tobacco use 8 (10.5%), hyperlipidemia 15 (19.4%), obesity 6 (7.8%) and family history of coronary artery disease (CAD) in 3 (3.4%). Forty-four (57.1%) cases presented with anterior wall myocardial infarction (AWMI), 18 (23.4%) inferior wall myocardial infarction (IWMI), 21 (27.3%) unstable angina and 10 (12.9%) cases with chronic stable angina; 62 (80%) cases had normal left ventricular (LV) function. Distribution of various arteries attempted were - left anterior descending (LAD): 43 cases (55.8%), right coronary artery (RCA): 18 (23.3%), left circumflex (LCx): 15 (19.4%) and others 1 (1.3%). Type A lesions were in 1 (1.2%) patient, type B1 12 (14.3%), type B2 25 (29.8%) and type C in 36 (42.8%). Analysis of reference diameter of vessels revealed ≤ 2.5 mm in 19 (22.6%) patients, 2.6-3 mm in 50 (59.5%) and 3.1-3.5 in 15 (17.8%) patients. 84 stents were used in 77 cases with the rate of 1.09 stent per patient. The lesion lengths were analyzed and found to have ≤ 15 mm in 18 (21.4%) cases, 16-20 mm in 19 (27%) and > 20 mm in 39 (46.4%) cases. Technical success rate was 100%. There was no death. Two patients had immediate complication. Follow-up was carried by clinical review in hospital, telephonic information about clinical status, stress test and angiogram. Out of 77 cases, 58 (75.3%) cases could be followed up. Five (6.6%) cases were found to have restenosis and one patient died of MI. Other 4 cases underwent coronary angiogram and were sent for coronary artery bypass grafting (CABG) giving the target vessel revascularization (TVR) rate of 6.9%. Out of those 5 cases, 2 cases underwent PTCA for restenosis in bare metal stent. Follow-up data of DES in India are not many. Although number of cases in our study was not enough to come to definite conclusion, it showed the trend of immediate and mid-term results of Pronova DES.

Sirolimus-Eluting Stents for the Treatment of Long Lesions in Small Coronary Arteries

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Sirolimus-eluting stents (SES) have been shown to reduce restenosis significantly. Predictors of instant restenosis (ISR) include smaller reference vessel diameter and longer lesion length. We sought to study the efficacy and safety of SES in patients with long lesions (≥ 28 mm) in small coronary arteries (≤ 2.5 mm); 170 patients (73% male, mean age 58.2 ± 20.6 years) with significant diffuse stenotic lesion (≥ 28 mm) in a small native coronary artery (≤ 2.5 mm) were treated with SES between September 2002 and March 2005 at our institution. Diabetes was identified as a major risk factor in 46% patients.
Long Overlapping Drug-Eluting Stents to Treat Diffuse (≥ 50 mm Length) Coronary Artery Lesions


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Diffuse coronary artery disease (CAD) is a challenge for the interventional cardiologist with high rate of restenosis with use of bare metal stents. We sought to study the safety and efficacy of multiple overlapping drug-eluting stents (DES) in diffuse coronary artery lesions (≥50 mm). Consecutive patients (n=64) with de novo diffuse coronary lesions treated with >50 mm long DES from September 2002 to December 2004 were analyzed. The study population consisted of 64 patients (56.8% diabetic); 49 patients were treated with sirolimus-eluting stents (SES) and 15 with paclitaxel-eluting stents (PES). The number of stents implanted per patient was 2.11±0.24, stent length varied from 51 to 91 mm, with mean total stent length of 62.1±11.9 mm. The mean reference vessel diameter was 2.89±0.4 mm. Angiographic and procedural success was achieved in 100% patients. 10.9% had in-hospital non-ST elevation myocardial infarction (MI) while none had in-hospital stent thromboses. Glycoprotein (Gp) IIb/IIIa inhibitors were used in 63.6% patients. Clinical follow-up has been completed in 92% patients with mean follow-up duration of 14.6±8.4 months. Total clinical major adverse cardiac event (MACE) rate was 9.3%. There were 2 deaths (1 non-cardiac). Two patients underwent target vessel revascularization, 1 following subacute stent thrombosis; 1 patient suffered MI 3 months after percutaneous coronary intervention (PCI). Implantation of long overlapping coronary artery lesions is a safe procedure with good intermediate term clinical follow-up.
underwent PCI from September 2004 to June 2005, were enrolled for this study. Forty-six patients received tirofiban (Group A) and 14 received eptifibatide (Group B). All patients received the standard loading dose of clopidogrel (300 mg) and aspirin. In Group A, indication for PCI was unstable angina (USA) or non-ST elevation myocardial infarction (NSTEMI) in 30.4%, ST elevation myocardial infarction (STEMI) in 65.2%, and chronic stable angina in 4.4%. In Group B, indication for PCI was USA or NSTEMI in 26.6%, STEMI in 64.3%, and chronic stable angina in 7.1%. Drug-eluting stents (DES) were used in 34.8% patients in Group A and 42.9% patients in Group B. Bare metal stents (BMS) were used in 78.3% patients in Group A and 71.5% patients in Group B. Post-procedure MI defined as CK-MB rise > 3 times upper limit of normal occurred in 8.3% of the total cohort, 6.5% in Group A and 14.2% in Group B (p=NS), while in-hospital mortality occurred in 3 patients (2 patients in Group A and 1 in Group B) (p=NS). Minor bleeding was observed in 10% of the patients (3 in each group). No episodes of major bleeding or thrombocytopenia were observed. 30-day major adverse cardiovascular events (defined as recurrent infarction, re-admission for ischemia or worsening heart failure and death) were similar in both groups (p=NS). No difference was seen in the two groups in either the DES or the BMS subgroups (p=NS). Use of tirofiban leads to no procedure-related complications. In conclusion, moderate success rates were achieved with PCI in CTO in our series with no procedure-related complications. In the last one year, 7 patients were taken up for CAG while being resuscitated for asystolic cardiac arrest. All the patients had previous history suggestive of coronary artery disease (CAD). All patients had cardiac arrest either in the emergency ward or on being transported to the hospital or referred from the Department of Medicine with severe bradycardia. None of the patients had an electrocardiographic (ECG) evidence of ST elevation myocardial infarction (MI). The patients were resuscitated and intubated. Recommended ACLS care was given. TPI was inserted in all the patients. All of them underwent CAG while cardiopulmonary resuscitation (CPR) was being done. CAG showed significant obstructive CAD in all the patients. Balloon angioplasty of the culprit vessel was done in 6 patients. Two patients survived and were discharged from the hospital. Two patients died within 12 hours and 3 died within 72 hours. Of the surviving patients, one had chronically occluded left anterior descending (LAD) and left circumflex (LCx) with thrombus-containing lesion in right coronary artery (RCA), which was opened. The other patient had LAD occlusion with significant disease in LCx and RCA. When facilities are available, an attempt at percutaneous coronary intervention (PCI) may be worthwhile in patients with cardiac arrest with history of heart disease.
(33.3%) patients the procedure was performed during off-hour (18.00 – 07.00) and in rest of the patients (n=80; 66.6%) the procedure was performed during routine hours (07.00 – 18.00). The clinical, angiographic and in-hospital course [(major adverse cardiac events (MACE)] are summarized in the table.

### Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Off-hour PCI (n=40)</th>
<th>Routine hour PCI (n=80)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>55±8.12</td>
<td>60±9.02</td>
</tr>
<tr>
<td>Male sex</td>
<td>30 (75%)</td>
<td>62 (77.5%)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>25 (62.5%)</td>
<td>58 (72.5%)</td>
</tr>
<tr>
<td>Family history</td>
<td>18 (45%)</td>
<td>41 (51.25%)</td>
</tr>
<tr>
<td>Smoking</td>
<td>28 (70%)</td>
<td>60 (75%)</td>
</tr>
<tr>
<td>Door-to-balloon time (min)</td>
<td>105±12.1</td>
<td>52.7±16.3</td>
</tr>
<tr>
<td>AWMI</td>
<td>28 (70%)</td>
<td>47 (58.7%)</td>
</tr>
<tr>
<td>Killip class ≥ 3</td>
<td>10 (25%)</td>
<td>15 (18.8%)</td>
</tr>
<tr>
<td>Culprit vessel LAD</td>
<td>28 (70%)</td>
<td>47 (58.7%)</td>
</tr>
<tr>
<td>RCA</td>
<td>10 (25%)</td>
<td>18 (22.5%)</td>
</tr>
<tr>
<td>LCx</td>
<td>02 (5%)</td>
<td>15 (18.8%)</td>
</tr>
<tr>
<td>Multivessel disease</td>
<td>15 (37.5%)</td>
<td>40 (50%)</td>
</tr>
<tr>
<td>Multivessel PCI</td>
<td>2 (5%)</td>
<td>23 (28.8%)</td>
</tr>
<tr>
<td>LVEF (%)</td>
<td>25±10</td>
<td>30±11.2</td>
</tr>
<tr>
<td>IABP</td>
<td>12 (30%)</td>
<td>19 (23.75%)</td>
</tr>
<tr>
<td>Abciximab</td>
<td>23 (57.5%)</td>
<td>42 (52.5%)</td>
</tr>
<tr>
<td>Prior thrombolysis</td>
<td>16 (40%)</td>
<td>60 (75%)</td>
</tr>
<tr>
<td>In-hospital MACE</td>
<td>4 (10%)</td>
<td>3 (3.8%)</td>
</tr>
<tr>
<td>Death</td>
<td>1 (2.5%)</td>
<td>1 (1.2%)</td>
</tr>
</tbody>
</table>

AWMI: anterior wall myocardial infarction; LAD: left anterior descending; RCA: right coronary artery; LCx: left circumflex; PCI: percutaneous coronary intervention; LVEF: left ventricular ejection fraction; IABP: intra-aortic balloon pump

To conclude, off-hour interventions in AMI are associated with increased chances of adverse outcome. The factors, which appear to be responsible, are prolonged door-to-balloon time, incomplete revascularization and worse clinical status at the time of admission.

### Intra-Aortic Balloon Pump Supported Coronary Angioplasty in Severe Cardiogenic Shock: Acute and Mid-Term Results

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Cardiogenic shock in acute coronary syndrome (ACS) carries a high mortality. Coronary interventions in such cases are necessary, but have high risk. We present our data of intra-aortic balloon pump (IABP)-supported urgent coronary angioplasty/stenting for patients in cardiogenic shock, acute coronary syndrome (ACS) and left ventricular (LV) dysfunction (LVD). Thirty-nine patients with ACS and cardiogenic shock, treated with vasopressors and IABP were taken up for urgent coronary interventions after taking high risk consent. The present study aimed to evaluate the immediate and mid-term results in such patients. Retrospective analysis of angiographic, echocardiographic and clinical records of these patients, who underwent percutaneous coronary intervention (PCI) from June 2003 to May 2005, was undertaken. IABP was inserted prior to coronary intervention in each patient. Majority (n=33, 84.6%) were men and the mean age was 62 ± 11 years (range: 41-78 years). Thirty-five (89.7%) patients presented with acute myocardial infarction (MI) and rest with previous MI with unstable angina (UA). Out of 35 patients with acute MI, 26 (74.3%) presented with anterior wall myocardial infarction (AWMI). Three (7.7%) patients had additional complete heart block (CHB). The mean left ventricular ejection fraction (LVEF) was 16.6±9.2 % (range: 5-35 %). Radial route was used for intervention for 30 (76.9%) patients and femoral route was used only when bilateral radial pulses were not palpable. Single vessel disease was present in 10 (25.6%) patients, double vessel disease in 10 (25.6 %) and triple vessel disease in 19 (48.8%) patients, left main coronary artery (LMCA) was critically diseased in 3 (7.7%) patients. Culprit vessel angioplasty was attempted in all patients and additional vessel intervention (non-infarct related artery) was performed if the artery was larger > 2.5 mm and was supplying viable myocardium. Total of 53 lesions in 47 vessels were intervened. Multivessel intervention was performed in 8 (20.5 %) and single vessel was performed in 31 (79.5%) cases. Plain old balloon angioplasty was done in 6 (12.8%) vessels and 41 (87.2%) vessels were stented. LMCA was stented in 3 (6.4 %), left anterior descending (LAD) in 27 (57.4%), left circumflex artery (LCX) in 4 (8.5%), right coronary artery (RCA) in 12 (25.5%) and Ramus in 1 (2.2%). Angiographic success was achieved in 34 (87.2%) patients. Abciximab was used in 18 (46.1%) patients, 8 (20.5%) required temporary pacing and 10 (25.6%) required ventilatory support. The mean duration of IABP support was 29±6.5 hours. Four (10.3%) patients died in hospital, 1 due to multi organ failure and 1 due to septicemia. Other 2 patients had unsuccessful PCI and died on the day of intervention. Two (5.1%) patients were referred for coronary artery bypass grafting for complete revascularization and were discharged on post-operative day 10. Follow-up is available in 29 (82.9%) patients. The mean follow-up duration was 7.6±3.3 months. Of these 17 (58.7%) were asymptomatic, 9 (31%) had dyspnea on exertion (NYHA class 2-3) due to LVD and 3 (10.3%) had died, all cardiac reasons. To conclude, IABP- supported coronary angioplasty in cardiogenic shock can be performed safely and has good acute and mid-term results.

### Efficacy of High-Dose Tirofiban during Elective or Urgent Precutaneous Coronary Intervention with Clinical or Angiographic High Risk Features

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The use of tirofiban during percutaneous coronary intervention (PCI) is controversial and preliminary data with
use of high-dose tirofiban (HDT) appears safe but is scanty. A total of 133 patients [mean age 57.6±10.6 years, 107 (80%) males, 47 (35%) diabetics, left ventricular ejection fraction (LVEF) 46.7±10.1%, body mass index (BMI) 26.2±4.2 kg/m²] pre-treated with aspirin and clopidogrel, undergoing high risk PCI were treated with administered tirofiban (25 µg/kg/3 min, then 0.15 µg/kg/min) for at least 18 hours (mean 22.15±3.7 hours, median 22 hours) immediately before the procedure. They were followed for median duration of 237 days (range: 60-555 days) for MACE [death, myocardial infarction (MI) and target vessel revascularization (TVR)]. The indications of PCI included acute coronary syndromes /ST elevation in myocardial infarction (STEMI) (n=44), unstable angina/non-stable STEMI (n=6), post-MI angina (n=16) stable angina (n=5), and silent myocardial ischemia (n=1). Twenty-four (18%) patients had prior MI, 27 (20%) had LVEF <35%, and 72 (54%) had multivessel (MV) disease. The reference vessel diameter was 2.55±0.3 mm. Single vessel-PCI was performed in 92 and MV-PCI in 41 patients [left anterior descending (LAD) 72, right coronary artery (RCA) 52 and LCx-48]. A total of 96 bare metal stents and 117 drug-eluting stents were deployed in 229 lesions (49 Type A/B1, 180 Type B2/C) at a mean of 14.6±2 atm. The mean stent diameter and length were 2.95±0.3 mm and 22.3±6.6 mm, respectively. The mean percent diameter stenosis decreased from 86.2±11.5% to 5.9±6.3%. Multiple overlapping stents were used in 24, direct stenting in 21 thrombolysis in 12, and cutting balloon in 5 patients. TIMI myocardial blush grade 3 (TMB-3) was achieved in 130, and TMB-2 in 3 patients. Fifteen (11%) patients (STEMI:14; UA:1) had periprocedural rise of CPK-MB (from 51.5 to 190.3 IU/L). There were 2 deaths at day 7 [sudden cardiac death (SCD) at home] and 8 months (subarachnoid hemorrhage), and 2 patients underwent TVR at 2.5 months coronary artery bypass grafting (CABG) and 6 months (PCI) [MACE 3.75%; (n=5)]. Two patients had major bleeding (G1, groin) requiring blood transfusion, 14 had minor groin bleed with pseudoaneurysm formation in two. Four patients had asymptomatic fall of hemoglobin (Hb) >3gm/dl. The median fall in platelet count and Hb was 23,500/mm³ and 1.15 gm/dl, respectively. This study seems to confirm that the use of HDT in patients undergoing high risk PCI is efficacious in reducing the incidence of post-PCI ischemic complications.

**Results of Stenting Using Very Long Cypher Stents**

Umesh Agrawal, Amresh Kumar, Naveen Garg, Sudeep Kumar, Satyendra Tewari, Aditya Kapoor, PK Goel, Nakul Sinha

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Results of coronary angioplasty for long segment coronary stenosis or diffuse disease are disappointing. Recently, significant reduction in instant restenosis and a need for repeat interventions has been shown by the use of drug-eluting stents (DES). But the data regarding DES of >30 mm length is limited. We report our experience with very long (33 mm) Cypher stent. Between January 2003 and June 2005, a total of 1850 coronary stenting procedures were performed, 66 patients belonged to this category. Mean age was 56±10.4 years (range: 42-64 years), 56 (85%) were males and 10 (15%) were females. Diabetes was present in 14 (21%) patients, hypertension in 17 (25%) patients, dyslipidemia in 6 (9%) patients, 17 (25%) patients were smoker and 3 (5%) had positive family history of premature coronary artery disease (CAD). The indications of angioplasty were chronic stable angina in 44 (66%), unstable angina in 19 (28%) and myocardial infarction (MI) in 3 (6%) patients. Left anterior descending (LAD) was stented in 50 (76%) cases, left circumflex (LCX) in 8 (12%) and right coronary artery (RCA) in 8 (12%) cases. All lesions were pre-dilated and stents were deployed at 12-14 atm pressure with an attempt to cover the lesion from normal segment to normal segment. The different diameters of the stents used were 2.75 mm, 3 mm, and 3.5 mm in 8 (12%), 28 (43%) and 30 (45%) patients, respectively. The mean diameter of the stents used was 3.15±0.34 mm. Fifteen (23%) patients received additional stent in another vessel in the same sitting. Total 15 (23%) patients received glycoprotein (Gp) IIb/IIIa inhibitors. All received aspirin as well as clopidogrel following the procedure. Procedure was successful with excellent results in all except one patient who developed acute instant thrombosis. At a mean follow-up period of 12.4±3.5 months (range: 3-22 months), there has been no instance of death/MI. One patient who was symptomatic underwent repeat coronary angiography which showed diffuse instant restenosis, which was successfully treated with plain balloon angioplasty. We conclude that very long lesions or diffuse disease can be successfully treated by very long Cypher stent with excellent acute results and good outcome on intermediate term follow-up.

**Drug-Eluting Stents in Small Vessels**

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Drug-eluting stents (DES) have been shown to reduce restenosis significantly. Bare metal stents in small vessels have a high restenosis rate. So, DES could be an attractive choice for such patients. We assessed the safety and efficacy of DES for the treatment of small native coronary arteries (< 2.5 mm in size). From January 2002 to June 2005, a total of 134 patients were treated using 2.5 mm size DES. Mean age was 60±10.2 years (range: 48–74 years). Out of all 134 patients, 110 (82.1%) were males, and 24 (17.91%) were females. Total 48 (35.82%) patients were diabetic. Other major coronary risk
factors were hypertension in 84 (62.7%), smoking in 48 (35.5%), dyslipidemia in 42 (31.3%) and positive family history of premature coronary artery disease (CAD) in 16 (12.7%) patients. Most common mode of presentation was chronic stable angina in 55 (41.1%) patients. Left anterior descending artery (LAD) was stented in 41 (30.6%), left circumflex (LCx) in 62 (46.3%), right coronary artery (RCA) in 27 (20.1%) and Ramus in 4 (3.0%) cases. Mean stent length was 18.0±10.0 mm (8.0–28.0 mm). Different DES used were Cypher in 13 (9.7%), Pronova in 31 (23.13%), Taxus in 43 (32.1%), Yukon in 30 (22.4%), others in 17 (12.7%) patients. Stents of ≤ 20 mm length were used in 84 (62.7%) patients, 20-30 mm length in 44 (32.8%) while >30 mm length size stents were used in 6 (4.5%) patients. Glycoprotein IIb/IIIa inhibitors were used in 42 (31.3%) patients. Elective stent placement was done in 70 (52.2%) patients, while stenting was performed for suboptimal results in 62 (46.3%) cases, and for dissection in rest of 2 (1.5%) patients. The procedure was successful in all without in-hospital major adverse cardiac events (MACE) in any patient. No patient developed in-stent thrombosis. Clinical follow-up is available in 104 patients and showed no death or myocardial infarction. Only 3 (2.9%) patients presented with recurrence of symptoms. Repeat coronary angiogram revealed in-stent restenosis in all 3 patients, which was successfully treated by repeat plain balloon angioplasty. To conclude, small vessel stenting using DES is safe and with low rate of MACE at intermediate-term follow-up.

**Comparison of Conventional 'Kissing Ballooning' with Dedicated Bifurcation Balloons for True Coronary Bifurcation Lesions**

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Precutaneous interventional treatment of coronary bifurcation lesions remains a challenging task. The kissing balloon technique resulted in improved outcome and is an accepted technique as a final step at many centers. We used Avion bifurcation RX2 balloons in the last 2 years in place of two separate balloons for such cases, both for pre-dilation and final kissing. This balloon has two distal balloons (MVB-main vessel balloon and SBB-side branch balloon). Cases matched for age, sex and lesion were non-randomly allotted to either conventional kissing balloon group (Group I, n=36) or dedicated bifurcation balloon group (Group II, n=24). The baseline characteristics including vessels involved were similar in both groups. The procedural success was comparable (91.6% and 87.5%). The bifurcation balloon could not be navigated in two lesions due to odd angle of the side branch. In one case the length of lesion was 23 mm in the main vessel and dedicated balloon could not cover the whole lesion. There were no deaths or emergency coronary artery bypass grafting (CABG) in either group. Major adverse cardiac events (MACE) rates were not significantly different. The main advantages with dedicated bifurcation balloon were ease of deployment and single-operator dependency, saving cost of one balloon, higher stability and 6 F compatibility. It is concluded that Avion RX2 balloon can be used as an alternative to conventional 'kissing' balloons in selected cases.

**Initial Experience with Dedicated Coronary Bifurcation Stents**

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Dedicated bifurcation stents for coronary stenting of the bifurcation lesions are yet to find wide acceptance. Only a few case reports or small series are reported so far. Recently, Invatec carina (non-drug coated) stents were used in our institute. Eight cases with bifurcation lesions had undergone bifurcation angioplasty. Six were males and the average age was 62±1.25 years. Five were diabetics and 3 had recent myocardial infarction (MI). The vessels involved were left anterior descending artery (LAD)-D1 (n=4), left circumflex (LCx) - obtuse marginal (OM) 1 (n=3) and posterior descending artery (PDA)-posterior left ventricular branch (PLVB) bifurcation (n=1). A dequate pre-dilation with conventional/dedicated bifurcation balloons was done in all cases. Procedural success was obtained in all cases. The optimal seating required the use of a buddy-wire in three cases. Additional stents were used in...
the side branch in two patients. There were no deaths/emergency coronary artery bypass grafting (CABG). Only four had follow-up angiogram and one case showed mild in-stent restenosis. It appeared that dedicated bifurcation stents deserve to be tried in more cases in view of simple design, ease of deployment and promising acute results by providing good adaption to the anatomy of carina and preservation of side branch access.

**Bifurcation Angioplasty Using Transradial Approach**

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Transradial approach is increasingly being used for coronary diagnosis and intervention. This study is an analysis of prospectively collected data on bifurcation angioplasty using right transradial approach. A strategy of provisional T stenting was used. Kissing balloon was done only in cases where there was significant pinching of the side branch ostium. A total of 18 patients underwent angioplasty of bifurcation lesions from December 2003 to April 2005 in our institution. There were 15 males and 3 females. In all the patients, right transradial approach was used with 6 F sheaths and 6 F Medtronic launcher guiding catheters. Bifurcation lesions involved were left anterior descending artery (LAD)/D1 in 7 patients, diagonal bifurcation in 1, circumflex(Cx)/marginal in 4, right coronary artery (RCA)/marginal in 2 and posterior descending artery (PDA)/posterior left ventricular branch (PLVB) in 4. Left extra back up guiding catheter was used in 12 patients; Judkins right was used in 5 and left Amplatz in one. Direct stenting was done in 4 patients and pre-dilation followed by stenting in 14. Cutting balloon was used in 2 patients. Bifurcation balloon was attempted but failed in one patient. Two cases had associated total occlusion, one being hidden bifurcation. In all 18 patients we used 2 wires and they were placed in the main vessel and side branch, respectively. In one patient, wiring was done with difficulty as the diagonal artery had a perpendicular take off. The main vessel was stented in 17 out of the 18 patients. In one patient, due to dissection in the side branch, both main vessel and the side branch needed stenting. Kissing balloon inflation was performed in 9 patients using compatible balloons such as Maverick, Sprinter or Voyager. Drug-eluting stents (DES) were used in 16 patients (7 Cypher, 9 Taxus) and 2 patients received bare metal stent. Glycoprotein (Gp) IIb/IIIa inhibitors were used in 6 patients. Angiographic success was 100% and no in-hospital major adverse events were noted. To conclude, bifurcation angioplasty using transradial approach is feasible and kissing balloon inflation using 6 F guiding catheters is possible. The availability of DES and Gp IIb/IIIa inhibitors has improved the in-hospital success rate of bifurcation angioplasty.

**Facilitated Percutaneous Intervention:**

**Thrombolysis followed by Immediate Percutaneous Intervention Thrombolytic Therapy alone in Acute ST Elevation Myocardial Infarction**

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Thrombolysis-facilitated percutaneous coronary intervention (PCI) is a new concept in which thrombolytic therapy and PCI are viewed as complimentary treatment modalities. Early reperfusion, which is achievable with thrombolytic treatment, is sustained with the performance of immediate PCI. Consecutive cases of acute ST elevation myocardial infarction (STEMI) (n=28) were given thrombolytic treatment with intravenous (IV) streptokinase (1.5 MU over 1 hour) and were randomized to either early intervention arm (n=14) or conservative arm (n=14). Coronary angiogram, followed by intervention was permitted in conservative arm, if indicated. All patients received 325 mg of aspirin at time of admission. Patients randomized to intervention arm received clopidogrel, 300 mg loading dose followed by 75 mg once daily for 6 months, started after thrombolytic treatment. After coronary angiography, patients who underwent PCI received IV unfractionated heparin 5000 IU. All patients received 160 mg aspirin daily. A administration of beta-blockers, angiotensin-converting enzyme (ACE) inhibitors, statins and nitrates were left to the discretion of treating physician. The end points of the study were death, recurrent ischemia, need for urgent target vessel revascularization (TVR) or a composite of death, recurrent ischemia and need for urgent TVR. The mean age was 56 years in Group I and 64 years in Group II (p=NS). 3/14 (21.4%) patients in Group I and 4/14 (28.6%) patients in Group II were females (p=NS). Prevalence of diabetes in Group I was 5/14 (35.7%) and 4/14 (28.6%) in Group II (p=NS). Group I received IV streptokinase within a mean window period of 4.2 hours and Group II received IV streptokinase within a window period of 5.1 hours (p=NS). 6/14 patients (42.5%) in Group I and 7/14 (50%) in Group II had anterior wall myocardial infarction (AWMI) (p=NS). Both groups had 6/14 (42.5%) patients with < 30% ST resolution after IV streptokinase (p=NS). Patients randomized to Group I underwent coronary angiography and percutaneous intervention within a mean time of 9.2 hours after the onset of chest pain and 4.4 hours after the administration of IV streptokinase. 12/14 (85.7%) patients underwent stenting of the infract-related artery. TIMI 3 flow in epicardial IRA was achieved in 13/14 (92.9%) patients. There was one (7.1%) death in each group (p=1.00). There were 3/14 (21.4%) patients with recurrent ischemia in Group II, while there was no incidence of recurrent ischemia in Group I (p=0.22). The composite of death, recurrent ischemia and urgent TVR was not significantly different between the two groups (1/14 (7.1%)...
Drug-Eluting Stents: Does Length Influence Restenosis?  

UN Mehta Institute of Cardiology and Research Centre, Ahmedabad

Restenosis rates appear to be in the range of 5%-6%. However, there is still a paucity of data about long drug-eluting stents (DESs) specially with regard to restenosis rates. This study attempts to evaluate the safety and feasibility of long (> 20 mm) DES in Indian patients with coronary artery disease (CAD) in real world situation including restenosis rate and incidence of sub-acute thrombosis in comparison to short DES. This was an open labelled, single centre study of 100 consecutive patients undergoing percutaneous coronary transluminal angioplasty (PTCA) with DES at the institute from 1st January 2002 onward. Patients were followed up clinically, regularly for six months. Check angiography was performed at 6 months. Those who showed clinical evidence of ischemia earlier were subjected to angiography earlier. Patients were divided into 2 groups: Group 1, with stent length < 20 mm; Group 2 with stent length > 20 mm). A total of 115 stents were deployed in 100 patients. The two groups had similar demographic and clinical characteristics. There were 96 paclitaxel-eluting stents (Infininium and Taxus) and 19 sirolimus-eluting stents (Cypher and Pronova). The average stent length in Group 1 was 15.86 mm and that in Group 2 was 26.73 mm. All 98 patients had undergone check angiogram by the end of one year. On check angiogram, in Group 1, 5/57 (8.77%) patients had instant restenosis (ISR) while in Group 2, 4/41 (9.75%) patients had ISR which was not significant (p>0.05). Implantation of long DES thus appears to be safe and ISR rates are not affected by the length of the stent. Further studies are, however, required to elucidate these findings.

Initial Experience with Supralimus-Sirolimus Eluting Indian Stent in Real World Cases  
UN Mehta Institute of Cardiology and Research Centre, Ahmedabad

Supralimus is a new and cheaper Indian drug-eluting stent (DES) that comprises an assembly of 3 established components as Matrix stent, sirolimus as the antiproliferative agent and biodegradable polymer as a drug carrier vehicle. This was a single centre, open labelled, first-in-human study to evaluate the efficacy, safety, feasibility and immediate and intermediate results of supralimus including instent restenosis (ISR), subacute stent thrombosis (SAT), and MACE rate. Between November 2003 to January 2005, 152 stent implantations were done in 100 patients using 129 supralimus stents and 23 other stents. Among them, risk factor profile was diabetes mellitus 33%, hypertension 59%, dyslipidemia 45%, smoking 22%, previous myocardial infarction (MI) 54%, left ventricular (LV) dysfunction [ejection fraction (EF) <40%] 26%, previous percutaneous transluminal coronary angioplasty (PTCA) 11%, stroke 2%. Vessels treated were single vessel in 58.9%, double vessel in 18.6%, three vessels in 3.12%. Among them, left anterior descending (LAD) target vessel in 61.5%, right coronary artery (RCA) in 29%, left circumflex (LCx) in 8%. Mean stent length was 20.59 ±12.79 mm. Of these, 11-14 mm stents were in 21.70%, 16-19 mm in 37.21%, > 23 mm in 41.08% patients. Average stent diameter was 3.07±0.72 mm; <3.0 mm diameter stents were implanted in 20.16%. Among lesion characteristic chronic total occlusion (CTO) was 15%, thrombotic lesion in 16%, ISR in 8%, ostial lesion in 8%, bifurcations in 5%. In majority of patients clinical, and if required angiographic follow-up was done. In-hospital MACE rate was 0%, MACE rate at 1 months was 1%, at 6 months MACE rate was SAT in 1%, ISR in 3%, death due to MI in 1%. Overall MACE rate was 6%. Event-free survival was 94% at 6 months. Supralimus – the new sirolimus-eluting stent from India is found to be promising in the real world cases. Supralimus stent implantation is safe, effective in reducing restenosis, and shows excellent immediate and intermediate results. However, long-term follow-up data is needed.

Profile and Intermediate Follow-up of Percutaneous Revascularization in Diabetic Patients  
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The aim of the study was to evaluate the clinical profile and intermediate term follow-up of diabetic patients undergoing percutaneous coronary intervention (PCI) in a single centre. A total of 80 patients were studied with a mean age of 56.3±9.5 years (range: 33-78 years). Of these 58 (72.5%) were males. The major indications for PCI were primary angioplasty in 4 (5%), post-infarct ischemia in 41 (51.3%), unstable angina in 29 (36.3%) and chronic stable angina in 6 (7.5%). There were 12 (15%) patients who were on insulin, majority were on oral anti-diabetic agents [n=69 (86.3%)], 9 were on...
diet control alone. Majority of lesions were Type B \([n=66 (82.3\%)]\), and 9 were Type A and 5 had Type C lesion. A repeat angiogram was done in 29 (36.3\%) of the 80 patients. Eight (10\%) patients had restenosis defined as \(>50\%\) lumen loss. Comparison between insulin requiring and non-insulin requiring groups showed no significant difference in age, sex, lesion type, stent length, or effort tolerance or treadmill test (TMT) positivity at 3 months and 6 months. There was no significant correlation between insulin requiring status and restenosis. Restenosis was not correlated with age, sex, lesion type or lesion length, functional status or effort tolerance at 3 months or 6 months. However, stent size \(\leq 2.5\) mm showed near significant correlation with incidence of restenosis \((p=0.053)\). NYHA class at one year showed a tendency toward significant correlation with restenosis \((p=0.080)\). 31 patients had a drug-eluting stent (DES). Comparing diabetics who had DES versus bare metal stent, presence of bare metal stent was significantly correlated with positive TMT at 6 months \((p=0.09)\). The presence of DES was not correlated with effort tolerance or negative TMT at 3 months. There were no significant differences in age, sex, indication for PCI or insulin requiring and non-insulin requiring status between diabetics who had DES versus those who had bare metal stent. Mortality was not analyzed as there were only 2 deaths in the population. In conclusion, NYHA functional class at one year had a tendency toward correlation with restenosis. Presence of bare metal stents in diabetics was significantly correlated with positive TMT at 6 months and there is a near significant correlation between stent size \(\leq 2.5\) mm and restenosis.

**Pre-Treatment with High-Dose Statin Improves TIMI Perfusion Grading after Primary Percutaneous Coronary Intervention**

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This retrospective study was undertaken to assess whether a high dose of statin use (atorvastatin: 40 mg daily) compared to standard low dose (atorvastatin 10 mg/simvastatin 10/20 mg daily) improved TIMI perfusion grading (TMPG) after primary percutaneous transluminal coronary angioplasty (PTCA)-stenting for myocardial infarction (MI), owing to other pleiotropic action. A total of 64 patients who underwent primary PTCA-stenting after MI, over last 2 years were enrolled for the study. There was no significant difference in the baseline characteristics between the high and low-dose statin groups. The PTCA-stenting angiograms were reviewed by an independent observer to assess TMPG. The result are presented in the table.

<table>
<thead>
<tr>
<th>No. of Pts.</th>
<th>TMPG (I+II)</th>
<th>TMPG III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atorvastatin 40 mg</td>
<td>20</td>
<td>22%</td>
</tr>
<tr>
<td>Low dose statin</td>
<td>44</td>
<td>56%*</td>
</tr>
</tbody>
</table>

\(*p<0.05, **p<0.05\) TMPG: TIMI perfusion grading

We conclude that pre-treatment with high dose of atorvastatin improve TMPG and thus, the outcome after primary PTCA-stenting for MI.

**Long Lesion Stenting with Drug-Eluting Stents**

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The objective of this study was to assess the acute and long-term follow-up of patients following drug-eluting stenting (Cypher) of long coronary lesions. In our institution, 70 patients over last 1 year required long lesion stenting \((>30\text{ mm})\). The mean age of patients was 58±2 years. Thirty patients were females, 30% patients were hypertensive, 40% were dyslipidemic, 35% were diabetic, 35% were smokers and 10% had positive family history of ischemic heart disease (IHD). About 60% patients had chronic stable angina while remaining 40% had either post-infarct angina (30%) or unstable angina (30%). Mean length of stents used was 30±0.5 mm. Left anterior descending (LAD) was stented in 42% lesions, right coronary artery (RCA) in 40% and left circumflex (LCx)/obtuse marginal (OM) in 12% lesions. Glycoprotein (Gp) IIb/IIIa inhibitors were used in 50% patients. Procedural success was achieved in all (100%) patients. One-year clinical follow-up was done for all patients. No death, myocardial infarction (MI) or recurrence of angina was observed. Follow-up treadmill test (TMT) was also done in 75% of patients. The results were encouraging as the test results were negative with significant improvement in exercise tolerance in all patients. Use of long drug-eluting stents (Cypher) is safe with excellent immediate results and good improvement on long-term follow-up.

**Nine-month Clinical Follow-up in Patients Receiving a Combination of Drug-Eluting Stents along with Bare Metal Stents during the Same Intervention**

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This study sought to assess the myocardial infarction (MI), death, and angina requiring repeat revascularization during 9 months follow-up in patients receiving combination of paclitaxel-eluting stents (PES) and bare metal stents (BMS) in
the same intervention. Patients-related factors, lesion morphology as well as stent properties are implicated in the pathogenesis of instant restenosis. We retrospectively studied the clinical outcome during 9 months following stenting with a combination of BMS and drug-eluting (paclitaxel) stent in the same patient. Fifty-five patients underwent stenting with combinations of BMS and DES between May 2003 and July 2004. There were 51 (92%) males and 4 (8%) females between 41 and 81 years (mean: 54±9.4 years). Forty-five percent of patients were diabetic and 64% were hypertensive; 21 (38%) had triple vessel disease, 1 (2%) had left main disease, 30 (55%) had double vessel disease and 3 (5%) had single vessel disease. A total of 136 stents were used (2.5 stents/patient) of which 65 (48%) were DES and 71 (52%) were BMS. The indications for BMS were edge dissection, vessel size, and socio-economic reasons. Five patients received 4 stents each, 16 had 3 stents and the remaining 34 had 2 stents each. 65 DES (1.18 stent/patient) with a mean length of 21.6±6.6 mm and diameter of 2.99±0.3 mm were placed in the following locations - left main: 2 (3%), left anterior descending (LAD): 43 (66%), right coronary artery (RCA): 13 (20%) and left circumflex (LCx): 7 (10%). Of the lesions that were treated with DES, 38 (59%) were Type B, 25 (38%) were Type C, and 2 (3%) lesions were Type A. 71 BMS (1.3 stent/patient) with mean length of 15.1±5.3 mm and diameter of 2.8±0.42 mm were placed in LAD: 7 (10%), RCA: 27 (38%), LCx: 36 (50%) and 1 for saphenous vein graft (SVG). The lesion morphology was Type B: 44 (62%), Type C: 19 (25%) and Type A: 9 (13%). During the entire follow-up of 9 months in 47 (85%) patients, there was 1 (2%) death and 3 (6%) reinterventions for recurrence of angina. One patient had restenosis of both BMS and DES, 1 had restenosis of BMS and 1 underwent PCI for a new lesion. Combination of DES and BMS for compelling indications is feasible and is not associated with increased mortality and repeat revascularization.

**Reconstruction of Saphenous Vein Graft—Instant Restenosis with Drug-Eluting Stents: A Case Report**

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A 64-year-old hypertensive ex-smoker Bangladeshi male subject with triple vessel coronary artery disease (CAD) and compromised left ventricular (LV) systolic function underwent coronary artery bypass grafting (CABG) surgery twice [LIMA to left anterior descending (LAD) and saphenous vein graft (SVG) to posterior descending artery (PDA)] in 1991; SVG to LAD and obtuse marginal (OM) in 1994. The patient became symptomatic again necessitating graft angioplasty and stenting with bare metal stent (SVG to PDA), in the year 2000. In the year 2004, the patient developed class III anginal symptoms again and coronary angioplasty revealed significant thrombus burden and 95% focal instant restenosis (ISR) in the SVG graft to PDA. Decision of interventional reconstruction of the ISR was taken. Thrombosis was done to reduce the thrombus burden. It was followed by deployment of two long drug-eluting stents in the SVG to PDA—in the instent restenosis segment and adjoining diseased area. TIMI III flow was achieved. Six months follow-up angiography revealed patency of the reconstructed ISR segment of SVG to PDA. The long-term follow-up is awaited.

**Drug-Eluting Stents versus Bare Metal Stents in Diabetic Patients undergoing Elective Percutaneous Coronary Intervention**

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Percutaneous coronary intervention in patients with diabetes mellitus is associated with high rate of restenosis and repeat revascularization due to excessive neointimal proliferation. We report our experience of safety and efficacy of drug-eluting stents (DES) in diabetic patients as compared to bare metal stents (BMS). A total of 194 diabetic patients (from January 2004 to June 2005) with de novo coronary artery lesions were included; 94 of them received DES and remaining 100 received BMS. Among DES group, 70 patients received sirolimus-eluting stents and remaining 24 received paclitaxel-eluting stents. DES reduced the rate of binary angiographic restenosis by 78% (6.9% vs. 36.4%, p < 0.0001), and reduced the 12 months rate of target lesion revascularization (TLR) by 61% (7.1% vs. 21.7%, p=0.0007), target vessel revascularization (TVR) by 54% (11.9% vs. 23.7%, p < 0.004), and composite of major adverse cardiac events (MACE) by 46% (15.9% vs. 28.9%, p=0.01). The one-year rates of cardiac death (1.7% vs. 2.2%), myocardial infarction (3.7% vs. 5.9%), subacute thrombosis (0.8% vs. 0.9%) were comparable between DES and BMS group, respectively. In conclusion, implantation of DES compared to BMS in de novo coronary lesions reduces MACE in patients with and without diabetes mellitus. DES is highly effective in reducing angiographic restenosis in patients with diabetes mellitus.

**Non-Left Anterior Descending Single Vessel Disease: Is it Worth Intervening?**

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LPS institute of Cardiology, Kanpur

We compared the long-term prognosis of patients with de novo single vessel disease of left circumflex (LCx), right coronary artery (RCA), Ramus or their branches—those who underwent intervention within the first 6 months with patients...
who were not initially revascularized. The patients (n=155) who underwent coronary angiography at our hospital from May 1997 to January 2002 and were diagnosed to have significant single vessel disease (SVD) of LCx or Ramus or RCA (or their major branches) were followed-up annually till January 2005, for a minimum period of 3 years with regard to their clinical status, anginal class, number of cardiovascular events and recurrent hospital admissions for myocardial infarction (MI) or unstable angina - into the 2 categories. Of 155 patients, 135 (males 110; females 25) could be followed-up. Eighty-five (63%) patients had RCA lesions and 50 (37%) had LCx lesions. Of these, 29 patients had undergone angioplasty within 6 months. All were on standard medications. Baseline characteristics like previous MI, diabetes, smoking and left ventricular ejection fraction (LVEF) were nearly the same. At 3 years of follow-up, the number of events were significantly lower in the early revascularization group compared to the conservative group [MI: 2 (6.9%) v. 32 (30.3%), unstable angina (USA): 8 episodes v. 70 episodes, death:1 (3.5%) v. 8 (7.5%), the former 2 being statistically significant]. There was also a significant need for revascularization in the conservative group; 22 (20%) versus 2 (7%) needed repeat percutaneous coronary intervention (PCI). There seems to be definite advantage of early intervention in single vessel disease - irrespective of its origin - left anterior descending (LAD) or non-LAD.

Sirolimus-Eluting Stent in Long Segment Disease

S Tyagi, V Trehan, M P Girish, M D Gupta, P Singh
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Instant restenosis remains a significant problem especially in patients with long segment disease and in patients with small coronary arteries. We aimed to study the incidence of restenosis in patients with long segment disease who undergo percutaneous transluminal coronary angioplasty (PTCA) and stenting with bare metal stent (BMS) and drug-eluting stent (DES). Patients with symptomatic coronary artery disease (CAD) who were amenable to catheter-based treatment, with lesion length >30 mm were included in the trial. Patients with pre-existing renal dysfunction, recent cerebrovascular accident (CVA), malignancy and other severe systemic disorder were not considered for inclusion. A total of 305 PTCA and stenting of long segment lesions were done till June 2004. There were 195 (63.93%) male patients and 110 (36.06%) females. The mean age of male patients was 50.18±19.17 years and mean age of female patients was 59±16.25 years. Out of 305 patients, 210 (68.85%) received a DES and 95 (31.14%) received a BMS. All patients received pre-procedure aspirin (150 mg/day) and clopidogrel (loading of 600 mg, followed by 150 mg/day). There were 2 cases of subacute stent thrombosis in the DES group and 1 case of subacute stent thrombosis in the BMS group. At the end of 1 year, 270 (88.5%) patients were available for follow-up, 190 (70.3%) patients in the DES group and 80 (29.7%) patients in the BMS group. There were 20 (25%) patients with restenosis in the BMS group and 10 (5.26%) patients with restenosis in the DES group. We conclude that the rate of restenosis is less in patients with long segment disease who undergo stenting with DES when compared to BMS. However, subacute stent thrombosis was not significantly different between the groups.

Percutaneous Intervention of Patients with Left Main Coronary Artery Disease

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Traditionally, coronary artery bypass graft surgery (CABG) has been the treatment of choice for left main coronary artery (LMCA) disease. With the advent of stents, percutaneous coronary intervention (PCI) has provided an alternative form of therapy for such patients. We report our experience of PCI in LMCA disease, 15 patients who presented to us with stable angina pectoris or acute myocardial infarction (MI) with significant LMCA disease were included in the study between June 2003 and June 2004. Patients with pre-existing renal dysfunction, recent cerebrovascular accident, malignancy and other severe systemic disorder were not considered for inclusion. Out of 15 patients, 12 (80%) were male patients and 3 (20%) female. 13 (86.67%) underwent elective stenting and 2 (13.33%) emergency stenting of LMCA because of acute MI and cardiogenic shock. The mean age was 49±12.56 years of male patients and 58.5±10.55 years for females. Of the two patients who underwent emergency stenting of LMCA, one was a male patient of 35 years and another was a female patient aged 36 years. There were 9 (60%) cases of ostial LMCA disease, 4 (26.67%) with LMCA shaft disease and 2 (13.33%) with distal LMCA disease. The mean diameter of stent used for LMCA was 3.95±0.80 mm. The immediate procedural success was 100%. There were no untoward event during the 30 days post-procedure follow-up period. At the end of one year follow-up there was one case (6.6%) of instant restenosis which was successfully dealt with cutting balloon angioplasty initially with 2.0×10 mm balloon followed by dilation with 3.0×10 mm balloon. This patient had undergone LMCA stenting for distal LMCA disease. In the present day scenario, percutaneous intervention of LMCA is feasible, safe and effective alternative to CABG in carefully selected population.
Sirolimus-Eluting Stent Implantation in Small Vessel Disease: Angiographic and Clinical Results
S Tyagi, V Truhan, M P Girish, M D Gupta, A Nigam, N Bhamri, J Yusuf, S Mukhopadhyay
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Drug-eluting stents (DES) are under evaluation. We aimed to study the incidence of restenosis in patients with small vessel disease who undergo percutaneous transluminal coronary angioplasty (PTCA) and stenting with bare metal stent (BMS) and DES. Patients with symptomatic coronary artery disease (CAD) who were amenable to catheter-based treatment with reference coronary diameter of <3 mm size were included in the trial. Patients with pre-existing renal dysfunction, recent cerebrovascular accident, malignancy and other severe systemic disorder were not considered for inclusion. A total of 410 PTCA and stenting were done between June 2003 to May 2004. There were 297 (72.52%) male patients and 112 (27.47%) females. The mean age of male patients was 48.13±17.14 years and mean age of female patients was 57±15.10 years. Out of 410 patients, 108 (26.37%) received a DES and 302 (73.62%) received a BMS. All patients received pre-procedure aspirin (150 mg/day) and clopidogrel (loading of 600 mg, followed by 150 mg/day). The number of cases of subacute stent thrombosis was comparable in both the groups (2.95 ± 0.75 mm in the direct stenting group and 4.5 ± 0.65 mm in the PTCA and stenting group). There were 3 cases of subacute stent thrombosis (all in the PTCA and stenting group, 1 patient had stent thrombosis at the end of 5 months, he discontinued clopidogrel for 10 days prior to the event). At the end of 1 year, a total of 217 (86.8%), 14 (70%) in the direct stenting group and 203 (88.2%) in PTCA and stenting group underwent restudy. Restenosis rate was comparable between the two groups. 6.99% patients in the DES group and 7.1% patients in the direct stent group. To conclude, in selected cases, direct stenting with a DES is as effective as PTCA and stenting with DES.

Direct Stenting versus PTCA and Stenting with Drug-Eluting Stents
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Percutaneous transluminal coronary angioplasty (PTCA) and stenting of the diseased coronary arteries is an established mode of treatment of symptomatic patients with coronary artery disease (CAD). We analyzed immediate and short-term results of direct stenting versus PTCA and stenting with drug-eluting stents (DES). Patients with symptomatic CAD amenable to catheter-based treatment and who were admitted to our cardiology ward constituted the study population. Patients with pre-existing renal dysfunction, recent cerebrovascular accident, malignancy and other severe systemic disorder were not included. Patients with total occlusion and patients with densely calcified coronary arteries were not considered for direct stenting. A total of 250 (72%) patients underwent stenting with DES between June 2003 and May 2004. There were 180 (72%) male and 70 (28%) female patients. The mean age of male patients was 49.6±15.8 years, and of female patients was 57.85±14.5 years. Twenty (8%) patients underwent direct stenting of the diseased coronary artery. There was no difference between the final luminal diameters in both the groups (2.95±0.75 mm in the direct stenting group and 3.10±0.65 mm in the PTCA and stenting group). There were 3 cases of subacute stent thrombosis (all in the PTCA and stenting group, 1 patient had stent thrombosis at the end of 5 months, he discontinued clopidogrel for 10 days prior to the event). At the end of 1 year, a total of 217 (86.8%), 14 (32.7%) in the direct stenting group and 203 (88.2%) in PTCA and stenting group underwent restudy. Restenosis rate was comparable between the two groups. 4.5% patients in the DES group and 90 (31.9%) patients in the BMS group. Four (70%) in the direct stenting group and 282 (76.2%) in the BMS group. Four (3 patients in the BMS group and 1 patient in the DES group had stent thrombosis at 5 months). At the end of 1 year follow-up, 370 (90.24%) patients underwent restudy; 88 (23.78%) had stent thrombosis at 5 months. At the end of 1 year follow-up for a mean period of 15.6±5.6 months, 5, 2 and 3 patients had CSA, unstable angina (UA) and myocardial infarction (MI), respectively. Thus, it may be concluded that direct stenting is safe and feasible with high success rate. The long-term outcome is favorable.

Direct Coronary Stenting without Predilation: Safety, Feasibility, Predictors of Success, Immediate and Late Outcomes
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Direct stenting of the lesion without pre-dilation offers certain theoretical and practical advantages. In the present study we prospectively analyzed the feasibility, safety, success rate, in-hospital complications and one-year follow-up in patients undergoing direct stent implantation at our center, and evaluated the predictors of clinical and angiographic outcomes. 102 patients (males: 89, females: 13) with 106 lesions were enrolled in the study. Presentation was chronic stable angina (CSA), unstable angina (UA) and myocardial infarction (MI) in 17 (16.6%), 33 (32.3%) and 47 (46.1%) patients, respectively. The target vessel was left anterior descending (LAD) in 68 (64.2%), left circumflex (LCx) in 13 (12.3%) and right coronary artery (RCA) in 25 (23.5%). The mean diameter stenosis was 74.5±10.54% and minimum luminal diameter (MLD) was 0.79±0.72 mm. The stents were deployed at a mean pressure of 12.2±1.89 atm. The average length of stent was 19.32±13.87 mm (range: 12-33 mm) and average diameter was 3.08±0.65 mm (range: 2.5–3.5 mm). Driver stent (Medtronic, USA) was used in 56 lesions and DES Cypher stent (Cordis, USA) in 38 lesions and others in rest. Procedural success was 92.4%. No patients had any major adverse cardiac event (MACE) in 30 days. During long-term follow-up for a mean period of 15.6±5.6 months, 5, 2 and 3 patients had CSA, unstable angina (UA) and acute myocardial infarction (MI), respectively. Thus, it may be concluded that direct stenting is safe and feasible with high success rate. The long-term outcome is favorable.
Transradial Approach for Coronary Angiography and Angioplasty

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Transradial (TR) approach has gained popularity in some interventional centers and has become the gold standard for the coronary procedures. We present our data of safety and feasibility of TR coronary procedures. From December 2001 to April 2005, 15103 patients underwent coronary angiography (CAG) and coronary interventions (PCI). Out of those patients, TR route was attempted in 14720 patients (suitable Allen's test) and was successfully completed in 14308 (97.2%) cases. In 412 (2.8%) patients, the procedure was completed from the transfemoral route. Following data was analyzed for the patients who had successful TR coronary procedures. In the TR group, 10488 (73.3%) patients underwent CAG and PCI was attempted in 3820 (26.7%) patients. The mean age was 62.6±10.8 years, and 11017 (77%) were men. In 671 (4.7%) patients, the left radial approach was required. In CAG group, 1143 (10.9%) patients had normal coronaries, 388 (3.7%) had slow flow in coronary arteries and 8957 (85.4%) patients had obstructive coronary artery disease. PCI was attempted in 3820 patients (4673 lesions) with angiographic success (per lesion) of 97%. Direct stenting (without pre-dilation) was attempted in 2429 lesions (52%) and successfully performed in 90% (2186 lesions); the remaining 243 (10%) lesions were pre-dilated to complete the procedure (overall success 100%). Conventional stenting (with pre-dilation) and plain balloon/cutting balloon angioplasty were attempted in 1823 (39%) and 421 (9%) lesions, respectively. The success rate in this combined group was 94.2%. All patients were ambulatory on the day after the angioplasty procedure, if clinical condition permitted. In all patients, the sheath was taken out immediately after the procedure and local compression was given using a Terumo device or compression bandage. None of the patients suffered from ischemia of the hand or impairment of hand function. No patient had a major bleeding from vascular access site requiring blood transfusion. Minor hematoma was noticed in 148 (1%) patients. Hematoma extending up to mid-forearm occurred only in 28 patients. Major complications occurred in 4 patients (cerebrovascular accidents); and all recovered. Radial artery spasm and pain was noted in 8.2% and 4% patients, respectively. Six patients had a small pseudoaneurysm, out of those 3 required surgical treatment and 3 were compressed under ultrasonographic guidance. Thus, coronary procedures can be performed safely using the TR approach with relatively few vascular complications and with better patient comfort.

Primary Percutaneous Coronary Intervention for ST Segment Elevation Myocardial Infarction in an Asian General Hospital without On-site Cardiothoracic Surgery

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For acute ST-elevation myocardial infarction (STEMI), primary percutaneous coronary intervention (PCI) is increasingly seen as a superior reperfusion therapy to fibrinolytic therapy with improved PCI techniques. The requirement for emergent coronary artery bypass surgery (CABG) has decreased significantly. We present our experience in a hospital, which does not have on-site cardiothoracic surgery facilities. This was a two-year registry of 132 patients from January 2003 till December 2004 who presented with STEMI and were sent to the cardiac catheterization laboratory for acute PCI. The primary outcome measured were, in-hospital major adverse cardiac events (MACE), MACE at 30 and 180 days and door-to-balloon time. 132 patients (100%) underwent cardiac catheterization for acute myocardial infarction (MI). Stenting was performed in 129 (97.73%) patients. Distal protection device was used in 64 (48.48%) patients. Glycoprotein IIb/IIIa inhibitors were used in 32 (24.24%) patients. There were no peri-procedural complications in 97.67% of patients. Two patients had dissection of the coronary artery and were treated with overlap stenting. One patient had stent dislodgement and another stent was deployed to crush the dislodged stent. Two patients had subacute stent thrombosis, one underwent another PCI and another was transferred for early CABG. The mean door-to-balloon time was 96.26 min. There were no in-hospital MACE in 127 (98.44%) patients who underwent PCI. At 6 months follow-up, survival from all-cause mortality was seen in 126 (97.67%) patients; 124 (96.12%) patients were MACE-free, and 16 (12.12%) patients were lost to follow-up. The lack of cardiac surgery backup, per se, need not limit the safety or efficacy of acute PCI in a district hospital. Rigorous standards for operators, staffing, equipment, laboratories, case selection and outcomes must be adopted to make it safe and successful.

Aneurysm Formation after Implantation of Drug-Eluting Stents: Report of 3 Cases - Probable Hypersensitivity Reaction?

PK Grant, CN M akhale, M S Hiremath, JS Hiremath, RS Shinde, AC M ehta, M Durairaj
Grant Medical Foundation, Ruby Hall Clinic, Pune

Drug-eluting stents (DES) have reduced the frequency of in-stent restenosis. However, most of the results have been...
 Derived from simple lesions in non-complex patients. But long-term safety data on DES is lacking. Here we present three probable cases of DES hypersensitivity reactions. Two cases showed aneurysm formation post-DES implantation and two had bilateral extensive interstitial pneumonitis. Case 1: An elderly gentleman was implanted with sirolimus-eluting stent in proximal right coronary artery (RCA). Two weeks later, he presented with unstable angina and high grade fever. Coronary angiography was done, which showed an aneurysm formation at the proximal end of the stent with total occlusion. Subsequently, the patient was sent for coronary artery bypass grafting (CABG). Case 2: A 58-year-old female was implanted with a sirolimus-eluting stent. Three weeks later, she was admitted with fever, rash, breathlessness, pneumonitis, bilateral pleural effusion and a pericardial effusion. Repeat coronary angiography showed aneurysm formation in the left anterior descending (LAD) artery. Case 3: A 62-year-old man was implanted with two sirolimus-eluting stents in RCA following an inferior wall myocardial infarction. Four days later, he presented with severe bilateral necrotizing interstitial pneumonitis.

### Saphenous Vein Graft Percutaneous Coronary Intervention

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We present our data of 20 patients; these included 16 (80%) males and 4 (20%) females. Mean age was 68.3 years. The risk factors were hypertension in 18 (90%), diabetes mellitus (DM) 12 (60%), smoking 2 (10%). Left ventricular ejection fraction (EF) ranged from 30% to 60% with mean of 45%. The presenting complaints were unstable angina: 15 (75%), chronic stable angina: 3 (15%), acute myocardial infarction (MI): 2 (10%). Vein grafts included saphenous venous graft (SVG) to right coronary artery (RCA): 7 (35%), SVG to obtuse marginal (OM): 9 (45%), SVG left circumflex (LCx): 2 (10%), SVG to D1: 1 (9%) and SVG to ramus: 1 (5%). All lesions were pre-dilated. Distal protection devices were used in 15 (75%) patients. Fifteen (75%) patients received glycoprotein (Gp) IIb/IIa inhibitors, 10 (50%) received abciximab and 5 (25%) received eptifibatide. Twelve (60%) patients received bare metal stents. Six (30%) patients received drug-eluting stents. Two patients received covered stents. Final vessel diameter was 3.5-4.25 mm. The mean diameter was 3.75 mm. None of the patients had major adverse cardiac event (MACE). On follow-up of 15 patients for mean duration of 13 months, 12 patients were symptom-free. One patient had effort angina, and 2 patients underwent coronary angiography for angina which showed patent stents. It can be concluded that SVG percutaneous coronary interventions (PCI) are safe and effective revascularization therapy.

### Drug-Eluting Stents in ST Elevation Acute Myocardial Infarction

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Safety and effectiveness of drug-eluting stents (DES) in acute myocardial infarction (MI) remains unknown. Few published series are available in the literature. We studied 32 cases of acute MI. The incidence of major adverse cardiac events (death, non-fatal myocardial infarction, reintervention) was evaluated. Diabetes mellitus (DM) was present in 10 (31.25%) patients. Primary angioplasty was performed in 20 (62.5%) patients and rescue angioplasty was performed in 12 (37.5%) patients. Anterior wall infarction was present in 18 (56.25%) cases and 14 (43.75%) had inferoposterior infarction. Four (12.5%) patients had cardiogenic shock. Procedural success (TIMI-3 flow) was achieved in 30 (93.75%) patients. Angiographic no-flow phenomenon was seen in 2 patients. Glycoprotein (Gp) IIb/IIa inhibitors were used in all patients. Thrombectomy devices and/or thrombus suction with Export catheter was used in 16 (50%) patients. In-hospital mortality was 4 (12.5%) patients. Two (6.12%) patients had reinfarction and required target lesion revascularization (TLR). During clinical follow-up of 6 months, two patients had effort angina and coronary angiography showed instant restenosis and was tackled with DES. In this series, drug-eluting stent implantation for patients with ST elevation acute myocardial infarction was safe and predictable.

### Long Term (> 18 Months) Follow-up of Paclitaxel-Eluting Stent in Native Coronary Lesions

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Development of restenosis within the stented segment is a major limitation of bare metal stents (BMS). Drug eluting stents (DES) claim to effectively decrease the rate of restenosis at long-term follow-up as compared to bare metal stents (BMS). However, the duration of these beneficial effects is unknown. Of over 400 DES implanted at our centre for various coronary artery lesions, 190 patients were stented with Taxus (paclitaxel-eluting stent, Boston-Scientific, USA), and have completed 18 months of clinical follow-up. We present our data of long-term follow-up of these patients. Mean follow-up duration was 21.7±4.5 months. The mean age of the group was 59±6.2 years (range: 37-79 years); 154 (81%) patients were men. The mean left ventricular (LV) ejection fraction was 42.6±15.3% (range: 10-70%) at the time of DES implant. A total of 214 vessels were stented with 238 Taxus stents. The
vessels stented were left main coronary artery: 4 (1.9%), left anterior descending artery 140: (65.4%), right coronary artery: 34 (15.9%) and left circumflex artery: 36 (16.8%). No patient had any in-hospital major adverse cardiac events (MACE). Three (1.4%) patients had dissections, which were stented with BMS. All patients were discharged from the hospital with stable cardiac status. Clinical follow-up is available in 180 (94.7%) patients. Actuarial survival rate at 18 months was 96.6%. Ten (5.6%) patients developed MACE at 18 months of follow-up. Six (3.4%) patients died (3 due to progressive heart failure, 2 due to sudden cardiac death, 1 due to non-cardiac death). Four (2.2%) patients had recurrence of angina and required reintervention in the target vessel. A majority of patients, 150 (83.3%) are asymptomatic and 20 (11.1%) patients have symptoms of heart failure due to LV dysfunction. These 20 patients had negative treadmill exercise test at 12 months post-DES implantation. Out of 150 asymptomatic patients, 104 (69.3%) patients have had a treadmill exercise test, which was negative in all. Thus, Taxus stent appears safe and effective with low MACE rate at 18 months of follow-up.

Minimizing Radial Artery Spasm during Transradial Coronary Procedures

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Radial artery spasm (RAS) is the Achilles heel of transradial coronary procedures (TRCP). Reasons for RAS include (i) Mismatch in radial artery (RA) versus sheath size specially in those with small radial arteries, and (ii) Need for repeated catheter exchanges and manipulation. The aim of this study was to compare incidence of RAS and procedure time for right (RRA) versus left radial access (LRA) with application of a protocol to match sheath size with RA diameter. As per our protocol, we selected sheath size as follows: 5 F, 6 F or smaller, 7 F or smaller, 8 F or smaller for >1.7 mm, ≥2 mm, ≥2.3 mm, ≥2.7 mm RA diameter (color Doppler ultrasound) respectively. For RA of 1.4-1.6 mm we injected diltiazem 2 mg (sometimes with 1-2 ml of 2% lignocaine) in the ipsilateral brachial artery prior to sheath insertion in order to dilate the RA, and minimize pain and spasm. Patients with RA < 1.4 mm were excluded. Catheters with radial curves (RB, Kimny) were not available. Judkin’s catheters were first choice. We report the results of 301 consecutive transradial coronary angiography (TRCA) (123 LRA, 178 RRA) and 73 transradial interventions (TRI) (53 LRA, 20 RRA). RA diameter and patient demographic characteristics were similar between LRA and RRA. There were 13 patients with RA diameter of 1.4-1.6 mm in LRA group versus 17 in RRA group (p=NS). Mean sheath size versus RA was 0.8±0.21 mm. Significantly, subclavian artery (SA) tortuosity was noted on the right side in 9.5% compared to only 1 on LRA. Significant RAS occurred in 8 (4%) with RRA and in only one with LRA. Tortuous SA was associated with RAS (p<0.05). Procedure duration for TRCA was 22±8.3 min for RRA versus 15±5.4 min for LRA (p=0.02). With matching of sheath size to RA diameter, LRA was associated with RAS in 1, while incidence of RAS was minimized in RRA. RAS correlated significantly with SA tortuosity.

Primary Thrombosuction with Export Aspiration Catheter during Percutaneous Coronary Intervention in Acute Coronary Syndrome: Acute Results and In-hospital Outcomes

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Percutaneous coronary intervention (PCI) for acute coronary syndrome (ACS) in lesions with a large thrombus load increases the procedural complication rate. Thrombus reduction with use of the Export aspiration catheter (EAC) has been reported in primary PCI in ST elevation acute myocardial infarction (STEMI) only. To the best of our knowledge, this has not been described in the setting of the other ACS such as unstable angina (UA) and non-ST elevation myocardial infarction (NSTEMI). The objective of this study was to evaluate acute angiographic results, procedural complications and safety and efficacy of this technique in reducing thrombus burden in ACS. The EAC, an over-the-wire device, is a component of the Guardwire plus system (PercuSurge, Sunnyvale, CA), which was originally developed for emboli containment in saphenous vein graft and peripheral vessel interventions. An empty syringe attached to the EAC was used for thrombosuction before PCI in consecutive cases of ACS with visible angiographic thrombus (filling defects, contrast staining) unless the reference infarct-related artery diameter was <2 mm. EAC thrombosuction was performed successfully in 47 patients undergoing PCI (18 STEMI, 15 UA, 14 NSTEMI) and gross thrombi were obtained from 23 (55%) patients. Primary EAC aspiration was preferred in most patients. Predilation was required prior to EAC aspiration in 22.8% patients only. Thrombus load was completely removed in 57.1% patients with EAC aspiration alone, TIMI flow improved following EAC aspiration alone in 97.1% patients, with TIMI 3 flow being restored in 71.4% patients. Atheroembolic treatment with stenting, TIMI 3 flow was restored in 98% target vessels. There was transient slow flow in 9 patients. Glycoprotein IIb/IIIa inhibitors were used in 65.7% patients and the mean procedural time was 45±20 min. There was no angiographic evidence of distal branch loss or vessel injury. No major procedural or in-hospital complication occurred in
any patients. EAC thrombosis technique can be safely applied for thrombus burden reduction in treating ACS patients including UA, and both STEMI as well as NSTEMI. In this small cohort, thrombosis with EAC was associated with good acute angiographic result and no significant procedural complications.

**Safety of Multivessel versus Infarct-Related Artery Angioplasty for Patients with Acute Myocardial Infarction**

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Patients with acute myocardial infarction (MI) may have multivessel (≥ 2) disease. Intervention of non-infarct-related artery (IRA) in the same setting [multivessel percutaneous coronary intervention (PCI)] or at a later date (staged procedure) are two options in such patients. Safety of multivessel PCI in the setting of acute MI is not well established. Unstable clinical status, hypotension, arrhythmias and prolonged procedure time may lead to adverse outcome. We retrospectively analyzed our data of multivessel PCI versus IRA PCI followed by staged procedure to judge the safety of multivessel PCI in acute MI subsets. We excluded patient with single vessel disease, prior coronary artery bypass graft (CABG) surgery, cardiogenic shock and patient with previous PCI. The clinical and angiographic profiles of these patients were retrospectively analyzed. Between April 2004 to April 2005, 55 patients underwent multivessel PCI [group II, n=25 (45.5%)] or IRA PCI followed by staged procedure [Group I, n=30 (54.5%)] in other vessels at a later date. All patients underwent the procedure through transradial (TR) route. Patients' demographic, clinical and angiographic characteristic as well as outcomes were compared.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Single vessel PCI (n=30)</th>
<th>Multivessel PCI (n=25)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>60±12.23</td>
<td>62±13.3</td>
</tr>
<tr>
<td>Male</td>
<td>18 (60%)</td>
<td>14 (56%)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>20 (66.6%)</td>
<td>18 (72%)</td>
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<tr>
<td>Hypertension</td>
<td>15 (50%)</td>
<td>13 (52%)</td>
</tr>
<tr>
<td>Family history</td>
<td>15 (50%)</td>
<td>13 (52%)</td>
</tr>
<tr>
<td>Smoking</td>
<td>18 (60%)</td>
<td>16 (64%)</td>
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<tr>
<td>IRA</td>
<td>LAD</td>
<td>17 (56.6%)</td>
</tr>
<tr>
<td></td>
<td>RCA</td>
<td>06 (26.6%)</td>
</tr>
<tr>
<td></td>
<td>LCx</td>
<td>05 (20%)</td>
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<tr>
<td>Non-IRA</td>
<td>LAD</td>
<td>11 (35.6%)</td>
</tr>
<tr>
<td></td>
<td>RCA</td>
<td>13 (43.3%)</td>
</tr>
<tr>
<td></td>
<td>LCx</td>
<td>7 (23.3%)</td>
</tr>
<tr>
<td>Mean vessel diameter (mm)</td>
<td>3.1±0.52</td>
<td>3.0±0.61</td>
</tr>
<tr>
<td>Abciximab</td>
<td>19 (63.3%)</td>
<td>18 (72%)</td>
</tr>
<tr>
<td>IABP</td>
<td>8 (26.6%)</td>
<td>5 (20%)</td>
</tr>
<tr>
<td>Procedural success</td>
<td>29 (96.7 %)</td>
<td>24 (96 %)</td>
</tr>
<tr>
<td>Sub acute thrombosis</td>
<td>0 (0%)</td>
<td>1 (4%)</td>
</tr>
<tr>
<td>Procedure time (min)</td>
<td>15±5.6</td>
<td>23±1±0.2</td>
</tr>
<tr>
<td>In-Hospital MACE</td>
<td>2 (6.6%)</td>
<td>1 (4%)</td>
</tr>
<tr>
<td>Major bleeding</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The two groups were comparable in their clinical and angiographic characteristics. The procedural success were similar in two groups; however, the procedure time was significantly higher in multivessel group. To conclude, multivessel PCI through TR route can be performed in the setting of AMI with equal success and safety as compared to staged procedure.

**Transradial Interventions in Women: Is there any Gender Bias?**

K Jali, N Tanwar, S Shah, P Panchal, N Vayada, S Gupta, H M alhotra, A Ranjan, T Patel
Sterling Hospital, Ahmedabad

Over 98% of percutaneous coronary interventions (PCI) are performed at our centre through transradial (TR) approach. There is no apparent difference between men and women as far as radial access, procedure success and complications are concerned. However, we retrospectively analyzed our data in 224 women to evaluate the overall success of PCI through TR approach performed from April 2003 to May 2005. Mean age of the patients was 60.4±10.3 years (range: 41-81 years). Clinically, 92 patients (41.07%) had unstable angina, 28 (12.5%) had acute myocardial infarction (MI), 44 (19.7%) had post-MI angina and chronic stable angina was present in 60 (26.8%) patients. Ninety-six (42.8%) patients were diabetic, 142 (63.3%) were hypertensive, 20 (8.9%) had dyslipidemia and 78 (34.8%) patients had multiple risk factors. Radial access was attempted in all and successfully achieved in 222 (99.1%) patients (right in 208, left in 14 patients). In 2 patients, femoral route was used to complete the procedure due to presence of severe radial loop anomaly. Fifteen (6.69%) patients complained of pain and spasm, which was relieved with additional doses of spasmytic cocktails. Single vessel PCI was performed in 176 (78.5%) patients, 42 (18.7%) had double vessel stenting and 6 (2.8%) patients had triple vessel stenting. A total of 258 stents (67 drug-eluting stents) were deployed. Average stent diameter was 2.9 ± 0.9 mm and mean length was 17.2±6.4 mm. Mean procedural time and mean fluoroscopic time was 20.2±5.5 min and 9.3±8.5 min, respectively. Acute procedural success rate was 98.21% (n=220). There was no in-hospital major adverse cardiac event (MACE). One patient had sub acute thrombosis 7 days after the PCI, which required reintervention. All patients were followed clinically after 1 month for local site complications. Four (1.7%) patients had a small pseudoaneurysm of the radial artery, 3 required local compression under ultrasound guidance and 1 required day care surgery. Incidentally, this patient had pseudoaneurysm of femoral artery following coronary angiography performed at another centre. Asymptomatic radial artery occlusion was seen in 9 (4.0%) patients. Two hundred six (91.9%) patients were followed for a mean of 8.6±6.3 months (range: 1-21 months). Recurrence
of angina was observed in 26 (11.6%) patients; 16 patients underwent check angiography; 10 patients required target vessel revascularization due to restenosis, while another 6 patients had developed de novo lesions. Five patients died (3 had sudden cardiac death and 2 had progressive heart failure), TR approach is safe, feasible and effective in women. There was no difference in success rate, procedure and fluoroscopic times or acute complication rate as compared to our overall data but there was a higher tendency of pseudoaneurysms in women. The mid-term follow-up results are comparable to international data.

Transradial Angioplasty in Thrombus-Containing Lesions
Pramod Kumar, BB Chanana, Amar Singhal
Maharaja Agraen Heart Institute, New Delhi
In last two years, 158 patients underwent percutaneous transluminal coronary angioplasty (PTCA) after myocardial infarction (MI) (primary or within three days of MI). Out of these 20 patients had significant visible thrombus exceeding the limits of the lesion necessating the use of any device. Out of 20 patients, 18 were native and two were saphenous vein grafts (SVG). Extraction catheter was used in all the patients through a 6 F guidewire. In two patients distal protection device was used. In one patient the distal protection device could not be put because of heavy thrombus load and procedure was abandoned. All except one required stenting. All the patients received clopidogrel, aspirin and glycoprotein (Gp) IIb/IIIa receptor antagonist. In one patient Intracoronary urokinase was used. None of the patient had any local complications or requirement of blood transfusions. It is concluded that transradial approach is feasible in thrombus-containing lesions and offers almost similar levels of comfort for the use of various devices like extraction catheter or filter devices.

Re-using Hardware in Transradial Procedures
V Anand Kumar, R Balaji, B Anupam, C Raghu
Yashoda Hospital, Hyderabad
During the 2 year period from January 2003-December 2004, a total of 2603 transradial procedures were done (2179 coronary/ peripheral angiographies, 418 coronary angioplasties, 6 renal angioplasties). Vascular sheath sizes used were 5 F in 2066 (79.37%), 6 F in 530 (20.36%), 7 F in 4 (0.15%) and 8 F in 3 (0.12%) cases. Glycoprotein (Gp) IIb-IIIa receptor blockers were used in 98 (3.76%) cases. Mid-forearm hematoma occurred in 19 (0.73%) patients. Nearly all resolved with conservative management strategies including arm tourniquet application, local ice-pack application and stopping glycoprotein IIb-IIIa receptor blockers. We observed that mid-forearm hematoma was more commonly associated with (i) radial artery dissection, (ii) use of glycoprotein IIb-IIIa receptor blockers, (iii) use of large size vascular sheaths ≥7 F size, and (iv) rescue procedures for retrieval of embolized material (guidewires, stents etc). One patient developed compartmental syndrome requiring decompression surgery. All others were managed conservatively.

Mid-Forearm Hematomas in Transradial Procedures
V Anand Kumar, R Balaji, B Anupam, C Raghu
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Thrombopulsion in Acute Coronary Syndrome
Vijay Trihan, S Ramakrishnan, Naresh K Goyal, Bishwa Bhushan Bharti, Vimal Mehta, S Anandaraja, M P Girish, Mohit Dayal Gupta, Bhola Shankar Vivek, Dinesh Raj, Sanjay Tyagi
GB Pant Hospital, New Delhi
Patients with acute coronary syndrome (ACS) - ST elevation myocardial infarction (STEMI) and non-ST elevation myocardial infarction (NSTEMI) often present at odd hours, and in younger and smaller centres often not catered to by the most experienced interventionists. Angiographically these patients usually have thrombus-containing lesions. The availability and the expertise in using the various
Intravenous Nicorandil in Patients with Acute Coronary Syndromes undergoing Percutaneous Coronary Intervention

AJ Swamy, M Rohit, A Bahl, YP Sharma, KK Talwar
Post Graduate Institute of Medical Education and Research, Chandigarh

The role of intravenous nicorandil in patients with acute coronary syndromes (ACS) remains uncertain. The purpose of this study was to evaluate the effect of intravenous nicorandil on clinical and echocardiographic outcome measures in patients undergoing percutaneous coronary intervention (PCI) for ACS. We evaluated systolic function, diastolic function, and regional wall motion abnormalities before and one month after PCI for ACS. Intravenous nicorandil was given for at least 48 hours in a dose of 3 mg/hour to 6 mg/hour as tolerated in a protocol-based escalation to 15 patients. One patient had acute myocardial infarction (MI), one had accelerated angina, and all others presented with post-myocardial infarction (MI) angina. Thirty-three patients were smokers, 26% diabetics, 46% had hypertension, 33% had pulmonary edema, 4% had recent inferior wall myocardial infarction (IWMI), 10% had recent anterior wall myocardial infarction (AWMI), and 1 had dynamic electrocardiographic (ECG) changes. Prior to PCI, 20% patients had left ventricular ejection fraction (LVEF) >50%, 33% had LVEF of 45–50%, 20% had LVEF 40–44% and 26% had LVEF <35%. After one month, LVEF improved in all except one patient. Sixty-three percent patients had LVEF >50%, 13% had LVEF of 40–44%, one had LVEF 35–39%. Diastolic function indices improved in 66% of patients. The wall motion score index improved from a mean of 1.46 to 1.2.

Effect of Rosuvastatin 40 mg on Patients with High C-Reactive protein after Percutaneous Coronary Intervention: Results at 3 Months

Debabrata Roy, BP Chatterjee, Sunip Banerjee, P Sahoo, J Naik
Rabindra Nath Tagore Internation Institute of Cardiac Science, Kolkata

High C-reactive protein (CRP) level, a marker of inflammation, is an independent predictor of unfavorable outcome after percutaneous coronary intervention (PCI). So, steroid use was proposed in this situation to improve the prognosis. In the present study, we used high dose of rosuvastatin (40 mg once daily), irrespective of the low-density lipoprotein (LDL) level, to assess its effect on CRP lowering and improvement in major adverse cardiac events (MACE) after PCI. A total of 96 patients (male: 84, female: 12) who underwent percutaneous transluminal coronary angioplasty (PTCA)-stenting were enrolled for the study. All of them had high CRP levels (>0.3 mg/dl) after the procedure. Majority (98%) were already on a statin (atorvastatin: 10–96%; simvastatin: 20–4%). The mean LDL level was 108±12 mg/dl at the time of entry. After enrollment, the patients were randomly assigned to receive either rosuvastatin 40 mg once daily or allowed to continue the statins they were already on. The two groups were followed up upto 3 months for MACE. There was no significant difference in baseline characteristics between the two groups. The result are presented in the table.

We conclude that a high dose of rosuvastatin was more effective in reducing CRP level after PCI and this was reflected in reduced MACE in this group.
managed conservatively. The aim of the present study was to assess the relationship between silent ischemia and TIMI perfusion grade (TMPG), another marker for unfavorable outcome, after percutaneous coronary intervention (PCI) in patients with acute coronary syndrome (ACS) [unstable angina (UA) and non-Q myocardial infarction (MI)]. A total of 105 patients with ACS (male: 95, female: 10) were enrolled for the study. All the patients underwent 24-hour ECG monitoring on admission. All of them had coronary angiography and subsequently underwent percutaneous transluminal coronary angioplasty (PTCA)-stenting within 72 hours of admission. TIMI perfusion grade after the procedure was assessed in each patient. The patients were divided into two groups depending on the presence or absence of silent ischemia on electrocardiogram (ECG) (ST segment depression >1 mm for >1 min). There was no significant difference in baseline characteristics between the groups. The result are presented in the table. 

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>TMPG (+I+II)</th>
<th>TMPG III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A (Silent ischemia)</td>
<td>63</td>
<td>49</td>
<td>14</td>
</tr>
<tr>
<td>Group B (No ischemia)</td>
<td>42</td>
<td>15*</td>
<td>27*</td>
</tr>
</tbody>
</table>

*p < 0.01, TMPG: TIMI perfusion grade

We conclude that patients of UA with silent ischemia have worse TMPG following early invasive management. This signifies an adverse prognosis for this group.

Stent Thrombosis in the Era of Coronary Stenting

M A Rahman, T Haque, A Khan, M Ahmed, M Hossain, M Amin, AAS M ajumder, SAM Husnayen, M Ali, SA Haque, H Banoo, S Rahman
National Institute of Cardiovascular Diseases, Dhaka, Bangladesh

Factors leading to stent thrombosis after percutaneous coronary intervention (PCI) have not been well established. The incidence of stent thrombosis has declined with the application of high pressure stent deployment along with use of aspirin and clopidogrel. However, in the era of coronary stenting, stent thrombosis remains a major life-threatening risk. We, therefore, tried to find out the frequency of stent thrombosis during PCI and factors related to it. Between 30 March 2002 and 31 July 2004, 286 consecutive patients underwent coronary stenting. We excluded patients who underwent coronary artery bypass surgery (CABG). A total of 286 patients (351 lesions) were included; 279 patients (344 lesions) without stent thrombosis and 7 patients (7 lesions) with stent thrombosis. Stent thrombosis was documented angiographically in 6 patients and clinically in 1 patient. Maximum deployment pressure was 16±4 atm in patients without stent thrombosis and 11±2 atm in patients with stent thrombosis. Reference mean vessels diameter was 2.5±0.25 mm with stent thrombosis and 3.0±0.25 mm without stent thrombosis (p<0.05). Average length of lesion was 19.87±5.37 mm without stent thrombosis and 21.28±6.73 mm with stent thrombosis (p<0.001). The rate of stent thrombosis was 2.44%. Seventy-one percent stent thrombosis was related to LAD PCI, 29% was present in LCx. All the stents were deployed at low pressure and in small caliber vessel. Stent thrombosis occurred in 2.44% of patients undergoing stenting of native coronary artery lesions and receiving routine antiplatelet therapy with aspirin plus clopidogrel. Our stent thrombosis subjects were related to long lesion, smaller reference vessel diameter and low-pressure stent deployment. LAD was most frequently involved. Continuous efforts to eliminate this complication are warranted given its serious clinical consequence.

Effectiveness of Thrombectomy for Patients with Non-ST Elevation Myocardial Infarction

Yoshiyuki Furuse, Yoshiya M uramatsu, Reko Tsukahara Ito, K esuke Hirano, Shigeru Nishimura, Takaya Tsubota, Tomohi Kawasaki Social Insurance Hospital, Kawasaki, Japan

The aim of this study was to evaluate the effectiveness of thrombectomy in patients with non-ST elevation myocardial infarction (NSTEMI). Of 254 patients of acute myocardial infarction (MI) admitted to our hospital from first January 2000 to April 2003, there were 54 cases of NSTEMI. Pre-procedural TIMI-3 flow cases were excluded. Finally, 47 patients were enrolled in this study. The patients were divided into various groups: the group for which thrombectomy was performed (Group T, n=11), cases in which distal protection was performed (Group C). Coronary angiographic findings, percutaneous coronary interventions (PCI) procedures, target lesion revascularization (TLR), left ventricular ejection fraction (LVEF) - acute and at 6 months were noted. Major adverse cardiac events (MACE) [cardiac death, AMI, CABG, TLR) were compared among the groups. Patients' background and baseline coronary angiography finding were similar in both groups. There were no differences in the procedures in the two groups except for diameter of the stent(s) deployed (Group T: 3.4±0.5 mm, Group C: 3.1±0.3 mm). TLR and LVEF were similar among both groups, however, cardiac events occurred less frequently in group T (Group T: 0% v. Group C: 16%, in days). To conclude, intracoronary thrombectomy improves myocardial reperfusion and reduces cardiac death in patients with NSTEMI.
Use of a Novel Dedicated Coronary Bifurcation Stent in Bifurcation Lesions (Frontier Bifurcation Stent)  

Aman Salwan, Teck Woe Wong, Dinesh Nair, Phillip Wong  
National Heart Centre, Singapore  

Percutaneous coronary intervention of coronary bifurcations is associated with a low success rate, high rate of complications and high incidence of target vessel revascularization. This is a single centre, non-randomized evaluation of Frontier bifurcation stent in 10 patients with 10 de novo bifurcation lesions. It is a revolutionary 2-wire, 2-balloon single stent design that provides side branch ostial scaffolding. The age range of patients was from 41 to 79 years, mean age was 64.8 years and median age was 52 years. All patients presented with recent unstable angina, myocardial infarction and angina on exertion. Two patients had thrombus at lesion site. Site of bifurcation lesion was left anterior descending/diagonal in 8 patients and right coronary artery (RCA)/ posterior descending artery (PDA) in 2 patients. Mean contrast was 215 ml, mean screening time was 26.5 min and mean procedure time was 54 min. Device success in main artery was 100%. One patient had suboptimal side branch implantation with residual stenosis of 70%.

Proximal Location of Stenosis in Left Anterior Descending Coronary Artery:  
Is it a Predictive Factor of Worse Outcome in the Era of the Stent?  

TN Sunil Roy, SV Praveen, Vikram Sankar, CG Sajaw, Johnson Francis, CC Velayudhan, M N Krishnan, K Venugopal  
Medical College Hospital, Calicut  

Lesions in the proximal left anterior descending artery (LAD) account for a major proportion of coronary morbidity and mortality. The aim of our study was to assess the major adverse cardiac events in patients undergoing stenting of the proximal LAD. Study comprised 48 patients who had undergone stenting of the proximal LAD in our institution who were prospectively followed-up for a period of one year. Mean age of the population was 49±8.7 years (range: 33-65 years), male-female ratio was 5:1. The distribution of predisposing factors was: 25% had diabetes mellitus, 25% had hypertension and 52% were smokers. There was history of previous myocardial infarction (MI) in 41%, unstable angina in 20.83% and 39% had effort angina. Lesions were single vessel disease (SVD) in 25, double vessel disease (DVD) in 14, and triple vessel disease (TVD) in 8. Six patients had total occlusion of the LAD. The mean length of stenosis was 13.8±5.1 mm (range: 8-28 mm) and diameter of the vessel was 2.92±0.51 mm. Total of 56 lesions were addressed and 50 stents were deployed. Diameter of the stents used were 2.5 mm in 14 patients, 3 mm in 24 patients and 3.5 mm in 12 patients. Procedure failure occurred in one patient (procedure success in 98%). He developed false passage with pericardial effusion. He was stabilized and later sent for coronary artery bypass grafting (CABG). One (2.08%) patient developed subacute stent thrombosis on day 3. Seven patients had inducible ischemia on follow-up. Coronary angiogram revealed stenosis or progression of the lesion in 5 patients. Two patients underwent CABG, 2 repeat coronary angioplasty, and one patient opted for medical therapy. The major adverse cardiac events (MACE) at the end of one year follow-up were death 4.1%, subacute stent thrombosis 2.08%, Q wave MI 4.1%, restenosis 10.41% and target vessel revascularization (TVR) in 8.33%. When stenting is feasible, the location of the lesion in the LAD is not predictive of worse outcome and consequently should not be taken into account in the choice of the revascularization strategy.

