Reminder of important clinical lesson

D-dimer is elevated in acute aortic dissection

Thomas Martin, Sohail Shariq

Acute Medical Unit, Ealing Hospital, London, UK

Correspondence to Thomas Martin, thomas.martin@cantab.net**Summary**

This case illustrates that d-dimer is elevated in patients with acute aortic dissection. A 49-year-old woman presented with central, crushing chest pain exacerbated on inspiration. The chest pain was associated with right-leg numbness and pain, although peripheral pulses and blood pressures were normal. Routine bloods demonstrated an elevated d-dimer with a normal ECG and chest x-ray radiograph. A differential diagnosis of pulmonary embolism and acute aortic dissection was made. CT-angiogram showed type B aortic dissection. This case report highlights the mounting evidence that d-dimer is elevated in practically all incidents of aortic dissection and could be useful as a negative predictive marker.

BACKGROUND

Acute aortic dissection is a comparatively uncommon cause of acute onset chest pain. However, given the high mortality associated with it, acute dissection must always be on the acute physician's differential diagnosis. Classical signs and symptoms are often absent, so any simple investigation

that could potentially guide management would be extremely useful.

D-dimer has been shown in various case series to be a useful marker of acute aortic dissection with a sensitivity of 95–100%, and hence, of useful negative predictive value. In certain situations (as in the one follows), it may also have

Figure 1 Dissection of the descending aorta with intimal flap dividing false and true lumen (tip of arrow).

positive predictive value. The European Society of Cardiology recommends requesting d-dimer in patients with suspected acute aortic dissection, so it is important the acute physician is able to interpret the results appropriately.¹

In what follows, we describe a case where a patient with acute aortic dissection was admitted with chest pain, neurological symptoms in the right leg and a d-dimer of 2904 ng/ml (normal <500 ng/ml).

CASE PRESENTATION

A 49-year-old woman presented to the acute medical team with a 7-h history of sudden-onset, severe chest pain that was crushing in nature with no radiation to the back, arm or neck. The pain was exacerbated on inspiration, and the onset was associated with right-leg pain and numbness. Systolic blood pressures were equal in both arms, there were no murmurs auscultated and neurological examination revealed decreased sensation to pinprick in the right foot. Peripheral pulses were present. Routine bloods were normal aside from a d-dimer of 2904 ng/ml (normal <500 ng/ml). Further questioning revealed the patient's son had died from an acute type B aortic dissection and that she was under investigation for a dilated aortic route. No genetic syndrome to link the patient and her son had been identified. A differential diagnosis of aortic dissection and pulmonary embolism was formed.

INVESTIGATIONS

CT pulmonary angiogram showed no filling defect of the pulmonary vasculature; however, CT angiogram subsequently confirmed type B acute aortic dissection originating just distal to the left subclavian artery and extending down the entire length of the aorta and continuing into the right common femoral artery (figure 1). Transthoracic echocardiogram showed a mildly dilated aortic route with minor aortic regurgitation and no intimal flap.

Table 1 Associated factors of patients presenting with acute aortic dissection in IRAD

Male sex
Hypertension
Atherosclerosis
Previous cardiovascular surgery
Aortic aneurysm
Marfan's syndrome
Iatrogenic (relating to coronary catheterisation)
Bicuspid aortic valve
Diabetes
Pregnancy (<1%)
Cocaine abuse (<1%)
IRAD, International Registry of Acute Aortic Dissection.

TREATMENT

The patient received an intravenous labetalol infusion to control her blood pressure and was transferred urgently to a tertiary vascular unit where it was decided to manage the dissection medically.

DISCUSSION

Acute aortic dissection is a potentially life-threatening break in the lining of the main artery leaving the heart.² It is an uncommon disease with a reported incidence in the range of 3–4 per 100 000 people per year, but remains an important differential in cases of chest pain due to its high mortality in the region of 25–60%.^{3 4}

Diagnosis in the emergency room is often hampered by the absence of clear-cut clinical features, a wide range of common differential diagnoses for chest pain and the lack of simple diagnostic investigations.⁵ The International Registry of Acute Aortic Dissection (IRAD) has accumulated the largest database of aortic dissections to date in an attempt to

Chart 1 Presenting features of patients with dissection in the IRAD.

characterise the disease further. Common comorbidities and presenting features of patients entered in IRAD are shown in table 1 and chart 1.^{6 7}

One of the dilemmas faced by admitting physicians is whether to proceed to definitive imaging with CT or MRI. It is clearly impractical to advise scanning of all patients that present with chest pain, yet chest pain is commonly the sole presenting feature in cases of acute aortic dissection.⁵ Whereas chest radiograph, electrocardiograph and echocardiography are used as simple non-invasive investigations, they all either lack sensitivity or specificity.

