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Delaware Valley Vascular Society
9400 W. Higgins Rd., Suite 315, Rosemont, IL 60018
Telephone: 312-334-2321 · Fax: 312-334-2320
Email: DVVS@vascularsociety.org · www.vascular.org/dvvs
The purpose of this meeting is to present state-of-the-art clinical research and vascular biology relating to surgical aspects of vascular disease. The program will include presentations of original research by investigators in the field of Vascular Surgery and other areas of practice building. A significant portion of the program has been reserved for question and answer interaction between the presenters and the audience.
PROGRAM OBJECTIVES
At the end of this activity, participants will be able to:

1. Discuss strategies in management and use of outpatient vascular lab, wound care center, outpatient angiography suite;
2. Recognize importance of radiation safety and implement changes to minimize radiation exposure;
3. Evaluate and discuss advanced open and endovascular surgical treatment options for rare arterial and venous aneurysms;
4. Review novel endovascular techniques for treatment of peripheral artery disease and bypass grafts;
5. Describe thoracic outlet syndrome (venous, neurogenic) anatomic variations and management;
6. Manage complex aortic pathology with unique open and endovascular surgical approaches.

CONTINUING MEDICAL EDUCATION CREDIT INFORMATION
Accreditation
This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of American College of Surgeons and the Delaware Valley Vascular Society. The American College of Surgeons is accredited by the ACCME to provide continuing medical education for physicians.

AMA PRA Category 1 Credits™
The American College of Surgeons designates this live activity for a maximum of 5.50 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Disclosure
In accordance with the ACCME Accreditation Criteria, the American College of Surgeons must ensure that anyone in a position to control the content of the educational activity (planners and speakers/authors/discussants/moderators) has disclosed all financial relationships with any commercial interest (termed by the ACCME as "ineligible companies", defined below) held in the last 24 months (see below for definitions). Please note that first authors were required to collect and submit disclosure information on behalf all other authors/contributors, if applicable.

BEST TRAINEE AWARD
Abstracts presented by our trainees will be eligible for the Clinical Research Award and Basic Science/Case Report Award.

DVVS members will conduct the review and scoring of these presentations. Please complete the score sheet and return them to the registration counter by 5:00 pm. There will be monetary awards and certificates presented to each winner at the evening’s dinner.
Delaware Valley Vascular Society  
44th Annual Meeting  
Thursday, April 14, 2022  
The Union League of Philadelphia

**SCIENTIFIC PROGRAM**

11:00 am  
**Welcome**  
Evan Ryer, MD, President, Delaware Valley Vascular Society

11:05 am - 12:30 pm  
**Rapid Fire Case Presentations**

11:05 - 11:12 am  
**Successful Open Repair of Bilateral Iliac Artery Aneurysms with Preservation of Pelvic Arterial Inflow in a Patient Presenting with Nephrolithiasis: A Case Report**  
Jake MacDonald, BS, Daniela Medina, BS, Cole, MD, Faisal Aziz, MD  
_Penn State College of Medicine_

11:12 - 11:19 am  
**Mycotic Common Carotid Pseudoaneurysm Secondary to Direct Heroin Injection to Neck**  
Luis Mejia Sierra, MD, Casey Patterson, MD, Emmanuel Nwachuku, MD, Danielle M. Pineda, MD, FACS  
_Abington Jefferson Health_

11:19 - 11:26 am  
**Successful Repair of Right Common Iliac Artery Aneurysm in Patient with Aneurysmal Degeneration of Chronic Type B Aortic Dissection**  
Jayne Rice, MD, Jaclyn Milici, DO, Domingo Uceda, MD, Nathan Belkin, MD, Benjamin Jackson, MD, Scott Damrauer MD  
_Hospital of University of Pennsylvania_

11:26 - 11:33 am  
**Nutcracker Syndrome Treated Successfully with Gonadal Vein Transposition**  
Emmanuel Nwachuku, MD, Aditya Das, MD, Luis Mejia Sierra, MD, Casey Paterson, MD, Danielle Pineda MD, FACS  
_Abington Jefferson Health_

11:33 - 11:40 am  
**May-Thurner Syndrome Causing Phlegmasia Cerulea Dolens in the Setting of Pregnancy**  
Christopher Cappellini, DO, Hong Zheng, DO, Renganaden Sooppan, MD, Robert Luo, DO, Kathleen Lamb, MD  
_Reading Hospital Tower Health_

11:40 - 11:47 am  
**Endovascular Repair of an Anastomotic Thoracoabdominal Aneurysm in a Patient with Marfan Syndrome**  
Matthew F. Carpinello, MD, Callie E. Dowdy, MD, Douglas A. Troutman, DO, Keith D. Calligaro, MD, Matthew J. Dougherty, MD  
_Pennsylvania Hospital_
11:47 - 11:54 am  Aortic Surgery with a Twist: Open Treatment of 1A Endoleak due to Extreme Tortuosity  
Callie E. Dowdy, MD, Matthew Carpiniello, MD, Matthew J. Dougherty, MD, Keith D. Calligaro, MD, Douglas A. Troutman, DO  
Pennsylvania Hospital

11:54 am - 12:01 pm  Treatment of Mycotic Femoral Pseudoaneurysm due to Primary Salmonella Arteritis  
Joseph Yoo, MD, Nadia Awad, MD, Evan Deutsch, MD, Rashad Choudry, MD  
Einstein Healthcare Network

12:01 - 12:08 pm  The Use of Shockwave Intravascular Lithotripsy as an adjunct to Performing a Covered Endovascular Reconstruction of the Aortic Bifurcation with Endologix AFX Aortic Bifurcated Device in Aorto-Iliac Occlusive Disease  
Michael Qaqish, MD, Alireza Mofid, MD, Dawn Salvatore, MD, Michael Nooromid, MD, Paul Dimuzio, MD, Babak Abai, MD  
Thomas Jefferson University Hospital

12:08 - 12:15 pm  A Novel Deployment of the AFX Endograft in the Setting of Acute on Chronic Aorto-Occlusive Disease  
Michael Qaqish, MD, Alireza Mofid, MD, Dawn Salvatore, MD, Michael Nooromid, MD, Paul Dimuzio, MD, Babak Abai, MD  
Thomas Jefferson University Hospital

12:15 - 12:22 pm  A Multi-Step Approach to Aorto-iliac Occlusive Disease in a Patient with Concurrent Left Lower Extremity Wet Gangrene  
Alireza Mofid, MD, Michael Qaqish, MD, Paul DiMuzio, MD, Babak Abai, MD, Michael Nooromid, MD, Dawn Salvatore, MD  
Thomas Jefferson University Hospital

12:22 - 12:30 pm  Rapid Fire Case Presentation Q&A

12:30 - 1:30 pm  LUNCH

1:30 - 3:00 pm  DEI  
Matthew Dougherty: Dialysis Access in Female or Elderly  
Katheryn Bowser: Aortic in Females  
Lawrence Oresanya: Limb Salvage in African Americans

3:00 - 3:30 pm  COFFEE BREAK
3:30 - 3:40 pm

**Defining Duplex Ultrasound Criteria for In-Stent Restenosis of the Internal Carotid Artery Using CT Angiography**

Matthew Major, MD, Lucas J. Bitsko, BS, Evan J. Ryer, MD, Ellen P. Penn, BA, BS, Gregory G. Salzler, MD, , Jeremy Irvan, MD, James R. Elmore, MD

