

# Wednesday, April 1<sup>st</sup>

## Scientific Session VI – Complex Aneurysm

**Presentation Number:** 18

**Publishing Title:** Staged Hybrid Repair of Extensive Thoracoabdominal Aortic Aneurysms Secondary to Aortic Dissections: Mid-Term Outcomes

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**OBJECTIVES:** Open repair of Crawford Extent I/II thoracoabdominal aortic aneurysms(TAAA) are associated with a high rate of major adverse complications. Staged hybrid repair of these extensive TAAAs may reduce this operative risk. In the present study, we review the mid-term outcomes of a previously described technique that combines proximal thoracic endovascular aneurysm repair (TEVAR) followed by staged distal open thoracoabdominal repair for patients with Crawford Extent I/II TAAAs.

**METHODS:** From July 2007 to June 2014, 19 patients with Crawford Extent I(n=1) or Extent II(n=18) TAAAs secondary to chronic aortic dissections underwent a staged hybrid repair. All patients had TEVAR as Stage 1 and open repair as Stage 2, with partial cardio-pulmonary bypass via left femoral arterial and venous cannulation for visceral and lower body perfusion. The open thoracoabdominal graft was anastomosed proximally in end to end fashion with the endograft.

**RESULTS:** Average patient age was 54 ±17.6 years (14 male). Nine patients had prior open proximal aortic surgery for Type I aortic dissections. TEVAR was performed via percutaneous (n=8), femoral cutdown (n=8) or iliac exposure (n=3). The left subclavian artery was covered in 9 patients and re-vascularized in 8 patients by carotid-subclavian bypass (n=7) or laser fenestration (n=1). There were no incidents of death, stroke, or paralysis in this cohort. Following TEVAR, three patients required repeat intervention for endoleak (Type 1A, n=1; Type1B, n =1; Type 2, n=1) prior to open repair. Following open repair, there was a single delayed permanent paralysis. Hospital length of stay was 7±4 days after TEVAR and 9±5 days after open repair. No deaths or neurologic events occurred in the remaining 18 patients over a median 85 week follow up (range 4 weeks to 6.2 years). Importantly, all patients have stable aortic size and remain free of reintervention over the follow-up period.

**CONCLUSIONS:** Staged hybrid repair, combining proximal TEVAR with open distal repair, for extensive TAAAs secondary to chronic dissection is an effective, durable and safe alternative to traditional open repair. This mid-term follow up data suggests that staged repair may reduce perioperative morbidity and mortality in patients with extensive TAAAs.

**Abstract Body:**

Outcome of Staged Hybrid Repair of Extent I/II TAAAs	
Outcome	Staged Hybrid Repairs (n=19)
<b>Stage 1: TEVAR</b>	
Death	0 (0%)
Stroke / Paraplegia	0 (0%)
Acute Kidney Injury	1 (5.2%)
Type 1 Endoleak	2 (10.5%)
Type 2 Endoleak	1 (5.2%)
<b>Stage 2: Open Distal Repair</b>	
Death	0 (0%)
Stroke / Paraplegia	1 (5.2%)
Acute Kidney Injury (serum Cr > 2)	5 (26.3%)
Chronic Renal Failure	0 (0%)

**Presentation  
Number:** 19

**Publishing  
Title:** Aortobifemoral Graft Infection: Is Unilateral Limb Excision Definitive?

**Author Block:** **Jeffrey D. Crawford, MD**, Amir F. Azarbal, MD, Timothy K. Liem, MD, Gregory J. Landry, MD, Gregory L. Moneta, MD,  
Erica L. Mitchell, MD.  
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**Abstract  
Body:**

**OBJECTIVES:** Aortobifemoral graft (ABFG) infections presenting with single limb involvement can be managed with unilateral limb excision or complete graft removal. This study aims to identify factors predictive of subsequent contralateral limb infection in patients initially undergoing unilateral limb excision.

**METHODS:** A retrospective review of patients treated for infected ABFGs from 2001-July 2014 was performed. Endovascular and aortic tube graft infections were excluded. Primary outcomes were freedom from contralateral graft limb excision, overall survival and factors potentially predictive of subsequent contralateral limb infection.

**RESULTS:** Fifteen patients underwent unilateral graft limb excision with retroperitoneal exploration of the affected ABFG limb and revascularization for unilateral graft limb infection. Original indication for placement of the ABFG was aortoiliac occlusive disease in 11 patients and aneurysm in 4. All patients had no clinical or radiographic evidence for contralateral limb infection at initial presentation. Seven patients, all of whom underwent initial operation for aortoiliac occlusive disease developed contralateral limb infection at a median follow up of 23.2 months. The remaining 8 patients had no evidence of contralateral limb infection at median follow up of 38.8 months. Patient demographics were similar between the two groups. Five of the seven patients who developed contralateral limb infection had imaging evidence of ipsilateral graft infection above the inguinal ligament at the time of initial graft infection. Operative exploration during unilateral excision in this group revealed a well-incorporated graft without extension to the bifurcation. There was no dominant organism cultured in either group and duration of targeted antibiotic therapy was similar in both groups ( $\geq 6$  weeks). For the series, there were no amputations and overall mortality was 40% with median follow-up of 44.7 months.

**CONCLUSIONS:** Unilateral infection of an ABFG can be managed with single limb excision, however, 50% of patients will return with contralateral limb infection at a median of two years. Clinical assessment of graft incorporation lacks specificity and does not indicate freedom from contralateral limb infection. Factors predicting contralateral involvement include initial operation for aortoiliac occlusive disease and initial imaging or operative findings suspicious for infection above the inguinal ligament of the unilateral limb.

**Presentation Number:** 20

**Publishing Title:** Percutaneous Endovascular Aortic Repair (PEVAR) of Complex Aneurysms using Large-Diameter Sheaths for Thoracic, Fenestrated and Branched Endografts

**Author Block:** **Leonardo Reis de Souza, MD**, Gustavo S. Oderich, MD, Peter Banga, MD, Jan Hofer, MD, Stephen Cha, MS, Peter Glaviczki, MD.

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**OBJECTIVES:** To review the outcomes of PEVAR of complex aortic aneurysms using large-diameter sheaths for thoracic, fenestrated and branched stent-grafts.

**METHODS:** We reviewed the outcomes of all consecutive patients who underwent PEVAR of descending thoracic (DTA), thoracoabdominal (TAAA), pararenal (PRA) or aortoiliac aneurysms (AIAs) using large-diameter sheaths for placement of thoracic, fenestrated or branched stent-grafts. Patients treated by fenestrated and branched stent-grafts were enrolled in prospective physician-sponsored investigational device exemption protocols. A percutaneous approach was selected in patients with <50% posterior, minimal anterior or no calcification in the common femoral artery using standardized pre-closure technique with two Perclose® devices (Abbott, CA) in each femoral puncture site. End-points were technical success, conversion to open femoral artery repair, 30-day mortality and major adverse events, and freedom from femoral access-site complications.

**RESULTS:** There were 102 patients treated for 48 PRA, 27 TAAA, 19 DTA and 8 AIAs. A total of 171 femoral arteries were closed using pre-closure technique. Trans-femoral sheath size was 18Fr in 4 vessels (3%), 20Fr in 120 (70%) and ≥22Fr in 47 (27%). 83 patients (81%) had visceral branch incorporation, which required brachial artery access using small incision in 48. Technical success for percutaneous trans-femoral closure was 95% (162/171). Nine intraoperative failures were managed by open femoral conversion using primary repair in 6, interposition graft in 2, and patch angioplasty in 1. Mean estimated blood loss was 444±569 ml. There were no patients with had uncontrolled puncture-related hemorrhage, retroperitoneal hematoma or intraoperative hypotension. 30-day mortality was 0.9% (1/101) and 30-day rate of major adverse events was 15% (16/102). Spinal cord injury occurred in 1 patient (0.9%). There were 5 (3%) access-related complications, including femoral artery occlusion in 3 and hematoma or pseudoaneurysm in 1 each. Wound-related complications occurred in 1 patient (0.5%) who required open femoral artery conversion for exposure and repair. After a mean follow up of 1-year, freedom from femoral access-site complication was 97±2%.

**CONCLUSIONS:** PEVAR using pre-closure technique is safe and effective in select patients with complex aortic aneurysms who have minimal or no femoral calcifications and require large-diameter sheaths for thoracic, fenestrated and branched stent-grafts. Rate of puncture (3%) and wound-related complications (0.5%) is low, and uncontrolled puncture-related hemorrhage, retroperitoneal hematoma and systemic hypotension has not occurred in this series.

**Abstract Body:**

**Presentation  
Number:** 21

**Publishing  
Title:** Left Subclavian Artery Occlusion During TEVAR in the Elderly is Associated with Significant Morbidity

**Author Block:** **Khanjan H. Nagarsheth, MD**, Jonathan Schor, MD, Matthew D'Alessandro, DO, Kuldeep Singh, MD, Jonathan Deitch, MD.  
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**OBJECTIVES:** Covering the left subclavian artery (LSA) during thoracic endovascular aortic repair (TEVAR) for proximal seal is generally safe and well tolerated. The purpose of this study is to determine if this practice is safe in elderly patients.

**METHODS:** The National Surgical Quality Improvement Program (NSQIP) database was queried, from the years 2005 to 2011, to identify patients who underwent TEVAR. Octogenarians were separated into two groups, one where the LSA was covered (C-SA) and another where it was not covered (U-SA). Patient demographics, comorbidities, perioperative data, and outcomes were compared.

**Abstract  
Body:**

**RESULTS:** There were a total of 392 patients over age 80 who underwent TEVAR. There were 128 patients in the C-SA group and 264 in the U-SA group. There was no significant difference in demographics or baseline cardiovascular or pulmonary comorbidities between groups. There was also no difference in emergency procedures between C-SA and U-SA groups (27% v. 21%,  $p=0.18$ ). It was found that the C-SA group had significantly more intra-operative cardiac arrest (4% v. 1%,  $p=0.03$ ) and significantly more received intra-operative blood transfusions (32% v. 21%,  $p=0.02$ ). There was also a higher post-operative rate of stroke (9% v. 3%,  $p=0.03$ ) and sepsis (9% v. 3%,  $<0.01$ ) in the C-SA group compared to the U-SA group.

**CONCLUSIONS:** Covering the LSA in octogenarians is associated with significantly increased peri-operative morbidity. We recommend caution when considering coverage of the LCA during TEVAR. These patients may benefit from elective revascularization when possible.

**Presentation  
Number:** 22

**Publishing  
Title:** Development of New Acute Dissection in the Ascending Aorta after Type B Dissection: Intramural Hematoma is not Benign

**Author  
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**OBJECTIVES:** Aortic dissection is a dynamic process that can extend distal to the entry tear or proximally in a retrograde fashion. We sought to determine associations for development of new acute type A aortic dissection (ATAD) after type B dissection (TBAD).

**METHODS:** We reviewed our aortic dissection database for cases of ATAD from 2002-2013 that had known TBAD. Imaging and intraoperative reports were used to determine presence of entry tear with dissection flap vs. intramural hematoma (IMH). Demographic and disease-related variables were analyzed.

**RESULTS:** Among 419 new cases of ATAD, we identified 16 (3.8%) patients with previous known TBAD. Presence of flap vs. IMH could be determined in 403/419 cases (96%). IMH was more common in patients with previous TBAD (56% vs. 13%,  $P < .001$ ). Previous thoracic (6/16, 38%,  $P < .001$ ) and abdominal aortic surgery (4/16, 25%,  $P = .004$ ) were also more common. There were 2 cases each of open and endovascular repair of the descending thoracic aorta (Figure); and 2 cases of open thoracoabdominal aortic repair. On multivariate regression analysis, IMH and previous aortic surgery were associated with new ATAD ( $P < .004$ ). In-hospital mortality after ATAD repair in TBAD patients occurred in 1/16 (6%).

**CONCLUSIONS:** Patients with IMH of the descending thoracic aorta may develop new dissection in the ascending aorta. Not surprisingly, in patients with TBAD and new ATAD there was an association with previous aortic surgery. Surveillance of the ascending aorta is mandatory in all patients with TBAD.

**Abstract  
Body:**



**Presentation Number:** MP24

**Publishing Title:** **Evolution from Physician-Modified to Manufactured Fenestrated and Branched Endografts to Treat Pararenal and Thoracoabdominal Aortic Aneurysms**

**Author Block:** **Gustavo S. Oderich, MD, Leonardo Reis de Souza, MD, Jan Hofer, RN, Peter Banga, MD, Sharon Mueller, RN, Stephen Cha, MS, Thanila Macedo, MD, Peter Glociczki, MD**  
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**PURPOSE:** To review outcomes of patients treated for pararenal (PRA) or thoracoabdominal aortic aneurysms (TAAAs) using physician-modified (PMSGs) or manufactured fenestrated and branched stent-grafts (MSGs).

**METHODS:** We reviewed clinical data of 207 consecutive patients (164 male, mean age 76±9 years old) treated for PRA/TAAAs using fenestrated and branched stent-grafts. Choice of device evolved from PMSGs (2007-2013) to MSGs (2012-2014) in patients enrolled in prospective physician-sponsored investigational device exemption protocols (PS-IDE). End-points were 30-day mortality, major adverse events (MAEs), patient survival, freedom from type I/III endoleak, sac growth (>5mm), primary target vessel patency and re-intervention.

**RESULTS:** 138 patients were treated by PMSGs, 69 had MSGs. 131 patients had PRAs (82 PMSGs, 49 MSGs), 76 had TAAAs (56 PMSGs, 20 MSGs). PMSGs patients had larger aneurysms, more cardiac, pulmonary and kidney disease, and higher comorbidity scores ( $P<0.05$ ). A total of 670 visceral arteries were targeted by fenestrations and branches. Technical success was 98% for PMSGs and 99.6% for MSGs ( $P=0.9$ ). 30-day mortality was 1% for PRAs (PMSGs 1%, MSGs 0%,  $P=0.44$ ) and 7% for TAAAs (PMSGs 9%, MSGs 0%;  $P=0.17$ ). There were more ( $P<0.05$ ) MAEs among PMSG patients treated for PRAs (44%, 24%) and TAAAs (58%, 25%). Mean follow up was longer in PMSG patients (31±21, 12±7 months;  $P<0.0001$ ). At 1-year, PMSGs and MSGs had similar freedom from type I/III endoleaks (PRAs: 95±4%, 99±1%; TAAAs: 100%, 100%), sac growth (PRAs: 99±1%, 100%; TAAAs: 97±3%, 100%), primary target vessel patency (PRAs: 97±1%, 98±1%, TAAAs: 98±1, 97±2%) and re-intervention (PRAs: 85±5%, 93±4%; TAAAs: 82±5%, 100%). Survival was lower ( $P<0.05$ ) in PMSGs patients treated for PRAs (84±3%, 98±2%) and TAAAs (78±5%, 100%). At 5-years, 20 PMSG patients (14%) developed type I/III endoleak and 10 (7%) had sac growth. In the PMSG group, patient survival, freedom from type I/III endoleak, sac growth, primary target vessel patency and re-intervention at 3- and 5-years was 71±4%/63±5%, 87±3%/76±7%, 96±2%/80±6%, 96±1%/96±1%, and 71±5%/57±7%, respectively.

**Abstract Body:**

**CONCLUSION:** Patients treated by PMSGs had higher clinical risk and larger aneurysms, reflecting the more liberal indication of MSGs under PS-IDE protocols. Despite differences, both devices were implanted with similar technical success, mortality, endoleak, sac growth, vessel patency and re-intervention rates. At late follow up, PMSGs were associated with significant rate (14%) of type I/III endoleaks and sac growth (7%).

**Presentation  
Number:** MP25

**Publishing  
Title:** **Clinical Application of Continuous Intraoperative Neuromonitoring And Selective Use of Temporary Femoral Conduits to Minimize Lower Extremity Ischemia and Risk of Spinal Cord Injury During Complex Endovascular Thoracic and Thoracoabdominal Aortic Repair**

**Author Block:** Peter Banga, MD, Gustavo S. Oderich, MD, Eric Sorenson, MD, Leonardo Reis de Souza, MD, Josh Netcott, R. EEG. T, Jan Hofer, RN, Stephen Cha, MS, Peter Gloviczki MD, MD.  
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**PURPOSE:** To review the clinical utility of intra-operative motor-evoked (MEP) and somatosensory-evoked potential (SSEP) monitoring with selective use of temporary femoral conduits (TFCs) in patients undergoing endovascular repair of descending thoracic (DTA) and thoracoabdominal aortic aneurysms (TAAAs).

**METHODS:** We reviewed the clinical data of 49 patients (38 male; mean age of 75±8 years old) who underwent endovascular repair of DTA and TAAAs (2007-2014). Patients treated by fenestrated and branched endografts were enrolled in prospective physician-sponsored investigational device exemption protocols. Patients requiring extensive aortic coverage had cerebrospinal fluid (CSF) drainage, permissive hypertension and MEP/SSEP monitoring. TFCs were used in patients with difficult visceral artery anatomy, allowing withdrawal of the device sheath into the conduit while performing visceral stenting. Changes in MEP/SSEPs prompted maneuvers to optimize spinal cord perfusion and restore lower extremity (LE) blood flow whenever possible. End-points were spinal cord injury (SCI) and LE ischemic complications.

**Abstract  
Body:**

**RESULTS:** 45 patients (92%) had TAAAs, 4 (8%) had DTAs. 163 visceral arteries were targeted by fenestrations and branches (mean, 3.7±0.1 vessels/patient). Temporary conduits were used in 12 patients/14 limbs (11 TFCs, 3 iliac). A stable MEP/SSEP was achieved in all patients. 29 patients (59%) had >75% decrease in MEP amplitude in 40 limbs. MEP changes started 76±29 minutes after vascular access and were more prominent in the side of the larger sheath. Patients with temporary conduits less often had MEP changes compared to those without conduits (21% vs 47% of limbs, P<0.01). MEP amplitude partially improved in 7 patients/ 9 limbs (23%) with intra-operative maneuvers to increase mean arterial pressure and lower CSF pressure. With restoration to LE blood flow, MEP/SSEPs returned to baseline in all except for one patient who developed immediate permanent paraplegia. A second patient developed delayed paraplegia after open repair of retrograde type A dissection 2 days after the initial procedure. There were no other SCIs or LE ischemic complications.

**CONCLUSION:** Neuromonitoring is a reliable technique to assess LE ischemia and spinal cord function and predicts immediate SCI during endovascular repair of complex aortic aneurysms. Temporary iliofemoral conduits allow immediate restoration of LE blood flow in difficult cases where prolonged LE ischemia is anticipated. Identification of MEP/SSEP changes allows institution of a standardized protocol to optimize spinal cord perfusion and restore LE blood flow.

