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Pseudo-Atrioventricular Block due to Premature Systoles with Concealed Conduction

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Two patients are presented with EKG findings suggesting pseudo AV block Mobitz type II. Pseudo AV block was related to the presence of premature junctional or ventricular beats with concealed conduction. Response to therapy confirmed the initial diagnosis of pseudo AV block. Awareness of clinical conditions simulating type II second degree AV block is important because of the therapeutic implications and prognosis.

Premature junctional beats are usually detected in the surface electrocardiogram (EKG) by the presence of antegrade and/or retrograde conduction.^{1, 2} Concealed junctional or ventricular premature beats may be solely manifested by their influence on the conduction of the subsequent beats giving rise to varying prolongation of the AV junctional or intraventricular conduction time.²⁻⁴ Rarely, if the timing is proper, concealed early beats can imitate various degrees of AV block.^{3, 4} Two cases are presented of pseudo AV block of the Mobitz type II variety resulting from the presence of concealed ventricular or junctional premature beats.

Case I

A 79-year-old man was admitted on 2-23-72 because of fainting episodes. He was previously hospitalized in 1950 and 1965 for acute myocardial infarction. He had a history of angina and congestive heart failure of several years' duration. Medical management included digitalis leaf 0.1 gm daily, oral nitrates, and furosemide.

On examination, the patient's blood pressure was 140/70 mm Hg, pulse irregular 80/bpm. There were bilateral basilar crepitant rales. The heart was enlarged with an apical impulse, thrusting and diffuse, 11 cm to the left of the midsternal line. There was a grade 2/6 systolic ejection murmur at the left sternal border.

Routine laboratory tests on admission were within normal limits. The serum potassium was 4.3 meq/l. The EKG findings were as follows

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(Figure 1): sinus rhythm 72/bpm, PR interval .20 sec, QRS .15 sec. The sinus rhythm was interrupted by frequent premature beats with the same wide QRS configuration and fixed coupling interval of 450 msec. The timing of these ectopic beats obscures the presence of the non-conducted sinus P wave. The QRS morphology of the conducted sinus beats shows complete left bundle branch block pattern. The rhythm is further complicated by brief runs of apparent 2:1 AV block (strips 1 & 4, Figure 1). Nonconducted P waves occur only when the expected but not manifest premature beats fall immediately before the sinus P wave as shown on the second strip of Figure 2. The origin of the premature beats cannot be known with certainty in the absence of His-bundle recordings. In Figure 2 we have assumed an AV junctional origin for the ectopic beats although a similar result is expected if the premature beats were ventricular in origin. The EKG was interpreted as representing an example of a pseudo 2:1 AV block caused by the concealed premature beats most likely of ventricular origin. The overall clinical and electrocardiographic findings suggested digitalis toxicity. When digitalis was withheld, the pseudo AV block disappeared within 24 hours, and premature beats ceased completely in 48 hours.

Case II

A 56-year-old woman with a history of rheumatic heart disease was admitted to the hospital on 2-25-72 because of an arrhythmia found on a routine clinic visit. The patient had had a mitral valve replacement with a Hancock xenograft in December, 1971, because of mitral stenosis and insufficiency. The patient had been on the following medications: digoxin 0.25 mg daily, hydrochlorothiazide 50 mg daily, propranolol 10 mg bid, procainamide 250 mg qid.

Blood pressure at examination was 140/90 mm Hg, pulse 90/bpm, irregular. Neck veins were flat. There were normal atrial pulses. The lungs were clear. There was moderate cardiomegaly. Auscultation revealed a faint presystolic murmur.

Routine laboratory tests were within normal limits. The serum potassium was 4.0 mEq/l. The EKG findings were: sinus rhythm at 115/min, PR interval .16 sec, QRS .11 sec. Frequent premature junctional beats of QRS configuration similar to the beats of sinus origin had a fixed

coupling interval of 380 msec. Brief runs of apparent second degree AV block Mobitz type II may be seen intermittently in all strips of Figures 3 and 4. This pattern occurs when the expected but concealed junctional beats fall immediately preceding the sinus P waves as shown in the diagram in Figure 4. The EKG was interpreted as representing an example of pseudo AV block Mobitz type II due to interference by concealed junctional premature beats. When propranolol was increased to 10 mg q 6 h and quinidine sulfate substituted for procainamide, there was suppression of the premature beats and disappearance of the pseudo AV block.

