

Delayed occurrence of atypical fast-slow atrioventricular nodal reentry years after successful slow pathway ablation for typical atrioventricular nodal reentry



Daniel Marks, MD, Bradley P. Knight, MD

From the Department of Cardiac Electrophysiology, Northwestern Memorial Hospital, Chicago, Illinois.

Introduction

Atrioventricular nodal reentrant tachycardia (AVNRT) is the most commonly diagnosed supraventricular tachycardia (SVT) in the electrophysiology (EP) lab in patients with recurrent sustained paroxysmal SVT. The ablation target for both typical (slow-fast) and atypical (fast-slow) AVNRT is usually the right inferior extension of the slow pathway (SP), found between the middle coronary sinus ostium and the tricuspid annulus along the posterior inferior right atrium. Success rates for first-time radiofrequency (RF) ablation have been reported as high as 95%–98%.^{1–3} Two patients are presented here who underwent successful SP modification for typical AVNRT without clinical recurrence, who presented years later with atypical AVNRT.

Case report

Case 1

A 58-year-old woman with a medical history of Crohn disease, psoriatic arthritis, and a prior diagnosis of typical AVNRT underwent successful catheter ablation at an outside institution 12 years prior to presentation. Before her ablation 12 years ago, she had monthly to weekly episodes of tachycardia over the previous few years. Ablation of the SP was reportedly successful with a single RF lesion. She had complete resolution of her symptoms for 12 years until 2 months prior to presentation, when she began to have frequent, daily episodes of palpitations. Rhythm strips recorded during symptoms showed a long RP tachycardia initially thought to be atrial tachycardia. An EP study was performed. At baseline, there was evidence of dual AV nodal physiology with a demonstrable A-H “jump” during delivery of incremental atrial extrastimuli. A mid RP tachycardia was easily induc-

KEYWORDS AVNRT; Recurrence; Reentry; Slow pathway modification; Supraventricular tachycardia
(Heart Rhythm Case Reports 2020;6:960–962)

Funding: None. Conflicts of Interest: There are no conflicts of interest for all authors listed on this manuscript. **Address reprint requests and correspondence:** Dr Daniel Marks, 251 East Huron Street, Feinberg 8-503, Chicago, IL 60611. E-mail address: Daniel.marks@northwestern.edu.

KEY TEACHING POINTS

- Ablation for atrioventricular nodal reentrant tachycardia (AVNRT) can be done with a high degree of success (>95%) at the slow pathway right inferior extension, whether typical or atypical.
- Recurrence of AVNRT is typically seen within 3 months, but can occur years after initial ablation, with a different tachycardia mechanism.
- When a patient who has undergone successful slow pathway ablation for typical AVNRT with elimination of symptoms develops a recurrent long RP tachycardia several years later, the diagnosis of atypical fast-slow AVNRT must still be considered.

ible during catheter manipulation and with ventricular burst pacing, with a tachycardia cycle length (TCL) of 485 ms and a septal VA time of 245 ms (Figure 1). Ventricular overdrive pacing (VOP) was performed during the only episode of tachycardia that was sustained and resulted in a pseudo V-A-A-V response, a long postpacing interval minus TCL interval of 180 ms, and acceleration of the atrial rate only after full ventricular capture without fusion, consistent with a diagnosis of atypical AVNRT. RF energy was delivered during sinus rhythm to the SP region at the edge of the mid coronary sinus and was associated with junctional ectopy. Postablation, the slow pathway was eliminated and tachycardia was noninducible despite isoproterenol infusion. The patient has had no recurrence of tachycardia after 18 months of follow-up.

Case 2

A 48-year-old woman with a history of typical AVNRT status post RF ablation 3 years prior presented with recurrent palpitations. Prior to her ablation 3 years ago, she had at least monthly episodes of tachycardia over 10 years. During her

