IMAGES IN CARDIOLOGY

Post-PVI Left Atrial Flutter Managed with Pulmonary Vein Re-Isolation Using Cryoballoon Ablation

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Abstract

A case of left atrial flutter occurring after pulmonary vein isolation effected via cryothermic balloon ablation for atrial fibrillation is presented, which was successfully managed with pulmonary vein re-isolation. Rhythmos 2020; 15(1):11-13.

Key Words: atrial fibrillation; atrial flutter; ablation; pulmonary vein isolation; pulmonary vein reconnection; cryoballoon ablation

Abbreviations: AF = atrial fibrillation; AFlu = atrial flutter; CTI = cavotricuspid isthmus; LA = left atrial; LSPV = left superior pulmonary vein; PV = pulmonary vein; PVI = pulmonary vein isolation; PVR = pulmonary vein reconnection; RF = radiofrequency

A 44-year-old gentleman with a 10-year history of paroxysmal atrial fibrillation (AF) (Figure 1) was referred for catheter ablation due to increased arrhythmia recurrences over the past one year despite medical treatment. He reported annual recurrences of his arrhythmia until one year ago, but the preceding year he sustained 4 episodes with each lasting 1-1 ½ hours despite receiving antiarrhythmic drug therapy with propafenone and bisoprolol. Past medical history was significant for sleep apnea syndrome (non-obese physique; body weight 85 kg) managed with use of a continuous positive airway pressure therapy.

He underwent a first procedure of pulmonary vein (PV) isolation (PVI) 9 ½ months earlier with use of cryoballoon ablation, where all four PVs were successfully isolated. An example of successful elimination of PV potentials in the left superior PV (LSPV) is presented in Figure 2 (compare encircled recordings of PV potentials which are present in the left panel and absent in the right panel). However, one week after the procedure, the patient developed an arrhythmic episode which was managed with antiarrhythmic drugs (oral propafenone). ECG recording indicated a regular atrial tachycardia rhythm with an atrial rate of ~300 bpm and a 2:1 and often variable atrioventricular conduction, compatible with atrial flutter (AFlu), albeit with positive flutter waves in the inferior leads and in lead V1 suggestive of a clockwise, possibly isthmus-dependent, AFlu pattern (Figure 3). Thus, a repeat ablation procedure was scheduled with the intent to perform a cavotricuspid isthmus ablation after checking for and having ascertained the absence of any pulmonary vein reconnection (PVR). During the repeat procedure, access to the left atrium was obtained via a transseptal puncture and PVR was first explored. Indeed, PVR was detected in the LSPV and the right inferior PV (RIPV), while the right superior and left inferior PVs remained isolated. Thus, re-isolation was undertaken with use of a cryothermic balloon. During insertion of the lasso catheter into the RIPV, ambient atrial activity was noted, which intensified with the start of delivery of cryothermic energy in the antrum of the RIPV but ceased with further drop of the temperature. After the isolation of the RIPV, the guiding catheter was accidentally moved into the right atrium and it took a while until it could be re-inserted into the left atrium. During these maneuvers, the atrial tachycardia occurred. After repositioning the catheter into the left atrium, the RIPV was re-checked during the tachycardia but no PV potentials were recorded (Figure 4, left panel, encircled...
recordings). However, when positioning the catheter into the LSPV, PV potentials were apparent (Figure 4, right panel, encircled recordings). Thus, cryoablation of the LSPV was initiated (Figure 5) and during the freezing process, these potentials were reduced (Figure 6, left panel) and when eliminated, the tachycardia was terminated and sinus rhythm was restored (Figure 6, right panel, arrow). At the end of the procedure a CTI line was also performed with use of radiofrequency ablation. The procedure remained uncomplicated and the patient was discharged home the next day. Over the subsequent 4 months the patient has remained free of arrhythmia recurrences.

Figure 4

![Figure 4](image)

Figure 5

![Figure 5](image)

Figure 6

![Figure 6](image)
the LSPV (Fig. 5), thus obviating additional electrophysiological maneuvers, such as entrainment and/or activation mapping.

In a prior series from our center comprising 67 patients undergoing PVI, 6 (9%) patients subsequently developed AFu. Typical CTI-dependent counterclockwise AFu was observed in 5 of these 6 patients who subsequently underwent additional CTI ablation, while in 1 patient with left AFu, re-isolation of the PVs abolished the arrhythmia, as demonstrated in the present case.4 Importantly, re-isolation of a PV responsible for a postablation PV-dependent AFu is commonly achieved using focal RF ablation to target gaps along the previous encircling lesions.9,10 Use of cryoballoon ablation to treat PV-dependent AFu after catheter ablation has been scarcely reported; an advantage of cryoablation relates to the fact that it obviates the need for precise localization of gaps.11 We could only find a case series of 3 out of 4 patients with post-PVI AFu where cryoballoon ablation was successfully applied.11 Thus, to the best of our knowledge, this is actually the fourth case reported to date in the literature of post-PVI left AFu due to PVR successfully managed with PV re-isolation with use of a cryoballoon.

References