NON-TRAUMATIC AORTIC DISSECTION: A PRIMER (SHORT VERSION)

Why the fuss about aortic dissection (AD)?

Unoperated mortality is 1-2%/hour in type A AD. AD is misdiagnosed in up to 39% of cases. ~4000 cases/year in UK, of whom only 1200 survive to hospital admission. For type A AD, there is a 100% chance of mortality without surgery, falling to a 20-30% risk of mortality after cardiac surgery. Therefore, timely and accurate diagnosis are very important.

Demographics/Risk factors

- Mean age = 61.5 yr (type A), 63.6 yr (type B). AD affects all age groups, however, including (very rarely) children. M:F 2:1.
- **PMH:** Hypertension (in 77%), atherosclerosis (27%), cardiac surgery (16%), aortic aneurysm (16%), aortic aneurysm/AD (9%), AVR (5%), Marfan syndrome (4%), iatrogenic e.g. coronary angiography (3%), bicuspid AV (9% in under-40s; 1% in older pts).
- Family history of aortic disease in 10-11%. See full version of primer for comprehensive risk factor list.

History

- Pain – location: Anywhere (96%), anterior chest (61%), back (53%), posterior chest (36%), abdomen (30%).
- Pain – description: Severe or worst-ever (91%), abrupt onset (85%), sharp (64%), tearing or ripping (51%), radiating (28%), migrating (17%).
- Syncope (9%). Shortness of breath, sweating, or nausea may be present.
- Think of AD as 'the subarachnoid haemorrhage of the torso' – with pain typically reaching maximum severity within seconds of onset (compare e.g. acute coronary syndrome, where pain onset is typically over a few mins). Obviously, these are not hard rules, they are just a guide. Pain may resolve completely, become intermittent, or persist. On return, pain may have moved elsewhere. Pain above and below the diaphragm is a classical presentation.
- The aorta supplies the whole body, and so symptoms can occur anywhere in the body. Symptoms may be positive (e.g. vomiting, diarrhoea, headache, neck pain, tingling, blurred vision) or negative (e.g. LoC, visual loss, numbness, weakness, urinary retention), and may be transient, recurring or persistent. See full primer.
- Apparently minor transient symptoms may be brushed over in the history despite high significance.
- Torso pain + neurological or vascular symptoms is highly concerning for dissection (unless typical sciatica, etc). More dramatic symptoms (e.g. weakness) may overshadow preceding pain.
- Severe, colicky chest pain? Can't get comfortable on trolley? Think AD. See full primer for pain descriptions.
- Common factors in misdiagnosis: Perceived mildness of illness (pain is not always severe and may be absent from the history), ambulatory patients, features of cardiac ischaemia, the clinician choosing a final diagnosis which only partly explains the patient's symptoms e.g. gastroenteritis, MSK pain, radiculopathy.

Examination

- Blood pressure: Systolic BP ≥ 150 mmHg (49%); 100-149 (35%), 81-99 (8%), <80 (shock/tamponade – 8%)
- Inter-arm BP differential >20 mmHg (30%)
- Aortic regurgitation (32%), pulse deficit (15%), CCF (7%), CVA (5%). Perhaps surprisingly, fever is common.

Investigations

- ECG: Normal (30%), non-specific ST/T wave changes e.g. LVH/strain (42%), ischaemia (15%).
  Conduction blocks of varying severity may be seen, and the presence of relatively minor conduction blocks (e.g. 1st degree heart block, partial bundle branch block) may be a clue to the diagnosis.
- CXR: Widened mediastinum and abnormal aortic contour are common. CXR may be normal. See full primer.
- Bloods: Often reveal a stress response. Inflammatory markers, troponin and D-dimer commonly elevated. See full primer.
- CT aorta: The investigation of choice for the vast majority of patients with suspected AD. Scans must be ECG-gated or dual-source high-pitch ('flash protocol') to accurately characterise the dissection flap/minimise motion artefact. A non-dedicated CT scan of the thorax (or abdomen) such as a CTPA is not an acceptable alternative scan for diagnosing AD.
- Transthoracic echocardiogram may diagnose pericardial effusion, aortic dissection flap, ascending aorta and aortic arch aneurysm, and abnormalities with the aortic valve. However, sensitivity is inferior to CT.

