Olgu Sunumu / Case Report

Ablation of Right Atrial Appendage Tachycardia Using 3D Electroanatomic Mapping System: A Rare Case Report

Üç Boyutlu Elektroanatomik Haritalama Sistemi İle Sağ Atriyal Apendiks Taşikardisinin Ablasyonu: Nadir Bir Vaka

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Öz.

Sağ atriyal apendiks (RAA) kaynaklı atriyal taşikardiler (AT) oldukça nadir görülen fokal atriyal taşikardilerdir. 38 yaşında bayan hasta acil servise çarpıntı ve baş dönmesi şikayeti ile başvurdu. Elektrokardiyografide (EKG) 150 atım/dk ventriküler hızında dar QRS'li düzenli taşikardi mevcuttu. Hastanın 5 senedir sık tekrarlayan çarpıntı atakları vardı. Medikal tedavi altında taşikardiyomyopati gelişen hastada işlem onamı alındıktan sonra elektrofizyolojik çalışma (EFÇ) yapılmasına karar verildi. İsoproterenol infüzyonu (1-4 mcg/dk) ile devamlı dar QRS taşikardi indüklendi. Taşikardinin diyagnostik elektrofizyoloji kriterleri AT ile uyumlu idi. Taşikardi esnasında quadripolar 3.5mm cooled-tip Thermocool Smarttouch bi-directional navigasyon kateteri ile üç boyutlu (3D) elektroanatomik haritalama sistemi kullanılarak eş zamanlı anatomik ve aktivasyon haritalaması yapıldı. Aktivasyon haritalamasında, taşikardi esnasında sentrifugal yayılım gösteren en erken endokardiyal aktivasyon RAA bazalinde saptandı ve lokal elektrogram Cs referans sinyaline göre 104 msn daha erkendi. Empedans kontrollü radyofrekans ablasyon (RF) (35 W, 42° C, 5-10 g of contact force) en erken sahaya uygulandı ve taşikardi 10 sn içinde sonlandı. RF ablasyon sonrasında 30 dk lık bekleme peryodunda AT gözlenmedi.

Anahtar Kelimeler: Atriyal taşikardi, Sağ atriyal apendiks

Abstract

Atrial tachycardias (AT) originating from right atrial appendage (RAA) are quite rare among focal atrial tachycardias. A 38-year-old female patient presented to the emergency room complaining of palpitations and dizziness. Electrocardiography (ECG) showed regular narrow QRS complex tachycardia with a ventricular rate of 150 bpm. The patient had frequent episodes of palpitations for 5 years. Considering the ensuing tachycardiomyopathy under medical treatment, electrophysiological study (EPS) and ablation procedure was planned after having informed consent. During isoproterenol infusion (1-4 mcg/min), a sustained tachycardia with narrow QRS complex was induced. Diagnostic electrophysiological findings were consistent with AT. During tachycardia, by using a three-dimensional (3D) electroanatomic mapping system, simultaneous anatomical and activation mapping was performed with a quadripolar 3.5mm cooled-tip Thermocool Smarttouch bi-directional navigation catheter. Activation mapping demonstrated that the earliest endocardial activation site was basal portion of the RAA where the local electrogram was 104 msn prior to the Cs reference signal during tachycardia which is spreading in a centrifugal fashion. Impedance-controlled radiofrequency ablation (RF) ablation (35 W, 42° C, 5-10 g of contact force) was performed at the earliest site and tachycardia terminated in 10 seconds. No AT observed during the waiting period of 30 min after RF ablation.

Key words: Atrial tachycardia, Right atrial appendage

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Introduction

Atrial tachycardias (AT) originating from right atrial appendage (RAA) are quite rare among focal atrial tachycardias. With a higher prevelance in males, these tachycardias may be incessant and present as left ventricular systolic dysfunction. Trabeculated tubular structure of the RAA, with pectinate muscles spreading throughout the entire thin wall, and the low blood flow inside, are the factors decreasing success of the catheter ablation of RAA tachycardias (RAAT). Owing to the thin wall structure, complications such as perforation and cardiac tamponade may occur during either mapping and ablation procedures (1).

Herein, we present successfully ablation of focal AT originating from RAA using 3D electroanatomic mapping system in a patient presented as tachycardiomyopathy. Review of the literature on catheter ablation of RAAT is discussed.

Case presentation

A 38-year-old female patient presented to the emergency room complaining of palpitations and dizziness. Electrocardiography (ECG) showed regular narrow QRS complex tachycardia with a ventricular rate of 150 bpm (Figure-1A). Blood pressure was 110/70 mmHg. Administration of intravenous adenosine and diltiazem did not terminate the tachycardia. Subsequently, sinus rhythm was maintained with 150 mg intravenous amiodarone. Clinical history revealed that she had palpitation episodes frequently for almost four years and had been taking propafenone 150 mg orally twice daily. Her physical examination, serum electrolyte levels, other biochemical and haematological analyses were all normal. Transthoracic echocardiogram (TTE) showed mildly depressed left ventricular ejection fraction (LVEF=50%), with normal chamber sizes. Considering the ensuing tachycardiomyopathy under medical treatment, electrophysiological study (EPS) and ablation procedure was planned after having informed consent.

