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Original Research Article

A comprehensive work up of various ventricular tachy-arrhythmias in relation to the underling cardiac disorder / status

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ABSTRACT

Background: Main objective of the study is details work up of the patients of ventricular tachy-arrhythmias and to find out its association with any structural heart disease.
Methods: This institution based observational study was conducted in patients of documented sustained VT (ventricular tachycardia) with consecutive 102 patients.
Results: The mean age of the VT patients was 56.7 years and the number of male patients were 70 (69%). In our study, among 102 patients 45 patients were diabetic, 64 patients were hypertensive, 30 patients were current smoker, family history of heart disease was present in 25 patients and family history of SCD (sudden cardiac death) was present in 5 patients. Among the patients who presented with symptoms of ventricular tachy arrhythmia, 25 patients had EF (ejection fraction) above 40%, 36 had EF between 31 to 40% and only 2 had EF below 30%. CAG (coronary angiography) done in 98 patients and 16 had normal coronaries. 20, 16 and 46 patients had single, double and triple vessel disease respectively. 80 patients had coronary heart disease (78%), 20 patients among them had acute ischemic events and 60 had chronic ischemic disease. 12 patients didn't have any structural heart disease.
Conclusions: Ischemic heart disease, acute or chronic, is the most common causes of ventricular tachyarrhythmia. male sex, diabetes mellitus, hypertension, smoking, family history of heart diseases or sudden cardiac death being the risk factors of coronary artery disease are also predisposing factors of ventricular tachyarrhythmia.

Keywords: Ischemic heart disease, Sudden cardiac death, Ventricular tachyarrhythmia

INTRODUCTION

Ventricular arrhythmias occur commonly in clinical practice and range from benign asymptomatic premature ventricular complexes (PVCs) to ventricular fibrillation (VF) resulting in sudden death (SCD). The presence of structural heart disease plays a major role in risk stratification; however, it is important to recognize potentially lethal arrhythmias that may occur in structurally normal-appearing hearts. Coronary artery disease remains the most important underlying cause for ventricular tachy arrhythmias and SCD in majority of adults. Other structural cardiac abnormalities including dilated cardiomyopathy, hypertrophic cardiomyopathy and arrhythmogenic right ventricular cardiomyopathy are important diseases associated with SCD. Primary electrical disorders including long QT Syndrome, Brugada syndrome and short QT syndrome are also associated with significant risk of SCD. As coronary artery disease (CAD) is the dominant cause for

cardiovascular disease, CAD accounts for more than half of deaths due to SCD.[1-4] Furthermore, since the south Asian population has a high prevalence of coronary risk factors, and have CAD at earlier age compared to developed countries, SCD proportionately occurs in younger individuals.[5-6] It has also been estimated that by the end of present decade, 60% of world's heart disease is expected to occur in India and proportionately the incidence and prevalence of SCD is expected to rise. In general, the prognosis and management of ventricular tachyarrhythmia depend on whether underlying structural heart disease is present. With the exception of patients with inherited VT-sudden cardiac death syndromes if structural heart disease is absent, the prognosis in patients with tachyarrhythmia is generally very good,whereas in those with structural heart disease, the subsequent risk for sudden cardiac death is increased.[7-8]

Keeping the above facts in mind, we took the survivors of ventricular tachy-arrhythmias (inside or outside hospital) admitted in our department. Main purpose of this work up was to determine whether the patient has any structural heat disease or not. If heart diseases were present, we assessed the nature and extent of disease which might be a very important issue in management planning.

METHODS

This institution based observational study was conducted at department of Cardiology, in a tertiary care referral centre catering to people of West Bengal and adjoining eastern Indian states from May 2015 to April 2017 (1 year duration) with patients of documented sustained VT. Routine blood along with electrolytes, ECG, Echocardiography were done to all patients and other investigations like angiography, Cardiac CT, CT angiography, cardiac MRI were done to the patients who needed these examinations for their management. Informed consents were taken and the ethics committee approval was obtained prior to study initiation.

RESULTS

Age of the VT patients range from 20 to 80 years in this study population. The mean age was 56.7 years. The demographic profile of the patients is shown in the Table 1.

In our study population 29% patients were farmer, 13% driver, 11% office-worker, 4% gardener, 13% retired, and 30% house wife. Apart from that, two teachers, one shop kipper and one health worker were also present.

