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Zero fluoroscopy radiofrequency ablation for Typical Atrioventricular Nodal Reentrant Tachycardia (AVNRT)



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1. Introduction

Symptomatic supraventricular tachyarrhythmias are easily amenable to catheter ablation with the help of fluoroscopic guidance with minimal risk and excellent success rates. Electroanatomic mapping is used as an adjuvant in certain situations, where it might enhance the chance of success. Ablation is generally avoided in pregnancy owing to the risks associated with fluoroscopy.

2. Case report

A twenty nine year old primigravida at two months of gestation, working as a medical professional, presented with recurrent hour long episodes of symptomatic palpitations, associated with extreme fatigue. Within a month, she had four admissions to the emergency department for the same. On examination during tachycardia, she was diaphoretic, with a regular heart rate of 220 beats per minute (bpm), blood pressure of 80/60 mmHg in the upper limbs, and prominent neck pulsations. Systemic examination was normal. The electrocardiogram (ECG) revealed narrow QRS regular tachycardia at 220 bpm, with a pseudo R' in lead V1 and a pseudo S in lead II, consistent with a diagnosis of typical AVNRT. The tachycardia terminated with 12mg of intravenous adenosine. She had not reported any episodes prior to her pregnancy. The nature of her illness and management options were discussed with

her. Since she was in her first trimester of pregnancy and it was her first episode she was discharged without medications.

She visited the out-patient department after a week, with multiple similar uncomfortable episodes of self-limiting tachycardia, lasting for a maximum duration of an hour. At this juncture she was given the option of adjunctive drug therapy to subdue the episodes albeit with a small risk of foetal toxicity. She consented and was initiated on oral metoprolol at 25mg twice daily. The dose despite being subsequently escalated to 75mg twice daily was of no avail. Morning sickness, anaemia (haemoglobin 11gm/dL) and hypovolemia probably further accentuated her symptoms.

At this juncture the option of catheter ablation was offered to her, as opposed to alternative antiarrhythmics that could be potentially more toxic to the foetus. The possibility of minimizing the use of fluoroscopy by using three dimensional electroanatomic mapping was explained to her. The risks of doing the ablation procedure without fluoroscopy were made clear. It was further elaborated to her that while we would attempt to keep fluoroscopy to an absolute zero, it was possible that we may be forced to use it when faced with difficult anatomy. After a clear understanding of the procedure, its benefits and risks, she consented for the same.

The procedure was performed under local anaesthesia with the Ensite Velocity three dimensional cardiac mapping system (St. Jude Medical) for guidance. An abdominal lead shield was placed over and below the patient, in case we needed to use fluoroscopy. Initially four accesses were taken from the right femoral vein. Fluoroscopy was disabled in the electrophysiology lab to prevent inadvertent use of the foot pedal. A flexible 5F quadripolar catheter was moved up to the heart with the Ensite Velocity system creating a geometric map of the inferior vena cava (IVC – refer to Fig. 1). The His bundle and ablation catheters were subsequently moved, using this IVC map as a guide. The coronary sinus (CS) catheter was placed from the jugular site. The position of the bundle of His was tagged on the three dimensional map. Geometric maps of the right atrium (RA), right ventricle (RV), tricuspid annulus (TA) and CS were created.

Electrophysiological study revealed the presence of an AH jump at 650–330 ms confirming the presence of dual AV node physiology. VA conduction was concentric and decremental and incremental atrial pacing did not reveal progressive pre-excitation. Programmed atrial stimulation and catheter manipulation easily induced a narrow QRS regular tachycardia with 1:1 AV conduction

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Fig. 1. Geometric map of the IVC created using Ensite Velocity.

at a rate of 230 bpm, with a VA interval of 20 ms and concentric retrograde atrial activation. His bundle refractory premature ventricular contraction (PVC), introduced during tachycardia failed to affect the timing of the subsequent atrial activation. These features were consistent with a diagnosis of typical AVNRT.

Slow pathway ablation was performed with a 4mm tip D curve Thermocouple Biosense Webster ablation catheter with Ensite

Velocity guidance for ablation. The slow pathway was targeted in the triangle of Koch and radiofrequency energy was delivered at 40 Watts (55° Centigrade), in the M1M2 region, where the A signal was much smaller than the V signal (refer to Fig. 2). A good run of slow irregular junctional beats, was noted during the two 1-minute burns. Post ablation there was no jump/echo/inducible tachycardia even with isoprenaline infusion. The PR, AH and HV intervals

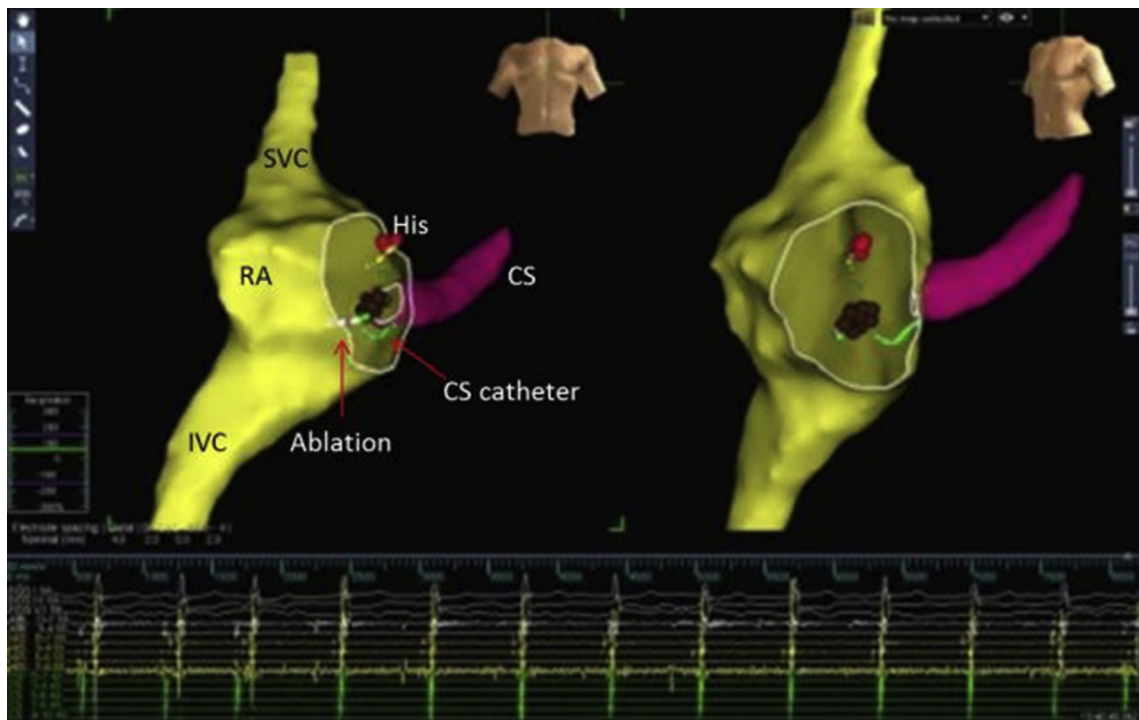


Fig. 2. Junctional beats during slow pathway ablation.

remained normal and not significantly altered from the pre-ablation study. There was no fluoroscopy used at all during the 95 minutes long procedure. The patient remained haemodynamically stable throughout the intervention.

3. Discussion

Catheter ablation with zero/minimal fluoroscopy has been performed in the recent past [1–5]. However in India, to the best of our knowledge, this is the first such reported case. We report this patient not only for the fact that the intervention was performed with zero fluoroscopy but more importantly to discuss the approach to a patient with a similar problem.

Our patient had her first episode of AVNRT during pregnancy, and subsequently proceeded to be extremely symptomatic with it. It made us go through the steps of management as would ideally be suited for such a patient. Initially we tried adenosine on an adhoc basis. When that failed we offered her the least toxic drug therapy. When she continued to be symptomatic despite increasing the drug dose, we considered ablation.

Patient safety must be top priority and hence it is wise to consent the patient for minimal use of fluoroscopy which may be used when faced with challenging anatomy. Three dimensional mapping may be used as an adjunct to help minimize fluoroscopy and should not be looked upon as an alternative to fluoroscopy. All the traditional precautions must be adhered to like using the protective lead shield during the procedure. Since our patient had typical AVNRT it was relatively easy to create a map and perform the ablation without fluoroscopy. Creation of good geometric maps of the RA, RV and the triangle of Koch with tagging of the His bundle region helps minimize the risk of complications. In situations where the anatomy is challenging, electroanatomic guidance will need to be supplemented with judicious use of fluoroscopy.

4. Conclusion

The following conclusions can be drawn from this account:

1. Pregnant women with arrhythmias may occasionally present with difficult management dilemmas.
2. Therapy in this group should follow the escalating steps of no to minimal drug therapy, with catheter ablation, when appropriate.
3. Catheter ablation of supraventricular arrhythmias with absolutely zero fluoroscopy is being reported first in the Indian context. It is a technique that has to be judiciously used and can come in handy in specific situations.
4. Patient safety is of great importance and judicious use of minimal fluoroscopy must be opted for when required than striving to do the procedure with zero fluoroscopy especially when there is a risk of a complication due to catheter manipulation.

Conflicts of interest

None of the authors have any conflicts of interest to declare.

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