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EVALUATION OF PREDICTORS OF ARRHYTHMIA IN HYPERTROPHIC CARDIOMYOPATHY PATIENTS

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Abstract

Introduction: Hypertrophic cardiomyopathy (HCM) is a condition in which part of the heart becomes thick (hypertrophy) for no apparent reason. Ventricular (fibrillation and ventricular tachycardia) and supraventricular (AF) arrhythmias are common in these patients. This study was performed to evaluate and evaluate the electrocardiographic and echocardiographic factors associated with arrhythmia in HCM patients referred to the Rajaei Heart Center undergoing ICD implantation in patients with sudden arrhythmia (SCD), stroke, and exacerbation of heart failure. Taken is designed.

Materials and Methods: The present study is a descriptive-analytical study that was performed on patients of Rajaei Heart Center with the diagnosis of HCM for whom a cardiac device was implanted. The variables studied in this study included age, sex, type of clinical manifestation of HCM, family history of sudden death, patient's underlying electrocardiographic findings, recorded patient arrhythmias, patient echocardiographic findings, and type and number of patient ICD treatments including shock and ATP. Finally, the data were entered into SPSS software and analyzed. A significance level of 5% was considered for all analyzes.

Results: In the present study, out of 116 patients, 62 were male and 54 were female. The age range of patients was 20 to 87 years and the mean age of patients was 50.4 14 14 years. In the present

study, there was a significant relationship between atrial fibrillation and mean ventricular thickness (P = 0.007) and left ventricular size (P = 0.04). In addition, there was no significant relationship between EF and ventricular arrhythmia (P = 0.57) but there was a significant relationship between EF and atrial fibrillation (P = 0.02).

Conclusion: In the present study, no factor was found that could significantly predict ventricular and supraventricular arrhythmias. In contrast, ventricular arrhythmias may be more common at older ages, with greater LV size, lower EF, and the presence of large, deep inverted TS.

Key words: HCM, ventricular arrhythmia, ICD

Introduction

Primary hypertrophic cardiomyopathy, as the most common genetic cardiac abnormality, disrupts the order of myofibrils and changes the structure of normal heart tissue and scar areas, and such changes are associated with life-threatening arrhythmias. Sustained VT and PVC are common arrhythmias in these patients (1).

Atrial fibrillation (the most common supraventricular arrhythmia in these patients) occurs in 20% of patients. The incidence of AF decreases the quality of life in HCM patients and increases morbidity and mortality (2). Various studies have shown that age and LA enlargement are directly related to the incidence of AF. The occurrence of AF is strongly associated with the severity of hypertrophy. Commonly seen in patients with outflow obstruction. (3-5) AF association with echocardiographic markers such as LA dysfunction, volume index (LAVI), fractional shortening, and electrocardiographic markers such as P wave dispersion has also been reported. (6)

SCD following ventricular arrhythmias (VF / VT) usually occurs in adolescence and adulthood less than 30-35 years and may be the first clinical manifestation in asymptomatic individuals with HCM. Risk factors for suden death including young age, syncope, family history, myocardial ischemia and sustained ventricular tachycardia have been shown in studies. Ventricular tachycardia has been reported to be associated with increased intraventricular septal thickness and the severity of hypertrophy (7).

ICD implantation is indicated for primary prevention in patients rescued from cardiovascular arrest and stable VT, and for primary prevention in patients with risk markers introduced according to available guidelines. Before using the ICD to prevent ventricular arrhythmias, electrocardiographic studies have shown that VF followed episodes of VT or AF RVR. The occurrence of PVC before VT has also been shown in some studies (8).

Identifying and selecting people with ICD implantation indications has always been a topic of discussion and procedure indications are subject to change. So far, few studies have been performed to identify the predictors of common arrhythmias in this group of patients and so far no study has been conducted in this field in this center and the findings obtained can not be generalized due to the small sample size. There is no independent algorithm in this field. As a result, we decided to conduct a study in this area and examine the various demographic, electrophysiological and paraclinical factors of patients with arrhythmia.

Materials and methods

Study design

This study is a descriptive-analytical and retrospective study on the information of 116 patients (62 men and 54 women) with a diagnosis of hypertrophic cardiomyopathy implanted in the device. The implementation protocol was approved by the Ethics Committee of Iran University of Medical Sciences. All patient information will be confidential, and their personal information will not be mentioned anywhere, and finally in the present study, no additional diagnostic and therapeutic

intervention was performed on the patients, and after obtaining the patients' consent, the studied variables were based on The information entered in the file was evaluated by examining the criteria studied during hospitalization and during the follow-up of patients.

