Cryoablation of two accessory pathways in a single session: Appraisal of a direct cryoablation approach in right septal locations

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A 37-year-old woman with Wolff-Parkinson-White syndrome had experienced atrioventricular re-entrant tachycardias for 3 years. The standard ECG showed a shortened PQ interval, a positive delta wave in leads I, II and aVF and a negative delta wave in V1, suggesting a parahisian AP location (Fig. 1A). A first electrophysiological procedure confirmed this location with the earliest ventricular activation during antegrade conduction recorded in the His-bundle area anteriorly on the His-bundle catheter. The patient was treated with antiarrhythmic drug therapy, but after several months, she remained symptomatic, so a second electrophysiological study was performed, confirming the parahisian location.

Cryoablation was applied without a prior transient cryomapping test as is usually recommended in such procedures. One application of cryoenergy at $-70^\circ$C caused a sudden loss of ventricular pre-excitation (Fig. 1B). The initial pre-excitation completely disappeared but, surprisingly, we observed a persistent short atrioventricular delay. The ECG showed a shortened PQ interval, a positive delta wave in leads I and aVL and a negative delta wave in leads III, aVF and V1, suggesting a dormant posteroseptal AP location (Fig. 2A and B). The earliest site of ventricular activation during antegrade conduction was recorded in the posteroseptal region on the coronary sinus catheter. One application of direct cryoenergy at $-70^\circ$C abolished the shortened PQ interval after 9 s (Fig. 2C). No complication occurred. The patient left the hospital 1 day later in sinus rhythm, with a PR interval of 130 ms and without any pre-excitation on the ECG (Fig. 3).

Abbreviations: AP, accessory pathway; ECG, electrocardiogram.

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Figure 1. (A) Initial intracardiac 12-lead electrocardiogram showing a shortened PQ interval with a positive delta wave in leads I, II and aVF and a negative delta wave in V1, consistent with a parahisian accessory pathway location. (B) After sudden loss of ventricular pre-excitation, we noticed a persistent short atrioventricular delay in the coronary sinus as well as in the His-bundle area, suggesting a second dormant accessory pathway. (C) Fluoroscopic image in frontal view showing the cryocatheter positioned within the His-bundle region. A decapolar catheter was positioned in the coronary sinus to allow more precise mapping and two quadripolar catheters were positioned in the His-bundle region and the right ventricle.

Figure 2. (A) Intracardiac 12-lead electrocardiogram during atrial pacing after ablation of the parahisian accessory pathway, showing a persistent shortened PQ interval with a positive delta wave in leads I and aVL and a negative delta wave in leads III, aVF and V1, with a precordial QRS transition between leads V1 and V2, suggesting a dormant right posteroseptal accessory pathway. (B) After positioning the cryocatheter in the right posteroseptal region, we noticed a fused atrioventricular complex. (C) During atrial pacing, we confirmed this ablation site as the correct target. Concomitant to the sudden loss of ventricular pre-excitation on the electrocardiogram during cryoenergy application, we observed a normal local as well as hisian atrioventricular delay from the ablation catheter (second QRS). (D) Fluoroscopic image in frontal view showing the cryocatheter positioned within the annulus tricuspid region, a decapolar catheter positioned in the coronary sinus and two quadripolar catheters positioned in the His-bundle region and the right ventricle.
In our experience, cryomapping before cryoablation could fail to successfully ablate the AP despite the site being 'the correct one', because of the deeper and/or the larger location of the AP compared with a slow pathway tissue. Hence, cryomapping with a lower negative temperature could be of limited interest in such patients. As a result, we advocate a direct cryoablation approach for a successful and more secure procedure than radiofrequency, especially because of the risk of block in the normal conduction tissue that is usually reversible even after cryoablation.

It should be noted that despite a complete study, we cannot exclude a single Y pathway with an oblique course that was damaged with the first application and completely destroyed with the second.

**Disclosure of interest**

The authors declare that they have no conflicts of interest concerning this article.