

# Full Program & Abstracts

12:42 pm - 12:54 pm

M2

## **Use of the Short Musculoskeletal Function Assessment For Assessing Limb-Specific Outcomes Following Extremity Vascular Injuries**

Daniel J. Scott\*, John Watson\*, Thomas A. Heafner\*,  
Randon W. Propper, Todd E. Rasmussen, Zachary M. Arthurs  
- San Antonio Military Medical Center, Ft. Sam Houston, TX

**Introduction & Objectives:** Vascular extremity injuries can be a significant burden on a patient's long-term quality of life. Currently, no limb-specific surveys have been used to quantify the relation between this injury pattern and the resultant physical or psychological impact. The objective of this study is to validate the utility of the Short Musculoskeletal Function Assessment (SMFA) in the setting of extremity vascular injury.

**Methods:** The Joint Theater Trauma Registry (JTTR) was queried for US troops with isolated extremity vascular injury. Injury and management data was obtained and both the Short Musculoskeletal Function Assessment (SMFA) and Short Form 36 (SF-36) were administered following patient contact and consent. Injury variables and SF-36 scores were analyzed and examined for correlation with SMFA scores.

**Results:** At mean follow-up of five years, 192 (median age 25, interquartile range 22-32 years) patients completed both surveys. Injury Severity and Mangled Extremity Severity Scores were 14.57 ( $\pm 8.5$ ) and 5.54 ( $\pm 1.4$ ), respectively. Overall SF-36 Physical and Mental Component Scores were 43.0  $\pm$  9.3 and 46.7  $\pm$  12.6 while overall SMFA Dysfunction and Bother scores were 24.8  $\pm$  14.7 and 29.3  $\pm$  20.8, respectively. Physical Component Summary scores correlated inversely with Dysfunction scores ( $r = -0.62$ ,  $p < 0.01$ ) whereas Mental Component Summary Scores correlated inversely with Bother scores ( $r = -0.60$ ,  $p < 0.01$ ).

**Conclusions:** When compared to the SF-36, there was a moderate to strong inverse relationship between overall scores. This study helps validate the supplemental use of the SMFA in quantifying patient-based outcomes after management of extremity vascular injuries. The added focus of a limb-specific quality of life survey will help guide management and long-term recovery. Further evaluation of specific extremity vascular injury patterns using the SMFA is warranted.

# Full Program & Abstracts

12:54 pm - 1:06 pm

M3

## **Functional Outcome After Resuscitative Endovascular Balloon Occlusion of the Aorta of the Proximal and Distal Thoracic Aorta**

Kira N. Long\*, Robert Houston, IV\*, Devin B. Watson\*, Todd E. Rasmussen, Brandon W. Propper, Zachary M. Arthurs - San Antonio Military Medical Center, Fort Sam Houston, TX

**Introduction & Objectives:** Non-compressible torso hemorrhage remains an ongoing problem for both military and civilian trauma. Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) has been described and presents a potentially life-saving maneuver in hemorrhagic shock. The objective of this study is to report the functional outcomes, paraplegia rates and survival of a 60-minute balloon occlusion in the proximal and distal thoracic aorta in swine.

**Methods:** Swine (*Sus scrofa*, 70-100 kg) were subjected to class IV hemorrhagic shock and underwent 60 minutes of REBOA. Devices were introduced from the femoral artery and positioned in the thoracic aorta in either the proximal location (pREBOA [n=8], just past take-off of left subclavian artery) or distal location (dREBOA [n=8], just above diaphragm). Animals were resuscitated with whole blood, crystalloid and vasopressors prior to a 4-day. Endpoints included evidence of spinal cord ischemia (clinical exam, Tarlov gait score, bowel and bladder dysfunction and histopathology), gross ischemia-reperfusion injury (clinical exam and histopathology) and mortality (spinal cord related and non-spinal cord related).

**Results:** The overall mortality was equal between pREBOA and dREBOA groups at 37.5% (n=3). Spinal cord-related mortality was 12.5% for both pREBOA and dREBOA groups. Spinal cord symptoms without death were present in 12.5% of pREBOA and dREBOA groups. Average gait scores improved throughout the post-operative period. Rates of improvement were comparable between pREBOA and dREBOA groups as well as to the control group.

**Conclusions:** REBOA placement in the proximal or distal thoracic aorta does not alter mortality or paraplegia rates. Functional recovery continues to improve following REBOA and mirrors recovery rate of the control group. REBOA provides another viable modality to control non-compressible hemorrhage.

# Full Program & Abstracts

1:06 pm - 1:14 pm

M4 (RF)

## **Utilization of Intra-Operative Duplex Ultrasound For Determining Appropriateness and Length of Interposition Venous Bypass In the Treatment of Popliteal Artery Entrapment Syndrome**

Joseph M. White, Scott R Golarz - Walter Reed National Military Medical Center, Bethesda, MD

**Introduction & Objectives:** Popliteal artery entrapment (PAE) syndrome represents a spectrum of anatomical compression of the blood supply to the lower extremity that often affects younger patients. Intra-operative duplex ultrasound (IDUS) offers an objective means to determine whether the chronic compression of the popliteal artery has injured the artery to such a degree that interposition bypass is required. IDUS criteria can also be utilized to establish the length of interposition graft required.

**Methods:** We present a case series of three patients in whom IDUS was used during surgical treatment of PAE. Patients initially underwent standard clinical evaluation, non-invasive testing including post-exercise ankle-brachial index (ABIs) and arterial duplex US, and angiography with and without evocative maneuvers prior to surgery. IDUS was performed by a staff vascular surgeon and vascular US technician. B-mode was used to assess artery wall thickness and sclerotic changes, and Doppler ultrasound was used to calculate velocities and velocity changes across areas of possible stenosis. Reversed greater saphenous vein (rGSV) was used as conduit for an interposition bypass if an injured arterial segment was discovered. IDUS was performed after completion of the bypass.

**Results:** Three patients underwent interposition bypass with rGSV following objective demonstration of significantly injured popliteal artery. Average peak systolic velocity was 300.4cm/s prior to bypass in the injured segment. B-mode demonstrated an average wall thickness of 11mm in the area of repetitive trauma and normal popliteal artery wall measuring 0.7mm above and below the area of injury. After interposition bypass, average velocity across the bypass was reduced to 58.7cm/s.

**Conclusions:** IDUS demonstrated clear utility in the operative management and intra-operative decision making process for popliteal artery entrapment. IDUS provided objective measurements which resulted in the confirmation both appropriateness and length of venous bypass. Additional prospective studies are warranted.

# Full Program & Abstracts

1:14 pm - 1:22 pm

M5 (RF)

## **Modified Bell Bottom Technique For Hypogastric Artery Preservation**

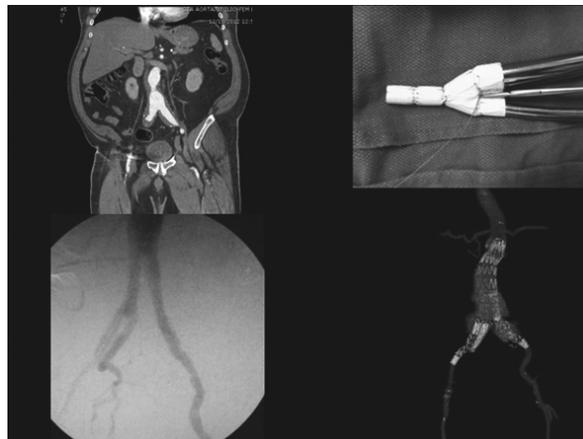
Magdiel Trinidad, Joseph Mills, Sr. - University of Arizona, Tucson, AZ

**Introduction and Objectives:** Intentional hypogastric coverage carries a risk of buttock claudication, sexual impotence, and other complications. This report aims to describe a technique to modify a flared limb to preserve hypogastric artery patency.

**Methods:** A 65-year-old man with severe COPD, hypertension, and obesity presented with rapidly expanding aorto-iliac artery aneurysms. His AAA measured 5.1 cm, the right common iliac 3.5 cm and the left common iliac 3.2 cm. The left hypogastric measured 2 cm. Anatomy was favorable for EVAR. A 24x56 Zenith limb was deployed on the back table, modified to have a flow divider and orientation markers, and resheathed. The left hypogastric artery was embolized with a 14 mm Amplatzer plug. Subsequently, a 36x95 Zenith stent graft was deployed through the left and the contralateral gate cannulated. Successively, the right hypogastric artery was cannulated through the left brachial approach. Next, the modified iliac limb was oriented and deployed partially. The hypogastric artery was selected again through the modified limb and a 11x10 mm Viabahn stent was deployed. Subsequently, a 13x90 ipsilateral limb extension was deployed. Both stent grafts were molded with simultaneous balloon inflations. Finally, the contralateral side was completed with a 13x71 mm limb.

**Results:** The patient tolerated the procedure well and was discharged on postoperative day 4. At his 3-month follow up visit he denied symptoms of buttock claudication. CT angiography demonstrated a widely patent hypogastric branch without evidence of endoleak.

**Conclusion:** A modified bell-bottom iliac limb is another way to preserve hypogastric flow in patients with common iliac aneurysms. This technique reduces costs in contrast to previously described techniques utilizing two main bodies.



# Full Program & Abstracts

1:22 pm - 1:45 pm

Coffee Break

## SVMS SCIENTIFIC SESSION II

Moderator: Zachary Arthurs, MD

1:45 pm - 1:53 pm

M6 (RF)

### **Implications of the Cardio-Respiratory Cycle On Renal Stent Failure In A Patient With Recurrent Hypertension Following Renal Artery Stenting**

Lin C. Wang\*, Daniel J. Scott, Sean J. Hislop, Zachary M. Arthurs - San Antonio Military Medical Center, Fort Sam Houston, TX

**Introduction & Objectives:** Endovascular techniques used in the management of renal artery stenosis (RAS) have unique complications. Described here is a unique complication seen in 56 year-old African American female with fibromuscular dysplasia who underwent bilateral renal artery stenting for refractory hypertension in the setting of RAS.

**Methods:** The patient underwent transfemoral bilateral renal artery stenting with 5mm x 16mm Atrium iCAST covered stents (Hudson, NH). Post-operatively, her blood pressures were watched closely, and renal arteries monitored with duplex ultrasound (RDUS).

**Results:** Immediately following stenting, there was appropriate improvement in renal artery velocities on RDUS associated with improved blood pressure control. However, despite her initial post-stent success, approximately 6 months after, the patient developed another episode of hypertensive urgency. On digital subtraction angiographic imaging, although the stents remained patent, just distal to the stents, there was kinking of the arteries without evidence of vessel dissection, stent fracture or migration. Arteriographic and intravascular ultrasound images of an acute turn within the segment of the arteries distal to the stent correlated well with RDUS findings indicating stenosis by velocity criteria. Furthermore, with each aortic pulsation and respiratory cycle, the angle of the kink became more acute, accentuating the degree of functional stenosis.

**Conclusions:** This case represents the first documented incidence of failure due to positioning of stents as related to dynamic motion of the aorta and renal arteries during the cardio-respiratory cycle. Further studies on dynamic motion with CT or MR contrasted imaging are needed to better understand the geometric implications the cardiac cycle has on endografts and stents, and on distal arterial complications and their effects on long-term vessel patency.

## Full Program & Abstracts



## Full Program & Abstracts

1:53 pm - 2:01 pm

M7 (RF)

### **Combined Arteriovenous Thrombolysis For the Treatment of Refractory Renal Vein Thrombosis**

Thomas A. Heafner\*, Daniel Scott, J. Devin Watson, Brandon Propper, Chatt Johnson, Zachary M. Arthurs - San Antonio Military Medical Center, Ft. Sam Houston, TX

**Introduction:** Acute renal vein thrombosis can rapidly lead to significant impairment and eventual loss of renal function. Classically presenting with flank pain, hematuria and acute kidney injury, therapeutic anticoagulation is the mainstay of treatment. Recently, multiple catheter-directed techniques have emerged as safe and effective means of quickly restoring luminal patency, but the optimal method has yet to be determined.

**Methods:** We present a case report on acute renal vein thrombosis refractory to venous thrombolysis and mechanical thrombectomy in a young female for renal salvage. After an unsuccessful venous approach, thirteen hours of dual arteriovenous thrombolysis with TPA was performed. Completion angiogram and venogram the following day showed filling of the left kidney with brisk outflow through the left renal vein on delayed images and prompt egress of contrast exclusively via the renal vein into the IVC, respectively.

**Results:** A combined arterial and venous approach successful recanalized the renal vein within 24hrs, preserved normal kidney function and provided complete resolution of clinical symptoms (e.g. flank pain). This technique also allowed a low-dose infusion of TPA to be used reducing systemic side effects.

**Conclusions:** Presented here is a case report of acute renal vein thrombosis refractory to venous mechanochemical thrombolysis and venoplasty with need for subsequent institution of combined arteriovenous thrombolysis; a proposed next step in the treatment algorithm.

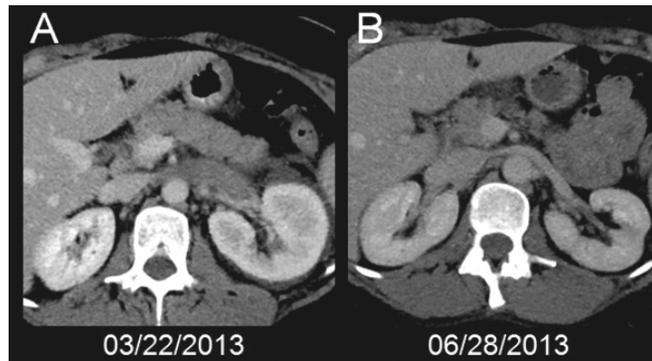


Figure 1: Axial imaging demonstrating acute renal vein thrombosis of the left vein. In 1A, the left renal vein is dilated, does not enhance and there is fat stranding around the edges of the vein. In addition, the left kidney is engorged, the cortex is thinned and there is a capsule fat stranding. Compared to the right kidney, it measured 1.5 times larger and the Hounsfield units were lower compared to the right. In 1B, the left renal vein is normal caliber and now enhances appropriately. The kidney has also returned to normal size. The size is now symmetric with the right at 10.Scm.

## Full Program & Abstracts

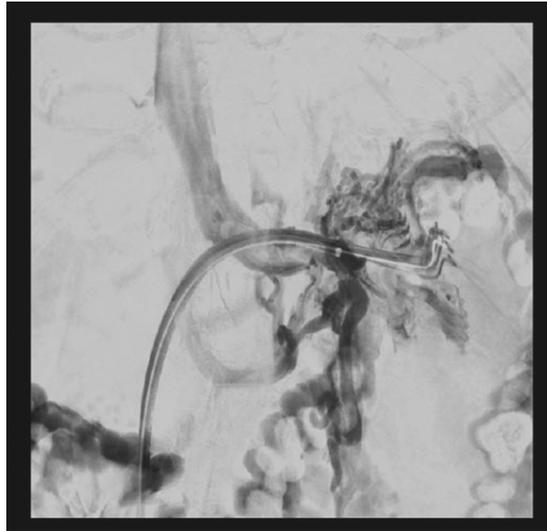


Figure 2: The catheter tip is across the renal vein thrombus. Flow is preferentially through the thrombus burden and via small pelvic collaterals.

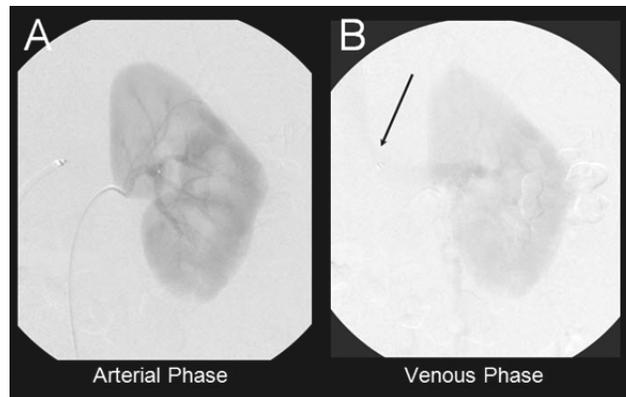


Figure 3: Completion angiogram following thrombolytic therapy. 3A. With arterial injection, there was complete enhancement symmetrically throughout the entire left kidney. 3B. On delayed imaging, the contrast emptied preferentially through the renal vein. The black arrow marks the border of the inferior vena cava.

## Full Program & Abstracts

2:01 pm - 2:13 pm

M8

### **A Diagnostic Evolution: Surgical Experience With Popliteal Artery Entrapment Syndrome At A Military Tertiary Referral Center**

Michael S. Clemens\*, Daniel J. Scott\*, J. Devin B. Watson\*, Sean J. Hislop, Zachary M. Arthurs - San Antonio Military Medical Center, San Antonio, TX

**Introduction & Objectives:** Popliteal Artery Entrapment Syndrome (PAES) is an increasingly encountered disorder that typically presents as claudication in young and active individuals. However, despite the increased recognition, accurate pre-operative diagnosis can be difficult. The objective of this study is to describe the surgical assessment and outcomes of patients treated for PAES.

**Methods:** Retrospective case series of all patients managed surgically for a diagnosis of PAES at the San Antonio Military Medical Center from 2005-2013.

**Results:** Over eight years, PAES was surgically treated in 25 consecutive limbs of 15 patients (mean age 35, range 21-49) in a military tertiary medical center. Type III was the most common variant (n=13, 52%), followed by type VI (n=7, 28%). Most patients presented with class I or II ischemia (88%), with anterolateral symptoms (56%), and were referred by orthopedics (66%). Diagnostic workup included stress ankle-brachial indices, MRI and provocative angiography. Sixty-three percent of limbs with negative MRI demonstrated findings consistent with either type III or V PAES. Tendon release was used in those with types III and V whereas liberal myectomy was employed in those with types I, II or VI. Two patients required revascularization. At a median follow-up of 126 days (range 25 days to 7 years), 83% of patients with type III demonstrated partial resolution of symptoms. Only twenty-seven percent of patients without an identifiable muscle slip had clinical improvement.

**Conclusions:** Despite modern imaging, open surgical exploration is the gold standard diagnostic modality for popliteal artery entrapment syndrome. Patients with a muscular or tendinous slip identified intra-operatively have the best clinical outcomes. Those with no identifiable muscle slip (functional entrapment) are less likely to demonstrate clinical improvement. Further evaluation on outcomes in the management in PAES is warranted.

## Full Program & Abstracts

2:13 pm - 2:25 pm

M9

### **Use of Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) Following Severe Blunt Hepatic Injury**

Daniel J. Scott\*, Thomas A. Heafner\*, Kira Long\*, Brandon W. Propper, Zachary M. Arthurs - San Antonio Military Medical Center, Ft. Sam Houston, TX

**Introduction & Objectives:** Descriptions and use of endovascular balloon occlusion of the thoracic aorta has re-emerged as an alternative means of obtaining proximal vascular control in the setting of hemorrhagic shock. Despite the theoretical advantages of an endovascular technique over thoracotomy and aortic cross-clamping, this technique has not become widely adopted. Several theoretical barriers have been implicated to include: increased time to insertion, technical complexity or unfamiliarity of balloon management, and doubt of its utility in the setting of blunt or solid organ injuries. Described is a case report of the successful deployment of a resuscitative endovascular balloon in the setting of hemorrhagic shock secondary to a grade IV blunt liver injury.

