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Radiofrequency ablation of recurrent, drug refractory, left posterior fascicular ventricular tachycardia in a pregnant lady without the use of fluoroscopy

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1. Introduction

Idiopathic fascicular ventricular tachycardia (IFVT) constitutes 10–15% of all idiopathic ventricular tachycardias (VT) involving the left ventricle (LV) [1]. It is usually seen in young males. It typically responds to verapamil. Radiofrequency ablation (RFA) provides an effective and permanent cure. In this report, we discuss a pregnant lady with recurrent IFVT and the challenges involved in treating her.

2. Case report

A 22-year-old primigravida was referred to us at 34 weeks of gestation with 10 episodes of sudden onset and offset palpitations within a span of 1 year. During each episode she reported feeling extremely weak and drained; 5 of the episodes being associated with syncope. Most of the paroxysms had required hospitalisation and intravenous verapamil. The frequency of the episodes had been increasing with the progress of her gestation.

Clinical examination during the last episode of palpitations had revealed an anxious, pale, profusely sweating lady with a heart rate of 170 beats per minute and a blood pressure of 80/60 mmHg. Systemic examination apart from the gravid uterus was unremarkable. The electrocardiogram (ECG) revealed a broad complex regular tachycardia with a QRS width of 150 ms. It had a RBBB like morphology with a left superior QRS axis (about −90 degrees). AV dissociation with occasional capture and fusion beats were seen, suggesting a diagnosis of left posterior fascicular ventricular tachycardia (LPFVT). Her haemogram, serum electrolytes, renal, liver, thyroid function, and baseline echocardiogram were normal. The baseline ECG (Fig. 1A) showed normal sinus rhythm. Obstetric examination revealed mild intrauterine growth restriction of the foetus.

She was started on oral verapamil which was escalated to the maximum tolerated dose. In spite of that, she continued to have paroxysmal episodes. Add on beta blockade was tried which did not control her symptoms. Further increase of beta blockade was not attempted as the obstetrics team opined that it would be detrimental to the foetus by causing foetal bradycardia. Amiodarone had been tried in the past elsewhere to no avail either.

At this juncture having exhausted most options of medical therapy, she was offered fluoroless RFA with electroanatomic mapping guidance, as a therapeutic measure. The risks and benefits of the procedure were explained to her as well as the possibility of minimal use of fluoroscopy should the situation so demand. After obtaining consent and application of a lead shield for the foetus she was taken up for RFA.

Fluoroscopy was disabled. Two right femoral venous accesses and one right femoral arterial access were taken following which she was fully heparinised. EnSite™ Velocity™ cardiac mapping system (St Jude Medical, Minnesota, United States of America) was used for electroanatomic mapping. The intracardiac echocardiography (ICE) catheter was kept on standby. The obstetrics and neonatology on-call teams were alerted. The procedure was performed under local anaesthesia.

A 5Fr deflectable quadripolar catheter was taken through one of the right femoral venous accesses and the courses of the right femoral vein and inferior vena cava (IVC) were delineated. Geometries of the right atrium (RA) and the right ventricle (RV) up to the pulmonary valve (PV) were then created. The tricuspid annulus was marked and the position of the right-sided His bundle was tagged. A quadripolar catheter was then placed in the RV. Catheters and accesses were kept to a minimum as the patient was pregnant with

