Case Report

Surgical Treatment of Atrial Tachycardia Arising from Left Atrial Appendage

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Abstract

Focal atrial tachycardia arising from the left atrial appendage (LAA) is less frequently encountered in clinical practice. Catheter ablation of this focal tachycardia is the main treatment and has a high success rate. Surgical radiofrequency isolation plus external closure of the appendage is an option in patients' refractory to catheter methods. An 18-year-old male patient was admitted to our hospital with a diagnosis of tachycardia-induced cardiomyopathy (ejection fraction 35%). His electrophysiological study revealed a centrifugal activation pattern in the LAA where local atrial activation was earliest. Sinus rhythm was not achieved despite multiple attempts. Surgery was planned to isolate the source of the refractory arrhythmia. LAA of the patient was electrically isolated by using AtriCure® Synergy Ablation Clamp through the left anterior mini-thoracotomy. Sinus rhythm was restored right after successful isolation. AtriClip® PRO device was used to externally exclude the LAA to eliminate possible thrombus formation in isolated appendage. Surgical ablation methods are valid and successful options in patients who are refractory to medical and catheter methods. Dedicated arrhythmia teams (cardiologists, electrophysiologists, and cardiac surgeons) have the potential to increase patients' outcomes.

Keywords: Ablation, atrial tachycardia, surgery

Introduction

Atrial tachycardia (AT) is a relatively rare arrhythmia, accounting for approximately 7% of supraventricular tachycardias investigated at electrophysiologic study.[1] AT typically arises from an ectopic source in the atrial muscle and produces an atrial rate of 150–250 beats/min-slower than that of atrial flutter[2] and is frequently unresponsive to medical therapy.[3] Although endocardial mapping and radiofrequency ablation are very effective in diagnosis and treatment,[4] surgical treatment is an option in cases where radiofrequency ablation fails.[5]

Case Report

A 18-year-old patient who admitted to our clinic with effort dyspnea has no attribute in physical examination. In his anamnesis, he had no other features except orthopedic surgery due to an arm fracture. Laboratory workup revealed no predisposing factor for AT. Electrocardiography was consistent with AT [Figure 1] and ejection fraction was 35% on echocardiography. AT induced cardiomyopathy was considered, and percutaneous ablation was planned.

Electrophysiology

The patient was admitted to the electrophysiology laboratory with the diagnosis of incessant AT despite medical treatment (amiodarone 200 mg 2 × 1, metoprolol 100 mg 1 × 1). Electrocardiogram (ECG) showed AT and variable atrioventricular conduction with the ventricular rate of 109/min.

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Electrophysiologic study was planned, and local anesthesia was applied with 20 cc lidocaine via in the right and left femoral region. 7F introducer vascular sheats were inserted into the right femoral vein by Seldinger method. Coronary sinus (CS), right ventricle, and His catheter were inserted. The atrial signals in CS distal electrode pairs were earlier than proximal. Electrophysiologic maneuvers confirmed AT with a cycle length of 260 ms. The right atrium was mapped with three-dimensional electroanatomic mapping system (Biosense Webster, Diamond Bar, California) [Figure 2]. Sixty percent of Total Cycle Length (TCL) covered and the earliest site was septal. Transseptal puncture was performed considering left-sided AT. The left atrium was mapped, and the centrifugal activation pattern with the earliest signal in the left atrial appendage (LAA) was noted [Figure 3]. First, we tried to ablate earliest site in appendix with irrigated catheter at 35 watts but we failed. Then we tried to isolate LAA, but despite multiple applications, we couldn't succeed [Figure 4]. Surgical ablation was planned.

Surgical technique

Under general anesthesia, the LAA was exposed through the left anterior mini-thoracotomy incision. Single lung ventilation was achieved by a double-lumen endotracheal tube. Central venous pressure, systemic arterial pressure, and ECG were monitored throughout the procedure. After opening the pericardium, the LAA was explored. LAA of the patient was electrically isolated from the rest of the left atrium by using AtriCure® Synergy radiofrequency ablation clamp. Sinus rhythm was restored right after successful isolation. AtriClip® PRO Device was used to externally exclude the LAA to eliminate possible thrombus formation in isolated appendage [Figure 5].

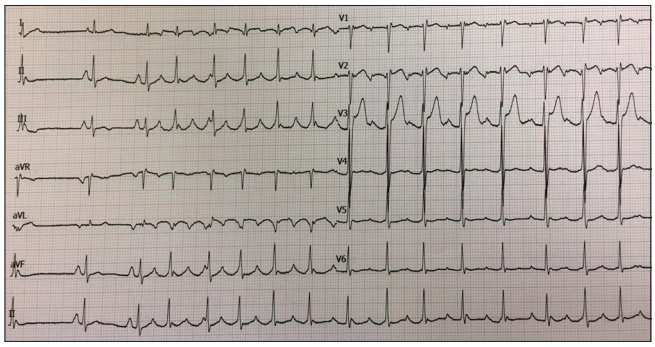

Figure 1: Preoperative electrocardiogram

Results

After surgical ablation, the patient was followed in sinus rhythm without antiarrhythmic therapy [Figure 6]. In the postoperative early echocardiography, ejection fraction was measured 55%. The patient was discharged on the 4th postoperative day. At the 1st month follow-up, the patient is followed in sinus rhythm without antiarrhythmic therapy and ejection fraction was measured 65% on echocardiography.

