Para-Hisian atrial tachycardia ablation in a patient with congenitally corrected transposition of great vessels

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Introduction

Atrial tachycardias originating in the para-Hisian area are not exceptional.[1] In order to avoid iatrogenic atrioventricular block, alternative techniques to conventional radiofrequency ablation have been proposed, such as cryoablation and, recently, ablation from aortic cusps.[1–6] Nevertheless, para-Hisian areas in patients with transposition of great vessels are not always related to aortic cusps because the pulmonary artery is posterior to the aorta in these patients. We present a unique case of a patient with great vessel transposition and atrial tachycardia (AT) originating in the atrial septum. Due to the complex anatomy, ablation from the pulmonary cusp was needed to ablate the tachycardia.

Case report

A 35-year-old man with congenitally corrected L-transposition of the great vessels (ccLTGV) and dextrocardia was admitted to the Arrhythmia Unit because of palpitations. The electrocardiogram showed AT. A first ablation procedure was performed with an Ensite Velocity (St. Jude Medical, St. Paul, MN) navigation system. Activation mapping showed focal AT with earliest activation in the right and left atrial septum. Radiofrequency was delivered in both sides (Figure 1), with transient termination of the arrhythmia. After several applications, at the end of the procedure arrhythmia was poorly inducible and nonsustained. Changes in A-A interval preceding V-V interval, cooling down of the tachycardia before recovering sinus rhythm (Figure 2), and absence of resetting of the tachycardia with ventricular premature beats that preexcited the atria confirmed the diagnosis of AT. Two weeks later the patient was admitted again because of severely symptomatic AT. A new procedure was scheduled. Access to the right femoral vein was gained for diagnostic catheters. Duodecapolar (7F Livewire, St. Jude Medical, St. Paul, MN) and decapolar (6F Inquiry, St. Jude Medical, St. Paul, MN) catheters were placed in the right atrium and coronary sinus, respectively. Activation mapping during tachycardia (Ensite Velocity, St. Jude Medical, St. Paul, MN) was performed with an irrigated-tip catheter (7F Therapy Cool Flex, St. Jude Medical, St. Paul, MN). Earliest activation was located in the high anterior right atrial septum near the Hisian region. Mapping was completed in the pulmonary root and

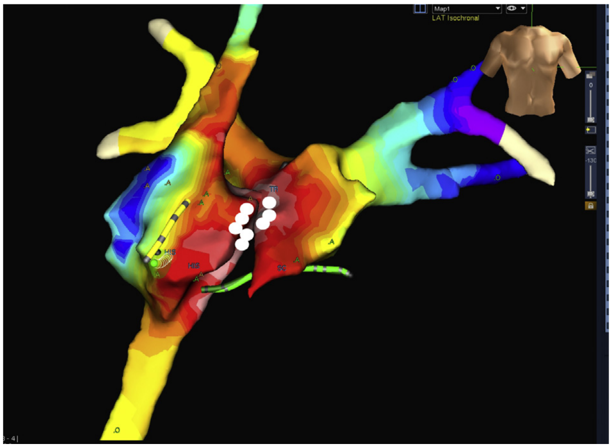

Figure 1 First procedure atrial tachycardia activation map showing earliest activation in high atrial septum in both right and left atrium. Radiofrequency applications were delivered in both sides of the atrial septum (white spots).

KEYWORDS Para-Hisian tachycardia; Great vessel transposition; Ablation; Pulmonary cusp; Congenital heart disease (Heart Rhythm Case Reports 2017;3:340–343)

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KEY TEACHING POINTS

- Ablation in the atrial septum carries the risk of iatrogenic atrioventricular block due to conduction system damage during ablation.
- The non-coronary cusp is an alternative site for ablation in the high atrial septum and para-Hisian area.
- In patients with transposition of great vessels, the pulmonary artery instead of the aortic artery is the vessel located close to the interatrial septum. In these patients, pulmonary cusps are the alternative site for ablation in the high atrial septum and para-Hisian area.

atrial activation time was as previously described in Hisian region. Location in the pulmonary root was confirmed by selective angiography through the ablation catheter in the ablation site. A single radiofrequency application terminated the tachycardia and it was noninducible posteriorly (Figure 3). No atrioventricular block or other complications occurred.