**Presentation  
Number:** MP26

**Publishing  
Title:** **Anatomic Severity Grading Score for Primary Descending Thoracic Aneurysms Predicts Reinterventions and Mortality After Thoracic Endovascular Aortic Repair**

**Chad Ammar, MD, Sebastian Larion, MS, Sadaf S. Ahanchi, MD, Kedar S. Lavingia, MD, David J. Dexter, MD, Jean M.**

**Author Block:** Panneton, MD

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**OBJECTIVES:** An anatomic severity grading (ASG) score for primary descending thoracic aortic aneurysms (DTAs) has recently been developed by our group. The objective of this study is to determine if an ASG score cutoff value for DTAs is predictive of reinterventions and mortality in patients undergoing thoracic endovascular aortic repair (TEVAR).

**METHODS:** A retrospective review from 2008 to 2013 of patient records was conducted of all consecutive patients who underwent a TEVAR for a primary DTA. A comprehensive scoring system of preoperative DTA morphology based on computed tomography angiography (CTA) images has been established to identify and classify anatomic features that may influence outcome after TEVAR. ASG score calculations were achieved using 3D reconstructions of preoperative CTA images (TeraRecon Aquarius iNtuition Workstation, Foster City, CA). Primary outcomes included aneurysm-related death, 30-day mortality, all-cause mortality, aneurysm rupture, primary technical success, and aneurysm-related reintervention rates. Secondary outcomes included device migration, endoleak formation, endoleak requiring reintervention, hospital readmission within 30 days, stroke, paraplegia, and conversion to open repair.

**Abstract  
Body:**

**RESULTS:** Of 469 patients with an ICD-9 diagnosis of a thoracic aortic aneurysm, 62 (13%) patients underwent TEVAR and had adequate preoperative imaging (mean age, 71 years). Applying the ASG score, we identified 30 (48%) patients with a score  $\geq 28$  (high score group) and 32 (52%) patients with a score  $< 28$  (low score group). Mean follow-up was 32.8 months post-TEVAR for both groups. Technical success was 100% in both groups. Aneurysm-related and all-cause mortality was significantly higher in the high score versus the low score group (13% vs. 0%,  $P=0.049$  and 27% vs. 3.1%,  $P=0.011$ , respectively). A significantly higher reintervention rate (43% vs. 13%  $P=0.015$ ) was present in the high score versus low score group. Endoleak formation and endoleak requiring reintervention was significantly higher in the high versus the low score group (53% vs 9%,  $P= <0.001$  and 40% vs 6%,  $P=0.004$ , respectively). No significant difference in aneurysm rupture (4%), device migration (6%), 30-day hospital readmission (13%), stroke or paraplegia (6%) was present between groups, and no patient had a conversion to open repair during the follow-up period.

**CONCLUSIONS:** Preoperative ASG score for primary DTAs predicts reinterventions for endoleaks, aneurysm-related and all-cause mortality after TEVAR.



**Presentation Number:** MP27

**Publishing Title:** Preventing Spinal Cord Ischemia in Complex Endovascular Aortic Aneurysm Repair

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**OBJECTIVES:** Complex endovascular aortic aneurysm repair (cEVAR) with branched and fenestrated aortic stent grafts has revolutionized the treatment of complex aortic aneurysms. While the risks of cEVAR appear to be less than those of open repair, devastating complications may still arise, particularly with repair of aneurysms of the thoracoabdominal aorta. One of the most severe complications of cEVAR is spinal cord ischemia (SCI), with a reported risk in the range of 10-15%. While multiple strategies have been proposed to reduce the risk of SCI, the use of 'paraplegia-prevention branches' (PPBs) to maintain temporary perfusion of the aneurysm sac allows for a staged approach to endovascular repair of complex aneurysms.

**METHODS:** Patients undergoing cEVAR who were deemed high risk for SCI, based mainly on extensive aortic coverage or previous aortic intervention, were treated with custom-made stent grafts with PPBs, consisting of one or two upward-pointing 6mm branches, ideally in proximity to large patent intercostal arteries. These branches were left open during the initial intervention, maintaining perfusion to the aneurysm sac. Routine institutional SCI prevention strategies were employed. During a planned secondary procedure, PPBs were then occluded using Amplatzer occluder devices, under local anesthesia. Demographic and peri-operative data were collected retrospectively for patients identified from a prospectively maintained database of all patients undergoing EVAR at our institution, and compared for patients undergoing cEVAR with and without PPBs.

**RESULTS:** Between 2010 and 2014, 71 patients underwent cEVAR for complex abdominal or thoracoabdominal aneurysms. Seven patients underwent cEVAR using PPBs, with a time-to-occlusion of 19±8 days. The overall rate of SCI was 12.7%, however none of the patients treated with PPBs developed SCI. Likewise, peri-operative mortality was 9.0%, consistent with reports in the literature. None of the patients treated with PPBs died in the peri-operative period.

**CONCLUSIONS:** Staged endovascular repair of complex aortic aneurysms using PPBs may represent a means of reducing the risk of SCI. Our experience adds to the growing body of literature supporting the notion of staged endovascular repair of complex aortic aneurysms. Further study is necessary to determine whether PPBs significantly reduce the risk of SCI.

**Abstract Body:**

**Presentation Number:** MP28

**Publishing Title:** A Novel Anatomic Severity Grading Score for Acute Type B Aortic Dissections and Correlation to Aortic Reinterventions after Thoracic Endovascular Aortic Repair

**Author Block:** Shirui Chen, BA, Sebastian Larion, MS, S. Sadie Ahanchi, MD, Chad P. Ammar, MD, Colin T. Brandt, MD, Jean M. Panneton, MD.

Eastern Virginia Medical School, Norfolk, VA

**OBJECTIVES:** We introduce a novel preoperative anatomic severity grading (ASG) system for acute type B aortic dissections and test the system with a cohort of patients who underwent thoracic endovascular aortic repair (TEVAR).

**METHODS:** A cohort of patients who received TEVAR for acute type B aortic dissection between 2008-2014 was identified. We developed an ASG score to measure aspects of aortic anatomy that we hypothesized may affect difficulty of repair (shown below). We also calculated a false lumen volume index (FLVI=false lumen volume divided by the sum of the true and false lumen volumes). Measurements were made using reconstructed CT angiography images and categorized using scores of 0 to 3 based on hypothesized severity, giving a potential range of 0-38.

**RESULTS:** We analyzed the CTA images on a cohort of 30 patients with acute (within 2 weeks of symptoms onset) type B aortic dissection who underwent TEVAR. The average age was 63 years (range 28-89 years) with 70% male and 50% Caucasian. The mean ASG score was 19 (range 10-29). We created an area under the receiver operating characteristic curve (AUROC) using ASG to predict aortic reinterventions. The area was 0.72 (95% CI 0.39 to 1.1). Guided by the AUROC, we divided patients into two groups, one with ASG scores <22 (n=20) and the other with scores ≥22 (n=10). With this cutoff, ASG exhibited 80% sensitivity and 76% specificity in predicting aortic reinterventions, with reintervention in 40% of high-score patients and 5% of low-score patients (P=0.031). In addition, patients in the high-score group were significantly younger (53.8 vs 66.9 years, P=0.006).

The mean thoracic aorta FLVI was 0.59 (range 0.19-0.94). Patients with high ASG score exhibited significantly larger thoracic aortic FLVI (0.73 vs 0.52, P=0.001). The correlation coefficient between thoracic aorta FLVI and ASG was 0.74 (P<0.001).

**CONCLUSIONS:** A preoperative ASG score of acute type B aortic dissections consists of analysis of the proximal landing zone, curvature and tortuosity of the aorta, dissection anatomy, aortic branch vessel anatomy, and supraceliac aorta anatomy. ASG score ≥22 correlated with larger false lumen to total aortic volume ratio and was an excellent predictor of aortic reinterventions.

**Abstract Body:**

Attribute	0	1	2	3	
<b>Proximal Landing Zone</b>	False lumen cross-sectional area index (FOI)	< 0.2	0.2 - 0.5	0.5 - 0.85	> 0.85
	Whole lumen cross-sectional area contour change (CC1)	< 200 mm <sup>2</sup>	200 - 450 mm <sup>2</sup>	450 - 700 mm <sup>2</sup>	> 700 mm <sup>2</sup>
	Maximum whole lumen cross-sectional area (MCSA1)	< 1000 mm <sup>2</sup>	1000 - 1200 mm <sup>2</sup>	1200 - 1400 mm <sup>2</sup>	> 1400 mm <sup>2</sup>
	Left common carotid to left subclavian distance (L1)	> 18 mm	18 - 12 mm	< 12 mm	
	Left common carotid to entry tear distance (L2)	> 100 mm	100 - 25 mm	< 25 mm	
	Calcification and thrombus index (CT)	< 0.3	0.3 - 0.5	> 0.5	
<b>Curvature and Tortuosity</b>	Thoracic aorta tortuosity index (TI)	< 1.25	1.25 - 1.55	> 1.55	
	Intraaortic distance (ID)	> 28 mm	28 - 23 mm	< 23 mm	
	Arch type	Type I	Type II	Type III	
<b>Dissection</b>	False lumen length (PLL)	< 300 mm		> 300 mm	
	Tear length	< 5 mm	5 - 17 mm	> 17 mm	
	Number of observable tears	0	= 6		
	Tear circumferential location	Not at outer curvature of arch	At outer curvature of arch		
<b>Branch Vessels</b>	Location (BVL)	0	1 - 3	4	> 4
	Patency (BVP)	0	1 - 3	> 2	
<b>Supraceliac Aorta Anatomy</b>	Whole lumen cross-sectional area contour change (CC2)	< 300 mm <sup>2</sup>	300 - 400 mm <sup>2</sup>	400 - 600 mm <sup>2</sup>	> 600 mm <sup>2</sup>
	Maximum whole lumen cross-sectional area (MCSA2)	< 650 mm <sup>2</sup>	650 - 850 mm <sup>2</sup>	850 - 925 mm <sup>2</sup>	> 925 mm <sup>2</sup>

Branch vessels examined: left subclavian artery, celiac artery, superior mesenteric artery, left renal artery, right renal artery, inferior mesenteric artery, left iliac artery, right iliac artery. BVL = number of branch vessels whose ostia are entirely or partially located in the false lumen. BVP is based on an occlusion index (OI), where a branch vessel is assigned an index of 0 if the ostium is patent, 1 if partially occluded and 2 if completely occluded. BVP for each patient is then categorized based on the summed occlusion indices of all branch vessels.

# Karmody Competition Topic: Aneurysm

**Presentation Number:** KC1

**Publishing Title:** Predictors of Perioperative Outcomes after Fenestrated EVAR

**Author Block:** **Tarik Z. Ali, MD**, David E. Timaran, MD, Kimberly Borges, Luis Gomez, MD, Martyn Knowles, MD, Mirza Shadman Baig, MD, Carlos H. Timaran, MD.

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**OBJECTIVES:** Fenestrated EVAR is a novel treatment modality for complex AAAs that could be applied to a greater number of patients compared to open repair. The safety and efficacy of fenestrated EVAR in high risk and frail patients has not been established. The aim of this study was to assess the risk factors, including a simplified frailty index (SFI), for postoperative complications and major adverse events after fenestrated EVAR.

**METHODS:** Over a 22-month period, 49 patients with complex AAAs underwent fenestrated EVAR with a custom made device, the Zenith Fenestrated AAA Endovascular Graft (Cook Inc, Bloomington, Ind). Perioperative data was collected into a prospectively maintained database. A SFI was calculated according to the presence of 11 items, including diabetes; functional status (not independent); chronic obstructive pulmonary disease or pneumonia; congestive heart failure; history of myocardial infarction; either prior percutaneous coronary intervention, previous coronary surgery, or history of angina; hypertension requiring medication; peripheral vascular disease or rest pain; impaired sensorium; history of either transient ischemic attack or cerebrovascular accident; or history of cerebrovascular accident with neurologic deficit. Perioperative major adverse events were defined as death, hospital re-admission, disability or life threatening adverse events at 30 days. Univariate analysis, non-parametric analysis and simple logistic analysis were used.

**Abstract Body:**

**RESULTS:** The Median age was 73 years (interquartile [IQR] 68-81). Median SFI was 0.27 (IQR, 0.18-0.36). The median number of fenestrations was 2 (IQR, 2-3). Univariate analysis and simple logistic analysis revealed that SFI was not a predictor of post-operative complications and major adverse events at 30 days ( $p>0.1$ ). BMI, increasing age and cardiac history of arrhythmias or valvular disease were found to be statistically significant risk factors for major adverse events ( $P<0.05$ ). Patients with lower BMI (25.5[IQR, 20.9-29.6] vs 28 [IQR, 25-31]) ( $p=0.03$ ), increasing age (78 [IQR 69-84] vs 70 [IQR, 65-75]) ( $p<0.01$ ) and a history of arrhythmias or valvular disease (47 % vs 4%) ( $p=0.03$ ) had a higher frequency of major adverse events and postoperative complications.

**CONCLUSION:** Fenestrated EVAR is a safe and effective for the treatment of complex AAAs, even in high-risk and frail patients. Increasing age, BMI and cardiac problems (other than MI and CHF) are predictors of perioperative major adverse events after fenestrated EVAR.

**Presentation  
Number:** KC2

**Publishing  
Title:** **Midterm Results of Parallel Grafts Used in the Endovascular Treatment of Complex Abdominal Aortic Aneurysms**

**Author Block:** **Andrew Cha, DO**, Michael Lieb, DO, Naiem Nassiri, MD, Randy Shafritz, MD, Saum Rahimi, MD.  
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**Abstract  
Body:**

**OBJECTIVE:** The use of endovascular stent grafts to repair abdominal and thoracic aortic aneurysms has become the mainstay of treatment. The technique of parallel stents grafts has emerged as a modality to provide an endovascular approach to aneurysm repair in high risk patients with challenging aneurysm neck anatomy. Here we evaluate our results using parallel self expanding covered stent grafts to treat complex aneurysms.

**METHODS:** We evaluated all patients undergoing endovascular aneurysm repair (EVAR) utilizing covered self expanding stents to extend either the proximal or distal seals zones from November 2010 to December 2013. Only patients with a post-operative CT angiogram were included for analysis. We evaluated the patients' most recent CTA to determine graft position and patency. The 30-Day and overall mortality, parallel graft patency rate, change in aneurysm size, and rate of endoleaks were calculated.

**RESULTS:** There were 13 patients ( 11 male, 2 female) an average of  $75 \pm 7.5$  years old included in analysis. Two thoracic aneurysms, 3 para-renal aneurysms, and 8 infra-renal aneurysms were treated. A total of 20 vessels were treated with 22 parallel grafts ( 14 Renal, 2 SMA, 1 Polar renal, 1 Celiac, 2 Hypogastric). There was an average of 1.7 parallel grafts per patient. The average length of parallel stent graft used varied by location (Renal 10.5cm, SMA 10 cm, Celiac 10cm, Hypogastric 12.5 cm). The average follow up was 13.6 months (Range 3-45 months). There was one early death resulting in a 7.7% 30-day mortality. The average maximum pre-operative aneurysm diameter was  $57 \pm 11$  mm (Range 40-84mm). The average maximum post-operative aneurysm diameter was  $54 \pm 7$  mm (Range 41-66mm). Post-operatively, there was an average decrease in aneurysm size of 4mm, representing a 4.4% decrease in aneurysm size. There were no patients with Type I or Type III endoleaks. There are currently 3 patients with Type II endoleaks (23%)

**CONCLUSION:** The use of parallel stent grafts has expanded the use of EVAR to patients who previously were deemed not to be candidates. We have observed excellent patency of the stent grafts in our patient population. These mid term results illustrate the utility of parallel grafts to treat complex aneurysm in high risk patients when fenestrated grafts are not an option.

**Presentation Number:** KC3

**Publishing Title:** Outcomes of Endovascular Interventions in Patients with Connective Tissue Diseases

**Author Block:** J Westley Ohman, MD, Chandu Vemuri, MD, Patrick J. Geraghty, MD, Luis A. Sanchez, MD, Alan Braverman, MD, Jeffrey Jim, MD.

WashU STL, Saint Louis, MO

**OBJECTIVES:** Patients with connective tissue disorders (CTD) requiring aortic repair are traditionally treated with open surgery as endovascular repair has been contraindicated due to concern about tissue integrity and outcomes with TEVAR. Our objective is to review a single center experience in endovascular treatment in CTD patients.

**METHODS:** A retrospective chart review was performed to identify patients with a diagnosis of a CTD who underwent an endovascular intervention between 12/1/2004 and 12/1/2013. Preoperative demographic information and postoperative outcomes were collected.

**RESULTS:** During the study period, a total of 6 patients met selection criteria, and were followed for 42.5 +/- 13.9 months. 4 carried a diagnosis of Marfan syndrome, 1 had Loeys-Dietz syndrome, and 1 was unspecified. 4 were treated for aneurysmal disease: 1 thoracic aorta, 2 abdominal aortoiliac, and 1 popliteal; and 2 were treated for acute complications from Type B aortic dissection. 1 patient had a recent thoracotomy with proximal suture line anastomosis dehiscence whom was not felt to be able to tolerate an open procedure following a prolonged code and was treated with proximal thoracic endovascular aortic aneurysm repair (TEVAR) on an emergent basis, the remainder were considered to be at prohibitive risk due to comorbidities and prior procedures. There was 1 periprocedural complications, the emergent TEVAR patient developed asymptomatic retrograde dissection

**Abstract Body:**

In follow-up, secondary interventions were required in two patients including embolization of a type II endoleak at 7 months and stent graft placement for a type IB endoleak at 1 month. The patient treated for popliteal aneurysm required open popliteal aneurysmorrhaphy at 15 months. 5 patients are alive with 1 death at 9.2 years from a gastrointestinal bleed unrelated to the endovascular repair.

**CONCLUSIONS:** Endovascular treatment for patients with CTD are associated with high rates of complication and reintervention. The use of this treatment modality should be reserved for patients where traditional open reconstruction is at prohibitive risk.

**Presentation Number:** KC4

**Publishing Title:** Evaluation of the current management guideline for popliteal artery aneurysms

**Author Block:** **Inkyong K. Parrack, M.D.**, Andrew J. Meltzer, M.D., Jeffrey J. Siracuse, M.D., Heather L. Gill, M.D., Darren B. Schneider, M.D., Peter H. Connolly, M.D..

NY Presbyterian, Cornell University, New York, NY

**OBJECTIVES:** Popliteal artery aneurysms (PAAs) represent a challenging treatment paradigm with a variety of presentations and management options. The purpose of this study is to better delineate the management algorithm and to evaluate the outcomes of the current management guideline.

