

subclavian vein was included and 18 were stenotic; five of these had stents in place. Decompression was performed via claviclectomy in three patients, two of whom underwent reconstruction, and one was stented. The other 21 underwent first rib resection, 20 via an infraclavicular exposure; 11 patients underwent post decompression stenting. The 30-day morbidity was minimal: there was one significant hematoma and one hemothorax in a patient who underwent on-table thrombolysis and no deaths. At follow-up up to 1 year (median, 5 months), 1 patient died of unrelated causes, and one patient undergoing central reconstruction with prosthetic required excision for infection. Assisted primary patency of the fistula was 88%, and of the central bypass, 78%. The index arm continued to be used for access in 93% of patients, and overall survival was 91%.

**Conclusions:** In this group of patients whose access was judged otherwise nonsalvageable, excellent long-term fistula and ipsilateral arm use can be achieved with aggressive decompression of the bony CCJ. Stents placed after such decompression seem to have good intermediate-term patency in this high-flow situation.

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#### VESS15.

##### Comparison of Endograft Explantation With Primary Open Aneurysm Repair: A Case-Controlled Study

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**Objectives:** Although rare, endovascular aneurysm repair EVAR explantation (EX) may be more complex than an initial open repair (OR). We compared EX with primary OR aneurysm repair in a case-controlled manner.

**Methods:** From 1998 to 2013, 46 EX (only infrarenal EVAR) and 1624 OR were treated. EX and OR groups were matched (3:1) for age, gender, and Society for Vascular Surgery/American Association for Vascular Surgery comorbidity score.

**Results:** The 46 cases (EX) and 138 controls (OR) included 164 men (41 EX, 123 OR; mean age, 71 years) and 20 women (five EX, 15 OR; mean age, 73 years). Mean SVS scores were 4.87 for EX and 4.88 for OR. EX indications were infection in 24 (52%), type I endoleak in 8 (17%), complex endoleak in 5 (11%), and type II endoleak in 4 (9%). Aortic clamp was suprarenal in 38 EX (83%) and in 43 OR (31%). Complications were higher for EX compared with OR (early: 61% EX vs 20% OR [ $P < .001$ ]; late: 20% EX vs 6% OR [ $P = .008$ ]). Mean LOS was 17 (EX), 9.6 (OR) days ( $P < .001$ ). Mean follow-up was 1.8 years (EX) and 5.1 years (OR). The 30-day overall mortality was similar: two EX (4%) vs one OR (1%;  $P = .15$ ). Four EX (9%) and 10 OR (8%) were ruptured; one of each group died <30 days. Long-term survival was better for OR vs EX (non-infected and infected) (Fig).

**Conclusions:** EX, even for noninfected indications, is associated with increased morbidity and reduced long-

term survival compared with matched primary OR. These data emphasize the need for careful EVAR patient selection because open reintervention after EVAR is inferior to primary OR.

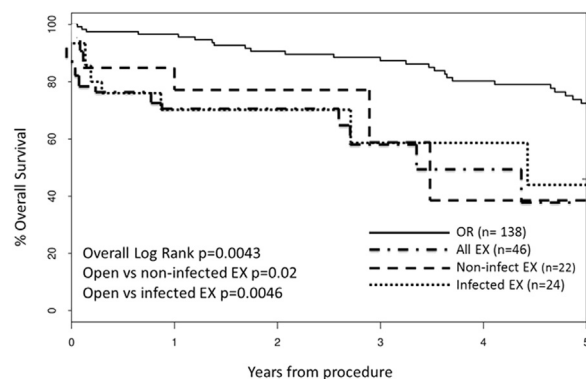


Fig.

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#### V2: Vascular and Endovascular Surgery Society Paper Session II

##### VESS16.

##### Impact of Renal Artery Angulation on Procedural Complexity During Fenestrated and Snorkel EVAR

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**Objectives:** To determine the relationship of renal artery angulation (RAA) on time to target branch vessel catheterization and procedural efficiency during fenestrated (f-EVAR) and snorkel (sn-EVAR) endovascular aortic repair (EVAR).

**Methods:** We reviewed imaging and procedural logs of 77 patients undergoing complex EVAR (53 sn-EVAR, 24 f-EVAR) from 2010 to 2013. RAA was measured on preoperative computed tomography angiography, with positive or negative orientation based on the relative position above or below the plane perpendicular to the lateral aortic wall at the level of each renal ostium. Intraprocedural time to renal artery catheterization was recorded and compared with preoperative RAA as well as periprocedural metrics.

**Results:** Included were 111 renal artery catheterizations (72 sn-EVAR, 39 f-EVAR). Mean RAA was  $-28^\circ \pm 21^\circ$  (range,  $37^\circ$  to  $-60^\circ$ ) for f-EVAR and  $-30^\circ \pm 19^\circ$  (range,  $22^\circ$  to  $-65^\circ$ ) for sn-EVAR ( $P = .66$ ). Comparative analysis using median RAA ( $-30^\circ$  for both f-EVAR and sn-EVAR) demonstrated that less downward angulated renals were associated with longer catheterization times for sn-EVAR (18.1 vs 12.3 minutes,  $P = .04$ ),

and *more* downward angulated renals were associated with longer times for f-EVAR (31.4 vs 15.7 minutes,  $P = .05$ ). The quartile of patients with the longest renal catheterization times was associated with increased operative time (303 vs 214 minutes,  $P < .001$ ), fluoroscopy time (125 vs 84 minutes,  $P = .01$ ), and blood loss (767 vs 473 mL,  $P = .01$ ) in the f-EVAR cohort, and increased fluoroscopy time (86 vs 69 minutes,  $P = .05$ ) in the sn-EVAR group.

