

# Ablation of a symptomatic spontaneous automatic focus arising from an atriofascicular fiber



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## Introduction

Atriofascicular accessory pathways (AP), often referred to as Mahaim pathways, are uncommon electrical connections that most often course along the lateral right atrium and insert within the distal right bundle branch (RBB). Pathognomonic electrophysiological characteristics are well described, including unidirectional anterograde conduction with AV node-like decremental properties. Reported targets for ablation include the site of the Mahaim potential along the atrial aspect of the tricuspid annulus or at the ventricular insertion site of the pathway.<sup>1</sup> Spontaneous activity arising from an atriofascicular AP fiber has been described during ablation of its atrial insertion.<sup>2</sup> Herein, we report the first case of ablation of symptomatic atriofascicular AP automaticity mimicking apicolateral right ventricular (RV) ectopy, which manifested years after AP ablation for antidromic atrioventricular reentrant tachycardia (AVRT).

## Case report

A 32-year-old woman with a structurally normal heart was referred to our institution for symptomatic premature ventricular contractions (PVCs) despite antiarrhythmic drug therapy. Sixteen years prior, she had antidromic AVRT via an atriofascicular AP that was successfully ablated at its proximal insertion site. She remained asymptomatic until recently, when brief but frequent palpitations emerged during fertility treatments that were different from her prior symptoms in the setting of AVRT. Twenty-four-hour Holter monitoring documented frequent monomorphic PVCs (18% of all heart beats). A 12-lead electrocardiogram (ECG), depicted in [Figure 1A](#), revealed PVCs with a left bundle branch block (LBBB) morphology and superior axis. No sustained ventricular tachycardia was recorded. Physical examination and echocardiography were unremarkable.

**KEYWORDS** Arrhythmias; Mahaim fiber; Atriofascicular pathway; Automaticity; Catheter ablation; Ventricular and supraventricular arrhythmias (*Heart Rhythm Case Reports* 2016;2:379–383)

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As a result of persistent and debilitating symptoms, an electrophysiological study was performed under local anesthesia with conscious sedation (ie, intravenous midazolam). Standard multielectrode catheters were introduced through the femoral veins and positioned under fluoroscopic guidance in the high right atrium, coronary sinus, His-bundle region, and RV apex. Reconnection of the atriofascicular pathway was demonstrated as follows: (1) pre-excitation induced by high right atrial pacing with a maximally pre-excited ECG during atrial pacing having the same morphology as spontaneous PVCs ([Figure 1B](#)); (2) decremental conduction across the atriofascicular bypass tract with progressive AV and AH interval prolongation coupled with shortening of the HV interval and progressive widening of the QRS complex during atrial pacing; (3) progressive prolongation of the AV interval with progressive prematurity of atrial extrastimuli; and (4) lack of retrograde conduction over the AP. The proximal insertion site was localized by identifying the atriofascicular pathway potential (ie, M-potential) along the atrial aspect of the posterolateral tricuspid annulus. The distal insertion was considered to be fascicular, with an RBB potential present before each non-pre-excited QRS complex. Antegrade refractory periods of the AV node and atriofascicular fiber were 290 and 350 ms, respectively. No tachycardia was inducible with atrial or ventricular pacing either with or without an isoproterenol perfusion (up to 2 µg/min). Frequent symptomatic and spontaneous PVCs were recorded throughout the procedure. Activation mapping was performed during PVCs to identify the site of earliest activation relative to the onset of the QRS. The earliest bipolar signal was localized to the apicolateral RV wall and was preceded (20 ms) by a sharp Purkinje potential ([Figure 2](#)). Pace mapping at a site where small potentials were recorded (presumably the distal RBB) produced a QRS morphology identical to PVCs and pre-excited beats. Radiofrequency ablation performed during sinus rhythm targeting this RV apicolateral site produced automatic ventricular ectopy ([Figure 3](#)). The morphology of this rhythm was identical to the patient's spontaneous PVCs. No recurrence of PVCs occurred after ablation. In addition, ablation at this site eliminated atriofascicular antegrade conduction. The ECG after ablation was normal, without RBB block. After a