**METHODS:** A retrospective review was performed to identify all PAAs between Aug 2007 to Dec 2013.

**RESULTS:** 74 limbs with PAAs in 61 patients (mean age  $74.6 \pm 11$ , 98% male) were identified. 51 PAAs underwent repair, 27 by endovascular means (ENDO) and 24 repaired via open bypass graft (BPG). 23 PAAs were followed via routine duplex imaging (OBS) q6-12months for asymptomatic size  $< 2.0$ cm. Average PAA size was  $2.8 \text{cm} \pm 1.0$  ENDO,  $3.6 \pm 0.5$  BPG,  $2.0 \pm 0.6$  OBS.

30% (9 patients) ENDO cohort had symptoms prior to repair, compared with 50% (12 patients) in BPG group. 4/27 (15%) PAA in ENDO group presented with acute thrombosis and underwent thrombolysis followed by covered stent placement. In the BPG cohort, there was acute ischemia in 6, rest pain in 2, tissue loss in 1, and swelling in 1.

**Abstract Body:**

4 (17%) patients crossed over from OBS to treatment for aneurysm growth, 2 ENDO and 2 BPG (mean follow-up  $14.6 \pm 10$ mo and 24mo, respectively and average increase growth 0.8cm across both groups).

Primary patency for ENDO and BPG was  $93.3\% \pm 6.4$  and  $71.3 \pm 15.2$  at 1yr, respectively. The 1/27 ENDO failure case was initially reintervened via endovascular means, however, eventually required a bypass. Of 3/24 BPG failure cases, 2 were successfully opened via endovascular means, and one required excision of the graft for infection. Secondary patency was 93% for both groups at 1yr. No limbs underwent major amputation.

**CONCLUSIONS:** The results suggest that the observation threshold of  $< 2.0$ cm is safe in monitoring asymptomatic PAAs without any incidence of rupture. Further, even though surgical bypass was more commonly used for symptomatic and larger diameter PAAs, there are similar patency outcomes between the ENDO and BPG groups. Therefore, determination of ENDO vs BPG method should be as indicated by anatomic parameters such as landing zone, symptomatology such as the need for relieving mass effect, and specific adjunct need such as thrombolysis for either acute thrombosis or for distal target.

**Presentation Number:** KC5

**Publishing Title:** One-Year Results of the Multilayer Flow Modulator Stent in the Management of Thoracoabdominal Aortic Aneurysms

**Title:** Stent in the Management of Thoracoabdominal Aortic Aneurysms

**Author Block:** Sherif Sultan, MD FRCS FACS, Niamh Hynes.

Western Vascular Institute, Galway, Ireland.

**OBJECTIVES:** We report early results from the Global Independent MFM Registry using a uni-modular multi-layer flow modulator stent technology.

**METHODS:** We present the first 55 thoracoabdominal aortic cases that were implanted under indication for use. All were done on compassionate basis, in 11 countries, and were fully analyzed through the MFM registry. Mean age of 64.5 years +/- 18years; mean aneurysm diameter was 6.04cm+/-1.66cm (Median 5.76cm) Primary Endpoints are Freedom from Rupture and Aneurysm-related Death. They were 31 Crawford Thoraco-abdominal aortic aneurysms (8 Type I, 3 Type II, 9 Type III, and 11 Type IV), 7 arch aneurysms, 3 abdominal aortic aneurysms, 8 suprarenal aortic aneurysms and 6 type B dissections. The mean number of side branches covered was 3.7 per case (SD 1.3, SE 0.18, median 4, range 0-6) for a total number of 202 branches. The Total numbers of stent used were 108 with mean of 1.96 MFM stents per case. (SD 1.09, SE 0.15, Median 2, range 1-5)

**RESULTS:** Aneurysm-related survival 93.7% (SE +/-4.44%) at one year. No rupture occurred. Four cases of consumptive coagulopathy were observed, two of which resulted in death from hemorrhagic cerebrovascular stroke and one of which resulted in death from a gastrointestinal bleed. Technical success was 98.2%. One-year all-cause survival was 84.8% (SE +/-6.25%). There was no paraplegia No peri-operative visceral or renal insult occurred. At 12 months all of the 202 side branches were patent.

There were no stent fractures. One-year intervention free survival was 92.4% (SE +/-5.09%) At six months the mean rate of sac volume increase was 0.36% per month, resulting in a mean volume increase of 2.14%. At twelve months the rate of increase had slowed to 0.28% per month, resulting in a total average increase in sac volume of 3.26%. The ratio of thrombus to total volume stayed almost constant over the 12 months at 0.48, while the ratio of flow to total volume fell from 0.21 to 0.12 at 12 months.

**CONCLUSIONS:** Increasing sac size did not herald rupture. MFM implantation instigates a process of aortic remodeling involving initial thrombus deposition, which slowed between six and twelve months. With physiological modulation of the aneurysm, MFM offers immense promise for resolution of complex thoraco-abdominal pathology with off-the-shelf availability.

**Abstract**

**Body:**

**Presentation Number:** KC6

**Publishing Title:** Outcome of Secondary Aortic Endovascular Interventions for Type Ia Endoleaks following EVAR

**Author Block:** Areek A. Ucuzian, MD, PhD, Eric Hager, MD, Luke Marone, MD, Rabih Chaer, MD, Steven Leers, MD, Michel Makaroun, MD, Michael J. Singh, MD.  
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Outcome of Secondary Aortic Endovascular Interventions for Type Ia Endoleaks following EVAR

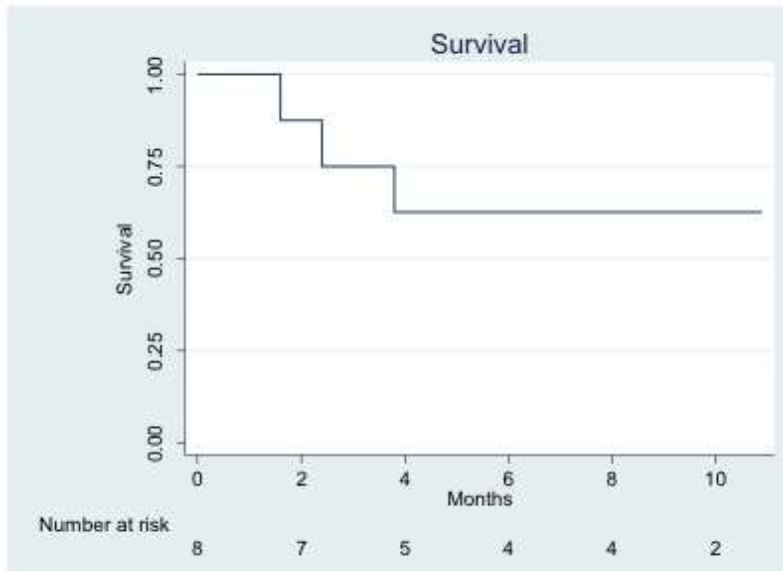
**OBJECTIVE:** The snorkel technique for endovascular aneurysm (sn-EVAR) repair has been described in the literature as a safe and viable alternative for treating juxtarenal aortic aneurysms. The purpose of this study was to determine the outcome of secondary aortic interventions (renal artery snorkel technique combined with proximal aortic cuff extension) for Type Ia endoleaks following EVAR.

**METHODS:** A retrospective chart review from January 2012 to April 2014 identified patients that underwent secondary aortic interventions for Type Ia endoleaks. Demographics, endoleak characteristics, surgical details and outcomes were collected. Patients with radiographically detectable Type Ia endoleaks (CT angio or completion aortography at the time of EVAR) were included.

**RESULTS:** A total of 8 patients underwent secondary aortic interventions for type Ia endoleaks. Five patients underwent single renal artery snorkel combined with aortic cuff and 3 patients underwent bilateral renal artery snorkels combined with aortic cuff. There were no identifiable endoleaks at the completion of the secondary aortic intervention. The mean follow-up was 6.5 months (1.6-9.5 months). One of eight patients failed to undergo post-operative imaging. Of the remaining 7 patients, 2 developed recurrent Type Ia endoleaks based on surveillance imaging (29%, n = 7). Both endoleaks were identified by 6 months. One of 2 recurrent endoleaks had an unremarkable 1 month post-operative CTA. Neither patient underwent re-intervention for the recurrent endoleak. Peri-operative complications included a peri-nephric hematoma and brachial artery pseudoaneurysm. At 1 month, there was no significant change in renal function compared to baseline (p=.11). The 30-day and 6-month mortalities were 0% and 38%. Two patients died from causes unrelated to the procedure and 1 expired from unknown causes.

**CONCLUSION:**Secondary aortic interventions for proximal Type Ia endoleaks following EVAR are safe and provide satisfactory technical success. However, the absence of a Type Ia endoleak at the completion of the re-intervention does not confirm mid-term success. The high frequency of recurrent Type Ia endoleaks suggest that caution be exercised in utilization of this technique and a more frequent surveillance imaging regimen may be

**Abstract Body:**



necessary.



# Karmody Competition Topic: Carotid

**Presentation Number:** KC7

**Publishing Title:** **Vascular Interventions in the Management of Advanced Head and Neck Cancer**

**Author:** Colin Brandt, MD, Neil Reddy, MD, Sadie Ahanchi, MD, Daniel Karakla, MD, FACS, Jean Panneton, MD, FACS.  
**Block:** Eastern Virginia Medical School, Norfolk, VA

**OBJECTIVE:** Extension of head and neck malignancies into major blood vessels can complicate patient management. Our study examined the multidisciplinary approach to the treatment of advanced head and neck cancer.

**METHODS:** We performed a retrospective review of cancer patients treated by head and neck surgery (HNS) and vascular surgery from 2007-2014. Data concerning history of cancer and radiation therapy, operative interventions, and perioperative morbidity and mortality was collected.

**RESULTS:** 31 patients with head and neck cancer were operated on by HNS and required vascular intervention. Vascular surgery intervention was synchronous (23) or metachronous (8) to the associated cancer procedure. Post-resection interventions occurred at an average of 4 years (41 days- 14 years). 25 patients (81%) had recurrent disease, of which 24 had previous radiation therapy and 14 had prior resection. 22 patients (71%) had flap coverage. 7 patients (23%) required emergent as opposed to elective intervention, all for bleeding. Indications for vascular intervention were invasion/encasement of major vasculature (17), bleeding/blowout (8), stenosis/occlusion (3), and aneurysm/pseudoaneurysm (3).

32 index operations were performed: Exploration/dissection in 8 patients (4 bilateral carotid arteries (CCA), 3 unilateral CCA, 1 innominate artery). Resection in 17 patients: 9/17 without reconstruction (7 external carotid artery (ECA), 1 internal carotid artery (ICA), 1 CCA) and 8/17 with reconstruction (6 CCA to ICA bypasses, 1 innominate/SCA bypass, 1 innominate to axillary vein bypass). 6 patients received stents (5 CCA/ICA and 1 innominate). 1 patient had an angioembolization (ECA).

6 patients (19%) required reintervention after index vascular procedure. (see Table 1)

There were three 30-day mortalities (9.7%), all from blowout. Based on Kaplan Meyer analysis, bypass and stent primary patency at 1 year was 67% and 100%, respectively. Survival at 1 and 2 years post vascular intervention was 62% and 19%, respectively. A significant increase in mortality (7 vs 22 months, p=0.06) and 30-day mortality rate (43% vs 0%) was noted in emergent versus elective cases.

**CONCLUSIONS:** Vascular involvement in head and neck cancer indicates advanced disease, commonly in patients who have had previous RT. Nonetheless, vascular intervention is feasible. Optimal treatment of these patients requires a multidisciplinary approach.

**Table**

**Abstract Body:**

<b>Patient #</b>	<b>Index Procedure</b>	<b>Indication for Reintervention</b>	<b>Reintervention</b>
<b>5</b>	Bilateral Carotid Dissection	Blowout	R CCA/ICA stent, re-stenting, embolization of CCA
<b>9</b>	R CCA bypass with RSVG	Thrombosis	Open thrombectomy with vein patch repair
<b>12</b>	L CCA/ICA stent with ECA embolization	Re-exploration per HNS	Ligation of ECA with patch angioplasty of CCA
<b>13</b>	L CCA bypass with RSVG	Blowout	Ligation of CCA
<b>16</b>	Resection of R ECA	L Lingual PSA	Angiography, thrombin injection
<b>19</b>	R carotid exploration with ECA resection	Bleeding	Diagnostic angiography

**Presentation Number:** KC8

**Publishing Title:** Carotid Endarterectomy: Gender Disparities and Anesthetic Choice Influences Outcome and Economics

**Author Block:** Elizabeth L. Chou, BS, Michael Sgroi, MD, Nii-Kabu Kabutey, MD, Roy M. Fujitani, MD.  
University of California Irvine School of Medicine, Irvine, CA

**OBJECTIVE:** Carotid endarterectomy (CEA) is the most commonly performed surgical procedure to reduce risk of stroke. The operation may be performed under local (LA) or general anesthesia (GA). Despite perceived advantages of LA, previous trials have found no difference in rates of transient ischemic attack, stroke, myocardial infarction and death in CEA under LA compared with GA. We performed a retrospective review to see if gender may be associated with type of anesthesia and post-operative outcomes.

**METHODS:** Patients who underwent CEA between 2005-2011 were extracted from the National Surgical Quality Improvement Program (NSQIP). The cohort was separated by sex and anesthesia type. Primary endpoints included 30-day incidence of stroke and myocardial infarction. Secondary endpoints included 30-day postoperative local complications, operative time and length of surgical stay.

**RESULTS:** Of the 41,442 CEA cases identified, most patients were male (16,874 F, 24,568 M) and most cases were performed under GA (86% of female cases, 85% male cases). Adjusted multivariate analysis showed no statistical difference between primary endpoint outcomes based on gender or type of anesthesia used. There was, however, a trend for increased risk of 30-day post-operative local complications and 30 day incidence of myocardial infarction amongst CEA conducted under GA compared to LA. Operative time and length of stay was decreased in females, regardless of anesthesia used (mean difference -8.15 [10.09, -6.21] p <0.0001; 0.34 [0.14, 0.54] p <0.02). Use of general anesthesia was associated with increased operative time, and increased total length of total surgical stay, regardless of sex, with statistical significance.

**CONCLUSIONS:** There is no significant difference in post-operative outcomes between women and men regardless of type of anesthesia used for CEA. GA was found to be associated with increased length of stay and operative time, compared with LA in women and men. This finding suggests that choice of anesthesia may have significant economic considerations for patients and institutions. The trend of increased 30 day post-operative local complications and 30 day myocardial infarction amongst GA cases also support the use of LA for CEA. These factors warrant further evaluation to improve patient outcomes and economic impact of this commonly performed procedure.

**Abstract Body:**

Variable	Adjusted OR/MD (95% CI)	Adjusted p-value
30-day Post-op local complications		
Females vs males	0.88 (0.49, 1.61)	1.0000
General vs local	1.50 (1.03, 2.18)	0.5744
Effect modification	1.29 (0.69, 2.41)	1.0000
30-day Mortality		
Females vs males	1.12 (0.56, 2.22)	1.0000
General vs local	1.00 (0.63, 1.60)	1.0000
Effect modification	0.99 (0.47, 2.07)	1.0000
30-day MI		
Females vs males	1.33 (0.60, 2.99)	1.0000
General vs local	1.94 (1.09, 3.42)	0.4173
Effect modification	0.73 (0.31, 1.69)	1.0000
30-day Stroke		
Females vs males	1.38 (0.87, 2.19)	1.0000
General vs local	0.98 (0.70, 1.37)	1.0000
Effect modification	0.94 (0.57, 1.55)	1.0000
Operative Time (min)		
<b>Females vs males</b>	<b>-8.15 (-10.09, -6.21)</b>	<b>&lt;0.0001</b>
<b>General vs local</b>	<b>19.46 (17.99, 20.93)</b>	<b>&lt;0.0001</b>
Effect modification	-1.86 (-4.07, 0.34)	1.0000
Length of total surgical stay		
<b>Females vs males</b>	<b>0.34 (0.14, 0.54)</b>	<b>0.0163</b>
<b>General vs local</b>	<b>0.35 (0.23, 0.48)</b>	<b>&lt;0.0001</b>
Effect modification	-0.15 (-0.37, 0.08)	1.0000

**Table 1.** Estimates of association with sex, anesthesia and their effect modification.

**Presentation  
Number:** KC9

**Publishing  
Title:** Common Carotid Artery Pseudoaneurysm Presenting as Upper Airway Obstruction

**Author Block:** **Gregory T. Clabeaux, D.O.**<sup>1</sup>, Paul M. Anain, M.D.<sup>1</sup>, Joseph Anain, Sr., MD<sup>2</sup>.  
<sup>1</sup>Sister's of Charity Hospital, Buffalo, NY <sup>2</sup>Sister's of Charity Hospital, Williamsville, NY

**OBJECTIVE:** In this discussion our intent is to review the etiologies of carotid artery pseudoaneurysm, and to discuss methods of treatment.

**METHODS:** Our particular case was managed with careful preoperative evaluation of the imaging and then surgical exploration. Repair of the vessel after isolation and debridement with GSV patch angioplasty. Upon completion, intraoperative patency was confirmed with duplex ultrasonography.

**RESULTS:** The patient's initial complaint on presentation to the ED at the outside facility was that of upper airway compression.

**Abstract  
Body:** The patient was initially admitted after non contrast ct of the neck with a diagnosis of retropharyngeal abscess. It was only on subsequent imaging with IV contrast that the pseudoaneurysm was able to be identified definitively. Favorable outcome, no neurologic deficits or recurrence of pseudoaneurysm in this particular patient at 1 year follow up.

**CONCLUSIONS:** In this particular case, the presentation was atypical in timing, as the only possible identifiable trauma was three weeks previous, and it did not seem remarkable to the patient. It took extensive questioning and then the patient recalled a possible mechanism of trauma. Physical exam was also atypical as there was no pulsatility to the mass.

A high index of suspicion must be maintained in the diagnosis of a cervical mass particularly when in the anterior cervical triangle.

**Presentation Number:** KC10

**Publishing Title:** Large neck paraganglioma with atypical blood supply from thyrocervical trunk

**Author Block:** Uwe Fischer, M.D., Ph.D., Mahesh Ramchandani, Orlando Diaz, Alan B. Lumsden.  
Houston Methodist DeBakey Heart & Vascular Center, Houston, TX

**OBJECTIVES:** Paragangliomas of the neck are rare tumors. The most common paragangliomas of the neck are located in the carotid bifurcation. These tumors are generally supplied by the external carotid artery. We present a case of a large right lower neck paraganglioma with atypical blood supply from the right thyrocervical trunk.

**RESULTS:** A 47 year old female presented with a right neck mass. Diagnostic workup included a computer tomography (CT) and ultrasound of head and neck which revealed a 4.5 cm in diameter hypervascular mass in the right lower neck lateral to the internal jugular vein. On the left side a smaller hypervascular lesion was discovered in the carotid bifurcation. We first addressed the large right sided neck mass.