The patient underwent an EPS in sinus rhythm. Catheters were placed: two 6F quadripolar catheters at the high right atrium and the His-bundle position, a 6F decapolar catheter at the coronary sinus (Cs). AH was 90 msn and HV was 40 msn. Programmed atrial stimulation and burst atrial pacings failed to induce sustained tachycardia in the basal state. During isoproterenol infusion (1-4 mcg/min), a sustained tachycardia with narrow QRS complex was induced. The earliest atrial activation was located in the proximal coronary sinus (Csp), in a similar way in sinus rhythm. Atrial cycle lenght was 340 msn. Variable VA intervals were observed during tachycardia (Figure-2A). Overdrive ventricular pacing was performed to entrain the tachycardia and the postpacing response was noted to be VAAV. Hereby, diagnostic electrophysiological findings were consistent with AT.

During tachycardia, by using a three-dimensional (3D) electroanatomic mapping system (CARTO), simultaneous anatomical and activation mapping was performed with a quadripolar 3.5mm cooled-tip Thermocool Smarttouch bi-directional navigation catheter (Biosense Webster, Diamond Bar, CA, USA) via by long shead (Preface, Biosense Webster, USA). Since the onsets of P waves, obscured by the preceeding T waves, were not clearly distinguishable, a stable Cs signal was selected as a reference. Activation mapping demonstrated that the earliest endocardial activation site was basal portion of the RAA where the local electrogram was 104 msn prior to the Cs reference signal during tachycardia which is spreading in a centrifugal fashion (Figure-2C). After delivery of radiofrequency (RF) energy (25 W) at this site, tachycardia terminated but recurred in a short while. A repeat impedance-controlled RF ablation (35 W, 42° C, 5-10 g of contact force) was performed at the same site (Figure-2D). Tachycardia terminated in 10 seconds (Figure-2B). Following RF ablation, tachycardia couldn't be induced with programmed atrial extrastimulation and burst atrial pacings by isoproterenol infusion in a 30 min period and sinus rhythm maintained (Figure-1B).

Discussion

In the right atrium, focal AT's are most commonly originate from crista terminalis, coronary sinus, tricuspid annulus and parahisian region. RAAT's are rarely seen and present specific ECG features; such as a negatif P wave in lead V1-V2 and transition to positivity of P wave polarity on the rest of precordial leads, positive P wave in lead 1 and the inferior leads and inverted or isoelectric p wave in aVL (2). Due to the thin wall structure and extending pectinate muscles throughout the inside of the RAA, catheter stabilization and maneuvers are challenging at this site (3). Particularly, success of RF ablation is much lower on the tachycardias originating from the narrowing apical region of the RAA, on account of these pectinate muscle structures. Cryobaloon ablation might be needed in such cases (4). In a case series report of Roberts-Thomson et al., among 10 patients with RAAT, 7 of them had incessant tachycardia causing tachycardiomyopathy and the origin was the base of triangulated component of the RAA in 9 of them (5). Similarly, in our case, the origin of AT was located at the basal site of the RAA. However, it wasn't incessant. In the report of Roberts-Thompson et al. symptom onset time considered to be associated with incessant tachycardias. In a stubborn case of RAAT originated from the apical region, Mohsin et al. reported that multiple RF ablations were failed due to the inability of achieving enough contact and stabilisation, finally successfully ablation could be performed using Stereotaxis Niobe magnetic navigation system (6). In the similar cases of distal RAAT resistant to RF ablations, right atrial appendectomy procedure was shown to be one of the effective therapeutic options (7-8). In our case, we consider that the origin of RAAT, the basal portion

of the RAA, promoted our success given the better tissue contact and catheter maneuver in this region and also higher blood flow compared with distal sites.

Conclusion

Due to the diffuculties of RF ablations on the RAAT, related to the anatomic structure of the RAA, ablations using an 3D electroanatomic mapping system is an efficient therapeutic option. The origin of RAAT, proximally or distally, might be one of the parameters predicting the success of ablation.