**Conclusions:** Preoperative RAA directly impacts the time to renal catheterization and sheath placement, which is the key step in f-EVAR and sn-EVAR. Angles steeper than  $-30^\circ$  favor the snorkel approach, whereas less angulated renal arteries favor the fenestrated strategy. Furthermore, renal artery catheterization time is related to procedural metrics of efficiency during complex EVAR; therefore, operative strategies and device/technique selection should take into account significant variations in renal artery angulation.

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#### VESS17.

**Readmissions After Complex Aneurysm Repair: Frequent, Costly, and Primarily at Nonindex Hospitals**  
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**Objectives:** Readmissions after complex vascular surgery are not well studied. We hypothesized that the rate of readmission after thoracic and thoracoabdominal aortic aneurysm repair (TAA/TAAAR) is underestimated by our single-center results and sought to analyze the risk factors and costs of these readmissions.

**Methods:** Using our institutional database in conjunction with Maryland Health Services Cost Review Commission, we reviewed index admissions and all statewide readmissions of Maryland patients who underwent TAA/TAAAR between 2002 and 2013 at Johns Hopkins Hospital (JHH).

**Results:** We identified 115 Maryland residents (mean age,  $65 \pm 1.2$  years; 58% men; 57% open repair). Readmissions occurred in 29% of cases. Most readmitted patients (79%;  $P < .001$ ) were not readmitted to the index hospital where their procedure was performed. Readmitted patients were not significantly different from nonreadmitted patients in preoperative comorbidities, aneurysm extent, or postoperative neurologic, renal, or cardiovascular complications. On multivariate analysis, significant risk factors for readmission were open repair (odds ratio, 3.1;  $P = .03$ ) and postoperative pneumonia (odds ratio, 4.3;  $P = .02$ ). Striking differences were seen between patients readmitted to JHH (R-JHH) vs an outside hospital (R-OSH): R-JHH were readmitted mainly for aneurysm-related surgical issues, and R-OSH for medical morbidities. Seventy-five percent of R-JHH required aneurysm-related intervention vs 9% of R-OSH. R-OSH also had significantly higher total index hospitalization charges ( $\$100,729 \pm \$12,772$  vs  $\$43,225 \pm \$24,615$ ,  $P = .05$ ).

**Conclusions:** Readmissions after TAA/TAAAR are frequent and occur at hospitals other than the index institution in the majority of cases. Risk factors for readmission include open repair and postoperative pneumonia, but not pre-existing patient comorbidities. Our study suggests preoperative assessment of patients for targeted interventions to reduce readmission is not likely to be efficacious. Minimizing nonoperative complications may reduce readmissions and the high costs associated with repeat care.

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#### VESS18.

**Arteriovenous Graft (AVG) Is Associated With Increased Secondary Procedures but Lower Catheter Use Than Arteriovenous Fistula (AVF)**

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**Objectives:** Arteriovenous fistula (AVF) is associated with improved long-term outcomes but longer maturation periods than arteriovenous graft (AVG). The Fistula First Breakthrough Initiative has recently emphasized tunneled dialysis catheter (TDC) avoidance. We sought to characterize the relationship of AVF and AVG to the utilization of TDCs as well as secondary procedures, defined as surgical revision, fistulogram, and thrombectomy.

**Methods:** Using the US Renal Data System (USRDS) database, we identified incident hemodialysis (HD) patients in 2005 who started HD with a TDC and survived at least 1 year. Access creation, TDC placement and secondary procedures were identified by Current Procedural Terminology codes. Multivariate logistic regression was used to identify risk factors for TDC placement or secondary procedures.

**Results:** In 2005, 56,839 patients started HD, 73% with a TDC. Of those patients, 6286 had an access procedure  $\leq 3$  months and had at least 1 year of follow-up available (AVF, 4,634; AVG, 1,652). Mean age was 67.7 years (AVF, 67.4; AVG, 68.7;  $P < .001$ ), 53.3% were male (AVF, 57.9%; AVG, 40.5%;  $P < .001$ ), and 33.9% were obese (AVF, 33.6%; AVG, 34.6%;  $P = \text{NS}$ ). Multivariate logistic regression demonstrates that AVG is associated with more secondary procedures (odds ratio, 1.403;  $P < .001$ ) but significantly lower TDC use (odds ratio, 0.845;  $P = .006$ ). Lower body mass index, white race, older age, and male gender also protect against TDC placement (Table). Lower body mass index, male gender, white race, and younger age are protective against secondary procedures.

**Conclusions:** In patients starting HD with TDC, AVG is associated with increased secondary procedures but lower TDC placement at 1 year.