**Methods:** Retrospective Case Study

**Results:** An 86 year old male presented following a crush injury resulting in a grade IV liver laceration. Upon transfer to a tertiary trauma center, the patient developed hemodynamic instability requiring emergent laparotomy and packing. Persistent bleeding and hemorrhagic shock required return to the operating suite where an endovascular Cook Coda balloon (Cook Medical, Bloomington, IN) was deployed via percutaneous femoral access. Immediate return of perfusing pressure and hemodynamic stability allowed for endovascular intervention from the contralateral limb. Due to concern for ongoing hemorrhage despite multiple attempts at endoluminal hemorrhage control, the intravascular balloon also allowed for augmentable proximal hemorrhagic control during repeat laparotomy.

**Conclusions:** Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) is a procedure that offers many benefits over open aortic cross-clamping in the setting of severe hemorrhagic shock. It is rapidly deployable, conceptually and technically straightforward, allows for simultaneous distal endovascular interventions, and permits dynamic augmentation of blood pressure during laparotomy for definitive injury management. Further investigation into other injury patterns should be considered.

# Full Program & Abstracts

2:25 pm - 2:37 pm

M10

## Technical and Early Outcomes Using Ultrasound Guided Reentry For Chronic Total Occlusions

Aaron C. Baker<sup>1</sup>, Misty D. Humphries<sup>1</sup>, Robert E. Noll<sup>2</sup>, Navjeet Salhan<sup>\*1</sup>, Timothy K. Williams<sup>2</sup>, W. Darrin Clouse<sup>2</sup> - <sup>1</sup>University of California Davis Medical Center, Sacramento, CA; <sup>2</sup>David Grant Medical Center, Travis Air Force Base, CA

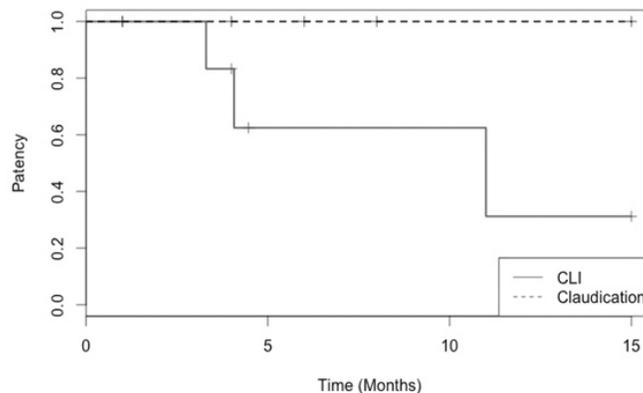
**Introduction:** Subintimal angioplasty has emerged as a common treatment for chronic total occlusions (CTO) in the iliac and infra-inguinal arteries. While technical success has been described using intravascular ultrasound guided reentry devices (IVUS-RED), outcomes are still not well defined. This report describes technical aspects and longitudinal follow-up after intravascular ultrasound guided reentry in CTO.

**Methods:** A retrospective review of 20 patients with lower extremity CTO treated with IVUS-RED from 2011 to 2013 was performed. Procedural success, patency estimates, ankle-brachial indices (ABI), complications and limb salvage were analyzed.

**Results:** Twenty patients (mean age 69±13), including 11 men and 9 women, underwent attempted IVUS-RED guided recanalization. Mean follow up was 7.4±8 months. Eleven patients presented with critical limb ischemia (CLI) and 9 patients with claudication. Technical success was achieved in 18 (90%) patients. Ten common iliac arteries (CIA), 3 external iliac arteries (EIA) and 5 superficial femoral arteries (SFA) were treated. No intraoperative complications resulted from device use. Post procedure ABIs significantly increased (0.47 to 0.9; p<0.01) in 17 patients with follow up. Primary patency for the entire cohort was 62% at 12 months (Figure1). No patient treated for claudication required reintervention, while 3 (27%) of those treated for CLI required repeat interventions. During follow-up, two patients died unrelated to the procedure, one patient required an amputation and one patient eventually required open revascularization.

**Conclusion:** Recanalization of CTO utilizing IVUS-RED is safe and effective. Early follow up demonstrates acceptable patency, especially in patients with claudication, and freedom from reintervention. Further investigation of IVUS-RED procedural benefits appears justified.

Figure 1: Primary Patency



## Full Program & Abstracts

2:37 pm - 2:45 pm

M11 (RF)

### **A Technique For Endograft Relining of A Type IV Endoleak Using A Surgeon-Modified Internal Gate**

Michael S. Clemens\*, Daniel J. Scott\*, Mamie C. Stull\*, Sean J. Hislop, Brandon W. Propper, Zachary M. Arthurs - San Antonio Military Medical Center, San Antonio, TX

**Introduction & Objectives:** Type IV endoleaks represent a rare etiology of late endograft failure; however, depending on the location, they can be extremely challenging to repair with endovascular solutions.

**Methods:** We present a case report of a Type IV endoleak at the flow divider of an Original Gore Excluder (WL Gore & Assoc. Inc., Flagstaff, AZ) with a short distance to the lowest renal artery. A Cook Zenith TFFB endoprosthesis (Cook Medical, Bloomington, IN) was modified in the operating room to foreshorten the main body and invaginate the contralateral gate internally. A gooseneck snare was sewn to the lateral edge of the contralateral gate as a back-up access via a brachial approach. This technique allowed for complete exclusion of the prior endograft while preserving bilateral antegrade flow and avoiding the placement of suprarenal struts.

**Results:** Endovascular relining with a surgeon-modified internal gate preserved antegrade limb perfusion, avoided extra-anatomic reconstructions, and ensured complete endograft exclusion through one year follow-up.

**Conclusions:** Early endoprosthetics have an increasing potential to present with late complications. These patients may benefit from novel endovascular techniques which avoid the morbidity of open surgical repair.

## Full Program & Abstracts

2:45 pm - 2:53 pm

M12 (RF)

**Case Report - Compression of the Distal Axillary Vein  
Secondary To An Abnormal Muscular Band**

Charles A. Andersen - Madigan Army Medical Center,  
Milton, WA

**Introduction:** Although axillary vein compression from Thoracic Outlet Syndrome is a well-accepted syndrome we present a case of axillary vein compression distal to the thoracic outlet

**Methods:** Patient presented with left upper extremity swelling, prominent upper extremity veins and prominent collaterals veins over the chest wall and deltoid region. An upper extremity venous duplex scan demonstrated axillary vein obstruction. The patient was started imperially on anticoagulation and scheduled for venography for possible lytic therapy vs. recanalization with venoplasty. Venography demonstrated a patent axillary subclavian venous system. Arteriography was performed to r/o and AV malformation. The arteriogram was normal. Further evaluation demonstrated the vein was patent when the upper extremity was in the neutral or an elevated position. When the arm was in the dependent position the axillary vein was obstructed. MRA demonstrated compression of the veins with an abnormal muscular band. Exploration of the vein demonstrated an accessory muscular slip compressing the vein. The muscular slip was resected with resulting decreased edema and collaterals veins.

**Conclusion:** This case represents a new type of venous compression with compression of the axillary vein in the dependent position in contrast to venous compression with arm elevation as seen in venous thoracic outlet syndrome.

## Full Program & Abstracts

2:53 pm - 3:01 pm

M13 (RF)

### **Congenital Renal Arteriovenous Fistula Diagnosed By Time-Resolved Contrast-Enhanced Magnetic Resonance Angiography: A Case Study**

Leo J. Daab\*<sup>1</sup>, Steven Satterly\*<sup>1</sup>, Jerry Michel\*<sup>1</sup>, Niten Singh<sup>2</sup> - <sup>1</sup>Madigan Army Medical Center, Tacoma, WA; <sup>2</sup>University of Washington, Seattle, WA

**Introduction:** Congenital renal arteriovenous malformations (AVMs) are extremely rare with an incidence of 0.04%. Some studies report a single congenital AVM in over 30,000 autopsies. Furthermore, congenital arteriovenous fistulas (AVFs) of the kidney are less common and difficult to diagnose without an angiogram. We present the case of a congenital renal arteriovenous fistula diagnosed with time-resolved contrast-enhanced magnetic resonance angiogram and review the current literature on this modality.

**Methods:** An Ovid and PubMed Search for "renal arteriovenous malformation," "renal arteriovenous fistula," and "magnetic resonance," was performed. A systematic review was then done of the references returned from this search. These references are presented in the context of a case report.

**Results:** A 29 year old female with an incidentally found right renal artery abnormality underwent arterial duplex concerning for a 2 cm renal artery aneurysm. Multiplanar MR sequences of the abdomen and pelvis were obtained using T1, T2, time-of-flight and time-resolved contrast-enhanced T1 post gadolinium sequences with attention to the abdominal vasculature. Findings were consistent with an AVM versus an AVF. An arteriogram then confirmed normal aortic anatomy and renal artery anatomy. Selective angiography of a suspicious inferior pole artery confirmed the finding of an AVF. The feeding vessel was successfully coil embolized. Completion arteriogram revealed no evidence of aberrant renal bloodflow. The patient experienced minimal pain postoperatively. Follow up renal ultrasound postoperatively and at one month revealed no recurrence of aberrant flow.

**Conclusion:** Congenital arteriovenous fistulae of the kidney are rare and typically diagnosed following angiography. Time-resolved contrast-enhanced magnetic resonance angiogram may prove invaluable for preoperative diagnosis and treatment planning for arteriovenous malformations. Increasing use of such modalities will benefit the patient by decreasing exposure to radiation and iodinated contrast agents.

# Full Program & Abstracts

3:01 pm - 3:09 pm

M14 (RF)

**Experience With Negative Pressure Incisional Management For the Prevention of Incisional Complications In Vascular Surgery Procedures**

Charles A. Andersen - Madigan Army Medical Center, Milton, WA

**Introduction:** Although the incidence of surgical site complications in Vascular Surgical procedures is low the consequences can be major including sepsis, hemorrhage, graft thrombosis, limb loss and death.

**Methods:** We present early experience utilizing Negative Pressure Therapy over closed surgical incisions in a wide range of vascular procedures including Redo groin explorations, Femoral popliteal bypass, Thoracic outlet decompression, Complex venous reconstruction and primary and revision major amputations.

**Results:** Since initiating this therapy we have not experienced any incisional complications.

**Conclusions:** Preliminary results suggest that surgical site complications associated with vascular procedures can be decrease utilizing Negative Pressure over closed Incisions. We will present the science behind incisional therapy and technical tips for utilization of this type on incisional management.

3:09 pm - 3:30 pm

Discussion/Adjournment

**3:30 pm - 6:30 pm**

**PVSS TECHNOLOGY FORUM**

**Endovascular Aortic Aneurysm Repair: State-of-the-Art From Imaging To Deployment**

Moderator: Ravi Veeraswamy, MD

Specifically designed for trainees (but open to all registrants), this intensive, hands-on experience will demonstrate how the field of endovascular aneurysm repair has advanced over the past few years and what constitutes as "state-of-the-art."

**6:30 pm – 8:00 pm**

**WELCOME RECEPTION**

All registered attendees, guests & exhibitors are welcome.

# Full Program & Abstracts

## Friday, January 31, 2014

6:00 am – 7:00 am	Continental Breakfast
6:00 am – 9:30 am	Registration
<b>7:00 am – 9:15 am</b>	<b>SCIENTIFIC SESSION I</b> Moderators: Jean Bismuth, MD & Katherine Gallagher, MD
7:00 am – 7:12 am	1 <b>Has Conventional Surgery For Short Saphenous Vein Insufficiency Met Its Match? A Two Year Follow-Up of A Randomised Control Trial Comparing Surgery With Endovenous Laser Ablation For Treatment of Small Saphenous Vein Insufficiency</b> Sandip Nandhra, Joseph El-sheikha*, Nehemiah Samuel, Tom Wallace, Daniel Carradice, Ian Chetter - Hull-York Medical School, Hull, United Kingdom

**Introduction:** Early results comparing endovenous laser ablation (EVLA) with surgery for the treatment of small saphenous vein (SSV) insufficiency revealed a faster recovery, lower peri-procedural pain and fewer sensory complications in those treated by EVLA. A two-year RCT follow-up aims to affirm whether EVLA is as effective as surgery for the management of SSV insufficiency in the medium-term.

**Methods:** Patients with primary sapheno-popliteal junction (SPJ) incompetence and/or SSV reflux were randomised to either EVLA or Surgery (SPJ ligation and stripping/excision of the SSV).

Follow-up at 1, 6, 12, 52 and 104 weeks assessed clinical recurrence, post-procedural complications and disease specific quality of life (QoL) (Aberdeen Varicose Veins Questionnaire, AVVQ).

**Results:** 106 patients were equally randomised and 88 patients (83%) were assessed at two years with equal losses (n=9) to follow-up in each group. At 2-years the surgery group consisted of 32 women and 12 men with a median (IQR) age of 48 years (37-57) and the EVLA group consisted of 20 women and 24 men with a median age of 45 (39-55) years.

**Recurrence:** There was no significant difference in clinical recurrence (surgery = 10/44 (23%) and EVLA = 7/44 (16%), p=0.74) or SSV incompetence on Duplex (surgery 7/44 (16%) and EVLA 2/44 (5%), P=0.157) between the 2 groups.

**Complications:** The early significant difference in sensory disturbance, became non-significant at 2 years (surgery = 3/44 and EVLA = 1/44, P=1.000).

**QoL:** No significant difference in median (IQR) AVVQ-scores (surgery 2.75 (0-7.25) and EVLA 3.53 (0-9.22), p=0.412) were apparent between the two groups at 2 years.

**Conclusion:** Two-year follow-up demonstrates that EVLA for SSV insufficiency offers highly efficacious mid-term benefits equivalent to surgery and given its early post-operative superiority, should be considered first-line treatment.

# Full Program & Abstracts

7:12 am – 7:24 am

2

## **Early Readmissions After Open AAA Repair Are Correlated With Increased Post-Discharge Mortality: A Retrospective Cohort Study of the National Medicare Population**

Andrew A. Gonzalez, Nicholas H. Osborne\*, Jonathan L. Eliason, Amir A. Ghaferi\* - University of Michigan, Ann Arbor, MI

**Introduction & Objectives:** Readmissions are common, costly, and increasingly targeted by quality improvement initiatives. For example, Medicare's has penalized 2,200 hospitals \$500 million since October 2012. Yet, critics contend that 30-day all-cause readmission is too coarse a measure to capture true quality differences. We examined the extent to which traditional measures of surgical quality (mortality and complications), varied by the interval between discharge and readmission.

**Methods:** This retrospective observational cohort study includes 98,655 Medicare beneficiaries who underwent open abdominal aortic aneurysm repair (OAR) from 2005-2009. We excluded patients suffering inpatient mortality. Readmitted patients were divided into cohorts based upon readmission interval (RI); <5 days post-discharge (n=2,118), 6-10 days (n=1,510), 11-15 days (n=1,156), 16-20 days (n=n = 833), and 21-30 days (n=1,301). We used logistic regression to account for patient demographics, comorbidities, discharge destination, and length-of-stay. Our primary analysis compared major complication and risk-adjusted mortality rates across cohorts.

**Results:** The post-discharge 30-day mortality rate was 1.4% in "non-readmitted" patients, which was similar to mortality in patients readmitted after 16-days. Mortality was highest for RIs <5 days, with a stepwise decline as RIs increased. For example, 30-day mortality in patients with RIs <5 days, 6-10 days, 11-15 days, 16-20 days, and 21-30 days was 4.7%, 3.5%, 2.8%, 1.2%, and 0.1% respectively. We observed similar decreases for 60-and 90-day mortality as RIs increased from <5 days to 21-30 days (ranges 9.8%-3.8%; and 12.0%-6.4% respectively). Major complications rates were very similar across RIs (range 36%-38%). P-values for between-group comparisons were <0.001 for all outcomes.

**Conclusions:** After OAR, patients readmitted within 15 days post-discharge had significantly higher mortality at 30, 60, and 90 days compared to those readmitted after 16 days. However, rates of major complications were similar across readmission intervals. Our findings suggest that Medicare should consider weighting readmission rates by readmission interval.

# Full Program & Abstracts

7:24 am – 7:36 am

3

## Anatomic Suitability of Aortoiliac Aneurysms for Next Generation Iliac Branched Systems

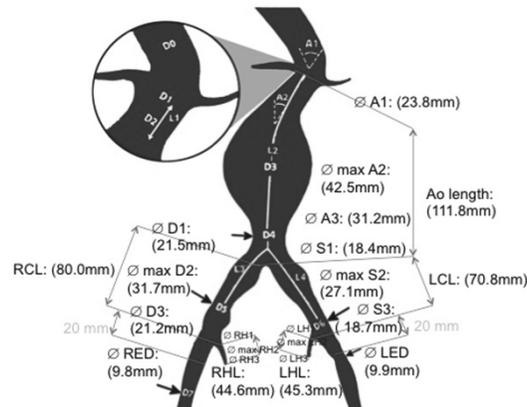
Vinit N. Varu<sup>\*1</sup>, Benjamin Pearce<sup>2</sup>, Roan Glocker<sup>\*2</sup>, Zdeneck Novak<sup>\*2</sup>, William D. Jordan<sup>2</sup>, Jason T. Lee<sup>1</sup> - <sup>1</sup>Stanford University, Stanford, CA ; <sup>2</sup>University of Alabama, Birmingham, AL

**Introduction & Objectives:** Preservation of internal iliac flow is an important consideration to prevent ischemic complications during EVAR. We sought to determine the suitability of aortoiliac aneurysms for off-the-shelf iliac branched systems currently in clinical trial.

**Methods:** Patients undergoing AAA repair from 2000-2013 at two institutions were reviewed. Centerline measurements of aortoiliac morphology were obtained using 3-D workstations and compared to inclusion/exclusion criteria for Cook and Gore iliac branch devices.

**Results:** Of the nearly 2400 aneurysm repairs performed during the study period, 109 patients had common iliac aneurysms suitable for imaging review. Mean measurements for the cohort are shown (FIGURE). 20/109 (18%) and 26/109 (24%) fit the inclusion criteria and thus able to be treated using the Cook and Gore iliac branch devices, respectively. The most common reason for exclusion from Cook was internal iliac diameter below 6 or above 9mm (72/109, 66%), followed by aneurysm distal to landing zone (21%) and external iliac artery diameter <7mm (18/109, 16%). The most common reason for exclusion from Gore was proximal common iliac diameter <17mm (42/109, 38%), followed by internal iliac diameter below 6.6mm or above 13.5mm (41/109, 38%) and aorto-hypogastric length <165mm (26/109, 24%).

**Conclusion:** Approximately 18-24% of aneurysm repairs involving common iliac arteries would have been candidates for the two iliac branch devices currently in trial. The major reason for exclusion is the internal iliac landing zone for both devices, as well as small external iliac diameters for Cook and adequate proximal common iliac diameters for Gore. Design modifications for future generation iliac branch technology should focus on diameter accommodations for the hypogastric branch stent and proximal and distal sizes of the iliac branch components.