41 patients admitted with sign and symptoms of ventricular tachy arrhythmias. Among them 34%patients had history of heart disease. Among the patients who presented with symptoms of ventricular tachy arrhythmia, 25 patients had EF above 40%, 36 had EF between 31 to 40% and only 2 had EF below 30%.

CAG done in 98 patients and 16 had normal coronaries. 20, 16 and 46 patients had single, double and triple vessel disease respectively. 80 patients had coronary heart disease (78%), 20 patients among them had acute ischemic events and 60 had chronic ischemic disease. 12 patients didn't have any structural heart disease.

Table 1: Baseline characteristics of patients presenting with ventricular tachyarrhythmia.

Sex	**Male**	**Female**	
	70	32	
DM	yes	no	
	45	57	
HTN	yes	no	
	64	38	
Smoking	yes	no	
	30	72	
Family history of heart diseases	yes	no	
	25	77	
Family history of SCD	yes	no	
	5	97	
CAG	Normal	Abnormal	
	16	Single vessel disease	20
		Double vessel disease	16
		Triple vessel disease	46
Etiology	Chronic IHD		80
	Acute coronary syndrome		20
	Other cardiac disease		10
	No structural heart disease		12

DISCUSSION

In general, the specific type, prognosis, and management of VT depend on whether underlying structural heart disease is present. With the exception of patients with inherited VT-sudden cardiac death syndromes, if structural heart disease was absent, the prognosis in patients with ventricular tachy-arrhythmia was very good, whereas in those with structural heart disease, the subsequent risk for sudden cardiac death was increased. Clinical setting and echocardiography were the two most important work up procedures to determine the etiology and prognosis.

The incidence of sudden death had two peak ages: within the first year of life (including sudden infant death syndrome (SIDS); and between 45 and 75 years of age.

In adults older than 35 years, the incidence of SCD was 1 per 1000 persons per year.[9,10] In our study population, average (mean) age of patients of ventricular tachyarrhythmia was 56.7 years. Majority of patients were between 50 to 65 years of age. This data correlate with the common age of SCD.

SCD syndrome has a large preponderance in men relative to women during the young adult and early middle-age years because of the protection that women enjoy from coronary atherosclerosis before menopause. Even though the overall risk for SCD is much lower in younger women, coronary artery disease is the most common cause of SCD in women older than 40 years, and the classic coronary risk factors, including cigarette smoking, diabetes, use of oral contraceptives, and hyperlipidemia, all influence risk in women.[11] In our study population, also 69% were male and rest were females.

Associations between levels of physical activity and SCD have been studied with variable results. Epidemiologic observations have suggested a relationship between low levels of physical activity and increased risk for death from coronary heart disease. The Framingham Study, however, showed an insignificant relationship between low levels of physical activity and the incidence of sudden death but a high proportion of sudden to total cardiac deaths with higher levels of physical activity. An association between acute physical exertion and the onset of myocardial infarction has been suggested, particularly in individuals who are habitually physically inactive. A subsequent case crossover cohort study confirmed this observation for SCD by demonstrating a 17-fold relative increase in SCD associated with vigorous exercise as opposed to lower level activity or inactive states.[12] However, the absolute risk for events was very low (one event per 1.5 million exercise sessions). Habitual vigorous exercise markedly attenuated risk. In contrast, SCD has a higher incidence in young athletes than in young nonathletic individuals in the same age range. Information about physical activity relationships in various clinical settings, such as overt and silent disease states, is still lacking.

The conventional risk factors used in early studies of SCD are risk factors for the evolution of coronary artery disease. However, risk factors specific for fatal arrhythmias are dynamic patho-physiologic events and occur transiently.[13]

Hypertension is a clearly established risk factor for coronary heart disease and also emerges as a highly significant risk factor in the incidence of SCD. In our study population 66% patients were hypertensive, mostly poorly controlled. Diabetes is a very important CVD risk factor. Apart from this a history of diabetes mellitus and a tendency to have longer QTc intervals on random electrocardiograms are suggested as a potential marker of interest for prediction of SCD.[14] In our study population 44% patients were diabetic. Other than advanced age, smoking remains the single most important risk factor for coronary artery disease. In addition to MI, cigarette consumption directly relates to increased rates of sudden death, aortic aneurysm formation, symptomatic peripheral vascular disease, and ischemic stroke. According to the 2010 Surgeon General's Report 15 cigarette consumption is the leading preventable cause of death and disease in the United States, in our study population 29% of patients were smoker; but when we calculated it among male patients it was 57%.

