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Research Brief

In-hospital and intermediate term outcome of ventricular tachycardia storm

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ABSTRACT

Real world data on management and outcomes of ventricular tachycardia (VT) storm are scarce. This prospective study evaluates the clinical profile, in-hospital outcome and intermediate outcome in patients presenting with VT Storm. A majority (36/50, 72%) were male and the age was 54 ± 15 years. Scar VT was the most common underlying substrate for VT stormand pleomorphic VT was the predominant morphology. Twenty-one (42%) patients underwent cardiac sympathetic denervation, 6 (12%) patients underwent radiofrequency ablation (RFA), 3 (6%) patients amongst these underwent both the precedures in addition to conventional medical management. The overall mortality was 18% and VT free survival was 54%at 6 months follow up. VT recurrence was more common with severe LV dysfunction.

1. Introduction

Ventricular tachycardia (VT) stormis characterized by > 2 episodes of VT or ventricular fibrillation within a span of 24 h.[1] VT storm carries a high mortalityrate even with current advancements in care.[2] Patients often require a multimodality approach using antiarrhythmic drugs, deep sedation, sympathetic blockade and radiofrequency ablation. Implantable cardiac defibrillator (ICD) is one of the mainstays for long-term management. Real-world data on VT Storm is sparse.

2. Method

The objectives of thissingle centre, prospectivestudy were to evaluate the clinical profile, in-hospital outcome and intermediateoutcome in consecutive adult (>18 years age) patients presenting with VT storm. Patients presenting with acute or recent myocardial infarction (MI) were excluded from the study Patients were enrolled from March 2017 to December 2018 VT storm was defined as occurrence of ≥2 hemodynamically stable or unstable VT within 24 h (patients without ICD) or ≥ 3 appropriate therapies for ventricular tachyarrhythmias, including anti-tachycardia pacing or shocks within a span of 24 h (patients with ICD).[2] VT was classified according to the QRS morphology as monomorphic (MMVT), pleomorphic and polymorphic. Pleomorphic VT was defined as >1 MMVT morphology, or a combination of MMVT and polymorphic VT.[3] The left ventricle ejection fraction (LVEF) was assessed by Simpson's method. Patients were considered free of VT if there was no recurrence of VT for at least 1 week. Data was collected at presentation, at the time of discharge andat follow up after six months (in person or telephonically). Mean, standard deviation, categorical variables, Chi square test using the SPSS 16 software was used to analyze data.

3. Results

Fifty patients were included in the study, with 36 (72%) males. The age was 54 ± 15 years. Baseline demographics and clinical profile is presented in Table 1. Scar VTwas the predominant underlying substrate seen in25 (50%) patients (19 post infarct and 6 post myocarditis) and pleomorphic VT was predominant morphology (Table 1). The majority of patients were on amiodarone (62%) and beta-blocker (46%) followed by sotalol (16%), phenytoin (12%) and digoxin (12%). The changes done in medical therapy is detailed in Table 3. In addition to standard care, cardiac sympathetic denervation (CSD) was done in 21 patients. Radiofrequency ablation was performed in 6

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Table 1
Demographics, clinical profile and ventricular tachycardia characteristics.

Variables (N = 50)	Value
Age in years	54 ± 15 years
Male gender	36 (72%)
Diabetes mellitus	13 (26%)
Systemic hypertension	13 (26%)
Family history of sudden cardiac death	4 (8%)
LVEF at baseline	0.38 ± 0.17
LVEF	
<0.3	20 (40%)
0.3–0.5	12 (24%)
>0.5	18 (36%)
Triggers identified for VT	4 (8%)
Unstable VT	6 (12%)
High risk patients*	28 (56%)
Anti-arrhythmic drugs	
Beta blockers	23 (46%)
Amiodarone	31 (62%)
Beta blockers + amiodarone	17 (34%)
Patients with prior Implanted Cardioverter-Defibrillator	34 (68%)
VT morphology	
Monomorphic	19 (38%)
Pleomorphic	27 (54%)
Polymorphic	4 (8%)
Etiology of VT	
Post infarction scar-related VT	19 (38%)
Post- myocarditis LV dysfunction	6 (12%)
Acute myocarditis	3 (6%)
Arrhythmogenic right ventricular dysplasia	4 (8%)
Dilated cardiomyopathy	5 (10%)
Sarcoidosis	3 (6%)
Hypertrophic cardiomyopathy	4 (8%)
Others	6 (12%)

VT: Ventricular Tachycardia; High risk patients include patients presenting with hemodynamically unstable VT or stable VT with co-morbidities (LVEF 0.<3, chronic kidney disease or pulmonary disease)[1,2]; Others include Long QT syndrome(2), idiopathic VT(2), fascicular VT(1) and congenital heart disease(1). The * symbol denotes the number of cases.

patients. Six patients were implanted with ICD during the index hospitalization. Amongst patinets already having ICD, device interrogation and programming was tailored as per the patient's clinical need. Overall, if patient had VT responding to ATP, then number of shocks were minimized in VT-1 and/or VT-2 zones. Twelve patients had VT storm which responded by ATP, 3 patients received shock. Overall 9 (18%) patients died, 4 patients during the index hospitalization and 5 during follow-up (all within 3 months). Among those who died, 6 patients had severe LV dysfunction, all of whomhad an ICD. When compared with patients who survived, only two factors: age above 50 years and scar VT were found to be significantly associated with mortality [X^2 = (1, N = 50) = 6.17, p = 0.013 and X^2 = (1, N = 50) = 3.83, p = 0.05 respectively]. Of the 41 patients who were alive at 6 months, 19 (46%) had VT recurrence; this was more common in those with severe LV dysfunction (Table 2).

