

ELECTROPHYSIOLOGICAL FINDINGS AND OUTCOME OF PATIENTS WITH IDIOPATHIC LEFT VENTRICULAR TACHYCARDIA

Malik Faisal Iftikhar¹, Chiragh Hussain², Imran Khan³, Abdul Sami⁴, Zahid Aslam Awan⁵

¹⁻⁵Department of Cardiology, Medical Teaching Institute, Hayatabad Medical Complex, Peshawar - Pakistan.

Address for correspondence:

Dr. Malik Faisal Iftikhar

Department of Cardiology, Medical Teaching Institute, Hayatabad Medical Complex, Peshawar - Pakistan.

E-mail: malikfaisal6@gmail.com

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ABSTRACT

Objective: To find out electrophysiological findings and outcome of radiofrequency ablation of Idiopathic left ventricular tachycardia.

Methodology: This retrospective study was conducted in the Cardiac Electrophysiology department of Hayatabad Medical Complex, Peshawar. Data was collected from records of the patients presented with idiopathic left ventricular tachycardia from January 2007 to January 2018. Seventy five patients of both genders and any age fulfilling the Zippes Triad criteria for Idiopathic left ventricular tachycardia were included. Electrophysiological studies and radiofrequency ablation were carried out for such patients. During ablation, diastolic potential was main target of ablation. Data was entered in SPSS version 18 and analyzed for descriptive statistics.

Results: Out of 75 patients, 63 were males and 12 were females. Ninety six percent of the patients complained of palpitations and 60% of the patients complained of chest pain accompanied by palpitations. Right bundle branch block with left axis deviation was the most common ECG finding whereas right bundle branch block with right axis deviation was found in 2.6 % patients. All ablations were successful with recurrence occurring in only 6.6% cases. Apart from one, all the ablations were done with retrograde technique.

Conclusion: Idiopathic left ventricular tachycardias are common arrhythmias in our population and catheter ablation is the standard treatment.

Key Words: Catheter ablation, Ventricular tachycardia, Idiopathic left ventricular tachycardia, Zippes Triad.

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INTRODUCTION

Idiopathic left ventricular tachycardia (ILVT) is a sub-type of ventricular tachycardia (VT) that is commonly seen with structurally normal hearts^{1,2}. The Verapamil-sensitive type of VT is the most common form of Idiopathic left ventricular tachycardia (ILVT). It was first recognized in 1979 by Zipes et al.³, who recognized the triad; induction with atrial pacing, right bundle branch block (RBBB) with left-axis configuration and manifestation in patients who do not have any structural heart disease. A fourth identifying feature was first demonstrated in 1981 by Belhassen et al.⁴ as the sensitivity of the tachycardia to verapamil. Another variant of this tachycardia presenting with RBBB and right-axis deviation was reported in 1988 by Ohe et al.⁵. There are subgroups with respect to QRS morphology which are left posterior fascicular VT with a QRS morphology of RBBB having a left axis configuration. The left anterior fascic-

ular VT with a QRS morphology of RBBB pattern and a right-axis configuration and the upper septal fascicular VT which unveils a narrow QRS complex with normal or right-axis deviation.

The most prevalent type of verapamil-sensitive fascicular VT is the left posterior fascicular VT. It is also the most common type and may be responsible for upto 90 % of the total cases whereas the left anterior fascicular VTs' are infrequent and yet left upper septal fascicular VTs' are a much rarer types⁶. The most common presenting age group is between 15 to 55 years. Cardiomyopathies are rare with ILVT. Most patients present with the complaints of chest pain, palpitations and shortness of breath; palpitations being the most common presenting feature. The exact nature of the reentry circuit in verapamil-sensitive VT is not known. Various postulates have been put forward among which the most widely accepted one is that of false tendons or fibromuscular bands as demonstrated by Suwa et al.⁶ who discovered

a false tendon in the left ventricle of a patient with idiopathic VT. In such patients, the VT was eradicated with the surgical resection of the particular false tendon. Studies have identified that the false tendons usually are spread from the posterior-inferior side of the left ventricle to the basal septum in 100% of the patients having idiopathic left VT as opposed to only 5% of the controls⁷. Another study found that most of the patients with idiopathic VT i.e. 17 of 18 patients had this fibromuscular band, but it was also found that majority of controls also had the fibromuscular band⁸. It was concluded that the band was a relatively common echocardiographic finding and could not be identified as an explicit source for this arrhythmogenic tachycardia.