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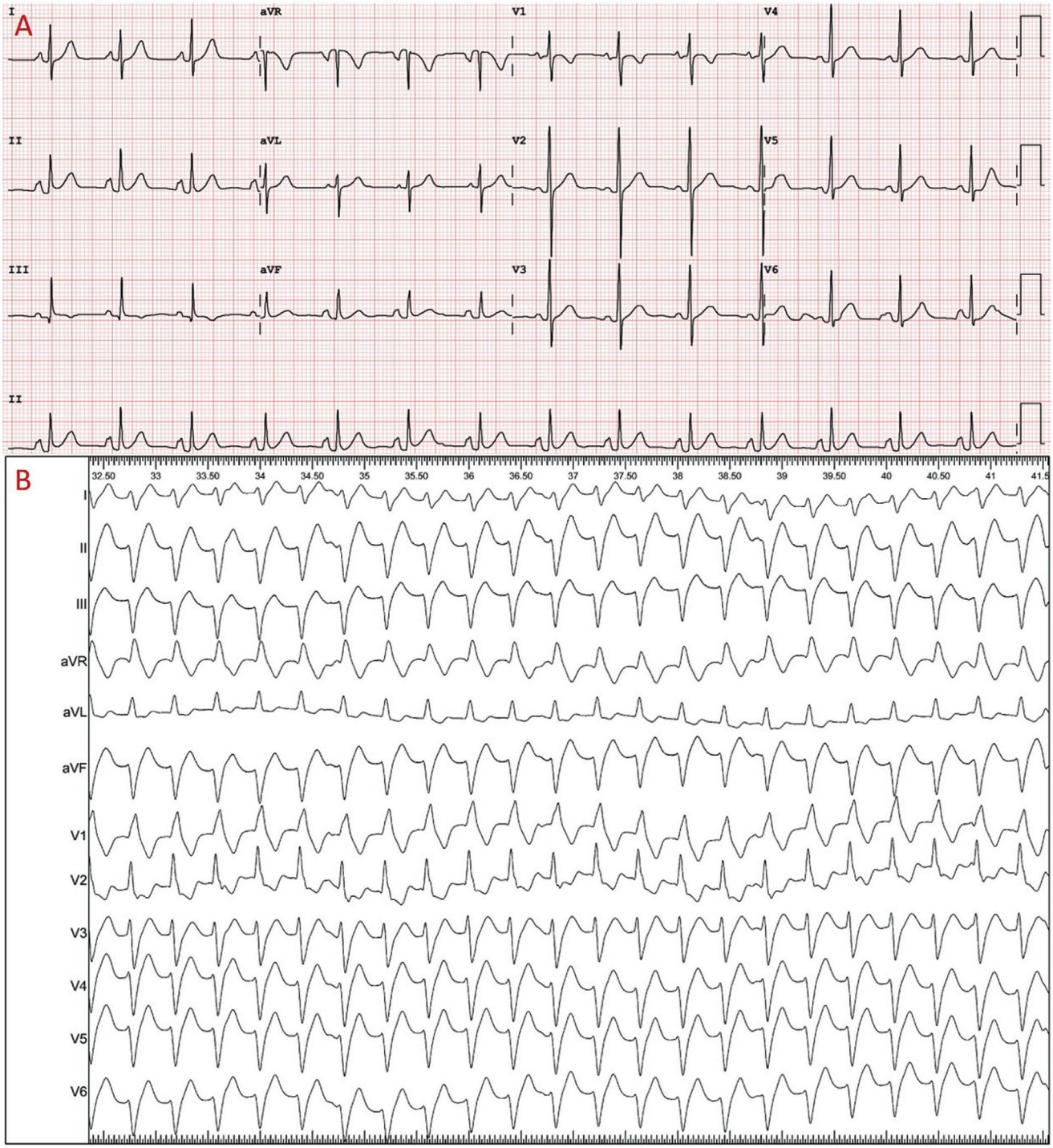

Fig. 1. **A**: Baseline ECG showing sinus rhythm. **B**: Tachycardia ECG in the electrophysiology lab.

difficulty in keeping the groin immobilized.

A 5Fr deflectable quadripolar catheter was then taken through the right femoral arterial access and the course of the aorta was delineated. The aortic valve was marked and the left ventricle (LV) was entered cautiously. The geometry of the LV was then created - the mitral annulus was marked and the left-sided His bundle deflection was tagged. A 5Fr deflectable decapolar catheter was then taken into the LV to annotate the positions of the left bundle branch (LBB), the left posterior fascicle (LPF) and the left anterior fascicle (LAF).

An electrophysiologic study revealed normal baseline intervals. Sustained tachycardia was easily inducible with catheter manipulation and programmed stimulation both from the RV and from the LV with the use of a single extra-stimulus. The tachycardia at 120 beats per minute was identical to the clinical arrhythmia (Fig. 1B). There was VA dissociation with more ventricular than atrial depolarisations. The HV interval during tachycardia was 0 ms. The tachycardia could be entrained from the ventricles. These features were consistent with a diagnosis of ventricular tachycardia (VT) with a probable reentrant mechanism. In view of the nature of the

QRS morphology and the QRS axis, the possibility of reentry in the vicinity of the left posterior fascicle (LPF) was suspected.