## KEY TEACHING POINTS

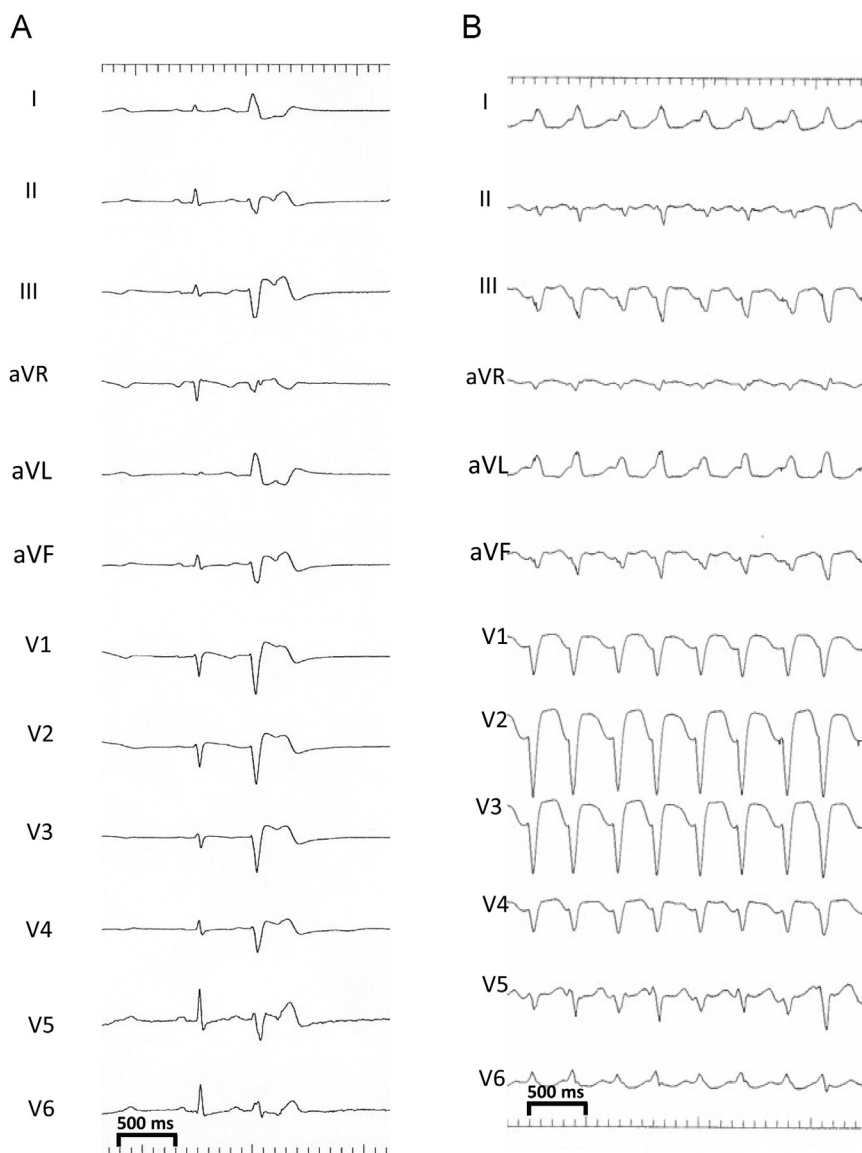
- Spontaneous automaticity of Mahaim fibers is rare and occurs predominantly soon after radiofrequency ablation.
- In this case, spontaneous automaticity occurred more than 15 years after radiofrequency ablation, preventing the patient from receiving fertility treatment.
- Electrophysiological study and careful mapping are essential in localizing the site of origin and identifying appropriate treatment.

follow-up of 2 years, the patient remains asymptomatic, with no PVCs recorded by multiple 24-hour Holter recordings.

## Discussion

Spontaneous automatic activity originating from an atriofascicular AP appears to be exceedingly rare, and has been reported in a minority of patients with atriofascicular pathways.<sup>3</sup> This case describes highly symptomatic PVCs with the same QRS morphology as pre-excitation across an atriofascicular pathway. The origin of these PVCs was mapped to the distal insertion of the atriofascicular fiber, where ablation resulted in the disappearance of PVCs and elimination of atriofascicular pathway conduction.

Rare cases of spontaneous automaticity arising from atrioventricular APs have been reported.<sup>4</sup> Spontaneous automaticity of Mahaim fibers has been infrequently observed, predominantly soon after ablation, sometimes competing with AV node escape rates.<sup>3,5-7</sup> Sternick<sup>8</sup> noted spontaneous automaticity in 12.5% of 40 patients with Mahaim fibers, with a spectrum of automatic rhythms



**Figure 1** Pre-excitation induced by atrial pacing with the same morphology as the clinical premature ventricular contractions (PVCs). **A:** Recordings of the surface 12-lead electrocardiogram (ECG) with monomorphic spontaneous “PVCs.” **B:** Recordings of the surface 12-lead ECG during the electrophysiology study with incremental atrial pacing and an atrial premature pacing at 390 ms. The QRS morphology during maximum pre-excitation is similar to the spontaneous “PVC.”

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