References

1 Pribila BA, Hertzler SR, Martin BR, Weaver CM, Savaiano DA. Improved lactose digestion and intolerance among African-American adolescent girls fed a dairy-rich diet. *J Am Diet Assoc* 2000;100:524–8.
2 Bulhões AC, Goldani HA, Oliveira FS *et al.* Correlation between lactose absorption and the C/T-13910 and G/A-22018 mutations of the lactase-phlorizin hydrolase (LCT) gene in adult-type hypolactasia. *Braz J Med Biol Res* 2007;40:1441–6.
3 Tishkoff SA, Reed FA, Ranciaro A *et al.* Convergent adaptation of human lactase persistence in Africa and Europe. *Nat Genet* 2007;39:31–40.
4 Matthews SB, Waud JP, Roberts AG, Campbell AK. Systemic lactose intolerance: a new perspective on an old problem. *Postgrad Med J* 2005;81:167–73.
5 Heyman MB. Lactose intolerance in infants, children, and adolescents. *Pediatrics* 2006;118:1279–86.
6 Singh KD, Bhasin DK, Rana SV *et al.* Effect of Giardia lamblia on duodenal disaccharidase levels in humans. *Trop Gastroenterol* 2000;21:174–6.
7 Swagerty DL Jr, Walling AD, Klein RM. Lactose intolerance. *Am Fam Physician* 2002;65:1845–50.
8 Montalto M, Curigliano V, Santoro L *et al.* Management and treatment of lactose malabsorption. *World J Gastroenterol* 2006;12:187–91.

Address for correspondence: Dr M Heydtmann, Southern General Hospital, Glasgow G51 4TF.
Email: m.heydtmann@bham.ac.uk

Clinical Medicine 2010, Vol 10, No 4: 409–11

lesson of the month (2)

Acute aortic dissection with a high D-dimer and pleuritic chest pain in an airline passenger

D-dimer can be significantly elevated in acute aortic dissection and poses a diagnostic challenge in someone with pleuritic chest pain occurring after a flight. Electrocardiogram abnormalities in isolated acute aortic dissection may mimic other acute cardiovascular conditions.

Lesson

A 68-year-old previously fit Caucasian man was admitted from Heathrow airport complaining of chest pain. He was in transit, having flown from France, and was lifting his cabin baggage on his connecting flight when he complained of pain in his left temple. The pain moved to the left side of his face and then to the centre of his chest. The chest pain was sharp, pleuritic and severe associated with shortness of breath, sweatiness, nausea and the patient feeling hot. It eased with glyceryl trinitrate spray provided by the London Ambulance Service (LAS) but worsened after he had reached the emergency department (ED). Past medical history included diet-controlled hyperlipidaemia and mild hypertension, treated with atenolol.

Arjun K Ghosh, specialty registrar in cardiology; **Freya M Lodge,** F2 in acute medicine; **Simon W Dubrey,** consultant cardiologist
Hillingdon Hospital, Uxbridge

The patient was tired and pale with cool peripheries. Blood pressure was 99/62 mmHg, oxygen saturation 96% on room air and pulse 58 beats per minute. Pulses and blood pressure were equal between the arms. First and second heart sounds were audible along with a soft systolic murmur in the aortic area. Mild bibasal crepitations were heard in the chest. The abdomen was soft and non-tender with no organomegaly detected. No neurological deficit was found.

Arterial blood gas (ABG) sampling while breathing room air showed a (normal ranges in brackets) pH of 7.39 (7.35–7.45), pCO_2 of 4.31 KPa (4.67–6.40), pO_2 of 9.91 KPa (11.10–14.40), HCO_3- of 21.2 mmol/l, lactate of 3.2 mmol/l (0.5–1.6) and base excess of −3.8. A chest radiogram (CXR) was unremarkable. Electrocardiogram (ECG) showed 0.5–1 mm concave ST segment elevation in leads II, aVF and V2–6 (Fig 1), mimicking the ECG appearance of pericarditis.

Given the chest pain and ECG changes acute coronary syndrome (ACS) was diagnosed by the ED and 300 mg of clopidogrel and clexane (1 mg/kg body weight twice daily) were administered. The patient had already been given 300 mg aspirin by the LAS.

