CASE REPORT

Left-septal ablation of the fast pathway in AV nodal reentrant tachycardia refractory to right septal ablation

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Abstract In more than 95% of patients with atrioventricular nodal reentrant tachycardia (AVNRT), curative treatment can be achieved with selective ablation of the slow pathway in the right-sided septum. We report a patient with typical AVNRT who had failed attempts to perform conventional right septal ablation of the slow as well as of the fast pathway and finally underwent successful ablation of the fast pathway on the left side of the interatrial septum using a transseptal approach.

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Introduction

Radiofrequency (RF) ablation is currently the method of choice for curative treatment of atrioventricular nodal reentrant tachycardia (AVNRT). Although both the fast and the slow pathway can be ablated selectively, nowadays slow pathway ablation is the preferred technique for elimination of AVNRT [1]. Very rarely, right sided ablation of the slow or the fast pathway using the conventional approaches is not possible. We report a patient with typical AVNRT who had failed attempts to perform conventional right septal ablation of the slow as well as of the fast pathway and finally underwent successful ablation of the fast pathway on the left side of the interatrial septum using a transseptal approach.

Case report

A 50-year old male was symptomatic with AVNRT for 20 years. For some months, the tachycardias occurred daily. Antiarrhythmic drug treatment
failed to prevent tachycardia. The diagnosis of common AVNRT was confirmed by an electrophysiological study and a slow pathway ablation was attempted. Due to early recurrence of AVNRT the ablation procedure was repeated. However, this second slow pathway ablation was unsuccessful and the patient was referred to our centre.

During electrophysiological study a slow-fast AVNRT with cycle length of 380 ms was reproducibly inducible (Fig. 1). Typical sites for slow pathway ablation were not successful, neither at the tricuspid annulus nor the coronary sinus area, though typical ectopic junctional beats were observed during RF application. Higher RF application close to the compact body of the AV node resulted in a transient block of the slow pathway, but tachycardia recurred 15 days later.

The second electrophysiological study, in our laboratory, demonstrated the same AVNRT with a cycle length of 390 ms. In the same session, due to the prior three unsuccessful slow pathway ablations, a fast pathway ablation was attempted. Though typical junctional beats were induced by RF application in the fast pathway area, the AVNRT remained reproducibly inducible. The decision was made to perform left sided ablation by a transseptal approach. After transseptal puncture the ablation catheter (7-French quadripolar with 4-mm distal electrode; Biosense Webster, Diamond Bar, CA, USA) was positioned on the left mid septum inferior to the His-bundle (Fig. 2) with the intention of targeting left sided inputs. At this site the AV electrogram amplitude ratio was less than 0.5, and no His-bundle potential was recorded (Fig. 2). During RF application at this site an ectopic junctional rhythm occurred. Continuous fluoroscopy during RF application showed stable catheter placement without dislocation. After ablation typical signs of successful fast pathway ablation were observed, i.e. prolongation of the atrial-His bundle interval plus complete VA-block (Fig. 3). No tachycardias were inducible after ablation. The patient was discharged without need for medication and has done well with no recurrence of tachycardia during a follow-up of 4 months.

Discussion

AVNRT may be cured with the ablation of the slow pathway or the fast pathway. Today, the first-line approach is the slow pathway ablation due a lower risk of AV block [1]. Although more than 95% of typical AV nodal reentry tachycardias may be cured by slow pathway ablation [2], a substantial variability of AV node anatomy and pathophysiology exists, i.e. functionally fast AV node pathways may be located posterior/inferior at sites where usually slow pathway ablation is performed [3].

Figure 1 Recordings of surface ECG leads I, II, V1 and V6 and intracardiac recordings of the high right atrium (HRA), His bundle region (HBE) and right ventricular apex (RVA). Slow-fast AVNRT (cycle length 380 ms) is induced by a single atrial extrastimulus (coupling interval 290 ms).
For the rare patients, in which right sided ablation of the slow pathway fails, left sided slow pathway ablation may be needed [4,5]. Alternatively, right sided fast pathway ablation may be attempted [6].

The concept of dual electrophysiological pathways is based on separate wavefronts that propagate in functionally dissociated, rather than electrically insulated domains [7]. Two main inputs to the atrioventricular node for activation proceeding from the right atrium have been described: The envelope of the transitional cells and a brief trespass through the compact nodal region in the anterior margin of the triangle of Koch may constitute the domain of the fast wavefront, the deeper inferior/posterior extensions and the compact region are the proposed domain of the slow wavefront [7]. Additionally, left atrial inputs have been described [8].

In our patient, stepwise right septal slow- and fast pathway ablation had failed and left septal ablation was attempted. Application of RF current at the left atrial septum inferior to the His bundle unexpectedly resulted in fast pathway ablation. Left-septal ablation of the fast pathway ablation has not been reported so far. This case shows, that if atypical anatomical and electrophysiological properties are observed on the right septal side, atypical conditions may exist also on the left septal side. Apparently, left atrial inputs to the atrioventricular node may serve as both slow or fast wavefronts.

AVNRT takes place in a highly complex three-dimensional non-uniform anisotropic AV junctional area [9—12]. It is essential to be familiar with the anatomical and electrophysiological peculiarities and variants in this region as well in order to assure
successful ablation procedures with minimal risk of complete AV block.

References


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Figure 3 Simultaneous recordings of surface ECG leads I, II and V1 and intracardiac recordings of electrodes in the high right atrium (HRA), in the His bundle region (HBE) and in the right ventricular apex (RVA). Before fast pathway ablation (A) the atrial-His bundle interval is 90 ms. After fast pathway ablation (B) an increase of the atrial-His bundle interval to 160 ms is observed. During ventricular pacing elimination of VA conduction is documented (C).