The use of d-dimer as a useful investigation for acute aortic dissection was first reported in a small case series by Weber *et al* in 2003.⁸ Subsequent meta-analyses have generally demonstrated a sensitivity of between 95% and 100% with a cut-off value of 500 ng/ml, providing a useful and simple rule-out test for suspected cases of acute aortic dissection.^{9 10} A recent prospective multicentre substudy of IRAD, IRAD-Bio, which enrolled 220 patients with suspected aortic dissection also confirmed these findings.¹¹ In addition, it demonstrated that greater sensitivity and specificity could be achieved if the sample for analysis was taken within 6 h of onset of symptoms.

One of the drawbacks of d-dimer as a test for aortic dissection is its lack of specificity. However, the IRAD-bio data have shown that if a cut-off value of 1600 ng/ml (normal <500 ng/ml) were used on patients presenting within 6 h of onset of pain, it would generate a positive likelihood ratio of 12.8. Thus, in a group of people with suspected aortic dissection, a high d-dimer could identify those with a high probability of disease. Whether integrating these findings into chest pain algorithms would decrease the need for further imaging or increase correct diagnoses remains to be seen in prospective studies.

Considering the high mortality rate associated with the disease, it is unlikely that physicians will rely on any one test, unless it has very high sensitivity and specificity, to reliably include or exclude acute aortic dissection. However, for a select group of patients the risk of acute aortic dissection can be reduced to virtually zero. For example, in high-risk patients, the probability of dissection can be reduced from 50% to 7% by the absence of tearing or ripping pain, pulse or blood pressure differentials, and mediastinal widening on chest x-ray radiograph.¹² If combined with a negative d-dimer, the post-test probability would be negligible obviating the need for further investigations such as CT or MRI.¹⁰

Learning points

- ▶ Consider using d-dimer in cases of acute chest pain alongside routine investigations such as trans-thoracic echocardiogram, ECG and chest x-ray radiograph.
- ▶ If clinical suspicion of acute aortic dissection is low, d-dimer could be a useful investigation to effectively rule out dissection.
- ▶ In suspected cases of aortic dissection, a d-dimer greater than 1600 ng/ml suggests high probability of disease.

Competing interests None.

Patient consent Obtained.

REFERENCES

1. **Erbel R**, Alfonso F, Boileau C, *et al*. Diagnosis and management of aortic dissection. *Eur Heart J* 2001;**22**:1642–81.
2. **Golledge J**, Eagle KA. Acute aortic dissection. *Lancet* 2008;**372**:55–66.
3. **Tsai TT**, Fattori R, Trimarchi S, *et al*. Long-term survival in patients presenting with type B acute aortic dissection: insights from the International Registry of Acute Aortic Dissection. *Circulation* 2006;**114**:2226–31.
4. **Rampoldi V**, Trimarchi S, Eagle KA, *et al*. Simple risk models to predict surgical mortality in acute type A aortic dissection: the International Registry of Acute Aortic Dissection score. *Ann Thorac Surg* 2007;**83**:55–61.
5. **Burt CW**. Summary statistics for acute cardiac ischemia and chest pain visits to United States EDs, 1995-1996. *Am J Emerg Med* 1999;**17**:552–9.
6. **Collins JS**, Evangelista A, Nienaber CA, *et al*. Differences in clinical presentation, management, and outcomes of acute type A aortic dissection in patients with and without previous cardiac surgery. *Circulation* 2004;**110**(11 Suppl 1):II237–42.
7. **Suzuki T**, Mehta RH, Ince H, *et al*. Clinical profiles and outcomes of acute type B aortic dissection in the current era: lessons from the International Registry of Aortic Dissection (IRAD). *Circulation* 2003;**108**(Suppl 1):II312–17.
8. **Weber T**, H gler S, Auer J, *et al*. D-dimer in acute aortic dissection. *Chest* 2003;**123**:1375–8.
9. **Sodeck G**, Domanovits 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.
10. **Marill KA**. Serum D-dimer is a sensitive test for the detection of acute aortic dissection: a pooled meta-analysis. *J Emerg Med* 2008;**34**:367–76.
11. **Suzuki T**, Distant A, Zizza A, *et al*. Diagnosis of acute aortic dissection by D-dimer: the International Registry of Acute Aortic Dissection Substudy on Biomarkers (IRAD-Bio) experience. *Circulation* 2009;**119**:2702–7.
12. **von Kodolitsch Y**, Schwartz AG, Nienaber CA. Clinical prediction of acute aortic dissection. *Arch Intern Med* 2000;**160**:2977–82.

This pdf has been created automatically from the final edited text and images.

Copyright 2010 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>.

BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Please cite this article as follows (you will need to access the article online to obtain the date of publication).

Martin T, Shariq S. D-dimer is elevated in acute aortic dissection. *BMJ Case Reports* 2010;10.1136/bcr.04.2010.2943, date of publication

Become a Fellow of BMJ Case Reports today and you can:

- ▶ Submit as many cases as you like
- ▶ Enjoy fast sympathetic peer review and rapid publication of accepted articles
- ▶ Access all the published articles
- ▶ Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow