

Immediate Outcome of Electrophysiology and Radiofrequency ablations for Supra ventricular Tachycardia and Wolff-Parkinson-White (WPW) syndrome at tertiary Cardiac Centre in Nepal

Murari Dhungana¹, Kunjang Sherpa², Kiran Prasad Acharya³, Roshan Raut⁴, Surakchhya Joshi², Prashant Bajracharya², Mukunda Sharma², Man Bahadur KC⁴, Sujeeb Rajbhandari⁴

1 Cardiologist, Department of Cardiology, Shahid Gangalal National Heart Center, Nepal

2 Registrar of Cardiology, Department of Cardiology, Shahid Gangalal National Heart Center, Nepal

3 Senior Resident, Department of Cardiology, Shahid Gangalal National Heart Center, Nepal

4 Senior Consultant Cardiologist, Department of Cardiology, Shahid Gangalal National Heart Center, Nepal

Corresponding Author: Dr. Murari Dhungana

Department of Cardiology Shahid Gangalal National Heart Center, Nepal

Abstract

Background and Aims:

Cardiac electrophysiological study (EPS) and Radiofrequency Ablation (RFA) is now a well recognized method for treatment of cardiac arrhythmias. The most common form of arrhythmias which are treated by EPS & RFA includes Paroxysmal supraventricular tachycardia (PSVT), Wolff-Parkinson-White (WPW) syndrome, atrial tachycardia and atrial flutter.

Aims and objectives:

The aim of our study is to study the profile and immediate outcomes of electrophysiological studies and Radiofrequency ablation procedure in Shahid Gangalal National Heart Centre, Kathmandu, Nepal

Materials and Methods:

It was a retrospective cross-sectional study. Patient's data were collected from the hospital records. All patients who underwent Electrophysiological study and Radiofrequency ablation (EPS and RFA) from 2018 June to 2020 May were included and their data were analyzed

Results:

A total of 563 EPS and RFA were done in Shahid Gangalal National Heart Center (SGNHC) from 2018 June to 2020 May. The most common indication for EPS and RFA was PSVT 409(72.6%), WPW Syndrome 124(22%), WPW pattern 12 (2.1%), Relapse procedure 10 (1.8%) and wide complex tachycardia 8 (1.4%). Among the study population, 53.1% of patients were female. The mean age of the patients was 40.5 ± 15.8 years. The most common diagnosis during EP study were atrioventricular nodal Reentry Tachycardia (AVNRT) 277 (49.2), followed by Atrioventricular reentry tachycardia (AVRT) 267 (47.4%), atrial flutter in 16 (2.8%) case and atrial tachycardia in 3 (0.5%). AVNRT were more common in female compared to male (p value 0.01). The Immediate success of radiofrequency ablation were achieved in most of the cases (97%) and the complication was low (0.2%).

Conclusion:

EPS and RFA is the long term treatment of choice for symptomatic and recurrent supraventricular tachycardia and WPW syndrome. EPS and RFA procedures are safe and has high success rate.

Key words:

Electrophysiological study, PSVT, Radiofrequency ablation, WPW syndrome

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I. Introduction

Cardiac electrophysiological study (EPS) and Radiofrequency Ablation (RFA) is now a well recognized method for treatment of cardiac arrhythmias¹. Electrophysiological study gives valuable information such as the normal and abnormal electrophysiological properties of the conduction system, mechanism of arrhythmia generation, electrical instability of various cardiac chambers and evaluation of anti arrhythmic treatment.

The EPS and RFA procedure consists of diagnostic EP study and therapeutic radiofrequency ablation followed for patients with appropriate arrhythmia substrate. Most of the Supra ventricular tachycardia is caused by the presence of accessory conducting Pathway or the presence of dual AV nodal physiology resulting in AV nodal reentrant tachycardia (AVNRT).

The safety and efficacy of the procedure has been proven in multiple studies². The success rates for ablation are variable with success rates of 98-100% in some series for AVNRT and 50% in tachycardia due to right free wall accessory pathway³. An initial report published by Rajbhandari S, et al. Cardiac EPS and RFA in Nepal showed the incidence of atrioventricular reentrant tachycardia (AVRT) 54.2%, AVNRT (41.95%), atrial tachycardia 1.5% and remaining others⁴.