Discussion

Premature ventricular and AV junctional beats are recorded in numerous clinical situations. Their presence is usually manifested in the standard EKG by antegrade or retrograde conduction or both. Antegrade block of AV junctional beats can usually be ascribed to their occurrence within a critical interval after the preceding atrioventricular beat.¹⁻³ Failure of conduction to the ventricles of the junctional premature beat results from unresponsiveness of distal components of the conduction system which depolarize late in the cardiac cycle and, therefore, recover later. Presumably, almost identical timing of the sinus and premature beat is responsible for two phenomena: 1) retrograde block of junctional beats; 2) failure of antegrade conduction of the sinus impulse. If coincidental blocking occurs of both antegrade and retrograde conduction of a junctional premature beat, it will conceal the junctional beat and its presence could be documented only by His-bundle recording. Or, it could be suspected in the surface EKG by its influence on the AV conduction of sinus beats.²⁻⁵ His-bundle recordings were not yet available at our institution at the time these patients were seen. First degree AV block following blocked or conducted premature atrial contractions is common but there are reported cases where atrial premature beats imitate second degree AV block.^{2,3}



Figure 1

Case 1: Rhythm strip lead II at admission examination. The strips are not continuous. Sinus rhythm is interrupted by frequent premature beats. The 9th QRS in strip 1, the 1st, 4th, and 7th QRS in strip 2, and the 3rd QRS in strip 4 are premature ectopic beats of junctional or ventricular origin. Apparent 2nd degree AV block Mobitz type II is best seen in Strips 1 and 4.

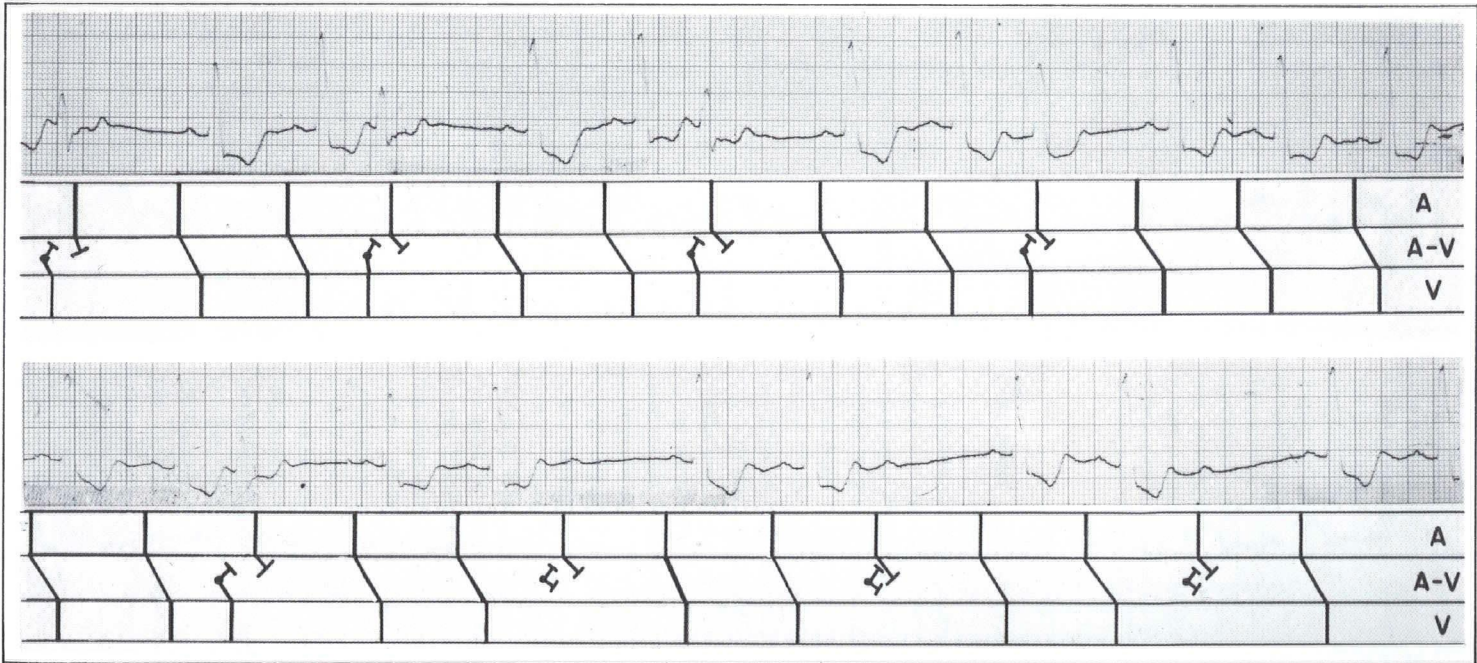


Figure 2
Case 1: Ladder diagram for rhythm strips No. 2 and 4 from Figure 1.