# Full Program & Abstracts

7:36 am – 7:48 am

4

## Safety and Effectiveness of Endovascular Therapy For Claudication In Octogenarians

Douglas W. Jones\*, Peter H. Connolly, Harry L. Bush, Darren B. Schneider, Andrew J. Meltzer - New York Presbyterian Hospital - Weill-Cornell Medical Center, New York, NY

**Introduction & Objectives:** Advanced age is associated with adverse outcomes after endovascular therapy (ET) for critical limb ischemia (CLI). As a result, in the Society for Vascular Surgery's Objective Performance Goals for CLI, age>80 is characteristic of "clinical high risk". Here, we assess the effects of advanced age on outcomes after ET for lifestyle-limiting intermittent claudication (IC).

**Methods:** Retrospective review of a prospectively maintained institutional database (2007-2012) identified all patients undergoing primary ET for IC. Demographics, procedural details and outcomes were assessed via univariate analysis and Cox regression. Endpoints included measures of safety and effectiveness, including: overall survival; freedom from major adverse limb event or post-operative death (MALE+POD); and freedom from reintervention, amputation or restenosis (RAS).

**Results:** 236 patients underwent primary ET for 295 affected limbs. 47 interventions (16%) were performed in patients  $\geq 80$  years old. Average age of octogenarians treated was  $84.5 \pm 3.6$ , compared to  $65.6 \pm 8.7$  among those aged  $< 80$  ( $p < 0.001$ ). Compared to younger claudicants, octogenarians were more likely to have no smoking history (40% vs. 16%,  $p < 0.001$ ) and more likely to undergo interventions involving the popliteal artery (49% vs. 31%,  $p = 0.018$ ). There were no other significant differences in demographics, comorbidities, TASC II classification, treated arterial segment, or procedural characteristics. 30-day freedom from MALE+POD was 100% for octogenarians. Throughout long-term follow-up, there were no differences in overall survival, freedom from MALE+POD, and freedom from RAS (Table).

**Conclusions:** Although age>80 years has been identified as an independent risk factor for poor outcomes in treatment of CLI, our results suggest that ET for selected octogenarians with lifestyle limiting claudication is as safe and effective as therapy in younger patients. Advanced age alone should not prohibit consideration of ET for patients with IC.

	Overall Survival*		MALE+POD*		RAS*	
	1 yr	3 yr	1 yr	3 yr	1 yr	3 yr
Age < 80	96.3 $\pm$ 1.4	80.1 $\pm$ 3.6	97.9 $\pm$ 1.1	95.2 $\pm$ 2.2	72 $\pm$ 3.4	47.9 $\pm$ 4.5
Age $\geq$ 80	93.5 $\pm$ 3.2	88.6 $\pm$ 6.4	97.4 $\pm$ 2.1	97.4 $\pm$ 2.1	74.2 $\pm$ 7.5	60.9 $\pm$ 9.3
p-value**	0.865		0.577		0.873	

\*Kaplan-Meier estimates, reported as freedom from event (%) $\pm$ S.E.

\*\*log-rank test

# Full Program & Abstracts

7:48 am – 7:56 am

5 (RF)

## Increased Prevalence of Pre-Eclampsia Among Women With Renal Artery Fibromuscular Dysplasia: Evidence of A Common Etiology?

Chardonnay J. Vance\*, Matthew S. Edwards\*, Timothy E. Craven\*, Robert N. Taylor\*, Matthew A. Corriere - Wake Forest University School of Medicine, Winston Salem, NC

**Introduction & Objectives:** Renal artery fibromuscular dysplasia (RA-FMD) has a higher prevalence among women and a presumed hormonal etiology. Although pre-eclampsia (Pre-E) has a clinical presentation similar to symptomatic RA-FMD and occurs exclusively in women, associations between these two diseases have not been characterized. To explore epidemiologic associations between RA-FMD and Pre-E, we administered a validated screening instrument for Pre-E to a cohort of women treated with procedural intervention for symptomatic RA-FMD.

**Methods:** Women treated with RA-FMD treated with endovascular and/or surgical interventions from 2000-2012 at a single center were identified and administered a validated survey instrument. This instrument has an 80% sensitivity for remote Pre-E. Clinical, anatomic, and procedural data were collected from medical records and archived images. Associations between renal artery FMD and Pre-E were evaluated using t-tests for continuous variables, and contingency tables/Fisher's exact test for dichotomous variables.

**Results:** A total of 53 women underwent procedural intervention for renal artery FMD during the study period; among these, 31 (58%) were contacted and completed the survey instrument. 27/31 participants (87%) reported a prior pregnancy, and 14/27 participants with prior pregnancy (52%) had experienced Pre-E. Among women with a history of pregnancy, those with Pre-E underwent intervention at a younger age ( $44 \pm 10$  vs.  $59 \pm 15$  years;  $P=0.004$ ) and were also younger at the time of survey completion ( $51 \pm 11$  vs.  $66 \pm 16$  years;  $P=0.007$ ).

**Conclusions:** Women with a history of procedural intervention for symptomatic RA-FMD had significant prevalence of Pre-E which greatly exceeded that expected among women in the general population. These results suggest an association between Pre-E and FMD, and further investigation is needed to characterize the etiology and mechanistic relationship.

Participant characteristics

	Total	Pregnancy without Pre-E	Pregnancy With Pre-E	P
Participants	27	13	14	
Race				
White	78%	92%	64%	0.16
Black	8%	8%	21%	0.60
Other	4%	0%	14%	--
Smoking History	33%	46%	29%	0.44
Open Surgical Intervention	59%	54%	64%	--
Current age	$54 \pm 17$	$66 \pm 16$	$51 \pm 11$	0.007
Age at time of renal artery intervention	$48 \pm 16$	$59 \pm 15$	$44 \pm 10$	0.004

## Full Program & Abstracts

7:56 am – 8:04 am

6 (RF)

### **Ferumoxytol Enhanced MR Angiography Is A Useful Tool In the Clinical Evaluation of Lower Extremity Arterial Disease**

Joy Walker\*, Emily Nosova\*, Joseph Rapp\*, Marlene Grenon, Christopher Owens\*, Warren Gasper\*, David Saloner\* - University of California San Francisco, San Francisco, CA

**Introduction & Objectives:** Renal toxicity from conventional iodinated or gadolinium-based intravenous contrast agents is a common complication in patients with peripheral artery disease (PAD). Ferumoxytol-enhanced magnetic resonance angiography (Fe-MRA) is a novel technique that uses an intravenous ultrasmall superparamagnetic iron oxide preparation, currently FDA approved for the treatment of iron deficiency anemia in adults with chronic kidney disease (CKD). Our objective was to determine the feasibility of Fe-MRA for clinical decision making in PAD patients.

**Methods:** Ten patients with suspected arterial occlusive disease were assessed with contrast-enhanced MRA of the aorta and lower extremities. Five patients with renal insufficiency underwent Fe-MRA and these images were compared to those from five consecutive patients undergoing gadolinium-enhanced MRA. Qualitative and quantitative evaluations of de-identified images at each arterial station were independently performed by 4 blinded vascular surgeons.

**Results:** All patients were male, with an average age of 67.9 ±4.3. The two groups had similar incidences of diabetes, hypertension, hyperlipidemia, and coronary artery disease. Patients undergoing Fe-MRA had significantly decreased renal function (eGFR 35.4 vs. 77.6; p=0.02). There were no adverse events during contrast administration in either group. No difference was found in the overall quality of the ferumoxytol versus the gadolinium studies (7.1±2.0 vs 7.4±2.4, p=0.67). Similarly, reviewers felt comfortable basing clinical decisions on the images 89% of the time with both the ferumoxytol and gadolinium groups (p=1.00). Inter-observer agreement of stenosis at the tibial station was better for Fe-MRA versus gadolinium (Kappa 0.73 versus 0.22).

**Conclusions:** This is the first report of an exciting, novel alternative to conventional CTA and MRA in PAD patients. Fe-MRA provides excellent imaging quality in patients with suspected lower extremity peripheral artery disease without the nephrotoxic risks of gadolinium.

## Full Program & Abstracts

8:04 am – 8:12 am

7 (CR)

### **Novel Use of the Gore Hybrid Vascular Graft During Redo Thoracoabdominal Aneurysm Repair In A Patient With Marfan's Syndrome**

Marvin D. Atkins, Jr., Landon Humphrey\*, Anthony Manning\*, Ruth L. Bush, William T. Bohannon - Scott & White Hospital & Clinic, Temple, TX

**Introduction & Objectives:** Patients with Marfan's Syndrome are prone to aneurysmal degeneration of visceral and intercostal islands created during previous thoracoabdominal aortic aneurysm repair. Redo surgery is associated with increased complexity, morbidity, and mortality compared to the index operation. We present the first reported use of the Gore Hybrid Vascular graft during redo thoracoabdominal aortic surgery in a patient with Marfan's Syndrome.

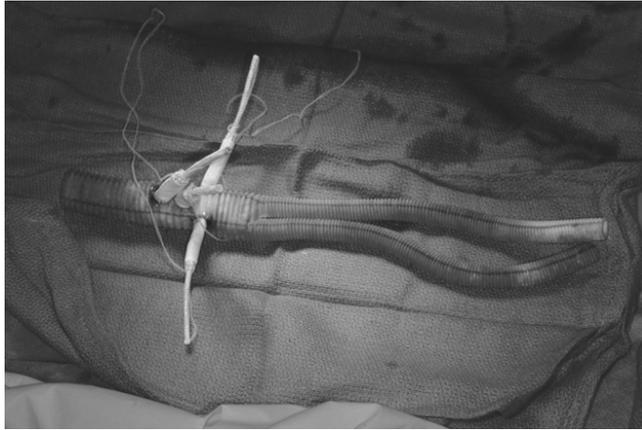
**Methods:** A 47 year old female with Marfan's Syndrome underwent Extent II Thoracoabdominal Aortic Aneurysm repair in 1998. She had a T8-T9 intercostal pair as well as the visceral segment reattached to the graft as an island. Follow up has shown pseudoaneurysmal degeneration of the visceral island at 4.5cm and a distal anastomotic pseudoaneurysm at 4.5 cm. Given the redo nature of her surgery and the need to minimize clamp times we created a hybrid endovascular/open graft on the back table prior to aortic clamping. (Figure 1). The visceral/renal hybrid anastomoses were created in under 90 seconds minimizing the most complex portion of the procedure. (Figure 2)

**Results:** The patient did well following surgery and was discharged home on POD #8. Follow up CT prior to discharge revealed patency of all four of the renovisceral hybrid stent grafts.

**Conclusions:** Use of the Gore Hybrid stent graft in this setting avoided dissection of the visceral/renal origins which were heavily scarred following the index operation. Long term follow up is needed to assess patency of the grafts as well as the use of stent grafts in patients with Marfan's Syndrome.



## Full Program & Abstracts



## Full Program & Abstracts

8:12 am – 8:24 am

8

### **Fistulas In Octogenarians: Are They Beneficial?**

Christopher G. Carsten, III, Jonathan Hudgins\*, Kevin T. Claudianos\*, Gail Keahey\*, David L. Cull - Greenville Hospital System, Greenville, SC

**Introduction & Objectives:** The incidence of End Stage Renal Disease is increasing most rapidly in patients greater than 75 years of age and their 5 year survival rates are the lowest of any dialysis cohort. Data are conflicting regarding the effects of age on fistula success. The purpose of this study was to evaluate the benefit of arteriovenous fistula construction in octogenarians.

**Methods:** A retrospective review of all arteriovenous (AV) fistulas placed between 11/01/2007 and 7/17/2013 in patients >80 years of age was performed using our hemodialysis database. Patient demographics, presence of catheters, time to first fistula use, fistula interventions, fistula patency and time to patient death were evaluated.

**Results:** Thirty-two fistulas were placed in thirty-one patients. Average patient age was 82.1 years, 74% were male and 71% African- American. Three patients never required dialysis and were excluded. One patient required 2 fistulas and the second fistula was excluded from analysis. Of the 28 patients with primary AV fistulas; 21 (75%) were utilized for hemodialysis. Seventeen of these patients (85%) required catheter-based dialysis prior to fistula use. Their mean length of catheter use was 157 days. Median time to first fistula use was 114 days. 52% required intervention to achieve or maintain patency. Median time to death was 565 days.

**Conclusions:** Successful fistula utilization can be achieved in an extremely elderly patient population with substantial effort. Patients require significant catheter utilization and over half of this group required secondary interventions to achieve or maintain fistula utilization. Given this group's limited survival and the fact that 27% of that survival time was spent dialyzing with a catheter, the benefit to the patient of a functioning fistula can be questioned.

## Full Program & Abstracts

8:24 am – 8:36 am

9

### **Predictors of Length of Stay After Carotid Endarterectomy in Patients With Asymptomatic Disease**

Linda J. Wang\*, Emel Ergul\*, Virendra I. Patel, Robert T. Lancaster\*, Mark F. Conrad - Massachusetts General Hospital, Boston, MA

**Introduction & Objectives:** Early hospital discharge (within 24 hours) after carotid endarterectomy (CEA) for asymptomatic carotid stenosis (ACAS) has been used as a surrogate for quality outcomes and appropriate resource utilization. The goal of this study was to identify factors that predict extended length of stay after CEA for asymptomatic disease.

**Methods:** All patients who underwent CEA for ACAS From 2010-2012 were identified in a prospective database. Length of stay was defined as short (<24hrs) and long (>24hrs). Multivariate models of demographic factors and complications were created as well as subgroup analysis of predictive factors.

**Results:** There were 308 patients who underwent CEA for ACAS. 141pts (46%) stayed >24hrs. Multivariate predictors of a long length of stay (LOS) were male gender (OR=2.0,p=0.01), history of hypertension(OR=2.7,p=0.01) and Post-operative hypertension(OR=4.8,p<0.001). Subgroup analysis of post-operative hypertension showed that diabetes (p=0.031), coronary artery disease (p=0.005) and CHF (p=0.02) were predictive while type of antihypertensive medication and intra-operative blood pressures were not.

**Conclusions:** Just over half of our ACAS population was discharged within 24 hours of CEA. Post-operative blood pressure lability is a major predictor of longer LOS.

# Full Program & Abstracts

8:36 am – 8:48 am

10

## **Utility of IVUS during Percutaneous Superficial Femoral Artery Interventions**

Elizabeth Hitchner\*<sup>1</sup>, Mohamed Zayed<sup>2</sup>, Vinit Varu<sup>2</sup>, Oliver Aalami<sup>2</sup>, Wei Zhou<sup>2</sup> - <sup>1</sup>Palo Alto Veterans Hospital, Palo Alto, CA; <sup>2</sup>Stanford University, Palo Alto, CA

**Objectives:** Endovascular interventions in the superficial femoral artery (SFA) have variable outcomes. Completion angiography is typically performed to confirm satisfactory outcomes following SFA angioplasty and/or stenting. However, it is unclear whether two-dimensional angiography accurately reflects the extent of residual stenosis. We sought to determine whether intravascular ultrasound (IVUS) can help with residual disease assessment and procedure outcome.

**Methods:** Patients with anticipated SFA disease were prospectively recruited to the study. Patients with primary SFA disease on diagnostic angiography were included. Following SFA endovascular intervention with angioplasty and/or stenting, a completion angiogram was performed to confirm satisfactory results before IVUS evaluation. IVUS-detected maximal residual stenosis, maximal residual lesion volume, and number of non-consecutive post-treatment SFA segments with >50% residual stenosis were evaluated. Peri-procedural ankle-brachial indexes (ABIs) and SF-36 surveys of walking impairment were also collected.

**Results:** 56 patients were included. 30 received angioplasty only, and 26 received angioplasty and stenting. All patients were male, mean age was 67 years, and major comorbidities included CAD (50%), active smoking (54%), hypertension (88%), and diabetes (66%). After achieving satisfactory angiographic results, 21 patients received additional interventions due to findings observed on IVUS evaluation. The angioplasty only cohort had more non-consecutive areas of >50% residual stenosis ( $p=0.004$ ), greater residual stenosis ( $p=0.04$ ), and smaller minimal lumens following treatment ( $p=0.01$ ) than the angioplasty and stenting cohort. Although there was no significant difference in ABI between the two groups, 68% of all patients demonstrated a >0.2 increase in post-intervention ABI. Change in ABI significantly correlated with post-intervention SF-36 survey scores ( $R=0.516$ ,  $p=0.002$ ).

**Conclusions:** IVUS evaluation provides more accurate intra-procedural insight on the extent of residual stenosis following SFA interventions. Long-term follow-up is warranted to determine whether IVUS-guided post-angioplasty stenting can impact long-term interventional outcome.

# Full Program & Abstracts

8:48 am – 9:00 am

11

## **A Single Center's Approach To the Non-Operative Management of Paget-Schroetter Syndrome**

Selena G. Goss\*, Sean Alcantara\*, John C. Lantis, II, George Todd - St. Luke's-Roosevelt Hospital Center, New York, NY

**Introduction & Objectives:** Effort thrombosis, known also as Paget-Schroetter Syndrome (PSS), is a relatively uncommon phenomenon. The preponderance of existing literature advocates for immediate thoracic outlet decompression (TOD) and clot lysis. The addition of venous stenting is associated with increased rates of re-thrombosis. However, as intrinsic injury to the vein is a hallmark of this condition and upper extremity post-phleblitic syndrome is very rare, we postulate that long term anticoagulation has equal outcomes to the more invasive, more costly surgical intervention. Reviewed here is our experience with non-operative management of a cohort of patients with PSS.

**Methods:** A retrospective review of charts between 1994 - 2011 was conducted in which twenty patients were identified as having been diagnosed with PSS. All patients were treated non-operatively.

**Results:** With a mean follow-up of 21 months (range: 1-117 months), 86% of patients were asymptomatic after being treated with oral anticoagulation alone. At least partial recanalization of vessels, with return of flow, was documented in 88% of patients. The mean length of oral anticoagulation therapy was 11 months (range: 2-54 months). All patients returned to pre-event activities, without invasive procedures.

**Conclusions:** The current published algorithm of immediate (rapid) TOD and lysis is associated with a 91% patency rate at one year and a 16% peri-procedural complication rate. The non-operative approach appears to offer very similar functional outcomes without complications and at much lower costs. Patients treated with TOD and lysis are generally treated with long term anticoagulation; this is no different from our cohort. Based upon equivalent functional results and noting that vein patency alone does not guarantee freedom from symptoms, we believe that most patients with PSS can be appropriately treated with non-surgical management and oral anticoagulation, while focusing primarily on the patient's functional status and utilizing repeat imaging to follow for resolution.

# Full Program & Abstracts

9:00 am – 9:12 am

12

## **Fast 5-Minute Dialysis Access Evaluation for Flow Maturation and Cannulation**

Dennis Bandyk<sup>1</sup>, Kelley Hodgkiss-Harlow<sup>2</sup>, John Lane, III<sup>1</sup> -  
<sup>1</sup>University of California - San Diego, La Jolla, CA; <sup>2</sup>Kaiser  
Permanente - San Diego, San Diego, CA

**Objective:** To describe an efficient duplex ultrasound technique to evaluate dialysis access for flow maturation and ease of cannulation prior to hemodialysis usage.

