AAA: Abdominal Aortic Aneurysm

The **infrarenal aorta** is the most common location for aneurysms

- AAA definition
  - Dilatation to more than 1.5 times the size of the normal aorta

Definitions

Figure 1: Classification of Abdominal Aortic Aneurysms. From UptoDate®
AAA: Scope of Problem

**Prevalence**
- Risk of AAA increases dramatically after age 60\(^1\)
- 4%-12.5% prevalence rate in males >65 years old\(^1,2\)
- 6-fold greater prevalence rate in men vs women\(^1\)
- AAA in women on the rise—now 1/3 of patients presenting with rupture\(^1\)

**Mortality** after rupture is high
- Death in 80% who reach hospital and 50% who undergo surgery\(^1\)
- Rupture accounts for 1-2% of all deaths in the US\(^1\)
- 12,986 deaths in the US reported in 2007\(^2\)

Impact of Endovascular Repair of AAA

*The decline in diagnoses, repairs, and deaths after the introduction of EVAR was greater than the decline prior to EVAR (P<0.0001).

Why Should We Worry?

- Most aneurysms are asymptomatic
- 1 of 3 aneurysms will rupture
- Most patients with rupture are unaware they have an aneurysm—importance of screening and diagnosis prior to rupture
- Many patients die before reaching hospital
- Only 50% undergoing surgery for ruptured AAA will survive >30 days

Morbidity and Mortality in AAA Caused by Rupture

- Sudden death from exsanguination if not repaired immediately
  - 50% operative mortality
- 4% to 5% of sudden death in US is from ruptured AAA
- Risk increases with the size of the aneurysm
- Women rupture aneurysms at smaller diameters

### Risk of Rupture: Size Matters!

<table>
<thead>
<tr>
<th>AAA Diameter</th>
<th>Annual Rupture Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 4.0 cm</td>
<td>0%</td>
</tr>
<tr>
<td>4.0 cm - 4.9 cm</td>
<td>0.5% - 5%</td>
</tr>
<tr>
<td>5.0 cm – 5.9 cm</td>
<td>3% - 15%</td>
</tr>
<tr>
<td>6.0 cm – 6.9 cm</td>
<td>10% - 20%</td>
</tr>
<tr>
<td>7.0 cm - 7.9 cm</td>
<td>20% - 40%</td>
</tr>
<tr>
<td>≥ 8.0 cm</td>
<td>30% - 50%</td>
</tr>
</tbody>
</table>
Factors Associated With Increased Risk of Rupture

• Most important predictor: size of AAA
• Expansion rate
• Smoking
• Hypertension
• Increased wall stress
• Gender (female)
• COPD

AAA Pathophysiology
AAA Pathogenesis

- Systemic disease processes
  - Proteolysis
  - Inflammation
  - Smooth muscle cell apoptosis
  - MMP9 critical to degradation and remodeling of aortic wall
  - Oxidative stress and autoimmune component also play a role
    - Lymphocyte and monocyte infiltration leading to deposition of immunoglobulin G
    - IL-6 genotype
- Biochemical wall stress implicated
- *Chlamydia pneumoniae* proposed role

AAA Pathogenesis (cont)

- Degradation in elastin and collagen (or abnormal production)
- Chronic inflammation, proteolysis, biomechanical wall stress
  - Mediated by B and T cell lymphocytes, macrophages, inflammatory cytokines, and matrix metalloproteinases (MMPs)
    - All degrade elastin and collagen
    - Alter tensile strength and the ability of the aorta to accommodate pulsatile stretch
  - Inflammatory markers increased
    - IL6, IL8, MMPs (matrix metalloproteinase 8 and 9), etc
    - Animal studies show slowed growth of aneurysms with roxithromycin/doxycycline
- Atherosclerosis
- Cystic Medial Necrosis
  - Proximal aorta and sinus of valsalva
  - Degeneration of collagen and elastic fibers in media of aorta

AAA Pathogenesis (cont)

- Familial disorder
  - 12%-19% of first-degree relatives of a patient with AAA will develop an aneurysm
  - Exact transmission unknown

- Rare genetic disorders associated with aneurysms (mostly thoracic)
  - Marfan syndrome
  - Ehlers-Danlos syndrome type IV