The patient was taken to the angiosuite for embolization of the right sided neck mass prior to excision. Selective angiogram of the right thyrocervical trunk visualized two main branches feeding the highly vascularized mass. Using a microcatheter system all branches were selectively cannulated and embolized with ethylene vinyl alcohol (Onyx Liquid Embolic System). A completion angiogram showed embolization of the entire mass.

**Abstract Body:**

The next day, the patient was taken to the operating room for excision of the mass. The mass was located postero-lateral to the internal jugular vein abutting but not adhered the common carotid artery. The embolized vessels were clearly visible which facilitated excision and minimized blood loss. The patient tolerated the procedure well and was discharged home on post-operative day 2. Histologic workup revealed a 4.5 x 3.4 x 2.2 cm paraganglioma.

**CONCLUSIONS:** Due to the size and vascular structure we decided to embolize the mass prior to resection. We chose the Onyx Liquid Embolization System which consists of ethylene vinyl alcohol copolymer dissolved in DMSO (dimethyl sulfoxide) and suspended micronized tantalum powder to provide contrast for visualization under fluoroscopy that precipitates in situ into a black, spongy embolus which makes it easy to visualize vessels intra operatively. As we could readily identify feeding vessels resection of the tumor was facilitated with minimal blood loss. We believe that preoperative embolization can be useful in selected cases, especially verifying the blood supply and assessing the risk of cerebral embolization to minimize the risk of stroke.

**Presentation  
Number:** KC11

**Publishing  
Title:** Extracranial Internal Carotid Artery Aneurysms: A Review Of The Past 20 years

**Author Block:** **Shahin Pourrabbani, MD**, Mauricio Szuchmacher, MD, K. V. Krishnasastri, MD, FACS.  
North Shore LIJ Medical Center, Manhasset, NY

***Extracranial Internal Carotid Artery Aneurysms: A Review Of The Past 20 years***

**OBJECTIVES:** Extracranial Internal Carotid Artery Aneurysm (ICAA) is rare and surgical repair accounts for less than 2% of all carotid operations. Their significance is linked to the natural history that, if left untreated, ICAA has a high incidence of significant cerebrovascular morbidity and mortality. In this study, we discuss the pathogenesis, clinical manifestation, diagnosis, and treatment options of this rare entity.

**METHODS:** A systematic literature search was conducted using MEDLINE, Cochrane Library and PubMed databases on all articles pertaining to Extracranial internal carotid artery aneurysm published in the English language between January 1994 and January 2014. Following keywords were used: carotid artery aneurysms, extracranial carotid artery aneurysms, and extracranial internal carotid artery aneurysms. A total of 50 review articles were found, and exclusion criteria were intracranial aneurysms, traumatic and non-traumatic dissections, and non-internal carotid artery aneurysms.

**Abstract  
Body:**

**RESULTS:** Fifteen articles were included in this study. According to the review of 52 patients, Internal Carotid Artery Aneurysms tend to develop later in life, at an average age of 37.5 years (range, 3 to 76 years). Among ICAA patients, 28 were men and 23 were women (M:F ratio 1.2). All patients were symptomatic, and predominant presenting symptoms are TIA or stroke, Cranial Nerve involvement, and a pulsatile cervical or parapharyngeal mass. Aneurysms were divided into 3 types: Degenerative Aneurysm (DA) was diagnosed in 21 patients (40.3%), Mycotic (MA) in 6 (11.5%), and Pseudoaneurysm/Trauma in 8 (15.3%). Surgical intervention was performed in 50 patients (96.1%) and endovascular procedure in 2 (3.8%). Complications occurred in 8 patients (15.3%), and included residual neurologic deficit, myocardial infarction, and death.

**CONCLUSIONS:** Although rare, ICA aneurysms should be considered in the differential diagnosis of a mass in the anterior triangle of the neck. Although recently endovascular therapy became a feasible option, open surgical repair is still the treatment of choice for most symptomatic patients. Additional randomized controlled trials studying ICAA is therefore necessary to confirm the conclusions presented here.

**Presentation Number:** KC12

**Publishing Title:** "Type & Screen" for CEA is rarely needed: Development of a risk prediction model using the NSQIP database and demonstration of significant cost-saving potential

**Author Block:** Lars Stangenberg, MD PhD, Thomas Curran, MD, Feroze Mahmood, MD, Dominique Buck, MD, Jack McCallum, MD, Jeremy Darling, Marc L. Schermerhorn, MD.

Beth Israel Deaconess Medical Center, Boston, MA

**OBJECTIVES:** Preoperative testing for carotid endarterectomy (CEA) often includes blood typing and antibody screen (T&S). In our institutional experience, however, transfusion for CEA is rare. We assessed transfusion rate and risk factors in a national clinical database to identify a cohort of patients in whom T&S can be avoided with the potential for substantial cost savings.

**METHODS:** Using the NSQIP database, transfusion events and timing were established for all elective CEAs in 2012.

Comorbidities and other characteristics were compared for patients receiving intra- or postoperative transfusion and those that did not using two-tailed t-test or Fisher's exact test. Using one half of the data set, a point-based risk prediction model that was then validated on the other half.

**RESULTS:** Of 7601 patients undergoing CEA in 2012, 139 received at least one transfusion prior to discharge (1.8%). 80% of transfusions occurred on POD#0 or #1. Hematocrit 1.2 [OR: 3.0; 95%CI: 1.7-5.1], female sex [OR: 1.8; 95%CI: 1.1-3.1] and preoperative open wound [OR: 5.0; 95%CI: 1.6-16.3] among other risk factors predicted transfusion.

**Abstract Body:**

Score was calculated with 1 point for female gender, preoperative dyspnea, preoperative coagulopathy and BMI 1.2 and 8 points for hematocrit <30. A risk prediction model based on these data produced a C-statistic of 0.84. Application of this model to the validation set demonstrated a C-statistic of 0.76. 77% of patients in the validation set received a score of 2 or less corresponding to a transfusion risk of 1.1%. Omitting a T&S in these patients would generate a potential annual cost-saving to NSQIP hospitals of over \$1,000,000 based on our institutional charge.

**CONCLUSIONS:** While T&S is commonly performed for patients undergoing CEA, transfusion following CEA is rare and well predicted by a transfusion risk score. Avoidance of T&S in this low-risk population provides a substantial cost-saving opportunity

without compromise of patient care.

**Presentation Number:** KC13

**Publishing Title:** Carotid Body Tumors

**Author Block:** M. A. Mansour, M.D., **Jennifer J. Watson, MD**, Michelle C. Kosovec, MD, Eanas Yassa, MD, Jason D. Slaikeu, MD. Spectrum Health, Grand Rapids, MI

**Abstract Body:**

**OBJECTIVES:** Carotid Body Tumors (CBT) are rare. Preoperative embolization has been advocated to decrease blood loss and facilitate resection.

**Purpose:** To review in detail the clinical management and outcomes of patients presenting with CBT for resection without preoperative embolization.

**METHODS:** A retrospective chart review of all patients presenting to our practice for CBT resection. Preoperative and operative details were reviewed as well as long-term follow-up.

**RESULTS:** In a 10-year period, ten patients (7 women and 4 men), average age 51 (range 38-60) underwent resection of CBT.

Six patients had a palpable mass and the others had discrete masses detected incidentally on imaging. All patients had either preoperative CTA or angiography. None had tumor embolization. Two patients required nasotracheal intubation and mandibular subluxation to facilitate resection. Harmonic scalpel and monopolar cautery were used in all patients. The average tumor size was 3.6 cm (range 0.7-5.8 cm). Classification of the tumors was: Shamblin type I (one patient), type II (5 patients) and type III (5 patients). Blood loss averaged 150 ml. Two patients had residual tumor near the skull base. One patient received postoperative radiation and the other presented 5 years later with intracranial recurrence. There were no deaths or perioperative strokes. Two patients had transient swallowing difficulties and one patient with vagus nerve involvement had a permanent deficit.

**CONCLUSIONS:** CBT while rare are quite challenging to resect. Despite a higher incidence of aggressive CBT in our patients, safe resection was accomplished in most cases without preoperative embolization.





**Presentation Number:** KC15

**Publishing Title:** Preoperative Evaluation Prior to Major Lower Extremity Amputation: Does it Occur?

**Author Block:** David Hardy, MD<sup>1</sup>, Xiaoyi Tend, MD<sup>2</sup>, Sean Lyden, MD<sup>1</sup>.

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**OBJECTIVES:** Peripheral arterial disease (PAD) affects more than 5 million American adults. Critical limb ischemia (CLI) is a major consequence of PAD and affects 250,000 Americans per year. For CLI patients who do not undergo revascularization, the risk of amputation within 1 year is 73% for Rutherford class IV and 95% for patients in class V or VI.

Allie reported that less than half (49%) of amputation patients had any diagnostic vascular evaluation prior to a major lower extremity amputation. They suggested that every patient with CLI should have a vascular imaging study to evaluate for revascularization to avoid amputation.

We evaluated all patients who underwent a major amputation and looked at whether or not these patients had a diagnostic vascular examination or testing prior to their amputation. We propose that all patients have a vascular evaluation exam prior to major LE amputation and some only need a physical exam.

**METHODS:** A retrospective analysis of major LE amputations was performed. Patient demographics, comorbidities, type of amputation, reason for amputation, Rutherford classification, type of preoperative vascular examination, and time since the last vascular examination were evaluated.

**Abstract**

**Body:**

**RESULTS:** During 2010 to 2013, 281 patients (64.1% male) required major LE amputation. The average age was 65 years (range, 25-96 years). AKA was performed in 39.1% of patients whereas BKA was performed in 60.9%. Amputation was performed due to CLI in 92.9% of patients whereas 7.1% of amputations were performed due to diabetes (ulcer, wet gangrene/sepsis) or other reasons. Preop vascular evaluation was performed in 100% of patients undergoing major amputation. Pulse and wound physical examination was most common(99.3%) followed by PVR/ABI (78.8%), Angio (54.8%), and CTA (29.3%), duplex ultrasonography (41.3%), and MRA (0.4%). Amputations most commonly occurred due to Rutherford classification VI (63.3%) with 97.2% of patients having Rutherford IV-VI classification. Patients with nonsalvageable limbs and non ambulatory patients did not have additional imaging.

**CONCLUSIONS:** We demonstrate that 100% of patients undergo preop vascular evaluation prior to major LE amputation at a tertiary referral hospital. Up to 50% of patients already have non salvageable limbs or are not revascularization candidates and do not need further diagnostic imaging. Recommending imaging in all individuals with CLI prior to major amputation is a waste of health care resources and money.

**Presentation Number:** KC16

**Publishing Title:** **Popliteal Artery injuries: A Meta-Analysis and Literature Review of a Complex Injury**

**Tejas R. Shah, MD, Ans Fakiha, MD, Diego Ayo, MD, Mark A. Adelman, MD, Thomas S. Maldonado, MD, Caron B.**

**Author Block:** Rockman, MD, Firas Mussa, MD.

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**OBJECTIVE:** Popliteal artery injuries are uncommon but potentially morbid and are associated with a significant risk of amputation. Previous studies identifying risk factors associated with high amputation rates have been limited to small cohort studies. Our aim is to conduct a meta-analysis of existing literature to identify predictors of limb loss associated with popliteal artery injuries.

**METHODS:** A systematic literature review was conducted on studies reporting amputation rate associated with popliteal artery injuries using PubMed, Embase and Medline databases. Eligible studies included those that reported on civilian population, mechanism of injury, and amputation rates. The military population, popliteal pseudoaneurysms, or other associated arterial injuries were excluded.

**RESULTS:** 705 articles were identified between 1954-2014. A total of 145 full text articles were reviewed of which 22 articles met inclusion criteria. 2370 patients with 2394 popliteal artery injuries were identified. 82% were male with a mean age of 32 years. Overall amputation rate was 16.3% (95% CI=[13.8%, 19.2%]). Mortality rate was 3.8% (95% CI=[2.7%, 5.1%]). Injury distribution included blunt trauma (61%), penetrating injury (38%), and iatrogenic (1%). Patients presenting with a blunt injury were 2.03x more likely to have amputation than those with penetrating injury (pooled odds ratio = 2.03, 95% CI = [1.78, 2.32], p<0.0001). Patients that presented with orthopedic fractures were 5.93x more likely to have an amputation (OR = 5.93, 95% CI = [1.51, 23.39], p=0.011). Among those patients with venous injuries, 19.4 % had amputation (OR = 1.57, 95% CI = [0.77, 3.21], p=0.213). Mangled extremity severity score (MESS) was stratified in 3 studies. The amputation rate were higher in patient with high MESS score (50%) than patient with low MESS score (9%) (OR = 9.38, 95% CI = [8.34, 10.56], p<0.001). From 1979 to 2014, the most commonly performed popliteal artery repair technique was saphenous vein grafts (36%) followed by end-end anastomosis (24%).

**Abstract Body:**

**CONCLUSIONS:** Popliteal artery injuries associated with blunt trauma, concurrent orthopedic injuries, and high MESS score are at higher risk of lower extremity amputation. Associated venous injury or fasciotomy failed to show any significant association to limb loss. Popliteal vascular injury remains a challenging clinical entity associated with a significant risk of amputation.

Identifying risk factors associated with higher amputation rates may help guide clinical management of these complex injuries.

**Presentation  
Number:** KC17

**Publishing  
Title:** Anesthesia type for major lower extremity amputation in frail elderly patients does not affect outcomes

Carla C. Moreira, M.D., Denis Rybin, Alik Farber, M.D., Jeffrey A. Kalish, M.D., Mohammad H. Eslami, M.D., Sebastian

**Author Block:** Didato, M.D., **Jeffrey J. Siracuse, M.D.**

Boston University School of Medicine, Boston Medical Center, Boston, MA

**OBJECTIVES:** The purpose of this study was to determine the impact of anesthesia type: general anesthesia (GA) and regional/spinal (RA), on outcomes after lower extremity amputation in frail elderly patients.

**METHODS:** The American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) dataset (2005-2012) was queried to identify all patients ages greater than 75 years-old with partial or total functional impairment who underwent major lower extremity amputations with use of GA or RA. To ensure comparability of the groups we used 2:1 propensity matching based on clinically important and significantly different at 0.2 level factors and multivariable analyses adjusting for the same factors.

**RESULTS:** There were 3260 patients identified - 702 RA and 2558 GA. The mean age was 82 and 50% were male. Anatomical distribution was 59% above the knee (AKA) and 41% below the knee (BKA). Patients undergoing GA were more likely to have impaired sensorium (9% vs. 6%,  $P=0.035$ ), be on anticoagulation or have a bleeding disorder (33% vs. 17%,  $P<0.01$ ), have had a previous operation within 30 days (16% vs. 10%,  $P<0.01$ ), and were more likely to be operated on by a general surgeon (16% vs. 12%,  $P=0.03$ ). Age and other comorbidities were similar. Propensity matching showed that RA was associated with longer anesthesia time to surgery ( $41\pm 31$  min vs.  $36\pm 34$  min,  $P<0.01$ ), however there was no difference in operative time ( $63.2\pm 31$  min vs.  $64.8\pm 33$  min). There was no difference in complications between GA and RA - specifically 30-day mortality (14.4% vs. 11.7%,  $P=0.14$ ), postoperative myocardial infarction (MI) (2.9% vs. 3.1%,  $P=0.08$ ), pulmonary complications (7.3% vs. 6.7%,  $P=0.6$ ), stroke (0.7% vs. 0.9%,  $P=0.7$ ), UTI (6.7% vs. 6.5%,  $P=0.9$ ), and wound complications (7.6% vs. 7.6%,  $P=0.75$ ). Median length of stay for both groups was 5 days. Multivariate analysis of complications and 30-day mortality confirmed that anesthesia type was not an independent risk factor.

**Abstract  
Body:**

**CONCLUSIONS:** The mode of anesthesia, general vs. regional/spinal, was not found to be associated with perioperative outcomes following major lower extremity amputation in the frail geriatric population. GA can safely be used in this high risk patient population.

**Presentation Number:** KC18

**Publishing Title:** Endovascular Treatment of Blunt Traumatic Bilateral Common Iliac Artery Intimal Injury

**Author Block:** Marissa Toma, MD, Carlos Rosales, MD, Satish Muluk, MD.  
Allegheny General Hospital, Pittsburgh, PA

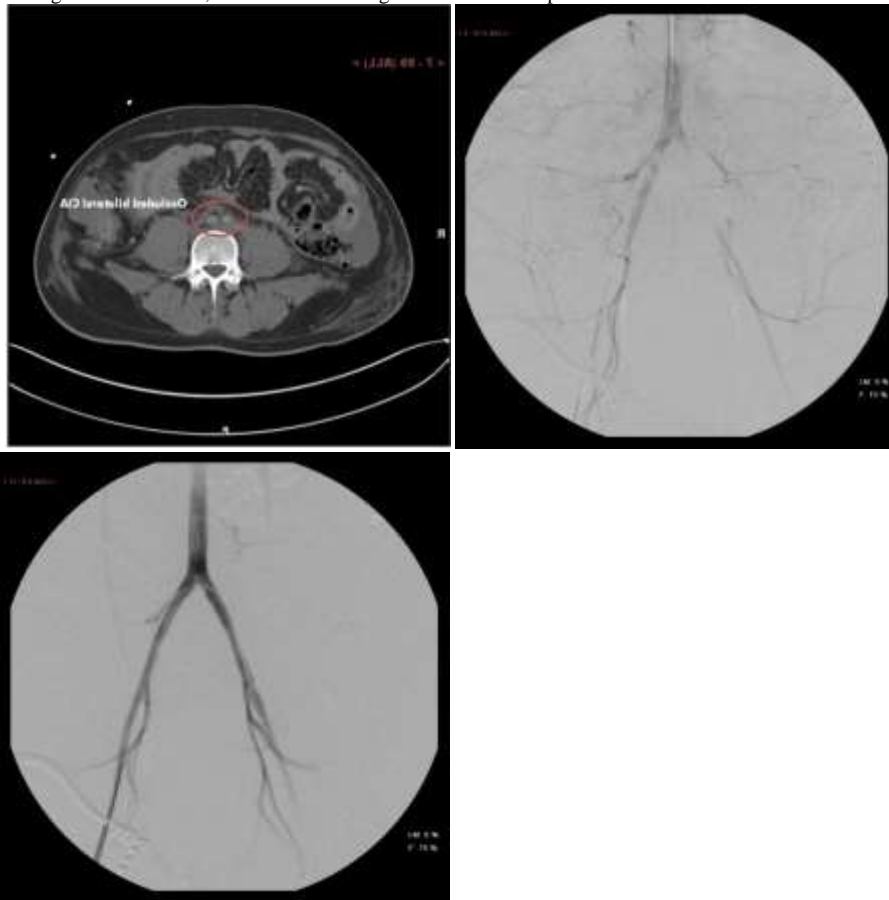
**OBJECTIVES-**Common traumatic arterial injuries include transections, dissections, arteriovenous fistulas, and pseudoaneurysms. Blunt bilateral common iliac artery (CIA) intimal shearing injuries are rare. Traditionally, aortobifemoral bypasses have been used to treat these lesions. However, endovascular stenting may be an alternative to open surgery.

