Is this heart block?

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ECG Education articles use real cases to illustrate the importance of knowledge about ECGs in relation to clinical situations in general practice. Management is not discussed.

Graham, aged 66 years, has mild hypertension but is otherwise well. He tries to keep fit, watches his weight and diet and ceased smoking 25 years ago. He takes felodipine 10 mg/day. Today he comes to see you because he fainted without any warning when he was sitting on the bed after having his morning shower – he has not fainted since age 20 years. He spontaneously regained consciousness, having slid to the floor, and thinks he was unconscious for several minutes.

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Q1. Should you arrange an ECG for this man?

Yes, because the faint may represent a cardiac condition, especially given his age, hypertensive history, lack of past tendency to fainting and lack of warning before the faint. An ECG is an easy investigation to do and should be obtained in all patients with recurrent fainting and in those who have atypical circumstances or an unsure diagnosis and cause of fainting.

Q2. What are the differential diagnoses?

Cardiovascular differential diagnoses include heart block, a vasovagal episode, a hypotensive episode (especially after a hot shower, which vasodilates), severe bradycardia of any cause, ventricular tachycardia, supraventricular tachycardias (less commonly), pulmonary embolus, acute haemorrhage (especially gastrointestinal) and vascular syncope (from extensive lateral head turning blocking off diseased carotids or from vertebrobasilar insufficiency). Neurological differential diagnoses include transient ischaemic attack, hypoglycaemia (spontaneous recovery is unusual) and epilepsy, and psychiatric differential diagnoses include hysteria and factitious collapse. Also, the faint may be medication related.

Q3. What does the patient's ECG show?

The patient's ECG on this page shows complete heart block or third-degree atrioventricular block. Note the absence of any relation between P-waves and QRS complexes; P-waves are best seen in the rhythm strip. The rate is slowed at 27 beats per minute and the distance from R to R is quite regular. The QRS complex is wide, suggesting the origin of the escape rhythm is in the distal conduction system or ventricular myocardium.

Q4. What is the physiological cause of the escape rhythm in complete heart block?

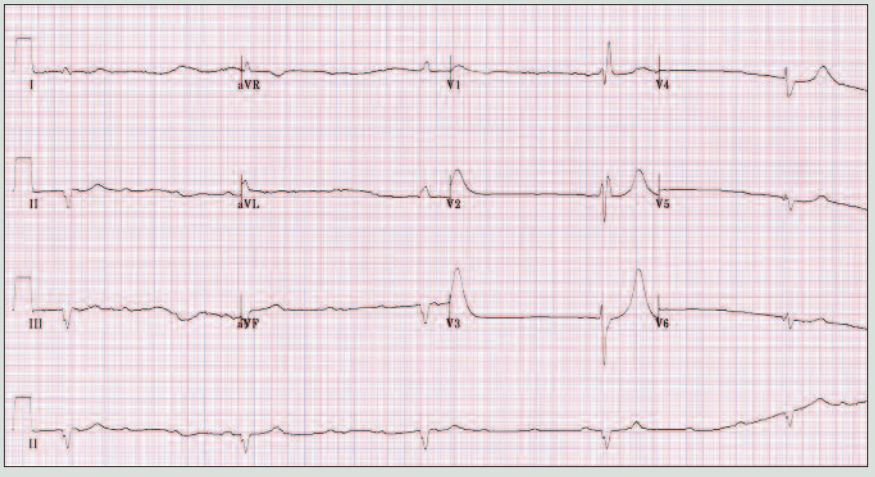
The His-Purkinje conduction tissue normally has slow spontaneous pacemaker activity that takes over when normal atrioventricular electrical impulses cannot pass to the ventricles. This results in an 'escape' rhythm that is perfectly regular and independent of the sinoatrial node activity. Due to the reflex responses to the bradycardia, the sinoatrial rate is often quite fast, generating P-waves faster than and dissociated from the escape rhythm. The closer the block is to the atrioventricular node, the narrower is the QRS complex of the escape beats.

Fusion and capture beats will never be seen in complete heart block, because the sinoatrial impulses never get through. This is in contrast to atrioventricular dissociation with an incomplete or variable heart block or with ventricular tachycardia).

Q5. What are the medical causes of complete heart block?

The medical causes of complete heart block are, most commonly, myocardial ischaemia, fibrosis, calcification and cardiomyopathy. Transient complete heart block is commonly caused by inferior wall myocardial ischaemia, which may affect the atrioventricular node.