*Geisinger Medical Center*

3:40 - 3:50 pm

**Instituting an Academic Incentivization Program in a Tertiary Care Health System**

Mikael Fadoul, MD, Jeffrey P. Carpenter, MD, Phillip Batista MD, Bruce Tjaden, MD, Katherine McMackin, MD, Devon Fromer, MD, Saba Daneshpooy, BS, Christine Chrupcala, BA, Joseph V. Lombardi, MD

*Cooper University Hospital*

3:50 - 4:00 pm

**The Use of Paclitaxel-Coated Devices in the Treatment of Peripheral Arterial Disease Is Not Associated with Increased Mortality or Amputations**

Neal Cooper, MD, Beau McCarver, Evan Bair, Shengxuan Wang, MS, Benjamin Greif, MD, Matthew Major, MD, Evan Ryer, MD, James Elmore, MD, and Gregory Salzler, MD

*Geisinger Medical Center*

4:00 - 4:10 pm

**A Forensic Analysis of Spin-off and Downstream Revenue in an Academic Vascular Surgery Practice. Determining the “Vascular X-Factor” at a Tertiary Healthcare System**

Devon Fromer, MD, Joseph Lombardi, MD, Philip Batista, MD, Katherine McMackin, MD, Bruce Tjaden, MD, Jeffrey Carpenter, MD

*Cooper University Hospital*

4:10 - 4:20 pm

**Obesity and Aortobifemoral Bypass – The Implications of Surgeon Case Volume and Hospital’s Obese Patient Proportion**

Ahsan Zil-E-Ali, MBBS, MPH, Faisal Aziz, MD, FACS, DFSVS, Matthew Goldfarb, MD, John F. Radtka, MD

*Penn State Milton S. Hershey Medical Center*

4:20 - 4:30 pm

**Higher Distressed Community Index Score can be Predictive of Postoperative Amputation After Lower Extremity Endovascular Interventions**

Ahsan Zil-E-Ali, MBBS, MPH, Tyler Bucker, MD, Krishna Patel, BS, Justin Brook, BS, Faizaan Aziz, Elizabeth Genovese, MD, MS, Faisal Aziz, MD, FACS, DFSVS

*Penn State Milton S. Hershey Medical Center*
4:30 – 4:40 pm

**Low Ventricular Ejection Fraction (<50%) is Associated with Increased Risk of Postoperative Major Adverse Renal Events after Open AAA Repair**

Ahsan Zil-E-Ali, MBBS, MPH, Krishna Patel, BS, Faisal Aziz, MD, FACS, DFSVS

*Penn State Milton S. Hershey Medical Center*

4:40 – 4:50 pm

**Arterial Thromboembolic Events During the Omicron COVID-19 Surge**

Ann Yufa, MD, Alexander Lam, MD, Nadia Awad, MD, Evan Deutsch, MD, Rashad Choudry, MD

*Einstein Healthcare Network*

4:50 – 5:00 pm

**Clinical Research Presentations Q&A**

5:00 - 5:10 pm

**DVVS Member Business Meeting**

5:00 - 6:00 pm

**Reception & Exhibits**

6:00 - 8:00 pm

**Keynote Lecture:**

Diversity, Equity & Inclusion
Bernadette Aulivola, MD
*Loyola University*
Successful Open Repair of Bilateral Iliac Artery Aneurysms with Preservation of Pelvic Arterial Inflow in a Patient Presenting with Nephrolithiasis: A Case Report
Jake MacDonald, BS, Daniela Medina, BS, Cole, MD, Faisal Aziz, MD
Penn State College of Medicine

Abstract:
Bilateral iliac aneurysms are a rare entity. However, because of the widespread use of different imagining modalities, asymptomatic iliac aneurysms have been increasingly detected. Here, we describe the case of a 62-year-old male with a history of nephrolithiasis who, as a work-up for hydronephrosis, underwent computed tomographic (CT) and was found to have bilateral common iliac artery aneurysms (Right=60mm, Left 51mm). The aneurysm in the right common internal iliac (RCI) extended into the right internal iliac and hypogastric artery. Figure 1 illustrates a three-dimensional reconstruction of the patient’s aneurysms. The anatomy was unsuitable for an endovascular repair as the right internal iliac artery did not have an appropriate landing zone distally. Additionally, there was no proximal landing zone into the left common iliac artery, which would prevent obtaining a good device seal. Although possible, this would’ve been associated with a high risk of endoleak formation. Therefore, the patient was scheduled to undergo an open aneurysm repair. He underwent an aorto-bi-iliac artery graft implantation with right limbs to ipsilateral external iliac arteries, ligation of aneurysmal right hypogastric, interposition graft from left limb to the left external iliac artery, and final reimplantation of the inferior mesenteric artery onto proximal graft. Due to the high risk of ureter damage, ureteral stent placement took place pre-operatively by Urology. The procedure was completed without complications, and the patient was discharged on postoperative day five. At post-operative follow-up at one month, the patient continues to do well without complications from the procedure. Although an endovascular repair approach for bilateral iliac aneurysm has been adopted in the past decade, open repair is still beneficial and indicated for those who do not have suitable anatomy for an endovascular technique.
Figure 1. Three-dimensional reconstruction of initial CTA illustrating bilateral common iliac artery aneurysms with right common internal iliac extending into the right internal iliac and hypogastric artery

11:12 - 11:19 am

**Mycotic Common Carotid Pseudoaneurysm Secondary to Direct Heroin Injection to Neck**

**Luis Mejia Sierra, MD**, Casey Patterson, MD, Emmanuel Nwachuku, MD, Danielle M. Pineda, MD, FACS

*Abington Jefferson Health*

**Case Presentation:**

We present the case of a 24-year-old intravenous drug abuser who presented to the emergency room for withdrawal symptoms. She admitted to injecting heroin in her neck and was incidentally found to have left neck swelling. CTA revealed a left common carotid pseudoaneurysm. She was taken emergently to the operating room for a neck exploration. There was significant scar tissue and an abscess cavity encasing the carotid sheath was encountered. Proximal control was obtained first and then distal control was obtained just proximal to the carotid bifurcation. A 7 cm segment of the left common carotid was completely devitalized from the infection with a large defect in the artery. After resection of the artery, we performed an interposition bypass using reversed saphenous vein as conduit. Cultures grew methillicin resistant staph aureus and long-term antibiotics were recommended by infectious disease. Unfortunately, the patient left against medical advice two days after surgery and has been lost to follow up.

**Discussion:**
Mycotic extracranial carotid artery pseudoaneurysms require emergent debridement and arterial reconstruction. These are sometimes encountered after carotid endarterectomy but more rarely can be secondary to iatrogenic causes. Here we present a case of a mycotic carotid pseudoaneurysm caused by repeated intravenous drug injection to the neck. Interestingly, she did not have any specific neck complaints on presentation, but the pseudoaneurysm was instead found on physical examination. The same principles that apply to mycotic pseudoaneurysm reconstruction in other areas apply to carotid arterial reconstruction. The infected artery should be widely debrided and vein should be used as a conduit where possible. As vascular surgeons treat more mycotic pseudoaneurysms from alternate injection sites, society guidelines should be published to guide surgeons in treating the clinical presentation.

