Disclosure

Relevant relationships with commercial entities
None

Potential for conflicts of interest within this presentation
None

Steps taken to review and mitigate potential bias
n/a

Learning Objectives

Define “aneurysm”
List risk factors & epidemiology
Recognize features of rupture
Describe screening & surveillance
List criteria for repair
Describe pre-op assessment
Definition: Aneurysm

“Focal, permanent dilatation of a blood vessel with a diameter ≥ 50% normal adjacent vessel”

Abdominal aortic aneurysm - “AAA” or “Triple A”

> 3.0cm

Abdominal Aortic Aneurysm - Epidemiology

Commonest peripheral aneurysm

Prevalence: 3 - 10% in western males over 50

UK National AAA screening data: ~1.7%

Less common in females (1/6th male incidence)
AAA - risk factors
- Age
- Male
- White
- Smoking
- Hypertension
- Family history of AAA (genetics)

Genetics
- Connective tissue / collagen disorders
  - Marfan’s Syndrome
  - Type IV (vascular) Ehler’s Danlos Syndrome
  - Loeys-Dietz Syndrome

Why does AAA matter?
- Usually slow asymptomatic growth until rupture
- **Rupture** usually a fatal event
- Mortality 80 - 90%
- 10th leading cause of death in males over 55
Rupture Symptoms

- Acute severe abdominal or back pain
- Hypotension (occ. collapse / LOC)
- Tender pulsatile abdominal mass

Rupture risk

<table>
<thead>
<tr>
<th>Diameter (cm)</th>
<th>Rupture Risk (%/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;4</td>
<td>0</td>
</tr>
<tr>
<td>4-5</td>
<td>0.5-5</td>
</tr>
<tr>
<td>5-6</td>
<td>3-15</td>
</tr>
<tr>
<td>6-7</td>
<td>10-20</td>
</tr>
<tr>
<td>7-8</td>
<td>20-40</td>
</tr>
<tr>
<td>&gt;8</td>
<td>30-50</td>
</tr>
</tbody>
</table>

Elective repair mortality approx 5%

Elective repair size: 5.5cm

AAA screening & surveillance with **duplex ultrasound**

Screening: All males 65 and over + 1st degree relatives

Surveillance:

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0 - 4.5cm</td>
<td>12 monthly</td>
</tr>
<tr>
<td>4.5 - 5.0cm</td>
<td>6 monthly</td>
</tr>
<tr>
<td>5.0 - 5.5cm</td>
<td>3 monthly</td>
</tr>
</tbody>
</table>

CT Angiogram

Gold standard for AAA assessment and planning
### Other Pre-Operative Tests

<table>
<thead>
<tr>
<th>Blood work</th>
<th>Cardiorespiratory testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creatinine and electrolytes</td>
<td>ECG</td>
</tr>
<tr>
<td>CBC</td>
<td>CXR</td>
</tr>
<tr>
<td>Cross-Match</td>
<td>Echocardiogram / stress test</td>
</tr>
<tr>
<td>Coagulation profile</td>
<td>Pulmonary Function Tests</td>
</tr>
</tbody>
</table>

### Treatment Options

- Open surgical repair
- EVAR - *endo*vascular *aneurysm* repair - “stenting”
- Conservative / expectant management

### Summary - Part 1

- AAA life threatening condition of older white males with vascular risk factors
- Screening & surveillance is cheap and effective
- Repair usually possible (≥5.5cm diameter)
- Open surgery vs EVAR
- Life saving

### Abdominal Aortic Aneurysm - Part 2:

**AAA Treatment**

Dr Mark Wheatcroft & Dr Elisa Greco  
Vascular Surgeon, St Michael's Hospital, Toronto & University of Toronto
Learning Objectives

List the 3 management options
Describe the basic steps in open AAA repair
Describe the basic steps in EVAR
Discuss the pros and cons of open vs EVAR
Discuss factors influencing choice of procedure

Recap

CT angiogram
≥5.5cm diameter in males
≥5.0cm in females
Other pre-op tests: Blood work, ECG, Echo/stress test, PFTs

Treatment Options

Open surgical repair
EVAR - **endovascular** aneurysm repair - “stenting”
Conservative / expectant management

Decision making

Assess the AAA for repair:
Size & shape
Location,
Proximity to visceral vessels (eg renal arteries - “juxtarenal AAA”),
Involvement of iliac arteries
Inflammatory component?

