



Premature complexes and pauses

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A 42 yr old woman from Zambia presented with complaints of fatigue and occasional palpitations for four months. The palpitations were momentary and recurrent but never sustained. She had a history of hypertension which was well controlled on telmisartan. Other than that, the past history was unremarkable.

Below is the ECG at presentation. Recurrent premature complexes and pauses are seen. How are these explained?

At first glance (Fig. 1) one sees bradycardia and frequent pauses. There are clearly 2 premature ectopic P waves without an ensuing QRS, suggesting blocked atrial ectopics. However, this cannot explain the 'interpolated' premature QRS, which does not change the basal RR interval. Interestingly, this duration is the same as that from the ectopic P to the next sinus P wave (the \leftrightarrow are equal).

Clinical examination, echocardiography, stress test and cardiac MRI were normal. A 24 hour Holter showed recurrent premature junctional complexes (PJCs), sometimes with AV block as seen in the ECG, but there was no clear correlation between the symptoms and these findings.

After due consideration, she underwent an electrophysiology study. During this, we could not demonstrate AV nodal duality or induce any tachycardia, even after isoproterenol. Recurrent PJCs were seen. During the study, all the PJCs conducted to the ventricles.

The following ECG (Fig. 2) was recorded during electrophysiology study:

Three premature QRS complexes (*) are seen. The first 2 are followed by a pause; the 2nd one shows a RBBB morphology.

Intracardiac signals from atrium (coronary sinus, CS) and His

bundle region. The ladder diagram helps explain the mechanism of the pauses. The \leftrightarrow are equal and represent the sinus cycle length. (see Fig. 3)

Basically there are frequent premature junctional complexes (PJCs). The 1st and 2nd PJC conducts retrogradely, resetting the sinus node, so an incomplete compensatory pause is seen. The 3rd PJC does not conduct retrogradely to the atrium. Hence the next sinus impulse arrives on time.

One more phenomenon seen in the baseline ECG, which couldn't be demonstrated during electrophysiologic study needs to be clarified, the pauses marked by an inverted P waves in lead V3 (P). This is explained in the ladder diagram below (see Fig. 4).

The PJCs conducted in three patterns. As shown in the ladder diagram, the first PJC (J) conducts both antegrade and retrograde, resetting the sinus node and resulting in a pause. The next PJC conducts antegrade but gets blocked retrograde, doesn't reset the sinus node, and hence there is no pause. The 3rd and 4th PJCs conduct **only retrogradely** and reset the sinus node, resulting in delay in the next sinus impulse.

The lady was counselled and reassured, and left alone on a small dose of metoprolol. After reassurance and following a regular programme of moderate exercise, the patient is asymptomatic at telephonic follow up at six months.

1. Discussion

A premature junctional complex (PJC) is an abnormality seen in the presence of an underlying sinus rhythm. It is an aberrant impulse that originates in the atrioventricular junction (junctional tissue) and occurs early or prematurely before the next expected P wave. This prematurity can make the rhythm irregular. Since the origin of the impulse is junctional, the premature complex may have any of the characteristics possible of junctional rhythms: inverted (abnormal) P wave, absent P wave, P wave after the QRS complex and a short PR interval. The QRS complex will be normal (60–100 ms) and generally be consistent in shape or morphology with the other QRS complexes. PJCs that arrive early in the cycle may be conducted aberrantly, most commonly with a RBBB morphology.

Junctional tachycardia may have complete exit block and similarly rapid junctional tachycardia may regenerate into other arrhythmias such as atrial fibrillation. Pseudo-AV block due to PJCs