**METHODS-**We present a 22-year-old male with two hours of severe bilateral lower extremity ischemia after a high-speed motor vehicle collision. On presentation, he had no motor function or sensation below his knees. CTA of the chest, abdomen, and pelvis revealed bilateral proximal CIA occlusive injuries. Open bilateral common femoral artery exposure and right iliofemoral thrombectomy were performed. No significant thrombus was removed, and inflow was still very weak. A sheath was placed, and angiography demonstrated bilateral CIA intimal shearing; no transections or dissections were evident. Endovascular stent grafts were deployed in bilateral CIAs. A grade 1 splenic injury and intraperitoneal free air suggestive of perforated viscus were seen on CT scan. During abdominal exploration, it was noted that the retroperitoneal space was compromised and included a segment of bluntly denuded sigmoid colon. There was also a small perforation of the ileum. These circumstances would have made an open revascularization challenging.

**RESULTS-**A combined open and endovascular technique was successfully used to treat bilateral CIA intimal injuries. On completion angiogram, there was brisk flow into both iliac vessels. At the end of the procedure, only the left PT pulse had Doppler signals due to vasoconstriction. By postoperative day two, bilateral PT and DP pulses became palpable. The patient regained full sensorimotor function in his right lower extremity with limited recovery of sensory and gross motor function in his left lower extremity.

**CONCLUSIONS-** Blunt traumatic bilateral CIA intimal injury in the absence of thrombus, transection, or dissection is a rare finding. In this situation, endovascular stent grafts are a viable option.

**Abstract Body:**



**Presentation Number:** KC19

**Publishing Title:** Early Post-Registry Experience with Drug Eluting Stents in the SFA

**Mathew Wooster**, Kirsten Dansey, BS, Paul Armstrong, DO, Martin Back, MD, Karl Illig, MD, Brad Johnson, MD, Neil

**Author Block:** Moudgill, MD, Peter Nelson, MD, Brian Park, MD, Murray Shames, MD.

University of South Florida, Tampa, FL

**OBJECTIVE:** Restenosis remains the primary failure mode after stenting of the superficial femoral artery. Drug-eluting stent technology claims to reduce stent failure and improve durability of endovascular management of SFA occlusive disease. We seek to present our early experience with the Cook Zilver PTX stent.

**METHODS:** We have retrospectively reviewed a prospectively collected database of patients undergoing placement of the Cook Zilver PTX stent for SFA or popliteal disease since its availability to our institution in October 2013. Patients treated with additional stents to extend coverage of the same lesion were excluded. Patient demographics, comorbidities, concomitant procedures, TASC classification, procedural details, and follow up were reviewed.

**RESULTS:** Thirty-one limbs in thirty patients were treated with PTX, five were excluded for concomitant use of non-PTX stents, leaving 26 limbs in 26 patients for analysis. Indications for intervention were claudication in 17 (65.4%), rest pain in 1 (3.8%) and tissue loss in 8 (30.8%). A median of 2 PTX stents per limb was used to treat a mean length of 14.2cm +/- 11cm with initial technical success of 100%. Concomitant inflow (N= 4) or atherectomy (N = 2) interventions were performed in 23%. Sixty-nine percent of lesions were TASC C (N = 7) or D (N = 11) and 42% were total occlusions. Over a mean 20 week follow up, 2 occlusions were noted (mean 27 weeks), one was treated with surgical bypass, the other with endovascular salvage. Review of completion angiograms from the index procedures demonstrated severely compromised outflow in the patient later treated with a fem-distal bypass. A residual stenosis just distal to the stent was noted in the second, which was able to be salvaged with a repeat angioplasty and additional stent placement. Limb salvage in the series was 92.3% with the two patients requiring major amputations for infected, non-healing wounds despite patent stents.

**Abstract Body:**

**CONCLUSION:** On mean 20-week follow we have seen 92.3% primary patency and 96.2% secondary patency. A larger number of patients and longer follow up will be required to determine the true real-world efficacy of this touted drug eluting device, but early experience is encouraging and warrants continued trial.

**Presentation  
Number:** KC20

**Publishing  
Title:** **Mid-term Results of Endovascular Stent Graft Repair of Asymptomatic and Symptomatic Popliteal Artery Aneurysms**

**Author Block:** Andrew Cha, DO, Naiem Nassiri, MD, Randy Shafritz, MD, Saum Rahimi, MD.  
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**OBJECTIVES:** The treatment of popliteal artery aneurysms (PAA) has evolved from open surgical revascularization to endovascular stent graft repair with favorable mid-term outcomes. This study reviews a single-center experience of endovascular popliteal artery aneurysm repair in both asymptomatic and symptomatic patients, including those who presented emergently with acute limb ischemia.

**METHODS:** A retrospective review was performed to identify all endovascular PAA repairs between April 2008 and October 2013. Data analysis included age of patients, indication for treatment, number of stent grafts per PAA treated, number of runoff vessels, perioperative outcome, and limb salvage.

**RESULTS:** Thirty-five popliteal artery aneurysms (mean size  $2.84 \pm 1.25$  cm) in 27 patients (mean age,  $73.5 \pm 11.4$  years, 96% men) were treated with endovascular covered stent graft(s) through open (74%) or percutaneous approach (26%). Indications for treatment included symptomatic presentation in 26% (n = 9), half of these (n = 5) emergent with acute limb ischemia. Asymptomatic presentation was found in 74% (n = 26). The average number of stent grafts per PAA treated was  $1.9 \pm 0.7$ . Primary patency at 1 year was 91.4%. Limb salvage rate was 97%. There were no perioperative (30-day) deaths. The mean follow-up was 18.9 months (range 1-55 months). A total of three stent graft failures occurred, all within 90 days (mean of  $50 \pm 34$  days). Stent graft failure rate was found to be statistically significant in patients younger than 70 years old ( $P = 0.03$ ), while the indication for treatment, number of stents, and runoff vessels were not significant contributing factors.

**Abstract  
Body:**

**CONCLUSIONS:** Endovascular stent graft repair of popliteal artery aneurysms is both safe and technically feasible in patients with either asymptomatic or symptomatic presentation. Despite favorable mid-term outcomes, early follow-up and closer observation especially in patients younger than 70 years old may be warranted.

# Karmody Competition Topic: Other

**Presentation Number:** KC21

**Publishing Title:** **Aortic remodeling after TEVAR for acute complicated type B aortic dissection**

**Author Block:** **Ryan Bishop, BS**, Daniel Ocazonez-Trujillo, MD, Kristofer Charlton-Ouw, MD, Rana Afifi, MD, Harleen Sandhu, MD, Samuel Leake, BS, Naveed Saqib, MD, Maria Codreanu, MD, Sheila Coogan, MD, Charles Miller, PhD, Anthony Estrera, MD, Hazim Safi, MD, Ali Azizzadeh, MD.

The University of Texas at Houston Medical School, Houston, TX

**OBJECTIVE:** Thoracic endovascular aortic repair (TEVAR) is a treatment option for patients with acute complicated type B aortic dissection (ACTBAD). The optimal extent of aortic coverage during TEVAR is not well defined. Our current practice involves coverage of the proximal entry tear with a single device. The purpose of this study was to evaluate aortic remodeling after TEVAR for ACTBAD.

**METHODS:** We reviewed TEVAR patients with ACTBAD between 2006-2014. The diameter, total aortic area, true lumen (TL), and false lumen (FL) were measured at six locations (1. left subclavian, 2. pulmonary artery, 3. left atrium, 4. celiac, 5. lower renal artery, 6. infrarenal aorta). A specialized radiologist obtained measurements using 3D software (TeraRecon, Fostercity, CA). Differences in diameter and area were computed and transformed to relative frequency (percent change from baseline). Percent change was analyzed in its native distribution and as distribution-free rank variables. Data were analyzed by linear multilevel model, using MIXED procedure in SAS 9.3 (SAS Institute Inc., Cary, NC).

**Abstract Body:** **RESULTS:** During the study period, 44 patients (median age of 64.5, 73% male) underwent TEVAR for ACTBAD. The 30 mortality, stroke, and paraplegia was (20.5%, 4.55%, 18.2%) respectively. Seventeen patients who had complete imaging datasets were included in the study. The mean extent of aortic coverage was 19.8 cm. Total aortic diameter was not changed by TEVAR at any location ( $p=0.78$ ). TL diameter and area were increased by 100% and 150%, respectively, at locations 2 and 3 ( $p<0.005$ ). FL diameter and area were reduced by 50% percent each at locations 1 and 3 ( $p<0.04$ ). Luminal diameters beyond the stent-graft were unchanged. The FL was thrombosed over the treated segment in 70% while the FL was patent in the untreated segment of the aorta in 100%. The median time for follow-up imaging was 36 days (IQR 17-48).

**CONCLUSION:** Aortic remodeling occurred as expected in the segments covered by the stent-graft, but distal segments were nchanged. This raises the question of whether exclusion of the proximal entry tear alone is sufficient, or whether extension of coverage is necessary. Long-term studies are indicated to determine the optimal length of coverage.

**Presentation Number:** KC22

**Publishing Title:** A Novel Hybrid Approach to the Management of Extensive Deep Venous Thrombosis

**Author Block:** **Stuart L. Blackwood, MD**, Biren Juthani, MD, Richard Hsu, MD, PhD.  
Danbury Hospital, Danbury, CT

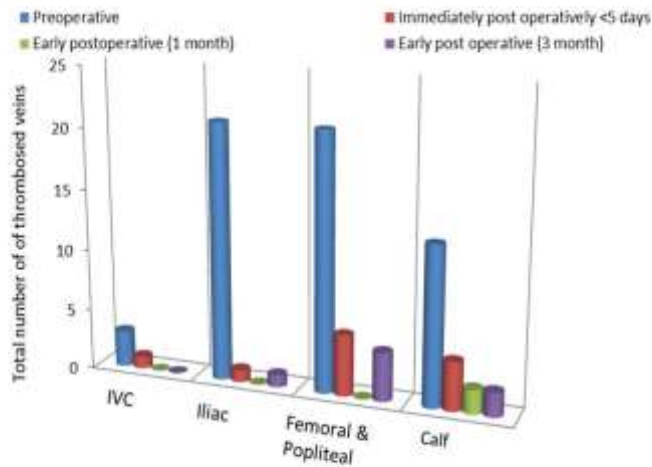
**OBJECTIVES:** Strategies aiming to reduce clot burden and achieve early venous recanalization have been shown to reduce the incidence of post thrombotic syndrome. Use of the Esmarch bandage to extrude leg DVT during open thrombectomy has been previously described. We report our experience with 5 consecutive patients with deep venous thrombosis treated with pharmacomechanical thrombectomy and adjunctive clot extrusion from infrainguinal venous thrombus.

**METHODS:** We performed a retrospective review of five patients who presented with extensive lower extremity DVT. These patients underwent Esmarch extrusion of the lower extremity DVT combined with pharmacomechanical thrombectomy and thrombolysis.

**RESULTS:** Of the five patients studied using this novel hybrid approach, post-operative duplex at 1, and 3 months showed complete resolution in all iliofemoral and caval thrombi and near complete resolution of all infrainguinal DVT.

**CONCLUSIONS:** Using the technique outlined it is possible to truly achieve near complete resolution of all leg DVT. This may translate to decreased long term complications from

**Abstract Body:**



DVT.



**Presentation Number:** KC23

**Publishing Title:** Decreased anti-inflammatory (M2) macrophages in a murine model of type II diabetes (T2D) impair wound healing.

**Author Block:** **Danielle Horne, MD**, Amrita Joshi, PhD, Anna Eliassen, MD, Tina Chen, MD, Dani Campbell, MD, Jordan Knepper, MD, Dawn Coleman, MD, Peter Henke, MD, Katherine Gallagher, MD.  
University of Michigan, Ann Arbor, MI

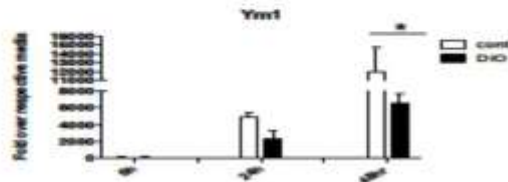
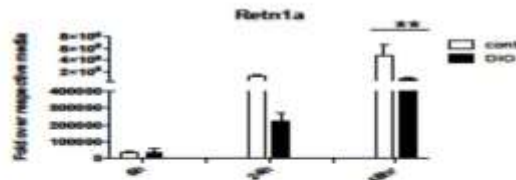
**OBJECTIVES:** Diabetic wounds are characterized by a chronic inflammatory state that is maintained by overexpression of pro-inflammatory cytokines, with a lack of “repair” or anti-inflammatory (M2) macrophages. We hypothesized that altered bone marrow in type 2 diabetic mice may contribute to the decrease in M2 macrophages seen wounds.

**METHODS:** Bone marrow derived macrophages (BMDM) were grown via standard conditions from the BM of diet induced obese (DIO) and wildtype (WT) C57B/6 mice. Macrophages were then treated on day 6 with M2 skewing agents (IL-4/IL-13)(100ng/mL) and mRNA expression of M2 markers was measured via RT-PCR at 6, 24 and 48 hours post-skewing.

**RESULTS:** RT-PCR demonstrated decreased transcript for M2 markers (Ym1 and FIZZ1(retn1a)) in the DIO macrophages as compared to controls. This corresponds with decreased M2 macrophages seen in diabetic wounds. (Figure 1)

**CONCLUSIONS:** DIO macrophages derived from BM appear to result in decreased Ym1 and FIZZ1, markers of the M2, anti-inflammatory phenotype, important for wound healing. Manipulation of macrophage phenotypes could allow for development of new therapies to prevent chronic inflammation and non-healing in diabetic

**Abstract Body:**



wounds.

**Presentation Number:** KC24

**Publishing Title:** Primary Stent Placement Improves Patency After Endovascular Treatment of Hepatic Artery Stenosis Following Liver Transplantation

**Author Block:** Linda Le, M.D., William Terral, M.D., Nicolas Zea, M.D., Hernan A. Bazan, M.D., Taylor A. Smith, M.D., George E. Loss, M.D., Edward Bluth, M.D., W. Charles Sternbergh, III, M.D., Ochsner Clinic Foundation, New Orleans, LA

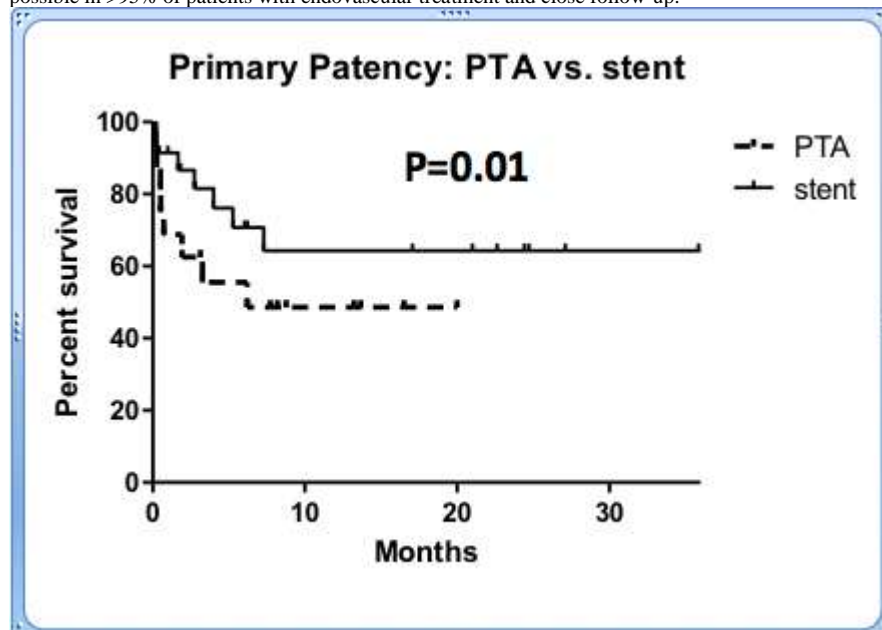
**OBJECTIVES:** Significant hepatic artery stenosis (HAS) after orthotopic liver transplantation (OLT) can lead to thrombosis with subsequent liver failure in 30% of patients. While operative intervention or re-transplantation has been the traditional solution, endovascular therapy has emerged as a less-invasive treatment strategy. Prior smaller studies have been conflicting in the relative efficacy of angioplasty (PTA) versus primary stent placement for HAS.

**METHODS:** This was a single center retrospective review of all endovascular interventions for HAS after OLT over a 54 month period (August 2009-December 2013). Patients with ultrasound imaging with evidence of severe HAS (peak systolic velocity > 400 cm/sec, resistive index of <0.5) underwent endovascular treatment with primary stent placement or PTA. Outcomes calculated were technical success, primary and primary assisted patency rates, re-interventions, and complications.

**RESULTS:** Sixty-two interventions for HAS were performed in 42 patients with a mean follow-up of  $19.1 \pm 15.2$  months. The rate of treated HAS was 6.4% (42/654). Primary technical success was achieved in 95% (59/62) of cases. Initial treatment was with PTA alone (n=16) or primary stent (n=26). Primary patency rates after initial stent placement were 91%, 81.3%, 77%, and 77% at 1,6,12, and 24 months, respectively, significantly better ( $P=0.01$ ) when compared to initial PTA (68.8%, 57.1%, 44%) see Figure. There were 20 re-interventions in 14 patients (8 stents, 6 PTA). The time to initial re-intervention in patients with PTA alone vs. initial stent was 51 and 105.8 days, respectively. Overall primary patency rates (Kaplan-Meier) were 82%, 70%, 63%, and 50% at 1,6,12, and 24 months, respectively. Overall primary-assisted patency was 96% and 93% at 12 and 24 months. Major complications were one arterial rupture and two hepatic artery dissections. Long-term risk of HAT in the entire patient cohort was 4.8%.

**CONCLUSIONS:** Hepatic artery stenosis after liver transplantation can be treated endovascularly with high technical success and excellent primary-assisted patency. This series represents the largest reported cohort of endovascular interventions for HAS to date. Initial use of a stent significantly decreased the need for re-intervention. Avoidance of hepatic artery thrombosis (HAT) is possible in >95% of patients with endovascular treatment and close follow-up.

