

ECG TEACHING COMPETITION

BEGINNER

IMAGING VIGNETTE: ECG CHALLENGE

Patient With Presyncope and Variable PR Interval and QRS Morphology



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ABSTRACT

We describe the case of a 72-year-old female patient, presenting with presyncope and variable PR Interval and changing QRS morphology on the electrocardiogram. Differential diagnosis is discussed. (**Level of Difficulty: Beginner.**)

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CASE

A 72-year-old female patient with a history of arterial hypertension, treated with losartan, and compensated hypothyroidism, presented with presyncopal episodes and intermittent palpitations during the last 2 months. Her blood pressure was 142/78 mm Hg, her pulse was regular at 64 beats/min, and a physical examination, apart from a mild aortic systolic heart murmur, was unremarkable. An electrocardiogram (ECG) was performed (**Figure 1**):

WHICH IS THE DIAGNOSIS?

- A. Wenckebach phenomenon in the atrioventricular (AV)-node after repetitive ventricular premature beats
- B. Idioventricular rhythm competing with isorhythmic sinus rhythm
- C. Alternating left and right bundle branch block
- D. Intermittent ventricular preexcitation over an atriofascicular Mahaim fiber
- E. Diffuse affectionation of the conduction system: left anterior fascicular block, slow conduction over the left posterior fascicle and conduction with Wenckebach phenomenon over the right bundle

The correct answer is E; alternatively, C is acceptable but not precise.

EXPLANATION

We observed regular sinus rhythm, variable PR intervals, and (progressively) changing QRS morphology. Let us start by observing complexes 1 and 6 (**Figure 1**). Complex 1 has a PR interval of 0.22 s and a typical left bundle branch block (LBBB) morphology (right bundle is conducting with only slightly prolonged PR interval). In complex 6, the PR interval is approximately 0.36 s, and the QRS morphology and left axis deviation are typical for a right bundle branch block (RBBB) plus a left anterior fascicular block (LAFB) (in complex 6, just the left posterior fascicle is slowly conducting). In complexes 2 to 4, we see prolongation of the PR interval and

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progressive fusion of QRS morphology from LBBB to RBBB-LAFB. The activation sequence repeats starting in complex 7. Of note, in the 3 complexes with LBBB morphology, the PR intervals are equal.

The most likely explanation for this ECG is a permanent LAFB, a slow but constant conduction over the left posterior fascicle (giving morphology of complexes 5 and 6) with a right bundle that starts conducting faster than the left posterior fascicle (complex 1 simulates a complete LBBB) but slowing down conduction velocity in a Wenckebach pattern over the next beats, leading to progressive fusion, until the right bundle blocks completely (complex 6). After the block, the right bundle conduces again, faster than the left posterior fascicle, resuming the LBBB morphology (complex 7) and the Wenckebach-like conduction in the right bundle over the following beats. A ladder diagram is shown in [Supplemental Figure 1](#).

Alternatively, answer 4 is very unlikely because Mahaim right-sided atriofascicular fibers present mostly with an LBBB morphology, but a superior axis; and a combination of a Wenckebach phenomenon in a Mahaim fiber plus normal conduction system disease is very rare.

The presence of a ventricular rhythm (alternative answers A and B) is almost discarded due to the stable PR interval during the LBBB morphology, which supposes an AV association.

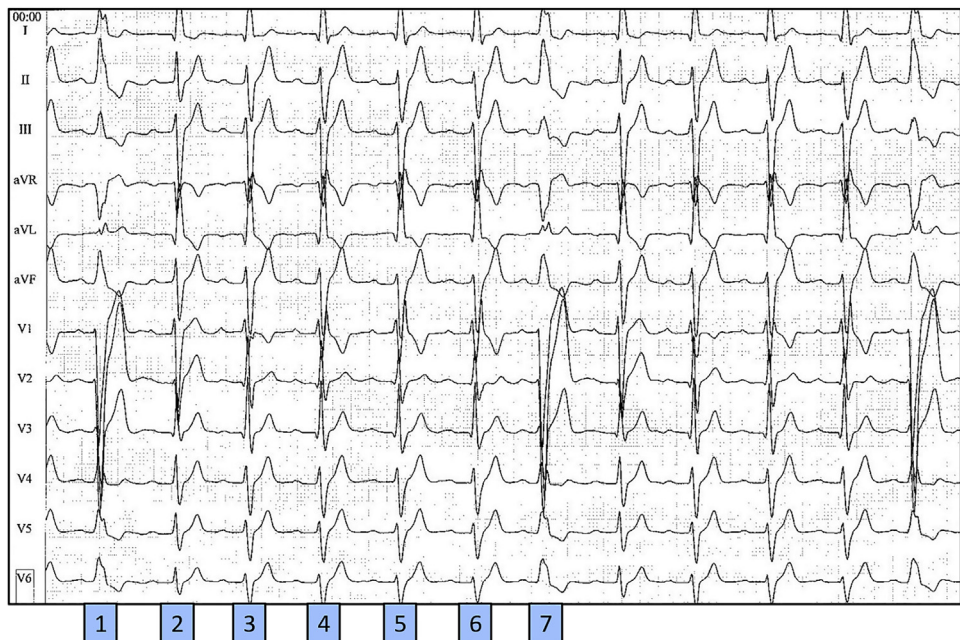
A Wenckebach phenomenon is seen mostly in the AV node, and it is considered benign, but in the presence of a wide QRS complex, it has been reported that in 60% to 70% of cases, the Wenckebach phenomenon occurs in the His-Purkinje system (1). First reports about infra-His Wenckebach-like conduction patterns were published over 4 decades ago (2). The combination of conduction disturbances described here should be a Class I indication for a permanent pacemaker, just like an alternating bundle branch block (3).

A 24-hour Holter ECG showed frequent episodes of 2:1 AV block (Mobitz 2). Symptoms disappeared after implantation of a dual-chamber pacemaker.

**ABBREVIATIONS
AND ACRONYMS**

- AV** = atrioventricular
- ECG** = electrocardiogram
- LAFB** = left anterior fascicular block
- LBBB** = left bundle branch block
- RBBB** = right bundle branch block

FIGURE 1 The 12-Lead Electrocardiogram Shows Variable PR Intervals and QRS Morphology



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KEY WORDS bundle branch block, conduction disturbance, infra-his block

APPENDIX For a supplemental figure, please see the online version of this article.