AAA Management:
A Review of Current Therapy, Techniques, Outcomes and Best Practices
Abdominal Aortic Aneurysm - Defined

A permanent localized dilatation of an artery with a diameter at least twice the normal diameter of the given segment

Pathological changes cause the aorta to:

• Become thinner
• Bulge
• Tear
• Dissect
• Rupture
Trivia Question

They all died from a ruptured Abdominal Aortic Aneurysm!
Natural History, Identification and Repair of AAA

- The prevalence of AAA is 4.5% in men and 1.0% in women (data from SAVE screenings)
- 1,452,294 Americans living with AAA
- Roughly 15% are diagnosed/year
- Approximately 63,300 are being treated of which a reported 60% are being done with conventional EVAR

The prevalence of AAA in the US Versus Diagnosis

Prevalence = 1,452,294
Diagnosed = 217,000
Total Treated = 63,300
Treated w / EVAR = 37,900

To date - Aneurysmal disease is under-diagnosed & under-managed in the US

1/26/2015

1 American Heart Association; Circulation; Online ISSN: 1524-4539
2 Society for Vascular Surgery; Vascular Web
Risk Factors for AAA

- **Males** (4x more likely than women)
- Over age 65
- ***Smokers*** (7x more likely than non-smokers)
- Caucasian

- ***Family history of AAA*** (20% of patients have a relative with AAA)
- Atherosclerosis
- Hypertension
Rupture Risk and Mortality Rates

Aneurysm rupture is influenced by a number of factors including aneurysm size, expansion rate and sex.

Annual rupture risk according to AAA diameter:\(^3\):
- Less than 4.0 cm in diameter – 0%
- 4.0 cm to 4.9 cm in diameter – 0.5% to 5%
- 5.0 cm to 5.9 cm in diameter – 3% to 15%
- 6.0 cm to 6.9 cm in diameter – 10% to 20%
- 7.0 cm to 7.9 cm in diameter – 20% to 40%
- 8.0 cm in diameter or greater – 30% to 50%

Mortality Rates are devastating with up to 50-65% dying before reaching the hospital; < 50% survive the repair
- AAA account for 4-5% of sudden deaths\(^4\)
- ~15,000 people die annually from AAA

---


AAA Diagnosis and Modalities

The majority of AAAs are asymptomatic and are most often detected as an incidental finding on ultrasonography (USG), abdominal computed tomography (CT) or magnetic resonance imaging performed for other purposes.

Approximately 30% of asymptomatic AAAs are discovered as a pulsatile abdominal mass on routine physical examination.

- Sensitivity of physical examination for the identification of an AAA ranges from 22% to 96%\(^5\)

Abdominal Ultrasound is considered the modality of choice given its relatively high sensitivity, safety and low cost. This modality is also utilized in the long-term follow-up of repaired AAA patients.

CT Angiography is critical to the evaluation and determination of repair type (Endovascular vs OSR), device selection and patient risk assessment.
Repair Options

The main treatment options are Endovascular Repair or OPEN Surgery

Endovascular

Open Surgery
Endovascular Repair

**Procedural Impact:**
- Minimal groin access (femoral exposure or percutaneous)
- Average procedural time of < 2hrs
- Graft is inserted via femoral access and AAA is excluded

**Average hospital stay: 1-2 days**

**Average recovery time: 7-10 days**

<table>
<thead>
<tr>
<th>Access Type</th>
<th>Pre/Post Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Femoral Exposure</td>
<td>![Image](Femoral Exposure)</td>
</tr>
<tr>
<td>Percutaneous</td>
<td><img src="Percutaneous" alt="Image" /></td>
</tr>
</tbody>
</table>

**PATIENT SELECTION IS CRITICAL IN MAXIMIZING GOOD ENDOVASCULAR OUTCOMES**

1/26/2015
Standard EVAR Repair – Pre EVAR

AAA ~ 5.6cm

Renals

Femoral Wire Access
Standard EVAR Repair – Post EVAR

Complete exclusion of the AAA

Renals
Complex EVAR Repair – Pre EVAR

- Bilateral Renal Stenosis
- Short aortic neck (1.2cm); Mural Thrombus
- Femoral Artery Access
- Axillary Access via conduit
Complex EVAR Repair – Post EVAR

