Bigeminal rhythm II

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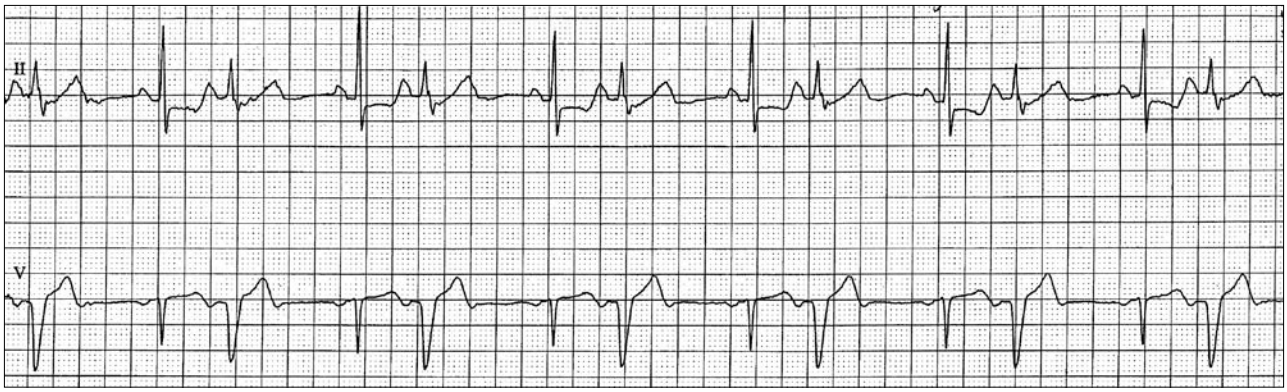

Figure 1. Initial electrocardiogram. See text for explication.

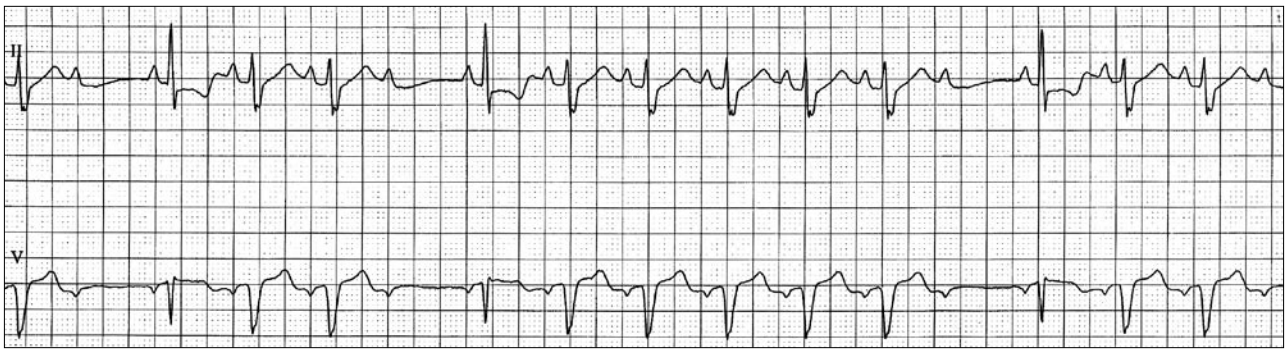

Figure 2. Electrocardiogram recorded the following day. See text.

The simultaneously recorded lead II and lead V_1 electrocardiographic rhythm strips show a narrow QRS followed by a wide QRS and then by a pause *(Figure 1)*. The cycle then recurs repeatedly. Superficially, this sequence suggests sinus rhythm with ventricular premature complexes occurring in a bigeminal pattern. Closer observation, however, reveals P waves in front of the wide QRSs as well as in front of the narrow ones. This raises the possibility of atrial bigeminy with the atrial premature complexes being conducted to the ventricles with aberration of the left-bundle-branch-block type. Even closer inspection shows that each cycle contains a third P wave, which is best seen as a negative deflection at the end of each second T wave in lead V_1. In lead II this third P wave appears as minimal widening, occasionally with a slight notch on the downslope, of the second T wave. Furthermore, the P-P intervals are regular. Thus, the rhythm is sinus tachycardia (rate = 118 beats/min), and second-degree atrioventricular block is present with a conduction ratio of 3:2.

Two questions remain. First, is this type I or type II atrioventricular block? Because the P-R intervals of all conducted P waves appear to be the same, this is type II block. Second, why is the first QRS of each cycle narrow while the second QRS is wide? There is rate-related left bundle branch block; the interval preceding the first QRS is long, allowing normal intraventricular conduction, but the interval preceding the second QRS is shorter than the refractory period of the left bundle branch.

An electrocardiogram recorded a day later further clarifies the rhythm *(Figure 2)*. The sinus rate has slowed to 98 beats per minute, and more P waves are conducted. The slower rate

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allows separation of the P waves from the preceding T waves. All QRSs except the one following the pause show left bundle branch block that is clearly rate related. In each group of beats, the first P-R interval is approximately 0.02 seconds shorter than all of the subsequent P-R intervals, which are identical at 0.16 seconds as measured in lead II. Pick and Langendorf have pointed out that the constancy of the P-R intervals after the first one is what establishes the diagnosis of type II atrioventricular block (1). The first P-R of each cycle may be shorter because the first QRS is actually a junctional escape beat. In addition, when the QRS morphology changes as in this case, the second QRS may have a longer initial isoelectric period, making the P-R interval appear slightly longer.

Bigeminal rhythms are common and have many causes (2). High on the list is 3:2 atrioventricular block, in this case type II block. This and the even more common rate-related bundle branch block are the salient features of this electrocardiogram.

1. Pick A, Langendorf R. *Interpretation of Complex Arrhythmias*. Philadelphia: Lea and Febiger, 1979:221.
2. Glancy DL, Breaux DM. Bigeminal rhythm. *BUMC Proceedings* 2001;14: 187–188.