Table 2
Follow up observations at 6 months on mortality and ventricular tachycardia (VT) recurrence.

	LVEF ≥0.3	LVEF <0.3	p value
Mortality at 6 months (n = 9/50, 18%)			
Overall **(9/50, 18%)**	3/30 (10%)	6/20 (30%)	0.71
In-hospital (4/50, 8%)	1/30 (3.3%)	3/20 (15%)	0.14
Six months follow up (5/50, 10%)	2/30 (6.6%)	3/20 (15%)	0.34
Survival at 6 months (n = 41/50, 82%)			
VT Recurrence (19/41, 46%)	7/27 (26%)	12/14 (86%)	0.0002
1–3 episodes	4	3	0.96
4-10 episodes	2	4	0.07
>10 episodes	1	5	0.0059

Table 3
Medication use before and after admission for VT Storm.

Medication	Medication before		Medication after	
	Number	Percent	Number	Percent
B Blocker	23	46	21	42
Amiodarone	31	62	35	70
Sotalol	8	16	12	24
Phenytoin	6	12	17	34
Digoxin	6	12	5	10
Nikorandil	1	2	0	0
Ranolazine	1	2	1	2
Mexilitine	2	4	4	8

4. Discussion

In comparison to published studies[1–11] the study cohort was similar in terms of age at presentation, male preponderance and scar VT as the predominant etiology. Data on VT Storm management from real-world setting is scarce, limited to studies on ICDs or specific to certain therapeutic interventions. Overall, triggers for VT storm have identified in a minority (up to 13%),[10] while in our studya trigger was identified in 4 (8%) of patients. Anti-arrhythmic drugs and sympathetic blockade with sedation and beta-blockers are the mainstay for stabilisation. Radiofrequency ablation is useful in selected cases, both in terms of mortality reduction and reduction of VT burden.[11] As a majority of our patients presented with pleomorphic VT, we chose CSD over ablation in these patients. As a single etiology, we agree that CAD was the most prevalent, but actually, 31 (62%) of patients had VT unrelated to CAD. And 27 (54%) of patients had multiple VT morphologies. In these subsets the efficacy of RF ablation is limited. The center is equipped with thoracoscopic CSD surgical expertise and we did jointly report satisfactory results recently.[12] CSD also appeared to be a financially more feasible approach in resource limited settings. In a meta-analysis of 39 studies, CSD was effective in acute suppression of ventricular arrhythmias in 72% of patients.[9] Compared to the study by Prabhu et al[10], we had a lower in-hospital mortality (8% vs19.5%) and a higher rate of CSD (42% vs 21%). The first 3 months following discharge is critical and close monitoring is warranted. Nearly half of the surviving patients had VT recurrence. The incidence and frequency of VT recurrences was higher in patients with severe LV dysfunction (LVEF<0.3). A larger sample size and a longer follow up would

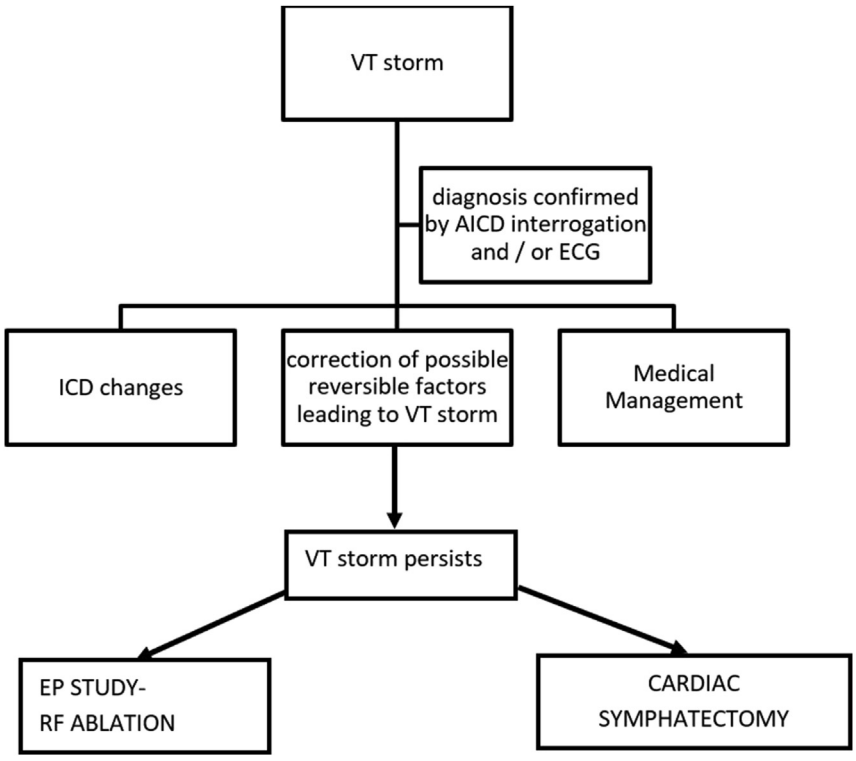

Fig. 1. Institutional protocol for managing VT Storms.

be more revealing. An institutional protocol to manage VT storm is shown in Fig. 1.

5. Conclusion

VT storm portends a high mortality both in acute settings and in the intermediate term. At intermediate term follow up, VT recurrences are common, especially in patients with severe LV dysfunction.

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Declaration of competing interest

Nil.

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