Predisposing Factors for AAA

- **Age**: steady increase after 6th decade
- **Family history**
- **Male gender**: 4x higher incidence
- **Cigarette smoking**
  - >90% of AAA patients report having smoked
  - Risk of AAA = 2.5x the risk for coronary artery disease (CAD)
- **Atherosclerosis and peripheral vascular disease (PVD)**
- **Hypertension**
- **Hypercholesterolemia**
- **AAA less likely in African-Americans and Asians**
- **Diabetics less likely to have aneurysms**

Cigarette Smoking and AAA

Patients With AAA (%)

- Never smoked
- Ever smoked

AAA Signs and Symptoms

- The majority of patients with AAA are asymptomatic
  - Condition is usually discovered during evaluation for some other disorder
  - Patient may be aware of pulsating sensation
- Symptoms are present with rupture or predict increased chance of early rupture
  - Back, chest, groin, testicle, buttock pain
  - Tenderness or pain on palpation

AAA Comorbidities

- AAA is associated with
  - CAD (53%; $P<0.0001$)
  - 3-vessel coronary disease (41%; $P<0.0001$)
  - Male gender (86%; $P<0.01$)
  - Smoking (88%; $P<0.01$)
  - COPD (30%; $P<0.01$)

Physical Examination

- Abdominal exam
  - AAA palpable only one-third of the time
    - Depending on AAA size, location, and body habitus
    - Imaging, usually ultrasound, is required for diagnosis
  - Noted usually in epigastrium or mid-abdomen
  - Deep manipulation used to check for tenderness
  - Iliac artery aneurysms harder to detect and are usually in lower quadrants

• Popliteal and femoral artery exam
  – Necessary with aneurysmal disease
    • 14% of AAA patients have popliteal or femoral aneurysms
  – Prominent pulse warrants investigation as femoral and popliteal aneurysms are limb-threatening
  – Abdominal ultrasound is also necessary in cases of peripheral aneurysms because
    • 62% chance of AAA with popliteal aneurysms
    • 85% chance of AAA with femoral artery aneurysms

AAA Screening

Note: Photograph does not depict actual patients; used to illustrate hypothetical patients.
Appropriate Indications for AAA Imaging

- Pulsatile abdominal mass
- Peripheral or thoracic aneurysms
- High-risk individuals
  - Male smokers and age >65
  - Female smokers and age >70
  - Family history of AAA and age >55

- Abdominal ultrasound best for initial diagnosis unless the patient is very large
Ultrasound Imaging for AAA

- Excellent for diagnosis and sizing
- Excellent for follow-up of small AAA
  - Noninvasive
  - Low cost
  - Can be repeated at frequent intervals
- CT scan indicated only for treatment planning or when duplex unsatisfactory

Medicare AAA Screening Reimbursement: The SAAAVE Act of 2006

- Effective January 1, 2007
- Free, 1-time, ultrasound screening for AAA in qualified seniors linked to their Welcome to Medicare Physical Exam (WTMPE)
  - Men who have smoked at least 100 cigarettes during their life
  - Men and women with a family history of AAA
Benefit of AAA Screening

Ultrasound

• Men 65-75 years old
  – Invitation for an AAA screen associated with a significant (43%) reduction in AAA-related mortality (OR: 0.57 [CI 0.45-0.74])

• Low-risk routine screening has a low yield

• U.S. Preventative Services Task Force recommended against screening women

Mortality Benefit Associated With AAA in Screening Trials

MASS=Multicentre Aneurysm Screening Study; OR=odds ratio.

Sustained Benefit of Screening

Screening Frequencies

Aortic diameter
- < 3 cm
- 3 - 4 cm
- 4 - 4.5 cm
- > 4.5 cm

Interval for follow-up
- No further testing
- Every 12 months
- Every 6 months
- Consider referral for vascular consultation

Rate of growth of AAA depends on original size
Mean growth: 4 mm/year for AAA 4-5 cm in size

Annual Growth Rate

- Annual growth rate: ~4.0mm/year
- UK Small Aneurysm Trial
  - 1090 patients with AAA 4.0-5.5 cm
  - Mean risk of rupture increased from 1.6% initially to 3.2% during the last 3 years

No Difference in Age Distribution With Different AAA Size

Reporting of AAA Size

• ADAM\(^1\)
  – “maximal external cross-sectional measurement in any plane”
• UK Small Aneurysm Trial\(^2\)
  – “maximum AP diameter by ultrasonography”
• Society for Vascular Surgery (SVS) consensus\(^3\)
  – “…the minor axis of the ellipse (smaller diameter) is generally a closer approximation of true maximum aneurysm diameter”