Pseudo-Atrioventricular Block

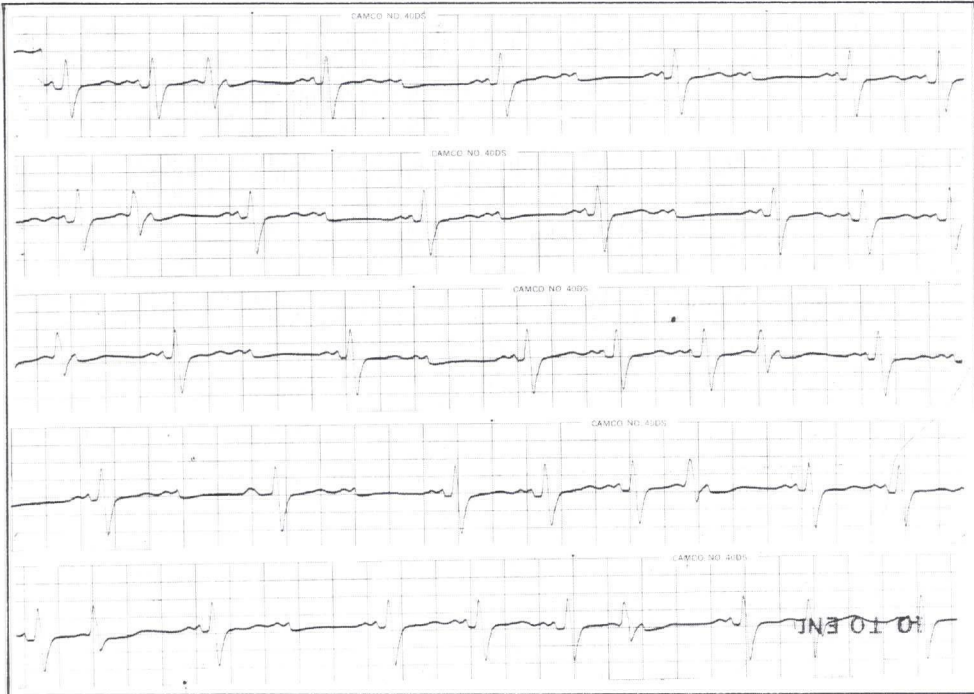


Figure 3

Case 2: Continuous rhythm strip, taken on admission to hospital, showing sinus rhythm at 115/min, frequent premature junctional beats with fixed coupling, and brief runs of apparent 2° AV block Mobitz type II may be seen intermittently in all strips.

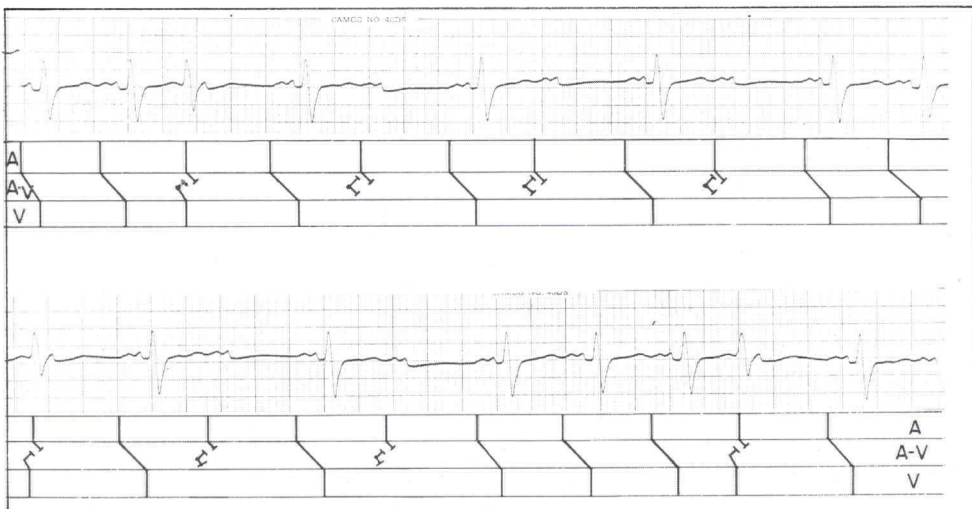


Figure 4

Case 2: Ladder diagram for rhythm strip No. 1 and 3 from Figure 3.

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In a review of the literature, we found several reports where concealed junctional premature beats^{3-6, 10, 11} or concealed parasystolic rhythms^{7, 8} imitate second degree AV block. In this group, three cases were documented by His-bundle recording. Schiener and Stock,⁹ by means of coupled pacing, were able to duplicate the phenomenon of prematurity eventuating second degree AV block. In the two cases presented here, the origin of the premature beats is not certain because the His-bundle recordings were not done. The standard EKGs seem to present evidence sufficient to support the deduction that concealed ventricular or junctional extrasystoles caused pseudo AV block. This diagnosis is supported by: 1) clinical setting of digitalis toxicity in one case; and recent surgical

operation in the second; and 2) the response to therapy in both cases—discontinuation of digitalis in the first and increased doses of propranolol and quinidine sulfate in the second. The role of pathologic changes in the conduction system as a factor in the first case (pre-existing left bundle branch block) cannot be ignored. Because of the immediate therapeutic implications and long term prognosis, awareness of the possibility of pseudo AV block Mobitz type II is important.

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