Abstracts From the Amputation Prevention Symposium (AMP)

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AMP 2022-1

Outcomes of Surgical Revascularization for Acute Limb Ischemia in COVID-19 Patients Compared With a Non-Infected Cohort

A. Predenciuc

Purpose: Below-knee amputation (BKA), either at the time of creation or after use, in patients with severe peripheral arterial disease (PAD) is complicated, with tissue necrosis leading to wound dehiscence with or without bone exposure. Treatment of BKA stump dehiscence with bone exposure, in most of the cases, is associated with eventual more proximal amputation and significant functional impairment. Complex reconstruction surgeries have been described with moderate success.
Materials and Methods: This report presents a case of a patient who was able to retain his BKA stump successfully and avoid a higher amputation using an innovative new multimodal limb preservation approach.
Results: A 67-year-old man with a history of critical limb ischemia and several other cardiovascular comorbidities presented with left BKA stump skin necrosis, wound dehiscence, and osteomyelitis with tibia and fibula exposure. Initially, a PICC line with I.V. antibiotics was started and endovascular revascularization of the distal branches was performed to improve inflow and distal perfusion (stage 1), followed by extensive removal of nonviable tissue (stage 2). Skin defect was estimated to be greater than 150 cm2, with extensive tibia and fibula exposure. Then, serial weekly debridement with retaining sutures, combined with negative pressure wound therapy, was performed for 7 weeks to reduce the size of the wound and facilitate secondary intention healing (stage 3). Eventually, the bones were partially covered with new healthy tissue and as such the patient could proceed to the next step of our treatment algorithm. Stage 4 included 4 serial sessions of wound debridement and application of dehydrated amnion/chorion allografts as postsurgical dressings. After 6 months of therapy, the stump was completely healed, and the patient was able to tolerate a prosthesis.
Conclusions: Knee function is critical for prosthetic rehabilitation and as such, preservation of limb length is crucial for the patient's best possible quality of life. We believe that our proposed multimodal treatment algorithm, together with close patient monitoring, antibiotic treatment. and risk factor modification, could adequately control tissue loss even in severe cases of BKA stump dehiscence with bone exposure, promising favorable functional outcomes.

AMP 2022-2

The Impact of Reducing Hospitalizations and Amputations in Patients With Diabetic Foot Ulcers

M.G. Garoufalis

Purpose: In the United States, it is estimated that 6.5 million people over the age of 40 have peripheral arterial disease (PAD). Radiologists examine computed tomography angiography (CTA) images for detection of clinically significant stenoses. Maximum intensity projections (MIPs) and angled 2D views of CTAs that have often undergone bone subtraction allow radiologists to study vasculature unimpeded by occlusions. Often, subtle signs of PAD can be underreported. Deep learning methods underpinned on regional attention can augment a radiologist's ability to identify PAD from standard-of-care CTA runoff projections after applying automated bone subtraction tools such as Autobone & VesselIQ Xpress (GE Healthcare).
Materials and Methods: Patient-specific bone-subtracted MIPs consisted of 7 normal and 11 PAD. The train/validation set consisted of 126 MIPs (bone-subtracted CTA runoff projections at ~ 6-degree rotations) from 4 patients (2 normal, 2 PAD) corresponding to 66 normal and 60 indicating PAD. Each MIP was resampled to 900 x 300 pixels before being split into 3⋆ 300 x 300 segments along the subject's height (3 segments per MIP image). We implement a vision transformer that: 1) transforms each image segment into 100 square patches, 2) extracts neural representations (fixed length numerical vectors), and 3) culminates in a multilayer perceptron that classifies PAD status.
Results: Segment-level classification was performed on the validation set where each prediction is associated with a segment. Segment-level classification achieved A) train set: 88% accuracy, 93% sensitivity, and 83% specificity; B) validation set: 91% accuracy, 91% sensitivity, and 92% specificity. MIP-level classification was performed on the validation set where each prediction is associated with the majority prediction taken across each MIP's segments (3 segment predictions and 1 MIP prediction). MIP-level classification performance achieved A) train set: 100% accuracy, 100% sensitivity, and 100% specificity; B) validation set: 92% accuracy, 89% sensitivity, and 95% specificity.
Conclusions: Novel binary classifier has promise for identifying PAD status from MIPs and improving the screening of CTA runoffs during radiologist review. Our 3-segment approach to characterizing MIPs may also have potential for regional localization of PAD.

