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Original Article

Outcome in Cardiac Electrophysiology and Radiofrequency Ablation of Atrioventricular Reciprocating Tachycardia - A Single Center Experience

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Key Words : *Atrioventricular reciprocating tachycardia, Cardiac electrophysiology, Radiofrequency ablation.*

Abstract:

Background: *Radiofrequency catheter ablation is a curative modality of treatment for paroxysmal supraventricular tachycardia. The aim of our study was to evaluate our experience of electrophysiology procedures and radiofrequency ablation in atrioventricular reciprocating tachycardia (AVRT).*

Methods: *All patients undergoing cardiac electrophysiology and radiofrequency ablation procedures during the period from July, 2019 to July, 2021 at Department of Cardiology, Evercare Hospital, Dhaka were included in this study. The study analyzed 141 patients of among them 75(53.2%) patients were male and 66(46.8%) were female.*

Results: *Patients who came with AVRT, 91 (65%) had concealed and 50 (35%) had manifested. The overall short term success rate was 99 %. There was no difference in the success rates between the younger and older patients. Complication rate is lower side of the spectrum, which is 1.4% (four patients).*

Conclusion: *Radiofrequency ablation is a safe and successful treatment modality for patients with atrioventricular reciprocating tachycardia in this real - world study.*

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Introduction:

Atrioventricular reciprocating tachycardia (AVRT) is a macro reentrant tachycardia that needs an accessory pathway to bypass the conventional conduction system. It has a circuit that consists of two different paths comprising of the regular conduction system through the AV node and an accessory pathway that enables communication between the atrium with the ventricle. AVRT is associated with the Wolf Parkinson White syndrome. AVRT is the second common type of paroxysmal supraventricular tachycardia (PSVT).[1]

An electrophysiological study (EPS) and radiofrequency ablation (RFA) is recommended for patients with documented symptomatic AVRT. RFA has been shown to be effective and safe, with a success rate exceeding 90- 95% in patients with atrioventricular reentrant tachycardia (AVRT) due to accessory pathways (AP).[2-5] Complications

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associated with these ablative procedures occur at a low incidence of 2-5%.[6,7]

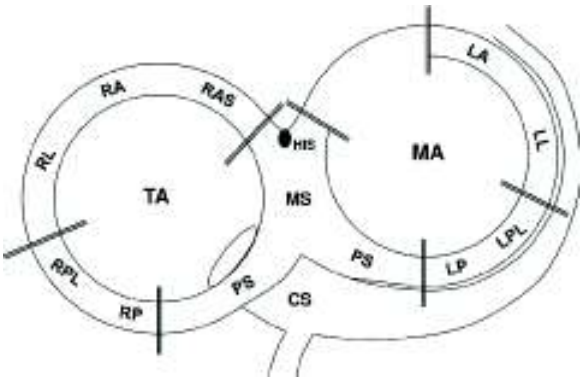

Fig.-1: *Different location of accessory pathway.*

Methods:

This was a retrospective observational study performed over a period of 2 years from July, 2019 to July, 2021 at Department of Cardiology, Evercare Hospital, Dhaka.

The electrophysiology study and ablation procedures were classified according to the arrhythmias induced using standard electrophysiological techniques and definitions. The arrhythmia types include AV reentrant tachycardia involving an AP, either concealed or manifested and their location. Ablation procedures were performed using standard mapping and ablative techniques. In greater than 99% of cases, radiofrequency was the energy source applied through a 4 mm tip ablation catheter. For 3D ablation an irrigated catheter was used. Radiofrequency energy was typically delivered at a power required to achieve a set temperature of 50º C- 65º C. Radiofrequency energy was applied for 30 s to 2 min during continuous electrocardiography, intracardiac electrogram monitoring and intermittent fluoroscopic monitoring. In complex cases electro-anatomic three-dimensional (3D) mapping catheter navigation systems (NavX, St Jude Medical) was used.

Patients were brought to the electrophysiology laboratory at least 4 hours in a fasting state. Catheters were introduced via femoral route majority of the time. Coronary sinus access was routinely performed with a deflectable decapolar catheter. Quadripolar catheters were placed in right atria, his and right ventricle (Fig 2). Detailed electrophysiological evaluation was performed using standard stimulation and recording techniques to establish the diagnosis and identify the appropriate ablation site.

