Right bundle branch block

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Articles in this section are inspired by, but not based on, real cases to illustrate the importance of knowledge about ECGs in relation to clinical situations in general practice. Management is not discussed in detail.

Amos is 80 years old and unknown to you. He has been to your practice a couple of times in the past three years. He takes no medications and tells you he has always had good health. He brings a medical report form for his driver's licence and says his usual doctor has retired suddenly because of ill health. Amos shows you some normal blood test results from the past year and you ask him to tell you a bit about himself. As part of the driving medical report, you take his blood pressure, which is 160/95 mmHg. You arrange an ECG for Amos (see Figure).

Q1. What does the patient's ECG show?

The ECG below shows a complete right bundle branch block. The QRS is over 120 msec, there is an 'M'-shaped QRS complex in the leads V1 to V3 (also known as an RSR' pattern). There is also slurring and widening of the S wave in the lateral limb leads I and aVL and the praecordial leads V5 and V6.

Q2. What causes the classic right bundle branch block ECG pattern?

Depolarisation travels from the left ventricle to the right ventricle across the septum. The left bundle branch depolarises normally but the right bundle branch does not. The electrical impulse is slowed in the right ventricle, as reflected in the right praecordial leads (V1, V2 and V3) as an 'M'-shaped QRS complex (or RSR' pattern), and in the S wave as slurring and widening in the lateral leads (I, avL, V5 and V6).

The secondary repolarisation is abnormal and so there are also ST abnormalities and T-wave inversion in the right praecordial leads (V1 to V3). The T wave is usually directed opposite to the latest portion of the QRS complex; if it is in the same direction, this is not just right bundle branch block. As the electrical impulse travels normally through the left side of the heart and the septum, the early section of the QRS complex in the left praecordial leads (V5 and V6) appear normal on the ECG. The axis is normal if the right bundle branch block is not associated with any other electrophysiological abnormalities.

Q3. What conditions are right bundle branch block associated with?

- Coronary ischaemia (acute or recent).
- Hypertension.
- Myocarditis.
- Post-surgical scarring.
- Transiently, during cardiac. catheterisation.
- Pulmonary embolism.
- Congenital heart disease (especially atrioseptal defects and pulmonary valve stenosis).
- Degenerative disease of the conducting system (ageing).
- Normal variation (especially thin individuals).
- Cardiomyopathy.
- Right ventricular dilation.
- Brugada syndrome.
- Tricyclic antidepressant overdose.

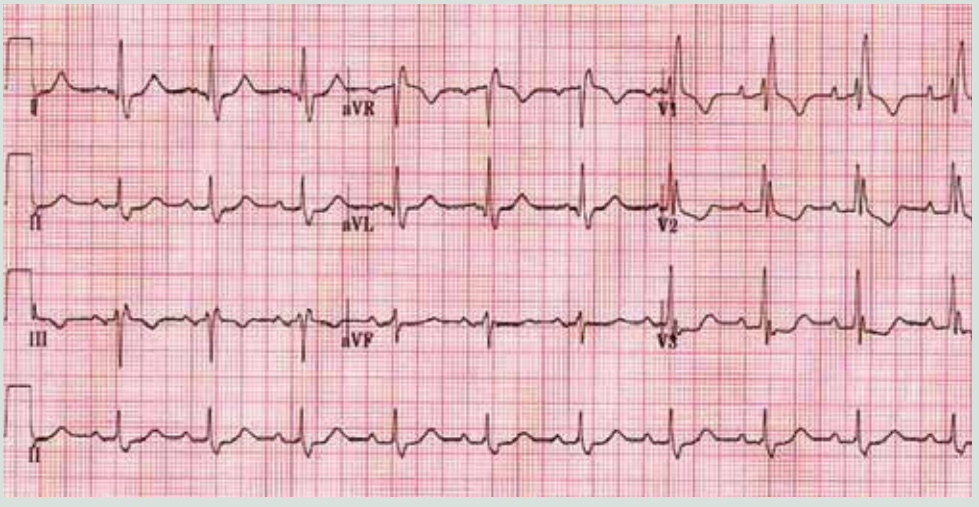

Figure. Right bundle branch block.

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It should be remembered that other conduction abnormalities, particularly hemiblocks and first-degree atrioventricular block, may coexist with right bundle branch block.