**Methods:** 108 patients with a new (n=78) or revised (n=30) upper extremity dialysis access were evaluated within 2-3 weeks of the procedure to assess maturation. Duplex testing of access conduit anatomy and flow was completed in <5 min (patient sitting in a chair and the arm resting on an exam table) and included:

- Inflow artery and access conduit imaging with velocity spectra recording,
- Suitability for cannulation was confirmed by conduit diameter >4 mm, depth beneath skin of <1 cm, and conduit length of >10 cm.
- Imaging for large side-branches precluding AVF maturation

Volume flow was estimated based on peak systolic velocity (PSV) in the inflow brachial artery or access conduit; PSV >150 cm/sec with diastolic/systolic ration > 0.3 predicts a volume flow (VF) >800 ml/min - a level predictive of successful dialysis

**Results:** In the majority (90 of 108) of patients, the vascular surgeon performed duplex testing confirmed a dialysis access with adequate volume flow and surgical site healing appropriate for needle cannulation. Autogenous accesses with VF>800 ml/min were released for hemodialysis at 10-12 weeks; and for new or revised bridge grafts at 2-3 weeks. The most common duplex abnormalities detected included vein segment sclerosis with low VF, perigraft hematoma, vein side-braches requiring ligation, and conduit depth > 1 cm. Duplex evaluation resulted in a decision for early dialysis access revision in 10 patients. All patients with "normal" duplex testing had subsequent successful hemodialysis.

**Conclusions:** A fast, 5-minute duplex evaluation of dialysis access procedures can predict successful hemodialysis usage based on estimation of VF and conduit imaging. The hands-on skills to perform and interpret this duplex ultrasound evaluation are easily acquired.

3:00 pm

Registration Re-Opens

3:30 pm – 4:00 pm

Coffee/Snacks – Visit Exhibits

# Full Program & Abstracts

4:00 pm – 5:30 pm

## SCIENTIFIC SESSION II

Moderators: James Black, MD & Luke Brewster, MD

4:00 pm – 4:12 pm

13

### **Long Term Survival and Cardiovascular Outcomes of Carotid Endarterectomy In Patients With Chronic Renal Insufficiency**

Efthimios Avgerinos\*, Catherine Go\*, Larry Fish\*, Michel Makaroun\*, Rabih Chaer - UPMC, Pittsburgh, PA

**Introduction & Objectives:** Patients with CRI have worse perioperative survival and CV outcomes post CEA. This study addresses the long term impact of CRI on CV events and survival following CEA.

**Methods:** A consecutive institutional cohort of CEAs (1/1/2000-12/31/2008) was analyzed. Estimated glomerular filtration rate (eGFR) was assessed at baseline and patients were divided into three CRI groups: I:normal (GFR>60 mL/min/1.73 m<sup>2</sup>), II:moderate (GFR 30-59), and III:severe (GFR<30). Endpoints were major coronary events (MI, CABG, PTCA), major cerebrovascular events (any stroke), and mortality. Survival analysis and Cox regression models were used to assess the effect of baseline predictors.

**Results:** 1342 CEAs (mean age 71.2±9.2 years; 55.6% male; 35.3% symptomatic) were performed, with a median clinical follow up of 55 months; 868 (65%) groupI, 414 (31%) groupII, and 60 (4%) groupIII (24 dialysis). Overall 30-day stroke and death rates were 2.3% and 0.9%, respectively. The combined 30-day stroke/death rates for groups were 2.1% (I), 3.6% (II), and 11.7% (III) (P=<.001). At 5 years groupIII experienced significantly more coronary events (36.9% vs 16.3%, P<.001), more cerebrovascular events (21.6% vs 6.3%, P<.001) and deaths (70.0% vs 20.3%, P<.001), while groupII had no significantly different outcomes compared to groupI, except for mortality (29.8% vs. 20.3%, P<.001). After adjusting for all risk factors, severe CRI remained predictive of coronary events (HR 2.3; P=.003), cerebrovascular events (HR 3.7; P<.001), and mortality (HR 4.0; P<.001). Kaplan-Meier estimates for asymptomatic patients revealed that at 5 years groupIII had significantly more cerebrovascular events (22.5% vs 8.0%, P=.001) and deaths (61.5% vs 18.3%, P=<.001) than groupI.

**Conclusions:** Severe but not moderate CRI is an independent predictor of CV events and death at 5 years following CEA. Asymptomatic patients with severe CRI are not acceptable candidates for CEA as they may not derive its long term CV and survival benefits.

# Full Program & Abstracts

4:12 pm – 4:24 pm

14

## Aortoiliac Elongation After EVAR

Venita Chandra\*, Martin Rouer\*, Trit Garg\*, Dominik Fleischmann\*, Matthew W Mell - Stanford University Medical Center, Stanford, CA

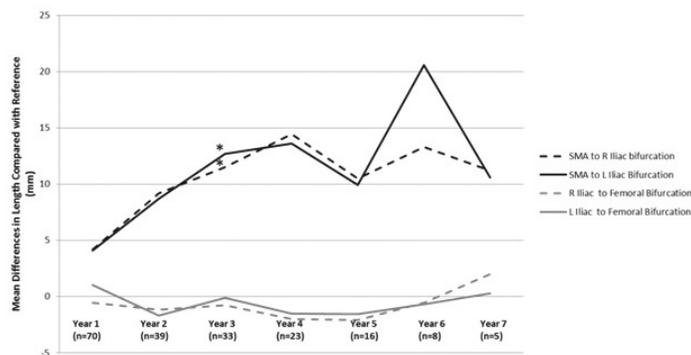
**Introduction & Objectives:** The healthy aorta is known to progressively dilate and elongate with time. Elongation after endovascular aortic aneurysm repair (EVAR) is not well studied. We sought to assess the long term morphologic changes after EVAR.

**Methods:** An IRB approved retrospective review was conducted of 341 consecutive patients who underwent EVAR at a single academic center from 2004-2007. Ninety five patients had at least two follow up computerized tomographic angiograms (CTA) available for review and constituted the study cohort. Standardized centerline aortic lengths and diameters were obtained on Aquarius iNtuition 3D workstation (TeraRecon Inc., San Mateo, California) on post-operative and all available follow-up CTA. Relationships to aortic elongation were determined using Wilcoxon rank-sum test or linear regression (Stata version 12.1, College Station, Texas).

**Results:** The study cohort was composed of mostly men (88%), with a mean age of 76 (+/- 9) and mean follow up of 3.2 years (range: 0.4-7.5 years). Fifty three percent of patients had devices with suprarenal fixation (Zenith 14%, Talent 39%) and 47% had no suprarenal fixation (Aneurix 36%, Excluder 11%). Significant aortic lengthening was observed over the study period in the aortoiliac segment by three years (Figure). Aortic elongation was not associated with changes in aortic diameter ( $p=0.18$ ), the presence of Type I ( $p=0.15$ ) or Type II ( $p=0.33$ ) endoleaks, or suprarenal fixation ( $p=0.51$ ). A trend was observed between aortic lengthening and re-interventions ( $p=0.10$ ).

**Conclusions:** Significant aortoiliac elongation was observed after EVAR. Such morphologic changes may impact long term durability of EVAR, warranting further investigation into factors associated with these morphologic changes.

FIGURE: Mean Differences in Lengths over Years of Follow-up



Statistically significant differences (\*) in length were observed by year 3 compared to reference between the superior mesenteric artery (SMA) and both iliac bifurcations (mean 12.1mm +/-10.2;  $p=0.01$ ), but not between the iliac and femoral bifurcations (mean -0.32 +/- 4.2;  $p=0.6$ )

# Full Program & Abstracts

4:24 pm – 4:36 pm

15

## **The Impact of Vein Mechanical Compliance On Arteriovenous Fistula Outcomes**

George E. Smith\*<sup>1</sup>, Rachel Barnes\*<sup>1</sup>, Michael Fagan\*<sup>2</sup>, Ian C. Chetter<sup>1</sup> - <sup>1</sup>Hull Royal Infirmary/Hull York Medical School, Hull, United Kingdom; <sup>2</sup>University of Hull, Hull, United Kingdom

**Introduction & Objectives:** Arteriovenous fistulae (AVF) provide ideal access to the circulation for haemodialysis but suffer significant rates of failure in the early post op period. This research aimed to determine how the mechanical properties of the vein used in AVF formation related to AVF failure.

**Methods:** 30 patients were consented to vein sample collection during AVF surgery. Samples were then tested on a bespoke jig to determine the elastic modulus of the vessel. Patients were followed for 30 days and comparisons made between the elastic modulus of failed and patent AVF veins.

**Results:** 29 samples were analysed. 9 subjects had AVF which subsequently failed. Veins from AVF which failed were significantly less mechanically compliant than those which formed patent AVF (median and IQ range of 0.2159 MPa (0.1264, 0.2543) compared to 0.0744 MPa (0.0305, 0.1538) respectively ( $p < 0.005$  - Mann Whitney U test). Compliance distribution was negatively skewed. The Modulus of elasticity demonstrated a moderate correlation with increasing age (Pearson's  $r = -0.465$ ,  $p < 0.05$ ).

**Conclusions:** This study demonstrated that subjects with failed AVF had less compliant veins as might be expected given the need for venous distension in AVF maturity. Decreasing elastic modulus and hence increasing compliance with increasing age suggests a weakening of the structure of vein walls with time, though multiple factors which might affect venous distension in vivo were not accounted for in this in vitro study.

# Full Program & Abstracts

4:36 pm – 4:48 pm

16

## **Resident Experience In Vascular Surgery: 20 Years of ACGME Case Logs**

Brandon T. Garland\*, Frederick T. Drake\*, Niten Singh, Nam T. Tran\*, Kenneth W. Gow\* - Harborview Medical Center, Seattle, WA

**Background & Objective:** Surgery resident education is based on experiential training, which can be influenced by changes in management strategies, technological advances and administrative regulations. This prompts concerns about changes in resident experience over time. We describe the vascular surgery operative experience of general surgery residents over the past 20 years.

**Methods:** The Accreditation Council for Graduate Medical Education (ACGME) database of operative logs was queried from academic year (AY)1989-90 to AY2009-10 to identify shifts in operative experience in vascular surgery. Annual case-log data for each cohort of graduating residents was combined into approximately 5-year blocks: Period I (AY1989-90 to AY1993-94), Period II (AY1994-95 to AY1998-99), Period III (AY1999-00 to AY2002-03), and Period IV (AY2003-04 to AY2009-10). The latter two periods were delineated by the year in which duty hour restrictions were implemented.

**Results:** Overall general surgery caseload increased from Period I to Period V. While there was also a significant increase from Period I to II (172.6 vs. 202.3) in vascular surgery cases, experience has significantly declined from 164.2 cases in Period III to 120.2 cases in Period V. Experience in open AAA similarly declined from 8.2 cases in Period II to 3.1 in Period V. Concomitantly, experience in EVAR increased from Period III to Period V. Carotid endarterectomy followed a different trend peaking in with an average of 21.3 cases in Period III, declining to 14.2 cases in Period V.

**Conclusions:** While overall case numbers have increased over the past 20 years, recent general surgery trainees perform fewer vascular operations than their predecessors. Although these changes reflect concurrent changes in the management of vascular disease, general surgeons may have less experience with vascular operations than before. Surgical educators must meet the challenge of training residents for vascular trauma and other procedures less frequently performed.

## Full Program & Abstracts

4:48 pm – 4:56 pm

17 (CR)

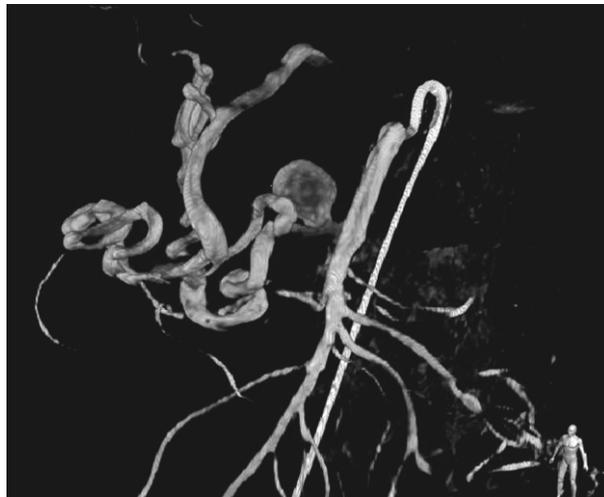
### **Pancreaticoduodenal Artery Aneurysm Secondary To Median Arcuate Ligament Syndrome**

Michael D. Sgroi\*, Nii-Kabu Kabutey, Roy M. Fujitani -  
University of California, Irvine, Orange, CA

**Introduction:** Median arcuate ligament syndrome (MALS) is a rare disorder defined by compression and narrowing of the celiac artery by the median arcuate ligament. Damage to the vessel and disruption of flow dynamics can lead to distal visceral artery aneurysm formation. The increased blood flow through the pancreaticoduodenal arcade can lead to the aneurysmal degeneration of the vessel. We report the case of an inferior pancreaticoduodenal artery aneurysm (IPA) in a patient with median arcuate ligament syndrome.

**Case Report:** Asymptomatic 61-year old female with no medical history was referred to vascular surgery for evaluation of a pancreaticoduodenal aneurysm incidentally found on CT scan. Real-time Cine MRI displayed near complete occlusion of the celiac origin with expiration, confirming the diagnosis of MALS. The patient was taken for a two-staged procedure, which included laparoscopic division of the median arcuate ligament followed by endovascular coil embolization and stenting of the IPA. The patient tolerated the procedure well with no complications and no signs of aneurysm enlargement on repeat imaging.

**Discussion:** Pancreaticoduodenal artery aneurysms secondary to MALS are very rare and most commonly diagnosed at time of rupture, which has a mortality rate that reaches approximately 30%, making early identification and treatment necessary. Digital subtraction angiography has been the standard imaging technique for diagnosis, however, with recent radiologic advancements, real-time Cine MRI can give a definitive diagnosis and a three-dimensional roadmap for treatment planning. Treatment should include exclusion of the aneurysm via coil embolization or stenting, as well as division of the median arcuate ligament.



## Full Program & Abstracts



## Full Program & Abstracts

4:56 pm – 5:04 pm

18 (CR)

### **Surgical Treatment of Popliteal Venous Aneurysms**

Jill K. Johnstone, Mark D. Fleming, Manju Kalra, Gustavo S. Oderich, Audra A. Duncan, Randall R. DeMartino, Thomas C. Bower, Peter Gloviczki - Mayo Clinic, Rochester, MN

**Background:** Popliteal venous aneurysms (PVA) are rare, however they can lead to pulmonary emboli (PE) and death. The purpose of this study was to review our institutional management of PVA.

**Methods:** Consecutive patients with PVA were identified over a 15-year period (1998-2013). A retrospective review was conducted. Clinical presentation, modality of diagnosis, surgical treatment, 30-day morbidity and mortality, and follow-up are reported.

**Results:** Four male and two female patients with PVA were identified. Mean age was 33.3 years (range 14-65). Three patients presented with PE; one developed PE while on anticoagulation. Two presented with calf pain. Two patients had PVA found incidentally during work-up for traumatic knee injury. Diagnosis of PVA was made by duplex ultrasound (US) in 4 patients. One patient was diagnosed by physical exam and confirmed with duplex US. Another patient had previous PVA repair at an outside hospital and had recurrence of PVA on follow-up duplex US. Mean aneurysm size was 26 mm (range 20-37). Four were saccular and 2 fusiform. Two PVAs contained thrombus. One patient with thrombus presented with PE, the other with calf pain. Four patients underwent aneurysmectomy with lateral venorrhaphy and two patients had resection of the aneurysm with interposition vein graft. There were no operative or 30-day mortalities. Both patients with vein grafts had postoperative complications; one developed a hematoma that required operative evacuation and one had thrombosis of the vein graft requiring thrombolysis. Mean follow-up was 12 months with 83% primary patency, 100% secondary patency, and no recurrences.

**Conclusion:** PVAs are rare, but can lead to significant morbidity and death. Based on this small series, aneurysmectomy with lateral venorrhaphy has few complications compared to those treated with vein grafts. Overall, operative repair of PVA is safe and recommended to prevent PE and death.

## Full Program & Abstracts

5:04 pm – 5:12 pm

19 (CR)

### Endovascular Management of Simultaneous Thoracic and Abdominal Aortic Contained Ruptures

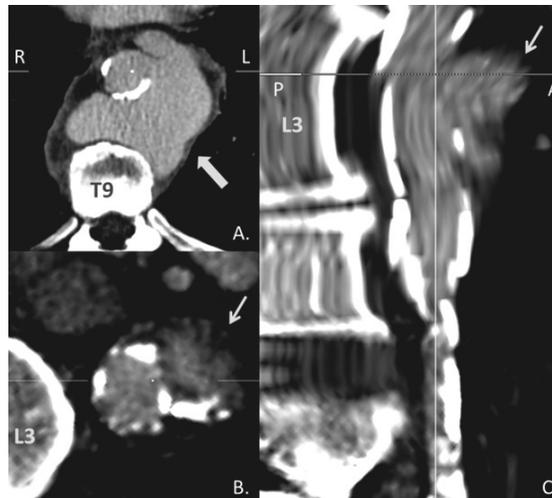
Lorena Gonzalez, George Pisimisis, Panos Kougias, Neal Barshes, Carlos Bechara - Baylor College of Medicine, Houston, TX

**Introduction & Objectives:** Treatment of acute aortic pathology can be challenging, especially when it involves both the thoracic and abdominal aorta. We present a case of simultaneous contained ruptures of the descending thoracic and abdominal aorta successfully excluded with endovascular stent grafts.

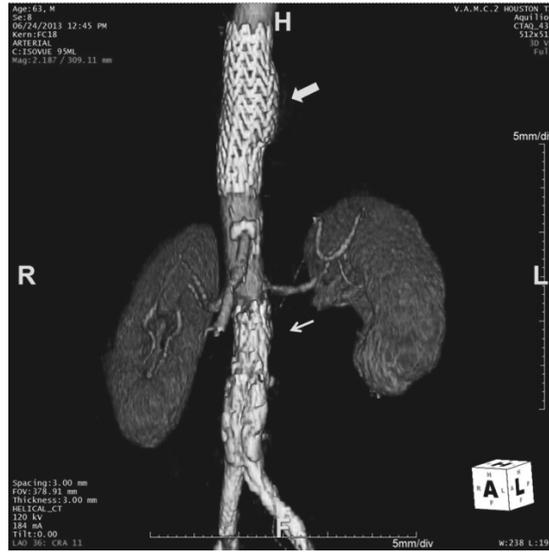
**Methods:** A 63 y/o male presented with a history of worsening mid-thoracic and lumbar pain, initially attributed to osteoarthritis based on x-ray films and spine-MRI. A few hours prior to emergency room admission the pain became excruciating, extending into his chest and abdomen. A contrast CT revealed two areas of contained rupture at the distal descending thoracic and abdominal aorta (Fig.1).

**Results:** The patient was taken emergently to the hybrid suite for endovascular aortic repair. A spinal drain was placed preoperatively to minimize risk of paraplegia given the anticipated extent of aorta to be covered. An aortogram confirmed the location of contained ruptures at both sites. TEVAR was performed followed by EVAR. Completion angiogram revealed successful exclusion of both ruptures without evidence of endoleak and preserved perfusion of the visceral aortic branches. The spinal drain was removed on POD#2 without neurologic complications. CT angiography prior to discharge verified thrombosis of both excluded sacs without endoleak (Fig.2).

