



Is this a case of acute coronary syndrome?



GORDIAN FULDE MB BS, FRACS, FRCS(ED), FRCS/FRCP, (A&E)ED, FACEM

FARZAD JAZAYERI MD

Articles in this section use cases to illustrate the emergency management of patients presenting in general practice with cardiac problems. They are inspired by, but not based on, real patient situations.

Arthur, an 82-year-old man who is staying for a few months in Sydney, is brought in to your general practice by his son (a patient of yours) for a second opinion. Arthur says he has noticed that he gets tired more quickly than before. He was seen by his regular GP in Melbourne (where he lives) a couple of months ago, and was told that this symptom was age- and weight-related and that he had to lose weight before he could expect to see any improvement.

Arthur has a background of long-standing hypertension, which is treated with losartan 25 mg twice daily and hydrochlorothiazide 25 mg daily. He also has benign prostatic hyperplasia for which he is taking tamsulosin 400 µg once daily. Arthur's GP had recently diagnosed him with asthma due to a cough mainly at night and started him on salbutamol and a combination inhaler of fluticasone and salmeterol. Arthur had, a long time ago, a reaction to aspirin, which caused gastrointestinal bleeding. He is a nonsmoker and social drinker, and lives independently with his wife in their own house.

What are the differential diagnoses at this point?

Answer: Arthur has very nonspecific symptoms and these broadly could be due to many conditions, including ischaemic heart disease, anaemia, an endocrine disorder, organ dysfunction, infection and malignancy.

What questions do you ask Arthur?

Answer: You start with a review of symptoms:

- What is the character of any pain in relation to exercise and rest. What is the radiation and duration?
- Does he have any cardiac risk factors, other than hypertension, such as diabetes, a family history of cardiovascular disease or a high

cholesterol level?

- Is he suffering from shortness of breath at rest, on exertion or with a change in position?
- Has he noticed paroxysmal nocturnal dyspnoea, lower limb swelling or weight change?
- Has he noticed a change in cold or warm preference or a change in appetite?
- Has he had syncope or presyncopal symptoms at rest or with exercise or postural changes?
- Has he had symptoms of infection and, if so, what is the likely source?
- Has he noticed any change in bowel habit?
- Does he have risk factors for pulmonary embolism, such as recent immobility, a recent long-haul flight, surgery, calf pain or any trauma to lower limbs?

Arthur says that he has noticed that he gets tired quickly only recently, and he is not sure exactly when this started. He has been walking daily with his wife for a few years now, but he has noticed a gradual shortening of the distance that he can walk without rest. Six months ago he was able to walk slowly for an hour. At the moment his exercise tolerance is 10 to 15 minutes, about 300 metres, and he has to rest for 10 to 15 minutes. The limiting factor is tiredness,



Table. Acute coronary syndrome risk assessment

High risk	Intermediate risk (no high risk features)	Low risk (no high or intermediate risk features)
Presentation with clinical features consistent with acute coronary syndrome (ACS) and any of the following risk factors		
<ul style="list-style-type: none"> • Repetitive or prolonged symptoms (>10 minutes) and still present • Syncope • Previous PCI/CABG <6 months • History of left ventricular systolic dysfunction (especially if LVEF <40%) or current symptoms of left ventricular failure • Haemodynamic compromise (systolic blood pressure <90 mmHg and/or new onset mitral regurgitation) • Diabetes and typical ACS symptoms • Chronic renal failure and typical ACS symptoms • Elevated troponin (consider haemolysis, renal failure) • Persistent or dynamic ECG changes of ST depression ≥0.5 mm or new T-wave inversion ≥2 mm • Transient ST elevation ≥0.5 mm in more than two contiguous leads • Sustained ventricular tachycardia 	<ul style="list-style-type: none"> • ACS symptoms within 48 hours that occurred at rest, or were repetitive or prolonged (but currently resolved) • Age >65 years • Previous PCI/CABG >6 months • Known coronary heart disease, especially if prior acute myocardial infarction or known coronary lesion >50% stenosis • Diabetes and atypical ACS symptoms • Chronic renal failure (especially if known glomerular filtration rate <60 mL/min/1.73m²) and atypical symptoms of ACS • Two or more of: hypertension, family history, active smoking or hyperlipidaemia • ECG is not normal and has changes from previous pain-free ECG but does not contain high-risk changes 	<ul style="list-style-type: none"> • ECG normal or unchanged from previous pain-free ECG
Abbreviations: CABG = coronary artery bypass grafting; LVEF = left ventricular ejection fraction; PCI = percutaneous coronary intervention.		

