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Radiofrequency catheter ablation of atrioventricular nodal reentrant tachycardia in a patient with dextrocardia

Summary

A 34-year-old male patient with situs inversus and recurrent sustained episodes of palpitations due to atrioventricular nodal reentrant tachycardia underwent successful radiofrequency catheter ablation of the slow pathway without complication. The procedure was performed using single plane fluoroscopy in the antero-posterior projection with simple left-right fluoroscopic image reversal. Radiofrequency ablation of atrioventricular nodal reentrant tachycardia in dextrocardia appears to be feasible and as safe as in normal patients.

Key words: catheter ablation; atrioventricular node reentrant tachycardia; dextrocardia

Introduction

Radiofrequency (RF) catheter ablation of the slow pathway is considered as the method of choice to cure patients with recurrent episodes of supraventricular tachycardia due to atrioventricular nodal reentrant tachycardia (AVNRT). Based on anatomic as well as electrophysiologic markers, RF ablation of the slow pathway is a safe (<0.5% risk of complete atrioventricular block) and effective (success rate >98%) therapy, at least in patients with structurally normal hearts [1, 2]. Dextrocardia is a rare anomaly and RF ablation in this setting has been only rarely reported [3–7].

Case report

A 34-year-old male patient with situs inversus including dextrocardia presented with recurrent episodes of supraventricular tachycardia (SVT) at a rate of 210 bpm. SVT was successfully terminated by adenosine and the 12-lead ECG during sinus rhythm disclosed an atypical right bundle branch block pattern with left axis deviation and very small R waves from V_3 to V_6 (fig. 1A). Normalisation of the precordial aspect was obtained by recording right precordial leads (V_1R–V_6R) (fig. 1B). At the age of 27, the patient had undergone closure of a ventricular septal defect with resection of a muscular ring in the mid right ventricular (RV) cavity. Physical examination was compatible with a situs inversus but was otherwise unremarkable. Doppler-echocardiography confirmed dextrocardia with slight RV dilatation but without residual left-to-right shunt. An electrophysiologic study was performed in a drug-free state using standard technique; one 6-French quadripolar electrode-catheter was inserted percutaneously from the femoral vein and positioned in the high right atrium; a 4-French bipolar electrode-catheter was positioned on the His bundle and a 7-French 4 mm-tip ablation catheter (Cordis-Webster® Inc.) was used first for ventricular stimulation and then to map the Koch triangle and to ablate the

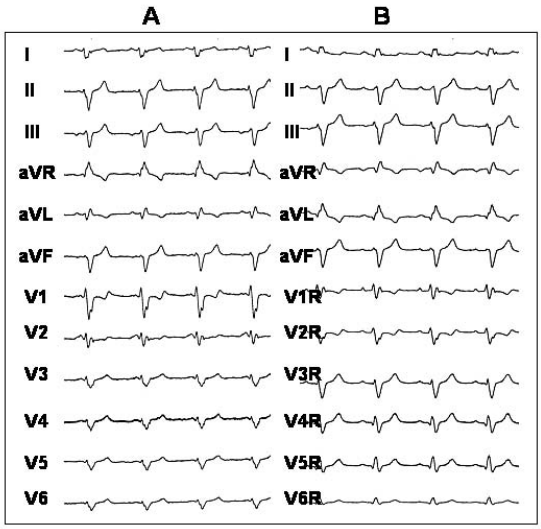

Figure 1
12-lead surface ECG during sinus rhythm with conventional precordial leads (A) and with right precordial leads (B).

There is no conflict of interest.

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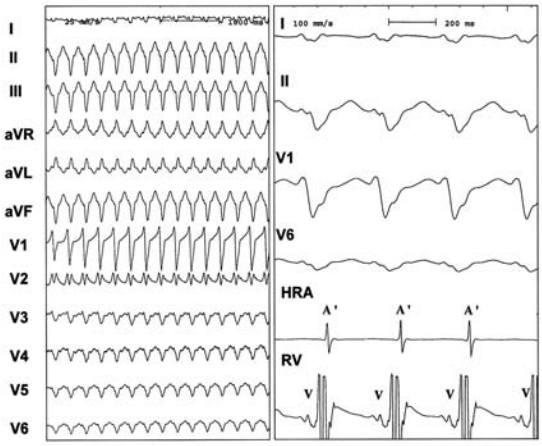
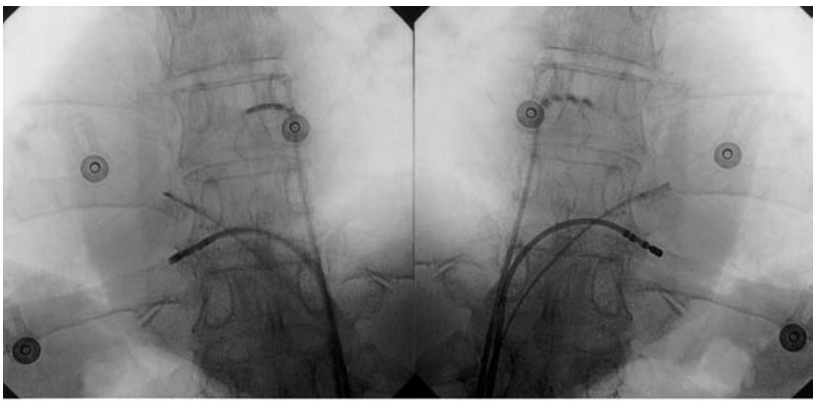