Although complete heart block may be the result of acute myocardial infarction, it is often a progressive degenerative process. It may therefore be the end result of previous conduction defects, such as first-degree atrioventricular block, progressing to incomplete bundle branch blocks, complete bundle branch blocks, bi-fascicular blocks and, finally, complete heart block.



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Idiopathic conduction defects, trauma, infiltration disorders (such as haemochromatosis and amyloidosis), lupus erythematosus, maternal systemic lupus erythematosus affecting the newborn, familial complete heart block and Lyme disease are other rare causes of complete heart block. Complete heart block may occur in patients with myocarditis, but usually there is an underlying cardiomyopathy.

Q6. What are the symptoms of untreated complete heart block?

Usually the heart rate in patients with complete heart block varies from 15 beats per minute to 60 beats per minute. If the heart rate is under 40 beats per minute, unconsciousness in the upright position is more common, but some individuals can tolerate heart rates of 30 beats per minute without significant symptoms unless they exert themselves.

The heart rate does not increase much with exercise in patients with complete heart block and untreated individuals trying to exert themselves usually have symptoms such as dizziness from low blood pressure, shortness of breath, severe fatigue and sometimes angina. Underlying cardiovascular health, level of usual fitness, comorbid conditions and certain prescribed medications are reasons for the variation in symptoms from person to person.

Q7. What is sick sinus syndrome?

Sick sinus syndrome is due to sinus node dysfunction. The hallmark of the condition is that the individual experiences severe bradycardias (including sinus pauses and arrests) and may also get tachyarrhythmias (especially atrial tachycardias, such as atrial fibrillation).

Sick sinus syndrome is a condition that may be idiopathic but is sometimes caused by ischaemic heart disease. It is more common from late middle age onwards. The symptoms of the bradycardias may be similar to those of complete heart block. Treatment of patients with bradycardias is usually with a dual-chamber pacemaker. Any tachyarrhythmias may then be medically managed without worsening the bradycardias.

Q8. What investigations are advisable for Graham?

Graham should be referred to hospital, where he would be expected to have serial measurements of serum tropinin levels, ECG monitoring, full blood count, liver function tests, iron studies, a chest x-ray and measurement of blood glucose level, urea, creatinine and electrolytes, C-reactive protein levels, fasting HDL-cholesterol and LDL-cholesterol levels, triglyceride levels, serum calcium levels and thyroid-stimulating hormone levels. An echocardiogram and an appropriate test for ischaemia (if indicated) would be arranged by the cardiologist.

Q9. What is the management of complete heart block?

Patients with acquired complete heart block should always be treated with a permanent pacemaker unless there is a rapidly reversible cause such as inferior infarction or an excessive medication effect. Patients with congenital complete heart block who tolerate the problem well physically may not need a pacemaker for the first few decades of life.

Individuals with sick sinus syndrome may, after pacemaker insertion, be able to commence (or recommence) medications such as calcium channel blockers or β-blockers. This may be necessary to control the tachyarrhythmic component of the syndrome. The insertion of a pacemaker ensures prevention of any adverse effect of these medications on the atrioventricular conduction system (causing symptomatic bradycardia or complete heart block).

Outcome

The cardiac echocardiogram showed a moderate cardiomyopathy with an ejection fraction of 45%. No other cause was found for the complete heart block, so it was presumed to be postviral (Graham had had a severe case of influenza the previous winter).

Graham agreed to have a dual-chamber pacemaker fitted to prevent future episodes of complete heart block, and he was commenced on bisoprolol 5 mg/day and candesartan 4 mg/day. His felodipine was reduced to 5 mg/day. His left ventricular function will need to be checked at intervals in the future, because mild left ventricular dysfunction may worsen with chronic pacing in a proportion of patients, who may then need to be upgraded to biventricular pacing systems with or without a defibrillator. **CT**

Key points

- **An ECG should be obtained in all patients with recurrent fainting and in those who have atypical circumstances or an unsure diagnosis and cause of fainting.**
- **Usually the heart rate in patients with complete heart block varies from 15 to 60 beats per minute.**
- **The heart rate does not increase much with exercise in patients with complete heart block.**
- **Patients with acquired complete heart block should always be treated with a permanent pacemaker, unless there is a rapidly reversible cause.**
- **Treatment of sick sinus syndrome in patients with bradycardias is usually with a dual-chamber pacemaker; any tachyarrhythmias may then be medically managed without worsening the bradycardias.**