Aortic Dissection

Pathophysiology

- Aortic lining intima tear (usually <3cms distal to AoV or left SC artery) → haemorrhage into false lumen → double lumen aorta.
- Dissection can result in
  - Occlusion of aortic branches organ → ischaemia
  - False lumen rupture back into aorta or into mediastinum, pericardium, GIT or IVC

Table 1	European Society of Cardiologists' classification of acute aortic syndrome
Classification	**Pathology**
Type 1	Classic dissection with true and false lumens separated by the dissecting membrane
Type 2	Intramural haematoma
Type 3	Discrete dissection with a bulge at the tear site but no haematoma
Type 4	Penetrating aortic ulcer
Type 5	Traumatic or iatrogenic dissection

Epidemiology

- Commonest emergency affecting the aorta. 3-4:100,000 per year. 25% PM diagnosis
- 2M:1F
- Usual age range: 50-70y & rare <40y unless inherited, congenital, iatrogenic conditions.

Risk Factors

- HT in up to 75%
- Atherosclerosis & so smoking and ↑cholesterol.
- Genetic: Marfan's, Turner's, Ehlers-Danlos type IV, familial thoracic aortic aneurysm types 1 & 2
- Cong bicuspid AoV & coarctation of aorta.
- Cocaine use
- Arteritis (Takayasu, Giant Cell), syphilis
- Pregnancy
- Iatrogenic dissection (*Cx* of cardiac catheterisation, cardiopulmonary bypass or balloon valvotomy).
- Trauma

DeBakey classification

Type I Originates in the ascending aorta; propagates at least to the aortic arch and often beyond it distally
Type II Originates in and is confined to the ascending aorta
Type III Originates in the descending aorta and extends distally down the aorta or, rarely, retrograde into the aortic arch and ascending aorta

Stanford classification

Type A All dissections that affect the ascending aorta, regardless of the site of origin
Type B All dissections that do not affect the ascending aorta

Starting Site

Asc aorta: 50%, Arch: 30%, and Distal aorta: 20%

Classifications

Stanford classification classifies dissections into type A & type B.

- Type A involves ascending aorta (DeBakey types I & II) 60-70%
- Type B does not involve the ascending aorta (DeBakey type III).

DeBakey classification:

- Type I: ascending aorta, aortic arch, and descending aorta.
- Type II: ascending aorta only
- Type III: descending aorta distal to left SCA, IIIa stops before & IIIb after diaphragm

Assessment

Can be quite variable.

History: >90% have pain – sudden severe, worst-ever pain of short duration. 75% chest (A>B), 50% back (B>A) and 30% abdo pain. Sharp (65%) or tearing (50%). Radiates in 30% to back, arms, chest, abdo. Neurological features (15-40%) – syncope, TIA, focal neurological deficits (this plus *CP* = very likely dissection).
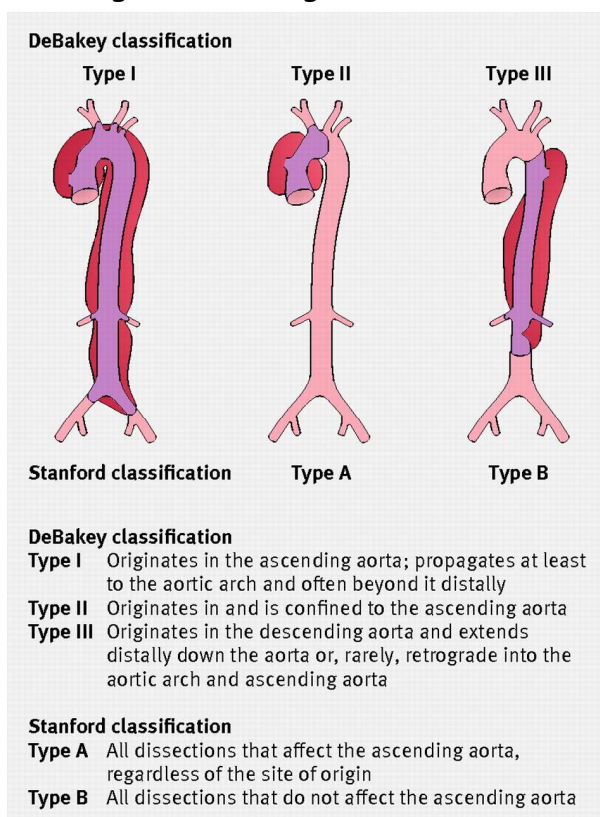
Examination: ~50% have ↑BP (B>A), unequal pulses (<40%), BP diff>20mmHg significant, may have diastolic murmur of AR (A>B), S3 or Austin Flint murmur. Evidence of tamponade (25% in A). Also may have signs of CVA/TIA, limb ischaemia, visceral ischaemia, paraplegia or Horner's.

Investigations

Bloods: FBC, UEC, Trop/CK, coags, XM, D-Dimer, [smooth muscle myosin heavy chain not useful]

ECG: 70% abnormal (non-specific ST-T wave changes, LVH or ischaemic changes - <5% have pattern indication for thrombolysis – which would be **disastrous** if given)

Imaging:

- CXR – cannot conclusively diagnose or exclude dissection, but 90% abnormal including:
    - Wide mediastinum in 60% (AP supine>8cm; PA erect>6cm or >25% chest width)
    - Obscured aortic knob; abnormal aortic contour
    - Ring sign - separation of aortic knuckle calcification > 5-10mm
    - Apical cap (i.e. pleural blood)
    - Left pleural effusion
    - Deviation of nasogastric tube rightward
    - Deviation of trachea rightward and/or left main stem bronchus downward
    - Left paraspinal stripe
    - Disparity in ascending/descending aorta size or double density of aorta
    - Loss of aorto-pulmonary window
    - Loss of paratracheal stripe
- Multidetector CT angiography: 100% sens/98% spec. Can't assess AV. SE: contrast, Xrad
- TTE: 80% sens, 90 spec for asc dissections & assessing AV. Not good for desc ones.
- TOE: 98% sens, 95% spec. Less sensitive for distal asc & desc aorta. Op-dependent.
- Aortic angiography (aortogram): ~90% sensitive, ~95% specific. Requires contrast. But can assess involvement of branches. Possibility of cannulating false lumen.
- MRI: 98-100% sensitive & specific but not usually stable enough and not readily available.

Management

Supportive: ABC, O$_2$, analgesia, monitoring, arterial line, CVL, good access (2 x large bore IVC).

Medical:

- Aim BPsys 100-110mmHg with **nitroprusside** titrate 0.25-10µg/kg/min IV or **labetalol** IV
- Intravenous beta blockers (or CCB if COPD) to keep HR 60-80 & as negative inotrope, e.g. **propranolol** 0.5-1mg IV q5min or **esmolol**.

Surgical: (cardiology & cardiothoracic consultations)

- If type A (type I and II) to prevent aortic rupture, tamponade, and relieve AR.
- If type B (distal dissection) often medical Mx unless significant AR, tamponade, leaking aneurysm, major vessel involved (& so limb/visceral ischaemia), or continued dissection.
- **Rel CI**: Poor outcome for type III dissections due to compromise of spinal blood flow.
- Acute dissections with ischaemia are treated usually endovascularly by stenting, graft or aortic fenestrations.
- Chronic dissections continue to be managed by open surgical techniques, usually grafts.
- If the aortic valve is involved it may need resuspension or replacement.

Prognosis

- Up to 20-50% die before reaching hospital, 30% in hospital.
- Operative mortality ~25%.
- Aortic rupture has 80% mortality.
- If undiagnosed: 50% mortality @ 48hrs rising by 1%/hr.