The tachycardia was haemodynamically stable - hence activation mapping was performed (the initiation of the QRS on the surface ECG was taken as the fiducial point for electroanatomic mapping). Initially, the 5Fr deflectable decapolar catheter was used to map the LV. In the region of the anatomic LPF (Fig. 2A) distinct P2 potentials were found discrete from the ventricular signal during

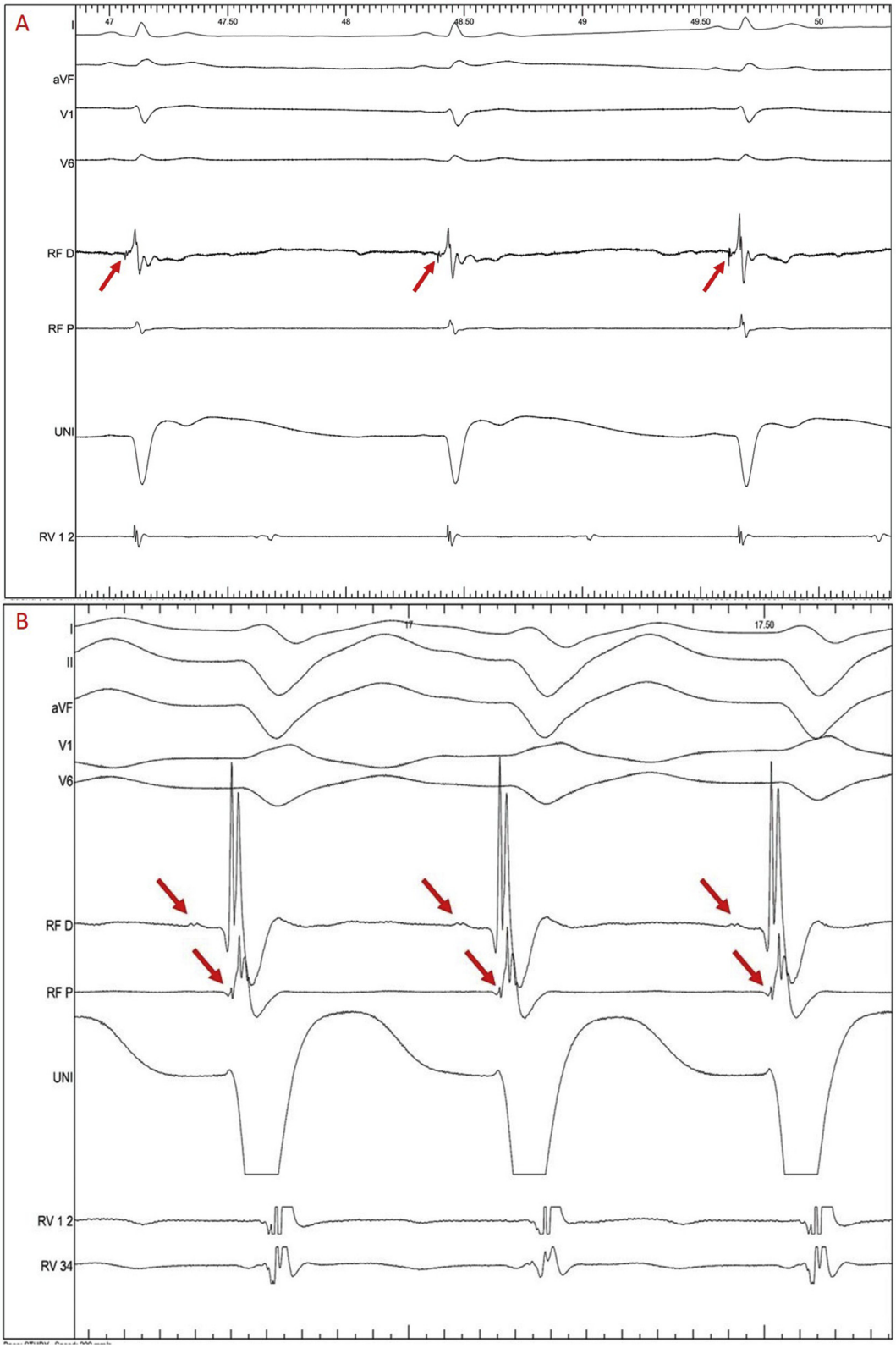

Fig. 2. A: Fascicular potentials during sinus rhythm. **B**: P2 potentials during tachycardia.

