Discordant Junctional Beats and Preexcitation

What Is the Mechanism?

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A 18-year-old woman with Down syndrome and ventricular preexcitation was referred to our center for electrophysiological evaluation. She had no structural heart disease, and her 12-lead ECG showed minimal preexcitation. After obtaining an informed consent, an electrophysiology study was performed under conscious sedation. Via bilateral femoral veins, multipolar diagnostic catheters were introduced and positioned at the His bundle region and coronary sinus. A roving quadripolar catheter was positioned alternatively in the right ventricle, the right atrium appendage, and successively was used for mapping. At the beginning of the procedure, nonpreexcited junctional beats were recorded, a phenomenon compatible with a typical atrioventricular accessory pathway (AP). However, a comprehensive electrophysiology study confirmed the presence of an innocent fasciculoventricular pathway (FVP), showing minimal and fixed preexcitation (ie, the His–ventricular interval) during multisite atrial pacing and at different pacing rates. The effective refractory period of the FVP itself could not be precisely determined during programmed atrial stimulation because block occurred earlier at the atrioventricular node level. Furthermore, incremental atrial pacing showed 1:1 atrioventricular conduction with fixed preexcitation to the point of nodal atrioventricular block at a pacing cycle length of 360 ms. Adenosine administration resulted in prolongation of the P-delta interval without any change in the preexcitation degree. Retrograde conduction was concentric and decremental, and Para-Hisian pacing maneuver showed a nodal pattern. Pure His capture was not feasible during this maneuver, which may have replicated the preexcitation morphology. No tachycardia was inducible with and without isoproterenol infusion. The ventricular insertion of the AP was mapped and localized at the para-Hisian region. No ablation was performed considering the innocent nature of this AP and the non inducibility of any tachycardia.

Interestingly, both preexcited and nonpreexcited junctional beats were successively observed (Figure A). Figure B shows the corresponding intracardiac recordings of a sinus preexcited beat (first beat) followed by 2 junctional beats. The first junctional extrasystole (second beat) reproduced identical preexcitation morphology further confirming the diagnosis of an FVP, whereas the last junctional beat (third beat) showed no preexcitation. This non-preexcited junctional beat could be explained by a slight shift of the junctional focus to a more distal site (the arrows indicate the earliest His activation) with normalization of the QRS and His–ventricular interval, indicating an early emergence of this FVP from the His bundle (Figure C). During the electrophysiology study, nonpreexcited junctional beats were not linked to short coupling intervals, making the hypothesis of antegrade AP block at its refractory period unlikely. However, a phase 4 (bradycardia-dependent) block cannot be excluded as a potential mechanism of this phenomenon.

In conclusion, preexcited junctional beats confirm the presence of an infra-atrial AP, typically an FVP. However, a junctional beat originating proximally may replicate the preexcitation morphology over a nodoventricular pathway as well. Moreover, nonpreexcited junctional beats, as in the presented case, do not exclude the diagnosis of an FVP. This may depend on the electrophysiological properties of the FVP, and the anatomic relation between the junctional focus and the emergence level of this pathway from the specialized His-Purkinje system. Recognizing these electrophysiological phenomena and this innocent preexcitation variant is crucial to avoid unnecessary and potentially harmful ablative attempts close to the His bundle.

Disclosures

None.

References


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Figure. Discordant junctional beats and preexcitation. Twelve-lead ECG (A) and intracardiac (B) recordings showing a preexcited sinus beat (First complex) followed by preexcited and nonpreexcited junctional beats (second and third beats, respectively). Note the slight distal shift of the ectopic junctional focus as suggested by the change in sequence/morphology of His electrograms (arrows indicate the earliest His potential). MAP d was located at the earliest activation site slightly proximal to His d. (C) Proposed propagation patterns illustrating this phenomenon (asterisks indicate the junctional foci). AVN indicates atrioventricular node; CS, coronary sinus; d, distal; LB, left bundle; m, mid; MAP, mapping catheter at the para-Hisian region; p, proximal; RB, right bundle; and UNI, unipolar recording.
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