Figure 2
A 12-lead surface ECG (paper speed 25 mm/s) recorded during tachycardia (rate 210 bpm).
B Intracardiac recording during tachycardia (paper speed 100 mm/s). Four surface ECG leads are shown (I, II, V_1 and V_6) together with 2 intracardiac recordings, one in the high right atrium (RA) and one in the right ventricle (RV). Retrograde atrial activation (A') occurs simultaneously to right ventricular activation (V) with a VA interval of 65 ms.

slow pathway. Programmed atrial and ventricular stimulation was performed using a Biotronik UHS 20™ stimulator. Multiple surface ECG leads and intracardiac ECGs were continously monitored and all data were recorded on optic disk using the CardioEP™ software (Prucka Engineering Instrument, Houston, Texas, USA). During sinus rhythm A-H-interval was 100 ms and H-V-interval 48 ms. No ventricular preexcitation was present during incremental atrial pacing and retrograde conduction was decremental during ventricular extrastimulation. A-H-jump (150 to 215 ms for an S_1–S_2 of 280 and 270 ms respectively) was observed during atrial extrastimulation but SVT (CL 290 ms) was induced only after isoproterenol infusion (fig. 2A); intracardiac recordings showed that atrial activation occurred simultaneously with ventricular activation with a V-A-interval of 65 ms during SVT (fig. 2B). A septal accessory pathway was excluded by RV stimulation at a time when the His bundle was refractory. Atrial tachycardia was excluded on the basis of transient 2:1 VA block in the first few beats of tachycardia. For catheter positionning in the presence of dextrocardia, we used single-plane fluoroscopy in the anteroposterior projection and simple left-right fluoroscopic image reversal (fig. 3). Control of the RF catheter position was made in the RAO 50° and in the LAO 30° positions. Identification of the optimal site for the slow pathway ablation was performed using anatomical and electrophysiological [2] landmarks. RF energy was delivered first during SVT (1 application) then during sinus rhythm (8 applications) in order to obtain a better stabilisation of the catheter and hence a better electrode-tissue contact. Nine full RF applications (20 to 45 watts; 30 to 60 s; mean temperature 56 degrees) were necessary to ablate the slow pathway. Junctional rhythm was observed during the 4 last applications. After the 9th application tachycardia was no longer inducible even during isoproterenol infusion, and no jump was observed any more. Total procedure time was 135 min and total fluoroscopy time was 46 min. No complication was observed and the patient was discharged from the hospital 6 hours after the procedure. After a follow-up of 5 years no recurrence of SVT has been observed.



A B

Figure 3
X-ray view in the anteroposterior projection. Standard view (A) and with right-left image reversal (B). A 4-French bipolar electrode catheter is positioned in the His bundle region; a 6-French quadripolar electrode catheter is positioned in the high right atrium and the 7-French RF ablation catheter is shown here in the region of the slow pathway immediately before radiofrequency ablation.

Discussion

Radiofrequency ablation in patients with dextrocardia has been only rarely reported. Hatala et al. [4] reported successful RF ablation of an incessant atrial tachycardia originating within the inferolateral pulmonary vein. In that case, transoesophageal echocardiography was used in addition to fluoroscopy for catheter guidance during the transseptal puncture and ablation site was identified by activation mapping and by the identification of a fragmented potential in the inferolateral pulmonary vein. Wu et al. [3] reported successful ablation of a reentrant right atrial tachycardia in a patient with dextrocardia and corrected secundum type atrial septal defect. These authors proposed adjustement of biplane fluoroscopy to the RAO 60° and LAO 30° positions to facilitate endocardial mapping. Abe et al. [5] described a case with successful ablation of a left posteroseptal accessory pathway in a patient with dextrocardia using standard fluoroscopic positions (RAO 30°, LAO 45°). Successful RF ablation for AVNRT in a patient with

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dextrocardia has been only rarely described [6, 7]. In Reithman's report, stable contact of the ablation catheter was difficult to obtain, procedure time was long (4–5 hours) as well as radiation exposure (69 min) and many RF applications were necessary for success. However, no rotation of the X-ray picture was used. By simply rotating the fluoroscopic image 180 degrees, positionning of the RF ablation catheter in the present report was easy and allowed the operator to use familiar anatomical landmarks. Because of the abnormal anatomy, the ablation procedure was conducted in a very prudent way using progressive increase of power, progressive ascent of the RF ablation catheter in the low septal region and immediate cessation of RF application in case of rapid junctional rhythm or presence of VA block during junctional rhythm. These considerations may explain the relatively long procedure (135 minutes) or fluoroscopy (46 minutes) times for a slow pathway ablation procedure. We conclude that RF ablation of AVNRT appears feasible and safe in patients with dextrocardia.

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