The transseptal approach was routinely used for left-sided APs. Right-sided APs were approached via the femoral veins using the antero-posterior or left anterior oblique view. For complex arrhythmias like previously failed RFA and post RFA recurrent SVT, 3D electro-anatomic mapping

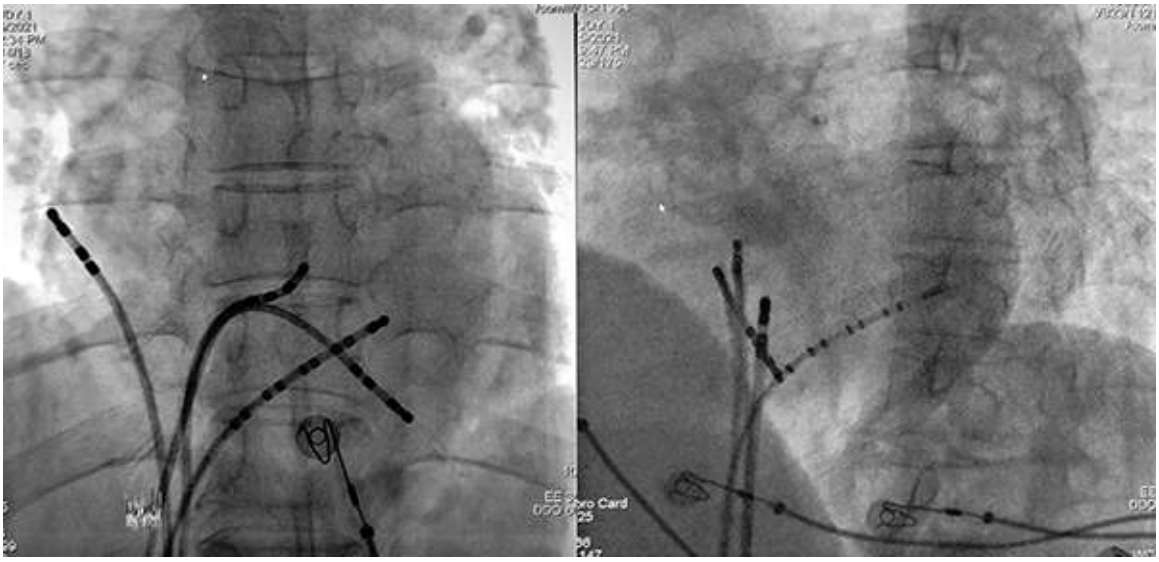

Fig.-2: *Catheter placement in RA, RV, coronary sinus and his region. and Fig 3: RFA in septal pathway.*

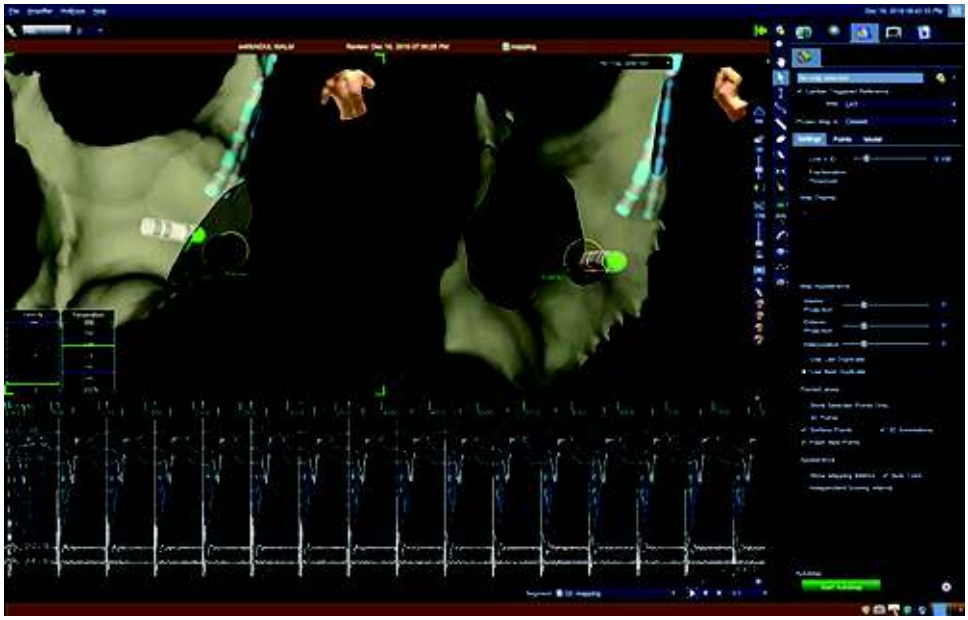

Fig.-3: *3D mapping and ablation.*

was used by NavX systems (Fig 4). Patients were routinely monitored for 24 h after the procedure. A 12- lead electrocardiogram was obtained before discharge.

Acute ablation success was defined as follows:

- AV reentry - absence of antegrade and/or retrograde AP conduction.