Acute and Mid-Term Results of Drug-Eluting Stents in Acute Myocardial Infarction  

K Thakkar, A Ranjan, N Tanwar, H Malhotra, R Pothiwala, K Fonseca, S Gupta, S Shah, T Patel  
Sterling Hospital, Ahmedabad  

Drug-eluting stents (DES) have been proven to reduce the rate of restenosis and target vessel revascularization (TVR) as compared to bare metal stents (BMS). However, the safety and effectiveness of DES in acute myocardial infarction (MI) is not well documented. Between January 2003 and January 2005, 76 patients (62 men; 81.6%) underwent percutaneous coronary intervention (PCI) in acute MI with DES. Acute results, in-hospital outcomes and mid-term clinical follow-up were retrospectively analyzed. The mean age of the patients was 56.7±11.1 years (range: 35-78 years). Twenty-nine (38.2%) patients had hypertension, 21 (27.6%) had diabetes mellitus and 18 (23.7%) patients were smokers. Dyslipidemia and family history of ischemic heart disease was present in 17 (22.4%) and 13 (17.1%) cases, respectively; 41 (53.9%) patients had anterior wall MI, 26 patients (34.2%) had inferior wall MI (2 with right ventricular MI) and 9 (11.8%) had inferolateral MI. The mean left ventricular ejection fraction was 37.7±9.2% (10-60%). The infarct-related artery (IRA) was the left anterior descending artery (LAD) in 41 (53.9%) patients, right coronary artery (RCA) in 22 (28.9%) and left circumflex artery (LCx) in 13 (17.1%) patients. Fourteen (18.4%) patients had additional multivessel disease. All the IRAs were treated with DES (Taxus 28 (36.8%), Cypher 37 (48.7%), Pravin 11 (14.5%). Two (2.6%) patients had dissections, which were treated with BMS. Angiographic success was achieved in all patients with TIMI grade 3 flow in 73 (96 %) patients. Major adverse cardiac events (MACE) were observed in 2 (2.6%) patients. One (1.3%) patient had subacute thrombosis and required reintervention, another patient had MI due to side branch occlusion which was treated conservatively. There was
no in-hospital mortality. A mean follow-up of 14.6 ± 6.7 months is available in 63 (82.9%) patients. Three (4.8%) patients died, all were sudden cardiac deaths. Fifty-seven (90.4%) patients are asymptomatic and 3 (4.8%) patients are in a compensated congestive heart failure state. No early or late stent thrombosis was documented. No patient required reintervention during follow-up. To conclude, DES implantation for patients with acute MI is safe and has good mid-term results.

**Trends in Pharmacotherapy Patterns of Patients undergoing Percutaneous Transluminal Coronary Angioplasty: A 5-Year Review at a Tertiary Cardiovascular Center**

Anil Vatwani, Prasanna Kumar, KK Mahesh, Praveen G Pai, M Vijaya Kumar, T Rajesh, C Rajiv, KU Natarajan, Prakash Kamath, KK Haridas, Amrita Institute of Medical Sciences, Kochi

Management patterns of patients with coronary artery disease (CAD) is a continuously evolving process. Contemporary cardiology management comprises implementation of evidence-based medicine into clinical practice. In this study, aimed to assess the impact of medical management patterns for patients undergoing percutaneous transluminal coronary angioplasty (PTCA) at a tertiary care cardiology center retrospectively. Trends in pharmacotherapy as prevalent 5 years back were compared with present day management.

<table>
<thead>
<tr>
<th>Drug</th>
<th>1999 (% of patients)</th>
<th>2004 (% of patients)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ticlopidine</td>
<td>87.54</td>
<td>0.13</td>
<td>NA</td>
</tr>
<tr>
<td>Clopidogrel</td>
<td>0.00</td>
<td>99.86</td>
<td>NA</td>
</tr>
<tr>
<td>Aspirin</td>
<td>98.30</td>
<td>98.20</td>
<td>0.88</td>
</tr>
<tr>
<td>Beta-blockers</td>
<td>70.18</td>
<td>97.35</td>
<td>0.0000</td>
</tr>
<tr>
<td>ACE inhibitors</td>
<td>14.71</td>
<td>42.42</td>
<td>0.0000</td>
</tr>
<tr>
<td>ARBs</td>
<td>04.71</td>
<td>14.74</td>
<td>0.0000</td>
</tr>
<tr>
<td>Calcium channel blocker</td>
<td>39.42</td>
<td>08.20</td>
<td>0.0000</td>
</tr>
<tr>
<td>Statins</td>
<td>57.35</td>
<td>95.96</td>
<td>0.0000</td>
</tr>
<tr>
<td>Nicotinic acid</td>
<td>00.00</td>
<td>02.50</td>
<td>NA</td>
</tr>
<tr>
<td>Other antilipids</td>
<td>0.94</td>
<td>02.22</td>
<td>0.08</td>
</tr>
</tbody>
</table>

The majority of patients were male; however, the number of female cases has shown an increase comprising 11.68% of cases in 2004 versus 9.62% in 1999. Hypertension was present in 38.67%, diabetes in 36.60% and peripheral vascular disease in 11.3% of patients undergoing PTCA in 1999 as compared to 49.37%, 46.03% and 1.80% in 2004. The mean age of patients who underwent PTCA was 53.80 ± 9.24 in 1999 and 55.77 ± 10.17 in 2004, with an increase in the number of patients >70 years undergoing PTCA, from 3.38% in 1999 to 9.18% in 2004. The pharmacotherapy trends show a complete replacement of ticlopidine with clopidogrel after the availability of the drug. The use of aspirin continues to be high. The use of beta-blockers has increased from 70.18% in 1999 to 97.35% of patients in 2004. Also seen is an increase in the use of angiotension-converting enzyme (ACE) inhibitors and angiotensin-receptor blockers (ARBs) from 14.71% and 0.471%, respectively to 42.42% and 14.74%. Use of statins has become more prevalent with 95.96% of patients receiving it in 2004 as compared to 57.35% in 1999. Calcium channel blocker usage has, however, shown a steep decline from 39.42% in 1999 to 8.20% in 2004. The usage of nicotinic acid is still low at just 2.50% and use of other antilipid agents though has shown a rise from 0.94% to 2.22% is still not widely prevalent. Thus, with implementation of available evidence the practice patterns have evolved, to rationalize pharmacotherapy in patients undergoing PTCA, and pass on the benefit of evidence-based medicine to the patients and population at large.

**Role of Bolus Dose of Abciximab in High Risk Percutaneous Coronary Intervention—Is Bolus Enough?**

R Pothiwala, A Ranjan, N Tanwar, F Panchal, K Fonseca, S Gupta, H M alhotra, S Shah, T Patel
Sterling Hospital, Ahmedabad

Traditionally use of abciximab has been recommended as a bolus followed by infusion for 12-18 hours after high-risk percutaneous coronary interventions (PCI). However, in the current PCI era, prolonged infusion of abciximab may not be required because of the routine use of dual antiplatelet therapy, improved device technology and further refinement in PCI techniques. It also adds to cost constraints and increased complications. Abciximab bolus will give additional protection during device manipulation, the time of maximum risk of endothelial injury. We have used abciximab in bolus doses in a majority of high-risk PCI and prolonged infusion was given only in a few patients. We retrospectively analyzed the records of such patients and analyzed the clinical outcomes and complications. During April 2004 to April 2005, a total of 240 patients (186 men, 77.5%) who had received bolus dose of abciximab during high-risk PCI. Out of these, 180 patients (76%) were diabetics, 120 (50%) were hypertensive, and 140 (58.3%) were smokers. Out of 240, 50 patients (20.8%) had anterior wall myocardial infarction (MI), 15 (6.25%) patients had inferior wall MI, 130 (54.2%) patients had unstable angina and 45 (18.8%) patients had stable angina. Procedure was done through transradial route in 236 (98.3%) of patients. All the patients were treated with usual doses of aspirin, clopidogrel and heparin. Heparin was given intravenously in an initial bolus dose of 70 IU/kg during the PCI; the goal was to keep the activated clotting time (ACT) between 300 s and 350 s. Heparin was continued by infusion drip for at least 12 hours to maintain the activated partial-thromboplastin time (APTT) at 1.5 to 2.5 times the control value. Seventy-two (30%) patients had multivessel disease and...
in 3 (1.25%) patients had left main disease. PCI was attempted in 347 lesions in 240 patients. Coronary stents were put in 336 lesions and plain old balloon angioplasty was performed in 11 lesions. Drug-eluting stents (DES) were used in 152 lesions and bare metal stents (BMS) in 184 lesions. 5 additional BMS were deployed to tackle dissections. Hybrid stents (a combination of DES and BMS) were used in 36 (15%) patients. Left anterior descending artery (LAD) was intervened in 119 (51.6%) lesions, left circumflex (LCx) in 56 (16.1%) and right coronary artery (RCA) in 112 (32.3%) lesions. Mean stent diameter was 2.97 ± 0.51 mm and mean length of stent was 21.8 ± 7.74 mm. Intra-aortic balloon pump (IABP) was used in 12 (5%) patients. Procedural success rate was 100%. No patient had major bleeding. Minor hematoma was found in 50 (20.8%) patients, thrombocytopenia (platelets < 1,00,000) was found in 8 (3.3%) of patients. No patient required either blood or platelet transfusion. Sub-acute thrombosis occurred in 1 (0.04%) and death in 2 (0.8%) patients. To conclude, ischemic events were effectively reduced with bolus dose of abciximab in high risk PCI and there were no major bleeding complications.

Results of Stenting using Very Long Pronova Stents

Amresh Kumar, Umesh Agrawal, Naveen Garg, Sudeep Kumar, Satyendra Tewari, Aditya Kapoor, PK God, Nakul Sinha
Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow

Significant reduction in instant restenosis and a need for repeat interventions has been shown by randomized controlled clinical trials of drug-eluting stents (DES). But data regarding the DES > 30 mm length is limited. We report our initial experience with very long (≥33 mm) Pronova stents. Between June 2004 and June 2005, a total of 870 coronary stenting procedures were performed, 31 patients belonged to this category. Mean age of the patients was 54.9 ± 10.3 years (range: 41-68 years); 25 (80%) patients were males and 6 (20%) were females. Diabetes was present in 8 (26%), hypertension in 4 (13%), and smoking in 8 (26%) patients. The indications of angioplasty were chronic stable angina in 20 (64%), unstable angina in 8 (26%) and myocardial infarction in 3 (10%) patients. Left anterior descending (LAD) was stented in 20 (64%) cases, left circumflex (LCx) in 5 (16%), and right coronary artery (RCA) in 6 (20%) cases. All lesions were pre-dilated and stents deployed at 12-14 atm pressure with an attempt to cover the lesion from one normal segment to another. The length of stent was 33 mm in 20 (64%) and 38 mm in 11 (36%) patients. The diameter of the stents was 2.75 mm, 3 mm and 3.5 mm in 6 (20%), 10 (32%) and 15 (48%) patients, respectively. The mean diameter of stents used was 3.11 ± 0.37 mm. Eight (26%) patients received another stent in another vessel. Glycoprotein (Gp) IIb/IIIa antagonists were administered in 8 (26%) patients. All received aspirin as well as clopidogrel following the procedure. Immediate post-procedure results were excellent in all patients without any complication. None of the patients developed instant thrombosis. At a mean follow-up period of 6.8 ± 3.5 months, there has been no instance of death/MI. One patient who was symptomatic and had positive treadmill test (TMT), underwent repeat coronary angiography which showed diffuse instent restenosis. It was successfully treated with plain balloon angioplasty. We conclude that angioplasty using very long Pronova DES stent is safe with good outcome on mid-term follow-up.

Predictors of Early Reinfarction after Primary Angioplasty for ST-Segment Elevation Myocardial Infarction

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Primary angioplasty with stenting is limited by significant rate of recurrent infarction associated with increased mortality. The aim of this study was to analyze predictors and outcome of early reinfarction involving reperfused culprit artery in patients undergoing successful primary angioplasty. Between December 2000 to May 2005, 728 patients with STEMI underwent primary percutaneous coronary angioplasty at our institute. All clinical and angiographic data was retrospectively analyzed. Patients were classified into Group A who had reinfarction (n = 22) and Group B who did not reinfarct (n = 706). Early reinfarction occurred in 22/728 (3.0%) patients with mean age of 61.5 years and male-female ratio of 1.4:1. Among these 17 (77.2%) were diabetics, 15 (68.1%) were in advanced Killip class III/IV, 12 (54.5%) had troponin-T levels >0.3 mg/ml. Angiographically 13 (59%) had proximal left anterior descending (LAD) lesions as the culprit infarct-related lesion, 8 (36.3%) were moderate to heavily calcified arteries, 10 (45.4%) were small vessels (<3 mm), 7 (31.8%) were ectatic arteries and 11 (50%) had post-procedural mean myocardial blush grade of 1.8. In group A, mean door-to-balloon time, mean hospital stay and in-hospital mortality were 7.4 ± 1.8 hours, 6.4 ± 2.1 days and 16/56 (28.5%) respectively in comparison to 5.1 ± 0.7 hours, 3.4 ± 1.2 days and 33/672 (4.9%), respectively in Group B. We conclude that diabetes mellitus, advanced Killip class and high troponin-T levels at presentation and angiographic features such as proximal LAD culprit lesion, moderate to heavily calcified, small and ectatic arteries and lower post-procedural myocardial blush score along with delayed door-to-balloon time are predictors of early reinfarction after primary angioplasty. Early reinfarction is an independent predictor of mortality.
Incidence of Coronary Slow Flow in Major Epicardial Vessel other than a Culprit Vessel during Acute Myocardial Infarction

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The study was conducted in our hospital during the period from January 1999 to January 2004. A total of 360 primary angioplasties were performed. Incidence was found out based on coronary slow flow in a vessel other than the culprit vessel. Slow flow was defined as the corrected thrombolysis in myocardial infarction (TIMI) frame count (CTFC) ≥ mean of 13 at a frame rate of 12.5/s, that is, more than 2 standard deviations of mean CTFC (9 ± 1.4) calculated for the 100 Indian patients with normal coronaries and normal flow (TIMI grade III) performed at our laboratory. Out of 360 coronary angiographies done immediately after acute myocardial infarction, slow flow in a vessel other than the culprit vessel was found in 80 (22.2%) patients. The cause of slow flow in such scenario as such is unknown but it may be because of endothelial dysfunction.

Percutaneous Coronary Intervention in Elderly

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Coronary artery disease is becoming an epidemic problem in Indian sub-continent. However, advances in medical treatment many patients are living up to 8th or 9th decade. So a significant number of patients coming for percutaneous coronary intervention (PCI) constitute elderly patients. In the year of 2004 to 2005, 980 patients had undergone PCI in our institute. Of these, 71 (7.1%) patients were above 70 years - 55 (77.7%) males and 16 (22.5%) females. 40 (56) patients had unstable angina, 20 (28.1%) patients had chronic stable angina. 8 (11.2%) patients had recent myocardial infarction (MI) within 1 month and 3 (4.2%) patients had undergone primary PCI. Hypertension was present in 40 (56%) patients, 16 (22%) patients were diabetic and smoking was present in 26 (36.6%) patients. Single vessel disease was present in 50 (70.4%) patients, 16 (22.5%) patients had double vessel disease and 5 (7%) patients had triple vessel disease. 45 (63.3%) patients had undergone left anterior descending (LAD) angioplasty, 8 (11.2%) patients right coronary artery (RCA) angioplasty, 7 patients (9.8%) underwent left circumflex (LCx) angioplasty, 7 (9.8%) patients - LAD and RCA angioplasty and 4 (5.6%) patients underwent LAD and LCx angioplasty. A total of 92 stents were used and of these 30 (32.6%) were drug-eluting stents. All lesions were predilated and all lesions were stented. All patients received dual anti-platelet therapy. Sheaths were removed on the same day except in 3 patients. 45 (63.3%) patients received unfractionated heparin (UFH) and 26 (36.6%) patients received low-molecular weight heparin (LMWH). 3 (4.2%) patients received tirofiban. Mean ejection fraction (EF) was 50%. One patient developed local hematoma requiring blood transfusion; 1 patient had hematursia, 1 patient had hematemesis leading to temporary withdrawal of heparin and aspirin and 1 patient died of cerebrovascular accident (CVA). This patient was an 85-year-old female with multiple cardiovascular risk factors. We conclude that PCI in elderly is a safe procedure and age should not be a deterrent for PCI.

Single Operator Experience of Mini Vessel Stenting in 107 Cases

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Advances in stent design and strut thickness have made it possible to introduce dedicated mini vessel stents (size ≤ 2.25 mm). Also, the need to tackle long lesions/diffuse disease has made it necessary to introduce greater lengths (upto 33 mm) in such mini vessel sizes, specially in the era of drug-eluting stents (DES). Although no selective randomized trial in mini vessel stenting is available, we present our real-world experience of using such stents since 1st January 2003 to July 2005 in 107 cases (male 93 and females 14; age group 27–78 years) in which 128 stents were deployed in native arteries (111 stents of 2.25 mm and 17 stents of 2.0 mm). Risk factor profile was - diabetes mellitus (DM): 43 (40.2%), hypertension (HT): 37 (34.6%), high cholesterol (HCl): 24 (22.4%), smoking: 19 (17.8%). Indication for angioplasty was stable angina (SA): 64 (50%) patients, unstable angina (UA)/ acute coronary syndrome (ACS) : 56 (47.8%) patients, acute myocardial infarction (MI): 8 (6.2%) patients. The lesion morphology was Type A in 8 (6.2%) cases, Type B in 48 (37.5%) cases and Type C in 72 (56.3%) cases. The culprit vessel was left anterior descending (LAD) 48 (37.5%), left circumflex (LCx) 29 (22.7%), obtuse marginal (OM) 14 (10.9%), right coronary artery (RCA) 22 (17.2%), posterior descending artery (PDA) / PLV 7 (5.5%), diagonal (Diag) 3 (2.3%), ramus intermedius (RI) 5 (3.9%). The average length of the lesion was 20.07 ±11.6 mm (8-33 mm). In 50 (46.7%) cases minivessel stents were overlapped with bigger sizes to cover the proximal lesion and one case to cover the distal dissection caused by a proximal stent. The stents used were Pixel: 27, Minivision (Guidant):15, Biodivysio 37, Dexamet: 9, Trimax (Abbott): 3, Micro Driver (Medtronics): 10, Cypher (J & J): 18, Taxus (Boston): 9. Stent delivery failed in 2 cases because of extreme tortuosity / diffuse calcification. Direct stenting was done in 8 lesions and after pre-dilation of 120 lesions. All patients received aspirin and clopidogrel; besides 66 (62%) patients received glycoprotein
Drug-Eluting Stents in Primary Angioplasty

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We studied the clinical utility and outcome of drug-eluting stents (DES) in primary angioplasty for patients with ST elevation myocardial infarction (STEMI). The in-house and short-term follow-up of 32 patients between January 2004 to June 2005 was done of patients admitted and treated at our hospital. The mean age was 55.5 years, with the youngest patient aged 33 years and the oldest 78 years. There were 27 male patients and 5 female patients. The average time from onset of symptoms to the onset of procedure was 60 min. Seven (21.8%) patients had past history of hypertension, 9 (28.1%) had past history of diabetes and dyslipidemia; 2 (6.25%) patients had cardiogenic shock at the time of procedure. Seven (53.1%) patients had left ventricular ejection fraction (LVEF) > 45%, 13 (40.6%) had LVEF ranging from 35 - 45%, and 2 (6.25%) patients had severe LV dysfunction (LVEF < 25%) at the time of admission. On angiography 10 (31.25%) patients had right coronary artery (RCA) as the culprit artery, 2 (6.25%) had left circumflex (LCX) involvement, majority 19 (59.3%) had left anterior descending (LAD) involvement and 1 patient had both LAD and LCX involvement. Significant thrombus burden was seen in 28 (87.5%) patients on angiography. Abciximab was used in 15 (46.8%) patients, eptifibatide in 8 (25%) patients. EPI filter was used in 2 (6.25%) patients. Temporary pacing was required in 1 patient. In 31 stents, size was 2.5 - 3.5 mm, 7 stents used were > 3.5 mm in size and 2 stents were < 2.5 mm. 24 stents were ≥ 20 mm in length and 16 stents were < 20 mm in length. Multiple stenting was done in 8 (25%) patients. No post-procedural arrhythmias were seen. Also there was no episode of acute or sub-acute stent closure. No reflow was seen in 5 (15.6%) patients, which responded to treatment with intracoronary nicorandil or auto perfusion. Two (6.25%) patients were noted to have dissection on check angiogram which were treated with overlapping stent. There was no post-procedural death or reinfarction. At one month clinical follow-up of 30 patients, 2 patients had NYHA class II dyspnea on exertion, none had history of angina. We conclude that use of DES in acute myocardial infarction is safe and has no incidence of major clinical events at 30 days.
Angiographic and Clinical Outcome of Stent Implantation for Long Coronary Artery Lesion

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Percutaneous coronary intervention (PCI) in patients with long segment coronary artery stenosis represents a difficult subset as it is associated with increased risk for coronary artery dissection, abrupt closure and higher restenosis rate. Between January 2004 and December 2004, we studied 140 patients in whom long stents (> 20 mm) were deployed. Of these, 117 (83.57%) were males. The average age was 59.9 years. There were 59 (42.14%) patients with hypertension, 54 (38.57%) with diabetes and 60 (42.86%) with dyslipidemia. 45 (32.14%) patients presented with stable angina, 91 (65%) with acute myocardial infarction (AMI), and 1 (0.71%) patient was asymptomatic. The lesions were Type C and located in left main (LM) (0.6%), left anterior descending (LAD) (40.37%), left circumflex (LCx) (16.77%), right coronary artery (RCA) (33%), saphenous graft (1.86%). Majority 124 (88.57%) patients had single vessel disease, 13 (9.29%) had double vessel and 3 (2.14%) triple vessel disease. The average lesion length was 25.12 mm. Of the 161 lesions stented, 2 (1.2%) were bifurcating, 4 (2.4%) were ostial, 10 (6.2%) were total occlusions, and 2 (1.2%) were calcified requiring rotablation. 3 (2.14%) of these patients underwent PAM1. Intra-aortic balloon pump (IABP) support was required in 1 (0.71%) patient. Glycoprotein (Gp) IIb/IIIa inhibitors were used in 16 (11.4%) patients. Of the total 161 stents deployed, 106 (65.8%) were drug-eluting stents (DES) with the average length being 27.29 mm and the average diameter as 2.76 mm. For the 54 (34.2%) non-DES, the average length was 27.29 mm and the average diameter was 2.86 mm. Of the 161 stents deployed, 70 (43.48) were ≤ 2.5 mm in diameter (small vessel stenting). Overlapping stents were deployed in 8 (4.97) lesions. Four (2.86%) of the 140 patients had coronary artery dissection. Successful stenting was achieved in all cases. None of the patients developed in-hospital events in the form of MI, target lesion revascularization, or death. In conclusion, elective stenting of long segment lesions is feasible and has good immediate angiographic outcome.

Enoxaparin versus Unfractionated Heparin in High Risk Patients of Non-ST Elevation Acute Coronary Syndrome undergoing Percutaneous Coronary Intervention

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In high risk patients of non-ST elevation acute coronary syndrome (ACS), early percutaneous coronary intervention (PCI) has been an established therapeutic strategy. We compared the outcome of these patients treated with enoxaparin versus unfractionated heparin (UFH) with or without glycoprotein (Gp) IIb/IIIa inhibitor who underwent early percutaneous transluminal coronary angioplasty (PTCA) and stenting. No differences in the incidences of ischemic events like abrupt and threatened abrupt closure of the vessel during and following PCI were seen (p=NS). There were no significant differences in the incidence of major bleeding episodes between the two groups. The incidence of minor bleeding and complications like groin hematoma were significantly less in the enoxaparin treated group as compared to UFH (p=0.03). Moreover, enoxaparin therapy does not require any monitoring of activated clotting time (ACT) or activated partial thromboplastin time (APTT) as in case of UFH recipient. We conclude that enoxaparin is a safe and effective alternative to unfractionated heparin in patients undergoing PCI without any increased risk of acute vessel closure.

Effect of Statin Therapy on Troponin-I in Patients undergoing Percutaneous Coronary Intervention

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Increased level of troponin-I is a sensitive and specific marker of cardiac damage in patients undergoing percutaneous coronary intervention (PCI). The aim of the present study was to ascertain whether chronic statin therapy can reduce cardiac damage after PCI. One hundred thirty-four patients undergoing PCI because of presence of anginal symptoms or evidence of inducible myocardial ischemia comprised the study population. Seventy-four patients (Group A) were on statin therapy for at least 6 months. Rest 60 patients (Group B) were not on statin. Troponin-I levels were measured 6, 12 and 24 hours after the procedure. Troponin-I was defined positive if the blood levels exceeded 0.1 ng/dl. One-vessel PCI was performed in all. Troponin values were elevated in 6 (8.1%) of patients belonging to Group A and in 16 (26.6%) of patients belonging to Group B. Multivariate analysis confirmed the relationship between statin therapy and the variation of troponin levels after PCI (p=0.01). We conclude that patients, not treated with statin before PCI, showed significantly more frequent rise in troponin-I levels after the procedure. These results suggest a possible protective role of statins against myocardial damage during PCI.
Effect of Tirofiban in Patients with High Risk for Percutaneous Coronary Intervention: Short- and Long-Term Follow-up

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The present era of antiplatelet therapy combines aspirin, clopidogrel and glycoprotein (Gp) IIb/IIIa inhibitors to reduce ischemic complications following percutaneous coronary intervention (PCI). In this study a total number of 48 patients with high risk features for PCI were administered tirofiban 2 hours before, during and 24 hours after PCI. There were 30 (62.5%) male patients with a mean age of 58±13.4 years and 18 (37.5%) females with a mean age of 54±12.8 years. The patients were admitted within a mean period of 18±4.6 hours of onset of chest pain and taken for PCI within 48 hours of admission. All patients were administered injection tirofiban with bolus dose of 25 mg/kg body weight over 3 min and continued for 24 hours after PCI with a dose of 0.15 mg/kg/min. On coronary angiogram, left anterior descending (LAD) was found to be commonly affected (54.1%). All patients underwent percutaneous transluminal coronary angioplasty (PTCA) and stenting. The composite end point of death, non-fatal MI and ischemia was seen in 4 (8.4%), 5 (10.5%), 6 (12.6%) and 6 (12.6%) patients at the end of 7 days, 30 days, 6 months and 1 year respectively. Hemorrhagic stroke occurred in 1 (2.1%) patient within 7 days. Minor bleeding from femoral access site occurred in 4 (8.4%) patients within 30 days. Therefore, the major and minor bleeding within 30 days occurred in 10.5%. Thrombocytopenia occurred in 1 (2.1%) patient at 6 months. Use of tirofiban in patients undergoing high risk for PCI is definitely beneficial with slightly higher incidence of bleeding complications.

Efficacy and Safety of Low Molecular Weight Heparin during Transradial Percutaneous Coronary Intervention

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Transradial approach (TRA) has gained popularity in many parts of the world and some of the Indian centers. Early ambulation, reduced hospital stay and reduced vascular complications are major advantages of this approach. Sheath is removed immediately in all of our percutaneous coronary interventions (PCI) in spite of intense anticoagulation. Low molecular weight heparin (LMWH) is fast replacing unfractionated heparin in cases where anticoagulation is required due to convenient dosage, better bioavailability, and reduced chances of bleeding. However, the experience with LMWH is limited in PCI in Indian population. We prospectively analyzed safety and efficacy of LMWH (enoxaparine) in transradial PCI. We studied 350 patients (male: 288, 82.3% with mean age of 52±12.3 years. Enoxaparine was given as 1 mg/kg intravenous as bolus; dose was decreased to 0.15 mg/kg if glycoprotein (Gp) IIb/IIIa inhibitors were used during PCI. Each patient was observed for bleeding complications and in-hospital major adverse cardiac events (MACE). Early ambulation was practised in all patients where clinical condition permitted. The dose of enoxaparine was repeated subcutaneously after 12 hours. The indication for PCI was unstable angina in 181 (51.7%) of patients, acute myocardial infarction (MI) in 57 (16.3%), prior MI in 76 (21.7%) and chronic stable angina in 36 (10.3%) of patients. A total of 431 lesions were stented in 350 patients. The following arteries were stented, left anterior descending artery [175 (40.6%)] lesions], left circumflex artery [136 (31.6%)] and right coronary artery [120 (27.8 %)]. The lesion characteristics were: 160 (37.6%) A Type; 126 (29.2%) B1 Type; 93 (21.6%) B2 type; and 52 (11.6%) C type. Mean stent diameter was 3.22±0.57 mm (range: 2.25-4.5 mm), and mean stent length was 19.2±7.5 mm (range: 8-38 mm). Single vessel PCI was performed in 255 (72.8%) patients; double vessel in 57 (16.3%) and multivessel (>2 vessels) in 22 (6.3%) patients, while in remaining 16 patients (4.6%) plain balloon angioplasty was done. Abciximab was used in 50 (14.3%) patients. No patient had any in-hospital MACE. No patient had any major bleeding or cerebrovascular event. Five patients had small forearm hematoma. Procedural success was achieved in 100% cases. Post-procedural TIMI III flow was achieved in 346 (98.9%) patients. To conclude, LMWH is safe and effective in transradial PCI. Immediate ambulation is feasible where clinical conditions of patients permit.

Spectrum of Reinterventions in Patients following an Index Percutaneous Coronary Intervention

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With growing interventional experience, angioplasty with stenting are being increasingly used as a primary modality of treatment for patients with single and even multivessel disease. More complex lesions and chronic occlusions are being treated with this combination. This has led to increasing number of patients presenting with restenosis for a repeat procedure. Also as coronary artery disease (CAD) is a progressive disease, many patients with new symptoms have new lesions or increase in severity of milder lesions which might need treatment. At our institute, we prospectively collected data on patients undergoing a repeat interventional procedure from the period of April 2004 till the present date. Twenty patients underwent such a procedure of which 18 were male and 2 female with a mean age of 54 years. Mean duration from the index procedure was 35 months. Twenty-two lesions were treated;
Drug-Eluting Stents versus Bare Metal Stents and Oral Methotrexate for Coronary Revascularization in Real World Lesions

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There is an ongoing search for potent oral drugs to prevent restenosis after coronary stent implantation. Methotrexate is an anti-proliferative agent which may reduce neointimal proliferation and the rates of restenosis. We gave 7.5 mg of methotrexate the night before the coronary angioplasty to patients receiving bare metal stents (BMS) and continued it weekly for 8 weeks. The efficacy of the BMS and methotrexate arm of our study (Group 1) was compared with the drug-eluting stent (DES) arm (Group 2) which included patients receiving the Cypher and Taxus stents in real world situation; 29 patients received BMS and 30 received DES. The primary end point was major adverse cardiac events (MACE) at 8 months [a composite of death, non-fatal myocardial infarction (MI), target lesion revascularization (TLR), target vessel revascularization (TVR)]. There were a total of 37 lesions in the BMS (Group 1) and 33 lesions in the DES (Group 2). The mean lesion length was 17.6 mm versus 18.4 mm in Group 1 versus group 2 (p=0.67). The overall MACE was 27.5% in Group 1 versus 10% in Group 2 (p=0.09). Mortality rates were 0% versus 3.3%, (p=NS), MI 6.8% versus 3.3%, (p=0.57), TLR 17.2% versus 3.3%, (p=0.09), TVR 20.6% versus 3.3%, (p=0.04) in group 1 versus group 2; 20 patients in each group underwent follow-up angiography at 8 months or earlier if indicated. The secondary end points (mean minimum lumen diameter, % diameter stenosis and late lumen loss) were 1.8 mm versus 2.39 mm, (p=0.02); 40% versus 15%, (p=0.003); 0.91 mm versus 0.3 mm, (p=0.01) in Group 1 versus group 2. The binary restenosis rates were 5/23 lesions (21.7%) in Group 1 versus 1/22 lesions (4.5%) in Group 2, (p=0.09). There was a trend toward benefit of DES when compared to the BMS and methotrexate arm of our study as far as the primary end point is concerned though it did not reach statistical significance (p=0.09). However, the DES scored over the BMS and methotrexate arm as far as the secondary end points are concerned. The MACE rates, binary restenosis rates and late lumen loss in the BMS and oral methotrexate arm of our study were lower compared to the BMS arm of our historical controls and the BMS arm of major landmark trials comparing the BMS with the DES. This probably reflects the beneficial effect of methotrexate. Methotrexate may thus be a potent anti-restenosis agent, especially if started prior to coronary stenting.

Rotational Atherectomy with Sirolimus-Eluting Stents in Calcific Lesions: Acute Results and Long-Term Outcome

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Large percutaneous coronary intervention (PCI) trials on drug-eluting stents (DES) have excluded vessels with significant calcification, diffuse disease and those requiring rotation. To the best of our knowledge, there is no data on rotation and sirolimus-eluting stents (SES) in moderate or severe calcific lesions. This study aimed to look at acute results and long-term follow-up in this subset of patients. We prospectively studied 110 patients with moderate to severely calcific lesions, who underwent rotation followed by a Cypher SES (J&J, Cordis) using standard procedures. All patients received aspirin and clopidogrel for 1 year. Patients with acute myocardial infarction (MI) <1 week, ongoing angina or ischemia, and thrombus-containing lesions were excluded. A majority (52%) of patients included had recent acute coronary syndrome (ACS), 41% unstable angina (UA), 11% recent acute MI; 21% had prior coronary artery bypass surgery (CABG); 45% were diabetic. Mean left ventricular ejection fraction (LVEF) was 49.7 ± 10.5%. 142 sirolimus-eluting Cypher (J&J, Cordis) stents were deployed in 110 patients (14% in 1 vessel, 32% in 2 vessels and 54% in 3 vessels) with 99% procedural success. Final TIMI 3 flow was achieved in 98%. Mean stent length was 22.4 ± 9.3 mm (45% >20 mm). Mean stent diameter was 2.9 mm ± 0.2 mm (90%<3 mm). Glycoprotein (Gp) IIb/IIIa inhibitor was used in 86%. Follow-up of 14.3±7.2 months was available in 97%. Major adverse cardiac events (MACE) occurred in 8%. Target vessel revascularization (TVR) was required in-hospital in 0.9% and on follow-up in 3% (CABG in 1; repeat PCI in 2). Non-Q MI occurred in 11.8%. Death occurred in 3.9% (n=4). Of these 1 each were non-cardiac and heart failure related; 2 were sudden deaths (11 and 14 months post-PCI). PCI of calcific vessels with rotational atherectomy and SES was associated with a high procedural success and low MACE in this largely diabetic population. Rota-stenting with SES in diffuse calcific lesions needs to be studied further in a larger population.
Early Invasive Approach in Elevation Myocardial Infarction Following Thrombolysis does not Result in Adverse Outcome at 6 Months Followup.

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Primary percutaneous transluminal coronary angioplasty (PTCA) is the recommended treatment modality for revascularization following ST elevation myocardial infarction (STEMI). However, primary PTCA is not always feasible in most centers around the world. Routine invasive approach few days after onset of symptoms is feasible in many centers. Present study was designed with the aim to perform complete revascularization in all patients of STEMI who consented for it between 48 hours to 7 days of onset of symptoms irrespective of whether thrombolysis were done or not, and to see the outcome at 6 months. We studied 80 consecutive patients presented with STEMI at Fifty one patients (Group-I) received thrombolysis with intravenous streptokinase 1.5 million unit over 45 min and 29 patients (Group-II) either did not qualify for it or had contraindications for it. Other treatments were given as per recommendations. Baseline parameters [electrocardiogram (ECG), fasting blood sugar (FBS), creatinine, lipid profiles, CPK-MB] were recorded. All patients underwent coronary angiogram (CAG) with plan for complete revascularization between 48 hours to 7 days of onset of symptoms. Group I: PTCA with stenting was performed in 29 patients. Coronary anatomy was not suitable for percutaneous coronary intervention (PCI) in 22 patients. Group-II: PTCA with stenting was performed in 16 patients. Coronary anatomy was not suitable for PCI in 13 patients. Baseline parameters were comparable in both groups. Only baremetal stents were used. Glycoprotein (Gp) IIb/IIIa blockers (eptifibatide) were used in all patients. Periprocedural heparin was used to achieve target ACT of 200 to 250 ms. All patients were followed-up for 6 months. The end points of the study were death, myocardial infarction (MI) or reinterventions for recurrence of symptoms.

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<th>p value</th>
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<td>Reintervention</td>
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<td>MI</td>
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<td>1</td>
<td>&lt;0.01</td>
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<tr>
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<td>0</td>
<td>&lt;0.001</td>
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<td>Total (%)</td>
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<td>3 (18.7%)</td>
<td>&gt;0.5</td>
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The study showed that early invasive approach for complete revascularization few days after acute MI result in equal outcome whether thrombolysis were done or not.

Complete Heart Block after Occlusion of the First Septal Perforator with Coronary Stenting

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We report a case of transient complete heart block (CHB) following occlusion of the first septal perforator (FSP) branch after stent deployment in the left anterior descending (LAD) coronary artery. The patient was treated with temporary transvenous pacing and reverted spontaneously to sinus rhythm. We postulate that the CHB in our patient is due to a small localized infarct, related to the occlusion of the FSP. The location of block is likely to be distal to the bundle of His, as the escape rhythm had right bundle branch block (RBBB) configuration. Restoration of sinus rhythm could be explained by resolution of pathological changes in the infarct region or perhaps by the restoration of blood flow into the FSP. Complete heart block associated with non-Q wave infarction due to occlusion of the FSP following proximal LAD stenting is rare and interesting phenomenon with a relatively favorable outcome. Conduction disturbances including CHB in this setting may become more commonly recognized in future.

Low-Dose Eptifibatide in Percutaneous Coronary Interventions

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Eptifibatide is one of the well accepted parenteral glycoprotein (Gp) IIb/IIa antagonist which is widely used in percutaneous coronary interventions (PCI). In the current percutaneous coronary interventions (PCI) era of routine use of dual anti-platelet therapy and improved techniques, prolonged infusion of (Gp) inhibitors may not be required. We share our experience of usage of eptifibatide in a specific low dose (180 µg/kg (bolus) plus 2 µg/kg/min as continuous infusion for 10 to 12 hours instead of 20-24 hours as recommended). From May 2001 till July 2003, 54 patients underwent angioplasty with stenting in our center with this protocol. The distribution of patients was 47 (87%) males and 7 (13%) females. The procedure was done electively in 18 (33%) and as ad hoc in 36 (67%), amongst which 48 (89%) had single stenting and 6 (11%) had two stents. The distribution of disease in the coronary arteries was; left anterior descending (LAD) 31 (57%), right coronary artery (RCA) 3 (6%), left circumflex (LCx) 6 (11%). More than one vessel lesion was present in 14 (26%) patients. Peri-procedural events and in-hospital mortality were analyzed and significant morbidity and mortality was found only in two (3.7%) of the cases. Our experience using this low-dose protocol with a very good outcomes should prove to be useful in our cost conscious society.
Primary Percutaneous Coronary Intervention through Transradial Approach

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Percutaneous coronary intervention (PCI) for acute myocardial infarction (MI) is superior alternative to thrombolytic therapy. Primary PCI through transradial approach is preferable because of zero vascular complication rate. As a protocol all primary percutaneous transluminal coronary angioplasty (PTCA) is performed through transradial route at our unit. We retrospectively analyzed 30 cases of primary PCI performed during January 2003 to July 2004. Twenty-seven (90%) patients underwent PCI through radial route. The procedure was performed from femoral approach in 3 (10%) patients because of cardiogenic shock. Culprit lesion was in left anterior descending (LAD) in 12 (44%) patients, left circumflex (LCx) in 5 (18%) and right coronary artery (RCA) in 10 (33%) patients. The mean door to stent time was 34±12 min. Direct stenting was done in 22 (82%) patients. 24 patients (88%) received glycoprotein (Gp) IIb/IIIa receptor blockers. None of the patients had major bleeding complications. Forearm hematoma was observed in 3 (12%) patients who received (Gp) IIb/IIIa receptor blockers, and in one patient we needed to discontinue the infusion. All culprit lesions were successfully opened. In two patients with persistent shock non-infarct-related artery was also opened. Cardiogenic shock was present in 5 (18%) patients, in whom intra-aortic balloon pump (IABP) was inserted. In conclusion, transradial route is a safe route in primary PTCA because of low vascular complications. With experience, this procedure can be performed as rapidly as from the femoral approach.

Our Experience with Sirolimus Eluting Indian Stent (Supralimus) in First 133 Patients

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Vijaya Heart Foundation, Vijaya Hospital, Chennai

Drug-eluting stents (DES) have remarkably changed the perspective of percutaneous coronary intervention (PCI). It has shown a significant reduction in restenosis and need for repeat interventions. We present our experience with Supralimus in the real world patients. From April 2004 to June 2005, we have treated 133 patients with 146 stents. The mean age was 54 years. Age range was from 36 years to 72 years. In the study population, diabetes mellitus present was in 38%, hypertension in 40%, post-myocardial infarction - 36%, unstable angina/NSTEMI in 19%, dyslipidemia in 12%. The target lesion was de novo in all patients with single vessel disease 105 (78%), double vessel disease: 26 (19%). The stent diameter used was 2.5 mm-4.0 mm (3.0 mm-4.3 mm) and stent length was 11-33 mm (19 mm-31.97 mm). Technical success was achieved in 126 (95.30%) patients. In 7 (4.7%) patients, lesion could not be crossed because of complex anatomy. Clinical follow-up data is available in 95.5%. One patient died of non-cardiac cause. Twenty-seven patients completed 9 months follow-up and their angiographic follow-up data will be presented. The result in both diabetic and non-diabetic patients is gratifying and deserves further evaluation.
Pregnancy in Women with Mechanical Heart Valves - The Anticoagulation Dilemma

Vijaya Bharat, Renu Sinha, NK Das, SB Basu
Tata Main Hospital, Jamshedpur

As the long-term survival of patients with mechanical heart valves (MHV) is steadily improving, there is a growing expectation to lead normal family life. However, in women with MHVs continues to be a “very high risk” situation and there is no consensus on the safest, most effective and practical regimens of anticoagulation. We analyzed the outcome of 18 pregnancies in 14 women treated in our hospital, from 1993. There were two groups. In Group 1 the outcome was full-term deliveries and Group 2 had the miscarriages. All the patients in Group 1 (n=8), except one were taking oral anticoagulants (OAC) throughout the 1st and 2nd trimesters. There were 5 mitral, 2 aortic and 1 aortic root prosthesis. One patient with Starr-Edwards prosthesis in mitral position was taking only aspirin from the time of valve replacement in 1988. In the rest, the maximum dose of OAC was warfarin 5 mg or nicoumalone 3 mg per day. The INR values ranged from 1.5 to 3.0. There were no congenital anomalies in the live born babies. Despite 3 different regimens of anticoagulation before delivery, intravenous heparin (n=3), subcutaneous heparin (n=2) or OAC till day 3 before delivery (n=2), there were no thrombotic or major bleeding complications. Labor was induced in all the 8 patients by prostaglandin gel and/or artificial rupture of membrane. There were 2 cesarean sections, 2 forceps and 4 normal deliveries. One baby with hyperbilirubinemia required exchange transfusion. In Group 2 there were 6 women, 3 with mitral prostheses and 3 with MHVs in both mitral and aortic sites. Three miscarriages occurred in 1st trimester and 1 patient had medical termination. Two miscarriages in 2nd trimester occurred in a patient with Rh negative blood group. Since autopsies of the fetuses were not conducted, the cause of abortions could not be ascertained. The text book recommendation of IV heparin from 6 to 12 weeks of pregnancy and in the last 2 weeks is seldom practised. Several studies have shown that warfarin embryopathy is an overstated complication and the ease of preventing prosthetic valve thrombus with OAC outweighs the cost and inconvenience associated with optimum heparin therapy. Even though there was no congenital anomaly in our series, the use of OAC is prohibited during early pregnancy and so there is a dilemma in recommendation. Before term, IV heparin guided by activated prothrombin time (APTT) monitoring offers the best protection for safe delivery. Since large controlled trials cannot be conducted in any single center for pregnancy in women with mechanical heart valves, pooling of data will help to identify the safest regimen for anticoagulation, suitable for our country.

Use of Alternative Drugs for Rheumatic Fever Prophylaxis in Place of Injection Benzathine Penicillin

A Lachchandani, M Shameen, S Chandra, P Sondhi, A Agarwal, V Agarwal, P Neelam, G Preethi, U Pandey
GSVM Medical College, Kanpur

While there is no doubt that injection penicillin for chronic prophylaxis of rheumatic fever is time-tested, the non-availability of injection, poor compliance and increasing reluctance of general practitioner to give penicillin injection, for fear of anaphylaxis have made us think of other suitable alternatives. Both admitted and out-patients of our Institute, both newly diagnosed and those already taking prophylaxis were included in the study. Among 100 patients selected, 50 were given injection benzathine penicillin and 50 were given cefadroxil 1000 mg daily for 2 years. A bout 40% of those taking penicillin missed their doses compared to 30% in the cefadroxil group; 12% of the patients did not turn up during follow-up compared to 6% in cefadroxil group. One patient developed recurrence of rheumatic fever in cefadroxil group. Among the causes of non-compliance in penicillin group were non-availability of the drug (78%), fear of injection (55%),

Thrombolytic Therapy for Prosthetic Mitral Valve Thrombosis

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Prosthetic valve thrombosis (PVT) is major and serious hazard to patient with prosthetic valves. Thrombolytic therapy for PVT has emerged as an acceptable alternative to surgery but its success and complication rate are still controversial. We had 15 patients treated by thrombolytic therapy for PVT of mitral valve, with streptokinase. Serial (usually at 6 hourly, at least 24 hourly) echo-Doppler parameters, transvalvular gradients and valve area were measured in all patients. All patients had TTK Chitra valve. The time since valve replacement varied from 4 months to 9 years (mean 33 months). Six (31.57%) patients died during thrombolytic therapy, 5 of them due to progressive cardiogenic shock and one possibly due to bleeding complications. All deaths occurred during 1st 24 hours after admission. The 13 survivors had complete resolution of thrombus, normalization/significant fall in gradients and symptomatic improvement. No statistically significant correlation was noted in relation to missed oral anticoagulants and international normalized ratio (INR) was in therapeutic range in 14/19 (73%) patients. Our study suggests that PVT can occur in presence of adequate anticoagulation and is associated with significant mortality despite thrombolysis. There is possibility of varied response to streptokinase in view of previous streptococcal infection which suggests the need for evaluation of other thrombolytic agents.
pain (50%), and non-availability of doctors/centre for administration of injection. In the cefadroxil group causes of non-compliance were cost of therapy (65%), lack of motivation (40%), side effects (7%) and non-availability of the drug in some villages. Even though one case of rheumatic fever occurred in the cefadroxil group, the compliance was better, and side-effects were minimal compared to injection penicillin. The prohibitive factor was cost of therapy. In an ongoing study by the same authors, the use of azithromycin 500 mg, 3 days a week is proving to be sufficient to prevent new attacks of rheumatic fever.

**Penicillin Prophylaxis in Rheumatic Fever: A Dismal Performance**

I Mammen, S Sreenivasan, H Bajaj, C Lanjewar, P Nyayadish, P Nathani, P Kerkar
King Edward Memorial Hospital, Mumbai

Penicillin prophylaxis, prescribed as three weekly benzathine penicillin injection, prevents recurrence of rheumatic fever. We reviewed the nature of compliance regarding penicillin prophylaxis amongst patients attending our outpatient clinic. Records of patients attending our cardiology outpatient department for receiving injection benzathine penicillin for preventing recurrence of rheumatic fever are meticulously maintained. Records of last years were analyzed retrospectively to assess the compliance over the last two years. Of the 1826 patients who attended our outpatient department for taking benzathine penicillin injections, 35.5% (n=640) had taken only ≤ 25% of the scheduled injections; 24.97% (n=456) had taken 25-50% of the injections, while 28.15% (n=514) had taken 50-75% of the injections and 11.82% (n=216) had taken more than 75% of the injections. Only 1.97% (n=36) of the study population were found to be 100% compliant. Compliance with penicillin prophylaxis was extremely poor in our population. This is likely related to unwillingness on the part of primary care physicians to give penicillin injections in setting of clinic, distance a patient lives from the tertiary care center, cost and difficulty of travelling to the tertiary center and poor educational status. More aggressive measures need to be taken to ensure that penicillin prophylaxis is taken regularly.

**Rheumatic Mitral Stenosis with Left Atrial Appendage Thrombus - Does Thrombus Really Resolve ?**

C Elangovan, V Jaganathan, R Alagesan, M Annamalai, S Shanmugasundaram, Geetha Subramaniyam, A Balaquuru, G Arunadha, G Gnanavud, S Venkatesan, G Karthikeyan, G Justin Paul, C Moorthy
Madras Medical College, Chennai

Left atrial (LA) thrombus formation remains a significant problem causing morbidity and mortality in rheumatic mitral stenosis. Medical treatment for it still remains unclear. We studied effect of oral anticoagulation on LA thrombus resolution. We analyzed 25 patients (16 female, 9 male) with severe rheumatic mitral stenosis aged between 22 to 42 years (mean: 35 years) who had definite evidence of LA appendage thrombus by transesophageal echocardiography (TEE) with complete echocardiographic (transophageal echocardiography (TEE) and TTE) and clinical data. Patients with NYHA class IV, LA body thrombus, and those with significant other valve lesions were excluded. 20 patients were in atrial fibrillation (AF) (including 3 patients in intermittent AF) and 5 patients in sinus rhythm during study. Mean mitral valve area, peak gradient, mean gradient were 0.62, 24.65 mmHg, 15.4 mmHg respectively. Mean Wilkins score was 7.3. Mean LA volume and LA appendage area were 151.05 cm³ and 5.32...
cm², respectively. LA appendage emptying velocity ranged between 10-40 cm/s with mean of 11.5 cm/s in those with AF and 39 cm/s in those in sinus rhythm. LA appendage clot size varied between 1.29 x 0.96 cm to 4.7 x 2.1 cm. All patients showed evidence of LA spontaneous echocardiographic contrast. All patients received oral anticoagulation and INR was maintained between 2-3 and followed up. Repeat TEE assessment was done after 6 weeks of anticoagulation. Four

(16 %) patients had complete resolution of LA appendage thrombus and four (16 %) patients showed reduction (>30%) in thrombus size. In our study, 16 % of patients showed thrombus resolution and another 16 % showed reduction in size. Factors associated with resolution or reduction in size include younger age, small clot size, sinus rhythm, intermittent AF and LA appendage emptying velocity more than 30 cm/s.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Rhythm</th>
<th>Clot size (major dimension)</th>
<th>LAA emptying velocity</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;30 (6)</td>
<td>AF (17)</td>
<td>&lt;1.5 cm (10)</td>
<td>&lt;30 cm/s (19)</td>
</tr>
<tr>
<td>30-40 (15)</td>
<td>AF-I (3)</td>
<td>&gt;1.5 cm (15)</td>
<td>&gt;30 cm/s (6)</td>
</tr>
<tr>
<td>&gt;40 (4)</td>
<td>SR (5)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Resolution, %</td>
<td></td>
<td>40</td>
<td>0</td>
</tr>
<tr>
<td>&gt;30% size reduction, %</td>
<td></td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Resolution, %</td>
<td></td>
<td>88</td>
<td>88.7</td>
</tr>
<tr>
<td>&gt;30% size reduction, %</td>
<td></td>
<td>33.3</td>
<td>33.4</td>
</tr>
<tr>
<td>Change, %</td>
<td></td>
<td>33.3</td>
<td>66.6</td>
</tr>
</tbody>
</table>

Table: Predictors of Morbidity in Mechanical Prosthetic Heart Valves

Patients on mechanical heart valve prosthesis have significant mortality and morbidity. The aim of this study was to find out morbidity patterns and predictors of morbidity in patients attending the prosthetic valve clinic of a tertiary care center. Consecutive patients (n=83, males: 39, females: 44) with mechanical prosthetic heart valves attending the prosthetic valve clinic were enrolled in the study. The mean age of patients was 37.6±12 years. There were 62 patients with mitral prosthesis, 11 with aortic, 8 with both and 2 with mitral, tricuspid and aortic prosthesis. The majority of mitral prosthesis were Starr Edwards, size varied from 18-40 mm. Six had St Jude prosthesis and 9 had TTK Chitra valves. The duration of follow-up varied from 3 months to 22 years with a mean of 4.78±5.3 years. The majority had rheumatic heart disease as the indication for valve replacement. All the patients were on oral anticoagulation; 35 (41%) patients in the study group had one or more morbidity events. Major bleeding manifestations occurred in 4 persons and minor bleeds in 28. Prosthetic valve thrombosis occurred in 3 persons with St Jude prosthesis in mitral position. Strokes occurred in 12; 3 major and 9 TIA’s. Peripheral embolism to femoral artery in 1 person was treated by embolectomy. Late prosthetic valve endocarditis occurred in 2 and dehiscence in 1 person was treated by reoperation. Prothrombin time monitoring was irregular in 25% of patients. Univariate and multivariate regression analysis were done for predictors of morbidity. On univariate analysis, inadequate anticoagulation and the number of years of follow-up were the only predictors of morbidity events. On multivariate analysis number of years of follow-up was found to have significant correlation with minor bleeding episodes. To conclude, patients with mechanical heart valves have significant morbidity. Morbidity increases over years of follow-up and inadequate anticoagulation is associated with increased risk of stroke.

Thrombolytic Therapy for Left-sided Prosthetic Valve Thrombosis

Patients on mechanical heart valve prosthesis have significant mortality and morbidity. The aim of this study was to find out morbidity patterns and predictors of morbidity in patients attending the prosthetic valve clinic of a tertiary care center. Consecutive patients (n=83, males: 39, females: 44) with mechanical prosthetic heart valves attending the prosthetic valve clinic were enrolled in the study. The mean age of patients was 37.6±12 years. There were 62 patients with mitral prosthesis, 11 with aortic, 8 with both and 2 with mitral, tricuspid and aortic prosthesis. The majority of mitral prosthesis were Starr Edwards, size varied from 18-40 mm. Six had St Jude prosthesis and 9 had TTK Chitra valves. The duration of follow-up varied from 3 months to 22 years with a mean of 4.78±5.3 years. The majority had rheumatic heart disease as the indication for valve replacement. All the patients were on oral anticoagulation; 35 (41%) patients in the study group had one or more morbidity events. Major bleeding manifestations occurred in 4 persons and minor bleeds in 28. Prosthetic valve thrombosis occurred in 3 persons with St Jude prosthesis in mitral position. Strokes occurred in 12; 3 major and 9 TIA’s. Peripheral embolism to femoral artery in 1 person was treated by embolectomy. Late prosthetic valve endocarditis occurred in 2 and dehiscence in 1 person was treated by reoperation. Prothrombin time monitoring was irregular in 25% of patients. Univariate and multivariate regression analysis were done for predictors of morbidity. On univariate analysis, inadequate anticoagulation and the number of years of follow-up were the only predictors of morbidity events. On multivariate analysis number of years of follow-up was found to have significant correlation with minor bleeding episodes. To conclude, patients with mechanical heart valves have significant morbidity. Morbidity increases over years of follow-up and inadequate anticoagulation is associated with increased risk of stroke.
valve replacement was done in 3 patients as they did not improve with thrombolytic therapy. Inadequate anticoagulation was a predominant cause of prosthetic valve thrombosis in our study. Successful thrombolysis was achieved at low risk of complications with intravenous thrombolytic therapy for both mitral and aortic valve thrombosis and in all types of prosthesis. Hence we recommend thrombolytic therapy as a safe and effective non-surgical method for treatment for prosthetic valve thrombosis.

Echocardiographic Evaluation of Prosthetic Valve Thrombosis before and after Thrombolysis

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SCB Medical College, Cuttack

Thrombolytic therapy has emerged as an alternative to surgery for prosthetic valve thrombosis (PVT). The objective of the present study was to analyze results of thrombolytic therapy in patients with left sided PVT. From 1990 to 2004, 67 consecutive patients with left sided PVT were treated with streptokinase. Serial echocardiographic examinations were done before and after thrombolytic therapy to assess resolution of thrombus. Complete resolution of the hemodynamic abnormalities was seen in 51 out of 67 (76.1%) patients, partial resolution in 7/67 (10.4%) and failure in 9/67 (13.4%) patients. Six (8.9%) patients died during infusion of streptokinase because of hemorrhage. Altogether there were 11 (16.4%) cases of haemorrhage. Embolic episodes occurred in 9 (13.4%) patients. We conclude that thrombolytic therapy is effective in majority of cases of left sided PVT. However it can give rise to complications like major bleeding episodes and embolization.

Contractile Reserve in Patients with Rheumatic Mitral Stenosis

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Contractile reserve (CR) may be an important issue in patients with rheumatic mitral stenosis (MS) who either present in cardiogenic shock or may have left ventricular (LV) systolic dysfunction either per se or secondary to chronic atrial fibrillation. We sought to characterize the quantum and frequency of contractile reserve in consecutive symptomatic patients with significant rheumatic MS in sinus rhythm by dobutamine infusion in incremental steps of 5 µg/kg/min up to a maximum of 20 µg/kg/min. Fifty-seven consecutive patients with symptomatic MS (mean mitral valve area 1.24±0.36 cm²) aged 29±7 years and having normal or mild LV systolic dysfunction either per se or secondary to chronic atrial fibrillation were studied by 2-dimensional echocardiography and Doppler examination at baseline and during dobutamine infusion up to a maximum dose of 20 µg/kg/min. Contractile reserve was defined as an increase in stroke distance ≥20% compared to baseline. The table shows the detailed parameters of contractile reserve.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Basal</th>
<th>Peak dose</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke distance (cm)</td>
<td>18.5±4.1</td>
<td>19.1±4.4</td>
<td>NS</td>
</tr>
<tr>
<td>Stroke volume (ml)</td>
<td>60.2±23</td>
<td>62.8±24</td>
<td>NS</td>
</tr>
<tr>
<td>Heart rate (bpm)</td>
<td>77±14</td>
<td>117±24</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Cardiac output (L/min)</td>
<td>4.0±0.96</td>
<td>5.6±1.22</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Diastolic flow rate (ml/s)</td>
<td>11.7±5</td>
<td>15.9±5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Fraction shortening (%)</td>
<td>30±6</td>
<td>38±7</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Despite significant inotropic and chronotropic effects of dobutamine, contractile reserve was demonstrable only in 11 (20%) cases. Most patients (80%) with mitral stenosis show insignificant contractile reserve due to pre-load insufficiency. This observation has significant implications in patients with mitral stenosis who present in low output state.
A Comparison of Steroids and NSAIDs in Rheumatic Carditis with regard to Cost, Efficacy, Side-Effects, Safety Profile and Compliance

A Lalchandani, M Shameem, R Chandra, SK Saxena, S Chandra, P Sondhi, A Agarwal, V Agarwal
GSVM Medical College, Kanpur

This study was conducted to compare the effects of steroids with that of aspirin and nimesulide in rheumatic carditis. Two hundred patients of rheumatic carditis were divided into 3 groups. Group I was treated with prednisolone 1-2 mg/kg daily (n=25). Group II was treated with aspirin 100 mg/kg daily (n=100) and Group III was treated with nimesulide 400 mg/day in 2 doses (n=75). Mean duration of resolution of C-reactive protein (CRP) level after treatment was 11±2.1 days, 15±1.95 days and 15.2±1.1 days, respectively in Group I, II and III. Among all groups, side effects were most common in aspirin group i.e. 55% followed by steroid group (40%) and nimesulide group having least incidence (6%). Five patients could not tolerate the drug in the aspirin group, compared to none in other groups. Average cost of therapy for steroid was Rs. 315 (6 weeks), aspirin Rs. 900 (6 weeks), nimesulide Rs. 120 (2 weeks). Rebound did not occur in nimesulide group even after abrupt withdrawal.

Age and Sex Distribution of Rheumatic Carditis

A Lalchandani, M Shameem, S Chandra, P Sondhi, A Agarwal, V Agarwal, P Neelam
GSVM Medical College, Kanpur

This is the report of a study of age and sex distribution of 200 patients of rheumatic carditis. Two hundred patients of rheumatic carditis were selected from patients attending our hospital. Out of 200 patients taken for study, maximum number of patients were in under 15 years age group (n=91) followed by 69 patients in 15-30 years age group, followed by 41 patients > 30 year age group. Youngest and eldest patients were 12 years and 36 years of age, respectively. In our study, 93 patients were males and 107 patients were females. Most of the patients were < 15 years (45.5%) age group followed by 15-30 years age group (34.5%) and > 30 years (20.5%) age group. Male-female ratio was 0.86:1. The eldest patient was 36 years old which stresses the importance of continuing anti-rheumatic fever prophylaxis for several years in a child with the disease.

Normal Gradients in Mechanical Aortic and Mitral Prosthesis

SV Praveen, Vikram Sankar, N Jayapradas, V Mubarak, M Ohamed Fassaludeen, Sunil Roy, Johnson Francis, CG Sajeev, K Venugopel
Medical College, Calicut

Prosthetic valves (PV) even when they function normally, are associated with some gradient across it. Doppler assessment of prosthetic valve function, thus, requires specification of valve type and size, and knowledge of the normal values. The aim of this study was to assess the normal gradient across different types of mechanical prosthesis. Doppler echocardiographic analyses of the gradients across mitral and aortic prostheses of consecutive patients (n=75) attending prosthetic valve clinic were analyzed. All patients who had symptoms of prosthetic valve dysfunction were excluded from the analysis. Mean mitral gradients were 5.62±22 mmHg (range: 2-12 mmHg). The mean and peak gradients across the mitral prosthesis as per valve type are shown in the table.

<table>
<thead>
<tr>
<th>Type</th>
<th>Mean gradient (mmHg)</th>
<th>Peak gradient (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starr Edwards (n=52)</td>
<td>6±2.2</td>
<td>13.8±5.4</td>
</tr>
<tr>
<td>St Jude (n=6)</td>
<td>4.2±2.3</td>
<td>8.8±2.2</td>
</tr>
<tr>
<td>TTK Chitra (n=9)</td>
<td>4.14±1.4</td>
<td>8.9±3.3</td>
</tr>
</tbody>
</table>

The mean and peak gradients for the prosthesis at the aortic position are shown in the table. Mean gradient was 14.7±6.4 mmHg and peak gradient was 26.3±10.3 mmHg.

<table>
<thead>
<tr>
<th>Type</th>
<th>Mean gradient (mmHg)</th>
<th>Peak gradient (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starr Edwards (n=2)</td>
<td>19.5±2.1</td>
<td>35.5±7.8</td>
</tr>
<tr>
<td>St Jude (n=5)</td>
<td>13.6±5.7</td>
<td>24.2±8.5</td>
</tr>
<tr>
<td>TTK Chitra (n=7)</td>
<td>16±8.4</td>
<td>28.3±14</td>
</tr>
</tbody>
</table>

On univariate linear regression analysis significant correlation was noted between the mean and peak mitral gradients and the type of mitral mechanical prosthesis (p=0.2 and 0.01, respectively). On multivariate analysis, peak gradient was correlated with type of prosthesis (p=0.4). Aortic mean and peak gradients correlated significantly with the size of prosthesis (p=0.0006 and 0.0001, respectively). Multivariate linear regression showed that the only correlate of the aortic gradients was size of the prosthesis. Thus, it is concluded that in normal functioning mechanical prosthesis, type of valve was associated with the different gradients but at the aortic position size of the valve was more important than type of the valve.
Atrial Fibrillation in Rheumatic Heart Disease
AKP Singh, UK Ojha, Chandan
Patliputra Medical College, Dhanbad

Atrial fibrillation (AF) is associated with increased risk of morbidity and mortality. We studied the long-term incidence of AF and compared it with chronic rheumatic heart disease without AF. We also studied its correlation with mitral valve area (MVA) and left atrial (LA) size. In AF there is significant increase in risk of heart failure, thromboembolism, angina pectoris and stroke as compared to pattern without AF. Larger LA dimension at presentation is associated with a progression of chronic AF. The study included 198 patients with chronic rheumatic disease with AF and 68 patients without AF. Echocardiographic data could be available in only 104 patients (72 with AF, 32 without AF). MVA were calculated along with LA size in two groups of patients. 198 patients with AF and 68 patients without AF were included in the analysis. Among 198 patients with AF, 114 were female and 84 were males. In non-AF group, females were 43 and males only 25. Age incidence in this series was from 8 years to 74 years. The incidence of AF in females outnumbered males, MVA among AF group varied from 0.6 cm² to 4.9 cm². LA size varied from 3 cm to 5 cm among mitral stenosis (MS) and 3.4 cm to 6 cm in combined lesion MS and mitral regurgitation (MR). In non-AF group, MVA varied from 0.7 cm² to 3 cm² among MS and 3 cm² to 6.4 cm² in MS and MR combined lesion. In this series, though MVA varied from 0.7 to 2.6 cm² still there was no AF, but LA size was larger in most of AF group, more than in non-AF patients. Incidence of AF is more in severe MS with large LA size than in non-AF. In both MS and MS and MR combined, females outnumbered males in AF Group.

Low Molecular Weight Heparin (Enoxaparin) could be a Lethal Choice in Mechanical Prosthetic Heart Valve in Pregnancy
A M ohanty, SC M anchanda, S Dhawan, JPS Sawhney, RR M antri, B Kandpal, R Jain, R Passey, A M ehta, R M ohan, S Sachdeva, PK Kanna, M anish Jain, Vipin Talwar
Sir Ganga Ram Hospital, New Delhi

A 29-year-old married female, operated case of mitral valve replacement (MVR) in 1999 with 27 size Carbomedics bi leaflet mechanical prosthesis came to us with 1-week pregnancy. The pregnancy was a precious one as the patient conceived after 3 years of marriage. After detailed counseling of both husband and wife, patient was started on subcutaneous enoxaparine at a dose of 1 unit/kg body weight in 2 equal divided dosage as per the recommendation of American College of Chest Physicians (2001) for use of anticoagulants in pregnancy and prosthetic heart valve. The oral anticoagulation was stopped to avoid the risk of teratogenicity. The low molecular weight heparin (LMWH) was monitored with direct pre-dose anti-Xa factor estimation. The pre-dose anti-Xa factor was maintained between 0.7 and 1.0 unit/L. The prosthetic valve function was periodically evaluated clinically as well as by echocardiography. In the 11th week of pregnancy, the patient developed easy fatigability and shortness of breath at rest for which she was examined clinically and found to have diminished intensity of the prosthetic valve click. The echocardiography revealed high mean diastolic pressure gradient across the prosthetic mitral valve with severe pulmonary arterial hypertension. After obtaining consent from the patient, limited fluoroscopy with abdominal lead shield was done which confirmed that one leaflet of the prosthesis was stuck. However, after detailed counseling, the patient could be successfully thrombolysed with streptokinase (STK). To conclude, LMWH enoxaparine may not be a safe choice of anticoagulation in prosthetic heart valves and could be lethal despite anti-Xa factor monitoring. There is a similar report of prosthetic valve complication with LMWH leading to maternal death in 2 patients in 2003 after which Food and Drug Administration USA (FDA) has issued added precautionary warning for the use of LMWH in pregnancy.

Relation of Left Atrial Thrombus and Spontaneous Echocontrast in Patients of Mitral Stenosis
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This study consisted of 60 patients of mitral stenosis who underwent transesophageal echocardiography (TEE) in our institute. The mean age of the study population was 32.5±8.45 years with male-female ratio 1:2.5. Spontaneous echo contrast (SEC) was observed in 39 cases in left atrium (LA) or its appendage; of them 19 cases had thrombus (effective frequency 13.65) and 20 cases had no thrombus (effective frequency 25.35). Twenty-one patients had no spontaneous echo contrast, of them majority (19 cases, effective frequency 25.35) had no thrombus. Only two cases (effective frequency 7.35) had thrombus in their LA or in its appendage. This analysis reveals that spontaneous echo contrast in LA or its appendage bears a close relationship with thrombus; when thrombus is present, spontaneous echocontrast is almost always present. Again, the presence of spontaneous echo contrast strongly predicts presence of thrombus and absence of echocontrast is rarely associated with thrombus.
Transradial Approach in Renal Angioplasty and Stenting

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Maharaja Agrasen Heart Institute, New Delhi

We have been using transradial approach for angioplasty and stenting since last nine years. We report two cases which demonstrate the feasibility of the transradial approach to treat severe renal artery disease safely with renal angioplasty and stenting in Indian scenario (smaller radial arteries). Case 1 was a 70 years male, known hypertensive, non-diabetic, non-smoker with normal lipids and history of percutaneous transluminal coronary angioplasty (PTCA) to left anterior descending artery (LAD) 3 years ago. A 6 F sheath was put in left radial artery. 6 F JR guide inserted and left renal artery was hooked. Direct stenting was done with 4 × 16 mm Helix stent which was dilated with 5 × 15 mm balloon with good results. Case 2 was a 85 years male, with history of hypertension, non-diabetic, non-smoker having mild dyslipidemia, recent worsening of angina and azotemia. A 5 F sheath was put in left radial artery. Radial artery angiography was done to check the size of radial artery. Sheath was changed to 8 F. The 8 F JR3.5 guide was used to hook the left renal artery. Lesion was dilated with 3 × 15 mm coronary balloon. Stenting was done with 7 × 24 mm Genesis renal stent with good result. At follow-up no local complications were observed and azotemia improved in 3 weeks time. In conclusion, (i) transradial approach is feasible and comfortable for renal artery interventions also; (ii) anatomically most renal arteries course caudally from the aorta and transradial approach provides more coaxial catheter placement making interventions easier than femoral approach; and (iii) left radial route is preferable since it is relatively shorter compared to right one and gives longer usable catheter length.

Predictors of Poor Outcomes after Amplatzer Device Closure of Post-Myocardial Infarction Ventricular Septal Rupture

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Transcatheter closure of post-myocardial infarction ventricular septal rupture (PMIVSR) is an emerging alternative to surgical closure in these high-risk patients. We retrospectively analyzed the clinical as well as the hemodynamic variables in patients who died following transcatheter closure to see if there are pre-procedural predictors of poor outcomes. Between April 2000 and June 2005, 13 patients underwent transcatheter closure of PMIVSR. There were 11 males and 2 females with age ranging from 46 to 85 years. There was history of prior reperfusion therapy with thrombolysis in 10 patients and with percutaneous coronary intervention (PCI) in 2 patients. One patient had no reperfusion therapy. The average time from myocardial infarction (MI) to PMIVSR closure was 9.6 ± 8.5 days. The device closure was done by standard technique using Amplatzer ventricular septal defect (VSD) (7) and atrial septal defect (ASD) (5) devices. Nine patients required intra-aortic balloon pulsation (IABP) support and 10 mechanical ventilation. There were 6 (46%) in-hospital deaths out of which 3 were non-cardiac. During a mean follow-up of 18.5 months there was no further death in survivors. Higher functional class (Killip class III or more), low mean arterial pressure (73 ± 8.4 mmHg) and need for early intervention (5.8 ± 2.4 days) after MI were noted in those who died in-hospital in comparison to survivors (Killip class II or less, mean arterial pressure > 85 ± 10 mmHg and late intervention 13 ± 19 days). Other factors like IABP requirement, days on ventilation, Qp/Qs ratio, pre-treatment, renal function, ejection fraction, number of vessel disease were not different. Mortality following device closure was 46% and the poor outcomes occurred in patients with higher Killip class, low mean arterial pressure and the need for emergent intervention early after the MI as dictated by the hemodynamic status.

Balloon Mitral Valvuloplasty with Accura Balloon: Comparison of Oversizing with Underdilation to Undersizing with Full Dilation

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Sixty-three patients who underwent balloon mitral valvuloplasty (BMV) in last one year were analyzed. Group A consisted of 32 patients who underwent BMV with oversizing the balloon and under-dilation. Group B had 31 patients who underwent BMV with undersizing balloon and full dilation. Definitions utilized for the study were as follows. Optimum dilation size: (height in cm/10) + 10, in mm; Oversizing: use of balloon of 1-2 mm size higher than optimum calculated dilation size; Underdilating: use of balloon 1-2 mm smaller than calculated optimum dilation size; Underdilation; balloon inflation to 1-2 mm less than maximum size at the vest. Mean age of patients was 24 years (range: 13-54 years); 78% patients were females and 22% men. There was no statistically significant difference in baseline characteristics of two groups. Same set of operators were involved in performance of procedure in both the groups. All patients in both groups had successful procedure. The mean mitral valve area increased from 0.82 cm² to 1.74 cm² in group A and 0.82 cm² to 1.9 cm² in group B. More than grade 1+ mitral regurgitation (MR) was noted in 7 (21.8%) patients in group A and 4 (12.5%) cases in group B. One patient in Group A had severe subvalvular trauma leading to severe MR requiring surgery.
Non-Coronary Interventions 469

Pre-BMV valve area 0.82 cm$^2$ 0.816 cm$^2$
Pre-BMV MR
Trivial 15 16
Grade I 13 16
Post-BMV
MR Grade I 25 27
More than grade 1+ 07 04
Sub valve apparatus trauma 01 00
Severe MR requiring surgery 01 00

Our study shows a trend toward comparable efficacy with better safety of BMV with Acurra balloon by undersizing with full dilation compared to oversizing and underdilation.

Transcatheter Sealing of Cardiac Perforation by Glue: A New Technique

Vijay Trehan, Saibal Mukhopadhyay, Jamal Yusuf, Mohit D Gupta, Vimal Mehta, Sanjeev Kathuria, BB Bharti, S Ramakrishnan, Sanjay Tyagi
GB Pant Hospital, New Delhi

Cardiac tamponade (CT) due to cardiac perforation (CP) is a dreadful complication usually requiring surgical repair. We report successful repair of CP percutaneously in two different clinical situations (i) during mitral valvuloplasty (MV) (ii) right ventricular (RV) perforation by temporary pacemaker lead (TPI) in 2 patients, by a new technique. Between January 2004 and May 2005, acute CT following inappropriate transseptal puncture occurred in 5 patients during MV and in 2 patients subacutely by TPI lead causing RV perforation and manifesting as intermittent capture failure with hypotension. During MV, CT occurred due to tear of right atrium (RA) and left atrium (LA) wall transpericardially without actual puncture of the septum (stitch phenomenon) by the 14 F dilator. All the patients were managed as follows: (i) a 14 F dilator was promptly passed into LA over roundwire to seal false tract; (ii) a 7 F sheath was passed from subxiphoid route and pericardiocentesis started; (iii) once hemodynamically stable, a 7 F right Judkin’s guiding catheter (GC) was introduced into pericardial space and manipulated over 0.035” Teflon wire till its tip touched the 14 F dilator (iv) after flushing catheter with 10% dextrose, a non-ionic media, 3-4 ml of cyanoacrylate glue (Nectacryl Reddy’s Lab, India) was injected rapidly through the GC with its tip abutting 14 F dilator (v) as polymerization time of glue is 15 s, the dilator, GC and roundwire were slowly withdrawn over next 10-12 s to avoid entrapment in glue. Steps (ii) to (iv) were also applied in the 2 patients with RV perforation with TPI lead tip in pericardial space depicting site of perforation, except that a second TPI lead was placed in RV before procedure. All patients remained hemodynamically stable without echocardiographic evidence of increasing pericardial fluid. On follow-up of 3-12 months, all patients were asymptomatic without any evidence of pericardial constriction. CP of “Stitch type” during MV or that by TPI lead is unique as dilator/TPI lead across pericardium depicts exact type of perforation, allowing transpericardial instillation of glue at perforation site, thus avoiding surgery.

Transcatheter Closure of Ruptured Sinus of Valsalva Aneurysms

Vijay Trehan, Saibal Mukhopadhyay, Jamal Yusuf, Mohit D Gupta, Ashutosh Sahu, Naresh Goyal, Arima Nigam, Vimal Mehta, Ramesh Arora, Sanjay Tyagi
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With advent of various occlusion devices for closure of congenital defect, we attempted transcatheter closure of congenital ruptured sinus of Valsalva (RSOV) in 14 patients. Between January 1993 and April 2005, transcatheter closure of RSOV was attempted in 14 patients (11 males, 3 females), in age range 14 to 35 years. All were asymptomatic (NYHA class I-II) with features of congestive cardiac failure. Echocardiography revealed origin of aneurysm (i) non-coronary sinus ($n=5$) with drainage into right atrium, (ii) from the right coronary sinus (RCS) ($n=9$) (drainage into right ventricular (RV) inflow in 3, into right ventricular outflow (RVOT) ($n=6$). None had associated ventricular septal defects (VSD) or significant aortic regurgitation (AR). Size of defect assessed echocardiographically varied from 6-12 mm. All patients had normal origin of coronary artery and significant left-to-right shunt ($>2:1$). Ateriovenous loop was established by crossing defect from aortic end and snaring it out of femoral vein. Defect sizing was done with Swan-Ganz catheter or Amplatzer sizing balloon and stretched diameter varied from 8 mm to 14 mm. Occluder devices were deployed by antegrade venous approach in all patients [Rashkind umbrella device, n=2 (before1998), Amplatzer duct occluder, n=10 and Amplatzer atrial septal occluder, n=2] under fluoroscopic and echocardiographic guidance taking care that there was no impingement on the coronaries or on aortic/tricuspid valve before releasing device. There was complete abolition of shunt in 12 patients. One had significant residual shunt causing intermittent hemolysis necessitating urgent surgical repair while another with mild residual shunt had infective endocarditis after 3 months. All but one patient (NYHA class IV pre-procedure who died of progressive heart failure) became asymptomatic within 2 weeks. On mean follow-up of 42 months (range 2-122 months) all patients were asymptomatic with device in situ and no residual shunt. Transcatheter closure of RSOV is safe and feasible with available Amplatzer devices and should be considered as a preferred treatment modality in patients without associated VSD or significant AR.
Importance of Echocardiographic Guidance for Septal Puncture in Mitral Stenosis Patients with Persistent Left Superior Vena Cava and Dilated Coronary Sinus

Vijay Trehan, Bishwa Bhusan Bharti, S Ramakrishnan, Naresh K Goyal, Vimal Mehta, S Anandaraja, Arima Nigam, Mohit Dayal Gupta, Manish Sharma, Dinesh Raj, Sanjay Tyagi
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Persistent left superior vena cava (LSVC) is an uncommon anomaly being reported in 1 out of 348 autopsies. Acquired rheumatic mitral stenosis (MS) may occasionally coexist. We report a series of 5 cases of rheumatic MS associated with persistent LSVC and share the difficulty encountered during percutaneous transvenous mitral commissurotomy (PTMC). In the last five years, 5 patients of symptomatic severe MS (mean age 22±8 years; 6 females) were found to be associated with persistent LSVC. In the first patient, the diagnosis was confirmed only after a difficult septal puncture. In the rest of the patients, a dilated coronary sinus (CS) on echocardiography led to the suspicion of LSVC, which was confirmed by contrast echocardiography. Detailed angiographic documentation of LSVC and dilated CS were done to delineate the distorted atrial septal anatomy. During PTMC, under fluoroscopic guidance the 0.032" guidewire could not be advanced into the left subclavian vein in all the patients. Echocardiographic guidance was very useful, as with traditional angiographic landmarks it was difficult to find the correct place for septal puncture. The septal puncture needle, while pointing postero-medially as it is pulled down along the interatrial septum (IAS), tended to frequently slip into the dilated CS through a wide funnel of CS os. The needle tip still pointing superomedially and posteriorly used to jut against the CS roof giving a mistaken feeling of IAS. At this point tenting of the IAS could not be seen on echocardiography, forcing us to withdraw and reposition the needle tip further anterosuperiorly, wherein tenting of the IAS could be confirmed on echocardiography. A little further advancement of the needle tip at this juncture accomplished a successful and safe septal puncture. None of the patients had pericardial tamponade or any major complications. Increased awareness, prior recognition of persistent LSVC, and use of echocardiographic guidance are essential to avoid difficult septal puncture and potential complications.

Outpatient Ilio-Femoral Interventions through Transradial Approach

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The traditional approach for percutaneous interventions of the iliac artery and arteries of lower limb is through femoral artery. There are no reports of these interventions through the radial artery to the best of our knowledge. We report our early experience of ilio-femoral interventions through transradial approach (TRA) in 4 cases of iliac and 2 cases of superficial femoral artery (SFA) interventions performed at our centre from January 2004 to June 2005. In all cases the left radial route was used to perform procedure. The mean age of these patients was 57.3±9.4 years, all were men, 2 patients were diabetic, 4 were hypertensive, 1 had dyslipidemia and 5 patients were smokers. The indications for intervention were intermittent claudication in all patients. Left radial artery was cannulated using 20" Jelco cannula, 0.025" Terumo guidewire and Terumo sheath. The hardware used and outcomes are summarized in the table.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Iliac PTA (n=4)</th>
<th>SFA PTA (n=2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheath/Guide</td>
<td>7F 90 cm Shuttle or Pinnacle sheath</td>
<td>6.0 Fr 125 cm Judkins right/Multipurpose</td>
</tr>
<tr>
<td>Guidewire</td>
<td>0.014&quot; (BMW/Exchanger)</td>
<td></td>
</tr>
<tr>
<td>Balloon length</td>
<td>Rapid-exchange 145-150 cm long balloon (Ultra-soft UV/Express biliary SD)</td>
<td></td>
</tr>
<tr>
<td>Stenting</td>
<td>100%</td>
<td>50%</td>
</tr>
<tr>
<td>Stents</td>
<td>Bridge assurent, Express LD Express biliary SD</td>
<td></td>
</tr>
<tr>
<td>Success</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Major complications</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Minor complications</td>
<td>1/4</td>
<td>0/2</td>
</tr>
</tbody>
</table>

All patients were mobilized immediately and discharged on the day of procedure on low molecular weight heparin, aspirin, clopidogrel and cilastazol. No patient had recurrence of claudication at a mean follow-up of 7.4±6.9 months. Availability of refined hardware (0.014" guidewire-based low profile balloons and balloon expandable stents, wide lumen guide catheters and long equipments) has played a big role in the success of these interventions through TRA. Thus, present equipment allows delivery of stents up to 8 mm with the use of 6/7 Fr long sheath. The left TRA is preferred as there is no need to traverse arch of aorta and it is easier to enter the descending aorta. To conclude, ilio-femoral interventions through TRA are technically feasible, safe and associated with no major complications. With refined hardware, TRA appears to be a good alternative entry site for ilio-femoral interventions with major advantage of immediate mobilization and same day discharge.

Failed Device Placements for Atrial Septal Defects - What have we Learned?

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Percutaneous closure of fossa ovalis atrial septal defects (ASDs) with an Amplatzer device is an effective treatment. However, detailed information regarding failure to deploy the
Balloon Angioplasty of Discrete Native Coarctation of Aorta in All Age Groups: Early and Intermediate-Term Follow-up Results

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Sri Sathya Sai Institute of Higher Medical Sciences, Bangalore

To evaluate the usefulness of balloon angioplasty for relief of native aortic coarctation, we reviewed our experience with this procedure with special emphasis on follow-up results [including cardiac magnetic resonance imaging (MRI) studies]. During the period of 4 years (March 2001 to March 2005), 115 patients of age group 11 months to 69 years, underwent the procedure. The recommended standard procedure was followed. The balloon diameter was chosen to be equal to or within 1 to 2 mm of the diameter of aortic isthmus and not greater than the diameter of the aorta at the diaphragm. There was significant reduction in the gradient across coarctation of aorta (CoA), achieved at the end of procedure (64 ± 23.4 mmHg to 13.17 ± 12.5 mmHg, p = 0.001). Significant increase in CoA gradient was found during the pre-discharge echo Doppler evaluation (from 13.17 ± 12.5 mmHg on cath study to 21.0 ± 9.1 mmHg, p = 0.0001). This post-procedure recovery of gradient was more in the sub-set of patients with left ventricular (LV) dysfunction (9.3 ± 9.4 mmHg to 22.7 ± 6.7 mmHg, p = 0.0001). The gradient recovery is possibly due to elastic recoil of the aorta and due to improvement in left ventricular (LV) function. Among patients with successful procedure (CoA gradient < 20 mmHg), restenosis was seen in 29.2% during the follow-up. During follow-up period (1.5 ± 1.07 years, max. 4.25 years), 89 patients were reevaluated clinically, echocardiographically and using cardiac MRI, 67/89 (75%) patients had significant CoA gradient (≥ 20 mmHg). None of the patients, who had undergone MRI evaluation (n = 26) had aneurysm or dissection of the angioplasty segment.

In conclusion, CoA balloon angioplasty is a safe procedure without significant immediate and intermediate-term complications, can be done in all age groups with significant gradient reductions, but optimal results are obtained only in 43.5% at discharge and recurrence of significant gradients was seen in 29.2% patients during follow-up. These results suggest that plain balloon angioplasty is not adequate and stenting may be required for optimal hemodynamic results.

Percutaneous Aortic Valve Balloon Dilation in Congenital Bicuspid Aortic Valve Stenosis: Immediate and Short-Term Results

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Percutaneous aortic valve balloon dilation (AVBD) is an effective treatment modality in congenital aortic stenosis (AS). Consecutive patients (n=150; males: 105; age range: 5 months - 36 years) who underwent AVBD for congenital bicuspid aortic valve stenosis from January 2001 to May 2005 at our institute were retrospectively studied. They were divided into 3 age groups; Group A < 1 year (n=3, 2%), Group B 1-18 years (n=114, 76%), Group C >18 years (n=33, 22%). Male-female ratio in each group was 2:1, 3:2:1 and 0.94:1, respectively. Associated congenital heart disease was seen in 20 (14%) patients, coarctation of aorta (CoA): 8 (40%), patent ductus arteriosus (PDA): 5 (25%), pulmonary stenosis (PS): 2 (1.3%), 1 each of congenital mitral stenosis (MS), PDA +CoA and PDA + ventricular septal defect (VSD). Three patients underwent CoA dilation along with AVBD. Left ventricular (LV) dysfunction was present in 12 (8%) patients overall - 1 (33%) in Group A, 7...
(6%) in Group B and 4 (12%) in Group C. 41% were asymptomatic or in NYHA class I and 35%, 19% and 5% of patients were in NYHA class II, III and IV, respectively. Echocardiography was performed in all cases prior to and after AVBD. AVBD was done using retrograde balloon technique in all cases and antegrade technique in one case. Single balloon technique was used in 140 (93.3%) and double balloon technique in 10 (6.6%). Aortic annulus diameter was measured by echocardiography and also by aortography and the lower value or slightly less used as balloon diameter. The mean annulus diameter was 14.3±2.1 mm. The overall balloon annulus ratio was 0.98 and in groups A, B and C it was 1.2, 0.9 and 0.95, respectively. The optimal result of AVBD was taken as a ≥50% reduction in mean Doppler gradient / cath peak gradient.

Optimal result was obtained in 100 (66.6%) patients-3 (100%) in Group A, 84 (73%) in Group B and 13 (39%) in Group C. The determinants of suboptimal result were older age (p<0.001), a lower balloon-annulus ratio (0.87±0.17 v. 1.0±0.12 mm; p<0.01) and a higher-mean Doppler bicuspid aortic valve stenosis with good immediate and short-term results. Optimal balloon-annulus ratio is the key to favorable outcome.

### Percutaneous Retrieval of Embolized Gianturco Coils during Transcatheter Closure of Patent Ductus Arteriosus

A Shah, A Sanghvi, B Thakkar, H Shah, C Lanjewar, P Nyayadhish, P Nathani, P Kerkar

King Edward VII Memorial Hospital, Mumbai

There are few data from India on transcatheter retrieval from the heart and the endovascular system of embolized iatrogenic foreign bodies. We describe our experience of percutaneous retrieval of Gianturco coils, used to attempt closure of patent ductus arteriosus (PDA). Among 143 patients who underwent transcatheter coil closure of PDA at our centre in the last one decade, 14 (10%) patients had embolization of the coil. Among these 14 patients (mean age 10.3±1.7 years, 9 females), coil embolization occurred during the procedure itself in all but one patient. Transcatheter retrieval of the coil was attempted using the nitinol gooseneck snare in 13 patients. Most commonly (n=8) 0.038” 8 cm×5 mm coil was retrieved. Venous sheath and a snare of appropriate size were used depending on the size of the coil to be retrieved, most commonly a 10 mm sized snare was required. Left pulmonary artery (n=10) was the commonest site of coil embolization followed by right pulmonary artery (n=2) and the descending aorta (n=2). Transcatheter coil extraction was successful in 12/13 (92%) cases. There was no mortality or any major systemic complications. One patient required an arteriotomy to remove the snared coil from the femoral artery. In the remaining 1 patient, after a failed attempt to remove the coil, the coil embolized to the segmental left pulmonary artery and was left in situ. There has not been any complication at 10 months of follow-up. In the second case, at the first follow-up visit after 3 months, 5 cm×5 mm coil was found to have embolized to the bifurcation of the abdominal aorta. This coil was not retrieved. That coil has remained at the same site 5 years after the event, without the patient experiencing any vascular complication. We conclude that an embolized Gianturco coil can be effectively and safely retrieved using a gooseneck snare, obviating the need for surgical removal.