**Conclusions:** This is the first reported case of successful endovascular repair of simultaneous contained ruptures in the thoracic and infrarenal aorta. Suspicion of acute aortic pathology should be high in patients with worsening degenerative spine symptoms and atherosclerotic risk factors.



# Full Program & Abstracts



# Full Program & Abstracts

5:12 pm – 5:24 pm

20

## **Late Longitudinal Comparison of Endovascular and Open Popliteal Aneurysm Repairs**

Mathew Wooster, Martin Back - University of South Florida, Tampa, FL

**Objective:** We sought to define suitable anatomy predicting durable exclusion of popliteal artery aneurysms (PAA) and define optimal patient selection criteria for endovascular repair.

**Methods:** Seventy-five PAA were repaired in 66 patients (64 male, 2 female) over the past 13 years. Fifty-two aneurysms (69%) were treated with open surgical exclusion/bypass using autologous vein (69%) or PTFE (31%) conduit. Extended bypass targets required inflow from the common femoral artery in 15% of limbs and outflow via a tibial artery in 31%. Since May 2001, endovascular repair was considered in patients with high medical risk, limited vessel tortuosity, absence of significant occlusive disease (ABI > 0.9), and PAA not involving below knee segments. Interventions were performed via antegrade femoral access in 23 limbs (31%) using commercially available endografts. Device diameters ranged between 7-13mm, number of devices averaged 2.1 per PAA, and mean treatment length was 22 cm (range 5-36 cm). All patients were followed with duplex ultrasound surveillance and were prescribed clopidogrel and/or aspirin.

**Results:** Patients treated endovascularly were older (80 v. 70 yo, P=.01), but had shorter LOS (1.4 v. 5.7 days, P=.01) and lower complication rates (6% v. 17%, P=.02). Mean surveillance interval was 39 months with similar 4-year survival (74% open, 68% endo). Primary and secondary patencies were 70%, 70% after endovascular repair and 75%, 91% for open at 4 yrs respectively. Four of 5 endovascular failures were thrombosis within 4 mo of intervention and had conversions to open repair. Secondary interventions were required after 28% of endovascular and 19% of open repairs. A single limb was lost in the series (1.3% after open repair).

**Conclusion:** Similar outcomes can be expected after endovascular and open PAA repair with adherence to specific anatomic and technical selection requisites.

5:30 pm – 6:30 pm

## **DIVERSITY PANEL**

Moderator: Wei Zhou, MD

Panelists: Hannah Valentine, MD, Ruth Bush, MD & W. Darrin Clouse, MD

6:30 pm – 7:15 pm

## **PVSS MEMBER BUSINESS MEETING**

Members Only

7:15 pm

Free Evening

# Full Program & Abstracts

## Saturday, February 1, 2014

6:00 am – 7:00 am	Continental Breakfast
6:00 am – 9:30 am	Registration
<b>7:00 am – 9:45 am</b>	<b>SCIENTIFIC SESSION III</b> Moderators: Murray Shames, MD & Mounir Haurani, MD
7:00 am – 7:12 am	21 <b>An Update On the Epidemiology of Surgically-Repaired Aneurysms in the United States, 2001-2010</b> Vito Mantese*, Shalini Selvarajah*, Babak Orandi, Christopher J. Abularrage, James H. Black, III, Bruce A. Perler, Yingwei Lum - Johns Hopkins School of Medicine, Baltimore, MD

**Introduction & Objectives:** There is paucity of recent data describing epidemiologic trends of aneurysms in the US. We sought to provide updated national estimates for inpatient treatment of extra-cerebral aneurysms.

**Methods:** The Nationwide Inpatient Sample (2001-2010) was queried using ICD-9-CM diagnosis codes for extra-cerebral aneurysms [N=2,823,066]. Aneurysm repairs were identified using ICD-9 procedure codes. Hospitalization and surgical rates, annual trends in mortality, length of stay (LOS) and hospital charges in 2010 inflation-adjusted dollars were described. Data was analyzed using survey weights.

**Results:** Aneurysm-related hospitalization rates increased from 616.11 in 2001 to 822.40 in 2010 (per-100,000 admissions). The mean patient age was 73.9 (SE=0.079), 64.1% male, 85.2% whites and 70.0% admitted for abdominal aortic aneurysms. The increase in the number of surgical repairs from 69,283 (30.2%) in 2001 to 72,922 (22.7%) in 2010 was disproportionately lower to the increase in annual aneurysm-admission rates. Endovascular repair rates increased from 64.8 in 2001 to 124.7 in 2010 while rates for open repair decreased from 237.6 in 2001 to 102.6 in 2010 (per 1,000 admissions)( $p < .001$ , all). Overall post-surgical mortality rate decreased from 7.6% in 2001 to 4.0% in 2010 with both surgical approaches showing a reducing trend ( $p < .001$ ). LOS remained stable in the endovascular intervention group (4.1 days), but decreased from 9.9 days in 2001 to 9.2 days in 2010 in the open surgery group ( $p < .001$ ). Average hospital charges per admission increased from \$38,928 (SE=263.97) in 2001 to \$57,903 (SE=309.45) in 2010 ( $p < .001$ , all) with a similar trend seen in all intervention groups.

**Conclusions:** The number of aneurysm-related hospitalizations in the US over the past decade is rising. Although overall surgical intervention rates are declining, relatively more surgeries are being performed using endovascular approaches. Despite a reduction in post-operative mortality rates and LOS over the decade, hospital charges are increasing regardless of type of intervention provided.

# Full Program & Abstracts

7:12 am – 7:24 am

22

## The End Stage of Dialysis Access: Femoral Graft or HeRO Vascular Access Device

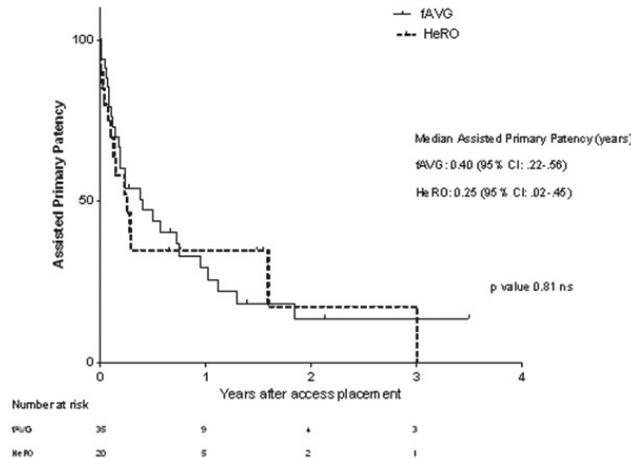
Elizabeth A. Kudlaty\*, Jeanne Pan\*, Matthew T. Allemang\*, Daniel E. Kendrick\*, Vikram S. Kashyap, Virginia L. Wong - University Hospitals Case Medical Center, Cleveland, OH

**Introduction & Objectives:** Maintaining and establishing vascular access in end stage renal disease (ESRD) patients is complicated when they are poor candidates for traditional upper extremity access. Our objective was to compare our experience with two alternative dialysis accesses, the femoral arteriovenous grafts (fAVG) and the Hemodialysis Reliable Outflow (HeRO) graft, in patients with limited remaining options.

**Methods:** One institution, retrospective review of ESRD patients with either a fAVG or a HeRO graft placed between May 2009 and February 2013. Adult patients were selected by reviewing all arteriovenous grafts placed at a single institution. Patient demographics, medical history, procedural data, and outcomes were recorded from both institutional and dialysis center databases. Data were evaluated using Fisher's corrected t-test, log-rank test, and univariate analysis.

**Results:** A total of 56 patients met these criteria, 35 fAVG, and 21 HeRO; with one HeRO patient lost immediately to follow-up. Clinical variables were similar except the HeRO group had more diabetic patients (60% HeRO, 22.9% fAVG,  $p=0.01$ ). The average number of years on hemodialysis was  $7.0 \pm 1.0$  for fAVG, and  $5.7 \pm 0.9$  for HeRO ( $p=0.41$ ). Assisted Primary patency was no different ( $p=0.81$ ) over 3.5 year period. Secondary patency was 62.6%, 50.6%, 19.3% for fAVG and 68.0%, 53.5%, 38.3% for HeRO at 6 months, 12 months, and 2 years ( $p=0.69$ ). Average number of interventions to maintain patency for fAVG was  $1.86 \pm .53$  and  $2.35 \pm .90$  for HeRO ( $p=0.62$ ). Bacteremia rate was 14.3% for fAVG and 5% for HeRO ( $p=0.54$ ).

**Conclusion:** Patients who received either fAVG or HeRO have dismal patency. ESRD patients who receive either of these procedures appear to be at the end stage of available access options.



# Full Program & Abstracts

7:24 am – 7:36 am

23

## **Outcomes After Endovascular Procedures Done In Patients With An Elevated INR**

Joshua A. Wilensky\*, Ahsan T. Ali, Mohammed M. Moursi\*, Guillermo A. Escobar, Matthew R. Smeds - University of Arkansas for Medical Sciences, Little Rock, AR

**Introduction & Objectives:** Patients treated with anticoagulants frequently require urgent vascular procedures and elevated INR is traditionally thought to increase access site complications after these interventions. We aimed to determine the safety of percutaneous arterial procedures on patients with high INR in the era of modern ultrasound-guided access and closure device use.

**Methods:** Patients undergoing arterial endovascular procedures at a single institution between October 2010 and November 2012 were reviewed (n=1333). We retrospectively analyzed all patients with an INR > 1.5. Venous procedures, lysis checks, and cases with no documented INR within 24 hours were excluded. 91 patients were identified. A comparison group was then generated from the last 91 patients intervened on with INR < 1.6. Demographics, intraoperative data and postoperative complications were compared.

**Results:** The demographics were similar. More Coumadin use and higher INR was found in the study group (71/91 and 0/91 respectively, p = 0.001; 2.3 seconds and 1.1 seconds, p = 0.001), but there was more antiplatelet use in the control group (68/91 and 51/91, p = 0.01). Intraoperatively, the sheath sizes, protamine use, closure device use, ultrasound guidance, brachial access, and procedure types were not statistically different. Sheath sizes ranged from 4 to 22 French in the study group and 4 to 20 French in the control group. Paradoxically, heparin was administered more frequently in the study group (64/91 and 50/91, p = 0.046). Bleeding complications occurred more commonly in the study group (3/91 and 1/91 respectively, p=0.62), but this failed to reach significance and the overall complication rate in both groups was low.

**Conclusions:** Endovascular procedures can be performed safely with a low risk of bleeding complications in patients with an elevated INR. Ultrasound guidance and closure device use may allow these cases to be done safely.

# Full Program & Abstracts

7:36 am – 7:48 am

24

## **Vascular Injury Is Associated With Increased Mortality In Winter Sports Trauma**

John C. Eun<sup>1</sup>, Deidre A. Kile<sup>\*1</sup>, Kristine Hansen<sup>\*1</sup>, Steven Moulton<sup>\*2</sup>, Omid Jazaeri<sup>1</sup>, Mark Nehler<sup>1</sup>, Joshua I. Greenberg<sup>1</sup> - <sup>1</sup>University of Colorado Denver, Aurora, CO; <sup>2</sup>Children's Hospital Denver, Aurora, CO

**Introduction & Objectives:** Trauma is the leading cause of injury and death for ages 44 and less. Since very little is currently known about this patient population, we sought to identify the incidence, injury patterns, and outcomes of vascular injuries resulting from winter sports trauma.

**Methods:** Patients with winter sports trauma as well as the sub-set with vascular injuries were identified by accessing the National Trauma Databank querying years 2007-2010. Patients with and without vascular injuries were then compared. Admission variables included transport time, Emergency Department hypotension (systolic blood pressure <90), Glasgow Coma score < or = 8, Injury Severity Score > or = 25, fractures, solid organ injury, and vascular injury. Outcomes were analyzed and independent associations with vascular injuries were determined.

**Results:** 2,298 patients were identified with winter sports related trauma, and 28 (1.2%) had associated vascular injuries. Overall, the top three injuries were thoracic vertebral fractures (5.5%), lumbar vertebral fractures (5.1%), and femur fractures (4.6%). The most common associated vascular injuries were to the popliteal artery (17.7%), splenic artery (14.7%), and brachial blood vessels (14.7%). In the entire cohort, 1 patient (0.04%) suffered an amputation and 15 patients (0.7%) died. There were no amputations in the vascular injury group. Mortality was 0.6% in patients without a vascular injury compared to 7.1% of those with a vascular injury (p=0.01).

**Conclusions:** While vascular injury is an uncommon associated finding in winter sports trauma, it is associated with a significant increase in mortality. These findings highlight the need for rapid identification of traumatic vascular injuries which predicts worse overall outcomes in this patient population.

## Full Program & Abstracts

7:48 am – 7:56 am

25 (CR)

### **A Rare Case of May-Thurner Syndrome Presenting As An Iliac Vein Aneurysm**

Stephanie M. Carvalho\*, Mark F. Conrad - Massachusetts General Hospital, Boston, MA

**Introduction & Objectives:** External iliac vein aneurysms are remarkably uncommon and previously reported cases usually involve trauma with a persistent arteriovenous fistula. We report a case of a symptomatic 5.2cm external iliac vein aneurysm secondary to May-Thurner syndrome

**Methods:** This is a single patient case report.

**Results:** We report a case of an athletic 59-year-old male (often bicycles 150 miles per week) who was found to have a 5.0 cm left external iliac vein aneurysm. His CTA also showed anatomy consistent with May-Thurner Syndrome (Figure 1). The majority of said aneurysms have been treated with open surgery but the unique relationship to common iliac vein compression in this case made an endovascular approach possible. The patient underwent percutaneous angioplasty and stenting of his common iliac vein on the left with resultant immediate decompression of the external iliac vein. Follow-up CTA at 6 weeks showed that the external iliac vein had decreased to 3.8cm with no evidence of thrombus.

**Conclusions:** This is the first reported case of an external iliac vein aneurysm secondary to May-Thurner Syndrome that was successfully treated with stenting of the common iliac vein.



## Full Program & Abstracts

7:56 am – 8:04 am

26 (RF)

### **Endovascular Repositioning of A Migrated Stent Graft Using Endo-Anchor Capture**

Brandon T. Garland\*, Niten Singh, Benjamin Starnes - Harborview Medical Center, Seattle, WA

**Introduction:** Endovascular aneurysm repair is increasingly used to treat patients harboring abdominal aortic aneurysms with severe comorbidities that make them unfavorable candidates for open repair. Graft related complications in these patients also require unique endovascular solutions. We report the novel technique of “endo-anchor capture” for successful repositioning of a migrated stent graft.

**Methods:** An 83 year-old man presents with right lower extremity claudication 3 years after successful treatment of infrarenal AAA with EVAR. CTA revealed proximal migration and kinking of the right iliac limb with large type 1B endoleak. As the lesion was not amenable crossing with a wire, a novel approach of “endo-anchor” capture was used to reposition the limb distally. It was then anchored it into position and extended to attain adequate distal seal.

**Results:** Completion angiogram revealed appropriate repositioning of the endograft with resolution of normal iliac flow and no evidence of endoleak. The patient returned to normal activity without claudication and an ABI greater than one.

**Conclusions:** Device migration remains a difficult complication of endovascular repair. “Endoanchor capture” may be a safe and effective method for repositioning migrated or malpositioned endografts.

## Full Program & Abstracts

8:04 am – 8:12 am

27 (CR)

### **Venous Ulcer: Late Complication of A Traumatic Arteriovenous Fistula**

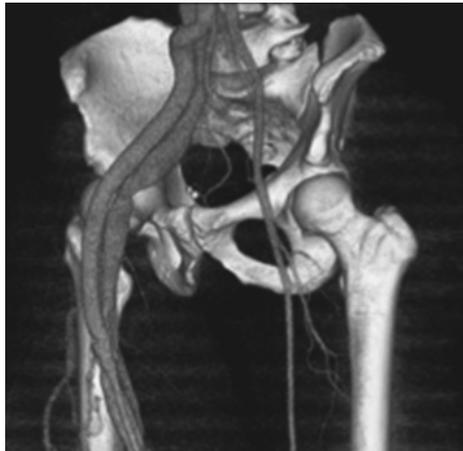
Calvin J. Young\*, Cassius I. Ochoa Chaar - Yale/New Haven Hospital, New Haven, CT

A 33 year-old man was admitted for the treatment of 5x3cm pretibial venous ulcer that was worsening despite compression therapy. His medical history is significant for gunshot wounds to the right lower extremity 3 years prior that were treated conservatively. Two years later, he developed a right lower extremity deep vein thrombus and a massive pulmonary embolus. He was treated with anticoagulation and received an inferior vena cava filter. A right femoral arteriovenous fistula (AVF) was discovered but the patient failed to follow up for surgical repair.

On exam, the patient was noted to have a palpable thrill in the right thigh with intact pedal pulses. Computed tomography angiogram demonstrated an AVF from the right superficial femoral artery to the femoral vein. The right iliac vessels were aneurysmal and measured twice the size of the left iliac vessels.

The patient was taken to the operating room for open repair. After intubation, the Nicoladoni-Branham sign was demonstrated by manual compression of the AVF. The heart rate decreased from 75 to 55 in one minute and reverted to the 70s after manual release. After control of the vessels, the AVF was divided. The femoral artery was repaired with patch angioplasty. The femoral vein was repaired primarily. The ulcer healed after one month and is no recurrence at one year.

\*The Nicoladoni-Branham sign was videotaped for educational purposes.



## Full Program & Abstracts



# Full Program & Abstracts

8:12 am – 8:24 am

28

## **Risk of Disease Progression In Patients With Moderate Asymptomatic Carotid Artery Stenosis: Implications of Tobacco Use and Dual Antiplatelet Therapy**

Caitlin W. Hicks\*, Katherine Talbott\*, Joseph K. Canner\*, Umair Qazi\*, Isibor Arhuidese\*, Eric Schneider\*, Christopher J. Abularrage, Julie Freischlag, Bruce Perler, Mahmoud Malas - Johns Hopkins Hospital, Baltimore, MD

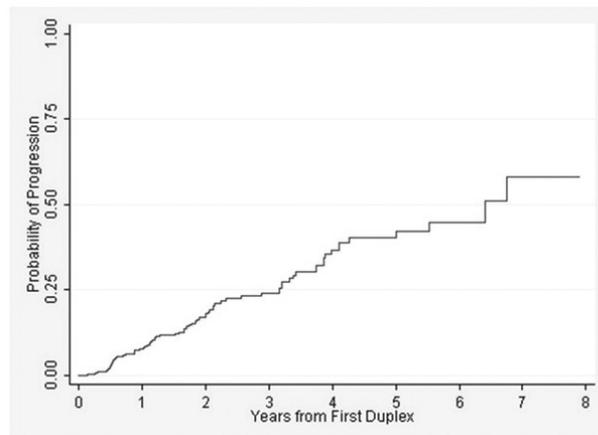
**Introduction & Objectives:** Data describing risk factors for disease progression in moderate asymptomatic carotid artery stenosis (ACAS) are lacking. The aim of our study was to determine the incidence and risk factors for disease progression in this group.

