Acute chest pain

Acute chest pain is a common presenting complaint in hospital practice. The differential diagnosis of chest pain is broad and includes life threatening conditions such as the acute coronary syndromes (ACS). ACS include ST elevation, myocardial infarctions (STEMI), non ST MI (NSTEMI) and unstable angina. Elderly patients can present in atypical ways making the diagnosis challenging. In this review we address some of the key issues facing clinicians when managing the elderly patient with chest pain. Focusing on the ACS, we discuss the possible differentials, pitfalls and the key information including investigations required to formulate the diagnosis.

Marie French Specialist Registrar in Care of the Elderly, Darlington Memorial Hospital.
Professor Jerry Murphy Consultant Cardiologist, Darlington Memorial Hospital and Professor of Cardiovascular Medicine, Durham University
Email frenchm@doctors.org.uk

Chest pain may be caused by the stimulation of visceral or somatic pain fibres. Visceral fibres originate from the heart, oesophagus, blood vessels and visceral pleura. These enter the spinal cord at multiple levels and produce pain that is poorly localised and often difficult for patients to describe. Somatic pain fibres originate from musculoskeletal structures, parietal pleura and the dermis. These fibres enter the cord at specific levels; producing pain that is well localised and easier to describe.

Chest pain is a common complaint that 20–40% of the general population will experience in their lives. It accounts for approximately 5% of visits to the emergency department, and up to 40% of emergency hospital admissions. It is therefore important for physicians to manage it correctly.

Elderly patients with chest pain can represent a challenge for many reasons. A multinational, prospective, observational study of ACS showed higher rates of atypical presentation in the elderly, leading to poorer prognosis. Elderly patients present more frequently with fatigue, worsening congestive heart failure, altered mental state, lightheadedness or syncope. This increases the risk of misdiagnosis.

The prevalence and severity of coronary artery disease increases with age, along with morbidity and mortality. Elderly patients have more multi-vessel and pre-existing coronary artery disease. They are more likely to suffer NSTEMI, develop heart failure, AV block, atrial fibrillation and cardiogenic shock after a coronary event. There is an increased prevalence of angina so chest pain may cause less alarm, leading to delayed presentation. One third of patients over 65 years with an MI present later than six hours after symptom onset.

The elderly population have higher in-hospital mortality from ACS but are less likely to receive aggressive therapy. They are likely to be on more medications and suffer side effects (postural hypotension or anaemia) making secondary prevention challenging.

Differential diagnosis

There are many differentials of chest pain that vary from life threatening to more benign causes.

- Cardiological: the acute coronary syndromes (ST elevation myocardial infarctions, non-ST myocardial infarctions and unstable angina), pericarditis and cardiac tamponade
- Vascular: pulmonary emboli (PE) and aortic dissection
- Respiratory: pneumonia, pneumothorax and pleurisy
- Gastrointestinal: oesophageal spasm and gastro-oesophageal reflux
- Musculoskeletal.

History

The critically ill patient with chest pain will require rapid assessment, starting with assessment of the airway, breathing, circulation and review of basic observations before obtaining a detailed history.
Some elderly patients may have cognitive impairment or dysphasia making it difficult to obtain an accurate history. In these circumstances cardiac risk, past medical history, examination findings and investigations will be valuable. The questions asked should be the same as for the younger patient (Table 1).

The patient should be assessed for cardiovascular disease risk factors: the most importance are advancing age, male gender and family history of premature coronary artery disease.⁹

### Examination

Signs of shock alert to a serious condition (MI, PE, dissection and sepsis) but are often a late feature and less useful in the elderly. The elderly patient is more likely to have comorbidities such as hypertension so a blood pressure of 120/80mmHg may be low for them. Similarly polypharmacy is common so the patient may be on a β-blocker and unable to mount a tachycardia. Nevertheless, a full examination must be performed.

### Possible investigations

Some tests can be less useful in the elderly patient and should be tailored to the individual patient.

