

A remarkable electrocardiogram

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Electrocardiogram contest

A 66-year-old male patient was admitted to our hospital for ST-segment elevation acute anterior myocardial infarction. In his past history, the patient suffered from benign prostatic hypertrophy, treated with Tamsulosin. He underwent urgent coronarography with angioplasty and implantation of a drug-eluting stent in the left anterior descending artery. After the procedure, the patient was transferred to the intensive cardiac care unit. Cardiopulmonary examination showed bilateral air entry and normal heart sounds. There was no peripheral oedema. During hospitalization, the patient underwent 24-h electrocardiographic monitoring. The patient was treated with acetylsalicylic acid, ticagrelor, high-dose atorvastatin, enalapril, and bisoprolol.

On the following day, the heart rate on the monitor was 40 b.p.m. Thus, a 12-lead electrocardiogram was performed, showing a singular bigeminal rhythm (Figure 1). A 24-h Holter electrocardiogram was performed showing five symptomatic pauses of more than 2.5 s, due to sinus arrest, the longest one of about 4 s. On the control echocardiogram, the left ventricular ejection fraction was 50% without segmental wall motion abnormalities. Blood tests showed no electrolyte imbalances.

Questions

- A. What is the origin of the third QRS complex of the electrocardiogram?
- (1) Junctional escape beat because of slow conducted atrial fibrillation
 - (2) Ventricular extrasystole
 - (3) Atrial extrasystole
 - (4) Junctional extrasystole
 - (5) Junctional escape rhythm during bradycardic sinus rhythm

The third QRS complex is 90 ms in duration and follows an R-R interval of 1600 ms. The axis of the QRS is 0°. The duration of the R-R interval makes the hypothesis of an extrasystole unlikely (incorrect

answers 2, 3, and 4). Regular rhythm irregularity and the evidence of partially hidden P waves between QRS complexes rule out atrial fibrillation (incorrect answer 1). Consequently, the third QRS complex is a junctional escape beat during bradycardic sinus rhythm (correct answer 5).

B) What is the explanation for this electrocardiogram?

- (1) Reverse coupling in parasystolic junctional bigeminy
- (2) Reciprocal junctional rhythm
- (3) Escape-capture bigeminy initiated by a S-A block
- (4) Reciprocal ventricular rhythm
- (5) Second Degree S-A block, Type II

The electrocardiogram shows P-P intervals of ~2280 ms. This P-P interval appears too long for sinus bradycardia and suggests the presence of S-A block (likely a 2:1 or 3:1 S-A block). A junctional escape beat follows each conducted sinus impulse (clear positive P wave in II lead is evident before the 6th and the 10th QRS complex, excluding retrograde conduction to the atrium of a junctional escape beat) at a constant escape interval of 1600 ms. The sinus impulse is conducted to the ventricles because its timing allows the atrioventricular junction to recover after junctional escape. Sinus impulses that occur relatively early after the escape beats are conducted with phasic aberrant ventricular conduction (8th beat). Thus, the escape beat followed by a conducted (capture) beat results in so called escape-capture bigeminy.¹ The correct answer is 3.

C) What is the next best treatment option for this patient?

- (1) Dual-chamber pacemaker implant
- (2) Loop recorder implant
- (3) Electrocardiographic monitoring by 24-h Holter electrocardiogram
- (4) Carotid sinus massage
- (5) Implantable cardioverter-defibrillator implant

The 24-h Holter electrocardiogram showed symptomatic pauses of more than 3 s due to sinus arrest. The latest guidelines about Cardiac Pacing of the European Society of Cardiology recommend pacemaker implantation in patients with symptomatic sinus node disease (Class IA).² Furthermore, due to the preserved ejection fraction