### Interventional Nephrectomy - Renal Alcoholization and Renal Artery Coiling:

Transferring Cardiac Technology to Kidneys


Vijaya Heart Foundation, Vijaya Hospital, Chennai

Surgical nephrectomy for refractory hypertension associated with shrunken kidney with renal artery stenosis or pyelonephritis is a well accepted strategy to control multi drug refractory secondary hypertension. Interventional renal artery embolization with coils is an extremely simple non-surgical
Dynamic versus Static Balloon Sizing of Atrial Septal Defects during Percutaneous Device Closure

S Mattummal, A Shah, B Thakkar, C Lanjewar, P Nyayadhish, P Nathani, P Kerkar
King Edward VII Memorial Hospital, Mumbai

Atrial septal defect (ASD) sizing is an important step in deciding the size of device in percutaneous closure of ostium secundum defects. The stretched balloon diameter (SBD) is the reference method in selecting appropriate device size. We prospectively compared two modalities of measurement of stretched balloon diameter for device sizing in 18 consecutive patients, from December 2004 to June 2005. Mean age of patients was 23.5 ± 14.3 years (range: 5-50 years). Thirteen females were 17 (81%) females. Mean body weight was 34 ± 9.5 kg. All patients underwent transthoracic and transesophageal echocardiogram (TTE and TEE) for measurement of maximum ASD diameter. ASD sizing was performed initially with Meditech balloon and later with Amplatzer balloon. SBD with dynamic balloon sizing was measured when the inflated Meditech balloon dropped from left atrium to right atrium on fluoroscopy. SBD with static balloon sizing was measured when inflated Amplatzer balloon obliterated the shunt. ASD diameters, as measured by various methods are tabulated.

<table>
<thead>
<tr>
<th>Method</th>
<th>TTE</th>
<th>TEE</th>
<th>SBD Meditech</th>
<th>SBD Amplatzer</th>
<th>Device size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (mm)</td>
<td>22</td>
<td>24</td>
<td>29</td>
<td>26</td>
<td>28</td>
</tr>
<tr>
<td>SD</td>
<td>7.3</td>
<td>8.1</td>
<td>6</td>
<td>7.4</td>
<td>8.1</td>
</tr>
</tbody>
</table>

There was no residual shunt or device embolization. There was no impingement on adjacent valves or aorta. No patient required upsizing of device. We found that dynamic balloon sizing tends to oversize the ASD when compared to static sizing. Hence, during ASD device closure, the device needs to be upsized by 2 mm if Amplatzer balloon is used, while device of the same size of the SBD is to be used in case of Meditech balloon.

Transcatheter Device Closure of Rupture of Sinus of Valsalva

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King Edward VII Memorial Hospital, Mumbai

Surgical closure is an established treatment modality for patients with rupture of aneurysm of sinus of Valsalva (RSV A). Transcatheter closure (TCC) of RSV A is a novel technique. We present our experience with 2 patients who underwent RSOV device closure at our hospital under transesophageal echocardiography (TEE) guidance. Between July 2004 and December 2004, TCC of RSV A was attempted using the Amplatzer duct occluder (ADO) in two patients. Both were females of age 23 and 30 years in NYHA class II. Both had bounding arterial pulses and continuous murmur at the lower left sternal edge. Two-dimensional and color Doppler echocardiography revealed RSV A from non-coronary sinus in both. The RSV A opened into right atrium in one and right ventricular inflow in the other. The echo-estimated minimum diameter of the defect was 9-10 mm. During TCC performed under TEE guidance, right heart pressures were elevated and Qp/Qs ratio was 2:3. In all patients the defect was crossed retrogradely from the aortic side and an arteriovenous wire loop was made using the noodle wire and the gooseneck snare. After ensuring no significant encroachment on aortic valve on TEE, the ADOs (14/12 mm in one and 12/10 mm in other) were successfully deployed by the antegrade venous approach. In one patient a 12/10 mm ADO slipped through and had to be upsized to 14/12 mm resulting in trivial aortic regurgitation (AR). Immediately post-procedure, one patient had trivial residual shunt and one had complete closure. On follow-up at 4-9 months (including angiography in both), both patients were in class I and had complete closure. There was no device embolization or infective endocarditis; trivial AR in one patient and no AR in other. These data highlight that TCC of RSV A is feasible, safe and effective with the Amplatzer duct occluder which is well suited to the typical tapering shape of the aneurysm. It has the advantage of avoiding sternotomy and cardiopulmonary bypass, specially in unstable patients.
Long-Term Results of Balloon Mitral Valvuloplasty in Relation to Initial Valve Score

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Even though balloon mitral valvuloplasty (BMV) as a therapeutic procedure of choice in well selected cases of mitral valve stenosis is established, there is controversy whether the long-term hemodynamic benefit of this intervention is uniform or variable depending on the initial valve scoring. This has prompted us to initiate a retrospective study involving a total number of 192 patients (60 males and 132 females) who underwent BMV in our institute between June 1996 and March 2001. The total echocardiographic score was derived from an analysis of mitral leaflet mobility, valvular and sub-valvular thickening and calcification, which were graded from 0 to 4, giving a total score of 0 to 16. Among the 192 patients, 54 (28%) had a mitral valve score > 8 (and < 12) and they were categorized as Group A. The 138 (72%) patients with valve score ≤ 8 were categorized as Group B. All patients underwent BMV using Inoue’s technique after ruling out left atrial (LA) appendage clot using transesophageal echocardiography. Mitral valve area (MVA) (the lesser among planimetry and pressure half time measurements) and mean transvalvular gradient (MG) were assessed in all cases before and one day after BMV and after 3 years. The results are given in the table as mean ± standard deviation.

<table>
<thead>
<tr>
<th>Mitral valve area (cm²)</th>
<th>Mean gradient (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>Group B</td>
</tr>
<tr>
<td>Before BMV</td>
<td>0.73 ± 0.11</td>
</tr>
<tr>
<td>After BMV</td>
<td>1.93 ± 0.38</td>
</tr>
<tr>
<td>After 3 years</td>
<td>1.79 ± 0.41</td>
</tr>
</tbody>
</table>

The mean MVA decreased 0.14 cm² in Group A after 3 years as compared to 0.13 cm² in Group B and MG increased 1.6 mmHg in Group A as against 1.4 mmHg in Group B. To conclude, whether it is a high valve score or acceptable valve score, both immediate and long-term benefit by way of achieved MVA or MG are same. Our study shows that a high valve score has no adverse impact on the long-term outcome of BMV.

Comparison of Coil Occlusion of Patent Ductus Arteriosus by Direct Delivery and Bioptome-Assisted Technique

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Transcatheter closure of patent ductus arteriosus (PDA) by coil is an accepted therapeutic modality in small PDA. With bioptome-assisted delivery technique even moderate-sized PDAs can be closed by coils. The aim of our study was to compare the safety and efficacy of direct delivery with that of bioptome-assisted delivery technique. This procedure was attempted in 103 patients from June 2000 to May 2004. In 34 patients procedure was attempted by direct delivery and in 69 patients by bioptome-assisted technique. Mean age of the population was 8.8±10.5 years (range: 8 months to 58 years) and weight ranged from 4 to 60 kg (mean 19±13.3 kg). Mean duct diameter was 2.6±0.68 mm in the direct group and 3.25±0.86 mm in the bioptome group. The PDA size was > 3 mm in 10 patients in the direct group and 45 patients in the bioptome group. Overall procedure success was 100% when the PDA diameter was <3 mm. Procedural success was 98% in direct delivery group and 98% in the bioptome-assisted group where PDA was > 3 mm. Residual shunt occurred in 2 patients and hemolysis in one patient in direct group compared to none in bioptome-assisted group.
biopomte group. Biopomte-assisted technique leads to less incidence of residual shunt and hemolysis in moderate-sized PDA and hence there is less need for further intervention compared to direct delivery technique in patients undergoing coil closure of PDA.

**Balloon Mitral Valvotomy in Children below 12 Years**

Mukesh Sharma, Satyendra Tewari, Sudeep Kumar, Aditya Kapoor, Naveen Garg, PK Goel, Nakul Sinha, Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow

We evaluated the immediate results of balloon mitral valvotomy (BMV) in 61 children aged 12 years with severe rheumatic mitral stenosis. We retrospectively analyzed procedural detail of mitral balloon valvotomy done between January 1999 to December 2004. Mean age was 10.15±2.67 years, male-female ratio was 27:34 with mean height of 135.4±12.56 cm. All patients were in sinus rhythm with majority in NYHA class II (n=43) or III (n=18) (mean NYHA class: 2.27±5.6). Pre-procedural mean pulmonary artery (PA) pressure was 48.12±21.5 mmHg. Twenty-three patients had severe pulmonary arterial hypertension (PAH) while 25 patients had moderate PAH. Balloon size chosen according to Lau and Hung and serial dilation was done starting 2 mm less than the estimated final size. The mean pulmonary capillary wedge pressure decreased from 23.14±6.58 mmHg to 12.1±7.51 mmHg. The mean PA pressure decreased from 48.12±21.5 mmHg to 22.74±13.54 mmHg. The mean mitral gradient decreased from 18.42±4.28 mmHg to 5.15±3.1 mmHg; mitral valve area increased from 0.76±0.15 cm² to 1.69±0.84 cm², end-diastolic gradient decreased from 14.19±2.46 mmHg to 2.62±1.46 mmHg. The procedure was successful in all patients. Four patients had moderate MR. All patients were on follow-up with MR becoming mild in one and remaining moderate in three. Our study shows that mitral balloon dilation is safe and effective in children <12 years of age with rheumatic mitral stenosis.

**Use of Amplatzer Vascular Plugs in the Closure of Coronary Arteriovenous Fistula**

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Besides coils, no dedicated device is available to close arteriovenous (AV) fistula as yet. The risk of dislodgement of coils and persistence of residual flow remains a major limiting factor in big AV fistulas. However, reports are available where patent ductus arteriosus (PDA) Amplatzer device has been used to close big AV fistulas. Recently, Amplatzer vascular plug (AVP) has been designed, but there are no reports regarding its safety and efficacy. We present here retrospective study of 3 patients, where this AVP was used to close AV fistulas (2 patients) andazygous vein (1 patient).

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>40 years</td>
<td>11 months</td>
<td>10 years</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Indication</td>
<td>Coronary AVF</td>
<td>Coronary AVF</td>
<td>Post-operative bi-directional Glenn shunt</td>
</tr>
<tr>
<td>Size of device</td>
<td>14 mm (neck of AVF12mm)</td>
<td>8 mm (neck of AVF7mm)</td>
<td>10 mm and 12 mm</td>
</tr>
</tbody>
</table>

AVF: arteriovenous fistula; RV: right ventricle; SVC: superior venacava

In two patients, because of the large size of the fistula, it was planned to deploy the vascular plug initially and then deliver the coil proximal to the device so as to prevent dislodgement of the coils. In the third patient, where azygous vein was occluded, second device was deployed as there was persistent residual flow across the device. Angiographically, no flow was seen 15 min after deployment of the device, which was reconfirmed with duplex scan two days after the procedure. AVP in a selected group of patients is safe, efficacious and easy to deliver.

**Percutaneous Transluminal Septal Myocardial Ablation**

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Hypertrophic obstructive cardiomyopathy is a genetically transmitted disease with an incidence of 0.2% in the population and is an important cause of sudden death and syncope. When there is no symptom relief with optimal medical therapy, surgery is an established mode of therapy. Septal ablation with alcohol is an alternative new technique. Over last 4 years, 5 patients have undergone this procedure. Mean duration of follow-up was 1.5 years (3 month to 4 years). Their age ranged from 40 to 64 years (mean 55 years) and 3 were women. All patients had angina, dyspnea and palpitation not responding to optimal medical therapy. Three patients had pre-syncope and 2 had recurrent left-sided heart failure. On Echocardiography, the Interventricular septum (IVS) thickness varied from 24 to 34 mm (mean 27 mm). Resting left ventricular outflow tract (LVOT) gradient varied from 40 to 325 mmHg (mean: 125 mmHg). On catheterization, all patients had right and left heart study – and after confirming LVOT gradient, septal artery of interest was identified on coronary angiogram, and ablation done as per standard procedure. Echo color Doppler guidance was used during the procedure. All patients had excellent symptom relief with peak LVOT gradient 7 to 40 mmHg (mean: 23 mmHg). Mitral regurgitation (MR) grade decreased by 2. Two patients had complete heart block and underwent dual chamber pacemaker after a week of observation. In all, post-procedure CPK values (425-1820 units) at 6 hours returned to normal at 48 hours.
At 6 month-follow-up, one patient with complete heart block had normal atrioventricular (AV) conduction. The symptomatic relief following the procedure is sustained to date in all the patients.

**Amplatzer Device Closure of Patent Ductus Arteriosus: Follow-up Results**

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Device closure of patent ductus arteriosus (PDA) is an acceptable and attractive alternative of surgery. Amplatzer duct occluder is most recent and user-friendly device, which can close PDA of almost all shapes and sizes. We have evaluated the immediate and follow-up results of Amplatzer device closure of PDA done at our institute between January 1999 to December 2004. Total 46 patients underwent this procedure during the study period. Average age of patient was 14±9.2 years (age range: 7 months-40 years). Majority were female: 25 (55%). Mean PDA size was 6.5±1.9 mm (range: 3.4 - 10.5 mm). Size of Amplatzer devices used range from 4×6 mm-12×14 mm. Procedure was successful in all cases. There was no procedural complication. Pulmonary artery systolic pressure fell from 47.2±25.2 mmHg to 32.7±18.7 mmHg. Immediately after implantation, 16 (35%) patients had residual shunt (minimal in 9, mild in 5, significant in 2). Doppler echocardiography at 24 hours showed persistent mild residual shunt in 3 patients. No gradients were seen in the left pulmonary artery or the descending thoracic aorta. Repeat echocardiography at 3 months showed residual shunt in only 1 patient, which too had vanished at 6 months. On follow-up of 6 months to 48 months there was no evidence of residual shunt, device embolization, hemolysis, branch pulmonary artery stenosis, aortic obstruction or endarteritis. None of our patient had reopening of duct on follow-up till date. To conclude, Amplatzer device closure of PDA is an excellent procedure with excellent immediate and medium-term follow-up results.

**Acquired Gerbode Defect - Successful Device Closure**

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GB Pant Hospital, New Delhi

Ventricular septal defect (VSD) with communication between left ventricle (LV) and right atrium (RA) (Gerbode defect) is a rare defect and is usually congenital. Only a few cases of acquired Gerbode defect are reported and are mostly due to infective endocarditis (IE) in patients with ventricular septal defect (VSD). We report the successful device closure of an acquired Gerbode defect following surgical closure of VSD. A 22-year-old male had presented with dyspnea on exertion class I with palpitations of 1-year duration. Previously, he had undergone surgical closure of perimembranous VSD two years ago. There was no evidence of IE. X-ray revealed cardiomegaly and increased pulmonary blood flow. Echocardiography showed an LV to right atrium (RA) shunt with a defect measuring 6 mm. Cardiac catheterization showed mild pulmonary arterial hypertension (PAH) and Qp:Qs ratio of 3:1. As the patient and the surgeons were reluctant for repeat surgery, the patient was taken up for device closure. Amplatzer septal occluder was successfully deployed across the defect. There were no complications. There was no significant increase in tricuspid regurgitation (TR) and no atrioventricular (AV) blocks. The patient remained symptom-free with optimal result on echocardiography at 3 months of follow-up. This is the first documentation of successful device closure of an acquired Gerbode defect.

**Non-Surgical Management of Cardiac Tamponade caused by Temporary Pacemaker Lead**

Vijay Trehan, Vimal M Bhatt, Saibal Mukhopadhyay, Jamal Yusuf, Biswa Bhushan Bhatti, S Ramakrishnan, Naresh K Goyal, Ashutosh Sahu, Ajay Raj, Sanjeev Kathuria, Asit Khanna, Sanjay Tyagi
GB Pant Hospital, New Delhi

Right ventricular (RV) perforation secondary to temporary pacemaker lead, resulting in cardiac tamponade, is a rare but life-threatening complication. Surgery is usually the definitive management described for such cases. We describe successful sealing of such a perforation by percutaneous instillation of cyanoacrylate glue, through a guiding catheter in the pericardial sac at the perforation site. An 80-year-old lady with third degree atrophic ventricular (AV) block underwent urgent temporary pacemaker implantation (TPI) with a 7 F femoral pacemaker lead. However, few hours after the TPI, echocardiography revealed large pericardial effusion with RV diastolic collapse and the temporary lead was seen traversing the RV into the pericardial space. Since the patient was pacemaker-dependent, a permanent VVI pacemaker was implanted leaving the 7 F temporary lead with its tip in pericardial space in situ. A 5 F introducer sheath was inserted into the pericardial space through which two 0.035" x 50 cm guidewires were inserted. One guidewire was positioned at a site distant from the RV apex for standby access to pericardial cavity. Over the other guidewire a 12 F introducer sheath was inserted and 300 ml blood was drained. An 8 F right Judkin’s guiding catheter was introduced into the pericardial space through the 12 F sheath and was maneuvered under fluoroscopy, so that its tip came in contact with the RV apex at the temporary lead perforation site. Then 4 ml of glue was...
injected as a rapid bolus, followed by 10% dextrose through the guiding catheter into the pericardial space under fluoroscopic guidance. To prevent entrapment in the glue, the 12 F sheath and the guiding catheter were pulled out, leaving only the guidewire for standby access to pericardial space. After the procedure there was neither worsening of the hemodynamics nor any increase in the pericardial effusion on echocardiography. The remaining guidewire was also pulled out of pericardial space. The patient remained stable and was discharged on the fourth day, after echocardiography confirmed only minimal pericardial collection.

Percutaneous Brachio-cephalic Interventions through Transradial Approach

The traditional approach for percutaneous brachio-cephalic interventions (BCI) is transfemoral route. Alternative brachial or axillary approaches have been reported. There are few reports in the literature of these interventions using the transradial approach (TRA). We report our early experience of brachio-cephalic interventions (BCI) through the TRA. From January 2004 to June 2005 we have performed 5 cases of subclavian stenting, 2 cases of vertebral stenting and 1 case each of basilar and carotid stenting. Contralateral radial access is used for carotid interventions and the ipsilateral radial is used for vertebral and subclavian interventions. The radial artery was cannulated using a 20" Jelco cannula and 0.025" Terumo guidewire. A Terumo sheath (5 F/6 F) was inserted, which was changed to a 90 cm long sheath (7 F Shuttle or Pinnacle) for subclavian and carotid stenting. For vertebral stenting, a 6 F right Judkins guiding catheter was used. A 0.014" percutaneous coronary angioplasty guidewire was used to cross the lesions in neuro-interventions, while a standard 0.035" guidewire was used for subclavian stenting. Coronary stents were used for basilar and vertebral artery stenting. Peripheral stents (8 mm Express-LD) were used for subclavian stenting. A carotid Wall stent was implanted in carotid artery. Angiographic success (residual stenosis < 30%) was achieved in all interventions (100%) and the procedures could be completed from the radial route with no need to cross over to the femoral route. No patient had major vascular complications including critical limb ischemia or need of blood transfusion. Minor hematoma occurred in 1 patient. All patients were mobilized immediately and discharged on aspirin and clopidogrel 2 to 3 days after the procedure. These interventions through TRA could be accomplished due to the availability of refined hardware (0.014" guidewire-based low profile balloons and balloon-expandable stents, wide lumen guide catheters). With present equipment stents up to 8 mm can be deployed easily with the use of 6 F/7 F long sheath.

Device Closure of Atrial Septal Defect in Children with Transthoracic Echocardiography Guidance

From January 2004 to May 2005, a total of 18 children underwent ASD device closure (8 males, 10 females; age range: 5-11 years, mean age being 7.2±2.1 years). Device closure was done under TTE guidance in 15/18 (83.33%) children. All procedures could be performed by using ketamine and midazolam sedation. ASD device size varied between 12 mm to 24 mm. Mean procedure time was 46 min (range: 32-78 min). Mean fluoroscopy time was 19 min (8-38 min). No complications were seen. To conclude, TTE provides adequate information needed for successful implantation of atrial septal occluder to close the secundum ASDs in most children thus avoiding need for TEE and attendant problems.

Carotid Artery Stenting with Neuroprotection

Carotid stenting has emerged as an attractive alternative to carotid endarterectomy in extracranial carotid artery stenosis. Distal embolization has been the Achilles heel of carotid artery stenting and may result in neurological deficit. Hence, neuroprotection is recommended during the procedure. We evaluated 67 patients who underwent carotid stenting with distal protection devices (DPD) in our institute over last 6 years. Out of these, 35 were males and 12 females; mean age was 66.4 years. There were 40 diabetics, 36 had associated coronary artery disease (CAD) and 9 had peripheral vascular
disease. Twelve patients had bilateral carotid artery (BCA) disease out of which 6 had contralateral occlusion. Three patients underwent bilateral carotid artery stenting. Of the 70 DPs deployed, balloon occlusion device (PercuSurge) was used in 6 and filter devices in 64 patients (Angioguard 30, Neuroshiel 5, EPI 28, Spider 3). Precise Cordis (J&J) stents were used in 36 patients and Wall stents (Boston-Scientific) were used in 34 patients. The procedure was successful in all the patients. Three had transient ischemic attacks and one had a major embolic stroke 2 days after the procedure. One patient died of intracerebral hemorrhage 4 days after the procedure. In conclusion, neuroprotection during carotid interventions increases the safety and overall procedural outcomes.

Inferior Vena Cava Filters in General and Cancer Patients: Indications and Outcome

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Metro Golden Heart Institute and Rajiv Gandhi Cancer Institute, New Delhi

Our experience with inferior vena cava (IVC) filter placement to prevent pulmonary emboli (PE) in general and cancer patients with deep vein thromboses (DVT) in particular was reviewed to identify indications, patient characteristics, complication, and long-term outcome. A total of 31 patients, 12 male and 19 female, were found eligible for IVC filter of which 16 patients agreed to undergo the same, between January 2002 and June 2005. Median age was 57 years (range: 15-88 years). Out of 16 patients, 11 had cancer of stage II to stage IV (cancer ovary 4, cancer breast 3, cancer cervix 3, cancer colon 2); two patients had postpartum DVT and PE. Two patients had intertrochanteric fracture.

Indications for IVC filter placement were DVT or PE in the presence of contraindications to anticoagulation therapy [perioperative, n=2; thrombocytopenia, n=1; bleeding, n=2 or anticoagulation failure (recurrent PE, n=2; recurrent DVT, n=4)]. A filter placement, two patients developed a recurrent PE, and four patients developed a recurrent DVT. No significant post-procedure complications were observed. IVC filter placement in patients with advanced cancer and thrombotic complications is safe, well tolerated, and can offer effective therapy/prophylaxis with a low incidence of treatment failure.

Role of Contrast Echocardiography in a Setting of Acute Temponade following Intervention

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Acute temponade during cardiac interventions requires prompt recognition and treatment. The placement of a drainage catheter under fluoroscopic guidance is the standard procedure. The small volume of blood causing temponade during procedure, accentuates the risk by accidental entry into cardiac chamber during pericardiocentesis. Contrast echo-guided pericardiocentesis was prospectively conducted in 7 consecutive patients (5 females, 2 males; mean age 26 ± 7 years) with acute temponade over a period of 1 year, following percutaneous transvenous mitral commissurotomy (PTMC) using JOMIVA technique. During pericardiocentesis, 5 ml of pericardial fluid was withdrawn, 1 ml of blood and 3 ml of saline was agitated in a 10 ml syringe, the visible foam and air expelled and the agitated fluid injected through the puncture needle into the pericardium. The area of enhancement caused by the microbubbles indicated the needle position. Contrast echo were observed in the pericardial space in 4 patients and in the right ventricle (RV) in 2 patients. The withdrawal of the needle for right ventricle (RV) and repeat pericardial contrast injection confirmed pericardial site of the needle. All the patients were successfully resuscitated without the need for open heart surgery. It is concluded that contrast echocardiography enhances the safety and operator confidence of pericardiocentesis in acute temponade and is a simple and widely applicable technique.

Feasibility and Safety of Device Closure of Perimembranous Ventricular Septal defect

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Device closure of ventricular septal defects (VSD) was reported first time in the literature in 1987. Thereafter many reports of attempts of transcatheter closure of such defects is available. However, transcatheter closure of perimembranous VSD (PMVSD) is a relatively newer modality. We attempted closure of the same in 13 cases; 8 females and 5 males with an average of 15 years to 16 years were included. All cases were either symptomatic or had the echocardiographic evidence of pulmonary arterial hypertension (PAH) or enlarged left-sided chambers and had an isolated PMVSD. Those with aortic regurgitation were excluded from study. One of the females was aged 55 years of age. Echo size of VSD in these cases ranged from 3.8 to 8.8 mm. Distance of VSD from aortic cusp ranged from 2.5 to 4.5 mm. Amplatzer PMVSD occluder was used to close the defect. Device size ranged from 4 mm to 10 mm. In one case the procedure was unsuccessful because of partial abutment of tricuspid valve apparatus with the defect, hindering the delivery of device. In one case the device emboziled in the pulmonary artery (PA) due to smaller device size, which was successfully retrieved and a bigger device was deployed, in the second sitting. There were two cases with trivial residual VSD in immediate post procedure period, which disappeared during follow-up in next three months. Transient right bundle branch block (RBBB) was seen in 5 cases, which
resolved in 3 months time (and at 4 months follow-up in one case). Device was well seated in all the defects. The first case of device closure developed complete heart block, which did not resolve in 3 months necessitating surgical implantation of epicardial (VVIR) pacemaker. One female patient aged 4 years developed limb ischemia which resolved 4 months later and had no residual defect during follow-up one year later. Transcatheter device closure of PMVSD is feasible and safe with Amplatzer (asymmetric) occluder PMVSD, in carefully selected cases. The device requires a close follow-up and the long-term safety needs to be established in future studies.

Transcatheter Closure of Perimembranous Ventricular Septal Defect with the Newer Perimembranous Ventricular Septal Defect Closure Device
Snehal Kulkarni, J Vimala, Pramod Jaiswal
International Centre for Cardiovascular and Thoracic Diseases, Chennai

Transcatheter closure of perimembranous ventricular septal defect (VSD) has been always a concern, mainly because of its proximity to surrounding structures like right coronary cusp of aortic valve and septal tricuspid leaflet. It has been possible to close these defects with the modified perimembranous VSD closure device. During last one year, we attempted to close perimembranous VSD in 10 patients. Patients with inadequate aortic rims i.e. distance of less than 2 mm from right coronary cusp of aortic valve, patients having prolapse of right coronary cusp or aortic regurgitation were excluded from the study. Age of the patient ranged from 1½ year to 40 years and weight range was from 11 kg to 62 kg. VSD size ranged from 3 to 6 mm and the device size ranged from 6 to 10 mm in size. There was no technical failure in any patient. In one patient the device needed to be removed immediately after deployment due to development of complete heart block on the catheterization table. There was no aortic regurgitation in any patient on follow-up up to 1 year. In selected group of patients, transcatheter closure of perimembranous VSD is an effective technique with the newer perimembranous VSD closure device.

Percutaneous Device Closure in a Post-Myocardial Infarction Ventricular Septal Defect: What have we Learned?
Pankaj Gupta, N Chouhan, Govind Goyal, Niraj Gupta, Atul Mathur, S Radhakrishnan, Ravi R Kasliwal, R Kapoor, N Trehan
Escorts Heart Institute and Research Center, New Delhi

Ventricular septal rupture complicating acute myocardial infarction (MI) has extremely poor prognosis with high mortality. Percutaneous ventricular septal defect (VSD) device closure (PVDC) is a novel but difficult approach in this subset of patients. Between January 2002 to April 2005, 34 patients presented to us with acute MI complicated with ventricular septal rupture. We report our experience of 13 patients (10 male) with mean age 63.8 ± 12.6 years (50-89 years) who underwent PVDC. Of these, 3 patients underwent secondary closure for residual VSD surgically. We faced difficulties while performing interventions, as these patients were very sick, hemodynamically unstable with gross pulmonary edema (n=7) and/or cardiogenic shock (n=6) and presented very early after MI (1.7 ±1.3 days). The VSD location was apical (n=11), basal (n=1) and mid muscular (n=1), with a mean size of 16.6 mm (range: 7-20 mm) on echocardiography. Percutaneous closure was performed via right internal jugular vein using the Amplatzer VSD (n=9) or ASD (n=4) closure devices, mean size 22.4 mm (range: 18-30 mm). Major difficulties faced while intervening are: (i) under sizing of VSD on transesophageal echocardiography (TEE) resulting into device prolapse, which was tackled by using larger devices (+4 mm), (ii) struck device with kinking of sheath at VSD site, which required procedural modification, either by crossing the VSD with whole struck assembly into left ventricle where kink was relieved, or by giving support to the sheath using right coronary artery (RCA) catheter through another groin, using rail-road technique. Procedural success was achieved in 11 patients. Two patients who had procedural failure, succumbed to cardiogenic shock and 2 others with initial success succumbed to device prolapse. Three patients are still alive with class I/II symptoms and one patient had sudden death after 10 months. Two patients were lost to follow-up. Percutaneous VSD device closure is less invasive although difficult technique for treating this subset of patients. Echocardiography underestimates the size. Oversized device and some modifications in technique are helpful.

Extent of Subvalvular Affection and its Effect on Outcome of Balloon Mitral Valvotomy
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We propose that severe subvalvular affection could undermine the acute results of balloon mitral valvotomy (BMV). A retrospective analysis of the extent of subvalvular affection scored prior to BMV and the outcome of BMV procedure was performed. 257 consecutive patients who underwent BMV procedure at our hospital between August 2004 and June 2005 were included in the study. The morphology of the mitral valve apparatus with respect to its
suitability for BMV was evaluated routinely.

\[
\begin{array}{c|c|c|c}
\text{Wilkins score} & \leq 3 & >3 & p \text{ value} \\
\hline
\text{Post-BMV} \\
MVA \leq 1.2 & 5 (2.6\%) & 8 (12.3\%) & < 0.01 \\
\geq \text{Mod MR} & 9 (4.7\%) & 4 (6.5\%) & \text{NS} \\
\end{array}
\]

A high subvalvular score is a strong predictor of outcome after the balloon mitral valvotomy procedure. Patients with high subvalvular score have a higher incidence of inadequate relief of mitral stenosis [mitral valve area (MVA) <1.2 cm²]. The presence of high subvalvular score, however, was not associated with increased risk of developing mitral regurgitation.

Mitral Valvuloplasty in the Pediatric Age Group: Immediate and Long-Term Follow-up Results

Vijay Trehan, Saibal Mukhopadhyay, Jamal Yusuf, Mohit D Gupta, Dinesh Raj, P Nandkishore, BB Bharti, MP Girish, Ramesh Arora, Sanjay Tyagi
GB Pant Hospital, New Delhi

Mitral balloon valvuloplasty (BV) is an effective therapeutic option but there is paucity of data on immediate/long-term efficacy of BV in pediatric age group (≤15 years). Hospital data between October 1987 and December 2004 were analyzed to determine immediate/long-term results of BV. In this study 603/6870 (8.7%) children ≤15 years were included. Age range was 6-15 years (mean: 11.3±2.8 years), mean height 142.2±11.8 cm; mean body surface area (BSA): 1.2±0.2 mm²/m² and male to female ratio was 1.2:1. All had sinus rhythm. Pre-procedure mitral valve area (MVA) by echocardiography ranged from 0.4-1 cm²; Wilkins score was ≤8 in majority (n=547, 90.8%). Mitral regurgitation (MR) was mild in 112/603 (18.5%), moderate in 28 (4.6%), severe in 20 (3.3%). Inoue balloon (Toray, Japan) was used for BV in 542 (89.8%) patients and double balloon (Mansfield Scientific Inc) in rest (BSA: 21-22 mm²/m²). Severe pulmonary arterial hypertension (mean PA pressure ≥50 mmHg) was present in 406 (67.3%). Successful procedure was defined as MVA > 1 cm²/m² BSA or mean gradient < 5 mmHg in absence of complication and restenosis (MVA ≤0.8 cm²/m² BSA or >50% gain loss); 592 (98.2%) patients had successful BV. MVA increased from 0.73 ±0.16 cm² to 1.88 ±0.32 cm² (p<0.0001) and mean PA pressure fell from 68±15.4 mmHg to 27.6±10.4 mmHg (p<0.001), transmitral gradient reduced from 18.6±6.12 mmHg to 3.6±3.20 mmHg (p=0.001). Six (0.9%) patients developed severe MR (4 required mitral valve replacement). One had cardiac tamponade (expired); 4 had suboptimal result. All with pre-existing severe MR had successful BV and symptomatic improvement; 18 patients showed reduction in severity of MR on follow-up (mild MR: 4, moderate MR: 14), only 2 required mitral valve replacement. Over follow-up of 96.4 ± 38.2 months (range: 5-195 months), 74 (12.2%) patients developed restenosis, of whom 58 (9.6%) with class III/IV symptoms underwent successful re dilation and 6 (0.9%) underwent successful third dilation. No deaths occurred during follow-up. MV provides excellent long-term palliation in pediatric patients preserving native valve and avoiding complications of valve replacement. Concomitant severe MR should not be considered an absolute contra indication in this age group.

Balloon Mitral Valvuloplasty in Patients <20 Years of Age: Acute and Intermediate Results

UN Mehta Institute of Cardiology and Research Centre, Ahmedabad

Rheumatic heart disease strikes young in developing countries and significant mitral stenosis is commonly seen in pediatric population in South Asia, specially India. We decided to study the acute and intermediate outcomes in this subgroup of patients undergoing balloon mitral valvuloplasty (BMV) and to evaluate if these patients behaved in a manner different from adults. Patients <20 years undergoing BMV between January to December 2004 were taken into the study. After clinical history, physical examination and laboratory investigations, detailed 2D echocardiography with Doppler study was done to confirm the feasibility of the procedure. All pre- and post-BMV hemodynamic data were evaluated. Balloon size used and amount of inflations given were noted. Of the 342 patients undergoing BMV, 38 (11.11%) were <20 years age, male-female ratio being 1.375:1.

<table>
<thead>
<tr>
<th>Mean height, cm</th>
<th>156.2</th>
<th>130 - 179</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean weight, kg</td>
<td>37.51</td>
<td>20 - 57</td>
</tr>
<tr>
<td>Mean LA pressure reduction, %</td>
<td>40.96</td>
<td>27.1 to 16</td>
</tr>
<tr>
<td>Mean PA pressure reduction, %</td>
<td>21.73</td>
<td>42.8 - 33.5</td>
</tr>
<tr>
<td>Mean balloon size</td>
<td>25.62</td>
<td>22 - 28</td>
</tr>
<tr>
<td>Increase in MVA, %</td>
<td>48.27</td>
<td>0.89 - 1.72</td>
</tr>
<tr>
<td>Increase in MR &gt; Grade II</td>
<td>4 (10.52)</td>
<td>-</td>
</tr>
</tbody>
</table>

LA: Left atrium; PA: Pulmonary artery; MVA: Mitral valve area; MR: Mitral regurgitation

None of the patients required surgery for mitral regurgitation (MR). 28 (73.68%) patients who completed 12 month follow-up, were in symptom class I and II. BMV in this subgroup is safe and feasible with a slightly higher predilection for MR owing to less fibrosed and non-calcified mitral apparatus. Unlike adults, not chasing valve dilation to optimal balloon size may reduce the incidence of valve tear and resultant MR.
Indian Heart J 2005; 57: 468–489

Non-Coronary Interventions 481

Effect of Redo-Balloon Mitral Valvotomy on Left Atrial Size and Spontaneous Echo Contrast in Left Atrium after Restenosis

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Left atrial (LA) size and spontaneous echo contrast (SEC) are important variables for development of thromboembolic complication in patients with severe mitral stenosis. We prospectively assessed the effect of restenosis on LA size and SEC in left atrium (LA). The study included 200 patients who had undergone successful balloon mitral valvotomy (BMV) and were on regular follow-up. Patients were assessed by transthoracic echocardiography at regular intervals for LA size and SEC before and after BMV. Other parameters evaluated included mitral valve area (MVA), presence of atrial fibrillation, LA and LA appendage SEC and clot. LA size was assessed by planimetry in 4-chamber and parasternal long axis views. The mean of two values was used. During follow-up, 38 (19%) patients had restenosis and there was significant increase in LA size in 40% patients, the SEC in LA reappeared. Of these 38 patients, 24 (mean age 31.3±8.2 years, 16 male) underwent redo-BMV. Their LA size and MVA are shown in the table.

<table>
<thead>
<tr>
<th>Control</th>
<th>Pre-BMV</th>
<th>Post-BMV</th>
<th>60-month FU</th>
<th>Restenosis 1-month FU</th>
<th>12-months FU</th>
</tr>
</thead>
<tbody>
<tr>
<td>MVA (cm²)</td>
<td>0.8±0.2</td>
<td>2.1±0.3</td>
<td>1.8±0.3</td>
<td>0.8±0.2</td>
<td>1.9±0.3</td>
</tr>
<tr>
<td>LA area (cm²)</td>
<td>13.0±2.1</td>
<td>29.4±8.3</td>
<td>24.8±6.6</td>
<td>19.2±4.2</td>
<td>26.4±8.2</td>
</tr>
</tbody>
</table>

One month after redo-BMV, there was significant decrease in LA size and 40% decrease in SEC. There was further decrease in LA size and reduction in SEC at 12 months follow-up (there was only gradel SEC in 8% of patients). We conclude that redo-BMV results in significant decrease in LA size and SEC formation which was maintained during follow-up.

Double Coronary Wire in Balloon Pulmonary Valvuloplasty: A Novel Approach

D Das, A Chattopadhyay, B Bandyopadhyay
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Crossing critical pulmonary stenosis by conventional procedures may be unsuccessful despite repeated efforts. We report here a novel approach for crossing such lesion successfully. A 23-day-old male baby weighing 3.1 kg, with severe valvular pulmonary stenosis (PS) and suprasystemic right ventricular pressure was taken up for urgent balloon pulmonary valvuloplasty (BPV). Repeated attempts to cross the pulmonary valve using Multipurpose (MP), right coronary artery (RCA) and Swan-Ganz (SG) catheters with the support of Teflon and Terumo wires were futile. Subsequently, with a floppy extra support (Guidant) straight tip coronary wire and a 4 F SG catheter, the valve was crossed easily. To provide adequate support for advancement of catheter, this coronary wire was placed in left pulmonary artery (LPA) and a second one was placed along side. Combined strength of two wires provided adequate support for advancement of SG catheter in LPA. The coronary wires were exchanged with a Teflon wire and the catheter was taken out. The pulmonary valve was successfully dilated with a 10×4 mm Tyshak II balloon. Double wire technique has been used during coronary intervention, but is not described for crossing critical valvular lesion as in this case. We successfully used this technique and expect it to be useful in desperate situations.

Retrieval of Foreign Bodies from the Vascular System

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Retrieval of foreign bodies from the vascular system is often a challenging job. We report here three difficult cases of retrieval of foreign bodies. In the first case, in a 57-year-old man, who underwent coronary artery bypass grafting (CABG), the tip of the central venous catheter in the right internal jugular vein broke away during its removal and lodged in the lower segmental branch of the left pulmonary artery (PA) with its proximal tip embedded in the wall of the branch PA. A right femoral artery (8 F) access was obtained. A 5 mm snare was used to grab the proximal end of the foreign body but it could not be dislodged from its location in the branch PA. Hence a 6 F right coronary artery (RCA) catheter was placed alongside the broken segment so as to move its distal end and position it parallel to the branch PA. The RCA was used as a guiding catheter and the snare was passed through it to grab the proximal end. Since the segment along with the snare could not be pulled in fully into the RCA catheter, the whole assembly was taken out as a unit through the femoral sheath. The broken segment measured 5.4 mm in length and was removed in totality. No other segments were found to be retained by fluoroscopy. In 2nd case, in a 25-year-old male who underwent a mitral valve replacement, the distal segment of the PA catheter was accidentally tethered from the main shaft and was found to be lodged in the right atrium. For retrieval, a 6 F RCA catheter was used as a guiding catheter along with a 10 mm snare. The broken segment measuring 5.2 mm was retrieved in totality. In 3rd case, in a 52-year-old female, during permanent pacemaker implantation the introducer sheath in the kit could not be negotiated and hence, a conventional 7 F sheath was cut through beyond the valve and used for the peel
away mechanism. During the procedure, it accidentally migrated into the left subclavian vein. A right femoral vein (RFV) access was obtained and a 10 mm snare was passed through the inferior vena cava (IVC), right atrium (RA), superior vena cava (SVC), innominate vein into the left subclavian vein. An 8 cm segment of the sheath was retrieved intact.

Balloon Mitral Valvotomy in Pregnancy
AS Sathe, SV Sathe, CN M akhale, AC M ehta, RS Shinde, PK Grant, M Durairaj
Grant Medical Foundation, Ruby Hall Clinic, Pune

Rheumatic mitral valve disease is the most prevalent organic valve disease encountered in pregnant women in South Asia, often unmasked by the circulatory stress occurring during normal pregnancy. Balloon mitral valvotomy (BMV) scores over surgical commissurotomy with excellent short-term results in these patients that pose complex therapeutic issues. This procedure was performed in 102 (6.6%) pregnant women among 1551 who underwent BMV in our institution between 2000-2004. Mean age of pregnant patients who underwent BMV was 26 years (range: 19-38 years). Average gestational period was 25±5 weeks (range: 21-32). Sixty-nine (71%) patients were primigravidas. Twenty-eight (29%) were multigravidas; 10 (10%) patients were in NYHA class IV, 39 (38%) were in class III and 53 (52%) were in class II. Atrial fibrillation was present in 7%. Wilkins score was > 10 in 6%, 8-10 in 27% and < 8 in 67% patients. Pre-BMV was 0.77±0.4 cm² and post-BMV was 1.8±0.4 cm². Pre-BMV mean gradient was 22±6 mmHg and post-BMV it was 5±6 mmHg. LA mean pressure was 26±8 mmHg pre-BMV and 9±7 mmHg post-BMV. Mean fluoroscopy time was 4.5 min (range: 2.8–7.5 min.). BMV was performed using a flow-guided Inoue balloon and was successful in 99 (98.5%) patients. Results were suboptimal in 3 (1.8%) patients. Mitral regurgitation increased by 1 grade in 48 patients and by 2 or more grades in 10 patients. One patient of 5 months gestation had an abortion 24 hours later. It is concluded that BMV during pregnancy is a safe and effective procedure provided due care for radiation protection and care of the expectant mother are ensured.

Tricuspid Balloon Valvuloplasty: Comparison of Various Techniques - Our 5 Years' Experience
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Grant Medical Foundation, Ruby Hall Clinic, Pune

Among a total of 1551 patients who underwent balloon mitral valvotomy (BMV) in our institute, 58 (3.7%) underwent tricuspid valvuloplasty during the same procedure. There were 36 (63%) females and 22 (37%) males. Methods of tricuspid valve dilation included: (i) Inoue balloon dilation using the 18 mm and 28 mm size balloons, (ii) Mansfield double balloon technique placing both double length wires in the right pulmonary artery, (iii) Right ventricle Inoue technique was used in 28 (48%) patients. Double balloon technique was used in 36 (62%) patients. Crossover from Inoue technique to double balloon method was required in 6 (10%) patients. Pre-dilation mean gradient across the tricuspid valve was 11 mm (range: 5-19 mm) and post-dilation was 4 mm (range: 2-8 mm). Double balloon technique achieved better results than Inoue method. Right pulmonary artery parking of wires in double balloon method gave maximum stability during dilation versus right ventricle position. In conclusion, Mansfield double balloon method gives better results than the single Inoue balloon technique. Parking the 2 wires in the right pulmonary artery gives maximum stability during dilation.

Balloon Mitral Valvuloplasty in Cases with Left Atrial Appendage Thrombus
SV Sathe, CN M akhale, RS Shinde, AC M ehta, AS Sathe, PK Grant, M Durairaj
Grant Medical Foundation, Ruby Hall Clinic, Pune

In our series of 1551 patients who underwent balloon mitral valvotomy (BMV) from 2000 to 2005, 112 (7.2%) had thrombus in left atrial appendage (LAA). There were 42 (38%) males and 70 (62%) female patients. Age ranged from 19 to 58 years (mean: 34 years). Mean mitral valve area (MVA) was 0.78 cm² (0.5-1.2 cm²). All patients were anti-coagulated optimally for a period of 6 weeks. The following technical tips are advocated: (i) minimal manipulation of the spring wire and balloon in the left atrium, (ii) avoiding horizontal balloon positioning, (iii) avoiding vigorous and sudden withdrawal of stylet during a failed crossing attempt. Mean valve gradient, pre-BMV was 16 mmHg, post-BMV was 6 mmHg. Mean valve area, pre-BMV was 0.78 cm² and post-BMV 1.7 cm². There was no occurrence of major or minor stroke or evidence of systemic embolization during or after procedure. Two patients had transient aphasia during the procedure which recovered immediately within 7 and 15 min. It is concluded that BMV is safe and effective in patients with left atrial appendage thrombus. Optimal anticoagulation protocol pre- and post-procedure and careful technique and precautions are necessary to avoid complications.
Transcatheter Closure of Atrial Septal Defects with Amplatzer Septal Occluder: Immediate and Long-term Follow-up Results
GB Pant Hospital, New Delhi

Transcatheter closure of ostium secundum atrial septal defects (OS ASD) is an accepted alternative to surgical closure with minimal morbidity and mortality. We report our single center experience, with the use of self-expanding Amplatzer septal occluder (ASO) along with long-term follow-up results. Between January 1998 and June 2005, 254 patients (152 females), age ranging from 2.5-56 years (median: 17 years) and weight ranging from 12-62 kg (median: 36 kg) underwent closure of OS ASD using the ASO. Included were patients with echocardiographic evidence of adequate septal margins as assessed by transesophageal echocardiography (TEE). However, 45 (17.7%) patients, with insufficient anterosuperior margin (< 5 mm) were also included. The size of the ASD as assessed by TEE varied from 8-36 mm (17.7±6.2 mm) and the balloon-stretched diameter varied from 10 to 38 mm (mean: 19.8±7.3 mm). The size of the device chosen was 1 to 3 mm larger than the balloon-stretched diameter and ranged from 12-40 mm (range: 21.2±7.2 mm). Device was deployed under echocardiographic and fluoroscopic guidance. Device could be positioned successfully in 252 (99%) patients including all with deficient anterosuperior margin. It could be positioned successfully in first attempt in 237 (94%) patients, while in 15 (6%) patients twisting of the waist after first deployment required reloading of the device and could be deployed successfully in all in second attempt. All patients were discharged after 48-72 hours on aspirin (5 mg/kg) for 6 months. The incidence of residual shunt assessed by transthoracic echocardiography (TTE) after the procedure was 2% (n=6) and all had trivial shunts. Two (1%) patients had mitral regurgitation and pulmonary edema during PTMC. In all the seven patients with deficient anterosuperior margin, there was no incidence of atrioventricular (AV) valve dysfunction, atrial arrhythmias or AV block. On follow-up of 3 months, all 6 patients with trivial shunt showed no residual shunt. On follow-up of 2-73 months (range: 43±7 months) there has been no incidence of migration or fracture of the device, thromboembolism, infective endocarditis or sudden cardiac death. Closure of OS ASD with ASO is safe and efficacious with very low rate of early and late complications. Patients with deficient anterosuperior margins can also be taken up for the procedure.

Duct Occluder - Deployment Difficulty due to Inadequate Shape Memory
Vijay Trehan, Arima Nigam, S Ramakrishnan, Naresh K Goyal, Bishva Bhushan Bharti, Vimal Mehta, Ravinder Batra, Ajay Raj, P Nanda Kishore, Asit Khanna, Sanjay Tyagi
GB Pant Hospital, New Delhi

Transcatheter closure of patent ductus arteriosus (PDA) by duct occluder (DO) is now an established procedure and is associated with relatively few complications. We report an unusual cause of deployment difficulty with the duct occluder. The duct occluder failed to assume the intended shape in seven patients amongst a series of 280 patients. Of these, 238 patients received Amplatzer duct occluder (AGA, USA) and 42 patients received Blockaid® duct occluder (Blockaid, Shanghai, China). In six patients, the non-resumption of the shape of the duct occluder occurred at the pulmonary end and in one patient it occurred at the aortic end. The non-resumption of the shape of duct occluder at the pulmonary end resulted in large residual shunt. The pulmonary end of the device was made to resume its original shape with the help of Amplatz gooseneck snare in four cases and by simple push by a pigtail catheter in one case. Non-opening of the retention skirt at the aortic end in one patient was rectified with a gentle push by a pigtail from the aortic side. All the seven patients with deployment difficulty had received Blockaid® duct occluder. The non-resumption of the intended shape was probably due to the inadequate shape memory of the device.

Acute Mitral Regurgitation Following Percutaneous Transvenous Mitral Commissurotomy - Acute Stabilization by Creation of Atrial Septal Defect
Vijay Trehan, Naresh K Goyal, S Ramakrishnan, Bishva Bhushan Bharti, Vimal Mehta, Ashutosh Sahu, Balram Misha, Mohit Dayal Gupta, Praveen Singh, SaiBal M ukhopadhyay, Sanjay Tyagi
GB Pant Hospital, New Delhi

Acute severe mitral regurgitation is a dreaded complication of percutaneous transvenous mitral commissurotomy (PTMC), often resulting in life threatening hemodynamic situation and may require urgent mitral valve repair or replacement. We describe a simple technique for stabilization of such patients. Inoue balloon was used to enlarge the atrial septal defect (ASD) and we studied the hemodynamic parameters. A total of 7 patients developed acute severe mitral regurgitation and pulmonary edema during PTMC. In all the 7 patients, a large V wave was found and the mean left atrial pressure was 36 mmHg. At this time, the same Inoue balloon
was passed across the interatrial septum and dilated to create an atrial septal defect (ASD) to decompress the left atrium. The hemodynamic results were favorable. There was a marginal increase in cardiac output, decrease in left atrial mean pressure and pulmonary artery mean pressure, and an increase in right atrial mean pressure. The pulmonary blood flow increased with a mean QP:QS ratio of 2.5:1. The mean size of the ASD by echocardiography was found to be 1.4 cm. All the patients underwent elective mitral valve replacement (MVR) with ASD closure after 3–7 days. This technique can be life-saving in patients who develop severe mitral regurgitation following PTMC to stabilize the acute hemodynamics and convert an otherwise emergency surgery to an elective surgery.

### Percutaneous Transvenous Mitral Commissurotomy in Patients with Severe Mitral Stenosis and Regurgitation

#### Vijay Trehan, Naresh K Goyal, S Ramakrishnan, Bishwa Bhushan Bhatti, Vimal M dha, Anandaraja S, Arima Nigam, M P Girish, Ashutosh Sahu, Praveen Singh, Sanjay Tyagi

GB Pant Hospital, New Delhi

Ideal treatment for patients of severe mitral stenosis with severe mitral regurgitation (MR) is mitral valve replacement (MVR). Many of the symptomatic patients with severe mitral stenosis and regurgitation cannot undergo MVR because of socio-economic reasons. We attempted percutaneous transvenous mitral commissurotomy (PTMC) in 22 such patients after taking their informed consent. All the patients were NYHA class IV symptomatic and had severe pulmonary arterial hypertension (PAH). Mean age was 25±12 years and 16 were female. Mean mitral valve area (MVA) was 0.8 cm² and mean jet area of MR was 9.5 cm². Patients with more than minimal calcification of the mitral valve and significant subvalvular deformity were excluded. All the patients had normal left ventricular (LV) systolic function. Twelve patients also had mild aortic regurgitation and 17 patients had atrial fibrillation. All the patients underwent PTMC with Inoue balloon. Their pre-procedure mean left atrial (LA) pressure was 28±8 mmHg. After PTMC, mean LA pressure reduced to 15±6 mmHg. One patient had significant increase in regurgitation because of leaflet tear and required urgent MVR. In other patients mitral valve opened well and there was no significant increase in regurgitant jet area. All the patients had symptomatic improvement. At a mean follow-up of 6 months, all the patients were doing well. They were asymptomatic or had NYHA class I symptoms. The mean MVA at follow-up was 1.35 cm² and mean regurgitant jet area was 12 cm². To conclude PTMC may be considered as a palliation even in severely symptomatic patients with combined severe mitral regurgitation and stenosis.

### Blood Pressure Monitoring: A Noble Method for Stepwise Decision Making during Percutaneous Mitral Valvuloplasty

#### Mahmoud Shabetari, Leila Alizadeh

Imam Reza Hospital, Mashad, Iran

The efficacy and safety of percutaneous transvenous mitral commissurotomy (PTMC) performed by the Inoue technique is well known. Atrial septal puncture is a critical step and requires expertise, as it is a blind procedure. Transesophageal echocardiography (TEE) is used in some centers for septal puncture under direct vision. In this report of 23 cases, we present our experience with the modified and simplified technique of atrial septal puncture under fluoroscopic guidance. This technique involves delineation of atrial septum by contrast injection in lateral view and puncturing it in the same view in its junction of upper two-third and lower one-thirds (1 cm inferior and anterior to the aortic valve). The septum could be punctured in all the cases with success, without any major complications attributable to this technique. Using this technique, PTMC could be performed, even in difficult cases wherein the conventional method of puncturing atrial septum has failed. This technique can also be used for septal puncture for procedures like electrophysiological study and balloon atrial septostomy. We conclude that our modification of the septal puncture technique is safe and effective as it is done under direct visualization.

### Balloon Mitral Valvuloplasty: Our Experience with a Modified Technique of Septal Puncture

#### Y P Sharma, S Nandakumar, SG Vivekanand, KK Talwar

Postgraduate Institute of Medical Education and Research, Chandigarh

The efficacy and safety of percutaneous transvenous mitral commissurotomy (PTMC) performed by the Inoue technique is well known. Atrial septal puncture is a critical step and requires expertise, as it is a blind procedure. Transesophageal echocardiography (TEE) is used in some centers for septal puncture under direct vision. In this report of 23 cases, we present our experience with the modified and simplified technique of atrial septal puncture under fluoroscopic guidance. This technique involves delineation of atrial septum by contrast injection in lateral view and puncturing it in the same view in its junction of upper two-third and lower one-thirds (1 cm inferior and anterior to the aortic valve). The septum could be punctured in all the cases with success, without any major complications attributable to this technique. Using this technique, PTMC could be performed, even in difficult cases wherein the conventional method of puncturing atrial septum has failed. This technique can also be used for septal puncture for procedures like electrophysiological study and balloon atrial septostomy. We conclude that our modification of the septal puncture technique is safe and effective as it is done under direct visualization.
Transcatheter Closure of Perimembranous Ventricular Septal Defect by Amplatzer Devices: Immediate and Long-Term Follow-up Results

Vijay Trehan, Sibal M ukhopadhyay, Asit Khanna, Jamal Yusuf, Mohit D Gupta, R Batra, S Ramakrishnan, MP Girish, Sanjay Tyagi
GB Pant Hospital, New Delhi

Transcatheter closure of perimembranous ventricular septal defect (PMVSD) is an evolving new therapeutic modality even for patients with restrictive defects. We report our single center experience with amplatzer muscular ventricular septal occluder (AMSO) and amplatzer asymmetric perimembranous occluder (ASPO) with long-term follow-up results. Between January 1998 and December 2004, 82 patients (male 58, female 24), aged 2-33 years (median: 12 years) and weight 8-52 kg (median 24 kg) underwent closure of PMVSD (60 with AMSO and 22 with ASPO). Included were patients of PMVSD with (i) small band or rim of > 5 mm from aortic valve (for ASPO defects with <5 mm were also included), (ii) distance from centre to insertion of right coronary cusp >50% of required device size, and (iii) aneurysm formation. Size of VSD assessed by echocardiography varied from 2.5 to 12 mm (mean 5.2±2.1 mm). 36 patients had aneurysm formation and 7 had left ventricle to right atrial communication. Pulmonary to systemic flow ratio was >2:1 in 32 (39%) patients. Device was delivered through transvenous route in all cases except one. Devices were deployed under fluoroscopic and transthoracic echocardiographic guidance (TTE)/angiography and size of device chosen (4-14 mm) was 2 mm larger than that determined by TTE but equal to stretched balloon diameter (n=34). AMSO could be positioned successfully in all (n=60) while ASPO had to be retrieved in 3 patients who developed acute aortic regurgitation (AR) with hemodynamic compromise (superior margin of defect <3 mm from aortic valve in all) resulting in a procedural success rate of 96.4%. Incidence of residual shunt 24 hours after procedure was 3 (0.03%). All had trivial shunts that disappeared within 1 month. New tricuspid stenosis was observed in 1 patient with AMSO that resolved with balloon dilation. Patients were followed-up by TTE and ECG at 24 hours, and then at 1, 3 and 6 months thereafter. At 6-84 months (mean 38.2±12.8) follow-up, there was no incidence of migration/fracture of device, infective endocarditis, AR, hemolysis or development of conduction defect. Closure of PMVSD with amplatzer devices is safe and effective with low rate of complications.

Alcohol Ablation of Septum for Hypertrophic Obstructive Cardiomyopathy: Feasibility, Immediate and Short-Term Outcomes

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Sri Jayadeva Institute of Cardiology, Bangalore

Percutaneous transluminal septal myocardial ablation (PTSMA) is a non-surgical method of treating severely symptomatic hypertrophic obstructive cardiomyopathy. Prior studies indicate that results are as good as surgical myectomy; transcoronary ablation of septal hypertrophy may be an effective alternative to surgery. We sought to evaluate symptomatic and immediate and short-term outcomes of alcohol ablation of septum in severely symptomatic hypertrophic obstructive cardiomyopathy (HOCM) cases. From January 2002 to June 2005 we selected 66 cases for PTSMA out of which 21 cases could not undergo PTSMA because of unsuitable septal artery anatomy; 43 cases had left ventricular outflow tract (LVOT) obstruction and 2 cases had mid cavity obstruction. Mean age was 43.68±9.86 (range 18-64) years with 31 males and 14 females; 12 patients were in NYHA class II, 30 in NYHA class III and 3 in class IV. One patient underwent prior myectomy; one patient underwent DDDR pacemaker before the procedure. Mean gradient across LVOT was 88.65±42.32 mmHg; 5 cases had no resting gradient but significant gradient was seen on provocation. Gradients more than or equal to mitral regurgitation (MR) was present in 20 cases. Mean amount of alcohol injected was 1.8±1.2 ml. 42 patients underwent septal 1 (S1) injection, 2 cases underwent S2 injection and one case underwent multiple injections. Immediate reduction of gradient was seen in 33 cases. Immediately after the procedure, gradients reduced from 88.65±42.32 mmHg to 22.33±18.42 mmHg which further reduced to 12.38±5.68 mmHg at 6 months. Complications observed were right bundle branch block (RBBB) (29 cases) complete heart block (CHB) 25 cases (20 transient, 5 cases persisted for about a week, all reverted back); 3 cases had periprocedural ventricular tachycardia (VT), One patient had anterior wall myocardial infarction (AWMI) and ventricular septal defect (VSD) and died. Three cases had signs of systolic dysfunction at 6 months. One case underwent myectomy subsequently. Two cases of mid cavity obstruction had injection of second septal with excellent results. Overall success rate was 86% (39/45 cases) at 6 months, all of them were maintaining good NYHA class (1.17±0.67); all the successful cases had reduction in MR. No case necessitated pacemaker implantation. On follow-up, there was significant fall in left ventricular outflow tract obstruction, and also improvement in symptomatology.
atrial dimension and LV posterior wall thickness also. There were 2 deaths during this period (1 had AWM, 1 had recurrent VT); mortality rate was 4%. A procedural success rate of 96% with no pacemaker implantation with excellent improvement of NYHA class at 6 months, progressive reduction in LVOT gradient and (PW) thickness even at 6 months and a mortality rate of 4%, indicate that PTSMA is a safe and effective alternative to surgery for severely symptomatic HOCM patients.

**Mid-Term Results of Endovascular Interventional Therapy for Budd-Chiari Syndrome**

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The mid term results of angioplasty and stent placement in patients with Budd-Chiari syndrome (BCS) are being presented. Twenty-eight consecutive patients with BCS (male 18 and female 10; average age, 27 years; age range 14-55 years) were treated with percutaneous transluminal angioplasty (PTA) and stents during a 2-year period. The mean duration of symptoms was 36 months. Underlying coagulation disorder was the cause of occlusion in 10 patients, while 18 patients had no detectable etiology. Sites of stenosis/occlusion included the inferior vena cava (IVC) alone (n=4), hepatic veins alone (n=16) and combined IVC and hepatic veins (n=8). Negotiation of the lesion was attempted through a combination of transfemoral, transjugular, or transhepatic routes. All cases of IVC intervention (n=12) underwent balloon angioplasty alone, while 8/17 patients with hepatic vein intervention had a balloon-mounted stent placed across the obstruction. Clinical patency was defined as absence or improvement of symptoms. Clinical follow-up was supplemented with color Doppler sonography in all, and venography in two patients. Technical success was achieved in 92% (11/12) of IVC and 88% (15/17) of hepatic vein procedures. The pressure gradient across the lesion decreased from 20±8 mmHg to 8±3 mmHg for the IVC, and from 25±10 mmHg to 7±2 mmHg for the hepatic vein following the intervention. Symptoms and signs disappeared or were relieved after the procedure in 96% (27/28) patients. One patient with accessory right hepatic vein dilation did not improve and underwent surgery. Complications included subcapsular liver hematoma (n=2), neck hematoma (n=1) and pneumothorax (1), of which the first 3 resolved following cessation of intravenous heparin infusion post-procedure. Pneumothorax necessitated intercostal chest tube placement. Mean follow-up period was 12 months (range: 1-24 months). One patient had a hepatic vein instant restenosis that was successfully redilated. To conclude, angioplasty and stent placement is a safe and effective treatment in patients with BCS with good mid-term results.

**Non-Conventional Uses of Coronary Angioplasty Guidewires**

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Coronary angioplasty guidewires are currently used only during percutaneous coronary interventions (PCI). We report here the other uses of coronary angioplasty guidewires than PCI. We used radiopaque floppy tips of used coronary angioplasty guidewires sterilized with ethylene oxide to manage four patients of different clinical situations. Case 1 was of a coronary to pulmonary arterial fistula in a 55-year-old female [conus branch of right coronary artery (RCA) to main pulmonary artery] who presented with angina on exertion, where conventional metallic coils could not be delivered into the tortuous fistulous tract. Case 2 was a child with tetralogy of Fallot with recurrent hemoptysis from a coronary pulmonary artery fistula. Again, due to tortuous anatomy of the fistula, even a Tracker catheter could not be stabilized for delivering platinum microcoils. So, cut floppy tips of guidewires delivered through an over-the-wire balloon successfully occluded the fistula. Case 3 was a 38-year-old male with hypertrophic obstructive cardiomyopathy (HOCM) refractory to medical therapy, in which septal artery occlusion with wires was attempted because the anatomy was not suitable for alcohol ablation. In Case 4, a patient of coronary branch perforation following inadvertent balloon dilation, closure with wires was attempted. Usual principles of closure techniques were followed, except that cut floppy tips of coronary angioplasty guidewires were used. Procedure was successful in all cases. Check angiogram 48 hours later showed complete closure of the fistula. Septal artery in the patient of HOCM and coronary perforation closed within 10 to 15 min. The left ventricular outflow tract (LVOT) gradient reduced from 187 to 80 mmHg immediately following occlusion of septal artery. Post-procedure period was uneventful in all cases. Floppy tips of used intracoronary guidewires adequately sterilized with ethylene oxide can be used effectively and safely to close the abnormal vessels in selective patients at reduced cost.

**Coil Closure of Large Patent Arterial Ducts**

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Conventionally, device closure is preferred over multiple coils-based approach for large (≥4 mm) patent ductus arteriosus (PDA). Although coil closure is significantly cheaper, it is rarely being attempted for this population. We describe our experience with coil closure of large PDA. Retrospective
analysis of patients, who had coil closure of PDA measuring ≥4 mm by angiography, was done. There were 41 patients [14 (34%) males] mean age 14.1±12.2 years, range 10 months–38 years. The procedures were done between 2000-2005. All were symptomatic before closure (respiratory infection or heart failure or failure to thrive or palpitation). PDA was 4.8±1.3 mm (range: 4-10 mm). Mean left-to-right shunt ratio was 1.68±0.5 L/min. Mean pulmonary artery pressure was 21.5±15.9 mmHg. All were delivered with a biopomte. Three patients had an additional deployment of a detachable coil from the arterial side due to residual flow. Mean number of coils used was 4.6±1.3. Two (5%) patients required 2 coils; 20 (49%) required 3 coils; 17 (41%) required 4 coils and 2 (5%) needed 5 coils each. Six patients had mild residual flow at end of procedure, 5 of these resolved at 3 months follow-up. Limb ischemia occurred in 8 patients, all were <2 years and were treated conservatively. There were no other peri-procedural complications. Obstruction to left pulmonary artery or descending aorta was not seen in any patient. During the early period (2002-03), 4 patients switched over to device or surgery as multiple coils could not be adequately deployed due to the large size of PDA or small ampulla. In the latter period, these types of PDA also were closed with coils. Morphology of PDA or patient size did not influence the success rate. For large PDA, biopomte - assisted closure with multiple coils is safe and effective, even in very small children.

Predictors of Mitral Regurgitation in Patients undergoing Balloon Mitral Valvotomy
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Balloon mitral valvotomy (BMV) has been established as the preferred therapeutic approach for treatment of symptomatic mitral stenosis and mitral regurgitation (MR). It remains a common complication of the procedure. We studied 332 consecutive patients of severe mitral stenosis who underwent BMV with Jomiva balloon catheter at our institute, with the aim of looking for any clinical, echocardiographic, hemodynamic or procedural factors that could predict occurrence of MR after BMV. Eighty-four patients (Group I) who had either new MR or progression of pre-existing MR were compared to those 248 (Group II) patients who did not have progression of MR. There was no significant difference between age, sex, NYHA class, incidence of past closed mitral valvotomy (CMV), atrial fibrillation or associated aortic regurgitation. There was no significant difference between two groups in echocardiographic variables of mitral valve (MV) annulus size, leaflet excision, leaflet thickness, papillary muscle length, chordal length, left ventricular (LV) cavity length/MV annulus ratio and nodules on MV leaflets. On hemodynamic study; MV area, mean diastolic gradient, mean pulmonary artery (PA) pressure and mean PA wedge pressure before and after BMV were also similar between two groups. MV annulus to maximum balloon size ratio and number of balloon inflations were also similar between the two groups. Therefore, we conclude that none of the variables studied could predict occurrence of MR after BMV.

Elective Transradial Renal Interventions in Indian Population
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Traditionally, percutaneous renal intervention (PRI) is usually performed either through the femoral or brachial artery approach. Transradial approach (TRA) for coronary procedures is now well established, due to lack of major access site complications. However, its clinical applicability for PRI is limited. We report our experience (from January 2004 to May 2005) of elective PRI utilizing the TRA. In 35 patients with hemodynamically significant unilateral renal artery stenosis (mean diameter stenosis, 88.4±8.6%; right, n =14; left, n =21), PRI was performed using left (n=30) or right (n=5) radial artery access. None of the patients had contraindication for femoral approach. The indications for PRI were uncontrolled hypertension in 51.4% (18/35), renal impairment in 42.8% (15/35), and flash pulmonary edema 5.8% (2/35). Ostial involvement was present in the majority (82.8%, 29/35 cases), while others had proximal lesion. After engagement of the renal artery ostium with a guiding catheter, the stenosis was crossed with a 0.014” percutaneous transluminal coronary angioplasty (PTCA) guidewire followed by stent implantation or balloon dilation. Guiding catheters used were Judkins right, Multipurpose and Patel right. The majority were 6 F in size and had standard length. Direct stenting was successfully performed in 74.3% (26/35) cases. Pre-dilation was required in 29.7% (9/35) cases. In 8 (22.8%) patients, optimal stent expansion was achieved by additional post-dilation. Majority (94.3%, 33/35) of vessels were stented and remaining 2 vessels had cutting balloon angioplasty. Mean stent length was 16.6±2.1 mm (range: 12-18 mm); mean stent diameter was 5.8±1.4 mm (range: 4.0-8.0 mm). Peripheral stents (Genesis: 22, Express SD: 4, AVE Bridge: 2) were used in the majority; in remaining patients, coronary stents were used (Propass 1, ST: 2, Driver: 2). Average deployment pressure was 11±2.6 atm. Angiographic success (residual stenosis <30%) was achieved in all cases. There was no crossover to the femoral route. There were no peri-procedural complications. Minor complications (pain, spasm and minor hematoma) were seen in 2 (5.7%)
Are Distal Protection Devices Underutilized in Peripheral Vascular Interventions?

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Distal protection devices are being used extensively in carotid stenting and its usage has been extended to renal interventions as well. The use of distal protection devices in peripheral vascular interventions has not been mentioned in the literature. We have come across some cases of distal thromboembolism during peripheral vascular interventions in thrombotic lesions of superficial femoral artery (SFA). This situation was seen in plain balloon angioplasty of SFA lesions in diabetic patients presenting with lower limb ischemia and distal atheroembolism. We proceeded to use distal protection devices in 2 such cases to preempt this complication. We have used Filter - EZ wires (Boston-Scientific, USA) in 2 cases of peripheral intervention in diabetics presenting with lower limb ischemia and distal embolism clinically suggested by multiple toe gangrene with interspersed normal areas. The first patient had critical external iliac stenosis and the second had popliteal stenosis with thrombotic lesions on angiography. In both the cases, the Filter - EZ wire was placed in the popliteal artery. Medronic SE 9×37 mm stent was used for iliac stenosis and plain balloon angioplasty was done for the popliteal artery. In both the cases, good chunk of plaque/thrombotic tissue (3 mm) was caught in the filter. These cases exemplify the role of distal protection device in specific situations of peripheral vascular intervention to prevent distal embolization. Positive catch of good chunk of material highlights the potential complication of the distal embolization, if the distal protection devices were not used.

Immediate Outcome of Peripheral Vascular Intervention

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Seventy cases of peripheral vascular disease (PVD) were treated by percutaneous method from May 1999 to October 2004. Symptoms, risk factors and angiograms of all cases were analyzed. There were 44 (62.8%) male and 26 (37.1%) female with mean age of 51.2 years (range 18-80 years). Risk factors analysis revealed diabetes in 19 (27.1%), hypertension 39 (55.7%), smoking 7 (10%), chewing tobacco 3 (4.2%) and hyperlipidemia in 2 (1.4%); 33 (47%) cases presented with
limb ischemia and out of that 25 (35.7%) had acute ischemia of either upper or lower limb; 23 (32.8%) cases of renal angioplasty presented with hypertension. Distribution of treatment in different parts of vascular system is as follows: aorta 2 (2.8%), renal 23 (32.8%), iliac 13 (18.6%), femoral 7 (10%), popliteal 5 (7.1%), tibial 1 (1.4%), carotid 2 (2.8%), subclavian 5 (7.1%), inferior vena cava (IVC) plasty 4 (5.7%), IVC filter 3 (4.2%), subclavian vein plasty 1 (1.4%) and coil embolization 5 (7.7%). Lower limb interventions were carried out by ipsilateral, bilateral or contralateral approach. In two cases femoral artery was punctured in antegrade direction for popliteal and tibial angioplasty. Other approaches used were radial and brachial. Total 54 stents were deployed. Out of 33 cases of limb ischemia 10 (33.35%) cases had percutaneous transluminal angioplasty (PTA) and thrombolysis, 8 (24.2%) had only thrombolysis and 15 (45.5%) had PTA with stenting; 3 (4.2%) cases were treated with cutting balloon angioplasty; 4 (5.7%) cases underwent simultaneous coronary angioplasty. Immediate results were analyzed. There were 2 (2.8%) deaths, 2 cases had groin hematoma and in 1 case the lesion could not be crossed. One patient had to undergo partial amputation (great toe) in spite of PTA to tibial artery. In one case the coil was embolized and retrieved subsequently. In conclusion, peripheral vascular intervention has become an important alternative to surgical treatment, specially for limb ischemia. Generally dedicated interventional radiologist performs peripheral vascular interventions in most of the centers. In their absence interventional cardiologist has to perform various vascular interventions and in our centre we had acceptable immediate results.

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Sixty-eight consecutive patients underwent transesophageal echocardiography (TEE) before elective percutaneous transvenous mitral commissurotomy (PTMC) on the day of procedure. The mean age of the patients was 32±5.6 years: male: 23, female: 45. Dense spontaneous echo contrast was seen in 36 patients. All of them had a mean gradient of more than 15 mmHg. Quantification of mitral regurgitation (MR) was further confirmed after TEE. In 6 patients, more than grade I MR was found which was not seen in TEE. All of them underwent successful PTMC without increase in severity of MR. Two patients had transient ischemic attack (TIA) following PTMC despite absence of clot in TEE. In three patients, the valve score was properly assessed after TEE. Interatrial septal (IAS) aneurysm was found in two patients. IAS puncture was difficult in these two cases. Patent foramen ovale (PFO) was observed in five patients (it did not affect the IAS puncture). To conclude, routine TEE is recommended in all cases awaiting elective PTMC. Whether it additionally decreases the chance of complications is not addressed in this study, but the severity of stenosis can be better assessed by TEE. The correlation between mean diastolic gradient (MDG) across mitral valve and spontaneous echo contrast was observed and better delineation of IAS anatomy was feasible.
Coil Closure of Patent Ductus Arteriosus without Arterial Puncture

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Coil closure of patent ductus arteriosus (PDA) is generally done through the venous route and documented by retrograde descending aortic angiography. We describe our experience with coil closure of PDA without arterial puncture. Between 2000-2005, 303 patients underwent coil closure of PDA. Retrospective analysis was done of those who had closure of PDA without arterial puncture. There were 108 patients (45 males, 42%), mean age 3.9 ± 5.1 years (range: 10 months - 36 years). Closure was done through venous route using single coils or biopomte-assisted delivery of multiple coils. Decision to avoid arterial puncture was based on operator preference, presence of good ampulla and the availability of echocardiography. Three patients who crossed over to need arterial puncture were not included. Mean left-to-right shunt ratio was 1.49 ± 0.66 L/min. Mean size of PDA was 2.47 ± 0.69 mm (range: 2 mm - 4.1 mm). Clear landmarks for coil deployment with fluoroscopic guidance were available. Echocardiographic monitoring of residual flow was performed at the end of procedure. Pulmonary artery mean (PAM) pressure averaged 16.1 ± 3.2 mmHg. Mean number of coils used was 1.4 ± 0.6. Seventy-three patients required 1 coil; 24 (22%) required 2 coils; 11 (10%) required 3 coils. Auscultation and echocardiography were used to assess closure at the end of procedure. Twelve patients had mild residual flow at end of procedure. All of them resolved at 3 months follow-up. There was no instance of limb ischemia. There were no other peri-procedural complications. Obstruction to left pulmonary artery or descending aorta was not seen in any patient by echocardiography. During the early period (2000-02), 114 patients had coil closure; 26 (23%) of them had no arterial puncture. During the later period (2000-02), 114 patients had coil closure; 26 (23%) of them had no arterial puncture. Mean age of the patients in the earlier period was 6.7 ± 5.9 years while it was 3.1 ± 2.7 years in the later period (p < 0.002). Mean PAM pressure was 14.2 ± 2.8 mmHg in the early period and 17.5 ± 5.3 mmHg in the later period (p < 0.01). To conclude, coil closure of PDA is safe and effective without arterial puncture in most of the patients. Clear landmarks for deployment, good ampulla and echocardiographic monitoring should be available. As the learning curve improves, more number of patients, larger ducts and those with higher pulmonary artery pressure are being considered for coil closure without arterial puncture. Avoiding arterial puncture saves time and cost and reduces vascular complications.

Is Computerized tomographic Angiography Superior to Cardiac Catheterization in Evaluation of Congenital Heart Disease

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To assess the diagnostic accuracy of multislice computerized tomographic angiogram (CTa) in management of congenital heart disease, CTa was performed in 65 consecutive patients of congenital heart disease (CHD) where echocardiographic data was inadequate for surgical fitness. Patients were classified as follows: tetralogy of Fallot (TOF): 25; ventricular septal defect (VSD) pulmonary artery (PA) collaterals: 17; single ventricle (SV) physiology: 8; arch anomalies: 7; peripheral pulmonary stenosis (PS): 2; partial anomalous pulmonary venous connection (PAVPC)/total anomalous pulmonary venous connection (TAPVC): 3; others: 3. Initial 22 patients underwent both cardiac catheterization (Cath) and CTa. Subsequent 30 patients were evaluated pre-operatively only by CTa. Surgical confirmation was used as the reference standard. 13 patients who underwent Cta were advised medical follow-up. Of 22 patients who underwent both catheterization and CTa, 17 had no discrepancy between catheterization, CTa and surgery. In 4 patients pulmonary or arch anatomy were not very clear by cardiac cath but was properly delineated by CTa. In one patient, CTa could not profile collaterals clearly which were profiled by cath. The sensitivity of CTa was found to be 98.4%, cath 81.8%. Of 30 patients who underwent CTA only, 3 patients needed cath; one due to inadequate image, one to obtain pressure data, and the other for coil-embolization. In all patients the findings correlated with that of surgery. Efficacy in this group was 96.6%. Also, management became easier in the last group (n=10) due to excellent anatomical profile. It is concluded that CT angiography can be an acceptable alternative to cardiac catheterization in pre-operative diagnostic assessment and post-operative follow-up.

A Review of Electrocardiographic Features in Tetralogy of Fallot in Indian Patients

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The pre- and post-operative electrocardiographic features in relation to the anatomic and hemodynamic features of 340 consecutive patients who underwent corrective surgery for tetralogy of Fallot (TOF) in our Institute from 2001-2004 were analyzed retrospectively. The following ECG parameters were noted - PR and QRS durations, P wave and QRS axes, QRS morphology and amplitude of R wave in V5, and V1, presence or absence of T wave inversions in V5, presence of right atrial enlargement, and the presence of abrupt transition of R from
Assessment of Right Ventricular Function in Congenital Heart Disease: Correlation between Various Echocardiographic Indices
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Assessment of right ventricular (RV) function is challenging, due to the complexity of RV chamber geometry and because of the load dependency of RV function. The aim of our study was to examine the correlation of RV function assessment by Simpson's method with tricuspid annular plane systolic excursion (TAPSE) and myocardial performance index (MPI) or Tei index by Doppler tissue imaging (DTI). From January 2005 to June 2005, a total of 58 patients with various congenital heart diseases (CHD) undergoing catheterization studies, aged up to 12 years were included in the study group. The CHDs were: ostium secundum atrial septal defect (OSASD); 13, total anomalous pulmonary venous connection: 3, ostium primum ASD: 2, ventricular septal defect (VSD): 12, patent ductus arteriosus (PDA): 11, tetralogy of Fallot (TOF): 11, trileogy of Fallot: 3, ASD plus VSD: 3. Echocardiograms and DTI were performed in all of them using an Agilent Sonos 5500 (Philips) machine. TAPSE was determined in apical four-chamber view. A value of <1.5 cm was considered abnormal. RV ejection fraction (EF) was calculated from apical 4-chamber view and subcostal 4C view using the Simpson's rule. (End diastolic volume-End systolic volume/End diastolic volume). A value of <50% was considered abnormal. DTI was performed in apical 4C view (high frequency filters, Nyquist limit <30 cm/s, minimal gains). MPI was calculated as follows: Isovolumic contraction time+Isovolumic relaxation time/ejection time. A value <0.40 was considered abnormal. All patients subsequently underwent catheterization studies. All the indices revealed RV dysfunction in all the three cases of trileogy of Fallot and in an older child with TOF. In two patients with VSD and pulmonary hypertension, in one patient with PDA and bi-directional shunt, in two patients with ASD and VSD, RVEF was normal by Simpson's rule and TAPSE was normal. But these patients had abnormal RV global function, as assessed by TDI (MPI > 0.40). These patients also had elevated RV end-diastolic pressures on right heart catheterization. The three patients with trilogy of Fallot underwent percutaneous balloon pulmonary valvuloplasty successfully. After 3 months of follow-up, RV function has normalized on repeat Echo assessment in all three patients. Study limitations include small number of patients and the load and heart rate dependency of RV function was not accounted for. We conclude that compared to the assessment of RVEF by Simpson's method, TAPSE and DTI indices such as MPI are easier to obtain and are reproducible. A TAPSE of <1.5 cm correlates well with RV systolic dysfunction. As MPI integrates isovolumic and ejection phases, it is the earlier and more sensitive indicator of RV dysfunction, before RVEF becomes abnormal.

Isolated Subvalvular Pulmonary Stenosis - Clinical and Hemodynamic Profile
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Isolated subvalvular pulmonary stenosis is a relatively uncommon condition, it comprises 1.5-10% in various series. The obstruction may be at infundibular or subinfundibular level. The aim of this study was to retrospectively analyze the clinical and hemodynamic profile of these patients. From 1979 to 2004, 5800 patients with congenital heart disease had undergone cardiac catheterization at our institute. Of these
27 had isolated subvalvular pulmonary stenosis and 150 had isolated valvular pulmonary stenosis. Their mean age was 22.5 years (range: 6-64 years) and 15 (55%) were males. Presenting symptoms were dyspnea: 19 (70%), palpitation: 12 (44%), syncope: 12 (44%) and recurrent respiratory tract infection: 10 (37%). Clinically all had ejection systolic murmur and signs of right ventricular hypertrophy. ECG showed "P" pulmonale in 6 (22%) with QRS axis > +60° in 22 (81%) and right ventricular hypertrophy in 14 (52%) patients. Chest X-ray showed cardiothoracic (CT) ratio > 50% in 20 (74%) and enlarged main pulmonary artery (MPA) in 8 (30%) patients. On cardiac catheterization, 9 patients had mean right atrial pressure (RAP) > 8 mmHg (33%). Mean right ventricular (RV) systolic pressure 115 mmHg (range: 40-220 mmHg). Twelve (44%) patients had supra systemic RV systolic pressure. Left ventricular (LV) angiogram showed interventricular septum (IVS) aneurysm in 5 (18%) patients. The level of obstruction was infundibular in 18 (67%) and subinfundibular in 9 (33%) patients. To conclude, in this small series males predominate, dyspnea was the commonest symptom, features suggestive of pre-existing shunt at ventricular level noted in 1/3 and RV supra systemic pressure in 44% of cases.

Single Center Experience of Double Outlet Right Ventricle Patients Requiring Single Ventricular Repair

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Double outlet right ventricle (DORV) is usually amenable to biventricular repair. DORV may be associated with certain complex features, which may preclude biventricular repair and make Fontan procedure a preferred modality with better outcome. Complex anatomic features which favor single ventricular repair include atroventricular septal defects (AVSD), inlet ventricular septal defect (VSD), straddling of one of the AV valves, multiple VSDs, and hypoplasia of one of the ventricles. We retrospectively analyzed all our cases of DORV undergoing single ventricular repair from 2003 to 2005 to see which factors prevented bi-ventricular repair. DORV was defined as origin of one great vessel along with >50% override of the other great vessel from right ventricle (RV) and presence of bilateral conus. We identified 12 cases of DORV (4 males, 8 females; age range: 6 months-5 years) who were subjected to single ventricular repair. All patients presented with cyanosis and failure to thrive since birth. Echocardiographic features, which prevented bi-ventricular repair, included AVSD (6 cases), multiple VSDs (4 cases) and hypoplasia of left ventricle (LV) (2 cases). Four cases had straddling of AV valve as well (2 with AVSD and 2 with multiple VSDs). Associated pulmonary atresia was seen in 2 cases and severe infundibular and valvular pulmonic stenosis (PS) in 8 cases. Only 2 cases had no PS, both of which underwent pulmonary artery (PA) banding as initial treatment. Surgery performed included bidirectional Glenn (BDG) in 11 patients of which 4 were bilateral BDG. Two cases needed ligation of Blalock Taussig shunt performed earlier. One patient underwent total cavopulmonary anastomosis as a single stage procedure. Four others underwent completion of extracardiac Fontan procedure subsequently. We conclude that reason to offer single ventricular repair in DORV is related to the morphology of the VSD in most cases at our centre, AVSD being the commonest.

A Rare Case of Criss-Cross Heart with Corrected Transposition and Ebstein's Anomaly of Left-Sided Atrioventricular Valve

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An apparently healthy, athletic, 20-year-old male, was referred to our hospital with recent onset dyspnea and cyanosis on exertion. On enquiry, his mother recollected cyanosis at birth, which had disappeared by 6 months of age. Her clinical examination revealed raised jugular venous pressure (JVP), cyanosis, and a pansystolic murmur at the apex and an unremarkable 2nd heart sound. Chest X-ray showed situs solitus with mild cardiomegaly and prominent aortic knuckle and ascending aorta. Echocardiography revealed anteroposterior relationship of the aorta with criss-crossing of the jets from the anteriorly placed right atrium (RA) to the posteriorly placed right ventricle (RV) and from left atrium (LA) to anteriorly placed left ventricle (LV). There was a large perimembranous ventricular septal defect (VSD) (1.4 cm). RV gave rise to an L-posed, anteriorly placed aorta and LV to pulmonary artery, which was larger and had multiple septations/bands above the valve, but with no significant gradient. The septal leaflet of the left (tricuspid) atrioventricular (AV) valve was grossly displaced downward producing atrialization of LV and also a severe regurgitation. Catheterization was planned but the patient had sudden cardiac death due to an unknown cause just before planned admission. Criss-cross heart is a rare anomaly in an adult and it may have normally related or transposed (D or L type) vessels. Review of literature does not show any mention of this combination of criss-cross heart, L-transposition and a left-sided (posterior) Ebstein's malformation.

Rotational Digital Angiocardiography in Congenital Heart Disease: Initial Single Centre Experience

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Angiocardiography in congenital heart disease (CHD) poses the challenge of extensive variance in anatomical
relationships. Fixed-angle projections and limitations of contrast dose may often lead to an incomplete study. Rotational angiography (RACG) provides enhanced visual information, and has been shown on single-plane systems to provide savings in contrast volumes and radiation dose. We tested RACG at our center on InnovaSpin™ (GE Innova 2000, Milwaukee, WI) to ascertain the clinical benefits of the technique on a variety of older children with CHD (n=16). Mean age of patients requiring diagnostic angiography was 9.6 years. The patient population included those with ventricular septal defect (VSD) (n=2), tetralogy of Fallot (TOF) (n=6), TOF with absent pulmonary valve (n=1), corrected transposition of great vessels (CTGV) (n=1), double outlet right ventricle (DORV) (n=2), hemitrunicus (n=1), aorto-cameral fistula (n=1), supravalvular aortic stenosis (n=1) and persistent truncus arteriosus (n=1). RACG provided us with a clear and dynamic definition of cardiac anatomy as well as relationships with a single contrast injection allowing for quantification of lesions in several projections. Significant contrast media (0.75 ml/kg/patient) and radiation dose savings were seen. The main benefits being the vivid demonstration of pulmonary artery anatomy; relationships and course of great arteries; semilunar- atioventricular (AV) valve discontinuities and elaboration of conal tissues and the course of coronaries, shunts and patent ductus arteriosus (PDA). Rotational angiography is thus a promising alternative to bi-plane angiography and a useful option in centres with a single plane catheterization laboratory that can be shared by adult as well as pediatric patients.

