

QUIZ

The EKG Quiz: “Pairs!”**Fathi Idris Ali**

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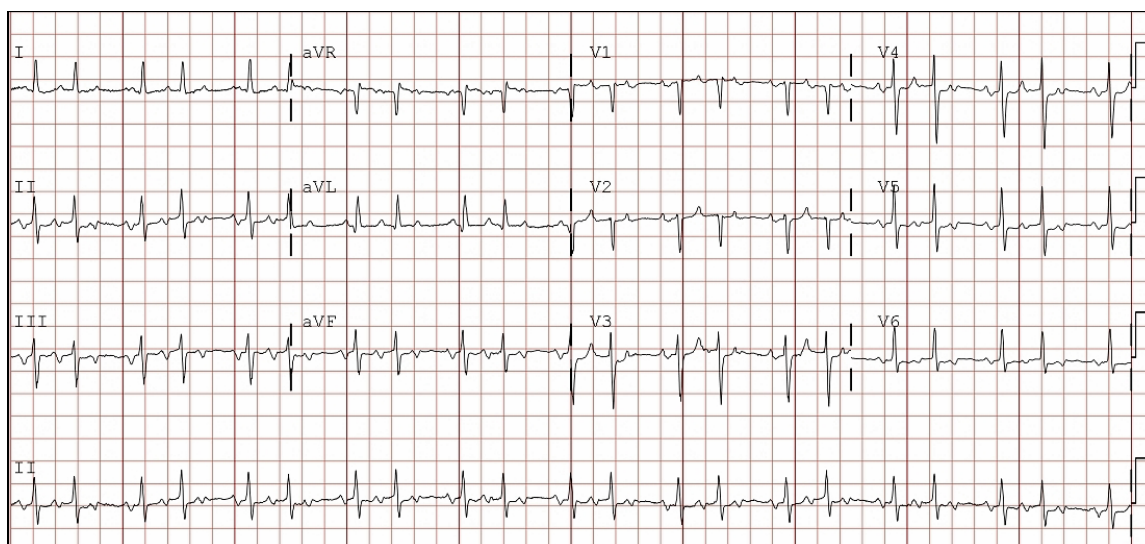


Figure 1: A 91 year-old man with palpitations.

History

This EKG is of a 91-year-old man who was in the hospital with a hip fracture. He complained of palpitations while resting in his bed. His cardiac examination was otherwise unremarkable.

Questions

1-What is the rhythm?

A-Atrial fibrillation

B-Atrial bigeminy

C-Atrial tachycardia (AT)

D-Blocked premature atrial contractions (PACs)

2-What is the rough average ventricular rate based on this EKG?

A-45 bpm

B-100 bpm

C-125 bpm

D-188 bpm

Answers

1-C

2-C

Discussion

The correct diagnosis is atrial tachycardia (AT) with 3:2 AV conduction. The rhythm is irregular but has a repeated pattern of QRS complexes occurring in “pairs” followed by a longer gap, i.e. group beating. A closer look reveals consistent P waves occurring at regular intervals of about 320 ms (eight small squares), which is equivalent to an atrial rate of 188 bpm (Fig. 2). This rate is significantly above the physiological sinus rate for a resting 91 year-old man. This is likely due to an atrial tachycardia. The presence of regular atrial activities excludes atrial fibrillation. Atrial bigeminy (conducted or blocked) is also excluded due to the regular occurrence of these atrial activities and the lack of resetting of the atrial rhythm.

What about the group beating pattern?

Although it can be seen in other situations (e.g. bigeminal rhythm), group beating is one of the “Wenckebach footprints”. Wenckebach’s periodicity is also characterized by progressive PR interval prolongation before blocked AV conduction. This pattern, also called decremental conduction, is unique to the atrioventricular node (AVN) (less commonly seen in other conduction tissues) and is related to its dependency on calcium channels for activation. Fig. 3 shows that this patient’s rhythm demonstrated Wenckebach’s periodicity (3:2 AV conduction) leading