and he has no chest pain or shortness of breath. Arthur's brother had bypass surgery at the age of 45 years, and his father's cause of death, when he was in his late 80s and had been previously well, may have been a heart attack. Arthur does not report any risk factors for pulmonary embolism, and does not appear to be concerned about his symptoms.

After taking a history from Arthur you proceed with a physical examination, concentrating on the cardiovascular system as you think ischaemic heart disease/congestive cardiac failure could be the main cause for his symptoms, including his recent diagnosis of asthma.

Except for Arthur's body mass index (BMI) of 31 kg/m², the rest of the physical examination is unremarkable.

What is your next step?

Answer: Your main differential diagnoses are ischaemic heart disease and/or heart failure. You risk stratify Arthur as being at intermediate risk for a potential acute coronary syndrome (Table).

You proceed with blood tests to assess renal function, lipid profile and thyroid function. Creatinine level was at the upper limit of normal, chronic and unchanged and the rest of the results were unremarkable. Troponin levels to test for silent myocardial infarction were not elevated. Full blood count for anaemia and bloody glucose levels were normal.

You send Arthur for a chest x-ray, which was reported as normal with no signs of cardiac failure or pulmonary disease. An ECG carried out in your office was also normal.

With an unremarkable physical examination and normal test results you suspect that Arthur's symptoms are the result of either ischaemic heart disease or simply due to his weight.

What are the tests you can perform to diagnose ischaemic heart disease?

Answer: Tests include the treadmill stress test, stress echocardiography, sestamibi test, cardiac CT angiography and coronary angiography. Each test is associated with cons and

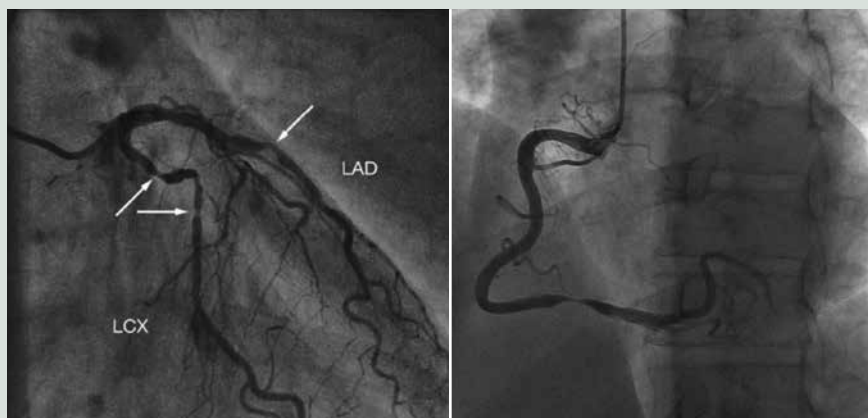
pros, which need to be considered for each individual patient.

Treadmill stress test

This test is very safe on its own but has a significant false-negative rate. The patient has to be able to perform the test physically, and clearly this is not an option for Arthur because of his age, weight and poor exercise tolerance.

Stress echocardiography

Stress echocardiography requires a comparison of the echocardiographic data obtained at the time of, or after, stress with baseline resting data. It is essential to review resting and stress images side by side. Stress echocardiography is performed with exercise or with the administration of a pharmacological agent. The exercise protocol includes a treadmill exercise test with immediate postexercise echocardiographic images. If a patient cannot exercise, stress is induced pharmacologically with dobutamine, dipyridamole or adenosine. Stress echocardiography is safe but



Figures 1a and b. a (left). Left anterior descending artery and left circumflex artery stenosis. b (right). Right coronary artery stenosis.

