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Misinterpretation of sleep-induced second-degree atrioventricular block

S Serge Barold

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Abstract

A number of publications have claimed that Mobitz type II atrioventricular block (AVB) may occur during sleep. None of the reports defined type II AVB and representative electrocardiograms were either misinterpreted or missing. Relatively benign Wenckebach type I AVB is often misdiagnosed as Mobitz type II which is an indication for a pacemaker. Review of the published reports indicates that Mobitz type II AVB does not occur during sleep when it is absent in the awake state. Conclusion: There is no proof that sleep is associated with Mobitz type II AVB.

Key Words: Wenckebach type I atrioventricular block; Mobitz type II atrioventricular block; Vagal tone; Heart block; Cardiac pacemaker

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Core Tip: A number of publications have claimed that Mobitz type II atrioventricular block (AVB) may occur during sleep. None of the reports defined it and representative electrocardiograms were either misinterpreted or missing. Sleep-induced relatively benign narrow QRS-Mobitz type I AVB must be differentiated from serious Mobitz type II AVB. This depends solely on strict electrocardiograms definitions and behavior of the sinus rate where slowing rules out Mobitz type II AVB even if all the PR intervals are constant. Mobitz type II AVB does not occur solely during sleep when it is absent in the awake state.

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INTRODUCTION

Second-degree and third-degree atrioventricular block (AVB) not uncommonly occur during ordinary sleep and sleep apnea. They are caused by enhanced vagal tone and generally considered benign. During sleep, second-degree AVB can be manifested by Wenckebach type I AVB block, 2:1 AVB or high grade AVB almost always with a narrow QRS complex. A number of publications have claimed that Mobitz type II AVB may also occur during sleep[1-5]. These reports have been largely discredited because none of the reports defined type II AVB and representative electrocardiograms (ECG) were either misinterpreted or missing[6]. Vagally-induced type I second-degree AVB during sleep occurs in the atrioventricular (AV) node and is reversible. Mobitz type II second-degree AVB is far more serious and irreversible because it is caused by structural changes in the His-Purkinje conduction system of the heart. Therefore, type II AVB is often associated with a broad QRS complex. It is therefore important especially for sleep-health care workers to be familiar with the strict definitions of the various manifestations of second-degree AVB to avoid diagnostic or even therapeutic errors.

Type I AVB is defined as intermittent failure of AV conduction in which a single blocked sinus P wave is preceded by prolongation of conduction time relative to the first conducted P wave after the block. There must be at least two consecutive conducted P waves (*i.e.*, 3:2 AV block), thereby ruling out 2:1 AVB. This definition accommodates all forms of typical and atypical type I block and is valid with variations of the sinus rate[7,8]. Narrow QRS-type I AVB is almost always localized in the AV node.

Mobitz type II second-degree AVB is defined as the occurrence of a single non-conducted sinus P wave associated with constant PR intervals before and after the blocked impulse, provided the sinus rate or the P-P interval is constant and there are at least two consecutive conducted P waves (*i.e.*, 3:2 AVB) to determine behavior of the PR intervals[7-10]. Therefore, type II block appears to represent an all-or-none phenomenon (Figure 1A). Mobitz type II AVB is always localized in the His-Purkinje conduction system and is an indication for a permanent pacemaker[9,11]. Stability of the sinus rate is an important criterion of type II AVB. A vagal surge causing type I AVB by simultaneously slowing of the sinus rate and depression of AV nodal conduction can superficially resemble type II AVB especially when the PR interval before the block is equal to that of the first conducted beat after the block[12,13] (Figure 1B).

Two to one AVB or higher degrees of AVB cannot be classified into Wenckebach type I or Mobitz type II AVB. A common mistake is to equate 2:1 and higher degree of AVB with type II infranodal block when block can be either in the AV node or the His-Purkinje system.

HOW TO AVOID THE MISDIAGNOSIS OF MOBITZ TYPE II BLOCK

Misdiagnosis may can occur in the following situations

First, ignoring the presence of a vagal surge with sinus slowing that may be subtle (at least 0.04 second) either before and/or after the block of a single blocked P wave. Vagally-induced AVB may sometimes present with an ECG pattern that superficially resembles type II block because the PR interval(s) before and after the block are constant (Figure 1B). Note that only the behavior of the sinus rate differentiates Figure 1A (type II AVB) from Figure 1B (type I AVB).

Second, in the presence of 2:1 or higher degrees of AV block.

