Combined remote magnetic navigation and ultra-high-density mapping (Rhythmia™) in slow pathway ablation

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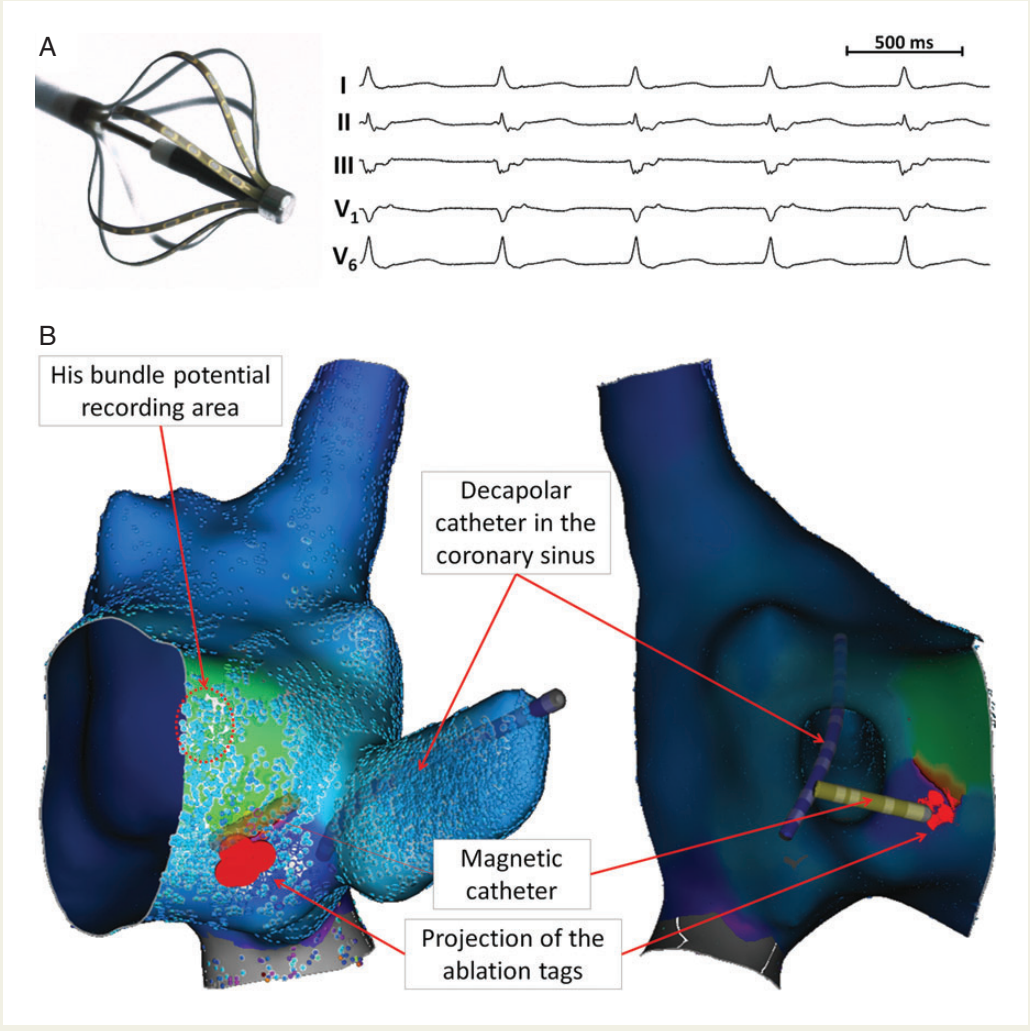
A new ultra-high-density mapping system (Rhythmia™) is gaining increasing interest from the electrophyology community, especially for the mapping of organized complex tachycardias. The system uses the magnetic tracking of the mapping catheter. Whether this system is compatible with magnetic navigation is not known. We report the first case of combined ultra-high-density mapping and remote magnetic navigation for a slow pathway ablation.

Case report

A 72-year-old female was admitted for catheter ablation of highly symptomatic, drug-refractory supraventricular tachycardia.

Under local anaesthesia, by right femoral vein access, a decapolar catheter was inserted into the coronary sinus (CS), a quadripolar catheter was placed in the region of the His bundle, and an Orion IntellaMap catheter (Boston Scientific, Cambridge, MA) in the right atrium. 'Orion' is a mini-basket catheter (expandable to a maximal diameter of 22 mm) with eight splines, each containing eight small electrodes (*Figure*, *Panel A*). The surface area of each electrode is 0.4 mm^2, and the interelectrode spacing is 2.5 mm measured from centre to centre.[1] There was no jump of the AH interval during the programmed atrial stimulation. The induced tachycardia (*Panel A*; cycle length 508 ms, HA 95 ms, AH 413 ms) was suggestive of 'slow–slow' atrio-ventricular nodal re-entry (AVNRT).[2] A right atrial and proximal CS map was created during AVNRT using the Rhythmia™ electroanatomical mapping system (*Figure*, *Panel B*). Points were



automatically acquired and annotated by the system on the atrial activation, with a minority of points requiring manual reannotation (<0.1%). Automatic acquisition was based on several beat acceptance criteria: cycle length stability, propagation (additional reference time delay with respect to the reference), end-expiratory phase of the respiration cycle, electrogram stability, catheter motion, and tracking quality. A total of 14 198 points were acquired in 27 min. Analysis of the atrial propagation wavefront during tachycardia showed a retrograde atrial activation starting in the region below that of the His bundle recording site (rightward inferior extension of the AV node), which is the site that we decided to ablate.

The Orion catheter was pulled out and the same femoral access used for the insertion of a Celsius RMT catheter (Biosense Webster, Inc., Diamond Bar, CA, USA) connected to a Quick-CAS catheter advancement system (Stereotaxis, St Louis, Missouri, USA).[3] This catheter has three small magnets embedded in its distal extremity for magnetic navigation. Impedance-based visualization of this catheter was accurate. Magnets (Niobe ES, Stereotaxis) were moved in the navigate position with a magnetic field intensity of 0.1 Tesla, without any effect on the map or the diagnostic decapolar and ablation catheters visualization (in navigate position, the visualization of the 'Orion' catheter and mapping are disabled). There was a perfect correspondence between fluoroscopy and catheters visualization in the map. No distorsion of the catheters image was noticed. Several radiofrequency (RF) pulses were delivered anterior to CS ostium and ablation sites tagged on the map (*Figure*, *Panel B*). Atrio-ventricular nodal re-entry was interrupted during RF delivery and not inducible afterwards. No complication occurred. After a 2 months follow-up, there was no tachycardia recurrence.

Conclusion

Rhythmia^{TM} mapping system can be combined with remote magnetic navigation, and it allows an accurate impedance-based visualization and guidance of the magnet-embedded catheters.

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