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Case Report

Vein of Marshall dependent Atrial Tachycardia Post Hybrid Atrial Fibrillation Ablation; A Case Report

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Introduction

We hereby describe a zero-fluoroscopy ablation procedure of a left atrial micro re-entry tachycardia in a patient with a previous hybrid atrial fibrillation ablation procedure. The tachycardia was demonstrated to be mediated by the vein of Marshall, which remained connected after the hybrid procedure.

Case presentation

A 60-year-old male with a past medical history of hypertension, severe sleep apnea on CPAP, and non-ischaemic cardiomyopathy triggered by persistent atrial fibrillation, which started about 1 year ago. The patient had a history of several cardioversions. An attempt to perform endocardial ablation was aborted as he was found to have echogenicity suggestive of left atrial thrombus on transoesophageal echocardiography prior to the procedure. Several echocardiography studies showed a severely dilated left atrium. The patient was referred for a hybrid ablation procedure.

The first portion of the hybrid ablation involved MAZE followed by Atriclip. 1 month later, endocardial ablation was performed with complete isolation of the pulmonary veins and the posterior wall. A few months after the hybrid ablation, the patient was transitioned from amiodaron to sotalol as he maintained sinus rhythm with recovered ejection fraction. His symptoms including palpitations, fatigue, and dyspnea on exertion completely resolved.1 year later, the patient developed a recurrence of his typical symptoms. A 12-lead EKG showed atrial tachycardia (Figure 1).

Figure 1: 12-lead EKG showing atrial tachycardia.

Echocardiography showed a new decline in ejection fraction (30-35%). Cardioversion was performed, however, the patient remained in sinus rhythm for only a few days. The patient was taken to the electrophysiology lab. Chronic anticoagulation with apixaban was not interrupted. The procedure was planned as a zero-fluoroscopy procedure and it was done under general anesthesia.

The right groin was prepped and draped in the usual sterile fashion. Vascular accesses were obtained under ultrasound guidance. The right femoral vein was cannulated percutaneously by the modified Seldinger technique at 3 sites. Two 8F sheaths with one 10F sheath were placed. A 9F intracardiac ultrasound (ICE) catheter was inserted into the 10F sheath and advanced to the right atrium. Baseline ICE images showed no pericardial effusion. The ICE catheter was used to identify the His area and the (coronary sinus) CSos. The ICE catheter was also used to delineate the anatomy of the left atrium and to identify the fossa ovalis.

A 3-dimensional fast anatomic map (FAM) of the right atrium, superior vena cava, inferior vena cava, and coronary sinus was acquired using a multipolar catheter (PentaRay, Biosense Webster) to create a matrix on the CARTO system (Biosense Webster). The matrix allowed for the advancement and positioning of the non-sensor-equipped decapolar CS catheter. The PentaRay catheter was also used to confirm the His position.

The patient was in persistent atrial tachycardia with a cycle length of 260ms and a proximal to distal CS activation. Activation mapping of the right atrium along with entrainment from different poles of the CS catheter was consistent with atrial tachycardia originating from the left atrium. A transeptal puncture was then performed.

The technique used was as follows: First, the wire was advanced through one 8F sheath until it was visualized by ICE in the superior vena cava. The short 8F sheath was then exchanged for the 3D visible sheath (VIZIGO, medium curve, Biosense Webster). The wire and the VIZIGO dilater were pulled out, and the ablation Thermocool Smart tough SF catheter (Biosense Webster) were passed through the VIZIGO sheath and used to position it onto the tagged fossa ovalis point. ICE was used to guide this position. The Smarttouch with mart touch catheter was then replaced by a Baylis needle (Baylis Medical) maintaining the position of the VIZIGO sheath. The transseptal puncture was performed while maintaining tenting of the fossa ovalis, as observed by the ICE images. The Baylis needle and its dilator were replaced with the Penta Ray catheter after the puncture was completed.

A Heparin bolus of 10,000 units was administered right after the transeptal puncture was performed. ACT was kept around 300-350 throughout the procedure while the catheters were in the left atrium. The activation map of the left atrium showed a micro re-entry tachycardia originating from the base of the left superior pulmonary vein (Figure 2).

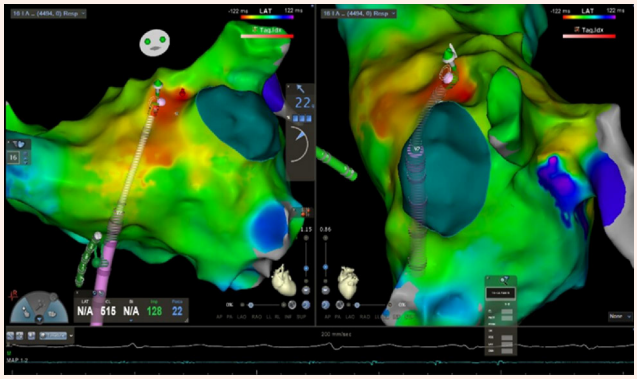

Figure 2: Activation map of the left atrium showed micro reentry tachycardia originating from the base of the left superior pulmonary vein

The Penta Ray catheter was replaced with the Smarttouch catheter which identified a long and fractionated EGM signal at the tachycardia origin site (Figure 3).