Third, when narrow QRS- type I block exhibits miniscule increments, a situation mimicking type II block. This pattern may be seen during ECG monitoring or Holter recordings and is associated with sinus slowing which rules out type II block. Furthermore, repeated ECGs or further monitoring should reveal more obvious runs of type I AVB. In this situation, type II AVB can then be safely excluded because type I and II blocks almost never occur together in a single ECG recording or one done at separate times.

Fourth, less commonly during stable sinus rhythm when there is a string of constant PR intervals before the block of a single P wave and the PR interval of the first conducted beat is shorter.

Szajerska-Kurasiewicz *et al*[5] recently warned that sleep-disordered breathing is a risk factor for unnecessary pacemaker implantation based on a study involving 207 patients hospitalized in a general cardiology ward. Paradoxically, about 5% of patients exhibited so called type II block but none received a pacemaker. As type II is rare, their reported incidence is excessive and suggests an incorrect diagnosis.

CONCLUSION

In conclusion, the separate diagnosis of relatively benign narrow QRS- type I AVB from that of serious type II AVB depends solely on strict ECG definitions and behavior of the sinus rate. A suspected diagnosis of true type II AVB during sleep mandates a detailed cardiology evaluation. As a rule, type II AVB does not occur solely during sleep when it is absent in the awake state.

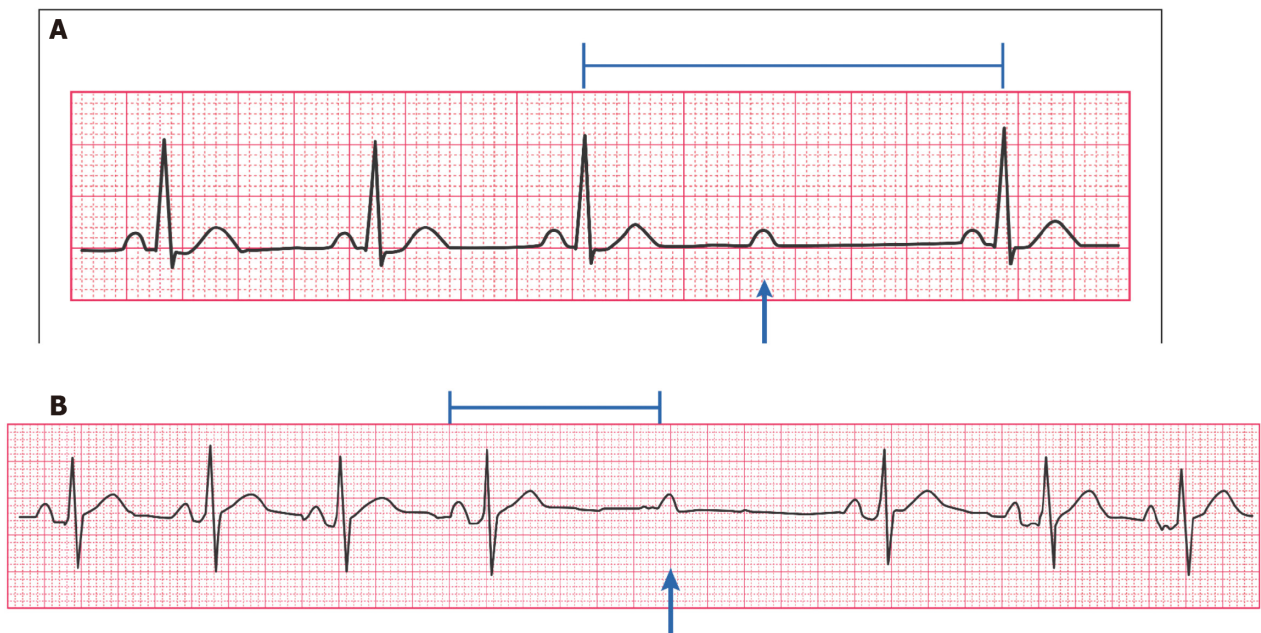


Figure 1 Mobitz type II atrioventricular block and vagally-induced type I atrioventricular block[14]. A: Mobitz type II atrioventricular block (AVB). There is regular sinus rhythm with a single non-conducted P wave. The PR intervals before and after the block are constant. The sinus rate is constant. The RR interval encompassing the blocked P wave is twice the RR interval prior to the blocked P wave; B: Vagally-induced type I AVB. There is sinus slowing shown by the long PP interval. The PR intervals before and after a single blocked P wave are constant simulating Mobitz type II block. However, type II AVB is ruled out because of sinus slowing consistent with vagally induced AVB. Citation: Barold DC, Barold SS. ECG Simplified. Facts You will Never Forget. San Marcos: Conductivity Press, 2022. Copyright ©The Author(s) 2019. Published by Conductivity Press.

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