CASE REPORT

Ablation Techniques in a Patient with a Right Accessory Pulmonary Vein. Is it Always Feasible?

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Abstract

A 32-year-old woman with lone paroxysmal atrial fibrillation had two pulmomary vein isolation procedures over 1 year, by means of the circular multipolar duty-cycled radiofrequency PVAC catheter in the first and the Thermocool® SmartTouch™ catheter in the second procedure. Following both procedures, the patient remained highly symptomatic on a weekly to monthly basis and a third procedure was performed by using the second generation of cryoballoon Arctic Front Advance™. Right inferior pulmonary vein was completely reconnected and an extreme hockey stick configuration was necessary in order to achieve complete occlusion and isolation. Thirty months later the patient remains symptom free in the absence of any therapy.
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Key words: cryoablation; pulmonary vein isolation

Abbreviations: AF = atrial fibrillation; PV = pulmonary vein

Short title: Is pulmonary vein isolation always feasible?

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INTRODUCTION

Ablation techniques for atrial fibrillation (AF) are plagued by frequent early and late recurrences, reported to occur in around 30-50% of patients, requiring repeat ablation, which is subsequently associated with better long-term freedom from recurrent AF.[1] The main reason for AF recurrences after an initial procedure is mostly related to reconnections at some segments of the perimeter of pulmonary veins (PV), rather than extrapulmonary sources.[1] Pulmonary vein anatomy may also explain the variable outcome to electrical isolation in patients with paroxysmal AF, since 4 discrete PVs are present in the minority of patients with paroxysmal AF undergoing PV isolation.[2] We present a case of a successful third attempt of PV isolation in a patient with a right accessory PV by means of cryoablation.

CASE REPORT

A 32-year-old woman with lone paroxysmal AF had 2 PV isolation procedures over 1 year. The circular multipolar duty-cycled radiofrequency PVAC catheter (Ablation Frontiers, Medtronic) was used in the first procedure both as a diagnostic catheter for PV potentials as well as an ablation catheter, indicating complete PV isolation. Following the intervention, she experienced recurrence of palpitations within a few days, clearly documented as paroxysms of AF despite antiarrhythmic therapy. She was offered a second ablation 6 months later, as she continued to be highly symptomatic on a weekly basis. Thermocool® SmartTouch™ (Biosense Webster©) with continuous assessment of catheter–tissue contact and three dimensional electroanatomic mapping system Carto 3® was used in the second procedure. A circumferential mapping catheter (Lasso™; BiosenseWebster©) confirmed full PV disconnection and both entrance and exit block at the end of the procedure. Following the second procedure, the patient remained highly symptomatic on a weekly to monthly basis and a third procedure seemed inevitable.

Preprocedural imaging of the left atrium and PVs by magnetic resonance imaging exhibited a right middle PV and a perpendicular outlet of a right lower PV (Fig. 1). Despite the challenging PV anatomy, the second generation of cryoballoon, Arctic Front Advance™, was selected for the third procedure. A 15 French deflectable sheath (FlexCath® Medtronic©) was introduced into the left atrium after a single transseptal puncture. The circular Achieve® Catheter (Medtronic©) was used to assess electrical activity within each PV.

It was confirmed that the left inferior, right superior and right middle PVs remained isolated. Minor electrical activity was present within the left superior PV while the right inferior PV was completely reconnected. Then, a 28-mm Arctic Front Advance™ balloon was inflated and advanced to the ostium of left superior PV and an application of 180 seconds was delivered since isolation was evident after only 25 seconds of ablation. Occlusion of the right inferior PV could not be achieved with a direct approach, the pull-down technique or the big loop technique as presented by Chun et al.[3] Finally, the Achieve® Catheter was placed deep in the right inferior PV. The sheath was then advanced with maximal bent to roof of the left atrium, allowing the balloon to be pushed into the inferior part of the PV ostium, which resulted in an extreme hockey stick configuration and complete PV occlusion (Fig. 2). A 240-sec application was delivered with continuous monitoring of the right phrenic nerve performed by high-output pacing through a hexapolar catheter in the superior vena cava. Administration of

adenosine did not reveal any left atrial–PV conduction in any vein. The patient was symptom free immediately after the third procedure and antiarrhythmic therapy was discontinued 3 months during the blanking period. Thirty months later she remains free of symptoms in the absence of any therapy.

