Second Edition

ECG Interpretation

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Foreword by John Camm

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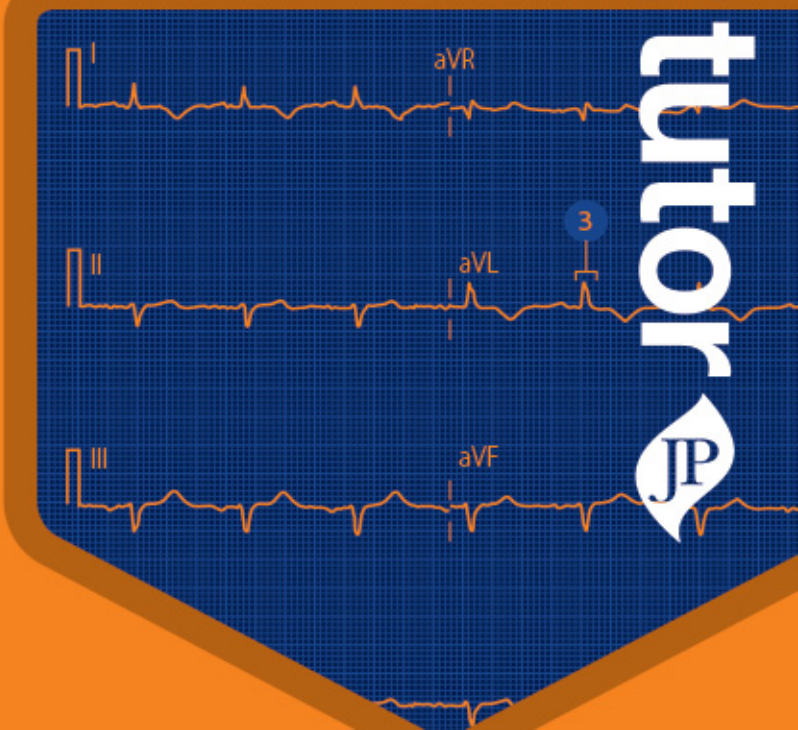

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Bradyarrhythmias I: sinoatrial node dysfunction

chapter 4

A bradyarrhythmia is a disturbance of heart rhythm where the rate is abnormally slow, usually under 60 bpm. Bradyarrhythmias occur either due to failure of rhythm generation, or to failure of rhythm conduction. Failure of rhythm generation is usually due to the sinoatrial (SA) node not 'firing' at the normal rate. The SA node may fire continuously at a slower rate, resulting in ongoing bradycardia. Alternatively, it may fire at a normal rate with intermittent periods of firing at slow rates, resulting in pauses. Sinus node disease may manifest itself as a failure to increase heart rate when required, such as during exercise. This is known as 'chronotropic incompetence'.

Abnormal SA node function often causes symptoms but does not put the patient at risk of sudden death. The key to assessing these patients lies in their haemodynamic response to bradyarrhythmia. This assessment includes enquiring about syncope or presyncope, checking blood pressure, and examining for signs of end-organ hypoperfusion, such as confusion or poor urine output. This assessment, together with the electrical diagnosis, helps to determine what treatment is required and how quickly it must be given.

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4.1 Sinus bradycardia (Figure 4.1)

Key features

- Heart rate is 60 bpm
- P wave before every QRS complex (1)
- PR interval is normal (120–200 ms) (2)

The rate is calculated as shown.

Pathophysiology

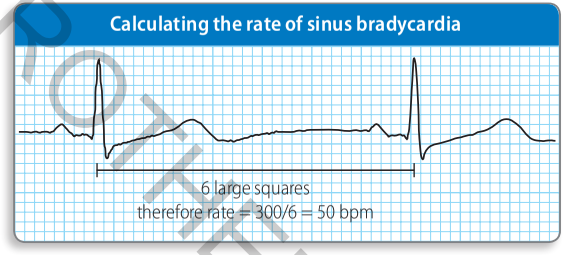
The SA node depolarises consistently, but slower than normal. This may be due to disease (e.g. trauma or ischaemia) of the SA node itself, or to extrinsic causes influencing the rate of SA node depolarisation.

Clinical relevance

Sinus bradycardia is a normal finding in athletes, and in normal individuals when asleep. Pathological causes include SA node disease, drugs, increased vagal tone, hypothyroidism, uraemia, raised intracranial pressure and glaucoma.

Management

In normal individuals who are asymptomatic no treatment is needed. However, if the bradycardia is causing lightheadedness or blackouts, a cause should be sought and, if possible, reversed.



