

Case Series

Management of Paroxysmal Supraventricular Tachycardia with Electrophysiology Study and Radiofrequency Ablation

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Paroxysmal supraventricular tachycardia (PSVT) describes the narrow zone of tachycardia. PSVT can diagnose with electrocardiography, but most specifically, it can be diagnosed by electrophysiology study (EPS) and further treated with radiofrequency ablation (RFA). Management of PSVT with RFA significantly reduces the reoccurrence of PSVT episodes in future. In the following case, presentation series of three cases will be used for creating panorama of existing knowledge of PSVT, along with diagnostic approach through EPS, and finally, the use of RFA as a treatment method will be demonstrated. Furthermore, development of patient-oriented concepts of PSVT management will be discussed.

Keywords: Paroxysmal supraventricular tachycardia, Arrhythmias, Radiofrequency ablation, Electrophysiology study, AVNRT

INTRODUCTION

Arrhythmias are the abnormal rhythms of heart, which may lead to comorbidity. As of now, 31% of the burden of cardiac diseases is contributed by arrhythmias.^[1] Arrhythmias can lead to cardiomyopathy and eventually to heart failure, if not treated.^[2] Arrhythmias can be tachycardia or bradycardia, which further classifies on the location, area of disturbed electrical activity, origin, transmission means and associated syndromes.^[3] Paroxysmal supraventricular tachycardia (PSVT) describes the narrow zone of tachycardia. In contrast to other arrhythmias, PSVT involves ventricular response, which leads to intermittent episodes and sudden termination.^[4] PSVT has been successfully seen to be diagnosed using electrocardiography (ECG) and specific study is done by electrophysiology study (EPS), which is further treated by radiofrequency ablation (RFA).^[5] In the past decades, the use of RFA has significantly increased due to successful treatment of various arrhythmias such as Wolff-Parkinson-White-syndrome, cavotricuspid-dependent atrial flutter, PSVT and atrioventricular (AV) nodal reentrant tachycardia.^[6] Furthermore, the use of RFA is seen to have a significant efficacy and holds a good safety record. Complications of PSVT can be easily prevented using RFA and reduce the chances of reoccurrences of PSVT. In the following case presentation, series of three cases will be

used for creating panorama of existing knowledge of PSVT, along with diagnostic approach through EPS, and finally, the use of RFA as a treatment method will be demonstrated. Furthermore, development of patient-oriented concepts of PSVT management will be discussed.

CASE PRESENTATION**Case 1**

A 62-year-old female patient came to casualty department with palpitation, nervousness, anxiety, exertional dyspnoea and one episode of vomiting. She was diagnosed to have PSVT. On general vital examination, she had a blood pressure of 110/70 mmHg, heart rate of 200 b/m and SpO₂ of 98% on room air. On systemic examination, the patient was conscious and oriented, respiratory clear with bilateral airway entry equal and clear, S1 and S2 sounds were present but rapid and per abdomen was soft. ECG was done, which was suggestive of PSVT. She has managed with metoprolol succinate 25 mg and alprazolam 0.25 mg. She responded well to the given treatment. Later, her heart rate came to baseline of 82 b/m. She was advised to take admission to intensive coronary cardiac unit (ICCU) for further evaluation. A 2D Echo was done, which showed good biventricular function, and no right wall motion abnormalities. She again had the episode of PSVT, this time the heart rate was 193 b/m. She was counselled for EPS, to which she agreed to consent. EPS was done through right femoral

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route, which showed baseline sinus rhythm. No pre-excitation. HV = 45 ms. Retrograde VA conduction was by the AV node. Common Atrioventricular nodal reentry tachycardia (AVNRT) was inducible on programmed atrial stimulation with extra stimulus technique after isoprenaline following a distinct AH jump. Slow pathway ablation was performed in M2-M1 region. Junctional rhythm was consistently noted. Five radiofrequency (RF) applications were delivered. Post-ablation non-inducibility and absence of dual AV nodal physiology were verified at baseline and after isoprenaline. However, junctional tachycardia (slower than the AVNRT) remained inducible. She tolerated the procedure well. She has later managed with metoprolol succinate 25 mg and alprazolam 0.25 mg. She responded well to treatment. She remained stable throughout the hospital stay and was discharged. She was asked to follow-up after 2 weeks. On her follow-up, she did not present any history of another episode of PSVT. Thus, confirms the efficiency and safety of EPS and RFA [Figures 1 and 2].