Q4. What are the differential diagnoses of right bundle branch block?

- Incomplete right bundle branch block (however, the QRS complex duration by definition would be under 120 msec).
- Brugada syndrome (right bundle branch block and risk of sudden death from ventricular fibrillation).
- Ventricular pre-excitation (Wolff-Parkinson-White syndrome) with a short PR interval.
- Nonspecific interventricular conduction delay (QRS >120 msec that does not meet criteria for right bundle branch block or left bundle branch block).
- Ventricular ectopics.
- Left bundle branch block.
- Left-sided hemiblocks (left anterior or left posterior).
- Pulmonary disease with right ventricular hypertrophy.
- Electrolyte abnormalities and drug toxicity may cause right bundle branch block.

Q5. When can right bundle branch block be considered normal?

- The cardiac echocardiogram is normal.
- There has been no likelihood of longstanding hypertension.
- A normal variation is likely if it is incomplete.
- A normal variant is more likely if there is a normal QRS duration.
- If it occurs in children as it is very common (and rarely of consequence) in children.
- There are no medical conditions or reasons present to account for the right bundle branch block.

It is wise to examine the patient thoroughly and to take the opportunity to assess the patient's overall cardiovascular risk factors (and other preventative health measures).

Q6. Right bundle branch block may be more sinister if it occurs with which other electrophysiological abnormalities?

- Bifascicular block (right bundle branch block and left axis deviation due to left anterior hemiblock).
- Trifascicular block (right bundle branch block, left anterior hemiblock and first-degree atrioventricular block).
- Alternating right bundle branch block and nonsinus rhythm, which suggests an active process rather than a stable one.
- Alternating right bundle branch block and left bundle branch block, which is very dangerous and may be associated with sudden atrioventricular block and death.

Q7. Of what significance is incomplete right bundle branch block?

- It is common and usually a normal finding.
- It may be associated with right ventricular hypertrophy.
- It may be associated with underlying pathology (such as degenerative disease of the conducting system).
- There is a significant likelihood of progression to complete right bundle branch block compared with people who have not got incomplete right bundle branch block.
- Most healthy young people with incomplete right bundle branch block do not convert to a complete right bundle branch block for many years (if they do so at all).
- Incomplete right bundle branch block is not associated with increased cardiovascular mortality in most healthy young people until they are much older (if at all).
- Normal variant right bundle branch block and incomplete right bundle branch block do not significantly affect cardiac output.

Q8. Do patients with isolated right bundle branch block ever warrant pacemakers or medication?

Generally, no treatment is required for patients with right bundle branch block, only management of any underlying causal disorder. Electrophysiological studies may be helpful to clarify if the right bundle branch block is associated with infranodal conduction disease that might warrant a pacemaker.

Key points

- **In right bundle branch block, the QRS is over 120 msec, there is an 'M'-shaped QRS complex in the leads V1 to V3 (also known as an RSR' pattern) and slurring and widening of the S wave in the lateral limb leads I and aVL and the praecordial leads V5 and V6.**
- **Right bundle branch block may be considered normal if the cardiac echocardiogram is normal and there are no medical conditions to account for it.**
- **Right bundle branch block is common in children and is rarely of consequence.**
- **In people with incomplete right bundle branch block the QRS complex duration by definition will be less than 120 msec.**
- **Incomplete right bundle branch block is common and usually a normal finding but may be associated with underlying pathology.**
- **ST segments can still be interpreted with right bundle branch block (but not left bundle branch block) for the diagnosis of myocardial infarction.**

Outcome

You take a detailed history from Amos of possible cardiac symptoms, especially syncope, presyncope and episodes of dizziness. You discuss the most likely cause of the ECG abnormality (which is a degenerative disease) with Amos. You refer him for a cardiac echocardiogram to ensure there is no evidence of hypertensive heart disease, ventricular dysfunction or other cardiac disease. You tell him he may drive at present and that you will extend his licence if needed for a short duration to enable him to complete the investigations.

Over the next couple of weeks, Amos' resting blood pressure reduces to 135/8 mmHg. His blood tests, glucose tests and other routine tests are unremarkable, and the cardiac echocardiogram result is normal, so he does not require further cardiology review. You sign Amos' medical report for his driving licence with a routine annual review. **CT**