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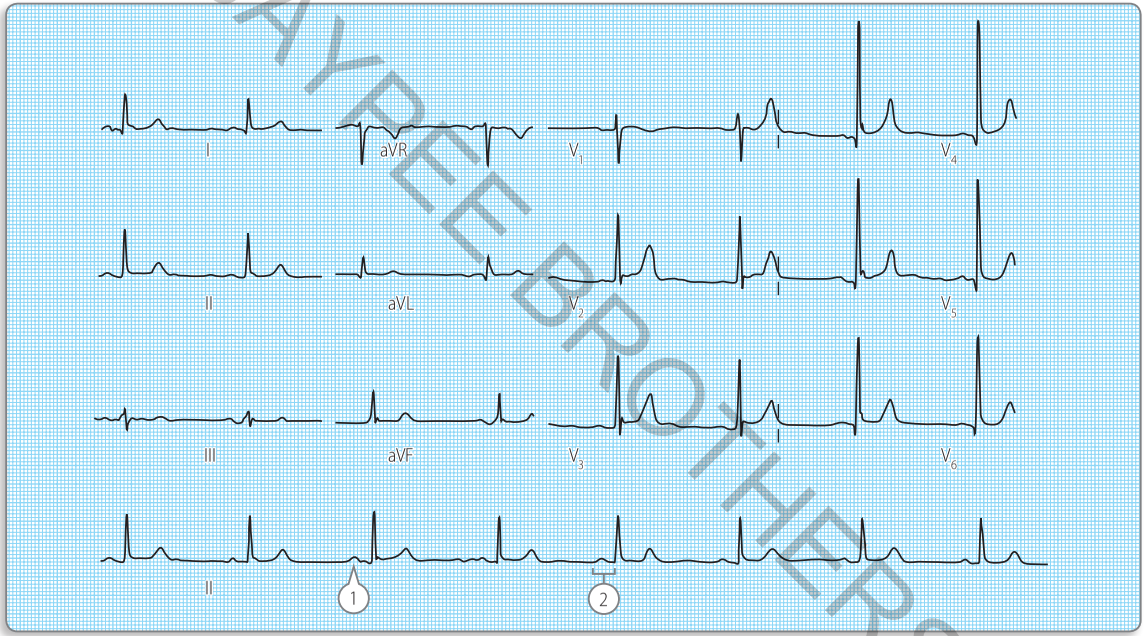

Figure 4.1 Sinus bradycardia.

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4.2 Sinus pause with junctional escape beat (Figure 4.2)

Key features

- Abnormally long interval between one sinus beat and the next (1)
- During the prolonged interval between sinus beats, other areas may depolarise as an 'escape rhythm'
- In the case shown here, a beat arising from near the AV node (junctional escape beat) occurs prior to the delayed next sinus beat (see junctional ectopic beat, section 6.3) (2)

Pathophysiology

The SA node fails to depolarise at the expected preceding rate. Due to its own 'automaticity' the AV node or 'junction' will depolarise, in order to avoid asystole.

Clinical relevance

Sinus pauses, with or without junctional escape beats, are not uncommon and are indeed a normal finding in many individuals, especially nocturnally. As a general rule, pauses are considered pathological if they last for longer than 3 s during waking hours, or if they are associated with symptoms.

Management

In normal individuals who are asymptomatic no treatment is needed. If symptoms do occur a cause should be sought, including electrolyte disturbances and medications that cause bradycardia. If no precipitating cause is found, or if there is one that cannot be reversed, a pacemaker may be implanted.

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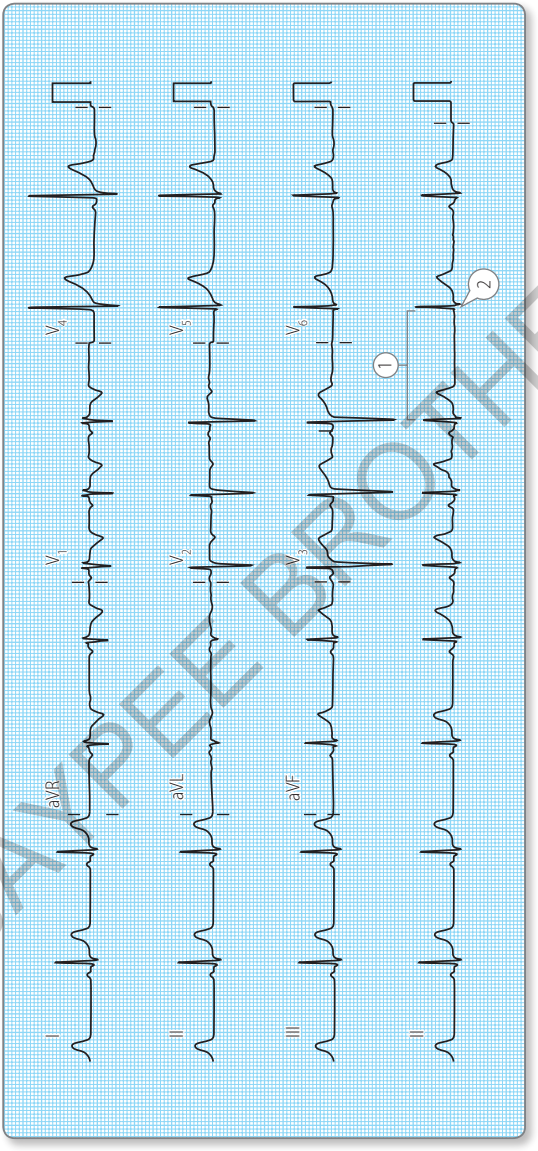

Figure 4.2 Sinus pause with junctional escape beat.

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ECG Interpretation

pocket tutor ECG Interpretation is the ideal companion for medical students, junior doctors and anyone seeking to improve their working knowledge of this universal diagnostic technique.

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