Open Repair of Pararenal Aortic Aneurysms: A Safe and Durable Option

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Continued Evolution of EVAR

• Suprarenal fixation
• Improved flexibility
• Larger diameter grafts for larger necks
• Smaller caliber delivery systems
• Fenestrations, “snorkels”
• Branched grafts
• Hybrid procedures- “De-branching”

• Technical feasibility may not equal clinical success

Disclosures

• NONE

Relative Indications for Open AAA Repair

• Juxtarenal or Suprarenal extent
• Unfavorable Neck
• Symptomatic Visceral Occlusive Disease
• Renal Artery arising from AAA
• Severe Aortoiliac Occlusive Disease
• Known or suspected infection
• Connective tissue disease
• Inadequate caliber access vessels
• Bilateral hypogastric exclusion in younger pt
• Younger, good-risk patient
Definitions

- **Juxtarenal**- extends up to renal arteries and may include inferior border
- **Pararenal**- involves the renal arteries; some authors include JRAA with these
- **Suprarenal**- aneurysm extends above renals
- **Paravisceral**- involves SMA ± celiac
- **Type IV TAAA**- involvement extends to diaphragm level as high as pulmonary ligament

Paravisceral Aneurysm

Open Repair of Suprarenal AAA

**Special Considerations**

- Warm ischemia time to kidneys, other viscera can lead to organ failure
- Coagulopathy
- Extensive dissection/ fluid shifts
- One vs two cavity incision— pulmonary compromise, pain management
- Spinal cord injury
**Paravisceral/Type IV TAAA: Preferred Operative Approach**

- Thoraco-retroperitoneal approach
- Choose interspace for adequate proximal control (7-10); shingle or excise rib
- Partial or complete diaphragm incision; divide crus
- Posterior to left kidney avoids renal vein
- External or internal control of viscerals, right iliac
- Incorporate multiple visceral orifices in proximal anastomosis or inclusion patch

**Pararenal AAA: Treatment Choices**

- Open repair using suprarenal or supraceliac clamp
  - Retroperitoneal or transperitoneal approaches
  - With or without renal artery reconstruction
- Fenestrated EVAR
- EVAR with "snorkel" grafts for one or both renals
- Branched graft repair
- Hybrid approach combining debranching and EVAR
Juxtarenal AAA: Operative Approach

- Retroperitoneal exposure favored
- Left flank incision; excise 11th rib
- Laparotomy with medial visceral rotation an alternative
- Posterior to left kidney avoids renal vein
- Anterior infracolic exposure with suprarenal or suprarenal clamping in selected cases, but less flexible for proximal anastomosis
- Reimplant or graft to renal arteries if necessary

Suprarenal Repair: Contemporary Results

- BWH Series N=171 (1990-2006) elective SRAAA
- 30-day mortality
  - SR 1.8%  IR (N=849) 1.2%
- Postoperative renal impairment
  - SR 17%  IR 9.5% (p=.003)
  - New onset dialysis rare (0.6% SR, 0.8% IR)
  - Postop decline linked to preop RF, renal revascular
- Five year survival
  - SR 67%  IR 69%

*Chong T et al JVS 2009;49:873-80*
Juxtarenal aortic aneurysm repair

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- Meta analysis of 21 studies, N=1,256 pts, 1986-2008
- Perioperative mortality 2.9% (95% CI 1.8-4.6)
- Postoperative renal dysfunction in 0-39% (median 18%) of patients
- New onset dialysis 3.3%
- Wide range of techniques and definitions precludes specific assessment of optimal strategies such as clamp location, adjuncts

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Comparable mortality with open repair of complex and infrarenal aortic aneurysm

Virendra I. Patel, MD, Robert T. Lancer, MD, Mark F. Conrad, MD, Glenn M. Lammaglia, MD, Christopher I. Kwolek, MD, David C. Brewster, MD, and Richard P. Cambria, MD, Boston, Mass