At the time of review by the acute medical team the D-dimer result was 3,520 μg/l (0–275). Five hour troponin I was also mildly positive at 0.10 μg/l (0–0.04). Full blood count and urea and electrolyte levels were within normal range. At this point the differentials included pulmonary embolus (PE) (given the history of the flight, pleuritic chest pain, slightly elevated troponin and significantly

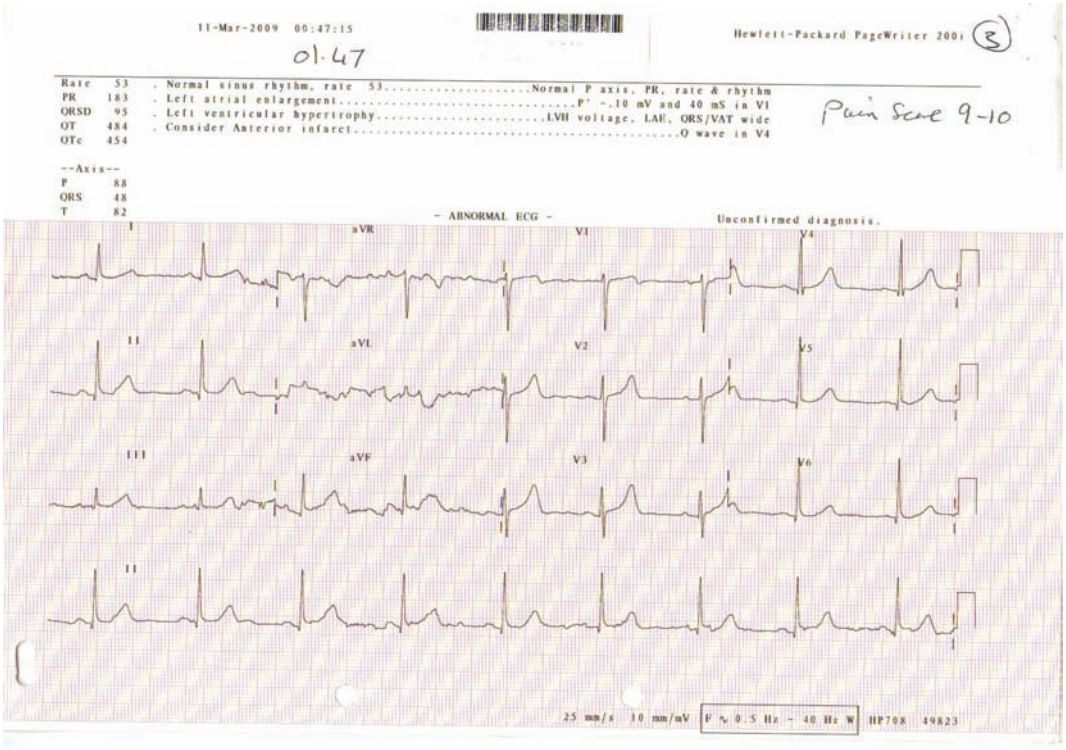

Fig 1. Electrocardiogram on admission.