Figure 1. A. Devitalized CC

11:19 - 11:26 am

**Successful Repair of Right Common Iliac Artery Aneurysm in Patient with Aneurysmal Degeneration of Chronic Type B Aortic Dissection**

Jayne Rice, MD, Jaclyn Milici, DO, Domingo Uceda, MD, Nathan Belkin, MD, Benjamin Jackson, MD, Scott Damrauer MD

*Hospital of University of Pennsylvania*

**DEMOGRAPHICS:**

66-year-old male with a history of an uncomplicated chronic Type B aortic dissection (TBAD)

**HISTORY:**
At 51 years of age the patient was discovered to have a 5.5 cm ascending sinus of valsalva aortic aneurysm and underwent an elective David V hemiarch reconstruction. He recovered well and for 15 years he was followed annually with conservative management of his residual dissection, which notably extended into the left common iliac artery. He subsequently developed aneurysmal degeneration of the descending thoracic and abdominal aorta and bilateral common iliac arteries. In 2020, surveillance imaging found growth of his right (non-dissected) iliac aneurysm to 4.5cm (from 3.9cm the year prior), prompting discussions of surgical repair. His proximal descending thoracic aorta measured 4.7cm, abdominal aorta 4.5cm, and left iliac artery 3.1cm (image).

**PLAN:**

Given that only the right common iliac aneurysm met criteria for repair and the relative stability of the thoracoabdominal and left common iliac aneurysms, the decision was made to address the aneurysmal right iliac in isolation. The patient underwent a staged repair with initial percutaneous placement of a right external-to-internal iliac artery stent graft, to sustain the right pelvic and spinal cord circulation, and a left to right femoral-femoral bypass, followed by interval ligation of the right common iliac artery through a transperitoneal approach two days later. The patient tolerated both procedures well. Post-operative imaging obtained at 1-month demonstrated exclusion and thrombosis of the right common iliac artery aneurysm, an occluded right external-to-internal iliac artery stent graft and a patent femoral-femoral bypass. The remainder of the aorta and left iliac artery was stable.

**DISCUSSION:**

This was a complex case given significant aneurysmal degeneration in the right iliac artery with stable chronic aneurysmal degeneration of the thoracoabdominal aorta and left iliac artery. Consideration was whether to pursue an open type 2 thoracoabdominal aortic repair as definitive treatment or repair the right iliac artery aneurysm in isolation. As the right iliac artery was the only aneurysm to meet criteria for repair, we elected to repair this in a hybrid fashion. This case demonstrates the complex management needed in patients with chronic TBAD.
CASE REPORT:

This is a case of a 68-year-old female who presented with left upper quadrant abdominal pain, in addition to pelvic pain for the past four weeks. On physical exam, she exhibited tenderness to the left upper abdomen. She also complained of hematuria and her urine analysis revealed microscopic hematuria. A computed tomography (CT) of the abdomen and pelvis showed significant, near-occlusive, compression of the left renal vein between the SMA and aorta. Her gonadal vein was dilated and she had significant pelvic varicosities. Given the constellation of symptoms, supported by imaging, the patient was diagnosed with NCS. We elected to provide surgical intervention. The patient was taken to the operating room for left gonadal vein transposition. The gonadal was ligated distally and there was significant backbleeding from the left kidney, The
gonadal vein was then transposed to the inferior vena cava (IVC) in an end-to-side fashion. The patient had an uneventful postoperative course and reported resolution of her symptoms during her postoperative visit.

CONCLUSION:

First described by the anatomist John C. Boileau Grant, nutcracker syndrome (NCS) is a rare condition in which there is compression of the left renal vein (LRV), most commonly between the aorta and the superior mesenteric artery (SMA) referred to as anterior nutcracker syndrome (ANS). The clinical manifestation is outflow obstruction leading to left renal vein dilation and pelvic varicosities. Although the symptomatology is variable, patients most commonly present with left flank pain that is associated with gross or microscopic hematuria. Most patients are managed conservatively but for the few patients that fail conservative approach or experience severe symptoms such as abdominal or flank pain and gross hematuria, a surgical intervention may be considered. Surgical options include renal vein transposition (RVT), saphenous vein bypass, and gonadal vein transposition to name a few. More recently, there has been an increase in endovascular strategies being implemented although long term outcomes are not yet well established. Nutcracker syndrome is a rare disease entity with very sparse documentation in literature and as a result, the true prevalence is unknown. In the few publications that discuss options for management and outcomes, there is no consensus on optimal management. Shortell et al., advocate for a gonadal vein transposition as opposed to renal vein transposition citing shorter operative times, lower blood loss, avoidance of manipulation of the
renal vein and the ability to address pelvic vein congestion as reasons. Although appropriate for our patient, GVT might not be feasible in other patients. Hence, it is important to be aware of the treatment options available.

May-Thurner Syndrome Causing Phlegmasia Cerulea Dolens in the Setting of Pregnancy
Christopher Cappellini, DO, Hong Zheng, DO, Renganaden Sooppan, MD, Robert Luo, DO, Kathleen Lamb, MD
Reading Hospital Tower Health

A 33-year old, 10-week pregnant female with no past medical history presented with left leg coolness, numbness, severe pain, and discoloration that started 2 hours prior. The left lower extremity was edematous with purple/blue discoloration and there was decreased motor function and sensation. There were no palpable pulses below the left femoral artery, and biphasic doppler flow was noted at the left PT and DP. Venous duplex was performed demonstrating acute, occlusive thrombus of the distal IVC extending throughout the iliac veins and left lower extremity. Open surgical thrombectomy and mechanical thrombolysis with tPA were discussed with the patient, including risks of fetal loss and growth abnormalities as a result of radiation and lysis. The decision was made to proceed with mechanical thrombolysis to address the thrombus and have the ability for angioplasty/stenting to treat the underlying May-Thurner. Venography was performed via left popliteal vein that showed thrombosis of left common iliac vein and distal IVC. Angiojet was used to perform mechanical thrombolysis and suction thrombectomy of the left common femoral vein, iliac veins, and IVC. Penumbra suction thrombectomy was then performed that yielded a significant amount of thrombus. IVUS demonstrated compression (>70% stenosis) of common iliac vein at the crossing of right common iliac artery. Angioplasty of left common iliac vein was done, followed by stenting of the common iliac vein into the distal IVC using a 12 x 72mm Wallstent. Both IVUS and completion venogram demonstrated widely patent veins and stent with no residual thrombus in the iliac veins or IVC. The left leg returned to normal color and the edema decreased significantly. Overall, minimal XRT and tPA were used. Discussion includes open thrombectomy versus mechanical thrombolysis, as well as use of tPA in pregnancy given the lack of randomized controlled trials. Available evidence supports tPA use in the setting of potentially life or limb-threatening events with preference given for catheter-directed lysis over systemic administration.
Objective

Surgical treatment of aortic complications of Marfan Syndrome is evolving with advancements of endovascular techniques. Traditionally, vascular surgeons have been hesitant to perform endovascular repairs in patients with Marfan Syndrome due to aortic friability and durability concerns. We report a complicated endovascular solution for a patient with an anastomotic thoracoabdominal aneurysm (TAA) between areas of prior open repair.

