Objectives

“Disease is very old and nothing about it has changed. It is we who change as we learn to recognize what was formally imperceptible.”

Jean Martin Charcot

- Prompt diagnosis
- Management plan
- Minimize morbidity
- Reduce mortality
Epidemiology

- Most common catastrophic disease affecting the Aorta
- 2-3 times more common than ruptured AAA
- Commoner in men 65%
- Mean age 63 Yrs
- Type B dissection in older age
- Woman with dissection are older

Etiology

- **Hypertension**
  - Over 72% of patients with dissection are hypertensive.

- **Arterial wall abnormalities**
  - Atherosclerosis
  - Cystic medial necrosis
  - Collagen disorders (Marfan synd.)
  - Bicuspid aortic valve

- **Abnormal haemodynamics**
  - Pregnancy
  - Coarctation of aorta
Thoracic Trauma

Blunt aortic injury

- 80 - 90% of non penetrating thoracic aortic injury is caused by deceleration

Mechanism

- Differential acceleration and deceleration forces
- Direct compression of sternum and rib cage and with high endoluminal pressure

Site of rupture

- Isthmus 80%
- Descending thoracic aorta 20%
Classification

DeBakey classification

Type I  Type II  Type III a  Type III b

Stanford classification

Type A  Type B
Clinical Presentation

- **Abrupt onset, severe sharp “tearing” chest pain**

- **Syncope** 13%

- **Low cardiac output state**
  - CHF 7%
  - Aortic valve insufficiency 32%
  - Cardiac tamponade

- **Sudden death**
  - Rupture in pericardial cavity and tamponade 70%
  - Ischemia due to shearing off coronary artery 1-2%
  - Free rupture into chest or abdomen

- **Pulse deficit** 19 – 30%

- **Occlusion of major vessels**

Diagnosis

- **Abrupt onset sharp tearing chest pain**
- **Mediastinal / aortic widening on CXR**
- **Pulse variation**
  - >20 mm of Hg BP difference between arms
  - Absence of extremity pulse
  - Absence of carotid pulse

**Chances of acute dissection are:**
- >83% with pulse variation or any combination of three variables
- 7% when all three variable are absent.

*Von Kodolitsch, Arch Intern Med 2000; 160:2977*
European Society of Cardiology Guidelines: Diagnostic Imaging in Acute Aortic Dissection

- Transthoracic echocardiography (TTE) followed by transesophageal echocardiography (TEE).

- Computed tomography (CT chest)


Over 61% of the patients had CT chest as their initial study in IRAD review.

Diagnostic imaging

Chest X-Ray

- Not diagnostic
- Several suggestive findings
- Normal CXR does not rule out dissection !!!!
Pleural cap

Tracheal displacement

Widened mediastinum
CT Scan

- Two distinct aortic lumina:
  - separated by an intimal flap
  - differential rate of contrast opacification

- Spiral CT scan
  - Sensitivity of 96%
  - specificity of 100%

- Associated injuries

Type I aortic dissection with intimal flap from ascending aorta thru descending aorta
TEE

- Two distinct lumina
- Flow in true & false lumen on colour doppler
- Associated cardiac abnormalities
  - Aortic valve assessment
  - Coronary ostia
  - Pericardial sac
- Sensitivity 97 – 99%
- Specificity 100%
  (TEE + TTE combined)

MRI

- High quality images in multiple planes
  - Sensitivity & specificity 98%
- Ideal for the evaluation of patients with
  - Preexisting aortic disease
  - Thoracic aortic aneurysms
  - Previous aortic grafts
- Cine for aortic incompetence.
- Non invasive
- Avoid ionizing radiation
- Limitations

Aortogram
Natural History

- 50% mortality within 48 hours
- 1% per hour increase in mortality for 2 days
- 90% mortality in 2 weeks
- 88% of deaths due to aortic rupture

- Emergency surgery for Aortic dissection is associated with 15 – 30% mortality
Medical Treatment

Aortic shear stress
- mean pressure
- pulse pressure
- maximal rate of rise of the pressure (dp/dt)

- Antiimpulse therapy
  - Control blood pressure
  - Reduce LV contractility
    - Reduce aortic shear stress
  - Beta blockers

- Relieve Pain
## European Society of Cardiology Guidelines: Management of Hemodynamically Unstable Patients with Suspected Aortic Dissection

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Profound hemodynamic instability: intubation and ventilation.</td>
<td>I</td>
</tr>
<tr>
<td>2. Transesophageal echocardiography as the sole diagnostic procedure; call surgeon.</td>
<td>II</td>
</tr>
<tr>
<td>3. Surgery, based on findings of cardiac tamponade by transthoracic echocardiography.</td>
<td>II</td>
</tr>
<tr>
<td>4. Pericardiocentesis (lowers intrapericardial pressure, may cause recurrent bleeding.</td>
<td>III</td>
</tr>
</tbody>
</table>