The aim of the study was to study the profile and immediate outcomes of electrophysiological studies and Radiofrequency ablation procedure using conventional 2D system at tertiary Cardiac Centre in Nepal at current context.

II. Materials and Methods:

This is a Retrospective observational study done at Shahid Gangalal National heart centre . All patients who underwent EPS and RFA using conventional (2D) EP system from June 2018 to May 2020 were included. Patients who underwent RFA with 3D mapping system were excluded The patient's data were collected from reviewing data from hospital record and were analysed.

Information on patient age, sex, indication of EPS , diagnosis after EPS , immediate outcome and complication were evaluated. The immediate successful ablation was define as no recurrence of tachycardia and reappearance of the accessory pathway 15-30 minutes after successful ablation.

Statistical analysis was performed with statistical software (SPSS-22.0 for windows). Results were analyzed using appropriate statistical methods. P-value was calculated under the predetermined level of significance (0.05) and Confidence interval (CI) of 95% was constructed. Results were expressed in percentage, mean and standard deviation. Ethical clearance was taken from Institutional Review Committee of Shahid Gangalal National Heart Center, Nepal.

EPS and RFA procedure :

Patients who were referred to cardiology OPD or presented to ER with documented PSVTs or WPW pattern in ECG with symptoms of PSVT and patients with WPW requiring ablation were included for EPS and RFA. Electrophysiological study and Catheter ablation procedures were performed in an electrophysiology laboratory equipped with recorders, programmed stimulators and ablaters using Work Mate EP system, ST Jude Medical, of Shahid Gangalal National Heart centre, Kathmandu, Nepal. RFA procedures were performed under fluoroscopy and the amount of radiation exposure was dependant on the length of the procedure being performed. For the EP study, all patients after a formal written consent were draped with all aseptic precautions. Venous and arterial accesses were obtained under local anesthesia. For Right sided pathway and AVNRT Three 6 French femoral sheath were placed percutaneous in the same femoral vein. Three 6 Fr quadripolar diagnostic catheters were inserted: one in the high right atrium (RA), one in Bundle of His, and one in the right ventricle (RV). Coronary sinus was cannulated via the right internal jugular vein with 6 Fr decapolar CS catheters. The same side femoral vein was cannulated as a fourth assess for ablation purpose and Trans-septal approach for left sided pathway ablation when required. Usually a retrograde approach was followed for left sided pathway ablation for which a femoral arterial assess was taken in the same side and 7 F Femoral sheaths was inserted.

EP study was conducted using different maneuvers and Tachycardia induced. Different maneuvers such as continuous atrial pacing, Programmed Atrial stimulation, Ventricular pacing and other maneuvers were done to induce tachycardia differentiate pathway and see the VA conduction pattern. After the identification of pathway an ablation catheter was inserted and mapping of the pathway localization was done. Ablation was done usually using a 6F ablation catheter with energy of 35-40 W, temperature of 60 degree Celsius and for a time of 60-90 Sec. After ablation EP maneuvers were conducted to see whether the pathway was present or not. 15- 30 minutes after ablation again maneuvers were conducted and considered immediate success if there was no tachycardia and pathway present.

III. Results:

Baseline Characteristics:

There were 563 Procedure of EPS and RFA done under 2D system were done at Shahid Gangalal National Heart Centre from June 2018 to May 2020. The mean age of the patients was 40.5 ± 15.8 years. Female patients (53.1%) were more than male (46.8%). The mean age of male patients was 38.54 ± 16.2 years and female patients were 37.7 ± 15.98 years. The most common indication for EPS and RFA was PSVT 409 (72.6%) and the second most common was WPW Syndrome 124(22%) and others indication as shown in table 1.