**Methods:** All patients presenting between 01/2005-05/2012 with moderate (50-69%) ACAS as determined by carotid artery duplex were included. Outcomes including incidence of symptoms, need for operative intervention, and disease progression to severe stenosis ( $\geq 70\%$ ) were recorded. Cox proportional hazard-regression models were used to identify risk factors for disease progression.

**Results:** We identified 284 patients over the 7.5-year study period (mean age  $70.6 \pm 9.3$ , 52% male). Mean follow up time was  $2.6 \pm 1.7$  years. Overall, disease progression to severe stenosis occurred in 25.4% and followed a linear trend (Figure 1). The incidence of symptoms including ipsilateral stroke (4.6%), TIA (2.1%), and amaurosis fugax (0.35%) was low. Carotid endarterectomy was performed in 14% of patients, all with severe disease. Risk of progression was higher in patients receiving dual antiplatelet therapy (HR 1.87, 95%CI 1.10, 3.16) and smokers (HR 1.91, 95% CI 0.99, 3.64). Age, female gender, hypertension, diabetes, hyperlipidemia, CAD, kidney disease, statin use, and ASA use were not significant predictors of severe stenosis (Table 1).

**Conclusions:** In our study, one quarter of patients with moderate ACAS progressed to severe disease, although the majority remained asymptomatic. Need for dual antiplatelet therapy may be indicative of more advanced systemic disease. Patients with identifiable risk factors may warrant more careful follow-up.

Figure 1. Probability of Progression of Moderate ACAS to Severe Stenosis



## Full Program & Abstracts

Table 1. Analysis of Risk Factors for Progression of Moderate ACAS to Severe Stenosis

<b>Risk Factor</b>	<b>Unadjusted Hazard Ratio (95% CI)</b>	<b>Adjusted Hazard Ratio (95% CI)</b>	<b>Adjusted p-value</b>
Age	1.00 (0.97, 1.03)	1.00 (0.98, 1.03)	0.71
Female	0.90 (0.57, 1.44)	0.71 (0.42, 1.21)	0.21
Smoking	1.84 (0.98, 3.44)	1.91 (0.99, 3.65)	0.05*
Hypertension	0.96 (0.49, 1.88)	0.79 (0.38, 1.64)	0.53
NIDDM	0.83 (0.45, 1.55)	0.66 (0.33, 1.31)	0.24
IDDM	0.75 (0.32, 1.73)	0.62 (0.23, 1.66)	0.34
Hvberlipidemia	1.10 (0.61, 1.97)	1.42 (0.70, 2.87)	0.33
CAD	1.01 (0.64, 1.60)	0.70 (0.40, 1.22)	0.21
CKD	0.65 (0.28, 1.50)	0.60 (0.25, 1.44)	0.26
Statin	0.85 (0.46, 1.54)	0.79 (0.42, 1.51)	0.48
ASA	1.11 (0.55, 2.25)	1.28 (0.57, 2.86)	0.55
Dual antiplatelet therapy	1.80 (1.12, 2.89)	1.87 (1.10, 3.16)	0.02*

# Full Program & Abstracts

8:24 am – 8:32 am

29 (CR)

## "Cheese-Wire" Fenestration of A Chronic Juxtarenal Dissection Flap To Facilitate Proximal Neck Fixation During EVAR

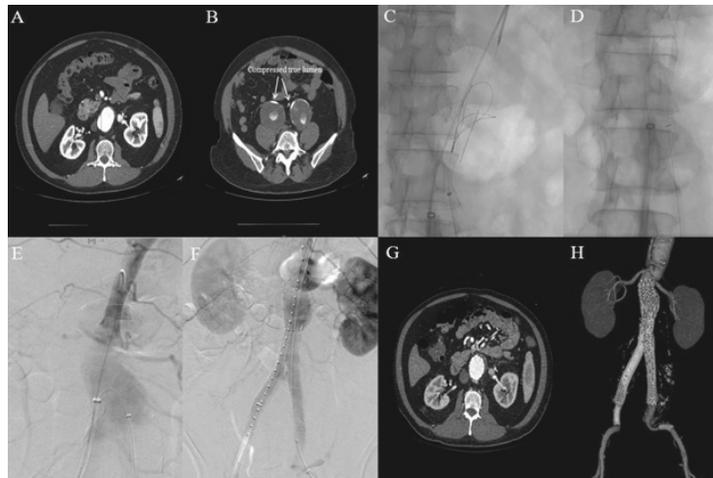
Brant W. Ullery\*, Eric G. Bluemn\*, Venita Chandra\*, Michael Dake\*, Jason T. Lee - Stanford University, Stanford, CA

**Introduction & Objectives:** To describe successful endovascular repair of a complex chronic aorto-iliac dissection facilitated by a unique endovascular fenestration technique at the proximal neck.

**Methods:** A 57-year-old male presented with claudication. CT-A demonstrated a complex aorto-iliac dissection with 7.7-cm false lumen dilatation and significant true lumen compression within bilateral iliac aneurysms and no suitable proximal neck free of dissection (Fig. A-B).

**Results:** Using IVUS, guidewires were introduced into true and false lumens. A 9-F sheath was placed on the right side and a 20-G Chiba needle was positioned at the level of the celiac artery and oriented toward the dissection flap. The needle was advanced to puncture the flap and an 0.014-inch wire was then snared from the true to the false lumen (Fig. C). Shearing of the dissection flap in the juxtarenal segment was performed using a "cheese-wire" technique, whereby both ends of the guidewire were pulled caudally in a sawing motion down into the aneurysm sac (Fig. D-E). Angiography confirmed absence of residual dissection and perfusion of the visceral vessels via the true lumen. Given the newly created infrarenal neck, standard EVAR was performed and antegrade and retrograde false lumen flow was obliterated from the visceral vessels (Fig. F). Post-operative imaging (Fig. G-H) confirmed aneurysm exclusion, no endoleak, and patent bilateral common iliac arteries with resolution of claudication symptoms and normal ABIs.

**Conclusions:** Endovascular management of false lumen aneurysms in the setting of chronic dissection is limited by the ability of stent-grafts to obtain adequate proximal or distal fixation. Endovascular fenestration of these chronic flaps facilitates generation of suitable landing zones, thereby serving as a useful adjunct to standard EVAR.



# Full Program & Abstracts

8:32 am – 8:44 am

30

## **Smoking Cessation Is the Most Unsuccessful Outcome of Risk Factor Modification In Uninsured Patients With Symptomatic Peripheral Arterial Disease**

Ravi R. Rajani, Kathy H. Huen\*, Ritam Chowdhury\*, Luke P. Brewster, Yazan Duwayri, James G. Reeves, Ravi K. Veeraswamy, Thomas F. Dodson - Emory University, Atlanta, GA

**Introduction & Objectives:** Patients with peripheral arterial disease (PAD) have multiple atherosclerotic risk factors. The Trans-Atlantic Inter-Society Consensus II (TASC II) has several recommendations regarding modification of atherosclerotic risk factors. The ability to provide proper services to patients may depend on adequate access to care, which is intricately linked to insurance status. The purpose of our study was to determine whether insurance status impairs the ability of patients with symptomatic PAD to meet select TASC II recommendations.

**Methods:** A retrospective review of patients with symptomatic PAD from August 2011 to May 2013 was conducted; standard outcome variables were collected. Patients were divided into the insured group (private insurance, Medicare, Medicaid) or the uninsured group (self pay). Insurance status was analyzed for its association to select TASC II recommendations: smoking cessation, LDL <100mg/dL, LDL <70mg/dL for patients with co-existing diabetes, HgA1c <7, systolic blood pressure <140mmHg, prescription of aspirin, and prescription of a statin.

**Results:** One-hundred and forty four patients with symptomatic PAD were identified. There was no significant difference between insured and uninsured patients in success rates of LDL targets (65.1% vs 51.1% for LDL < 100), HgA1c targets (61.9% vs 61.1% for HbA1c <7), blood pressure control (51.1% vs 50.0% for systolic blood pressure <140), aspirin use (72.8% vs 59.6%), or statin use (77.2% vs 63.5%). However, insured patients were more likely to quit smoking (35.9%) than uninsured patients (17.7%) (p=0.023).

**Conclusions:** With the exception of smoking cessation, insurance status does not affect the ability of patients to meet TASC II recommendations for modification of atherosclerotic risk factors. This is despite equal rates of enrollment in a multidisciplinary smoking cessation program between insured and uninsured patients. Efforts towards risk factor modification must address the poor smoking cessation rates among uninsured patients.

8:50 am – 9:00 am

Introduction of the President

**9:00 am – 9:45 am**

**PRESIDENTIAL ADDRESS**  
**EVOLVE: The Aura of Change**  
W. Darrin Clouse, MD

3:00 pm

Registration Re-Opens

3:30 pm – 4:00 pm

Coffee/Snacks

# Full Program & Abstracts

4:00 pm – 6:00 pm

## SCIENTIFIC SESSION IV

Moderators: Brian DeRubertis, MD & Ravi Rajani, MD

4:00 pm – 4:12 pm

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### **The Influence of the Hostile Neck On Restenosis After Carotid Stenting**

Kevin A. Brown\*<sup>1</sup>, Dina S. Itum\*<sup>2</sup>, James G. Reeves\*<sup>2</sup>, Yazan Duwayri<sup>2</sup>, Ravi Rajani<sup>2</sup>, Ravi K. Veeraswamy<sup>2</sup>, Shipra Arya<sup>1</sup>, Atef Salam<sup>1</sup>, Thomas F. Dodson<sup>2</sup>, Luke P. Brewster<sup>1</sup> - <sup>1</sup>Emory University/Atlanta VA Medical Center, Atlanta, GA; <sup>2</sup>Emory University, Atlanta, GA

**Introduction & Objectives:** Carotid artery stenting (CAS) for carotid stenosis is favored over carotid endarterectomy (CEA) in patients with a hostile neck from prior CEA or cervical irradiation (XRT). We hypothesize that these patients have higher restenosis/occlusion rates than patients undergoing CAS for other reasons. Our objective is to determine if hostile necks are at higher-risk for restenosis which would require aggressive surveillance.

**Methods:** All patients with follow up imaging, undergoing CAS from 2007 to 2013 for carotid artery stenosis were queried from our institutional database (N=236). Patients with hostile necks (XRT, N=37; prior CEA; N=65) were compared to patients who underwent CAS for other reasons (unfavorable anatomy, N=46; medical comorbidities; N=88). The primary end points were repeat intervention, high grade in-stent restenosis (ISR) of >70%, and stent occlusion. Secondary endpoints were of stroke/MI/death at 30 days, perioperative CVA, TIA, MI, groin complications, cerebral hyperperfusion, and periprocedural hypotension/bradycardia.

**Results:** The CEA/XRT group required more reinterventions (8% vs. 2%; P=.04) and had a greater incidence of >70% ISR (11% versus 4%; P=.03). There was a trend for prior CEA and not XRT in driving these differences (ISR >70%, P=.03; Reintervention, P=0.08). ISR >50%, stent occlusion, and periprocedural morbidity/mortality was similar between these groups. The hostile neck cohort was younger, had lower incidence of COPD, CAD, and renal insufficiency than the non-hostile neck group. There were no other differences identified.

**Conclusions:** While periprocedural complications of CAS are acceptable, hostile necks may have an increased need of repeat interventions, particularly in patients treated by CAS for restenosis after CEA. This population may require closer surveillance than the general population of CAS patients.

## Full Program & Abstracts

4:12pm – 4:24 pm

32

### **Gender Effects On Two Year Outcome of Durability II Trial: Despite Equivalent Patency Rates, Women Have Persistently Worse Pain Score and Walking Distance Compared To Men**

Marvin V. Weaver\*, Peter L. Faries, Varinder S. Phangureh\*, Rami O. Tadros\*, Nicholas Sikalas\*, Rajesh Malik, Victoria Teodorescu, Michael L. Marin, Ageliki G. Vouyouka - Mount Sinai Medical Center, New York, NY

**Introduction & Objectives:** This study investigates the gender effects on the two-year outcome of the Durability II trial.

**Methods:** Two hundred eighty-seven patients enrolled in the Safety and Effectiveness Study of EverFlex Stent to Treat Symptomatic Femoral-popliteal Atherosclerosis (DURABILITY II) trial (a prospective, nonrandomized, core laboratory audited, and independently adjudicated investigational device exemption trial) were stratified by sex (190 men and 97 women) and reviewed.

**Results:** Women were found to present with femoropopliteal occlusive disease (FPOD) at an older age than men ( $71.3 \pm 11.2$  vs.  $65.9 \pm 9.9$  years;  $P < 0.001$ ). At two years, there was no difference seen in survival rates of men and women (93.1% vs. 92.2%). The decrease in primary (66.9% vs. 77.3%), primary-assisted (73.2% vs. 81.6%), and secondary patency (75.7% vs. 82.7%) rates at two years seen in women did not achieve statistical significance ( $P = NS$ ) and was similarly seen in men. No difference in ankle brachial index was observed at two years and no difference was observed between men and women. When looking at walking impairment questionnaires at two years versus one year, women continued improving their scores for pain (76.4% vs. 68.0%) and had marginal improvement in walking distance (51.6% vs. 49.7%). In men these scores plateaued in the first year and there was no further improvement.

**Conclusion:** In this study gender had different effects on the two-year subjective outcomes after femoropopliteal reconstruction with women having more prolonged improvement in their pain scores compared to men. Further investigations are necessary to better determine the impact of vascular disease and revascularization on the functional status of women.

## Full Program & Abstracts

4:24 pm – 4:36 pm

33

### **Repair of Ruptured and Symptomatic Abdominal Aortic Aneurysms Using A Structured Protocol In A Community Teaching Hospital**

Katrina S. Oyague<sup>\*1</sup>, Omar A. Mubarak<sup>1</sup>, Jennifer G. Gainer<sup>\*1</sup>, Thomas F. Rehring<sup>1</sup>, Maureen O'Brien<sup>\*2</sup>, Harris W. Hollis, Jr.<sup>\*1</sup> - <sup>1</sup>Exempla Saint Joseph Hospital, Denver, CO; <sup>2</sup>UC Denver, Denver, CO

**Introduction:** Open abdominal aortic aneurysm (AAA) repair has gradually been replaced by endovascular repair (EVAR). Rapidly evolving improvements in endovascular technology have expanded indications beyond elective repair to include management of symptomatic (sAAA) and ruptured (rAAA) AAAs. Our goal was to compare the success of our standardized protocol for sAAA and rAAA repair to published findings using similar approaches.

**Methods:** 49 consecutive sAAA or rAAAs from 8/07/09 – 8/13/13 were treated via a multidisciplinary emergency protocol that was developed from previous algorithms. We retrospectively reviewed 30-day post-operative mortality of patients presenting with sAAA or rAAA as defined by CT scan interpretation at presentation. Patient variables including systolic blood pressure (SBP), serum creatinine (CR), hematocrit (HCT), incidence of abdominal compartment syndrome (ACS), and intra-operative transfusion requirement greater than 2 units packed red blood cells (PRBC) were also examined.

**Results:** 49 patients were treated via activation of the rAAA protocol and 48 underwent repair. 69.4% had rAAA and 30.6% had sAAA. 70.8% total patients and 75.8% of rAAA were managed with EVAR. The 30-day mortality for rAAA and sAAA was 32% vs 20% respectively, with the mean 30-day mortality 29.2%. In contrast, conversion from EVAR to open procedure resulted in mortality of 66.7%. 41.1% of rAAA presented with hypotension. Incidence of ACS was 16.7% overall but occurred in 53% of deaths. (Statistical Analysis pending)

**Conclusions:** Management and endovascular repair of sAAA or rAAA can be accomplished safely at the community hospital level using standardized protocols. Hemodynamic instability is not an absolute contraindication to EVAR. Conversion from EVAR to open repair has a high mortality. Abdominal compartment syndrome is a major issue complicating rAAA repair.

## Full Program & Abstracts

Table 1: Ruptured and Symptomatic AAA Repair in Community Teaching Hospital			
	Symptomatic AAA (n=15)	Ruptured & Contained Ruptured AAA (n=34)	Total Patients (n=49) Total procedures (n=48)
Mean Age	76.4	75.3	75.6
Gender	80% male	85% male	83% male
Presenting Systolic Blood Pressure < 90	6.7%	41.1%	32.7%
Mean serum creatinine	1.2	1.4	1.4
Mean Hematocrit	42.5	37.6	39.0
% Procedures EVAR	60%	75.8%	70.8%
30-day Deaths	3	11	14
Abdominal Compartment Syndrome	0	8	53.3% of deaths 16.7% of procedures
Intraoperative transfusion $\geq$ 2 units PRBCs	13.3%	41.2%	53.3% of deaths 33.3% of procedures

## Full Program & Abstracts

4:36 pm – 4:48 pm

34

### **Technical and Financial Feasibility of Inferior Vena Cava Retrieval Program At A Level One Trauma Center**

Kristofer M. Charlton-Ouw, Samuel S. Leake\*, Cristina N. Sola\*, Harleen K. Sandhu\*, Rondel Albarado\*, Charles C. Miller, III\*, Anthony L. Estrera\*, Hazim J. Safi\*, Ali Azzadeh  
- University of Texas, Houston, TX

**Introduction & Objectives:** Considering new guidelines for retrievable inferior vena cava filters (IVCFs), we examine our initial experience after establishing a comprehensive filter removal program in our Level I Trauma Center.

**Methods:** Trauma patients receiving IVCFs from 2010-2013 were consented and prospectively enrolled in the study program. Retrieval rates were assessed for the years prior to study initiation. Primary outcome was IVCF retrieval attempt. Hospital charges for retrieval were examined and univariate analysis performed. Hospital cost-to-charge ratios were assessed.

**Results:** Prior to study initiation, 66 IVCFs were placed in trauma patients with only 2 retrievals in two years. During the study, 261 trauma patients had IVCF placement of which 107 were enrolled. Retrieval was attempted in 103 patients with success in 87 (84%). Mean time from placement to attempt was 6.2 +/- 4.0 months (range 0.5-31.8). Of the total attempts, 29% were nonresource patients, 11% had Medicaid, and 60% had commercial insurance. Chances of successful retrieval were higher if performed later during the study ( $P=.03$ ). Successful retrieval was not related to insurance status ( $P=ns$ ). The mean total hospital charges related to retrieval were \$4493 (range \$4379-\$9106). Successful retrieval contributed to lower total charges ( $P<.01$ ). Factors contributing to higher total charges were retrieval attempt later in study period ( $P=.01$ ) and commercial insurance status ( $P=.04$ ).

**Conclusions:** The rate of IVCF placement in trauma patients increased 4-fold over four years. The ratio of IVCF retrieval to placement increased over 10-fold during the same period after establishment of the retrieval program. Operator experience increases chance of successful retrieval but also increases hospital charges possibly due to more obstinate attempts at difficult retrievals. A dedicated IVCF retrieval program can benefit patients and hospitals even with a significant portion of patients with inadequate insurance.

## Full Program & Abstracts

4:48 pm – 4:56 pm

35 (CR)

### **Complete "In Situ" Avulsion of the Radial Artery Complicating Transradial Coronary Rotational Atherectomy**

Nicolas J. Mouawad, Iyore James, Quinn Capers, IV, Mounir  
J. Haurani - The Ohio State University, Columbus, OH

**Introduction:** Transradial percutaneous access (TR) is promoted due increased patient comfort and convenience as well as a lower risk of access site and cardiac complications in the literature. Increased use of the TR purports a new set of possible complications for which the vascular surgeon must be capable to recognize and manage.