Discussion

ATs originating in the atrial septum are not uncommon (representing 15%–20% of ATs).[1] Ablation in this area carries the risk of iatrogenic atrioventricular block because it is in the vicinity of the conduction system. In the population of patients with ccLTGV, the disposition of the conduction system could be very different from that of patients with normal vessel configuration and, indeed, could vary from one patient to another. These patients can have twin atrioventricular nodes, posterior connections of the conduction system, His extension anterior to the membranous septum, and, especially, fast pathways, usually located in the high atrial septum. Furthermore, in this type of AT, mapping of both atria is often necessary.[3] Finally, it is important to consider that this area is anatomically related to the outflow tract region.[4] The non-coronary cusp (NCC) overlies the paraseptal region and the His bundle is located between the NCC and the right coronary cusp. Ablation in the NCC due to this anatomic configuration was first described for this AT in 2004,[5] and since that time several case series have been published.[1,2,6] The preferred approach (septal or NCC/right coronary cusp ablation) of this para-Hisian AT is not well established. Some groups routinely map and ablate in the atrial septum, and only when ablation has failed (up to 25% in these groups) do they deliver radiofrequency in the aortic cusps.[7] Nevertheless, some groups perform aortic cusp ablation in this para-Hisian AT in the majority of the cases.[1,2] In our patient, the para-Hisian region was not close to the NCC because it had underlying different anatomy. In CC-LTGV patients, due to L-looping of the ventricles and the aorta anterior and leftward of the pulmonary artery, this vessel and not the aorta is the vessel closer to the interatrial septum (Figure 4).[8,9] For these reasons, in the second procedure we decided to map the pulmonary cusps, as we would have done in the aortic cusps in a patient with normal configuration of the great vessels. As in NCC in non-TGV patients, ablation in the pulmonary cusp, even with Hisian electrogram in proximal electrode of the ablation catheter (Figure 2), was effective without damaging the conduction system. We used selective angiography through the ablation catheter to confirm the location of the catheter tip.[10]

To our knowledge, this is the first case described in literature of ablation of para-Hisian tachycardia from this region. Although case series are needed to confirm the effectiveness and safety of this approach, we believe that this approach should be considered as an alternative when mapping this type of tachycardia in the ccLTGV population.

Figure 2 Left panel shows tachycardia cycle length with A-A cycle variation preceding V-V variation, suggesting that the atrium drives the tachycardia. Right panel shows the same phenomenon during cooling down of tachycardia before reversion to sinus rhythm.

