Successful catheter ablation of atrial tachycardia using a remote magnetic navigation system

ABSTRACT
A 28-year-old man was admitted to our institution because of recurrent palpitation. He had had frequent premature atrial contraction and atrial tachycardia for 4 years. His atrial tachycardia was refractory to bisoprolol and flecainide; hence, he was referred for electrophysiological study and catheter ablation. Atrial tachycardia was consistently induced spontaneously or with rapid atrial pacing. Intracardiac electrograms and a 3-dimensional mapping system showed atrial tachycardia from the right atrial posterior wall. The earliest atrial activation was found with a remote magnetic navigation system. Radiofrequency energy was applied at the target region, successfully terminating the atrial tachycardia.

Key words: arrhythmia, catheter ablation, remote navigation

Introduction
Catheter ablation of supraventricular arrhythmias has progressed since it was first introduced in the 1980s. Although advancements have been made in mapping and imaging, conventional ablation methods are still dependent on manual manipulation. Robotic catheter navigation is a cutting-edge technique for ablation procedures. Robotic catheter manipulation has the advantage of a more precise and unrestricted catheter movement, enhancing procedural safety and efficacy. Remote robotic catheter navigation could reduce physical stress and radiation exposure of physicians.

Herein, we report our experience with focal atrial tachycardia around the coronary sinus region. We used the NiobeTM system (MNS, Stereotaxis, USA) to perform remotely controlled high-density 3-dimensional electroanatomical CARTO® (Biosense Webster, USA) mapping and radiofrequency (RF) ablation,
Case

A 28-year-old man presented with frequent occurrence of premature atrial contraction and atrial tachycardia, which had caused symptoms of palpitations and dyspnea for 4 years (Figure 1). Given the symptomatic and drug-refractory (beta-blockers and flecainide) nature of the arrhythmia, the patient was indicated for invasive electrophysiological study and RF ablation. The ablation procedure was performed under a conscious sedative state induced with intravenous midazolam and fentanyl. Intracardiac electrograms from the high right atrium, His-bundle location, coronary sinus, and right ventricular apex region were simultaneously recorded and displayed using a surface electrocardiogram on a multichannel recorder (Cardiolab, Prucka Engineering, Houston, TX, USA) (Figure 2). During the electrophysiological study, atrial tachycardia with a variable cycle length (approximately 170–400 ms) was spontaneously or easily induced by rapid right atrial pacing. Atrial tachycardia was repeatedly induced and terminated usually within 10 seconds. The earliest atrial activation site was found at the right atrial posterior wall (around the inferior part of the crista terminalis). Mapping and ablation around the right atrium were subsequently performed using a 4-mm tip Navistar-RMT catheter (Biosense Webster). Electroanatomical mapping was performed using the CARTO-RMT integration (Stereotaxis Inc.) system (Figure 3). The

**Figure 1.** Holter findings during the frequent premature atrial contractions.
electroanatomic activation mapping confirmed a focal right atrial tachycardia originating from the inferior part of the crista terminalis. Intracardiac electrograms recorded at the earliest site were 42 ms before the inscription of surface P-waves. Using magnetic navigation, RF ablation was performed at this site. The Stockert RF generator (Biosense Webster) was used to deliver RF in a temperature-controlled mode (maximum temperature, 50°C; power, 35 W). The RF ablation of the lesion terminated the tachycardia. Subsequently, several additional RF ablation procedures were performed on contiguous lesions circumferentially surrounding the successfully ablated site. Atrial tachycardia could no longer be induced. With an aggressive stimulation protocol (decremental burst pacing up to 180 ms and up to 2 extrastimuli in both atria), only atrial fibrillation was induced, requiring intracardiac cardioversion.

The patient had remained symptom-free during the 8-month follow-up period after the ablation.

**Discussion**

The magnetic navigation system can provide a soft mapping catheter in conjunction with the integrated 3-dimensional electroanatomical mapping system. In addition, this allows gentle, nontraumatic mapping, which may be advantageous in focal arrhythmias such as atrial tachycardia. Previous studies have demonstrated its application in supraventricular and ventricular arrhythmias. All cardiac chambers, including the coronary sinus and epicardial space, have been successfully accessed and mapped.

Most studies reported that the magnetic
navigation system decreased X-ray exposure of the operator. However, being remote from the patient might have the risk of overlooking a potential deterioration in clinical status. Careful nursing is therefore mandatory. Our experience with remote navigation was still preliminary, and a conclusion with regard to long-term success could not be drawn.

References


