Ablation of a Resistant Right Atrial Appendage Tachycardia Using a Magnetic Navigation System

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The right atrial appendage is an uncommon site of origin for ectopic atrial tachycardia. Right atrial appendage tachycardia (RAAT) has been noted to be prevalent in young males and responds well to radiofrequency ablation. We report a case of RAAT resistant to multiple attempts of ablation that responded to ablation using Stereotaxis Niobe™ Magnetic Navigation System (RMN, Stereotaxis, St. Louis, MO, USA). (PACE 2012;XX:1–4)

catheter ablation, ectopic atrial tachycardia, right atrial appendage tachycardia, atrial fibrillation, magnetic navigation system

Case Report

A 16-year-old previously healthy girl presented to the emergency department with symptoms of palpitations and near syncope. She was found to have a heart rate (HR) of 175/min with an irregular pulse. Her blood pressure (BP) was 105/70 mmHg. Examination was otherwise unremarkable. The electrocardiogram (ECG) demonstrated an atrial tachycardia with P-wave morphology very similar to sinus rhythm (Fig. 1). She was admitted to the hospital. An echocardiogram demonstrated a structurally normal heart. She was referred for catheter ablation.

In the electrophysiology laboratory, a quadrapolar right ventricular (RV) apical catheter, a decapolar coronary sinus catheter, and a quadrapolar 4-mm Navistar ablation catheter (Biosense Webster, Diamond Bar, CA, USA) were inserted. With low-dose intravenous isoproterenol (2 mcg/min), the tachycardia was incessant. Mapping using the CARTO XP (Biosense Webster) demonstrated an atrial tachycardia with P-wave morphology very similar to sinus rhythm (Fig. 1). She was admitted to the hospital. An echocardiogram demonstrated a structurally normal heart. She was referred for catheter ablation.

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Figure 1. Twelve-lead ECG showing atrial tachycardia at ventricular rate of 140 beats/min.

Figure 2. Carto XP view of successful ablation site in the right atrial appendage with presystolic, fractionated electrograms.
ABLATION OF RAAT WITH MAGNETIC NAVIGATION

Figure 3. RAO projection of right atrial appendage. A decapolar catheter is in the coronary sinus. Arrow points to the tip of the right atrial appendage.

(Biosense Webster) was used to make a map of the right atrium and right atrial appendage. Once again, the earliest presystolic signals were at the base of the appendage on the lateral aspect just anterior to the sinus node. The Thermocool Navistar ablation catheter (Biosense Webster) was again used to ablate the RAAT. In spite of ablation lesions of up to 40 W the tachycardia remained unabated and the procedure was unsuccessful. She underwent a cardiac magnetic resonance imaging to evaluate for a blind pouch within the right atrial (RA) appendage. This did not demonstrate any abnormality or blind pouch. Consideration was made for cardiothoracic surgical referral for RA appendagectomy. After extensive discussion, it was decided that one final endocardial ablation procedure would be attempted, this time with remote magnetic navigation (RMN, Stereotaxis, St. Louis, MO, USA).

An 8.5-Fr SRO sheath (St. Jude Medical, St. Paul, MN, USA) was inserted into the RA. A 0.32-inch J-tipped wire was advanced through this sheath into the RA appendage (Fig. 3). The sheath was then advanced to the base of the RA appendage. Contrast cineangiograms of the RA appendage were performed in the anteroposterior and right anterior oblique positions. This demonstrated a narrowing and lateral deviation of the distal appendage. Following this, a 4-mm Navistar RMT™ ablation catheter (Biosense Webster) was advanced through the SRO sheath. Using remote magnetic navigation, the ablation catheter was advanced deep into the appendage. A site was found, which was 55 ms presystolic to the P wave. Ultimately, radiofrequency energy was delivered starting with 20 W and titrated up to 40 W. This led to immediate acceleration followed by termination of the tachycardia. Two further applications of energy were delivered at the same location. The tachycardia was rendered noninducible. Follow-up clinical evaluations and 24-hour Holter monitoring at 1 month, 6 months, and 12 months have demonstrated only sinus rhythm.

Discussion
Ectopic atrial tachycardia in the right atrium often arises from the crista terminalis, the parahisian region, the coronary sinus ostium, and the tricuspid annulus. The right atrial appendage is an uncommon site of origin for AT. The appendage forms the anterior wall of the atrium and is composed of ridges formed by pectinate muscles, which arise from the prominent crista terminalis. Roberts-Thomson et al. and later Friexa et al. described the characteristics of RAAT based on a large study of patients with ectopic atrial tachycardia. RAAT arises more commonly
in younger male patients. Because of its incessant nature, it often presents with left ventricular dysfunction secondary to tachycardia-induced cardiomyopathy.7,8 The specific electrocardiography pattern associated with right atrial appendage tachycardia shows negative P waves in leads V1-V2 with variable but always present trend toward positivity of P-wave polarity in the rest of the precordial leads. RAAT has been associated with a greater proportion of successful ablation and lower recurrence rate as compared to ectopic tachycardia arising from other atrial sites.9 Although there is a report of right atrial appendagectomy for RAAT refractory to radiofrequency ablation,10 the role of Stereotaxis Niobe™ magnetic navigation system in RAAT has never been studied. We believe that the ectopic focus in this case was in the distal appendage, beyond the lateral bend seen on angiography. Because it was on the inferior/lateral aspect of the appendage after this bend, traditional manual catheters could not make close contact at the appropriate site. RMN allowed the ablation catheter to steer around the bend and make contact with the inferior surface of the appendage.

Conclusion

Although radiofrequency ablation has resulted in high rates of success in the management of RAAT, inadequate ablation as a result of inability to reach target sites, catheter instability, induction of AF, prolonged procedure times, and radiation exposure constitute some of the limitations in achieving success. The Stereotaxis Niobe™ RMN offers several advantages13 and should be considered for difficult-to-ablate RAAT.

References