Adverse outcomes and follow-up:

The patients were followed up after procedure for any adverse outcome in hospital and outpatient visits. Outcome variables were comprised of hematoma/hemorrhage, deep vein thrombosis, cardiogenic shock, hypotension, atrioventricular block, arrhythmia, recurrence, stroke/TIA, MI/ischemia, pericardial effusion, heart failure and death. Complications were grouped into the following three categories according to the seriousness or permanence of the event:

1. Major or life-threatening complications: death, myocardial infarction, embolic stroke involving transient or permanent neurological alteration, persistent unintentional heart block (second- or third-degree) and pericardial effusion with tamponade.
2. Serious complications: deep venous thrombosis, heart failure, arrhythmia, pericardial effusion requiring drainage, cardiogenic shock and transient heart block.
3. Minor complications: infection, hematoma, hypotension and pericardial effusion without tamponade.

Statistical analysis:

Results are presented as the number of procedures performed, percentages and mean ±SD where appropriate.

Results

In this study, total population is 141, among them 75(53.2%) patients are male and 66(46.8%) female (Fig 5). Fig 6 is showing types of pathways- 91 (65%) manifest and 50 (35%) concealed. AVRT presents in male predominantly but no significant difference. The mean age group of patients was 40 ± 15 years. Table I is showing location of accessory pathways. Among accessory pathways, most prevalent ones found in this study were right posteroseptal and left lateral AP. Location and different types of APs are shown in figure 6.

The overall acute success rate is 99.3 % (Table II). There was no difference in the success rates between the younger and older patients. Only one failed case and 5 late recurrences of pre-excitation were found.

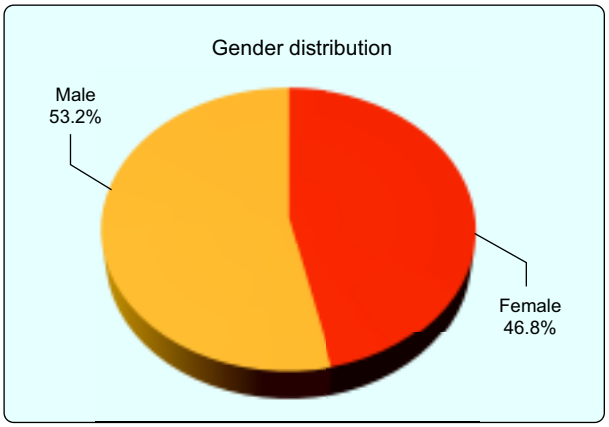

Fig.-4: *Pie diagram showing sex distribution of the study patients.*

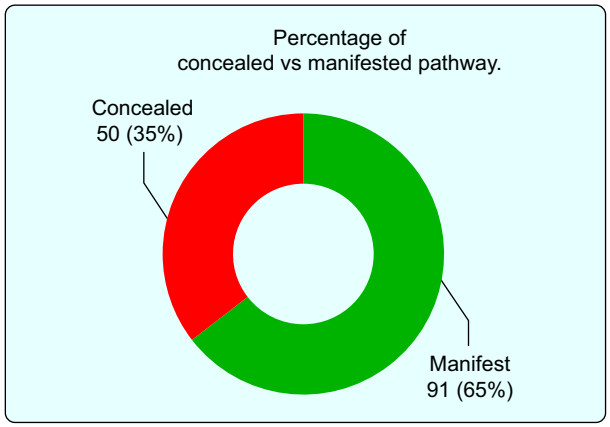

Fig.-5: *Circle diagram showing concealed vs. manifested distribution of the study patients.*

The incidence of complications is given in Table III. Two patients (1.4%) had complications, including zero major, one serious and one minor complications (Table III). Among patients undergoing ablation, only one patient had a hemorrhagic shock during procedure requiring a blood transfusion. Recurrence of AVRT within 1 year occurred in five patients with accessory pathway, two were located in right posteroseptal, one in coronary sinus, left posteroseptal region and last one had a multiple pathway. All patient's procedure were done via femoral except one, in which right internal jugular vein was chosen due to interrupted inferior vena cava.

Table-I

Distribution of Accessory pathway (N=141).

Serial	Location of pathway	Concealed (%)	Manifested (%)	Total (%)	(%)
1.	Left Lateral	41	12	53	37.9
2.	Right Posteroseptal	30	22	52	36.9
3.	Right Free Wall	5	8	13	9.2
4.	Right Anteroseptal	2	0	2	1.4
5.	Coronary Sinus Diverticulum	3	2	5	3.5
6.	Left Posteroseptal	6	6	12	8.5
7.	Multiple Pathway	4	0	4	2.8