AMP 2022-3

Crossover of a Complex CTO Lesion Using the Double-Crossing Flossing Technique

D. Kesani

Purpose: Gold standard treatment for occlusive lesions of the common femoral artery (CFA) used to be endarterectomy. In recent years, interest for endovascular treatment of the CFA has been increasing. Vessel preparation with rotational atherectomy, followed by drug-eluting balloon usage, could be a good option.

Materials and Methods: Between June 2021 and March 2022, 22 patients with 26 occlusive diseases of the CFA had been treated with rotational atherectomy followed by drug-coated balloon. They were reviewed prospectively.

Results: There were 15 men and 7 women. Mean age was 75 years. Eighteen legs had preoperative Rutherford stage 3 peripheral arterial disease (PAD). The mean preoperative ankle brachial index was 0.69. The mean length of the lesions was 4.2 cm. All lesions were heavily calcified. Three chronic total occlusions were present. All procedures were performed with the patient under local anesthesia. Nineteen were anterograde with contralateral femoral puncture and 7 were retrograde with ipsilateral superficial femoral puncture. No filters were used. Technical success rate was 100%. One case of asymptomatic embolization occurred in the deep femoral side branch. One of the patients died after 1 month following cardiac decompensation. Two patients experienced a non-ST-elevation myocardial infarction, 1 on the first and 1 on the 30th postoperative day. Two patients had developed a false aneurysm at the puncture site, and 1 was treated surgically and with thrombin injection. All others had no complications. At short term, the primary patency rate was 100 %. All patients had decreased Rutherford stage PAD.

Conclusions: These short-term results have shown that rotational atherectomy with drug-coated balloon angioplasty for common femoral calcified occlusive disease is feasible and safe. It has the advantages of avoiding the potential complications of surgical treatment, and of not leaving a stent.

AMP 2022-4

Atherectomy With Drug-Eluting Balloon for Common Femoral Artery Occlusive Disease: Short-Term Experience

A. Kerzmann

Purpose: Chronic limb-threatening ischemia has associated morbidity, mortality, and impact on quality of life. This endovascular case had a high-complexity target path anatomy with retrograde access to allow treatment. Objective: Presenting an endovascular case of high complexity with medial artery calcification (MAC) and management with a coronary stent in the posterior tibial artery (PTA).

Materials and Methods: Case report: Male, 57 years old, with diabetes mellitus for a long time with 7 days of ischemic lesion in the first and fifth toes of the right foot. There was an absence of pulses in the foot and behind the knee, as well as congestive heart failure with a reduced ejection fraction of 25%. In the classification system Wound, Ischemia, and foot Infection (WIfI): wound 2, infection 1, ischemia 3, with Stage 4 given a high risk of amputation and high revascularization benefit. Computed tomography angiography showed multiple stenotic lesions with continuous, thin, and annular calcifications. This corresponds to a dominant medial calcification pattern. The endovascular management was planned, finding in the Global Limb Anatomic Staging System (GLASS) femoropopliteal disease grade 4, infrapopliteal (IP) disease grade 4, and pedal disease grade 2. As the anterograde was not possible, the retrograde access in the posterior tibial with ultrasound guidance was used. The wire was snared to create a through-wire; after passing the lesion, an angioplasty was performed with a drug-eluting balloon in the superficial femoral artery, popliteal artery, anterior tibial, and posterior tibial. The persistent injury of occlusion at the level of the PTA due to stent placement managing to permeabilize. The patient has been followed for 3 months to date with primary patency.

Results: MAC has an impact on the risk of extremity loss associated with a worse limb outcome and complex disease. The use of IP stents has been debated. Different studies show higher patency immediately; technical success, however, is not clear for the long term.

Conclusions: It is necessary to have an endovascular strategy for revascularization of the IP vessel to secure an optimal vessel. This provides a good runoff of flow to the foot given greater durability, permeability, and a decrease in major complication and amputations.

AMP 2022-5

Dealing With Calcium: A Case Report

A. Salcedo-Mercado, R. Lozano-Corona

Purpose: We report the 24-month outcomes of the PROMISE I early US feasibility study (EFS) after treatment of no-option chronic limb-threatening ischemia (CLTI) with Transcatheter Arterialization of Deep Veins (TADV) using the LimFlow System.