Case Presentation

A 68 year-old male with Marfan’s Syndrome was incidentally found to have a 6.5cm TAA with dissection after having been lost to follow-up for over a decade (Figure 1). He has undergone the following procedures: emergent open TAA repair of the proximal descending thoracic aorta for Type B aortic dissection in 1989 (complicated by lower extremity paraplegia), open distal TAA repair extending to the iliac arteries in 1990, ascending aortic repair for a Type A dissection in 1995 and aortic root replacement with aortic valve replacement in 2005.
The initial CTA showed occlusion of the proximal Superior Mesenteric Artery (SMA) and no clear continuity between the aortic flow lumen and Celiac Artery ostium. The patient denied symptoms of chronic mesenteric ischemia. We performed a diagnostic angiogram to delineate the visceral anatomy and identified an anastomotic TAA with dissection flap and four patent graft limbs from his prior open repair— one to each renal artery and one to each iliac artery. The distal aspect of the aneurysm was within 2cm of the takeoff of the four limbs. The SMA and celiac artery were occluded at their origins but were perfused via hypogastric collaterals (Figure 2).

Repair was recommended and an endovascular approach elected. We placed bilateral femoral artery sheaths and two 8F infraclavicular axillary artery sheaths, all percutaneously. We performed TEVAR with a Medtronic Valiant device (tapered 26-22mm) with the proximal portion of the new graft positioned within the proximal descending thoracic aortic graft and the distal portion of the new graft positioned 2cm proximal to the renal and iliac artery graft limbs. We then deployed Gore VBX stent grafts from within the TEVAR to all four graft limbs by cannulating the iliac limbs via our femoral sheaths and the renal limbs via our axillary sheaths. All four stent graft limbs were inflated simultaneously with 12mm diameter balloons. A completion angiogram revealed a large gutter endoleak (Figure 3), which resolved after extending all four limb stent grafts proximally. The patient did well post-operatively and was discharged home on POD#2.

**Conclusion**

Marfan Syndrome patients with complex aortic pathology often develop progressive degeneration of the non-repaired aorta after open or endovascular intervention. Despite open repair of thoracoabdominal segment, this patient developed an intervening aneurysm, dissection, and loss of visceral patency over time. Endovascular treatment avoided complex redo thoracoabdominal surgery and has eliminated any remaining continuity with the patient’s native aorta. Although technically successful, this patient will need close long-term surveillance to monitor for further degeneration or other complications.
Figure 1: CTAngiogram showing 6.5cm thoracoabdominal aneurysm with dissection
Figure 2: Diagnostic angiogram showing thoracoabdominal aneurysm between areas of prior open repair. Diagramatic representation of patient’s aortic/visceral anatomy after diagnostic angiogram.
Figure 3: Initial angiogram after deployment of four VBX stent grafts within the TEVAR device, showing endoleak. The endoleak resolved after proximal extension and balloon expansion of four additional VBX stent grafts.

11:47 - 11:54 am

Aortic Surgery with a Twist: Open Treatment of 1A Endoleak due to Extreme Tortuosity

Callie E. Dowdy, MD, Matthew Carpiniello, MD, Matthew J. Dougherty, MD, Keith D. Calligaro, MD, Douglas A. Troutman, DO

Pennsylvania Hospital

Objective
The need for secondary interventions after EVAR is well documented, especially in patients who have atypical aortic anatomy. We report a case of endoleak caused by extreme aortic tortuosity treated with open device explantation and reconstruction with graft-to-endograft distal anastomoses.

Case Details

Our patient is a 75-year-old man who initially presented with a 6 cm AAA and 8 cm left common iliac aneurysm (CIA). Extreme tortuosity of the infrarenal aorta was noted on imaging for operative planning and open surgery was discussed due to two areas of ~90-degree angulation in the aortic neck. However, the patient had a strong preference for endovascular intervention and was ultimately treated with Endurant stent graft exclusion and left internal iliac artery coiling. There was no evidence of endoleak on intra-operative completion arteriogram or initial surveillance imaging. At a six-month follow-up visit, he was asymptomatic but DU showed a Type 1A endoleak and interval growth of AAA 7.0cm and L CIA aneurysm to 8.5cm. Extreme angulation of the infrarenal aortic neck was again noted. We were concerned endovascular attempts to treat the endoleak with proximal extension and bilateral renal artery snorkels would be high risk for failure. After discussion with the patient and his family, we chose to proceed with open surgical treatment.

Through a 10th intercostal left retroperitoneal approach, the aorta was exposed from the SMA to the common iliac arteries. The extreme tortuosity of the aorta was highly apparent, and dissection of the distal aorta and iliac vessels was challenging due to the large L CIA aneurysm obstructing a significant portion of the field (Figure 2). Once exposure was achieved, a suprarenal clamp was placed proximal to the suprarenal fixation struts. The aortic and iliac aneurysm sacs were opened and the EVAR iliac limbs were clamped. The proximal segment of the endograft was removed by twisting and applying gentle cephalad pressure on the graft to promote graft contraction and release the suprarenal fixation wires (Figure 3). The suprarenal clamp was moved distally to the infrarenal aortic neck after 9 minutes of renal ischemic time. The aorta was reconstructed with a 16 x 8 mm bifurcated rifampin-soaked Dacron graft with the proximal anastomosis to the infrarenal aorta and the distal anastomoses to the remnant endograft iliac limbs. Full exposure of the bilateral iliac arteries to perform distal anastomoses to the native iliac vessels would have required extensive dissection in a field highly distorted by the large LCIA aneurysm. (Figure 4).
Results

The patient recovered well after surgery and was discharged the following week.

Conclusion

Complications after EVAR are being seen with increasing frequency, especially when implanted outside IFU. Although these complications can frequently be treated with additional endovascular techniques, hostile anatomy, particularly when it involves an endograft seal zone, can make endovascular approaches challenging. We present a case of open repair for type 1A endoleak that highlights the important role of open surgical treatment of these difficult cases.

Figure 1: 3D rendering of aorta preoperatively, highlighting tortuosity.

11:54 am-12:01 pm  

Treatment of Mycotic Femoral Pseudoaneurysm due to Primary Salmonella Arteritis  

Joseph Yoo, MD, Nadia Awad, MD, Evan Deutsch, MD, Rashad Choudry, MD  

Einstein Healthcare Network

Introduction:

Primary vascular infection is a rare etiology for pseudoaneurysm formation that requires careful surgical planning given increased rates for rupture and need for reconstruction in an infected field. In the era of widespread antibiotic use as well as the increase in prevalence of patients with immunosuppression,
atypical organisms such as Salmonella, rather than those typically found in endocarditis, tend to be isolated
from cultures. Various conduits such as autologous vein, cadaveric vein, and prosthetic graft have been utilized
for repair with or without the addition of muscle flap coverage. We describe a case of mycotic
pseudoaneurysm involving the distal common femoral artery involving the proximal superficial femoral and
profunda femoris artery.

**Case Report**

A 70-year-old presented with generalized weakness and 5 days of right groin pain associated with a
small, tender, pulsatile mass in the right groin. Laboratory studies were significant for leukocytosis to 11.9,
mild normocytic anemia to 11.8 g/dL, c-reactive protein of 76 mg/L, and an erythrocyte sedimentation rate of
71 mm/hr. Blood cultures at the time were obtained and later were determined to be positive for Salmonella
species (serogroup D1). Computed tomography angiography demonstrated a 1 cm pseudoaneurysm arising
from the distal right common femoral artery with extensive soft tissue stranding. The resulting
pseudoaneurysm was causing severe stenosis of the proximal superficial femoral artery due to mass effect.

