

# Minimally preexcited tachycardia: What is the mechanism?



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## Introduction

Careful interpretation of the intracardiac electrograms is required to diagnose a minimally preexcited tachycardia QRS morphology that is similar to that during sinus rhythm.

## Case report

A 75-year-old man with chronic obstructive pulmonary disease but without any overt structural heart disease was referred to our institution for catheter ablation of a wide QRS complex tachycardia. The 12-lead electrocardiograms (ECGs) during the tachycardia and sinus rhythm are shown in [Figure 1](#). During sinus rhythm, the PR interval and QRS width were 95 ms and 110 ms. Which differential diagnoses should be considered from the ECG findings?

Multielectrode catheters were placed in the high right atrium (HRA), His bundle region, coronary sinus, and right ventricle. During sinus rhythm, the cycle length (CL), atrio-His interval, and His-ventricular interval were 700, 60, and 10 ms, respectively. Programmed ventricular stimulation revealed concentric decremental retrograde conduction. Intracardiac electrograms during atrial burst pacing at pacing CLs of 600 ms and 350 ms are shown in [Figure 2](#). A decrease in the atrial extrastimulus coupling interval with an isoproterenol infusion induced a long RP tachycardia without the occurrence of atrio-His jump. The tachycardia with a 1:1 ventriculoatrial relationship exhibited a fluctuation in the CL of 270–290 ms and ventriculoatrial interval of 190–210 ms ([Figure 3A](#)). The tachycardia reproducibly and spontaneously terminated with the ventricular activation before performing any diagnostic pacing maneuvers despite its reproducible induction ([Figure 3B](#)). What is the mechanism of this tachycardia?

**KEYWORDS** Atrial tachycardia; Electrophysiology; Fasciculoventricular pathway; Minimally preexcited tachycardia; Preexcitation (*Heart Rhythm Case Reports* 2020;6:805–807)

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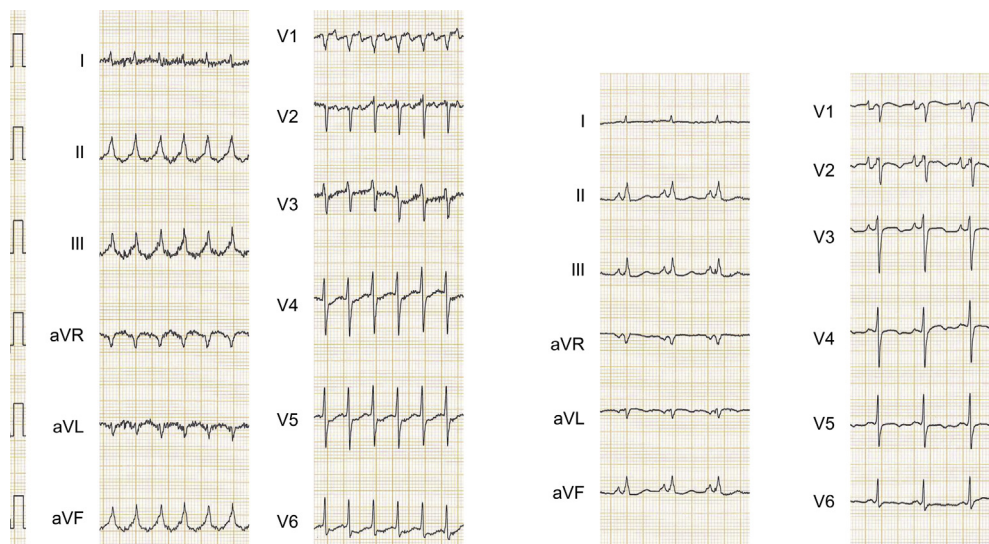
## KEY TEACHING POINTS

- The fasciculoventricular pathway mimics a septal accessory pathway with a relatively longer PR interval and narrower QRS width (minimal preexcitation).
- The fasciculoventricular pathway is well known not to be involved in the tachycardia circuit.
- Electrophysiologists should be aware of the possibility of a supraventricular tachycardia with a bystander fasciculoventricular pathway for a minimally preexcited tachycardia QRS morphology that is similar to that during sinus rhythm.

## Discussion

### ECG interpretation

The ECGs during both the long RP tachycardia and sinus rhythm exhibited minimal preexcitation. The most major differential diagnosis of a preexcited tachycardia would be antidromic reciprocating tachycardia with an accessory pathway, which is seen in 10% of patients with manifest ventricular preexcitation during sinus rhythm.<sup>1</sup> During the antidromic reciprocating tachycardia, a maximal preexcitation is usually seen because the entire ventricular depolarization is caused by antegrade conduction over an accessory pathway. In this case, however, the QRS morphologies during the tachycardia and sinus rhythm were similar with minimal preexcitation. Furthermore, a relatively longer PR interval and narrower QRS width were observed.<sup>2,3</sup> These findings suggested the presence of a fasciculoventricular pathway (FVP) mimicking a septal accessory pathway; however, the FVP played no active role in the tachycardia circuit. Therefore, in the setting of a bystander FVP, the differential diagnoses of a long RP tachycardia such as atrial tachycardia (AT), atrioventricular nodal reentrant tachycardia, and orthodromic reciprocating tachycardia via another concealed accessory pathway should be considered.