Case 2

A 22-year-old female patient came to casualty with the complaints of palpitation, anxiety and nervousness and chest pain for 1 week. She was diagnosed to have PSVT. On taking history, she mentioned of same problem for 5 years, but in acute onset, on and off. On vital examination, she had heart rate of 184 b/m, SpO₂ of 98% on room air and blood pressure of 130/80 mmHg. On systemic examination, chest had bilateral air entry equal and clear, S1 and S2 positive, conscious and oriented. ECG was done, which was suggestive of PSVT. She was managed using metoprolol succinate 25 mg, alprazolam 0.25 mg and vitamin B complex. Looking at the long-time history of the patient, the patient was asked for admission to ICCU and EPS. 2D Echo was done, which was normal. EPS was done through right femoral route, which

showed baseline sinus rhythm. Gross pre-excitation with positive delta waves in precordial leads (V2-6) and negative delta waves in v1 and inferior leads. Deep S waves in leads V5/6. HV = 0 ms. Retrograde VA conduction was concentric and non-decremental. Orthodromic AVRT was inducible on atrial stimulation. Left coronary angiogram revealed a large coronary sinus diverticulum. Accessory pathway ablation was performed at the neck of the coronary sinus diverticulum, –dV = 24 ms. 3–4 RF applications were required before loss of pre-excitation and retrograde accessory pathway conduction could be obtained. Post-ablation non-inducibility and absence of bidirectional pathway conduction were verified with adenosine and isoprenaline. She tolerated the procedure well. She was asked to continue medication. Later, she was discharged and asked follow-up after 2 weeks. She presented to follow-up with no history of PSVT after the RFA [Figures 3-5].

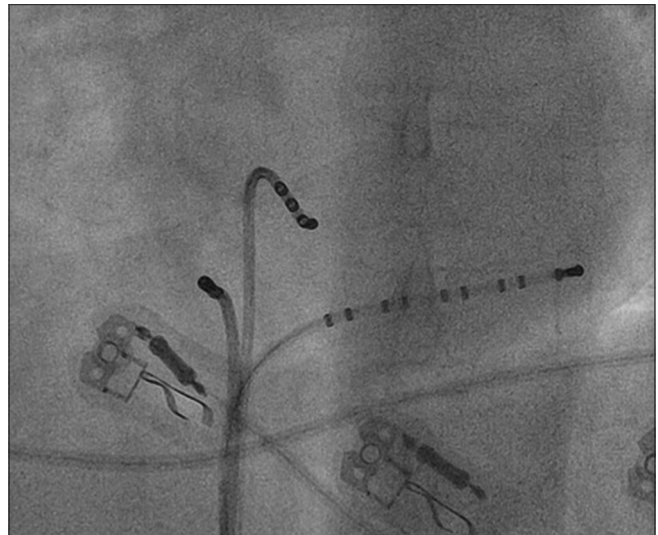


Figure 2: Radiofrequency ablation of Case 1.

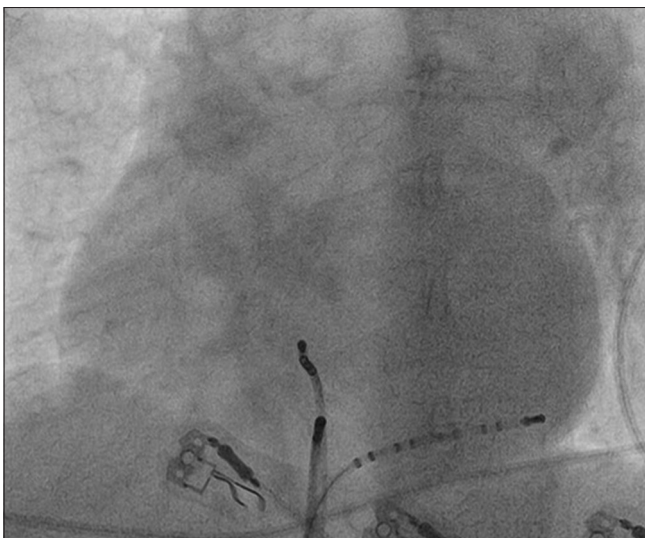


Figure 1: Electrophysiology study of Case 1.

