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Electrocardiogram Quiz – Case 8

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An 83-year-old man presented to the emergency department of our hospital complaining of palpitations of 2 hours duration. The patient's personal history included a well-controlled arterial hypertension under ramipril and paroxysmal atrial fibrillation under propafenone and acenocoumarol. He was hemodynamically stable with normal vital signs. The 12-lead surface ECG is depicted below.

Questions

a. What abnormalities of cardiac rhythm are shown?
b. What is the clinical significance of these findings?

Comment

The basic rhythm is sinus in origin. Midway through the recording, an extrasystole with an incomplete RBBB morphology is seen, preceded by P wave. This is an example of Ashman phenomenon,

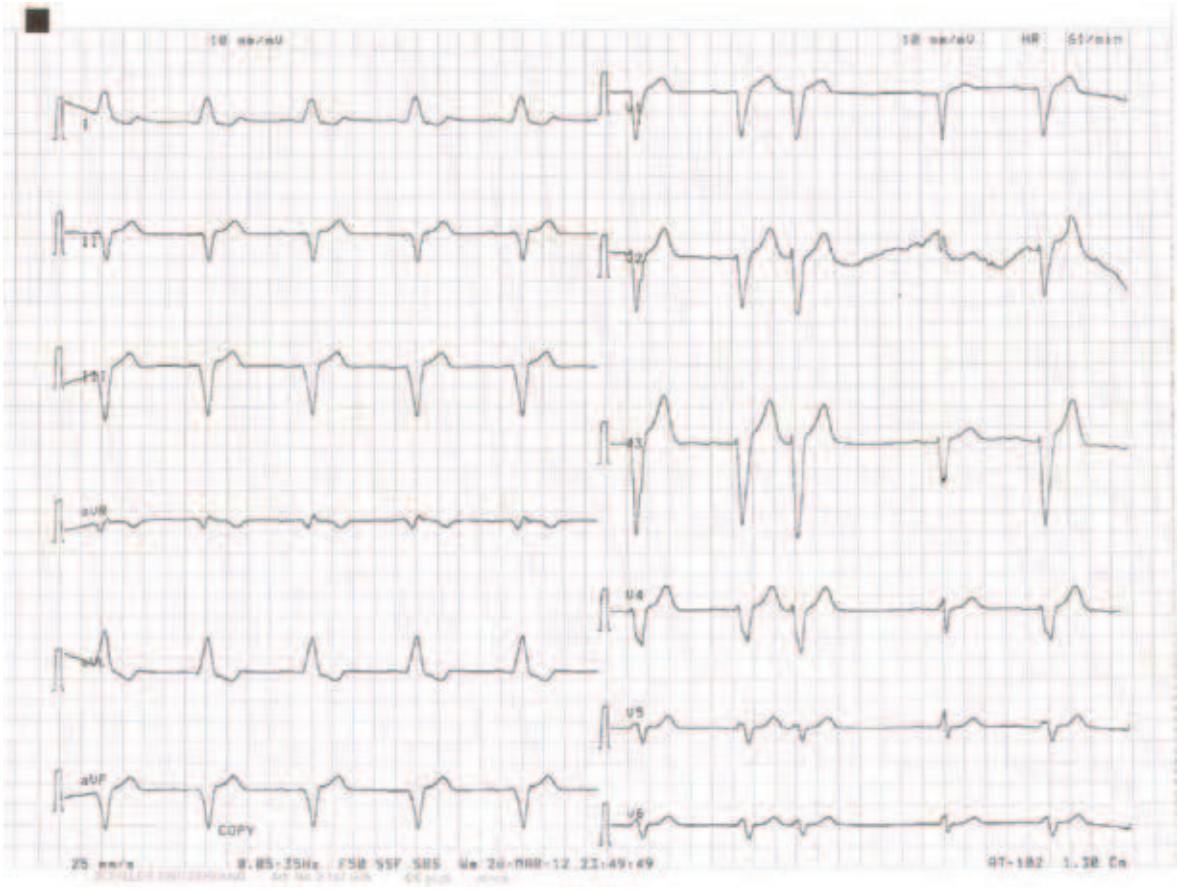

Figure 1

which comprises an aberrant ventricular conduction as a result of a change in the QRS cycle length.

Aberrant ventricular conduction means an intraventricular conduction delay that appears with changes in heart frequency. This is a reversible phenomenon that both arises and terminates with changes in heart rate. Aberrant ventricular conduction occurs because of differences in refractory periods of the right and the left branch of the His-bundle. Therefore, a supraventricular impulse can be conducted from the atria to the ventricles at a time when one of the branches has just completed its refractory period, while the other is still refractory. The still refractory branch will act as if it is blocked, and the result is a situation not unlike the usual bundle branch block (BBB). Due to this intermittent "block", the QRS complex will be splitted and broadened as with a BBB. The duration of the refractory period varies with the length of the preceding RR interval. The longer the preceding RR interval, which means the slower the heart frequency is, the longer the refractory time and the larger the difference in refractory times of the bundle branches gets. Often, the combination of a long RR interval and then a following short interval to the premature beat, will lead to aberrant ventricular conduction, that is Ashman phenomenon. Thus, a premature atrial impulse can conduct to the ventricles normally, aberrantly as in our case, or not at all.

Cycle lengths are the classic way to point out Ashman beats. The classic Ashman beat is a wide, premature beat that terminates a short cycle after a long cycle. The Ashman criterion is commonly described as "a wide QRS that terminates the short cycle that follows a long cycle". The problem with this criterion is that it does not prove that the beat is aberrantly conducted. When a beat terminates a short RR interval that follows a long RR interval, a ventricular premature beat (VPB) could just as easily have occurred in the same spot. That is the reason why several other approaches on how to distinguish Ashman beats from VPBs have been developed, the most common being the Fisch criteria.

Clinical conditions that give rise to Ashman phenomenon are those leading to altered duration of the myocardial refractory period. These include atrial fibrillation, atrial tachycardia, atrial ectopy, and sinus arrhythmia in young, athletic persons. Ashman phenomenon does not have a clinical significance; however a run of aberrantly conducted beats may simulate ventricular tachycardia. Therefore, it is important to distinguish it.

Ashman phenomenon by itself is asymptomatic. Symptoms, if present, are related to the premature complexes but not to aberrantly conducted complexes. Treatment includes diagnosis and appropriate management of disease entities associated with the described phenomenon.

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