

Abdominal Aortic Aneurysm: Small vs Large, Natural History, Progression

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Abdominal Aortic Aneurysms

General Information

- Diagnosis - Most often made in 7th decade
- Male:Female Ratio 3-4:1
- 10th leading cause of death in men > 55 yrs
- 15,000 deaths/yr



Abdominal Aortic Aneurysms

Natural History

- Expansion Rate
 - 0.2 cm - 0.8cm per yr
 - Average ~ 0.4cm/yr



Abdominal Aortic Aneurysms

Natural History

- Factors influencing aneurysm growth
 - COPD
 - Tobacco
 - HTN
 - Aneurysm size
- Alpha-1-antitrypsin

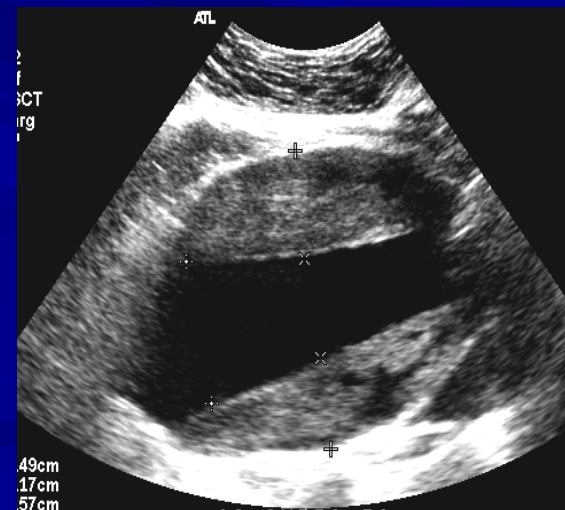
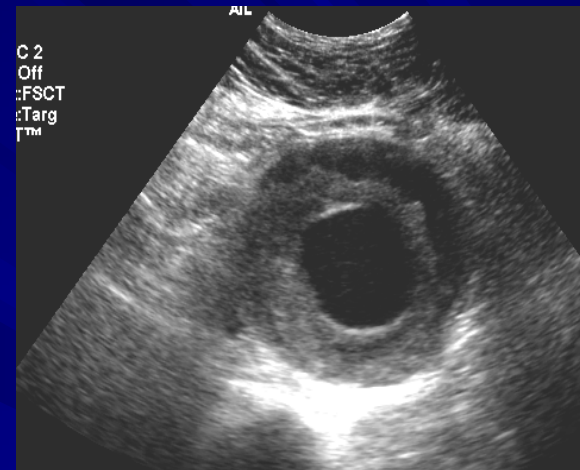
AAA- Rupture Risk

| <u><i>Aortic Diameter</i></u> | <u><i>Est. Rupture Risk</i></u> |
|-------------------------------|---------------------------------|
| < 4 cm | 0% per year |
| 4-5 cm | 0.5 - 5% |
| 5-6 cm | 3 - 15% |
| 6-7 cm | 10 - 20% |
| 7-8 cm | 20 - 40% |
| > 8 cm | 30 - 50% |

Rutherford, Vascular Surgery, 5th ed., 1254-1255, 2000

Clinical Presentation

- **75%** of patients are **Asymptomatic**
- **25%** of patients are **Symptomatic**
- Many patients are diagnosed when undergoing routine testing for other problems or complaints



Abdominal Aortic Aneurysm

- 20% of patients have associated popliteal artery aneurysm
- 20% of first degree relatives have abdominal aortic aneurysm

Abdominal Aortic Aneurysms

Rupture

- 63% die before reaching the hospital
- 50% operative mortality

Overall Mortality >80%

DIAGNOSIS

Physical Examination

- Sensitivity depends upon aneurysm size, patient size and skill of examiner
- Study of 243 patients undergoing elective AAA repair:
 - 38% detected by physical exam
 - 23% not detected after diagnosis was known
 - 66% not detected in *obese* patients after diagnosis was known

DIAGNOSIS

Ultrasonography

■ Advantages

- Up to 95% accurate
- Low cost
- Noninvasive

■ Disadvantages

- Visualization of suprarenal aorta and iliacs may be obscured by bowel gas
- Upper extent of aneurysm
- Obese patients

***Test of choice for initial confirmation of AAA
and f/u of small aneurysms**

Imaging

■ Contrast-enhanced CT

- most useful study for preoperative AAA evaluation
- Spiral CT - faster, better resolution, 3D reconstruction

■ MRI/MRA

- comparable to CT + info re periph occlusive disease
- more expensive, time consuming, claustrophobia
- preoperative test of choice if contrast contraindicated

■ Arteriography

- reserved for patients with suspected disease of adjacent arteries (renal, visceral, iliofemoral) or anomalies e.g., horseshoe or pelvic kidney

Current ACC/AHA Screening Recommendations

Screening High-Risk Populations

- Class I – men 60 years of age or older who are either the siblings or offspring of patients with AAAs should undergo physical examination and ultrasound screening for detection of aortic aneurysms
(Level of Evidence: B)
- Class IIa – men who are 65-75 years of age who have ever smoked should undergo a physical examination and 1-time ultrasound screening for detection of AAAs
(Level of Evidence: B)