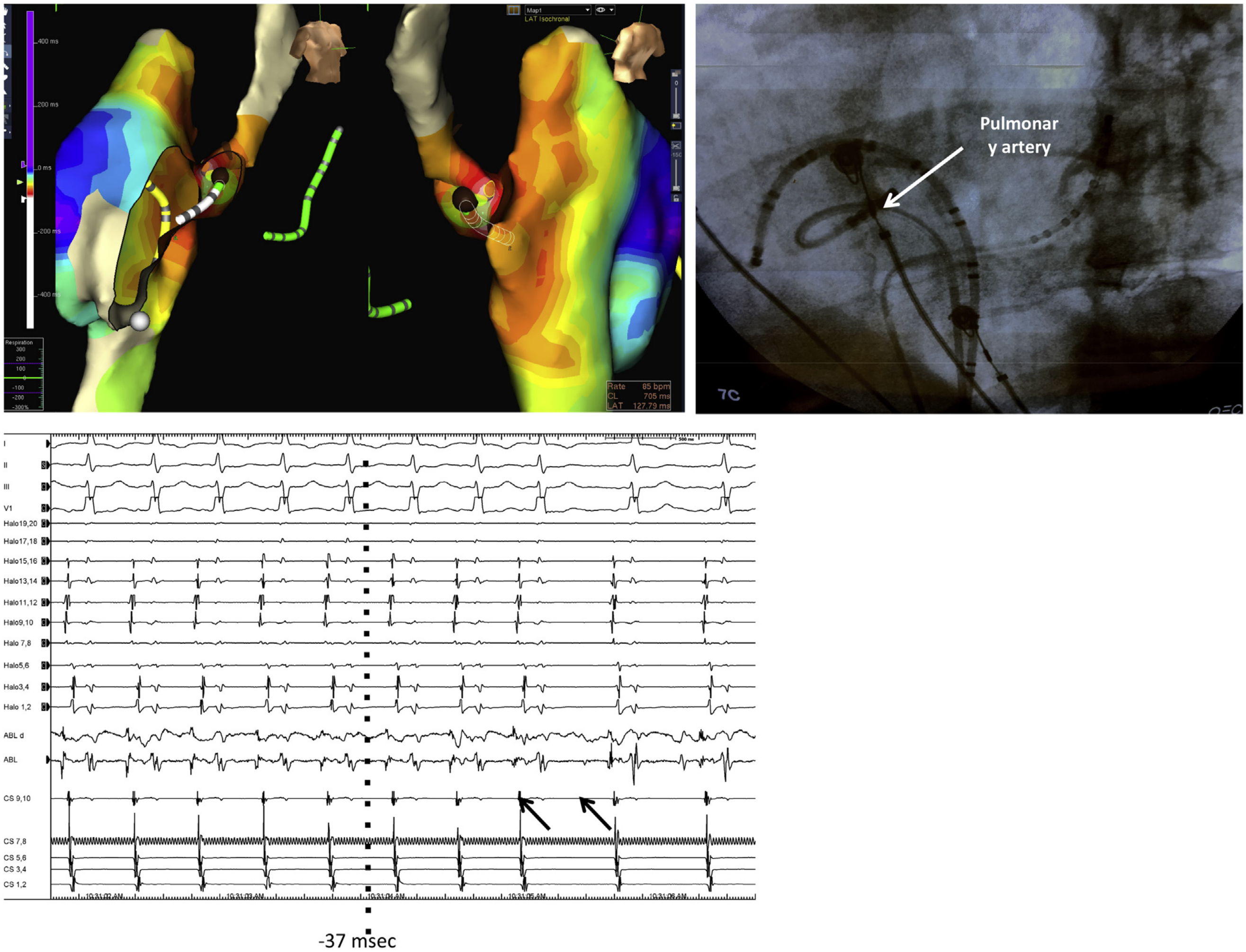

Figure 3 **Upper left:** activation mapping with earliest activation in pulmonary cusp (orange dot) close to Hisian region (brown dot and catheter tip). **Upper right:** Left anterior oblique projection fluoroscopy with diagnostic catheters/decapolar catheters in coronary sinus and duodecapolar catheter in right atrium and ablation catheter in pulmonary cusp. **Bottom:** Atrial signal in effective ablation site (−37 msec before earliest duodecapolar electrogram) with His signal in proximal pole of ablation catheter (black arrow) and ending of tachycardia during radiofrequency delivery.

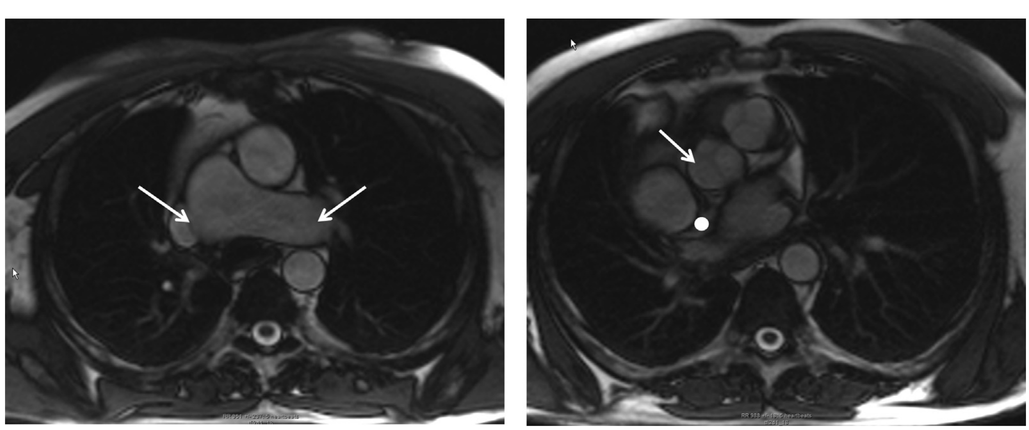

Figure 4 Cardiac magnetic resonance image showing the relationship between high atrial septum from right and left atria and pulmonary cusps. **Left:** L-transposition of great vessels with pulmonary artery (identified by right and left pulmonary branch, white arrows) located posteriorly to the aorta. **Right:** Relation of pulmonary cusps (white arrow) and interatrial septum (para-Hisian area, white spot).

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