Materials and Methods: There were 32 patients with no-option CLTI who were enrolled in this single-arm EFS of the LimFlow TADV System. Following TADV treatment using the LimFlow System, patients were assessed for clinical status and pain, wound healing status, and duplex ultrasound at 30 days and 6 months post treatment. Primary endpoint analysis was amputation-free survival (AFS) at 30 days and 6 months. Secondary endpoints evaluated included technical success of the procedure, wound healing, and secondary patency at 6 months.

Results: Of 32 enrolled patients, 31 were successfully treated with the LimFlow System at the time of the procedure. The 30-day and

6-month, 12-month, and 24-month AFS rates were 91%, 74%, 70%, and 59%, respectively. The 30-day and 6-month, 12-month, and 24-month limb salvage rates were 91%, 77%, 77%, and 77%, respectively. There were no amputations after day 75. Wound healing status of fully healed or healing was 92% at 24 months.
Conclusions: The LimFlow TADV System was effective in treating no-option CLTI with a high technical success rate, resulting in a significant percentage of patients treated surviving free of major amputation at 24 months. These results, combined with a high percentage of patients with full or partial wound healing, suggests the LimFlow System is safe and technically feasible.

AMP 2022-6

36-Month Results From the Tack Optimized Balloon Angioplasty II Below-the-Knee Study

G. Adams

Purpose: The purpose of this study was analysis of clinical characteristics and results of surgical revascularization in patients with acute limb ischemia (ALI) and COVID-19, compared with cases without SARS-CoV-2 infection.
Materials and Methods: For 2 years (2020-2021), all consecutive patients with ALI admitted to the tertiary emergency vascular service and supposed to surgical revascularization were prospectively enrolled. On admission, all patients were tested for SARS-CoV-2 infection. The mortality, major amputation rate, and amputation-free survival (AFS) during 3 months' follow-up were defined as study outcomes.
Results: One-hundred thirty patients (139 limbs with ALI) were included and 21 (16.1%) from them (23 limbs with ALI) were positive for SARS-CoV-2 infection. There was no significant difference in demographic and clinical characteristics of infected and noninfected patients. Lower limbs were affected more frequently: 90 (77.5%) limbs vs 17 (73.9%) limbs in the infected group. The ALI of Rutherford grade IIB was diagnosed mostly: 72 (62%) limbs in the noninfected group and 16 (69.5%) limbs in the COVID-19 patients. In 90% of cases, COVID-19 patients developed ALI during hospitalization. Thus, time from ALI onset until admission in vascular service and time from admission to revascularization both were insignificantly shorter compared with the noninfected group: 16 (6-24) vs 22 (5-96) hours and 2 (2-5) vs 3 (2-8) hours (P >.05). Infected patients had limited access to vascular imaging before revascularization. Computed tomography angiography was performed in 5 (21.7%) cases and duplex ultrasound in 2 (8.6%) cases, compared with 49 (42.2%) cases and 54 (46.5%) cases in the noninfected cohort (P <.05). Embolic etiology of ALI was diagnosed more frequently in the noninfected group: 86 (74.1%) vs 11 (47.8%) cases in patients with COVID-19 (P <.05). Patients with COVID-19 had significantly worse outcomes of treatment: 5 (21.7%) limbs were amputated and 9 (42.8%) patients died vs 12 (10.3%) limbs and 17 (15.5%) patients, respectively, in the noninfected group (P<.05 for mortality). At the end of follow-up, the AFS in the entire cohort was 69.2%: 74.3% in the noninfected patients and 42.8% in the COVID-19 group (P <.01).
Conclusions: Despite the similarity of clinic and demographic characteristics, patients with ALI and concomitant SARS-CoV-2 infection have significantly worse outcomes of surgical revascularization compared with noninfected cases.