Assess the Patient for repair:
Age & Comorbidity
Overall fitness
Previous major abdominal surgery
Unrelated life limiting pathology (eg cancer)
Patient wishes
Decision making

Is the patient fit for major open surgery?
Is the AAA anatomically suitable for EVAR?
Which method is best for the patient?
Patient concerns / preferences

Open Repair

Epidural catheter (post-op analgesia)
General Anaesthesia
Central venous line
Radial arterial line
Prophylactic antibiotics
Urinary catheter

Open Repair

Major, highly invasive procedure

Open repair

Open Repair

Major procedure, ICU
Mortality & morbidity
Very robust
No longterm follow up necessary (CT at 5 years)

Open Repair - Consent & Complications

Wound - Infection, bleeding, bruising, scar, incisional hernia

Major blood loss & transfusion

Renal Failure - transient vs permanent

Limb threat / loss

Bowel - ischemia, adhesive obstruction

Cardiac - MI

Sexual dysfunction - impotence

Death
EVAR

Minimally invasive, often ICU not needed
More anaesthetic options
Rapid recovery
Initial mortality & morbidity advantage
**Life long follow up with duplex ultrasound**
Possibility of re-intervention

EVAR - Consent & Complications

Wound - Infection, bleeding, bruising
**Renal Failure** - transient vs permanent
Limb threat / loss
Bowel - ischemia
Cardiac - MI
Sexual dysfunction - *impotence*
Death
EVAR - Consent & Complications

Endograft failure - Endoleak, migration, rupture AAA

Summary - Part 2

Most AAA can be repaired electively with relatively low peri-op mortality

Careful patient and procedure selection imperative

Rigorous pre-op planning (esp for EVAR) is essential
Abdominal Aortic Aneurysm - Part 3

Ruptured AAA

Dr Mark Wheatcroft & Dr Elisa Greco
Vascular Surgeons, St Michael's Hospital, Toronto & University of Toronto

Learning Objectives

Discuss why AAA and rAAA are important

List the classic triad of ruptured AAA

Describe key initial management of suspected rAAA

Know the treatment options for rAAA

Epidemiology of rAAA

Important cause of death:
15th overall
10th in males >55yrs

Age standardized death rate (1999 - 2009):
males (9.0/100,000)
females (3.2/100,000).
Highest risk groups (11.3/100,000) in whites, males, and non-Hispanics older than 55 years.

Epidemiology of rAAA

Population-based study of ruptured AAAs:
Male incidence - 76 per 100,000 person-years
Female incidence - 11 per 100,000 person-years
**Male/female ratio of 6.9 : 1**
Epidemiology of rAAA

Most AAAs are asymptomatic
Until they rupture!

Overall mortality of rupture exceeds 80%

75% rAAA die before reaching hospital

Peri-Operative mortality approx 40%

Size & AAA rupture risk

<table>
<thead>
<tr>
<th>AAA diameter (cm)</th>
<th>Rupture risk (%/y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;4</td>
<td>0</td>
</tr>
<tr>
<td>4-5</td>
<td>0.5-5</td>
</tr>
<tr>
<td>5-6</td>
<td>3-15</td>
</tr>
<tr>
<td>6-7</td>
<td>10-20</td>
</tr>
<tr>
<td>7-8</td>
<td>20-40</td>
</tr>
<tr>
<td>&gt;8</td>
<td>30-50</td>
</tr>
</tbody>
</table>


Risk factors for AAA rupture

AAA max diameter
HTN
Current smoking
COPD

Female
Positive Family Hx (in up to 20% pts)
Saccular (vs. fusiform)
Rapid rate of expansion (>1cm/yr ↑ diameter)
Symptomatic
Marfan's syndrome
Ehler's Danlos syndrome (Type IV)

rAAA Diagnosis

Abdominal and/or Back pain

Hypotension

Pulsatile abdominal mass
Any male >55yrs old with possible renal colic………
THINK AAA!
Better to be wrong than miss it!

Pathophysiology

Free / intraperitoneal rupture
- Large volume space
- Massive bleeding
- Rapidly fatal & death out of hospital

rAAA Management Principles:

- Make the diagnosis (clinical +/- FAST) & get help.
- 2 large bore IV (fluids/blood resuscitation) + O₂
- Allow permissive hypotension
- Inform vascular surgeon + anaesthesia + OR
  (Or emergency transfer to vascular centre)
- Baseline blood work and 8 unit cross match – sent from the ER
- Imaging (CTA) - depends on stability of patient - D/W
- Vasc. Surgeon
CT Scan with & without IV contrast

rAAA Management Principles:

- Make the diagnosis & get help.
- 2 large bore IV (fluids/blood resuscitation) + O₂
- Allow permissive hypotension
- Inform vascular surgeon + anaesthesia + OR
  (Or emergency transfer to vascular centre)
- Baseline blood work and 8 unit cross match – sent from the ER
- Imaging - depends on stability of patient
  Fix the aneurysm (open or EVAR)
  Or palliative care

Open AAA repair

Endovascular repair (EVAR)
<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>No improvement for several decades</td>
<td>Recognize rAAA immediately – back pain, hypotension, pulsatile abdominal mass</td>
</tr>
<tr>
<td>Despite massive advances in critical care</td>
<td>Surgical emergency</td>
</tr>
<tr>
<td>rEVAR may be first advance to improve outcomes</td>
<td>High mortality rates with rAAA</td>
</tr>
<tr>
<td>BUT - IMPROVE Trial - No benefit at 30 days, Possible benefit to EVAR at 3 years</td>
<td>Open surgical repair vs Endovascular repair</td>
</tr>
</tbody>
</table>