**Abstract Body:**



**Presentation  
Number:** KC25

**Publishing  
Title:** Initial Experiences Utilizing Optical Coherence Tomography Imaging in Crossing Femoropopliteal Chronic Total Occlusions

**Author Block:** Christopher M. Paprzycki, MD, Sophia G. Afridi, MD, Nessa E. Miller, MD, Lala R. Hussain, MSc, Matthew H. Recht, MD, Patrick E. Muck, MD.

TriHealth - Good Samaritan Hospital, Cincinnati, OH

**OBJECTIVES:** Femoropopliteal chronic total occlusions (CTO) are among the more challenging Trans-Atlantic Inter-Society Consensus (TASC) II class D lesions to treat from an endovascular approach. Optical coherence tomography (OCT) uses near-infrared light to optimize intravascular visualization and allows characterization of plaque and vessel wall anatomy. The Ocelot<sup>®</sup> catheter (Avinger) is an OCT guided catheter with spiral wedges on the tip rotating in counter directions, and can be used as an adjunct to fluoroscopy. We reviewed our experience with crossing these complex lesions utilizing OCT guidance.

**Abstract  
Body:** **METHODS:** A retrospective review of 28 patients with TASC II class D femoropopliteal lesions was performed where OCT guidance was used. Procedural success was determined by establishing true lumen guidewire access beyond the CTO. We assessed for complications including perforation and embolization. **RESULTS:** Intraluminal crossing was successfully performed in 22 of 28 cases. The average SFA CTO length was 27.7 cm and the average popliteal CTO length was 15.8 cm. There were two cases with combined lesions with lengths of 63.1 cm and 27.0 cm. There were no cases of perforation and embolization. **CONCLUSIONS:** Optical coherence tomography is a safe and effective technique to assist in intraluminal crossing of TASC II class D femoropopliteal CTO's.

**Presentation Number:** KC26

**Publishing Title:** Celiac Artery Decompression for Median Arcuate Ligament Syndrome: A Single Center Experience

**Author Block:** **Alec Rezig, BS<sup>1</sup>**, Rana O. Afifi, MD<sup>1</sup>, Sapan S. Desai, MD<sup>2</sup>, Kristofer M. Charlton-Ouw, MD<sup>1</sup>, Naveed U. Saqib, MD<sup>1</sup>, Charles C. Miller, PhD<sup>1</sup>, Anthony L. Estrera, MD<sup>1</sup>, Hazim J. Safi, MD<sup>1</sup>, Ali Azizzadeh, MD<sup>1</sup>.

<sup>1</sup>The University of Texas at Houston Medical School, Houston, TX <sup>2</sup>Southern Illinois University School of Medicine, Springfield, IL

**OBJECTIVES:** Median Arcuate Ligament Syndrome (MALS) results from celiac artery compression by the median arcuate ligament and is most often associated with chronic abdominal pain. A recent National Inpatient Sample (NIS) study has shown that only 2.4% of patients with MALS undergo celiac artery decompression (CAD). The objective of this study was to evaluate the outcomes of MALS after CAD.

**METHODS:** We collected retrospective data on patients diagnosed with MALS who underwent CAD at our institution. All patients underwent evaluation by a gastroenterologist to rule out other pathology. All patients diagnosed with MALS underwent open CAD through a midline incision. Patients completed a postoperative questionnaire used to evaluate specific MALS related symptoms and their improvement after CAD.

**Abstract Body:**

**RESULTS:** Between 2009 and 2014, we treated 8 patients (5 female, mean age, 58.8 years) with MALS by open CAD. Abdominal pain was the primary clinical symptom (n=8;100%), followed by nausea and weight loss (n=4;50% for both). Angiography (inspiration and expiration) was the most utilized imaging modality (n=7, 88%) followed by computed tomography (CT) (n=6, 75%), magnetic resonance imaging (n=3, 38%) and ultrasound (n=1, 13%). There were no immediate intraoperative or postoperative complications. All 8 patients reported improvement in abdominal pain and corresponding symptoms based on the questionnaire. Two patients with residual symptoms underwent post-operative revascularization, one receiving celiac artery percutaneous transluminal angioplasty (PTA) and the other celiac PTA and stenting (25%). The patients who required postoperative revascularization had documented preoperative celiac artery stenosis or dissection. The median follow-up time was 7.5 months (range 1 to 63 months).

**CONCLUSION:** Open CAD appears to be a safe and effective treatment modality for MALS. Patients with intraluminal lesions (dissection or stenosis) may require additional revascularization.

**Presentation Number:** KC27

**Publishing Title:** Computerized Tomography Angiography by Direct Intra-Aortic Low Volume Contrast Injection in Patients Being Evaluated for EVARs

**Author Block:** Pedro G. Teixeira, MD, Leonardo Clavijo, Fred A. Weaver, MD.  
University of Southern California, Los Angeles, CT

**OBJECTIVES:** Computerized tomography angiography (CTA) is an important tool for anatomic delineation and pre-procedure planning in patients who are being considered for endovascular repair of an abdominal aortic aneurysm (EVAR). The iodinated contrast volume required for conventional CTA in patients with pre-existing renal dysfunction may result in further renal function deterioration. The aim of this study was to evaluate the utility of CTA using direct intra-aortic injection of a low volume of iodinated contrast in patients being considered for EVAR.

**METHODS:** The patients were brought to the angiography suite the day prior to planned EVAR. Through common femoral artery percutaneous access, the infusion end of a 5F high-flow angiographic catheter was positioned in the mid-thoracic aorta. CTA was then performed using a multidetector scanner, with image acquisition starting simultaneously with power injection of 10 mL of iopamidol 76% diluted with normal saline to a total volume of 50 mL (10 mL iodinated contrast + 40 mL saline), at 6 mL/sec through the angiographic catheter. Aortic enhancement was assessed with a circular region-of-interest cursor within the aorta and values  $\geq 150$  HU were considered adequate.

**Abstract Body:**

**RESULTS:** Six patients with AAA and associated chronic renal dysfunction underwent CTA with intra-arterial contrast injection for endovascular therapy planning. Mean age was  $80.2 \pm 5.7$  years, 67% were male, mean BMI  $27.8 \pm 2.9$  and baseline creatinine  $1.7 \pm 0.5$  mg/dL. Adequate CTA aortic enhancement was obtained in all cases (mean intra-aortic density  $259.9 \pm 10.5$  HU). Using acquired CTA images EVAR was performed the following day. The total contrast volume used for the CTA and the endovascular repair combined was  $33.3 \pm 25.2$  mL, with four of the patients receiving less than 30 mL of contrast. No significant change in renal function occurred perioperatively, as demonstrated by equivalent creatinine clearance pre and post-procedure ( $36.1 \pm 4.6$  mL/min versus  $37.8 \pm 6.9$  mL/min,  $P = .53$ ). Successful EVAR was achieved in all patients. Patients remained in hospital for an average  $3.2 \pm 0.4$  days. No endoleak or aneurysm growth occurred over a median follow-up of 379 days (range 30-764).

**CONCLUSIONS:** The use of direct intra-aortic injection of a low volume of iodinated contrast provides an adequate and reproducible pattern of aortic enhancement on CTA. The CTA so acquired can be used for planning and successful execution of EVAR while limiting the total volume of iodinated contrast required.

# Karmody Competition Topic: Peripheral

**Presentation Number:** KC28

**Publishing Title:** Ultrasound Guided Arterial Access is Associated with Decreased Arterial Complications

**Author Block:** **Danielle N. Campbell, MD**, Adina Robinson, PhD, Andrew Plaska, Hannah Hill, Matthew Sherman, Stefan Garcia, Simanjit Mand, John E. Rectenwald, MD, Peter K. Henke, MD.  
University of Michigan, Ann Arbor, MI

**OBJECTIVE:** Multiple specialties use percutaneous arterial access to perform a range of interventional vascular procedures. Vascular Surgeons manage many of the complications of access. We reviewed our institution to assess the rate of access complications, and factors associated with these complications.

**METHODS:** All cases involving arterial access completed at our institution from May-December 2010 were identified using CPT codes (N = 1584 cases). Patient demographics as well as the details surrounding each case (service performing the intervention, site of access, ultrasound use, French size, micropuncture technique, closure device, peri and post-operative anticoagulation and/or platelet therapy, and complications) were extracted. Complications were defined as those related to vascular access specifically. These complications ranged from minor (hematoma, arterial-venous fistula and psuedoaneurysm), to serious (operative intervention, retroperitoneal hematoma, arterial dissection, and thrombosis). Descriptive, univariate, and multivariate logistical regression statistics were used.

**Abstract Body:**

**RESULTS:** The mean age of our patients was 51 years old, with a mean BMI of 28.3. Most had hypertension (53%) and were smokers (50%). Only 19% had DM and 16% had PAD. The mean French size used was 5.4, and 51% of cases were completed using a micropuncture technique. Only 19% of arterial access was completed using ultrasound guidance while 14% of cases utilized a closure device. Most patients (54%) were anti-coagulated during or prior to their procedure, yet only 18% were reversed, and 35% remained on post-operative anti-coagulation or anti-platelet therapy. Access related complications occurred in 3% (N = 54) of this cohort. Of the factors assessed, only ultrasound guided access was associated independently with fewer access complications (OR=0.371; 95% CI: .145-.952, p= .039)

**CONCLUSIONS:** Arterial access complications were lessened with ultrasound guided access. No other factor was significantly associated with complications. Further assessment of access techniques may suggest that ultrasound guided access be the standard of care.

**Presentation  
Number:** KC29

**Publishing  
Title:** Systematic Review of Hospital Mortality: Can we Bend the Curve?

**Author Block:** M. A. Mansour, M.D., **Lindsey M. Korepta, MD**, Christopher M. Chambers, MD, PhD, Robert F. Cuff, MD.  
Spectrum Health, Grand Rapids, MI

**OBJECTIVE:** The ostensible goal of participating in quality improvement programs is to improve surgical outcomes. Our hospital has been submitting data since 2006.

**Purpose:** To assess whether systematic review of deaths with specific feedback to surgeons can influence behavior and improve mortality rates.

**METHODS:** Our hospital participates in NSQIP. Status reports are provided on a quarterly basis. The hospital is ranked based on calculation of the observed versus expected rate. Surgeons are given feedback on their performance and identification of opportunities for improvement is done.

**Abstract  
Body:** **RESULTS:** We reviewed our results from 4 consecutive years: 2010 to 2013. In 2011, the mortality rate was 0.71% for general surgery (9 of 1268), 3.8% for colorectal (7 of 180) and 4.5% for vascular (14 of 310). This resulted in decreasing the hospital ranking to the 9<sup>th</sup> decile. Detailed analysis revealed that the median age at death was 79.5 years. There were 8 women (26%). Nearly half the deaths occurred due to futile care or failure to rescue after a life-threatening complication in the postoperative period. In several cases, the families of these patients elected to withdraw support in the first week postoperatively. The results were shared with vascular and general surgeons. In 2012, mortality was decreased by half.

**CONCLUSION:** Surgeons are frequently pressured to operate on moribund patients whose chances of survival are dismal.

Analysis of our hospital mortality rate revealed that many deaths were attributed to futile care or failure to rescue. By sharing this information with multiple disciplines and early engagement of hospice, a significant decrease in mortality has been achieved.

**Presentation Number:** KC30

**Publishing Title:** Air pollution association with hospital admissions for peripheral arterial disease and lower extremity amputations

**Author Block:** John F. Pearson, M.D., **Abimbola B. Pratt, M.D.**, Michael Shapiro, M.D., John S. Brownstein, M.D., Donald Risucci, Ph.D., Marcus D'ayala, M.D., NY Methodist Hospital, Brooklyn, NY

**OBJECTIVE:** There is increasing evidence that air pollution may have an impact on observed regional variations in disease incidence and hospital admissions. A recent national study demonstrated that the number of hospital admissions for cardiac and respiratory diseases was associated with daily fluctuations in airborne fine particulate matter concentrations  $\leq 2.5 \mu\text{m}$  ( $\text{PM}_{2.5}$ ). This study examines the previously unreported relationship between regional variations in hospital admissions for Peripheral Arterial Disease (PAD) and regional estimates of  $\text{PM}_{2.5}$  concentrations.

**METHODS:** The Center for Medicare and Medicaid Services Limited Data Set for 2008 was used to identify all U.S. hospital admissions for PAD among patients insured by Medicare. Annual mean  $\text{PM}_{2.5}$  concentration estimates were calculated for each county in the United States based on 2008 data from the Environmental Protection Agency. Pearson correlations and multiple regression analyses were used to examine the association between county level  $\text{PM}_{2.5}$  estimates and the county level incidence of PAD admissions and associated surgical procedures (above and below knee amputations).

**Abstract Body:** **RESULTS:** There were 847668 admissions for PAD, 14407 below knee amputations, and 13466 above knee amputations. The annual mean  $\text{PM}_{2.5}$  level per county was (Mean  $\pm$  SD)  $9.88 \pm 2.04$ ; range: 4.27 - 16.39 across the 3096 counties for which data were available. Statistically significant direct correlations ( $p < 0.001$ ) were observed between  $\text{PM}_{2.5}$  levels and the percentage of Medicare admissions for PAD per county ( $r = 0.21$ ), and those undergoing above knee amputation ( $r = 0.12$ ). Statistically significant inverse correlations were observed between  $\text{PM}_{2.5}$  levels and age of PAD patients ( $r = -0.22$ ), and with male gender of PAD patients ( $r = -0.11$ ). Multiple regression analyses revealed that the relationship between county annual percentage of Medicare PAD admissions and  $\text{PM}_{2.5}$  was independent of the size of the county populations.

**CONCLUSIONS:** This study suggests that Medicare patients may have a higher likelihood of hospital admission for PAD if they live in an area with higher levels of airborne fine particulate matter concentrations. Further, the data suggest that patients admitted for PAD who reside in more highly polluted regions tend to be younger and are more likely to be female than those living in less polluted regions. If confirmed in future studies, these results may have significant implications for public health and resource allocation.



**Presentation Number:** KC31

**Publishing Title:** Multivariate Analysis of 319 Iliac Stents Reveals the Strong Impact of Demographic Factors and Lesion Severity on Stent Patency

**Author Block:** Amy Roach, BS, Sebastian Larion, MS, Chad Ammar, MD, Colin Brandt, MD, S. Sadie Ahanchi, MD, David Dexter, MD, Jean Panneton, MD.

Eastern Virginia Medical School, Norfolk, VA

**OBJECTIVES:** The aim of our study was to perform a large scale multivariate analysis to identify the demographic, anatomic, or procedural factors that impact primary iliac stent patency.

**METHODS:** Iliac stents from 2011- 2013 were retrospectively reviewed. Differences in demographic, anatomical, and procedural characteristics were analyzed by univariate analysis between groups based on primary patency. Variables that were considered significant ( $p < 0.05$ ) were brought forward in the cox regression multivariate analysis.

**RESULTS:** 224 patients underwent primary iliac artery stenting and a total of 319 limbs were analyzed. Average age was 66 years (range 38 to 93), 53% were male, and 57% were Caucasian. Indication for procedure was 64% claudication, 23% rest pain, and 13% ulcer/gangrene. The cohort included all TASC classifications: 50% TASC A, 25% TASC B, 12% TASC C, and 13% TASC D. The treated anatomic location was isolated EIA 27%, isolated CIA 55%, and combined CIA/EIA 18%. Intervention distal to the iliac arteries was performed in 37% of the cohort.

**Abstract Body:** Kaplan Meier (KM) analysis at 1 and 3 years revealed a primary patency of 86%/51%, primary assisted patency 98%/89%, and secondary patency of 99%/90%. For those patients with critical limb ischemia preprocedurally, limb salvage was 88% at one year. Based on KM analysis, primary patency (PP) at 1 year for Caucasian patients was 93% versus non Caucasian 79%,  $P = .001$ . PP was 76% in patients  $< 60$  years of age, 86% in patients 60-70 years of age, and 97% in patients  $> 70$  years of age, with a significant difference in KM analysis between all groups,  $P < .001$ . PP was significantly different for those with and without EIA occlusion ( $P < .001$ ), with one year PP by KM analysis 71% and 86%, respectively. PP was also significantly different for those with and without aortic occlusion, ( $P = .008$ ), with one year patency of 84% and 87%, respectively. We evaluated five factors on multivariate analysis and three factors were identified to impact primary patency: Caucasian race (HR, .517; 95% confidence interval [CI], .313-.852;  $P = .01$ ) and older age at the time of procedure (HR, .945; 95% CI, .920-.971;  $P < .001$ ) positively impacted patency. EIA occlusion (HR, 2.352; 95% CI, 1.294-4.275;  $P = .005$ ) negatively impacted primary patency.

**CONCLUSIONS:** In our experience with a large number of iliac interventions, race, age, and EIA occlusion all impacted primary patency.

**Presentation  
Number:** KC32

**Publishing  
Title:** Occlusion of infrainguinal bypass is associated with increased postoperative wound infection after major lower extremity amputations

**Author Block:** Sajid Shah, Amita Pathak, George Pisimisis, Andrea Garcia, Ronan Allencherril, Neal Barshes, Panos Kougiias.  
Baylor College of Medicine, Houston, TX

**OBJECTIVES:** Infections occur frequently after major lower extremity amputations (LEA) performed in patients with the diagnosis of peripheral arterial disease. We sought to determine whether history of a prior infrainguinal bypass in the amputated extremity is associated with increased incidence of postoperative wound infection following major LEA.

**METHODS:** This was a retrospective cohort analysis on consecutive patients who underwent major LEA either below or above the knee. Indications for LEA included severe rest pain or tissue loss. For each patient included in the analysis a propensity score was calculated as the probability of having a prior infrainguinal bypass operation in the amputated extremity. Input variables for this calculation included demographics, comorbid conditions, and urgency and symptomatology of the initial presentation. The final risk adjustment was performed using the inverse propensity score weighting methodology.

**Abstract**

**Body:** **RESULTS:** We analyzed 294 major LEA that occurred over a 5 year period and led to 36 (12%) infections. Propensity score weighting resulting in excellent balance for all the variables that were included in the propensity score calculation. In the final multivariable model there was no association between native (OR: 1.19, p=0.88) or prosthetic (OR: 0.63, p=0.65) bypass and the occurrence of postoperative wound infection. However, the presence of an occluded bypass regardless of type of conduit was associated with infection (OR: 4.7, p=0.03). There was also a trend for increased incidence of wound infection in patients with lower extremity infection as indication for the amputation (OR: 3.1, p=0.06).

**CONCLUSIONS:** The presence of an occluded bypass graft regardless of conduit increases the risk of wound infection after major lower extremity amputation.

**Presentation Number:** KC33

**Publishing Title:** Bleeding independently predicts morbidity and mortality in both endovascular and open revascularizations

**Author Block:** Sara L. Zettervall, MD, Peter A. Soden, MD, Dominique B. Buck, MD, John C. McCallum, MD, Jeremy D. Darling, BA, Marc L. Schermerhorn, MD.