Table 1: Baseline Characteristics:

| Variable | Frequency |
|---------------------------------|----------------|
| Age (mean±SD) | 40± 15.8 years |
| Male | 38.54 ± 16.2 |
| Female | 37.7 ±15.98 |
| Gender (N/%) | |
| Male | 46.8% |
| Female | 53.1% |
| Indication Of EPS and RFA (N/%) | |
| PSVT | 409(72) |
| WPW SYNDROME | 124(22) |
| WPW PATTERN | 12(2.1) |
| WIDE COMPLEX TACHY | 8(1.4) |
| RELAPSE PROCEDURE | 10(1.8%) |

The most common diagnosis during EP study were atrioventricular nodal Reentry Tachycardia 277 (49.2), followed by Atrioventricular reentry tachycardia 267(47.4%), atrial flutter in 16 (2.8%) case and atrial tachycardia in 3 (0.53%). Shown in table 2

Table 2: Diagnosis during EP study

| EPS diagnosis | N (%) |
|--------------------|-------------|
| AVNRT | 277 (49.2%) |
| AVRT | 267 (47.4%) |
| ATRIAL TACHYCARDIA | 3 (0.53%) |
| ATRIAL FLUTTER | 16 (2.8%) |

AVNRT occurred more in female patients 173(62.5%) as compared to male patients 104 (37.5%) and AVRT was seen in more in male patients 148 (55.4%) compared to female 119 (44.6%) (Pvalue 0.001) as shown in figure 1.

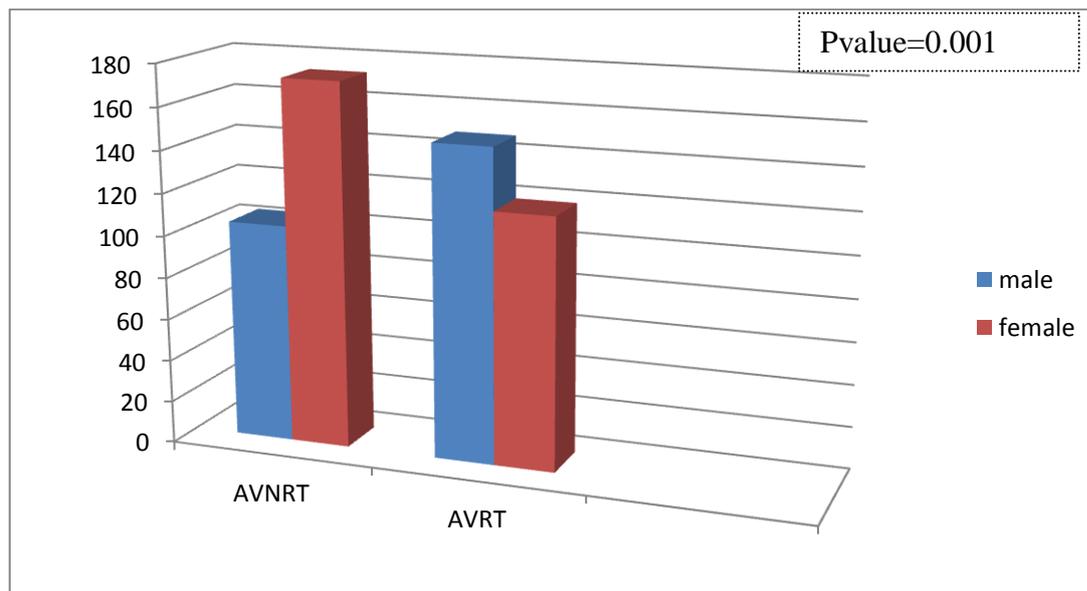


Figure 1: Gender distribution in AVNRT and AVRT group

The most common accessory pathway involved in AVRT was left lateral accessory pathway 137(51.3%) followed by posteroseptal accessory pathway 35(13.1%), left posterior(5.9%), right posterior(5.6%), left antero lateral 13(4.8%), right free wall 13(4.8%), posterolateral 13 (4.8%) and other pathway as shown in table 3.

| Types of AVRT Pathway | N =267(%) |
|--------------------------------|------------|
| Left Lateral | 137(51.3%) |
| Posteroseptal | 35 (13.1%) |
| Left posterior | 16 (5.9%) |
| Right posterior | 15 (5.6%) |
| Left anterolateral | 13 (4.8%) |
| Right free wall posterolateral | 13 (4.8) |
| Left anterior parahisian | 6 (2.2%) |
| Right anterolateral Mahaim | 3 (1.1%) |
| Midseptal | 3(1.1%) |
| Right Anteroseptal | 2 (0.7%) |
| Left Posterolateral | 1(0.37%) |
| Middle cardiac vein | 1(0.37%) |

Table 3: Various type of pathway in AVRT

The immediate success, which is considered as no recurrence of tachycardia and reappearance of the accessory pathway 15-30 minutes after successful ablation, was achieved in most of the cases with a number of 546 (97%) as shown in table3. Among the number of major as well as minor immediate complications there was only 1 patient (0.2%) , who had severe anaphylaxis of Cefazolin and was successfully treated and later discharged after 2 days as shown in table 4.