ILVT must be suspected in every patient who present with RBBB morphology tachycardia with axis deviation. The specific ECG findings like AV dissociation, Q wave in lead 1 and aVL with positive aVR lead makes the diagnosis almost certain for this tachycardia. Once the diagnosis is certain, both acute and long term therapy is different than supra ventricular tachycardia (SVT) with aberrancy or any other broad complex tachycardia. Radiofrequency ablation is almost always curative in recurrent cases with recurrence rate being very low. Hence, proper diagnosis and referral to electrophysiologist can decrease morbidity like recurrent tachycardia induced cardiomyopathy and improves quality of life. This study was aimed to find out electrophysiological findings and outcome of radiofrequency ablation of idiopathic left ventricular tachycardia.

METHODOLOGY

This retrospective cohort study was conducted in the cardiac electrophysiology department of Hayatabad Medical Complex Peshawar. Patients of both genders and any age group were included in the study. Patients with RBB morphology, relatively narrow QRS morphology, left, right or normal axis with structurally normal heart were included.

Drugs were stopped for 5 half-lives before the procedure. All the patients were given Alprazolam 0.25 mg 12 hours before the procedure. A standard four wire study was performed in which a Quadripolar catheter (Courand) CRD was used from the right atrium and the right ventricle, and a CRD-2 for HIS. A Decapolar catheter (St. Jude Medical, Minnetonka MN, USA) was used for mapping the Coronary Sinus. For ablation and mapping the left ventricular spectrum, we used a Quadripolar Therapy™ catheter from St. Jude with 2mm spacing and a 4 mm tip. Four 6F sheaths (3 on the left and 1 on the right) were passed using the Seldinger technique and for ablation a 7 F sheath was passed in the right femoral artery. A right sided catheter was inserted into the right vein to the right side of the heart and for ablation the femoral artery was accessed and the catheter was advanced in a

retrograde manner across the aortic valve. Intravenous heparin was administered in a bolus dose of 5,000 units. Activated clotting time (ACT) was checked and then kept at two to three times the baseline by checking the ACT every 15 minutes. Bipolar intracardiac electrograms were recorded using a filter bandwidth of 30 to 400 Hz. ECG leads I, aVL, and V1, as well as intracardiac electrograms from RA, RV and HIS were displayed simultaneously and recorded on a multichannel system from Bard Lab System™ Pro EP Recording system (Seattle, WA, USA) mapping both in the sinus rhythm. Diastolic potential (DP), and Purkinje Potential (PP), were targeted more⁹ ¹⁰. Tachycardia was induced in all cases with Atrial Extra systole (AEST) at a drive train of 500 ms to 370 ms ± 50 ms. VT cycle length was 365 ± 73 ms. Diastolic potential was recorded at the LV basal septal area and PP was recorded at the posterior third of the LV septum.

During the sinus rhythm the DP was targeted which precedes the PP during VT and is seen after ventricular activation in the sinus rhythm. Ablation was preferred in sinus rhythm and targeted the PP. During ablation in sinus rhythm, VT was intermittently induced and was self-terminated, after successful ablation. AEST were given to check for inducibility of the VT. Patients were kept under observation and monitoring for 24 hours in order to see if there was any recurrence after which they were discharged on Aspirin 75 mg for one month. Follow up visits were planned at 1 month and 4 months after ablation. Data was entered in SPSS version 18 and analyzed for descriptive statistics.

