Endovascular repair of ruptured abdominal aneurysms

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Declaration of competing interest

Speaker: Bruno Freitas

No conflict of interest
AAA Expansion and Rupture

- Average growth rate: ~0.4cm per year
  - Factors: BP, size at detection, COPD

- Size is the best determinant of rupture
  - 40% of untreated aneurysms 5.5-6cm or larger will rupture within 5 years
  - Average survival without treatment: 17 months

Lederle FA et al. JAMA 2002;287:2968.
AAA Expansion and Rupture

- Most frequently asymptomatic
- Abrupt rupture scenario
- Mortality among elective patients: 3-5%
- The vast majority of patients die before appropriate medical care
- Screening effectively reduces mortality
- Family history, smoking, arterial hypertension, heart diseases
- Age-related: from 65 years, particularly males (6-7%)
Ruptured AAA

- **Die outside Hospital**
- **Die In Hospital**
- **Survive with major complications**
- **Survive with minor or no complication**
Ruptured AAA

- RAAA is misdiagnosed 16% - 30% of the time
  - Common misdiagnosis:
    - Renal colic, perforated viscous, diverticulitis, gastrointestinal hemorrhage and ischemic bowel
- Mortality rates for correctly diagnosed was 58%, and 44% for misdiagnosed
  - Likely due to fact that less severe ruptures have a more subtle presentation and can survive longer before going to OR
Diagnosis

Clinical Presentation

- “Classic triad:”
  - **Severe abdominal/back pain**
  - **Hypotension**
    - An episode of syncope may be a hint
  - **Paleness**
  - **Fainting**
  - **Pulsatile mass**
    - Large girth may obscure

- **Physical exam**
  - Overall sensitivity of 52%
    - Sensitivity increases with diameter
    - 29% for 3.0 to 3.9cm
    - 50% for 4.0-4.9 cm
    - 76% for > 5.0 cm
Imaging

Incidental, ultrasound, CT angiogram and angiogram
Diagnosis

Imaging

• **Plain Films**
  - Enlarged outline of calcified aortic wall
    - A retrospective review showed that 65% of x-rays form RAAA had calcified aortic wall
  - Loss of psoas shadow

• **Abdominal U/S**
  - Sensitive in detecting aneurysm but not in detecting rupture

• **Abdominal CT**
  - Most accurate method
  - See presence of retroperitoneal blood (77% sensitive and 100% specific)
Enlarged outline of calcified aortic wall

Loss of psoas shadow
Sensitive in detecting aneurysm but not so in detecting RUPTURE
Diagnosis

Computer Tomography
But sometimes it is not so cinematographic...
Ruptured AAA Diagnosis

• Importance of suspicion
• Fast, coordinated, sistematic response from the team
• AngioCT
• Arterial and venous lines
• Blood sampling and ordering
• Lab tests
Nursing Care

Nursing Assessment

- Endotracheal Tube
- Arterial line
- Central venous catheter
- Peripheral I.V. Line
- Indwelling urinary catheter
- Nasogastric tube
- Continuous ECG and oximetric monitoring

Ruptured AAA patient
Ruptured AAA

**Resuscitation**

- If suspecting rAAA:
  - 2 Large bore IVs
  - Type and Cross for at least 6 Units of pRBCs

- Confirmed rAAA:
  - Transfer to Operating room (transfer to center with experienced surgeons prepared for rAAA)
  - Establish an arterial line and foley catheterization
No randomized trials testing the different degrees of resuscitation with rAAA

- Animal studies show increased mortality when resuscitation occurs before control of hemorrhage
Ruptured AAA

**Resuscitation**

• Minimally resuscitate to “maintain consciousness” (~80 systolic) and use blood

• No randomized trials testing the different degrees of resuscitation with rAAA
  
  – Animal studies show increased mortality when resuscitation occurs before control of hemorrhage
Treatment

• OPEN SURGERY

• ENDOVASCULAR
Endovascular repair of ruptured Abdominal aneurysms

- OPEN SURGICAL REPAIR
- EVAR w/ CUTDOWN
- PEVAR
Ruptured AAA

Basics of decision-making process

• Improvement of classical surgical and anesthetic technique over past 50y

• Results of open Surgery for rAAA Unsatisfactory: Mortality of 45-50%
Ruptured AAA

Basics of decision-making process

• EVAR for rAAA first performed by Veith and Yusuf > 15 years ago
• Many multicenter experiences
• Mortality 0-45%
• EVAR significantly reduced rAAA mortality (odds ratio 0.634) and morbidity"
• This reduction only achieved in high volume centers

Veith F, J Cardiovasc Surg, 2009)
When indicated...