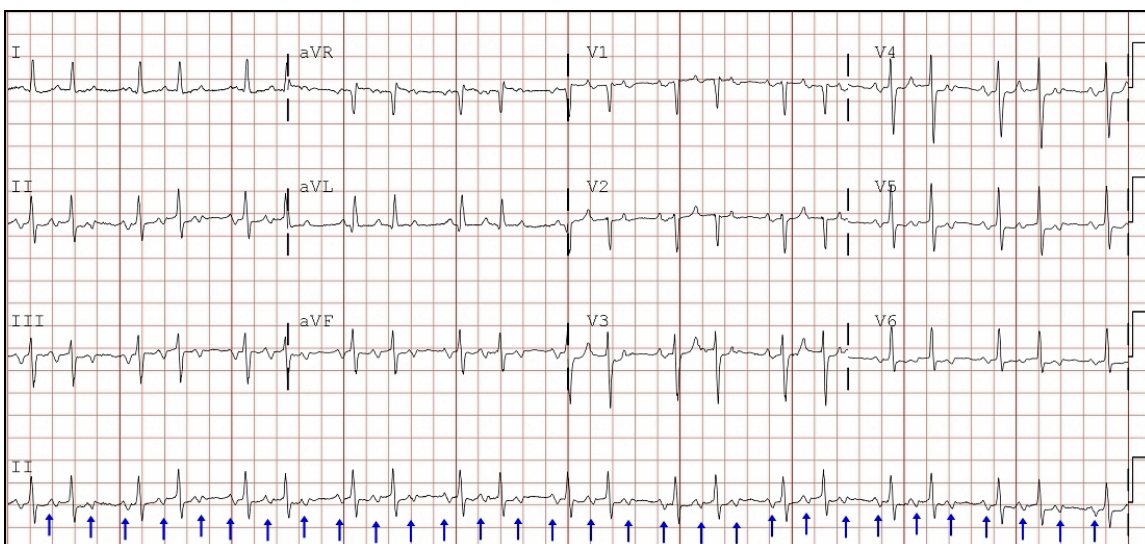


Figure 2: Atrial activities (blue arrows) are fast (about 188 bpm) and regular.

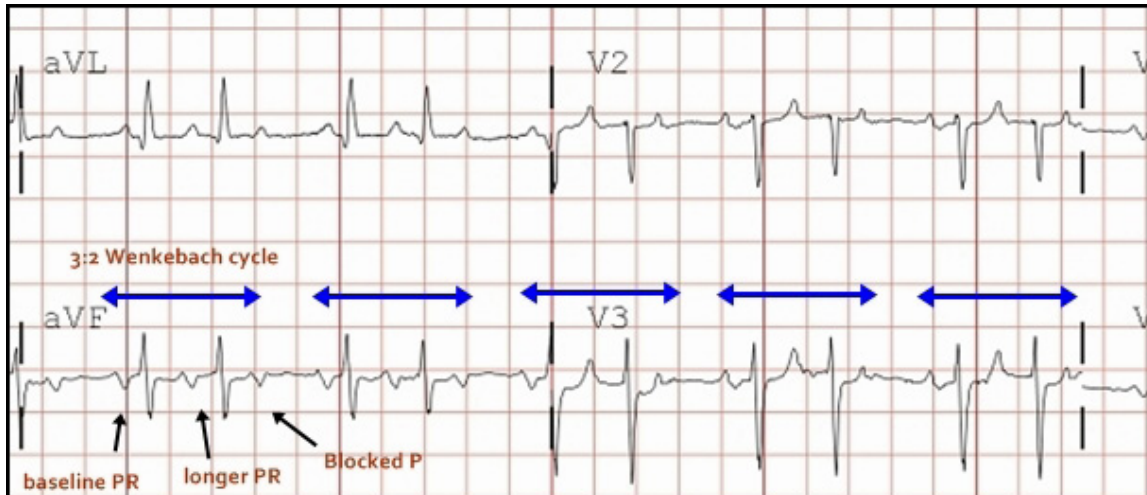


Figure 3: Wenkebach periodicity (3:2 AV conduction).

to the group beating. This behavior, i.e. gradual PR prolongation before blocked AV conduction, is a “healthy” physiological response of the AVN to the abnormally fast atrial rates and does not reflect conduction abnormality. It can provide some “protection” to the ventricle from this rather fast non-physiological atrial rate. For example, in this case if all the atrial beats are conducted to the ventricle the ventricular rate will be the same as the atrial rate, about 188 bpm. However, when only 2/3 of the atrial beats are conducted to the ventricle due to this decremental conduction (3:2 AV Wenkebach periodicity), the ventricular rate will be around 125 bpm ($188 \times 2/3$) which will be better tolerated.

The take home message: Although usually encountered during bradycardia (typically type-I second degree AV block), Wenkebach behavior at higher atrial rates is a physiological phenomenon and does not necessarily reflect a conduction abnormality.