#### ECG

An ECG should be obtained in all patients. The baseline ECG of an elderly patient is more often abnormal so correlation with previous ECGs is vital. Elderly patients with ACS are less likely to have typical ECG changes. They present less frequently with ST segment elevation (31.4% versus 50.1%; p<0.05) and more often with left bundle branch block (LBBB) (8.0% versus 0.6%; p<0.05).¹⁰ Elderly patients are also more likely to have a pacemaker in situ leading more frequently to non-diagnostic ECGs.¹¹ In those over 85 years old the full diagnostic triad (chest pain, ECG changes and biochemical changes) is present in under a third.¹²

#### CXR

Look for any lung abnormalities, fractured ribs or widening of the mediastinum. The aorta often unfolds with age so the...
contours of the aortic arch should be assessed and compared with previous films when considering aortic dissection.

Blood tests
Routine bloods, full blood count, U+Es and inflammatory markers are useful. In acute blood loss, the haemoglobin may not drop immediately and in the frail septic elderly patient, the inflammatory markers may take a day or so to rise.

D-dimers
The D-dimer should only be requested if thromboembolism is suspected as there are many causes of a raised D-dimer. These include:
- Venous thromboembolism
- ACS
- Stroke
- Aortic dissection
- Disseminated intravascular thromboembolism
- Post operatively
- Sepsis

- Vasculitis
- Cancers
- Superficial phlebitis.

The level of circulating D-dimer increases with age but even when used in the elderly with chest pain, D-dimer has been shown to provide a high sensitivity and a negative predictive value in the diagnosis of pulmonary embolism.17

Troponin
Cardiac troponins are regulatory proteins of the thin actin filaments of the cardiac muscle. Troponin T and troponin I are highly sensitive and specific markers of myocardial injury. There are, however, many conditions that are commonly found in the elderly which will cause “false positives”.18 Troponins should therefore only be requested if you suspect a cardiac source for the pain. Causes of raised cardiac troponins in absence of ACS include:
- Pulmonary embolism
- Pericarditis
- Heart failure
- Myocarditis
- Sepsis

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Examination findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute coronary syndromes</td>
<td>Patient may be clammy and unwell</td>
</tr>
<tr>
<td></td>
<td>Heart failure may be present (raised JVP, pulmonary, sacral and peripheral oedema)</td>
</tr>
<tr>
<td>Pericarditis</td>
<td>Pericardial rub</td>
</tr>
<tr>
<td>Tamponade</td>
<td>Kussmaul’s sign (JVP rising on inspiration)</td>
</tr>
<tr>
<td></td>
<td>Pulsum paradox (pulse fades on inspiration)</td>
</tr>
<tr>
<td>PE</td>
<td>Tachycardia, tachypnoea, hypotension, pleural rub, pleural effusion, hypoxia signs of right sided heart strain (raised JVP)</td>
</tr>
<tr>
<td>Aortic dissection</td>
<td>Unequal arm pulses and BP</td>
</tr>
<tr>
<td></td>
<td>Aortic incompetence</td>
</tr>
<tr>
<td></td>
<td>As dissection unfolds branches of aorta occlude leading to: hemiplegia (carotids), paraplegia (anterior spinal), anuria (renal arteries)</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>Fever, hypoxia, delirium, tachypnoea, tachycardia, hypotension, crepitations, Bronchial breathing, increased vocal resonance/fremitus</td>
</tr>
<tr>
<td>Pneumothorax</td>
<td>Reduced expansion, hyper-resonance to percussion, decreased or absent breath sounds</td>
</tr>
<tr>
<td></td>
<td>Deviated trachea</td>
</tr>
<tr>
<td>Musculoskeletal</td>
<td>Tender chest wall on palpation</td>
</tr>
<tr>
<td>GORD</td>
<td>Tender epigastrum</td>
</tr>
<tr>
<td>Oesophageal spasm</td>
<td>May be normal</td>
</tr>
</tbody>
</table>