Abbreviations: LAD = left anterior descending artery; LCX = left circumflex artery.

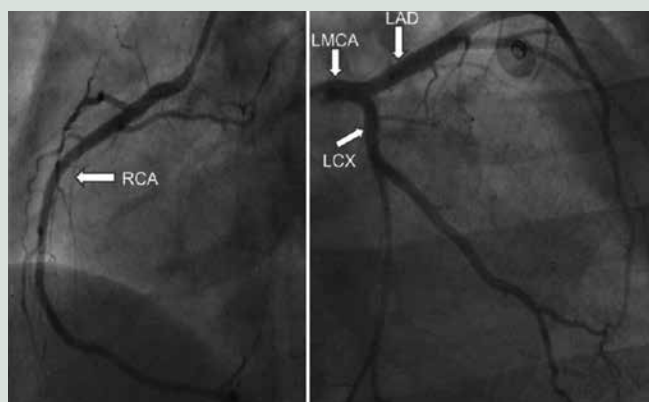


Figure 2. A patient with normal anatomy, for comparison.

Abbreviations: RCA = right coronary artery; LAD = left anterior descending artery; LCX = left circumflex artery; LMCA = left main coronary artery.

sometimes the body habitus makes it technically difficult to obtain desired images. For Arthur, it does not appear to be the best option because of his high BMI and the greater chance of this being technically a difficult study.

Nuclear medicine cardiac imaging (sestamibi)

The most commonly performed imaging procedure in nuclear cardiology is single-photon emission computed tomography (SPECT) imaging of myocardial perfusion. After injection of the chosen radiotracer (e.g. sestamibi), the isotope is extracted from the blood by viable myocytes and retained within the myocyte for some time. Gamma ray photons are emitted from the myocardium in proportion to the magnitude of tracer uptake, which in turn is related to perfusion. The standard camera used in nuclear cardiology studies, a gamma camera, captures the photons and converts the information into digital data representing the

magnitude of uptake and the location of the emission. SPECT is likely to be the preferred option for Arthur as there is no nephrotoxic contrast, body habitus is less likely to affect the results and there is no need to be physically fit for the test.

Cardiac CT angiography

Cardiac CT angiography (CCTA) is a relatively new modality and is seen as an effective non-invasive method of imaging the coronary arteries.

There are two different types of cardiac CT: coronary calcium scoring and CCTA. Each has a different clinical indication. Calcium scoring is primarily used for risk stratification of asymptomatic patients, whereas CCTA is primarily used in patients with acute or chronic chest pain. One potential use of performing a nonenhanced calcium scoring study before a CCTA is to help decide whether to proceed

with CCTA in patients with an extensive coronary calcium score. There is no established cutoff calcium score above which a CCTA will not be diagnostic because of heavy load of calcium in the arteries and therefore difficulty reporting the CCTA; however, a score of 1000 is often used.

CCTA has an excellent sensitivity (98%) and very good specificity (88%). It is used most appropriately in symptomatic patients with low to intermediate pretest probability of coronary artery disease. There are different techniques for assessment of the stenosis but the cross-sectional area technique, which looks at the cross section of the coronary arteries, is seen to have the highest correlation with quantitative coronary angiography. Because the spatial resolution (number of pixels forming an image) is inadequate for precise grading, coronary stenoses are often graded with semi quantitative descriptors such as normal, mild (<50% stenosis), moderate (50 to 70% stenosis), severe (>70% stenosis) and occluded. Stenosis is typically over-estimated in areas where heavily calcified plaques are present. As Arthur has an upper limit creatinine level and a higher chance of heavily calcified coronary arteries, CCTA is not the ideal option for him.

Coronary angiography

Coronary angiography is too invasive as the initial investigation for a patient who is not at high risk, has minimal symptoms and has a higher risk of contrast nephropathy.

What test do you order for Arthur?

