

## HANDS ON

# Nodo- and fasciculoventricular pathways: Electrophysiological features and a proposed diagnostic algorithm for preexcitation variants

Hussam Ali, MD, Antonio Sorgente, MD, PhD, FHRS, Pierpaolo Lupo, MD, Sara Foresti, MD, Guido De Ambroggi, MD, Cristina Balla, MD, PhD, Gianluca Epicoco, MD, Riccardo Cappato, MD, FHRS

*From the Arrhythmia and Electrophysiology Center, IRCCS Policlinico San Donato, San Donato Milanese, Milan, Italy.*

## Introduction

Fasciculoventricular and nodoventricular pathways (FVP and NVP) are uncommon preexcitation variants that can be misleading during electrophysiology studies (EPSs), and differentiating them could be challenging.<sup>1-3</sup> In this article, we describe 2 representative cases and then we present various electrophysiological features and phenomenon encountered in patients with these particular accessory pathways (APs).

## Case 1

An 18-year-old female athlete with electrocardiographic preexcitation was referred to our center for electrophysiological evaluation. Her electrocardiogram showed sinus rhythm with minimal preexcitation (Figure 1A), and her echocardiogram showed no abnormalities. At EPS, basal AH and HV intervals were 65 and 18 ms, respectively. Right ventricular pacing demonstrated nodal retrograde conduction. Multisite atrial pacing at similar cycle lengths did not affect the preexcitation degree (Figures 1B and 1C). During isoproterenol infusion, there was a phase of junctional rhythm replicating the preexcitation morphology (Figure 1D). Importantly, incremental and programmed atrial stimulation (PAS) showed a significant prolongation of the AH interval without any change in the HV interval or preexcitation degree (Figure 1E). The diagnosis of an FVP was established, and no ablation was performed considering the innocent nature of this AP and the noninducibility of any tachycardia.

**KEYWORDS** Nodoventricular pathways; Fasciculoventricular pathways; Preexcitation variants; Diagnostic algorithm

**ABBREVIATIONS** AP = accessory pathway; AV = atrioventricular; EPS = electrophysiology study; FVP = fasciculoventricular pathway; HB = His bundle; NVP = nodoventricular pathway; PAS = programmed atrial stimulation; RBBB = right bundle branch block (Heart Rhythm 2015;0:1-6)

**Address reprint requests and correspondence:** Dr Hussam Ali, Arrhythmia and Electrophysiology Center, IRCCS Policlinico San Donato, Via Morandi 30, 20097 San Donato Milanese, Milan, Italy. E-mail address: hussamali.ep@gmail.com.