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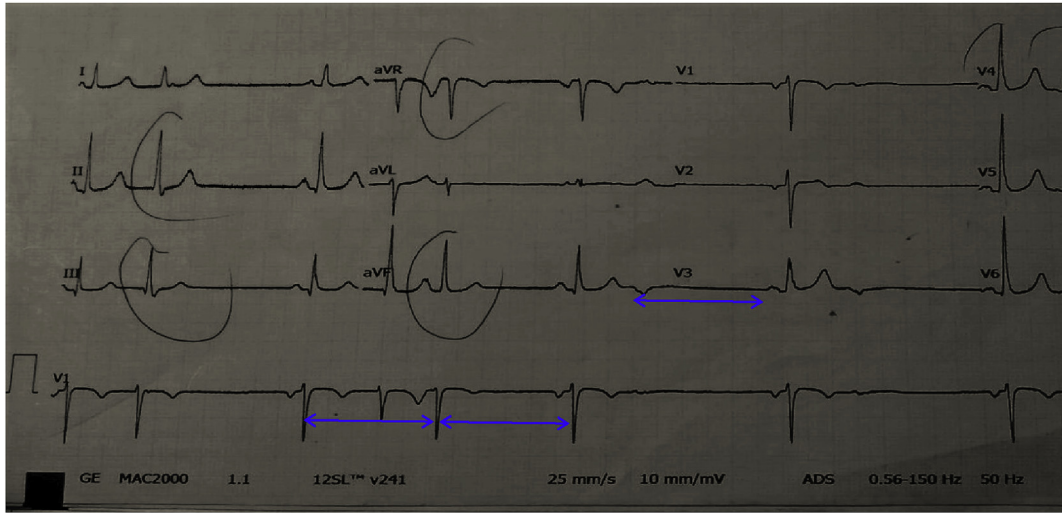


Fig. 1. Baseline ECG.

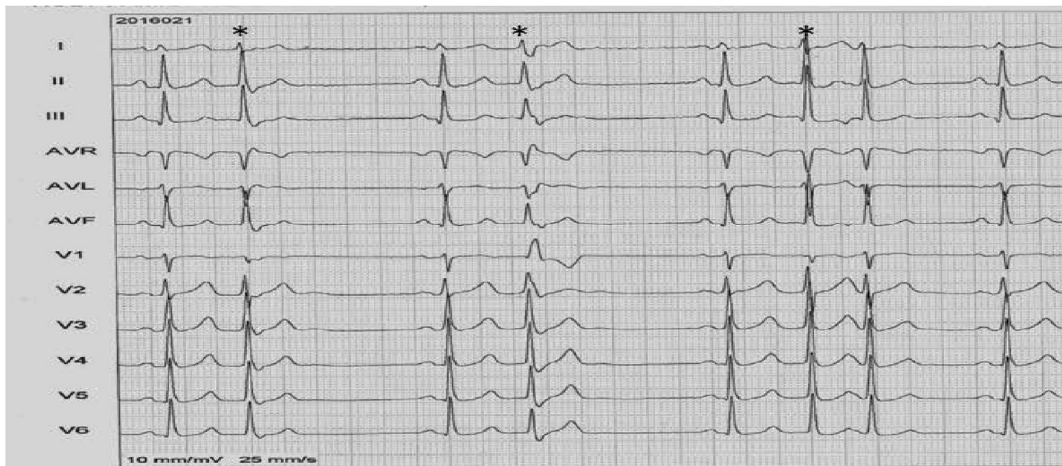


Fig. 2. ECG during EPS.