**Crochetage Sign: A New Independent Electrocardiographic Sign of Atrial Septal Defect**

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Crochetage sign is basically a notch near the apex of R wave in inferior leads (II, III and aVF) of surface electrocardiogram (ECG). The aim of our study was to substantiate the diagnostic role of this sign in atrial septal defect (ASD) of secundum type. We selected cases attending our institute. Sixty cases of ASD secundum type were studied. All the cases were subjected to 12-lead ECG and echocardiography and also the color Doppler. Crochetage sign was found positive in 90% of ASD compared to 10% of other congenital heart diseases and 13.3% of acquired heart disease. This sign was positive in 4% of isolated right bundle branch block (RBBB) and only 2% of control group. Cases of ASD with negative sign had a small shunt. Pulmonary arterial pressure did not affect this sign. Six cases were followed up after ASD closure and it revealed disappearance of this sign. It is concluded that Crochetage sign on surface ECG is a valuable sign of ASD and positivity depends on size of ASD and significant left-to-right shunt irrespective of pulmonary arterial pressure.

**Echocardiographic Study of Truncus Arteriosus**

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Cases of truncus arteriosus constitute 2-3% of congenital heart defects. A review of 8300 echocardiograms performed during the past 9 years in our institution in patients with congenital heart disease revealed truncus arteriosus in 47 (0.6%) patients. A majority of patients were male (72%) and the mean age was 2.5±1.0 years (range: 6 days -19 years). Type I truncus arteriosus was the most common (87%), Type II (4%) and Type III (9%) were infrequently seen. Generally, SDX subset was seen (98%). One patient belonged to AX subset. Subtruncal ventricular septal defect (VSD) was large and non-restrictive in all patients except one. Truncal valve (TV) was quadricuspid in a majority (64%) of the patients; tricuspid (29%) or bicuspid (7%) valve was present in the remaining patients. Regurgitation of the TV was present in 65% of the patients, reported as mild in 36%, moderate in 25% and severe in 4%. Occasionally (4%) a stenosed truncal valve was found. An overwhelming majority (90%) had developed pulmonary hypertension at presentation. However, pulmonary stenosis was uncommon (5%). Left pulmonary artery could not be seen in 8% of patients. Two patients had a patent ductus arteriosus (PDA). Associated anomalies included a left superior vena cava in 2 patients and an interrupted aortic arch, tricuspid atresia, common atrium or a single ventricle in 1 patient each. A review of our echocardiographic database suggests that truncus arteriosus is a relatively rare congenital heart disease. Type I variety is predominantly found. The truncal valve is commonly quadricuspid and is regurgitant in two-third of the cases. Suboptimal delineation of pulmonary arteries suggests the need of an additional imaging modality.

**A Rare Case of Double Chambered Right Ventricle Associated with Congenital Absence of Pulmonary Valve**

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A double chambered right ventricle (RV) is a relatively uncommon congenital cardiac defect in adults, characterized by presence of anomalous muscle bundles dividing the RV into a high pressure proximal chamber and a low pressure distal chamber. It is reported to be associated with various other anomalies, commonly ventricular septal defect (VSD),
Role of Oral Sildenafil in Eisenmenger Syndrome: Cardiac Catheterization Follow-Up Study

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Eisenmenger syndrome (ES) is associated with severe disability and poor prognosis. Presently, no safe and effective therapeutic option is available except heart-lung transplantation. There are only anecdotal reports of therapeutic efficacy of sildenafil in these patients. Its effect on various cardiac catheterization parameters is also not well established. This study was conducted to evaluate the safety and efficacy of oral sildenafil therapy in patients of ES. In this ongoing study, we have studied 8 patients of ES (3 secondary to atrial septal defect (ASD), 1 with ventricular septal defect (VSD), 3 with patent ductus arteriosus (PDA) and 1 with combined lesions; male-female ratio: 5:3, mean age: 28.38±10.9 years, range: 13-45 years). Two patients were in NYHA functional class II while 6 were in NYHA class III (mean NYHA class: 2.75±0.6). Baseline as well as echocardiographic and cardiac catheterization study was performed in all patients. Sildenafil was started at a low dose (6.25 mg thrice a day) and was gradually increased up to a maximum dose of 300 mg/day. Mean maximum dose achieved was 285±33.54 mg per day (range: 225-300 mg/day). All patients tolerated the drug very well and no major side effect was observed in any patient. One patient reported rhinorrhea at 300 mg/day dose which responded by decreasing the dose to 150 mg/day. No significant fall in blood pressure was noticed in any patient. At mean follow-up of 9.1±6.6 months (range: 6-18 months), functional class improved by ≥1 class in all patients. Mean NYHA class was improved from 2.63 to 1.23. Six-minute walk test distance was improved significantly from 255.68±86.35 m to 399.8±73.15 m (p=0.001). Follow-up cardiac catheterization revealed significant fall in pulmonary artery (PA) systolic pressure (108.43±90.2 mmHg v. 98.8±11.5 mmHg), PA diastolic pressure (47.57±12 mmHg v. 40.8±10.9 mmHg), PA mean pressure (68.43±11.6 mmHg v. 58.4±11.4 mmHg) with a significant fall in pulmonary vascular resistance (PVR) [12.69±2.6 WU v. 6.5±3.1 WU (p<0.02)]. PVR: SVR ratio also decreased from 0.520±0.278 to 0.284±0.128 (p<0.01). To conclude, oral sildenafil therapy is safe, it improves functional class and decreases pulmonary artery pressure and pulmonary vascular resistance in patients of Eisenmenger syndrome.
Cryo-modified Maze in Patients with Atrial Fibrillation undergoing Concomitant Cardiac Surgery
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Chronic atrial fibrillation (AF) persists in majority of patients after correction of underlying structural abnormality. Maze procedure is an effective surgical method to eliminate AF. Maze incisions can be equally effective with various energy modalities. Cryo energy has been shown to be superior to radiofrequency and microwave energy lesions. In this study, we used cryo energy to create lines of conduction block in left atrium during cardiac surgery as a modification of maze III procedure. Between October 2004 and June 2005, 12 patients (6 males, 6 females, mean age 37 years) of chronic AF underwent concomitant cardiac surgery. Mitral valve replacement for rheumatic mitral valve disease was done in 11 and one patient underwent off-pump coronary artery bypass graft surgery (OPCAB). Endocardial modified maze was done in 11 and epicardial procedure in one patient. The additional crossclamp time required for the AF ablation procedure was 16±4 min. There were no peri-procedural complications because of cryo lesions. Eleven patients were in sinus rhythm post-surgery and one patient who underwent epicardial ablation converted to sinus rhythm in 3rd post-operative week. Over a mean follow-up of 5.6±3 months, all patients are maintaining sinus rhythm on single antiarrhythmic drug (amiodarone). Cryo-modified maze as an adjunctive procedure is safe, economical, time-saving and effective in eliminating chronic atrial fibrillation.

Radiofrequency Ablation of Arrhythmias in Pediatric Population
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We narrate our experience of the last 5 years, regarding radiofrequency ablation (RFA) of arrhythmias in children ≤16 years. Among 929 RFA procedures performed in the last 5 years, 36 (4%) procedures were performed in children (mean age: 12.4±1.3 years, 20 boys). RFA was performed for supraventricular tachycardia (SVT) in 24 (66%) patients [atrioventricular nodal reentrant tachycardia (AVNRT): 4, left lateral accessory pathway (AP): 10, right-sided AP: 5, left posteroseptal AP: 3, right posteroseptal AP: 2] and for stable ventricular tachycardia (VT) in 12 (36%) patients [right ventricular outflow tract (RVOT) VT: 6, fascicular VT: 6]. All but 3 patients with SVT had a structurally normal heart. Two out of the three patients with right-sided AP had Ebstein's anomaly while remaining 1 had an interrupted inferior vena cava. Three patients with VT had a dilated cardiomyopathy (DCM) [mean left ventricular (LV) ejection fraction: 25%], while other patients had a structurally normal heart. Prior to RFA calcium channel blockers (66%) were used most commonly, followed by beta-blockers (24%) and amiodarone (10%). Ablation was successful in all but one case (97%). In one patient who had two morphologies of RVOT VT, only one morphology could be induced and successfully ablated. LV ejection fraction improved (>50%) at 3 months in all the 3 patients with DCM following successful ablation. All diagnostic as well as ablation catheters were introduced by the femoral route using 6 F, 5 F and 7 F sheath in the descending order of frequency. In only 1 patient, the internal jugular vein was used for access. Left-sided AP ablation was performed.
Treatment of Incessant Ventricular Tachycardia in Patients with Structural Heart Disease

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Radiofrequency ablation (RFA) may be the only therapeutic option remaining for patients with incessant ventricular tachycardia (VT). From a group of 146 patients with structural heart disease (ischemic: 117, others: 29) who underwent RFA of VT at our centre between 1991 and 2002, 13 patients [8.9%, 65±14 years, 12 men, ischemic:11, right ventricular (RV) dysplasia:2] underwent ablation of an incessant VT (477±86, 360-600 ms). Despite intravenous amiodarone and/or procainamide (n=12), repeated overpacing (n=7) and/or external cardioversion (n=3), implantable cardioverter-defibrillator (ICD) therapies (shocks:3, anti-tachycardia pacing: 4) and intravenous sedation (n=3), right bundle branch block pacing (RBBB: 10, left bundle branch block (LBBB): 5) were recurrent in every patient. The mean left ventricular (LV) ejection fraction was 31±15%. The target clinical VT was incessant (n=10) or was suppressed by procainamide infusion and required induction (n=3). RFA was performed using entrainment criteria (n=3), activation with/without pace mapping (n=7) or the CARTO electroanatomical mapping system (n=3). The target VT was successfully ablated in the LV (n=3), RV (n=2), or on both sides of the ventricular septum (n=1) in 10/13 (77%) patients after a delivery of 5±4 pulses. In-hospital, 7 (54%) patients had no recurrence. Recurrences of sustained VT required re-RFA (n=4), further optimization of AAD therapy (n=1) or ICD implantation (n=1) prior to discharge in the remaining 6 patients. A follow-up of 22±18 months (range: 4-70 months), 4 patients had no VT recurrences, 2 patients had received appropriate ICD therapies, 1 patient underwent re-RFA and 6 patients had died [heart failure (HF) in 4 patients, sudden death and intracranial bleed in 1 patient each]. Our results suggest a moderate acute procedural success (77%) of RFA in patients with incessant VT. However, recurrences of VT and heart failure adversely influence the long-term outcome.

Ablation of Supraventricular Arrhythmias Guided by CARTO Electroanatomical Mapping

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We present the results of CARTO electroanatomical mapping and ablation (AB) of supraventricular tachyarrhythmias (SVT) performed at our centre. Between August 2004 and January 2005, 6 patients (mean age: 30±13, year: range: 17-53 years, 3 men) underwent ablation of symptomatic SVT. Procedural details are shown in Table.

ARVD: arrhythmogenic right ventricular dysplasia; ASD: atrial septal defect; AFL: atrial flutter; AT: atrial tachycardia; CMC: closed mitral commissurotomy; LPV: left inferior pulmonary vein; MA: mitral annulus; RSPV: right superior pulmonary vein

Guided by the CARTO electroanatomical mapping system, ablation was successful in 5/6 (83%) patients. In every patient a minimum follow-up of 6 months was available. One patient had recurrence of the ablated atrial tachycardia (AT) following initially successfully ablation. In conclusion, CARTO electroanatomical mapping allows a detailed understanding of the mechanism of SVT and guides successful ablation.

Arrhythmogenic Right Ventricular Dysplasia: A Comparative Study of Different Imaging Modalities with CARTO-Based Electroanatomical Mapping

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Arrhythmogenic right ventricular dysplasia (ARVD) is morphologically characterized by fatty infiltration in the right ventricular (RV) wall which can lead to RV dysfunction. In some patients the left ventricle could be involved. Different imaging modalities such as echocardiography, magnetic resonance imaging (MRI) and angiocardiography can localize the ventricular involvement. Bipolar voltage mapping (scar defined as ≥0.1mV) performed using the CARTO electroanatomical mapping system can localize the scar and
consequently the dysfunctional and arrhythmogenic areas. Four patients with ARVD who had recurrences of ventricular tachycardia and were considered for ablation using the CARTO electroanatomical mapping system were included in this study. The results are tabulated.

<table>
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<td>Normal LV function</td>
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Our results show that a combination of various imaging modalities and the CARTO electro-anatomical mapping can help to confirm the diagnosis of ARVD and evaluate the RV in terms of dysfunctional -hypocontractile and arrhythmogenic regions.

Radiofrequency Ablation of Ventricular Tachycardia using Unipolar Ablation Electrograms

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Percutaneous catheter radiofrequency (RF) ablation of ventricular tachycardia (VT) has been found to an effective and desirable modality of treatment in some types of VT. Idiopathic ventricular tachycardia has been found to be particularly amenable to RF ablation. Eleven cases of VT have been treated by RF ablation in the past. They included right ventricular outflow tract (RVOT) VT in 7 and idiopathic left ventricular VT (ILVT) in 4. There were 9 men, and the mean age was 33, with the youngest being 11 years and the oldest 62 years. The electrophysiological study (EPS) procedure was done using a Prucka 4000 EP Lab, an EPT 1000 RF generator and a Bloom stimulator initially and a Micropace stimulator later. All the cases (100%) could be successfully ablated using conventional methods: mapping the earliest ventricular electrograms during tachycardia or, mapping the ventricular premature depolarizations (VPDs) and pace mapping to confirm. In one case ablated with the use of VPDs as endpoint; the VT recurred after three months and successful RF ablation was done in the second sitting. The later cases (5 cases) were ablated using the unipolar signal from the RF ablation catheter tip. The presence of an early ventricular negative signal with a sharp initial deflection indicated the site of the successful RF ablation consistently and with great accuracy. All the cases done using unipolar mapping were successful and there was no recurrence in this group. In conclusion, idiopathic VT can be successfully treated by radiofrequency ablation using conventional methods, sharpened by using the unipolar electrogram in the RF ablation catheter.

Baseline Characteristics, Electrophysiological Findings, Immediate and Follow-up Results of Radiofrequency Ablation of Accessory Pathways - A Retrospective Analysis

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A total of 170 patients (mean age: 39 years, range: 11-67 years; male-female ratio 1:2) underwent electrophysiological (EP) study and attempted radiofrequency ablation (RFA) for atrioventricular reentrant tachycardia (AVRT) from March 2000 to March 2005. Symptoms persisted for more than 2 years prior to referral in 82% patients and 8% underwent EP evaluation within 1 year of onset of symptoms. A history of cardioversion was available in 3% patients. Manifest premature on surface ECG was seen in 87 (51%) patients. In the EP lab orthodromic tachycardia was inducible in 88% patients and the remaining had either antidromic tachycardia or atrial fibrillation with pre-excitation. The location of the accessory pathway (AP) was left lateral in 85 (50.3%), septal in 36.7%, anteroseptal 7 (11.2%), mid septal 6(9.6%) and posteroseptal 49 (79%), right free wall in 16 (9.4%) patients. Six (3.5%) patients had a Mahaim pathway. Successful RFA of the AP was achieved in 95% of the patients. The preferred approach in our institute for left lateral AP was transseptal which was done in 94% and the remaining 6% had retrograde transaortic approach. Two patients had cardiac tamponade requiring pericardiocentesis (one each during coronary sinus (CS) cannulation and radiofrequency energy delivery). One patient had an uncomplexed pericardial entry during CS cannulation. One patient had a frontal lobe infarction within 48 hours following a left free wall AP ablation. One patient had associated coronary artery disease hence EP and RFA was deferred. Two patients with mid/anteroseptal pathway opted out of RFA due to high risk of complete heart block (CHB). Attempts at RFA were unsuccessful in 6 (3.5%) patients. The possible reason for the unsuccessful ablation in these patients was: CS divert (n=1), oblique/broad/epicardial left anterolateral pathway (n=1) and right free wall AP with catheter instability in 1, Ebstein’s anomaly in 2 and Mahaim fibres in 2. Out of 161 patients who underwent successful RFA, 3 (1.5%) patients had recurrence which required a second ablation procedure. RFA can be achieved safely in patients with AP with high success rates and low risk of recurrence. Right free wall pathways, Mahaim fibres and associated Ebstein’s have a relatively higher risk of failure due to catheter instability.
Radiofrequency Ablation for Atrioventricular Nodal Re-entry Tachycardia - A Follow-up Analysis
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A retrospective analysis of 238 patients (female: male ratio 1:4) was undertaken who underwent radiofrequency (RF) ablation from March 2000 to March 2005. 90% of patients had symptoms for > 2 years prior to referral for electrophysiological (EP) evaluation. 11.8% of patients required hospitalization and intravenous (IV) medications/cardioversion for termination of supraventricular tachycardia (SVT). In the EP lab, typical atrioventricular nodal reentry tachycardia (AVNRT) was induced in 97.9% of patients. In the remaining patients the induced arrhythmia was atypical AVNRT, 3 patients had both. Of the 238 patients, 235 (98.7%) underwent successful RF ablation. Successful slow pathway modification was done in 149 (62.6%) patients and 86 (37%) patients had ablation of the slow pathway. The standard practice in our institution for successful ablation is inability to induce AVNRT with triple atrial extra stimuli protocol on pharmacological provocation with isoproterenol. One patient who earlier had atrial septal defect (ASD) surgical closure, had failure due to dilated coronary sinus (CS) ostium as she also had a left superior vena cava (LSVC) to CS. Two patients preferred medical treatment in view of explained high risk of complete heart block (CHB) due to possible anterior location of slow pathway following procedural failure after ablation in the posterior and mid septal locations. The procedure was complicated by heart block in 4 patients. In 1 patient CHB was transient, another had transient CHB which recovered to 2:1 AV block with a heart rate above 95 bpm. He underwent permanent pacemaker implantation (PPI) after 3 months due to effort intolerance. One patient with hypertrophic cardiomyopathy received DDD pacemaker. The 4th patient did not undergo PPI in view of a stable escape rhythm of >50 bpm and asymptomatic status and has remained so after 24 months. One patient developed cardiac tamponade during CS cannulation needing pericardiotomy. One patient presented with deep vein thrombosis after one week and required anticoagulation. During follow-up, there was no clinical recurrence of AVNRT in any of the patients who underwent successful RF ablation. Acute cure of AVNRT with RF ablation is high and during follow-up, had negligible or no recurrence with minimal complications.

Primary Ventricular Fibrillation - Clinical Profile
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Primary ventricular fibrillation (VF) during an acute myocardial infarction (MI) occurs with a high incidence and mortality rate in the pre-thrombolytic era. Its incidence and characteristics in the current era is rarely reported. In this context, we analyzed the relationship between primary VF, infarct size and prognosis. We studied 22 consecutive patients surviving acute MI and primary VF with a control population of acute MI uncomplicated by primary VF. The following risk factors were included in multivariate models to estimate their importance for its incidence and 30-day prognosis: age, gender, risk factors, Killip class, type of infarct, pulmonary edema, cardiogenic shock and thrombolytic status. Primary VF was seen in 22 of 450 consecutive patients (4.8%) admitted within 24 hours after the onset of acute MI. Compared with patients without primary VF they showed a lower mean age group (age 46 years), male, non-smokers, a higher incidence of anterior infarction, first MI and non-thrombolyzed state (14 without streptokinase). 30-day mortality rate did not differ much between the two study groups (9.0% vs. 8.4%). Warning ventricular arrhythmias preceded primary VF in only 28% of cases (ventricular premature beat (R on T in 60%) and ventricular tachycardia). Primary VF occurred during or immediately after thrombolytic therapy in 4 patients. One patient had electrical storm which responded with beta-blocker therapy. To conclude, primary VF is more common in young population, those with first MI, anterior infarction and when successfully treated does not alter short-term prognosis.

Syncpe in the Setting of Ischemic Heart Disease and Left Ventricular Dysfunction: A Class I Indication for Internal Cardioverter-Defibrillator
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In the setting of ischemic heart disease (IHD) syncope is considered as ominous symptom, and in few studies it has been equated with aborted sudden cardiac death (SCD). Here, we report 6 cases of recurrent syncope, who had IHD and left ventricular (LV) dysfunction. All of them underwent electrophysiological (EP) study and were found to have inducible monomorphic ventricular tachycardia. They all underwent implantable cardioverter-defibrillator (ICD) implantation. In the follow-up ranging from 3 months to 1
From August 2002 to June 2005, 140 patients underwent radiofrequency (RF) ablation for supraventricular tachycardia (SVT) in our center. Among them, 90 patients had a total of 92 accessory pathways (age range: 8-75 years). Accessory pathway was more commonly found (64%) than other varieties of SVT. Fifty-five (61%) patients had manifest Wolff-Parkinson-White (WPW) syndrome, while 35 patients had concealed accessory pathway. Right-sided concealed pathway was relatively uncommon. Overall left-sided pathway was commoner (69 cases (75%)). Among the left-sided pathways, left lateral pathway was found in majority (54 (78%) cases, left posteroseptal in 5 cases, left posteroanterior in 2, left posterior in 5, and left anterior in 3 cases. Right-sided pathway was present in 21 cases (right posteroseptal: 9, free wall: 11, Mahaim: 1). Two patients had accessory pathways within coronary sinus (1 had coronary sinus (CS) diverticulum). RF ablation was attempted in these cases. Primary success in RF ablation was achieved in 89 cases. Three failed cases had accessory pathway. One each in right posteroseptal, right free wall and CS diverticulum. Four (4%) patients had recurrence. Two had repeat successful ablation. One patient had thromboembolic event in cerebellar artery territory. Two patients had compromised femoral arterial flow, which resolved with medical therapy. In our centre, left lateral pathway-mediated SVT was found to be the commonest variety in patients undergoing ablation, which was highly successful in these cases.

Implications of Coronary Artery Disease in Patients with Complete Heart Block during Permanent Pacemaker Implantation: An Angiographic Study

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The exact etiology of chronic complete heart block (CHB), specially the role of ischemia in the pathogenesis of CHB remains uncertain. The aim of this study was to detect the incidence of coronary artery disease (CAD) in patients who were undergoing permanent pacemaker (PPM) implantation and determine the anatomical and pathologial basis of conduction defects. The study population consisted of 32 consecutive patients with CHB who were admitted for PPM implantation. The mean age of the study group was 58 years (range: 50-66 years) and male-female ratio was 1:2. The clinical parameters, demographic data and echocardiographic data were collected. All patients underwent coronary angiogram (CAG) prior to or at the time of PPM implantation. Patients with valvular heart disease and cardiomyopathy were excluded. The CAG study included measurement of diameter and stenosis severity, qualitative assessment of flow particularly the blood supply to territories that supply conduction system (proximal left anterior descending (LAD))

Profile of Radiofrequency Ablation in Pediatric Population - Initial Experience

Bobby John, Purendra Kumar Pati, Yash Y Lokhandwala
Christian Medical College, Vellore

Radiofrequency ablation in pediatric population is challenging. We performed electrophysiological study in 14 patients and successful radiofrequency ablation in 13 patients from November 2003 to June 2005. The age ranged from 2 years to 18 years (mean 12.6 years). The pediatric age group formed 7% of our study population. All except one patient had supraventricular tachycardia (SVT). Accessory pathway (AP)-induced orthodromic tachycardia was the commonest arrhythmia, detected in eight patients. Dual AP was seen in three; however in one of them, the second AP manifested after a month. Left-sided accessory pathway was found in majority of patients (5 out of 8 APs) and 3 were concealed. Typical atrioventricular nodal re-entrant (AVNRT) tachycardia was ablated in 3 patients. Incessant high right atrial tachycardia was seen in one and another had fascicular ventricular tachycardia. Successful ablation of typical atrial flutter following atrial septal defect (ASD) device implantation in a 2-year-old with one and half catheter technique was also performed. Ebstein’s anomaly was seen in only one of our patients who had dual right-sided accessory pathway. Tachycardia was not inducible in one child who presented with narrow QRS tachycardia. The average procedure time was 91.25 min (range: 30-180 min) and fluoroscopy time was 33.6 min (range: 7.4-50.4 min). The accessory pathway effective refractory period was < 250 ms in six patients. Tachyarrhythmia in the pediatric age group in our study was mediated mainly by accessory pathway and multiple accessory pathways are common in this age group.
and right coronary arteries (RCA) were documented. Among 32 patients with PPM, 12 (37.5%) had CAD and 20 had normal epicardial coronary arteries (62.5%). Among patients with underlying CAD, the conduction defect was localized to infranodal in 8 and atrioventricular (AV) nodal in 4 patients. There were no statistically significant differences in coronary artery diameter and anatomical variations compared with those patients who had normal coronaries. Among the patients with CAD, lesions were more often observed in proximal segments of LAD and right coronary artery (RCA). TIMI 3 flow was documented in the major vessels supplying the conduction system. Instead of significant proximal CAD, we presume these lesions per se may not be responsible for the conduction defects. None of the patients had a lesion compromising blood flow to the sino atrial (SA) node. Contrary to the expectations, critical and diffuse coronary artery involvement were uncommon. We conclude that CAD was more prevalent in patients who were undergoing PPM implantation. But the lesions encountered are generally not critical. Diffuse CAD are uncommon. Since the blood supply to conduction system were not much compromised, urgent revascularization procedures along with PPM implantation may not be necessary.

Tissue Doppler Characteristics of Patients with Congenital Complete Atrioventricular Block and on Long-Term Right Ventricular Pacing

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The aim of the study was to look into the tissue Doppler echocardiographic characteristics of paced patients with congenital complete atrioventricular block (CCAVB) in comparison to normal controls. 25 patients with CCAVB on right ventricular (RV) pacing (mean age 26.9 ±11.7 years, males 45%) were studied clinically and with transthoracic echocardiography (TTE) (including tissue Doppler) at a mean follow-up of 10±6 years and compared with 75 controls (mean age 30±19 years). The mean age at which permanent pacemaker implantation (PPI) was done was 15.7±10.4 years.

No patient in the study group had congestive heart failure (CHF). The mean left ventricular (LV) end-diastolic, end-systolic dimensions and ejection fraction (EF) were 49.5±7 mm, 31.7±7 mm and 72.5±9% respectively. Mean six min walk test distance was 380±93 m (normal values: 400-700 m). Indication for PPI was syncope in 72%. The Tei index was significantly higher in the CCAVB group (1.3±0.7 vs 0.64±0.3, p=0.0001). Similarly, the modified Tei index was also significantly more in CCAVB group (1.7±0.9 v. 0.6±0.3, p<0.0001). The lateral mitral Em (9.8±3.3 v. 11.5±2.9), Am (4.1±1.9 v. 6.2±6.2) and Sm (5.3±1.5 v. 7.8±2.7) were significantly lesser in the CCAVB group. The time interval between the onset of the q wave and peak of the systolic wave (q to Sm) was significantly higher in CCAVB group (282.3±54 ms v. 140±53 ms). Em acceleration time was significantly less in the study group (58.6±13 ms). Em deceleration time and Am deceleration time were higher in the CCAVB group (100±24 v. 84±23 ms and 71±55 v. 55±19 ms). The sum of the mitral annular velocities (Em+A m +Sm) was significantly lesser in CCAVB group (19±3 v. 25±5). The ratios E/Em and S1/Sm were higher in the study group (17±3 v. 9±2.5 and 0.89±0.6 v. 0.4±0.2). At the lateral tricuspid annulus, only Em (no difference in Am and Sm) was found to be significantly less compared with control group (9.2±2 v. 12.3±12). The intraventricular dyssynchrony represented in the RV as the difference between (q to Sm peak) at the septum and lateral RV free wall was 35.9±35 ms. In the left ventricular (LV) the difference between maximum and minimum q to Sm peak at 6 different points in the mitral annulus was 80.4±34 ms. To conclude, individual amplitudes of tissue Doppler waves are significantly reduced in the left ventricle. This may represent progressive depression of long axis of left ventricle. Tei index and modified Tei index, which represent myocardial performance, were greater in the study group. No gross LV dysfunction or effort intolerance was noted in the CCAVB patients on follow-up.

Long-Term Outcome of Pacemaker Implantation with Different Pacing Modes in Sick Sinus Syndrome

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The aim of the study was to analyze effects of different pacing modes in patients with sick sinus syndrome. From 1995 to 1999, 94 patients (male-female ratio 0.88:1, mean age at implantation 44.2±15.2 years) who underwent pacemaker implantation for sick sinus syndrome formed the study population. At follow-up, 4 had reached elective replacement indication (ERI) and one end of life. The ERI was not achieved in the routine ECG with magnet and was detected on interrogation. Five patients had new onset atrioventricular (AV) conduction delay. The incidence of 1st degree AV block was 1.3% per year. At follow-up, none of the AAI patients developed atrial arrhythmias; 4 out of 51 VVI patients developed new onset atrial tachyarrhythmias. The incidence of atrial tachyarrhythmia was 1% per year.
A Follow-up Study of Permanent Atrial Sensed Ventricular Pacing Mode

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In subjects with normal sinus rhythm and atrioventricular (AV) block, VDD mode of pacing has the advantage of maintaining AV synchrony and physiological hemodynamics. A retrospective analysis of the follow-up pacing mode in 78 consecutive patients who underwent atrial sensed ventricular pacing (VDD mode) from September 1999 to March 2005 was performed. Out of these 78 patients, 61 (78.2%) underwent permanent pacemaker implantation (PPI) for degenerative/congenital complete heart block (CHB), 14 (17.9%) for 2:1 AV block, 3 for post-operative CHB and 1 for post-myocardial infarction CHB. The mean age was 59 years (range: 6-87 years) with 54 males and 24 females. Thirty-two percent were diabetic, 38% hypertensive and 48% had angiographically proven coronary artery disease (CAD). The follow-up ranged from 3 months to 5 years. The mode of pacing prior to discharge and during follow-up was analyzed. At the time of discharge, the mode of pacing was atrial sensed ventricular pacing in all the patients. During follow-up, 71 (91%) patients continued to track the atrium and pace the ventricle. Six (7.6%) patients were in VVI mode of pacing and 1 patient was in sinus rhythm with 1:1 AV conduction. Sub-analysis of the 6 patients in VVI moderevealed that 4 of them were in appropriate VVIR mode. Of these 3 had significant sinus bradycardia and predominant VVIR pacing with intermittent atrial tracking whenever sinus P waves were present. One patient developed atrial flutter and was reprogrammed to VVIR mode. Of the remaining 2 who were in inappropriate VVIR mode, 1 child had loss of atrial tracking due to unlooping of atrial loop and the other had no P wave sensing due to possible lack of contact. Thus, in our group of 78 patients with VDD mode of pacing only 2 (2.5%) patients had inappropriate VVIR pacing due to lack of atrial sensing. Atrial sensed ventricular pacing is an acceptable pacing option in patients with normal sinus function and AV block. However, a small percentage of patients could have loss of atrial tracking. Considering the lower cost of VDD pacing, more frequent utilization of this mode needs to be promoted as an affordable alternative to DDD pacing for maintaining AV synchrony in patients with AV block.

Common Problem during Follow-up in Pacemaker Clinic of a Tertiary Care Hospital

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There is a proliferation in centres implanting pacemakers. However, at most places the pacemaker clinics are non-existent. At such places, the pacemaker clinics follow-up is done by an ECG and pacemaker interrogation done only if some problem is suspected. We decided to interrogate pacemakers of all patients coming to our pacemaker clinic in addition to routine electrocardiography (ECG). The results of 600 pacemaker interrogations during follow-up showed some problems. The study population included 365 patients of VVI, 50 patients of VVIR, 20 patients of AAIR, 5 patients of AAI, 20 patients of VDD, 102 patients of DDD and 35 patients of DDDR pacemakers. Following problems were detected and corrected: (i) 48 patients with elective replacement time (ERT)/end-of-life (EOL) were advised pacemaker change. Five patients had completely exhausted the battery and showed no pacing. Two of them were having syncope. (ii) Chronic thresholds were adjusted in 100 patients. Output was adjusted to 2.5 versus 3.5 at 0.4 ms pulse width, resulting in average increase of 18
months in pacemaker longevity; (iii) Output was increased in 10 patients to achieve more consistent pacing; (iv) Hysteresis was switched on in 20 patients to help patients have their own rhythm more often; (v) Rate responsiveness was switched on in 10 patients (8 VVIR, 2 AAIR); (vi) Undersensing was corrected in 24 patients; (vii) Paced and sensed AV intervals were increased in 12 patients resulting in patients having their own rhythm more often; (viii) Mode switch was switched “On” in patients with DDD with atrial fibrillation (AF); (ix) Wound dehiscence and pacemaker extrusion requiring explantation and reimplantation done in 3 patients. Regular pacemaker interrogation in pacemaker clinic detects host of problems which can be easily tackled by simple programming. This improves the longevity of pacemaker, leads to more physiological pacing and decreased reimplantation rates.

**Pacemaker Clinic: A Learning Experience**

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Permanent pacemaker implantation (PPI) was started in our hospital in 1982. The initial devices were non-programmable, and were replaced on battery depletion. With the availability of pacemakers with programmable parameters suitable modifications were done on need basis. In 1998 a pacemaker follow-up clinic was started and all patients were instructed to attend it as per standard protocol. The frequency of attending the clinic was 1 month, 3 months, 6 months and 1 year after the implantation. Thereafter annual check up for 5 years, half yearly check up from 5 to 10 years and 3 monthly checks before 10 years were recommended. The clinic was conducted on the 1st Monday and Tuesday of every month by a clinician, a biomedical technologist and assisted by a trained nurse. In the first 2 visits greater attention was paid to wound healing. Threshold values for pulse width (PW) and amplitude were checked on the 2nd visit and kept at 3 to 4 times the values. Heart rate adjustment and hysteresis were made depending on the intrinsic rhythm. The position of lead tip and loop were checked under fluoroscope in the 1st visit and then on a need basis.

<table>
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</tr>
<tr>
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<td>18</td>
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</tr>
<tr>
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<td>6</td>
<td>18</td>
<td>20</td>
<td>9</td>
<td>13</td>
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</tbody>
</table>

With an annual implantation of about 100 pacemakers, our procedure-related complications reduced to < 2% per year. Frequent visits in the early post-operative phase helped to deal with wound-related complications promptly. Lead dislodgement in 2 asymptomatic patients in sinus rhythm was detected in routine visits and repositioned. Down-regulation of pacing mode from VDD to VVI and DDD to VVI were seen in 4 patients and restored by increasing the sensitivity. Failure to pace in 5 patients with no symptom or mild symptoms could be corrected by increasing the pulse width and/or amplitude. Elective replacement indication (ERI) and EOL warning were noted in 4 asymptomatic patients. By prolonging the battery life, replacement of end of life pacemaker was done less frequently. In 2 patients with AAIR pacing, even after 10 years no progression to atrioventricular (AV) nodal disease was noted. The clinic is being attended by patients with pacemakers implanted elsewhere. Apart from facilitating care and giving confidence to patients, the clinic familiarized the staff with programming, dealing with trouble shooting and learn more about higher pacing models, including implantable cardioverter-defibrillators (ICDs).
Immediate and Medium-Term Results of Definitive Radiofrequency Ablation for Paroxysmal Atrial Fibrillation

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The number of patients undergoing definitive ablation procedures (e.g., ostial ablation or segmental isolation of pulmonary veins (PV)) for paroxysmal atrial fibrillation (PAF) is increasing. Cure rates of 80% have been achieved by leading centers in the world in the immediate- to long-term. At our institute, the procedure has been undertaken since October 2000. This study was conducted to assess our immediate and medium-term results of definitive radiofrequency ablation (RFA) therapy for PAF. A retrospective analysis of all cases subjected to a definitive ablation procedure for PAF between October 2000 to March 2005 at our institute was undertaken. Data was analyzed for patient demographics, procedural details, immediate results, complication rates and recurrence over the medium-term. A total of 72 procedures were undertaken in 53 patients. Mean age of the patients was 54.1±8.5 years (range: 36-70 years), 38 males. All patients were highly symptomatic and had been suffering from PAF for a mean duration of 66.5±44.4 months (range: 6-240 months) and were resistant to a mean of 3.1±1.3 drugs (range 1-6). A minority had comorbid conditions. Thirteen patients underwent multiple procedures (maximum 5). One trans-septal puncture was undertaken in 12/72 (16.7%) procedures, remaining underwent two punctures. Ostial ablation was undertaken in 61/72 (84.7%) procedures with segmental isolation in the rest. Mean of 2.5 veins were ablated perprocedure. In 27/72 (37.5%) procedures, additional ablation lines between right and left superior PV and between the left inferior PV and the lateral mitral annulus were also undertaken. Total fluoroscopy time was 41.2±20.6 min (range: 6-111 min). Mean duration of follow-up was 14.7±10.7 months. After the first procedure, 29/53 (54.8%) of patients were completely asymptomatic with or without drugs. This percentage increased to 35/53 (69.8%) after the second procedure. Cardiac tamponade occurred in 5/72 (6.9%) procedures. All were successfully treated with an echo-guided percutaneously inserted pericardial drain. Other complications were hematomas in 4/72 (5.6%) and pericarditis in 3/72 (4.2%) procedures. There was no mortality. Definitive ablation for PAF is highly effective in controlling symptoms in the medium-term. It can be safely undertaken with an acceptable morbidity. In our experience, the cure rate is lower when compared to centers who have pioneered this procedure.
Echo-Guided Management of Tamponade during Atrial Fibrillation Ablation
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Curative percutaneous radiofrequency catheter ablation (RFCA) of atrial fibrillation (AF) is increasingly practised. Known complications of this procedure are pulmonary vein (PV) stenosis, embolic stroke and cardiac tamponade. Literature review suggests that the latter complication occurs in 0.7% to 3.0% procedures. The aim of this study was to report our rate of tamponade and highlight the safety and efficacy of echo-guided non-surgical management during AF RFCA. A retrospective analysis was undertaken of 72 consecutive AF RFCA procedures performed in our institution from October 2000 to March 2005. All patients had the procedure performed through the right femoral vein and access to the left atrium was obtained using one (12/72 procedures) or two separate transseptal punctures (TSP). Two transseptal sheaths were placed in the left atrium in 60 cases. At least 10,000 units of heparin was given into the left atrium in 63 cases on completion of the second TSP. PV angiograms were obtained by injection through the sheaths. Segmental ablation was undertaken in 9 cases. The rest underwent ostial ablation guided by a 10 Polar Lasso catheter, with RFCA using an EPT ablation catheter. A total of 72 focal AF procedures were performed in 53 patients (38 male). Mean age was 54 ± 8.5 years (range: 37-70 years). Thirteen patients underwent multiple procedures. Five procedures (6.9%, all male, 55 ± 11 years) were complicated by cardiac tamponade. No case was coincident with TSP. 3 PVs were ablated before tamponade occurred. All patients were treated with an echo-guided placement of a percutaneous apical pericardial drain in the cath lab. This drained 963 ± 640 ml (range: 250-1555 ml), but stopped draining within 24 hours. All drains were removed within 48 hours. There were no deaths. Median hospital stay was 3 days (range: 3-5 days). Tamponade during RFCA can be safely and effectively managed by a non-surgical echo-guided pericardial drainage in the cath lab with minimal morbidity and no mortality and should be the default guided pericardial drainage in the cath lab with minimal morbidity and no mortality and should be the default.

Long-term Outcome of Venous Access Sites in Permanent Pacemaker Implantation
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The aim of this study was to assess the status of access veins used for permanent pacemaker implantation (PPI) over long-term follow-up. From 1995 to 1999, 94 patients (male:female ratio: 0.88:1, mean age at implantation 44.2 ± 15.2 years) who underwent pacemaker implantation for sick sinus syndrome formed the study population. The data regarding the initial venous access for the pacing lead insertion was available in 88 patients. A total of 92 pacing leads were inserted. The approaches were right or left cephalic vein, or
right or left direct subclavian puncture. The most common venous access site was right cephalic vein for 87 leads. Right subclavian vein was punctured for 21 leads. Only 4 leads were inserted from the left side (2 via left cephalic and 2 via left subclavian vein). Ten of the 15 patients with AAI pacemaker, underwent right cephalic approach, 1 had left cephalic approach and 4 direct subclavian puncture. Of the 75 patients with VVI pacemaker in whom approach were known, 54 underwent right cephalic approach, one had left cephalic approach and 14 had direct subclavian puncture (12 right, 2 left). At follow-up, contrast venogram on the side of pulse generator was done through antecubital vein to assess the status of the access vein after getting informed consent. Sixty-two patients underwent contrast venogram; 3 had total occlusion of distal subclavian vein with collateral filling of SVC, and 3 had total occlusion of proximal SVC with collateral filling of distal SVC. One patient with no structural heart disease had blocked SVC with collateral filling of left SVC draining to coronary sinus to right atrium; 5 of these patients had right cephalic vein approach, and one direct subclavian puncture. Two patients had AAI, while remaining had VVI pacemaker implantation. 59.6% (37/62) patients had no or <50% narrowing of the distal subclavian vein, 30.6% (19/62) had more than 50% narrowing (by QCA) and 9.3% (6/62) had total obstruction. One patient who underwent PPI in 1997 presented 6 months later with SVC obstruction was diagnosed to have carcinoma bronchus. Comparing the cephalic vein and direct subclavian approaches, there was no significant difference in the incidence of total subclavian obstruction. Though other studies have reported total occlusion, no previous study has quantitatively analyzed venous narrowing. To conclude, the incidence of access venous complications at follow-up is high, but there is no difference in incidence between the different approaches, cephalic or direct subclavian puncture.

Electrophysiological Study Predicts Treatment Options in Unexplained Syncope

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Though thorough investigation of patients of syncope for exclusion of cardiac cause is necessary because of bad prognosis of this group of patients. Ninety cases of unexplained syncope in the age group of 9 to 88 years, in whom rigorous non-invasive evaluation was done, were sent for electrophysiological (EP) study between March 2003 to February 2005. Head up tilt (HUT) test was negative in 78 of these patients. Coronary angiography was done in 63 patients who were above 35 years of age. Bradycardia was evaluated with measurement of baseline intervals e.g. AH, HV, PR, QRS, QT followed by SNRT, CSNRT, SACT, chronotropic response to drug challenge and Wenkebach point to see atrioventricular (AV) conduction. Tachyarrhythmia was assessed after induction of tachycardia, giving single, double and triple extrastimuli and high rate pacing of right ventricle, right atrium followed by drug provocation with injection isoprenaline and atropine. Our results showed sick sinus syndrome in 6 (10%), increased HV interval with 2nd degree AV block in 3 (5%), right bundle branch block (RBBB) (n=4) and left bundle branch block (LBBB) (n=8) with prolonged HV interval in 12 (20%), bundle branch block with AV block (10%), paroxysmal supraventricular tachycardia (PSVT) was found in 9 (15%), which included atrioventricular nodal reentry tachycardia (AVNRT) in 2, concealed accessory pathway in 4, atrial fibrillation in 2, atrial flutter in 1, inducible ventricular tachycardia (VT) was found in 6 (10%) which included right ventricular outflow tract-ventricular tachycardia (RVOT-VT) in 4, left septal VT in 1 and ischemic VT in 1. EP study was inconclusive in 18 (30%) of cases. One-third of the patients showed coronary artery disease, radiofrequency ablation (RFA) was indicated in 9 (15%) patients and internal cardioverter defibrilator (ICD) implantation was advised in 1 patient. Secondly, in 30% of the patients, permanent pacemaker indication could be decided. To conclude, coronary angiography is mandatory after the age of 35 years before EP study. Appropriate treatment for tachyarrhythmia could be decided accordingly.

Head Up Tilt Test Has Low Sensitivity in Diagnosis of Neurocardiogenic Syncope

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Syncope accounts for 1-3% of emergency department visits and up to 5% of hospital admissions as reported in the Western literature. Cardiac and neurological disorders include 20% of the whole spectrum and the rest 80% include situational, orthostatic and neurocardiogenic syncope. Head up tilt (HUT) test is the only means to diagnose atypical cases of neurocardiogenic syncope. The sensitivity of HUT test varies from 30% to 80% in different reports giving low diagnostic yield among majority of investigators. We reviewed 120 cases of HUT test conducted in our hospital between March 2003 to February 2005. Of these, 30 (25%) patients were referred from outside and the rest 90 (75%) were evaluated in our hospital. The age range varied between 9 to 78 years of which 40% were females. Only 4 of the patients had cardiac ailment but suspected to have syncope of neurocardiogenic origin. Rigorous evaluation was done to exclude cardiac and neurologic origin with electrocardiogram (ECG), echocardiography (Echo), Holter, electroencephalography.
(EEG), computerized tomographic (CT) scan of brain. In HUT test, the patient is monitored in supine position for 10 min. Then the patient is tilted at 70° for 30 min. If the result is negative then drug provocation with injection isoprenaline at dose 2-5 µg/min followed by isosorbide dinitrate 10 mg sublingual is started to reach the end point (sycope, presycope or tachyarrhythmia). We could provoke syncope and pre-sycope in only 32 (26.6%) patients. Out of the positive cases, 18 (56%) showed mixed (Type I) response, 8 (25%) showed cardioinhibitory response (Type III) and 6 (19%) showed vasodepressor syncope (Type III). It was concluded from the above results that HUT test has a low yielding value in evaluation of syncope of unknown etiology after exclusion of cases of cardiac and neurologic origin.

**Right Ventricular Apical v. Right Ventricular Outflow Tract Pacing – Our Initial Experience**

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Prior studies suggest that right ventricular apical (RVA) pacing has deleterious effects on left ventricular function. Whether the right ventricular outflow tract (RVOT) is a more optimal site for permanent pacing in patients with standard indications for permanent pacing has not been established. Previous randomized trials in which patients were paced from the RVA have been noted to have worsening of left ventricular (LV) systolic function, specially during long-term follow-up. Secondly, the issue of the procedure time and also long-term stability/higher incidence of lead displacement with reference to RVOT pacing needs to be studied. We undertook to test the feasibility of performing RVOT pacing as a routine in patients receiving permanent pacemaker therapy. Patients were randomly assigned to receive either RVA apical pacing or RV outflow tract pacing. The patient characteristics as well as the results of the study are shown in the table.

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<tr>
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In conclusion, (i) RV Septal pacing appears to match RV apical pacing in terms of safety and procedure times. (ii) RVA pacing in patients with impaired LV systolic function appears to be detrimental even in the short-term, and possibly worsens it further. (iii) The possible advantage of RV septal pacing in patients with preserved LV systolic function would be evident in long-term follow-up studies.

**Intraoperative Radiofrequency Pulmonary Vein Isolation by Conventional Percutaneous Radiofrequency Ablation Catheter**

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Percutaneous catheter pulmonary vein (PV) isolation is an effective means of curing and controlling atrial fibrillation.
Patients requiring mitral valve (MV) surgery may be candidates for intraoperative isolation of PV by radiofrequency ablation (RFA). We report the use of conventional percutaneous RFA catheters to create ablation lines in the PV under direct observation during MV surgery. Three patients of chronic AF with duration > 1 year, two of them males, with ages 31, 48 and 55 years had left atrial (LA) sizes of 55 mm, 62 mm and 49 mm. The operating surgeon approximated an 8 mm tip Bard Stinger RFA catheter on contiguous sites around the four PVs to create a continuous line of electrical block. Radiofrequency energy was delivered by an EPT 1000 RF generator, with appropriate grounding. Power mode was selected, and the power maximum set at 45 Watt. The impedance was monitored and the catheter tip was irrigated manually by saline from a syringe-needle to keep the temperature from cutting off the power. Energy was delivered at each site for 60 s or until contact was broken. The procedure took on an average of 25 min extra surgical time, with an average of 22 energy deliveries. All the three patients were in sinus rhythm at the end of the surgery and one returned to AF three days later. The other two were discharged in sinus rhythm at the end of the surgery and one returned to AF three days later. The other two were discharged in sinus rhythm. All patients had amiodarone prior to and after the AF three days later. The other two were discharged in sinus rhythm.

Prospective Study of Incidence of Catheter-Induced Supraventricular Tachycardia during Electrophysiologic Studies in Consecutive Patients of AVNRT and AVRT

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Induction of supraventricular tachycardia (SVT) while placing catheter for electrophysiological studies (EPS) is well known. However, its incidence in different types of SVT in Indian patients has not been studied in a prospective manner. We evaluated this in consecutive patients of atrioventricular nodal reentrant tachycardia (AVNRT) and atrioventricular reentrant tachycardia (AVRT) undergoing EP studies with a view to look for overall incidence of catheter-induced SVT and ease of repeated induction of tachycardia with catheter manipulation in this group of patients. There were 120 consecutive patients (final diagnosis was AVNRT in 75 and AVRT in 55) over a period of 8 months. The EP study was done under local anesthesia (LA) and mild sedation. Four diagnostic catheters were used – high right atrial (RA), coronary sinus (CS), His and RV in most SVT patients. In patients with manifest accessory pathway (AP), the number of catheters varied according to operator’s discretion. The high RA catheter was placed immediately (if already not in place) if catheter manipulation with CS catheter resulted in SVT induction. SVT got induced during catheter placement in 40 (33%) patients. The incidence was 29% (22/75) in patients of AVNRT and 33% (18/55) in the AVRT population. In the catheter-induced SVT group, the final diagnosis was AVNRT in 22 (55%) patients and AVRT in 18 (45%) patients. The AP was concealed in 12 (66%) and manifest in rest. In the concealed AP group, the location was antero-septal in 1, postero-septal in 5 and left lateral in 6 patients. In the manifest group the location was as follows: left lateral in 4 and postero-septal in 2. Recurrent SVT induction during further repositioning of diagnostic catheter and RF catheter manipulation was seen in 4 (18%) patients of AVNRT, 8 (66%) patients of concealed AP and 3 (50%) patients of manifest AP. Catheter positioning can induce SVT in about one-third of AVNRT/AVRT patient population and provides important opportunity to make the diagnosis. Thirty-eight percent of these have repeated catheter-induced tachycardias.

Prospective Study of Incidence of Catheter/Programmed Stimulation-Induced Non-Clinical Atrial Fibrillation during Electrophysiologic Studies

S Anandaraja, R Batra, A Sahu, M Sharma, S M ukhopadhayay, J Yusuf, V Trehan, S Tyagi
GB Pant Hospital, Delhi

Induction of non-clinical atrial fibrillation (AF) while placing EP catheters for electrophysiological studies (EPS) or during programmed stimulation is well known. However, its incidence in supraventricular tachycardia (SVT) patients has not been studied in a prospective manner. We evaluated this in a study of consecutive patients of atrioventricular nodal reentrant tachycardia (AVNRT) and atrioventricular reentrant tachycardia (AVRT) undergoing EP studies. The study included 120 consecutive patients (final diagnosis AVNRT in 75 and AVRT in 55) over a period of 8 months. The EP study was done under local anesthesia (LA) and mild sedation. Four diagnostic catheters used were – high right atrium (RA), coronary sinus (CS), His and right ventricular (RV) in most SVT patients. In patients with manifest accessory pathway (AP), the number of catheters varied according to operator’s discretion. Programmed stimulation included conventional pacing protocols of ventricular and atrial stimulation. AF was induced in 12 (10%) patients. This included 7 patients of AVNRT and 5 patients of AVRT. The episodes were self limiting (lasting <5 min) in 7 patients and sustained in 5. The AF was induced.
Beat-Buffer Technique for Mapping Difficult Tachycardias

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CARE Hospital, Hyderabad

Electro anatomical non-fluoroscopic 3D mapping (CARTO) system improves mapping of tachycardia circuits for better success of radiofrequency catheter ablation (RFCA) in difficult arrhythmias. Clinical tachycardias may sometimes be non-inducible in electrophysiology (EP) lab despite best efforts; beat-buffer facility in CARTO system allows acquisition of 10 consecutive beats at a time, of which one optimal beat may be accepted for mapping the tachycardia circuit. This facilitates precise mapping of even ill-sustained tachycardias. We report use of this technique in 3 male patients (mean age 26 years), with recurrent symptomatic episodes (syncopal in one). Documented tachycardia was suggestive of idiopathic right ventricular outflow tract ventricular tachycardia (R VOT-VT) in 2 patients and left atrial tachycardia in one. In all 3, tachycardia was non-inducible during EP study; but isoproterenol infusion induced frequent isolated ectopic beats identical in morphology to the documented 12-lead clinical tachycardia beats. Beat-buffer facility was used for precise mapping of these ectopic beats with CARTO system which allowed successful targeting of RFCA in all 3. There were no peri-procedural complications. Mean procedural time was 180 ±66 min and mean fluoroscopic time was 44 ±36 min. Over a mean follow-up period of 14 months, all the patients are free of arrhythmia recurrences without being on any antiarrhythmic medication. Beat-buffer technique on CARTO system allows precise mapping of isolated tachycardia beats, even when sustained tachycardia is non-inducible, facilitating successful radiofrequency catheter ablative procedure.

Effect of Changes in Heart Rate on the Corrected QT Intervals Calculated Using Bazett’s and Fridericia’s Formulae

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Quintiles ECG Services, Mumbai

The QT interval is inversely related to heart rate. Several methods including Bazett’s and Fridericia’s formulae are used to obtain QTc (QT corrected for the effect of heart rate). The optimal correction formula is a subject of controversy. The aim of this study was to evaluate the difference in QTc obtained by Bazett’s and Fridericia’s correction formulae. In phase II, a new drug for amyotrophic lateral sclerosis was sought to be evaluated. Patients were given the drug twice daily for 28 days. 12-lead electrocardiograms (ECGs) were recorded at baseline and on day 29 and analyzed in a central core lab using onscreen digital calipers. Female patients had a statistically significant decrease in QTcB, but not in QTcF, at day 29 as compared to baseline values. However, they also had a statistically significant decrease in heart rate. No statistically significant effect was seen in males.

<table>
<thead>
<tr>
<th></th>
<th>Day 0</th>
<th>Day 29</th>
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<td></td>
<td></td>
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<td>HR (bpm)</td>
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<td>QTcF (ms)</td>
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<td></td>
</tr>
<tr>
<td>HR (bpm)</td>
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<tr>
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<tr>
<td>QTcF (ms)</td>
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<td>390</td>
<td>4</td>
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</table>

The Bazett’s formulae (QTcB = QT/RR^{0.5}) is known to overcorrect for the effect of the heart rate. This produced a significant shortening of QTc in the female patients, who also had a significant decrease in heart rate. Fridericia’s formula (QTcF=QT/RR^{0.33}) does not have this limitation and showed no significant change in QTc. To conclude, Fridericia’s formula is more accurate than Bazett’s formula and should be used more frequently in clinical practice.
Single Center Experience of Atrioventricular Nodal Re-entrant Tachycardia Ablation from Armed Forces

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Atrioventricular nodal reentrant tachycardia (AVNRT) is commonest cause of supraventricular tachycardia. At our center, 98 patients (age range: 18-67 years, 62 males) underwent ablation in last 3 years. Arrhythmia was documented by electrocardiogram (ECG) in 61 cases. Tachycardia was induced in all but 2 cases. In both these, the ECG was suggestive of AVNRT. Tachycardia cycle length was 250-376 ms. Presence of associated bypass tract was excluded by rapid atrial pacing and ventricular pacing. In one case associated bypass tract was found in left posterolateral region. This tract was not ablated because it had long refractory period and was not participating in atrioventricular reentrant tachycardia (AVRT). Ablation of slow pathway was done by combined ECG and anatomic criteria with 60 s radiofrequency lesion at 50 W power and 60°C temperature. In selected cases gradual increase of power was done starting from 25 W. Functional rhythm was seen in all cases. End point was non-inducibility of the tachycardia by 2 atrial extra-systole with and without isoprenaline till atrial refractoriness. Ablation was successful in 96 (98%) cases. The unsuccessful ones included one case where tachycardia was not inducible and another in which ablation site was considered dangerously close to the His bundle recording site. Complications during the procedure included complete heart block (CHB) (1 case), transient CHB (3 cases), vaso-vagal attack during the procedure (1 case). Cause of transient CHB was mechanical bumping of AV node (2 cases) and movement of ablation catheter to His bundle region during delivery of lesion (1 case). We conclude, slow pathway ablation for AVNRT has high safety and efficacy at our multi-operator and upcoming EP center.

QRS Width as a Predictor of Occurrence of Clinical Ventricular Tachycardia in Patients with Internal Cardiovertex Defibrillator

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Increased QRS duration is considered predictor of sudden cardiac death due to ventricular tachycardia (VT) in patients with left ventricular (LV) systolic dysfunction. We tried to test this hypothesis by follow-up of implantable cardioverter-defibrillation (ICD) patients. We divided our ICD recipients into two groups according to QRS duration irrespective of the indication of implantation. Those with QRS <120 ms were considered narrow QRS and >120 ms were considered wide QRS. We followed both groups by periodical ICD interrogation for episodes of ventricular arrhythmia and therapies delivered. A total of 40 patients were followed for average of 25 months. Eighteen (45%) patients had narrow QRS and 22 (55%) patients had wide QRS duration. Mean ejection fraction was 28±5% in narrow QRS group and 29±4% in wide QRS group. (p>0.05) Among narrow QRS group, 13 (72%) patients had one or more episodes of VT terminated by either anti-tachycardia pacing or shock. Among wide QRS group 15 (68%) patients had at least one episode of ventricular tachycardia terminated by either anti-tachycardia pacing or shock. Average number of therapies received per ICD was 1.5 in the narrow QRS group and 1.35 in wide QRS group. Our study suggests that QRS width has no relation with occurrence of clinical VT in patients with LV dysfunction and ICD.
Stokes-Adams attack. Significant number of patients presumed to have pure drug-induced AV block do have recurrence of AV block even after discontinuation of the culprit drug, indicating underlying degenerative disease of conduction system. HV interval seems to have no role in predicting this possibility.

Direct Current Cardioversion of Atrial Fibrillation following Percutaneous Transmitral Commissurotomy - A Pilot Study

Vikram Sankar, N Jayapradas, SV Praveen, Mubarak, Babu Vasudev, Kader Muneer, Shyam Kumar, Vinayakumar, CG Sajeev, Johnson Francis, CC Velayudhan, K Venugopal Medical College, Calicut

Atrial fibrillation (AF) affects hemodynamics of mitral stenosis (MS) adversely. Even in patients with mild to moderate MS, AF produces symptoms in addition to the added risk of embolic episodes. There are reports of successful direct current (DC) cardioversion as an elective procedure 4 weeks after percutaneous transvenous mitral commissurotomy (PTMC). We studied the efficacy and safety of DC cardioversion immediately after PTMC and the short-term follow-up. Ten patients with severe rheumatic MS and AF who underwent successful PTMC were studied. Patients had a mean age of 40.6 years with mean AF duration of 2.8 years, mean left atrial (LA) size: 51.4 mm, mean right ventricular systolic pressure (RVSP): 55.2 mmHg, mean mitral valve area (MVA): 0.8 cm². All patients underwent DC cardioversion with 100 to 200 J immediately after PTMC in catheterization laboratory (Cathlab). All of them except one converted to normal sinus rhythm after cardioversion. They were started on amiodarone and were followed-up. At follow-up of 4-7 months (mean: 6.2 months) all remained in sinus rhythm. The patient who did not convert to sinus rhythm had a huge LA (60 mm) and long standing AF (10 years). This study shows that DC cardioversion immediately after BMV is effective and safe. All patients underwent transesophageal echocardiography (TEE) prior to procedure to exclude clot in LA. Cardioversion was done in Cathlab with all the facilities for resuscitation with pacing lead in place. Advantage of procedure is that no repeat admission and TEE is required for later cardioversion. Hence early cardioversion may be considered after PTMC in all patients with AF.

QTc Dispersion in Acute Myocardial Infarction as a Predictor of Ventricular Arrhythmias

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In acute myocardial infarction (AMI) QTc dispersion demonstrates ventricular instability and is linked to arrhythmic events. This study was conducted to assess whether increased QTc dispersion in acute myocardial infarction (MI)
predicts ventricular arrhythmias and the relation of QTc dispersion with the site of infarct, in-hospital mortality and effect of thrombolysis. Hundred consecutive patients admitted to coronary care unit with acute ST elevation myocardial infarction (STEMI) and 50 normal controls were included in the study. QTc dispersion was measured from simultaneous 12-lead electrocardiogram (ECG) taken at presentation and at 72 hours. Patients were followed up for one week and the end points (ventricular tachycardia, ventricular fibrillation and death) were measured. Fifty-eight patients had anterior and 42 had inferior wall myocardial infarction. Mean QTc dispersion in anterior wall MI was 98.57±32.11 ms and inferior wall MI, 67.66±26.33 ms. The corresponding value in the control group was 46.18±12.42 ms. Seventeen percent of patients had ventricular tachycardia or fibrillation. QTc dispersion was significantly increased in those who developed ventricular tachyarrhythmias. Persistently increased QTc dispersion at 72 hours was correlated with increased risk of fatal ventricular tachyarrhythmias. Thrombolysis significantly reduced the QTc dispersion and the risk of ventricular tachyarrhythmias in anterior wall MI, but had no significant effect on QTc dispersion in inferior infarcts. In-hospital mortality was 11% at 1 week. QTc dispersion in non-survivors was more than that of survivors (131.73±25 v. 82.14±27 ms). A QTc dispersion of >110 ms during the first week of acute MI was correlated with fatal ventricular tachycardias. QTc dispersion was significantly increased in acute MI patients with fatal ventricular tachyarrhythmias. QTc dispersion persistently elevated at 72 hours was correlated with fatal arrhythmias. Thrombolysis significantly decreased QTc dispersion and ventricular tachyarrhythmias in anterior wall infarcts.

**Left Ventricular Function based on Electrocardiography in Patients with Left Bundle Branch Block**
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Prolongation of QRS duration, particularly in left bundle branch block (LBBB) is commonly associated with many cardiac problems. Electrocardiographic (ECG) study of QRS duration and electrical axis may be predictor of severe left ventricular (LV) systolic dysfunction. In this prospective study (2001-2003), 150 patients with diagnosis of LBBB were divided into two groups (one with QRS≥0.16 ms and the other with QRS<0.16 ms). Then relationship between QRS duration, left axis deviation (LAD) and echocardiographic LV ejection fraction was analyzed. There were 85 male and 65 female patients, all within 35-65 years range. One hundred and six patients had coronary artery disease, 29 patients had valvular and 15 had myocardial disease. Eighty-six patients had normal axis, and 64 had LAD. The mean ejection fraction in the patients with a QRS duration ≥0.16 s (n=19) was significantly lower than the mean ejection fraction in the patients with a QRS duration <0.16 s (n=131) (p<0.15). Presence of left axis deviation associated with LBBB did not have added predictive value and was not significantly correlated with ejection fraction. In conclusion, the QRS duration ≥ 0.16 s in the presence of LBBB has a significant inverse relation with ejection fraction and is a simple and appropriate marker of significant LV systolic dysfunction.

**Assessment of the Accuracy of Stress/Rest Myocardial Perfusion Studies in Patients with Bundle Branch Blocks**
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Nelson R Mandela School of Medicine & Inkosi Albert Luthuli Central Hospital, Durban, South Africa

Rest and exercise electrocardiogram (ECG) has limited value in the assessment of myocardial ischemia in patients with left (L) or right (R) bundle branch block (BBB). Perfusion scanning with 99 mTc-MIBI is an alternative non-invasive test when the ECG is uninterpretable. However, the significance of septal perfusion defects in patients with septal wall motion abnormalities is unclear. We sought to assess whether the information from myocardial perfusion studies is comparable with the findings of standard coronary angiography in patients with BBB. Patients with LBBB (n=33) or RBBB (n=43) who underwent both MIBI studies and coronary angiograms were selected for study. The extent and arterial territory of ischemia or infarction on the polar map was compared with standard coronary angiogram studies. Normal or non-occlusive disease was found on angiography in 3 of 14 LBBB and 3 of 11 RBBB patients. MIBI showed 2 and 1 of these patients (with non-occlusive disease), respectively having small fixed defects which included the septum. Ischemic or infarct territories of the 3 major coronary arterial distributions on MIBI scan matched with disease seen on angiography in 11 out of 14 LBBB and 8 out 11 RBBB patients (p<0.05). A moderate reversible defect was found in 3 LBBB patients, and 2 of the RBBB patients. A significant reversible defect was found in one each of RBBB and LBBB. In patients with BBB myocardial perfusion rest-stress studies: (i) can detect ischemia/infarct and indicate the degree of reversibility, (ii) correlate well with angiographic coronary artery involvement, (iii) small fixed septal perfusion defects may occur in normal persons with BBB. This is a useful investigation in the assessment of patients with BBB and clinical indications requiring angiographic assessment.
Effects of Atorvastatin on Inflammatory Markers in Patients with Congestive Heart Failure

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Institute of Post Graduate Medical Education and Research, Kolkata

We studied whether atorvastatin treatment improves endothelial function and affects inflammatory markers in patients with congestive heart failure (CHF) having normal cholesterol levels. CHF is associated with activation of inflammatory process and endothelial dysfunction. We investigated effect of 4 weeks therapy with atorvastatin (40 mg/day) on inflammatory markers and on endothelial function in patients of CHF with normal cholesterol levels (<200 mg/dl). Patients were randomly allocated to statin (n=19) and no-statin (n=19). Serum level of high sensitivity C-reactive protein (hsCRP) was measured as inflammatory marker. Flow-mediated dilation of brachial artery was measured for determining endothelial function. Brachial artery flow-mediated dilation was significantly improved in patients who received atorvastatin (from 3.2% ±1.5% to 5.1%±2.2%, p< 0.05). Levels of hsCRP decreased in atorvastatin-treated patients from 1.3 ±0.5 mg/dl to 0.8±0.2 mg/dl (p<0.05). These findings indicate that atorvastatin may improve forearm vasodilatory response to reactive hyperemia and depress inflammatory process in patients with CHF and normal baseline cholesterol levels.

Clinical Profile of Acute Myocarditis

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Malabar Institute of Medical Sciences, Calicut (Kerala)

Patients treated with a diagnosis of myocarditis over a period of six months were included in this study. Out of 10 patients (age range: 7-88 years), nine had elevated serum cardiac troponin-I. The cases were seasonal, occurring at time of infectious fever epidemics. Two patients had a primary diagnosis of leptospirosis. Six patients presented with acute febrile illness and myocarditis with breathlessness and hypotension. Two patients had viral fever with multisystem involvement including myocarditis. Three patients had conduction system involvement at presentation. Two patients with complete heart block required temporary pacing. One patient had only transient complete heart block. Patients with leptospirosis and myocardial involvement had normal left ventricular (LV) function. Half of patients with viral myocarditis had LV dysfunction. Patients with multisystem involvement with viral fever, incidentally, had normal LV function. One-third cases of viral myocarditis had presented with conduction disturbances, namely complete heart block, which reverted to sinus rhythm in all except one patient. All the patients with LV dysfunction had regained normal LV function on follow-up, within two months. These patients were treated with angiotensin-converting enzyme (ACE) inhibitors, carvedilol, digoxin and diuretics. In our series, troponin-I had a high sensitivity as a screening tool in acute myocarditis, with 90% cases being troponin-I positive with high values. Troponin I had higher sensitivity than two-dimensional echocardiography- derived LV function and global LV hypokinesia as a diagnostic tool in myocarditis.

Changing Trends in Management of Congestive Cardiac Failure: The Dor-type Procedure for an Atypical Large Infero-Posterior Wall True Aneurysm Masquerading As Congestive Cardiac Failure

Binoy John, N Madhu Sankar, M ohammad Mustaffa, Pramod K Jaiswal, BR Jaganath, KM Cherian
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In the current era of interventional therapeutic and surgical re-vascularization, there has been a dramatic decline in the incidence of left ventricular (LV) aneurysms and the need for aneurysmectomy. So also, with increasing survival rates, there has been a change in the cardiac patient profile with a rise in the number of patients with congregate cardiac failure. Thus there has come the evolution of various LV reconstruction surgeries as the Dor procedure and also non-surgical methods as cardiac re-synchronization therapy. The Dor-type repair is a technique, which excludes the infarcted segment with a patch restoring the overall LV shape to as close to normal as possible. LV true aneurysms are a known complication of myocardial infarction. But 4/5 involve the antero-apical wall with a four times more frequency in this wall than the infero-posterior wall. We report the case of a 59 years old diabetic, hypertensive male who suffered an infero-posterior myocardial infarction 15 years back, and was on medical management. He had presented with class III exertional dyspnea and symptoms of congestive failure. Clinical examination revealed a heart rate of 98/min and a systemic blood pressure of 100/80 mmHg elevated venous pressure with prominent V and Y waves, pitting pedal edema, loud P2 and LV S3 gallop. Echocardiogram revealed regional wall motion abnormality (RWMA) with a large infero-posterior true aneurysm, moderate mitral regurgitation, mild tricuspid regurgitation and pulmonary artery (PA) systolic pressure of 50 mmHg and LV ejection fraction of 39%. In view of the above profile, an oximetry and right heart pressure study was done which revealed a PA diastolic pressure of 20 mmHg and cardiac index of 1.9 L/min/m2. Coronary angiogram revealed significant left main and triple vessel disease and left ventriculogram defined the infero-posterior wall aneurysm. He was subsequently treated with coronary artery bypass graft (CABG) surgery with 4 grafts and Dor-type repair. The aneurysm was seen to be abutting onto the posterior annulus of the mitral valve and also had dense pericardial adhesion to the diaphragm. The aneurysm was opened along the inferior
Effect of a Simple Intervention by Intensive Telephonic Management on the Quality of Life in Patients with Heart Failure

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All India Institute of Medical Sciences, New Delhi

Patient counseling, promotion of compliance, and aggressive drug therapy lead to improved outcome in patients with congestive heart failure (CHF) resulting in reduced symptoms and a better quality of life. We assessed the effectiveness of using telephonic case management intervention in improving the quality of life of heart failure patients, a form of non-pharmacological intervention, which has not been tried earlier in a developing country like India. Patients followed up at the heart failure clinic were randomized into two groups (25 patients each). Control group was managed in a heart failure clinic in a routine fashion (patients received advice regarding fluid management and drugs). The intervention group in addition to the routine management, received the following interventions: (i) 1-hour interactive session with patient and spouse on the disease, the rationale of the drugs being used and their side effects, (ii) Training in self management of fluid intake and diuretic dose-adjustment, (iii) Weekly telephonic advice and emergency consultation through a telephonic helpline. The quality of life was assessed using the Kansas City Cardiomyopathy questionnaire. The questionnaire was evaluated (Max score 123) in all patients at 1st visit and after 2 months. There was significant improvement in the quality of life of the patients in the intervention group as compared to those in the control group.

(i) Intervention group - 1st visit score: 83.43±5.11; 2-month score: 100.27±5.1 (p < 0.05). (ii) Control group - 1st visit score: 87.04±4.01; 2-month score: 89.25±7.89. This study demonstrates that in the setting of a developing country, the improvement in quality of life by intensive management of heart failure patients through telephonic means is greater than that usually achieved with pharmaceutical therapy in a routine heart failure clinic.

Brain Natriuretic Peptide and Troponin-I Levels in Systolic Heart Failure for Prognostication

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Plasma brain natriuretic peptide (BNP) and troponin-I levels are elevated in systolic heart failure. We report 160 patients of systolic heart failure with NYHA class II–IV symptoms and ejection fraction (EF) of <40%. Patients were on antifailure medications (digoxin, diuretics, angiotensin-converting enzyme inhibitors [ACEI], angiotensin receptor blockers [ARBs], beta-blockers) based on clinical symptoms. All patients had undergone transthoracic echocardiography (TTE) with Doppler velocities (E/A ratio, E/Ea ratio, E deceleration time [EDT], ejection fraction [EF] [modified Simpson's method]). Plasma levels of BNP and troponin-I were estimated on admission and once in 2–3 months for a period of 13 months. BNP levels ranged from 68.02 to 4200 pg/ml and troponin-I levels 0.06 to 0.23 ng/ml. Mean left ventricular ejection fraction (LVEF) was 34±6%, E/A ratio 1.8±3, E/Ea ratio
8.6±0.5; EDT 152±2 ms. It was found that 86% of patients with elevated BNP correlated with NYHA clinical symptoms and Doppler velocities, whereas only 9% of patients with elevated troponin-I levels did correlate with clinical symptoms. Further, the patients with BNP levels >2000 pg/ml had worse prognosis despite optimal medical treatment. Plasma BNP levels would be more useful in risk stratification and predicting prognosis.

Heart Failure: Gender Differences
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Gender-based differences have been reported in the manifestations and management of various medical maladies including heart failure. We studied the data of heart failure patients to see the differences in the clinical profile and medical management between women and men. The study evaluated heart failure patients (309 (43%) women, 405 (57%) men), included in the prospective heart failure registry data between January 2003 and May 2005. Mean age was 56.5±17.6 years for women and 58.2±14.6 years for men. While valvular heart disease (n=58, 18.8% v. n=43, 10.6%, p=0.002) and dilated cardiomyopathy (n=67, 22.2% v. n=61, 15%, p=0.02) were seen more often in women, coronary artery disease (CAD) (n=144, 46% v. n=273, 67.4%, p<0.001) was more common in men. Smoking, alcohol ingestion, dyslipidemia and renal dysfunction were more frequently seen in men (n=264, 65% v. n=11, 3.5%, p<0.001; n=138, 34% v. n=6, 1.9%, p<0.001; n=296, 73% v. n=203, 65.7%, p=0.03; and 9.0% v. 0.9%, p=0.01, respectively). There were no significant differences in NYHA class at presentation, hypertension, diabetes, chronic obstructive airway disease or cerebrovascular event. More women (n=148, 47.5%) compared to men (n=124, 30.6%, p=0.001) had preserved left ventricular (LV) systolic function (n=52, 17.3% v. n=22, 5.4%, p<0.001). In patients with LV systolic dysfunction (n=196, 63%), 40.7% were more frequently seen in men. There was no gender difference in the usage of angiotensin-converting enzyme (ACE) inhibitors, angiotensin receptor blockers, antialdosterone drugs, diuretics, beta-blockers, nitrates and statins. But aspirin (n=222, 71.8% v. n=340, 83.9%, p<0.001) and clopidogrel (n=127, 41.1% v. n=218, 53.8%, p<0.001) were used more frequently in men. No significant difference was noted in the mortality between the two groups. To conclude, women with heart failure as compared to men have more often valvular heart disease and dilated cardiomyopathy as the underlying cause. Preserved LV systolic function and atrial fibrillation were more common in women. There was no gender bias in the use of anti-failure pharmacotherapy.

Left Ventricular Diastolic Dysfunction: A Valuable Predictor of Prognosis in Heart Failure Patients
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Left ventricular (LV) systolic dysfunction has been used as a prognostic indicator in patients with heart failure. We prospectively evaluated the role of LV diastolic dysfunction in predicting the prognosis in heart failure. Eighty-six consecutive patients admitted with heart failure to our ICCU were studied with clinical and echocardiographic evaluation. Mean follow-up was 6.1±1.6 months. Patients had a mean age of 60.02±12.9 years with 55 (64.0%) males and 31 (36.0%) females. LV diastolic dysfunction was present in 59 (68.6%) patients. Among these 19 (22.1%) patients had isolated diastolic dysfunction whereas 40 (46.5%) patients had associated LV systolic dysfunction. Impaired relaxation pattern was seen in 17 (19.8%) patients, pseudo normal in 8 (9.3%) patients and restrictive filling pattern in 34 (39.5%) patients. Mitral deceleration time (DT) was significantly lower in patients in NYHA class III and IV (n=59) compared to those in NYHA class II (n=26) (215.29±88.12 ms v. 293.46±68.84 ms; p=0.0001). More patients with restricted diastolic dysfunction were in NYHA class III and IV (n=30, p=0.0136) compared to those with lower grades of diastolic dysfunction. More patients in diastolic dysfunction group needed >2 days of ICCU treatment (n=20, p=0.0161). Similarly, more patients in the diastolic dysfunction group required >7 days of hospital stay (n=15, p=0.0013). Significant number of patients with diastolic dysfunction received ventilatory support (n=24, p=0.0047). In-hospital mortality was higher in patients with restricted diastolic dysfunction (n=10) compared to those with lower degrees of diastolic dysfunction (n=2) (p=0.042). Patients who had event-free survival (no death, readmission or worsening heart failure) on follow-up trend to have longer mitral DT (n=39) compared to others (272.63±83.51 ms v. 229.95±79.69; p=0.0485). We conclude that the echocardiographic analysis of diastolic function is very valuable in predicting prognosis in heart failure patients being admitted to hospital.

Value of N-Terminal Pro-Brain Natriuretic Peptide for Identifying High Risk Patients with Heart Failure in the Intensive Care Unit
TM Jaison, Charles T Itty, Kapil Chattree
Christian Medical College, Ludhiana

N-terminal pro-brain natriuretic peptide (NT-proBNP) is a marker of left ventricular dysfunction. We assessed the usefulness of NT-proBNP to identify high risk heart failure patients in the critical care setting. We prospectively studied
86 consecutive patients admitted in our intensive coronary care unit (ICCU) with heart failure. Mean age of the patients was 60.2±12.9 years. There were 55 (64.0%) males and 31 (36.0%) females. All patients underwent complete clinical evaluation, echocardiography and NT-proBNP estimation on admission. Mean follow-up was 6.1±1.6 months. Twenty-six (30.2%) patients were in NYHA class II (NT-proBNP: 3610.83±7368.15 pg/ml) while 34 (39.5%) were in class III (8454±12551.82 pg/ml) and 26 (30.2%) in class IV (12605±13734.94 pg/ml). NT-proBNP levels were significantly high in those in higher NYHA classes (p=0.0033). Those with higher transmitral early diastolic velocity/tissue Doppler early diastolic mitral annular velocity (E/Ea) ratio had elevated NT-proBNP levels (E/Ea≥14, n=32, NT-proBNP = 10519.97±13690.90 pg/ml v. E/Ea<14, n=47, NT-proBNP = 6099.55±9483.87 pg/ml; p=0.0291). Those with higher degrees of diastolic dysfunction had significantly higher levels of NT-proBNP (impaired relaxation group: n=15, NT-proBNP 2777.8±6150.11 pg/ml; pseudonormal group: n=8, NT-proBNP 4088.88±5801.41 pg/ml; Restrictive group: n=34, NT-proBNP 11624.62±13746.49 pg/ml; p=0.015). Patients who developed ventricular tachycardia (n=17, NT-proBNP 15859.59±15525.79 pg/ml) had higher NT-proBNP levels compared to others (n=64, NT-proBNP = 6227.33±10156.83 pg/ml; p=0.001). Patients who required ventilatory support (n=26) had higher NT-proBNP levels (13688.77±14530.49 pg/ml v. 5677.35±9804.29 pg/ml; p=0.0012). Those who had higher NT-proBNP levels needed longer stay in ICCU (>2 days, n=27, NT-proBNP = 12529.65±12301.87 pg/ml v. ≤2 days, n=49, NT-proBNP = 5696.37±10613.19 pg/ml; p=0.0181). Patients who had adverse events (death, readmission or worsening heart failure) on follow-up (n=24) had significantly higher NT-proBNP levels compared to others (12561.58±12824.91 pg/ml v. 5015.62±8783.80 pg/ml; p=0.001). In conclusion, higher NT-proBNP levels on admission in heart failure patients points to increased risk for complications during hospital stay and on follow-up.

Effect of Nebivolol on Circulating N-Terminal Pro-BRAINatriuretic Peptide Levels in Patients with Heart Failure
A Lalchandani, P Sondhi, R Chandra, NN Khanna, A Agarwal, G Preethi, V Agarwal, M Shameem
Post Graduate Institute of Medicine, GSVM Medical College and Escorts Heart Centre, Kanpur

Plasma brain natriuretic peptide (BNP) levels and cardiac autonomic functions are strongly related to severity of, and are independent predictors of outcome in patients with heart failure. The long-term effects of nebivolol on BNP in heart failure patients are yet not known. This study examines the effects of nebivolol compared to placebo on plasma concentrations of NT-proBNP in patients with heart failure. This study enrolled 47 patients of heart failure attending our outpatient department or admitted to our hospital. In addition to history, clinical examination and echocardiographic evaluation, the baseline and follow-up concentrations of NT-proBNP were measured using electrochemiluminescence method. All patients received stable conventional therapy for heart failure, and were randomly assigned to double-blind treatment with either nebivolol (n=25) or placebo (n=22) and were followed for a period of 12 weeks. NT-proBNP concentrations were increased at baseline: 656.22±764.1 pmol/L, median: 335 pmol/L). There was marked decrease (31.27%) in NT-proBNP concentration in nebivolol group at 12 weeks (469.55±547.9 pmol/L, median: 216 pmol/L) as compared to placebo group in which the fall was just 11.21% from the baseline. Nebivolol improves cardiac function in patients with reduced left ventricular function. NT-proBNP could be used not only for risk stratification and monitoring of therapy in heart failure, but also for evaluation of efficacy of different β-blockers in heart failure.

Evaluation of Effect of Nebivolol on Left Ventricular Functions in Patients with Heart Failure
A Lalchandani, P Sondhi, SK Saxena, RK Bansal, NN Khanna, A Agarwal, V Agarwal, P Nedam
LPS Institute of Cardiology, GSVM Medical College, Kanpur

Large randomized trials have shown that beta-blockers reduce mortality and hospital admissions in patients with heart failure. But each beta-blocker in heart failure need to be evaluated separately and the effects of one cannot be extrapolated to another. This study evaluated the efficacy of the new β-blocker nebivolol on left ventricular (LV) function in patients with heart failure. Study was conducted on 47 patients of heart failure in our institution. All patients received stable conventional therapy for heart failure, and were randomly assigned to double-blind treatment with either nebivolol (n=25) or placebo (n=22) and were followed for a period of 12 weeks. Heart rate, systolic and diastolic blood pressure and echocardiographic parameters of LV function were recorded at baseline and after 12 weeks of therapy. Nebivolol was well tolerated and the NYHA class improved in all patients. Heart rate decreased significantly (p<0.005). LV systolic function improved [ejection fraction (EF) 39.2±7.2% to 44.2±5.2%, p<0.005, stroke volume(SV) from 66.7±11.1 to 79.2±13.2, p < 0.005]). LV diastolic function improved (increase in peak E (cm/s) from 59±10 to 64±6, p<0.05, E/A ratio from 1.30±0.41 to 1.44±0.32, p <0.05) after 12 weeks of nebivolol. The present study shows that Nebivolol is well tolerated and improves LV systolic and diastolic function in patients with heart failure.
Hypertrophic Cardiomyopathy - Profile and Varied Presentation: Experience at a Tertiary Care Centre

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Hypertrophic cardiomyopathy is (HCM) commonly undiagnosed condition until completely evaluated at a well-equipped centre. It has varied clinical presentations. Various diagnostic modalities are now available to assist the clinician. In an institutional review, this study was done on HCM patients attending OPD or admitted at our institute. The study period was of 2 years from January 2002 to December 2004. Data was analyzed with regards to demography, HCM type [hypertrophic obstructive cardiomyopathy (HOCM), hypertrophic non-obstructive cardiomyopathy (HNOCM) hypertrophic apical cardiomyopathy (HACM)], and HCM with unusual findings. Detailed history, examination, routine investigation, electrocardiogram (ECG), 24-hour Holter monitoring, echocardiography was done. Those having associated congenital heart disease (CHD), rheumatic heart disease (RHD), and infective endocarditis (IE) were included in this study. Of the total patients, 55 were diagnosed to have HCM (1.12%) by echocardiography; 67% (n=37) were males and 33% (n=18) were females. Age range was 2 months to 79 years. Positive family history was noted in 7 (12.7%) cases. Symptomatic disease was seen in 64% cases, of which chest pain predominated (77%), followed by dyspnea (60%), syncope (42%) and palpitation (28%). Clinico-electrocardiographically, atrial arrhythmias was in 3 patients, ventricular arrhythmias in 35 (frequent VPCs, couplet, bigeminy) and complete heart block (CHB) in 1. Left ventricular hypertrophy (LVH) with strain pattern (80%), mean QRS voltage: 42mV, giant T inversion in V1-V4, I and aVL leads in 4 cases. None of the patients had history of sudden cardiac death (SCD). Echocardiographic analyses revealed: (a) HCM: 50%, (b) HOCM: 32%, (c) HACM: 7%, (d) Associated subaortic stenosis: 1.12% (n=2), (e) HCM with RHD: n=1 pt, (f) HCM with tricuspid valve prolapse (TVP) n=1 and IE+ mitral valve prolapse (MVP): n=1. ASH in 96% and SAM in 100%. Biventricular involvement was seen in 2 patients. Diastolic dysfunction was found in 50% cases. Mean LV mass was 204 gm/m². Valvular lesions included: mitral regurgitation (MR) 70%, aortic regurgitation (AR) 05% & tricuspid regurgitation (TR) 21%. HCM with mitral stenosis (MS): n=1. Mean resting LV outflow tract gradient was 70 mmHg (20-120 mmHg). Dobutamine-provocated gradients were also studied when resting LV outflow tract gradients were <50 mmHg. A angiographic coronary artery disease (CAD) was found in 25% cases specially in age group > 45 years. None of the cases had acute coronary event. HCM is not an uncommon disease entity. It has varied presentations and needs clinical acumen for diagnosis as also the expert diagnostic armamentarium.

Effect of Carvedilol on Functional Capacity and Cardiac Output in Patients with Cardiomyopathy

G Prathap Kumar, RA Janarthanan, S Palanichamy, V Aimuthan, S Murugan, S Balasubramanian, S Naina M ohamed, S Balashankar, P Kannan, G Jeyakumar, M Anandan
Madurai Medical College and Government Rajaji Hospital, Madurai

The aim of the study was to establish the potency and efficacy of carvedilol in improving the cardiac output and functional capacity in patients with left ventricular (LV) systolic dysfunction. Twenty patients in the age group 23 to 60 years were enrolled in the study of which only 18 completed the study. Ten patients had dilated cardiomyopathy (DCM) and the rest, ischemic cardiomyopathy. On entry, baseline echocardiographic evaluation was done and end-diastolic volume (EDV)/end-systolic volume (ESV)/left ventricular ejection fraction (LVEF)/cardiac output/tricuspid regurgitation (TR) gradient were calculated for all patients. Functional capacity estimation was standardized as number of seconds the patients were able to walk on a treadmill at 2.5 MPH and 10° grade. Eccentricity index was calculated in all patients as the ratio of LV long axis length and short axis length in apical 2 chamber view. All patients were started on 3.125 mg twice daily of carvedilol and stepped up at biweekly intervals up to 12.5 mg twice daily. After 6 weeks, patients were reevaluated with echocardiography and functional capacity assessed on the treadmill as before. Among the DCM patients there was a significant increase in LVEF from 40.3±4.62% to 48.3±0.01%. Similarly the cardiac output also improved from 3.56±0.27 L/min to 3.99±0.34 L/min. The functional capacity increased from 197.9±98.6 sto 373.7±108.14 s. TR gradient decreased from 42.7±8.17 mmHg to 32.6±6.77 mmHg. Among the ischemic cardiomyopathy group, LVEF increased from 37.5±3.88% to 45.25±4.95%, cardiac output also increased from 3.37±0.38 L/min to 3.83±0.37 L/min. Functional capacity showed an increase from 317.5±83.145 s to 514.88±58.74 s. There was also a significant decrease in TR gradient from 52.37±9.9 to 40.25±10.43 mmHg. The eccentricity index did not show significant change, probably more time might be needed for favorable improvement in geometry. The statistical analysis was done using paired t test.