Table 4. Outcome and complication during the EP procedure

| Outcome | N/% |
|---------------------|-----------|
| Successful Ablation | 546 (97%) |
| Complication | 1 (0.2%) |

The EP and RFA procedures were quick and prompt with radiation exposure to a very acceptable time. The mean average Fluoro time of the procedure was 20.33 minutes. Apart from the conventional ablations for SVTs, Few typical Atrial flutter(16) and Atrial Tachycardia(3) were successfully ablated using 2D EP system during the recent years, though 3D system are usually used for the ablation of Atrial tachycardia.

IV. Discussion:

Though vagal maneuvers and pharmacologic therapy can be effective in arrhythmia termination in acute or emergency settings, Cardiac Electrophysiology and Radiofrequency ablations (EPS and RFA) is a treatment of choice for the symptomatic patients with PSVTs for long term⁵. PSVT (Paroxysmal supraventricular Tachycardia) which are episodes of rapid heart rate that starts in a part of the heart above the ventricles and occurs at time to time and constitutes mainly of AVNRT, AVRT and Atrial Tachycardia⁶.

AVNRT is a type of paroxysmal supraventricular tachycardia that results due to the presence of a reentry circuit within or adjacent to the AV node⁷. It is one of the most common forms of SVT, especially in women⁸. In our study, we found the similar female predominance in the AVNRT group. The treatment options regarding this form of SVT is Adenosine in the acute setting to EPS and RFA in the long term for symptomatic patients⁵. Ablation is performed by targeting an area in the posteroseptal right atrium, often close to the roof of the coronary sinus ostium. Slow pathway modification results in an impressive success rate of 99% for permanent cure of AVNRT. However, the incidence of complete heart block remains 1%-1.5%, even in experienced hands.^{9, 10} There is significant success rate (97%) of EPS and RFA for this type of arrhythmia as reported by ESC in the recent Guidelines. In one previous study conducted in SGNHC in 2012 it was around 98%^{iv} and for AVRT 92%. Similar Result has been shown in one study conducted in other centre in Nepal which shows AVNRT is the most common form followed by AVRT¹¹. AVRT which is a reentrant tachycardia with an anatomically defined circuit that consists of two distinct pathways, the normal AV conduction system and an AV accessory pathway, linked by common proximal (the atria) and distal (the ventricles) tissues¹². This is also common form of SVT especially in male population⁸.

Accurate localization of the accessory pathway is a key for successful ablation. The morphology of the delta wave and QRS complex is helpful in the preliminary localization of pathways with manifest preexcitation. Ablation of pathways located near the atrioventricular node (most commonly anteroseptal or midseptal pathways) carries an increased risk of atrioventricular block.^{13, 14}

Ablation of Typical atrial flutter involves the creation of a complete bidirectional conduction block across the cavotricuspid isthmus. RF energy is applied in a point-by-point fashion or as a linear drag lesion from

the tricuspid annulus to the inferior vena cava to create the line of conduction block. Pacing from the lateral right atrial and the coronary sinus is then performed to confirm isthmus block. Atrial flutter ablation is successful in more than 99% of cases, and recurrence rates are low^{15, 16}.

Our recent experience with the success and complications regarding EPS and RFA for different SVTs are almost similar to those mentioned in European Guidelines. Apart from the Conventional EPS and RFA procedures for AVRTs and AVNRTs in Gangalal Hospital in previous years now typical atrial flutter and Atrial Tachycardia are being treated successfully and without much complication.

V. Conclusion

EPS and RFA is a very safe mode of treatment of different PSVTs including typical atrial flutter and also for WPW syndrome. Our experience shows the safety and efficacy of the treatment modality with high success rate, few relapse cases and very few complications.

Conflict of Interest: None

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