EP CASE REPORT

Sinus node modification with an ultra high-density electroanatomical mapping system in inappropriate sinus tachycardia

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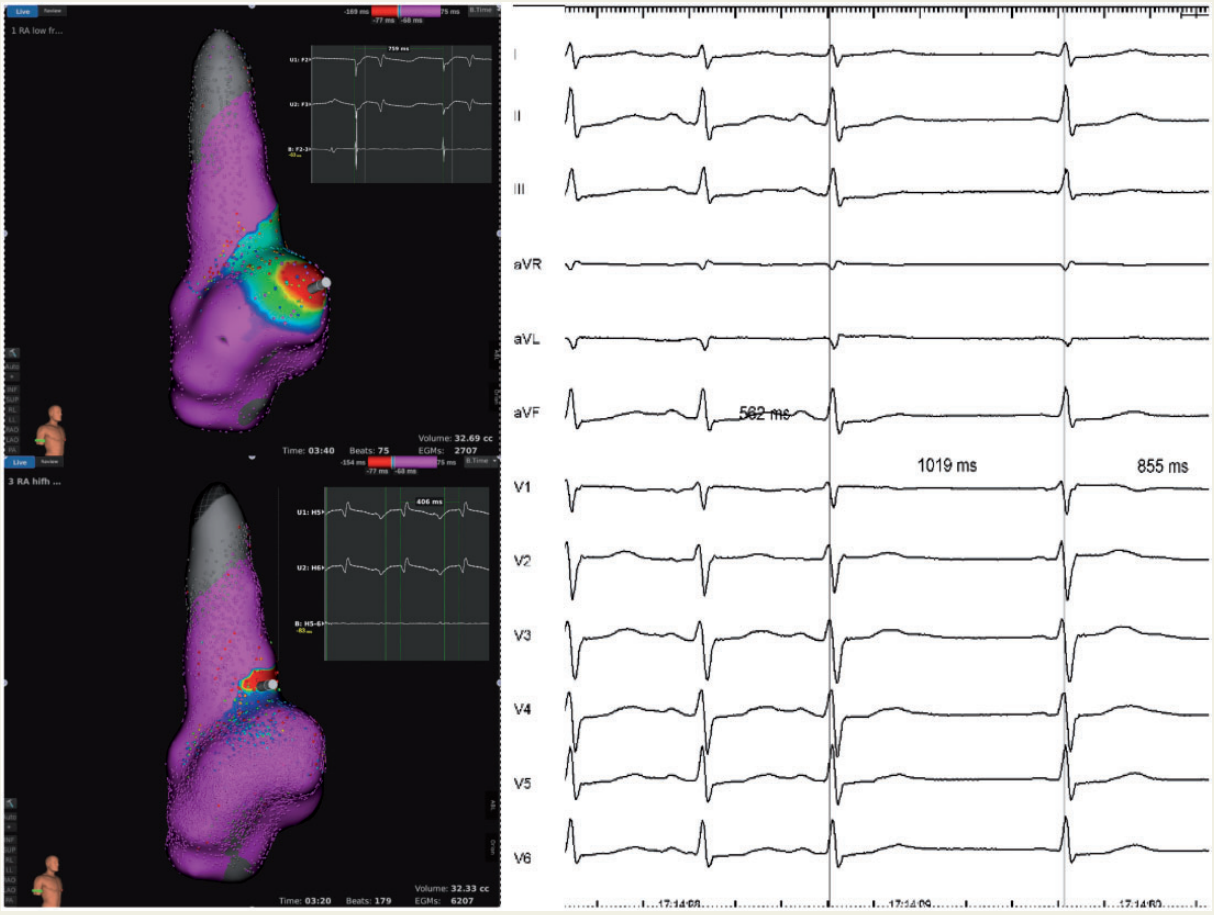
A 45-year-old woman without overt heart disease or significant comorbidities with a longstanding history for inappropriate sinus tachycardia since adolescence presented in our hospital. She had undergone consecutive treatments with verapamil, beta-blockers, and ivabradine without success. Clinical manifestations were symptomatic tachycardia, dizziness, and near syncope. Different causes for sinus tachycardia, e.g. hyperthyroidism, had been excluded.

The patient presented with a sinus tachycardia showing a heart rate of 110 b.p.m. in the 12-lead electrocardiogram (ECG). Holter ECG showed heart rate variability from minimum 59 b.p.m. to maximum 171 b.p.m. with a mean heart rate of 102 b.p.m. Exercise testing revealed an acceleration in rate with minimal exercise until a maximum heart rate of 180 b.p.m. We decided to perform an electrophysiology study and catheter ablation. Electroanatomical maps of the right atrium (RA) were created using the Rhythmia™ system (Boston Scientific, Inc.).[1] Mapping data were collected with a mini basket (1.8 cm diameter), containing eight splines of eight electrodes (total 64 electrodes, 2.5 mm spacing). The system automatically acquires electrograms and location information based on predefined set of beat acceptance criteria. Activation mapping and determination of earliest atrial activation were performed as described previously.[2,3]



Baseline cycle length was 550 ms. To identify sinus node areas responsible for lower (target) heart rates and determine the distance between this area and areas with higher heart rates deemed appropriate for ablation, mapping was performed after consecutive intravenous metoprolol and orciprenaline administration.

Under deep sedation with propofol, a heart rate reduction to a cycle length of 760 ms was achieved with metoprolol. Within 3:40 min, 2.707 data points were acquired and the earliest activation site was located at the inferior base of the right atrial appendage (top left panel). Afterwards, intravenous orciprenaline was administered to determine the earliest activation site and to identify the target for catheter ablation under higher heart rates increasing the cycle length to 410 ms. A new map with 6.207 mapping points was completed in 3:20 min. The earliest activation site was shifted cranially, anterior to the crista terminalis (bottom left panel). There under orciprenaline administration, radiofrequency energy (Intella NavOI, Boston Scientific, Inc.) was delivered, and during radiofrequency ablation, an abrupt decrease of the heart rate was documented (right panel). After switching off orciprenaline infusion, heart rate was 75 b.p.m. (cycle length (CL) 800 ms).

Before discharge from the hospital, the 12-lead ECG showed a normal sinus rhythm about 80 b.p.m. and the patient left the hospital symptom-free without any medications.

This case report supports findings that orciprenaline shifts activation to more cranial sites, while propranolol and amiodarone result in downward shifts highlighting the complexity of the sinus node.

In this case, ultra high-density mapping allowed rapid, very detailed assessment of early activation sites at different heart rates resulting in successful radiofrequency ablation of inappropriate sinus tachycardia.

Conflict of interest: none declared.

References

1. Nakagawa H, Ikeda A, Sharma T, Lazzara R, Jackman WM. Rapid high resolution electroanatomical mapping evaluation of a new system in a canine atrial linear lesion model. *Circ Arrhythm Electrophysiol* 2012;**5**:417–24.
2. Bollmann A, Hilbert S, John S, Kosiuk J, Hindricks G. Insights from preclinical ultra high-density electroanatomical sinus node mapping. *Europace* 2015;**17**:489–94.
3. Bollmann A, Hilbert S, John S, Kosiuk J, Hindricks G. Initial experience with ultra high-density mapping of human right atria. *J Cardiovasc Electrophysiol.* 2016;**27**:154–60.