Minor Axis Is Better Representation of 3D Anatomy

2-Dimensional CT Scans

Calc 2
70.6 mm

Calc 1
83.8 mm

3-Dimensional Reconstructions

Mark 9
71.4 mm

Reporting of AAA Size

A~B: 32.4 mm

Diámetro Méd: A: 6.48 mm
B: 6.87 mm
1 - 6.48/6.87 = 5.75%
AAA Treatment
Goals of Treatment

1. Prevent rupture
2. Prevent death
3. Limit morbidity
4. Rapid return to baseline functional status
Guidelines for the Treatment of AAA:
Report of a Subcommittee of the Joint Council of the American Association for Vascular Surgery and SVS

- Measurements by minor axis
- AAA should be treated when >5 cm
- Women should have their AAA repaired at a smaller size than men
- 4.5-5.0 cm size is an appropriate size for repair in women

# Variables Associated With Small AAA Rupture

The risk of rupture was independently and significantly associated with female sex ($P < 0.001$)

<table>
<thead>
<tr>
<th>Baseline Variable</th>
<th>Hazard Ratio (95% CI)</th>
<th>$P$-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>1.02 (0.93-1.13)</td>
<td>0.67</td>
</tr>
<tr>
<td>Female sex</td>
<td>4.5 (1.98-10.2)</td>
<td>0.000</td>
</tr>
<tr>
<td>AAA diameter (cm)</td>
<td>2.51 (1.08-5.80)</td>
<td>0.032</td>
</tr>
<tr>
<td>Current smoker</td>
<td>2.11 (0.95-4.67)</td>
<td>0.066</td>
</tr>
<tr>
<td>Mean blood pressure</td>
<td>1.04 (1.02-1.07)</td>
<td>0.002</td>
</tr>
</tbody>
</table>

Gender Differences

- Size of AAA rupture in women\(^1\)
  - 24% of rAAA <5.5 cm
  - 76% of rAAA >5.5 cm

In-Hospital Mortality: Elective AAA\(^2\)

\[ *P=0.003; \ P<0.0001; ^AP<0.0001 \]

Gender Differences (cont)

Despite decline in mortality from 1994-2003 and improved operative techniques, women continue to have significantly higher mortality from OPEN repair and ruptured AAA.

Although women have a lower prevalence of AAA (1.1%), they have a significantly higher rupture rate (3.1%).

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>$P$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average LOS (elective repair)</td>
<td>6.9 days</td>
<td>8.9 days</td>
<td>$&lt;0.01$</td>
</tr>
<tr>
<td>Rupture mortality</td>
<td>44.3%</td>
<td>52.8%</td>
<td>$&lt;0.001$</td>
</tr>
</tbody>
</table>

Medical Optimization

- **Goal of optimization**
  - Reduce expansion of aneurysm diameter
    - Smoking cessation
    - Rx hypertension
    - Rx hypercholesterolemia
    - Role of β-blockers to reduce dp/dt, and tetracycline to suppress MMPs is experimental
  - Prepare patient for operative procedure
    - Cardiac stress test for OPEN repair
    - β-blockers for both types of procedures

Medical Treatment for AAA

• Observation
  – Safe in men for AAA up to 5.5 cm (level A evidence)
• Beta blockers?
  – Propanolol does not slow aneurysm growth (level A)
• Smoking cessation
  – Smoking increases aneurysm expansion
• HTN control
  – Sounds like a good idea—animal data only
• Statins may inhibit aneurysm expansion
  – Level B and C evidence
• Doxycycline/Roxithromycin (level B evidence)
  – Lowers MMP levels and slows aneurysm growth in animals

## Medical Interventions

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Effect on AAA Growth</th>
<th>Level of Evidence</th>
<th>Class of Evidence</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propranolol</td>
<td>No inhibition</td>
<td>A</td>
<td>III</td>
<td>Propranolol</td>
</tr>
<tr>
<td>Statins</td>
<td>Inhibition</td>
<td>B</td>
<td>IIb</td>
<td>Statins</td>
</tr>
<tr>
<td>Antibiotics (tetracycline/macrolide)</td>
<td>Inhibition</td>
<td>B</td>
<td>IIa</td>
<td>Antibiotics (tetracycline/macrolide)</td>
</tr>
<tr>
<td>ACE</td>
<td>No inhibition</td>
<td>B/C</td>
<td>IIb</td>
<td>ACE</td>
</tr>
<tr>
<td>ARB</td>
<td>Animal data</td>
<td>C</td>
<td>IIb</td>
<td>ARB</td>
</tr>
</tbody>
</table>