Renals wired bilaterally

AAA Excluded and Proximal Seal Extended to SMA
Open Repair

Procedural Impact:
- Either large flank or retroperitoneal incision
- Either infrarenal or suprarenal cross-clamp of the aorta
- Average procedural time of 3-5hrs
- Removal of the affected aorta and replacement with surgical graft

Average hospital stay: 4-10 days
Average recovery time: 1-3 months
25-30% patients require tertiary recovery care
Perioperative Results of EVAR and OSR

Intra-Operatively

Comparative Recovery Statistics

Recovery Period

EVAR Durability Examined

Existing published randomized trials, together with information from Medicare and SwedVasc databases included - 25 078 patients undergoing EVAR and 27 142 undergoing open repair for AAA.

### Table 1. Long-Term Outcomes After EVAR

<table>
<thead>
<tr>
<th>Study</th>
<th>Enrollment, Years</th>
<th>Main Devices</th>
<th>EVAR, N</th>
<th>Mean Follow-Up, Years (max)</th>
<th>Type I/III Endoleaks, N (%)</th>
<th>Secondary Interventions, N (%)</th>
<th>Conversion, N (%)</th>
<th>Migration, N (%)</th>
<th>Aneurysm Rupture, N (%)</th>
<th>Aneurysm-Related Mortality, N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EUROSTAR12</td>
<td>1996–1999</td>
<td>Vanguard (Medtronic, Inc.), Freeport, Grand Bahama, The Bahamas, Stentor (Boston Scientific Corporation, Natick, MA)</td>
<td>5190</td>
<td>5 (8)</td>
<td>258 (21.7)</td>
<td>319 (26.8)</td>
<td>84 (7.1)</td>
<td>153 (12.9)</td>
<td>29 (2.4)</td>
<td>30 (3)</td>
</tr>
<tr>
<td>EVAR-17</td>
<td>1990–2003</td>
<td>Zenith, Talent (Medtronic, Inc.), Excluder (Medtronic, Inc.), AneuRx (Medtronic, Inc.), Quantum (Boston Scientific Corporation)</td>
<td>620</td>
<td>6 (10)</td>
<td>NS</td>
<td>140 (23.3)</td>
<td>25 (4)</td>
<td>NS</td>
<td>25 (4)</td>
<td>30 (3.8)</td>
</tr>
<tr>
<td>DYNAMIC6</td>
<td>2000–2006</td>
<td>Zenith, Talent, Excluder, AneuRx, Quantum</td>
<td>373</td>
<td>64 (8.2)</td>
<td>12 (6.9)</td>
<td>48 (27.7)</td>
<td>1 (1.7)</td>
<td>7 (4.3)</td>
<td>1 (0.6)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Medicare21</td>
<td>2001–2004</td>
<td>NS</td>
<td>22 880</td>
<td>NS (5)</td>
<td>NS</td>
<td>NS (6.9)</td>
<td>NS (0.4)</td>
<td>NS</td>
<td>NS (1.8)</td>
<td>NS</td>
</tr>
<tr>
<td>OVER27</td>
<td>2002–2007</td>
<td>Zenith, Excluder, AneuRx</td>
<td>644</td>
<td>52 (0)</td>
<td>NS</td>
<td>98 (22.1)</td>
<td>NS</td>
<td>6 (1.4)</td>
<td>10 (2.3)</td>
<td>NS</td>
</tr>
<tr>
<td>ACE2</td>
<td>2005–2008</td>
<td>NS</td>
<td>150</td>
<td>3 (4.8)</td>
<td>NS</td>
<td>24 (16)</td>
<td>NS</td>
<td>NS</td>
<td>3 (2)</td>
<td>5 (4)</td>
</tr>
</tbody>
</table>

