Infranodal Wenckebach conduction block and illustration of the gap phenomenon

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Introduction

Wenckebach second-degree atrioventricular (AV) block can rarely occur at the infranodal level. This case illustrates Wenckebach conduction delay at the nodal and infranodal levels during programmed stimulation, resulting in the gap phenomenon.

Image

A 58-year-old woman underwent an electrophysiological study for recurrent palpitations (Figure). The patient was not under any medication. Atrial extrastimuli (S2) were delivered from the high right atrium (HRA) after a drive of 8 beats at a cycle of 600 ms. The baseline electrocardiogram and AH/HV intervals were within normal limits. Right bundle branch block (RBBB), most probably due to Ashman’s phenomenon, occurred with an S2 of 340 ms (panel A). Unexpectedly, infranodal Wenckebach (Mobitz type 1) conduction with an HV interval of 126 ms was observed after an S2 of 330 ms (panel B), with left bundle branch block (LBBB) and a superior axis. Infranodal AV block occurred with an S2 of 320 ms (panel C). AV conduction resumed (“gap phenomenon”) with an S2 of 310 ms, due to slight prolongation of the His-His (HH) interval resulting from decremental AH conduction, with recovery of infranodal conduction (panel D). The HV interval was measured at 270 ms (the longest reported so far, to the best of our knowledge) with nonspecific intraventricular conduction delay (NIVCD) and an inferior axis. Differential diagnosis was infranodal AV block with a ventricular premature beat. This, however, was unlikely, given the absence of retrograde conduction (which was present at shorter coupling intervals during programmed ventricular pacing). Further prolongation of the AH and H-H intervals occurred with an S2 of 300 ms (panel E) with subsequent shortening of the HV interval and normalization of QRS morphology (probably due to conduction delay in both bundle branches, as the HV interval remained prolonged at 92 ms). With an S2 of 290 ms, a “jump” in the AH interval of 108 ms was observed, indicating dual AV nodal physiology. This resulted in prolongation of the H-H interval, with normalization of the HV interval (panel F). Nodal block (without a His potential) was observed with an S2 of 280 ms (panel G).

Cardiac magnetic resonance imaging was performed to screen for sarcoidosis1 or presence of septal fibrosis, which could have explained the conduction disorder, and was normal. In accordance with current guidelines,2,3 the patient underwent implantation of a dual-chamber pacemaker.

Wenckebach AV block at the infranodal level is rare, with a risk of adverse prognosis. It should be suspected in instances where the block worsens with increases in atrial rate, for example during exercise.

KEY TEACHING POINTS

- Wenckebach (Mobitz type 1) second-degree atrioventricular (AV) block may be infranodal in rare cases.
- A “gap phenomenon” can occur when there are multiple levels of conduction delay (in the present example, slowing of conduction at the nodal level allowed resumption of conduction at an infranodal level that had previously been blocked).
- Decremental conduction with infranodal Wenckebach AV block may be substantial, with increments in AV and HV intervals of ≥200 ms.
- Infranodal Wenckebach is pathologic and requires implantation of a pacemaker.

KEYWORDS

Atrioventricular block; Gap phenomenon; Infranodal; Infrahisian; Mobitz type 1 block; Wenckebach block

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Figure 1  Endocavitary tracings during programmed atrial pacing, illustrating impact on nodal and infra-nodal conduction of different coupling intervals.

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