OPEN Repair of AAA

- Offered for younger patients, < 65
- Older patients with minimal medical comorbidities
- Minimal prior abdominal surgery
- Short necks or para-renal AAA
- Severe iliac arterial occlusive disease
OPEN Repair of AAA

1. Abdomen opened anteriorly or from a lateral retroperitoneal approach
2. Aorta clamped, preferably below the renal arteries; common iliac arteries clamped
3. Aneurysm sac opened longitudinally; backbleeding lumbar arteries and inferior mesenteric artery are typically sutureligated
4. Prosthetic graft sutured in place proximally and distally
5. Bifurcated graft used in >50% of cases with distal anastomoses
6. Aneurysm sac closed over graft to provide separation from intestines

OPEN Repair of AAA (cont)

- Technically, all AAAs can undergo open repair
- Limited by
  - Cardiac disease (mostly coronary)
  - Pulmonary disease (especially O₂ dependent)
  - Hostile abdomen: colostomy, multiple procedures
  - Difficult anatomies
    - Inflammatory aneurysms
  - Systemic diseases
    - Cirrhosis

Endovascular Repair of AAA

- Has largely supplanted open repair
- Totally percutaneous femoral access, no incisions
- Home in 24 Hours
- Anatomic obstacles becoming less limiting as newer devices are developed
Common Devices

Gore Excluder

Endologix AFX

Cook Zenith Flex

Medtronic Endurant
The aortic and iliac arterial anatomy boundary conditions defined by the IFU that are packaged with each FDA-approved commercial endovascular aortic device.

Andres Schanzer, and Louis Messina J Am Heart Assoc 2012;1:e000075
© 2012 Andres Schanzer, and Louis Messina
EVAR Repair of AAA

1. Stiff wires introduced through common femoral arteries over which a fabric covered stent (stent-graft) is introduced
2. Proximal graft positioned just below the renal arteries
3. Stent-graft initially constrained in a low-profile state until deployment
4. A modular device is depicted in which a separate component for the left iliac limb is inserted through and overlaps with a docking limb on the main device
5. Seal zone in the normal infrarenal aorta and bilateral iliac arteries, which excludes AAA

EVAR Repair of AAA (cont)

- Can only be used with suitable anatomy: good landing zones and iliac access

- Limited by anatomy
  - Short proximal neck
  - Diseased landing zones
  - Aneurysmal necks
  - Severe angulations
  - Access problems

# Endovascular Repair of AAA

## TABLE 1. IFU FOR NEWER-GENERATION DEVICES

<table>
<thead>
<tr>
<th></th>
<th>Nellix Endovascular Aneurysm Sealing System*</th>
<th>Ovation iX Abdominal Stent Graft System†</th>
<th>Zenith Fenestrated AAA Endovascular Graft‡</th>
<th>Zenith p-Branch Standard Fenestrated Endovascular Graft‡</th>
<th>Aorfix AAA Endovascular Stent Graft‡</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proximal neck diameter</td>
<td>18–32 mm</td>
<td></td>
<td>18–32 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximal neck length</td>
<td>Infrarenal ≥ 10 cm</td>
<td>≥ 4 mm</td>
<td>Infra-SMA zone length</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximal neck angulation</td>
<td>≤ 60°</td>
<td></td>
<td>≤ 45°</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: AAA, abdominal aortic aneurysm
*CE Mark approved.
†CE Mark and US Food and Drug Administration approved.
‡Not yet CE Mark or FDA approved; currently in clinical use.
Endovascular Repair of AAA

Nellix Endovascular Graft

• Proximal neck 18-28mm diameter, ≥10mm length

• Proximal Neck angulation of ≤60°

• Blood lumen diameter ≤60mm

• Distal seal zone:
  • with length of ≥ 10mm and
  • diameter range of 9 to 20mm
Endovascular Repair of AAA
Nellix Endovascular Graft

- Prevents endoleak of any type
- Prevents acute sac thrombosis – reduced Post implant syndrome
- Analogous to open surgical repair with sac ablation
Endovascular Repair of AAA
Nellix Endovascular Graft