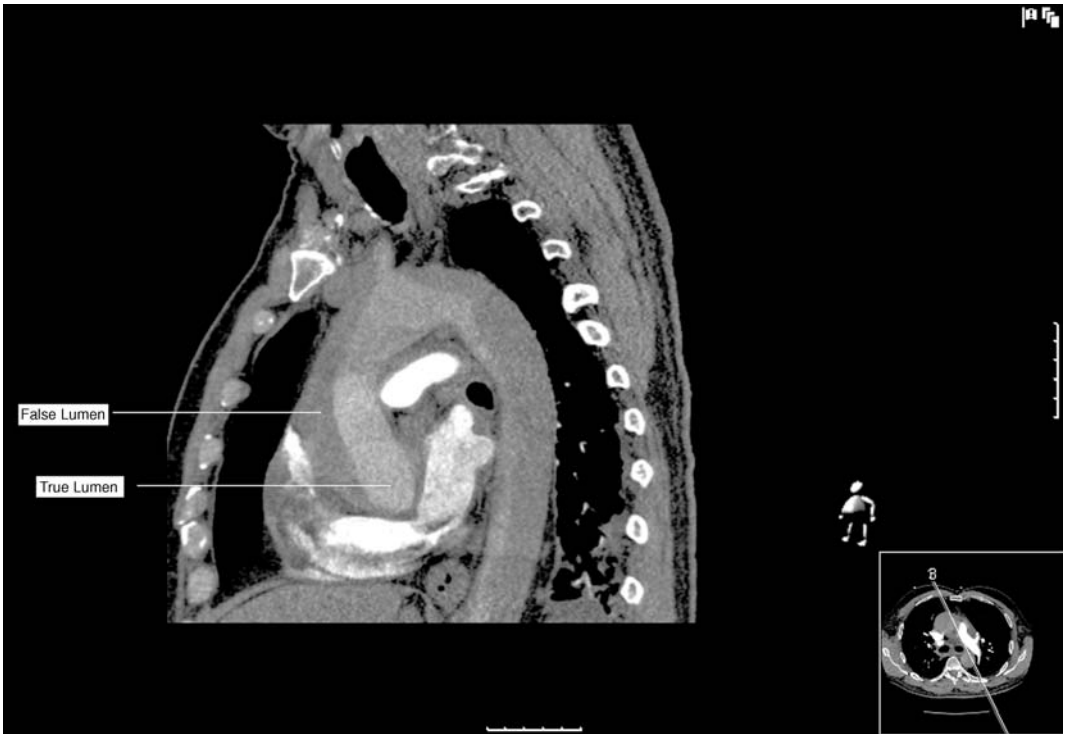

Fig 2. Computed tomograpthy pulmonary angiography image showing aortic dissection.

elevated D-dimer value), acute coronary syndrome (given the ECG changes and troponin rise, but in the context of atypical chest pain) and myopericarditis (given the ECG changes, chest pain worse with inspiration and slight troponin rise).

Portable echocardiography showed normal left and right heart function, a mildly dilated aortic root (3 cm at the proximal ascending aorta, normal range between 1.4–2.9 cm) and no evidence of pericardial effusion.

Computed tomography pulmonary angiography (CTPA) was performed. This did not show evidence of PE but did show an extensive Stanford type A/DeBakey type 1 aortic dissection originating at the aortic arch and extending to the diaphragm (Fig 2).

The patient was transferred as an emergency to the local tertiary cardiothoracic centre where in spite of an eight-hour operation involving aortic root and valve replacement and then coronary artery bypass surgery (left internal mammary artery to left anterior descending artery and saphenous vein graft to first obtuse marginal artery) he died on the operating table. (Coronary artery bypass grafting was attempted as while trying to wean the patient off cardiopulmonary bypass there was global ST segment elevation on the ECG and very poor ventricular contraction.)

Discussion

Acute aortic dissection (AAD) is uncommon but complications develop rapidly and the outcome is often fatal.[1] Mortality rates for type A AAD remain above 30% in a variety of series.[1–3] It is often misdiagnosed as myocardial infarction, PE, pericarditis and even as a cerebrovascular event (usually through dissection extending to the carotid arteries).[1] In one series nearly one third of AAD cases were initially misdiagnosed.[4] Classical signs and symptoms are often not present (sharp chest pain more often than tearing, pulse deficit is only present in 20% and the murmur of aortic regurgitation is audible in 44% of patients with type A AAD).[1] In 12.4% of patients with AAD the chest radiograph is normal.[1] The teaching in the past has been to move away from a diagnosis of AAD and focus on myocardial ischaemia if the ECG is abnormal.[5,6] On occasion, dissection and myocardial ischaemia may occur together and it is interesting to note that the ECG was abnormal in two-thirds of patients with isolated AAD in one registry.[1]

Hillingdon Hospital is the local hospital for Heathrow airport. Over a 12-month period (March 2008 to February 2009), 88 patients were admitted with acute PE and only two with AAD. In this case PE was the leading differential diagnosis. The significantly elevated D-dimer level seemed to support this. However, a subsequent literature review showed that at least 30 recent publications demonstrated a relationship between elevated D-dimer levels in the presence of AAD.[7–9]