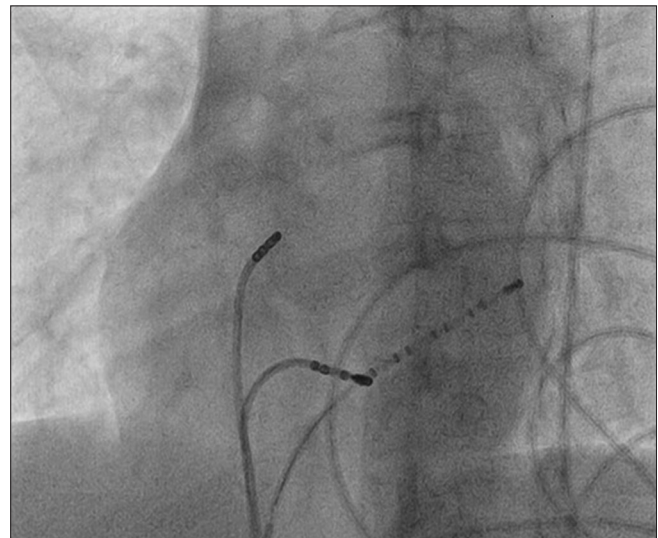


Figure 3: Electrophysiology study of Case 2.

Case 3

A 62-year-old male patient was brought to the hospital after the episode of syncope, with the presenting complaints of palpitation, nervousness and anxiety, exertional dyspnoea since 2011 and persistent increase in dyspnoea for 1 month. He was diagnosed to have PSVT. On vital examination, heart rate was 178 b/m, SpO₂ of 98% on room air and blood pressure of 150/90 mmHg. On systemic examination, the patient was conscious but slightly oriented, Chest had bilateral air entry and was clear, S1 and S2 were positive and per abdomen was soft. He was kept under observation in ICCU, after which he had a recurrent episode. 2D Echo showed mild left ventricle dysfunction with the left ventricle ejection fraction of 60%. He

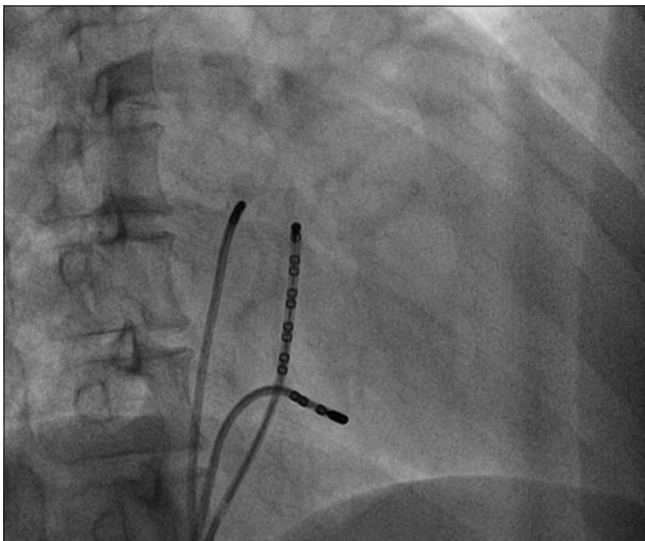


Figure 4: Radiofrequency ablation of Case 2.



Figure 5: Left coronary angiogram showing left large coronary sinus diverticulum.

was managed with rosuvastatin 10 mg, pantoprazole 40 mg and metoprolol succinate 25. He had another episode of PSVT with heart rate of 198, for which he was given intravenous adenosine 6 mg followed by normal saline flush, his heart beat was controlled to baseline of 109 b/m. He was taken up for EPS, which showed baseline sinus rhythm. On gross pre-excitation with positive delta waves in precordial leads (V2-6) and negative delta waves for V1 and inferior leads. Deep S waves were seen in lead V5/6, with HV = 0 ms. On retrograde VA conduction, it was seen to have concentric and non-decremental. Orthodromic AVRNT was seen as inducible on atrial stimulation. A left coronary angiogram revealed large coronary sinus diverticulum, for which RFA was performed at the neck of coronary sinus diverticulum, with $-dv = 24$ ms. 3-4 RF applications were required before loss of pre-excitation and retrograde accessory pathway conduction was obtained. Post-ablation non-inducibility and absence of bidirectional pathway conduction were verified with adenosine and isoprenaline. He tolerated the procedure well. He was asked to continue same medications and discharged. The patient did not present any history of recurrent episodes of PSVT after RFA [Figures 6 and 7].