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**OBJECTIVES:** Studies have documented the effects of transfusion on morbidity and mortality for open lower extremity revascularization. However, no studies to date compare the effect of bleeding on open and endovascular approaches. In this study we aim to compare the morbidity and mortality associated with bleeding in patients undergoing open and endovascular intervention.

**METHODS:** All patients who underwent a lower extremity revascularization between 2011 and 2012 in the Vascular Targeted NSQIP database were identified. Patients were divided based on the operative approach. All patients who underwent endovascular intervention in conjunction with a bypass were placed in the open group. Bleeding was defined as perioperative transfusion or return to the operating room due to bleeding. Patient demographics and perioperative risk factors were identified and a univariate analysis was completed using Chi-Square and Fisher Exact tests. A stepwise multivariate logistic regression was utilized to identify independent predictors of each outcome.

**RESULTS:** 5492 patients underwent revascularization including 2058 who underwent endovascular procedures and 3434 who underwent open procedures. Bleeding was seen in 12.9%(707) of all cases, 7.2%(149) of endovascular procedures, 16.2%(558) of open procedures, 16.3%(102) of suprainguinal open procedures, 7.2%(43) of suprainguinal endovascular procedures, 16.2%(456) infrainguinal open procedures, and 7.3%(106) of infrainguinal endovascular procedures. Bleeding was an independent predictor of death (OR 3.5, 95% CI 2.3-5.4) and all major NSQIP complications with the exception of pneumonia. (Table 1)

**CONCLUSIONS:** Bleeding is an independent predictor of morbidity and mortality in both endovascular and open revascularizations. However, bleeding and adverse events independently associated with bleeding are more common in patients undergoing open operations. The significant association between bleeding and adverse outcomes highlights the importance of meticulous hemostasis regardless of operative approach.

**Abstract Body:**

Outcomes predicted by bleeding			
	All Cases (5492)	Endovascular Cases (2058)	Open Cases (3434)
Death	2.0% 3.5 (2.3-5.4)*	1.7% 4.8 (2.3-10.3)*	2.2% 3.3 (2.1-5.4)*
Return to Operating Room	12.5% 3.6 (3.0-4.4)*	8.7% 8.0 (5.4-12.0)*	14.8% 2.9 (2.4-3.7)*
Amputation	2.6% 2.9 (2.0-4.2)*	2.3% 3.4 (1.7-6.7)*	2.7% 3.0 (1.9-4.6)*
MI or Stroke	3.3% 3.1 (2.2-4.3)*	1.3% 4.5 (1.9-11.0)*	4.5% 3.2 (2.2-4.4)*
Prolonged Ventilation	1.3% 6.7 (4.1-11.0)*	0.8% 16.0 (5.9-43.9)*	1.6% 4.4 (2.6-7.8)*
Pneumonia	0.9% 2.1 (1.1-4.1)	0.4% 7.0 (1.7-28.9)	1.1% 1.4 (0.7-3.2)
Wound Complication	5.8% 1.8 (1.3-2.3)*	1.3% 2.5 (1.1-5.8)*	8.6% 1.5 (1.1-2.1)
Septic Shock	0.8% 5.4 (2.8-10.3)*	0.5% 12.7 (3.6-45.0)*	1.0% 3.8 (1.8-8.0)*
Readmission	3.9% 1.7 (1.2-2.4)*	3.7% 2.3 (1.2-4.3)	4.0% 1.4 (0.9-2.1)

# Karmody Competition Topic: Venous/Dialysis

**Presentation Number:** KC34

**Publishing Title:** Duplex Criteria for the Diagnosis of Fat Embolism Syndrome

**Author Block:** Jason Andre, MD, Stanley Bly, James Pan, MD, Douglas Hood, MD, Kim J. Hodgson, MD, Sapan S. Desai, MD, PhD, MBA. Southern Illinois University, Springfield, IL

**OBJECTIVES:** Fat Embolism Syndrome (FES), associated with up to 20% of long bone and pelvic fractures, is a disease process that can be potentially fatal. FES is often confused with deep venous thrombosis (DVT), and there are no commonly accepted diagnostic criteria to assist with diagnosis. As the management of these two diseases is markedly different, early and accurate diagnosis can help guide proper management in these patients.

**METHODS:** We identified two patients with FES who underwent bilateral lower extremity venous duplex studies after sustaining long bone fractures. We were able to document sonographic evidence of fat emboli in two patients and use them to generate diagnostic criteria that distinguish them from DVT.

**Abstract Body:**

**RESULTS:** The first patient was an 83-year-old female with an open distal femur fracture sustained after a fall. Due to concerns for a possible pulmonary embolism after the onset of pleuritic chest pain, a lower extremity venous duplex study was obtained. A second patient was an 18-year-old male thrown from a vehicle who sustained bilateral femur fractures. A venous duplex ultrasound was completed due to concerns for a DVT. In both patients, no DVT was identified, but a discrete, free floating, and embologenic lesion was identified on ultrasound. Sub-centimeter radio-opaque, spherical lesions were identified passing through the deep veins. There were no findings consistent with venous augmentation, respiratory variation, compressibility or flow limitations.

**CONCLUSIONS:** Fat emboli are distinguished from DVT by their radio-opaque, spherical nature. They are not attached to the venous wall and are not compressible. As a result, standard signs associated with a DVT are not found with FES. Patients with ultrasonographic evidence of FES who develop subsequent PE should not be heparinized.

**Presentation  
Number:** KC35

**Publishing  
Title:** Surgeon-Performed Intraoperative Vein Mapping Facilitates Timely Creation of New Arteriovenous Access

**Author Block:** **Jeffrey B. Edwards, BS**, Zachary B. Fang, Susan M. Shafii, MD, Luke P. Brewster, MD, Shipra Arya, MD, Yazan Duwayri, MD, Ravi K. Veeraswamy, MD, Thomas F. Dodson, MD, Ravi R. Rajani, MD.  
Emory University School of Medicine, Atlanta, GA

**Abstract  
Body:** **OBJECTIVES:** Preoperative duplex ultrasound is routinely performed prior to upper extremity arteriovenous (AV) access creation. Socioeconomically disadvantaged patients, however, may not have the resources necessary to obtain such testing. Focusing on surgeon-performed intraoperative ultrasound, we present a streamlined algorithm to minimize the need for preoperative testing in resource-poor environments.

**METHODS:** All patients referred for first-time arteriovenous access creation at an urban county hospital were initially assessed with a full history and physical exam, including bilateral upper extremity blood pressure measurements. Unless an abnormality was identified, no other preoperative testing was performed. Patients were consented for creation of arteriovenous access, and all potential outcomes were explained to them. Intraoperatively, the patient's non-dominant arm was examined by the operating surgeon using duplex ultrasound. The cephalic and basilic veins were evaluated for diameter (>2.5 mm), presence of large branches, and continuity to their draining confluences. Radial and brachial arteries were examined for size, patency, and the presence of significant calcification. Priority was given to access creation in the following order: radiocephalic, radiobasilic, brachiocephalic, brachiobasilic, and AV graft placement.

**RESULTS:** 95 consecutive patients treated with this algorithm were included (age  $53 \pm 13$  years; ESRD 56%). 87 patients (92%) received a primary AV fistula (37% brachiocephalic, 31% radiocephalic, 24% basilic transposition, and 8% arm AV graft). On average, intraoperative duplex ultrasound took an additional 6.2 minutes. Unassisted maturation was achieved in 57% of patients. The six-month assisted primary patency was 65%. There was a 14% complication rate, including an infection rate of 1% and a clinically significant steal rate of 3%.

**CONCLUSION:** Permanent AV access creation is able to be performed at success rates similar to previously published results with no specific preoperative testing other than a thorough physical exam. Intraoperative surgeon-performed venous mapping can be performed with minimal added operative time, thus obviating the need for any preoperative studies. Such success is able to be accomplished while maintaining a very high rate of primary fistula creation.

**Presentation  
Number:** KC36

**Publishing  
Title:** Epidemiology and Predictors of Outcome of Postphlebotic Syndrome

**Author Block:** **Abdallah Naddaf, MD**, Nick Nolte, MD, Imran Khan, MD, James Pan, MD, Douglas Hood, MD, Kim J. Hodgson, MD, Sapan S. Desai, MD, PhD, MBA.

Southern Illinois University, Springfield, IL

**OBJECTIVES:** Postphlebotic syndrome (PPS) is the most common complication of lower extremity deep vein thrombosis (DVT), affecting up to one half of patients. PPS is associated with significant patient morbidity and increased healthcare costs. The aim of this paper is to evaluate the epidemiology and demographics of patients admitted for lower extremity PPS, and to determine risk factors that impact outcome. A risk score to identify at-risk patients was developed.

**METHODS:** A retrospective analysis was completed using the Nationwide Inpatient Sample (NIS) from 2002 to 2011. Patients with lower extremity PPS were identified using ICD-9 codes. Epidemiology, demographics, comorbidities, hospital covariates, and outcomes were determined. Statistically significant variables and odds ratios were identified by multivariate analysis. A discriminant function and the area under the receiver operating characteristic curve (AUC) were used to identify factors predictive of surgical intervention.

**Abstract  
Body:**

**RESULTS:** The overall incidence of inpatient PPS is 3.1/100,000 and has been decreasing since 2002. The average age of patients with PPS is 61.2 years, with 48.3% female. Patients diagnosed with PPS with complications (37.8%) such as ulcers are more likely to undergo an intervention such as venogram ( $P>0.05$ ), stent ( $P=0.05$ ), venous bypass ( $P>0.05$ ), vein stripping ( $P<0.001$ ), or wound debridement ( $P<0.001$ ). The median length of stay (LOS) is greater for patients who have PPS with complications (5 vs. 4,  $P<0.01$ ), and median cost of care is greater (\$7,293 vs. \$6,399,  $P<0.001$ ). Inpatient mortality is greater for those who have PPS with complications (0.8% vs. 0.4%,  $P<0.01$ ). PPS with any complication, age under 60, urban hospital location, and peripheral vascular disease are risk factors that predict the need for intervention.

**CONCLUSIONS:** PPS is a disabling disease with little known about its true epidemiology and risk factors. PPS with complications is a major predictor of future interventions and resource burden. The ability to identify at-risk patients may better guide resource allocation and mitigate the effects of complications from PPS.

**Presentation Number:** KC37

**Publishing Title:** Pseudoaneurysm Development Associated with the VWING Hemodialysis Device

**Author:** Ritoban Sen, MD, John Blebea, MD, MBA, FACS, William C. Jennings, MD.

**Block:** University of Oklahoma (Tulsa), Tulsa, OK

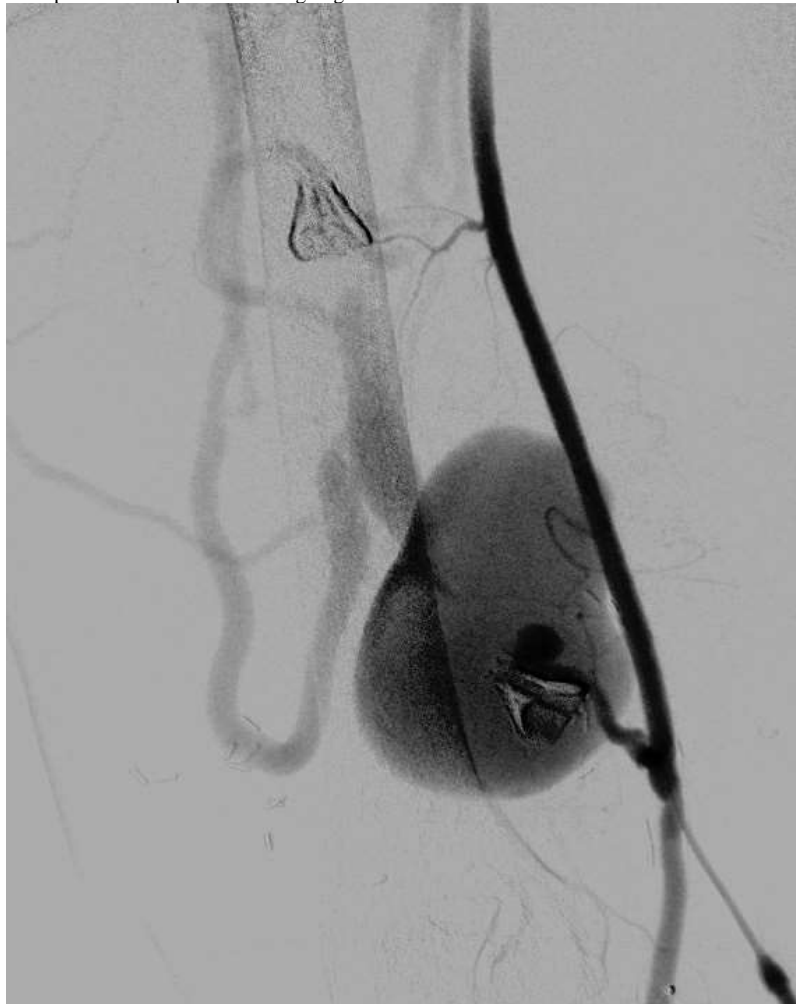
**OBJECTIVE:** The Venous Window Needle Guide (VWING) is an implantable hemodialysis cannulation device recently FDA-approved for use on arteriovenous fistulas (AVF) which cannot be otherwise cannulated. It is a small titanium funnel, sutured directly on the vein, which provides a palpable and predictable pathway for placement of needles during hemodialysis access. We describe the first report of the development of a pseudoaneurysm associated with the use of the VWING device.

**METHODS:** The patient was a 55 year old obese female who had had a brachial-cephalic AVF fistula with a VWING two years previously. She presented acutely to the hospital with a painful and enlarging pulsatile mass of the AVF at the site of the VWING device placement. She was also reported to have difficulty with flows from the AVF during dialysis.

**RESULTS:** The patient underwent a fistulagram which revealed a 3.3 cm pseudoaneurysm at the inferior VWING placement site along with occlusion of the vein at the superior VWING with a branch vessel maintaining AVF patency (see image). The patient subsequently underwent surgical excision of the aneurysm. The VWING was free-floating within the pseudoaneurysm suggesting disruption of the vein by the sutures which had been attached to the VWING. A temporary dialysis catheter was placed and the patient later had creation of a new AVF in the other arm.

**CONCLUSIONS:** This is the first reported case of a pseudoaneurysm associated with the VWING device, likely due to traumatic disruption of the venous wall during cannulation attempts. This complication is a potential hazard with placement of these devices and should be explained to the patients undergoing this

**Abstract Body:**



procedure.

**Presentation Number:** KC38

**Publishing Title:** Heparin bonded PTFE does not improve hemodialysis arteriovenous graft function

**Author Block:** Nicolas Zea, MD, Grayson Menard, MD, Linda Le, MD, Hernan A. Bazan, MD, W Charles Sternbergh, MD, Taylor Smith, MD. Ochsner Clinic Foundation, New Orleans, LA

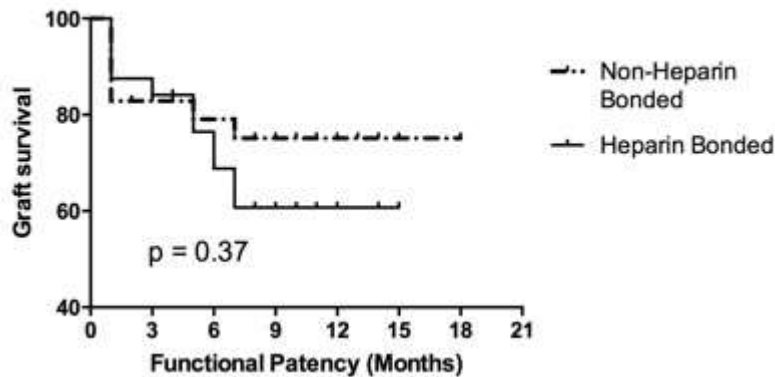
**OBJECTIVES:** While heparin-bonded polytetrafluoroethylene (PTFE), when compared to standard PTFE, has been shown to be beneficial in distal extremity bypass grafts, the data supporting its usage for dialysis access is less clear. We compared the patency rates, number of interventions, and complications between heparin-bonded (HEP) and non-heparin-bonded (NonHEP) PTFE grafts placed for dialysis access.

**METHODS:** A retrospective review of all dialysis access procedures entered into a prospectively maintained vascular surgery database was performed. Primary end points included functional graft patency, time to graft abandonment, and number of procedures required to re-establish graft patency following thrombosis. The number of interventions required to maintain graft patency and graft related complications were also reviewed. Kaplan-Meier curves were used to compare the two groups.

**RESULTS:** Between January 2013 and March 2014, 301 dialysis access procedures were performed which included 72 AV grafts (AVG) comprised of 32 HEP (32 6mm straight grafts) and 39 NonHEP (36 4-7mm taper and 3 6mm straight). At a mean follow-up of  $7.35 \pm 5.15$  months, 22/32 HEP grafts were functional compared to 31/39 NonHEP grafts (67% vs. 79%,  $p=0.22$ ). Primary, primary-assisted, and secondary patency at 1, 3, 6 and 12 month follow-up was not significantly different between the HEP and NonHEP grafts. The incidence of grafts abandoned due to thrombosis (5 HEP, 4 NonHEP, 16% vs. 10%,  $p=0.51$ ) and time to graft abandonment were also not different ( $4.55 \pm 3.11$  months vs.  $2.38 \pm 2.72$ ,  $p=0.13$ ). The number of HEP grafts undergoing an open or percutaneous thrombectomy was significantly higher than the NonHEP grafts (34% vs. 13%,  $p=0.03$ ), as was the incidence of any intervention performed to maintain graft patency (84% vs. 51%,  $p=0.002$ ). Kaplan-Meier survival curve failed to show a benefit in functional patency with HEP vs. NonHEP

**Abstract Body:**

### Heparin vs Non-Heparin bonded AV Grafts



PTFE

**CONCLUSIONS:** We did not demonstrate a benefit to the routine use of heparin-bonded PTFE for AVG creation especially given the higher cost of these grafts. Functional patency rates were not improved and the rates of re-intervention were higher with heparin bonded PTFE AV grafts.