**Abbreviations:** NS, not stated.

*Predicting outcomes after contemporary endovascular aneurysm repair.*

By Nelson Oliveira, MD; Frederico Bastos Gonçalves, MD; Sander ten Baa, MD, PhD; Ellen Rouwet, MD, PhD; Johanna Hendriks, MD, PhD; and Hence Verhagen, MD, PhD

Cardiovascular Update For Primary Care Physicians 2015
Highlights of EVAR/OSR Meta-analysis

Short-term/ Mid-term 9:
Patients who had EVAR had a significantly lower 30-day or in-hospital mortality rate (1.3 per cent versus 4.7 per cent for open repair; odds ratio (OR) 0.36, 95 per cent confidence interval 0.21 to 0.61; \( P < 0.001 \)). By 2-year follow-up there was no difference in all-cause mortality (14.3 versus 15.2 per cent; OR 0.87, 0.72 to 1.06; \( P = 0.17 \)), which was maintained after at least 4 years of follow-up (34.7 versus 33.8 per cent; OR 1.11, 0.91 to 1.35; \( P = 0.30 \)).

Long-term*:
A significantly higher proportion of patients undergoing EVAR required reintervention (\( P = 0.003 \)) and suffered aneurysm rupture (\( P < 0.001 \)) as a result of loss of follow-up and continued surveillance.... However, a closer look at this data identifies:
- Long-term results from randomized trials may no longer accurately represent contemporary EVAR repair
- Secondary interventions in the OSR group, such as incisional hernias and adhesion-related bowel obstructions, were not proportionately reported. Estimated laparotomy-based complications of 9.7% in OSR close the secondary intervention rate gap with EVAR considerably10.
- Accumulated experience, patient selection, and technical execution have now traversed a steep EVAR-related learning curve
- AAA suitability was only 60% with ancestral devices, and many of the implanted endografts have been significantly modified or even withdrawn from the market11

9 Systematic review and meta-analysis of the early and late outcomes of open and endovascular repair of abdominal aortic aneurysm
Author: P. W. Stather, D. Sidloff, N. Dattani, E. Choke, M. J. Bown, R. D. Sayers


11 Predicting outcomes after contemporary endovascular aneurysm repair.

By Nelson Oliveira, MD; Frederico Bastos Gonçalves, MD; Sander ten Bos, MD, PhD; Ellen Rouwet, MD, PhD; Johanna Hendriks, MD, PhD; and Henze Verhagen, MD, PhD
Surveillance and Follow-up

Surveillance is an essential aspect of patient management to ensure good long-term results post repair

- Historically, CTA has been chosen as that modality; however, given the cumulative exposure to ionizing radiation – particularly in younger patients – is a concern

Guidelines for any post-procedural modality must be able to address\textsuperscript{11}:

1. size measurement,
2. characterization of morphological details and placement of stent grafts
3. detection and classification of endoleaks

Currently, the SVS recommends post-operative contrast enhanced CT imaging at months 1 and 12; however, most clinicians have radically reduced the number of CTAs, particularly if the first follow-up CT is unremarkable\textsuperscript{12}:

- Many investigators now follow patients almost exclusively by \textit{ultrasound} to measure maximum AAA diameter and only obtain further imaging if the AAA sac fails to shrink, expands >5mm.

\textsuperscript{12}Imaging Surveillance of EVAR in the Era of Radiation Awareness; John M. Moriarty, MD, and Jonathan K. Park, MD; Vascular Disease Management
Conclusions

Advancements in the treatment capability of patients with AAA have increased patient applicability for safe, effective and durable outcomes at a far lower risk than previously available.

Given the safe and effective nature of EVAR today, more challenging patients (e.g. age, physiologic condition, anatomic limitation) once believed to be untreatable can now be evaluated and repaired.

EVAR conveys significant benefits over OSR in the procedural, recovery and short term (2-year) aspects of patient management. Many of the perceived limitations of EVAR have been overcome through innovation, experience and analysis of outcomes.

Management of today’s AAA patient takes a comprehensive approach and can provide sustainable and significant quality of life improvements with EVAR.