Country cardiograms case 51: Answer

The electrocardiogram (ECG) (Fig. 1, page 107) shows an initial sinus rhythm at a rate of 46 beats/min. The axis is normal with upright QRS complexes in leads I and aVF. Intervals reveal a normal QRS width (78 ms) and normal corrected QT interval (392 ms); PR interval shows beat-to-beat variation, which is evidence of complete (third-degree) atrioventricular (AV) block. There are minimal ST depressions in the lateral leads I, aVL, V5 and V6. There is a junctional escape rhythm noticed on the lead II rhythm strip after the fifth QRS complex. No P waves are present for the last 3 QRS complexes. Follow-up 15-lead ECG did not show any evidence of posterior ST elevation myocardial infarction (MI).

This patient was promptly transferred to a regional hospital. Because of the syncope and concurrent chest and back pain, computed tomography of the chest was performed to investigate for aortic dissection; no evidence of this was found. A follow-up 6-hour troponin test was positive at 6.75 µg/L, and non–ST elevation MI was diagnosed. The peak troponin level the following day was 47 µg/L. The patient underwent angiography, which revealed a critical (90%) narrowing in the right coronary artery; this was successfully stented. Subsequently in hospital, he was persistently bradycardic with sinus pauses and presyncopal symptoms. In addition, he showed mild left ventricular dysfunction (ejection fraction 35%–40%), and because of the need for medical therapy for heart failure, a DDDR pacemaker was inserted. Electrocardiography was performed (Fig. 2).

The P wave on the electrocardiogram reflects atrial depolarization, initiated by pacemaker cells in the sinoatrial (SA) node. When sinus node dysfunction occurs, alternate pacemakers in the
heart take over. Although almost any cardiac cell is capable of spontaneous depolarization, the most common secondary pacemakers are alternate atrial cells (60–80 beats/min), AV nodal or junctional cells (35–60 beats/min), His–Purkinje cells (25–35 beats/min) and ventricular myocytes (<35 beats/min). With junctional or AV nodal rhythms, the QRS complex is narrow because the ventricles are depolarized in a normal fashion and the atria are depolarized in a retrograde fashion, so the P waves are absent. However, negative P waves can be seen in leads II, III and aVF, with a positive P wave in lead aVR. Blood to the SA node is supplied most commonly by the right coronary artery (60%) or the left circumflex artery (40%). Blood to the AV node is mostly supplied by the right coronary artery (90%) or the left circumflex (10%). Acute inferior MI can result in conduction abnormalities such as sinus bradycardia and varying degrees of AV block, including complete heart block, and can be associated with narrow-complex escape rhythms. Conduction abnormalities with inferior MI likely result from heightened vagal tone in addition to edema and infarction of the SA nodal and AV nodal arteries, and generally resolve within 2 weeks without the need for permanent pacing. High-degree (second- or third-degree) heart block is seen in 15%–20% of cases of acute inferior MI, usually within the first 24 hours.

Acute inferior MI results from occlusion of either the right coronary or left circumflex coronary arteries. Infarction of the right coronary artery is associated with ST-segment elevation in lead III that is greater than ST-segment elevation in lead II, with concurrent ST-segment depression in leads I and aVL. Infarction of the left circumflex artery is distinguished by ST-segment elevation in leads I, aVL, V5 and V6, and ST-segment depression in leads V1, V2 and V3.

Unlike inferior MI, conduction abnormalities with anterior MI are generally due to necrosis of the conducting system, are often permanent and imply higher mortality, with complete heart block in anterior MI associated with up to 80% mortality.

Conduction disturbances due to MI are important diagnostic and prognostic factors, and their recognition is essential to proper management.

For the question, see page 107.

Competing interests: None declared.

REFERENCES

“Country cardiograms” is a regular feature of CJRM. We present an electrocardiogram and discuss the case in a rural context. Please submit cases to Suzanne Kingsmill, CJRM, 45 Overlea Blvd., P.O. Box 22015, Toronto ON M4H 1N9; cjrm@cjrm.net.