<table>
<thead>
<tr>
<th>LVEF (%)</th>
<th>CO (L/min)</th>
<th>Func. Cap(s)</th>
<th>TR PG (mmHg)</th>
<th>LVEF (%)</th>
<th>CO (L/min)</th>
<th>Func. Cap(s)</th>
<th>TR PG (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>40.3±4.62</td>
<td>3.56±0.27</td>
<td>197.9±98.6</td>
<td>242.7±8.17</td>
<td>37.5±3.88</td>
<td>3.37±0.38</td>
<td>373.7±108.14</td>
</tr>
<tr>
<td>Post</td>
<td>48.3±4.95</td>
<td>4.27±0.27</td>
<td>32.6±6.77</td>
<td>45.25±4.95</td>
<td>3.83±0.38</td>
<td>514.88±58.74</td>
<td>40.25±10.43</td>
</tr>
</tbody>
</table>

*p value <0.002 <0.0009 <0.0005 <0.0057 <0.0048 <0.0037 <0.0005 <0.0002

LVEF: left ventricular ejection fraction, CO: cardiac output, TR: tricuspid regurgitation, PG: peak gradient.
Natural History of 142 Cases of Hypertrophic Cardiomyopathy
Adarsh Kumar, R.K. Sharma, Harcharpreet Kaur, Varun Mohan
Government Medical College, Amritsar

In last 9 years, 142 cases [males: 96, (67.6%); females: 46 (32.4%)] of hypertrophic cardiomyopathy (HCM) were examined. The diagnosis was based on clinical examination, electrocardiogram (ECG), and detailed echocardiographic evaluation. Age of presentation was 18.7-72.6 years (mean: 46.2 years). Follow-up period ranged from 34.3 months-96.4 months with median period of 60.4 months. Palpitation, angina, shortness of breath and syncope were the commonest presentations (76%; 46; 39.2%; 11.3%, respectively) with 2 (1.4%) patients presenting with sudden cardiac death (SCD) from which both were resuscitated in coronary care unit (CCU).

On ECG 39.6% cases had left ventricular hypertrophy (LVH); 20.4% cases had non-Q infarct like presentation; 5 (3.5%) cases presented with ventricular tachycardia (VT); 5 (3.5%) had atrial fibrillation (AF) and 3 (2.1%) with supraventricular tachycardia (SVT). On echocardiography, asymmetrical septal hypertrophy (ASH) was seen in 63/142 (44.4%); concentric LVH in 61/142 (42.9%); apical hypertrophy in 13/142 (9.2%) and left ventricular posterior wall (LVPW) hypertrophy in 5/142 (3.5%). Systolic anterior motion (SAM) of mitral valve was seen in 59/142 (41.5%) cases and significant left ventricular outflow tract (LVOT) gradient in 26/142 (18.3%) (all had SAM). Mitral regurgitation (MR) grade IV seen in 80/142 (56.3%). All the patients were empirically put on long-term amiodarone therapy 100-400 mg per day, in addition to other symptomatic treatment. One patient resuscitated from SCD due to recurrent VT, and had to be given automatic implantable cardioverter defibrillator (AICD). Only 5 (3.5%) patients died during this long follow-up period with all of them symptomatic-2 having recurrent VT; 2 having severe diastolic LV dysfunction and 1 had refractory angina. To conclude, HCM runs a relatively benign course on long-term basis and mortality rate is not high as was previously thought. Long-term amiodarone therapy perhaps provides survival benefits.

Atorvastatin Reduces Inflammatory Marker in Dilated Cardiomyopathy and Improves Long-Term Outcomes
UK Saha, DP Sinha, M. Das, M Panja
Institute of Post Graduate Medical Education and Research & SSKM Hospital, Kolkata

Patients with dilated cardiomyopathy (DCM) have poor prognosis despite all available treatments. Statins have been shown to reduce the risks of future cardiovascular events. Atorvastatin reduces the level of high-sensitive C-reactive protein (hsCRP) independent of its lipid lowering effects. The present study was designed to see the effects of atorvastatin on hsCRP in patients of DCM and its long-term outcomes. Forty-six patients of DCM with stage II/III heart failure were randomly assigned either to receive atorvastatin at dose of 40 mg/day in addition to their conventional treatment or to continue their usual drug treatment for 18 months. Patients were evaluated at baseline and at 6, 12 and 18 months with clinical examination, biochemical analysis, fasting blood sugar (FBS), lipid profiles, creatinine, liver enzymes and hsCRP and echocardiography; 23 patients received atorvastatin (Group I) and rest 23 served as control (Group II). Baseline clinical, biochemical and echocardiographic parameters were comparable in both groups. Atorvastatin added to usual treatment significantly improved the patients functional status as assessed by NYHA functional class although the mean left ventricular ejection fraction (LVEF) were not improved significantly in comparison to control. It also reduced hsCRP and low-density lipoprotein (LDL-c) levels. No significant adverse effect or change in liver enzymes were noted.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Groups</th>
<th>Baseline</th>
<th>6 mo</th>
<th>12 mo</th>
<th>18 mo</th>
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<tr>
<td>Functional class (average)</td>
<td>Grade-I</td>
<td>2.74</td>
<td>2.61</td>
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<tr>
<td>LDL-c (mg/dl)</td>
<td>Grade-I</td>
<td>96.13±</td>
<td>90.21±</td>
<td>82.69±</td>
<td>68.23±</td>
</tr>
<tr>
<td></td>
<td>Grade-II</td>
<td>94.08±</td>
<td>18.53</td>
<td>12.29</td>
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<tr>
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<td></td>
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Treatment with atorvastatin for long-term in patients of DCM resulted in symptomatic improvement in functional class and also in reduction of inflammatory marker. However, LV function as measured by echocardiography is not improved significantly when compared with controls.

Atorvastatin Alone/in Combination with Co-Enzyme Q10 in 108 Cases of Ischemic Dilated Cardiomyopathy
Adarsh Kumar, Harcharpreet Kaur, Sunil Kumar, Varun Mohan, Pushpa Devi
Government Medical College, Amritsar

In addition to their lipid modulatory effects, statins may be helpful in heart failure (HF) due to ischemic dilated cardiomyopathy (DCM), because of their effect in endothelial function, ventricular remodeling and suppression of cytokine release. Very few patients are given statins in HF due to fear of reducing the coenzyme (CoQ) 10 levels. Atorvastatin reduces the level of high-sensitive C-reactive protein (hsCRP) independent of its lipid lowering effects. The present study was designed to see the effects of atorvastatin on hsCRP in patients of DCM and its long-term outcomes. Forty-six patients of DCM with stage II/III heart failure were randomly assigned either to receive atorvastatin at dose of 40 mg/day in addition to their conventional treatment or to continue their usual drug treatment for 18 months. Patients were evaluated at baseline and at 6, 12 and 18 months with clinical examination, biochemical analysis, fasting blood sugar (FBS), lipid profiles, creatinine, liver enzymes and hsCRP and echocardiography; 23 patients received atorvastatin (Group I) and rest 23 served as control (Group II). Baseline clinical, biochemical and echocardiographic parameters were comparable in both groups. Atorvastatin added to usual treatment significantly improved the patients functional status as assessed by NYHA functional class although the mean left ventricular ejection fraction (LVEF) were not improved significantly in comparison to control. It also reduced hsCRP and low-density lipoprotein (LDL-c) levels. No significant adverse effect or change in liver enzymes were noted.

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<tr>
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Treatment with atorvastatin for long-term in patients of DCM resulted in symptomatic improvement in functional class and also in reduction of inflammatory marker. However, LV function as measured by echocardiography is not improved significantly when compared with controls.
of global LV hypokinesia (EF ≤30%). In 108 treated cases (Group I) (male-female ratio was 67:41-62.1%/37.9%; aged 38.3-76.4 years; mean: 54.5 years). Study cases of Group I, 54 (50%) were given 20 mg atorvastatin daily in addition to the standard treatment of digoxin, angiotensin-converting enzyme (ACE) inhibitors and beta-blockers etc. (Group IA) and 54 (50%) were given atorvastatin and 100 mg CoQ10/day combined with conventional therapy (Group IB). Simultaneously 96 age/sex matched cases were given only routine treatment for the same period (Group II). The mean follow-up period was 11.4 months. The end points were improvement in quality of life, by 6 min walk test, reduced number of hospitalizations, improvement in left ventricular ejection fraction (LVEF) ≥5% at the end of study period and mortality benefits. The atorvastatin alone (Group IA) caused symptomatic improvement in 48.15% and in Group IB it was 59.25% whereas it was 25% in control Group II (p<0.02). LVEF improved by ≥5% in 9.26% of Group IA, in 14.32% of Group IB and only in 3.12% (p<0.02) in controls. Mortality benefit was statistically insignificant.

<table>
<thead>
<tr>
<th>Side effect</th>
<th>Statin alone Group IA</th>
<th>Statin+CoQ10 Group IB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscle fatigue/myalgia</td>
<td>5/54 (9.26%)</td>
<td>1/54 (1.85%)</td>
</tr>
<tr>
<td>Severe myopathy</td>
<td>1/54 (1.85%)</td>
<td>0/54 (0)</td>
</tr>
<tr>
<td>Hepatic enzyme abnormality</td>
<td>1/54 (1.85%)</td>
<td>0/54 (0)</td>
</tr>
<tr>
<td>Stoppage of drug therapy due to side effects</td>
<td>2/54 (3.70%)</td>
<td>0/54 (0)</td>
</tr>
</tbody>
</table>

Addition of statins in treatment of HF due to ischemic DCM leads to significant improvement in clinical class and in LV dysfunction. CoQ10 adds further benefits.

**Effect of Beta-Blocker Therapy on Tei Index in Ischemic Cardiomyopathy**

CV Arunavalli, ST Yavagal, CN M anjunath
Sri Jayadeva Institute of Cardiology, Bangalore

Beta-blockers used in stable heart failure reduce mortality and frequency of hospitalizations by neurohumoral antagonism and by preventing the downregulation of beta1 receptors. We studied the effect of carvedilol on global left ventricular (LV) function as assessed by tissue Doppler-derived Tei index. From July 2004 to January 2005, 40 patients with ischemic cardiomyopathy (known coronary artery disease (CAD) and left ventricular ejection fraction (LVEF) <30%) were included in the study. Male-to-female ratio was 1.81:1 (26 patients were males, 14 were females). Twenty-two (55%) patients were diabetics, 8 (20%), were hypertensive. Only 15 (37.5%) underwent prior coronary angiogram-triple vessel disease in 8 (20%), double vessel disease in 7 (17.5%). None of the patients underwent coronary interventions. The mean duration from acute coronary event to current presentation was 3.6 years. All patients were in NYHA class IV at presentation. Thirty-four patients (85%) had pure LV failure, 6 (15%) had biventricular failure. After initial stabilization with intravenous (IV) dobutamine, angiotensin-converting enzyme (ACE) inhibitors, IV diuretics, and digoxin for one to two weeks, all patients were started on carvedilol at a dose of 3.125 mg twice daily, with step-up of dosage every two weeks. The maximal dosage achieved was 25 mg twice daily. 2D echocardiograms and Doppler tissue imaging (DTI) were performed initially on all patients, using an Agilent Sonos 5500 (Philips) machine. The average LVEF was 28% and average Tei index was 48%. The patients were followed over six months. Six patients experienced worsening of heart failure, requiring stoppage of the drug. At the end of 6 months, 15 patients (40%) improved to NYHA class III and 10 (25%) improved to class II. The average improvement in LVEF was 7.4%. Tei index improved by 6.2% to 11.4%. Four patients were lost to follow-up. Five patients required repeat hospitalization for exacerbation of heart failure. We conclude that beta-blocker therapy in ischemic cardiomyopathy improves the functional status and global (i.e. systolic and diastolic) LV function as assessed by Tei index.

**Isolated Noncompaction of Left Ventricle: A Common Cause of Adult Dilated Cardiomyopathy**

A Bahl, A Swamy, HK Bali, YP Sharma, R Vijayvergiya, M Rohit, A Grover, KK Talwar
Postgraduate Institute of Medical Education and Research, Chandigarh

Isolated noncompaction of left ventricle (ILNC) is being increasingly recognized as a cause of left ventricular (LV) dysfunction in adults. The prevalence of INLC and the scope of the problem is not known. The aim of this study was to determine the clinical spectrum of ILNC and its prevalence in an adult patient population with non-ischemic dilated cardiomyopathy. All adult probands with non-ischemic left ventricular systolic dysfunction and left ventricular ejection fraction (LVEF) less than 40% presenting over a 21 month period were screened echocardiographically for ILNC. Seventy-seven patients met the inclusion criteria for non-ischemic LV systolic dysfunction. Of these 17 (22.1%) were found to have ILNC. The mean age of patients with ILNC was 37.9±14.8 years. Eleven (64.7%) were males. Presentations included peripartum cardiomyopathy, preexcitation and complete heart block. Associated conditions included facial dysmorphism, Dupuytren’s contracture and hypothyroidism. Noncompaction was restricted to the LV apex in 13 (76.5%) individuals. ILNC is a common cause of non-ischemic LV systolic dysfunction and is found in over one-fifth of adult patients with the condition. It has a heterogeneous presentation and can present as acute or chronic heart failure, peripartum cardiomyopathy, complete heart block or facio-noncompaction.
syndrome. It is most commonly segmental and localized involving only the apex. Careful echocardiographic screening of the apical segments is essential to identify this condition.

Histomorphological Features and Immunohistochemical Characterization of Inflammatory Cells in Dilated Cardiomyopathy: An Autopsy Study

Uma Nahar Saikia, Bhubinder Kaur, Ajay Bahl, KK Talwar, K Joshi
Post Graduate Institute of Medical Education and Research, Chandigarh

A total of 10 cases of dilated cardiomyopathy (DCM) which met the diagnostic criteria were retrieved from the autopsy files over a period of 5 years with male-female ratio of 2.3:1. The age ranged from 6 months to 53 years with 3 pediatric cases. Five cases presented with congestive cardiac failure of which 3 had history of preceding fever with clinical suspicion of myocarditis. Cardiomegaly was seen in 7 cases on chest X-ray. At autopsy gross examination revealed enlargement of the heart in all the cases. Biventricular dilation was noted in 3 cases and the remaining cases had four-chamber dilation and enlargement. Right auricular thrombosis was seen in 6 cases. Endocardial thickening and fibrosis were noted in 4 cases, more prominent on the right side. The coronaries did not show significant narrowing in any of the cases. Microscopic examination revealed epicardial, myocardial and interstitial mononuclear infiltrate in 6 cases where the predominant cell population was CD68+ by immunohistochemistry (IHC). True myocarditis with ‘T’ cell infiltrate (CD3+) was seen in 3 cases only, of which 2 belonged to pediatric age group. Interstitial fibrosis was present in seven cases where was moderate in 3 cases and one case showed severe replacement fibrosis. Myocarditis is a possible cause of DCM and more than half of our cases (60%) demonstrated interstitial infiltrate which was predominantly histiocytic in nature. These features may suggest that the histiocytic infiltration may represent resolving myocarditis. Therefore, IHC may enhance the sensitivity of endomyocardial biopsy for the diagnosis of myocarditis for instituting early therapy and thus prevent mortality.

Differences between Physicians and Cardiologists in the Management of Chronic Heart Failure: Relation to Practice Guidelines

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All India Institute of Medical Science, New Delhi

Heart failure (HF) is one of the most common causes of cardiovascular morbidity and mortality. Recent studies have shown improved outcomes when patients are managed by cardiologists or heart failure specialists in special clinics. Most studies on this topic have been before the publication of HFSA (Heart Failure Society of America) guidelines in 1999 and especially in India such an evaluation has never been considered. The objective of the present study was to ascertain the differences in practice patterns and compliance to established HF guidelines among physicians and cardiologists from diverse locations. A questionnaire examining the diagnostic and treatment patterns in HF was designed and responses obtained from 104 cardiologists and physicians. They were analyzed to bring out the differences between the two groups and to ascertain their adherence to established guidelines. Significant differences were seen in the practices of cardiologists as compared to physicians. Cardiologists were more likely to use echocardiography as compared to physicians as the primary modality for diagnosing HF (93.4% v. 59.16%, p<0.05) whereas physicians were more likely to use chest X-ray (40.84 v. 6.6%, p<0.05). Cardiologists ordered coronary angiography in larger number of patients with HF with history of angina than physicians (96.6% v. 29.5%). Physicians expressed more concern in starting angiotensin-converting enzyme (ACE) inhibitors in patients with raised serum creatinine >2.5 (35% only started above or at this level as compared to 63.2% of cardiologists, p<0.05) and were less likely to initiate them in patients with low systolic blood pressure (90 mmHg). Cardiologists prescribed higher target doses of ACE inhibitors and β-blockers (42.8% prescribed 20 mg of enalapril as compared to only 27.65% of physicians (p<0.05)) (85.17% prescribed ≥100 mg of metoprolol as compared to 67.05% physicians). Physicians were less likely to rate the role of water restriction in the management of CHF as very important and they imposed less stringent salt restriction when compared with cardiologists. Significant differences existed between the two groups in the use of diagnostic modalities, ACE inhibitors and β-blockers where cardiologists tend to be more aggressive as compared to physicians. Cardiologists report practices more in conformity with published guidelines than do physicians. These results may suggest the need for specialized training of physicians on the evidence-based management of HF specially in India where a large number of heart failure patients are being treated by physicians.

Relationship between N-Terminal ProBrain Natriuretic Peptide and Doppler Estimation of Left Ventricular Filling Pressure in Patients with Heart Failure

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Transmitral early diastolic velocity/tissue Doppler early diastolic mitral annular velocity (E/Ea) is a novel method of
non-invasive estimation of left ventricular (LV) filling pressure. N-terminal probrain natriuretic peptide (NT-proBNP) is also correlated with LV filling pressure. We examined the relationship between NT-proBNP and E/Ea in heart failure patients during hospital stay and/or short-term follow-up (mean 6.1 ± 1.6 months). We evaluated prospectively 86 patients admitted with heart failure. Clinical evaluation, echocardiography, and NT-proBNP estimation were done on admission. Mean age was 60.02 ± 12.9 years with 55 (64.0%) males and 31 (36.0%) females. LV systolic dysfunction [left ventricular ejection fraction (LVEF) <45%] was present in 50 (58.8%) patients. Various degrees of LV diastolic dysfunction was present in 59 (68.6%) patients of which 19 had isolated diastolic dysfunction. The mean NT-proBNP level was 8248.91 ± 12042.74 (median 1563) pg/ml and the mean E/Ea ratio was 11.27 ± 4.91 (median 11.0). NT-proBNP (10201.79 ± 13106.62 pg/ml) and E/Ea (12.79 ± 4.61) were significantly high in patients belonging to NYHA class III and IV (n = 57) compared to NYHA class II patients (NT-proBNP p = 0.0082; E/Ea p < 0.0001). Patients requiring ventilatory support (n = 26) had elevated levels of NT-proBNP (13688.77 ± 14530.49 pg/ml) and higher E/Ea ratios (13.76 ± 4.94) (NT-proBNP p = 0.0012; E/Ea p = 0.0014). Both NT-proBNP (15859.59 ± 15525.79 pg/ml) and E/Ea (13.51 ± 5.59) were high in patients who developed ventricular tachycardia (n = 17) (NT-proBNP p = 0.001; E/Ea p = 0.0336). Patients who had event-free survival (no death, readmission or worsening heart failure) on follow-up (n = 39) had significantly lower NT-proBNP (5015.62 ± 8783.80 pg/ml) and E/Ea (9.04 ± 2.22) values (NT-proBNP p = 0.001, E/Ea p = 0.0118). NT-proBNP levels were elevated in patients with E/Ea ≥ 14 (n = 32) compared to those with E/Ea < 14 (10519 ± 13690.90 pg/ml vs. 6099.55 ± 9483.87 pg/ml; p = 0.291). However, on linear regression analysis NT-proBNP showed little correlation with E/Ea (r = 0.22). Non-invasive estimation of LV filling pressure by E/Ea only poorly correlated with NT-proBNP levels. However, both parameters are useful in the identification of high risk heart failure patients with increased in-hospital and follow-up mortality and morbidity.

Treating Heart Failure: Are Trial Doses of Drugs Appropriate in Asian Patients?

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The use of angiotensin-converting enzyme inhibitors (ACE-I) blockers to improve mortality and morbidity in heart failure is well entrenched in evidence-based practice of medicine. We studied the frequency and dosage of usage of such recommended drugs, treatment in patients with congestive heart failure. Between April 2002 and March 2005, 104 consecutive patients in the heart failure outpatient clinic were studied. Information regarding their demographies, clinical features and treatment were retrospectively obtained from case records. Majority (85%) of the patients were male. Mean age was 53.4 ± 13.3 years, while the mean left ventricular ejection fraction (LVEF) was 27%. Ethnic distribution closely mirrors the national demography. Ninety-nine percent of patients were prescribed ACE-I or angiotensin receptor blocker (ARB). Beta-blocker was given in 89% of patients. Other significant drugs were spironolactones: 56%, digoxin: 40% and diuretics: 65%. Of the 71 patients in Group 1 (ACE-I), only 35% achieved target doses. Of the 89 patients in Group 2 (recommended beta-blockers), only 9% achieved target doses. The blood pressure (BP) and heart rate (HR) in the 2 groups are shown in Table. In our study cohort, there was a high usage of drug classes recommended in treatment guidelines. However, most patients did not achieve the target doses of drugs shown to be effective in clinical trials probably because it was limited by BP or HR. We postulate that this is due to physicians’ reluctance or fear. The underscoring of evidence-based therapies is of concern and warrants to bridge such gaps in clinical practice.

<table>
<thead>
<tr>
<th>Mean HR (bpm)</th>
<th>BP (mmHg)</th>
<th>% achieving target dose</th>
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<tbody>
<tr>
<td>Group 1: ACE-I</td>
<td>72 ± 10</td>
<td>121/75</td>
</tr>
<tr>
<td>Group 2: Beta blockers</td>
<td>71 ± 10</td>
<td>119/74</td>
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Impaired Long Axis Dynamics of the Left Ventricle in Hypertrophic Cardiomyopathy: Relationship with Wall Thickness and Left Ventricular Outflow Tract Gradient

Vimal M. Mehta, Ajay Raj, Saibal Mukhopadhyay, Jamal Yusuf, S Ramakrishnan, Naresh K. Goyal, Manish Sharma, Bishwa Bhushan Bharti, Asit Khanna, Naveen Bhamri, Vijay Trehan, Sanjay Tyagi
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The assessment of left ventricular atrioventricular (AV) plane displacement (LVAVD) during the cardiac cycle has been shown to be effective in the evaluation of cardiac function in normal subjects as well as in some diseased states. However, LVAVD has not been studied adequately in patients with hypertrophic cardiomyopathy (HCM). We studied the role of LVAVD in evaluation of patients with HCM and compared the data with age- and sex-matched healthy controls. The relationship of LVAVD to interventricular septal and posterior wall thickness, left ventricular (LV) outflow tract (LVOT) gradient and diastolic parameters was also studied. Complete 2D echocardiography and Doppler examination was performed in 47 HCM patients (34 ± 12 years; 24 males) and 30 age- and sex-matched controls. Using high frame rate tissue Doppler imaging, color Doppler myocardial imaging data was obtained which allowed measurement of LVAVD from the four corners of the mitral annulus, that is, lateral, septal, anterior and inferior corner. The interventricular septal and LV posterior
Left Atrial Flow Dynamics in Severe Left Ventricular Dysfunction

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Thromboembolic episodes carry a significant mortality and morbidity in patients with severe left ventricular (LV) dysfunction. Emboli commonly arise from mural endocardium and left atrium. Now it is increasingly recognized that left atrial appendage (LAA) is an important source of thromboembolism. In this context we studied the left atrial (LA) flow dynamics in severe LV dysfunction and the relationship of LAA thrombus formation. This study was conducted in 30 patients with mean age of 50 ± 8.5 years, all of whom were in severe LV dysfunction. Patients with valvular heart disease and atrial fibrillation (AF) were excluded. They were compared with 30 healthy individuals. M-mode, two-dimensional (2D) and transesophageal echocardiogram (TEE) and tissue Doppler imaging (TDI) were performed to record the LA flow dynamics like atrial emptying velocity, atrial filling velocity and left atrial appendage ejection fraction (LAA EF). LAA EF was calculated from the maximum minus minimum area of LAA divided by the maximum area of LAA. LA volume was assessed by the formula 0.85 x A1 x A2/L. Patients with severe LV dysfunction were found to have lower LA emptying velocity (30 ± 5 v. 55 ± 16) (p < 0.05), lower LA filling velocity (40 ± 7 v. 56 ± 15) (p < 0.05), lower LAA EF (27 ± 10.5 v. 45 ± 15), 8 out of 30 (27%) patients had thrombus in the LAA. This study concludes that all patients with severe LV dysfunction have LAA dysfunction and increased incidence of thrombus formation.

A Randomized Trial to Study the Effectiveness of a Holistic Approach with Telephonic Follow-up on Emotional and Social Health of Heart Failure Patients

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Heart failure (HF) is a progressive, debilitating syndrome with significant physical and psychological co-morbidities. Poor quality of life, social isolation, depression and anxiety, all have been linked to increased risk of re-hospitalization and mortality in patients with HF. Combating chronic HF requires the organization of centers for continuous care—preferably with a multi-disciplinary structure to provide a “holistic approach”. The aim of the study was to assess the effectiveness of continuous, intensive care by regular telephonic follow-up for improving the emotional and social health of HF patients. Fifty patients with dilated cardiomyopathy (ejection fraction <45%) coming to HF clinic were randomized into two groups of 25 each (control and interventional groups). A baseline assessment of the psychosocial quality of life was done using a modification of the Kansas City cardiomyopathy questionnaire. Patients in the control group were treated in a routine HF clinic on an average at a 2-monthly interval. They were advised about fluid and diet restrictions. The interventional group, in addition, underwent regular family counseling, was provided a telephonic helpline and imparted training in self-management of the disease. At the end of a 2-month period, all the subjects were re-assessed on their quality of life based on their subjective feelings, state of mind and social functioning, using the questionnaire (max score:35). Subjects in the intervention group were better able to cope with the emotional and social aspects of their disease as compared to the subjects in the control group, as evidenced by their higher subsequent scores. (a) Interventional group: 1st visit score 23.6±1.5; 2nd visit score 28.5±2.08 (p < 0.05); (b) Control group: 1st visit score 23.6±0.98; 2nd visit score 25.33±4.22. The results of the study show that in a developing country like India, addressing the psychosocial aspects in the management of HF leads to greater improvement in quality of life in chronic patients.
Determinants of Functional Capacity and Quality of Life in Patients with Chronic Heart Failure

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Functional capacity and quality of life in heart failure (HF) is usually independent of the left ventricular (LV) systolic function as represented by the ejection fraction (EF). We tried to determine the various correlates of quality of life (QoL) and functional capacity in a cohort of patients with heart failure. Quality of life and functional capacity (with a 6 min walk test) was assessed in patients with heart failure; 50 patients were assessed and then divided into two groups: Group A (reduced quality of life) and Group B (better quality of life). Various parameters including LV function, ventricle dimensions, renal function, sodium, potassium, electrocardiographic (ECG) abnormalities, and medications were assessed (mean ± SD). Group A patients had a lower 6 min walk test (160.3 ± 11 m) and reduced quality of life (65.5 ± 5 out of a maximum score of 123) as compared to Group B (247 ± 9 m and QoL: 104 ± 4).

Patients with heart failure in Group A were more likely to have pedal edema, more likely to have impaired renal function (blood urea: 50 ± 4 mg/dl v. 30 ± 2 mg/dl), were on lower doses of beta-blockers (carvedilol dose: 7.4 ± 1.1 v. 16.8 ± 2.1 mg/day), and higher doses of spironolactone. There was no correlation of functional capacity and quality of life with the LV function (EF: 21 ± 2% v. 20 ± 1%) or with left ventricle dimensions. There was also no correlation with the vasodilators’ doses in the two groups, sodium, potassium levels or with ECG abnormalities. Quality of life and functional capacity is not correlated with LV function or dimensions or with ECG abnormalities. Renal dysfunction, pedal edema, tolerance of lower doses of beta-blockers and requirement of higher doses of spironolactone are better predictors of poor functional capacity.

Extreme Altitude Cardiac Failure-Sub Acute Mountain Sickness

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The clinical profile of subacute mountain sickness (SAMS), a unique entity was studied at a hospital at Ladakh (3100 m), catering to subjects at heights up to 7000 m. Fifteen cases of SAMS formed the study population. All were males, predominantly young, 14 (93.3%) being < 45 years. All patients had been deployed at heights >17000 feet, 10 (66.67%) had been at height >18000 feet. All patients had stayed at these heights for >14 days, 9 (60%) had stayed for >90 days. Dyspnea on effort (DOE) was the commonest symptom seen in 13 (86.6%), followed by lassitude and swelling of feet in 11 (73%), and cough in 10 (66.6%) patients, respectively. Tachycardia was present in 5 (33.3%) patients, pitting pedal edema in 9 (66.67%), raised jugular venous pressure (JVP) in 13 (86.6%) and loud P2 in 15 (100%). Hepatomegaly was found in 12 (80%), which was tender in 6 (40%) patients. Hb>15 gm/dl in 14 (93.37%) and leukocytosis in 4 (26.67%) patients. Chest radiograph revealed prominent (R) descending pulmonary artery in all patients and cardiomegaly, right ventricular (RV) type in 5 (53.3%). All cases had deep arrowhead T wave inversions in (R) precordial chest leads. Evidence of associated illness was found in 7 (46.6%) cases. All the patients responded to descent, rest, salt and fluid restriction and small doses of diuretics within 8-12 weeks. SAMS is a manifestation of extreme altitude presenting as cardiac failure in normal subjects, usually after a prolonged stay. DOE, lassitude and swelling of feet are common presentations; loud P2, raised JVP and pedal edema are the commonest signs. Evidence of precipitating stress and thrombotic disorders is suggested. Electrocardiographic changes are characteristic and aid diagnosis. Recovery without sequelae is the rule.

Isolated Non-Compaction of Left Ventricle: 4 Cases with Varied Presentation

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Isolated non-compaction of left ventricular (INLV) is a rare congenital cardiomyopathy (CMP) characterized by a double layer myocardium having a thick spongy (non-compact) inner layer with deep trabeculation, which is at least two times thicker than normal outer (compact) layer of the myocardium. Heart failure is the most common presentation followed by arrhythmia or embolic manifestation. We report 4 cases with different modes of presentation in 1 infant and 3 adults. All had diagnostic echoatomic features and characteristic color flow pattern deep into the trabeculation. A 4-month infant presented with heart failure which improved with decongestive treatment and inotropic support. The 2nd case was that of a 46-year-old diabetic male who presented with congestive heart failure (CHF). Echocardiography revealed mild systolic dysfunction with dominant diastolic dysfunction with restrictive filling pattern. He continued to have class III symptoms despite decongestive treatment. The 3rd case was of a 30-year-old male without risk factor who sustained an acute inferior wall ST MI elevation (STEMI) and was thrombolysed; on subsequent follow-up had normal coronary
angiogram and was asymptomatic. The 4th case was of a 25 year-old female with left ventricular (LV) dysfunction, symptomatic class III/IV. He developed cerebrovascular accident (CVA), left classical hemiplegia with right middle cerebral artery infarct and there was partial improvement of symptoms with decongestive treatment, inotropic support and anticoagulants. The presentation of an adult with acute myocardial infarction (AMI) with normal coronary arteries and cerebral infarction, both possibly due to embolism, is unusual and rare entity. Dyssynchrony, 9 (31.0%) had intraventricular dyssynchrony and 4 (13.8%) patients had evidence of both. There is high incidence of MD in patients with LV dysfunction even in presence of normal QRS duration. Since CRT can potentially benefit these patients, echocardiography including tissue Doppler imaging should also be included along with ECG as a modality for selection of patients for CRT.

**Mechanical Dyssynchrony in Patients with Left Ventricular Dysfunction with Normal QRS Duration**

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Patients with left ventricular (LV) dysfunction with electrical dyssynchrony (ED) identified by wide QRS duration on electrocardiogram (ECG) have been shown to benefit from cardiac resynchronization therapy (CRT). However, it has been realized that ED does not accurately identify those patients who benefit from CRT. Hence, there has recently been great interest in evaluation of CRT in other subgroups of patients as well as those found to be having dyssynchrony by other modalities.

We therefore studied evidence of mechanical dyssynchrony (MD) by echocardiography in patients with LV dysfunction without ED. We studied 143 consecutive patients who had been referred for echocardiography for various indications and had normal QRS duration (<120 ms). All patients underwent echocardiography including tissue Doppler imaging. MD was considered to be present if the patient had any of the following-septal-posterior wall delay (SPWD) ≥ 130 ms, dyssynchrony index ≥ 32.6 and difference between aortic pre-ejection period and pulmonary pre-ejection period ≥ 40 ms. Dyssynchrony index was calculated as the standard deviation of time-to-peak excursion of 12 LV segments on tissue Doppler imaging from apical views. The first two parameters indicate intraventricular dyssynchrony and the last parameter indicates interventricular dyssynchrony. For the purpose of comparison, patients were divided into two groups: Group A patients with LV dysfunction (left ventricular ejection fraction (LVEF) ≤ 40%), n = 29 (20.1%) and Group B patients without LV dysfunction (LVEF >40%), n=114 (79.9%). Mean LVEF of patients in Group A was 33.24±6.8% versus 54.82±5.6 in Group B. Mean QRS duration were similar in the two groups (73.10±12.3 ms v. 71.95±12.0 ms, p=0.646). Thirteen (44.8%) patients in Group A were found to have MD as compared to 15 (11.6%) in Group B (p<0.001). In Group A, 8 (27.6%) patients had evidence of interventricular
dysynchrony.
Heart Rate and Blood Pressure Variability in 50 Cases of Heart Failure - A Chronomic Approach
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The aim of this study was to assess the chronome (time structure) of blood pressure (BP) and heart rate (HR) of patients treated for heart failure (HF). BP and HR are usually characterized by a circadian variation in MESOR (chronome-adjusted mean) - normotensive and/or hypertensive subjects. Between January and June 2004, 25 male and 25 female patients treated for HF automatically measured their BP and HR round the clock for 1-3 days with TM-2430 ambulatory monitor. Data were analyzed by sphygmochron, each patient's profile being compared with time-specified reference data from healthy subjects matched by gender and age. Results were summarized by population - mean consensus. All patients were on conventional treatment of heart failure with angiotensin-converting enzyme (ACE) inhibitors, beta-blockers and diogxin/diuretics as and where needed. A circadian rhythm is detected for HR (p=0.029) but not for BP. The 12- and 6-hour components are invariably prominent (p<0.001). No difference was found between men and women. The MESOR of systolic BP increased with age (r=0.428, p=0.002) and the MESOR of HR decreased with age (r=0.341, p=0.0015). "Hypertensive" patients tended to have a higher pulse pressure (p=0.0079). Patients with diabetes tended to have smaller circadian double amplitudes of systolic (p=0.076) and diastolic (p=0.089) BP. Patients with coronary artery disease had a higher MESOR of diastolic BP (p=0.002). In conclusion, HR and BP variability provides a very important diagnostic and prognostic parameter in patients of HF with relation to MESOR and presence of diabetes may also alter circadian double amplitudes of systolic and diastolic BP.

Anatomy of the First Septal Artery in Hypertrophic Obstructive Cardiomyopathy Patients
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Intentional infarction of the interventricular septum by infusing alcohol into the septal artery (SA) as treatment in hypertrophic obstructive cardiomyopathy (HOCM) is gaining lot of importance. Hence evaluation of SA anatomy is of paramount importance for good procedural success. The aim was to determine the variability in the origin, size and distribution of the first SA in HOCM. In this study, 25 patients with HOCM and 25 patients who underwent coronary angiogram for suspected coronary artery disease (CAD) but found to have normal coronaries were evaluated. The origin (SA) size and distribution of SA was studied. Of the 25 patients with HOCM 16 had a large, 4 had medium-sized, 3 had small and 2 had tiny first SA. Second SA was large in 6, medium-sized in 7, small-sized in 8 and tiny in 1. Four of them had first SA measuring >2 mm. Ectopic origin of SA were seen in 7 patients with HOCM. Only one patient had second SA measuring >2 mm. Only one patient had common origin of S1 and S2. The distance from left anterior descending (LAD) ostium to S1 ostium varied widely from 5-30 mm and that from S1 ostium to S2 ostium 6-40 mm. One patient had SA arising at an acute angle from LAD and we had to abandon the procedure. Of the 25 patients without HOCM, 10 had large, 6 had medium, 9 had small and none of them had tiny first SA. S2 was large in 10, medium-sized in 5, small in 6 and tiny in none. S1 was >2 mm in 3 and S2 >2 mm in 1. Distance from LAD to S1 varied from 8 mm to 36 mm that from S1-S2, 5-40 mm. No common origin of SA was seen in control group. The characteristic milking effect of the SA was seen in 15 of HOCM group and 3 of control group. In control group 7 of them had valvular heart disease as underlying pathology and one had coarctation of aorta.

Rapid Measurement of B-Type Natriuretic Peptide in Diagnosis of Heart Failure
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B-type natriuretic peptide (BNP) is released from the cardiac ventricle in response to increased wall tension. Now it has been widely accepted as a marker of heart failure. We conducted a prospective study of 210 patients who came to our institute with acute dyspnea from September 2004 to June 2005. Clinical, echocardiography and BNP data of all patients were analyzed. The age range was 35 to 80 years (mean age: 60.4 years). There were 65 females and 145 males. The final diagnosis was dyspnea due to left ventricular (LV) dysfunction in 140 patients, and non-cardiac in 66 patients. In 4 patients dyspnea was due to non-cardiac causes but they also had LV dysfunction. The NYHA Class of patients was I in 10 patients, II in 25 patients, III in 56 patients, IV in 25 patients. The range of BNP was 5-6000 pmoles/L. BNP level by themselves were
more accurate than any historical or physical findings or laboratory findings. Mean BNP level correlated with class of patients class I: 30-100 pmoles/L, Class II: 100-200 pmoles/L, class III: 200-400 pmoles/L, Class IV: 400-500 pmoles/L. High BNP (> 100 pmoles/L) was seen predominantly in patients with severe left ventricular (LV) dysfunction. BNP is a useful marker in identifying heart failure. It correlates with severity of LV dysfunction.

### Stage 1 Diastolic Dysfunction: Do we Need to Subclassify it?

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Apollo Gleneagles, and Institute of Post Graduate Medical Education and Research and SSKM Hospital, Kolkata

Diastolic dysfunction is increasingly recognized as an important cause of heart failure. However, on the other hand, delayed relaxation abnormality of left ventricle (stage 1 diastolic dysfunction) is very commonly seen, specially in older individuals, even in asymptomatic patients. Thus, the correlation of stage 1 diastolic dysfunction (using Doppler values of mitral diastolic inflow E/A ratio, pulmonary venous flow S/D) with clinical symptoms is not always good. We did an echocardiographic study of 100 patients (age range: 40-70 years, mean 52 years; males 56, females 44) of Stage 1 diastolic dysfunction with normal systolic functions [left ventricular ejection fraction (LVEF) > 50%] using Doppler mitral diastolic inflow and pulmonary venous flow with and without pre-load manipulation using Valsalva maneuver (variable measured after 10 s of Valsalva strain). Then we retrospectively analyzed it in relation to presence or absence of symptoms of cardiac dysfunction (shortness of breath, palpitation fatigue etc.) using NYHA classification. In the subgroup of patients where there is change in A wave velocity (10%-20% decrease with a Valsalva strain) (n=52), it was found that all of them were asymptomatic whereas in the subgroup with no or minimal change in A wave velocity with Valsalva (n=48), 46 of them were asymptomatic. These findings were independent of age and sex. Thus, these variable measurement have high sensitivity, specificity and negative predictive value (96% each). Based on these findings, it may be suggested that stage 1 diastolic dysfunction may be sub classified as pre-load sensitive (Group I) and pre-load insensitive (Group II) which may have therapeutic implication. Stage 1 Group II patients are probably the ones with high left ventricular end-diastolic pressure (LVEDP) which may require treatment.

### N-Terminal Pro-brain Natriuretic Peptide in Patients with Heart Failure and Myocarditis Associated with Hepatitis C Infection

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The importance of hepatitis C virus (HCV) infection has been recently noted in patients with cardiomyopathies and myocarditis. We analyzed sera stored during a trial of immunosuppressive therapy in patients with heart failure (HF) and myocarditis. Patients without coronary artery disease (CAD) or other specific etiology, and history of HF for ≤2 years, were enrolled into the trial between 1986 and 1990 at 31 US, Canadian and Japanese centers. At the time of baseline echocardiography and exercise stress test, an endomyocardial biopsy was performed and blood samples were stored at -80°C. Biopsy findings were classified as “myocarditis”, “borderline myocarditis” or “no myocarditis” based on the Dallas criteria. Among 2,233 patients enrolled, 1,355 sera were available. HCV antibody was measured and quantification and grouping of HCV RNA were performed. Circulating N-terminal pro-brain natriuretic peptide (NT-proBNP) was also measured. Anti-HCV antibodies were identified in 59 of 1,355 (4.4%) patients, including 6 of 102 (5.9%) patients with biopsy-proven myocarditis, and 53 of 1,253 (4.2%) patients whose biopsy specimens did not satisfy the Dallas criteria. Since the prevalence of HCV infection in the general US population is 1.8% (by the Center for Disease Control prevention), HCV infection is more prevalent in patients with HF due to myocarditis (p<0.01). Further, wide variations were found in prevalence of HCV infection among the different medical centers and regions (0-15%). Among 59 patients with HCV antibody, HCV genomes were found in the sera of 29 (49%) patients. Group 1 HCV was detected in 23, group 2 in 1, and unclassifiable HCV in 5 patients. The mean concentration of circulating HCV was 159±57 kU/ml (n=29, mean±SEM, range 1-800 kU/ml). Circulating NT-proBNP was elevated (>55 pg/ml) in all 42 patients (100%) with HCV antibody (10,000±5,860 pg/ml), and mean value was significantly greater than those without HCV antibody (n=1,276, 2,508±160 pg/ml, p<0.0001). Anti-HCV antibodies were identifiable in sera stored for 13-17 years, and were more prevalent in patients with myocarditis and HF than in the general population. In regions where its prevalence is high, HCV infection may be an important cause of HF and myocarditis. NT-proBNP was increased more prominently in patients with HCV infection than those without, suggesting more severe myocardial injury in the former than in the latter.
Outpatient Ilio-Femoral Interventions through Transradial Approach

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The traditional approach for percutaneous interventions of the iliac artery and arteries of lower limb is through femoral artery. To the best of our knowledge, there are no reports in the literature of these interventions through the radial artery. We describe our early experience of ilio-femoral interventions through transradial approach (TRA). We report 4 cases of iliac and 2 cases of superficial femoral artery (SFA) interventions performed at our centre from January 2004 to June 2005. In all cases the left radial route was used to perform procedure. The mean age of these patients was 57.3 ± 9.4 years, all were men, 2 patients were diabetic, 4 were hypertensive, 1 had dyslipidemia and 5 patients were smokers. The indications for intervention were intermittent claudication in all patients. Left radial artery was cannulated using 20" Jelco cannula, 0.025" Terumo guidewire and Terumo sheath. The hardwares used and outcomes are summarized in the table.

<table>
<thead>
<tr>
<th></th>
<th>Iliac PTA (n= 4)</th>
<th>SFA PTA (n= 2)</th>
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<tbody>
<tr>
<td>Sheath/Guide</td>
<td>7 F 90 cm Shuttle or Pinnacle sheath left / Multipurpose</td>
<td>6.7 F 125 cm Judkins</td>
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<td>Guidewire</td>
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<tr>
<td>Major complications</td>
<td>1/4</td>
<td>0/2</td>
</tr>
</tbody>
</table>

PTA: Percutaneous transluminal angioplasty

All patients were mobilized immediately and discharged on the day of procedure on low molecular weight heparin, aspirin, clopidogrel and cilastazol. No patient had recurrence of claudication during a mean follow-up of 7.4 ± 6.9 months. The availability of refined hardware (0.014" guidewire-based low profile balloons and balloon-expandable stents, wide lumen guide catheters and long equipments) has played a big role in the success of these interventions through TRA. Thus, present equipment allows delivery of stents up to 8 mm with the use of 6 /7 F long sheath. The left TRA is preferred as there is no need to traverse arch of aorta and it is easier to enter the descending aorta. To conclude, ilio-femoral interventions through TRA are technically feasible, safe and associated with no major complications. With refined hardware, TRA appears to be a good alternative entry site for ilio-femoral interventions with major advantage of immediate mobilization and same day discharge.

Results of Self-Expanding Nitinol Stents for Femoropopliteal Artery Disease

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Data regarding use of balloon-expanding or self-expanding stainless steel stents in femoropopliteal (FP) arteries is disturbing in terms of low patency rates. Scanty data exists regarding use of self expanding nitinol stent in FP arteries. We present retrospective data of 64 patients (48 males, mean age 56.1±2.8 years, 44 diabetics) who underwent percutaneous revascularization of FP arteries with self-expanding nitinol stents between December 2002 - December 2004 at our Institute. Follow-up duplex scan were performed in 58/64 (90.6%) patients. Primary patency was defined as ≤ 50% instant restenosis by duplex scan. Whenever restenosis was picked up by duplex scan, angiography was done which confirmed instant restenosis in more than 90% of patients. Out of 64, 46 presented with severe claudication (Fontaine stage II b) while rest had critical limb ischemia (Fontaine stage III or IV). Total occlusion was found in 18 patients while rest of the patients had high grade stenosis. Procedure was technically successful in 100% of patients and pre-dilation was done in 54 patients. One stent was used in 38 patients, while 24 patients received 2 stents and 2 patients were put 3 stents. Average stent length was 64.1 mm. Three patients were followed-up for mean period of 8.1 ±1.4 months and primary patency was observed in 39/58 (67.2%) patients. Binary instant restenosis was found in 16/58 (27%) patients. Three patients where duplex scan showed significant narrowing had non-critical stenosis on angiography. It is concluded that the use of self-expanding nitinol stents for FP arteries appears to be promising with better patency rates.

Iatrogenic Iliac Artery Rupture - Emergency Management by Longer Stent-Graft on a Shorter Balloon

Vijay Trehan, S Ramakrishnan, Arima Nigam, Bhiswa Bhusan Bharti, P Nanda Kishore, Naresh K Goyal, Vimal M etha, Balram M ishra, MP Girish, Naveen Bhamri, SaiBal M ukhopadyay, Sanjay Tyagi
GB Pant Hospital, New Delhi

Rupture of an iliac artery during percutaneous transluminal coronary angioplasty (PTCA) is a rare but potentially devastating complication. We report a case of
iatrogenic external iliac artery rupture that was successfully treated by endovascular stent graft placement in an unusual manner. Limited availability of hardware necessitated the use of a longer bare stent graft mounted on a relatively shorter balloon. A 45-year-old diabetic male presented with anterior wall non-Q myocardial infarction (MI) with recurrent episodes of rest angina. The patient was taken up for percutaneous coronary intervention (PCI) after 12 hours of epinephrine infusion. Coronary angiography revealed 90% discrete stenosis of left circumflex (LCX), which was successfully stented. Progressive hypotension and tachycardia were noted around half-an-hour following the procedure. After initial fluid resuscitation, the patient was immediately taken up for check angiography which revealed normal instant coronary flow. In view of the difficulty encountered during sheath insertion, an iliac artery angiogram was done that revealed torrential extravasation of contrast from a rupture site in right external iliac artery. An angioplasty balloon catheter (6 mm × 2 cm, Symmetry, Boston-Scientific, Meditech) was immediately positioned at the rupture site and inflated at 2 atm to tamponade the leak and to achieve temporary hemostasis. It was decided to seal the leak by endovascular stent graft. However, there was only one peripheral balloon catheter (6 mm × 20 mm, Symmetry, Boston-Scientific, Meditech) available in our catheterization laboratory at that time and the only peripheral stent graft available (Jostent 58 mm stent-graft, Abbott Vascular Devices) was three times longer than the balloon itself. The cranial end of the stent graft was hand-crimped on the balloon and rest of the graft was crimped on the catheter shaft with the help of artery forceps, keeping the guidewire inside the lumen of the balloon catheter. Since such stent-graft-balloon assembly might slip from the balloon during stent delivery, a 7 F Mullins sheath was first deployed across the lesion. Then the assembled stent-graft was passed into the Mullins sheath and positioned at the site of the rupture within the sheath itself. Mullins sheath was gradually withdrawn and the stent-graft was deployed. The balloon was first inflated in the cranial part (the only mounted part of the stent graft) at 2 atm pressure, and the deflated balloon was withdrawn within the stent graft to be positioned in the middle part of the stent graft and was reinfated. Subsequently, the balloon was inflated in the caudal part of the stent graft at 5 atm pressure. A final inflation was then given at the cranial part of the stent graft at 6 atm pressure. Further check angiography showed smooth vessel lumen with no extra luminal extravasation of contrast. Patient remained hemodynamically stable after the procedure. Repeat angiogram after 24 hours showed normal instant flow without any leakage of contrast. Since mounted stent grafts of varied sizes are unlikely to be available in a catheterization laboratory at all times, the technique described could be of use in emergency situations.

**Should Coronary Angiography be Routinely Done in all Patients undergoing Peripheral Angiography?**

Girish S Godbole, Kiron Varghese, Annie Shetha, Sindhu, Biju Isaac, M J Santhosh, GG Shetty, CB Patil, SS Iyengar, St John's Medical College Hospital, Bangalore

Although peripheral vascular disease (PVD) is common, and shares many risk factors with coronary artery disease (CAD), there is scanty data on the prevalence and extent of CAD in patients with PVD. These patients often have limited exercise capacity and hence may not manifest angina or dyspnea and are also not candidates for a treadmill stress test. We therefore prospectively evaluated the coronary artery anatomy in 280 consecutive patients referred to us for a peripheral angiogram (PAG). We also evaluated the prevalence of risk factors and non-invasive markers of CAD. The average age was 53.3 ± 13.5 years, and 83.2% were male. 46.8% of the patients (131/280) had significant CAD defined as 50% or more diameter stenosis of one or more coronary arteries. An additional 10.1% (30/280) had mild CAD. Patients with significant CAD were older (59.2±11.6 v. 46.2 ± 12.5 years, p < 0.0001), had a higher incidence of diabetes (57.3% v. 13.5%, p < 0.0001), hypertension (56.5% v. 25.2%, p < 0.0001), and a history of dyslipidemia (16.8% v. 7.6%, p = 0.034) compared to patients with no CAD. There was no significant difference in the incidence of smoking (54.2% v. 50.4%, p = 0.61, NS). CAD was more commonly associated with lower extremity PVD (110/198, 55.6%) compared to patients presenting with upper extremity PVD (13/62, 20.9%, p<0.0001), and compared to other locations (8/20, 40%, p = 0.3, NS). Of 131 patients with significant CAD, 30.5% (40/131) complained of chest pain and 37.4% (49/131) had ischemic changes on ECG. Only 18.3% (24/131) had obvious evidence of CAD on echocardiography. Overall, 54.2% of all patients with significant CAD had chest pain, or ECG / echocardiography suggestive of coronary ischemia. Our findings suggest that although CAD is common in patients with PVD only about half of them had evidence of CAD by history or on routine non-invasive testing. Therefore, coronary angiography may be indicated in all patients with PVD being considered for peripheral angiography, and specially in older patients with diabetes, hypertension, dyslipidemia, or involvement of the lower extremities.
**Dilation and Distortion of Arch of Aorta: “Mind Your Step” During Transradial Procedures**

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Sterling Hospital, Ahmedabad

The radial artery has currently been regarded as a useful vascular access site for coronary procedures. More than 96% of our coronary procedures are performed from radial route. We retrospectively analyzed 55 “loops” at the level of aortic arch and ascending aorta and the peculiar procedural problems associated with these loops. “Loops” were defined according to the shape of catheter or guidewire in subclavian or innominate artery, aortic arch and ascending aorta. Following loops were noted; (i) “Sigma” loop (5 cases) (ii) “S” loop (13 cases) (iii) “Z” loop (23 cases) and (iv) “Roller Coaster” loop (14 cases). Loops due to arteria lusoria were excluded from the analysis because of their peculiar problems. These loops posed two problems (a) entry in ascending aorta, and (b) maneuvering of catheter. The standard 0.35” guidewire tends to slip into descending aorta. A ‘U’ curve loop to 0.35” guidewire, Terumo wires or catheters (Simmons, Amplatz left (AL), Patel diagnostic or Judkins) are helpful for the entry into ascending aorta. Maneuvering of the catheter is difficult due to poor application of torque due to multiple angulations in the passage. AL and Amplatz right (AR) and Judkins are preferred over the normal diagnostic catheters [Tiger (Terumo Corporation, Japan)] at our center. The guidewire is preferably changed to Amplatz superstiff guidewire (exchange length) to provide adequate support for careful maneuvering. Cannulation of left coronary ostia was done with AL or Judkins left 3.5/4 in 27 and 14 cases, respectively. Cannulation of right coronary ostia was done with AL/AR or JR 3.5/4 in 11 and 30 cases, respectively. The mean number of catheters (2.6±1.1) and guidewires (2.3±0.7) required to complete coronary procedures were higher than routine cases. Selective cannulation of left coronary artery (LCA) was achieved in 40 out of 41 cases and 39 out of 41 cases in right coronary artery (RCA). Non-selective cannulation was done in remaining vessels. Left ventriculogram was performed in all cases. Mean procedural time (25.1±5.2 min) and fluoroscopic time (12.4±5.4 min) was higher than routine cases. For percutaneous coronary interventions (PCI), guiding catheters with long tip and gentle curve (no sharp angulations) that take support of opposite wall of aorta properly cannulated coronary ostia [Voda (Boston-Scientific, USA)] for LCA and Patel right (Boston-Scientific, USA) for RCA. Once the coronary ostia were cannulated properly the rest of the procedure was uneventful. There was no increase in the rate of local vascular site complication rate. No cross over to femoral artery was needed. To conclude, these “loops” are infrequently encountered during TR coronary procedures. Although they can prolong the procedure and fluoroscopic times, the procedure can be completed safely using TR approach.

**Acute Aortic Dissection : Clinical Profiles and Outcomes**

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Escorts Heart Institute and Research Centre, New Delhi

Acute aortic dissection is a life threatening medical emergency associated with high rates of morbidity and mortality. No data is available regarding clinical profiles and outcomes of these patients and the effect of recent imaging and therapeutic advances on patient care and outcomes in the Indian subcontinent. Our aim was to assess the presentation, management and outcomes of acute aortic dissection at a single center in India. In a retrospective analysis, we studied 49 consecutive patients (mean age 52.3±12.3 years, 89% males) of acute aortic dissection enrolled between January 2000 and May 2005. Data were collected regarding presenting history, physical findings, management and mortality by review of hospital records. A majority of the patients had Stanford type A dissection (81.6%). Hypertension (67%) was the single most common risk factor. Other risk factors like prior aortic aneurysm (10.2%), bicuspid aortic valve (6%) and Marfan’s syndrome (2%) were less commonly seen. History of prior aortic valve replacement and history of prior coronary artery bypass surgery was found in 6% patients each. While the sudden onset (67%) of severe pain (81.6%) was the commonest presenting complaint, the clinical presentation was diverse. Syncope was present in 3%. Classical findings such as aortic regurgitation and pulse deficit were noted in only 40% and 16.3% of patients, respectively. Initial chest radiography and electrocardiogram (ECG) were frequently not helpful (no abnormalities noted in 30% and 44% of patients, respectively). Echocardiography (transthoracic and transoesopagical) was the most frequent initial modality of choice (61%). Overall inhospital mortality was 36.7%. Mortality of patients with type A dissection managed surgically was 10%, whereas in those managed conservatively, mortality was as high as 60% (p=0.001). Hypotension/shock was the most frequent in-hospital complication (24.5%) and mortality in these patients was high (66.7%). Acute aortic dissection presents with wide range of manifestations and the classical findings are often absent. In-hospital mortality rates can be significantly improved if surgical management is done early. Our data support the need for continued improvement in prevention, diagnosis and management of acute aortic dissection.
Left Ventricular Mass in Hypertension with Wall Motion Abnormality

Gurpal Singh, S Singh, GSP Singh
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The aim of this study was to examine the left ventricular mass (LVM) in hypertension with wall motion abnormality (WMA). Hypertension with higher LVM represents structured left ventricular mass (LVM) in hypertension with wall motion abnormality. Fifty-four hypertensive patients (23 males, 31 females) of either sex attending outpatient department or admitted in our hospital were studied. Detailed history, examination, routine investigation including electrocardiography (ECG) and echocardiography were done. Patients with congenital rheumatic, pulmonary, renal and pericardial diseases were excluded. Patients were divided into two groups - Group 1 of hypertension without WMA, and Group 2 with WMA. Blood pressure (systolic, diastolic) was recorded; hypertension was said to be present according to JNC-7 guidelines or if on antihypertensive medication. LVM was calculated in each case using Devereurex formula. The results were analyzed and compared in both groups. Mean age of patients in Group 1 was 53.85 years, and in Group 2, 53.15 years. Nine patients were < 40 years; 13 (8.5%) were between 41-50 years; 12 (3.9%) 51-60 years; 15 (5.10%) 61-70 years and 5 (3.2%) patients above 70 years of age. Presenting complaints were dyspnea, palpitation, and edema feet. Systolic murmur were present in all. Blood pressure (BP) was 165.9/100 mmHg and 160/90 mmHg, respectively. One patient was detected to be diabetic, 1 had cardiovascular accident (CVA), 4 (2.2%) had mitral valve prolapse (MVP), 2 had aortic regurgitation (AR), 4 (2.2%) had AR and mitral regurgitation (MR) both, 7 (4.3%) MR, 2 each had aortic stenosis (AS) AR, tricuspid regurgitation (TR), pulmonary regurgitation (PR), MR, TR, PR; 26 had E<A in Group 1 and 13 in Group 2. LVM was 165.16 gm in Group 1 and 277.35 gm in Group 2, LVM was higher in hypertensives with WMA as compared to hypertensives without WMA. Echocardiography is non-invasive and more sensitive indicator for evaluating cardiac damage in hypertension and monitor therapy accordingly.

Brainstem Auditory-Evoked Response in Patients with Hypertension

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University College of Medical Sciences and GTB Hospital, Delhi

Neurological complications in hypertension usually present catastrophically in the absence of a marker for early damage. This study was undertaken to measure the brainstem auditory-evoked response (BAER) in hypertensive patients and to see the effect of control of blood pressure (BP). Patients with newly detected essential hypertension (n=120), in the age group 30-60 years, were divided into 4 groups (JNC VI) and another group of 30 controls were also enrolled. While recording BAER, peak latencies and amplitudes of the component waves and interpeak latencies (IPL) between I-III, III-V and I-V were determined. The BP was controlled to achieve the target goal of <140/90 mmHg. The patients were followed up for another two weeks to ensure adequate BP control before a repeat BAER recording. Our study showed an increase in the absolute latencies of all the waves of BAER. Many latencies showed a rising trend with the stages of hypertension, with the latencies being always maximum in the stage 3 hypertension group. The IPLs were prolonged in stage 3 hypertension group when compared to the control group. The amplitude of wave I and V was also decreased in this group. Following treatment, there was a significant decrease in latencies of waves I and IV in the stage 3 hypertensives. The IPLs also showed a decrease following treatment and there was a rise in amplitude in wave I and V. These changes were consistent in the stage 3 group. It was noted that the number of patients with IPL and wave I latency beyond the 95 percentile and 99 percentile of the control group increased with the severity of hypertension. Thus our findings suggest that hypertension does affect the neuronal excitation/conduction in the auditory pathways. Both the peripheral auditory pathway and the central brainstem pathway of transmission are affected. The changes in the neuronal conduction may not be permanent, and show improvement with control of BP. There was a rising pattern of abnormal BAER with the increasing severity of hypertension. This suggests that BAER can act as potential marker of early neurological damage and emphasizes the need for more research in this field.

Risk stratification in Hypertension: Insights from the Sentinel Surveillance Program in Indian Industrial Population

All India Institute of Medical Sciences, New Delhi, on behalf of the investigators of the sentinel surveillance for CVD risk factors in Indian industries

Hypertension usually occurs in combination with other cardiovascular disease (CVD) risk factors. However, the amount of risk factor clustering accompanying elevated blood pressure (BP) is not well documented in Indian population. This study sought to estimate the CVD risk factors clustering accompanying elevated BP levels in Indian population. The study subjects were employees selected by age and sex-stratified random sampling and their family members aged 20-69 years (n=19973 for the questionnaire survey and n=10442 for the biochemical investigations). The chi-square test was used to assess the difference in prevalence of CVD risk factors and binary logistic regression to analyze the relationship of different clusters of risk factors with hypertension. The prevalence of pre-hypertension and hypertension (stage 1 and
Renal Characteristics and Effect of Angiotensin Suppression in Oral Contraceptive Users

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BM Birla Heart Research Centre, Kolkata

Oral contraceptives (OCPs) increase arterial blood pressure and the relative risk of hypertension. Clinical and renal variables associated with the development of OCPs related to hypertension were assessed. The study included 30 women in whom hypertension developed while they were taking combination estrogen, pregesten OCPs, 30 women with essential hypertension who were not taking an OCP and 30 normotensive women, 50% of whom were taking an OCP. The hypertensive groups were matched in terms of age, body mass index (BMI) and blood pressure (BP) level. Before and after acute blockade of angiotensin-converting enzyme (ACE) inhibitor with captopril, GFR was assessed. These studies were repeated after withdrawal of the OCP in 10 hypertensive women. The women with OCP-induced hypertension had higher plasma rennin activity than those with essential hypertension. However, both groups showed similar alterations in BP and renal function in response to captopril. The 24-hour urinary albumin excretion was higher in women with OCP-induced hypertension than in those with essential hypertension. Six months after OCP withdrawal, plasma rennin activity and GFR decreased along with BP. However, these follow-up studies showed no significant change in urinary albumin excretion or in the BP and renal hemodynamic response to captopril. The renin-angiotensin system does not appear to play any role in the maintenance of OCP-induced hypertension. Use of OCPs may also lead to increased albumin excretion, perhaps as a result of endothelial dysfunction. In conclusion, markers of susceptibility to OCP-induced hypertension must be assessed along with the possible predictive value of excessive albumin excretion.

A Profile of Clinical, Electrocardiographic and Echocardiographic Studies of Left Ventricular Hypertrophy in Hypertension Patients

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An elevated arterial pressure is the most important modifiable cardiovascular risk factor. We studied the relationships of the clinical (by physical examination), radiological (chest X-ray), electrocardiographic (ECG) by voltage criteria of Sokolow and Lyon) and echocardiographic finding [M-mode and diastolic wall of left ventricular hypertrophy (LVH) thickness of >11 mm] in 50 patients of hypertension [blood pressure (BP) > 140/90 mmHg, ≥2 occasions or on anti-hypertensive]. Mean age was 54.48±13.45 years (range 16-70 years) and 72% were males. Mean systolic and diastolic BP were 167±18.21 and 98±12.99 mmHg. Complaints included headache (38%), palpitation (34%), fatigue (34%), giddiness (32%), exertional dyspnea (24%), chest pain (24%), right-sided weakness (24%), left-sided weakness (14%), orthopnea (12%), syncope (8%), polyuria (8%), epistaxis (2%) and flank pain (2%). On physical examination, using displaced apical impulse as a sign of LVH, it was seen in 30 patients (sensitivity: 62.22%); using chest X-ray, it was seen in 30 (sensitive 62.22%) patients. On ECG examination, LVH was seen in 16 (32% sensitivity) patients.

<table>
<thead>
<tr>
<th>LVH</th>
<th>Sensitivity</th>
<th>Specificity%</th>
<th>PPV (%)</th>
<th>NPV (%)</th>
<th>Accuracy (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical</td>
<td>46.66%</td>
<td>60.00</td>
<td>91.30</td>
<td>11.11</td>
<td>48.00</td>
</tr>
<tr>
<td>Chest-X-ray</td>
<td>62.22%</td>
<td>60.00</td>
<td>93.33</td>
<td>15.00</td>
<td>62.00</td>
</tr>
<tr>
<td>ECG</td>
<td>32.33%</td>
<td>80.00</td>
<td>93.75</td>
<td>11.76</td>
<td>38.00</td>
</tr>
</tbody>
</table>

By echocardiography, concentric LVH was diagnosed in 45 (90%) patients, with only 5 (10%) patients showing normal wall thickness. Echocardiography remained the most cost effective, non-invasive tool for evaluation of LV wall thickness.

Prevalence of Diastolic Dysfunction in Healthy Hypertensive Female

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Diastolic function plays an important role in cardiac mortality and morbidity. Incidence of hospitalization for heart
Family-Oriented Treatment of Hypertension
FRB Geronimo, RF Abarquez, FE Punzalan, El Cabral
UP-Philippine General Hospital, Manila

This study sought to determine how many household members of hypertensive patients can be motivated to consult for cardiovascular screening and to determine the compliance to follow-up of patients and household members. The study aimed to find out the prevalence of hypertension, co-morbid risk factors, and metabolic syndrome in both groups. This was a cross-sectional pilot study of 100 consecutive adult hypertensive patients (index patients) and their household members seen in our outpatients clinics in UP-Philippine Hospital. They were screened for hypertension, diabetes, dyslipidemia, obesity, smoking, sedentarism, and metabolic syndrome. First, follow-ups were monitored. Among index patients, 71% brought household members and 58% had follow-ups. Only 36% of household members responded for screening and 40% of respondents had follow-ups. Mean duration of follow-up was 29 days. Work prevented a majority to attend screening and follow-ups. They shared similar anthropometric and biochemical profile except that index patients had older age, lower high-density lipoprotein (HDL) levels, and higher low-density lipoprotein (LDL) levels. They shared similar risk factors. The greatest percentage increase in detection rate was found in sedentarism, dyslipidemia, and obesity. In both groups, dyslipidemia was most prevalent followed by sedentarism, obesity, diabetes, and smoking. Reduced HDL levels was the most common form of dyslipidemia. Diabetes and metabolic syndrome were more common among index patients. Metabolic syndrome occurred in 57% of index patients and 29% of household members. Hypertensive patients can bring household members for screening and follow-ups and compliance can be improved. Risk factors are prevalent in the household members of the patients. Hypertension and risk factor management should be a family affair and "family affair" approach can improve detection rate of risk factors. Dyslipidemia and reduced HDL levels may contribute to development of cardiovascular disease among Filipino patients. Metabolic syndrome has a high prevalence among hypertensive patients. A prospective study should investigate whether "family affair" approach can improve blood pressure control in the private clinics and industrial setting.

Echo-Doppler Evaluation of Hypertensive Disorders of Pregnancy
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Echo-doppler was used to assess maternal hemodynamics and uterine artery Doppler velocimetry in 40 untreated pregnant hypertensives in an attempt to define high risk pregnancies. Fetal outcome was assessed as adverse or non-adverse, by birth weight, time of delivery and fetal complications.

<table>
<thead>
<tr>
<th>Gestation</th>
<th>Pre-eclampsia</th>
<th>Gest. hypert.</th>
<th>Pre + Chronic hypert.</th>
<th>Chronic hypert.</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>37</td>
<td>29</td>
<td>29</td>
<td>0.024*</td>
<td></td>
</tr>
<tr>
<td>Cardiac ind</td>
<td>3.51</td>
<td>3.75</td>
<td>3.82</td>
<td>3.79</td>
<td>0.727</td>
</tr>
<tr>
<td>Systolic BP</td>
<td>166</td>
<td>134</td>
<td>179</td>
<td>154</td>
<td>0.001*</td>
</tr>
<tr>
<td>Diastolic BP</td>
<td>96</td>
<td>82</td>
<td>104</td>
<td>101</td>
<td>0.014*</td>
</tr>
<tr>
<td>Birth weight</td>
<td>169</td>
<td>3.02</td>
<td>1.56</td>
<td>2.77</td>
<td>0.004*</td>
</tr>
<tr>
<td>LV Septum</td>
<td>1.2</td>
<td>1.1</td>
<td>1.5</td>
<td>1.3</td>
<td>0.009*</td>
</tr>
<tr>
<td>LV mass/m²</td>
<td>110</td>
<td>99</td>
<td>141</td>
<td>119</td>
<td>0.006*</td>
</tr>
<tr>
<td>LVES stress</td>
<td>98</td>
<td>77</td>
<td>105</td>
<td>90</td>
<td>0.100</td>
</tr>
<tr>
<td>SVRI</td>
<td>2796</td>
<td>2132</td>
<td>2837</td>
<td>2472</td>
<td>0.079</td>
</tr>
<tr>
<td>UARI</td>
<td>0.67</td>
<td>0.48</td>
<td>0.67</td>
<td>0.58</td>
<td>0.002*</td>
</tr>
</tbody>
</table>

There was no difference in cardiac index between groups. Fetal birth weight correlated poorly with cardiac index in pre-eclamptic women (r = 0.21). A better correlation was seen with uterine artery resistance index (UARI) (r = -0.65) and systemic vascular resistance index (SVRI) (r = -0.49). In conclusion, higher risk patients were better selected by uterine artery resistance index (and proteinuria) than maternal hemodynamics.
The diagnosis of right ventricular myocardial infarction (RVI) accompanied by acute inferior myocardial infarction (MI) is still a problem. This study was designed to find out the usefulness of both peak myocardial systolic velocity (Sm) and of the myocardial performance index (MPI) of the right ventricle measured by pulsed-wave tissue Doppler imaging (TDI) in assessing right ventricular function. Twenty patients who experienced a first acute inferior MI were prospectively assessed. Their clinical data, Killip class and 15-lead electrocardiogram (ECG) including right-sided leads were collected. From the echocardiographic apical four-chamber view, the Sm, the peak early diastolic velocity, the peak late diastolic velocity, the ejection time, the isovolumetric relaxation time, and the contraction time of the right ventricle were recorded at the level of the tricuspid annulus by using TDI. Then, the MPI was calculated from the formula: isovolumic contraction time (IVCT) + isovolumic relaxation time (IVRT)/ET. All patients underwent coronary angiogram before discharge. The patients were classified into the three groups, according to the localization of the infarct-related artery (IRA). Group I - proximal right coronary artery (RCA) disease; Group II - distal RCA disease; and Group III - circumflex coronary artery disease; and Group III - circumflex coronary artery disease.

The right ventricular Sm was observed to be significantly low (<12 cm/s) in patients with RVMI and those in Group I compared to those without RVMI and those in groups II and III. The MPI was higher in patients with RVMI (0.80 ± 0.10 vs. 0.25 ± 0.11) than in those patients without RVMI. Out of 10 patients, 6 showed electrophysiologic evidence of RVMI. To conclude, Sm <12 cm/s and MPI >0.70 obtained by TDI may define RVMI concomitant with acute inferior MI. Our study also shows the superiority of TDI over surface ECG in diagnosing RVMI.

Mitral L Wave in Patients with Hypertrophic Cardiomyopathy: A Marker of Advanced Diastolic Dysfunction


The significance of the prominent mid-diastolic filling wave, termed as an L wave, has not been studied in patients with hypertrophic cardiomyopathy (HCM). The aim of this study was to determine the clinical implications of L wave in patients with HCM using tissue Doppler imaging. Complete 2D echocardiography and Doppler examination (Vingmed GE System Five) was performed in 51 HCM patients (mean age: 33±12 years, males 36). When mitral inflow is triphasic, including mid-diastolic flow velocity of at least 0.2 m/s, it is termed as mitral L wave. Peak velocity of E, L, and A, and deceleration time were measured from pulsed Doppler of mitral inflow. Early diastolic mitral annular velocities (E') were measured by tissue velocity imaging from the lateral mitral annular corner. Based on the presence and absence of L wave, the mitral inflow pattern was divided into two groups, Group I (L wave present, n=14), and Group II (L wave absent, n=37).

The heart rate was significantly lower in Group I (54±5 vs. 68±6, p<0.01). Group I patients had significantly higher E/A (1.6±0.3 vs. 1.1±0.3, p<0.001), higher E/E' (14±3 vs. 10±4, p<0.001), and higher left atrial volume index (40±8 vs. 31±4 ml/m², p<0.01) and shorter deceleration time (184 ±23 vs. 263±43 ms, p<0.001). We conclude that the presence of L wave in HCM is associated with higher E/A, higher E/E', shorter deceleration time and enlarged left atrium, indicating advanced diastolic dysfunction with elevated filling pressure. Thus the presence of L wave in patient with HCM identifies a subgroup with advanced diastolic dysfunction.

Serial Changes in Left Ventricular Diastolic Indexes Derived from Doppler Echocardiography after Primary Percutaneous Coronary Intervention for Anterior Wall Myocardial Infarction

Debika Chatterjee, Debabrata Roy, Sunip Banerjee, BP Chatterjee, B Dev

Patients with acute anterior wall myocardial infarction (MI) either show restrictive ventricular filling pattern indicative of initial myocardial stiffness or complications or prolonged deceleration time (DT) indicative of favorable remodeling or healing of complication. The aim of the present study was to assess whether primary percutaneous coronary intervention...
(PCI) for anterior wall MI was associated with favorable diastolic function. A total of 36 patients (male-female ratio=35:1) who underwent primary PCI over last one year were compared with 60 age-, sex- and infarct area-matched patients who underwent thrombolyis. Doppler echocardiography was done in all the cases 48 hours after primary PCI or thrombolyis. There was no significant difference in baseline characteristics between the two groups. The results are presented in the table.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Mean Diff. (mm)</th>
<th>r</th>
<th>SEE</th>
<th>Equation</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2D PHT MVA v. 3D planimetery MVA</td>
<td>0.129</td>
<td>0.965</td>
<td>0.051</td>
<td>y=0.874</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>2D planimetery MVA v. 3D planimetery MVA</td>
<td>0.069</td>
<td>0.985</td>
<td>0.035</td>
<td>y=0.924</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>2D minimum MVA v. 3D planimetery MVA</td>
<td>0.02</td>
<td>0.987</td>
<td>0.033</td>
<td>y=0.937</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>3D planimetery MVA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PHT: pressure half time, MVA: mitral valve area

Thus, primary PCI for MI conferred a better diastolic function.

### Real-Time 3D Transthoracic Echocardiographic Assessment of Mitral Valve Area: A Comparative Study with Conventional 2D Echocardiographic Methods

Nagendra S Chouhan, Vivek Kumar, Ravi R Kasliwal, Simmi Manocha, Govind Goyal, Naresh Trehan

Escorts Heart Institute and Research Centre, New Delhi

The conventional two-dimensional transthoracic echocardiography (2DTTE) and Doppler assessment of mitral valve orifice area (MVA) are the acceptable methods for assessment of mitral stenosis. However, they are highly dependent on hemodynamic variable and cutting plane on 2DTTE. Real time Three-dimensional transthoracic echocardiography (RT 3DTTE) can visualize the overall structure of the mitral valve apparatus 'enface', thus rendering an accurate measurement of area and better assessment of mitral valve apparatus. We studied 32 consecutive patients (12 females, mean age 36.45±8.88 years) of isolated mitral stenosis of rheumatic etiology. Conventional 2DTTE short-axis view with shortest MVA was acquired for planimetery assessment, while RT 3DTTE image envelope covering whole mitral valve apparatus was acquired from any available window without localizing for smallest MVA. On these 3D images, three modifiable cutting planes were aligned to the axis of valve opening plane to get short axis image in the plane of shortest valve area enface. RT 3DTTE measurements were recorded by two independent echocardiographers and then repeated by one of them. Results were compared. In our study 3DTTE-derived planimetry MVA had a good correlation with conventional 2DTTE method [3DTTE planimetry MVA and 2DTTE planimetry MVA, r=0.985; 3DTTE MVA and 2DTTE pressure half time (PHT) MVA, r=0.965, p value (two-tailed) ≤0.0001)].

3DTTE also provides additional information about surface anatomy of leaflets and the subvalvular apparatus with clear demarcation of commissural fusion and scallops of leaflets in real time. Inter observer and intra observer variability was good for 3DTTE (r=0.93 and 0.96, p<0.03 for MVA). RT 3DTTE can efficiently and accurately assess MVA with more comprehensive assessment of anatomical details, and is not operator-dependent.

### Tissue Doppler-Derived Post-Systolic Motion: A Sensitive and Specific Non-Invasive Marker for Diagnosing Left Anterior Descending Disease in the Presence of Left Bundle Branch Block

N Ganesan, V Jaganathan, R Alagesan, M Annamalai, S Shunmugasundaram, Geetha Subramanian, A Balaguru, G Anuradha, G Gnanavelu, S Venkatesan, PS Mohanurugan, K M anakshi

Madras Medical College, Chennai

Non-invasive diagnosis of left anterior descending artery (LAD) stenosis in patients with left bundle branch block (LBBB) is particularly difficult because of the well known ECG limitations, echocardiographic abnormal septal wall motion and possible myocardial scintigraphic anteroseptal perfusion defect artifacts. Recent reports show that tissue Doppler-derived post-systolic motion, an asynchronous contraction occurring during an isovolumetric relaxation period is a sensitive and specific marker for LAD occlusion. The aim of this study was to analyze the incidence and characteristics of post-systolic motion (PSM in LBBB) with or without stenosis of the LAD. Twenty-eight patients with chest pain without prior myocardial infarction (MI) and complete LBBB were included for the study. Standard Doppler echocardiography and tissue Doppler of both the middle posterior septum and lateral mitral annulus were performed in the apical 4-chamber view. Tissue Doppler-derived septal PSM was measured and all patients underwent coronary angiography within 1 month. Angiographically the study population were divided into two groups; 13 without LAD stenosis and 15 with LAD stenosis (> 50%). The clinical, ECG and standard Doppler diastolic indices were comparable between the two groups. Septal tissue Doppler showed lower myocardial systolic (Sm) and atrial peak velocities (both p < 0.05), a higher PSM (>2 cm/s; p < 0.005),
in patients with LAD stenosis. A Sm/PSM ratio <1 was detected in 93.3% of patients (14/15) with LAD stenosis (sensitivity 93.3%, specificity 100%); 23% (3/13) patients without LAD stenosis also had PSM but with a Sm/PSM ratio >1. To conclude, tissue Doppler-derived higher PSM is a simple, non-invasive marker with high sensitivity and specificity to diagnose LAD disease in the presence of LBBB.

Right Ventricular Function in Inferior Myocardial Infarction by Tissue Doppler Imaging

T M unusamy, V Jaganathan, R Alagesan, M Annamalai, S Shanmugasundaram, Geetha Subramaniam, A Balaguru, C Morthy, Justin Paul G, PS M ohanamurugan, K M enakshi
Madras Medical College and Government General Hospital, Chennai

The purpose of this study was to analyze the right ventricular function in patients with acute inferior wall myocardial infarction (IWMI) by tissue Doppler imaging (TDI) of tricuspid annulus. Thirty patients with first acute IWMI were prospectively compared with as many patients with first acute anterior wall myocardial infarction (AWMI) and as many age matched controls. Right ventricular (RV) infarction in IWMI was diagnosed by standard criteria. From the echocardiographic apical 4-chamber view, the systolic motion of the tricuspid annulus was recorded at the RV free wall. Peak systolic and peak early and late diastolic velocities of the tricuspid annulus at the RV free wall also were recorded with the use of pulsed-wave Doppler tissue imaging. The tricuspid annular motion was reduced in IWMI compared with that in healthy individuals (20.5 mm and 25 mm, respectively, p<0.001). The peak systolic velocity of the tricuspid annulus was significantly reduced in IWMI compared with healthy individuals (12 cm/s v. 14.5 cm/s, p<0.001) and patients with AWMI (12 cm/s v. 14.5 cm/s, p<0.001). Patients with IWMI were divided into 2 subgroups; those with and those without ECG signs of RVMI. The tricuspid annular motion was significantly lower in patients with RVMI than in patients without RV infarction. In addition, compared with patients without signs of RVMI, patients with RV infarction also had a significantly decreased peak systolic tricuspid annular velocity (13.3 cm/s and 10.3 cm/s, p<0.001) and peak early diastolic velocity (13 cm/s and 8.2 cm/s, p<0.001).

<table>
<thead>
<tr>
<th>Group</th>
<th>IWMI</th>
<th>IWMI with AWMI</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>n=29</td>
<td>n=30</td>
<td>n=30</td>
</tr>
<tr>
<td>Tricuspid annular motion (mm)</td>
<td>20.5</td>
<td>18.5</td>
<td>25</td>
</tr>
<tr>
<td>Peak systolic velocity of tricuspid annulus (cm/s)</td>
<td>12</td>
<td>10.3</td>
<td>14.5</td>
</tr>
</tbody>
</table>

IWMI: inferior wall myocardial infarction; RVMI: right ventricular myocardial infarction; AWMI: anterior wall myocardial infarction; A x C = adjusted p value.

We observed from our study that all patients with IWMI had significant degree of RV dysfunction as assessed by TDI analysis of tricuspid annular motion velocity. This was still more significant in patients with associated RVMI.

Myocardial Performance Index in Acute ST Elevation Myocardial Infarction

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Medical College Hospital, Thrivananthapuram

Left ventricular (LV) ejection fraction is being used as a measure of LV function and provides prognostic value in acute ST elevation myocardial infarction (STEMI). Ejection fraction is a load-dependent variable which interferes with its assessment. Myocardial performance index has been proposed to be a load independent variable. The prognostic value of myocardial performance index in STEMI is not clear. To determine whether myocardial performance index correlates with other indices of LV function and to estimate its prognostic value, 40 consecutive patients with acute STEMI within 48 hours of onset of chest pain were included in this study. A detailed echocardiographic (Echo) evaluation, with regard to LV ejection fraction, LV end-systolic volume, Doppler-derived right ventricular (RV) and LV myocardial performance indices were determined. Patients were grouped into different tertiles according to their myocardial performance indices, and followed up for 7 days or until hospital discharge. The end points were death, recurrent ischemia, need for urgent target vessel revascularization (TVR) or a composite of death, recurrent ischemia and need for urgent TVR. The mean age was 54.05±9.27 years; 8/40 (20%) patients were females; 38/40 (95%) patients received intravenous (IV) streptokinase within a mean window period of 4±2.2 hours. 17/40 (42.5%) patients had anterior wall myocardial infarction (AWMI), End points were reached in 23/40 (57.5%) patients. RV myocardial performance index value of ≥ 0.5 was significantly predictive of the in-hospital occurrence of recurrent ischemia [5% (2/40) v. 17.5% (7/40), p<0.0001] and need for urgent TVR [5% (2/40) v. 17.5% (7/40), p<0.0001]. The value of ≤ 0.5 was not found to correlate with increased mortality [0% (0/40) v. 10% (4/40), p=NS] although all the deaths occurred in the ≥ 0.5 tertile. The value was not useful to predict reduced LV ejection fraction [≤ 45%, 0% (0/40) v. 10% (4/40), p=NS] or elevated LV end-systolic volume [≥ 40 ml, 10% (4/40) v. 30% (12/40), p=NS]. LV myocardial performance index value of ≥ 0.5 was not found to be useful to predict death [0% (0/40) v. 10% (4/40), p=NS], recurrent ischemia [7.5% (3/40) v. 15% (6/40), p=NS] or need for urgent TVR [7.5% (3/40) v. 15% (6/40), p=NS]. The value also did not correlate with reduced LV ejection fraction [2.5% (1/40) v. 7.5% (3/40), p=NS] or...
Elevated end-systolic volume (22.5% vs. 17.5%) was significant (p=NS). Early performance of Doppler-derived RV myocardial performance index is useful in risk stratification of patients with acute STEMI. A higher value of this index is associated with adverse in-hospital outcomes.

Transesophageal Echocardiographic Study in Ischemic Stroke
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The aim of the study was to find out cardiac source for ischemic stroke. During the period, March 2005 to June 2005, 126 patients with computerized tomography (CT) – proved ischemic stroke were studied. Transthoracic echocardiography (TTE) and transesophageal echocardiography (TEE) were done using ALOKA SSP PRO 2000 machine with multplane TEE capabilities. Bubble study was done in all patients. Carotids and descending aorta were also imaged for the presence of plaques. There were 62 male patients and the age group under study was between 14 and 80 years. All stroke patients were divided into ‘rheumatic heart disease (RHD)’, ‘cryptogenic’ and other causes group; 12 patients had hypertension alone, 10 patients had diabetes alone and 36 patients had both diabetes and hypertension; 24 patients had RHD. Abnormal ECG was present in 66 patients. Atrial fibrillation was seen in 10 patients. The mean left atrial appendage (LAA) mass in patients with left ventricular hypertrophy (LVH) was 198±22 gm. Abnormal TEE was present in 62 patients. Atrial septal aneurysm (ASA) was present in 8 patients and bubble study was positive in 4 patients; 16 patients had LAA clot, 2 (9.1%) in cryptogenic group, 2 (3.3%) in other causes group and 12 (50%) in RHD group. Descending aorta plaque was seen in 6 patients in cryptogenic group.

Right Ventricular Tei Index: Echocardiographic Marker for Right Coronary Artery Stenosis and Improvement with Angioplasty
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SCB Medical College, Cuttack

Sixteen patients without history of infarction underwent percutaneous transluminal coronary angioplasty (PTCA) and stenting of right coronary artery (RCA) in our institute. The right ventricular (RV) Tei index was studied before PCTA, (pre-Tei), after PTCA (post-Tei) and at 6 months follow-up. Ten patients with normal coronaries and without ventricular systolic or diastolic dysfunction served as control. RV Tei index was calculated as: "a-b divided by b." [a = time between the end of one tricuspid valve (TV) flow and onset of the next, b = pulmonary flow ejection time]. Severity of lesion was assessed by diameter stenosis (% stenosis). Pre-and post-PTCA Tei index was correlated with diameter stenosis.

- **p< 0.05 between pre-PTCA and control as well as pre- and post-PTCA

Thus, a Tei index > 40 could predict the presence of RCA stenosis (sensitivity 80% and specificity 73%). The Tei index is increased in patients with RCA lesion, is significantly related to the severity of the lesion and improves with PTCA and stenting, the improvement being maintained on follow-up (RV Tei index 38.7±9.7). It can predict the presence of RV ischemia with some accuracy.
The aim of the study was the evaluation of the patients with atrial fibrillation using transesophageal echocardiography (TEE). We studied 152 patients of atrial fibrillation admitted during the period, August 2004 to June 2005. All patients underwent transthoracic echocardiography (TTE) and TEE evaluation using ALOKA SSP PRO 2000 with multiplane TEE probe. TEE evaluation was done in all patients, to record left atrial appendage (LAA) velocity and to look for the presence of spontaneous echo contrast, left atrial thrombus and LAA size measurement. Out of 152 patients, 66 (43%) were males. Mean age of study population was 36±10 years; 136 (90%) patients had rheumatic heart disease (RHD), 10 patients had hypertension, 4 patients had thyrotoxicosis, 2 patients each had congenital heart disease (atrial septal defect (ASD)), dilated cardiomyopathy (DCM), hypertrophic obstructive cardiomyopathy (HOCM), and coronary artery disease (CAD). TTE examination revealed LA clot in 42 (27%) patients and spontaneous echo contrast was seen in 32 (21%) patients. TTE did not reveal the presence of clot. However, TEE examination revealed LAA spontaneous echo contrast in 112 (73%) patients. LAA thrombus was seen in 78 (51%) patients. Only 10 of the patients with thrombus had cardiovascular accident (CVA). The mean LAA flow velocity in patients with left atrial thrombus was 0.17±0.05 m/s and in patients without left atrial thrombus it was 0.36±0.08 m/s. The mean thrombus size in patients with CVA was 2.54±1.02 cm and in those without CVA was 1.22±0.31 cm (p<0.05).