Table VI. Summary of outcomes for complex aneurysm repair

- Reflux
- Distal
- Types of repair
- Renal complications
- Mortality


Durability of open repair of juxtarenal abdominal aortic aneurysms

Shirlin Tsai, MD, Mark F. Conrad, MD, Virendra I. Patel, MD, Christopher J. Kwolek, MD, Glenn M. Lammaglia, MD, David C. Brewster, MD, and Richard P. Cambria, MD, Boston, Mass

- Single center (MGH) experience 2001-2007, N=199
- Left flank retroperitoneal approach in >90%
- Mean f/u 41 ± 28 months
- 30-day mortality 2.5%
- Perioperative renal insufficiency 8.5%, 2% dialysis
- Postop renal artery occlusion 3% of imaged arteries
- Five year survival 74%
- Graft-related complications 2% at 40 months
- Increased age, steroid use, preop renal insufficiency negative predictors of long term survival

J Vasc Surg 2012; 56:2-7

Predictors of Abdominal Aortic Aneurysm Sac Enlargement After Endovascular Repair

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Background—The majority of infrarenal abdominal aortic aneurysm (AAA) repairs in the United States are performed with endovascular methods. Baseline demographic and anatomic characteristics are fundamental criteria for appropriate patient selection for endovascular aortic repair (EVAR) and key determinants of long-term success. We compared compliance with anatomic guidelines for EVAR and the relationship between baseline anatomic and procedural characteristics and post-EVAR AAA sac enlargement.

Methods and Results—Patients with pre-EVAR computed tomography scans were identified from the MGH, Inc, imaging database (1996 to 2008). Preoperative baseline anatomic characteristics were reviewed for each patient. Data relating to the specific AAA endovascular device implanted were not available. Therefore, morphologic measurements were compared with the most liberal and the most conservative published anatomic guidelines stated in each manufacturer’s instructions for use. The primary study outcome was post-EVAR AAA sac enlargement (>50% diameter increase). In 30126 patients undergoing EVAR, 39% had a minimum AAA diameter below the 55 mm threshold at which intervention is recommended over surveillance. Only 42% of patients had aneurysms that met the most conservative definition of device instructions for use: 98% met the most liberal definition of device instructions for use. The 7-year post-EVAR rate of AAA sac enlargement was 61%. Independent predictors of AAA sac enlargement included older age, male gender, preoperative aneurysm sac diameter >55 mm, and common iliac ostia diameter <16 mm.

Conclusion—In this multicenter observational study, compliance with EVAR device guidelines was low and post-EVAR aneurysm sac enlargement was high, raising concern for long-term risk of aneurysm repair.

J Vasc Surg 2011; 52:952-9
Overall incidence of sac enlargement 41% at 5 years Many first detected beyond 2 years

Long-Term Durability remains a concern for EVAR

Fenestrated EVAR for JRAA
- Early studies have shown favorable technical success and 30-day mortality (2-3%)
- F/u has been generally limited 1-2 years
- Proximal migration rates as high as 14% at one year have been reported
- Branch vessel patency >90%; renal impairment in up to 22%
- Approximately 20% reintervention rate within two years
- First FDA approved device (Cook) on US Market

2.1% mortality
16%-30% renal impairment
13.5%-22.6% reinterventions

“Chimneys” and “Snorkels” for JRAA
- Modest sized single center series with limited follow-up (generally 1 year or less)
- 30 day mortality 0-12%
- Type I endoleak up to 12%
- Long term renal artery patency, sac behavior, endoleak rates unclear
- Should likely be reserved for unique anatomic subset of high-risk patients
Conclusions

• Contemporary results of open repair for juxta- and para-renal AAA from referral centers show mortality is comparable to infrarenal AAA, and durability of repair is excellent. However, postoperative morbidity > open infrarenal repair.

• Increased age and baseline renal impairment are important risk factors for postoperative mortality.

• Early results of fenestrated and snorkel EVAR suggest low mortality but substantial rates of endoleak and reintervention; learning curve appears significant and durability is unknown.

• Younger (<80), average risk patients with PRAA should be offered open repair at experienced aortic centers as the current “gold standard” treatment option.