Study population

In this study, all patients' residence at Tehran, Iran, who with a diagnosis of hypertrophic cardiomyopathy implanted in the device. Inclusion criteria include definitive diagnosis of HCM, Being an adult, absence of obstructive CAD, rejection of other cardiomyopathies such as DCM, presence of accurate echo or CMR, ECG and accurate history in patient records to extract variables required, presence of concomitant heart disease as other anomalies Congenital and surgical history, device implantation for the patient, patient referral for follow-up, and for device analysis and recording of arrhythmias, consent to participate in the study. Exclusion criteria included any deficiencies in test information, other types of cardiomyopathy, and unwillingness to participate.

Data gathering

For this study, using the keyword HCM and with the help of the IT department of Rajai Heart Center, the hospital code of all patients with a possible diagnosis of HCM for whom a heart device was implanted was extracted and studied with the help of the patient records center archive. After extracting the data in the file, with the help of another researcher, the device analysis information in patients was extracted and recorded from the electrophysiology department of the center.

The variables used in this study included age, sex, type of clinical manifestation of HCM, family history of sudden death, patient's baseline electrocardiographic findings, patient-recorded arrhythmias, patient echocardiographic findings, and type and number of patient ICD treatments including shock. And ATP.

Statistical analysis

All data were analyzed with SPSS (Version 25.0, SPSS Inc., Chicago, IL, USA). Quantitative variables were described using the mean ± standard deviation (SD) of the data, and qualitative variables were described using the frequency and percentage of the data. Students' paired t-test and Chi-square tests were applied to analyze the variables. $P < 0.05$ was considered statistically significant.

Results

In this study, out of 147 patients who were included in the study, 12 due to incomplete records, 6 due to ischemic cardiomyopathy, 5 due to other cardiomyopathies, 4 due to childhood, 2 due to congenital anomalies and Two patients were excluded from the study due to lack of follow-up and finally the data of 116 patients were collected and analyzed.

Among 116 patients (62 men and 54 women) with a diagnosis of hypertrophic cardiomyopathy for whom a device was implanted, The age range of patients was 20 to 87 years and the mean age of patients was 50.4 ± 14 years.

37.04% of patients with syncope, 20.37% of patients with dyspnea, 16.67% of patients with cardiac arrest, 14.81% of patients with palpitations, 11.11% were asymptomatic. 61.11% of patients had a family history of sudden cardiac death.

Nearly 40% of patients had a recorded history of death. Suddenly in first- or second-degree relatives, type III disease is the most common type of HCM in the patients studied. A total of 30 patients received ICD therapy (shock and ATP), of which 13 were appropriate and the rest were due to supraventricular arrhythmias. Out of 30 patients, all received shock And 11 of them also received ATP.

The most common findings of electrocardiography were STT change (73.2%) followed by R Tall (47.4%) and Q Abnormal (40.5%). Conductive disturbance (LBBB, RBBB, Other IVCDs, High degree AV Block) was seen in a total of 38 patients according to the table above.
HCM types 1, 2 and 3 were present in 92.2% (n = 10) of patients and type 4 in 8.8% (n = 9) of patients. Max LV thickness was 2.5 + 0.6 cm and 75 patients (64.6%) were SAM + and 34 patients (29.3% (more than 50 mm Hg gradient) had EF value of 52.4 + 7.9%. LVE, LAE, significant MR were observed in 19, 24, 17 patients (16.3, 20.7, 14.6%, respectively).

During 2-4 year follow-up, AF / AT / Flutter was seen in 30 patients (20.8%), VT in 15 patients (12.9%), NSVT in 43 patients (37%) and VF in 8 patients (6.9%).

According to the results of Independent T test, there was no significant relationship between mean ventricular thickness with ventricular arrhythmia (P = 0.78) but there was a significant relationship between mean ventricular thickness with atrial fibrillation (P = 0.007). There was also no significant relationship between EF and ventricular arrhythmia (P = 0.57) but there was a significant relationship between EF and atrial fibrillation (P = 0.02).