Vein mapping studies were obtained and demonstrated acute deep and superficial thrombus in the
bilateral lower extremities that precluded autologous vein reconstruction. The patient was ultimately
successfully treated with an in situ reconstruction of the right common femoral artery to superficial femoral
artery utilizing rifampin soaked 8 mm Gelweave graft, and interposition bypass graft from the right common
femoral artery to superficial femoral artery graft to right profunda femoris with rifampin soaked 8 mm
Gelweave graft. The procedure was completed with antibiotic bead placement and sartorius flap coverage of
the interposition graft. The patient was successfully discharged back to his living facility with a PICC line in
place for IV antibiotic therapy for 6 weeks.

**Discussion:**

We present a case of primary infected pseudoaneurysm with the involvement of the bifurcation of the
common femoral artery. With the multitude of conduit and repair options available, careful preoperative
workup as well as intraoperative decision-making is important to successfully treating the pathology. There
exists a need for further research regarding the patency and robustness of these various conduits and
operative adjuncts such as antibiotic beads or muscle flap coverage.
12:01 - 12:08 pm

The Use of Shockwave Intravascular Lithotripsy as an adjunct to Performing a Covered Endovascular Reconstruction of the Aortic Bifurcation with Endologix AFX Aortic Bifurcated Device in Aorto-Iliac Occlusive Disease

Michael Qaqish, MD, Alireza Mofid, MD, Dawn Salvatore, MD, Michael Nooromid, MD, Paul Dimuzio, MD, Babak Abai, MD
Thomas Jefferson University Hospital

Introduction

Aortoiliac occlusive disease can be a debilitating condition that can limit functionality due to severe claudication or rest pain in the lower extremities. Revascularization of the lower extremities can be offered as an open procedure which will provide a durable repair with antegrade flow. However, this can be quite morbid, especially in our older patients. Endovascular intervention provides relief in a minimally invasive fashion for high risk patients but that comes with its own difficulties as well. We may have difficulty passing wires, sheaths, or stent grafts and adjunct maneuvers may be needed to successfully re-establish flow to the lower extremities. Here we have a case of a 77-year-old female with severe aortoiliac occlusive disease which required intravascular lithotripsy to advance the Endologix AFX endograft and perform a covered endovascular reconstruction of the aortic bifurcation (CERAB).

Our patient is a 77-years-old with a past medical history of obesity, diabetes mellitus, hypertension on 5 anti-hypertensives, peripheral arterial disease and aortoiliac occlusive disease. She presented to the office with significant complaints of severe claudication which has limited her mobility. A CTA provided adequate information to proceed with CERAB. The AFX device was chosen as the endograft to provide a single lumen for flow and avoid stent compression that can occur in tight aortas during placement of kissing stents or standard EVAR grafts. Given the amount of atherosclerosis and calcium burden, the decision was made to perform intravascular lithotripsy using the Shockwave device. This would disrupt the plaque to perform less aggressive pre-dilation with angioplasty and allow for better tracking of the sheaths as well as better expansion of the endograft. The procedure was able to be performed and we provided improved antegrade flow into the lower extremities.
Post-operatively the patient recovered well and repeat ankle-brachial index and pulse volume recordings were done showing mild improvement, however, she showed significant clinical improvement and is more active post procedure.

Although the AFX device for CERAB is an off label use, there is a theoretical benefit to avoiding multiple stents in the aorta and recreation of the native bifurcation. We avoid stent thrombosis due to compression that can occur in the limbs of a standard EVAR endograft or with kissing stents. This also saved our patient from the complications that come with open surgery by remaining endovascular. It is important to use technology to our advantage and the use of Shockwave improved our ability to advance our sheaths as well as deploy the endograft safely in our patient leaving us with good results. Although the objective measures did not show significant improvement, clinically, the patient is doing well.

A Novel Deployment of the AFX Endograft in the Setting of Acute on Chronic Aorto-Occlusive Disease
Michael Qaqish, MD, Alireza Mofid, MD, Dawn Salvatore, MD, Michael Nooromid, MD, Paul Dimuzio, MD, Babak Abai, MD
Thomas Jefferson University Hospital

Covered Endovascular Reconstruction of the Aortic Bifurcation has been described in reports for over 10 years. There have been multiple reports of different techniques such as 2 adjacent stents that sit in the aorta and extend into with iliac (“kissing stents”), 3 stent system with one aorto-aortic stent and kissing stents sitting within the aortic stent-graft, and bifurcated aortic endografts. One way of recreating the aortic bifurcation is the use of the Endologix AFX bifurcated endograft. The graft provides an advantage in that it reforms the bifurcation and mimics normal anatomy without the concern of two limbs competing for space within the aorta which can be seen in other aortic bifurcated devices. The use of this graft for CERAB is off label but has had good success both in reports and at our institution. In this instance, we had a patient present with acute on chronic aortoiliac occlusive disease that required good problem solving and a unique approach to the placement of the AFX device.

Our patient is an 83 year-old-female with a past medical history of atrial fibrillation off her Xarelto for 1 week, coronary artery bypass, chronic kidney disease, congestive heart failure, and peripheral arterial disease presenting to our hospital as a transfer with thrombosis of the aortic bifurcation, mottling of her legs, and Rutherford IIA grading of acute ischemia. CT Angiography showed what appeared to be an acute occlusion of the infrarenal aorta into the bilateral common iliacs. The patient was taken to the OR and was planned on bilateral thrombectomies via bilateral femoral artery cut-downs. Unfortunately, no clot was retrieved likely due to the chronicity to her occlusion. The patient is not a candidate for open surgery given frailty and comorbidities, so plan was to continue an attempt at an endovascular approach before resorting to an axillary bi-femoral bypass. We were able to pass a wire via right femoral access into the descending aorta but we had no luck from the left femoral access. Brachial approach was attempted as well which failed. Out of shear luck we were able to pass a wire from the left femoral artery up and over the bifurcation and retrieve it from the right femoral arteriotomy (flossing the aortic bifurcation). To avoid an extra-anatomic bypass in this patient our plan was to deploy an AFX device and restore antegrade flow to the lower extremities. Unfortunately, to deploy the AFX device it requires intra-aortic snaring of the contralateral limb wire but given the situation with this patient, that was not possible. We decided to perform the snaring of the contralateral limb wire ex-vivo. We started by loading the Endologix sheath and back loading the device and connecting the two pieces. With a snare catheter entering the left femoral arteriotomy and coming out the right femoral arteriotomy, we snared the contralateral limb externally and partially advanced the device through the sheath until the nose-cone protruded from the end of the sheath. We then advanced the sheath with the device over a stiff wire while pulling the contralateral limb wire simultaneously through the right femoral arteriotomy over the stiff wire. Once we had the device fully advanced and the device was seated on the bifurcation, we were able to deploy the AFX device in the standard fashion. After deployment, dilation, and closure of the arteriotomies, we had restored flow to the lower extremities. The patient has done well with recovery and has a resolution of her symptoms.

The use of AFX for CERAB is not new, however, in acute situations, it may take some problem solving as well as a good understanding of how a device works to be able to resolve the matters at hand. As vascular surgeons, we constantly think outside the box to provide care in a minimally invasive fashion. We are constantly challenged with complex issues but thankfully, we have an armamentarium of endovascular devices
that allow us to solve these issues. Our patient has now had successful revascularization via a minimally invasive approach and we were able to avoid an extra-anatomic bypass.