DISCUSSION

The presented case series involves three patients had PSVT and undergone EPS followed by RFA, which marked the reduction of incidence and burden of ventricle, which will further not lead to PSVT. Patients after the RFA, when presented for follow-up, presented with no history or reoccurrence; furthermore, the EPS and RFA were completed within an hour. Furthermore, patients were later asked to stop antiarrhythmic drugs as they presented normal electrical activity and sinus rhythm.

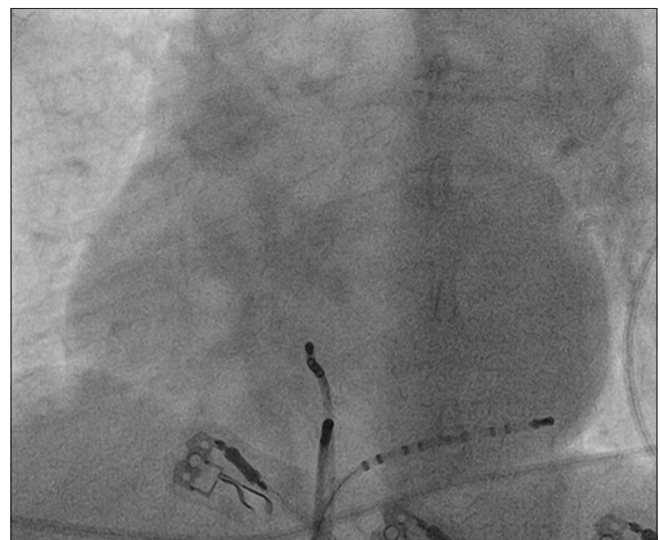


Figure 6: Electrophysiology study of Case 3.

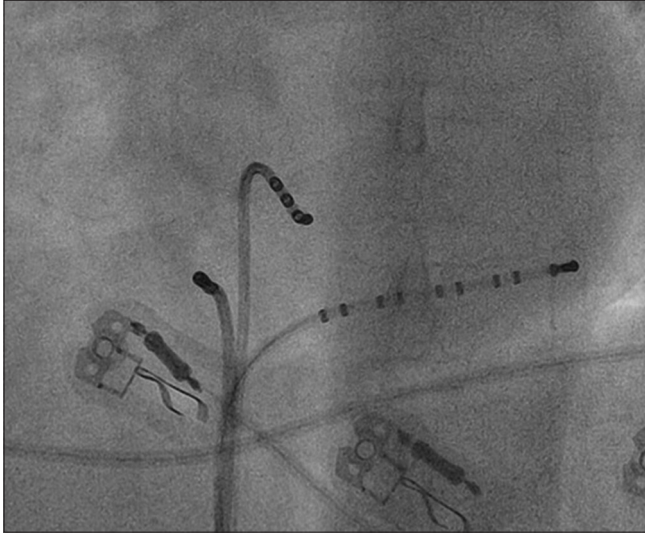


Figure 7: Radiofrequency ablation of Case 3.

The use of catheter RFA has been increasing worldwide to treat the ventricular arrhythmias, Wolff-Parkinson-White syndrome and cavotricuspid-dependent atrial flutter.^[7] RFA is much more effective in absence of ventricular scar or idiopathic ventricular tachycardia.^[8] Toward its excellent prognosis, RFA has shown nearly zero incidences of PSVT episodes in the 1st year of treatment.^[9] The rare reoccurrence may be due to triggers like poor prognostic heart failure. Furthermore, the use of RFA leads to reduction of mortality rate due to arrhythmias by four to six folds AVNRT.^[9]

CONCLUSION

All the three patients with PSVT were treated with technique of RFA. This had no adverse effect on patient and was minimally invasive. Furthermore, RFA is very much effective. Thus, this technique of EPS is very specific in diagnosing the PSVT and RFA is much more efficient to treat PSVT. The use of RFA has significantly proven to reduce the reoccurrence of PSVT episodes in future.

Authors' contributions

All authors contributed equally to the manuscript and read and approved the final version of the manuscript.

Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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