Familial patterns of risk for ventricular tachyarrhythmias, which result from known or suspected genetic variations, are emerging as important factors for risk profiling. This concept is generally applicable in regard to both disease development and SCD expression in the common acquired disorders and in a specific sense to inherited arrhythmogenic conditions associated with SCD. To the extent that SCD is an expression of underlying coronary heart disease, hereditary factors that contribute to risk for coronary heart disease operate nonspecifically for the SCD syndrome. However, studies have identified mutations and relevant polymorphisms along multiple steps of the cascade, from atherogenesis to plaque destabilization, thrombosis, and arrhythmogenesis, each of which is associated with increased risk for a coronary event.[16,17] In our study population 25% had family history of heart disease and 5% had family history of SCD.

Approximately 50% of cardiac arrests occur in individuals without a known heart disease1. But in contrary to above data, when patent admitted with symptoms of ventricular tachy-arrhythmias in our institution, most of the patients had given the history of either past cardiac events or ongoing cardiac diseases for which he/she is under treatment. This is probably due to the fact that those with known cardiac diseases come to medical attention when minimal symptoms occur and referred to tertiary centre early.

The patients, who presented with symptoms of ventricular tachyarrhythmias, commonly are of known heart disease. Common symptoms of presentation are palpitation, breathlessness, vertigo, chest pain and syncope. Symptom, like prolong unconsciousness, is rare probably due to underdeveloped emergency transport system. Most of them succumb before admission. Though ventricular fibrillation is the most common cause of SCD than ventricular tachycardia, patients of ventricular tachycardia usually reach hospital alive.

In patients with cardiomyopathy who have good functional capacity (Classes I and II), total mortality risk is considerably lower than in those with poor functional capacity (Classes III and IV), but the probability that a death will be sudden is higher. In our study population, who presented with symptoms of ventricular tachy arrhythmia, are of class I and class II functional capacity before the arrhythmic episodes. Only 6% of patients are of class III symptomatic. This data suggests that, those who are of advanced functional class could not tolerate arrhythmia for prolong time, which is necessary for transport to the hospital.

We assessed LV function of the patients admitted with symptomatic ventricular tachy arrhythmias after proper resuscitation. 57% of patients had EF between 31 to 40%,

40% patients had EF more than 40%, and 3% patients had EF below 30%. We have already discussed that proportion of SCD more among the patients with preserved LV function.

Survivors of out-of-hospital cardiac arrest tend to have extensive coronary artery disease but no specific pattern of abnormalities. Acute coronary lesions, often multifocal, were present in most survivors. Significant lesions in two or more vessels were present in at least 70% of patients who had any coronary lesion. In patients who had recurrent cardiac arrest, the incidence of triple vessel disease was higher. However, the frequency of moderate to severe stenosis of the left main coronary artery did not differ between cardiac arrest survivors. In our study CAG was done in 98 patients. Among them 16% patients had normal coronary. 47% patients had triple vessel disease, 16% patients had double vessel disease and 21% had triple vessel CAD. CAG was not done in 4 patients.

Ultimately wed estimate the association of ventricular tachyarrhythmias with structural heart diseases. Among the population 78% of patients had coronary artery disease. Among them 60 patients had chronic ischemic heart disease, 20 patients had acute heart disease. 10 patients had structural heart diseases other than CAD. Among them two had myocarditis (viral other SLE myocarditis), two patients had HCM, one patient had DCM, one ARVD, one lead endocarditis, one had peripartum cardiomyopathy and one had valvular AS. 12% of patients had no such structural heart disease. Among them 5 patients had VT associated with CHB. Though if CHB patients show attack of VT, most of the cases were polymorphic and considered as the manifestation of underlying long QT syndrome. But in our study 4 patients had monomorphic VT and the causes were undetermined.

This study had few limitations. The number population was very small. Though we had performed echocardiography of all patients, we could not do MRI of all the patients. We could not perform genetic testing which might have helped to find out the etiology of ventricular arrhythmias.

CONCLUSION

Ischemic heart disease, acute or chronic, is the most common causes of ventricular tachyarrhythmia. Male sex, diabetes mellitus, hypertension, smoking, family history of heart diseases or sudden cardiac death being the risk factors of coronary artery disease are also predisposing factors of ventricular tachyarrhythmia.

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