

A Heavy Heart

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A 58-year-old man is referred for evaluation of heart failure and an irregular cardiac rhythm. He recalls having been told following a prior echocardiogram that his heart function was abnormal. He has no history of MI or symptoms other than reduced energy levels and exertional dyspnea. His ECG is shown (Figure 1).



Figure 1. ECG on presentation.

1. What is the cardiac rhythm?

2. What diagnosis should be suspected?

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This Month's ECG Diagnosis

1. The ECG shows an irregular rhythm at a rate of approximately 100 bpm. However, the rhythm is not completely irregular and at slower rates the RR intervals appear constant, varying only as the rate increases. The QRS complexes have a right bundle branch block (RBBB) morphology and there is marked right axis deviation (approximately 180°) in the frontal plane. The QRS voltage is conspicuously low and the presence of an appropriate calibration standard confirms that this is not due to technical factors. P waves can be seen in leads II, III and aVF but are less easily detected elsewhere. The P wave morphology is not consistent with origin from the sinus node and suggests that the direction of atrial depolarization is caudocranial, the reverse of normal.

Close inspection of the lead II rhythm strip reveals an inverted P wave

preceding each QRS complex. There is another negative deflection buried in each ST segment; this too is an inverted P wave. These inverted P waves are present throughout the tracing, occurring regularly at a rate of 185 bpm. Initially, there is 2:1 atrioventricular (AV) conduction; subsequently, the varying RR intervals are due to a changing conduction ratio. The persistence of the arrhythmia in the presence of AV block makes AV node re-entry very unlikely and excludes accessory pathway re-entry as a mechanism. The rhythm is either an ectopic atrial tachycardia or slow atrial flutter.



Figure 2. An earlier ECG

2. An ECG recorded several months earlier was obtained (Figure 2). The patient was in sinus rhythm at that time, with upright P waves in the inferior leads. The QRS voltage is very low and the RBBB and abnormal right axis deviation (signifying left posterior fascicular block) indicate infranodal conducting system disease. The combination of low QRS voltage and conducting system disease is very suggestive of an infiltrative cardiomyopathy such as amyloidosis. Atrial arrhythmias, likely due to atrial enlargement and distension, are not infrequent in this setting. An echocardiogram was performed and showed marked myocardial thickening with increased echogenicity and a restrictive filling pattern. Subsequently, a myocardial biopsy confirmed the diagnosis of cardiac amyloidosis.

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