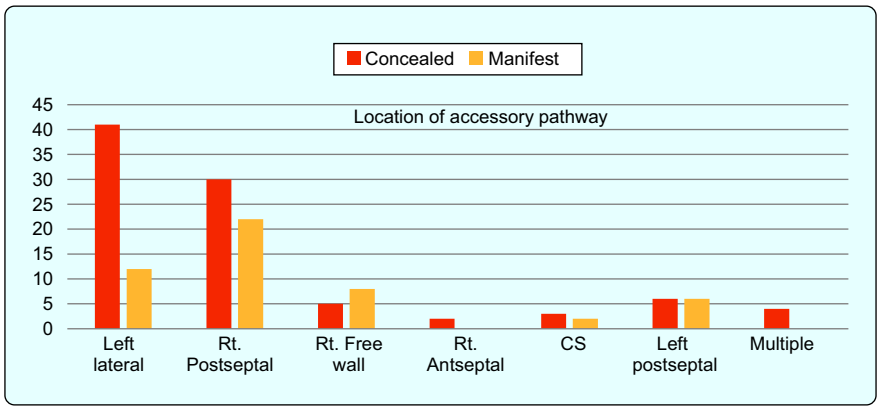

Fig.-6: *Bar diagram showing location distribution of AP.*

Table-II

Short-term success rates of variables who underwent RFA (N=141).

Points	Total Number RFA	Acute Success of RFA	%
AVRT	141	140	99.3%

Table-III

Adverse outcomes of the RFA (N=141).

Complications	No.	Complications	No.
Hematoma/Hemorrhage	1	Infection	0
DVT	0	Stroke/TIA	0
Shock	0	MI/Ischemia	0
Hypotension	0	Pericardial effusion	0
AVB	1	Heart failure	0
Arrhythmia	0	Death	0

Discussion:

SVTs (excluding atrial fibrillation or flutter and multifocal AT) have an estimated incidence of 35 per 100,000 person-years,[8] with a prevalence of 2.29 per 1,000 persons. Although AVNRT is the most common SVT in adults (approximately 50 to 60 percent),[9] AVRT is most common in children (accounts for approximately 30 percent of all SVTs).[9,10] The prevalence of atrioventricular reentry tachycardia in general population is rare and estimated to be less than 1%.[13]

In this study, two third of the patients had left lateral (37.9%) and right posteroseptal pathway (36.9%). Distribution of other APs in descending order are right free wall (9.2%), right anteroseptal (1.4%), coronary sinus (3.5%), left posteroseptal (8.5%) and multiple pathway (2.8%). In another study also showed the most frequent location of the accessory pathway was left lateral pathway (39.3%) which had high ablation success rate.[15] Some studies show no significant difference in left free wall (which is most common) and posteroseptal location. The right free wall location seems to be more frequent in females and the right anteroseptal location is more frequent in males, but the literature data are not completely consistent.[14]

Several studies have reported results of RF ablation for cardiac arrhythmias. The present study confirms the safety and efficacy of radiofrequency catheter ablation (RFA) for AVRT. We found a high acute success rate APs were 99.3% vs. 93% in published reports.[7] We had a relatively low complication rate (1.4% vs. 2-5%) with no mortality related to the procedure. Who underwent accessory pathway ablation, found that complications include cardiac tamponade, acute MI, femoral artery pseudoaneurysms, AV block, pneumothorax, and pericarditis.[14] In this registry, all of these complications occurred in less than 2% patients. The success rate and incidence of major complications reported in the present study are similar/superior to the results from published reports.[7] RFA improves health-related quality of life to a greater extent than medical treatments.[11,12] It is less expensive than medical therapy over time among patients who have frequent symptomatic episodes of tachycardia.

To the best of our knowledge, the present study is the first and largest observational, single-center study ever reported in privet hospital in Bangladesh. The overall success rates remaining stable over time. Of note, our electrophysiology procedures are performed in the real world where the cardiac catheterization laboratory time is shared amongst other invasive cardiology work. However, this factor did not result in an increase in the complication rate or in ablation failure, rather than that this reduces our rate of complication due to other helping hands. The more time passed, we have made forays into 3D electro-anatomic mapping for complex arrhythmias. However, the stumbling block remains the steeper learning curve and long procedure time further clustering the cardiac catheterization laboratory time and staff. The population of this study would

be higher if not current COVID-19 pandemic situation.

Conclusions:

The results of this large single tertiary care center hospital highlight the experience of cardiac electrophysiology in Bangladesh. Many accessory pathways are concealed, and orthodromic AVRT due to concealed accessory pathways is frequently documented in patients with SVT referred for RFA. Majority of the accessory pathways are found to be left free wall and right posteroseptal. Results confirm that RFA in AVRT is safe and effective, supporting ablation therapy as a first-line therapy for the majority of patients with recurrent symptomatic or disabling cardiac arrhythmias.

Conflict of Interest - None.

Acknowledgments:

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