Answer: You give Arthur a request for a myocardial perfusion scan (sestamibi test). Later that week you received a call from the nuclear medicine clinic to say that Arthur's sestamibi test is positive for inferior/lateral wall reversible ischaemia and his left ventricular ejection fraction was estimated as normal. You contact Arthur and advise him regarding the results of his test and the need for a review to discuss further management. You refer him to a cardiologist for consideration of angiography of his coronary arteries. At angiography, Arthur has severe triple vessel disease with more than 85% blockage of all of his coronary arteries (Figures 1 and 2).



Figure 4. Postoperation persistent right pleural effusion and right hemidiaphragm elevation due to phrenic nerve palsy.

In elderly patients, what are the risk factors for ischaemic heart disease?

Answer: The classic risk factors for ischaemic heart disease, such as hypertension, high total cholesterol level and high LDL-cholesterol level, and tools such as those developed from the Framingham Study in younger populations are still noteworthy but, in the elderly or in women, may be less accurate for predicting cardiovascular risk.

Predictive models that incorporate both traditional risk factors (such as smoking, blood pressure, lipid levels, diabetes) and age-specific markers (such as pulse pressure, arterial stiffness and, possibly, albuminuria with adjustment for sex) may therefore provide the best estimates of cardiovascular risk in older people without known coronary artery disease.

How do angina symptoms in the acute setting in older patients differ from those in younger patients?

Answer: Angina symptoms are more likely to be absent (silent ischaemia) or atypical in older patients than in young patients. Symptoms are termed atypical because the description differs from the classic description of substernal pressure with exertion. Symptoms may primarily be dyspnoea, shoulder or back pain, weakness, fatigue (in women) or epigastric discomfort, and may be precipitated by concurrent illnesses. Some older patients

describe symptoms with effort, but those with limited physical exertion (which is common in the elderly) may not report any symptoms.

What are the differences in the presentation of acute coronary syndromes in elderly patients compared with younger patients?

Answer: Chest pain or discomfort is the most common complaint in patients up to the age of 75 years with ACS, but after the age of 80 years, complaints of diaphoresis increase and chest discomfort decreases. Altered mental status, confusion and fatigue become common manifestations of acute myocardial infarction in older patients. Older patients may also present with sudden pulmonary oedema or neurological symptoms, such as syncope or stroke. The ECG is also more likely to be nondiagnostic. Nonspecific symptoms and nondiagnostic electrocardiographic findings lead to potential delays in diagnosis and initiation of therapy. This highlights the importance of rapid laboratory testing for serum markers of myocardial damage in the acute setting in older patients.

Outcome

Arthur was admitted to hospital for bypass surgery for severe triple vessel disease. His stay in hospital was complicated by paroxysmal atrial fibrillation, phrenic nerve palsy, pneumonia, ileus, acute kidney injury and the need for rewiring of the sternal wound because of wound dehiscence (Figure 4). He had a persistent pleural effusion and required a pleurodesis. Arthur was discharged from hospital after 28 days but he was readmitted 10 days later due to a sternal wound infection, which required a wash out of the sternal wound and use of intravenous antibiotics.

Arthur returned home to Melbourne and he now walks for 45 minutes a day without rest and also goes to the gym every day for 45 minutes. He has lost 14 kg and is not taking any antihypertensive medications. His symptoms of asthma have completely resolved and he is not using any inhalers. Arthur feels good about the operation although it was very complicated in every way possible.

Key points

- **Ischaemic heart disease presents atypically in elderly patients and can easily be missed. In the acute setting, the diagnosis could solely rely on testing of cardiac biomarkers.**
- **Lifestyle modification to reduce cardiovascular disease is of great importance in all age groups but especially so in elderly populations because the risk of complications of any invasive treatment is much higher in elderly patients than in younger patients.**
- **There are many different modalities for screening for ischaemic heart disease. Each test is associated with pros and cons, which need to be considered for each individual patient.**
- **Atypical onset of a respiratory condition could be a warning symptom of cardiac ischaemia.**

Further reading

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COMPETING INTERESTS: None.