DISCUSSION

Pulmonary vein isolation with use of radiofrequency ablation is the most common ablation technique for paroxysmal and/or persistent AF. Using cryothermic ablation via a cryoballoon is an alternative rapidly growing technique and the second generation cryoballoon is considered to deliver more effective lesions.[4] These approaches, however, are limited by fixed balloon sizes which do not sufficiently account for the variable PV anatomy. We assume that the accessory right PV rather than the minor electrical activity in the left superior PV was the main cause of arrhythmogenicity and AF recurrences in our case. This challenging anatomy did not allow long-term PV isolation despite the use of the novel contact force irrigated catheter in the second procedure.

The key message of the present case report is to indicate the role of preprocedural imaging and present specific techniques that may be used in order to occlude any vein in cryoablation procedures. Preprocedural imaging of the left atrium and PVs (e.g. by computed tomography, magnetic resonance imaging, rotational angiography) reveals the individual cardiac anatomy and facilitates catheter ablation, especially after a failed procedure. Finally, the extreme hockey-stick transformation with the support of left atrium roof is recommended in inferior PVs with a perpendicular outlet.

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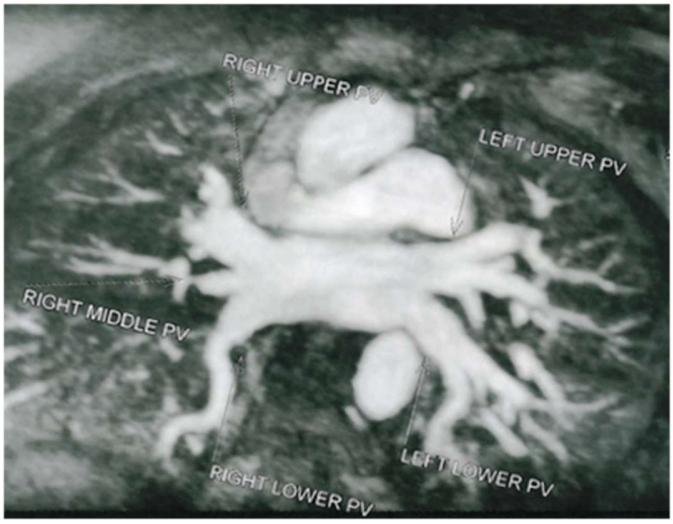

Figure 1. Preprocedural imaging of the left atrium and pulmonary veins by magnetic resonance imaging exhibited a right middle pulmonary vein and a perpendicular outlet of a right lower pulmonary vein.

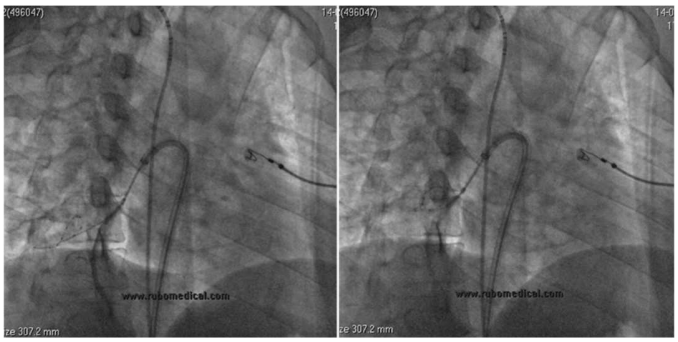

Figure 2. The sheath is advanced with maximal bend to roof of the left atrium, allowing the balloon to be pushed into the inferior part of the pulmonary vein ostium resulting in an extreme hockey stick configuration and complete occlusion (right panel) while the Achieve® Catheter is moved towards the ostium of the right inferior pulmonary vein (left panel).