**Figure 1** Twelve-lead electrograms during the tachycardia (left panel) and sinus rhythm (right panel).

### Intracardiac electrogram interpretation

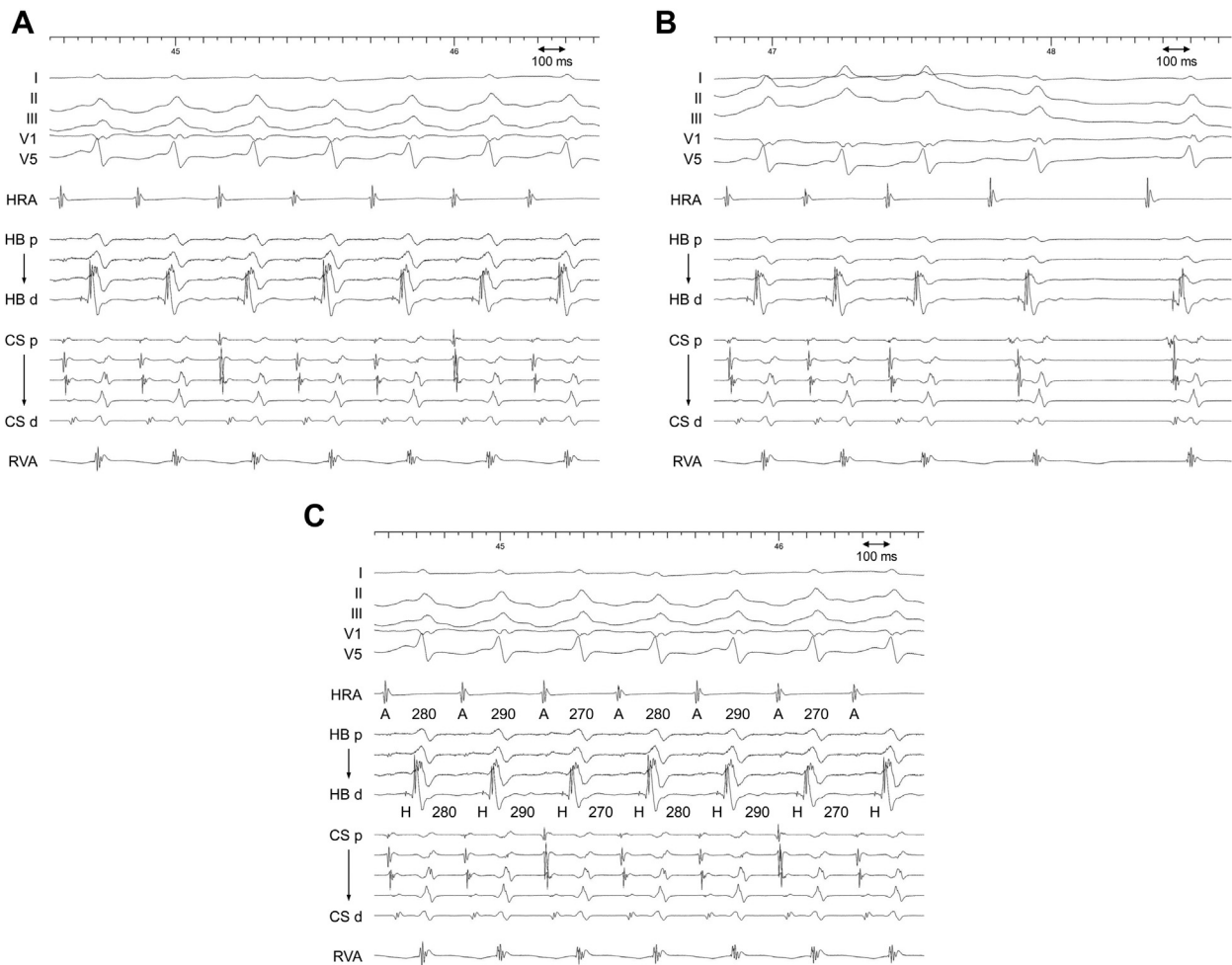
The HV interval was short during sinus rhythm, suggestive of antegrade conduction of an accessory pathway. The HV interval and QRS width were fixed despite the AV interval prolongation by a decrease in the atrial pacing CL, which indicated the presence of an FVP. During the long RP tachycardia, His bundle activation preceded the QRS, and the earliest atrial activation was seen in the HRA despite the concentric atrial activation during right ventricular pacing in sinus rhythm, which was less likely in atrioventricular nodal reentrant tachycardia. Although no diagnostic pacing maneuvers were performed owing to the tachycardia termination before the pacing, the tachycardia

reproducibly terminated with the ventricular activation, and the change in the atrial CL drove that of the His CL (Figure 3C). Given these findings suggesting an AT, we mapped the AT with a 3-dimensional mapping system, which located the earliest activation at the inferolateral aspect of the tricuspid annulus. A radiofrequency application at the earliest site immediately terminated the AT, and any tachycardia was not inducible after the procedure despite the persistent preexcitation.

Because an FVP is well known not to be involved in the tachycardia circuit, the electrophysiologists tend to rule out the presence of an FVP when they encounter a preexcited tachycardia. However, the electrophysiologist should be



**Figure 2** Intracardiac electrograms during atrial burst pacing at pacing cycle lengths of 600 ms and 350 ms. CS d = coronary sinus distal; CS p = coronary sinus proximal; HB d = His bundle distal; HB p = His bundle proximal; HRA = high right atrium; RVA = right ventricular apex.



**Figure 3** Intracardiac electrograms of **A:** the tachycardia, **B:** the tachycardia termination, and **C:** (A) with the labels and intervals. A = atrial; CS d = coronary sinus distal; CS p = coronary sinus proximal; H = His bundle; HB d = His bundle distal; HB p = His bundle proximal; HRA = high right atrium; RVA = right ventricular apex; V = ventricle.

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