## Transesophageal Echocardiographic Evaluation of Patients with Atrial Fibrillation

<table>
<thead>
<tr>
<th></th>
<th>Thrombus (n=78)</th>
<th>No Thrombus (n=74)</th>
</tr>
</thead>
<tbody>
<tr>
<td>n=152 (90%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>34±7</td>
<td>34±10</td>
</tr>
<tr>
<td>Male</td>
<td>38 (51)</td>
<td>20 (32)</td>
</tr>
<tr>
<td>Female</td>
<td>36 (49)</td>
<td>42 (68)</td>
</tr>
<tr>
<td>LA size (cm)</td>
<td>4.7±0.3</td>
<td>4.2±0.9</td>
</tr>
<tr>
<td>LAA size (cm)</td>
<td>3.8±1</td>
<td>3.7±1</td>
</tr>
<tr>
<td>LAA velocity</td>
<td>0.17±0.05</td>
<td>0.36±0.08</td>
</tr>
</tbody>
</table>

RHD: rheumatic heart disease; LA: left atrial; LAA: left atrial appendage

Values in parentheses show percentage

We conclude that atrial fibrillation is one of the commonest arrhythmia in clinical practice; 55% of RHD patients and 25% of patients in non-RHD group had LAA thrombus and anticoagulation therapy was must for these patients.

## Correlation of Diastolic Dysfunction with Left Atrial Volume

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Lokamanya Tilak Municipal Medical College and General Hospital, Mumbai

We examined the relationship between left atrial volume (LAVI) indexed to body surface area and clinical and Doppler echocardiography parameter in patients, with one of the following diagnosis: hypertension, congestive heart failure, coronary artery disease (CAD) and diabetes mellitus (DM). Patients with valvular disease were excluded. All patients were more than 40 years of age. The diastolic function was graded as normal, Grade I to III diastolic dysfunction. Twenty-four percent patients had no diastolic dysfunction, 64% had Grade I diastolic dysfunction, 9% Grade II diastolic dysfunction and 3% had Grade III diastolic dysfunction. The LAVI increased with worsening of diastolic dysfunction: 21±7 ml/m² (normal), 25±6 ml/m² (grade I diastolic dysfunction) 34±8 ml/m² (Grade II diastolic dysfunction), and 46±12 ml/m² (Grade III diastolic dysfunction). The predictive value of LAVI for detection of diastolic dysfunction is moderate to high. In this study there was 69% sensitivity and 77% specificity for any grade of diastolic dysfunction. It further increases to 88% with severe diastolic dysfunction. Our data suggest that LAVI is correlated with diastolic dysfunction and has moderate sensitivity and specificity.

## Assessment of Right Ventricular Function by Tissue Doppler Imaging and its Comparison with Radionuclide Scan

International Centre for Cardiovascular and Thoracic Diseases, Chennai

Assessment of right ventricular function is difficult by conventional 2D echocardiography owing to the complex structure and asymmetrical shape of the ventricle. Tissue Doppler imaging (TDI) is a technique of analysis of myocardial wall motion. It may be used for right ventricular (RV) walls from the apical 4-chamber view, from which velocities can be measured from tricuspid annulus to the apex. In this ongoing study we assessed the post-operative right ventricular function in 8 patients [tetralogy of Fallot (TOF): 4, mitral valve disease with pulmonary artery hypertension (PAH): 2, coronary artery bypass grafting (CABG): 2] by TDI and compared it with First pass radionuclide scan. The echocardiography done pre-operatively, on day 7 and at 3 months follow-up. Radionuclide
Right Ventricular Dysfunction in Patients with Chronic Constrictive Pericarditis: A Tissue Doppler Imaging Study


GB Pant Hospital, New Delhi

Echocardiographic evaluation of right ventricular (RV) function remains challenging due to the complex RV anatomy and near field artifacts. Tissue velocity imaging is a newer technique for quantitative analysis of regional and global right ventricular function. Limited data exists on systolic and diastolic function of the right ventricle in patients with chronic constrictive pericarditis (CCP). Tissue Doppler imaging was performed in 35 cases (male: 22; age: 22 ± 8.1 years) with surgically proven CCP using Vingmed GE System Five. Peak systolic (Sa), early diastolic (Ea) and late diastolic (Aa) tissue velocities were obtained by pulsed tissue Doppler imaging of tricuspid free wall annulus and compared with 30 age- and sex-matched healthy controls. All patients with CCP showed markedly decreased systolic and early diastolic tricuspid-free wall annular velocities. The tissue velocities in CCP and controls are given in the table.

<table>
<thead>
<tr>
<th>CCP</th>
<th>Controls</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RV (2D) (cm)</td>
<td>1.7±1.4</td>
<td>1.6±1.3</td>
</tr>
<tr>
<td>Sa (cm/s)</td>
<td>13.9±3.1</td>
<td>16.1±3.2</td>
</tr>
<tr>
<td>Ea (cm/s)</td>
<td>11.6±2.3</td>
<td>18.2±3.3</td>
</tr>
<tr>
<td>Aa (cm/s)</td>
<td>8.5±4.1</td>
<td>13.2±4.4</td>
</tr>
</tbody>
</table>

We conclude that there is significant impairment of tricuspid free wall annular velocities in patients with CCP. Further studies are required to ascertain the clinical significance of these interesting findings.
underwent successful BMV and were regularly followed up for mitral valve area (MVA) and LAA function. During the follow-up of up to 60 months, 20 patients developed restenosis (mean age 30.4±8.0 years; 12 males). The LAA function parameter of these patients are shown in the table.

<table>
<thead>
<tr>
<th></th>
<th>Pre-BMV</th>
<th>Post-BMV</th>
<th>6 months FU</th>
<th>Restenosis</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>MVA (cm²)</td>
<td>0.78±0.15</td>
<td>2.02±0.28</td>
<td>1.87±0.35</td>
<td>0.98±0.2</td>
<td></td>
</tr>
<tr>
<td>LAA EF (%)</td>
<td>39.2±11.6</td>
<td>53.3±12.1</td>
<td>52.1±13.2</td>
<td>40.4±8.4</td>
<td>61.1±10.2</td>
</tr>
<tr>
<td>EV*</td>
<td>20.0±8.4</td>
<td>32.7±10.8</td>
<td>33.8±8.0</td>
<td>22.0±8.0</td>
<td>46.6±18.3</td>
</tr>
<tr>
<td>FV*</td>
<td>24.0±11.1</td>
<td>35.9±11.2</td>
<td>38.1±12.4</td>
<td>26.0±12.0</td>
<td>46.0±21.6</td>
</tr>
</tbody>
</table>

MVA: mitral valve area; LAA: left atrial appendage; EF: ejection fraction; EV: emptying velocity; FV: filling velocity.

There was significant improvement in all the parameters of left atrial (LA) function immediately after BMV, which was maintained during follow-up in the absence of restenosis. Patients who had restenosis showed deterioration in all the parameters of LAA function. One patient developed LAA clot during follow-up. Improved LAA function after BMV again deteriorated after restenosis and worsened to pre-BMV levels. We conclude that if restenosis is not relieved, the LAA dysfunction may lead to LAA clot formation.

Effect of Mitral Restenosis on Pulmonary Venous Flow after Balloon Mitral Valvotomy

KC Goswami, NK Goyal, S Anandaraja, R Yadav
All India Institute of Medical Sciences, New Delhi

The pulmonary venous flow (PVF) normally shows systolic and diastolic flow with systolic velocity greater than diastolic velocity. In mitral stenosis, the pattern is changed. After balloon mitral valvotomy (BMV) the systolic and diastolic flow are also reversed and reach near the level of controls (systolic duration more than diastolic) which is maintained during follow-up in the absence of restenosis. However, no study has assessed the effect of restenosis on PVF pattern. We prospectively assessed the PVF in 100 consecutive patients with severe mitral stenosis by transesophageal echocardiography before and after BMV and at regular intervals. During follow-up of up to 60 months, 20 patients (mean age 30.4±8.0 years; 12 males) developed restenosis and their PVF parameters are shown in the table below.

<table>
<thead>
<tr>
<th></th>
<th>Pre-BMV</th>
<th>Post-BMV</th>
<th>6-month FU</th>
<th>Restenosis</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sys vel: peak systolic velocity in cm/s</td>
<td>32±17.9</td>
<td>53±16.2</td>
<td>53±14.2</td>
<td>34±18.1</td>
<td>63±13.7</td>
</tr>
<tr>
<td>Sys dur: systolic duration in ms</td>
<td>203±62.6</td>
<td>315±45.2</td>
<td>322±48.4</td>
<td>210±64.4</td>
<td>388±60.4</td>
</tr>
<tr>
<td>Dia vel: diastolic velocity in cm/s</td>
<td>35.4±10.0</td>
<td>44.1±12.2</td>
<td>40.0±12.6</td>
<td>36.4±8.4</td>
<td>42.2±12.3</td>
</tr>
<tr>
<td>Dia dur: diastolic duration in ms</td>
<td>296±31.8</td>
<td>240±88.2</td>
<td>244±64.1</td>
<td>291±32.4</td>
<td>284±51.3</td>
</tr>
<tr>
<td>Re vel: reverse velocity in cm/s</td>
<td>19.4±8.1</td>
<td>20.6±8.3</td>
<td>22.4±8.0</td>
<td>19.6±8.0</td>
<td>19.8±5.4</td>
</tr>
<tr>
<td>Re dur: reverse duration in ms</td>
<td>108±49.9</td>
<td>125±31.2</td>
<td>134±26.8</td>
<td>110±40.4</td>
<td>143±50.0</td>
</tr>
<tr>
<td>MVA: mitral valve area in cm²</td>
<td>0.78±0.15</td>
<td>2.02±0.28</td>
<td>1.87±0.35</td>
<td>0.98±0.2</td>
<td>-</td>
</tr>
</tbody>
</table>

Sys vel: peak systolic velocity in cm/s; Sys dur: systolic duration in ms; Dia vel: peak diastolic velocity in cm/s; Dia dur: diastolic duration in ms; Re vel: peak reverse velocity in cm/s; Re dur: reverse duration in ms; MVA: mitral valve area in cm².

We conclude that after mitral valverestenosis, the near normal PVF pattern obtained after BMV returned to the pattern found in severe mitral stenosis.

Color M-Mode and Tissue Doppler Evaluation of Diastolic Function in Ischemic Heart Disease Patients and its Simultaneous Correlation with Invasively Assessed Left Ventricular End-Diastolic Pressure

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Left ventricular (LV) diastolic function can be assessed by measuring LV end-diastolic pressure (LVEDP) and time constant of LV pressure decay (tau). As these measures are invasive, non-invasive methods of assessment of LV diastolic function have been developed like transmitral and pulmonary vein flow pattern. But, these are confounded by effects of atrial compliance, left atrial pressure, pre-load, heart rate etc. Several indices have been developed that can be determined using color M-mode (CMM) echocardiography and tissue Doppler imaging (TDI) and are found to correlate well with invasively assessed LVEDP. This study sought to explore the validity of diastolic indices derived from CMM and TDI in a population of ischemic heart disease (IHD) patients by comparing with simultaneously obtained invasively assessed LVEDP. LVEDP was assessed in 60 IHD patients undergoing diagnostic coronary angiogram. Transmitial Doppler, pulmonary vein Doppler, TDI-assessed annular motion velocities and CMM-derived flow propagation velocity (Vp) were determined. Ratio of peak E mitral velocity to septal annular motion velocities by TDI (E/Em) and ratio of peak E mitral velocity to propagation velocity by CMM (E/Vp) were obtained. LVEDP was calculated using the formula 5.27×(E/Vp)+4.6. Echocardiographically-derived values were correlated with invasively determined LVEDP. Westudied 60 IHD patients who underwent coronary angiography and assessment of LVEDP [AM]: 28, unstable angina (USA): 18, stable angina: 14; mean age 59.8 years. male-female ratio 33:27. Echocardiographic indices are as follows: mean Vp: 53.6 cm/s (range: 24-80 cm/s); E/Vp: 0.9-2.9, mean Em septal annular motion by TDI (Em) 10.4±4.7 cm/s; A: 6.6±3.2 cm/s; E/Em ratio: 10.9±5.6. Mean EDP 11.4 mmHg (range: 5-20 mmHg). There was good correlation between E/Vp ratio and LV EDP ratio > 2 predicts LVEDP > 15 mmHg with 100% sensitivity. Also non-invasively calculated LVEDP using formula derived from Vp correlated with invasively measured LVEDP. Though E/Em ratio predicted LVEDP, the correlation was not as strong as that with E/Vp. Non-invasively determined indices using CMM and TDI correlate well with invasively-derived diastolic function. These indices can used to predict LVEDP in IHD patients.
Significance of Echocardiographic Evaluation in Neonates with Respiratory Distress
Rakesh Jalota, SS Sarkar
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The objective of this study was to evaluate the contribution of congenital cardiac defects (CCD) in neonates with respiratory distress in first week of life. Total 240 neonates with respiratory distress were echocardiographed in detail. All neonates were reassessed 6 weeks later and data was noted. Total infants: 240 (males: 135, females: 105), normal 82 (34.16%), with CCD 158 (65.85%), full-term normal delivery (FTND): 118, full-term cesarean section (FTCS): 97, premature normal delivery (PMND): 18, premature cesarean section (PMCS): 7. It was found that common defects among the neonates having CCD was patent ductus arteriosus (PDA) (43%), atrial septal defect (ASD) (11.39%), patent foramen ovale (PFO) (10.75%), PDA + ASD/PFO (11.35%) and 25.9% with left-to-right shunt and P AH. Its probable reason is slow resolution of infantile pulmonary circulation, perhaps due to the left-to-right shunt from CCD. Within six weeks, majority of the neonates improved, CCD closed and PAH was also normalized. It is concluded that all the neonates with respiratory distress, if found to have CCD with left-to-right shunt and PAH should be deferred from active intervention, and managed medically up to 6 to 8 weeks as there is significant chance of their improvement due to spontaneous closure of left-to-right shunt and resolution of PAH.

Tissue Doppler Imaging as a Superior Tool in comparison to Conventional Modalities in Assessment of Responders and Achieving Better Synchrony in Cardiac Resynchronization Therapy:
Binoy John, KM Cherian
International Center for Cardiothoracic and Vascular Diseases, Chennai

Dilated cardiomyopathy is a relatively common cause of heart failure. But, despite improvements in the treatment of congestive failure in the past decade, the outcome is essentially the same with a mortality of 25% at 1 year and 50% at 5 years. Of late, cardiac resynchronization therapy (CRT) has emerged as an excellent non-surgical means of improving left ventricular (LV) function by improving septal contraction, reducing mitral regurgitation (MR) and preventing ventricular remodeling. Conventional selection for CRT is based on more subtle criteria as left bundle branch block (LBBB) with QRS duration >120 ms, ejection fraction <40% and NYHA class III-IV. However, experience with these parameters has shown that there were few responders to CRT. Thus emerged the concepts for clear demonstration of inter- and intra-ventricular dyssynchrony. Initially these were based on less accurate M-mode criteria. But evolution of tissue Doppler criteria have been able to clearly differentiate responders and non-responders to CRT. Our patient was a 56-year-old lady with only NYHA class II dyspnea with a QRS duration of 160 ms and with an LV EF of 22% and end-systolic dimension (ESD) of 52.8 mm, with normal epicardial coronaries. Interventricular dyssynchrony was demonstrated by an inter-ventricular mechanical delay (IVMD) of 101 ms, which was defined as the delay between LV and RV pre-ejection intervals as assessed from aortic and pulmonary valve Doppler velocities. Intraventricular dyssynchrony was demonstrated by a septal to posterior wall motion delay (SPWMD) of 355 ms as assessed by M-mode of LV in parasternal short axis (PSAX) view at papillary muscle level. But, due to the fallacies of M-mode, tissue Doppler imaging (TDI) was used to demonstrate intraventricular dyssynchrony with 2 sample volumes at the septum and lateral wall with a delay of 122 ms showing marked dyssynchrony. With demonstration of clear dyssynchrony she was categorized as a responder and bi-ventricular pacemaker implantation was done. Thereafter, programming was done again under the guidance of TDI, achieving a septal to lateral wall delay in the range of 20 to 50 ms with the establishment of excellent inter- and intervventricular synchrony and achievement of an EF of 35%, MR jet area of 2.3 cm², though her QRS duration had decreased only by 40 ms. She was followed up at 2 weeks, 1st, 2nd, 3rd, 6th month and 1 year with minor adjustments in the programming with TDI and at 1-year follow-up LV ESD was 43 mm without MR and EF doubled to 45% with good functional status. Deviation from conventional rules and implantation for only class II symptoms led to marked improvement in LV parameters thus preventing progression of failure and functional class. Going by conventional goals, it may not be necessary to aim for a marked narrowing of the QRS duration. A more sensitive and definitive improvement in the intraventricular synchrony as assessed by TDI should be the ideal target which will enable the achievement of a wholesome ventricular synchrony and improvement in LV function.
Correlation of Left Ventricular Filling Pressure by Tissue Doppler Imaging and Cardiac Catheterization in Patients with Coronary Artery Disease
Rashmi Gupta, Satish C Govind, B Jayakumar, R Keshava, SS Ramesh, ASC Rao
Bhagwan Mahaveer Jain Heart Centre, Bangalore

Assessment of left ventricular (LV) diastolic function (filling pressure) is of diagnostic and prognostic importance specially in patients with coronary artery disease (CAD). Non-invasive assessment of LV diastolic function can be done using various echo Doppler parameters (i) Pulse wave (PW) doppler mitral inflow waves (E&A, E/A ratio), deceleration time (DT) of mitral inflow velocity (ii) PW tissue Doppler imaging (PW TDI) - E/e’ ratio, where E is initial mitral inflow velocity and e’ initial diastolic velocity of mitral annular movement. However, E/A ratio and DT are influenced by presence of systolic dysfunction, pre-load and other conditions. The aim of our study was to investigate the reliability of E/e’ ratio in estimating LV filling pressure. So, we prospectively evaluated these PW Doppler and PW TDI parameters in 48 consecutive patients with CAD who underwent measurement of left ventricular end-diastolic pressure (LVEDP) before coronary angiogram within 16±4.8 hours of echo Doppler studies. LVEDP was correlated with E/A ratio, DT and E/e’ ratio. We found good correlation of LVEDP with E/e’ ratio (r=0.982) compared to other parameters and particularly when E/e’ ratio was > 15, LVEDP was predictably > 12 mmHg (sensitivity 87.8%, specificity 100%). We conclude that simple, bedside PW TDI measurement of E/e’ ratio is an accurate and useful tool for non-invasive assessment of LVEDP in CAD patients.

Myocardial Contrast Echocardiography Provides Superior Prognostic Information Compared to Clinical Variables in Patients Presenting with Chest Pain to the Emergency Room
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Changi General Hospital, Singapore, and University of Virginia, USA

Chest pain is a common complaint in patients presenting to an emergency room (ER), but accurate diagnosis and stratification of these patients is difficult. We hypothesize that the assessment of left ventricular (LV) function and myocardial contrast echocardiography (MCE) will provide increased prognostic information over clinical variables in patients presenting with suspected cardiac chest pain to an ER. A total of 957 patients who presented with suspected cardiac chest pain were enrolled from the ER and underwent MCE. A thrombolysis in myocardial infarction (TIMI) score was calculated from 7 clinical/laboratory variables as previously described and a modified TIMI score (mTIMI) that excluded serum cardiac marker was also derived. Wall motion and perfusion on MCE were interpreted with all other clinical data. Follow-up was performed for early and late primary (cardiac death and myocardial infarction) or secondary (unstable angina, heart failure, revascularization) cardiovascular events. The mTIMI score was unable to adequately risk-stratify the patients at an intermediate compared to a high risk for developing an early event. In contradistinction, only 2/523 patients with normal motion on MCE had an early primary event versus 61/434 with abnormal motion on MCE (p=0.001). The presence of abnormal myocardial perfusion provided prognostic information in those with abnormal wall motion. Linear regression analyses showed that wall motion and perfusion on MCE provide incremental prognostic information over clinical variables for predicting early or late primary, or any cardiovascular event. MCE can rapidly and accurately provide short- and long-term prognostic information in patients presenting to the ER with cardiac causes of chest pain.
A ratio > 0.5 was used as M-mode posterior aortic wall echocardiogram. 42 patients had raised LVEDP on invasive measurement and color M-mode propagation velocity index had a sensitivity of 100% and specificity of 90% when compared to M-mode posterior wall echocardiogram which had a sensitivity of 96% and specificity of 86%. Patients with coronary artery disease (CAD) and arrhythmias were excluded from the study. In our study e'/vp ratio was correlated well with high LVEDP. It identified LVEDP >12 in 92% cases and >15 mmHg in 100% cases. There was inverse relation between vp and LVEDP formula to predict LVEDP has predicted EDP. M-mode posterior aortic wall echocardiogram had lesser sensitivity and specificity of estimating LVEDP. VP determination by color M-mode is a useful tool to assess LVEDP. VP correlates inversely with LVEDP. E/VP >2 identifies patients with LVEDP >15 mmHg. Formula to predict LVEDP correlates well with invasive measurements.

Follow-up of Patients undergoing Cardiac Resynchronization Therapy Using 2DEchocardiography and Tissue Doppler Imaging: Are we Wiser?
RR Kasiwal, Simmi M anchaa, NS Chouhan, Aparna Jaswal, Govind Goyal, Jitender Singh, Vanita Arora, TS Kler, N Trehan
Escorts Heart Institute and Research Centre, New Delhi

Recent studies demonstrated benefit of cardiac resynchronization therapy (CRT) even in patients with narrow QRS complex provided they have mechanical dyssynchrony (MD) on echocardiography (Echo). This study was conducted to assess the role of Echo and tissue Doppler imaging (TDI) in assessment of acute hemodynamic changes before and after CRT in patients of left ventricular (LV) dysfunction with varying QRS duration. Twenty consecutive patients (mean age: 63.8±8.7 years) of refractory heart failure were evaluated for hemodynamic parameters, atrioventricular dyssynchrony (AVD), interventricular dyssynchrony (IVD), atrioventricular dyssynchrony (AVD) ([AEP-P EP>40 ms and time delay between right ventricular (RV) free wall interventricular septum (IVS) >40 ms]), interventricular dyssynchrony (IVD) (septal posterior wall delay (SPWD) >130 ms and maximum delay between any two walls (Ts) >60 ms) using echo and TDI. Subsequently pre- and post-CRT parameters (mean values) were compared in patients with electrical dyssynchrony (ED) (wide QRS >130 ms) and MD i.e. VVD or IVD. All but 1 patient with documented MD showed improvement in cardiac output (CO). Of them 6 patients with SPWD >130 ms showed maximum benefit. Comparison of different groups according to presence or absence of ED or MD is shown in the table.

A significant change in CO and ‘Tel’ index was found only between patients with MD and no-MD (p=0.018 and 0.013). A trend toward improvement (although statistically not significant) was also observed in DFP/RR in patients with MD. Refinement of the selection criteria based solely on mechanical measures of resynchronization is promising, but premature. A analysis of both electrical and mechanical measures of dysynchrony may not only help us better select patients for the CRT, but may widen the benefits of the therapy in groups presently left out for the therapy.

Non-invasive Estimation of Pulmonary Vascular Resistance by Simple Technique
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GB Pant Hospital, New Delhi

Pulmonary vascular resistance (PVR), an important hemodynamic parameter is useful in assessing response to pharmacological therapy in patients of pulmonary arterial hypertension (primary or secondary). While serial right heart catheterization to determine PVR is technically not feasible, a reliable non-invasive technique is still not available. We compared PVR derived by Doppler echocardiography with catheterization-derived PVR in patients of mitral stenosis (MS) undergoing successful balloon valvuloplasty. Thirty patients of severe mitral stenosis (valve area < 1 cm²) in normal sinus rhythm with echocardiography evidence of moderate or severe tricuspid regurgitation (TR) formed the study group. PVR was calculated by using the formula:

Doppler PVR = TR/TVI × 10+0.16 Wood units (WU)
Catheterization - derived PVR = PA (mean) - LA (mean) / Qp WU

TR: tricuspid regurgitant velocity; TVI: time velocity integral across right ventricular outflow tract; Qp: pulmonary blood flow (cardiac output); PA (mean): mean pulmonary artery pressure, LA (mean): mean left atrial pressure
PVR derived by Doppler technique and by catheterization study were determined before mitral valvuloplasty by Inoue balloon and after valvuloplasty. Cardiac output was determined by Fick’s method. Pre-valvuloplasty Doppler and catheterization-derived PVR were 5.04 ±1.89 WU (mean±S.D.) and 4.88±2.02 WU respectively while post-valvuloplasty Doppler and catheterization-derived PVR were 2.67±0.96 WU and 2.69±1.03 WU, respectively. The difference between Doppler and catheterization-derived PVR on analysis by paired t test was not found to be significant (p>0.05), implying good agreement between the two techniques. Calculation of correlation coefficient (r) between TR V/TVI RVO T and catheterization-derived PVR (r = 0.98) showed a high degree of correlation. Doppler echocardiography may provide a reliable, non-invasive method to determine PVR.

The Impact of Low-dose Dobutamine Stress Echocardiography on Dysfunctional Segments on Long-term Follow-up after Surgical Revascularization
N Trehan, B Paul, A Mustaqueem, M Bansal, RR Kasliwal
Escorts Heart Institute and Research Centre, New Delhi

In patients with ischemic left ventricular (LV) dysfunction, low-dose dobutamine stress echocardiography (DSE) predicts recovery of LV systolic function following revascularization. We tried to assess the impact of low-dose DSE on dysfunctional segments after revascularization. In a retrospective analysis we studied 54 consecutive patients of LV systolic dysfunction [left ventricular ejection fraction (LVEF) <40% by low-dose DSE (16-segment model)]. Dysfunctional segments that improved at low-dose DSE (20 µg/kg/min) were considered viable. The patients were divided into viable (n=38) and non-viable (n=16) groups to assess the dysfunctional segments. All patients underwent surgical revascularization. At subsequent follow-up (3 months, 1 year and 2 years) the dysfunctional segments were compared between the two groups. The mean number of dysfunctional segments at baseline in viable and non-viable groups were 9.5±3.3 and 8.2±2.9, respectively (p=NS). Mean number of dysfunctional segments revascularized were 8.3±2.9 in viable group and 6.2±3.4 in non-viable group (p=0.03). An improvement in 3.4±3.0 segments was observed in the viable group and in 1.7±2.3 segments in the non-viable group at the end of 2 years follow-up (p=0.001). A statistically significant difference with regards to revascularization of dysfunctional segments and improvement of dysfunctional segments was observed at long-term follow-up in the viable group. Detection of viability on low-dose DSE is associated with greater emphasis on complete revascularization during surgery that translates into more significant improvement in LV function. The functional recovery of dysfunctional segments following revascularization is maintained at long-term follow-up.

Low-Dose Dobutamine Stress Echocardiography Predicts Recovery of Dysfunctional Segments and Wall Motion Score Index following Revascularization by Percutaneous Coronary Intervention
RR Kasliwal, B Paul, A Mustaqueem, M Bansal
Escorts Heart Institute and Research Centre, New Delhi

The impact of viability determination by low-dose dobutamine stress echocardiography (LDDE) prior to percutaneous coronary intervention (PCI) is not adequately represented in the Indian literature. We tried to assess an improvement in wall motion score index (WMSI) following PCI in those with viability. We retrospectively analyzed the data of 26 consecutive patients who underwent PCI following LDDE. Viability was defined as an improvement in any dysfunctional segment at LDDE (20 µg/kg/min). For the purpose of comparison of WMSI and dysfunctional segments, the patients were divided into viable (n=18) and non-viable (n=8) groups. At 3 months follow-up, the WMSI, mean number of dysfunctional segments revascularized and the mean number of dysfunctional segments which improved were compared between the two groups. The mean number of dysfunctional segments was 7.1±2.2 in viable group and 8.7±3.3 in the non-viable group (p=NS). At LDDE, mean number of dysfunctional segments that improved in the viable groups was 3.2±0.9 (p<0.001) and therefore a contractile reserve of 18.7 ± 7.0% (p<0.001). The WMSI at baseline was similar between viable and non-viable groups (1.7±0.3 v. 1.9±0.2; p=0.95) but assumed difference of statistical significance at LDDE (1.6±0.3 v. 1.9±0.2; p=0.008). At 3 months follow-up, the WMSI between viable and non-viable groups was statistically significant (1.5±0.3 v. 1.9±0.3; p=0.004). Although the number of dysfunctional segments revascularized were similar between viable and non-viable groups (6.3±2.9 v. 6.2±2.6; p=0.95) the number of dysfunctional segments which improved was statistically significant (2.9 ±1.6 v. 0.90±2.3, p=0.03). It is concluded that LDDE predicts recovery of dysfunctional segments following PCI that manifests as an improvement of WMSI at follow-up.
Cardiovascular Risk Profile in Industrial Populations across India: Results from the CVD Surveillance in Industrial Populations Study

All India Institute of Medical Sciences, New Delhi, on behalf of the Investigators of the Sentinel Surveillance for CVD risk factors in Indian industries

Cardiovascular diseases (CVD) are rapidly rising in India, specially in urban areas. Here, we report the CVD risk factor profile, in the employees and the families of 10 large industries across India. Basic CVD risk assessment was carried out in a representative cross-sectional survey in 19,973 adults aged 20-69 years (60% men), of which 10, 442 individuals (60% men) underwent detailed assessment including biochemical evaluation. The mean age of the population was 40 ± 12 years (men 41 years, women 39 years) and varied from 32 years at Nagpur to 45 years at Delhi. Tobacco was being used by 40% of men (22.6% in Hyderabad to 90% in Dibrugarh), while 15% of non-smoking men were exposed to passive smoking regularly. The overall prevalence of major risk factors in men and women is given in the table.

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Male % (CI)</th>
<th>Female % (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>30 (28-31)</td>
<td>25 (23-25)</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>11 (10-12)</td>
<td>8 (7-9)</td>
</tr>
<tr>
<td>BMI ≥ 23 kg/m²</td>
<td>51 (50-52)</td>
<td>52 (50-54)</td>
</tr>
<tr>
<td>Abdominal obesity</td>
<td>40 (39-32)</td>
<td>33 (31-35)</td>
</tr>
<tr>
<td>TC/HDL ratio ≥ 4.5</td>
<td>43 (41-45)</td>
<td>32 (29-34)</td>
</tr>
<tr>
<td>Triglycerides ≥ 150 mg/dl</td>
<td>32 (30-34)</td>
<td>20 (17-23)</td>
</tr>
<tr>
<td>Current smokers</td>
<td>21 (19-23)</td>
<td>0.2 (0-21)</td>
</tr>
</tbody>
</table>

BMI: body mass index; TC: total cholesterol; HDL: high-density lipoprotein

Most risk factors increased with age at all the centres. The risk factor profile varied considerably across centres, with urban centres having high prevalence of metabolic and obesity-related risk factors. History of heart disease was elicited in 1.3% participants while that of stroke was present in 0.3%. To conclude, the prevalence of CVD risk factors in this nationwide, large survey was high at all centres, though the profile of risk factors was different in varied settings. CVD surveillance and prevention in work-force settings is likely to aid informed decisions on policies and prevention.

Treadmill Test in Asymptomatic Patients: Have we Pressed the Panic Button?

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Awareness regarding coronary artery disease (CAD) has increased in general population. There has been a spurt in health check-up schemes in hospitals. Many investigations are clubbed together to offer early detection of CAD at a lower cost. We retrospectively analyzed the results of one of the ‘cardiac scheme’, which included a treadmill test (TMT), echocardiogram and routine blood investigations. Patients enrolled themselves directly to rule out CAD. From June 2004 to May 2005, 447 asymptomatic patients with a normal electrocardiogram (ECG) and echocardiogram underwent TMT at our institute. The TMT was interpreted according to ACC/AHA guideline criteria. Majority of patients (339; 75.8%) were men and the mean age was 47.7 ± 10.2 years (range: 19-72 years). Twenty-nine (6.4%) patients were diabetic, 109 (24.3%) hypertensive; dyslipidemia was present in 38 (8.5%) and 40 (8.9%) patients were smokers. Family history of premature CAD was present in 28 (6.2%) patients. Majority of patients (311; 69.5%) had sedentary lifestyle. Multiple risk factors were seen in 24 (5.3%) patients. All patients were subjected to Bruce protocol. Patients achieved average METS of 8.3 ± 3.1 (range: 4-13 METS; median: 8 METS). The TMT was negative in 389 (87.1%) patients, positive test result was found in 49 (10.9%) patients and in 9 patients the TMT was inconclusive due to poor effort tolerance. Patients with negative TMT were reassured and advised to repeat TMT after 5 years. Importance of coronary risk factors, their control and healthy lifestyle was explained to everyone. Out of those with positive TMT, 35 (71.4%) patients were males and 14 (28.6%) were females. Mean age was 53.5 ± 10.5 years. Fifteen (30.6%) patients were hypertensive, 11 (22.4%) patients were diabetic and dyslipidemia was present in 30 (61.2%) patients. Twelve (24.4%) patients had multiple risk factors. Patients with low risk TMT (n=40) were explained about the CAD and importance of modification of risk factors. They were advised to remain in close follow-up, repeat TMT annually and to report if any symptoms of CAD developed. Nine patients with high risk TMT were subjected to coronary angiography. Out of those, 2 patients had significant triple vessel disease (TVD) and were recommended coronary bypass surgery. Four patients had critical left anterior descending artery (LAD) disease and were subjected to coronary interventions, while other 3 patients had non-LAD disease and were managed medically. To conclude, there has been a substantial increase in asymptomatic patients seeking cardiac health check up schemes. A negative TMT is present in more than 87% cases and they can be effectively reassured. The small number of patients with positive TMT can be followed up regularly and their plan of management can be optimized properly and early in their course of disease.
Tobacco Chewing - A Potential Cardiovascular Risk Factor: A Comparative Study in a Tertiary Center

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Tobacco chewing is a potential risk factor resulting in adverse prognostic impact in chronic user. The aim of this study was to evaluate the effect of prolonged tobacco chewing on cardiovascular system (CVS) compared to smoking. One hundred and fifty patients were evaluated thoroughly of which 50 were chewing tobacco or smoking for more than 10 years. They were compared with the normal ones who did not take tobacco in any form. Those having renal, endocrine or liver disease, diabetes, or on drugs for CVS disorder were excluded. Males outnumbered females with mean age of 48.36±8.20 years in tobacco chewer group. In this group mean systolic blood pressure (SBP) was 132.04±24.44 mmHg, mean diastolic blood pressure (DBP) was 85.72±15.5 mmHg. Systolic hypertension (≥140 mmHg) was found in 38% and diastolic hypertension (≥90 mmHg) in 54% of cases. In smoker group, it was 47.58±9.62 years, 135.84±17.73 mmHg, 84.36±14.05 mmHg, 44% and 50%, respectively. Regarding lipid profile (mg%) though closely matched, total cholesterol and triglyceride (TG) levels were higher in smokers (183.84±45.24 v. 180.62±31.22 and 125.2±71.79 v. 123.6±51.18, respectively), nearly similar low-density lipoprotein-cholesterol (LDL-c) and very low-density lipoprotein-cholesterol (VLDL-c) (115.9±39.44 v. 115.82±30.35 and 24.34±14.3 v. 24.7±10.25 respectively) but high-density lipoprotein-cholesterol (HDL-c) was lower in tobacco chewer group (43.96±12.1 v. 41.90±11.19 respectively). In comparison with controls, tobacco chewer group showed significant increase in blood pressure (BP), total cholesterol, TG, LDL-c, VLDL-c and decrease in HDL-c (p<0.05) in blood pressure gradient (PG) and triglyceride (TG) levels were higher in smokers. Models showing significant adverse impact on CHD status. Interestingly, the prevalence of low HDL was similar in both groups. Discriminant analysis showed that 77.2% of all entry for patients and 72.6% of all entry for controls were correctly classified using conventional risk factors. Our results suggest that resident Indians with multiple risk factors are at a substantially increased risk for CHD and warrant early intervention for conventional risk factors.

Risk Factors for Coronary Heart Disease in Indians: A Case-Control Study from Kolkata

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Coronary heart disease (CHD) incidence is very high in people of South Asian descent (originally from India, Pakistan and Bangladesh). The purpose of this study was to examine the association of risk factors with the development of CHD in resident Indians. In this case-control study (150 cases, 176 controls), age, sex, residence (urban v. rural), anthropometric measures, educational level, physical activity, smoking status, lipids, plasma glucose, blood pressure, chest X-ray and ECG were obtained in a pre-designed schedule. Age, height, weight, body mass index (BMI), and hip circumference were similar in both groups. The results of the multivariate binary logistic regression revealed that 'odds' of being 'patients' were at least 4 times higher for subjects with male sex [odds ratio (OR): 4.6, p=0.001] and total cholesterol (TC)/high-density lipoprotein (HDL) ratio of 4.4 (OR: 4.0; p=0.001). Logistic regression also revealed that systolic blood pressure (BP) (OR=3.0), diastolic BP (OR=3.6), fasting plasma glucose (FPG) OR=3.0), post-load pressure gradient (PG) (OR=3.2), impaired fasting glucose (OR=3.7), elevated TC (OR=3.0), elevated triglyceride (OR=3.1), low-density lipoprotein (LDL) (OR=3.1), LDL/HDL ratio (OR=3.4), central obesity (OR=3.0), smoking (OR=3.7) and urban residence (OR=3.1) had significant (p<0.05) adverse impact on CHD status. Interestingly, the prevalence of low HDL was similar in both groups. Discriminant analysis showed that 77.2% of all entry for patients and 72.6% of all entry for controls were correctly classified using conventional risk factors. Our results suggest that resident Indians with multiple risk factors are at a substantially increased risk for CHD and warrant early intervention for conventional risk factors.

Prevalence of Coronary Artery Disease in a Rural Community of North India

Rajeev Bhardwaj, Arvind Kandoria, Rajeev Marwah, Bakshish Singh, Praveesh Dhiman, Avinash Sharma
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The incidence of coronary artery disease (CAD) is on the increase in India. There has been no study regarding the prevalence of CAD from north part of the country, hence this study was undertaken. Kunihar is a village situated about 40 km from Shimla. A team of six doctors did a family survey of the village for 3 days, on holidays, so that majority of the population could be screened. The team was divided into 3 groups of two doctors each. Each group was accompanied by an ECG technician. Persons above 30 years of age were included in the study. Detailed history about having suffered myocardial infarction (MI) and chest pain was taken. All persons were subjected to 12-lead electrocardiogram (ECG) and 23 (3.8%) persons were found to have CAD; out of these 19 (6.15%) were male and 4 (1.4%) were females. 17 patients had old MI, and 6 had angina. Ten patients had undergone coronary angiography, 3 each percutaneous transluminal coronary angioplasty (PTCA) and coronary artery bypass grafting (CABG). In conclusion, the prevalence of CAD in the rural population of Himachal Pradesh is around 4%. It is almost 3 times more common in males.
Tobacco Chewing is Associated with Greater Cardiovascular Risk: A Population-Based Study

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Chewing tobacco is a widely prevalent practice in India. We studied 200 subjects who are in the habit of chewing tobacco for at least 10 years. All the subjects were divided into two groups depending upon life time total tobacco consumption (Group A persons weighing <40 kg, group B ≥ 40 kg) and compared them with well-matched 200, non-tobacco users healthy subjects (Group C). The results are shown in table.

Our study shows that tobacco chewing is associated with greater cardiovascular risk.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean values</th>
<th>A – B</th>
<th>p values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>41.8</td>
<td>52.47</td>
<td>46.73</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>24.01</td>
<td>23.94</td>
<td>24.10</td>
</tr>
<tr>
<td>WHR</td>
<td>0.90</td>
<td>0.93</td>
<td>0.90</td>
</tr>
<tr>
<td>Pulse rate</td>
<td>82.69</td>
<td>86.15</td>
<td>79.95</td>
</tr>
<tr>
<td>SBP (mmHg)</td>
<td>129.11</td>
<td>134.28</td>
<td>128.94</td>
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<tr>
<td>DBP (mmHg)</td>
<td>86.34</td>
<td>87.70</td>
<td>82.58</td>
</tr>
<tr>
<td>TC (mg/dl)</td>
<td>177.25</td>
<td>186.56</td>
<td>169.74</td>
</tr>
<tr>
<td>TG (mg/dl)</td>
<td>117.76</td>
<td>121.23</td>
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<tr>
<td>HDL (mg/dl)</td>
<td>44.43</td>
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<td>48.41</td>
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<tr>
<td>LDL (mg/dl)</td>
<td>109.38</td>
<td>120.17</td>
<td>99.09</td>
</tr>
<tr>
<td>WHR</td>
<td>1.11</td>
<td>1.21</td>
<td>1.23</td>
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<tr>
<td>HDL (mg/dl)</td>
<td>12.72</td>
<td>12.84</td>
<td>12.90</td>
</tr>
<tr>
<td>WHR</td>
<td>0.97</td>
<td>0.95</td>
<td>0.94</td>
</tr>
<tr>
<td>VLDL (mg/dl)</td>
<td>32.8±18.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HDL (mg/dl)</td>
<td>35.8±9.2</td>
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<tr>
<td>LDL (mg/dl)</td>
<td>185.3±41.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WHR</td>
<td>0.93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HDL (mg/dl)</td>
<td>167.2±88.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LDL (mg/dl)</td>
<td>53.0±13.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WHR</td>
<td>0.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HDL (mg/dl)</td>
<td>44.8±7.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LDL (mg/dl)</td>
<td>167.2±88.07</td>
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<td></td>
</tr>
</tbody>
</table>

BMI: body mass index; WHR: waist-hip ratio; SBP: systolic blood pressure; DBP: diastolic blood pressure; FBS: fasting blood sugar; TC: total cholesterol; TG: triglyceride; HDL: high-density lipoprotein; LDL: low-density lipoprotein; VLDL: very low-density lipoprotein

Profile of Coronary Artery Disease in Coastal Andhra Pradesh - An Institutional Review

DK Baruah, M Srinivas, NK Panigrahi
Apollo Hospital, Visakhapatnam

The purpose of the study was to analyze the angiographic profile as well as risk factors of coronary artery disease (CAD) in the coastal belt of Andhra Pradesh. Of the 2044 patients who underwent coronary angiogram in our institute between 1999 and 2001, 1528 (74.7%) cases were found to have significant CAD (Group A) and 516 (25.25%) had normal coronaries (Group B). Both the groups were compared for various risk factors and lipid abnormalities: 1356 (88.7%) were male in Group A and 359 (69.6%) in Group B. Mean age was 56±9 years and 57±10 years in Group A and Group B, respectively. Number of cases with premature CAD (male < 45 years, female < 55 years) were 193 (12.6%). Angina was the main clinical presentation (94.4%). Prior history of myocardial infarction (MI) was present in 670 (43.8%) cases, anterior wall myocardial infarction (AWMI) in 247 (36.8%), ASMI 133 (36.8%), inferior wall myocardial infarction (IWMI) 280 (41.8%) and lateral MI in 10 (1.5%). 265 (17.3%) cases presented with unstable angina and 66 (4.3%) had non-ST elevation myocardial infarction (NSTEMI). Risk factor analysis revealed diabetes in 534 (35%), hypertension in 725 (47.4%), tobacco use in 350 (23%), obesity in 164 (10.7%) and family history of CAD in 96 (6.3%). Estimation of lipid levels showed high cholesterol (> 200 mg/dl) in 31.2%, high triglycerides (> 150 mg/dl) in 591 (48.5%), high-density lipoprotein (HDL) (< 40 mg/dl in males) in 809 (74%), HDL (< 50 mg/dl in females) 117 (86%) and low-density lipoprotein (LDL) (> 130 mg/dl) in 377 (31.4%). Statistical analysis was carried out using χ² test and compared between both the groups. Diabetes was found to have significant association (p=0.004) with CAD. In quantitative analysis, total cholesterol was 185.3±41.8 mg/dl, triglycerides 167.2±88.07 mg/dl, HDL 35.8±9.2 mg/dl, LDL 114.9±34 mg/dl and very low-density lipoprotein (VLDL) 32.8±18.6 mg/dl. Comparative values between CAD group and normal coronary group were analyzed (using t test). Significantly, low HDL cholesterol (p=0.03) and high triglycerides (p = 0.05) were recorded in CAD group. Coronary angiographic analysis revealed diffuse coronary disease in 175 (11.5%) cases which included multiple lesions involving segments of coronary arteries. 492 (32.2%) cases had single vessel disease, 402 (26.3%) 2-vessel disease, 503 (32.9%) 3-vessel disease and 131 (8.6%) had left main disease. In this angiographic review equal prevalence of single or multivessel CAD was recorded and diabetes was found to be the most significant risk factor. Analysis of lipids revealed low HDL-cholesterol and high triglycerides in significantly more number of patients with CAD.

Profile of Lipid Abnormalities in Hypertensive Urban Population of Dibrugarh District of Upper Assam

Arijit De, RK Kotokoy, S Hazarika, BC Kaila, RK Dhanwar
Assam Medical College and Hospital, Dibrugarh

A population-based study was conducted for a period of one year from 1 April 2003 to 31 March 2004, on 1005 persons, selected from a population of approximately two lakh of urban dwellers of Dibrugarh town of Upper Assam, to analyze the lipid profile of the hypertensive population. All subjects with hypertension, as per the criteria laid down by JNC VI, 1997 and JNC VII, 2003, without any history of renovascular hypertension, renal parenchymal disease, pregnancy-induced hypertension, or receiving hypolipidemic drugs were included in the study. A total of 280 (27.9%) persons from the study population, were found to be hypertensive, of which 151 (54%) persons were dyslipidemic with maximum incidence (26.1%).
in the age group of 50-59 years. 34.4% had elevated total cholesterol (>200 mg/dl), 25.2% had elevated triglycerides (>200 mg/dl), 33.1% had elevated low-density lipoprotein-cholesterol (LDL-c) (>130 mg/dl), 22.5% had low high-density lipoprotein-cholesterol (HDL-c) (<40 mg/dl). Female hypertensives had significantly higher values of triglycerides (TG) than males (p < 0.01) while total cholesterol, HDL-c, LDL-c were higher in males (p < 0.001). Both males and female hypertensives had significantly higher values of total cholesterol, TG, LDL-c as compared to controls (p < 0.001). The present study puts footsteps on the pattern of lipid abnormalities in the hypertensive patients of the urban population of Upper Assam.

### Influence of Initial and Subsequent Motivation on Control of Hypertension and Risk Factors in Rural Punjab

Vitull Gupta, Sonia Gupta
Kishori Ram Hospital, Bhatinda

We evaluated the influence of initial and subsequent motivation in achieving normal blood pressure (< 120/80 mmHg) and improvement in risk factor profile like, weight, body mass index (BMI), waist-hip ratio, smoking, alcohol and exercise in randomized controlled study conducted in 400 patients (who completed the study) of hypertension. All were above the age of 18 years attending the outpatient department of our hospital. They were randomly divided into two groups, Group I consisting of 200 patients was motivated at the start of the study (initial motivation) and Group II of 200 patients were educated and motivated at the start and every month of their visit to the hospital for 6 months (subsequent motivation), the duration of the study. Education and motivation included interaction with patients, the printed and audio-visual information about hypertension, complication, drug treatment and importance of lifestyle modification in the course of disease. The results are shown in the Table.

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Group (I)</th>
<th>Group (II)</th>
</tr>
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<tr>
<td>Blood pressure, mm Hg</td>
<td>Initial motivation (n=200) % (N)</td>
<td>Subsequent motivation (n=200) % (N)</td>
</tr>
<tr>
<td>&lt; 160/100</td>
<td>76 (152)</td>
<td>6 (12)</td>
</tr>
<tr>
<td>159-140/99-99</td>
<td>24 (48)</td>
<td>5 (10)</td>
</tr>
<tr>
<td>139-130/89-89</td>
<td>0 (0)</td>
<td>23 (46)</td>
</tr>
<tr>
<td>&lt; 120/80</td>
<td>0 (0)</td>
<td>66 (132)</td>
</tr>
<tr>
<td>Body mass index, kg/m²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 18.5</td>
<td>17 (34)</td>
<td>17 (34)</td>
</tr>
<tr>
<td>18.5-24.9</td>
<td>28 (56)</td>
<td>32 (64)</td>
</tr>
<tr>
<td>&gt; 25</td>
<td>55 (110)</td>
<td>51 (102)</td>
</tr>
<tr>
<td>Waist-hip ratio</td>
<td></td>
<td></td>
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<tr>
<td>Males: &gt; 0.9</td>
<td>34 (34)</td>
<td>30 (30)</td>
</tr>
<tr>
<td>&lt; 0.9</td>
<td>66 (70)</td>
<td>70 (74)</td>
</tr>
<tr>
<td>Females: &gt; 0.8</td>
<td>48 (46)</td>
<td>46 (44)</td>
</tr>
<tr>
<td>&lt; 0.8</td>
<td>52 (50)</td>
<td>54 (52)</td>
</tr>
<tr>
<td>Exercise</td>
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<tr>
<td>Sedentary</td>
<td>74 (148)</td>
<td>65 (130)</td>
</tr>
<tr>
<td>Moderate</td>
<td>24 (48)</td>
<td>33 (66)</td>
</tr>
<tr>
<td>Strenuous</td>
<td>2 (4)</td>
<td>2 (4)</td>
</tr>
<tr>
<td>Smoking</td>
<td>11 (10)</td>
<td>8 (8)</td>
</tr>
<tr>
<td>Alcohol</td>
<td>21 (22)</td>
<td>18 (18)</td>
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</tbody>
</table>
Demographic Data and Outcome of Acute Coronary Syndrome in the South African Asian-Indian Population
N Ranjith, RJ Pegoraro, DP Naidoo
University of KwaZulu-Natal, Durban, South Africa

Significant differences in the prevalence of coronary heart disease (CHD) exist with respect to gender, age, and ethnicity. The disease has been reported to be higher in Indian populations that have emigrated from the Indian subcontinent. The aim of this study was to examine differences in major cardiovascular risk factors and clinical outcome in South African Asian-Indians of different age groups and gender, who presented with acute coronary syndromes. The study cohort consisted of 2290 consecutive patients admitted between 1996 and 2002 divided into 3 age subgroups: young age (<45 years; 20%), middle age (≥45 ≤ years; 59%), and old age (>65 years; 21%). All 3 age groups were predominantly male, but this was more evident in the younger (88%) and middle age groups (71%), and became less striking as the proportion of females increased with age. Smoking was found more common in young men compared with young women (p < 0.01). Diabetes mellitus (21%) and hypertension (18%) were seen less frequently in young patients but this was confined to men only. Total cholesterol was elevated in 65% to 70% of all patients whilst high-density lipoprotein (HDL) levels were significantly lower in men compared with women for all age subsets. Hospital mortality was extremely low in young (1%) and middle-aged patients (2%), but was expectedly higher in older patients (8%, p < 0.0001). A family history of CHD was the most common familial vascular disease seen. Young patients were more often subjected to diagnostic and therapeutic interventions. They had more aggressive disease, with 48% of those subjected to angiographic studies having triple vessel disease (TVD), and 14% undergoing coronary artery bypass grafting (CABG). Triple vessel disease was also detected most commonly in middle age (64%) and old patients (75%). Significant differences in risk factor status exist in South-African Indians between genders and for different age groups. Also, young Indians differ from other young groups with CHD in that they frequently have premature atherosclerosis with diffuse and aggressive disease.

Lipoprotein(a) and Apolipoprotein E Polymorphisms in Young South African Indians with Myocardial Infarction
N Ranjith, RJ Pegoraro, L Rom, MC Rajput, DP Naidoo
University of KwaZulu-Natal, Durban, South Africa

Lipoprotein(a) (Lp(a)) and apolipoprotein E (ApoE) polymorphisms have been shown to be important genetic determinants of cardiovascular risk in Asian Indians who are at high risk for this disease. The aim of this study was to
To examine the association of the Lp(a) promoter pentanucleotide repeat polymorphism and the apoE codon 112 and 158 genotypes in 195 young South African Indian patients (< 45 years) with myocardial infarction (MI). Results were compared with 300 healthy age-matched control subjects drawn from the same community and 107 unaffected siblings (18-45 years). Besides, fasting lipograms were performed on all patients and a detailed history of conventional risk factors and family background was obtained. Of the six different Lp(a) alleles detected, the 8-repeat sequence was most frequently seen. However, no difference in frequencies existed between patient and control groups. The most frequently occurring apoE genotype in the three study groups was E3/E3 (patients 71%, siblings 70%, controls 70%). A significant difference in the E3/E4 genotype was seen between patients and controls (23% v. 14%, p=0.018) and between siblings and controls (24% v. 14%, p=0.027). These patients were also likely to have significantly higher low-density lipoprotein (LDL) and lower high-density lipoprotein (HDL) levels (p=0.005 and 0.045, respectively). No association was observed between any of the Lp(a) or ApoE genotypes and conventional risk factors such as smoking, diabetes, hypertension, obesity or a family history of coronary heart disease. The apoE3/E4 genotype is strongly associated with the incidence of MI in young South African Indians. This genotype also adversely affects LDL and HDL cholesterol levels, both of which contribute to premature atherosclerosis. In contrast, Lp(a) pentanucleotide repeat polymorphism does not appear to have any etiological role in MI in this population.

**Jakarta Cardiovascular Score : A Modified Framingham Score for Estimating Cardiovascular Risk Stratification in Developing Countries**

Dede Kusmana  
University of Indonesia, National Cardiovascular Center, Jakarta

Cardiovascular disease is on the increase in developing countries. Prevention program is the rational approach to be implemented in the community. Framingham Score is already in wide use to assess the risk for future cardiovascular event. We developed Jakarta Cardiovascular Score as a modification of Framingham Score based on gender, age, body mass index (BMI), blood pressure, smoking, diabetes, and physical activity through a cohort study. A 13 years historical cohort study was done from the patients who were residing at three districts of South Jakarta since 1988. Assessment included complete history of cardiovascular risk factors (hypertension, were present in 50%, 23% and 24% patients respectively; 64% had normal body mass index (BMI). 25% had overweight and 7% were obese (BMI as per WHO criteria). Only 3% of patients had no conventional risk factors; 97% had one or more risk factors, 77% had two or more risk factors. To conclude, conventional risk factors still constitute the major risk in patients undergoing coronary revascularization. This study further proves that metabolic syndrome is a dominating risk factor in Indian patients.

**Prevalence of Coronary Risk Factors in Indian Population vis-á-vis Framingham Cohort**

G Venkatesh, M Ramanathan, CJ Reddy, KN Reddy  
Vijaya Heart Foundation, Chennai

According to Framingham study, conventional risk factors are absent in 15% to 20% of the coronary artery disease (CAD) population. We analyzed 100 consecutive patients who underwent coronary revascularization either by percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG) (50 in each group). Diabetes mellitus, hypertension, dyslipidemia, smoking, family history of CAD and age more than 60 years were considered as conventional risk factors. Male to female ratio in our study was 4.9:1. Diabetes mellitus constituted 62% and hypertension was present in 61%. Dyslipidemia, family history of CAD and smoking were present in 50%, 73% and 24% patients respectively; 64% had normal body mass index (BMI). 25% had overweight and 7% were obese (BMI as per WHO criteria). Only 3% of patients had no conventional risk factors; 97% had one or more risk factors, 77% had two or more risk factors. To conclude, conventional risk factors still constitute the major risk in patients undergoing coronary revascularization. This study further proves that metabolic syndrome is a dominating risk factor in Indian patients.

**Angiographic Profile of Coronary Artery Disease in Women in Urban Kerala**

Rachel Daniel, NP Padmaja, V Ramakrishna Pillai, Ramesh Natarajan, Shahul Hameed, Dennis Jose Joseph, John Joseph, G Vijayaraghavan  
Kerala Institute of Medical Sciences, Thiruvananthapuram

Coronary angiographic profiles of 131 consecutive female patients subjected to coronary angiography were analyzed. Of
Relevance of three Separate 10-Year Predictive Risk Scores Developed for the Caucasian Population to Asymptomatic Indians at Baseline: Indian Atherosclerosis Research Study

S Kanjilal, M Mukherjee, VS Rao, BK Natesha, SS Iyengar, VV Kakkar
Narayana Hrudayalaya, Bangalore and Thrombosis Research Institute, London, UK

The aim of this study was to examine the relevance of British, European and Framingham predictive coronary risk scores to the asymptomatic Indian population at baseline. Three hundred and fifty-four unaffected family members from 93 families enrolled in the IAR study were included in the analysis. The three scores displayed a statistically significant correlation with one another (p < 0.01) due to common variables used in their computation. While 1% of the subjects had high coronary risk scores as per the British and European scoring systems, 7% had high risk scores as per the Framingham scoring system. Relative to those with corresponding low risk scores, subjects with high British risk scores at baseline had significantly elevated levels of lipoprotein(a) (p = 0.004) and C-reactive protein (p = 0.041). Those with high European risk score had elevated levels of C-reactive protein (p = 0.022); and those with high Framingham score had elevated levels of triglyceride (p = 0.041), lipoprotein(a) (p = 0.017) and interleukin-6 (p = 0.041). Despite the association of lipid and pro-inflammatory markers with high coronary risk scores, it may be more relevant to develop predictive coronary risk scores on a test population of Indian origin for application to the Indian population.

Quality Control Measures in an Epidemiological Study

All India Institute of Medical Sciences, and Center for Chronic Disease Control, New Delhi

Measurement of lipids and lipoproteins are necessary for the diagnosis and clinical management of disorders of lipoprotein metabolism. A major limitation in large-scale multicentric epidemiological studies is the need to perform laboratory analysis in co-coordinating as well as in the performing labs and ensure both reliability and validity of the laboratory measurements. Ten Industrial centres from India participated in a large collaborative study to identify cardiovascular disease (CVD) risk factors (n = 10442). We carried out lipid measurements both at the central and the individual laboratory. To ensure quality control we performed the following: (a) For internal quality control – we estimated inter-assay and intra-assay coefficient of variation and plotted Levey-Jenning curves. (b) We randomly analyzed 10% of all the samples from each centre. (c) We exercised external quality control by providing blinded lyophilized samples to the centres and compared the measurements of the individual labs with the mean values of all the labs including coordinating lab. The results were expressed in terms of ‘Variance Index’. Lower the variance index better is the performance of the lab. The inter-assay and intra-assay coefficient of variation were <2% and 3% respectively for all the participating labs. Levey-Jenning curves for internal quality control samples were monitored closely. None of the labs performance was outside ± 3 SD. Coefficient of variation for random analysis of 10% of all samples was < 5% except for one centre [(for high-density lipoprotein-cholesterol (HDL-c)]. Twenty distributions of lyophilized external quality control samples were distributed. Nine labs out of ten had a variance index of < 1.0 by the end of the distribution. We have demonstrated a simple method of establishing quality assurance in 10 different laboratories of India. The model would be useful in standardizing laboratories for lipid measurements across the country.

Clinical, Epidemiological, and Cytogenetic Studies in Rheumatic Heart Patients in Vellore Population

K Thirumal Babu, Radha Saraswathy, P Mugundan, P Bhuvaneswary
Government Vellore Medical College Hospital, and Vellore Institute of Technology, Vellore

Rheumatic heart disease (RHD) is known to be a major public health problem and has a very high prevalence in and around Vellore. The aim of this study was to analyze the clinical, epidemiological and cytogenetic aspects of RHD patients. This study is the first of its kind done in Vellore.
Prevalence of Hypertension in a Rural Community of North India

Rajeev Bhardwaj, Arvind Kandoria, Rajeev Marwah, Bakshish Singh, Praveesh Dhimani, Avinash Sharma
Indira Gandhi Medical College, Shimla

Hypertension (HT) is a common disease which often remains unrecognized. There has been no study regarding the prevalence of HT from this part of the country, hence the purpose of the study. Kunihar is a village situated about 40 km from Shimla, with a population of around 2000. A team of six doctors did a family survey of the village for 3 days, all on holidays, so that majority of population could be covered. In all 799 adults were screened; 377 were males. JNC 7 criteria were used for diagnosing hypertension. Out of 339 (31.3%) persons found to be hypertensive, 176 (31.4%) were males and 163 (31.3%) were females. In population aged more than 30 years, in which primary HT is more common, out of 599 people studied, 309 were males and 290 were females. 56.9% of this population were having HT (56.6% males and 56.2% females). Only 72 hypertensives were aware of their disease and only 12 (16.6%) of them were controlled. In conclusion, more than 50% of the rural population was found to be hypertensive. Majority of them were unaware of the disease and in 86% of the people who were aware, the HT was not controlled.

Cardiovascular Disease in Afghanistan: Lessons from a Community Outreach Programme

Ravi R Kasliwal, Sameer Shrivastava, Manohar Shinde, Govind Goel, Arif Mustaqueem, Niraj Gupta, Pankaj Gupta, N Chouhan, M Bansal, Naresh Trehan
Escorts Heart Institute and Research Centre, New Delhi

A 12 days program was initiated at Kabul and Herat (Afghanistan) to assess pattern of heart disease under the aegis of Community Outreach Programme of our Institute. We studied 1559 patients (702 males, 857 females) 1 to 82 years old. A detailed Proforma was filled with history, clinical examination and diagnosis. Electrocardiogram (ECG), exercise treadmill test and echocardiography were done in relevant cases to support the diagnosis. This effort was the first of its kind to find out pattern of heart disease in Afghanistan. This data shows large burden of coronary artery disease (27.44%) and rheumatic heart disease (18.40%) in adult age group. Patent ductus arteriosus (19.95%) and ventricular septal defect (19.73%) were common in congenital heart disease group. Though this data is possibly not representative of the entire population in general because of referral bias, however, it does emphasize the need for systematic epidemiological assessment and subsequent medical measures.
Prevalence of Obesity in Patients admitted with Acute Anterior Wall Myocardial Infarction and its Relation to Pre-Discharge Left Ventricular Ejection Fraction

RPS Bhardwaj, Mohd Ahmad, Ramesh Thakur, CM Varma, J Rajagopal, Amit Gupta, Suvir Gupta
LPS Institute of Cardiology, Kanpur

This study aimed to assess the prevalence of obesity as defined by body mass index (BMI) and waist hip ratio (WHR), which is an important risk factor for coronary artery disease (CAD) and its relation to the left ventricular ejection fraction (LVEF) (at discharge), which is an important marker for survival post-myocardial infarction (MI). 128 consecutive patients (90 male, 38 female) admitted with first episode of acute ST elevation MI (STEMI) (>2 mm in any 2 leads from V1 to V6) treated with thrombolysis were classified into 4 categories according to BMI (≤20, 21-25, 26-30, >30 kg/m²) and WHR (<0.85, 0.85-0.99, 1-1.2, >1.2). Patients with inhospital mortality were excluded. A 2-D echo was performed on 3rd to 6th day post-MI and LVEF calculated by estimation of wall motion index (rounded) by an observer blinded to patient data. A analysis was done with SAS software. Prevalence of overweight and obesity on the basis of BMI was 38% and 15% in men and 48% and 24% in women; whereas that based on WHR was 45% and 20% (men) and 56% & 26% (women). Mean LVEF in men was 42%, 41%, 46% and 48% and in women was 40%, 42%, 42% and 44% in the BMI categories. It was 40%, 44%, 46% and 44% (men) and 38%, 42%, 46% and 46% (women) in the WHR categories. Obesity is highly prevalent in MI patients admitted with MI. It has no significant relationship with LVEF after MI in men, but seems to have a positive co-relationship in women. The relative risk and specificity of BMI and WHR remains to be further investigated.

Intra-Urban Disparities in Cardiovascular Risk Factor Prevalence among Indian Males

Rajeev Gupta, P Rastogi, H Prakash, M Sarma, N Bhagat, M R Soangler, VP Gupta
Monilek Hospital and Research Centre, and University of Rajasthan, Jaipur

There is a wide variation in prevalence of cardiovascular diseases and mortality in different Indian regions. To evaluate whether there are significant differences within an urban location we performed serial epidemiological studies. Successive epidemiological Jaipur Heart Watch (JHW) studies were performed in Rajasthan locales in rural (JHW-R, years 1992-93, n=3148) and urban studies (JHW-1, 1993-94, n=2212; JHW-2, 1999-2000, n=1123; JHW-3, 2002-03, n=458; and JHW-4, 2004-05, n=887). The studies included adults ≥20 years evaluated using standardized methodology. JHW-R, JHW-1 and JHW-2 were population-based while JHW-3 and JHW-4 included specific ethnic groups. For the present analysis we included males in age-group 20-59 years (1700, 1294, 469 and 179 in various groups respectively, n=3642). Prevalence of various coronary risk factors: tobacco use, sedentary habits, overweight/obesity (body mass index ≥25 kg/m²), truncal obesity, hypertension, diabetes, dyslipidemias and metabolic syndrome were determined and trends analyzed. The prevalence of tobacco use and smoking was significantly greater in rural (50.0%) as compared to urban groups (25.4%) while overweight/obesity, truncal obesity, hypertension, diabetes and hyper low-density lipoprotein (LDL) cholesterolemia were significantly greater in the urban cohorts (p<0.05). Within the urban cohorts there were significant differences in risk factors. In population-based cohorts (JHW-1 and JHW-2), over a period of 7 years, there was a significant increase in mean body mass index (BMI), total and LDL cholesterol, and triglycerides and decline in high-density lipoprotein (HDL) cholesterol (p<0.05). Compared to JHW-2, in community-specific groups of JHW-3 and JHW-4 (different geo-ethnic groups) prevalence of risk factors, obesity (BMI >30 kg/m²) (14.0% v. 24.9%), central obesity (55.7% v. 75.6%), hypertension (33.5% v. 47.8%), diabetes (11.8% v. 13.8%), and metabolic syndrome (22.5% v. 36.8%) was significantly greater while smoking (17.7% v. 2.5%) was lower (p<0.05). The present study shows significant intra-urban and urban-rural differences in prevalence of major cardiovascular risk factors (hypertension, high cholesterol, diabetes and low HDL) in India. Community-specific and risk factor targeted cardiovascular preventive approaches are recommended.

Awareness of Heart Disease among General Population in Punjab: A Pilot Survey in Healthy Hospital Visitors

Charles T Itty, TM Jaison
Christian Medical College, Ludhiana

The coronary artery disease (CAD) rates in India have increased substantially. However, the awareness about heart disease among the masses is inadequate. We interviewed 100 healthy hospital visitors on consecutive days in our hospital with the help of a questionnaire regarding their awareness of coronary risk factors and perceptions about CAD. Mean age was 40.39±10.08 with 67 males and 33 females. Sixty-one subjects had education only up to 10th standard or less. Majority of subjects (54%) considered themselves as having poor (<25%) knowledge about CAD; 28 subjects said that they have no knowledge regarding heart disease. Nevertheless most of the subjects (96%) felt that one should seek immediate medical attention if anybody develops symptoms of CAD. Forty-five candidates thought that heart disease is the leading cause of death in India, however, only 18 subjects saw heart disease as a major health problem. Only 64 subjects said that a patient developing acute coronary syndrome (ACS) will have chest pain. Various other symptoms reported include sweating (31%), giddiness (26%), shortness of breath (21%), anxiety (21%) etc; 59 candidates identified stress as a risk factor for heart disease. Only few subjects knew about the major...
coronary risk factors (smoking 10%, high cholesterol 14%, hypertension 10%, diabetes mellitus 4%, over weight 15% and lack of exercise 15%). Fifty-five subjects believed that regular exercise can prevent CAD; 46 (46%) candidates felt that reducing dietary fat is important and 36 of them considered stress control as a preventive measure. Most of them (80%) were interested in acquiring more knowledge about CAD; however, only 14 of them had ever discussed this with a health care provider. Significantly more number of females reported that they have no knowledge of the symptoms (n=6, p=0.03), risk factors (n=8, p=0.041) or preventive measures (n=10, p=0.006) of CAD. More subjects with higher education (beyond 10th standard) and better income (≥Rs. 10,000/month) felt that they have more knowledge about heart disease (education p=0.002; income p=0.0382) compared to those with lower education and lesser income. Higher number of candidates with better education and income could enumerate more coronary risk factors (education p=0.015; income p=0.0416). Awareness of CAD risk factors and prevention was poor in this group of healthy hospital visitors. It was significantly worse in females and those who had lesser education and lower income. Educational interventions to improve CAD awareness are the need of the hour to control this modern day ‘epidemic’.

High Prevalence of Metabolic Syndrome-X in Siblings of Patients with Angiographically Proven Coronary Artery Disease in Young Indians
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Twin epidemics of diabetes and coronary artery disease (CAD) is striking the Indian populations much more prematurely at the peak of their productive life. This study sought to find out the prevalence of metabolic syndrome-X, the earliest metabolic risk expression for premature atherosclerosis, in siblings of patients with angiographically proven CAD. Siblings of 60 patients (Group 1, n=30) and siblings of 40 age- and sex-matched control (Group 2, n=70) having normal coronary angiogram were evaluated for abdominal obesity [body mass index (BMI) and waist-hip ratio (WHR)], systemic hypertension, dyslipidemia [high low density lipoprotein cholesterol (LDL-c), low high-density lipoprotein cholesterol (HDL-c) and high triglyceride level], glucose intolerance and high plasma insulin level. Mean age of G1 and G2 were 37.6±12.4 years, and 36±10.4 years, respectively and male-female ratios were 8:5 and 5:2, respectively. There were statistically significant differences in prevalence of metabolic syndrome between two groups (p<0.001) in only male subjects. Prevalence was low and statistically not significant in female siblings. Regarding isolated manifestations of metabolic syndrome-X, all features were highly prevalent in G1 male subjects in compared to G2 male subjects except systemic hypertension which is equally prevalent in both groups. In conclusion, siblings (specially males) of young patients with angiographically proven CAD should be searched for the metabolic markers of premature atherosclerosis to institute early prevention strategies to fight against twin epidemics of diabetes and coronary artery disease.

Clinical and Angiographic Profile of Coronary Artery Disease in Western Punjab
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Present study was carried out to find out clinical and angiographic profile of coronary artery disease (CAD) in a defined geographical area. 208 patients were enrolled for the study from January 2004 to January 2005. The age range was 21-90 years with mean age of 57.4 years. There were 142 (68.2%) males and 66 (31.8%) females. Of 208 patients, 50 (24.03%) were diabetics, 146 (70.19%) were hypertensive, 62 (29.8%) were smokers. The family history of premature CAD was found in 50 (24.03%) patients, while 96 (46.15%) were obese (waist-hip circumference ratio>1). 80 (38.46%) patients had chronic stable angina (CSA) as clinical presentation while unstable angina (USA) and acute myocardial infarction (AMI) were noted in 52 (25.0%) and 44 (21.15%) patients, respectively. Angina equivalent symptoms (syncpe, fatigue, palpitation) were noted in 24 (11.53%) patients and congestive heart failure in 10 (4.80%) patients. Single vessel disease (SVD) was seen in 74 (35.57%) patients, while 44 (21.15%) and 64 (30.76%) patients had double vessel disease (DVD) and triple vessel disease (TVD) respectively. Six (2.88%) patients had left main coronary artery (LMCA) disease, 12 (5.76%) had normal coronaries, 2 (0.96%) had patent coronary anomalies [(left circumflex (LCx) artery arising anomalously from right coronary sinus). Left anterior descending (LAD) artery was the main vessel involved in 144 (69.23%) patients while right coronary artery (RCA) and LCx and LMCA were involved in 72 (34.62%), 42 (22.19%) and 8 (3.84%) patients, respectively. The lesion morphology was complex: Type C in 36 (24.47%) patients, Type B in 76 (55.88%) patients while Type A lesions were seen in 24 (17.64) patients. Thus it is concluded that CAD population of Western Punjab has clinical and angiographic profile akin to North Indian population with the exception that hypertension, central obesity and smoking are the major coronary risk factors. Almost 50% patients had involvement of more than one coronary artery and lesions were more complex.

Prevalence of Coronary Artery Disease in Women
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This study aimed to assess the prevalence of coronary artery disease (CAD) in women. 789 females who underwent
coronary angiography (CAG) between December 2001 and 2004 formed the cohort. Clinical, risk factor profile and angiographic findings were analyzed. Mean age of the cohort was 57.16 years. Overall, 579 had angiographically proven CAD (> 50% diameter stenosis) and 210 had no significant CAD. There was a steady increase in percentage of CAD as age increases (37% in 31-40 years to 87% in > 60 years). The study patients were divided into two groups (Group I - post-menopausal, Group II: pre-menopausal). Group-wise analysis showed 492 (77%) had CAD in Group I. Mean age was 60.64 ± 7.06 years. Diabetes mellitus (DM) was seen in 239 (48.58%), systemic hypertension (SHT) in 315, (64.02%), dyslipidemia (DLP) in 90 (18.29%). Family history of CAD in 52 (10.5%); 195 (39.6%) patients presented with acute myocardial infarction (AMI) and 172 (34.9%) presented with unstable angina (UA). Disease pattern was triple vessel disease (TVD): 217 (44%), double vessel disease (DVD): 103 (20.9%) and single vessel disease (SVD): 172 (34.9%) and left main disease (LMCD): 33 (6.7%). Univariate analysis showed significant association of SHT, DM, DLP and family history of CAD (p = 0.005). Multivariate family history analysis showed DM as the variable showing strong association with CAD. In group II, mean age of presentation was 48.48 ± 7.27 years. DM was seen in 35 (40%), SHT in 48 (55%) and DLP in 32 (36%) and family history of CAD in 13 (15%). Eighty-seven (57%) had CAD. SVD in 40 (45.9%), DVD 22 (25.29%), TVD 25 (28.74) and LMCD 5 (5.7%). SHT, DLP and DM were found to have significant association with CAD in univariate analysis, but DLP emerged as the most significant variable associated with CAD in multivariate analysis. We conclude that CAD is prevalent in significant number of females in both groups. TVD is seen in higher age group. Traditional risk factors have significant association with CAD.

**Normal Coronary Artery Dimensions in Kerala Population — An Angiographic Study**

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Traditional way of expressing severity of coronary artery stenosis is by percentage stenosis. Hence, it may be erroneous in patients with diffuse coronary artery disease (CAD). Prediction of normal coronary dimensions may overcome the inadequacies of percentage stenosis in diffuse CAD. There is no published data regarding normal coronary artery dimension in south Indians. Hence, this study was conducted to find out normal coronary artery dimensions in Kerala population. All consecutive patients with normal coronary angiograms were selected from our coronary angiogram database from January 2003 to October 2004. Patients with structural heart disease, prior myocardial infarction (MI), diabetes and mild luminal irregularities were excluded from the study. Of the total 58 patients, 30 were females and 28 were males. Mean age was 49.19 years. Fifty-one patients had right dominant system, 6 had left and 1 had codominant system. Left main coronary artery (LMCA) size varied from 3.2 to 6.8 mm with mean of 4.3 mm. Proximal left anterior descending (LAD) 2.5 mm to 5.4 mm with mean 3.48 mm. Left circumflex (LCx) size ranged from 2.1 mm to 4.7 with mean 3.16 mm. Right coronary artery (RCA) 2 mm to 4.4 mm with mean 3.15 mm. Mean diameters of posterior descending artery (PDA) and PLB were 1.95 and 1.88 mm respectively. Coronary dimension showed significant correlation with gender, body weight and coronary dominance on multivariate analysis. Based on these parameters, regression equations for coronary dimensions were formulated. In conclusion, coronary dimensions in Keralites are similar to western population. Weight, sex and coronary dominance correlated with coronary artery dimensions.
Prevalence of Coronary Risk Factors in Asymptomatic Subjects Attending Preventive Health Check up

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A total of 2318 people above the age of 20 years (male: 1446, females: 872), who attended preventive health check up at our hospital between June and August, 2004 were included in the study. 48.5% of the people had body mass index (BMI) > 25; 47.9% of the people had waist-hip ratio (WHR) > 0.9 (men), >0.85 (women). There was a significant increase in BMI, WHR after the age of 30 years (p<0.001). Multivariate analysis showed that increase in BMI correlated with triglyceride, diastolic blood pressure levels and had no correlation with low-density lipoprotein (LDL), high-density lipoprotein (HDL), systolic blood pressure, fasting and post-prandial sugar levels. WHR correlated with fasting sugar levels. There were 21% of people with known hypertension. The incidence of hypertension increased with age 3.4%, in 20 – 29 years: 10.3%, in 30 – 39 years: 22%, in 40 – 49 years: 38% in 50 – 59 years and 41% in above 60 years. 23% had newly detected hypertension, 26.5% had pre-hypertension. Known diabetes mellitus (DM) was present in 17%, newly detected DM in 13%, impaired fasting glucose >100 mg/dl in 34.3% of the people. Total cholesterol (TC) >200 mg/dl was present in 36%, HDL, <40 mg/dl (males), 50 mg/dl (females) in 37%, LDL >130 mg/dl in 25%, triglyceride (TG) >150 mg/dl in 41% of the people. Combined dyslipidemia of high LDL + low HDL was present in 6%, high TG + low HDL in 18%, high LDL + high TGL in 13%, triad of high LDL, high TG, low HDL levels was present in 10% of the people. The metabolic syndrome was present in 17.5% (ATP III criteria). On multivariate analysis, there was a significant increase in TC and TG levels with age, BMI, WHR but LDL, HDL levels did not vary with age, BMI, WHR; 17% of the people were smokers. To conclude, there is an increase in the prevalence of conventional risk factors, with the exception of smoking, and aggressive life style change is warranted. Lipid lowering therapy to reach the goal levels of LDL and TGL is advised.

Public Knowledge of Heart Attack in a Population Survey in Nepal

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Limited knowledge of heart attack symptoms may prevent patients from seeking time-dependent thrombolytic therapy - an intervention that offers impressive survival benefit. Previous studies carried out in developed countries demonstrated deficiency of knowledge about wide range of heart attack symptoms. The aim of this study was to profile the knowledge of heart attack, its symptoms and the anticipated first response to symptoms among the lay public in Nepal. A total of 1192 participants (657 men, 535 women), 16 to 88 years were interviewed in a cross sectional manner. Subjects below 16 years of age, all health professionals and individual with history of heart attack were excluded. A total of 862 (72.3%) respondents had heard of heart attack. Significantly, more male participants had heard of heart attack than female participants (p<0.001). 91.7% respondents with educational attainment of ≥10 years had heard of heart attack, while only 54% respondents with educational attainment of <10 year or who were illiterate (unable to read and write) had heard of heart attack. In both male and female population, higher percentage of the > year 10 education group had heard of heart attack than < years 10 education or illiterate group (92.6% v. 60% and 85.6% v. 49.6%). Significantly higher number of 31 to 50 years age group respondents had heard of heart attack than 16 to 30 years and ≥50 years age group (p=0.01). Among 862 respondents who had heard of heart attack, 21.3% could not name any heart attack symptom. A total of 16 different heart attack symptoms were named. Faint/collapse (48%), chest pain (22.4%), shortness of breath (9%), dizzienss (8.4%), palpitation (7.4%) and sweating (7.4%) were the leading symptoms named by respondents. Faint/collapse was named more frequently among > year 10 group respondents and 31 to 50 years age group males. Chest pain and shortness of breath were named more frequently among ≥ year 10 group respondents and >50 years age group males. Only 3.7% could name ≥2 typical heart attack symptoms. A significantly larger number of ≥ year 10 group named ≥2 typical symptoms than their counterparts (p<0.001). A large number (77.6%) of respondents preferred immediate hospital referral/doctor consultation after a heart attack. In Nepal, 31 to 50 years age group, better educated males are more aware of heart attack. Faint/collapse, chest pain and shortness of breath are leading heart attack symptoms named by the general population. Public heart attack awareness is not adequate and knowledge of wide range of heart attack symptoms is deficient in the Nepalese general population.
Endoventricular Patch Plasty – Does Ventricular Arrhythmias Bother You?

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Endoventricular patch plasty (EVPP) in an emerging surgical ventricular restoration procedure for patients in severe left ventricular (LV) dysfunction with dyskinetic segments. EVPP excludes ineffectively contracting segments with a Goretex patch and reduces wall stress on the already ischemic myocardium. Total number of 441 patients underwent EVPP in our center from 1996 till date. We selected a subpopulation of 62 consecutive patients who underwent EVPP from February 2004 to January 2005 with age ranging from 36 to 72 years (average 57 years). Male-female ratio was 7.9:1. When combined with an encircling endoventriculotomy, the procedure effectively isolates the electrical substrate of ventricular re-entry and may prevent ventricular tachycardia (VT). Diabetes mellitus, hypertension and dyslipidemia were present in 48%, 48%, 40% patients, respectively. The coronary angiographic profile was single vessel disease (SVD) in 11.3%, double vessel disease (DVD) in 21% and triple vessel disease (TVD) 67.7%. All patients underwent (24-hour) Holter monitoring on post-operative day 10. Holter study revealed no cases of non-sustained (NS)/sustained VT, normal study 48.4%, VPCs < 10/hour 35.5%, VPC ≥ 10/hour 4.8%, atrial fibrillation (AF) 3.2%. Two patients died in immediate post-operative period due to non-arrhythmic cause. One patient- a redo coronary artery bypass grafting (CABG) case with EVPP – died of cardiogenic shock; second patient, a case of emergency CABG, died of septicemia. On follow-up (clinical/telephonic interview) 59 patients had no mortality or hospitalization; one patient had recurrent VT for which he underwent automatic implantable cardioverter- defibrillator (AICD). To conclude, the fear of ventriculotomy causing future ventricular tachycardia should be allayed. In fact, EVPP prevents ventricular arrhythmias in majority of patients by excluding the arrhythmic substrate as shown in our experience.

Long-Term Survival in Endomyocardial Fibrosis after Left Ventricular Endocardiectomy and Mitral Valve Replacement Surgery

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Endomyocardial fibrosis (EMF) is a form of restrictive cardiomyopathy with dense fibrous thickening of the ventricular cavity and thromboses, typically found in regions near the equator including India and Sri Lanka. It is an otherwise aggressive disease with rapid deterioration and poor prognosis, the medical management of which is at best palliative and mostly refractory with a 35-50% 2-year mortality. Operative excision of the fibrotic endocardium and replacement of mitral and tricuspid valves lead to substantial improvement. However, operative mortality is high, between 15-25% and long-term survival is still limited by recurrent fibrosis and cumulative mortality, again limiting the overall success of the operative approach. We describe the strategy of left ventricular (LV) endocardiectomy and the long-term follow-up of two patients who were offered the same along with mitral valve replacement (MVR) surgery for predominant LV EMF. One was a 25-year-old male evaluated for dyspnea on exertion 19 years back and was found to have severe mitral regurgitation (MR) with LV EMF suggested by LV cavity obliteration which was later confirmed by histopathologic examination from multiple samples at the time of endocardiectomy. This procedure is characterized by the removal of the fibrous endocardium from the mostly unaffected and healthy myocardium, providing a well-preserved plane of cleavage between the myocardium and the thickened endocardium. MVR was done with a Bjork-Shiley valve. He had been on frequent follow-up and at one time he had atrial fibrillation (AF), which was treated with rate control and after 19 years follow-up he developed prosthetic valve dehiscence with severe para-valvular leak. Cardiac catheterization was done with pressure studies, which showed the typical ‘square root’ sign showing residual restriction; left ventriculogram showed a rocking mitral prosthesis with a Grade 4 para-valvular leak and coronary angiogram done was normal. He was re-operated with just a re-suturing of the valve. Echocardiographic evaluation showed a normal functioning prosthesis. With concomitant medical therapy, he is asymptomatic and back to his work. The second was a 59-year-old male who presented at the age of 31 years with palpitations and was found to have AF, predominant LV EMF with severe MR, good LV function and mild pulmonary arterial hypertension. He was offered the same and has been on beta-blockers, aspirin, warfarin and digoxin. At 28 years of follow-up, he is essentially asymptomatic and walks 5 km every day. The last evaluation showed a mitral prosthetic peak gradient of 12 mmHg and mean gradient of 5 mmHg with Grade 2 tricuspid regurgitation and a pulmonary arterial systolic pressure of 44 mmHg with good bi-ventricular function and a focal calcific plaquing of the LV endocardium. Thus long-term survival benefits and quality of life can be offered for an otherwise refractory, debilitating disease with adverse prognosis.
Off-Pump Coronary Artery Bypass Surgery in Patients of Left Main Coronary Artery Disease
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Left main coronary artery (LMCA) stenosis is considered to be a risk factor for coronary artery bypass grafting (CABG). The objective of this study was to assess the safety and efficacy of off-pump coronary artery bypass (OPCAB) surgery for patients with significant LMCA disease. This study was performed using analysis of prospectively collected data of all the patients who underwent OPCAB in our hospital from January 2003 to 15 June 2005. Patients with significant (50%) LMCA stenosis were selected for the study. During the study period, total of 2175 isolated CABG operations were performed in our unit. Out of them, 295 patients had significant LMCA stenosis. All these patients underwent OPCAB with cardiopulmonary bypass (CPB) standby. A total of 4 (1.36%) patients had pre-operative intra-aortic balloon pump (IABP) support. Average number of grafts per patient was 3.98. Only 15 patients received 22 vein grafts and remaining 280 (94.92%) patients received total arterial OPCAB. The early mortality rate was 0.34% (n=1), neurological complication rate was 1.02% (n=3) and atrial fibrillation rate was 6.78% (n=20). We conclude that our technique of OPCAB is safe in patients of LMCA stenosis. Total arterial OPCAB is safe in patients with LMCA stenosis.

Mitral Valve Repair Surgery
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The aim of our study was to evaluate various techniques of mitral valve repair, popularized by Lillehei and Carpentier. This retrospective study involved 18 patients undergoing mitral valve repair from January 2003 to June 2005. Six patients had isolated mitral valve repair done and almost half of this patient subgroup had mitral valve repair + coronary bypass surgery. Several techniques ranging from annuloplasty (4 Duran rings and 9 Edwards bands) to chordal transfer, quadrangular resection of posterior mitral leaflet (PML) of mitral valve were used in this subset of the population. Transesophageal echocardiography (TEE) was used in all patients intraoperatively. There was no in-hospital death. Fifty-five percent patients were free from atrial tacharyrhythmias during their stay in the hospital and 45% patients were in sinus rhythm post-operatively after one month. Cardiovascular accident (CVA) occurred in none (0%). Renal complications requiring hemodialysis was seen in one (5.5%) patient. Mitral valve repair can be safely performed in properly selected group of patients with rheumatic or degenerative heart disease. Serial follow-up with two-dimensional (2D) color Doppler echocardiography should be done on a regular basis post-operatively to assess valve function and measure left ventricular ejection fraction (LVEF).

