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Successful high-density mapping and ablation of atrial tachycardia in a patient with dextrocardia and *situs inversus*: a complex case

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A 56-year-old man was referred to our laboratory for treatment of recurrent atrial tachycardia (AT) and severe left ventricular (LV) dysfunction [ejection fraction (EF) 28%]. He had a history of complex congenital heart disease, including *situs inversus*, dextrocardia, pulmonary stenosis and hypoplasia of the right pulmonary artery, congenitally corrected transposition of the great vessels according to Rastelli's conversion, and two subsequent surgeries on the right ventricular-pulmonary conduit. In the years before his referral, the patient had experienced multiple arrhythmic episodes of ectopic AT and atrial fibrillation and had subsequently undergone ablations, including isthmic flutter ablation.

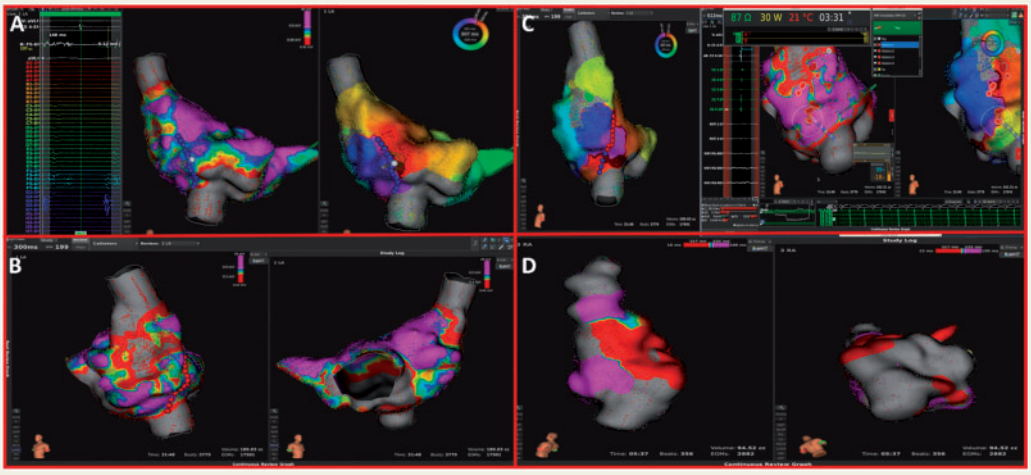

Figure 1 (*A*) Activation map of the systemic venous atrium. Ultra-high resolution activation mapping revealed evidence of slow conduction areas with fragmented and late potentials with 145 ms potential duration in the posterior–postero-lateral region near dense scar areas (areas of surgical incision). (*B*) Voltage map of the left atrium. The bipolar voltage map showed large areas of low potential signals at the level of the atrial wall close to the CS pouch seat (also visible on the diagnostic magnetic resonance imaging), posterior near the superior vena cava, and at the vena cava-tricuspid isthmus (site of previous ablation). (*C*) Radiofrequency delivery to the ablation target sites. On completion of the lesion line to the inferior vena cava, tachycardia was interrupted and sinus rhythm restored. (*D*) Complete activation of the right atrium during atrial pacing from the CS ostium, confirming the isthmic block obtained during previous ablation and a continuous line of block along the new ablative line, validated by means of the Orion catheter.

The activation and voltage maps were constructed by means of the Orion™ multipolar basket catheter and the Rhythmia 3-dimensional electroanatomic mapping system (Boston Scientific, USA). An open-irrigated ablation catheter was used for radiofrequency (RF) delivery (IntellaNavMiFi OI, Boston Scientific, USA). The clinical AT presented with a cycle length of 310 ms and a wavefront activation moving from the proximal to the distal coronary sinus (CS) (Supplementary material online, *Figure S1*). The activation map of the systemic venous atrium revealed evidence of slow conduction areas with fragmented and late potentials of 145 ms duration inside the posterior-lateral region close to the areas of previous surgical incision (dense scar areas, at the site of intercaval line of the previous heart surgery) (*Figure 1A*; Supplementary material online, *Video S1*). The bipolar voltage map showed large areas of low potential signals at the level of the atrial wall close to the CS ostium, posterior near the superior vena cava, and at the vena cava-tricuspid isthmus (site of previous ablation) (*Figure 1B*). Interestingly, the slow conduction area within the scar area provided information perfectly coincident with what was shown by the propagation map. In this area, the ablation catheter recorded low-quality electrogram signals, which however revealed low-amplitude fragmented

signal on mini-electrodes. This signal matched the fragmented signals recorded in the same targeted area by the Orion catheter (Supplementary material online, *Figure S2*).

After a few seconds of RF delivery, the tachycardia slowed down (cycle length from 310 ms to 500 ms) but did not cease. On completion of the lesion line to the inferior vena cava, the tachycardia was interrupted and sinus rhythm restored (*Figure 1C*; Supplementary material online, *Video S2*). We then proceeded to map the complete activation of the right atrium during atrial pacing from the CS ostium, confirming the isthmic block obtained during previous ablation and a continuous line of block along the new ablative line, validated through the Orion catheter. The arrhythmia was no longer inducible after provocative pacing manoeuvres (extrastimuli burst and atrial pacing at high frequency about 20 min after the last RF delivery) (*Figure 1D*). No complications occurred. The patient remained free from AT recurrence and symptoms after 6-month follow-up. There was a dramatic improvement in LVEF after the first follow-up examination at 1 month, with total recovery of normal values of LV function at 6 months (EF 64%).

Rare cardiac anatomic disorders are commonly associated with complex anatomy due to corrective surgical interventions, and often exhibit abnormal electrical activation; thus, catheter ablation procedures in patients of this kind may be challenging.[1–3] To our knowledge, this is the first case described in the literature of successful ablation of AT in a patient with *situs inversus* and dextrocardia mapped by means of an ultra-high density Rhythmia mapping system. In our case, the 3D mapping system helped to orient the heart chambers and locate the ablation target and other structures of interest. In addition, recognition of fractionated and low-amplitude electrograms was of paramount importance in identifying the diseased tissue with arrhythmogenic activity that contributed to tachycardia maintenance, and thus in targeting the ablation. This system was useful in accurately and rapidly identifying the geometry and complex pattern of arrhythmia activation. Thus, it may facilitate challenging ablations of complex atrial arrhythmias in cases of congenital heart disease.

Supplementary material is available at *Europace* online.

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