Wednesday, April 1<sup>st</sup>  
Scientific Session VII – Venous/Dialysis

**Presentation  
Number:** 23

**Publishing** **Infraclavicular**

**Title:** **First Rib Resection for the Treatment of Acute Venous Thoracic Outlet Syndrome**

**Jeffrey J. Siracuse, M.D.**, Paul C. Johnson, M.D., Douglas W. Jones, M.D., Gregory G. Salzler, M.D., Heather L. Gill, M.D.,

**Author Block:** Andrew J. Meltzer, M.D., Peter H. Connolly, M.D., Darren B. Schneider, M.D.

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**OBJECTIVES:** Venous thoracic outlet syndrome (VTOS) most commonly is treated by transaxillary, supraclavicular, or paraclavicular approaches based on surgeon preference. However, we have adopted an infraclavicular approach to VTOS as the surgical pathology is in the anterior costoclavicular space. We hypothesize that this approach for thoracic outlet decompression provides excellent access to the costoclavicular space and the axillosubclavian veins for safe and effective treatment of patients with an acute presentation of VTOS.

**METHODS:** We retrospectively reviewed all consecutive patients that underwent infraclavicular thoracic outlet decompression for an acute presentation of VTOS from July 2005 to February 2014 by a single surgeon. Acute presentation was defined as less than 14 days between the onset of symptoms and catheter directed thrombolysis (CDT). Demographics, primary and secondary subclavian vein patency, perioperative outcomes, and reinterventions were recorded.

**RESULTS:** 30 patients underwent an infraclavicular approach for treatment of VTOS. Average age was 33 and 60% were male. All patients underwent CDT and subsequent infraclavicular first rib resection and intraoperative venography, which was technically successful in all patients. Intraoperative subclavian vein angioplasty was performed in 70%. Median postoperative length of stay was 2 days (range 2-6), blood loss was 75 ml (20-200), and operative time was 117 minutes (76-166). Median follow-up was 78 days (2-483). Ultrasound at follow-up was performed on 24/30 (80%) with all patients having patent subclavian veins at last follow-up. Reinterventions included 2 cases for rethrombosis and one case of hemothorax. There were no complications of brachial plexus or phrenic nerve injury. All patients at last follow up were symptom free and subclavian veins were patent.

**CONCLUSIONS:** An infraclavicular approach is a safe and effective treatment for acute VTOS. It provides excellent access to the costoclavicular space for first rib resection and subclavian venolysis while at the same time minimizing the risk of brachial plexus and phrenic nerve injury.

**Abstract  
Body:**

**Presentation Number:** MP29

**Publishing Title:** Operative Explantation of Inferior Vena Cava Filters

**Author Block:**

**Mark E. O'Donnell, MD FRCS<sup>1</sup>**, Cristine Velazco, MD<sup>1</sup>, Ryan Day, MD<sup>1</sup>, Richard J. Fowl, MD<sup>1</sup>, William M. Stone, MD<sup>1</sup>, Thomas C. Bower, MD<sup>2</sup>, Peter Gloviczki, MD<sup>2</sup>, Samuel R. Money, MBA MD<sup>1</sup>.

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**OBJECTIVES:** Inferior vena cava (IVC) filter placement is not without risk. It has been associated with puncture site bleeding, venous thrombosis as well as filter migration and perforation. The objective of this study was to assess our experience with open operative explantation of IVC filters.

**METHODS:** After IRB approval, patients were identified from case logs that had transabdominal IVC filter removal between 1994 and 2013. Patient demographics, thromboembolic risk profile, clinical history, operative indication and outcomes were recorded for each case.

**RESULTS:** Eighteen patients (male=9, mean age=49.6 years) were identified. IVC filters (permanent=4, retrievable=8, unknown=6) were deployed for a combination of significant thromboembolic events (n=16), post-trauma (n=3) or after failure of anticoagulation therapy (n=2). Ten patients had retrievable filters that were not removed percutaneously due to filter strut perforation into surrounding pericaval tissue (Figure 1). Seven patients subsequently presented with abdominal/back pain, hematuria or sepsis. Midline laparotomy was utilized for explantation in eleven patients during oncological resections. A subcostal incision (n=5) was used for planned explantation alone. One patient had robotic-assisted laparoscopic removal and another had an open transjugular removal. Caval venotomy was primarily closed (n=15) or patched with bovine pericardium (n=2). No complications attributed to filter removal were identified in the post-operative period. One patient died from advanced malignancy and the other seventeen patients remain well (mean follow-up 618 days).

**CONCLUSIONS:** Filter strut caval perforation remains the most significant indication for transabdominal removal. Filter removal is often considered incidentally during oncological resection. Although operative explantation still remains infrequent, our series suggests that it may be performed safely without significant post-operative complications.

**Abstract Body:**



**Presentation Number:** MP30

**Publishing Title:** Isolated Soleal and Gastrocnemius Vein Thrombosis Revisited: The Proper Treatment

**Author Block:** **Ali Elfandi, MD**, Clifford M. Sales, MD, Scott Sundick, MD, Sharen Anghel, MD, Rami Bustami, PhD. Overlook Medical Center, Summit, NJ

**OBJECTIVES:** We have advocated for the “non-anticoagulant” approach to the management of isolated soleal or gastrocnemius vein thrombosis (ISGVT) showing that the addition of therapeutic anticoagulation does not affect the rate of propagation of thrombi in these vessels. Our original report was based on data through 2009. The current report re-examines our more current data for the calendar year 2013.

**METHODS:** All in-patients with a diagnosis of ISGVT made in our ICAVL noninvasive laboratory were included for review. Only those with a follow-up duplex examination were included in the statistical analysis. Review of the medical record data and of the duplex ultrasound examinations allowed for the determination of progression of thrombosis

**Abstract Body:** **RESULTS:** 100 patients were found to have ISGVT in 2013 at our institution\_56 (56%) had a follow-up duplex study available for review and constitute the study group. 32% (n=18) were treated with full-dose anticoagulation (TX group) following the diagnosis of ISGVT. Compared to our historical control (54% had been so treated in our prior report) this represented a significant change in practice pattern (p=.006 .) There were no statistical differences between those in the TX group and those in the NoTX group (those not treated with full-dose anticoagulation) in terms of demographics, risk factors or comorbidities. Two of the 18 patients in the TX group (11%) and 6/38 (16%) in the NoTX group had propagation of their ISGVT (p=1.00)\_all of which propagated to tibial vessels.

**CONCLUSIONS:** We repeat our strong support for the avoidance of full-dose anticoagulation in the management of ISGVT. This data shows that propagation is related to factors other than treatment protocols and the addition of therapeutic anticoagulation only exposes patients to the risks of this treatment without proven benefit. We are impressed to see that the medical staff in our institution has apparently accepted this information and has begun to alter their practice patterns.

**Presentation Number:** MP31

**Publishing Title:** Successful Venous Repair and Reconstruction for Oncologic Resections

**Author Block:** **Yana Etkin, MD**, Paul J. Foley, III, MD, Grace J. Wang, MD, Guzzo J. Guzzo, MD, Robert E. Roses, MD, Douglas L. Fraker, MD, Jeffrey A. Drebin, MD, PhD, Benjamin M. Jackson, MD.  
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**OBJECTIVES:** We report our institutional experience of various venous reconstruction methods during oncologic resections, especially examining the patency of venous reconstructions and the conduits used.

**METHODS:** All patients undergoing venous repair or reconstruction for oncologic resections between 2008 and 2014 were identified by a retrospective search of a prospectively-maintained database at a single university hospital. Extent and manner of venous reconstruction and conduit or patch material were recorded. Need for intraoperative veno-venous bypass or cardiopulmonary bypass were also recorded. While no prescribed follow up protocol has been instituted, patency and survival data as available were analyzed.

**RESULTS:** 119 patients were identified during the study period. Five patients had primary ligations, without limb loss. Of the remaining 114 patients, 73 (64%) underwent primary repairs, 23 (20%) had patch repair, and 18 (16%) had bypasses. Of these, 26 (23%) were for portal vein reconstruction during Whipple, 42 (37%) were for caval repair during caval thrombectomy in the setting of renal cell cancer, and 27 (24%) were for caval repair during resection for other abdominal malignancies. (Table 1) Veno-venous bypass was used in 16 repairs and cardiopulmonary bypass in 8. Patency of all bypass grafts was 87% at one year.

Occlusions were only suffered in the prosthetic grafts group. There was no limb loss or significant long term morbidity in patients with occluded grafts. Rate of infection was 0%, and there was no evidence of an increased infection rate in prosthetic or bioprosthetic conduits or patches. Perioperative mortality was 6%.

**CONCLUSIONS:** The portal vein reconstruction during Whipple can be done with bovine pericardium despite contamination and prosthetic grafts can be used for most reconstructions with no infections and good patency rates. Overall, venous reconstruction for oncologic resection can be done safely with very low complication rates and good patency rates.

**Abstract Body:**

Table 1: Techniques of venous reconstruction

Type of Repair	Portal Vein	Vena Cava	Other Intra-abdominal	Extremity	1 Year Patency
Primary	7	51	11	4	100%
Patch	15	7	1	-	100%
Bypass	4	11	2	1	87%

**Presentation Number:** MP32

**Publishing Title:** Sustained Hemodynamic Benefits Following Catheter Directed Interventions for Acute Pulmonary Embolism

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**OBJECTIVES:** Catheter-directed thrombolysis (CDI) for acute pulmonary embolism (PE) is commonly performed but hemodynamic benefits have not been clearly defined beyond the peri-procedural period. The objective of this study is to report midterm outcomes of CDI for treatment of acute PE.

**METHODS:** Records of all patients who underwent CDI for massive (MPE) or submassive (SPE) pulmonary embolism were retrospectively reviewed. Endpoints were procedure-related complications, PE-related mortality, and longitudinal changes in echocardiographic parameters. Subgroup analysis was performed between MPE and SPE groups. Standard statistical techniques were used.

**RESULTS:** 69 patients underwent CDI for PE (mean age 59±15yrs, 56% male). 11 had MPE and 58 SPE. 21.7% had previous deep venous thrombosis (DVT) and PE; 52% had concurrent acute DVT. Troponin-I and BNP were abnormally elevated in 63% of patients. Baseline characteristics did not differ significantly by PE subtype.

52% of patients underwent ultrasound-assisted thrombolysis, 39% standard catheter-directed thrombolysis, and 8.7% aspiration, rheolytic therapy, or directed lytic bolus without continuous infusion. Bilateral interventions were performed in 89.9%. Average treatment time was 17.8±11.3h with average t-Pa dose of 24.2±14.6 mg.

There was significant improvement in supplemental oxygen requirement in the cohort during hospitalization. There were 2 major (2.9%, requiring transfusion) and 6 minor (8.7%) peri-procedural bleeding complications with no strokes or cerebral hemorrhage. 3 patients (4.35%) required conversion to surgical thrombectomy. Significant improvement was demonstrated in all echocardiographic parameters between baseline and 1-year follow-up in the total cohort and in the SPE group; the MPE group improved in most parameters, but this was not statistically significant (Table). There was 1 PE-related death in each subgroup (9.1% MPE, 2.04% SPE, 3.3% overall), and all-cause mortality was 8.7% at 90 days. Survival at one year was 88%, and estimated survival by Kaplan-Meier analysis was 84.9±5.7% and 80.7±6.8% at 1 and 3 years.

**Abstract Body:**

**CONCLUSIONS:** CDI are safe and effective for treatment of acute PE, with sustained hemodynamic improvement at one year. Further prospective large scale studies are needed to determine the comparative effectiveness of catheter directed intervention, systemic thrombolysis, and anticoagulation.

Table. Change in Echocardiographic Parameters, Baseline - 1 Year

	MPE		SPE		Total	
	% Improved	p	% Improved	p	% Improved	p
RV Dilation	66.7%	0.56	71.4%	<0.001	70.8%	<0.001
RV Dysfunction	100%	0.11	80%	<0.001	81.4%	<0.001
RV Hypokinesis	100%	0.13	93.8%	<0.001	95%	<0.001
	Average Improvement ±SD	p	Average Improvement ±SD	p	Average Improvement ±SD	p
Tricuspid Regurgitant Jet Velocity (m/s)	0.07±0.3	0.43	0.54±0.10	<0.001	0.76±0.27	0.007
Estimated Pulmonary Arterial Pressure (mmHg)	7.5±8.5	0.27	13.40±2.53	<0.001	15.52±4.61	0.002

**Presentation Number:** MP33

**Publishing Title:** Long-Term Patency Of Primary Inferior Vena Cava Reconstructions

**Author:** George E. Havelka, MD, Heron E. Rodriguez, MD, Andrew W. Hoel, MD, Mark K. Eskandari, MD.

**Block:** Northwestern University, Chicago, IL

**OBJECTIVE:** Inferior vena cava (IVC) repair after planned and unplanned venotomy may take the form of either interposition bypass, patch venoplasty or lateral venorrhaphy and primary repair. Direct repair of the IVC avoids the use of foreign material, and allows for an all-autologous repair in an expeditious fashion. Furthermore, primary repair can be accomplished without compromising venous outflow from the lower extremities and exhibits excellent long-term patency rates.

**METHODS:** Enrollment consisted of 47 consecutive patients who underwent direct IVC repairs between January 2002 and January 2014. Primary repair followed lateral venorrhaphy for tumor extraction (figure 1) or to repair an iatrogenic or traumatic IVC injury. Patient demographics, vena cava dimensions and patient outcomes were tabulated.

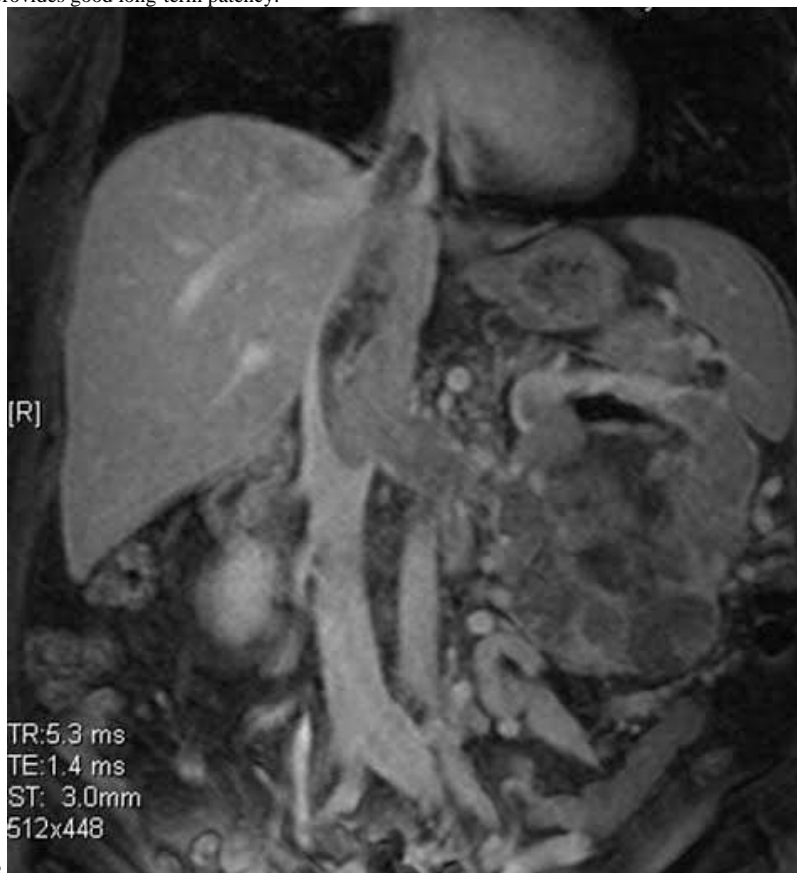
**RESULTS:** Most patients underwent *en bloc* nephrectomy, IVC tumor thrombus extraction and primary lateral venorrhaphy; 92% had RCC on final pathology. This group consisted of 15 men and 11 women; the average age was 61.0 years (39-83 years); the mean operative time was  $410.3 \pm 119.9$  minutes; mean estimated blood loss (EBL) was 3395.4 mL and the mean follow-up period was 38.1 months (1-96 months). Complications included one pulmonary embolism and one case of anuria requiring re-operation. Five patients required a supra-hepatic IVC clamp associated with a longer operative time compared to those requiring an infrahepatic clamp (532 minutes vs. 360 minutes, respectively). The group undergoing primary repair for iatrogenic or penetrating traumatic IVC injury consisted of 15 men and 6 women; the average age was 52.7 years (31-82 years); the mean operative time was  $366.1 \pm 137.9$  minutes; mean EBL was 1610.1 mL and the mean follow-up period was 20.2 months (3-92 months).

Complications included one pleural effusion requiring chest tube drainage and one hospital acquired pneumonia. There were no intra-operative deaths nor pulmonary emboli in either group.

Neither group exhibited post-op clinical or radiographic evidence of IVC stenosis or occlusion.

**CONCLUSION:** Regardless of the indication or the level of IVC clamping, primary IVC repair is a safe, expeditious technique that provides good long-term patency.

**Abstract Body:**



**Presentation Number:** MP34

**Publishing Title:** Proximalization of Arterial Inflow: An Effective Treatment for Ischemic Steal Syndrome After Access Creation

**Author Block:** **Thomas M. Loh, MD**, Matthew E. Bennett, MD, Mark G. Davies, MD, PhD, Eric K. Peden, MD  
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**Abstract Body:** **OBJECTIVES:** Ischemic steal syndrome (ISS) is a dreaded complication following hemodialysis access creation. Its management is complex and varied with a majority requiring surgical revision for correction of symptoms. Proximalization of arterial inflow (PAI) is an alternative to distal revascularization-interval ligation (DRIL) that obviates the need to ligate the axial artery. We present our experience, of PAI for the treatment of ISS.

**METHODS:** We retrospectively reviewed consecutive patients who underwent PAI for ISS from April 2008 to June, 2014. Data collection included demographics, past medical histories, subsequent procedures, volume flows, access usage, limb salvage and patient survival.

**RESULTS:** We performed 38 PAI (21 women, 17 men). Indications for surgery were extremity pain in 38 patients, neurologic dysfunction in 18 patients and tissue loss in 4 patients. 29% had prior surgical intervention for ISS. 74% of patients had a history of diabetes. 49% had a history of atherosclerotic disease. Time to intervention from creation was 23 months (range, 1-94).

Accesses included 9 radiocephalic, 26 brachiocephalic and 3 brachiobasilic fistulas. Proximalization targets were 1 radial artery, 3 ulnar arteries and 34 proximal brachial arteries. Primary assisted patency at 1 year was 71%. Secondary patency at 1 year was 74%. Symptom resolution was reported as complete in 69% and markedly improved in 22%. 6 patients underwent subsequent procedures for continued symptoms with 4 fistulas ultimately ligated for ISS. The average flow in the 4 ligated fistulas increased by 629cc/min (remaining fistulas, average decreased flow of 101cc/min).

**CONCLUSIONS:** PAI is an effective and durable treatment for ISS without ligating axial flow to the extremity. Early results are concerning that PAI can potentially increase flow to the access inducing further steal. Patient selection and monitoring of post-op flow is key for optimizing relief of symptoms and maintaining use of the access. Further investigation into intraop flow monitoring or combination Proximalization/plication are needed.