* A difference in pulse can be seen in as many as 60% of patients with aortic dissection.13 A difference of 20mmHg between the arms has been shown to be an independent predictor.14 However, as many as 19% of patients will have inter-arm blood pressure differences of over 20mmHg.15,16
Chest pain

Case history

A 77 year old man was brought to the emergency department following a collapse. Whilst watering his garden he developed chest heaviness, became short of breath and collapsed to the ground. His wife witnessed him grasping his chest, he appeared pale but did not lose consciousness. His symptoms resolved with a cup of tea within 15 minutes but he remained short of breath and not quite right. He was a fit gentleman with type 2 diabetes and hypertension but had been unwell for several weeks with a chest infection.

On arrival he was pain free, saturations were 92% on room air and he was haemodynamically stable. ECG showed a sinus tachycardia with new T wave inversion anterolaterally. CXR was normal as were FBC and U+Es. He was treated with aspirin, clopidogrel and enoxaparin and admitted to the medical admissions unit. The twelve hour Troponin T was raised at 0.8ug/l. He was diagnosed with NSTEMI and ACS treatment continued. As his six month predicted mortality was high he underwent in-patient coronary artery angiography which confirmed coronary disease but no lesions requiring PCI. He was discharged home with secondary prevention (aspirin, clopidogrel, β-blocker and statin) plus his usual medications.

One week later he was readmitted following a similar collapse and increasing shortness of breath. D-dimer was elevated at 4822 ng/mL. CTPA showed a large pulmonary embolus. He was commenced on anticoagulants and discharged six days later.

This case highlights alternative causes for elevated troponins, the high prevalence of cardiovascular risks and limitations of conventional scoring systems.

The Global Registry of Acute cardiac events (GRACE)

GRACE is an established scoring system that predicts six month mortality in patients with unstable angina or NSTEMI. By using a simple calculator reflecting patient age, heart rate, systolic blood pressure, creatinine, clinical presentation, ST segment deviation and elevated cardiac markers, the probability of death in hospital and at six months can be calculated. This should guide further management regarding medication, percutaneous intervention (PCI) and coronary artery bypass grafting.

Top tips

The relief of chest pain by GTN does not predict a cardiac source. A retrospective study of 251 emergency department patients with chest pain found that 88% of patients who had cardiac chest pain and 92% of patients with non-cardiac chest pain reported some relief after receiving sublingual nitroglycerine.

A meta-analysis by Panju et al reported likelihood ratios for ACS based on clinical features and found that radiation to both arms had the strongest association with ACS.

Not all troponin positive cases of chest pain will be due to an MI. Remember alternative diagnoses and
Red flags to alert a possible diagnosis of ACS

Known coronary artery disease
Clammy, unwell patient
Exertional chest pain
Heavy, tight, pressure type chest pain
Pain radiating to left arm, right shoulder or both arms
Association with nausea or vomiting
Known history of coronary artery disease
Family history of premature coronary artery disease
Male sex
New ECG changes: ST elevation, pathological Q waves, LBBB, ST depression, T wave inversion
Positive Troponin

the universal definition of an MI. If your patient has an abnormal ECG (eg. LBBB) it is useful to give them a copy.

Conclusion

Chest pain is one of the most frequent complaints in the elderly population presenting to hospital. The incidence of coronary artery disease and other comorbidities are high. Elderly patients with ACS commonly present with atypical symptoms and non-specific examination findings, making diagnosis and management challenging. The frequency of misdiagnosis is high, leading to poorer outcomes. A comprehensive geriatric assessment with high clinical suspicion is required to improve patient care.

Conflict of interest: none declared

References

16. Lane D, Beevers M, Barnes N, et al. Inter-arm differences in blood pressure: When are they clinically significant? J Hypertens 2002; 20: 1089–95