

# Ablation of Atrial Fibrillation in a Patient with a Mechanical Mitral Valve

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## KEYWORDS

• Atrial fibrillation • Catheter ablation • Mechanical mitral valve

## KEY POINTS

- Clinicians must be mindful of the left ventricular lead when cannulating the coronary sinus with a decapolar catheter or an ablation catheter.
- Left atrial catheter ablation for the treatment of atrial fibrillation in patients with a mechanical mitral valve, when approached carefully, can be performed safely and effectively.
- Block across linear lines should be confirmed using differential activation and/or differential pacing to decrease risks of proarrhythmias.

## CLINICAL PRESENTATION

A 69-year-old man was referred for evaluation of recurrent atrial fibrillation (AF). He had a history of surgical mechanical prostheses in the aortic and mitral positions for valvular stenosis related to rheumatic heart disease. He also had a history of a nonischemic dilated cardiomyopathy with severe left ventricular systolic dysfunction and left bundle branch block, and a biventricular implantable cardioverter-defibrillator was implanted. With cardiac resynchronization, his left ventricular ejection fraction normalized.

In the intervening time, he developed AF and underwent catheter ablation at an outside institution. Review of the patient's prior procedure report revealed that, in addition to pulmonary vein isolation (PVI), he also had linear radiofrequency ablations (RFAs) across the cavotricuspid isthmus, the left atrial roof, and a mitral annular line from the left inferior pulmonary vein (PV) to the mitral annulus.

He is now referred, several years later, for repeat ablation after AF and atrial flutter recurrence. His persistent AF has been highly symptomatic and

refractory to multiple antiarrhythmic drugs and electrical cardioversions. Furthermore, in AF, appropriate biventricular pacing has decreased to 50%.

## CLINICAL QUESTION

What is the approach to AF ablation in a patient with a mechanical mitral prosthesis and prior linear ablations?

## CLINICAL COURSE

The patient presented to the electrophysiology laboratory for repeat PVI, assessment of prior ablation lines, and ablation of any inducible atrial flutters. Venous access was obtained, and a double transseptal puncture was performed under intracardiac ultrasonography and fluoroscopy. An open-irrigated, force-sensing ablation catheter was placed through a deflectable sheath (Aglilis, St Jude Medical) into the left atrium (LA), and a circular mapping catheter (CMC) was placed through an SL1 long sheath to the LA. At baseline, the right

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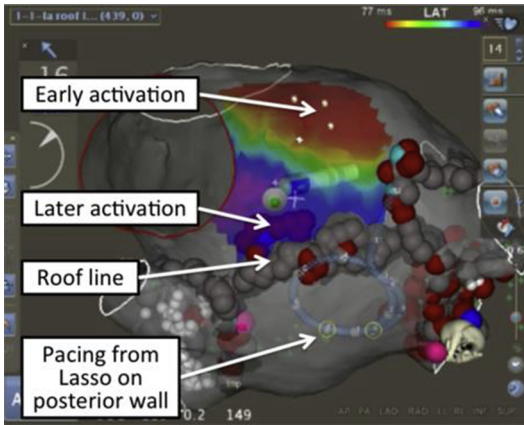
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**Fig. 1.** Assessment of block across the left atrial roof line. This pattern of activation, when pacing the posterior wall, is consistent with block in the posterior to anterior direction. Pacing from the anterior side, and confirming an inferior to superior activation along the posterior LA, confirmed block in the anterior to posterior direction (data not shown).

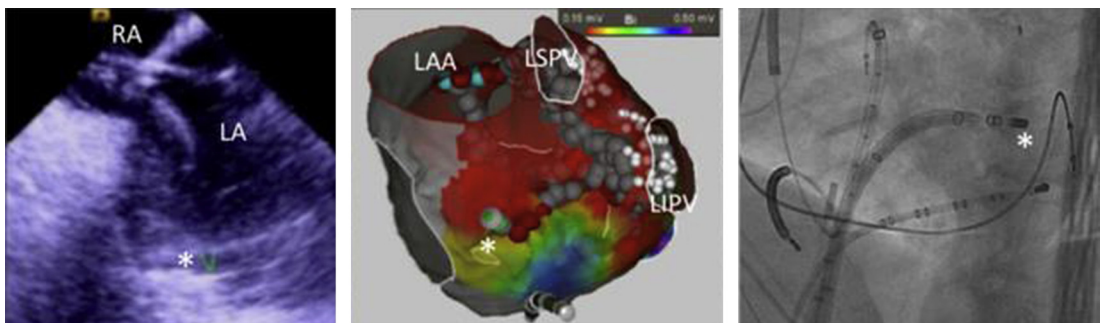
superior and left inferior PVs were isolated, but the right inferior and left superior PVs had reconnected, as assessed by the CMC. Care was taken with manipulation of the CMC to avoid entrapment within the mechanical mitral prosthesis. When not being used, the CMC was retracted into the long sheath, with a small tail remaining out of the sheath, to minimize the risk of it inadvertently being displaced toward the valve because of interaction with the ablation catheter.

A left atrial voltage map was created to help identify the locations of the prior circumferential antral lines of ablation, LA roof line, and posterolateral mitral annular line. Additional ablation around PV antra was guided both by early signals on

the CMC and by areas of pace capture when pacing the line.<sup>1</sup> Four-vein entrance and exit block was achieved in this manner, and pharmacologic challenge with adenosine after a waiting period showed no evidence of dormant conduction.<sup>2</sup>

Bidirectional block was not present across the left atrial roof line at baseline. Additional RFA was delivered in areas of pace capture on the left atrial roof. After ablation of gaps in the roof line, the CMC was positioned on the posterior wall, and the ablation catheter was positioned anterior to the roof line. With pacing from the CMC, activation mapping was performed with the ablation catheter. The latest activation was observed anteriorly just adjacent to the roof line (**Fig. 1**). The process was repeated with the catheters reversed, again showing latest activation just opposite to the roof line from the site paced, confirming bidirectional block across the left atrial roof. Differential pacing was also used to further confirm bidirectional block.

Next, bidirectional block was found to also not be present across the posterolateral mitral annular line. Using intracardiac echocardiography, fluoroscopy, and electroanatomic mapping, the ablation catheter was carefully advanced to the mitral annulus (**Fig. 2**), where additional lesions were delivered in areas of pace capture. Ultimately, block across the mitral annular line could only be achieved after the ablation catheter was advanced into the coronary sinus (CS) (**Fig. 3**) and RFA was delivered opposite the endocardial lesion set. Bidirectional block was confirmed with assessment of differential activation, akin to the technique used to assess the roof line. In this case, the distal pole of the CS catheter was paced and activation was latest just adjacent to the pacing poles on the opposite side of the line



**Fig. 2.** Multiple imaging modalities were used to avoid catheter entrapment in the mechanical mitral valve with ablation near the mitral annulus. (*Left*) ICE showing the ablation catheter tip projected (*asterisk*) at the mitral annulus. (*Middle*) Electroanatomic map with contact force sensing. Gray lesion tags represent scar, or areas of noncapture with pacing. Additional RFA (*red lesion tags*) was guided by areas of pace capture along the posterolateral mitral annular line. (*Right*) Fluoroscopy in left anterior oblique (LAO) projection. ICE, intracardiac echocardiography; LAA, left atrial appendage; LIPV, left inferior PV; LSPV, left superior PV; RA, right atrium.

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