

A Stimulating Problem

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A 74-year-old man undergoes permanent pacemaker implantation for treatment of symptomatic bradycardia caused by sinus node dysfunction. A few weeks later, he is seen for evaluation of complaints of intermittent chest pain and chest wall muscle spasms. As part of the evaluation, an ECG is obtained (Figure 1).

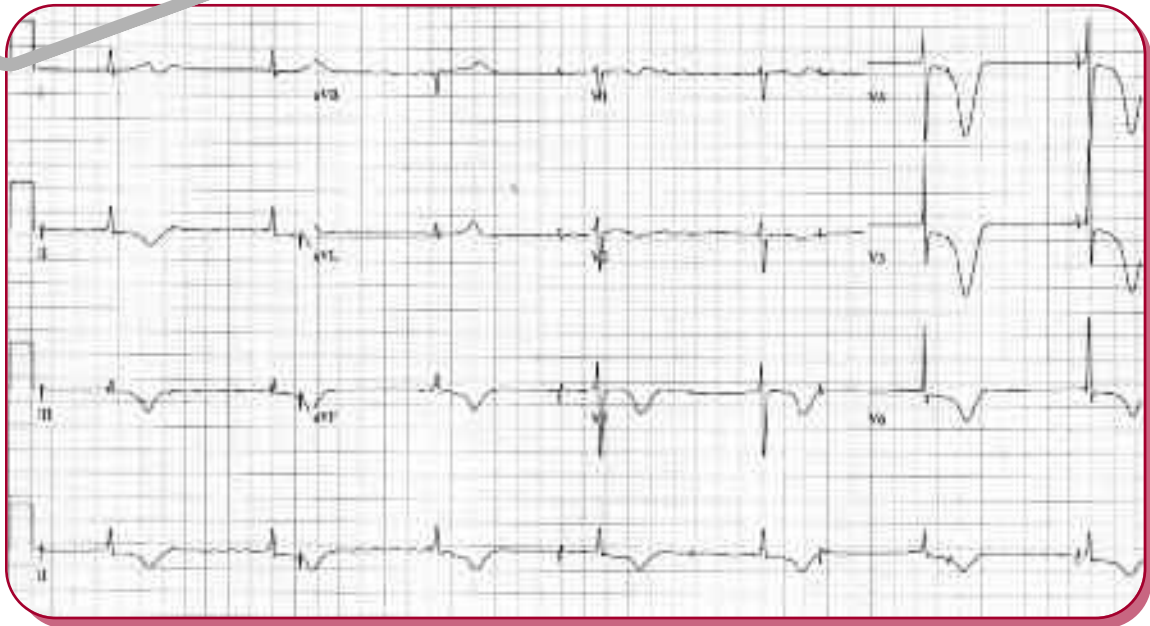



Figure 1. ECG on presentation.

1. What abnormalities are present on his ECG?

2. How should the ECG findings influence his management?

3. What is the likely explanation for his symptoms?

This Month's ECG Diagnosis

1. The ECG shows atrial fibrillation (AF) with what appears to be a relatively slow ventricular response at 40 bpm. However, careful measurement of the R-R intervals reveals that the rhythm is completely regular. Because AF is always irregular, it follows that a conducted ventricular response should also be irregular. The presence of a slow, completely regular QRS rhythm indicates that the patient is in complete heart block
2. The pacemaker spikes are occurring independently of the QRS complexes, several falling within the QT interval or shortly after the T wave. This indicates complete loss of pacemaker sensing function. Even when the pacemaker spike falls
3. Loss of pacemaker sensing and capture early after implantation usually means displacement of the pacemaker lead. A chest x-ray (Figure 2) was obtained and the pacemaker lead can clearly be seen outwith the cardiac silhouette. A CT scan confirmed that the pacemaker lead had perforated the apex of the right ventricle and migrated towards the left costophrenic angle. The patient's chest wall muscle twitching was due to intercostal muscle stimulation by the now extra-cardiac pacemaker lead. The lead was subsequently repositioned without complications under fluoroscopic and echocardiographic monitoring. 

with a narrow QRS junctional escape rhythm. There are two other abnormal ECG findings. The T waves are deeply, symmetrically inverted in multiple leads with associated marked prolongation of the QT interval. Possible explanations include ischemia, metabolic or electrolyte disturbance, drug effect and post-pacing T wave "memory." Small pacemaker spikes are also seen at a rate of 50 bpm.

outwith the QT interval (which roughly approximates the ventricular refractory period), no paced QRS complex occurs. So there is loss of pacemaker capture in addition to loss of sensing.



Figure 2. Patient's chest x-ray.

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