Observational Management

Blood Pressure Control and Beta-Blockade

- Class I – Perioperative administration of beta-adrenergic blocking agents, in the absence of contraindications, is indicated to reduce the risk of adverse cardiac events and mortality in patients with coronary artery disease undergoing surgical repair of atherosclerotic aortic aneurysms
(Level of Evidence: A)
- Class IIb – Beta-adrenergic blocking agents may be considered to reduce the rate of aneurysm expansion in patients with aortic aneurysms
(Level of Evidence: B)

Medical Risk for AAA Repair

| Factor | Level 0 | Level 1 | Level 2 | Level 3 |
|--------------------------------------|------------------|----------------------|-------------------------|-----------------------|
| Age: | <75 | 75-80 | 85-90 | >90 |
| Cardiac: LVEF | no CAD normal | neg stress 30-50% | small defects 20-30% | large defects <20% |
| Lung: | normal | mild COPD | mod COPD | home O2 |
| Renal: | normal | 1.5-2.0 mg/dl | 2-3.5 mg/dl | >3.5 mg/dl |
| Predicted mortality rate: | <1% | 1-3% | 3-8% | 8-30% |

Influence of Statins and Beta-Blockers on Patients Undergoing AAA Repair

- Study by Kertui and colleagues reviewed 570 patients who underwent AAA surgery
 - Peri-op mortality or MI occurred in 8.9%
 - Composite endpoint was lower in statin users compared to non-users 3.7% vs 11%
 - Beta-blocker use was associated with significant reduction in composite endpoint

Open Aneurysm Surgery: Contemporary Series

Operative Results

| <i>Institution (author)</i> | <i># Pts</i> | <i>Operative Mortality</i> |
|---------------------------------|--------------|----------------------------|
| Mayo Clinic (Reigel, '87) | 299 | 2.8% |
| Vanderbilt (Perry, '87) | 160 | 0.0% |
| Scripps Clinic (Bernstein, '88) | 123 | 0.8% |
| Rochester (Green, '89) | 379 | 2.1% |
| Albany (Leather, '89) | 299 | 3.7% |
| Brigham & Wom (Golden, '90) | 500 | 1.6% |
| Mass General (Cambria, '92) | 202 | 2.0% |
| <hr/> | | |
| TOTAL | 2162 | 2.1% |

Endovascular Repair

- It is estimated that approximately 50-60% of pts with AAA are suitable for EVAR
- Initial application of EVAR was far more limited because of device limitations and incomplete understanding of factors such as: Angulated and funnel necks, calcification, thrombus etc.
- Technical improvements in devices, cuffs, delivery systems, and operator understanding has extended EVAR applications

Endovascular Aortic Aneurysm Repair

Theoretical Advantages

- Less invasive
- Decreased morbidity and mortality
- High risk and elderly patients
- Shorter LOS
- Decreased cost

What About the Management of Small AAAs?

- 1136 consecutive patients with AAA 4.0-5.4 cm
- Mean follow-up 4.8 years
- Rate of rupture 0.5%/year
- Survival significantly better in *Observed* patients as compared to Surgically treated patients.
- Aneurysms < 5.5 cm should be followed with serial duplex ultrasonography

Follow-up Surveillance and Treatment Decisions

- Trial data from the UK Small Aneurysm trial and the VA Aneurysm Detection and Management trials suggest annual US surveillance for AAA < 4.0 cm and every 6 months for those 4.0 – 4.9 cm
- Elective AAA repair is considered appropriate when the AAA is at least 5.0 cm in size
- Current available evidence does not support a lower size threshold for the endovascular repair of AAAs than for conventional surgical repair

ACC/AHA Recommendations to Avoid Rupture

■ Class I

- Patients with infrarenal or juxtarenal AAAs measuring 5.5 cm or larger should undergo repair to eliminate the risk of rupture (*Level of Evidence: B*)
- Patients with infrarenal or juxtarenal AAAs measuring 4.0 to 5.4 cm in diameter should be monitored by ultrasound or computed tomographic scans every 6 to 12 months to detect expansion (*Level of Evidence: A*)

ACC/AHA Recommendations to Avoid Rupture

■ Class IIa

- Repair can be beneficial in patients with infrarenal or juxtarenal AAAs 5.0 to 5.4 cm in diameter
(Level of Evidence: B)
- Repair is probably indicated in patients with suprarenal or type IV thoracoabdominal aortic aneurysms larger than 5.5 to 6.0 cm
(Level of Evidence: B)
- In patients with AAAs smaller than 4.0 in diameter, monitoring by ultrasound examination every 2 to 3 years is reasonable
(Level of Evidence: B)

ACC/AHA Recommendations to Avoid Rupture

■ Class III

- Intervention is not recommended for asymptomatic infrarenal or juxtarenal AAAs if they measure less than 5.0 cm in diameter in men or less than 4.5 cm in diameter in women (*Level of Evidence: A*)

Management Algorhythm

AAA Risk of Rupture

(<4.0cm)

Low Risk

- Management of co-morbidities
- Smoking cessation
- Consider beta blocker and statin therapy
- Ongoing periodic surveillance

(>5.0cm)

High Risk

- Assess co-morbidities and surgical risk
- Risk factor modification
- Suitability for EVAR or open repair
- Pre-operative evaluation
- Surveillance

Summary

- Early recognition of AAA is important!
- Ultrasound is initial imaging modality of choice
- Risk of rupture is directly related to size
- Small aneurysms need to be followed with periodic surveillance
- While there is no specific medical therapy smoking cessation and BP control is helpful