tachycardia (Fig. 2B). The earliest P2 was mapped with the help of Ensite Velocity in the infero-posterior ventricular septum. This was found in the mid segment of the septum. This map was validated by using a 4mm tip bidirectional Flexability (St Jude Medical, Minnesota, United States of America) irrigated ablation catheter (ablation settings: 30 watts power, 48 degrees centigrade temperature). At the site of the earliest P2, concealed entrainment was confirmed (Fig. 3). Radiofrequency (RF) energy was delivered at this site during tachycardia (after making sure that the site was well away from the left-sided His/LBB signal) which resulted in tachycardia termination (Fig. 4). Three additional radiofrequency (RF) lesions were given in and around the site of successful ablation for purposes of consolidation. Post-ablation there was no tachycardia inducible – even with three extra-stimuli down to 400-200-200-200 ms from the RA, RV and LV, with and without isoprenaline infusion.

Post-ablation an echocardiogram ruled out any pericardial collection. She remained stable and was discharged the following day. All her antiarrhythmic medications were stopped. She reported no further recurrence of symptoms and went on to have a normal vaginal delivery. She has been symptom-free now for 1.5 years after the procedure.

3. Discussion

Fluoroless RFA aided by an electroanatomic map has been in use for a while now. Two large series of fluoroless RFA have been published recently where the centres have dealt both with supraventricular tachycardias (SVTs) as well as with VTs [2,3]. In both the studies the proportions of patients for VT ablation were significantly small.

Giaccardi et al. [2] studied 442 consecutive patients, the first 145 of them undergoing conventional RFA and the next 297 being assigned to fluoroless ablation with electroanatomic mapping (Ensite Velocity). 255 (86%) of the 297 patients planned for fluoroless procedures underwent ablation, completely without the use of fluoroscopy, with the rest requiring minimal fluoroscopy. None of the included patients was pregnant. Only 6 patients underwent ablation for VT. Overall success rates (more than 95% in both groups), procedure times and complication rates were no different in the two groups. Fluoroscopy times were understandably markedly reduced in the second group compared to the first group (14 ± 6 seconds vs 1159 ± 833 seconds; $P < 0.0001$).

Razminia et al. [3] retrospectively analysed clinical data from 500 consecutive patients undergoing fluoroless RFA targeting a total of 639 arrhythmias including both SVTs and VTs. Intracardiac echocardiography (ICE) was used in most of their cases. Ablation for VT was performed only in 14 patients. The recurrence rate for VT ablation over 20.5 months of follow-up was 21.4%. There were only 5 (1%) major complications – 4 patients had cardiac tamponade and 1 patient (with atrial fibrillation ablation) developed atrio-oesophageal fistula.

Szumowski et al. [4] performed mapping and ablation in 9 pregnant women (12–38 weeks of gestation). 3 patients had the permanent form of junctional reciprocating tachycardia (PJRT), 3 had Wolf Parkinson White syndrome, 2 had atrial tachycardia (AT) and 1 had atrioventricular nodal reentrant tachycardia (AVNRT) – all had severe symptoms that were drug refractory. None of the patients had VT. Of the 9 patients, only 3 had completely fluoroless RFA solely guided by electroanatomic mapping – one with a right atrial AT and 2 with PJRT. The mean procedure time was 56 ± 18 minutes, with no major complications. All patients were arrhythmia free at 43 ± 23 months of follow up.

Conservative non-interventional management has been emphasised to the extent possible for all arrhythmias during pregnancy [5]. There are absolutely no accounts of idiopathic VT