**Methods:** A 48 year old, devout Jehovah's Witness, woman with a history of coronary artery bypass surgery presented with a non ST segment elevation acute myocardial infarction. Pre-transfer catheterization demonstrated a heavily calcified, 90% distal left main stenosis with an occluded left internal mammary artery graft to the left anterior descending coronary artery. To minimize the risk of bleeding requiring a blood transfusion, a coronary rotational atherectomy via a TR was performed. A non-hydrophilic, 7Fr sheath was used to accommodate the larger rotational atherectomy burr sizes. The coronary procedure was successful, but the sheath removal was complicated by significant resistance to pullback while the patient complained of severe pain. Post procedure she developed a hematoma with motor and neurological deficits of her hand.

**Results:** Emergent surgical exploration with fasciotomy was planned. The radial artery was explored and found to be redundant and pulseless, prompting proximal evaluation and revealing complete avulsion of the radial artery at its origin. An intraoperative arteriogram revealed that the brachial and ulnar arteries and interosseous branches were patent and filled the palmar arch and surgical ligation of the radial artery was conducted.

**Conclusion:** Vascular surgeons need to be aware of potential complications related to TR which are likely to increase as this method is more widely disseminated.



## Full Program & Abstracts

4:56 pm – 5:04 pm

36 (CR)

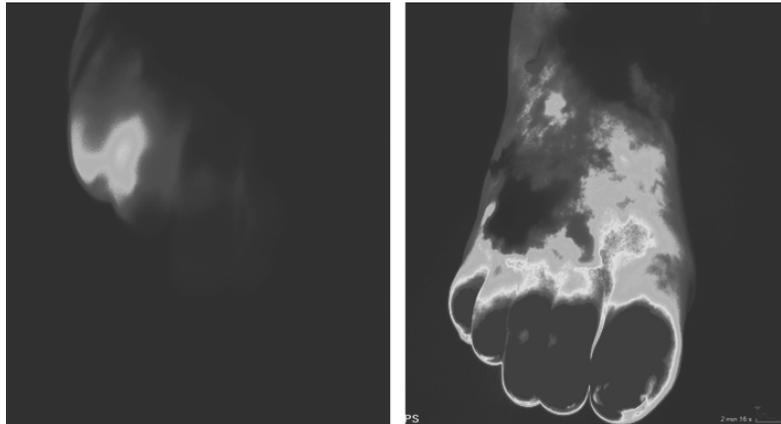
### **Indocyanine Green Angiography Aids Prediction of Limb Salvage In Vascular Trauma**

Peter H. Connolly, Andrew J. Meltzer, Jason Spector\*,  
Darren B. Schneider - Weill Cornell Medical College, New  
York, NY

**Objectives:** In cases of severe vascular trauma, traditional means for assessing viability using doppler and angiography can have limited application. Indocyanine green angiography (ICGA) allows a rapid qualitative assessment of tissue perfusion that serves as an important adjunct to these traditional methods, which can be particularly helpful in guiding therapy.

**Methods/Results:** We present a case of a complicated ankle fracture with severe vascular compromise, which illustrates the role of ICGA as an assessment tool to guide therapy and decision-making in cases of acute limb threat. ICGA using the SPY system (Novadaq) was performed as part of our initial assessment to evaluate the extent of malperfusion and potential for revascularization. Pre-procedure imaging with ICGA showed very limited uptake in the foot. Treatment was also performed with traditional angiography and infusion of intra-arterial nitroglycerin into the posterior tibial artery. Post-procedure imaging with ICGA was performed a day later and showed marked difference in the perfusion profile, with rapid uptake into the forefoot and toes, which corresponded with the patient's clinical improvement. The patient went on to have complete limb salvage.

**Conclusion:** The addition of ICGA for assessment of tissue perfusion in cases of complex vascular trauma has several implications: it guides surgical therapy for excision of devitalized tissue and aids in decision-making for major considerations such as revascularization efforts or amputation.



PRE

POST

# Full Program & Abstracts

5:04 pm – 5:12 pm

37 (RF)

## **Facilitating Bedside Placement of Vena Cava Filter (VCF) With Electromagnetic Guidance**

Ali Irshad, Cassidy Duran, Alan B. Lumsden, Jean Bismuth - Houston Methodist Hospital, Houston, TX

**Introduction/Objectives:** VCF placement for trauma patients is increasing 13% annually. Critical condition of these patients frequently warrants exigent placement of VCFs at bedside. Electromagnetic navigation systems provide a bedside alternative to fluoroscopic imaging. With a novel proprietary guidewire and 3D electromagnetic navigation system, our group explored an alternative modality for reliable placement of VCFs at bedside with goals of precision and freedom from X-ray.

**Methods:** Swine was placed in supine position, sedated and draped. Standard right femoral vein access was achieved. VCFs were placed using two methods:

1. A DynaCT dicom data set, analogous to pre-procedural CTA, was converted to a 3D map to guide placement of the first VCF.
2. A “touch-mapping” technique using a sensed navigation guidewire and custom software to create a 3D map of the anatomy was used to deliver a second VCF without a pre-procedural CTA.

For both techniques, a 3D navigation system was used to advance a sensed guidewire to a desired location below the right renal vein. The filter was advanced over the guidewire and subsequently deployed.

**Results:** Successful placement of both filters was confirmed with fluoroscopy. No fluoroscopy was used for VCF placement. Each VCF was delivered in less than 4 minutes. The 3D anatomical map facilitated faster IVC placement than touch mapping because less time was spent interrogating the vena cava.

**Conclusion:** This novel method of IVC placement has compelling utility. Our team was able to accurately place two different VCFs, indicating transferability of the method. Intuitive and accurate placement of VCF without contrast imaging is feasible under EM guidance. Moreover, the EM method minimizes transport of critically ill patients and radiation exposure of patient and physician, and could provide a new standard for bedside VCF placement.

## Full Program & Abstracts

5:12 pm – 5:24 pm

38

### **Stent Stress Across Joint Spaces: Comparison of Distal SFA To Popliteal**

Inkyong Kim, Jeffrey J. Siracuse, Heather Gill, Zhen Huang, Andrew J. Meltzer, Darren B. Schneider, Peter H. Connolly - NY Presbyterian-Cornell University, New York, NY

**Introduction & Objectives:** Insertion of stents across the joint spaces, especially retrogeniculate popliteal artery, is frequently avoided due to the belief that movement across this area would lead to stent kinking/fracturing. In comparison, stents are frequently deployed across the distalSFA, which physiologically may have more significant stress.

**Methods:** A retrospective review of a prospectively maintained institutional database of all endovascular interventions from 2005-2010 was performed. All distalSFA stent interventions were compared with popliteal stent interventions. T-test, Fisher exact, and Kaplan-Meier curves were performed. Angiograms were performed with knees flexed at 45degrees to delineate the area of physiologic stress.

**Results:** A total of isolated 89 distalSFA and 51 popliteal lesions were treated. Of these, 77.5% of the distalSFA lesions were treated via stent, versus only 45.1% of the popliteal lesions via stent. Kaplan-Meier curve of primary patency showed a trend toward worse outcomes of the distalSFA segment compared to popliteal or any other SFA segments. However, there was no statistically significant difference in primary patency between the two segments at 6months (distalSFA  $80.9 \pm 5.2$  vs popliteal  $87.5 \pm 8.3$ ), 12months ( $66.3 \pm 6.6$  vs  $63.6 \pm 13.2$ ), or 18months ( $58.9 \pm 7.1$  vs  $53.0 \pm 14.7$ ). Similar results were found for primary assisted and secondary patency. The angiogram of the arteries with knee flexion showed stent kink at distalSFA segment and unaffected popliteal segment.

**Conclusions:** There is no significant difference in the outcome with stents across the popliteal versus the distalSFA, although there is trend toward worse outcomes for distalSFA. Further, flexion angiogram shows stent kink stress across the distalSFA and not the popliteal segment. Therefore, avoiding stent of the popliteal segment is not warranted, and employment of modalities such as cryoplasty or atherectomy, which have worse outcomes in inexperienced hands, to avoid stenting, is not warranted.

## Full Program & Abstracts

5:24 pm – 5:36 pm

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### **Brachial Artery Stiffness Is Associated With Lower Endothelium-Driven Vasodilation**

Joy Walker\*, Christopher Owens\*, Hugh Alley\*, Marlene Grenon, Joseph Rapp\*, Warren Gasper\* - University of California San Francisco, San Francisco, CA

**Introduction & Objectives:** Arteriovenous fistulas (AVF) are the most durable method of permanent hemodialysis access yet only 50% mature sufficiently to initiate high quality hemodialysis. Beyond arterial or venous morphometrics, factors associated with maturation are poorly understood. We hypothesized that physiological parameters including endothelial function and vascular stiffness would be important in AVF maturation.

**Methods:** Prospective cohort study of patients undergoing upper extremity AVF. Preoperative measurements included patient characteristics, central and brachial arterial stiffness using applanation tonometry and endothelium-dependent vasoreactivity using flow-mediated vasodilation (FMD) testing. AVF maturation was assessed at 3 months.

**Results:** Twenty-three patients were enrolled. Median follow-up was 87 days (IQR 65-98.5) and 3 patients were lost to follow-up. 91.3% of patients were men, 65.2% were white, 69.6% were diabetic and 39.1% were on dialysis at the time of AVF creation. There were 9 radiocephalic and 14 brachiocephalic/basilic AVFs. Median hsCRP was 15.3mg/L (IQR 0.95-17.7). Mean arterial stiffness (Aix) was  $23.4\% \pm 10\%$ . The mean FMD was  $5.0\% \pm 4.4\%$  (healthy controls 10-12%), with brachial artery diameter increasing from  $4.0 \pm 0.8\text{mm}$  to  $4.3 \pm 0.9\text{mm}$ , blood flow increasing from  $100 \pm 51\text{ml/min}$  to  $368 \pm 222\text{ml/min}$  and shear stress increasing from  $10 \pm 5\text{dyne/cm}^2$  to  $32 \pm 14\text{dyne/cm}^2$ . Stiffer arteries (higher Aix) were significantly associated with lower reactive hyperemia velocity ( $p=.047$ ) and lower reactive hyperemia wall shear stress ( $p=.014$ ). There was a trend toward a lower absolute change in flow velocity from baseline to hyperemia ( $p=.074$ ). There was no correlation between arterial stiffness and FMD. The maturation rate was 52.2%.

**Conclusions:** Renal failure is associated with increased brachial and central arterial stiffness and impaired endothelial function. With a high prevalence of endothelial dysfunction, AVF maturation may be driven more by geometric changes related to inflammation and pressure than endothelium-dependent dilatation. Arterial stiffness is inversely proportional to reactive hyperemia velocity, but further study is needed correlate these physiologic parameters with outcome.

## Full Program & Abstracts

5:36 pm – 5:48 pm

40

### **The Evidence for Non-Operative Management of Isolated Visceral Artery Dissection - A Single Center Experience**

Sean Alcantara, Jordan Sasson, Selena Goss, John Lantis, II, George Todd - St. Luke's Roosevelt Hospital Center, New York, NY

**Introduction:** Visceral artery dissection (VAD) is an uncommon condition encountered by clinicians. Presentation may vary from asymptomatic to acute intestinal ischemia, although a clear natural history has yet to be elucidated. No consensus exists on how best to manage these patients in the absence of true intestinal ischemia, however much of the literature suggests that intervention is required. We present our institution's experience with ten patients, both symptomatic and asymptomatic, all but one of whom was managed medically.

**Methods:** From September 2009 to August 2013, ten patients presented to our institution with celiac or mesenteric artery dissection. We retrospectively reviewed these patients' clinical presentation, treatment, and follow up.

**Results:** The mean age of the patients was  $61.5 \pm 10.3$  (SD) years (range, 41-77 years) and the mean follow-up period was  $10.6 \pm 10.8$  (SD) months (range, 0.5-31 months). Four (40%) patients had abdominal pain and no ischemic changes of the bowel. There were 1 type I, 6 type II, 2 type III, and 1 type IV dissections according to Sakamoto's classification. Treatments included observation without anticoagulation treatment in 8 patients (80%), anticoagulation treatment in 1 patient (10%), and endovascular stenting in one patient (10%) with unremitting abdominal pain. Anticoagulation was used in the one symptomatic patient with radiographic evidence of associated thrombus. The disease stabilized in all patients during follow-up.

**Conclusions:** Most authors tend to advocate an endovascular or even operative repair for these processes. In our experience, most of these patients have a self limited course of symptoms or their dissections are found incidentally. We believe the results of conservative management in our cohort of patients, one of the largest reported of this disease, support the conservative approach over the once recommended operative repair.

7:00 pm – 10:00 pm

### **PRESIDENT'S DINNER**

Separate Subscription - Tickets Required

# Full Program & Abstracts

## Sunday, February 2, 2014

6:30 am – 7:00 am	Continental Breakfast
6:30 am – 9:00 am	Registration
<b>7:00 – 9:00 am</b>	<b>SCIENTIFIC SESSION V</b> Moderators: Mark Conrad, MD & Ravi Veeraswamy, MD
7:00 am – 7:12 am	41 <b>Analysis of Upper Extremity Arterial Duplex Indications May Reveal Potential Cost Savings</b> Mounir J. Haurani, Bhagwan Satiani - The Ohio State University, Columbus, OH

**Introduction & Objectives:** There has been constant pressure on Vascular Laboratories (VL) through reduced reimbursement. In this environment cost reduction is increasingly necessary. There have been attempts to publish guidelines for appropriate non-invasive testing, while others have attempt to reduce unnecessary and after-hours venous duplex testing. Little has been written regarding upper extremity duplex (UED) and reduction of unnecessary testing.

**Methods:** We queried our database for UED performed between 2006-2013. We excluded test for which the indication listed was unrelated to the test or if an indication was not clearly noted. UED were then separated based on these indications into Symptoms or Objective findings, and then further subcategorized into more specific indications (Table). The indication and the results were categorized as positive (abnormal) or negative (normal). Statistical analysis was performed with Chi Squared for nominal categorical data.

**Results:** 368 of the 475 UED were available for analysis. Overall, 35% of UED were abnormal. There was no difference when categorized broadly into Symptoms or Objective indications (32% vs. 37%,  $p=0.4$ ). When subdivided into more specific indications, differences were noted in the percent of positive UED (Table). Patients who had findings such as pulse deficit or bruit had the highest rate of positive UED. Those tested for presumed complications had the lowest rates (Table  $p<0.001$ ).

**Conclusions:** UED is more often abnormal in patients who have objective findings on physical examination then symptoms, pre-existing diagnosis of vascular disease, or presumed complications. With 65% of UED reported as normal, further analysis of the patient characteristics that did have positive studies, we can reduce the number of negative UED performed, therefore decreasing VL costs.

## Full Program & Abstracts

<b>Indication</b>	<b>Negative (Normal)</b>	<b>Positive (Abnormal)</b>	<b>Total</b>	<b>% Positive (Abnormal)</b>
Physical Exam (Bruit / Pulse Deficit)	5	18	23	<b>78%</b> <b>(p&lt;0.001)</b>
Complications or Hematoma	56	17	73	23%
Vascular Hemodialysis Access Complications	55	31	86	36%
Symptoms (blue fingers, cold hands etc.)	69	32	101	32%
Diagnosis of Vascular Disease	53	32	85	38%
<b>Total</b>	<b>238</b>	<b>130</b>	<b>368</b>	<b>35%</b>

# Full Program & Abstracts

7:12 am – 7:24 am

42

## Remote Stroke Is Associated With Worse Survival In Patients With Asymptomatic Carotid Artery Stenosis Treated Medically

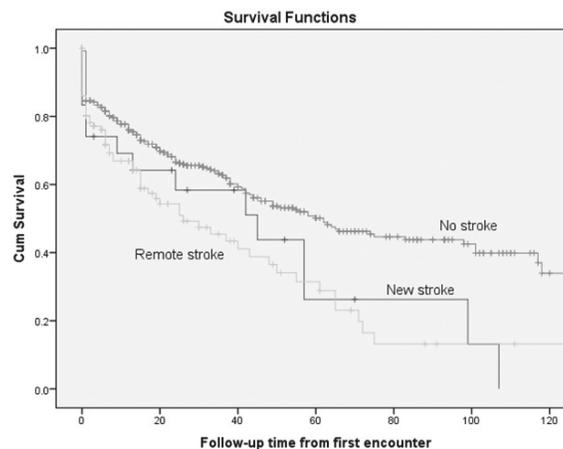
Shonak Patel, Zdenek Novak\*, Ryan Corrick\*, Joseph Karam\*, Thomas C. Matthews, Benjamin J. Pearce, Marc A. Passman, Mark A. Patterson, William D. Jordan, Jr. - University of Alabama at Birmingham, Birmingham, AL

**Introduction & Objectives:** Surgical therapy for asymptomatic carotid artery stenosis (ACS) remains controversial. While prior clinical trials confirm superiority of endarterectomy over medical therapy, recent reports have suggested improved medical therapy may be superior to endarterectomy. This study is designed to assess stroke rate and mortality in medically managed ACS patients.

**Methods:** A vascular database was queried for medically treated ACS patients between 1995-2012. We identified 868 patients who had at least 2 outpatient encounters with non-invasive imaging. Patients with stroke within 6 months before first visit were excluded; patients with stroke >6 months were classified as a remote stroke (RS). Significance and predictive values were assessed by Cox proportional hazards regression. KM plots were used to compare survival.

**Results:** Of 868 patients with ACS, 15.8% patients (138/868) had a documented stroke >6 months before their first encounter, 2.9% patients (26/868) had a stroke documented after their first encounter (new strokes, NS). Only 53.8% (14/26) of the NS occurred ipsilateral to the most severe carotid stenosis. The 30-day mortality after the first visit was 1.4% patients (2/138) with RS, 0% for NS, and 0.7% (5/699) with no stroke. The 3 year mortality beyond the date of first visit was 26.1% (36/102) with RS, 15.3% patients (4/26) with a NS and 14.5% patients (102/602) with no stroke. Univariate Cox regression revealed that stroke likelihood increases with PSV severity ( $p=0.001$ ). KM analysis demonstrates marginally better survival among patients experiencing NS compared to RS and the best survival for no-stroke patients (Log Rank  $p<0.001$ ).

**Conclusions:** Patients managed medically for ACS have better survival risk compared to those that have a remote history of stroke and are medically treated.



## Full Program & Abstracts

7:24 am – 7:36 am

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### **Endovascular Repair In Patients With Acute Mesenteric Ischemia Presenting With Lactic Acidosis**

Robert Beaulieu\*, Joshua C. Grimm\*, Christopher J. Abularrage, David T. Efron\*, Shalini Selvarajah\*, James H. Black, III - Johns Hopkins Hospital, Baltimore, MD

**Introduction & Objectives:** In the setting of acute mesenteric ischemia (AMI), lactic acidosis has been used as a surrogate for at-risk or necrotic bowel. The role of endovascular therapy in patients with lactic acidosis has not been well elucidated and thus its role as an initial management strategy remains controversial. Therefore, we sought to examine the results of endovascular therapies in patients with lactic acidosis in the setting of AMI.

