Emergency Department's
Case of the Month

"Doctor, please help! My chest hurts!"

Katrina Hurley, MD; and Janet MacIntyre, MD, FRCPC

Nicole's case:

Nicole, 67, presents to the ED via ambulance.

One hour ago, she experienced a presyncopal episode while on the toilet at her home, followed by an acute onset of intrascapular pain.

She is still complaining of intrascapular pain and now has chest pressure as well.

Her past medical history is significant. She had breast cancer three years ago. She takes no medications.

Her vitals are as follows:
- Temperature: 37 C
- Heart rate: 42 bpm
- Respiratory rate: 18 breaths per minute
- BP: 96/60 mmHg

BP is equal in both arms. Heart sounds are normal with no murmurs.

Her initial ECG is shown in Figure 1.

Nicole underwent a CT of the aorta to rule out aortic dissection. After an unremarkable CT, she had primary percutaneous transluminal coronary angioplasty (Figure 2). Angioplasty demonstrated occlusion of the right coronary artery.

Nicole recovered uneventfully in hospital and was discharged.

Questions & Answers

1. What is the differential diagnosis of this presentation?

The differential diagnosis for chest/back pain is broad and encompasses diseases of the cardiovascular, respiratory and GI systems. The following diagnoses should be considered:

- Aortic dissection
- Pulmonary embolism
- Acute coronary syndrome
- Pericarditis
- Esophageal rupture
- MI

2. What investigations should be performed on Nicole?

Nicole requires the following tests: an ECG, chest x-ray, complete blood count, electrolytes, creatinine and cardiac enzymes (creatine kinase and troponin I). She will require imaging to rule out aortic dissection; a CT-scan, transesophageal echocardiogram or an aortogram.

3. What is posterior MI?

An MI arises in the setting of a mismatch between myocardial oxygen supply and demand. An acute coronary occlusion usually arises after a local plaque rupture when a thrombus forms on the exposed basement membrane. Total or near total occlusion leads to myocardial ischemia and infarction. A posterior MI involves the posterior aspect of the left ventricle. The culprit occlusion is usually in the right coronary artery, or its posterior descending branch. Less commonly, the lesion occurs in the circumflex artery. An isolated posterior MI is rare; it usually occurs in conjunction with an inferior or lateral MI.

Figure 1. 12-lead and 15-lead ECG.

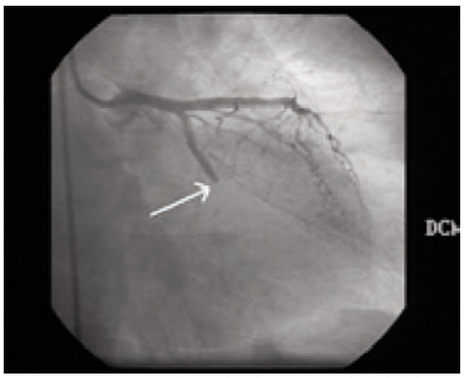

Figure 2. Coronary angiography shows an occluded right coronary artery.

Table 1

ECG changes in posterior MI

- ST depression in V_1 to V_3
- Tall T waves in V_1 to V_3
- Tall R waves in V_1 to V_3
- R/S wave ratio ≥ 1 (V_1 to V_3)
- ST elevation in V_8 to V_9

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***This department covers selected points to avoid pitfalls and improve patient care by family physicians in the ED. Submissions and feedback can be sent to* diagnosis@sta.ca.**

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4. What are the ECG changes associated with a posterior MI?

A standard 12-lead ECG does not include any posterior leads. As such, an isolated posterior MI will not result in ST segment elevation. Rather, ST segment depression will be seen in the anterior leads (V_1 to V_3) along with upright T waves. Tall R waves develop over a few hours (analogous to an evolving Q wave).

A 15-lead ECG will show the typical findings of an acute MI with ST segment elevation in V_8 and V_9 (Table 1).

5. What if the intial ECG in this patient had been normal?

About half of the patients who present with an acute MI initially have a non-diagnostic ECG. While some of these patients will fall into the category of a non-ST segment elevation MI, a significant portion will go on to develop characteristic ST segment elevation. As such, patients with ongoing chest pain should have frequent serial ECGs.

6. What is the management of an acute posterior MI?

The principles of management are to relieve symptoms, reverse ischemia, limit the size of the infarct and reduce the cardiac workload. In general, patients should receive supplemental oxygen, 160 mg to 325 mg of acetylsalicylic acid (chewed) and intravenous morphine. Patients with posterior MIs are often hypotensive, so the use of ß-blockers and vasodilators, like nitroglycerin, is limited. Time to reperfusion should be as short as possible. Patients undergoing thrombolysis should have a door-to-needle time of 30 minutes or less. Patients undergoing primary percutaneous transluminal coronary angioplasty (PTCA) should have a door-to-balloon time of 90 minutes or less. PTCA candidates also benefit from the use of glycoprotein IIb/IIIa receptor inhibitors. Dx

Resources

1. Aufderheide TP, Brady WJ, Gibler WB: Acute Ischemic Coronary Syndromes. In: Marx JA, et al (ed.): *Rosen's Emergency Medicine: Concepts and Clinical Practice*. Fifth Edition. Mosby, St. Louis, Montana, 2002, pp. 1011-52.
2. Harrigan RA, Chan TC, Brady WJ: Basic Electrocardiographic Techniques. In: Roberts JR, et al (ed): *Clinical Procedures in Emergency Medicine*. Fourth Edition. WB Saunders, Philadelphia, Pennsylvania, 2004, pp. 270-81.