EVAS FORWARD Global Registry

- 300 patients, 30 centers with five year follow-up
- 1.8% endoleak through latest follow-up
- Longer follow-up and further studies will demonstrate EVAS potential as a vital tool to enable aortic specialists to treat multiple aortic pathologies
Endovascular Repair of AAA
EndoAnchors for Challenging Necks

Aptus™ Heli-FX™ EndoAnchor™ system

Heli-FX System: Applier + Guide + 10 EndoAnchors

Images courtesy of Aptus Endosystems, Inc.
Endovascular Repair of AAA
EndoAnchors for Challenging Necks

• 50,000 implants to date
  – No evidence of EndoAnchor dislocation or Fracture

• Favorable Performance
  – Despite majority hostile anatomy, only 0.6% patients had a Type I endoleak at 1 year Follow-up

2 Data on file at Medtronic as of October 2016
Endovascular Repair of AAA
EndoAnchors for Challenging Necks

- Recreates stability of surgical anastomosis
- On the spot targeted treatment of Type I endoleaks
- Augment seal in complex neck anatomies
- Preserve all other ancillary and future EVAR options for the patients

2 Data on file at Medtronic as of October 2016
Fenestrated Repair of AAA (FEVAR)

Components of the Zenith Fenestrated AAA Endovascular Graft (Z-fen) (Cook Medical, Inc., Bloomington, Ind) (Z-fen). A, Proximal device containing a scallop and fenestration. B, Distal device that seals into the fenestrated device and allows completion of the repair similar to that for the nonfenestrated Zenith device. C, Posterior location of diameter-reducing ties for the proximal device. These temporary constraining ties aid in cannulating the renal arteries, as shown in D.

Cook Zenith Fenestrated Endograft
Chimney Repair of AAA (ChEVAR) or Parallel Endografting

From Thoracic Key, Chapter 91, Technique Managing Branches During Endovascular Aortic Aneurysm Repair
<table>
<thead>
<tr>
<th>Chimney EVAR</th>
<th>Fenestrated EVAR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Limitations</strong></td>
<td><strong>Limitations</strong></td>
</tr>
<tr>
<td>Gutter related Type Ia endoleaks</td>
<td>Anatomic suitability</td>
</tr>
<tr>
<td>Chimney stent graft patency</td>
<td>IFU 4-14mm neck</td>
</tr>
<tr>
<td>Long-term renal dysfunction</td>
<td>Iliac access, tortuosity, pararenal angulation,</td>
</tr>
<tr>
<td>Long-term durability</td>
<td>Complexity of case planning</td>
</tr>
</tbody>
</table>
| 21+ day lead time | }
Comparative Results Of FEVAR And ChEVAR For Juxtarenal AAAs:

- There is similarly high branch patency and technical success for the two repair types.
- Parallel endografting performed for juxta renal aneurysms has similar reintervention rate to fenestrated repair.
- Parallel endografting for more complex aneurysms increases reintervention rate, but not mortality.
Comparative Results Of FEVAR And ChEVAR For Juxtarenal AAAs:

• Parallel endografting and fenestrated repairs have similar length of stay, operative time, and blood loss.

• Fenestrated repair is associated with greater fluoroscopy time and contrast usage.

Comparative Results Of FEVAR And ChEVAR For Juxtarenal AAAs:

- Elective patients anatomically suitable – FEVAR
- Urgent patients and those in whom FEVAR not anatomically suitable may benefit from ChEVAR vs. open surgery
- ChEVAR results best when using standardized protocol with appropriate oversizing and parallel stent configurations.
Endoleaks after EVAR

- Endoleak in 25% of pts, majority are type II
- 3% require reintervention at one year
- 94% AAA decrease in size or stable at one year
Type Ia Endoleak

- Aptus EndoAnchor
- Place aortic cuff vs FEVAR vs ChEVAR
- Coil embolization of the "gutter"
- Observation
Endoleak Management

• Type II is observation unless sac enlarging
  – Coil embolization of Lumbar or IMA
  – Translumbar Onyx glue or coil embolization of the sac
Type II Endoleak Management
EVAR Surveillance

- Duplex US is the modality
- Every 3 months for one year and then yearly
- CTA if endoleak is detected or aneurysm is enlarging
EVAR Surveillance

