Catheter ablation of the anteroseptal accessory pathway from the non-coronary aortic cusp in a pediatric patient

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Introduction

For patients with Wolff-Parkinson-White (WPW) syndrome, several algorithms have been published for the prediction of the location of accessory pathways (APs) from the QRS morphology on the ECG. Hence, these algorithms may fail to identify the locations of midseptal or right APs (1, 2). APs may traverse the central fibrous trigone or involve the right atrial appendage; these may be mistaken as anteroseptal APs and be an uncommon source of ablation failure (3). Here we report a case of WPW syndrome with anteroseptal APs in which ablation was successfully performed from the non-coronary aortic cusp (NCAC).

Case Report

A 17-year-old-girl was referred to our institution because of palpitations for 3 years despite being on β-blocker treatment. Physical examination and echocardiography results were normal. Twelve-lead ECG showed manifest preexcitation with a positive delta wave in I, II, III, and aVF leads and a negative delta wave in V1-V2, suggesting an anteroseptal AP (Fig. 1a). During an exercise test, WPW-AP did not disappear. After obtaining informed written consent, electrophysiological study was performed. EnSite NavX® Mapping System (St. Jude Medical Inc., St. Paul, MN, USA) was used during the procedure (Fig. 1b). Basic electrophysiological data revealed an AH interval of 68 ms and an HV interval of -22 ms. The AP effective refractory period was 310 ms and the preexcited RR interval during atrial fibrillation was 320 ms. The AP was not responsive to adenosine. Clinical arrhythmia with a cycle length of 360 ms was easily and reproducibly induced by atrial and ventricular stimulation (Fig. 2a). During tachycardia, the earliest atrial activation was found in the right anteroseptal region. In addition, delta wave mapping in sinus rhythm revealed an AP in the right anteroseptal area.

Cryoablation of the AP was attempted. At the 15th second of cryoablation, the AP was eliminated; however, an atrioventricular (AV) block occurred (Fig. 2b). Based on the anatomical relationship between the anteroseptal region and the NCAC, mapping in the aortic cusp was performed with a mapping catheter via the right femoral artery. During tachycardia, the earliest atrial electrogram was found to be a near-field signal recorded in the NCAC. In addition, during sinus rhythm with delta wave mapping, the earliest atrial activation found 52 ms before surface QRS in the NCAC. Following aortic root angiography, radiofrequency (RF) energy was then delivered at the NCAC pathway potential site, eliminating AP conduction 4 s after RF onset (Fig. 2c). Following ablation, there was no recurrence of pathway conduction or of inducible orthodromic reciprocating tachycardia with and without orciprenaline infusion. In addition, during adenosine testing, no AP conduction was observed (Fig. 2d). The total fluoroscopy time was 7 min. No tachycardia recurred during 6 months of follow-up.

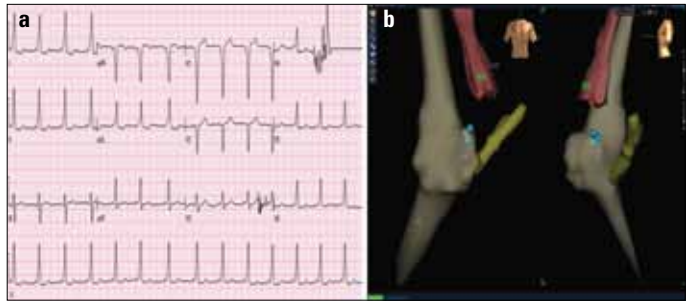

Figure 1. a, b. Twelve-lead electrocardiogram with a positive delta wave in I, II, III, and aVF leads and a negative delta wave in V1 and V2 (a), EnSite NavX® Mapping System (b)

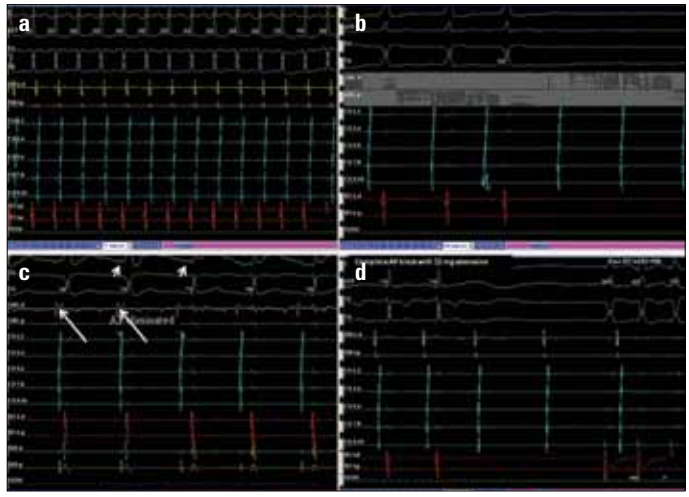

Figure 2. a-d. Tachycardia with a cycle length of 360 ms (a). Both AP elimination and AV block note that although atrial signals are present no ventricular pulse observed (b), Elimination of accessory pathway, first short; arrow in the surface electrocardiogram delta wave present, second short; arrow no delta wave exists, long arrows; near-field potential showing highly suggestive of AV connection site on the tracing which was obtained during the mapping in the non-coronary cusp (c). The adenosine test shows an AV block, suggesting elimination of the accessory pathway (d)

Discussion

Catheter ablation is recommended as the first-line therapy for older children with symptomatic WPW syndrome. However, septal APs (anteroseptal and midseptal) continue to be challenging targets for RF ablation, primarily because of their proximity to the normal AV conduction system and the propensity for heart block with aggressive lesion creation in this location (2-5). Therefore, anteroseptal AP ablation may fail because of conservative energy delivery at these sites. Less commonly, despite optimal energy delivery, anteroseptal AP ablation has been unsuccessful for unclear reasons. Rarely, APs may traverse the central fibrous trigone or involve the right atrial appendage; these may be mistaken as anteroseptal APs and be an uncommon source of failure (3). We initially tried cryoablation for our patient. However, an AV block occurred during cryoablation. Therefore, we need to find another possible way to perform ablation.

Although APs can bridge the atrial and ventricular myocardium at most sites along both AV annuli, the left anteroseptal region is an exception because of the presence of the aortic valve. In rare situations, RF ablation from the left side (NCAC, anteroseptal mitral annulus) or right ventricular outflow tract myocardium is successful in eliminating anteroseptal pathways (4). Although APs located in the NCAC are possibly rare, the exact incidence is unknown (4). Some previous studies have reported APs being ablated from the NCAC (3-7). In the presented case, the AP was eliminated 4 s after RF energy onset from the NCAC.

Conclusion

In patients with anteroseptal APs, if ablation is not possible on the right atrial side, the NCAC may provide an alternative ablation approach.

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