Ablation of a concealed accessory pathway within a persistent left superior vena cava: role of the LocaLisa navigation system

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We report the ablation procedure of a concealed accessory pathway (AP) localized within a persistent left superior vena cava (PLSVC) in which the use of the LocaLisa system was of great value. The AP was the source of symptomatic AV re-entrant tachycardia and located in the initial portion of a PLSVC. The LocaLisa system allowed correct catheter placement and monitoring of stability. Five cooled-radiofrequency applications within the PLSVC suppressed the AP.

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Case report

A 49-year-old woman, without organic heart disease, was referred for an electrophysiological study of a recurrent reciprocating orthodromic tachycardia (Figure 1). Baseline sinus 12-lead ECG was unremarkable. Reciprocating orthodromic tachycardia was easily induced by a single atrial extra stimulus. During tachycardia, the earliest atrial activation was recorded in the middle part of the coronary sinus (CS) (Figure 1). This eccentric retrograde activation sequence was reproduced by ventricular pacing during sinus rhythm. The diagnosis of a left-sided concealed accessory pathway (AP) was confirmed by the use of a ventricular premature complex, which was able to reset atrial activation in tachycardia during the His bundle refractory period. At first, the AP was targeted at the left atrial endocardium and at the left ventricular endocardium, following a retrograde aortic approach. Although ablation catheter stability was reached, seven radiofrequency (RF) current applications (7-French Boston Scientific Chilli™ catheter, San Jose, CA, USA) failed to ablate the AP. Thus, the AP was targeted within the CS. The ablation catheter was advanced through a persistent left superior vena cava (PLSVC) (Figure 2A and B). Appropriate RF ablation criteria were met at the middle aspect of the CS roof (Figures 1 and 2A). Nevertheless, under fluoroscopy guidance, cardiac movements and the tremendous dilation of the CS were responsible for major instability of the ablation catheter and inaccurate repositioning within the target area once the catheter was displaced. Conversion to the LocaLisa navigation system (Medtronic, Inc., Minneapolis, MN, USA) allowed precise localization of the target AP area and efficacious RF application by creating a short linear lesion (five RF lesions presettings: 48°C/30 W) and led to successful ablation of the AP. The diagnosis of a persistent left superior vena cava (PLSVC) was confirmed 10 days later by a contrast-enhanced spiral computed tomographic imaging (Figure 2B).

Discussion

There are few cases of manifest left-sided AP coexisting with a PLSVC, and only one case report of a concealed left-sided AP with a PLSVC, which was not ablated.1-4 To the best of our knowledge, this is the first case report of a left-sided concealed AP successfully ablated within a PLSVC using the LocaLisa navigation system.

PLSVC can be a source of difficulties for RF ablation of APs located in the CS, as in our case. When in the CS, excessive motion of the CS mapping catheter in this cavernous vessel virtually precludes accurate AP localization, catheter stability, and ablation.1 Furthermore, in our observation, excellent RF ablation criteria were met (i.e. V-A merged signals)

Keywords
Persistent left superior vena cava;
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over a large area of the mid-CS roof, suggesting a wide AP.

The LocaLisa navigation system provided good depiction of the PLSVC anatomy and allowed accurate catheter positioning in order to create a short linear lesion (ablation dots shown in the LocaLisa screen—Figure 2A).

A cooled-tip catheter with internal irrigation was used for the procedure. This catheter safely delivered sufficient power within the CS.\textsuperscript{5}

PLSVC is a common cause of CS dilation.\textsuperscript{6} In contrast, the association of a PLSVC with a left-sided AP is infrequently

\textbf{Figure 1}  Body surface ECG and endocardial recordings during reciprocating orthodromic tachycardia. The V and A signals are merged in the ablation catheter (black arrow). From top to bottom leads I, V1, His bundle (HBE), distal CS (1–2), middle part of the CS (2–3), proximal CS

\textbf{Figure 2}  (A) LocaLisa navigation system imaging in the left anterior oblique (LAO) view. Consecutive locations of the tip of the mapping catheter (i) in the PLSVC in purple; (ii) in the CS in yellow; and (iii) during RF ablation in the CS in red are shown. The His bundle location (His) is represented in white. (B) Contrast-enhanced computerized tomographic imaging reconstruction in the LAO view. The superior vena cava (SVC) and the PLSVC connected to a dilated CS are shown.
reported. Notably, an embryological link between a PLSVC and a left-sided AP is possible. APs may result from incomplete separation of atrial and ventricular myocardium by the annulus fibrosis, which develops at the same stage as the CS in the embryo. Thus, from a chronological and an anatomical point of view, PLSVC and left-sided APs can be linked. APs can also result from myocardial tracts inserting into the CS and left atrial free wall from the ligament of Marshall or a PLSVC (the embryological precursor of the ligament of Marshall).

In summary, left-sided APs associated with a PLSVC can be challenging to ablate within the CS. The Localisa navigation system by guiding the anatomical understanding can be helpful in the RF ablation procedure. In such a procedure, the use of a cooled-tip catheter appears to be safe.

References