**A Multi-Step Approach to Aorto-iliac Occlusive Disease in a Patient with Concurrent Left Lower Extremity Wet Gangrene**

**Alireza Mofid, MD, Michael Qaqish, MD, Paul DiMuzio, MD, Babak Abai, MD, Michael Nooromid, MD, Dawn Salvatore, MD**

**Thomas Jefferson University Hospital**

**Introduction:**
TASC D lesions of the aorto-iliac system tend to pose significant challenge in management of vascular patients. Patients with TASC D aorto-iliac occlusive disease are typically treated with open revascularization using synthetic conduit. However, the management of these patients can be further complicated in presence of concurrent life threatening infection, such as lower extremity gangrene or osteomyelitis secondary to poor peripheral blood flow. Here, we discuss a case of a patient with TASC D aorto-iliac occlusive disease with concurrent wet gangrene of the left lower extremity.

**Case report:**
A 41 year old male patient with past medical history of heavy smoking and uncontrolled hypertension presented with wet gangrene of the forefoot and clinical signs of sepsis. During work-up, his ABI was noted to be 0.21 on the left and 0.53 on the right, indicative of peripheral vascular disease. Further work up with a CTA revealed occlusion of the infra-renal abdominal aorta as well as complete occlusion of the left superficial femoral artery and profunda femoris. All run off vessels were supplied through collaterals on the left. Given the patient’s active, life-threatening infection, decision was made to approach revascularization in a stepwise manner, with initial focus on source control. The patient was initially taken to the OR for guillotine above the ankle amputation for source control. Following six days of meticulous wound care, the patient’s WBC, and vitals normalized, with blood cultures negative multiple days in a row, indicating successful source control. He was then taken to the OR for transabdominal aorto-right common iliac artery and aorto left common femoral/profunda femoris artery bypass utilizing Gore Proplaten 14 mm x 7 mm bifurcated graft. The procedure was successful with the patient now having a palpable bilateral femoral pulses. Post-operatively, meticulous wound care to the guillotine stump was continued. One week after revascularization, the patient was then taken to the operating room for a formal left above the knee amputation. The remainder of his hospital course was uncomplicated and he was ultimately discharged to rehab with a well-healed amputation stump.

**Conclusion:**
Concurrent presence of TASC D aorto-iliac occlusive disease requiring revascularization with synthetic grafts and active life-threatening lower extremity gangrene can pose significant challenges in treatment of vascular patients. While source control should remain the primary initial focus, a stepwise and strategic approach to source control followed by revascularization should be implemented to optimize healing and to avoid post-operative complications of synthetic conduit infection.
Duplex ultrasound (DUS) velocity measurement is the preferred method for evaluating carotid artery stenosis. However, DUS velocity criteria based on native carotid arteries are not applicable to internal carotid artery (ICA) stents. Previously, catheter-based angiography was used to determine DUS criteria for in-stent restenosis (ISR), but conventional angiography is invasive and can be limited. This study sought to define DUS velocity criteria for predicting ≥60% internal carotid ISR by correlating in-stent velocities with computed tomographic angiography (CTA) measurements of percent stenosis.

METHODS:
A retrospective chart review was conducted on all patients who underwent ICA stenting within our health system between January 2013 and February 2020. Thirty-eight surveillance DUS studies were found to have CTA performed within 30 days. Centerline reconstructions of internal carotid artery stents were created using TeraRecon Aquarius iNtuition software. Two independent observers measured percent stenosis by mean vessel diameter reduction and stenotic areas were matched to peak systolic velocities (PSV) obtained with DUS. Receiver operating characteristic (ROC) curves were generated. The optimal DUS velocity criteria in the stented ICA were determined by maximizing Youden’s Index.

RESULTS:
The area under the ROC curve was 0.995. A PSV cutoff of 240 cm/s resulted in the highest Youden’s Index (97%) with 100% sensitivity and 97% specificity, a positive predictive value (PPV) of 86%, and a negative predictive value (NPV) of 100% (Table 1).

CONCLUSIONS:
A PSV cutoff of 240 cm/sec can predict a ≥60% ISR with high sensitivity and specificity.

Table 1:

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<th>Specificity %</th>
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Instituting an Academic Incentivization Program in a Tertiary Care Health System

Mikael Fadoul, MD, Jeffrey P. Carpenter, MD, Phillip Batista MD, Bruce Tjaden, MD, Katherine McMackin, MD, Devon Fromer, MD, Saba Daneshpooy, BS, Christine Chrupcala, BA, Joseph V. Lombardi, MD

Cooper University Hospital
Objective: The desire to increase academic productivity within a department can be challenging at any institution, particularly when tasked with the never-ending responsibility of maintaining high levels of clinical productivity. With the creation of a new medical school and the support of the health system to fund several new residency positions within the department of surgery, a complimentary desire to increase academic productivity among our faculty was identified. We sought to report the structure and outcomes implementing an academic incentive physician program in an RVU based compensation plan.

Methods: An academic incentivization program was instituted at Cooper University Hospital on January 1st 2014 and data over the course of 7 years was analyzed. We constructed a chairman’s discretionary fund composed of 10% of each division’s revenue with the intent of complete redistribution back to the providers in the form of incentive pay based on academic achievement. A point system was utilized to assign weight to academic contributions in the following manner: First, second or last author in a peer reviewed publication (PRP) (5 points); Grant awarded not including salary support (2 points); Invited podium presentation at a national meeting (1 Point); Participation in residency interview sessions (1 Point); and Didactic residency lecture >4 times (1 point). Descriptive statistics were used for clarification and illustration.

Results: During the study period, the average participation during the first 3 years was 52% of eligible providers (22) and 67% (24) during the last 4 years. The average number of points per provider ranged from 5 points to 32 points across the study period. The most valued academic achievement was PRP, which contributed 73% (1,078) of the total points (1,467) accrued since inception. PRP was also the only incentive that achieved a relatively sustained increase in participation, growing by 223% compared to the first year of implementation. The total trend of academic growth achieved is demonstrated in Figure 1. The average aggregate funding available to faculty per year for academic incentive was $370,289.00 with an average of $1,876.00 per point and $30,294.00 per faculty member who participated.

Conclusion: Academic incentivization is feasible in a tertiary healthcare system with sustained academic growth and participation. This study demonstrates that success in creating provider alignment with an integrated model of reward can be accomplished within the framework of an RVU based compensation model. Assigning strategic weight to particular metrics is an effective tool to achieve institutional academic goals. Successful incentivization requires creative resource allocation and agreement of prioritized values between an organization and its providers.
The Use of Paclitaxel-Coated Devices in the Treatment of Peripheral Arterial Disease Is Not Associated with Increased Mortality or Amputations

Neal Cooper, MD, Beau McCarver, Evan Bair, Shengxuan Wang, MS, Benjamin Greif, MD, Matthew Major, MD, Evan Ryer, MD, James Elmore, MD, and Gregory Salzler, MD

Geisinger Medical Center

INTRODUCTION AND OBJECTIVES:

Strategies for the most effective treatment for peripheral arterial disease (PAD) remain controversial among clinicians. Several trials have shown improved primary patency of infrainguinal interventions with the utilization of paclitaxel-coated balloons or stents (DCBS) compared to conventional balloons or stents. However, a 2018 meta-analysis suggested an increased mortality risk for patients receiving DCBS, resulting in an international pause in the use of DCBS. A 2021 meta-analysis by the same group suggested an increased risk of major amputation following DCBS use in peripheral arterial revascularization procedures. Here we report our long-term institutional outcomes comparing uncoated devices to DCBS.