Figure 3: Long and fractionated EGM signal (ABL 1-2) at the tachycardia origin site

The first ablation lesion resulted in the termination of the tachycardia. Consolidation lesions with a power of 30 watts for 30 seconds were applied in the adjacent area (Figure 4).

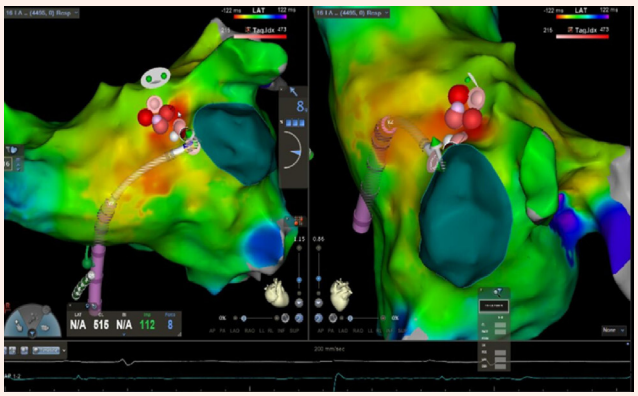

Figure 4: First ablation lesion resulted in the termination of the tachycardia, consolidation lesions were applied in the adjacent area.

A voltage map of the left atrium in sinus rhythm was then obtained, which showed isolated pulmonary veins and the posterior wall. ICE images at the conclusion of the procedure showed no pericardial effusion. 20 mg of protamine was then given intravenously to reverse the heparin and all catheters were removed. Haemostasis was obtained by direct manual pressure after two figure-of-8 sutures were applied to the right groin. The patient was evaluated 4 weeks later, and he indicated that he was doing very well. All of his symptoms were resolved and his 12-lead EKG showed normal sinus rhythm (Figure 5).

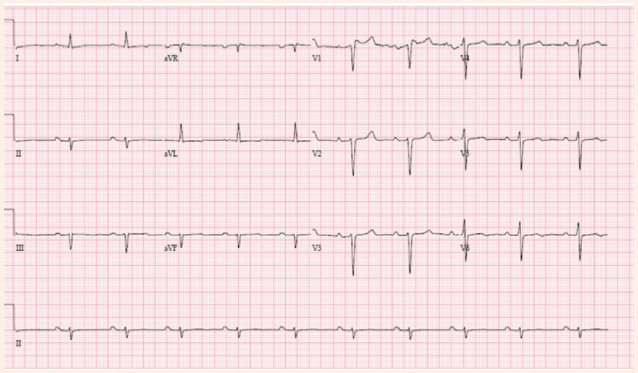

Figure 5: Follow-up 12-lead EKG showed normal sinus rhythm

Discussion

This case report illustrates the safety and efficacy of zero-fluoroscopy ablation in complex arrhythmias and the importance of targeting the vein of Marshall during the epicardial portion of hybrid ablation. Simple ablation procedures are now widely performed without the need for fluoroscopy. The use of advanced 3-D mapping systems and intracardiac ultrasound has allowed for a steady increase in the zero-fluoroscopy approach for more complex procedures [1-2]. The sequential, two-staged hybrid ablation (surgical thoracoscopic followed by catheter ablation) has been proven to be safe and effective for patients with persistent atrial fibrillation [3]. While all hybrid procedures are minimally invasive, the surgical portion varies considerably [4]. The primary components are pulmonary veins isolation and left atrium linear lesions. Adjunctive measures include targeting the ganglion plexus and the vein of Marshall, complete "box lesion", right atrium linear lesions, endocardial Cavo tricuspid ablation, and left atrium appendage occlusion [5].

Vein of Marshall-dependent atrial tachycardias is common after atrial fibrillation ablation. Ablation of the vein-left atrium junction, CS-vein connection, or ethanol infusion inside this vein is required to treat these tachycardias [6]. The vein-left atrium junction site is accessible from the endocardium; it is located at the ridge anterior to the left pulmonary veins, which can show continuous fractionated potential lasting >100 ms [7]. Figure 3 in this case showed this potential. This case emphasizes the crucial rule of targeting the vein of Marshall during the epicardial portion of hybrid procedures.

Conclusion

This case reports a successful zero-fluoroscopy ablation of left atrial tachycardia mediated by the vein of Marshall after a hybrid atrial fibrillation ablation of persistent atrial fibrillation.

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