Discussion

AT is characterized by atrial activation starting rhythmically at a small area from where it spreads centrifugally.[6] AT does not occur randomly throughout the atria, but rather cluster at predefined

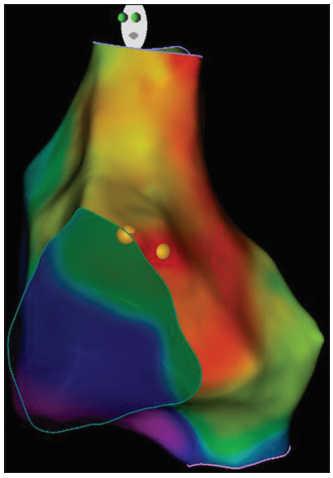

Figure 2: Activation map of the right atrium

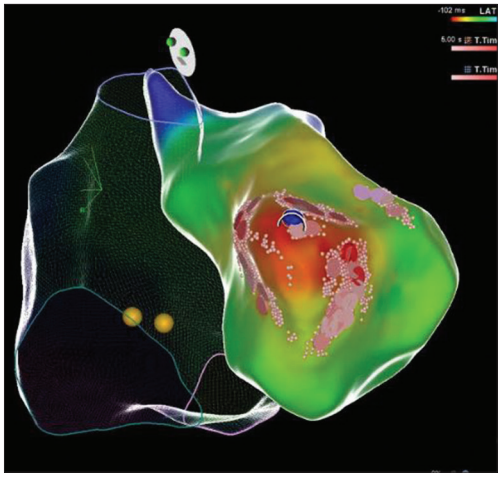

Figure 3: Activation map of the left atrium

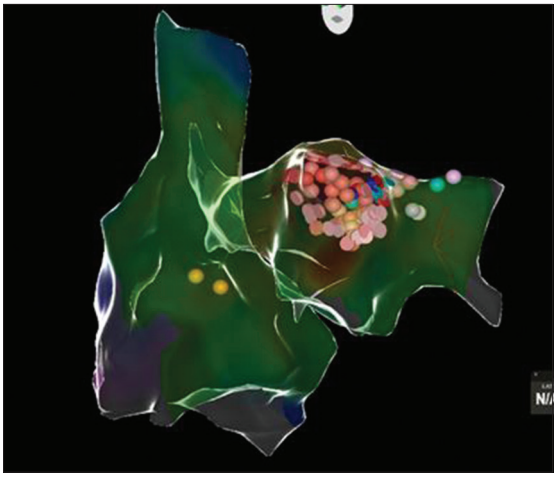

Figure 4: Ablation points

Figure 5: AtriClip® PRO Device

anatomic locations.[7] These locations are characterized by alterations in myocardial fiber orientation or sites of automatic tissue. In a series of Kistler *et al*.,130 patients with clinically documented paroxysmal or incessant AT, 63% of ATs arose in the right atrium and 37% in the left atrium. The distribution of sites of origin among the right ATs was; tricuspid annulus (35%), crista terminalis (34%), CS ostium (17%), perinodal tissues (9%), right atrial appendage (4%). Left ATs were predominantly located around the pulmonary veins (67%). Less common sites of origin include the mitral annulus (17%), CS body (6%), left interatrial septum (6%), and the LAA (4%).[8] Anguera *et al*. published results of AT that treated with percutaneous ablation and achieved successful results in 77% of 105 patients, but 23% did not respond to treatment.[9]

Endocardial mapping and radiofrequency ablation have a high success rate in the treatment AT and nowadays are used as the primary treatment in diagnosis and treatment. Despite the effective use, radiofrequency ablation may fail in less common origins, such as the LAA. The internal surface of the LAA is composed of pectinate muscles, which result in an uneven surface in contrast to the relatively smooth walls of the rest of the left atrium. Therefore, LAA isolation is challenging and it often requires to redo ablation. Surgical ablation, which provides a significant clinical and echocardiographic improvement in patients after failed percutaneous ablation, should be kept in mind as an easily applicable and fast effective option.

ECG may help localizing focal ATs arising from LAA by negative *P* wave morphology in lead I, positive in lead II, III and arteriovenous fistula, positive in V1 through V3 and isoelectric in lateral precordials as shown in our patient also.

Surgical ablation methods are valid and successful options in patients who are refractory to medical and catheter methods. Dedicated arrhythmia teams (Cardiologists, electrophysiologists, and cardiac surgeons) have the potential to increase patients' outcomes.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

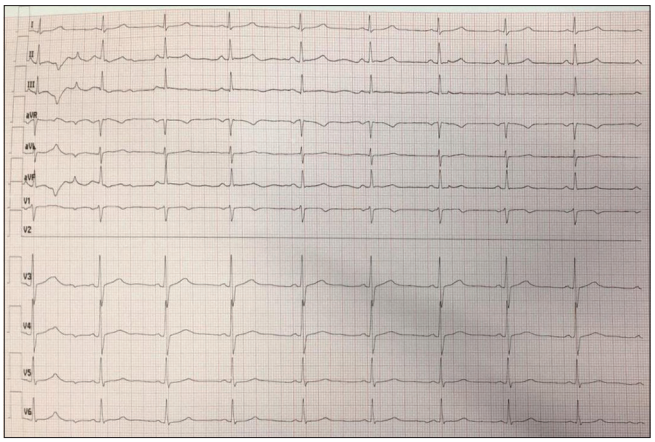

Figure 6: Postoperative electrocardiogram

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Conflicts of interest

There are no conflicts of interest.

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