Balloon Dilatation of the Atrial Septum to Facilitate Trans-septal Access to the Left Atrium for Mapping and Ablation of Atrial Tachycardia: A Case Report

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ABSTRACT. Radiofrequency ablation of drug refractory symptomatic atrial fibrillation is a common procedure that is performed in many interventional electrophysiology laboratories worldwide. Re-do ablation of recurrent symptomatic atrial fibrillation and tachycardias often entails difficult trans-septal access to the left atrium secondary to atrial septal thickening and fibrosis. We describe a case of difficult trans-septal access that required balloon dilatation of the atrial septum, a procedure that is familiar to pediatric and adult interventional cardiologists. The details of the procedure are discussed.

KEYWORDS. atrial fibrillation, atrial tachycardia, ablation, balloon atrial septostomy, trans-septal access.

A 58-year-old man with history of obstructive sleep apnea, paroxysmal atrial fibrillation, and no significant structural heart disease presented with sudden onset of palpitations and rapid heart rates. His resting electrocardiogram (ECG) revealed atrial tachycardia with rapid ventricular rates. He had three prior radiofrequency ablation procedures for symptomatic atrial fibrillation and left atrial tachycardia. All the prior ablation procedures required trans-septal catheterization to access the left atrium and pulmonary veins. In view of persistent symptomatic atrial tachycardia despite antiarrhythmic drug therapy with Sotalol, he was brought to the electrophysiology laboratory for mapping and ablation of the arrhythmia.

The procedure was performed under general anesthesia. Bilateral femoral venous access was obtained and a duo-decapolar catheter (St. Jude Medical, St Paul, MN) was introduced into the coronary sinus. A 10-Fr intracardiac echo (ICE) imaging catheter (Accunav, Siemens, Malvern, PA) was introduced into the right atrium through the left femoral vein. Baseline rhythm was an atrial tachycardia at a cycle length of 250 ms. Both activation and entrainment mapping were consistent with left atrial macro re-entrant tachycardia.

An 8,000-unit bolus dose of heparin was administered, following which an intravenous infusion of heparin was started to maintain the activated clotting time in the 300–350 range. Baseline ICE images revealed a thick, fibrotic atrial septum and no left atrial appendage thrombus (Figure 1). A radio frequency (RF) trans-septal needle (Bayliss Medical, Montreal, Canada) was used to perform the trans-septal puncture, and the needle along with the dilator was advanced into the left atrium under biplane fluoroscopy and ICE guidance. The needle was then removed and a 0.032-inch guidewire was advanced into the left upper pulmonary vein. Attempts to advance the sheath (St. Jude Medical, SL-1, outer diameter 2.8 mm) into the left atrium over the dilator/guidewire assembly were unsuccessful. The guidewire was left in place and the sheath was exchanged for a steerable sheath (St. Jude Medical, Agilis) with dilator. Once again, the dilator advanced into the left atrium over the wire, but not the sheath, despite changing the curvature of the sheath using the steering mechanism (Figure 2).
At this point, the dilator was left in place in the left atrium and the 0.032-inch guidewire was exchanged for a 0.018-inch guidewire (V-18, Boston Scientific, St. Paul, MN). The tip of the guidewire was positioned in the left upper pulmonary vein. The dilator was removed and the steerable sheath was positioned in the right atrium close to the septum to act as a guide catheter. A 4.0 × 20 mm balloon (Ultra-thin SDS, Boston Scientific) was advanced over the wire and positioned across the septum using biplane fluoroscopic views and ICE images. Balloon selection was based on the fact that the outer diameter of the Agilis sheath was 3.8 mm. Some degree of elastic recoil was also expected. The balloon was inflated at 12 atmospheres for a total of 90 s (Figures 3 and 4). The balloon was then removed and the dilator was re-advanced over the wire into the left atrium.

The Agilis sheath then advanced easily over the dilator/wire into the left atrium (Figure 5). Fluoroscopic views, ICE images, and pressure measurements confirmed proper positioning of the sheath in the left atrium. A 3.5-mm irrigated tip catheter (Thermocool Celsius, Biosense Webster, Diamond Bar, CA) was then advanced through the sheath into the left atrium for mapping and ablation. At the end of the ablation procedure, repeat ICE images showed no pericardial effusion, normal left ventricular systolic function, and minimal residual color flow across the atrial septum at the site of balloon dilatation (Figure 6). The patient recovered uneventfully from the procedure and was discharged from the hospital after 48 h. At the patients one-month follow-up, the patient was clinically stable.
Graded balloon dilatation atrial septostomy has been described in the literature as a treatment option for hypoplastic left heart syndrome and transposition of the great arteries in the pediatric population and in the management of pulmonary hypertension in adults refractory to vasodilator therapy. To our knowledge, it has not been attempted to gain access to the left atrium for ablation procedures. However, the objective of the procedure in our case was to obtain left atrial access for mapping and ablation. Therefore, the balloon dilatation was not progressive and graded, which is necessary to create a persistant right to left shunt large enough to confer the hemodynamic benefit desired in pediatric congenital heart disease and pulmonary hypertension patients. Re-do ablation procedures for management of drug refractory atrial fibrillation and tachycardias is not an uncommon procedure in this interventional electrophysiology era. Therefore, difficult trans-septal access secondary to a thickened, fibrotic atrial septum is a common occurrence. RF trans-septal needle use to cross the septum is frequently required for re-do ablation procedures. In this patient, RF trans-septal puncture alone was not enough to gain access to the left atrium. Balloon atrial septostomy is a valuable adjunctive technique in these clinical situations. It can be performed easily with minimal risk to the patient in most high-volume electrophysiology laboratories that have access to intracardiac echocardiography and high-quality fluoroscopy.

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References