METHODS:

We performed a retrospective review of all patients who underwent peripheral arterial angioplasty, stenting, atherectomy, or a combination between 2011 and 2020 within our regional healthcare system. Univariate and
survival analyses were performed using standard statistical methods to assess the primary endpoints of overall survival, 5-year survival, and amputation-free survival.

RESULTS:
A total of 2717 patients were identified, of whom 1965 were treated with conventional uncoated devices and 752 were treated with DCBS. Univariate analysis of our cohort demonstrated that overall mortality was higher in patients receiving conventional therapy as compared to those receiving drug-coated balloons and stents, as was overall mortality at 1, 3 and 5 years. Furthermore, patients in the conventional treatment group were significantly more likely to undergo a major amputation (p<0.001 for all endpoints). However, Kaplan-Meier estimates found no significant difference in overall survival probability (p=0.99) and amputation-free survival (p=0.3310). Lastly, our multivariate logistic regression analysis showed that age, diabetes, dyslipidemia, chronic kidney disease, prior MI or TIA, atrial fibrillation, and the use of warfarin all significantly increased mortality at 5 years, overall mortality, and the rate of major amputation and/or mortality. Most importantly, treatment with conventional non-drug coated devices was associated with a greater risk of 5-year mortality (OR 2.152 (1.72-2.69), greater overall mortality (OR 2.5 (2.00-3.13), and a greater rate of major amputation and/or mortality (OR 2.30 (1.87-2.83).

CONCLUSIONS:
The use of Paclitaxel-coated devices does not increase the risk of mortality or amputation at any given point in time. In contrast, our univariate and multivariate analyses both indicated that treatment with conventional non-drug coated devices were associated with a higher risk and rate of mortality and major amputation.

INTRODUCTION: Due to the high level of patient and operative complexity, vascular surgery represents a major driver for elevating case mix index within healthcare institutions. Although, several specialty services are
recruited in the care of these patients, it has been difficult to quantify the financial impact of these vascular patients across the health care enterprise. This study aims to quantify all revenues attributable to the introduction of vascular surgery patients within a tertiary healthcare system.

METHODS: Billing data from 2017 to 2020, for all new vascular surgery patients entering a tertiary healthcare system, were captured and vascular revenue streams were analyzed according to procedural pathology types, such as aneurysm, peripheral vascular disease (PVD), cerebrovascular, venous, etc. Subsequent revenues for non-vascular services were also captured for encounters that were tied to the initial vascular surgical encounter. Revenues attributable to vascular patients were analyzed and followed with respect to other hospital service lines.

RESULTS: A total of 1115 new patients were introduced to the healthcare system for the 1st time by Vascular Surgery. These new patients generated over 26 MM dollars in gross revenue and over 10 MM dollars in profit margin to the hospital during this time interval in aggregate. From a procedural standpoint, Aortic Surgery generated over 7.4 MM in revenue and 2.9 MM in total health system profit margin. PVD contributed 7.3 MM and 2.6 MM in revenue and profit margin, respectively. Aortic surgery cases generated the highest margin per encounter encompassing the total sum of contributions. Subtracting all revenue attributable to vascular billing, new patients brought in by vascular generated 9.6 MM in revenue and 4.3 MM in profit margin from utilization of other service lines (spin-off). Vascular Access procedures produced the greatest spin-off margin per encounter at $10,985, while Ancillary Inpatient/Outpatient generated the greatest number of spin-off encounters (597) and total revenue (8 MM).

CONCLUSIONS: Patients introduced by a tertiary care vascular surgery program produce a significant downstream revenue/margin for the parent healthcare system. When considering the fiscal health of a vascular program within a tertiary healthcare system, spin-off and down-stream revenue should also be considered in evaluating their overall value.

Table 1. Vascular and spinoff encounters, revenues, costs, and margins. The Vascular X-Factor is a multiplier calculated by spinoff percentage derived from respective vascular encounters, revenues, costs, and margins.
Obesity and Aortobifemoral Bypass – The Implications of Surgeon Case Volume and Hospital’s Obese Patient Proportion
Ahsan Zil-E-Ali, MBBS, MPH, Faisal Aziz, MD, FACS, DFSVS, Matthew Goldfarb, MD, John F. Radtka, MD
Penn State Milton S. Hershey Medical Center

Background

Aortobifemoral (ABF) bypass is the gold standard for treating symptomatic aortoiliac occlusive disease. In the era of heightened interest in the length of stay (LOS) for surgical patients, this study aims to investigate the impact of obesity on the postoperative outcomes of ABF bypass operations.

Methods

This study utilized the Society of Vascular Surgery (SVS) Vascular Quality Initiative (VQI) suprainguinal bypass database from 2003-2021. The selected study cohort was divided into obese patients (BMI ≥ 30) (Group I) and non-obese patients (BMI < 30) (Group II). Primary outcomes of the study included mortality, operative time, and postoperative LOS. Univariate and multivariate logistic regression analyses were performed to study the outcomes of ABF bypass in Group I. Operative time and postoperative LOS were transformed into binary values by median split for regression analysis. A p-value of ≤ 0.05 was deemed to be statistically significant in all the analyses of this study.

Results

The study cohort consisted of 5,392 patients. In this population, 1,093 were obese (Group I), and 4,299 were non-obese (Group II). Group I was found to have more females with higher rates of comorbid conditions, including hypertension, diabetes mellitus, and congestive heart failure. Patients in Group I had an increased risk of prolonged operative time (≥ 250 mins) and an increased LOS (≥ 6 days). Patients in this Group also had higher risks of intraoperative blood loss, prolonged intubation, and required vasopressors postoperatively. There was also an increased risk of postoperative decline in renal function in the obese population. LOS was higher (≥ 6 days) among the obese patients with CAD and after urgent or emergent procedures. The hospital’s obese patient proportion of ≥ 25% ABF bypasses was less associated with LOS (≥ 6 days). Patients undergoing
ABF for CLTI or acute limb ischemia had longer LOS and increased operative time. Obese patients who surgeons with high case volumes operated on had decreased operative time.

**Conclusion**

ABF bypass in obese patients is associated with prolonged operative times and longer LOS than non-obese patients. Obese patients operated by surgeons with a high case volume of ABF bypasses have shorter operative times and reduced LOS. An increasing hospital’s obese patient proportion was related to a decrease in LOS.

**Figure 1.** Significant Risk Factors for prolonged LOS and Operative Time with Adjusted Odds Ratios and 95% Confidence Interval.
Higher Distressed Community Index Score can be Predictive of Postoperative Amputation After Lower Extremity Endovascular Interventions

Ahsan Zil-E-Ali, MBBS, MPH, Tyler Bucker, MD, Krishna Patel, BS, Justin Brook, BS, Faizaan Aziz, Elizabeth Genovese, MD, MS, Faisal Aziz, MD, FACS, DFSVS
Penn State Milton S. Hershey Medical Center

Objectives: Patient’s socioeconomic background is known to influence the surgical and overall health outcomes. This study is aimed to specifically explore the outcomes of peripheral vascular interventions (PVI) in patients from socioeconomically disadvantaged populations undergoing the procedures for peripheral artery occlusive disease (PAOD).
**Methods:** PVI Vascular Quality Initiative (VQI) data registry from 2003 to 2021 was utilized for this study. Using the Distressed Communities Index (DCI) score, derived from the US Census Bureau, the patients in the registry were stratified to yield two study groups: Group I: Patients from Distressed Communities, and Group II: Patients from Non-Distressed Communities. Group I comprised of patients with DCI score of more than 80, and Group II had patients with DCI score from 0 to 80. Mortality, amputation, amputation free survival (AFS) and a composite outcome of mortality or amputation at 30-day and 1-year were defined as the primary outcomes of the study. Logistic and cox proportional hazard regression analyses were performed to study the outcomes. A p value of <0.05 was deemed to be statistically significant.