Serum D-dimer is elevated when there is endogenous fibrinolytic activity which counteracts the activation of the extrinsic pathway of the coagulation cascade.[10] In AAD this cascade is triggered by exposure to tissue factor from the dissected aorta.[11] The value of D-dimer testing in AAD has been evaluated in over 400 patients where it has been shown that AAD can be excluded with a sensitivity of 100% if the D-dimer level is less than 0.1 μg/ml and with a sensitivity of 99% if the value is less than 0.5 μg/ml.[12] Cut-off values vary from hospital to hospital, however, as do the assay methods, and thus creating a universal cut-off would be difficult. Other studies have shown that the level of D-dimer elevation correlates with the anatomical extent of the dissection and with the delay form the onset of symptoms to laboratory testing.[13,14] D-dimer levels can also be used to predict prognosis.[11] Ohlmann *et al* showed that there was no positive correlation between C-reactive protein, lactate dehydrogenase and leucocyte levels and the presence of AAD (unlike with D-dimer).[14]

Computed tomography (CT) is the most common imaging tool used to diagnose AAD followed by transoesophageal echocardiography (TOE). Although magnetic resonance imaging (MRI) has the highest sensitivity and specificity, availability is often an issue.[1]

In conclusion, AAD can often present with non-classical features and should be part of the differential in any patient presenting with chest pain and a raised D-dimer. Conversely a negative D-dimer is likely to rule out AAD in someone of low risk but imaging (CT, TOE, MRI) would be recommended in the context of a negative D-dimer with moderate to high suspicion of AAD.[12]

References

1 Hagan P, Nienaber C, Isselbacher E *et al.* The International Registry of Acute Aortic Dissection (IRAD): new insights into an old disease. *JAMA* 2000;283:897–903.
2 Von Bierbrauer A, Dilger M, Fink T. Acute aortic dissection – vascular emergency with numerous pitfalls. *Vasa* 2008;37:53–9.
3 Tsai T, Nienaber C, Eagle K. Acute aortic syndromes. *Circ* 2005;112:3802–13.
4 Asouhidou I, Asteri T. Acute aortic dissection: be aware of misdiagnosis. *BMC Res Notes* 2009;20:25.
5 Eagle K, DeSanctis R. Aortic dissection. *Curr Probl Cardiol* 1989;14:225–78.
6 Slater E, Desanctis R. The clinical recognition of dissecting aortic aneurysm. *Am J Med* 1976;60:625–33.
7 Eggebrecht H, Naber CK, Bruch C *et al.* Value of plasma fibrin D-dimers for detection of acute aortic dissection. *J Am Coll Cardiol* 2004;44:804–9.
8 Sodeck G, Dornanovits H, Schillinger M *et al.* D-dimer in ruling out acute aortic dissection: a systematic review and prospective cohort study. *Eur Heart J* 2007;28:3067–75.
9 Weber T, Hogler S, Auer J *et al.* D-dimer in acute aortic dissection. *Chest* 2003;123:1375–8.
10 Weber T, Auer J, Eber B *et al.* Value of D-dimer testing in acute aortic dissection. *Circ* 2004;109:E24.
11 Weber T, Rammer M, Auer J *et al.* Plasma concentrations of D-dimer predict mortality in acute type A aortic dissection. *Heart* 2006;92:836–7.
12 Sodeck G, Domanovtis H, Schillinger M *et al.* D-dimer in ruling out acute aortic dissection: a systematic review and prospective cohort study. *Eur Heart J* 2007;28:3067–75.
13 Weber T, Hogler S, Auer J *et al.* D-dimer in acute aortic dissection. *Chest* 2003;123:1375–8.
14 Ohlmann P, Faure A, Morel O *et al.* Diagnostic and prognostic value of circulating D-dimers in patients with acute aortic dissection. *Crit Care Med* 2006;34:1358–64.

Address for correspondence: Dr AK Ghosh, Department of Cardiology, Hillingdon Hospital, Pield Heath Road, Uxbridge UB8 3NN. Email: arjunkg@doctors.net.uk