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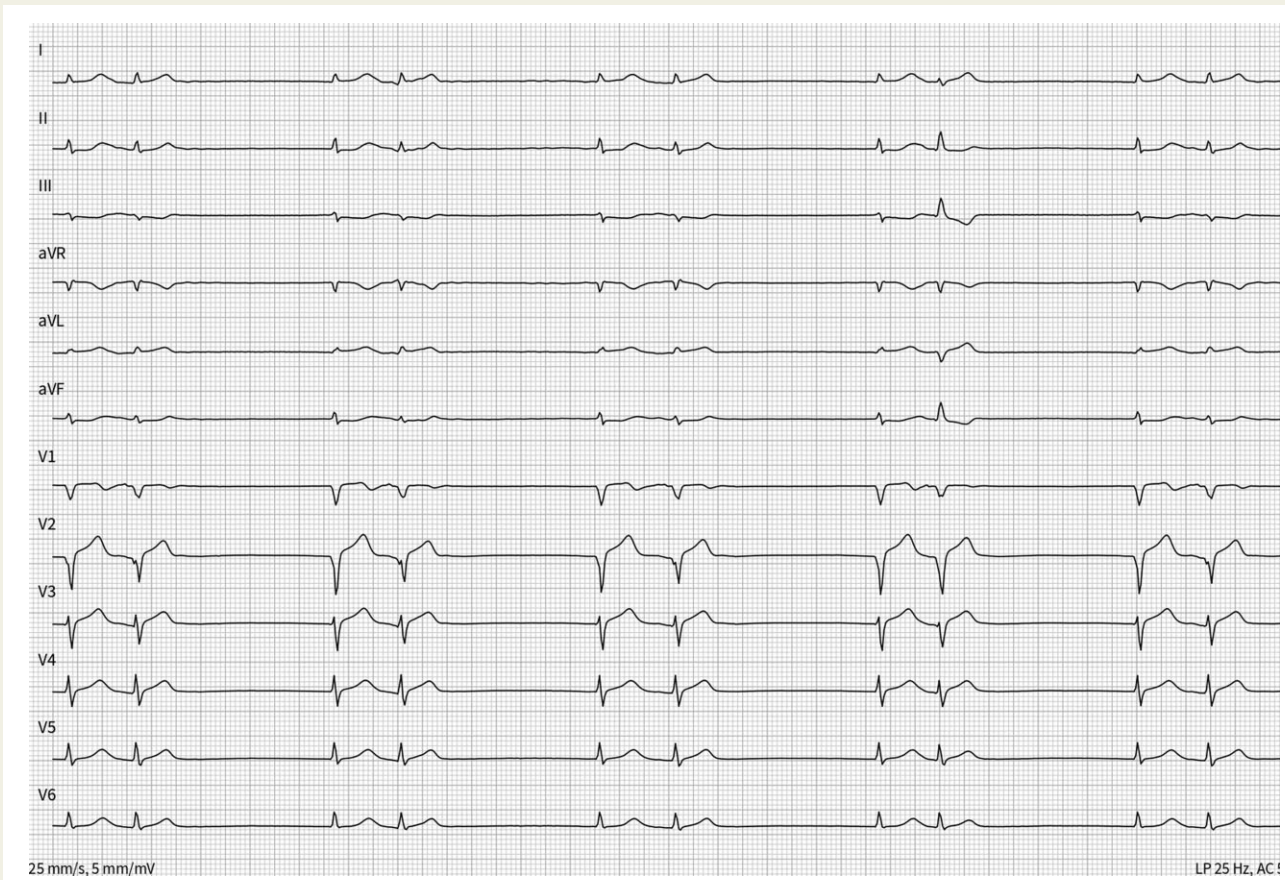


Figure 1 12-lead electrocardiogram.

and the temporal proximity to acute myocardial infarction, there was no indication for implantable cardioverter-defibrillator implantation (incorrect answer 5). Therefore, the patient underwent implantation of dual-chamber pacemaker and was discharged 3 days later. The correct answer is 1.

Consent: The authors confirm that written consent for submission and publication of this case report including images and associated text has been obtained from the patient in line with COPE guidance.

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