AMP 2022-7

Internal Iliac Artery Revascularization to Save an Above-the-Knee Stump: Case Report

V. Demesmaker, A. Kerzmann

Purpose: Poor stump healing concerns a significant number of patients. It can be due to lack of vascularization or infection. We report the case of an above-the-knee (ATK) stump wound treated by atypical revascularization.
Materials and Methods: A 46-year-old man had a large ATK stump wound. He had a history of bilateral deep vein thrombosis; pulmonary embolism; stroke; renal infarction; left femoral artery endarterectomy with stenting of the left common iliac artery; embolectomy of the left iliac, femoral, and popliteal arteries; and a prosthetic femoro-femoral bypass from the right to the left. He had toe necrosis due to thrombosis of the superficial femoral and popliteal arteries. He had undergone several attempts at revascularization. At least he had an amputation ATK. The following evolution was not favorable, with large stump wound development. The common iliac, external iliac, and common femoral arteries were occluded. The ipsilateral internal iliac artery was still patent.
Results: We performed a percutaneous common iliac artery recanalization by left humeral puncture to enhance the inflow into the left lower limb through the internal iliac artery. The external iliac and common femoral occlusions were not treated because of the heavy previous history. After 1 month, the stump was completely healed.
Conclusions: Percutaneous recanalization of the common iliac artery to increase the inflow into the left lower limb through the internal iliac artery is helpful to ensure healing of a wound stump.

AMP 2022-8

The Circle of Care: The Multidisciplinary Approach to Limb Salvage, Acute Limb Ischemia: Case Presentation

M.L. Raja, J.M. Mendivil, L.C. Henderson

Purpose: Acute limb ischemia (ALI) occurs with an abrupt interruption of blood flow to the extremity and a sudden decrease in limb perfusion, threatening the limb viability. The incidence is 1.5 per 10,000 and requires immediate revascularization. Prompt diagnosis and revascularization with thrombectomy is critical to minimize the risk of limb loss. Here, a 29-year-old man presents with ALI with

cold left lower extremity and severe pain. He underwent emergent angiogram with mechanical thrombectomy with repeat attempts at revascularization, then was referred to vascular surgery for an open attempt that also yielded no success, leaving the treating team with only the option of major amputation. The critical limb ischemia (CLI) team and committee were critical in favor of limb preservation.
Materials and Methods: This case shows the importance of a multidisciplinary approach to limb salvage in ALI. It discusses the vascular intervention and the surgical procedure and advanced wound modalities used to achieve healing. We also will introduce the CLI team and CLI committee process that allowed for a committee review of this case prior to amputation and allowed for a formal second opinion process to provide all options before a major amputation. A 29-year-old man with ALI presented to another hospital where he was treated with many failed attempts and worsening tissue loss. Orthopedics was consulted and referred the patient to be transferred to a CLI center of excellence for treatment by the CLI team. Through a CLI committee process he was referred to be evaluated by limb preservation specialists who determined that he warranted an attempt at conservative transmetatarsal amputation vs below-knee amputation and repeat vascular evaluation. Successful limb preservation and minor amputation was achieved.
Results: The progression to wound healing and limb preservation, even after failed attempts due to a formal CLI committee review and second opinion leading to a successful revascularization and conservative wound management. The multidisciplinary approach from vascular intervention to surgical intervention and wound care that led to healing a wound where the only option was major amputation as recommended by all other specialists on his case.
Conclusions: The authors portray the importance of a team approach and coordination of care essential to bring all disciplines together for optimal wound healing and limb preservation.

AMP 2022-9

Use of Novel Autologous Fibrin, Leukocytes, and Platelets in Patients With Diabetic Foot Wounds

