

IMAGES IN ELECTROPHYSIOLOGY

# Termination of Persistent Perimitral Atrial Flutter by Selective Contrast Injection Into the Vein of Marshall

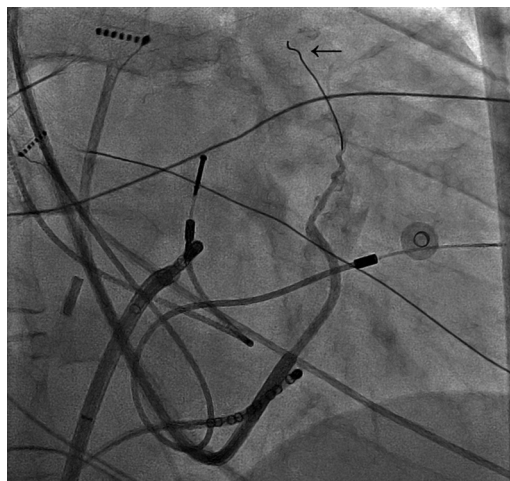


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A 60-year-old male patient with a 15-year history of paroxysmal atrial fibrillation, pacemaker implantation for sinus bradycardia, and cavotricuspid isthmus ablation for typical atrial

flutter underwent pulmonary vein isolation. One month after the procedure, he developed perimitral atrial flutter (PMF), which persisted despite electrical cardioversion and propafenone therapy. He underwent repeated left atrial catheter ablation, during which the PMF could not be terminated with prolonged endocardial ablation at the mitral isthmus and epicardial ablation in the coronary sinus. During the following 7 months, he had persistent PMF despite 4 cardioversions and amiodarone therapy. At the subsequent session, the coronary sinus was cannulated using a right internal jugular approach and occlusion coronary sinus angiography revealed the Marshall vein, which was cannulated using a left internal mammary guide catheter, through which an angioplasty guidewire was inserted into the vein. Immediately after selective contrast injection through the guide catheter into the Marshall vein the PMF terminated ([Figure 1](#), [Online Video 1](#)) and could not be reinduced with aggressive atrial stimulation. Pacing maneuvers proved there was a conduction block at the mitral isthmus. Subsequently, 2 injections of 98% ethanol were delivered through an over-the-wire angioplasty balloon into the vein of Marshall, which led to the occlusion of the vein. Persistent conduction block was shown on the mitral isthmus, and the patient remained free of atrial tachyarrhythmia during 5 months of follow-up using device telemetry.

**FIGURE 1** Selective Contrast Angiography of the Vein of Marshall at the Moment of Termination of PMF



An angioplasty wire (marked with an **arrow**) was previously inserted into the vein of Marshall. See accompanying [Online Video 1](#). PMF = perimitral flutter.

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Termination of persistent PMF by intravascular pressure elevation due to selective contrast injection into the Marshall vein supports earlier assumptions that epicardial connections of the Marshall vein can participate in the PMF circuit (1).

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#### REFERENCE

1. Briceño DF, Valderrábano M. Recurrent perimitral flutter due to vein of Marshall epicardial connections bypassing the mitral isthmus: response to ethanol infusion. *Circ Arrhythm Electrophysiol* 2014;7:988-9.

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**KEY WORDS** ethanol injection, Marshall vein, perimitral flutter

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 **APPENDIX** For a supplemental video, please see the online version of this article.