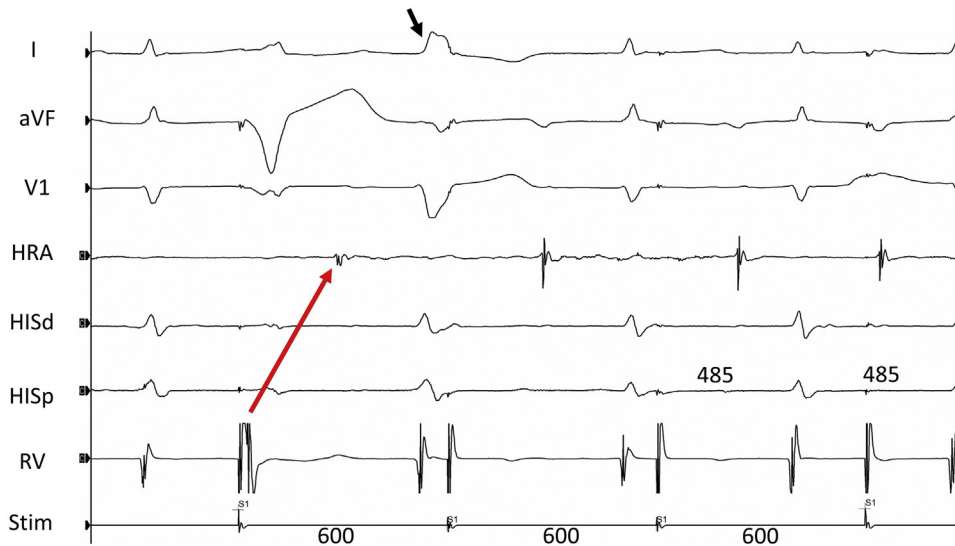


Figure 1 Induction of tachycardia with ventricular burst pacing. After the first beat of ventricular pacing at 600 ms, there is retrograde conduction through the slow pathway (red arrow) followed by antegrade left bundle branch block (black arrow) and induction of tachycardia with a tachycardia cycle length of 485 ms and V to HRA time of 245 ms.

initial EP procedure, a short RP tachycardia with a TCL of 455 ms and VA time of 30 ms was induced and was consistent with typical AVNRT. A total of 4 RF lesions were delivered to the SP region with elimination of the SP. She had no recurrence of tachycardia for 3 years, but then developed frequent, daily palpitations. Rhythm strips documented recurrent sustained and nonsustained episodes of a long RP tachycardia initially thought to be atrial tachycardia. An EP procedure was performed. At baseline, there was no evidence of anterograde SP with and without isoproterenol. However, long RP echo beats were inducible with ventricular extrastimuli

and a sustained long RP tachycardia was induced with ventricular burst pacing, with a TCL of 415 ms and septal VA time of 315 ms. Interestingly, when VOP was first performed, the tachycardia terminated spontaneously at the beginning of the pacing train, with reinduction upon cessation of pacing, associated with a retrograde 2-for-1 phenomenon (Figure 2). This finding was thought to be either a retrograde double fire or initiation of an atrial tachycardia. Eventually, VOP exhibited a pseudo V-A-A-V response with a long postpacing interval – TCL interval of 155 ms, establishing the diagnosis of atypical fast-slow AVNRT

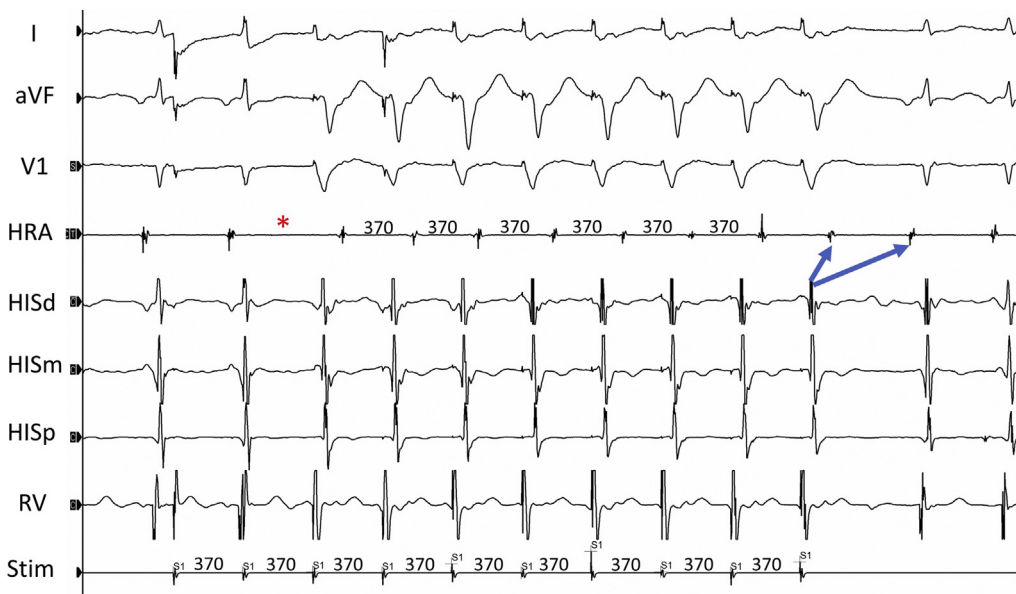


Figure 2 Termination of tachycardia at the onset of ventricular pacing and reinduction with a retrograde double fire. While the patient is in supraventricular tachycardia (SVT), ventricular burst pacing is delivered at 370 ms in an attempt to perform ventricular overdrive pacing. However, SVT terminates spontaneously at the onset of the drive train (red asterisk). After cessation of pacing, the last paced beat is followed by 2 atrial electrograms, with reinitiation of tachycardia with a retrograde 2-for-1 response.