**Methods:** The Nationwide Inpatient Sample (NIS) was examined for patients presenting with acute mesenteric ischemia (557.9) between the years 2005-2009. Patients were included if they presented urgent/emergently and underwent subsequent endovascular therapy. Patients were then grouped into cohorts according to the presence of lactic acidosis. The primary outcome measure was in-hospital mortality. Secondary outcomes included need for bowel resection, TPN administration, and length of stay.

**Results:** During the study period, 663 AMI patients met inclusion criteria. Of these patients, 74 (11.2%) were determined to have lactic acidosis. The two cohorts did not differ significantly in emergent admission status (75.6 vs. 77%,  $p=0.9$ ) or the presence of comorbidities. Patients with lactic acidosis were found to have an increased mortality compared to patients without lactic acidosis (47.1% vs. 20.8%,  $p=0.029$ ). Despite a significantly shorter time from admission to intervention (0.3 vs. 2.2 days,  $p < 0.001$ ), the lactic acidosis and no lactic acidosis cohorts did not differ in rates of bowel resection (19.8 vs. 12.4%,  $p=0.41$ ), TPN administration (23.1% vs. 14.1%,  $p=0.382$ ) or mean length of stay (11.4 days vs. 13.6 days,  $p=0.54$ ).

**Conclusions:** The presence of lactic acidosis in patients with AMI was not associated with significant change in bowel related outcomes. As endovascular intervention for AMI in patients with lactic acidosis was associated with significantly increased mortality, endovascular interventions should be considered cautiously as a primary therapeutic strategy.

# Full Program & Abstracts

7:36 am – 7:48 am

44

## **Popliteal Endarterectomy For Segmental Popliteal Disease**

Hosaam Nasr\*<sup>1</sup>, Simon Hobbs\*<sup>2</sup>, Chandra Abrew\*<sup>1</sup> -

<sup>1</sup>Russells Hall Hospital, Walsall Manor Hospital, Birmingham, United Kingdom; <sup>2</sup>Russells Hall Hospital, Birmingham, United Kingdom

**Introduction & Objectives:** The incidence of segmental popliteal disease (SPD) is rare. Currently, patients presenting with symptomatic SPD are offered femoro-popliteal or tibial bypass, if the disease is not amenable to radiological intervention. We feel that popliteal endarterectomy through posterior approach with patch angioplasty as a primary procedure is a viable surgical option. This approach has many advantages. It enables full exposure of the vessel and its surrounding structures and preserves the long saphenous vein, which could be used in secondary revascularisation procedure in the event of re-occlusion. We aim to assess the durability of popliteal endarterectomy in patients with SPD, which is not amenable to radiological intervention.

**Methods:** This was a retrospective review of all patients who underwent popliteal endarterectomy for SPD in our institution in past 3 years. All patients underwent a pre-operative assessment with CTA. Angioplasty was attempted in all patients prior to surgical intervention. Patency was assessed radiologically 6 weeks post-op. Patients were followed up routinely at 6 weeks, three months, six months and a year following surgery.

**Results:** A total of seven patients (5 men and 2 women) underwent popliteal endarterectomy. Mean age was 67.3 years, with a mean follow up period of 9.9 months (range 2-26 months). 4 patients were treated for activity limiting claudication (<100 yards) and 3 patients were treated for ischaemic rest pain. The procedural success rate was 100% without mortalities or in hospital morbidities. Symptomatic resolution was achieved in 6 patients. One patient occluded 1 month following endarterectomy, due to a critical stenosis at the tibial bifurcation.

**Conclusion:** Popliteal endarterectomy through posterior approach is advantageous in managing popliteal artery pathology restricted to the popliteal fossa. It is safe with good short-term results.

## Full Program & Abstracts

7:48 am – 7:56 am

45 (CR)

### **A Limitation of Endovascular Repair of Traumatic Pelvic Arteriovenous Fistula**

Justin Hurie, Edward Hal Kincaid\*, Kimberley J. Hansen -  
Wake Forest University, Winston-Salem, NC

**Introduction:** We describe a case report illustrating the limitations of an endovascular approach to repair of a large pelvic arteriovenous fistula. There have been case reports advocating the use of endovascular repair for arteriovenous fistulae.

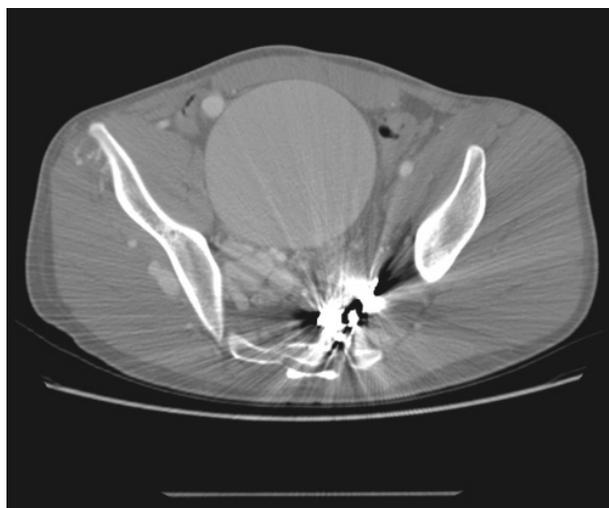
**Methods:** A 30 year old male sustained a transpelvic gun-shot wound in 2001 and underwent a small bowel resection, colon repair and ligation of the right hypogastric artery. On follow up five years later, the patient was experiencing symptoms of shortness of breath and was found to an arteriovenous fistula. The patient underwent embolization of the IMA. On subsequent imaging, the patient was found to have continued venous aneurysm enlargement and recruitment of additional feeding vessels. Despite two additional attempts at embolization, the patient had continued growth of the venous aneurysm. Under circulatory arrest, the patient underwent open repair involving oversewing of the fistula and graft interposition replacement of the right iliac venous aneurysm.

**Results:** The patient recovered well and had no evidence of recurrent fistula on subsequent imaging. The patient reports increased energy and less shortness of breath.

**Conclusion:** There has been great enthusiasm for endovascular repair of pelvic arteriovenous fistulae. While this may be an acceptable initial strategy, there are still patients that will require open repair.



## Full Program & Abstracts



## Full Program & Abstracts

7:56 am – 8:04 am

46 (CR)

### **Mycotic Popliteal Aneurysm Rupture As A Consequence of Campylobacter Fetus Infection**

Barbara Melendez\*<sup>1</sup>, Harris W. Hollis, Jr.\*<sup>1</sup>, Thomas F. Rehring<sup>2</sup> - <sup>1</sup>Exempla St. Joseph Hospital, Denver, CO; <sup>2</sup>Colorado Permanente Medical Group, Denver, CO

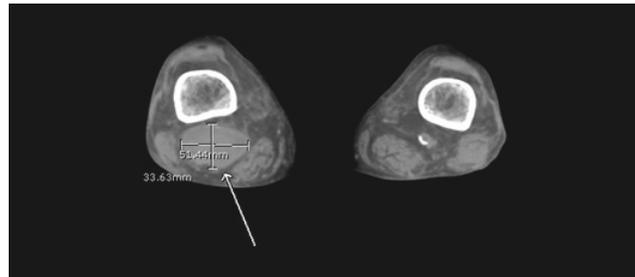
**Introduction & Objectives:** Mycotic aneurysms of the popliteal artery are uncommon. Popliteal aneurysms rarely rupture. The authors present the second reported case of popliteal arterial rupture as a result of Campylobacter fetus infection. This report confirms the arterial destructive potential of C.fetus infection in a peripheral artery.

**Methods:** An 85 yo male who had previously undergone endovascular abdominal aortic aneurysm repair (EVAR) in 2007, presented with positive blood cultures for Campylobacter fetus. No endocarditis was detected. No peri-prosthetic fluid to suggest aortic endograft infection was present. During hospitalization for sepsis he developed acute right knee pain and swelling. A 5.2cm popliteal aneurysm, with contained rupture, was found on ultrasound and confirmed by CT and angiography (Figure 1). Recommendations for treatment and a literature review are provided.

**Results:** This patient was successfully managed with total excision of the aneurysm via a posterior approach with reconstruction through a medial approach using autologous saphenous vein bypass (Figure 2). Culture directed antibiotic therapy (6 weeks of intravenous ertapenem) to eradicate the pathogen completed the therapy. The patient is doing well at 18 month follow up.

**Conclusions:** Mycotic popliteal aneurysm is a rare but potentially fatal condition. Medical management in the form of antibiotics alone has proved ineffective. Isolating Campylobacter fetus should alert the surgeon to the peripheral arterial destructive potential of this pathogen, as manifested by acute rupture in this patient. Traditional resection through a posterior approach and revascularization through non contaminated tissue with culture directed therapy is the treatment of choice.

## Full Program & Abstracts



## Full Program & Abstracts

8:04 am – 8:12 am

47 (CR)

### **External Carotid Artery Angioplasty and Stent For Symptomatic External Carotid Artery Stenosis and Ipsilateral Internal Carotid Artery Occlusion**

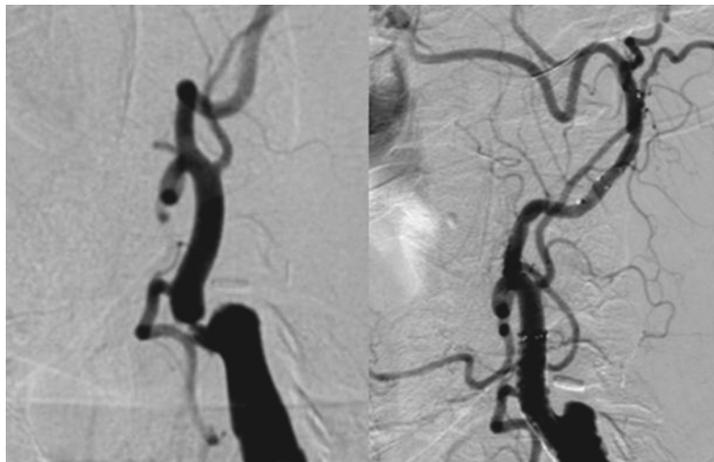
Michael Williams\*, Juan Carlos Correa, Richard C. Pennell - Saint Louis University, Saint Louis, MO

**Introduction:** Symptomatic ipsilateral carotid artery occlusion with external carotid artery stenosis is a rare disease that requires individualized care and special considerations. In the presence of ICA occlusion, the contralateral extracranial vasculature becomes the focus of attention to determine adequate cerebral perfusion. The ipsilateral external carotid artery may supply up to 15% of flow to the middle cerebral artery when the internal carotid artery is compromised, and if it has flow limiting stenosis it should become a consideration for treatment. If an endovascular approach is sought we believe that it may necessitate the same embolic protection considerations that would be applied to revascularization of the ICA.

**Methods:** We present a case report of a 10 year follow up of angioplasty and stent placement of the external carotid artery for symptomatic transient ischemic attacks in a 70 year old woman. She had TIA's ipsilateral to an ICA occlusion with contralateral severe stenosis. She continued to have TIA's after contralateral ICA stent and only became asymptomatic after the ECA was stented. The use of an embolic protection device for angioplasty of the external carotid artery to our knowledge has not been described in the literature.

**Results:** Treatment of external carotid artery stenosis with ipsilateral ICA occlusion with angioplasty and stent deployment under embolic protection device provided has provided a durable and safe treatment option.

**Conclusions:** We advocate revascularization of the external carotid artery in the setting of ICA occlusion in the symptomatic patient. It is our practice to always utilize an embolization protection device when manipulating the cerebral vasculature. There is proven benefit of this practice but no paper exists in this particular setting.



## Full Program & Abstracts

8:12 am – 8:24 am

48

### **Blunt Aortic Injuries: The Impact of Associated Injuries**

Sara Mijal\*<sup>1</sup>, Rachael Nicholson<sup>1</sup>, Parag Patel<sup>2</sup>, Brian Lewis<sup>2</sup>

- <sup>1</sup>University of Iowa, Iowa City, IA; <sup>2</sup>Medical College of Wisconsin, Milwaukee, WI

**Introduction & Objectives:** The presence of associated injuries is a well-accepted indication for delayed repair of blunt aortic injury. However, the injuries of highest risk for poor outcome are poorly defined. Our goal is to identify the patients at high risk for death, prolonged hospital stay, or discharge other than to home.

**Methods:** We performed a retrospective chart review of all patients seen at two Level I trauma centers with blunt aortic injury over a 5 year period. Outcomes measured included length of ICU and hospital stay, discharge disposition, and survival. Data was analyzed to determine the influence of associated injuries.

**Results:** 85 patients were identified. None of the associated injuries conferred an increased risk of death. Patients with head injuries ( $p=0.048$ ), pelvic injuries ( $p=0.036$ ), major orthopedic extremity injuries ( $p=0.028$ ) and "other" injuries (mostly spinal injuries,  $p=0.014$ ) were less likely to be discharged to home. Patients with bowel ( $p=0.0015$ ) or solid organ injuries ( $p=0.041$ ) and those undergoing bowel ( $p=0.0047$ ) or abdominal ( $p=0.0006$ ) procedures were more likely to have longer hospital stays. Patients with head ( $p=0.0348$ ) and bowel ( $p=0.025$ ) injuries and those undergoing solid organ ( $p=0.0505$ ) or abdominal ( $p=0.0208$ ) operations had longer ICU stays. Median ISS scores were 33 in survivors versus 35 in those who died, and 29 in those discharged to home versus 36 in those not discharged to home.

**Conclusions:** A single category of associated injuries did not increase mortality risk, so multiply injured patients should be offered aggressive treatment. Patients with head or orthopedic injuries had increased need for placement after their hospital stay, perhaps due to need for prolonged intensive physical therapy. Conversely, those with bowel or GI injury or surgery spent more of their recovery time as an inpatient. Both of these play important roles in patient counseling and expectations.

# Full Program & Abstracts

8:24 am – 8:36 am

49

## **Outcomes and Declining Use of Iliac Conduit In Endovascular Management of Aortic Pathology**

Fernando D. Carlo\*, Salvatore T. Scali\*, Thomas S. Huber\*, Alyson Waterman\*, Adam W. Beck\*, Robert J. Feezor - University of Florida, Gainesville, FL

**Introduction & Objectives:** Aortic pathology is being treated mostly with an “endo first” approach in the majority of practices. The initial challenge is the delivery of the endograft, classically trans-femorally. Iliac conduit(IC) usage was commonplace early in the EVAR experience, and exhibited resurgence in the TEVAR experience, but seems to have declined of late. We sought to determine the incidence and outcomes of IC creation in the endovascular repair of aortic pathology.

**Methods:** We performed a retrospective review of a prospectively maintained database of all endovascular aortic repairs performed at a single institution from July 1, 2000 until June 30, 2013. Procedures for whom an IC was created were identified and perioperative outcomes were analyzed.

**Results:** Over the 13 years, 1765 endovascular aortic procedures were performed, including 994 EVARs (56%) and 771 TEVARs (44%). Among these, 58(5.8%) of EVARs and 97(12.6%) of TEVARs required an IC, for an overall conduit usage rate of 8.8%. This rate was 5.0%, 4.1%, and 3.4% among 139, 146, and 145 endovascular aortic procedures in the final three years of the study period. The mean overall operating room time was 220±107 minutes and the mean estimated blood loss was 445±421 mL. Among patients requiring IC, complications included respiratory failure(N=15,9.7%), spinal cord ischemia(N=9, 5.8%), stroke(N=6, 3.9%), and renal insufficiency(N=4, 2.6%). Six patients had a surgical wound infection clinically(3.9%), and a total of 29 patients required post-operative transfusions(18.7%). Nineteen patients(12.3%) required a secondary surgical procedure. The average post-operative length of stay was 7.1±8.9 days. In this subset, there was a 7.1% in-hospital/30-day mortality (N=3,5.2% EVAR, N=8,8.2% TEVAR).

**Conclusions:** Although relatively well-tolerated, the usage of iliac conduits to facilitate delivery of an aortic endograft seems to be declining. Potential reasons include surgeon experience, smaller device/sheath profiles, and adjunctive techniques to facilitate passage of the device.

# Full Program & Abstracts

8:36 am – 8:48 am

50

## Peripheral Embolectomy Remains Associated With Significant Mortality Among the Elderly

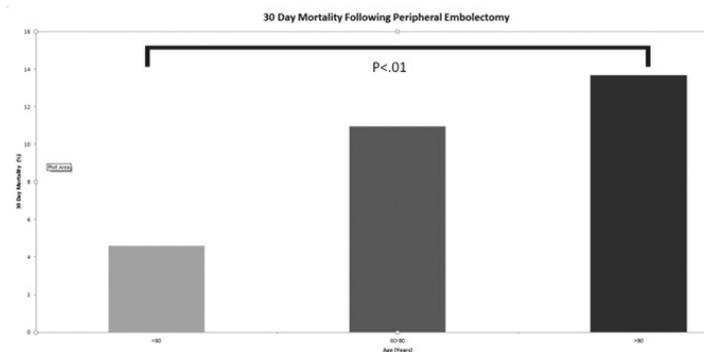
Samuel T. A. Simone<sup>\*1</sup>, Randall R. DeMartino<sup>\*2</sup>, Philip P. Goodney<sup>1</sup>, Brian W. Nolan<sup>1</sup>, Jessica Wallaert<sup>\*1</sup>, Daniel B. Walsh<sup>\*1</sup>, David H Stone<sup>\*1</sup> - <sup>1</sup>Dartmouth-Hitchcock Medical Center, Lebanon, NH; <sup>2</sup>Mayo Clinic, Rochester, MN

**Introduction & Objectives:** Though peripheral surgical embolectomy is perceived to be a low magnitude operation, elderly patients often experience significant perioperative morbidity and mortality. This study sought to examine the impact of age on outcomes of embolectomy.

**Methods:** All patients undergoing peripheral surgical embolectomy from 2005-2010 within the American College of Surgeons NSQIP were identified. The primary study endpoint was 30-day mortality. Additional endpoints included myocardial infarction (MI), renal failure, and cardiac arrest. Multivariate logistic regression was used to identify factors associated with 30-day mortality.

**Results:** Over the study interval, 3162 patients underwent upper(N=935) and lower extremity(N=2227) embolectomy. Thirty day mortality for those greater than 80 was nearly 3-fold higher than in patients less than 60(13.7% vs 5%,  $p<0.01$ ). Rates of acute renal failure, pneumonia, and cardiac arrest were not significantly different among age groups, though there was a trend toward increased MI in the oldest cohort compared to those under 60(2% vs 0.69,  $p=0.08$ ). Multivariate logistic regression revealed that age greater than 80 was independently associated with increased 30-day mortality(OR 3.4, 2.0-5.8  $p<0.01$ ). Additionally, disseminated cancer was associated with a 7-fold increased risk of perioperative mortality(OR 7.4, CI 4.0-13.6  $p<0.01$ ).

**Conclusions:** Though a low magnitude procedure, peripheral embolectomy remains associated with significant perioperative mortality when performed in the oldest old. This finding was amplified when performed in the setting of malignancy. Accordingly, these findings may facilitate appropriate expectations surrounding clinical outcomes among the elderly with peripheral embolic complications.



9:00 am

Meeting Adjourns