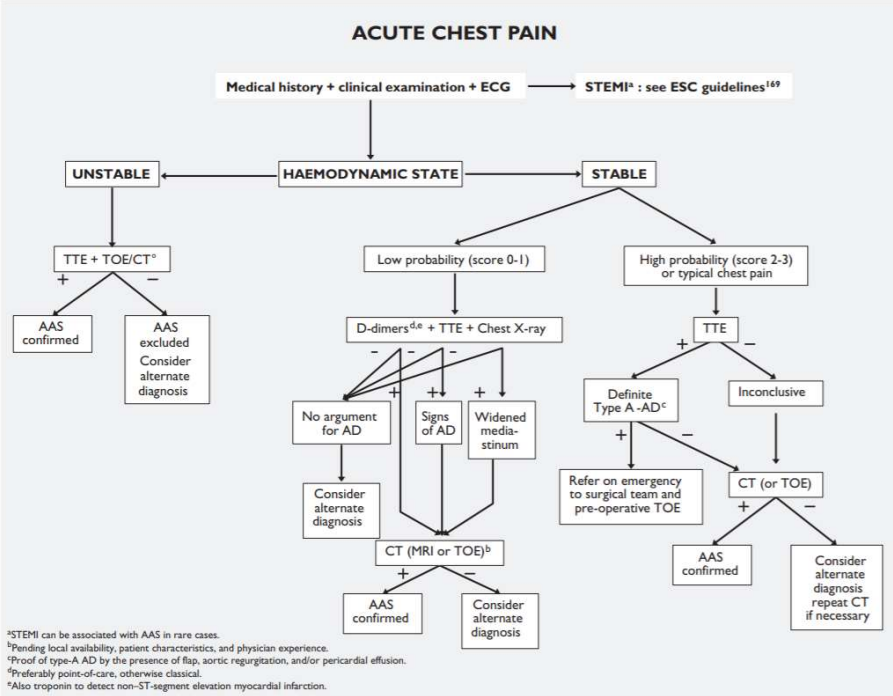
Management

- Liberal opiate analgesia (+ antiemetic). Reduction of pain helps reduce shear stress on the aorta and complications.
- Review CT images with EM consultant/ST4+ immediately (+/- refer) whilst waiting for formal report.
- Contact cardiac surgery for aortic dissections proximal to the left subclavian artery, and vascular surgery for more distal aortic dissections. Critical care admission will be required.
- Aggressive heart rate and BP reduction with IV labetalol. See Treatment of Aortic Dissection SOP.
- Nil by mouth, bloods including G&S(s)/cross-match, catheter, arterial line (do not delay transfer to theatre for this).

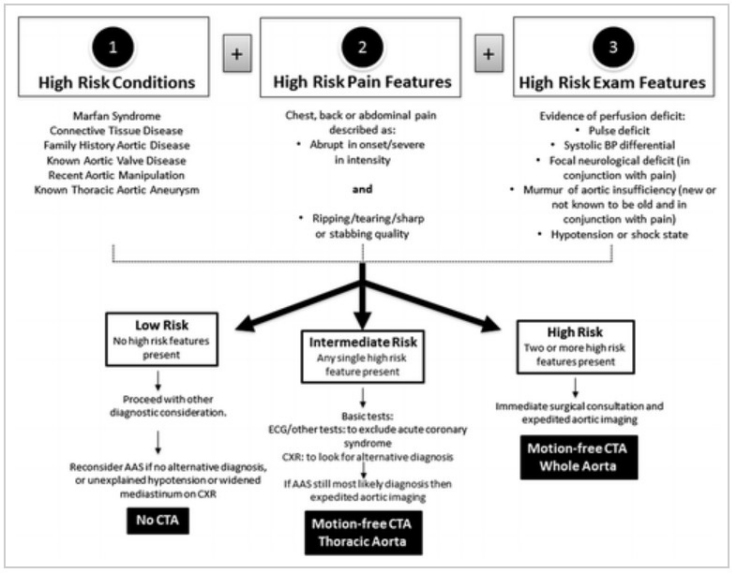
Diagnostic strategies

No algorithm can replace a considered assessment by an experienced clinician. However, the **European Society of Cardiology's recommended decision-making flow-chart** (2014) is presented below. In the algorithm, patients may score a **maximum of 1 point in each of the 3 'high-risk' categories**, giving a probability score of 0-3 (note, however, that the presence of typical chest pain puts the patient on the 'high probability' side of the algorithm automatically):

High-risk conditions	High-risk pain features	High-risk examination features
• Marfan syndrome (or other connective tissue diseases) • Family history of aortic disease • Known aortic valve disease • Known thoracic aortic aneurysm • Previous aortic manipulation (including cardiac surgery)	• Chest, back, or abdominal pain described as any of the following: - abrupt onset - severe intensity - ripping or tearing	• Evidence of perfusion deficit: - pulse deficit - systolic blood pressure difference - focal neurological deficit (in conjunction with pain) • Aortic diastolic murmur (new and with pain) • Hypotension or shock



The British Institute of Radiology's '**Risk stratification for acute aortic syndrome and appropriate management strategy**' is also useful, and reflects the wide availability of CT compared to other imaging modalities in UK practice:



In the case of initially -ve imaging with persistence of suspicion of AD, repeat imaging (CT or MRI) is recommended (ESC 2014).

Dr Charles Gallaher, September 2020. With thanks to Dr Will Glazebrook, Prof Peter Holt and Prof Marjan Jahangiri