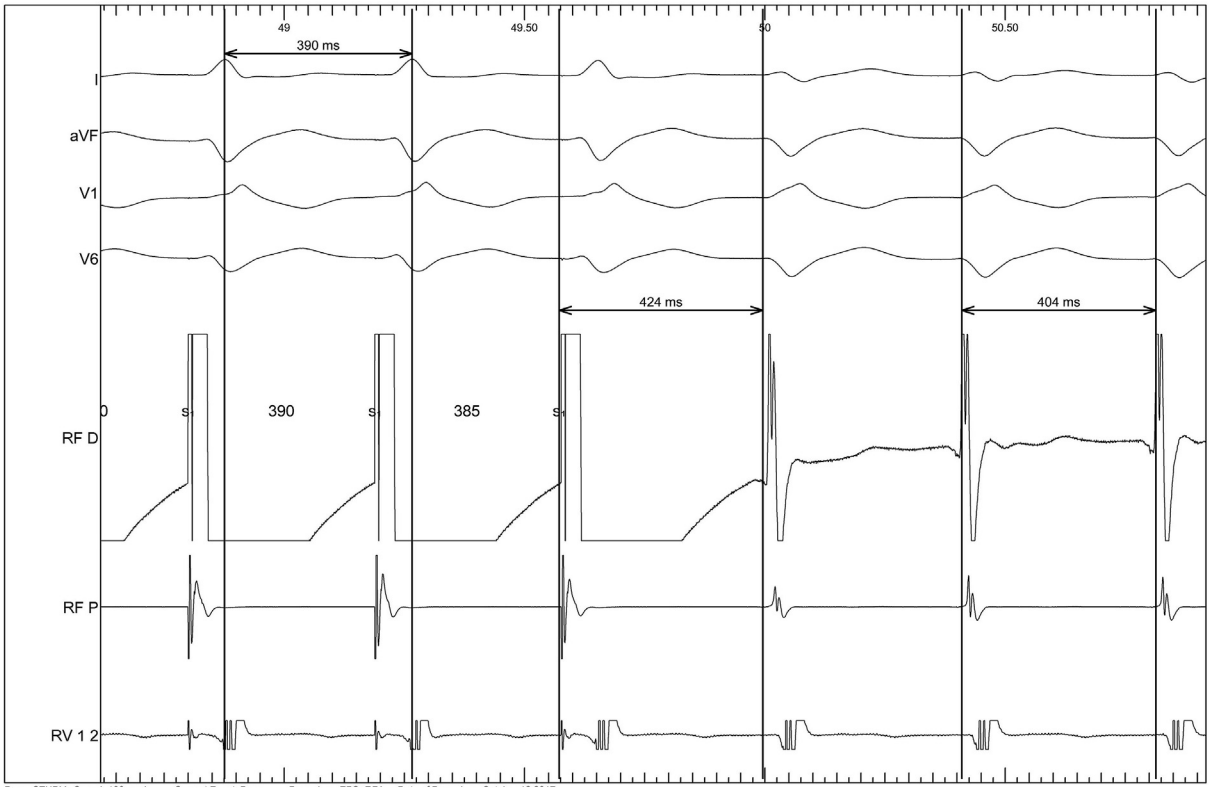

Fig. 3. Entrainment from the left ventricle.

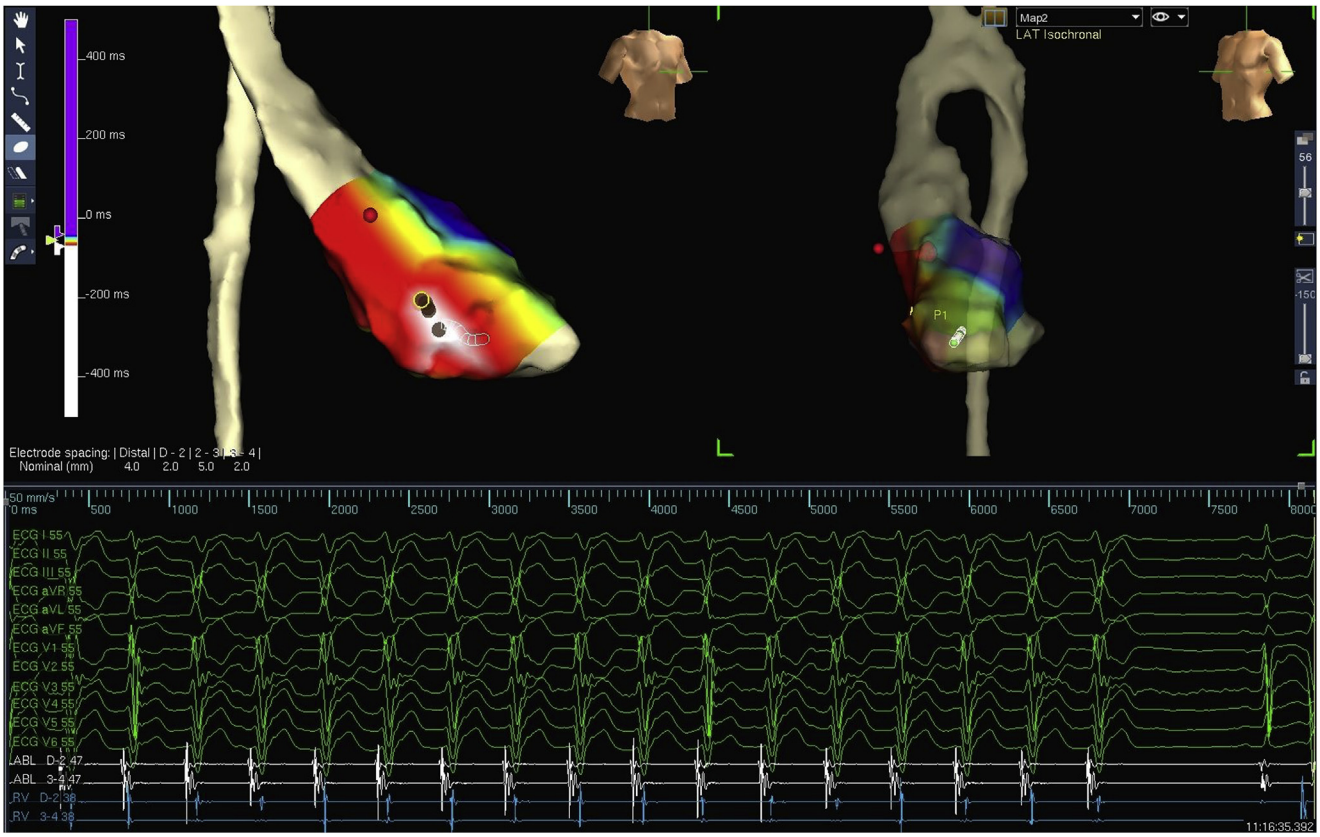

Fig. 4. Tachycardia termination on Ensite Velocity (RAO on the left, LAO on the right); the red dot represents the site where the His signal was recorded.

ablation in pregnant patients in the literature [5]. However, tackling drug-resistant arrhythmias in the pregnant sub-group remains debatable. Sometimes, situations arise, as in the case of this pregnant lady, where the arrhythmia is drug refractory, causing troublesome symptoms. RFA during pregnancy is difficult as fluoroscopy puts the foetus at risk. An electroanatomic map guided approach helps to overcome this limitation. We reported successful zero fluoroscopy RFA in a similarly symptomatic pregnant lady with drug-refractory AVNRT a few months ago [6]. Such an option can be considered in pregnant women with non-drug-responsive arrhythmia. Detailed discussions with the patient are imperative prior to the procedure where the risks versus benefits of such a procedure are clearly defined. Informed consent should be obtained for minimal use of fluoroscopy should the anatomy so demand. The other precaution to be considered in a pregnant lady, who is near term, is the chance of the procedure precipitating labor. The obstetric and neonatology teams should be on alert to tackle any emergencies that may arise in case of such an eventuality.

IFVT diagnosed and managed in pregnancy has been reported only twice in the literature in the past [7,8]. In the report by Cleary-Goldman et al. [7], the patient was managed successfully both in the acute phase and for repressive therapy with verapamil. In the patient described by Makhija et al. [8], IFVT could be acutely reverted by verapamil – however, for chronic suppression, this patient required a combination of verapamil and beta-blockers. None of the patients was ablated during pregnancy. To the best of our knowledge, our patient is the first reported account of fluoroless RFA for IFVT, in a pregnant lady, in the world.

The field of fluoroless RFA, despite having been studied, has some areas that are under-represented. These areas include VT ablation and the clinical scenario of a pregnant symptomatic lady requiring RFA. Long term follow-up data is also lacking in these areas. More reports need to be analysed to gain further insights in these two specific clinical situations.

4. Conclusions

1. Conservative stepwise management with escalating drug therapy to combinations that are safe in gestation should be the primary strategy in pregnant women with recurrent symptomatic arrhythmias.
2. Fluoroless RFA as an option should be considered only after the failure of drug therapy. The patient should be counselled on the risks and benefits of such a procedure, after making it known that small doses of fluoroscopy might have to be resorted to should the situation demand it.
3. Fluoroless RFA has been studied more in cases of SVT than in VT - more reports will aid in the understanding and elucidation of the use of this strategy in VT. Its use in the pregnant population with VT has not been studied.

Declaration of interests

The authors have no conflicts of interest to declare.

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None.

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