According to the results of square-Chi test, there was no significant relationship between left ventricular size and ventricular arrhythmia (P = 0.71), but there was a significant relationship between left ventricular size and atrial fibrillation (P = 0.04). There was no significant relationship between QT Long and ventricular arrhythmia (P = 0.2). But there was a significant relationship between QT Long and atrial fibrillation (P = 0.01)

Discussion

In the present study, out of 116 patients, 62 were male and 54 were female. The age range of patients was 20 to 87 years and the mean age of patients was 50.4 ± 14 years. Nearly 40% of patients have a history of sudden death in first or second-degree relatives. Type III disease is the most common type of HCM in the patients studied. the most common clinical manifestation of syncope was 37% of patients.

Primary hypertrophic cardiomyopathy, as the most common genetic abnormality of the heart, disrupts the order of myofibrils and changes the structure of normal heart tissue and scars, and such changes are associated with life-threatening arrhythmias. Supraventricular and ventricular arrhythmias, especially non sustained VT and PVC, are common arrhythmias in these patients (9).
Atrial fibrillation (the most common supraventricular arrhythmia in these patients) occurs in 20% of patients. The occurrence of AF reduces the quality of life in HCM patients and increases morbidity and mortality.

Various studies have shown that LA enlargement and aging is directly related to AF. The incidence of AF is strongly associated with the severity of hypertrophy and is commonly seen in patients with obstruction outflow. The relationship between AF incidence and echocardiographic markers such as fractional shortening, LA dysfunction volume index (LAVI) and electrocardiographic markers such as P wave dispersion has been reported (10,11). In the present study, the most common electrocardiographic findings were STT change, followed by R Tall and Q Abnormal. Conductivity disorders were seen in a total of 38 patients, and in the follow-up of 1 to 11 years (middle 3 years), more than 25% of patients experienced AF rhythm and more than 55% of them experienced ventricular arrhythmias.

In the present study, the most common clinical manifestation of syncope patients was 37% of patients (mean LV Max thickness was 2.5 ± 0.6 cm) and 75 patients was SAM + 64.6 %, and the mean EF was 52.4 ± 7.9 %. Also 61.11 % of patients had a family history of sudden cardiac death.
In a similar study by siontis et al., The following results were obtained:

18% of patients with HCM had AF. Age of patients with AF was reported higher and a significant relationship was reported between AF and larger left atria, higher E / e ratio, worse cardiopulmonary execise tolerance. (12)

Another study by Hen et al. On MRI findings in patients with non-sustained VT significantly increased AF, T2-high signal, LV end-systolic volume index, and number of segments with late gadolinium enhancement and reduction. Higher LVEF was reported (13)

In a study conducted by KIM JW et al. In individuals with ICD. ECG changes including T wave alternance, T wave peak-to-end interval, QT interval and RR interval between VT clinical and VT induced groups were examined. T-wave changes were reported higher among VT clinical groups. Finally, they concluded that repolarization changes play an important role in the induction of VT in humans (14). In another study, QRS duration has been proposed as a constant predictor of threshold defibrillation (15). A study by Candan et al. Concluded that fibrosis and fiber disarray may cause arrhythmias such as non-sustained ventricular tachycardia, sustained ventricular tachycardia, and even VF (16).

In another study by Debonnaire et al., The reduction in global longitudinal peak strain (GLPS) found in patient echocardiography was strongly associated with fibrosis detected in patients' CMR and was introduced as a predictor of arrhythmic events (17). In a study by WEN et al., QTc prolongation was suggested as a predictor of arrhythmia recurrence in patients undergoing AF ablation (18). In another similar study by Fasoli et al., QTcd was proposed as a predictor of ventricular electrical instability and as a guide for appropriate drug therapy (19). In the study, the prevalence of myocardial scar reported in CMR was higher in patients with VT (20). In a study conducted by Terai H et al., Increased cardiac sympathetic activity as an increase in wash out in scintigraphy was introduced as a predictor of malignant VT in HCM patients (21). It should be noted that physiologically, the causes of cardiomegaly are related to other diseases and problems that lead to excessive activity of the heart muscle, such as high blood pressure or thyroid diseases (22-39).

Conclusion:

The results of this study can help us better identify patients at risk for HCM and better classify disease risk. Also, with a better understanding of the pathophysiology of the disease, we can hope for new therapeutic measures both in terms of early diagnosis and treatment.

Given the significant prevalence of HCM and the heavy burden of this disease on the health and economy of society, it is worthwhile to find new diagnostic and therapeutic methods for these diseases with more research in this field and a better understanding of the pathophysiology of the disease.

Author contribution:

All authors contributed to the study conception and design. All authors read and approved the final manuscript.

Compliance with ethical standards:

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