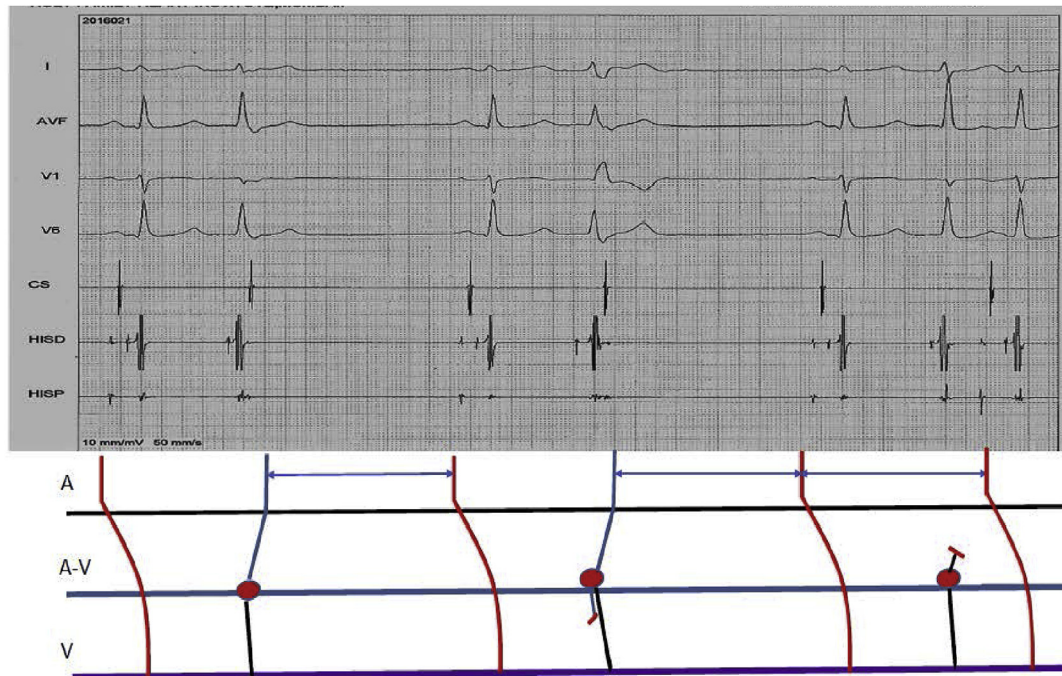


Fig. 3. Intracardiac signals from CS and His bundle region along with ladder diagram.

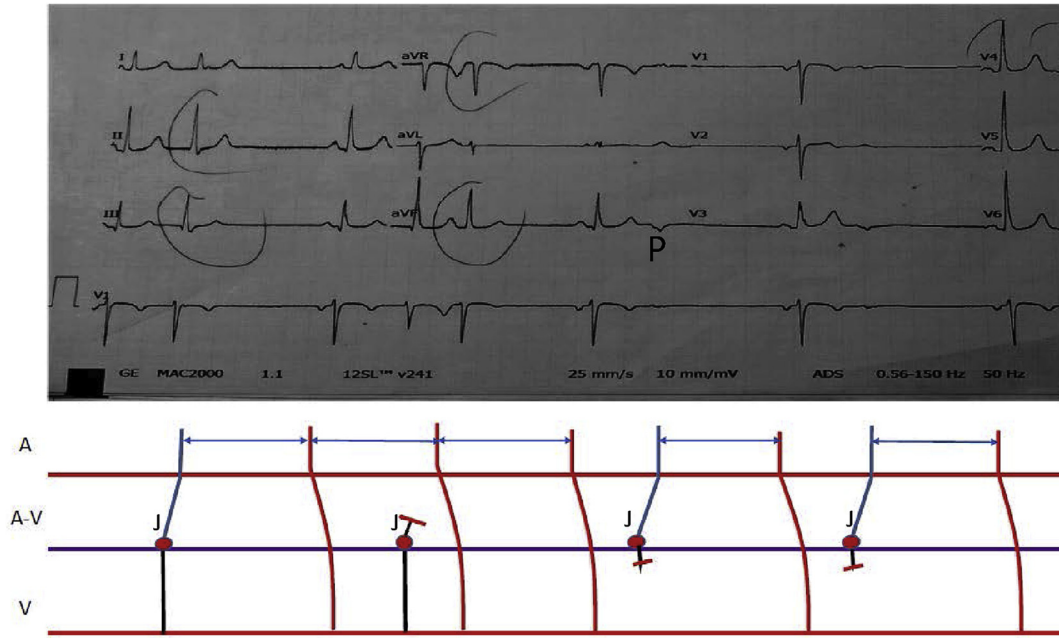


Fig. 4. Ladder diagram explaining Baseline ECG.

were postulated on surface ECG [1] and validated with the advent of intracardiac recordings [2]. It is crucial to diagnose concealed AV block, since pauses associated with premature beats of any kind, either junctional or atrial, are not an indication for pacing. Moreover, unnecessary pacemaker implantation can actually worsen symptoms [3]. As seen in our patient, a precise diagnosis helped us adhere to the dictum “Primum Non Nocere”.

References

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