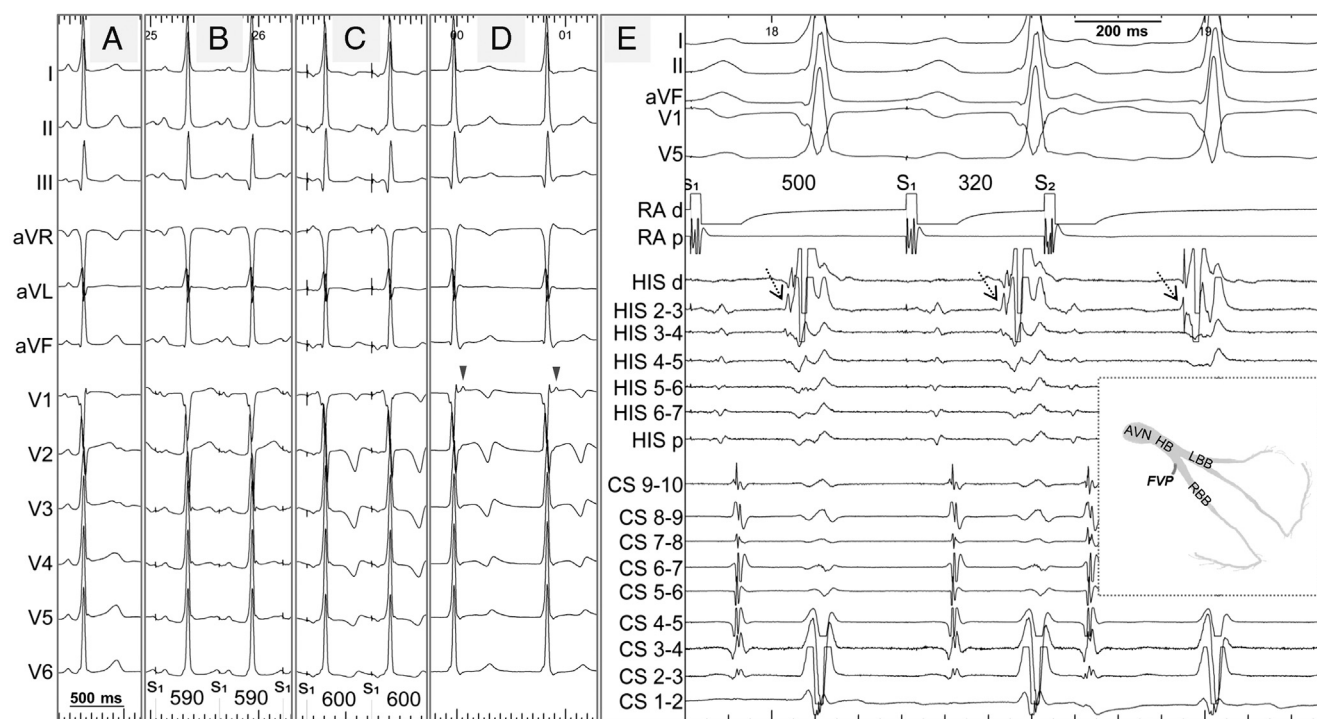
## Case 2

A 21-year-old male subject with preexcitation and normal heart underwent an EPS. A 12-lead electrocardiogram showed sinus rhythm with minimal preexcitation (Figure 2A), and basal AH and HV intervals were 60 and 15 ms, respectively. Retrograde conduction showed a nodal pattern. Multisite atrial pacing at similar cycle lengths did not affect the preexcitation degree, incompatible with an atrioventricular (AV) AP (Figures 2B and 2C). Furthermore, PAS showed a significant AH prolongation associated with a negative HV interval and increased preexcitation (Figure 2D), favoring the diagnosis of an NVP over an FVP. The ventricular insertion of this pathway was mapped and localized at the para-Hisian region. Neither rapid antegrade conduction nor inducible reentrant tachycardias were observed, and no ablation was attempted.

## Discussion

The hallmark of FVPs and NVPs is their infra-atrial nature arising from the specialized conduction system, either from the AV node itself (NVP) or from the His-Purkinje system (FVP), and then usually inserting into the ventricular myocardium adjacent to the para-Hisian region. These anatomical considerations lead to common and diverse electrophysiological features.

- Both FVP and NVP commonly present with minimal preexcitation (Figures 1A and 2A). Since the atrial impulse should propagate either through the entire AV node (FVP) or through its proximal portion (NVP), these pathways demonstrate adenosine sensibility (Online Supplemental Figure S1) and progressive prolongation of the stimulus-delta interval during PAS (Figures 1E and 2D).
- Atrial pacing maneuvers
  - Multisite atrial pacing: It has no effect on the preexcitation degree in both FVP (Figures 1B and 1C) and NVP (Figures 2B and 2C). This maneuver is



**Figure 1** A case of a fasciculoventricular pathway. **A–D**: Twelve-lead electrocardiographic recordings showing fixed and minimal preexcitation during sinus rhythm, lateral right atrial pacing, distal coronary sinus pacing, and junctional rhythm, respectively. Solid arrows in panel D indicate retrograde P waves. **E**: Intracardiac recordings during programmed atrial stimulation, showing prolongation of nodal conduction time (AH interval) with a fixed HV interval. Dotted arrows indicate His potentials. d = distal; p = proximal.

helpful to differentiate these APs from typical AV bypass tracts and atriofascicular pathways. The atriofascicular AP usually demonstrates an increased preexcitation degree with typical left bundle branch block during pacing from the right atrium close to the AP atrial insertion ([Online Supplemental Figure S2](#)).<sup>4</sup> Even a para-Hisian AV-AP, adjacent to the atrial input into the AV node, usually shows decreased preexcitation during distal coronary sinus (pacing). A limitation of this maneuver might be the presence of severe impairment of the antegrade nodal conduction since a fully preexcited morphology would be observed independently of the atrial pacing site. (b) Incremental atrial pacing and PAS: These maneuvers normally produce, at shorter pacing intervals, physiologic prolongation of the nodal conduction time (ie, the AH interval). An FVP takes off from the His bundle (HB) or fascicles, and it is completely an infranodal structure. Consequently, the HV interval remains constant and positive (usually > 10 ms) and the QRS morphology remains fixed even with variable conduction times over the AV node ([Figure 1E](#)).<sup>1</sup> An exception might be the coexistence of aberrant conduction with a wider QRS morphology. This phenomenon could be confusing since the typical aberrancy pattern is muted by the FVP itself and the minimal delta waves masquerade the characteristic rapid onset of QRS morphology. In this scenario, the HV interval is the key, as it remains fixed and positive

even with the wider QRS morphology ([Online Supplemental Figure S3](#)). In contrast, an NVP is not totally an infranodal structure, as it bypasses only a portion of the AV node with decremental conduction properties. Therefore, the preexcitation degree may change with rapid atrial pacing or at shorter coupling intervals during PAS, and the HV interval may decrease even to negative values ([Figure 2D](#)). This phenomenon usually necessitates a significant AH prolongation to dissociate the antegrade conduction over the NVP and the distal portion of the AV node and consequently to change the fusion and preexcitation degrees. The more proximal the emergence level of this pathway from the AV node, the more evident this feature, and vice versa.

3. The presence of *preexcited junctional beats* excludes an AV-AP (eg, atriofascicular pathway) and favors the diagnosis of an FVP ([Figure 1D](#) and [Online Supplemental Figures S4A and S4B](#)). These junctional beats may occur spontaneously or be provoked by isoproterenol infusion ([Figure 1D](#)), radiofrequency ablation of the slow pathway, or the pause induced after burst atrial pacing.

However, some points should be taken into consideration. Junctional beats of a high (proximal) origin may produce preexcitation over both FVP and NVP. An example might be observed during radiofrequency ablation of the nodal slow pathway (inferior AV node extensions), which provokes junctional beats originating

Download English Version:

<https://daneshyari.com/en/article/5959871>

Download Persian Version:

<https://daneshyari.com/article/5959871>

[Daneshyari.com](https://daneshyari.com)