Off-Pump Coronary Artery Bypass Surgery
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Even though off-pump coronary artery bypass (OPCAB) is being practiced widely for last seven years, there is still controversy about the safety and efficacy of OPCAB. Out of a cumulative experience with 3467 OPCAB surgeries performed by a single surgical team, we analyzed a single center data of 2175 consecutive patients operated over last two and half years. All patients who underwent coronary artery bypass grafting (CABG) at our institute, from January 2003 to 15 June 2005 were included in the study. The study was performed by retrospective analysis of collected data. Out of 2175 patients operated using OPCAB technique, one patient required institution of cardiopulmonary bypass (CPB). Total number of grafts per patient was 3.91. Only 83 patients received 118 vein grafts. The remaining 2092 (96.18%) patients received total arterial bypass grafting. Our post-operative 30-day hospital mortality rate was 0.64% (n=14), neurological complication rate 0.73% (n=16), peri-operative myocardial infarction (MI) 1.7% (n=37), re-operation for bleeding 0.55% (n=12), post-operative atrial fibrillation rate was 5.65% (n=123), deep wound infection rate 0.22% (n=5), superficial wound infection rate 0.55% (n=12). We conclude that OPCAB provides excellent early results with very low morbidity and mortality. Using total arterial OPCAB in 96.18% patients, we expect it will have superior long-term results.

LESS Procedure - Better than Traditional Bypass Surgery?
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MIDCAB is usually performed using left anterior thoracotomy wherein only the left anterior descending (LAD)
Randomized Trial of Atorvastatin for Reduction of Myocardial Damage following Valvular and Congenital Shunt Lesion Surgery

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Myocardial necrosis, assessed by enzymes [CPK-MB, troponin T (Trop-T)] elevation, is relatively frequent after cardiac surgery, and is a marker of cardiac events. We conducted a prospective study to analyze if pre-treatment with statin therapy could have a bearing on enzyme release and post-operative course. A total of 62 patients (mechanical valve replacement surgery: 46, and surgery for intra-cardiac shunt lesions: 16) were included in this study. Thirty-one patients were pre-treated with 20 mg atorvastatin started at least ≥ 1 week prior to surgery while remaining 31 were without statin. Both groups were matched for age and sex (mean age: 30.32±12.19 years vs. 29.55±12.56 years; male-female ratio was 16:15 vs. 14:17). There was no significant difference in type of surgery performed in these groups (mitral valve replacement (MVR), aortic valve replacement (AVR) or double valve replacement (DVR), atrial septal defect (ASD) or ventricular septal defect (VSD) closure). There was no significant difference in NYHA functional class and left ventricular ejection fraction (LVEF) (59.23±2.67% vs. 57.41±8.2%). Basal enzymatic levels were similar in both groups. Enzymatic release after surgery was more in no-statin group versus statin group.

Prognostic Influence of Troponin-T in Valve Surgery

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To assess the prognostic influence of troponin T (Trop-T) in valve surgery, 25 consecutive patients who underwent surgeries for their valvular lesions formed the study cohort. All patients had quantitative Trop-T and CPK-MB measured at 12 hours and 24 hours post-surgery. They were also assessed by echocardiogram post-operatively and compared with pre-operative parameters. The mean age of the group studied was 43.75 years; 14 were male and 11 female. Eight patients underwent mitral valve replacement (MVR) alone, 6 had aortic valve replacement (AVR) alone, 2 had MVR with tricuspid valve (TV) repair, 1 had AVR with MV repair and 1 AVR with TV repair. The mean value of Trop-T at 12 hours post-operatively was 0.48 and at 24 hours was 0.40. Mean CPK-MB was 25.6 and 23.5, respectively. The mean cardiopulmonary bypass (CPB) time was 91 min and aortic cross clamp (ACC) time was 63 min. There was no death. Eight patients had worsening left ventricular (LV) function post-operatively, though not clinically apparent. The mean Trop-T and CPK-MB values at 12 hours and 24 hours were 0.6 ng/ml, 0.8 ng/ml 0.48 and 29.2, 26.0, respectively. The Trop-T and CPK-MB values in this group were significantly high (p<0.05). To conclude, valve surgeries are associated with increase in Trop-T and significant elevations are seen in patients with worsening LV function though not clinically apparent.
Smoking Cessation Reduces Restenosis after Coronary Artery Bypass Surgery: A 10-Year Follow-up Study

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The study aimed to determine the influence of smoking cessation on restenosis after coronary artery bypass graft surgery (CABG). The study cohort consisted of 1141 patients who underwent CABG between January 1989 and December 1993. The smoking habits of these patients were retrieved. They were classified as non-smokers, ex-smokers, or smokers. 327 patients had symptomatic restenosis requiring repeat PTCA/ CABG within 10 years. The results were analyzed in a multivariate Cox analysis. Smoking status pre-CABG revealed that 56% (639/1141) were smokers, 26.7% (305/1141) were ex-smokers, and 17.2% (197/1141) were non-smokers. Smoking status post-CABG revealed 45% (514/1141) quit smoking and 55% (627/1141) continued to smoke. 29% (327/1141) had symptomatic restenosis requiring repeat PTCA/CABG within 10 years. In the restenosis group, 48% (156/327) were smokers, 31% (101/327) were ex-smokers, and 21% (70/327) were non-smokers. Repeat intervention (PTCA/CABG) was required in 19.2% (62/327) for those who quite smoking compared to 79.8% (265/327) who continued to smoke. The smokers who continued smoking had a greater relative risk (RR) of restenosis (RR 1.68, 95% confidence interval: 1.33 - 2.13) as compared with patients who stopped smoking. The quitters were less likely to undergo repeat CABG or a percutaneous coronary angioplasty procedure (RR 1.41 CI: 1.02 - 1.94). To conclude, smoking cessation after surgery was an important independent predictor of re-stenosis, and patients who continued to smoke after CABG had a greater risk of restenosis requiring repeat CABG or percutaneous angioplasty procedure than patients who stopped smoking.

Effect of Atorvastatin on Markers of Inflammation in Patients with Acute Coronary Syndrome

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High-sensitive C-reactive protein (hsCRP), a marker of vascular inflammation is a good predictor of atherosclerotic cardiovascular disease. We prospectively studied the role of atorvastatin (20 mg/day) in reducing hsCRP levels in 54 patients admitted with acute coronary syndrome. Mean age of the patients was 55.33 ± 9.7 years with 16 (29.6%) females and 38 (70.3%) males. Twenty-four (44.4%) patients had ST elevation myocardial infarction (STEMI), 3 (5.6%) had non-STEMI (NSTEMI) and 27 (50%) patients had unstable angina. The incidence of various coronary risk factors included smoking in 18 (33.3%) patients, hypertension in 23 (42.6%), diabetes mellitus in 19 (35.2%) and family history of coronary artery disease (CAD) in 20 (37.0%) patients. Patients were divided into two groups. Group A (n=35) comprised of those with low-density lipoprotein (LDL) cholesterol at admission > 100 mg/dl. They were given atorvastatin 20 mg/day for 30 days. No significant side effects were reported. Group B (n=19) patients had LDL < 100 mg/dl at admission and they did not receive atorvastatin. Fasting lipid profile and hsCRP was measured at admission and at the end of 30 days. Both groups were comparable regarding age, sex and risk factor profile (p=NS). Both group of patients received all other cardiac medications including aspirin. Mean baseline hsCRP of Group A was 2.28 ± 2.11 mg/dl and that of Group B was 1.74 ± 1.44 mg/dl (p=0.32). At the end of 30 days, the hsCRP levels reduced by 70.6% in Group A while it decreased by 49.4% in Group B. This difference did not reach statistical significance (p=0.067). However, in smokers the hsCRP at 30 days was significantly lower in Group A (n=10, hsCRP=0.81±2.15 mg/dl) compared to Group B (n=8, hsCRP=1.34±0.9) (p=0.0159). The mean LDL at admission was 134.43±31.44 mg/dl in Group A and 81.68±14.85 mg/dl in Group B (p<0.0001). In those who received atorvastatin, in the LDL reduced by 40% while in Group B the mean LDL increased by 30% (p=0.025). HDL and triglyceride levels showed similar trends. Treatment with atorvastatin (20 mg/day) showed a positive trend toward reduction in hsCRP level in patients with acute coronary syndrome (ACS). Atorvastatin produced significant reduction in hsCRP levels in smokers admitted with ACS and may have an important role in plaque stabilization in this group of patients. To the best of our knowledge this is the first study on South Asian Indian patients with ACS, clearly showing the effect of atorvastatin in reducing hsCRP levels specially in smokers.

Revascularization Pattern in Female Coronary Artery Disease

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Revascularization in coronary artery disease (CAD) among females has not been as aggressive as in males. We, therefore, decided to analyze revascularization pattern in our population. The objective of this study was to analyze the revascularization pattern in female cases of CAD. Out of 400 patients who underwent coronary angiogram between May 2003 and December 2004, 325 who had angiographically proven CAD formed the study cohort. Of these, 229 patients were advised revascularization. Percutaneous coronary intervention (PCI) was advised in 100 patients (Group I), and coronary artery bypass grafting (CABG) in 129 patients (Group II). Among
the 100 patients, PCI was performed in 68 (68%), 38 had PCI to left anterior descending (LAD), 15 to right coronary artery (RCA), 5 to circumflex, 2 to Ramus, and 8 had 2-vessel PCI. Of the remaining 32, 20 (62%) were lost for follow-up, 12 (38%) did not undergo PCI for financial constraints. Among the 129 patients who were advised CABG, 49 (38%) underwent the procedure. Out of the remaining 80, 52 (65%) were lost to follow-up and 28 (35%) did not have CABG due to financial reasons. Both forms of revascularization [percutaneous transluminal coronary angioplasty (PTCA) and CABG] were done more in older age group. Fifty-one percent of females with CAD underwent revascularization. Of the 129 patients who were advised CABG, 49 (38%) did not undergo PCI for financial constraints. Both the cases are doing well at follow-up with functioning prosthetic valves. In patients with multivalvular disease usually the aortic and mitral valves are replaced and tricuspid valve repair is preferred. In both our patients, the tricuspid valve was severely diseased and not suitable for repair and hence, all the three valves were replaced. In tricuspid position, the choice of valve is controversial and tissue valves are usually preferred due to thromboembolic complications. However, with mechanical valves in these two places, it is prudent to use similar valve in tricuspid position in children undergoing Glenn shunt surgery who were more than 5 years of age, as compared to those in the ‘traditional’ age group for Glenn shunt. A total of 23 patients underwent Glenn shunt at our centre from 1998-2005. Majority of the patients i.e. 19 (82%) were above 5 years of age; 20 (87%) were male. The indications for Glenn shunt were tricuspid atresia with pulmonary stenosis - 10 (43.4%), single ventricle with pulmonary stenosis - 5 (21.7%), double outlet right ventricle (DORV) with pulmonary stenosis (PS):3 (13%), corrected transposition of great vessels (CTGV) with PS:3 (13%) and tetralogy of Fallot with PS with hypoplastic right ventricle (RV): 2 (8.6%). In the immediate post-operative period, the oxygen saturation improved from 72.90% (pre-operative) to 86.69% (post-operative). Majority of patients (20 (86.9%)) required inotropic support for 24 hours. Average period of ventilation was 15.75 hours irrespective of age. Four (17%) patients developed pleural effusion which did not require any intervention. One patient developed transient complete heart block (CHB) requiring temporary pacing for 12 hours. One patient required re-exploration for increased bleeding. Average duration of hospital stay was 9.78 days in the post-operative period. There was no peri-operative mortality. It is concluded that bi-directional Glenn is possible with minimal morbidity and no mortality in children who are above the ‘traditional’ age group prescribed for Glenn shunt. Therefore, older age need not be a contraindication for bi-directional Glenn Shunt surgery.

**Pediatric Cardiac Surgery for All - A Long Way to Go**


GB Pant Hospital, New Delhi

Awareness of pediatric cardiac diseases is ever increasing and with the better availability of echocardiography, more number of patients are recognised to have serious cardiac diseases. Yet, the number of patients ultimately able to undergo successful surgical correction appears small in India and there is a paucity of data in such cases. We followed 250 consecutive patients (age range: 2 days-12 years; 168 male) who had congenital heart disease, and who required surgical intervention for a follow-up period of 2-6 months. The diagnosis of patients requiring surgical intervention at initial evaluation included ventricular septal defect (VSD) (n=58), other left-to-right shunts (n=52), tetralogy of fallot (TOF) (n=67), total anomalous pulmonary venous connection (TAPVC) (n=10), and transposition of great arteries (TGA) (n=7). Of the 250 patients, 17 patients opted for surgery in some other center and 30 patients were lost to follow-up. Of the remaining 203 patients, only 42 (20.7%) were willing to undergo or had undergone surgery. Of the patients diagnosed to have serious pediatric cardiac diseases, only one in five patients landed up for surgery even in a tertiary care center. Such data from the population could be still more alarming.

**Bi-directional Glenn In Children more than 5 Years of Age - A Retrospective Study**

SV Pagad, AG Narayanaswamy, G Sudarsana

Southern Railway Headquarters Hospital, Chennai

The aim of this study was to evaluate the causes of morbidity and mortality in the immediate post-operative period of patients undergoing Glenn Shunt surgery who were more than 5 years of age, as compared to those in the ‘traditional’ age group for Glenn Shunt. A total of 23 patients underwent Glenn shunt at our centre from 1998-2005. Majority of the patients i.e. 19 (82%) were above 5 years of age; 20 (87%) were male. The indications for Glenn shunt were tricuspid atresia with pulmonary stenosis - 10 (43.4%), single ventricle with pulmonary stenosis - 5 (21.7%), double outlet right ventricle (DORV) with pulmonary stenosis (PS):3 (13%), corrected transposition of great vessels (CTGV) with PS:3 (13%) and tetralogy of Fallot with PS with hypoplastic right ventricle (RV): 2 (8.6%). In the immediate post-operative period, the oxygen saturation improved from 72.90% (pre-operative) to 86.69% (post-operative). Majority of patients (20 (86.9%)) required inotropic support for 24 hours. Average period of ventilation was 15.75 hours irrespective of age. Four (17%) patients developed pleural effusion which did not require any intervention. One patient developed transient complete heart block (CHB) requiring temporary pacing for 12 hours. One patient required re-exploration for increased bleeding. Average duration of hospital stay was 9.78 days in the post-operative period. There was no peri-operative mortality. It is concluded that bi-directional Glenn is possible with minimal morbidity and no mortality in children who are above the ‘traditional’ age group prescribed for Glenn shunt. Therefore, older age need not be a contraindication for bi-directional Glenn Shunt surgery.

**Triple Valve Replacement with Mechanical Prosthesis - A Report of Two Cases**

K Jai Shankar, N M Adhu Sankar, BR Jeganathan, KM Cherian

International Centre for Cardiovascular and Thoracic Diseases, Chennai

We report two cases of triple valve replacement (TVR) with mechanical prosthesis. The first patient underwent TVR in 1998 with bioprosthetic valve and was subjected to redo TVR with mechanical prosthesis in January 2005 due to degenerated valves in mitral, aortic, tricuspid position. The second patient underwent TVR with mechanical prosthesis and coronary artery bypass grafting (CABG) x 1 graft in 2002. Both the cases are doing well at follow-up with echocardiography. Both the patients revealed normally functioning prosthetic valves. In patients with multivalvular heart disease usually the aortic and mitral valves are replaced and tricuspid valve repair is preferred. In both our patients, the tricuspid valve was severely diseased and not suitable for repair and hence, all the three valves were replaced. In tricuspid position, the choice of valve is controversial and tissue valves are usually preferred due to thromboembolic complications. However, with mechanical valves in these two places, it is prudent to use similar valve in tricuspid position.
also. Simultaneous valve replacement with myocardial revascularization involves relatively higher risk than either procedure alone. The risk is even higher in TVR with CABG.

Left Ventricular Pseudoaneurysm: An Uncommon and Potential Cause for Electro-Mechanical Dissociation - Management Strategies

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International Center for Cardiothoracic and Vascular Diseases, Chennai

Left ventricular (LV) pseudoaneurysms are quite uncommon, in comparison with true aneurysms and pose a unique surgical challenge. Due to its high propensity (30-45%) for rupture and impending electro-mechanical dissociation due to cardiac tamponade, it requires an urgent surgical intervention. Pseudoaneurysms contain ruptures and therefore its wall is made of pericardium, clots and scar tissue with lack of myocardial elements, located most commonly in the infero-posterior wall and they have a narrow neck in contrast to true aneurysms which have all three layers of the wall including myocardium and epicardium and is located commonly in the antero-septal regions. Prompt identification and surgical repair is important and is life-saving. Our patient was a 55-year-old male diabetic who suffered an infero-posterior wall myocardial infarction associated with complete heart block for which a permanent pacemaker implantation was done three years back. He presented now with New York Heart Association (NYHA) class II angina and evaluation revealed moderate LV dysfunction (ejection fraction 38%), moderate mitral regurgitation (MR), mild pulmonary arterial hypertension (40 mmHg) with a large pseudoaneurysm with a small neck in the posterior wall. A coronary angiogram was done which showed severe triple vessel disease and left ventriculogram identified a large thin-walled pseudoaneurysm measuring 48 × 27 mm with a narrow neck on the posterior wall. He was taken up for coronary artery bypass graft surgery (CABG) with resection of the pseudoaneurysm. It was done on-pump. Grafts were given to the left anterior descending(LAD), ramus-intermedius, first diagonal and distal right coronary artery (RCA). The wall of pseudoaneurysm was incised and the defect in the ventricular wall was closed with a Gore-Tex patch and the surrounding myocardial wall was used to cover the patch. The post-operative period was uneventful and with rehabilitation and concomitant medications he was discharged on the 10, post-operative day, without anginal symptoms. This report describes how a rare patient with contained rupture of left ventricle, underwent successful surgical repair and revascularization and emphasizes the necessity for prompt surgical intervention to prevent impending tamponade and mortality.

Redo Off-Pump Coronary Artery Bypass

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Asian Heart Institute, Mumbai

The objective of this study was to scrutinize the technical feasibility and advantages of total arterial revascularization (TAR) in patients presenting for redo off-pump coronary artery bypass grafting (OPCAB). From October 1999 to June 2005, a total of 123 consecutive patients underwent redo OPCAB. Amongst these patients, 90 (73.2%) had TAR. In only 33 patients, venous grafts were needed to supplement arterial grafting. The average number of grafts per patient were 3.6 and the number of arterial grafts were 3.37 per patient. In the year 2005, all redo OPCAB cases have had a TAR procedure. There was zero conversion rate to ONCAB. The 30-day mortality was 2.4%. The length of stay in intensive care unit (ICU) was 3 days and length of stay in hospital was 8 days which is comparable with conventional first time coronary artery bypass grafting (CABG). The wound infection rate was comparable to that of first time OPCAB, i.e. 3.7%. None of the patients had a cerebrovascular accident (0%), and 9 (7.5%) patients had atrial fibrillation (AF) post-operatively. Renal failure was detected in the ICU in one (0.8%) patient. In our series, myocardial revascularization was complete and if during revascularization, the patient became unstable hemodynamically, then intra-aortic balloon pump (IABP) was inserted in two (1.6%) patients. Redo TAR OPCAB is feasible in almost all cases presenting for redo coronary bypass surgery as the surgical experience of the team grows. High risk cases benefit the most by this technique.

Post-Partum Acute Aortic Dissection

Pradyot Kumar Rath, Kamales Kumar Saha, Mahesh Singh, Sunil Vanzara, S Bhagia, Umakanth Patil, Ramakanta Panda
Asian Heart Institute, Mumbai

Acute aortic dissection is a life-threatening event. An association between pregnancy and aortic dissection has been reported. The “physiologic changes of pregnancy” accelerated the development of pathologic changes in the arterial wall. Patients with Marfan’s syndrome are more likely to be affected. We present a case of non-Marfan female with pregnancy-induced hypertension who had acute aortic dissection within two days of cesarian section for delivery of an intra uterine growth retarded (IUGR) baby. It was a Type A (DeBakey Type I) dissection with the intimal tear starting in the ascending aorta and the dissection extending up to the infrarenal aorta. She was taken up for emergent surgery and a valve-sparing ascending aortic replacement with reimplantation of the aortic valve was done. She had an uneventful recovery and was
Can Pre-Treatment with Statin Reduce Myocardial Damage following Open Heart Surgery

Mukesh K Sharma, SK Agarwal, Aditya Kapoor, S Pandey, Satyendra Tewari, Sudeep Kumar, N Garg, PK Goel, Nakul Sinha
Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow

Myocardial necrosis, assessed by enzymes (CPK-MB, troponin-T) elevation, is relatively frequent after cardiac surgery and is a marker of cardiac events. We conducted a prospective study to analyze if pre-treatment with statin therapy could have a bearing on enzyme release following open heart surgery (OHS) and on events in post-operative course. A total of 109 patients were included in the study (coronary artery bypass graft (CABG), n=47; mechanical valve replacement surgery, n=46; and surgery for intra-cardiac shunt lesions, n=16). The coronary artery disease (CAD) patients were randomized into low statin (atorvastatin 10 mg) or high statin (atorvastatin 40 mg) group at least 1 week prior to surgery, while the rest of the patients were randomized to 20 mg statin versus no statin. Enzyme evaluation was done prior to surgery, 8 hours and 24 hours following surgery. Of the total 109 patients, 52 received statin while 57 received no statin. Mean age (40.89±17.63 years v. 42.6±18.8 years), gender distribution (male - female ratio 32:15 v. 32:22), type of surgery performed and basal enzymes level were similar in both groups. Enzymatic release after open heart surgery (OHS) was more in no-statin group versus statin group.

<table>
<thead>
<tr>
<th>Statin group</th>
<th>Basal 8 hrs</th>
<th>Basal 24 hrs</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basal 8 hrs</td>
<td>13.3±1.33</td>
<td>51.6±2.23</td>
<td>&lt;0.01</td>
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<tr>
<td>Basal 24 hrs</td>
<td>14.8±1.33</td>
<td>52.3±2.33</td>
<td>&lt;0.01</td>
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</table>

Interestingly, statin pre-treatment prevented an enzyme elevation at 24 hours following OHS in a significant proportion of patients (17/52-33%) while the corresponding figure in control patients was low (3/57 - 5%) (p<0.01). The mean ICU stay (42.19±19.38 hours v. 57.42±38.05 hours), mean total drainage (513±356.68 ml v. 566.9±388.03 ml) and mean total hospital stay (10.44 days v. 14.25 days) were much shorter in those pre-treated with statin. We conclude that pre-treatment with statin (≥1 week prior to surgery) is effective in reducing myocardial damage with reduction in enzymatic release and better in-hospital outcome after OHS.

Randomized Trial of High versus Low-Dose Atorvastatin for Reduction of Myocardial Damage Following Coronary Artery Bypass Graft Surgery

Mukesh K Sharma, Aditya Kapoor, SK Agarwal, Satyendra Tewari, S Pandey, SK Singh, Sudeep Kumar, N Garg, PK Goel, Nakul Sinha
Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow

Myocardial necrosis, assessed by creatine kinase-MB (CK-MB) or troponin elevation is relatively frequent after coronary artery bypass grafting (CABG) and is considered a marker of adverse events. Statins are known to have cardio-protective effects. We sought to evaluate the efficacy of statin in preventing the enzymatic release following surgery. Since it was considered unethical to withhold statin therapy in any patient of CAD, the patients were randomized into two groups - those receiving 40 mg versus 10 mg atorvastatin started atleast ≥1 week prior to CABG. A total of 47 patients were included in study - 23 were cases (pre-treated with 40 mg atorvastatin) and 24 were control (pre-treated with 10 mg atorvastatin). Both groups were matched for age (mean age 57.1±10.63 years v. 57.2±10.8 years); male-female ratio 17:6 v. 18:6). There was no significant difference in prior history of myocardial infarction (MI) or acute coronary syndrome (ACS) (10 v. 12 patients), left ventricular ejection fraction (LVEF) (48.89±12.67 % v. 51.39±12.93), diabetes mellitus (DM) (43% v. 41%), hypertension (HT) (41% v. 43%) and smoking (17% v. 20%), total cholesterol, high-density lipoprotein (HDLC), low-density lipoprotein (LDL) and triglycerides levels in both groups. Type of surgery (off-pump v. on pump) and number of grafts were not statistically different in both groups. Basal enzymes level was similar in both groups. Enzymatic release after CABG was more in low statin group versus high statin group.

<table>
<thead>
<tr>
<th>Statin group</th>
<th>Basal 8 hrs</th>
<th>Basal 24 hrs</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basal 8 hrs</td>
<td>32±22</td>
<td>51±23</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Basal 24 hrs</td>
<td>54±32</td>
<td>65±36</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

Statin pre-treatment prevented an enzyme elevation at 24 hours following CABG in a significant proportion of patients (14/23, 60%) while the corresponding figure in control patients was lower (3/24, 12.5%) (p<0.01). The mean ICU stay (46.24±18.38 hours v. 54.24±24.99 hours), total drainage (615±223.7 v. 711.4±469.9 ml) and mean total hospital stay (11.14 v. 13.95 days) were much shorter in those pre-treated with statin. We conclude that pre-treatment with statin (≥1 week before CABG) is effective in reducing myocardial damage with reduction in enzymatic release and better in-hospital outcome in patients undergoing CABG.
Ezetimibe as an Adjunct to Atorvastatin in Patients of Dyslipidemia

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Pt BD Sharma Post Graduate Institute of Medical Sciences, Rohtak

The incidence of more than half of coronary artery disease (CAD) is attributable to lipid abnormalities. Despite established efficacy, statins do not achieve recommended low-density lipoprotein cholesterol (LDL-c) goals. Hence the need for additional therapy. Our aim was, therefore, to evaluate the safety and efficacy of ezetimibe (EZE) as an adjunct to atorvastatin (ATV) in patients of dyslipidemia. We studied 80 patients with baseline LDL-c ≥130 mg/dl and triglyceride (TG) ≥150 mg/dl with no secondary cause of hypercholesterolemia. These patients were randomly assigned to receive one of the following regimens for 12 weeks: Group I received ATV 10 mg/day; Group II ATV 20 mg/day; Group III ATV 10 mg/day plus EZE 10 mg/day; Group IV placebo. After 12 weeks, EZE plus ATV resulted in greater reduction in TG (56.4% v. 44% v. 30.4% v. 0.04%), total cholesterol (46.7% v. 31.8% v. 37.7% v. 0.02%) and LDL-c (53.9% v. 34.6% v. 48.0% v. 0.02%) compared to ATV 10 mg, ATV 20 mg and placebo, respectively (p<0.05). Thus, EZE plus ATV significantly reduced TG, LDL-c and total cholesterol as compared to ATV 10 or 20 mg given alone. No significant elevation in hepatic transaminases or creatinine-kinase were observed. No case of myopathy or rhabdomyolysis were observed in any group during these 12 weeks of study. Co-administration of EZE with ATV offers a well-tolerated and highly efficacious new treatment option for patients of dyslipidemia and thus may help in prescribing low dose ATV which may reduce side effects. However, this is a preliminary report of the large ongoing trial.

Comparative Study of Three Lipid Lowering Strategies in Indian Hyperlipidemic Subjects

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To determine ideal lipid-lowering combination for Indian dyslipidemic (high low-density lipoprotein cholesterol (LDL-c), triglycerides (TG) and lipoprotein(a) and low high-density lipoprotein cholesterol (HDL-c)) patients, we evaluated various drug combinations, lovastatin-niacin (LN), atorvastatin-niacin (AN) and atorvastatin-ezetimibe (AE). In a controlled single-blind parallel group multicentric study we recruited successive consenting high-risk patients (≥2 major coronary risk factors) with significant hyperlipidemia (LDL-c≥130 mg/dl) meeting prespecified inclusion and exclusion criteria. Group 1 was given a combination pill of lovastatin 20 mg and extended release niacin 375 mg (n=131, follow-up 12 weeks). Group 2 was given atorvastatin 10 mg and niacin 375 mg (n=115, 8 weeks) and Group 3 given atorvastatin 10 mg and ezetimibe 10 mg (n=17, 12 weeks). Various lipid parameters were measured at baseline and at 4, 8 and 12 weeks of therapy. Incidence of significant clinical and biochemical side-effects was noted. Compared to baseline, at 12 weeks, total cholesterol decreased in Group 1 from 233.9±27 to 174.9±27 mg/dl (−59 mg/dl), in Group 2 from 244.2±32 mg/dl to 173.2±38 mg/dl (−71.0 mg/dl) and in Group 3 from 235.7±33 mg/dl to 167.9±20 mg/dl (−67.8 mg/dl) (t test p<0.001); LDL-c decreased in Group 1 from 153.4±22 mg/dl to 95.1±23 mg/dl (−58.3 mg/dl), in Group 2 from 164.4±27 mg/dl to 106.7±31 mg/dl (−27.7 mg/dl) and in Group 3 from 158.1±25 mg/dl to 90.8±16 mg/dl (−67.3 mg/dl) (p<0.001). Triglycerides decreased in Group 1 from 171.1±72 mg/dl to 135.2±41 mg/dl (−35.9 mg/dl), in Group 2 from 156.3±57 mg/dl to 127.8±44 mg/dl (−28.5 mg/dl) and in Group 3 from 186.5±72 mg/dl to 133.3±37 mg/dl (−53.2 mg/dl) (p<0.01); and LP (a) decreased in Group 1 from 48.5±26 mg/dl to 26.9±19 mg/dl (−21.6 mg/dl), in Group 2 from 31.5±16 mg/dl to 23.5±19 mg/dl (−8.0 mg/dl) and in Group 3 from 36.8±17 mg/dl to 36.5±17 mg/dl (−0.3 mg/dl). HDL-c increased in Group 1 from 45.6±7 mg/dl to 53.3±9 mg/dl (+8.3 mg/dl) in Group 2 from 45.7±8 mg/dl to 50.8±11 mg/dl (+5.1 mg/dl) and in Group 3 from 45.1±7 mg/dl to 49.5±11 mg/dl (+4.4 mg/dl). ApoA1/ApoB ratio increased in Group 1 from 0.96±0.7 mg/dl to 1.46±0.5 mg/dl (+5.1 mg/dl), in Group 2 from 1.72±0.7 mg/dl to 2.93±1.9 mg/dl (+1.21 mg/dl) and in Group 3 from 2.14±1.1 mg/dl to 2.72±1.6 mg/dl (+0.58 mg/dl). Adverse reactions leading to withdrawal of therapy were noted in 4 (3.1%) cases in Group 1, 2 (1.7%) in Group 2 and 2 (1.7%) in Group 3. Minor side effects, nausea, dyspepsia, tolerable flushing and myalgia were observed in 26 (19.8%), 18 (15.6%) and 5 (4.3%) cases, respectively. All the three combinations significantly reduce LDL-c, TG and Lp(a) but the greatest LDL reductions were observed with AE combination. Niacin-containing combinations (LN, AN) significantly increase HDL and ApoA1/ApoB ratio. A polypharmaceutical approach with atorvastatin, ezetimibe and niacin appears to be the most effective for Indian dyslipidemic patients.

Aspirin Resistance - Indian Perspective

Viji Samuel, Bobby John, Jacob Jose
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Aspirin resistance, as quoted in the literature, varies widely, from 5% to 40%. Indian data regarding this is scarce and limited. In our study we attempted to profile the pattern of aspirin response in a cohort of patients with chronic stable coronary artery disease (CAD), compared to healthy controls. The response variability in vascular risk subsets of CAD like...
Atorvastatin-Induced Polyneuropathy

SD Singh, Suraj Singh, S Mondal, D Mukherjee
Regional Institute of Medical Sciences, Imphal and Institute of Post Graduate Medical Education and Research & SSKM Hospital, Kolkata

Statins are commonly used and very well tolerated drugs. They also have proven benefit in both primary and secondary prevention of coronary heart disease (CAD). A case report of a 53-year-old patient of CAD is presented here. He had undergone coronary artery bypass grafting (CABG) for triple vessel CAD, with associated atherosclerotic renal arterial disease. The creatinine clearance level was 20 ml/min. He had no symptoms of hyperlipidemia. The patient presented with progressive numbness and tingling sensation of 3 months duration in both hands. His medications included standard treatment of ischemic heart disease and atorvastatin 20 mg daily. The patient did not complain of muscle tenderness, weakness or paralysis and had no difficulty in using his hands. Electromyography (EMG) and nerve conduction velocity (NCV) studies of upper limbs revealed a neuropathic process affecting small caliber sensory nerve fibers. Three months after, the therapy with atorvastatin was stopped, the numbness and tingling resolved. The corresponding EMG and NCV studies also reverted to normal. There is 4 to 14 fold increased risk for idiopathic polyneuropathy with atorvastatin for which the mechanisms remains unclear.

Clinical Pattern of Real World Use of Eptifibatide in 207 Consecutive Cases of Glycoprotein IIb/IIIa Antagonist Therapy

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Antithrombotic agents like glycoprotein (Gp) IIb/IIIa antagonists are effective in acute ischemic syndromes as they have shown to block >80% platelet aggregation. Eptifibatide has shown significantly better results in acute coronary syndrome (ACS), acute myocardial infarction (AMI) and during percutaneous coronary intervention (PCI). However, there are many “Real World” situations where urgent anti-thrombotic action is required, but such cases are not included in trials. We analyzed the clinical pattern of the use of eptifibatide in 207 consecutive cases out of 223 intended to be given between January 2003 to July 2005. In 16 cases, eptifibatide could not be given because of contraindications like serum creatinine > 4 mg (7 cases) and thrombocytopenia (platelet < 100000) in 9 malignancy cases. No other Gp IIb/IIIa antagonist was used during the study period. Out of 207 cases, there were 172 (83.1%) males and 35 (16.9%) females in the age group 21-80 years (median age 57 years). Their risk factor profile were diabetes mellitus (DM): 83 (40%), hypertension: 100 (48.2%), hyperlipidemia: 83 (40%), smoking: 162 (80%), and diabetes: 83 (40%).

Dyslipidemia in Diabetics and Non-Diabetics: A Comparative Study

Jayaraj C Sindhu, HG Ashoka, RK Bhat, Vittal Rao, Girish Sonwalkar, Kiran Aithal, Indumati, SK Shama
SDM College of Medical Sciences and Hospital, Dharwad

Coronary heart disease is a leading cause of death worldwide. Atherosclerosis is responsible for almost all cases of coronary heart disease especially in patients with diabetes and hypertension. This is a cross sectional comparative study of diabetics and non-diabetics comprising 150 patients in each group. None of these patients were on any hypolipidemic agents. Various parameters like age, sex, body mass index (BMI), dietary habits, alcohol and tobacco use, blood sugar levels, fasting lipid profile were studied and analyzed. Mean age in cases was 52.94 years, and in controls 55.22 years; mean fasting blood sugar in cases was 167 mg% and in controls it was 96 mg%. Mean post-prandial blood sugar in cases was 270 mg% and in controls, it was 125 mg%. BMI was significantly higher in diabetics. Low-density lipoprotein (LDL) and triglycerides (TGs) were significantly higher in diabetics as compared to non-diabetics. High-density lipoprotein (HDL) levels were significantly lower in diabetics.
hypertension (HT): 75 (34.8%), high cholesterol (HC): 47 (22.7%), smoking: 37 (17.9%) and family history (FH) in 23 (11.1%). The drug was administered in: elective high risk percutaneous transluminal coronary angioplasty (PTCA) 84 (40.5%), rescue PTCA: 22 (10.6%), unstable angina (UA)/non-Q MI: 43 (20.7%), post MI-UA: 29 (14%), acute MI: 12 (5.8%), bailout during diagnostic angiography: 7 (3.3%) cases (LM bifurcation: 3, LM ostial: 2, post-coronary artery bypass grafting (CABG): 2), bailout during routine PTCA 5 (2.4%) cases (abrupt closure: 3, slow flow: 2), subacute thrombosis (SAT) leading to acute MI in 5 cases (2.4%). All patients were administered 2 boluses (180 \( \mu g/kg \) at 10 min interval, alongwith 2 \( \mu g/kg/min \) infusion for maximum 96 hours. Twelve cases received repeat drug during the same admission, 6 patients later during the study period, and 2 cases received 3 times during the entire study period. The drug was discontinued in 5 cases, 3 groin hematomas and 2 gastrointestinal (GI) bleed requiring blood transfusions. Total of 176 patients underwent successful PTCA in which 316 stents were implanted. CABG was done in 16 patients, 5 within 72 hours and 11 after 72 hours, without any mortality. Remaining 15 patients underwent conservative medical management. A total of 3 patients died, 1 cardiogenic shock with ancer stomach, 1 cardiogenic shock with anteroseptal myocardial infarction (ASMI) following SAT, 1 post-CABG “No Option” CAD with severe LV dysfunction. Minor self limiting side effects like gum bleeding occurred in 46 (22.2%) cases, stool occult blood positive in 36 (17.4%) cases and hematuria in 16 (7.7%) cases. In conclusion, Gp IIb/IIIa antagonist eptifibatide can be used in a broad spectrum of cases where urgent anti-thrombotic action is required with excellent in-hospital results.

Effect of High Dose Statin on Silent Ischemia in Non-Q Myocardial Infarction

Debabrata Roy, Sachin Deba Singh, Indranil Dutta
Rabindra Nath Tagore International Institute of Cardiac Sciences, Kolkata, Regional Institute of Medical Sciences, Imphal, and Institute of Post Graduate Medical Education and Research, Kolkata

Silent ischemia in patients with acute coronary syndrome confers on unfavorable outcome. The aim of the present study was to assess whether endothelial protective effect of atorvastatin in high dose can decrease the incidence of silent ischemia in patients with unstable angina. A total of 140 patients (male-female ratio 118 : 22) with non-Q myocardial infarction (MI) who were not on any hypolipidemic drugs previously were enrolled for the study. The baseline low-density lipoprotein (LDL) was 114±8 mg/dl. They were randomly assigned to receive either atorvastatin - 40 mg once daily or atorvastatin -10 mg once daily. All the patients were assessed for the occurrence of silent ischemia by 48 hours electrocardiogram (ECG), monitoring after 3 weeks of therapy. There was no significant difference in baseline characteristics between the two groups. The results are presented in the table.

<table>
<thead>
<tr>
<th>No.</th>
<th>Silent ischemia</th>
<th>No ischemia</th>
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</thead>
<tbody>
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<td>Atorvastatin-40</td>
<td>70</td>
<td>11*</td>
</tr>
<tr>
<td>Atorvastatin-10</td>
<td>70</td>
<td>40*</td>
</tr>
</tbody>
</table>

* p<0.01; ** p<0.01

We conclude that use of atorvastatin in high dose could reduce the incidence of silent ischemia significantly as compared to its low dose. This might improve the prognosis in patients of silent ischemia.

Side Effect Profile of Trimetazidine

SD Singh, Bhimo Singh, B M Ajumdar, A Chowdhury
Regional Institute of Medical Sciences, Imphal, and Institute of Post Graduate Medical Education and Research & SSKM Hospital, Kolkata

Trimetazidine is an increasingly used antianginal agent. We followed 100 patients of ischemic heart disease with 35 mg twice daily dose of trimetazidine for a period of 2 months. Forty (40%) patients were female. Mean age was 42±1.5 years (range 29-75 years). Side effects were seen in 5 (5%) patients. Reported side effects were abdominal bloating sensation (2.2% patients), insomnia (2.2% patients) and diuresis (1.1% patients). All side effects were seen on initial days (2-5 days) of therapy, except for diuresis, which was seen within hours of starting therapy. In this patient, who was also suffering from compensated alcoholic liver cirrhosis and who was not taking other drugs at that time, the drug had to be withdrawn. In all other patients, the drug was continued and tolerance to side effects occurred. Thus, we conclude that it is relatively safe drug, with one interesting side effect of diuresis which was not previously reported.
Radial Artery Size in Adult Indians
K Jani, A Ranjan, N Tanwar, SM Shah, R Pothiwala, N Vayada, H M alhotra, S Shah, T Pat
Sterling Hospital, Ahmedabad

Transradial (TR) approach to percutaneous coronary procedures is an attractive alternative to transfemoral route. Initial apprehension about feasibility of this route in short stature Asian population was unfounded. Large studies from Japan and India have proved TR approach to be as effective as transfemoral route in all subsets of coronary procedures and at all ages. The most important prerequisite to TR procedure is a normal Allen’s test. The radial artery accommodates routine sheath and catheters in these patients. However, radial artery sizes is not well documented in Indian population. We measured radial artery size by ultrasound using 3-11 mega Hz transducer probe (L11-3) and HP Sonos 5500 machine. Bilateral radial artery diameter (intima to intima inner luminal diameter), height, body surface area (BSA) and gender of the patient were recorded and analyzed. We analyzed the data to correlate the radial artery size with gender, height and BSA of patients. A total of 1000 patients (772 men; 77.2%) were examined. The average size of right radial artery in men was 2.37±0.45 mm and in women it was 2.19±0.33 mm. The average size of left radial artery in men was 2.38±0.42 mm and in women it was 2.10±0.38 mm. Over 85% of men and >90% of women had radial artery size > 1.7 mm. The sizes of radial arteries were similar irrespective of height and BSA of patients. To conclude, the average radial artery sizes are not different in either men or women. In adult Indian population, it showed no correlation either with height, gender or BSA of patients.

Atherosclerotic Risk Factors in Chronic Kidney Disease
Jijith Krishnan, SV Praveen, TN Sunil Roy, Vikram Sankar, N Jayaprasad, Johnson Francis, M uneer, Sreelatha, K Venugopal
Medical College, Calicut

Renal insufficiency has been shown to be a significant and independent risk factor for accelerated atherosclerosis. Cardiovascular disease is the leading cause of premature death in more than 50% of renal failure patients. Renal dysfunction causes a rapid enlargement of pre-existing plaques rather than mediating de novo generation of plaques. The aim of the study was to analyze the atherosclerotic risk factors in patients with non-diabetic chronic renal disease. This study included 31 patients with established chronic renal disease without diabetes, infectious or inflammatory disease and not on renal replacement therapy. Sociodemographic parameters, nutritional parameters, renal failure indices, and cardiovascular risk factors like fasting lipids, lipoprotein(a), C-reactive protein (CRP), serum fibrinogen, homocysteine, and left ventricular hypertrophy (LVH) were analyzed. Mean age of the population was 47 years (range: 18-85 years), males 87% and females 13%. Mean serum creatinine level was 6.6 mg/dl; 58% were smokers and 87% had hypertension. LVH by electrocardiogram (ECG) was present in 45.2% and mean LV mass index was 242.57 gm. Mean total cholesterol was 176.97 mg%, mean low-density lipoprotein (LDL) 104.5 mg%, mean high-density-lipoprotein (HDL) 41.6 mg%, mean triglyceride 146.32 mg% and mean lipoprotein(a) 27.9 mg%. Mean CRP level was 29.28 mg% (0.8-181 mg%), values >10 mg% were found in 61.2% of patients. Serum fibrinogen level >350 mg/dl was found in 32.25% and <350 mg/dl in 67.75% (mean value: 302.87 mg/dl). Mean serum homocysteine was 11.6 µmol/L. Homocysteine >10 µmol/L was found in 45.16%. Results of the study indicated that patients with chronic kidney disease have elevated levels of inflammatory markers in the blood, which predisposes these subjects to greater cardiovascular risk. This study shows that inflammation plays an important role in accelerated atherosclerosis and is perhaps more important than abnormal lipid profile in patients with chronic renal disease.
Cardiovascular Involvement in Leptospirosis

Cardiovascular involvement in leptospirosis is common. It is also characterized by abnormalities in hypertension and electrocardiogram (ECG). The usual ECG abnormalities are conduction disturbances, T wave changes, and atrial fibrillation. Myocarditis and pericarditis are also described but are relatively rare. All patients with leptospirosis who were admitted from February 2002 to October 2002 were studied in our institution. Diagnosis of leptospirosis was made using WHO criteria and serological tests. Cardiovascular involvement was assessed by clinical examination, ECG, X-ray and Doppler echocardiographic examination. Out of 200 patients (125 males, 75 females) with leptospirosis, 20 (10%) had atrial fibrillation, 30 (15%) had cardiomegaly with prominent upper pulmonary veins on chest X-ray. ECG changes occurred in 150 (75%), with sinus tachycardia being the most common abnormality. First degree atrioventricular block occurred in 30% and bundle branch blocks occurred in 8 patients. Twenty percent patients had transient ST elevation. On echocardiography, wall motion abnormality was observed in 50 patients of which 40 (20%) had left ventricular (LV) dysfunction. Forty patients died at one month of follow-up, all of them had renal dysfunction and only 5 had LV dysfunction. To conclude, cardiovascular involvement is common in patients with leptospirosis. LV dysfunction is common but not a major predictor of mortality.

Measurement of C-Reactive Protein from Filter Paper-Dried Blood Spots

C-reactive protein (CRP) is one of the acute phase proteins synthesized in the liver and is normally present as a trace constituent of serum/plasma. More than a dozen population-based studies have demonstrated increased CRP level as an independent risk factor for future cardiovascular disease. Use of dried blood for the population-based screening has advantages of ease of collection, transportation, minimal invasiveness and small volume. Blood spot assay of CRP would be of use in epidemiological studies. In this study, a high sensitive immunoassay for quantitation of CRP in blood spots dried on filter paper (Whatmann no.3) was standardized by using a commercially available immunoassay kit. Analysis was carried out on 4.5 mm diameter discs punched out from blood-based CRP standard and test samples. The extraction time carried out was 3 hours as compared to the other overnight extraction procedures described earlier. The detection limit of the dried blood assay was 0.005 mg/L with mean inter- and mean intra-assay coefficient of variance correlating well with the serum/ plasma assay. The linearity of the assay was studied by serially diluting a known concentration of purified CRP quality control supplied commercially with washed red blood corpuscles (RBCs) and spotted on filter paper. The observed mean value of the recovery of low and high control sample was 98%. We conclude that the extraction and quantitation of CRP from dried blood on filter paper is quicker and simpler as compared to the presently available methods. This method can be used to monitor CRP level in epidemiological studies.

Chylopericardium and its Management: Role of Nuclear Scintigraphy

Chylopericardium is an uncommon condition and the treatment is difficult. We report two cases of chylopericardial effusion. First case presented with a tamponade in a 22-year-old male, and in a second case as asymptomatic cardiac enlargement. Lymphoscintigraphy confirmed the communication between the lymphatic trunk and pericardial space in both the cases. The first case was managed surgically and the second one was managed conservatively. This demonstrates spectrum of presentations and the extremes of management strategies.

N-Acetylcysteine Prevents Contrast-Induced Nephropathy after Elective and Urgent Coronary Angiography and Intervention

Several studies have utilized low-dose regimens of N-acetylcysteine (NAC) for 48 hours to prevent contrast-induced nephropathy (CIN) after cardiac catheterization (cath) and percutaneous coronary intervention (PCI). A lengthy pre-treatment period with NAC may not be feasible in urgent situations. The purpose of this study was to assess the efficacy of an abbreviated, higher dose regimen of NAC for the prevention of CIN after elective and urgent coronary angiography (cath) and/or percutaneous coronary intervention (PCI). We prospectively evaluated 48 (36 male, 12 female) patients referred for elective or urgent cath and/or PCI with stable chronic renal insufficiency (creatinine
Role of N-Acetylcysteine in Preventing Contrast-Induced Nephropathy due to Exposure to Conventional High Osmolar Ionic Contrast in Patients with Normal Baseline Renal Function
RPS Bhardwaj, Mohd Ahmad, Ramesh Thakur, CM Varma, J Rajagopal, Gagandeep Singh, Subrat Akhoury
LPS Institute of Cardiology, Kanpur

There is conflicting evidence regarding efficacy of n-acetylcysteine (NAC) in preventing contrast-induced nephropathy (CIN). There is great paucity of data with regard to efficacy with ionic contrast which is commonly used in our set-up. This study compared the incidence of CIN in patients undergoing diagnostic angiography (coronary and non-coronary) with 76% urograffin, randomized to receive NAC and placebo. During study period of June 2004 to March 2005, 152 patients undergoing angiography were randomized to receive either NAC 600 mg twice daily 4 doses or placebo starting 12 hours before procedure. Patients with baseline creatinine level >1.4 mg/dl were excluded. A dequate hydration was ensured in both the groups. Blood urea, serum creatinine and creatinine clearance were calculated at baseline, 24 hours and 48 hours after the procedure. CIN was defined as an increase in serum creatinine of ≥25% of baseline or an absolute increase of 0.5 mg/dl above baseline. There were 76 patients each in NAC and placebo groups. Male-female ratio was 3:1. The average dose of contrast used was 85 ml. The mean creatinine level changed from baseline of 1.1±0.35 to 1.2±0.8 in NAC group versus rise from 1.05±0.4 to 1.6±0.8 in patients with placebo at 48 hours. The incidence of CIN was 3.9% (3/76) in NAC group versus 15.78% (12/76) in placebo group which was statistically significant. NAC has definite role in prevention of CIN with use of ionic contrast even in low risk patients.

New Born Venous Cord Blood and Maternal Lipoprotein Status in Uncomplicated Pregnancies
Sudhir Varma, Monica Varma, Harpreet Singh, Vivek Sharma, Neeraj Goyal, Prabhjot Kaur, Monika Singh, Amarbir Singh, Upendra Kaul
Sadbhavna Medical and Heart Institute, Patiala

Maternal lipids during pregnancy have been extensively studied. However, their impact on fetal lipids in uncomplicated pregnancy needs to be further evaluated. In this ongoing study, the lipid abnormalities in pregnancy and its correlation with lipid profile of newborn was evaluated. Maternal lipid profile at term (n=40, age 24±5 years) also compared with age-matched non-pregnant female controls (n=34, age 26±6 years). Maternal and venous cord blood samples were studied for total cholesterol (TC), low-density lipoprotein (LDL), high-density lipoprotein (HDL), very low-density lipoprotein (VLDL) and triglyceride. All these parameters were significantly higher in pregnant subjects as compared to controls (p<0.01). The maternal lipids in the range of TC≥200 mg% and triglycerides ≥175 mg% are significantly more frequently associated with newborn TC and triglyceride level ≥100 mg%. These reference values are potentially pertinent for understanding atherogenic state during pregnancy and offspring's future cardiovascular health. Maternal and new born cord blood status of lipoproteins in uncomplicated pregnancies is shown in the table.

New Born Venous Cord Blood

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Maternal (n=40)</th>
<th>Newborn cord blood (n=40)</th>
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<tr>
<td></td>
<td>(mg%, mean ±SD)</td>
<td>(mg%, mean ±SD)</td>
</tr>
<tr>
<td>Total cholesterol</td>
<td>221±49</td>
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<td>HDL</td>
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<td>125±27</td>
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<td>VLDL</td>
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<td>23±16</td>
</tr>
<tr>
<td>Triglyceride</td>
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<td>88±24</td>
</tr>
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</table>

HDL: high-density lipoprotein; LDL: low-density lipoprotein; VLDL: very low-density lipoprotein

Radio-femoral Delay: A Classical Sign Revisited
A Bahl, KKN Nambodhri, HK Bali, M Rohit, YP Sharma, R Vijayvergla, A Grover, KK Talwar
Postgraduate Institute of Medical Education and Research, Chandigarh

The aim of this study was to elucidate the mechanisms of radio-femoral delay in patients with coarctation of aorta and interrupted aortic arch. Five patients of coarctation of aorta, interrupted aortic arch and 6 control subjects were included in the study. Combined electocardiographic (ECG) and pulsed Doppler recordings were used to measure flow signal onset time, acceleration time, R to peak time and acceleration slope in radial and femoral arteries. Mean and standard deviations
Right Ventricular Hypertension in a Case of Isolated Left Pulmonary Artery Stenosis

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A 13-year-old girl child presented with mild shortness of breath. She was a well grown girl with normal development and intelligence. She was not syndromic. Karyotyping was normal female. Connective tissue disorders and Takayasu’s disease were ruled out. There was no cyanosis, heart sounds were normal and there was a soft systolic murmur in upper left sternal border. There was bilaterally equal breath sounds. Electrocardiogram (ECG) showed normal sinus rhythm and chest X-ray showed bilateral equal pulmonary vascularity. Echocardiography showed diffuse narrowing of the left pulmonary artery (LPA) with mild flow acceleration. Theright pulmonary artery was of normal size (13 mm near the first branching). A ventilation/perfusion scan was done which showed diffuse photopenia in the left lung. The right lung had good perfusion. She was taken up for angiography with an idea to stent the LPA. The right ventricular pressure was noted to be at two-third of systemic level. Angiogram in the shallow and steep LAO/CR view showed diffuse long segment stenosis of the main portion of the LPA, along with stenosis of the lower lobe branch. Initially we balloon-dilated the lower lobe branch with a 8 x 4 Tyshak-2 balloon which showed a beaded appearance and signified that it was diseased. So initially the main portion of the LPA was stented with a 12 x 27 mm Palmaz stent and through that stent the lower lobe branch was stented with a 7 x 18 Genesis stent. Following this, the right ventricular (RV) pressure came down to less than one-third of systemic level. Post-procedure angiogram showed well opened up LPA along with its lower lobe branch and there was good perfusion to the left lung. Isolated branch pulmonary artery stenosis can cause significant RV hypertension and it is worth relieving those obstructions.

Hyperhomocysteinemia, Hyperleptinemia and Increased Procoagulant Activity in Insulin-Resistant Subjects

RA. Karatda, GS. Sainani
Jaslok Hospital and Research Centre, Mumbai

Insulin resistance syndrome (IRS), which contributes significantly to the pathogenesis of coronary heart disease (CHD), has been brought in sharp focus. This is due to increased predisposition of Asian Indians and ethnic Indians to develop CHD due to their typical obesity phenotype [i.e. higher percentage of body fat at a lower value of body mass index (BMI)] and abnormal metabolic profile. The objective was to determine if the novel risk factors for coronary artery disease (CAD) like high plasma levels of homocysteine, leptin (a hormone derived from adipocytes), coagulation factor VII (FVII, proconvertin) and lipid tetrad index (LTI) were also present in the middle-aged IRS subjects. We determined plasma levels of homocysteine, leptin, FVII, fibrinogen, lipid profile, fasting, post-prandial blood glucose, insulin, BMI, waist:hip ratio for the IRS subjects (n=45) and the age- and sex-matched controls (n=45). We found significantly elevated LTI (16.48 ± 0.7 vs. 9.18 ± 1.7, p<0.001) and homocysteine levels in IRS subjects compared to controls (18.94 ± 0.9 vs. 12.3 ± 0.4 µmol/L, p<0.001). Hemostatic factors such as FVII and fibrinogen were also found significantly elevated in the IRS group compared to controls (p<0.01). Furthermore, elevated plasma leptin levels (36.61±2.9 vs. 17.3±1.3 ng/ml in males, 49.47±3.1 vs. 32.1±3.2 ng/ml in females, p<0.01) were observed in the IRS group when compared to the controls, with higher levels in females. Hyperinsulinemia was observed in the IRS group. The calculated values of HOMA-IR (Homeostasis Model Assessment), a marker of insulin resistance, were significantly higher in the IRS (p<0.001). However, only plasma leptin correlated with serum insulin levels (r=0.46, p<0.001) and insulin resistance values (r=0.31, p<0.02). To conclude, the novel CHD risk factors like hyperhomocysteinemia, hyperleptinemia and increased FVII coagulant activity are also associated with IRS, and thus, may help in evaluating CHD predisposition in this subset of patients.

Tilt Table Testing in Patients Presenting with Syncope

M. P. Girish, M. Anish Sharma, M. Mohit D Gupta, R. Batra, BB. Bhartia, P. Nandkishore, V. Trehan, S. Tyagi
GB Pant Hospital, New Delhi

Various tests used for the diagnosis of syncope include electrocardiography (ECG), echocardiography, tilt table testing,
High Altitude Pulmonary Hypertension
FM N Ahmad
Army Hospital, 56 APO

High altitude pulmonary hypertension is an extremely rare entity seen after prolonged stay at high altitudes, first reported from the higher reaches of Ladakh. A 27-year-old medical officer was admitted at a hospital located at 3100 m in Ladakh after a stay of 140 days at height >20,000 feet, with history of recently aggravated breathlessness on exertion NYHA class III, episodic (L) sided chest pain, palpitations and dry cough of 20 days duration. There was no swelling of feet. The patient had undergone a medical examination including electrocardiogram (ECG) prior to induction. On examination, he was an averagely built individual, with pulse: 98 beats/min regular, blood pressure (BP) 136/92 mmHg; no cyanosis, edema, or raised jugular venous pressure (JVP). Systemically he had a loud P2 with right ventricular (RV) heave and epigastric pulsations. Investigation revealed hemoglobin 16 gm/dl, normal hemogram and biochemical profile. ECG revealed deep negative T wave inversion in precordial leads, V1-V4 and cardiomegaly on chest X-ray. Patient was treated with rest and descent to the planes. After 8 weeks, he was asymptomatic. Echocardiography was reported normal. This rarely seen condition is an illustration of interaction between man and an environment of hypobaric hypoxia.

Usefulness of Quick Bedside Test of Erythrocyte Mean Cellular Volume and its Relationship between Serum Homocysteine in Ischemic Heart Disease
Nitin M Kulkarni, Jagdish S Hiremath, M I Hasan, TS Pol
Poona Hospital and Research Center, Pune

Decrease in serum homocysteine levels decreases the rate of restenosis and the need for revascularization of the target lesion after coronary angioplasty. Cobalamin (B12) and folate deficiency is related to both increased erythrocyte mean cellular volume (MCV) and raised serum total homocysteine (tHcy) values. Studies show that serum B12 and folate values do not exactly represent the tissue status of the two vitamins. Therefore, a direct relationship between MCV and tHcy, supports the hypothesis that tHcy is a better indicator for tissue vitamin status than the serum levels of B12 and folate. We studied the correlation between MCV, and tHcy values in 104 patients in the age group of 20 to 77 years with mean age of 50.2±13.1 years. There were 81 (77.9%) males and 23 (22.1%) females. MCV values ranged from 72 to 110 fl with mean of 90.81 fl± 50.2 Fl. MCV values did not exactly represent the tissue status of the two vitamins. MCV values ranged from 72 to 110 fl with mean of 90.81 fl ± 50.2 fl. tHcy values from 6 to 78 µmol/L with mean of 23.9 ± 7.1 µmol/L. Our study showed younger age and high MCV levels independently predicted high tHcy (β = - 0.20, p =0.037 and β = + 0.78 , p=0.001) after controlling for the gender in patients with cardiovascular disease. A simple inexpensive test of MCV (using computerized cell counter analysis) can be a useful indicator of high levels of tHcy (expensive test) which can be performed only in selected patients.

Use of Sodium Bicarbonate and N-Acetyl Cysteine in Patients with High Serum Creatinine undergoing Invasive Procedure
Nilesh Gautam, Sudhir Vaishnav, Sunil Karande, Tilak Suvarna
Asian Heart Institute, Mumbai

Contrast-induced nephropathy is a common complication following invasive procedures in patients with compromised renal functions. We conducted this study to examine the efficacy of sodium bicarbonate (NaHCO3) as prophylaxis for contrast-induced nephropathy in high-risk patients. Contrast-induced nephropathy was defined as an increase of 25% or more in serum creatinine the next day after contrast injection. We report our experience in 43 consecutive patients who underwent invasive procedures with an initially raised serum creatinine and an increased risk of contrast-induced
nephropathy from July 2004 to June 2005. All patients were hydrated with 3 ml/kg NaHCO₃ one hour before invasive procedures, followed by 1 ml/kg for 6 hours post-procedure. All patients were given N-acetylcystiene 600 mg twice a day for 2 days. Non-ionic contrast, iopamidol was used in all patients. Average amount of dye used in these patients was 64.86 ml±8.23 ml. Of the 43 patients, 55.81% (n=24) underwent CAG alone, 16.27% (n=7) underwent CAG+percutaneous transluminal renal angioplasty (PTRA), 27.9% (n=12) underwent CAG+percutaneous transluminal coronary angioplasty (PTCA) and 6.97% (n=3) underwent CAG+PTRA + PTCA. Pre- and post-procedure serum creatinine were compared in all patients. Pre-procedure serum creatinine was 1.76±0.26 mg% and post procedure (24-hour) serum creatinine was 1.48±0.17 mg%. Of the 43 patients 44.18% (n=19) showed no difference in pre and post-procedure serum creatinine, 60.46% (n=26) showed reducing trend and 0.46% (n=2) showed an increasing trend in pre- and post-procedure serum creatinine (rise was not > 25%). No patient went into renal shut down or required dialysis. The results suggest that hydration with NaHCO₃ is efficacious, safe and inexpensive way for preventing contrast-induced nephropathy.

**Do Electrocardiography Characteristics Predict Variability in QT Measurements in Clinical Trials?**

Sheetal Shetty, M ehes Khan, Sugam Salvi, Dilip Karnad, Snehal Kothari, Dhiraj Narula, Yash Lokhandwala
Quintiles ECG Services, Mumbai

Drug regulatory authorities require new drugs to be evaluated for drug-induced QT prolongation, which can cause Torsades de pointes. To enhance precision of measurements, it is recommended that all electrocardiograms (ECGs) be read manually at a central core lab by a few skilled readers. Some ECGs are difficult to read even by skilled readers leading to considerable inter-reader and intra-reader variability. To identify ECG characteristics which make QT interval measurements difficult, 100 digitized ECGs were randomly selected from a database. Twenty-four experienced readers measured the RR and QT intervals using digital onscreen calipers with precision of 2 ms. Each reader read all ECGs a second time in random sequence. Values from the first reader were used to determine inter-reader variability and the difference between the first and second reader for intra-reader variability. As the next step, 25 ECGs with the largest variability. The following features were seen more frequently in ECG that had a large variability: noisy baseline (13 v. 5), flat/low voltage T waves (7 v. 3), inverted T waves, biphasic T waves and noisy baseline make QT measurement difficult.

**An Algorithm for Diagnosis of Acute Pulmonary Thromboembolism**

Jain T Kallarakkal, M Ramesh, M Jayarajah, JSN Murthy, Ashamoorthy, S Thanikachalam
Sri Ramachandra Deemed University, Chennai

The aim of the study was to devise a simple and practical algorithm applicable for the diagnosis of acute pulmonary thromboembolism (PTE). We did a retrospective analysis of 30 patients of proven acute PTE who presented with acute dyspnea. The diagnosis was confirmed by spiral computerized tomographic (CT) pulmonary angiography. All the patients presenting with acute dyspnea had analysis of D-dimer, room air ABG, ECG and bedside echocardiography. Out of 30 patients with proven acute PTE by spiral CT pulmonary angiogram from January 2004 to December 2004, 28 patients had D-dimer >500 ng/ml (93%). Twenty patients had resting inferior wall and anteroseptal changes (66%). All 30 patients had room air PaO₂ <70 mmHg (100%) and bedside echocardiography findings of right ventricular (RV) strain were observed in 18 patients (60%). Only 2 patients with D-dimer >500 ng/ml had no acute PTE. To conclude, the combination of elevated D-dimer, PaO₂ <70 mmHg, ECG changes and RV strain in echocardiography are highly sensitive tests to diagnose acute PTE. We therefore present the algorithm for diagnosis of acute PTE.
Myocarditis in Celphos Poisoning as Evidenced by CPK-MB Levels and Electrocardiographic Changes
A Lalchandani, A Agarwal, SK Saxena, V Agarwal, P Sondhi, M Shamesh, P Naqash
GSVM Medical College, Kanpur

Celphos poisoning is a common mode of suicidal poisoning in India and associated with high mortality rates. Myocarditis is an important factor in mortality due to celphos poisoning. This study was conducted to determine whether CPK-MB levels and electrocardiographic (ECG) changes can predict the outcome and its prognostic significance in patients with celphos poisoning. The study included 23 patients of celphos poisoning admitted to emergency wards of our hospital. All patients were examined for serum CPK-MB levels and 12-lead ECG at admission in addition to other routine investigations. 78.2% of patients (n=18) had elevated CPK-MB levels at admission and either ST-T changes or ventricular arrhythmias in ECG. Of these patients, 16 (69.5%) expired, only 2 being discharged in healthy condition (p<0.05). Majority of patients with normal CPK-MB group were discharged in healthy condition (80%). Patients of celphos poisoning with elevated CPK-MB levels on admission had poorer prognosis compared to those with normal levels. CPK-MB levels thus carry prognostic value in such patients. High CPK-MB levels also indicate that celphos poisoning is a cause of myocarditis in India.

Vegetation Negative Infective Endocarditis
S Venkatesan, G Ganavelu, G Karthikeyan, V Jaganathan, A Alagesan, M Annamalai, S Shanmugasundaram, S Geetha, A Balaguru, G Anuradha
Madras Medical College, Chennai

The definitive diagnosis of infective endocarditis (IE) remains a contentious clinical issue. Many diagnostic criteria have been formulated, but none has withstood the test of time. Currently Duke’s criteria is considered as the sine qua non of IE and evidently they constitute the major criteria. Ironically, according to Duke’s criteria, IE could still be diagnosed in the absence of vegetation, provided it fulfills other major criteria of culture positivity. In this context, we report our analysis of patients with IE without vegetation. Out of 24 patients admitted between 2004-2005 in our hospital with the diagnosis of IE, 4 patients failed to show vegetations. All had rheumatic heart disease (RHD) and presented with prolonged fever. All had severe eccentric mitral regurgitation (MR). One had severe aortic regurgitation (AR) also. One had flail posterior mitral leaflet (PML). All had blood culture positive - 3 for staphylococcus aureus 1 for pseudomonas. None had vegetations on the first echocardiographic examination. Transesophageal echocardiography (TEE) also failed to detect a vegetation or abscess. The diagnosis of IE was made on the basis of Duke’s criteria (1 major and 3 minor features). Treatment was started based on culture positivity and sensitivity. All patients underwent serial echocardiography every week for 6 weeks. New mobile vegetation was detected in 1 patient in anterior mitral leaflet (AML) measuring 12 mm after 2 weeks. Three patients never showed any evidence of vegetation. One patient developed cerebral vasculitis and another renal insufficiency during the course of treatment. Two patients stabilized with medical management. One expired and other had refractory cardiac failure and was referred for emergency surgery. The mechanism of absence of vegetation in IE could be varied. Simple temporal dissociation between appearance of vegetation and the clinical syndrome should be the first possibility. Further, vigorous antimicrobial treatment might have prevented the formation of vegetation. But, as we have seen in few patients, it never appeared. This was possibly due to layered vegetation like that of a thrombus on the surface of the valve or adjacent myocardium. The process of vegetation formation need not be endoluminal, it can burrow into the tissue plane intramurally without projecting into the cavity. Spontaneous rupture of chordae secondary to inflammation without any vegetation is another possibility. We conclude that even though vegetations are considered sine qua non of IE in many clinical situations, IE occurs without vegetation. The mechanisms could be varied.

Prevalence of Chronic Kidney Disease in Patients with Coronary Artery Disease Referred for Cardiac Catheterization
LR Nath, JC Mohan
Metro Golden Heart Institute, Jaipur Golden Hospital, New Delhi

Chronic kidney disease (CKD) has serious impact on clinical outcome after percutaneous coronary intervention (PCI) and surgical revascularization in patients with coronary artery disease (CAD). Little data are available regarding prevalence of CKD in the Indian population with CAD referred for invasive procedures. The study was designed to estimate the frequency of CKD in patients with CAD who were referred to a tertiary care centre with cardiac catheterization facilities. 1102 consecutive patients with definite CAD and complete datasheet (male: 858 and females: 244; mean age 58±7 years; 22% >70 years of age) who underwent coronary angiography or percutaneous coronary intervention (PCI) between January 2002 and May 2005 were analyzed retrospectively. The baseline clinical data regarding age, sex, diabetes status, hemoglobin and serum creatinine were examined. CKD was defined as glomerular filtration rate (GFR) < 60 ml/min/1.73 m², calculated by using MDRD equation as suggested by the National Kidney Foundation. Patients with GFR between 60 - 90 ml/min/1.73m² were classified as having mild renal insufficiency. 275 (25%) patients were detected to have CKD of which 220 (25.6%) were male and 55 (22.7%) female.
renal insufficiency was present in 594 (54%) patients of whom 462 (53.8%) were male and 132 (54.5%) female. Diabetes mellitus was detected in 330 (30%), [242 (28.2%) male and 88 (36.3%) female]. A significant patient population with established CAD presenting to a tertiary care centre in India have pre-existing or undetected CKD or mild renal insufficiency. These data have relevance with regard to complications, morbidity and risk of contrast-induced nephropathy. Such information would help formulate future strategies to safeguard against complications and further deterioration of renal function.

**Comparative Angiographic Findings on Coronary and Renal Artery Affection in Diabetes Mellitus**

M Nitin Kulkarni, Jagdish S Hiremath, SV Sathe, S Hardas, P Shah
Poona Hospital and Research Center, Pune

Recently, incidence of diabetes mellitus is showing an alarmingly rising trend in Indian population with particular affection of younger generation. To study the variable impact of metabolic changes in diabetes mellitus in same group of patients, we analyzed obstructive renal artery stenosis in 317 patients with acute coronary syndrome (ACS) who underwent simultaneous coronary and renal angiography. There were 233 males and 84 females in the age group of 24 - 85 years with mean age of 59.24±11.01 years.

<table>
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<td>Coronary artery disease</td>
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<td>159</td>
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<tr>
<td>No</td>
<td>11</td>
<td>56</td>
<td>67/317 (21.1%)</td>
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<tr>
<td>Total</td>
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<td>215</td>
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<tr>
<td>Renal artery stenosis</td>
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<td>23</td>
<td>34</td>
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<tr>
<td>No</td>
<td>79</td>
<td>181</td>
<td>2 6 0 / 317 (82%)</td>
</tr>
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</table>

Statistically significant discriminative macrovascular affection of renal (p > 0.05) and coronary arteries (p < 0.05) is seen in same group of diabetic patients after correction for age and sex in the present study. Larger studies can be undertaken to confirm the above findings.

**Study of Pre-Clinical Atherosclerosis in Middle Aged Type 2 Diabetic Subjects Compared to Matched Non-Diabetic Subjects**

Subir Ghose, Kumar Sankar Poddar, Soumitra Kumar
Vivekananda Institute of Medical Sciences, Kolkata

Diabetic patients are at an increased risk of cardiovascular disease; however, some patients do not develop cardiovascular sequelae. To assess whether the people with Type 2 diabetes without any clinical evidence of atherosclerotic macrovascular complication like coronary artery disease (CAD), cerebrovascular disease, peripheral vascular disease exhibit an increased risk of atherosclerosis as measured by the intima media thickness (IMT) of carotid artery compared to matched non-diabetic subjects, we are conducting this study. Twenty patients in the age group of 45 to 64 years without clinical evidence of atherosclerosis were studied. They were divided into two groups: (i) 13 subjects with Type 2 diabetes (ii) 7 subjects without diabetes. They were matched for age, sex, hypertension, smoking, dyslipidemia and family history of premature CAD. Carotid artery IMT was measured (as a marker of atherosclerosis) on each side by using high resolution B-mode scanning with 7.5 MHz linear phased array transducer by two independent observers. The average IMT of subjects with Type 2 diabetes was 0.76 mm and without diabetes was 0.74 mm. There was no significant difference in carotid IMT in subject with Type 2 diabetes compared to matched non-diabetic subjects.

**Non-Steroidal Anti-Inflammatory Drugs and Risk of Acute Coronary Events and their Outcomes**

Jojy Boben, Sathish, M Ramesh, JSN Murthy, M Jayarajaha, S Thanikachalam
Sri Ramachandra Medical College and Research Institute, Chennai

Non-steroidal anti-inflammatory drugs (NSAID) are reversible inhibitors of cyclo oxygenase (COX-2). Inhibitors of COX-2 enzyme lead to reduction of prostacyclin synthesis. Unopposed inhibitions could translate into increased cardiovascular risk. COX-2 inhibition, unlike COX-1 inhibition, predisposes to acute coronary events according to literature survey. We did a prospective study of 100 patients with acute coronary syndrome (ACS). Patients with a history of old myocardial infarction (MI), congestive cardiac failure, valvular heart disease and renal failure were excluded. Our results indicate that use of NSAIDS predispose to ACS specially ST elevation myocardial infarction (STEMI) (p <0.001). Our patients were mainly taking both selective and non-selective NSAIDS. The incidence was found to be higher in the patients taking selective NSAIDS. Cardiovascular morbidity was also higher in these groups.

**Utility Value of Inconclusive Exercise Stress Test**

S Venkatesan, G Gnanavelu, V Jaganathan, SD Jayaraj
Madras Medical College, Chennai

Exercise stress test (EST) continues to be an important diagnostic modality in the initial and subsequent evaluation
Can Linseed Correct Hyperlipidemia?

Farzad Jalali, K Hajian, M R Niaki
Babol University of Medical Sciences, Babol, Iran

Hyperlipidemia is an important cause of coronary artery disease (CAD). Linseed contains large amount of omega-3 fatty acids, and has major role in lowering lipid levels. This study evaluated the effects of flaxseed powder in patients that have not responded to regular diet regimen. Fifty-six patients with hyperlipidemia that did not respond to 3 months regular diet regimen and had serum levels of total cholesterol (TC) > 240 mg/dl, or triglyceride (TG) >300 mg/dl, or low-density lipoprotein (LDL) >160 mg/dl or high-density lipoprotein (HDL) < 30 mg/dl were selected and 6 gm/day linseed powder in the form of biscuits was given to them for 3 months. Serum levels of lipids were measured before and after the regular diet regimen and then after 3 months of linseed biscuits consumption. The data were then statistically analyzed. Mean serum level of TC before treatment was 258.4±55.59 mg/dl and after treatment it was 232.05±41.47 mg/dl (p=0.0001). Mean serum triglyceride before treatment was 289.92±126.57 mg/dl and after treatment it was 225.07±82.57 mg/dl (p=0/0001). Mean serum LDL-cholesterol before treatment was 173.82±25.87 mg/dl and after treatment was reduced to 141.12±39.94 mg/dl (p=0.0001). Mean serum HDL-cholesterol before treatment was 43.89±25.66 mg and after treatment, it was 43.53±13.84 mg/dl (p=0/848). Linseed powder regimen for 3 months decreased total cholesterol by 10.2%, serum triglycerides by 22.35% and LDL-cholesterol by 18.8% while serum level of HDL increased by 14.5%.

Steroid-Induced Intrapericardial Mass
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Regional Institute of Medical Science, Imphal and Institute of Post Graduate Medical Education and Research and SSKM Hospital, Kolkata

Glucocorticoids regulate fatty acid mobilization by enhancing the activation of cellular lipase by lipid-mobilizing hormones (e.g. catecholamines and pituitary peptides). Hypercortisolism promotes the deposition of adipose tissue in characteristic sites, mainly the upper face and the interscapular area. Rarely, the episternal fatty tumors and mediastinal widening secondary to fat accumulation can occur. We report the case of a 42-year-old female who was suffering from chronic bronchial asthma. She was put on prolonged oral steroids (prednisolone 20 mg once daily for more than 6 months) by the treating physician with features of Cushing's syndrome (iatrogenic), who was also having inappropriate sinus tachycardia. Transthoracic echocardiography (TTE) was performed to look for any cardiac dysfunction. The cardiac functions were normal, but there was an ecchogenic sessile mass measuring 11x10 mm attached to posterior atrioventricular (AV) groove. Subsequently, oral steroids were gradually changed to inhaled beclomethasone at a dose of 800 µg/ day. As a result, asthmatic symptoms were controlled. After 3 months of stopping oral steroids, TTE was repeated, and it was observed that the mass had disappeared. Thus, we consider that iatrogenic Cushing's syndrome can induce fatty deposits even in pericardial cavity.

Axillary Nerve Block to Prevent Radial Artery Spasm in Transradial Coronary Procedures: A Pilot Study
F Panchal, A Ranjan, N Tanwar, H M alhotra, K Jani, R Radadiya, S Gupta, S Shah, T Patel
Sterling Hospital, Ahmedabad

Radial artery spasm (RAS) is a known complication of the transradial (TR) approach for coronary procedures. Incidence of severe spasm is rare. However, severe spasm can prevent not only the procedure but also removal of sheath/catheter after the procedure. In extreme cases, general anesthesia is required to break the spasm to remove sheath and catheters. We did a prospective study to see the effect of axillary nerve...
masquerading presence of coronary-pulmonary fistula

government roslyn, t rajkumar, t jain kalirakikal, b m adan mohan, tr m urulidhanam, m jayarajah, jsn morthi, s thanikchalam

sri ramachandra medical college and research institute, chennai

in our institution, a total of 5,356 patients underwent coronary angiography with clinical suspicion of coronary artery disease (CAD) from september 2002 to january 2005. nine patients among them (4 males, 5 females and mean age 52.6±7.3 years) exhibited coronary-pulmonary fistula in adulthood, even though there was no clinical indication of such an entity in any of them. the coronary side of the fistula arose from left anterior descending (LAD) artery in 4 patients, right coronary artery (RCA) in 3 and first-diagonal artery in 2. four among the 9 patients (1 male, 3 females; mean age 54.8±5.7 years) had no associated CAD (Group A), while 5 (3 males, 2 females mean age 51.3±6.2 years) had significant occlusive CAD (Group B). all 4 patients in Group A were clinically suspected to have CAD as all of them had significant effort angina (with a mean duration of 3.5 years). two of them had abnormal rest electrocardiogram (ECG) with both having deep symmetrical T inversion and 1-2 mm ST depression in precordial leads; one among them presented initially with a classical clinical picture of acute coronary syndrome (ACS) with class IV angina and troponin-T elevation (0.22 ng/ml), which was treated with low molecular weight heparin therapy. All of them were positive for inducible ischemia in exercise electrocardiography but did not reveal any wall motion abnormality at rest. five patients in Group B had multiple risk factors for CAD; 4 patients in this group had abnormal rest ECG and wall motion abnormality in echocardiogram. Two among them had history of transmural myocardial infarction of which one presented to us with acute pulmonary edema and was detected to have severe left ventricular dysfunction. triple vessel disease was seen in 3 patients and one each had double and single vessel disease. all 9 patients were taken-up for surgical ligation of coronary-pulmonary fistula with all 5 Group B patients undergoing coronary artery bypass grafting along with it. complete symptomatic relief was observed in all the patients after surgery. to conclude, coronary-pulmonary fistula may present without any identifying clinical features, along with CAD or as an isolated condition, emphasizing that this entity has to be kept in mind in all cases that go in for coronary angiography.

long-term effects of sildenafil citrate therapy in children with pulmonary hypertension

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Nizam's Institute of Medical Sciences, Hyderabad

there are a few reports of use of sildenafil citrate in children with pulmonary hypertension with encouraging acute and short-term benefits and acceptable safety. however, the long-term outcome and its side-effects are largely unknown. there were 18 children less than 14 years who were put on chronic sildenafil therapy during 2000-2002. the age ranged from 10 months to 14 years (mean 11±0.76 years). seven were females. all had severe pulmonary hypertension [primary: 11, ventricular septal defect (VSD) - pulmonary arterial hypertension (PAH): 4, atrial septal defect (ASD)-PAH: 2 and patent ductus arteriosus (PDA)-PAH: 1]. all were asked to come 3 monthly for thorough physical examination, routine hematological test, renal and hepatic function tests-besides electrocardiogram (ECG) and echocardiogram. three were lost to follow-up and there were 3 drop-outs due to economic reasons. twelve children completed 3 years of continuous therapy. at a mean follow-up of 3±0.25 years, one child developed significant hirsutism and two had elevated SGOT and SGPT. there were no deaths or major systemic complications. the fall in pulmonary artery (PA) mean pressure at 3 months did not change significantly over the next 2-3 years. chronic sildenafil therapy appears to be reasonably safe and effective in children with severe pulmonary hypertension. however, its effect on growth, maturation and development are not yet clear. larger studies are suggested for further clarification and guidance.
Interventricular Septal Hypertrophy in Lawrence-Moon-Bardet-Biedl Syndrome: A Rare Association
Archana Gupta, Aparna Jain
GR Medical College, Gwalior

We report an interesting echocardiographic observation of interventricular septal hypertrophy in a patient of a rare polymorphic autosomal recessive disease, the Lawrence-Moon-Bardet-Biedl syndrome. Our subject was a 14-year-old male born to non-consanguineous Indian parents having congenital postaxial polydactyly, bilateral rod-cone dystrophy, central obesity, and mental retardation. Presence of 4 primary features, or 3 primary plus two secondary features is required.

<table>
<thead>
<tr>
<th>Primary features</th>
<th>Secondary features</th>
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<tbody>
<tr>
<td>Rod-cone dystrophy*</td>
<td>Speech disorder*</td>
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<tr>
<td>Polydactyly*</td>
<td>Brachydactyly*</td>
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<tr>
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<td>Developmental delay*</td>
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<tr>
<td>Hypogonadism*</td>
<td>Polyuria/polydipsia</td>
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<td>In males</td>
<td>Ataxia</td>
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<td>Renal anomalies</td>
<td>Poor coordination/</td>
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<td></td>
<td>Hepatic fibrosis</td>
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<td></td>
<td>Spasticity</td>
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</table>

*Features seen in the reported case.

PPAR Agonists—From Discovery to Development
A Taneja, NR Srinivas, SK Kankanwadi
Dr Reddy’s Laboratories Ltd., Hyderabad

The PPARs are a family of transcription factors which play a central role in regulating the storage and catabolism of dietary fats. These were cloned less than a decade ago as orphan members of the nuclear gene family that include the receptors for the steroid, retinoid and thyroid hormones. The term PPAR is a misnomer as far as humans are concerned and has been coined on the basis of the levels of expression of this receptor in rodent species. The α receptors are located in the liver, heart, kidney and muscle. Agonists of these receptor subtypes have beneficial effects on the arterial wall via down regulation of proinflammatory/prothrombotic factors. The PPAR γ is the most extensively studied of the receptor subtypes. It is predominantly expressed in adipocyte tissue, regulates adipocyte function and systemic lipid homeostasis. PPAR γ agonism enhances the sensitivity of target tissues to insulin and reduces plasma glucose, lipids and insulin levels in animal model of Type 2 diabetes. PPAR δ receptors are widely expressed in human tissues and are involved in aspects of lipid homeostasis/metabolism. A number of agonists of PPAR receptor subtypes are currently approved for human use. The fibrates, which are predominantly PPAR α receptor agonists, decrease triglyceride (TG) levels while elevating high density lipoprotein cholesterol (HDL-c) levels. This receptor subtype may regulate target genes relevant for inflammation and atherosclerosis; trials of fibrates such as VA-HIT, BECAIT suggest that long-term use of this class of drugs may lead to significant reduction in cardiovascular events. No drugs which predominantly activate this receptor are currently approved for human use. However, dual as well as pan PPAR agonists, targeting this receptor sub-type, are currently under development. Partial PPAR γ agonists and SPARMs (selective PPAR receptor modulators) are under development. These compounds are expected to provide similar benefit, but without the attendant side effects associated with contemporary PPAR γ agonists. Another approach toward optimizing therapy for metabolic disorders has been the development of dual and pan activators of PPAR receptor subtypes. These compounds combine insulin sensitization with an improvement in lipid metabolism. As on date, clinical efficacy data is available on three dual PPAR agonists viz regaglitazar, maraglitazar and tesaglitazar. These drugs are being developed for the treatment of dyslipidemia and Type 2 diabetes mellitus. Till such time, more selective agonists of PPARs are available, therapy with this class of drugs will have to be individualized, in order to characterize individual who are likely to derive maximal benefits from the PPAR agonists currently available.

Effect of Dried Garlic Supplementation on Blood Lipids in Hypercholesterolemic Patients
Mohammad Raza, Khososi Niaki
Babol Medicine, University, Iran

Garlic has been reported to reduce cholesterol and other serum lipids. Yet, the beneficial effects of garlic powder supplementation is controversial. We sought to investigate the lipid-lowering effect of dried garlic supplementation in hypercholesterolemic patients. The effects of dried garlic powder/tablets (garlet) on the serum lipid and lipoprotein (Lp) levels were studied in 93 primary hypercholesterolemic subjects over a period of 12 weeks. In a placebo-controlled, randomized, double-blind parallel trial, patients were sub-divided into four groups and were given 1200, 2400, and 3600 mg/day of garlic and placebo to the last group. Serum lipid and lipoprotein levels were measured at the beginning and at the end of the study. No dietary interventions were implemented during the trial. The calorie intake between and within each group were the same. The mean serum cholesterol and low-density lipoprotein (LDL)-cholesterol in those who received 2400 mg/day of garlet, were reduced by 21.2 mg/dl (8.2%, p<0.001), and 20.4 mg/dl (11.7%, p<0.002), and the mean serum triglyceride in those who received 1200 mg/dl decreased significantly. Garlic powder supplementation has some
having coronary artery disease (CAD) without other in at least one coronary artery. The patients with diabetes who fulfilled the inclusion criteria of having in patients undergoing coronary angiography in our institute a case-control study was done from January to December 2000. DM on coronary collaterals. This cross sectional comparative study was to evaluate the effect of diabetes mellitus (DM) has any effect on coronary variability is not well understood. Likewise, it remains unclear whether diabetes mellitus (DM) has any effect on coronary collaterals, but there are considerable variations in their formation. The nature of this development of coronary collaterals, but there are no studies that could identify whether diabetes mellitus (DM) has any effect on coronary collaterals.

**Clinical Follow-up and Assessment of Angiographically Intermediate Coronary Artery Stenosis and Borderline Fractional Flow Reserve using Pressure Wire**

Teck Wee Wong, Aman Salwan, Qiang Zhang, Dinesh Naik, Soo Teik Lim
National Heart Centre, Singapore

Percutaneous coronary intervention (PCI) of intermediate coronary stenosis (50-75% diameter stenosis) without documented ischemia is often performed, but its benefit is unproven. Fractional flow reserve (FFR) is the fraction between the values of post- and pre-stenotic pressure at maximum hyperemia. From January 2001 to December 2004, 36 patients with single vessel disease and one intermediate lesion were selected through routine coronary angiography. Mean follow-up was 37±5 months. Mean age was 59.4 years and 28% had diabetes mellitus. Thirty-nine percent patients had either unstable angina or recent myocardial infarction. Depending on FFR values, patients were grouped into three subgroups (Group A, B and C). Group B with 5 (14%) patients had borderline FFR (0.76-0.80), where a critical clinical decision has to be made for medical or percutaneous intervention. Two patients from Group B who were treated medically, became symptomatic during follow-up. However, they responded to aggressive medical intervention.

**Comparative Study of Coronary Collaterals in Diabetic and Non-Diabetic Patients by Angiography**

AEM M Islam, AAS M ajumder, M Farque, GM Faruque, M Jalaluddin
National Institute of Cardiovascular Diseases, Dhaka, Bangladesh

Myocardial ischemia is known to be significantly related to the development of coronary collaterals, but there are considerable variations in their formation. The nature of this variability is not well understood. Likewise, it remains unclear whether diabetes mellitus (DM) has any effect on coronary collaterals. This cross sectional comparative case-control study was done from January to December 2000 in patients undergoing coronary angiography in our institute who fulfilled the inclusion criteria of having ≥75% stenosis in at least one coronary artery. The patients with diabetes having coronary artery disease (CAD) without other modifiable major risk factors (hypertension, smoking, dyslipidemia) constituted the case study group (n=36) and non-diabetic patients having CAD with those risk factors constituted control group (n=50). Coronary collaterals were graded according to Rentrop scoring system and the collateral score was calculated by summing the Rentrop number of every patient. There was no statistical difference between patients with and without diabetes in clinical characteristics. The mean number of diseased vessel in DM group (2.6 ±0.6) was higher than that in non-diabetic patients (2.1±0.8, p>0.05). The mean collateral score was 0.5±0.6 in DM group and 1.2±1.0 in non-diabetic group. These findings suggest that coronary collateral development is significantly poorer in diabetic than in non-diabetic patients.