RESULTS

Most of the patients were in the age range of 36-55 years. Sixty three percent were males. Palpitations was presenting symptom in 96% and chest pain and palpitations in 60% of the cases. RBBB morphology with a left axis configuration was most common (97.4 %) electrocardiographic finding. RBBB morphology with a right axis configuration was found in only 2.6% patients. The site of earliest ventricular activation during VT of RBBB with LAD, the exit site was in the region of the inferoposterior LV septum in 97.4% of ILVTs, i.e. of LPF, and with patients with RBBB with RAD was near the anterosuperior LV septum in 2.6% of the left ventricle as shown in figure 1-3. In most cases, ventricular electrograms were discrete in both the normal sinus rhythm. VT ablation was done successfully in all cases (100%) as shown in figure 4. Recurrence occurred in only 6.6% of the patients.

DISCUSSION

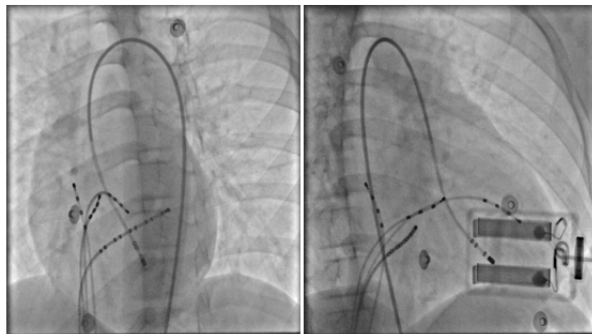
ILVT is one of the most common VTs' seen in the structurally normal heart. Patients who suffer from ILVT may present with symptoms like palpitations which are the most common, followed by chest pain. Right sided VTs' are more common than left sided ones. Prognosis is

Table 2: Baseline characteristics

| Total Number of Patients | Total suspected patients 119 | | ILVT 75 |
|--------------------------|------------------------------|--------------|-----------------------|
| AGE | 15-35 | | 10 |
| | 36-55 | | 60 |
| | 56-75 | | 5 |
| Gender | Male | | Female |
| | 63 | | 12 |
| Presentation | Palpitation with chest pain | | Palpitations |
| | 45% | | 65% |
| ECG pattern | RBB with LAD | RBB with RAD | RBB with normal axis. |
| | 97.4% | 2.6% | 0.0% |

Figure 1: Fluoroscopic images LAO 40 and RAO 30 showing ablation catheter on mid inferior septum

LAO View RAO View.



Left Anterior Oblique (LAO) View. Right Anterior Oblique (RAO) view.

Figure 2: Mapping in sinus rhythm showing diastolic potential and purkinje potential

very good in these patients. Treatment can be medical or by radiofrequency catheter ablation which is class I recommendation for symptomatic patients. Our study data is similar to international data^{10,11}. ILVT generally presents in young adults (15–40 years) and mainly affects males (60%–80%)^{11,12}. The most frequent clinical presentation is paroxysmal episodes of palpitations and dizziness. Syncope and sudden death are very rare. Tachycardia induced cardiomyopathy has been described in as many as 6% of the total cases of persistent tachycardia. It is

Figure 3: Electrophysiological tracing showing diastolic potential during tachycardia precedes the QRS.**Figure 4: Electrophysiological tracing during successful ablation showing termination of tachycardia**

usually reversible after successful ablation¹³. Although most episodes occur at rest, exercise, emotional stress, and catecholamine infusion can act as triggers.

The radiofrequency ablation technique used in most cases in most similar studies is retrograde. We have also used this technique for ablation and was successful. Recurrence was also seen in our study and rate of recurrence was similar to that found in other studies.

Catheter ablation is a very effective treatment method and is recommended in ILVT¹¹ as the success rate is very high and the complications are very few¹². It is im-

portant to recognize and treat ILVT early with RF ablation in such cases. Radiofrequency catheter ablation is the best option for the treatment of ILVT¹³.

CONCLUSION

Catheter ablation is effective treatment modality for ILVT.

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CONTRIBUTORS

MFI conceived the idea, wrote initial manuscript, collected data and finalized the draft. CH and IK helped correction of the proposal, literature search, data collection, interpretation and overall supervision of the project. AS and ZAA provided technical support, helped in data interpretation and provided expert guidance where needed. All authors contributed significantly to the submitted manuscript.