Rupture Repair – EVAR is superior

- 30 day mortality
  - EVAR 19%, Open 47%
- Length of Stay
  - EVAR 6, Open 18.5
- Major complication
  - EVAR 36%, Open 80%
- OR time
  - EVAR 3 hours, Open 4.5 hours
- Blood loss
  - EVAR 200 cc, Open 4 liters
Ruptured AAA

Basics of decision-making process

• Neck at the level of renal arteries
  – Diameter: 32mm or less
  – Length: 1cm or longer

EVAR

• If not >>>>>>>> Open repair
Aneurysms suitable for EVAR
Aneurysms suitable for EVAR

Narrow Access Vessels

Access Vessel Tortuosity

Reverse Tapered Necks

Calcium/Thrombus lined Necks

4.9 mm

5.1 mm

At Inferior Renal Artery

At IR + 5

At IR + 13
Nursing Care

Preoperative Care

• Allow time for questions and expression of fears and concerns from the family

• These explanation provide a sense of control and comfort for the family
Ruptured AAA
Endovascular Repair

• Institution requirements:
  – 1) Rapid CT scanning
    • For neck diameter, angulation, and iliac size
    • Only about 20-46% of rAAA are suitable for EVAR
  – 2) Training
  – 3) Devices
  – 4) Suite for Endovascular procedure
Ruptured AAA
Endovascular Repair

• Anesthesia
  – Can use local (unless patients are squirming)
    • Don’t lose the sympathetic tone that can maintain pressure – Pain 😞
    • Some start under local and convert to general for positioning and release of graft
Ruptured AAA
Endovascular Repair

• Strategies for Repair:
  – Aorto-unifemoral graft → ipsilateral internal iliac exclusion and a femorofemoral crossover graft (Montefiore group)
  – Modular aortouniiliac and aortobiiliac

• Now rupture kits for repair
Aorto-unifemoral graft

Modular aortouniiliac and aortobiiliac

Early Experience with the Talent™ Stent-Graft System for Endoluminal Repair of Abdominal Aortic Aneurysms
Ruptured AAA
Endovascular Repair
Endovascular repair of ruptured Abdominal aneurysms

• Mortality Rates → 10% to 45%, but limited numbers of patients

• Causes →
  – Colon ischemia
  – MOF
  – Continued hemorrhage

  • Endoleaks are a much bigger problem in this setting as hemorrhage isn‘t controlled
EVAR in ruptured AAA

Complications

- Postoperative bleeding
- Limb ischemia
- Colonic ischemia
  - Highly lethal (73%-100%)
- Spinal Cord Injury: incidence 2.3%.
  - Interruption of pelvic blood supply, prolonged aortic cross-clamping, intraoperative hypotension, aortic embolization, internal iliac interruption
- Respiratory Failure
  - 26-47% (mortality up to 68%)
  - High O2 requirements, increased lung permeability, decrease in lung compliance
- Renal impairment
  - Incidence is 26-42% in patients in symptomatic aneurysms or rAAA
Nursing Care assessment

Postoperative care

• Monitor for and report manifestations:
  – Ecchymoses of the scrotum, perinium, or penis; a new expanding hematoma
  – Increased abdominal girth
  – Weak or absent peripheral pulses, tachycardia, hypotension
  – Decreased motor function or sensation in the extremities
  – Fall in Hb and HT
  – Increasing abdominal, pelvic, back or groin pain
  – Decreasing urinary out put (less than 30 ml/ hr)
Acute intervention

Nursing Implementation

...Nursing team must monitor graft patency and renal perfusion...

• Adequate blood pressure
  
• IV fluids and blood components as indicated
  
• Central venous pressure
  or
  
• Pulmonary artery pressures
  and
  
• Urinary output

Hourly monitored
Acute intervention - postoperative Nursing Implementation

• **Pulses:** mark lightly with a felt-tip pen

• **An ultrasonic Doppler** is useful in assessment of peripheral pulses

• Skin **temperature and color, capillary refill time and sensation/movement** of the extremities
• Report manifestations of spinal cord ischemia: lower extremity weakness or paraplegia.

• Impaired spinal cord perfusion may lead to ischemia and impaired function.

Nursing Implementation

Neurological evaluation
Nursing Implementation
Gastrointestinal status

- Nasogastric tube irrigation and drained. **DOCUMENT IT !!!**
- Bowel sounds: **AUSCULTATE**
- Are there already flatus? **RECORD IT**
- Assure early deambulation

- It is **unusual** for paralytic ileus to persist beyond the fourth postoperative day... **BE AWARE ! INFORM MEDICAL STAFF !**
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Conclusions

• Diagnosis – Have rAAA on the differential, don’t miss the diagnosis
• Resuscitation – Less is more until aorta is clamped
• INTERVENTION – Quick, safe exposure. Use a method that you are experienced with.
• Complications – Expect them… SURVEILLANCE
Conclusion

• EVAR should be considered as the 1st line treatment for rAAA
• Rupture protocol may improve EVAR result
• Success is a combination of technical and structural background, experience, volume and importantly....
TEAM WORK
Vielen Dank für Ihre Aufmerksamkeit!