Written consent was obtained from the patient for this article

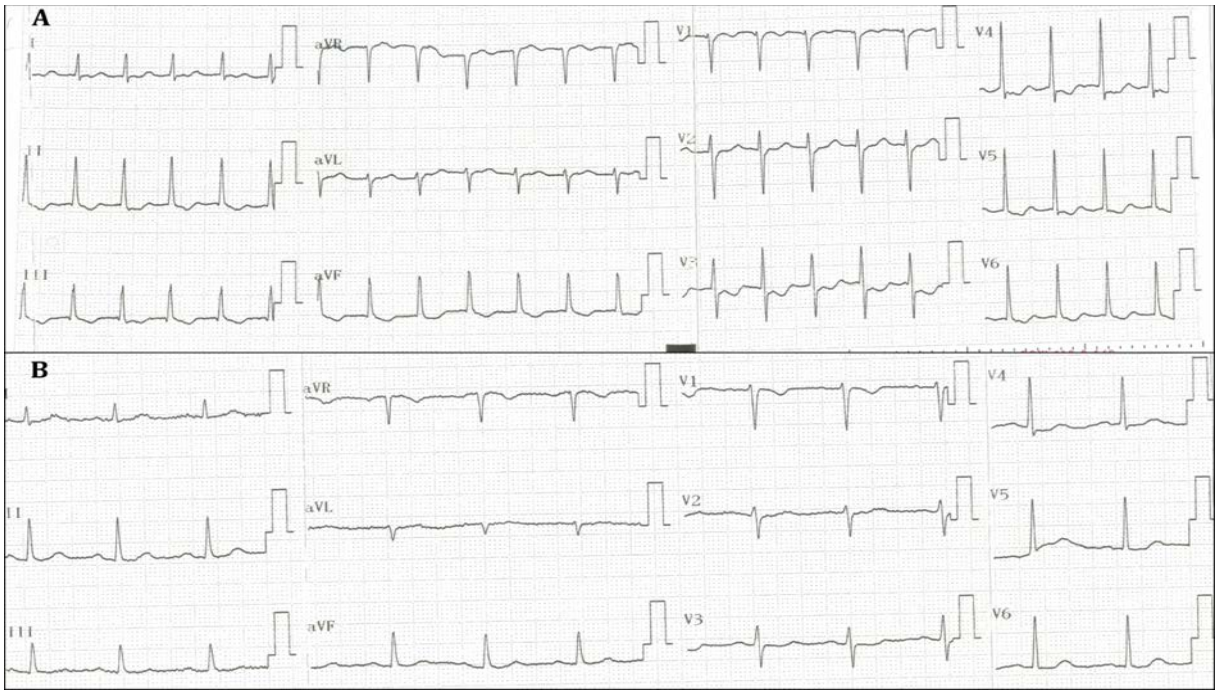

Figure 1. Panel A: 12-lead surface ECG showing narrow QRS tachycardia at 150 beats/min. Panel B: Post-ablation 12-lead surface ECG showing sinus rhythm.

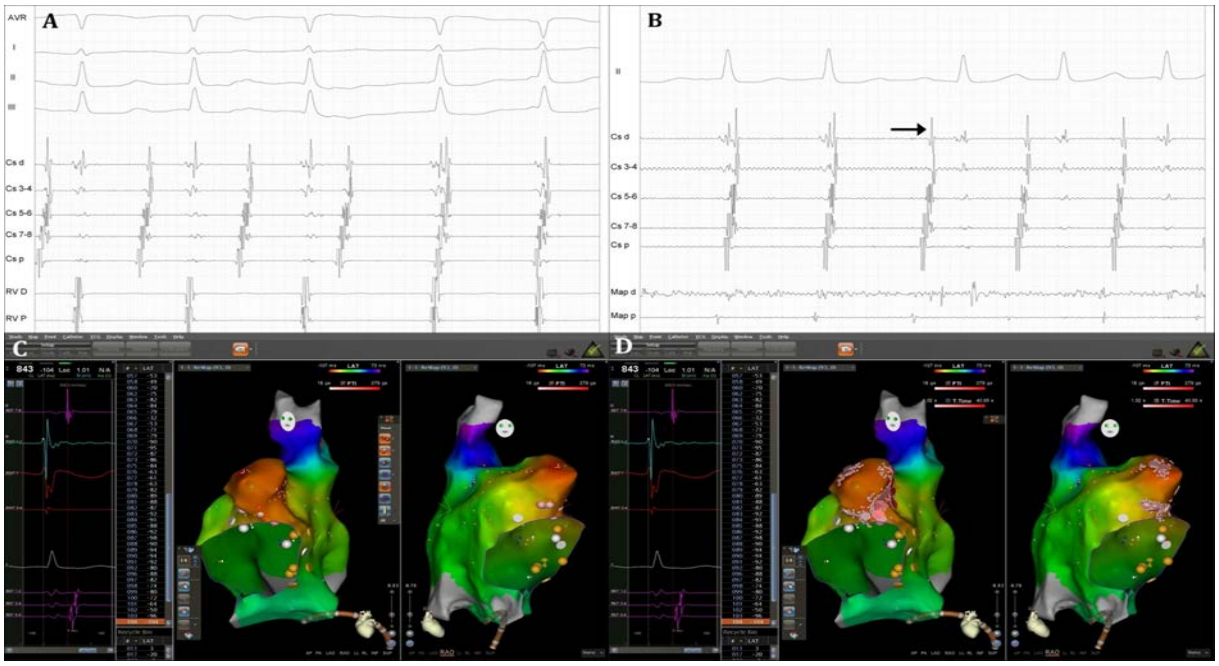

Figure 2. Panel A: Intracardiac electrogram showing a VA variable tachycardia (atrial cycle lenght: 340 msn). Panel B: Tachycardia termination on RF ablation (black arrow). Panel C: Simultaneous fast anatomical and activation mapping by using a three-dimensional (3D) electroanatomic mapping system (CARTO) during tachycardia, the earliest endocardial activation site was basal portion of the RAA where the local electrogram was 104 msn prior to the Cs reference signal. Panel D: Successful ablation site in the right atrial

appendage basal portion

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