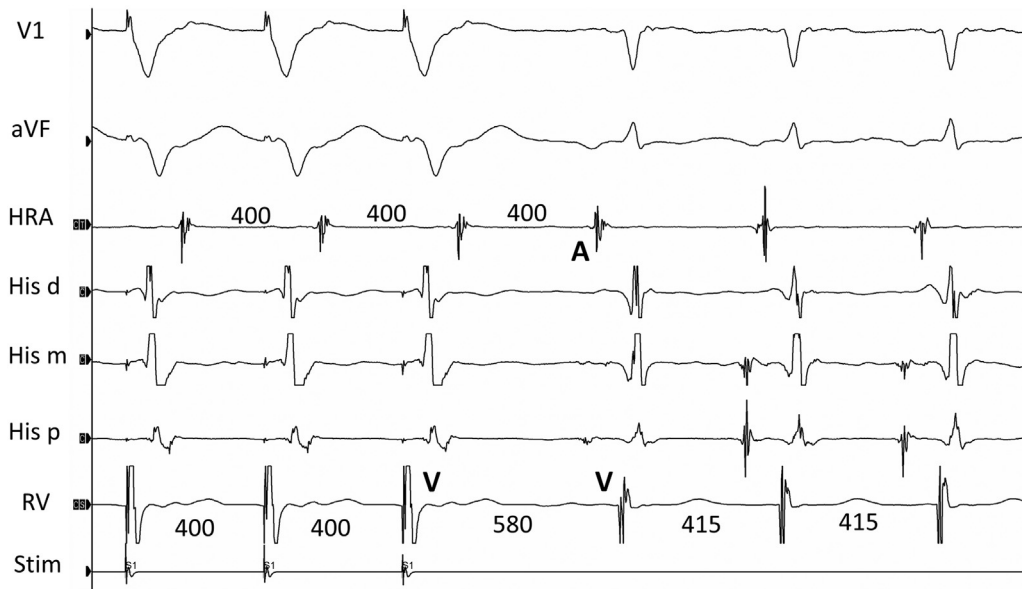


Figure 3 Ventricular overdrive pacing showing a V-A-V response. Right ventricular pacing is performed at a cycle length (CL) of 400 ms during tachycardia, with acceleration of atrial electrograms to the paced CL. A true V-A-V response is demonstrated, with a long postpacing interval – tachycardia cycle length interval of 155 ms, consistent with a diagnosis of atrioventricular nodal reentrant tachycardia.

(Figure 3). RF ablation was performed at the conventional SP region and was associated with accelerated junctional beats. Subsequently, tachycardia was noninducible with and without isoproterenol infusion.

Discussion

The 2 patients described in the present series had de novo development of atypical AVNRT multiple years after an initially successful SP modification for typical AVNRT. Because each patient had undergone successful SP ablation and done well for several years, the long RP tachycardia that they each developed much later was thought to be most likely atrial in origin. The time between successful ablation of typical AVNRT and the development of atypical AVNRT in the present cases is significantly longer than the time of recurrent typical AVNRT reported in a recent case series, where the majority (21 of 24 patients) occurred within 3 months.¹ It is unclear as to why these recurrences occurred so late and in the form of atypical AVNRT. A likely explanation was that there was late SP recovery and that SP modification produced the necessary substrate for retrograde SP conduction and maintenance of AV nodal reentry. In these cases,

repeat ablation at the standard SP location was successful. Targeting the conventional SP region in cases of atypical fast-slow AVNRT has been shown to be effective, with an equivalent recurrence rate as compared to ablation for typical AVNRT.⁴

In conclusion, in a patient who has undergone successful slow pathway ablation for typical AVNRT, has experienced complete elimination of symptoms but develops a long RP tachycardia several years later, the diagnosis of atypical fast-slow AVNRT must still be considered, which can be readily ablated at the usual right atrial slow pathway region.

References

1. Katritsis DG, Zografos T, Siontis KC, et al. Endpoints for successful slow pathway catheter ablation in typical and atypical atrioventricular nodal re-entrant tachycardia. *JACC Clin Electrophysiol* 2019;5:113–119.
2. Feldman A, Voskoboinik A, Kumar S, et al. Predictors of acute and long-term success of slow pathway ablation for atrioventricular nodal reentrant tachycardia: a single center series of 1,419 consecutive patients. *Pacing Clin Electrophysiol* 2011;34:927–933.
3. Nakagawa H, Jackman WM. Catheter ablation of paroxysmal supraventricular tachycardia. *Circulation* 2007;116:2465–2478.
4. Katritsis DG, Marine JE, Contreras FM, et al. Catheter ablation of atypical atrioventricular nodal reentrant tachycardia. *Circulation* 2016;134:1655–1663.