**Results:** A total of 86,555 patients were selected for this study. Of which, 16,809 (19.4%) patients were in Group I and 69,746 (80.6%) were categorized in Group II. There were higher proportions of Females, African Americans, Underweight and Obese Patients in Group I. Patients in Group I also had more patients with ambulatory status requiring assistance and wheelchair and received PVI at advanced stages of PAD. Regression analysis showed that patients in Group I had 12% (AOR: 1.12 [CI: 0.93 – 1.33] p=0.021) and 15% (HR: 1.15 [CI: 0.99 – 1.29] p=0.043) higher risks of major amputation at 30-day and 1-year endpoint. Lower incidence of AFS for the patients in Group I at 30-day (AOR:0.86 [0.72 – 1.04] p=0.022) and 1-year (HR:0.89 [CI:0.77 – 1.01] p=0.042) was observed. A composite mortality or major amputation at 1-year was found to be higher in the Group I (HR: 1.14 [CI: 1.05 – 1.23] p=0.001). Patients in Group I treated for chronic limb threatening ischemia was seen to have higher mortality at 1-year endpoint (HR: 1.12 [1.02 – 1.24] p=0.041). Figure 1 shows Nelson Aalen Cumulative Hazard estimate of amputation within 1-year.

**Conclusion:** Socioeconomic disadvantaged PAOD patient populations who receive endovascular interventions present with the more advanced stages, with a higher proportion of patients undergoing urgent or emergent interventions and having higher risks of short-term and long-term amputation.
Low Ventricular Ejection Fraction (<50%) is Associated with Increased Risk of Postoperative Major Adverse Renal Events after Open AAA Repair

Ahsan Zil-E-Ali, MBBS, MPH, Krishna Patel, BS, Faisal Aziz, MD, FACS, DFSVS
Penn State Milton S. Hershey Medical Center

Objectives: The objective of this study was to assess the impact of preoperative left ventricular ejection fraction (LVEF) on the postoperative renal outcomes in patients undergoing open AAA repair. Since increased risk of mortality has been reported in patients with postoperative renal complications, the risk of developing major adverse renal events should be evaluated.

Methods: Patients undergoing open AAA repair were identified in the VQI database from 2003-2020, and patients with missing information were excluded. Patients were divided into two groups based on preoperative left ventricular ejection fraction: Group I (LVEF ≥ 50%), and Group II (LVEF <50%). Postoperative renal changes were evaluated utilizing the following four outcomes: creatinine change > 0.5mg/dL, temporary dialysis, permanent dialysis, and composite major adverse renal event (MARE). Univariate analysis using baseline characteristics, preoperative, intraoperative, and postoperative factors was performed to identify the risk factors associated with developing postoperative renal changes after open AAA repair. Multivariate
regression analysis was also performed to adjust for potential confounders. A p-value of ≤ 0.05 was considered significant.

**Results:** Of 8,109 patients included in the study, 1672 (20.62%) patients had a MARE. 1,318 (17%) patients had creatinine change > 0.5mg/dl, 229 (3.44%) required temporary dialysis, and 125 (1.90%) had permanent dialysis. Based on simple regression analysis, the odds of developing postoperative renal changes after open AAA repair in patients with low ejection fraction are as follows: 34% MARE (1.34, CI: 1.16, 1.53, <0.001), 32% creatinine change > 0.5mg/dL (1.32, CI: 1.13, 1.53, <0.001), 24% temporary dialysis (1.24, CI: 0.89, 1.75, p 0.192), and 73% permanent dialysis (1.73, CI: 1.15, 2.62, p 0.009). Renal ischemia time for patients undergoing open AAA repair had a mean of 20.19 ± 31.29 mins and a median of 10 mins. The risk of 30-day mortality after a MARE was also calculated (2.09, CI: 1.82, 2.40, p <0.001).

**Conclusion:** Patients with a low ejection fraction are at a significantly increased risk of developing postoperative MARE, including creatinine change > 0.5mg/dL, temporary dialysis, and permanent dialysis after undergoing open AAA repair. Additionally, patients who develop postoperative MARE have a significantly higher risk of 30-day mortality.

**Arterial Thromboembolic Events During the Omicron COVID-19 Surge**  
**Ann Yufa, MD, Alexander Lam, MD, Nadia Awad, MD, Evan Deutsch, MD, Rashad Choudry, MD  
Einstein Healthcare Network**

**Introduction**  
As health systems enter the third year of the COVID-19 pandemic, there has been increased recognition of its pulmonary and extra-pulmonary manifestations. Patients with severe COVID-19 may develop multisystem organ dysfunction, mediated by a pro-inflammatory response with both micro- and macrovascular thromboembolic phenomena. Occlusive venous thromboembolic events have been well documented during the pandemic. There have been increasing reports of also occlusive arterial thromboembolic events, which prompt vascular surgical involvement. Additionally, the arterial thromboembolic events occur in varied vascular beds, including aortic, peripheral, and mesenteric. We present three cases that highlight COVID-19-related arterial thromboembolic events during the most recent surge in January 2022 over a period of three weeks.

**Case Report**  
Our patients presented with either recent or active symptomatic COVID-19 infection, found to have severe arterial thromboses in varied vascular beds. COVID-19 infection was confirmed with nasopharyngeal
swab using a reverse transcriptase polymerase chain reaction assay or serum SARS-CoV-2 IgG antibodies. One patient was a 28-year-old woman, who presented with subacute bilateral lower extremity foot pain and acute left lower extremity numbness, found to have infrarenal aortic occlusion with bilateral lower extremity thromboembolism, now status-post aortobiiliac and bilateral lower extremity thromboembolectomy, left femoral to below knee popliteal bypass, and four-compartment fasciotomies. The patient ultimately survived but required a below knee amputation. Another patient was a 58-year-old man, who initially presented with shortness of breath, who later developed progressive left upper quadrant abdominal pain, found to have celiac and splenic artery thrombosis with splenic infarction. The patient was medically managed with anticoagulation but ultimately expired from respiratory compromise. Our last patient was a 73-year-old woman, who presented with left upper extremity pain, numbness, and weakness, found to have left subclavian artery occlusion, status-post left upper extremity thromboembolectomy and forearm fasciotomies with carpal tunnel release. The patient had resolution of left upper extremity neurologic symptoms with palpable radial and ulnar pulses, but remained mechanically ventilated.

Discussion

There have been several studies suggesting an association between COVID-19 infection and development of a hypercoagulable state. As we enter the third year of the COVID-19 pandemic, we found that COVID-19-related arterial thromboembolic events affect a varied patient population in various arterial beds. Despite its largely medical management, several patients with severe COVID-19 necessitate vascular surgical involvement. These arterial thromboembolic events are notoriously challenging to address given the patients’ concomitant respiratory compromise and hypercoagulable state. Vascular surgical interventions in these patients are frequently emergent, and patients may have already developed multisystem organ failure. Even with successful thromboembolectomy with distal reperfusion, they remain at risk for re-thrombosis with high morbidity. Nevertheless, acute vascular surgical intervention and anticoagulation could be life-saving.