## Operative indications

<table>
<thead>
<tr>
<th>Acute dissection</th>
<th>Operative indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type A</td>
<td>Presence</td>
</tr>
<tr>
<td>Type B</td>
<td>Rupture</td>
</tr>
<tr>
<td></td>
<td>Malperfusion</td>
</tr>
<tr>
<td></td>
<td>Progressive dissection</td>
</tr>
<tr>
<td></td>
<td>Failure of medical therapy</td>
</tr>
</tbody>
</table>

*Cardiac Surgery in the Adult, 2003:1095-1122*
Surgical intervention

**Indications**

- Prevent aortic rupture
- Correct aortic valve insufficiency
- Prevent coronary malperfusion
- Prohibit cerebral malperfusion
- Prevent extension of dissection
- Reverse or prevent organ ischemia

**Endovascular techniques**

**Objective**
- Cover the intimal flap
- Seal the entry site

<table>
<thead>
<tr>
<th>Type A dissection</th>
<th>Limited experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type B dissection</td>
<td>small numbers</td>
</tr>
</tbody>
</table>

**Meta analysis of 39 studies**
- 609 patients with Type B dissection
- Procedure success: 98%
- Major complications: 21% in acute, 9.1% in chronic
- Mortality: 5.2%

_Eggebrecht, H, Eur Heart J 2006; 27:489._
Results of Treatment

Type A dissection

- Operative mortality 9 - 32%

- Discharged alive after surgery
  - Survival at 1 yrs 96%
  - at 3 yrs 91%
  - at 10 yrs 88%

- Medical treatment
  - Hospital Mortality 56.2%

- Discharged alive after medical treatment
  - Survival at 1 yr 88.6 ± 12.2%
  - at 3 yrs 68.7 ± 19.8%

Tsai, TT et al. IRAD. Circulation 2006; 114:I-350 – I-356
Type B aortic dissection

**Medical management**
- **Hospital mortality**: 10 – 15%
- **Survival at 1 yr**: 73%
- **at 5 yrs**: 58%

**Surgical treatment**
- **Hospital mortality**: 28 – 65%
- **Paraplegia**: 30 - 36%
- **Survival at 1 Yr**: 48%
- **at 5 yrs**: 29%

Type B aortic dissection

Conclusions

- High clinical index of suspicion
- Early diagnosis & intervention (Surgery or stents)
- Mortality & Morbidity is much higher with conservative management for Type A dissection
- Medical treatment has a better immediate and long term prognosis for Type B dissection
- Endovascular stenting is an alternative to surgical treatment for distal aorta
- Continued improvement in ability to prevent, diagnose and manage acute aortic dissections.
Thank You!

shmakh@hotmail.com
Surgical Options
History

- 1st description of aortic dissection by (Sennertus D: Cap. 42 Op Omn Lib 1650; 5:306)
- Hunter, Morgagni in 18th century described cases
- 1st description of term “dissection” (Maunoir JP: Memoires Physiologiques et Practiques Paschoud, 1802)
- Laennec described aneurysmatic property of dissection
- Excision and reconstruction of type III dissection (Debakey 1955)
- Replacement of ascending aorta (Debakey and Cooley 1956)
Aortic dissection is characterised by an intimal tear or intramural disruption in the aorta resulting in a medial cleavage plane and creation of true and a false lumen. Dissection in an already aneurysmal aorta is a dissecting aortic aneurysm.
Predisposing Factors

Hypertension 72%
Cystic medial necrosis
Atherosclerosis
Collagen disorders (Marfan synd.)
Bicuspid aortic valve
Pre-existing aortic aneurysm
Trauma
Surgical manipulation of thoracic aorta
Coarctation of aorta
Pregnancy
Surgical intervention

**Indications**
- Prevent aortic rupture
- Correct aortic valve insufficiency
- Prevent extension of dissection
- Reverse or prevent organ ischemia

**Contraindications**
- Advanced age (Relative contraindication)
- Incurable comorbid disease
- Neurological deficit
  - Coma
  - Focal deficits are not necessarily a contraindication

Thoracic Trauma

- **Penetrating**
- **Non penetrating**

- **80 - 90% of non penetrating thoracic aortic injury is by deceleration caused by**
  - Motor vehicles
  - Fall from height
  - Compression by heavy objects.

- **Mechanism**
  - Differential acceleration and deceleration forces
  - Direct compression of sternum and rib cage and high endoluminal pressure

- **Site of rupture**
  - **Isthmus** 80%
  - **Descending thoracic aorta** 20%