• EVAR requires close follow-up
• Despite initial mortality advantage w/ EVAR, by 1-4 years, no difference in mortality\(^1\)
  – DREAM trial\(^2\)
    • Survival benefit of EVAR lost at 1 year
    • Late ruptures in EVAR group more likely to be missed
    • Re-intervention rates higher w/ EVAR (11 vs 4 %)
  – EVAR 1 (EVAR vs OPEN repair)\(^3\)
    • 30-day mortality lower w/ EVAR (1.8 vs 4.3 %)
    • 5-year mortality—no different
    • EVAR: more graft related complications (12.6 vs 2.5 %)

EVAR Surveillance

- **EUROSTAR**
  - EVAR patients risk of rupture 1%/year
    - No different than annual risk of AAA 4-5 cm natural history
  - Risk of rupture higher w/ endoleak, migration, kinking
  - EVAR secondary interventions (for migration/rupture mainly) 18%/year at a mean of 14 months from repair

- **EVAR may be less successful if AAA ≥ 6.5 cm**
  - EUROSTAR: post op complications/mortality, late rupture, and aneurysm related death w/ EVAR higher if AAA > 6.5 cm
  - Cleveland Clinic: EVAR w/ AAA ≥ 5.5 cm—poorer survival and greater risk of aneurysm related death at 2 years

OPEN vs EVAR Repair:
UK EVAR 1 Trial

- 1082 patients suitable for both procedures
- Randomized from 1999-2003 at 41 hospitals
- >60 years old with AAA >5.5 cm

<table>
<thead>
<tr>
<th></th>
<th>OPEN</th>
<th>EVAR</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-day mortality</td>
<td>4.7%</td>
<td>1.7%</td>
<td>0.01</td>
</tr>
<tr>
<td>Secondary procedures</td>
<td>5.8%</td>
<td>9.8%</td>
<td>0.02</td>
</tr>
</tbody>
</table>

OPEN vs EVAR Repair: DREAM Trial

- OPEN (n=174)
  - Operative mortality: 4.6% (95% CI: 2.0%-8.9%)
  - Operative mortality/severe complications
    • 9.8% (95% CI: 5.8%-15.2%)
  - Operative mortality/moderate-severe complications
    • 23.6% (95% CI: 17.5%-30.6%)

- EVAR (n=171)
  - Operative mortality: 1.2% (95% CI: 0.1%-4.2%)
  - Operative mortality/severe complications
    • 4.7% (95% CI: 2.0%-9.0%)
  - Operative mortality/moderate-severe complications
    • 18.1% (95% CI: 12.7%-24.7%)

OPEN vs EVAR Repair: Operative Mortality

**OPEN vs EVAR Repair of AAA**

**OPEN**
- **Advantages**
  - Fewer subsequent aneurysm-related procedures
- **Disadvantages**
  - Greater use of ICU
  - Increased 30-day mortality
  - Increased hospital length of stay
  - Increased postoperative pain

**EVAR**
- **Advantages**
  - Local or regional anesthesia
  - Lower in-hospital mortality
  - Lower 30-day mortality rate
- **Disadvantages**
  - Endoleaks
  - Increased reintervention rates
  - Metal fatigue and fabric wear-and-tear
  - Conversion to OPEN repair
  - **Lifelong surveillance imperative!**

OPEN vs EVAR Repair in Patients Aged ≥80 Years

• Pooled analysis of 6 observational studies (N=13,419)
  – Higher immediate postoperative mortality after open repair compared with EVAR (RR=3.87, 95% CI: 3.19-4.68)
  – Immediate mortality rate after OPEN repair was 8.6% and 2.3% after EVAR
  – OPEN repair was associated with a significantly higher risk of postoperative cardiac, pulmonary and renal complications

• Pooled analysis of 3 studies showed similar overall survival at 3 years

• Elective EVAR in patients aged ≥80 years is associated with significantly lower immediate postoperative mortality and morbidity than OPEN repair and should be considered the treatment of choice in these patients

Take-Home Messages

• **AAA Pathophysiology**
  – AAAs are a local representation of a systemic disease process
  – Ruptured AAAs continue to be associated with high mortality

• **AAA Screening**
  – Consider AAA/TAA in patients >65 years old
    • Especially those with comorbid conditions
  – Inquire about family history of AAA/TAA
  – Recommend ultrasound for patients at risk with or without symptoms

• **AAA Treatment**
  – Medical optimization is important part of treatment
  – Survival improves with early intervention for AAA >5.5 cm before rupture
  – Treatment options include both OPEN and EVAR procedures
Thank You!