**Correlation of Ejection Fraction Calculation by EKG, M-Mode and Modified Simpson’s Formula**

RR Kasiwal, Sharad Tandon, Ramesh Raikar, Rahul Singhal
Escorts Heart Institute and Research Centre, New Delhi

Left ventricular ejection fraction (LVEF) is the most important predictor of motality after myocardial infarction/acute coronary syndrome (MI/ACS) and has been studied in many previous trials. A positive correlation was found between the ejection fraction (EF) derived from 12-lead EKG and M-mode dimension method, using the inexpensive and easily available 12-lead surface EKG [EF%=(R+S) aVR × 2.264 + age x 0.645]. We also tried to find a correlation between EF calculated using EKG, M-mode echo, modified Simpson formula in our set up. Twenty-two patients who presented to Echo Lab with history of ACS were subjected to EF calculation by each method (EF1 by Dimensions method, EF2 by modified Simpson method and EF3 by 12-lead EKG method). These values were found to be EF1: 51.3±8.1%, EF2: 58±9.2% and EF3: 56±7.0% and respectively. Correlation was drawn between EF1 & EF3 and EF2 & EF3 and coefficient of correlation was found to be 0.037 (EF1/EF3) (p=NS) and 0.132 (EF2/EF3) (p=NS). However, coefficient of correlation between EF1/EF2 were found to be significant (p<001). In our study we could not find a significant correlation between the EF calculation using EKG formula (EF3) with the other methods of EF calculation i.e., M-mode dimension method and modified Simpson’s formula unlike some previous studies but needs further validation in future.
Apical Ballooning of the Left Ventricle

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SCB Medical College, Cuttack

Although exact etiology of apical ballooning syndrome of left ventricular (LV) remains unclear, nor-epinephrine-induced cardiac damage has been implicated in its etiology. We report 6 cases (all females), age 21-44 years, presenting with severe transient LV systolic dysfunction and clinically developed left ventricular failure (LVF) in 4 cases and cardiogenic shock in 2 cases. Two cases developed following laparoscopic cholecystectomy, 3 cases following general surgery and one case following loss of her husband. All the patients had electrocardiographic (ECG) findings suggestive of acute myocardial infarction (AMI) i.e. ST elevation myocardial infarction in 4 cases and non-ST elevation myocardial infarction in 2 cases, raised cardiac enzyme, severe LV systolic dysfunction (mean EF : 36 ± 24) and normal coronary angiogram. All patients made a complete recovery with inotropic support and were asymptomatic at 1-month and 6-month follow-up. Thus this is a rare but important entity of transient severe LV systolic dysfunction following physical or emotional stress, but leads to complete recovery with appropriate diagnosis and treatment.

Assessment of the Longer-Term Effects of a Dietary Portfolio of Cholesterol-Lowering Foods in Hypercholesterolemia

Cyril WC Kendall
University of Toronto, Toronto, Canada

The objective of this study was to determine the effectiveness of dietary advice to consume a combination of cholesterol-lowering foods (dietary portfolio) and to compare these results with published data from the same subjects taking the same diet during metabolic trials of the diet and a statin. For a period of six months, 66 hyperlipidemic subjects were prescribed diets high in plant sterols (1.0 gm/1000 kcal), soy protein (22.5 gm/1000 kcal), viscous fibers (10 gm/1000 kcal) and almonds (23 gm/1000 kcal). Their 4-week data were also compared with published results on the same subjects (n=29) who had undergone separate one-month metabolic trials of the diet and a statin. Sixty-one subjects completed the six-month study. Their low-density lipoprotein (LDL)-cholesterol reduction was 14.9 ± 1.6 mg% (p<0.001) and 13.9 ± 1.7 mg% (p<0.001), at 12 and 24 weeks, respectively. These reductions were significantly less than those observed on the metabolic diet or following a statin. Nevertheless, 33% of the subjects who completed the ad libitum diet (n= 20/61) showed LDL-cholesterol reduction of >20% (mean 27.4 ± 1.1 mg%), The LDL-c reduction in this group was not different from their respective metabolically controlled portfolio or statin treatment. A correlation was found between total compliance and LDL reduction (r=0.43, p<0.001). Only two subjects with <55% compliance (n=25) achieved >20% LDL-cholesterol reduction at 24-weeks. Just over 30% of motivated subjects who ate the dietary portfolio of cholesterol-lowering foods under real world conditions were able to lower LDL-cholesterol >20%, which was not significantly different from their response to a first generation statin, taken under metabolically controlled conditions.

Alterations of Cardiac Functional and Morphological Parameters in Chronic Diabetic Nephropathy

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Diabetic Hospital, Dhaka, Bangladesh

Cardiovascular involvement is widespread in diabetes and it is thought that subjects with diabetic nephropathy (DN) are more affected. This study was undertaken to observe the extent of cardiac involvement in diabetic patients with renal failure and its association with different clinical and biochemical parameters. Type 2 DN patients (n=130) (71 male and 59 female) with normal to mild renal failure (serum creatinine <3 mg/dl), with or without hypertension and variable proteinuria were selected. Relevant clinical, biochemical evaluation and color Doppler echocardiography was done. Age of the patients was 53 ± 10 years and body mass index (BMI) 26 ± 3 kg/m². The diagnosed duration of diabetes was 10 ± 8 years, hypertension 13 ± 4 years, nephropathy 3 ± 2 years and chronic renal failure 2 ± 1 years. Mean blood pressure (MBP) was 107 ± 11 mmHg, HbA1c 7.1 ± 2, serum creatinine (Scr) 1.7 ± 0.6 mg/dl and urinary total protein (UTP) 2.3 ± 2 gm/day. Multiple comparisons among different subgroup of patients were done to identify the association of cardiac parameters to others. Patients with and without left ventricular (LV) hypertrophy (LV mass index-LVMI>131 gm/m² in male and 100 gm/m² in female) were compared (52% v. 43%, p<0.05), NS and LVMI 150 ± 34 v. 90 ± 19 gm/m², p<0.001) to different echocardiographic and other parameters which showed no difference in any of the parameters between groups. Then patients with normal and diastolic dysfunction (E/A <1) groups (34% v. 66%, p<0.001 and E/A 1.6±0.5 v. 0.7±0.1, p<0.03) were compared and this time, the differences were found in creatinine (1.4 ± 0.6 v. 1.7 ± 0.7 mg/dl, p<0.03), creatinine clearance rate (60 ± 26 v. 49 ± 22 ml/min, p<0.04) and duration of nephropathy (2.2 ± 1.5 v. 3.7 ± 4.1 years, p<0.04) more altered in diastolic patients. When patients were divided in normal and renal failure (creatinine >1.5 mg/dl) groups (48% v. 52%, p=NS and Scr 1.2 ± 0.2 v. 2.1 ± 0.5, p<0.001) for comparisons, differences in duration of hypertension (5 ± 4 v. 11 ± 8 years, p<0.001) and period of nephropathy (2.3 ± 1.7 v. 4.3 ± 4 years, p<0.02) higher in the
later group were observed. Then the normotensive and hypertensive (≥140/90 mmHg) groups were compared (26% vs. 74%, p<0.001, MBP 92±7 v. 112±8 mmHg, p<0.001) and this also showed no significant difference in any parameter including echo findings. Correlation studies showed lower creatinine clearance rate was negatively associated with LVMi (r = -0.2, p<0.05) and LV end-diastolic volume index (r = -0.2, p<0.05); higher serum creatinine associated with increased MBP (r = 0.2, p<0.01) and greater LVMi with higher UTP excretion (r= 0.3, p<0.01). It may be concluded that cardiac functional and morphological parameters are grossly altered in diabetic nephropathy at early renal failure. Diastolic dysfunction and increased left ventricular (LV) hypertrophy is the predominant presentation, which is more influenced by renal impairment than diabetes or hypertension per se.

### Role of Adenosine in the Investigation of Blackouts

S Petkar, Amir Zaidi, Alan Fitchet, Adam Fitzpatrick
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Intravenous bolus ATP (IVA) has been proposed as an alternative to tilt-table testing in provoking an episode in patients with reflex syncope. However, we postulated that a pause ranging from 6 to 10 s after IVA actually identifies a group of patients with syncope who have sub-clinical intrinsic atrioventricular (AV) nodal disease rather than reflex syncope, who should receive pacemakers. However, the effects of intravenous adenosine (to which ATP is metabolized and which lacks the vagal effects of ATP), has not been studied previously. We sought to prospectively study the effects of intravenous bolus adenosine in syncope patients and controls, and to assess the value of adenosine as a diagnostic test for the investigation of syncope. 169 patients with 2 or more episodes of unexplained syncope and a normal resting 12-lead ECG turned up for tilt testing; 20 healthy controls were also studied. After a 15 min rest period, each patient received a rapid 18 mg intravenous bolus of adenosine through an antecubital vein, followed by a 20 ml saline flush, during continuous electrocardiographic (ECG) monitoring. Maximum RR interval (RR max) was calculated. After investigations, patients were designated: tilt positive reflex syncope (TPRS), carotid sinus syncope (CSS), ECG proven bradycardia (Brady) or syncope of unexplained origin (SUO), according to their final diagnosis. The age and sex characteristics were similar except the CSS group which was older (60±13.4 years, p <0.05). The CSS group also showed a significantly greater RRmax compared to other groups (p<0.05). There was a rising trend for RR max with age, from 2.9 s in < 20 years to 7.9 s in patients >80 years. There was no correlation between RR max and diagnosis. The risk of a long pause was positively correlated with increasing age (r=0.57) and female sex (p<0.05). Adenosine bolus administration to syncope patients produces effects similar to ATP. The observed effect correlates with age rather than the underlying cause of syncope. We could not show that this test identified patients whose syncope might be due to paroxysmal AV block and might need pacing. Hence, adenosine bolus testing appears to have little role in the investigation of syncope.

### Infective Endocarditis: The Present Scenario

VZ Parekh, A Sheela, BC Isaac, MJ Santhosh, GG Shetty, K Varghese, CB Patil, SS Iyengar
St John’s Medical College Hospital, Bangalore

In recent years the profile of infective endocarditis is changing. We studied 47 patients of infective endocarditis admitted to our hospital over the last 3 years. There were 35 males and 12 females. Mean age was 43±17.5 years. 37 (79%) of the cases had underlying heart diseases. Rheumatic heart disease was seen in 15 (32%), congenital heart disease in 12 (26%), and mitral valve (MV) prolapse in 10 (21%). 10 had no underlying structural heart disease. Fever 34 (72%) and dyspnea 25 (53%) were common symptoms. Clinical signs were pallor 30 (64%), splenomegaly 14 (30%), clubbing 13 (28%), congestive heart failure 7 (15%) and icterus 8 (17%). Investigations revealed raised erythrocyte sedimentation rate (ESR) in 34 (72%), leukocytosis in 27 (57%), anemia with Hb<10 gm in 22 (47%), thrombocytopenia in 12 (26%), proteinuria 25 (53%), raised serum creatinine in 11 (23%) patients and microscopic hematuria in 7 (15%). Blood culture was positive in 17 (36%) patients out of which 10 had Staphylococcus aureus (22%), followed by Streptococci in 6 (13%) and Enterococci in 1 (2%) patient. Vegetations were observed in 42 (89%) cases, 21 (45%) on mitral valve, 19 (40%) on aortic valve, 2 (4%) on tricuspid valve and 1 (2%) on right ventricular outflow tract (RVOT) and 1 (2%) on pulmonary valve. Complications seen were hematological 27 (57%), cardiovascular 23 (49%), renal 11 (23%), septicemia 7 (15%), neurological 6 (13%) and others 7 (15%). Ten (21%) patients died and 2 (4%) were lost to follow-up. Old age, low platelet count and renal dysfunction were associated with fatal cases. We compared our study with a previous Indian study published in 2001. Culture positivity (36% v. 56%, p=0.02), clinical signs like clubbing (28% v. 58%, p=0.003) and splenomegaly (30% v. 61%, p=0.001) were significantly less in our study. Right-sided endocarditis was seen in 8% of our cases. Infective endocarditis was more often seen in elderly and mitral valve was most frequently involved. Culture negativity was often seen and Staphylococcus aureus was the commonest organism. Old age and renal dysfunction were associated with high mortality.
Role of Oral Sildenafil in Pulmonary Arterial Hypertension: Intermediate Term Follow-up Study

Mukesh K Sharma, Naveen Garg, Sudeep Kumar, Aditya Kapoor, Satyendra Tewari, PK God, Nakul Sinha, Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow

The prognosis and functional capacity of patients with pulmonary arterial hypertension (PAH) is poor, and there is no effective oral treatment available for management of PAH. In this context, oral phosphodiesterase type-5 (PDE-5) inhibitor, sildenafil has shown promising results. Sildenafil is an effective and selective pulmonary vasodilator. This study was conducted to evaluate the safety and efficacy of oral sildenafil therapy in patients of severe PAH. It is still ongoing and, until now, we have studied 40 consecutive patients of severe PAH (18 with primary pulmonary hypertension, 22 with Eisenmenger’s syndrome; male-female ratio 19:21; mean age 25.37 ± 11.32 years (range: 12-56 years). Fifteen patients were in NYHA functional class II while 25 were in NYHA class III (mean NYHA class 2.63 ± 0.49). Sildenafil was started at a low dose (6.25 mg thrice a day) and was gradually increased to 100 mg thrice a day. Mean maximum dose achieved was 185.65 mg/day (range: 150-300 mg/day). All patients tolerated the drug very well and no major side effect was observed in patients. Two patients reported rhinorrhea at 300 mg/day dose responded by decreasing the dose to 150 mg/day. No significant fall in BP was noticed in any patient. At mean follow-up of 8.26 months (range: 3-28 months), functional class improved by ≥ 1 class in all patients. Mean NYHA class was improved from 2.63 ± 1.52. Six min walk test distance was improved significantly from 245.28 ± 105.25 m to 326.68 ± 124.91 m (p = 0.001). A significant fall in predicated right ventricular (RV) systolic pressure by echocardiography was also noticed from 121.83 ± 19.34 mmHg to 99.11 ± 15.46 mmHg (p = 0.001). Follow-up cardiac catheterization was done in 10 cases which revealed significant fall in pulmonary artery (PA) mean pressure (67.9 ± 9.97 mmHg to 55.38 ± 10.03 mmHg, p = 0.001) with decrease in pulmonary vascular resistance (14.50 ± 5.51 WU to 9.12 ± 5.74 WU; p = 0.001). To conclude, oral sildenafil therapy is safe and improves functional class and decreases RV systolic pressure in patients of PAH and can be a safe and effective treatment for PAH.

Treatment of Cardiac Emergencies through Telemedicine

Vindh K Gupta, Devi Prasad Shetty, Alok Roy, Sanjeev Garg, Rabindranath Tagore International Institute of Cardiac Sciences, Kolkata

Telemedicine is the one of the ways to treat patients in places where it is difficult to provide specialist medical advice. An effort was made by Asia Heart Foundation to provide emergency cardiac care to patients where such facilities were not present. Connectivity was through a simple telephone, fax, International Subscribers Dialling Network (ISDN), satellite link. The outcome was satisfactory and morbidity and mortality levels were reduced significantly. India is a vast country where majority of the population reside in towns and villages. These places do not have access to specialist medical advice and care. For such a facility they need to travel long distances, spend a lot of time and money. In cardiac patients, early recognition of the problem and its early treatment helps reduce morbidity and mortality. Asia Heart Foundation has set up a few cardiac care units in the districts and sub-divisional hospitals in West Bengal, Tripura, Karnataka in collaboration with the respective governments and Indian Space Research Organization (ISRO) over a period of nearly four years. Any person attending the emergency department with complaint of chest pain or any other complaint related to heart is referred to the cardiac care unit (CCU). Here he is examined by the doctor - who is a medical graduate- history is recorded, and an electrocardiogram done. This data is sent to RN Tagore International Institute of Cardiac Sciences (RTIICS) or Narayana Hrudyalaya (NH) at Bangalore through the communication network set up. A specialist at the hub center then gives his advice which is carried out by the doctor at the remote center. Similarly, any patient wanting to consult any specialist at the hub centers is similarly screened. A total of nearly 6000 in-patients and around 13000 other patients have been advised and treated through this network without having to travel. This group included new, follow-up, and post-operative patients. Most of the in-patients were discharged. Feedback forms from these patients were positive and the role of telemedicine in helping them was appreciated. India is a vast country where majority of the population reside in the semi-urban and rural areas. These people do not have access to specialist medical care and advice as such facilities are available only in a few metropolitan cities. One of the many reasons for such a disparity could be the high infrastructure costs and the lack of enough number of specialists. Telemedicine can help to bridge this gap. It is concluded that the telemedicine is the only way to provide specialist care and facility to places where such facilities do not exist. A team of motivated doctors, nurses, technicians, politicians, bureaucrats along with a reliable tele-communication link can change the health scenario of the country. The telemedicine project is under the joint partnership of Asia Heart Foundation, ISRO and the governments of West Bengal, Karnataka, Tripura.
Study of Prevalence of Syndrome Z
SD Singh, YI Singh, KSH B Singh, L Prasad
Regional Institute of Medical Sciences, Imphal

Cardiovascular metabolic syndrome X is becoming very common in India. And the combination of syndrome X with obstructive sleep apnea (OSA) has been labeled syndrome Z which has cardiovascular implications. We studied the prevalence of syndrome Z among patients visiting our cardiology department and syndrome X was diagnosed based on NCEP III guidelines and OSA was diagnosed based on overnight oximetry study. Recurrent episodes of arterial oxygen desaturation (10-15 events/hour) were used to diagnose OSA. Of 100 patients of syndrome X studied, 35 patients (35/100) had syndrome Z, of which 25 patients were male. Mean age was 47.1±0.6 years (varying from 38-64 years). Alcohol intake was also significantly (p< 0.05) associated with OSA and uncontrolled hypertension. Results of the study are, fasting blood sugar (FBS) > 110 (mg/dl): 21 (60.0%) patients; abdominal obesity: 34 (97.1%) patients; high triglycerides: 23 (65.7%) patients; low high-density lipoprotein cholesterol (HDL-c): 33 (94.3%) patients; hypertension: 35 (100%) patients; mean oxygen desaturation 78% (range: 70-84%) patients. Thus, it is concluded in our study that syndrome Z was present in 35% of syndrome X patients (in males 71.4%).

Marathon Participation in Heart Disease Patients
Aashish Contractor, Pradnya Salgaonkar, Jigar Shah, Sangeetha Subramanium, Ramakanta Panda
Asian Heart Institute and Research Centre, Mumbai

Physical inactivity is an established risk factor for coronary heart disease (CHD). After a cardiac event, patients are made to begin low-level physical activity immediately after they are clinically stabilized. This is increased to a moderate level of physical activity within a few weeks, which should then be maintained lifelong. Low-risk patients may even participate in strenuous physical activity provided they increase their activity level in a graded symptom-limited manner. 22 CHD patients took part and successfully completed the 7 km dream run in the 2004 Mumbai Marathon. In 2005, we enrolled a total of 47 patients to take part in the Standard Chartered International Mumbai Marathon. Of these, 30 had undergone coronary artery bypass graft surgery (CABG), 9 had undergone angioplasty, and 6 were on medical management for stable CHD. These individuals were enrolled in the cardiac rehabilitation department at our institute, for an endurance training program. Here, they exercised thrice a week with telemetry monitoring for a duration of 3 months. They were also taken for training sessions outdoors once every 3 weeks. At the end of the training period they were subjected to a pre-participation stress test. Average time from the coronary event to marathon participation was 104 days. The mean age was 59 years, mean ejection fraction 53%, mean Bruce protocol time 9 min 47 s and mean time from coronary event to participation 104 days. Two patients had a positive stress test (for which they were further evaluated) and were not allowed to participate. All the remaining patients completed the 7 km dream run with an average time of 63 min and 30 s (fastest time was 53 min and the slowest was 74 min). No adverse events were recorded during or after the marathon. All of them reported a boost in their self-confidence levels and reported a high level of motivation to continue with their previous levels of physical activity. Hence, it is concluded that strenuous physical activity is safe for CHD patients, provided they are appropriately screened and activity is increased in a graded symptom-limited fashion.

Changes in Cardiorespiratory Parameters before and after Sudarshan Kriya
JS Bhuvaneswaran, K Srikanth, D Priya
PSG Institute of Medical Sciences and Research, Coimbatore

Sudarshan Kriya (SK) is a special yogic programme conducted by Art of Living group devised by Guruji Sri Sri Ravishankar. It has various components of specialized breathing patterns in sequence. Millions of followers all over the world practice and report positive well being and better health. There are reports available on effect of Sudarshan Kriya on brain functions, endocrine system, immune system and treatment benefits in patients of addiction, depression and post-traumatic disorders. To test the effect of Sudarshan Kriya on cardiorespiratory (CR) functions, we conducted a programme with the participation of 11 healthy Sudarshan Kriya practicing volunteers. Various cardiorespiratory parameters were assessed using echocardiography color Doppler and computerized pulmonary function testing before and after Sudarshan Kriya. It was found that for short Sudarshan Kriya there is a significant increase in tidal volume (p<0.05), fractional shortening and ejection fraction (p<0.05). For long Sudarshan Kriya there is a significant effect on tidal volume and oxygen saturation (p<0.05). Our study confirms the positive effect of Sudarshan kriya on certain cardiorespiratory parameters. More studies are being organized to see its therapeutic implications in selected group of cardiorespiratory illnesses so that it can become a supplementary modality of treatment in these patients.

Transmission of Electrocardiogram through Cellphones
Y Suman Vyas, V Karani, C Narasimhan
CARE Hospitals, Hyderabad

Electrocardiogram (ECG) is one of the most vital diagnostic tools in cardiology widely available, being informative,
inexpensive and non-invasive. Interpretation of ECG needs good experience and knowledge in cardiology which may not always be available at a peripheral center especially in developing countries thus delaying access to vital therapeutic strategies. Transtelephonic transmission of ECGs from peripheral center to a cardiologist at tertiary center may be helpful in solving the said problem. In the present study we transmitted 30 ECGs through cell phone over a distance varying between 5 to 500 km using Card Guard CG-7100G, (Scientific Survival Ltd.) instrument between March 2005 to July 2005. Variables compared were as follows: standardisation, rate, rhythm, P, QRS, T morphology, PR interval, QRS duration, ST segment, QT interval, presence of features suggestive of infarction, ischemia, infarction or injury, chamber enlargement and arrhythmias. Of the 30 ECGs studied 17 were of acute coronary syndrome(ACS), three were bundle branch block, four arrhythmias, one arrhythmogenic right ventricular dysplasia. Five were of left ventricular hypertrophy (LVH). There was no difference in magnitude of ST or T changes in patients with ACS. ECGs of arrhythmias and arrhythmogenic right ventricular dysplasia (ARVD) transmitted were truly represented. Transmitted ECGs of LVH and left bundle branch block (LBBB) showed decrease of 0.2-0.3 mv in R wave height. We conclude that transmission of ECG through cell phones is at least helpful in initial diagnosis of life-threatening cardiovascular conditions. It can be used by paramedics to initiate treatment with consultation of an expert at far off distance.

Pulmonary Embolism - Diagnosis and Management

F Sushmita, BC Isaac, MJ Santosh, GG Shetty, K Varghese, CB Patil, SS Iyengar
St John’s Medical College Hospital, Bangalore

Pulmonary embolism (PE) being often underdiagnosed requires astute judgement by the clinicians in view of its protean manifestations and variable clinical course. We retrospectively analyzed 40 cases of pulmonary embolism admitted to our hospital between June 2002 and May 2005. Out of the 40 cases, 22 were males and 18 females. The age range was 23 to 60 years with a median of 50 years. Dyspnea (87.5%), pleuritic chest pain (37.5%) and cough (30.0%) were the common symptoms. Tachypnea (97.5%), raised jugular venous pressure (JVP) (65.0%), pulmonary rales (65.0%) and tachycardia (55.0%) were the frequent signs. Pulmonary embolism occurred post-operatively in 32.5% cases. Other predisposing factors were hypertension in 30.0%, pre-existing cardiopulmonary disease in 27.5%, deep vein thrombosis (DVT) in 12.5%, malignancy in 12.5% and history of trauma in 10.0%. D-dimer was done in 21 cases and was raised in all. The electrocardiogram findings were ST-T changes (57.5%), sinus tachycardia (35.0%), S1Q3T3 (30.0%), rightward axis (25%) and right bundle branch block (RBBB) (20.0%). Chest X-ray showed cardiomegaly in 25.0%, pleural effusion in 17.5%, consolidation in 22.5% and prominent pulmonary artery in 10%. Echocardiogram done in all patients, showed right atrial (RA)/right ventricular (RV) dilation in 90.0%, pulmonary artery hypertension in 90.0% and RV dysfunction in 50%. Thrombus in pulmonary artery was visualized in 30% of cases. CT thorax was done in 20 cases and 35% showed thrombus in pulmonary artery. Lower limb venous Doppler was done in 24 cases and thrombus was detected in 30%. Tests for thrombophilic state were carried out in 8 patients; 9 patients were thrombolized with streptokinase; 37 out of 40 were treated with anticoagulants; 3 patients received inferior vena cava (IVC) filter. Six out of 40 patients died in hospital while the rest were discharged on oral anticoagulants. With a strong clinical suspicion of pulmonary embolism it is found that D-dimer, echocardiography and CT thorax helped in confirming the clinical diagnosis while ECG and chest X-ray were relatively non-specific. Treatment was individualized. While most of the patients received anticoagulation only few were thrombolysed and a few received IVC filter.
Arteria Lusoria and Right Transradial Procedures: Issues and Solutions!
K Jani, A Ranjan, N Tanwar, S Suryawanshi, R Radadiya, S Gupta, H M alhota, S Shah, T Patel
Sterling Hospital, Ahmedabad

Arteria lusoria is the retroesophageal right subclavian artery originating from distal and posterior aspect of the horizontal part of aortic arch at its junction with descending aorta. Although one of the commonest congenital aortic arch anomaly, its overall incidence is very less. We have performed over 10,000 cases through right radial approach but it was encountered in only 14 cases so far. Difficult entry into ascending aorta is the first indication of arteria lusoria. The subclavian angiogram confirms the presence of arteria lusoria. Between January 2002 to June 2005, arteria lusoria was found in 14 patients. Mean age of the patients was 54.8±11.1 years; 10 (71.4%) were male. No patient had any symptoms attributable to arteria lusoria. The first task in such cases is to enter ascending aorta. The standard 0.35" guidewire has a tendency to go into descending aorta. The entry into ascending aorta is facilitated by giving a "U" curviloop to 0.35" guidewire or with catheters like Simmons, Amplatz left (AL), Patrick diagnostic or Judkins catheters. Terumo wires are helpful in difficult cases. Once wire has reached ascending aorta, the catheters are carefully maneuvered into ascending aorta and the guidewire is preferably changed to Amplatz superstiff guidewire (exchange length) to provide adequate support. The cannulation of the coronary arteries is difficult in such cases and requires gentle maneuver. Maneuvering of the catheter is difficult due to poor application of torque due to marked angulation at entry in ascending aorta. Amplatz left (AL), Amplatz right (AR), Judkins left (JL) Judkins right (JR) are preferred to the normal diagnostic catheters [Tiger (Terumo Corporation, Japan) at our center]. Cannulation of left coronary ostia was done with AL or JL 3.5/4. Cannulation of right coronary ostia was done with AL/AR or JR 3.5/4. The mean number of catheters (3.2±1.4) and guidewires (3.7±0.8) required to complete coronary angiogram were higher than routine cases. Selective cannulation of left coronary artery (LCA) was achieved in all cases in right coronary artery (RCA). Non-selective cannulation of RCA was done in 1 case. Left ventriculogram was performed in all cases. Mean procedural time (32.7±4.9 min) and fluoroscopic time (14.3±6.3 min) was higher than routine cases. For percutaneous coronary interventions (PCI), guiding catheters with long tip and gentle curve (no sharp angulations) that take support of opposite wall of aorta properly cannulated coronary ostia (Voda (Boston-Scientific, USA) for LCA and Patel right (Boston-Scientific, USA) for RCA). Once the coronary ostia were cannulated properly the rest of the procedure was uneventful. There was no increase in the rate of local vascular site complication rate. No crossover to femoral artery was needed. Wherever, the arteria lusoria was diagnosed earlier (index procedure) the subsequent procedures were performed through left radial route. It is concluded that arteria lusoria is a rare aortic arch anomaly encountered during transradial coronary procedures. Although it can prolong the procedure and fluoroscopic times, the procedure can be completed from right radial approach.
Problems of Subclavian Tortuosity in Transradial Approach: ‘Easy or not so Easy’!
S Suryawanshi, N Tanwar, A Ranjan, F Panchal, K Fonseca, S Gupta, H M alhotra, S Shah, T Patel
Sterling Hospital, Ahmedabad

Transradial approach (TRA) has gained popularity in many parts of the world, including some Indian centers. Tortuosity of subclavian artery may cause prolonged catheter manipulation, incomplete examination or cross over to other access site. From January 2002 to June 2005, we retrospectively analyzed 80 patients who underwent coronary procedures through TRA and had problems of the passage (crossing or maneuvering of either guidewire or catheter) in the subclavian artery. When standard J-tipped 0.035” guidewire encountered resistance in subclavian area, it was replaced with exchange length hydrophilic-coated Terumo wire to cross subclavian area. Subclavian angiograms were recorded if there was difficulty in manoeuvring of Terumo guidewire. A 0.014-angioplasty guidewire was used to cross subclavian artery. When standard J-tipped 0.035” guidewire is due to poor application of force and torque due to abnormal angulation. These problems were overcome by the maneuvers described above.

Radio Contrast Nephropathy in Type-2 Diabetes Mellitus: Simple Measures to Prevent Complication
F Panchal, A Ranjan, N Tanwar, H M alhotra, K Jani, K Fonseca, SM Shah, S Shah, T Patel
Sterling Hospital, Ahmedabad

Radio contrast nephropathy (RCN) is a known complication after coronary angiography and interventions. The risk of developing RCN is higher in diabetic patients. Adequate hydration along with sodium bicarbonate (NaHCO3) before and after the procedure and oral N-acetylcysteine (NAC) have been effective in preventing RCN. We prospectively studied 102 Type-2 diabetes mellitus patients (54 men; 52.9%) with mean duration of diabetes of 13.9 ±11.8 years, who underwent coronary procedures at our center from January 2005 to May 2005. Each of these received NAC 600 mg for 3 days (at least 1 dose prior to procedure) and 5% dextrose solution (420 ml) with 80 ml NaHCO3, at the rate of 60 ml per hour for 12 hours, starting at least 4 hours prior to procedure. We excluded patients with decompensated congestive heart failure and acute myocardial infarction (AMI) (Killip class>3). Average 71.8±21.3 ml of contrast (Omnipaque) was used during the procedures. Serum creatinine (Scr) levels were measured before procedure, and 24 hours, 72 hours and 7 days (only in patients where RCN was present) post–procedure. RCN was defined, as an increase in Scr level >0.25 mg/dl. The clinical profile of the patients and the Scr levels are indicated in the table.
was aimed to see the effect of another PDE-5 inhibitor (PDE-5) with severe pulmonary arterial hypertension (PAH). This study conducted a prospective randomized controlled trial comparing the effects of oral tadalafil added to conventional therapy with that of conventional therapy alone. In our study, clinical improvement was seen in 96.5% and hemodynamic improvement was seen in 93.1% of patients.

### Short-Term Results of Tadalafil in Severe Pulmonary Arterial Hypertension

SD Singh, M K Singh, NB Singh, RKB Singh
Regional Institute of Medical Sciences, Imphal

Recent studies reported the efficacy and safety of phosphodiesterase-5 inhibitor (PDE-5-I) sildenafil in patients with severe pulmonary arterial hypertension (PAH). This study was aimed to see the effect of another PDE-5-I, tadalafil on clinical outcome and hemodynamics of patients of severe PAH (pulmonary artery systolic pressure ≥ 80 mmHg). We conducted a prospective randomized controlled trial comparing the effects of oral tadalafil added to conventional therapy with that of conventional therapy alone, over a six months period (June 2004 to December 2004) in 35 patients of severe PAH. Twenty-nine patients (primary pulmonary hypertension: 10; Eisenmenger: 10, collagen vascular disease: 1, chronic cor pulmonale-1) received 20 mg of tadalafil and 13 patients received conventional therapy. Age of tadalafil receivers ranged from 1 year to 45 years (mean 20.1 ± 0.6 years).

**Hemodynamic measures using transthoracic echocardiography (TTE) and 6 min walk test were used as monitors.** Improved parameters started at 4 weeks and was sustained till 6 months follow-up. Clinical benefit was noted in all etiologic forms of PAH. The result after 6 months follow-up has been tabulated.

<table>
<thead>
<tr>
<th>Group I (tadalafil 20 mg)</th>
<th>Group II (conventional)</th>
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<tbody>
<tr>
<td>Baseline</td>
<td>After treatment</td>
</tr>
<tr>
<td>Six min walk test (m)</td>
<td>311.1±24.2</td>
</tr>
<tr>
<td>Pulm. art. sys. pressure (mmHg)</td>
<td>86.2±61.6</td>
</tr>
<tr>
<td>Pulm. art. mean pressure (mmHg)</td>
<td>49.1±9.2</td>
</tr>
<tr>
<td>Pulm. art. size (mm)</td>
<td>30.0±4.0</td>
</tr>
</tbody>
</table>

Only one patient of atrial septal defect (ASD) Eisenmenger deteriorated and tadalafil had to be withdrawn. Another patient of primary PAH had an improvement in 6 min walk test, but there was no change in pulmonary arterial pressure (hemodynamics). Thus, tadalafil, like sildenafil is a useful adjunctive drug to conventional therapy for severe PAH. In our study, clinical improvement was seen in 96.5% and hemodynamic improvement was seen in 93.1% of patients.
Role of N-Acetylcysteine in Prevention of Contrast-Induced Nephropathy in Diabetic Patients undergoing Coronary Interventions

S. Nandakumar, P.P. Sharma, V.K. Sahhuja, A. Grover, A. Bahl, N. Ganju, K.K. Talwar

Postgraduate Institute of Medical Education and Research, Chandigarh

N-acetylcysteine (NAC) has been shown to reduce the risk of contrast-induced nephropathy (CIN) in patients with real dysfunction undergoing coronary angiography. To study the role of NAC in prevention of CIN in diabetic patients, 122 diabetic patients undergoing coronary angiography or intervention were randomized to two groups of 61 each to receive NAC (600 mg twice daily for two days) plus saline hydration or saline hydration alone. Serum creatinine and creatinine clearance was estimated at baseline, 24 hours, 48 hours and 72 hours after procedure. Urinary albumin was estimated semi-quantitatively. Contrast nephropathy was defined as rise in serum creatinine by 0.5 mg/dl or 25% increase above baseline at 48 hours after procedure. There was no significant difference between the NAC group and controls in baseline characteristics, baseline creatinine and volume of contrast used. Incidence of CIN was significantly lower in the NAC group (13.11% v. 36.07%, p=0.001). Mean change in serum creatinine after 48 hours was +0.033 (0.32) in control group (p=0.016). Mean change in creatinine clearance after 48 hours was +1.5 (22.92) in NAC group versus -10.53 (16.42) in control group (p=0.001). Subgroup analysis revealed significant decrease in the incidence of CIN with NAC in diabetics with albuminuria and renal failure (15.4% v. 56.3 (p=0.05) and in diabetics with albuminuria without renal failure (10.5% v. 41.2%, p=0.05). No significant difference in CIN was noted in diabetics without albuminuria or renal failure (13.8% v. 21.4%, p=0.5). We conclude that prophylactic administration of N-acetyl) cysteine along with saline hydration prevents contrast-induced nephropathy in diabetic patients with albuminuria with or without renal failure.

A RANDOMIZED, PLACEBO-CONTROLLED, DOUBLE BLIND, CROSS-OVER STUDY TO EVALUATE THE EFFICACY AND SAFETY OF ORAL SILDENAFIL TREATMENT IN SEVERE PULMONARY ARTERY HYPERTENSION

TP Singh, M. Anuj Kumar Rohit, Anil Grover, Samir M. Alhotra, Rajesh Vijayvargiya

Post Graduate Institute of Medical Education and Research, Chandigarh

Severe pulmonary artery hypertension (PAH) is a disorder with limited treatment options. Several new drugs have recently been tried to treat PAH. Oral sildenafil has shown promise in the treatment of PAH in several uncontrolled studies but controlled trials have been few. In this randomized, placebo-controlled double-blind, cross-over study, we evaluated the efficacy of oral sildenafil in idiopathic pulmonary artery hypertension (IPAH) and PAH due to Eisenmenger syndrome. The primary end point of efficacy was the improvement in distance covered in 6 min walk test (6MWT). Secondary end points were reduction in pulmonary artery pressure (PAP) as measured by Doppler echocardiography after 6 weeks of treatment and improvement in clinical condition, New York Heart Association (NYHA) class, and exercise duration and METS achieved on modified Bruce exercise protocol. Patients were randomized to receive placebo or sildenafil in a double-blind manner for 6 weeks and after a washout period of 2 weeks, were crossed over. Ten cases each of IPAH and PAH due to Eisenmenger syndrome showed significant improvement in primary and secondary end points. Distance covered in 6MWT improved from 262.05 ± 98.99 m to 358.95 ± 96.51 m (P<0.0001). PAP improved from the baseline of 98.6 ± 25.3 mmHg to 68.5 ± 4.1 mmHg (p<0.0001), NYHA class improved from 2.65 ± 0.59 to 1.55 ± 0.51 (p<0.0001), exercise duration from 6.270 ± 0.729 min to 9.985 ± 0.582 min (p<0.0001), and METS achieved from 3.32 ± 1.57 to 6.04 ± 1.87 (p<0.0001). There was no significant fall in blood pressure with placebo and sildenafil and no serious side effects were observed in the study. Oral sildenafil significantly improved the symptomatic status, exercise capacity, NYHA class and hemodynamic parameters of patients with severe PAH due to IPAH and Eisenmenger's syndrome and may be safely used as a primary or adjunctive treatment of the same.

Effect of Sildenafil on Secondary Pulmonary Hypertension in Patients with COPD - A Case Control Study

Santanu Guha, S. Chatterjee, S. Pal, Sharmila Guha, Niloy Chatterjee, P.P. Chakraborty, S. Roy Chowdhury

North Bengal Medical College, Darjeeling

Chronic obstruction of pulmonary disease (COPD) is one of the commonest cause of secondary pulmonary hypertension (PHT) encountered in clinical practice. Other than trying to improve the primary condition, there is hardly any therapeutic option to reduce the PHT. Sildenafil, a phosphodiesterase (PDE) 5 inhibitor has been shown to reduce PHT in some studies presumably by increasing the cyclic GMP concentration. In this case-control study, we tried to assess the effect of sildenafil on PHT in patients with COPD. Subjects for the study were taken up from those attending our institute and who were found to be having PHT on echocardiography. Patients having concurrent diseases which may cause PHT were excluded. Informed consent from all patients and approval of the institutional ethical committee were taken.
Phosphodiesterase-5 Inhibitors in Eisenmenger Syndrome: A New Therapeutic Option
Saibal Mukhopadhyay, Manish Sharma, Jamal Yusuf, Mohit D Gupta, S Ramakrishnan, S Anandraja, R Batra, Sanjay Tyagi
GB Pant Hospital, New Delhi

Pulmonary vascular pathology is similar in Eisenmenger syndrome (ES) and primary pulmonary hypertension (PPH). Phosphodiesterase-5 inhibitors (PDEI-5) have produced significant reduction in pulmonary vascular resistance (PVR) in PPH. The present study assessed acute hemodynamic and short-term (3 months) effects of tadalafil (PDEI-5) on symptoms/exercise capacity in patients of ES. Fourteen symptomatic (NYHA class II/III) patients of ES [8 with ventricular septal defect (VSD), 4 with patent ductus arteriosus (PDA), 2 with atrial septal defect (ASD)] age range: 18-42 years, mean 25.4±7.7 years; weight: 42-65 kg, mean 46.1±7.9 kg on optimal medical therapy underwent cardiac catheterization at the end of 1 month, 3 months and 6 months period. The results were assessed and statistically analyzed. There was a significant reduction in PAP in Group A patients (p<0.01) when compared with controls who experienced a marginal reduction of PAP.

<table>
<thead>
<tr>
<th>Mean PAP</th>
<th>Initial</th>
<th>After 1 month</th>
<th>After 3 months</th>
<th>After 6 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases</td>
<td>46</td>
<td>32</td>
<td>26</td>
<td>19</td>
</tr>
<tr>
<td>Controls</td>
<td>39</td>
<td>35</td>
<td>36</td>
<td>28</td>
</tr>
</tbody>
</table>

Sildenafil has a favorable effect in reducing pulmonary artery pressure in patients of COPD with secondary pulmonary hypertension.

Phosphodiesterase-5 Inhibitors in Eisenmenger Syndrome: A New Therapeutic Option
Saibal Mukhopadhyay, Manish Sharma, Jamal Yusuf, Mohit D Gupta, S Ramakrishnan, S Anandraja, R Batra, Sanjay Tyagi
GB Pant Hospital, New Delhi

Pulmonary vascular pathology is similar in Eisenmenger syndrome (ES) and primary pulmonary hypertension (PPH). Phosphodiesterase-5 inhibitors (PDEI-5) have produced significant reduction in pulmonary vascular resistance (PVR) in PPH. The present study assessed acute hemodynamic and short-term (3 months) effects of tadalafil (PDEI-5) on symptoms/exercise capacity in patients of ES. Fourteen symptomatic (NYHA class II/III) patients of ES [8 with ventricular septal defect (VSD), 4 with patent ductus arteriosus (PDA), 2 with atrial septal defect (ASD)] age range: 18-42 years, mean 25.4±7.7 years; weight: 42-65 kg, mean 46.1±7.9 kg on optimal medical therapy underwent cardiac catheterization after 6 min walk test (6 MWT). After baseline study, all patients were given tadalafil (40 mg) orally and restudied after 90 min. Patients with >20% fall in PVR were defined as responders. All including non-responders (NR) were put on 40 mg/day tadalafil under supervision in hospital with monthly follow-up and repeat catheterization at 12 weeks. Of 14 patients, 11 were responders. There was significant decrease in PVR (22.8±6.1 mmHg to 17.6±6.4 mmHg, p= 0.004), mean pulmonary artery pressure (84.6±12.8 mmHg to 79.4±11.1 mmHg, p = 0.02), right-to-left shunt (L/min) (2.1±1.1 to 1.3±0.5, p = 0.004) and improvement in systemic oxygen saturation (%) (85.1±5.3 to 88.9±3.3 p=0.002). There was no change in SVR (systemic vascular resistance) (22.4±7.3 WU to 23.9±7.1 mmHg, p=0.21). None of the patients showed worsening of SaO₂. Seven patients have completed 12 weeks follow-up study (including 2 NR). All 5 responders have shown improvement in functional class by ≥ 1, significant increase in 6 MWT without further fall in PVR than that achieved acutely. Both NR have shown improvement in NYHA class, 6 MWT and no further increase in PVR. No adverse effects of the drug were seen. Interim results suggest that PDEI-5 in ES is well tolerated, improves symptoms, and produces either significant decrease or arrest in progress of PVR. It may be considered a new therapeutic option in patients of ES. Three months follow-up data of all patients will be presented.

Cardiac Evaluation in Patients with HIV Infection
M Prashanth Kumar, RG Srikant, Chandragouda, K Pramod
Vijayanagara Institute of Medical Sciences, Bellary (Karnataka)

The objective of this study was to conduct clinical, electrocardiographic (ECG), chest skigram and echocardiographic evaluation in patients with HIV infection. A prospective study of 100 patients with HIV infection in our institute was undertaken. The patients were evaluated using two-dimensional (2D) echocardiography with Doppler analysis, ECG, chest roentgenogram. One hundred normal volunteers also underwent echocardiographic assessment and served as controls. On electrocardiography, various abnormalities like low voltage complexes, sinus tachycardia and ST-T changes were found. On chest skigram, cardiomegaly was found in many patients. 2D echocardiography with Doppler analysis revealed abnormalities in various parameters like left ventricular (LV) systolic dysfunction, diastolic dysfunction, decreased ejection fraction and pericardial effusion. The study shows that cardiac abnormalities are quite common in patients with HIV infection. Thus, baseline cardiac evaluation in patients with HIV infection was considered essential by means of simple non-invasive investigations like ECG, chest skigram and echocardiography.
Radial Artery Antispastic Diltiazem Study
KA Sambasivam, S Natarajan, PR Vyidianathan, RK Abhaichand, S Suvasini
G Kuppusamy Naidu Memorial Hospital, Coimbatore

The aim of the study was to compare the two different doses of intra-arterial diltiazem (IAD) during transradial (TR) coronary procedures. This was a prospective double-blind randomized study comparing 5 mg versus 10 mg of IAD in patients undergoing TR coronary angiograms. Out of a total of 669 patients, 320 patients were given 5 mg bolus of IAD (Group I) and 349 patients received 10 mg of diltiazem (Group II). 1 ml of 1% xylocaine was used as local anesthetic and 1 µg/kg of fentanyl was given intravenously in all patients. All patients received 5000 units of heparin and 100 µg of nitroglycerine intra-arterially after the sheath insertion. Pain, spasm, need for additional drugs, need for hemodynamic support and the time between sheath insertion and coronary cannulation (sheath cannulation time (SCT)) were compared in both groups. Baseline characteristics were comparable in both groups. There was no statistically significant difference between the two groups in the incidence of pain, spasm, need of additional drugs and SCT. More patients in Group I needed hemodynamic support. IAD is an effective antispastic agent that can be used in transradial procedures. Also, 5 mg of bolus diltiazem is as effective as 10 mg.

Cardiovascular Manifestations in HIV-Infected Patients
P Kannan, RA Janarthanan, S Palanichamy, V Amuthan, S M urugan, S Balasubramanian, M ohamed S Naina, S Balashankar, G Prathap Kumar, G Jeyakumar, P Thirumalai Kolundu Subramanian, PAT Jagadeshwari, A Uma, K Karthikeyan, M R Parthasarathy, M Anandan
Madurai Medical College, and Government Rajaji Hospital, Madurai

The aim of the study was to find out cardiovascular manifestations in patients with HIV infection. We studied 200 patients with HIV infection attending our hospital during the period January 2005 - June 2005. All patients were subjected to thorough clinical examination and then underwent echocardiographic evaluation using Aloka Pro 2000. All patients were submitted for T-lymphocyte count and ELISA test. Patients in whom there was pericardial effusion were submitted for microbiological evaluation like IgM antibodies for tuberculosis/toxoplasma, etc. Patients with history of drug abuse, previous history of cardiac illness, previous treatment with antiretroviral drugs, left ventricular (LV) dysfunction were excluded. The results of the study are as follows: 120 patients were male, 80 patients were female. The mean duration of HIV illness among them was 6 months-7 years. LV dysfunction was present in 28 patients; among them a CD4 count of <200 was seen in 20 patients. Pericardial effusion was seen in 20 patients, out of them a CD4 count of <200 was seen in 15 patients. Tuberculous as etiology for pericardial effusion was proved in 16 patients, pulmonary hypertension was present in 10 patients and 1 patient had dilated cardiomyopathy.

<table>
<thead>
<tr>
<th>CD4 count &gt;200</th>
<th>CD4 count &lt;200</th>
</tr>
</thead>
<tbody>
<tr>
<td>LV dysfunction</td>
<td>8</td>
</tr>
<tr>
<td>Pericardial effusion</td>
<td>4</td>
</tr>
<tr>
<td>Pulmonary hypertension</td>
<td>4</td>
</tr>
<tr>
<td>Dilated cardiomyopathy</td>
<td>1</td>
</tr>
</tbody>
</table>

Measurement of Cholesterol and Triglyceride in Dried Blood
R Lakshmy, R Quraishi, D Prabhakaran, M Irshad, AK Mukopadhyay, BL Jailkhani
All India Institute of Medical Sciences, New Delhi

Dried blood on filter discs has wide applicability if the analyte of interest can be extracted from filter discs and assayed. To the best of our knowledge this approach has not been explored for lipid measurement. In the present study, feasibility of extraction of cholesterol and triglycerides from blood dried on filter paper and subsequent measurement of the analytes using enzymatic method was evaluated. A comparison of blood dried on filter paper and plasma collected on the same day was made in 75 samples. A correlation of 0.97 and 0.94 was observed for cholesterol and triglycerides, respectively. Further, the stability of dried blood for measurement of cholesterol and triglycerides was tested for three months at different storage temperatures. The dried blood cholesterol concentrations were stable for 2 months when stored at room temperature, while triglycerides remained stable for one month only. At lower temperatures (4°C) both the analytes were stable up to 3 months. After standardization of the technique, blood was collected on filter paper (n=60) and cholesterol and triglycerides were measured. The mean cholesterol values of serum analyzed directly was 4.914 mmol/L. Same samples dried on filter paper, extracted and assayed gave a mean cholesterol value of 4.885 mmol/L. The difference was not statistically significant when analyzed by repeated measure ANOVA. A good correlation was also observed in triglycerides measurement by the two methods. In conclusion, cholesterol and triglycerides can be stored and extracted from dried blood and these are suitable for epidemiological studies.
Importance of Rapid Estimation of Prothrombin Time and INR
BP Chatterjee, Sachin Deba Singh, S Banerjee, D Roy
Rabindranath Tagore International Institute of Cardiac Sciences, Kolkata

Appropriate oral anticoagulation requires accurate estimation of internationalized normal ratio (INR). The time required for estimation of INR by conventional technique is long and hence delays the process of disposal of service to the follow-up patients with prosthetic device, increasing the duration of their stay in the clinic. The total antioxidant level in serum samples of healthy individuals (n=50) by this method was found to be 1.2±4.2 mmol/L.

Comparative Assessment of Vascular Endothelial Function in Athletes versus Normal Population by Arterial Elasticity Index
Madan Mohan, Georgey Koshy, S Thanikachalam, M Jayarajah, Ashamoorthy, TR Muralidharan, M Ramesh
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The present study was designed to assess whether athletes seasoned by exercise training had enhanced endothelium-dependent vasodilation by assessment of arterial elasticity in comparison to a age- and sex-matched normal lifestyle population. Our study involved 50 healthy volunteers who were non-athletes and 50 age-matched athletes involved in aerobic exercise training; their respective endothelial functions were assessed using the cardiovascular (CV) profiler instrument and a comparative analysis was done. The CV profiler is a non-invasive instrument to assess the endothelial dysfunction by a pulse contour wave analysis and simultaneous analysis of other multiple parameters such as systolic, diastolic and mean arterial blood pressure, pulse.
pressure, pulse rate. It is an easily reproducible test. Large and small artery compliance values or elasticity indices were compared. Our analysis showed a higher elasticity index of large and small vessels in the athletic group in comparison to the normal population with significant statistical value. The large vessel elasticity in the normal population was 12.91±2.94 and in athletes, it was 16.98±3.47 (p<0.001). The small vessel elasticity in the normal population was 5.93±1.52 as compared to athletes (elasticity 8.63±1.78) (p<0.001). We also noted the small vessel elasticity to be a more precise indicator of underlying endothelial dysfunction.

To conclude, regular exercise training in addition to its known beneficial effect in obesity, blood pressure control, diabetes control and cardiac conditioning is essential for maintaining good endothelial function and thereby reducing the risk of cardiovascular/cerebrovascular events. The cardiovascular benefit of exercise in obesity, blood pressure control, diabetes control and cardiac conditioning is essential for maintaining good endothelial function and thereby reducing the risk of cardiovascular/cerebrovascular events.

**Deteriorationg Infective Endocarditis Patients: Is Routine Add on Rifampicin the Answer?**

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Madras Medical College, Chennai

Infective endocarditis (IE) continues to be a dreaded clinical entity for the patient as well as the treating physicians. The complexity of the microbiology and the methods to detect it amplify the issue. Organisms highly sensitive to particular antibiotic in standard laboratory conditions behave differently in vitro. This has possibly encouraged a greater role for empirical antimicrobials. Rifampicin is an approved indication for prosthetic valve IE. We share our experience with add on rifampicin in refractory native valve IE. We report a series of 4 patients with rheumatic heart disease (RHD) and IE. All had severe mitral and/or aortic regurgitation. Mobile vegetations were documented over the concerned valves. They fulfilled the Duke's criteria. Culture was positive as per criteria in two patients. One had negative culture. One had a random culture positive. Organisms grown were Staphylococcus aureus in two and pseudomonas in one. They were initially treated with crystalline penicillin then switched over to culture-guided treatment. The drugs used were ceftrioxone, amikacin, ciprofloxacin and garamycin. The response was either partial or nil. All patients continued to have spikes of temperature even after 10 days of therapy. Two patients developed embolic episodes, one in cerebral circulation and the other in periphery. Renal function deteriorated in two. Cardiac failure worsened in three patients. Emergency surgical management aiming at physical removal of infective focus (vegetation) and valve replacement were planned. In view of poor hemodynamic and systemic condition, surgery could not be done. Refampicin was added in all these patients on an average of 12 days after the diagnosis of IE. The dose administered was 450 mg three time a day. There were significant improvements in all clinical parameters, namely systemic symptoms, sense of wellbeing, weight gain, reduction of erythrocyte sedimentation rate (ESR). There was also a favorable effect on number of afebrile days, maintenance of normal temperature, duration of hospital stay. Further, patients who were on rifampicin were more likely to get discharged in a stable state and facilitate early take over by the surgeon for valve replacement. The mechanism of beneficial effect of rifampicin in IE is still speculative. Being a locker of RNA polymerase it has wide spectrum of action. Apart from its antimicrobial action, there is strong evidence that it suppresses systemic inflammatory mediators by blocking the neutrophil release. It has already proven to be a useful drug in the management of rheumatoid arthritis. It is well known that, there is a strong activation of systemic immuno-inflammatory system in IE. With rifampicin emerging as a strong anti-inflammatory agent, this property has to be fully exploited for the benefit of IE patients. We conclude, routine add on rifampicin over and above the culture-guided treatment could significantly improve the clinical outcome in IE. Further controlled studies are required on this issue urgently.

**Carcinoma Tongue Metastatizing to Right Atrium and Presenting as Budd-Chiari Syndrome**

Naushad, Sanjay M dhrotra, Pradeep Shetty, Gayatri, Ravi Kishore, Narayana Hrudayalaya, Bangalore

Carcinoma tongue metastatizing to right heart is a rare occurrence. Herein we are presenting a case of carcinoma tongue in a 22-year-student, who had undergone radical neck dissection and radiotherapy. One year after this, he presented to our center with features of acute Budd-Chiari syndrome. On evaluation, the patient was found to have right atrial mass at inferior vena cava (IVC) junction, causing obstruction. He also had IVC thrombus, ascites and other features of right-sided failure. Biopsy of right atrial mass was done which confirmed squamous cell carcinoma.
Volumetric Quantification of Pulmonary Regurgitation with Flow Velocity-Mapping Technique on Magnetic Resonance Imaging in Patients following Total Correction for Tetralogy of Fallot
GS Gulati, M Chadha, P Jigga, U Chowdhary, K Pradeep, S Sharma, R Singh, A Saxena, SS Kothari, R Juneja
All India Institute of Medical Sciences, New Delhi

This study sought to quantify pulmonary regurgitant fraction (RF) with phase contrast magnetic resonance imaging (MRI) in patients following tetralogy of Fallot (TOF) repair, and to compare it with measurements derived from ventricular volumes on cine-MRI. MRI (1.5T, Sonata, Siemens, Germany) was performed in 55 patients (males 46; age: 2-27 years (mean: 9 years)) following surgical repair of TOF. Tricuspid regurgitation (TR) was assessed by echocardiography (Echo) in 25 cases. MRI techniques included velocity-encoded (VEC) MRI in main pulmonary artery (MPA), and segmented K-space cine (short axis) MRI for right ventricular (RV) and left ventricular (LV) end-diastolic (EDV) and end-systolic volumes (ESV). RF on VEC-MRI = reverse flow/forward flow in MPA; stroke volume (SV) = EDV – ESV; RF by ventricular volumes = (RV SV–LV SV)/RV SV. RF values were correlated using Pearson’s r (correlation coefficient), b (regression coefficient). Pearson’s r was used to correlate RF at VEC-MRI with RV-EDV, RV-ESV, RV-SV and RV ejection fraction. Image quality was diagnostic in 50 patients (in 5 cases, artifacts due to embolization coils resulted in suboptimal image quality). There was strong positive correlation between RF values derived from VEC-MRI (mean 41%) and ventricular volumes (mean 43.3%) (r=0.786, p=0.00; b=0.762±0.9, p=0.75; r’=0.31, p=0.21; b=0.96). Echo showed minimal/no TR in 23/25 patients. In 4 patients (2 of whom had Echo showing moderate TR) the SV-derived RF significantly overestimated PR. To conclude, VEC-MRI is more accurate than ventricular volume-based MRI technique for quantifying pulmonary regurgitation after TOF repair, particularly in patients with concomitant TR.

Use of 16-Slice Multi-Detector CT Angiography in the Imaging of Patients with Takayasu’s Arteritis
GS Gulati, S Sharma, P Jigga, S Seth, SS Kothari, R Juneja, A Saxena
All India Institute of Medical Sciences, New Delhi

The aim of this study was to describe the imaging spectrum of Takayasu’s arteritis (TA) on multi-detector computerized tomographic angiography (MDCTA), and compare the results with digital subtraction angiography (DSA) in a patient subset. 40 patients [34 females; age range: 10-50 (mean 22 years) underwent MDCTA. 21 patients had DSA. MDCTA of thoraco-abdominal aorta was performed (120 kv/130 mAs/0.5 s tube rotation time; collimation: 0.75 mm; table feed/rotation: 15 mm, slice thickness: 1.5 mm), after intravenous injection of 80 ml non-ionic contrast (iohexol) and 40 ml saline at 3.5 ml/s. Scan delay was set by bolus tracking over aortic arch. Axial and reconstructed multi-planar and maximum intensity projection images were reviewed. DSA was done by the standard technique in multiple views. MDCTA and DSA were interpreted independent of each other. Site and nature of involvement, branch vessel disease, and calcification and reformation of occluded renal arteries were analyzed with both techniques. MDCTA was also used to assess vessel wall thickness and pulmonary artery (PA) involvement. MDCTA images were diagnostic in all cases. Descending thoracic and abdominal aorta were most frequently involved (74% each). Left subclavian artery was more often involved than right (53% v. 21%). Carotid involvement was equal on either side. Bilateral renal involvement was seen in 37% of cases, left being more commonly diseased. Iliac arteries were the least affected (11%). Stenotic lesions predominated (84%) over dilation (26%) and dissecting aneurysms (32%). Wall thickness was 3.1±2.9 mm. PA involvement was seen in 21%. In 21 patients who underwent both the techniques for all lesions, the sensitivity and negative predictive value of MDCTA were 100% each. Presence of minimal disease (wall thickening) caused false positives on MDCTA. MDCTA additionally showed a small dissecting aneurysm and calcification in 3 cases each. Renal artery reformation beyond occlusion was better seen with MDCTA (70% v. 20%). MDCTA reliably displays the spectrum of vascular lesions in TA. Compared to DSA, it can detect minimal disease (increased wall thickness), as well as better visualize reformation of blocked renal arteries, presence of calcification and small aneurysms.

Effect of Duration of Diabetes Mellitus on Arterial Elasticity by Radial Artery Pulse Wave Analysis
Nitin M Kulkarni, Jagdish S Hiremath, Manisha A Mehta
Poona Hospital and Research Center, Pune

Peripheral occlusive arterial disease is a serious complication of diabetes associated with high morbidity and mortality. We analyzed radial artery waveformusing the HDI/pulse wave CR-2000 cardiovascular profiling system calibrated tonometer device. We studied 721 patients with age group from 19 to 88 years, with mean age of 50.72 ± 12.1 years. There were 527 (73.1%) males and 194 (26.9%) females. There were 88 (12.2%) diabetics and 633 (87.8%) non-diabetics. A computerized assessment of the radial
waveform electricity indices large artery (C1) and in small artery (C2) were analyzed. Progressive age, gender and duration of diabetes mellitus (DM) related changes in arterial indices were studied.

<table>
<thead>
<tr>
<th>Patient Category</th>
<th>Number of patients</th>
<th>Mean large artery elasticity indices (ml/mmHg100)</th>
<th>Mean small artery elasticity indices (ml/mmHg100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No DM</td>
<td>633 (87.8%)</td>
<td>12.21</td>
<td>4.91</td>
</tr>
<tr>
<td>DM &lt; 5 years</td>
<td>43 (5.6%)</td>
<td>12.14</td>
<td>3.84</td>
</tr>
<tr>
<td>DM &gt; 5 years</td>
<td>45 (6.2%)</td>
<td>12.12 &gt; p = 0.38</td>
<td>3.19 &gt; p = 0.001</td>
</tr>
</tbody>
</table>

Although statistically significant influence on endothelial function is noted in long standing diabetic individual, the effect is also seen to be dependent on other factors like age and gender of the patients.

Coronary Artery Anatomy and Other Risk Factors as Predictors of Renal Artery Stenosis

Charanjit Singh, Harminder Singh, Prashant Bharadwaj, A Banerji, N Aggarwal, Anil Kumar
Military Hospital, Pune

Ischemic nephropathy is currently a major health issue in atherosclerotic population. Atherosclerotic renal artery involvement in patients with coronary heart disease (CHD) and/or heart failure is frequent and it may influence cardiovascular outcomes and survival in these patients. There is no simple and reliable test to indicate renal artery stenosis (RAS) on large scale. This study was aimed to determine the incidence, pattern and angiographic correlation of RAS in patients undergoing coronary angiography. Three hundred and seven patients consecutively referred to our center for coronary angiography were subjected to renal angiography. Risk factors considered were hypertension, diabetes mellitus and age. Patients with renal dysfunction (serum creatinine >1.5 mg%) were excluded from study. Out of 290 patients 98 were females and 192 males. Insignificant RAS (30-49%) was found in 32 (11%) patients. Six patients had bilateral involvement, rest had unilateral involvement. Significant RAS (>50%) was found in 27 (9%) patients; 3 patients had bilateral involvement, rest had unilateral involvement. Patients with significant RAS were older in age. Out of 59 patients of RAS majority involved ostium and even if midsegment was involved it was with involvement of ostial lesion. Diabetes was more frequent in RAS group. Systolic blood pressure was higher in RAS group. There was increased preponderance of triple vessel disease in patients with RAS. Out of 27 patients, 20 patients had triple vessel disease, 3 had double vessel disease, 1 had single vessel disease and 3 did not have obstructive coronary artery disease. Increased age was more commonly associated with RAS (p< 0.05). Multivessel coronary artery disease (diffuse disease, multiple lesions) were independent predictors of RAS (p<0.001). Hypertension and diabetes were also predictors of RAS. Male gender was more commonly associated with RAS but was not independent risk factor.

Clinical Correlation of CD4 Cell Count and Total Lymphocyte Count with Cardiac Manifestations of HIV Disease

Prakash Chandra Mondal
Apollo-Glenoagles Hospital, Kolkata

Cardiac involvement in HIV-infected persons can occur directly or due to secondary opportunistic infections and secondary malignancies. Cardiac involvement may also be the direct cause of death. The objective of this study was, to evaluate the incidence of cardiac involvement and its correlation with CD4 cell count and total lymphocyte count (indicators of immunological competence). A total of 68 patients were evaluated from May 1996 to May 2005 in our hospital. Besides routine clinical and laboratory examinations, all the patients were evaluated cardiologically with 12-lead ECG, color doppler. Computerized tomography (CT)/magnetic resonance imaging (MRI) of heart and pericardioctesis with pericardial fluid study were done in selected cases. Parameters of 6 (8.82%) patients having cardiac involvement is shown in the table.

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>CD4 Count</th>
<th>TLC</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCM with CCF (2 cases)</td>
<td>230 &amp; 210</td>
<td>1670 &amp; 1580</td>
</tr>
<tr>
<td>Pericardial effusion (lymphoma-1, Koch's-1)</td>
<td>70 &amp; 510</td>
<td>260 &amp; 1680</td>
</tr>
<tr>
<td>Constrictive pericarditis (Koch's)</td>
<td>390</td>
<td>1170</td>
</tr>
<tr>
<td>Recurrent SVT</td>
<td>110</td>
<td>470</td>
</tr>
</tbody>
</table>

DCM: dilated cardiomyopathy; CCF: congestive cardiac failure; SVT: supraventricular tachycardia; TLC: total leucocyte count

In conclusion, cardiac involvement is not so common in HIV disease. CD4 count and total lymphocyte count have no correlation with clinical cardiac involvement except those due to secondary malignancies which usually occur at lower CD4 count.

Angiographic Pattern of Coronary Collaterals in Diabetic Patients

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Myocardial ischemia is known to be significantly related to the development of coronary collaterals, but there are considerable variations in their formation. The nature of this variability is not well understood. Likewise it remains unclear whether diabetes mellitus (DM) has any effect on coronary collaterals. The aim of this study was to evaluate the effect of diabetes mellitus on coronary collaterals. This cross-sectional comparative case-control study was done from January to December 2000 in patients undergoing coronary angiography in our Institute. The inclusion criteria was, having 75% stenosis in at least one coronary artery. The patients with diabetes having coronary artery disease (CAD) without other
modifiable major risk factors (hypertension, smoking, dyslipidemia) constituted the case study group (n=36) and non-diabetic patients having CAD with those risk factors constituted control group (n=50). Coronary collaterals were graded according to Rentrop scoring system and the collateral score was calculated by summing the Rentrop number of every patient. There was no statistical difference between patients with and without diabetes in clinical characteristics. The mean number of diseased vessel in diabetes mellitus group (2.6±0.6) was higher than that in non-diabetic patients (2.1±0.8, p>.05). The mean collateral score was (0.5±0.6) in diabetes mellitus group and (1.2±1.0) in nondiabetic group. These findings suggest that coronary collateral development is significantly poorer in diabetic than in non-diabetic patients.

Non-Invasive Cardiac Output Estimation by Ultrasonic Cardiac Output Monitor in Patients undergoing Biventricular Pacemaker Implantation

Aparna Jaswal, Simmi Manocha, Rajesh Chand, Manish Bansal, Anil Saxena, Yatin Mehta, TS Kler

Escorts Heart Institute and Research Center, New Delhi

Cardiac Output (CO) estimation in patients undergoing biventricular (BiV) pacemaker implantation is a part of the procedure. The technique routinely used is the conventional continuous wave (CW) Doppler method which though reliable, is time-consuming. A new Doppler device-USCOM® (ultrasonic cardiac output monitor) has recently been developed to measure CO non-invasively. We compared CO measured by USCOM device with the values derived from conventional echo-doppler method. We included 25 consecutive patients of refractory heart failure referred for BiV pacemaker implantation. CO estimation was done by both the methods and compared. The study was done 1 day prior to the procedure and then post-procedure on day 2 and post-discharge. USCOM has a non-imaging transthoracic probe and uses CW Doppler signals to obtain a velocity time integral (VTI) at the ascending aorta. The cross section area (XSA) of the vessel is predicted by a height-based nomogram which is incorporated in the USCOM software. Stroke volume (SV) is measured by XSA × VTI and CO by SV × heart rate (HR). The signals are obtained from the ascending aorta in the suprasternal notch. CO measurements by echo and by USCOM device were done by 2 different observers who were unaware of the results obtained from the other modality. There was very good agreement between the values derived by echo and USCOM. Correlation coefficient for comparison between CO derived by the 2 methods was 0.9202 (p<0.001) for measurements obtained pre-procedure, 0.9301 (p<0.001) for measurements on day 2 post-procedure and 0.9707 (p<0.001) for the measurements post-discharge. USCOM-derived CO measurement showed excellent correlation with that derived from echo-Doppler method. Ease of application and relative lack of operator dependance should make this a preferred modality for CO measurements in the lab to guide optimal lead placement and also for frequent use in the outpatient department.

Influence of Baseline Leptin Levels on Weight Loss in Obese Subjects: A Nutrigenomic Study

Yogita Mehta, Anuradha Goyal, Priyanka Rastogi, SK Sharma, VK Kaul, Rajeev Gupta

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Obesity is a major cardiovascular risk factor and is characterized by peripheral leptin resistance and high leptin levels. To assess the predictive value of leptin levels at baseline for weight loss during an intensive weight management programme we performed a controlled study. Successive patients with body mass index (BMI) > 30 kg/m2 presenting to the obesity clinic and interested in weight loss were evaluated. Of 182 subjects screened, 80 (males: 38, females: 42; age range 22-58 years) were enrolled and a detailed clinical, dietary and physical activity history, and anthropometry data obtained. These subjects were randomly divided into groups that were advised usual care (Group 1, n=40) and intensive care (Group 2, n=40). Baseline glycemic status, lipid profile and leptin levels were obtained in all. Leptin levels ranged from 0.2 to 84.3 ng/ml (median ng/ml). Group 2 was further subdivided into those with higher than median leptin levels (Group A, n=20, leptin > 10 ng/ml) and Group B (n=20, leptin < 10 ng/ml). All subjects were followed for a period of 12 weeks and appropriate statistical analyses performed. The mean BMI of study subjects was 33.1±4 kg/ m2, weight 86±13 kg, waist size 105±8 cm in men and 96±9 in women, waist:hip ratio 0.94±0.1 and 0.84±0.1, body fat 37.4±5.3% and visceral body fat 19.0±5.5%. Total cholesterol (TC) was 203±40 mg/dl, low-density lipoprotein (LDL) 123.4±41 mg/dl, high-density lipoprotein (HDL) 42.8±6 mg/dl, and triglycerides 174.4±67 mg/dl. Fasting leptin in men was 12.9±13.5 ng/ml and in women, 19.1±17.7 ng/ml, (range 0.2-84.3 ng/ml). Leptin levels correlated significantly with BMI (Spearman’s r=0.23) and body fat (r=0.34) and not with other anthropometric and biochemical variables. There was no significant difference in baseline clinical variables in the Group 1 and 2 (p>0.05). In usual care Group 1 subjects, no significant change was noted in body weight, BMI, waist and percent body fat at 12 weeks; while in intensive care Group 2 there was a significant decrease in body weight (-2.1%), BMI (-1.8%), body fat (-6.3%), visceral fat (-12.3%), and systolic BP (-6.4 mmHg). Intensive care group with low leptin levels (<10 ng/ml) had lower BMI than with high leptin levels (32.7±4.5 ng/ml v. 35.1±5.1 ng/ml) but lost significantly more weight (-2.5 kg v. 1.3 kg), body fat (-3.2 v 1.2%) and visceral...
fat (-2.7 v. 1.9%) at the end of 12 weeks. The weight loss was associated with significant decline in calorie and fat intake in the intensive care groups. To conclude, fasting leptin levels correlate significantly with BMI and obesity in Indian adults. Obese subjects with baseline leptin levels <10 ng/ml (low leptin resistance) have greater weight and visceral fat loss during an intensive weight management programme.

**Local Complications in Transradial Procedures**

V Anand Kumar, R Balaji, B Anupam, C Raghu
Yashoda Hospital, Hyderabad

During the two year period from January 2003 to December 2004, a total of 2603 transradial procedures were done; 2179 of these were coronary/peripheral angiographies, 418 coronary angioplasties, and 66 renal angioplasties. Vascular sheath sizes used were 5 F in 2066 (79.37%), 6 F in 530 (20.36%), 7 F in 4 (0.15%) and 8 F in 3 (0.12%) cases. Glycoprotein IIb/IIIa receptor blockers were used in 98 (3.76%) cases. Seventy-one (2.73%) patients were classified to have local complications. This included local urticaria in 60 (2.31%) patients, forearm hematoma in 19 (0.73%) patients and hand hematoma in 2 (0.08%) patients. One patient with forearm hematoma developed compartmental syndrome requiring fasciotomy. All other patients were managed conservatively. No patient developed acute hand/finger ischemia or nerve injury. During three months follow-up, 58 out of 229 (2.6%) patients had asymptomatic loss of ipsilateral radial pulse.

**Efficacy of Enhanced External Counterpulsation on Endothelial Dysfunction in Patients with and without Diabetes Mellitus**

RR Kasliwal, M Bansal, P Sidhu, S Mittal
Escorts Heart Institute and Research Centre, New Delhi

Improvement in endothelial function has been reported in patients undergoing enhanced external counterpulsation (EECP). Patients with diabetes mellitus (DM), as compared to non-diabetics, are known to have worse endothelial function which is responsible for greater incidence of adverse cardiovascular (CVS) events in them. We conducted this study to assess effect of EECP on endothelial function in patients with DM. Eighty-one consecutive patients who underwent EECP at our center were included in the study and divided into two groups: Group 1 non-diabetics (n=41), and Group 2 - diabetics (n=40). All patients underwent 35 hours of EECP therapy. Endothelial function was assessed by brachial artery flow-mediated dilation (FMD) in all patients at baseline and at the completion of therapy. At baseline, there was no significant difference in the two groups with respect to age, gender, prevalence of other conventional cardiovascular risk factors, extent of coronary artery disease (CAD) and use of beta-blockers, angiotensin - converting enzyme (ACE) inhibitors and statins. FMD at baseline was 11.78±6.8% in Group 1 and 11.74±6.5% in Group 2 (p=NS). At the end of therapy, FMD increased to 15.15±7.9% in Group 1 (p=0.04 for comparison from baseline) and to 13.3±6.8% in Group 2 (p=0.29 for comparison from baseline). It is concluded that non-diabetic patients derive greater benefit in endothelial function with EECP as compared to diabetics. Whether this difference translates into greater improvement in clinical outcome as well, needs to be assessed in further studies.
**58TH ANNUAL CONFERENCE**
Cardiological Society of India
December 7-10, 2006, New Delhi, India

---

**REGISTRATION FORM**

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<thead>
<tr>
<th>Title:</th>
<th>Dr [ ]</th>
<th>Prof [ ]</th>
<th>Mr [ ]</th>
<th>Mrs [ ]</th>
<th>Ms [ ]</th>
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</thead>
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| Designation: | | | | | |
| Institution/Company: | | | | | |

| Address for Correspondence: | | | |
| City | | | |
| State | | | |
| Pin Code | | | |
| Country | | | |

| Telephone: | | | |
| STD (R) | | | |
| (O/H) | | | |
| Fax | | | |
| Mobile | | | |

| E-mail: | | | |
| CSI Membership No.: | | | |
| Preferred Name for Badge: | | | |

| Accompanying Persons: | | |
| Name (As to be written on Badge) | | |
| 1. | | |
| 2. | | |
| 3. | | |

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**Registration Fee:** (Only by Demand Draft. Cheques will not be accepted)

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<th>Before 31\textsuperscript{st} August</th>
<th>Before 15\textsuperscript{th} November</th>
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<td>Rs. 10000/-</td>
</tr>
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<td>Foreign Delegates</td>
<td>US$300/-</td>
<td>US$400/-</td>
<td>US$500/-</td>
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Demand Draft should be drawn in favour of "Annual CSI Conference-2006"

Draft No. | Dated | Amount Rs. | Drawn on (Bank) | payable at New Delhi.

---

**Pre-Conference Workshop:**

| Attending [ ] | Not Attending [ ] |

<table>
<thead>
<tr>
<th>Dr V K Bahl,</th>
<th>Organizing Secretary</th>
</tr>
</thead>
<tbody>
<tr>
<td>#29, 7\textsuperscript{th} Floor, Department of Cardiology, Cardio Thoracic Centre, All India Institute of Medical Sciences, New Delhi - 110 029, India</td>
<td></td>
</tr>
<tr>
<td>Phone: 26594890, 26589339, Mobile: 9871053131, Tel./Fax: 91-01126589299</td>
<td></td>
</tr>
<tr>
<td>e-mail: <a href="mailto:bahl58csi@yahoo.com">bahl58csi@yahoo.com</a>, website: <a href="http://www.58csi.com">www.58csi.com</a></td>
<td></td>
</tr>
</tbody>
</table>

Signature: ...........................................
Date: .............................................

---
# HOTEL & TOURS RESERVATION FORM

**Title:** Dr □ Prof □ Mr □ Mrs □ Ms □

**Name:**

**Designation:**

**Institution/Company:**

**Address for Correspondence:**

<table>
<thead>
<tr>
<th>City</th>
<th>Pin Code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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<th>Country</th>
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<tr>
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</tbody>
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**Telephone:**

STD □ (R) □ (O/H) □

Fax □ Mobile □

**E-mail:**

**Passport Details:**

(Foreign Delegates)

<table>
<thead>
<tr>
<th>No.</th>
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<th>Place of Issue</th>
<th>Valid until</th>
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**Hotel:**

(List overleaf)

<table>
<thead>
<tr>
<th>Check-In Date</th>
<th>Check-Out Date</th>
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<table>
<thead>
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<th>No. of Nights</th>
<th>No. of Rooms</th>
<th>Occupancy</th>
<th>Single □</th>
<th>Double □</th>
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</thead>
<tbody>
<tr>
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<table>
<thead>
<tr>
<th>Type</th>
<th>Superior □</th>
<th>Deluxe □</th>
<th>Executive □</th>
<th>Standard □</th>
</tr>
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<tbody>
<tr>
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**Arrival Details:**

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<table>
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<th>From</th>
<th>To</th>
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**Departure Details:**

<table>
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<th>To</th>
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**Conference Tours:**

<table>
<thead>
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<th>Tour No.</th>
<th>Date</th>
<th>No. of Persons</th>
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</thead>
<tbody>
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</tr>
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<tbody>
<tr>
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Demand Draft should be drawn in favour of **Alpcord Network-CSI A/C**

<table>
<thead>
<tr>
<th>Draft No.</th>
<th>Date of Issue</th>
<th>Place of Issue</th>
<th>Valid until</th>
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<th>Drawn on (Bank)</th>
<th>Payable at New Delhi</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please mail the completed Form along with payment to:

**Official Travel Coordinator:**

SUMMIT – Alpcord Network, 614, 6th Floor, New Delhi House, 27, Barakhamba Road, New Delhi – 110 001, India

Tel: 2332 4465, 2332 4467, 2332 4470, Fax: 2332 3928

Mobile: 98181 68638 (Mr. Amarjeet Talwar, Director)

9811059036 (Mr. Chander Mansharamani, Managing Director)

Email: summit@alpcord.net

**Signature:**

**Date:**
### Hotel Tariff for CSI - 2006

<table>
<thead>
<tr>
<th>Name of the Hotel</th>
<th>Room Type</th>
<th>Tariff (Single)</th>
<th>Tariff (Double)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5 Star Deluxe</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hotel Le Meridien</td>
<td>Executive</td>
<td>Rs. 9000/-</td>
<td>Rs. 9500/-</td>
</tr>
<tr>
<td>Taj Palace</td>
<td>Deluxe</td>
<td>Rs. 12000/-</td>
<td>Rs. 13000/-</td>
</tr>
<tr>
<td><strong>5 Star</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Park</td>
<td>Deluxe</td>
<td>Rs. 7000/-</td>
<td>Rs. 7500/-</td>
</tr>
<tr>
<td>Crowne Plaza Surya</td>
<td>Superior</td>
<td>Rs. 8250/-</td>
<td>Rs. 8250/-</td>
</tr>
<tr>
<td>The Grand Inter Continental</td>
<td>Deluxe</td>
<td>Rs. 10050/-</td>
<td>Rs. 10600/-</td>
</tr>
<tr>
<td>Claridges</td>
<td>Deluxe</td>
<td>Rs. 10185/-</td>
<td>Rs. 10815/-</td>
</tr>
<tr>
<td>Hotel Samrat</td>
<td>Standard</td>
<td>Rs. 5000/-</td>
<td>Rs. 5500/-</td>
</tr>
<tr>
<td><strong>4 Star</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hotel Hans Plaza</td>
<td>Standard</td>
<td>Rs. 4500/-</td>
<td>Rs. 4500/-</td>
</tr>
<tr>
<td>Hotel Indraprastha</td>
<td>Standard</td>
<td>Rs. 4500/-</td>
<td>Rs. 5000/-</td>
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<td>The Connaught</td>
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<td>Rs. 5575/-</td>
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<td><strong>3 Star</strong></td>
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<td>Hotel Janpath</td>
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<td>Rs. 3000/-</td>
<td>Rs. 3500/-</td>
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<td><strong>Resort</strong></td>
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<tr>
<td>Uppal’s Orchid</td>
<td>Superior</td>
<td>Rs. 7000/-</td>
<td>Rs. 7500/-</td>
</tr>
</tbody>
</table>

All room rates are on per room/per night basis **inclusive of breakfast**.

The tariff is exclusive of tax which is 12.5% as on date. All taxes to be paid separately at the prevailing rate at the time of check out.

One night room rent has to be paid in advance by Demand Draft favoring "Alpcord Network-CSI A/C".

All further correspondence regarding hotel and travel arrangements should be done with Official Travel Coordinator "SUMMIT-Alpcord Network".

---

### Tariff for Pre & Post Conference Tours

<table>
<thead>
<tr>
<th>Tour No.</th>
<th>Date</th>
<th>Details</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>December 7, 8 &amp; 9</td>
<td>Vrindavan &amp; Mathura (same day)</td>
<td>Rs. 1800/-</td>
</tr>
<tr>
<td>2</td>
<td>December 7, 8 &amp; 9</td>
<td>Bharatpur Bird Sanctuary</td>
<td>Rs. 2000/-</td>
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<tr>
<td>3</td>
<td>December 7, 8 &amp; 9</td>
<td>Taj Mahal</td>
<td>Rs. 1900/-</td>
</tr>
<tr>
<td>4</td>
<td>December 7, 8 &amp; 9</td>
<td>Haridwar - Rishikesh (01 night/02 days)</td>
<td>Rs. 4100/-</td>
</tr>
<tr>
<td>5</td>
<td>December 7 &amp; 8</td>
<td>Taj Mahal &amp; Fatehpur Sikri (01 night/02 days)</td>
<td>Rs. 4100/-</td>
</tr>
<tr>
<td>6</td>
<td>December 7 &amp; 8</td>
<td>Jaipur (01 night/02 days)</td>
<td>Rs. 4500/-</td>
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<tr>
<td>7</td>
<td>December 7</td>
<td>Agra &amp; Jaipur (02 night/03 days)</td>
<td>Rs. 7500/-</td>
</tr>
</tbody>
</table>

Travel by air-conditioned coach with English speaking guide.

Inclusive of all Taxes, Lunch and Accommodation in budget class hotels

Full amount to deposited in advance by Demand Draft favouring "Alpcord Network-CSI A/C".
HOTEL & TOURS RESERVATION FORM

<table>
<thead>
<tr>
<th>Title:</th>
<th>Dr ☐</th>
<th>Prof ☐</th>
<th>Mr ☐</th>
<th>Mrs ☐</th>
<th>Ms ☐</th>
<th>First Name</th>
<th>Middle Name</th>
<th>Last Name</th>
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<td>Name:</td>
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<td>(O/H) ☐</td>
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<td>(Foreign Delegates)</td>
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<table>
<thead>
<tr>
<th>Hotel:</th>
<th>(List overleaf)</th>
<th>Check-In Date</th>
<th>No. of Nights</th>
<th>Check-Out Date</th>
<th>No. of Rooms</th>
<th>Occupancy</th>
<th>Single ☐</th>
<th>Double ☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type:</td>
<td>Superior ☐</td>
<td>Deluxe ☐</td>
<td>Executive ☐</td>
<td>Standard ☐</td>
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</tbody>
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<table>
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<tr>
<th>Arrival Details:</th>
<th>Date</th>
<th>Time</th>
<th>Flight/Train No.</th>
<th>From</th>
<th>To</th>
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<th>Departure Details:</th>
<th>Date</th>
<th>Time</th>
<th>Flight/Train No.</th>
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<th>To</th>
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<table>
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<tr>
<th>Conference Tours:</th>
<th>Tour No.</th>
<th>Date</th>
<th>No. of Persons</th>
<th>Tour No.</th>
<th>Date</th>
<th>No. of Persons</th>
<th>Tour No.</th>
<th>Date</th>
<th>No. of Persons</th>
</tr>
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</table>

Demand Draft should be drawn in favour of Alpcord Network CSIA/C
Draft No. .......................................................... Dated ..........................................................
Amount Rs. ..................................................... Drawn on (Bank) ..................................................
Payable at New Delhi.

Please mail the completed Form along with payment to

Official Travel Coordinator:
SUMMIT – Alpcord Network, 614, 6th Floor, New Delhi House, 27, Barakhamba Road,
New Delhi – 110 001, India
Tel: 2332 4465, 2332 4467, 2332 4470, Fax: 2332 3928
Mobile: 98181 68638 (Mr. Amarjeet Talwar, Director)
981109036 (Mr. Chander Manoharamani, Managing Director)
Email: summit@alpcord.net

Signature .................................
Date .................................
**TARIF CARD**

**Hotel Tariff for CSI - 2006**

<table>
<thead>
<tr>
<th>Name of the Hotel</th>
<th>Room Type</th>
<th>Tariff (Single)</th>
<th>Tariff (Double)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5 Star Deluxe</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>Standard</td>
<td>Rs. 4500/-</td>
<td>Rs. 5000/-</td>
</tr>
<tr>
<td>The Connaught</td>
<td>Standard</td>
<td>Rs. 5575/-</td>
<td>Rs. 5575/-</td>
</tr>
<tr>
<td><strong>3 Star</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hotel Janpath</td>
<td>Standard</td>
<td>Rs. 3000/-</td>
<td>Rs. 3500/-</td>
</tr>
<tr>
<td><strong>Resort</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UpaI’s Orchid</td>
<td>Superior</td>
<td>Rs. 7000/-</td>
<td>Rs. 7500/-</td>
</tr>
</tbody>
</table>

All room rates are on per room/per night basis **inclusive of breakfast**.

The **tariff is exclusive of tax which is 12.5% as on date.** All taxes to be paid separately at the prevailing rate at the time of check out.

One night room rent has to be paid in advance by Demand Draft favoring "Alpcord Network- CSIA/C"

The balance payment for the entire duration of stay has to be deposited by 6th November 2006 (30 days prior to check in).

All further correspondence regarding hotel and travel arrangements should be done with **Official Travel Coordinator “SUMMIT-Alpcord Network”**

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**Tariff for Pre & Post Conference Tours**

<table>
<thead>
<tr>
<th>Tour No.</th>
<th>Date</th>
<th>Details</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>December 7, 8 &amp; 9</td>
<td>Vrindavan &amp; Mathura (same day)</td>
<td>Rs. 1800/-</td>
</tr>
<tr>
<td>2</td>
<td>December 7, 8 &amp; 9</td>
<td>Bharatpur Bird Sanctuary</td>
<td>Rs. 2000/-</td>
</tr>
<tr>
<td>3</td>
<td>December 7, 8 &amp; 9</td>
<td>Taj Mahal</td>
<td>Rs. 1900/-</td>
</tr>
<tr>
<td>4</td>
<td>December 7, 8 &amp; 9</td>
<td>Haridwar - Rishikesh (01 night/02 days)</td>
<td>Rs. 4100/-</td>
</tr>
<tr>
<td>5</td>
<td>December 7 &amp; 8</td>
<td>Taj Mahal &amp; Fatehpur Sikri (01 night/02 days)</td>
<td>Rs. 4100/-</td>
</tr>
<tr>
<td>6</td>
<td>December 7 &amp; 8</td>
<td>Jaipur (01 night/02 days)</td>
<td>Rs. 4500/-</td>
</tr>
<tr>
<td>7</td>
<td>December 7</td>
<td>Agra &amp; Jaipur (02 night/03 days)</td>
<td>Rs. 7500/-</td>
</tr>
</tbody>
</table>

Travel by air-conditioned coach with English speaking guide.

Inclusive of all Taxes, Lunch and Accommodation in budget class hotels.

Full amount to deposited in advance by Demand Draft favouring "Alpcord Network-CSIA/C"