J.M. Mendivil

Purpose: The investigators of this study provide an analysis of 15 patients treated with an autologous patch consisting of fibrin, leukocytes, and platelets. These patients have failed conventional treatment for diabetic foot wounds. In addition, the investigators will present data on patients with critical limb ischemia (CLI) and ankle-brachial index < 0.8. The effects of fibrin and growth factors found in autologous plasma have been documented in wound healing and the formation of collagen. The autologous combined leucocyte, platelet, and fibrin patch is a novel treatment created by a unique centrifugation of autologous blood. The patch is applied to chronic diabetic foot wounds that have failed conventional wound care treatment alone.
Materials and Methods: The study presents 15 patients who failed at least 4 weeks of conventional wound care. In addition, some of these patients had proven CLI. These patients continued to have a wound size of more than 50% of their original size at 4 weeks, despite weekly sharp debridement, local wound care, and total contact cast offloading. All patients presented with type II diabetes and peripheral arterial disease. Four patients were on hemodialysis. The patch was applied weekly; 1 to 20 applications per patient were done. Patient age range was 37 to 89 years. Wound sizes were analyzed weekly utilizing digital wound-imaging software.
Results: It was determined that after 1 application of a patch, in conjunction with sharp
debridement, local wound care and adjunctive total contact casting, the average decrease in length was 22.5%, width decrease was 16.45%, depth decrease was 4.5%, and total surface area decrease was 20.25%.
Conclusions: In our case series of 15 patients, the use of the autologous patch, in conjunction with local sharp debridement and offloading measures (total contact casting), has shown to decrease the size of diabetic foot wounds on a weekly basis, especially in the setting of chronic wounds lasting more than 4 weeks duration. Of the 15 patients evaluated, 11 patients completely healed with the use of the patch during the 20-week evaluation period. One patient underwent a minor (hallux) amputation and 3 patients have continued care with noted improvement in their wound on a weekly basis. Patients with CLI showed benefit from treatment, even in those not fully revascularized.

AMP 2022-10

Endovascular Approach After Occluded Surgical Bypass: Last Option Limb Salvage Case Presentation

M.L. Raja, L.C. Henderson

Purpose: Critical limb ischemia (CLI) affects approximately 1 to 2 million people in the United States. One-year mortality after CLI diagnosis and amputation is 40%. This case presents a 71-year-old man with a history of peripheral arterial disease, hypertension, and dyslipidemia who is very active golfing daily. He had a wound to the medial aspect foot, first metatarsal that had not healed and was worsening to the point where he could not golf. He had undergone 2 surgical revascularizations with a fem-fem and fem-pop bypass by 2 different surgeons in 2018 and 2021. At his last visit, below-knee amputation was recommended as the only option. His wound care specialist became concerned when this wound was not responding and referred the patient to Dr. Laiq Raja for a second opinion.
Materials and Methods: The patient was taken for angiogram in April 2021 and found to have a totally occluded arteriofemoral bypass to the right limb. Dr. Raja was able to revascularize the native anterior tibial artery and performed mechanical thrombectomy with infusion of tPA to the right fem-pop bypass with subsequent stent placement to the proximal anastomotic site of the right fem-pop bypass and percutaneous transluminal angioplasty and stent placement to the distal anastomotic site of the right fem-pop bypass. After

this procedure, his wound began to heal well; however, in September 2021 he presented with severe pain. He called the CLI nurse practitioner navigator, was seen urgently in the office, and was subsequently directly admitted for treatment of the thrombosed occluded bypass. He underwent percutaneous transluminal angioplasty and revascularization of the chronically occluded posterior tibial artery and tPA infusion to the fem-pop bypass graft using an EKOS catheter (Boston Scientific) retrogradely. He was discharged on aggressive anticoagulation and followed very closely; however, he did reocclude in December 2021 and underwent one more intervention to treat thrombosed fem-fem and fem-pop bypass grafts successfully.

Results: The patient is followed closely and reaches out to the CLI navigator with any concerns urgently. His wound is now completely healed and has continued to do well. He has maintained close follow-up with our team and continues to golf several times a week and follows with wound care as needed for offloading. The team communicates on his care plan often.

Conclusions: Treatment of CLI requires advanced endovascular intervention and a multidisciplinary team with close follow-up and good communication as well as rapid response when there is a setback. By educating patients on this process, we can intervene in an urgent manner and prevent further tissue loss, allowing for continued healing and resolution of wounds.

AMP 2022-11

Challenging Multisite Tibial Intervention Using XO Cross 14 Microcatheter in Coaxial Configuration

R, Saxon

Purpose: Accessing stenosed lower-limb vasculature in peripheral arterial disease (PAD) and critical limb ischemia (CLI) patients requires low-profile catheters with long working lengths without sacrificing the ability to navigate to, and cross, lesions. Coaxial catheter systems provide additional push ability and control when crossing challenging lesions, but the standard tapered design of long microcatheters often prevents the use of a support catheter due to its profile.

Materials and Methods: The 2F XO Cross microcatheter (Transit Scientific) is a nontapered exoskeleton catheter that supports low-profile, triaxial catheter configurations as demonstrated in a complex case involving a PAD/CLI patient with a focal peroneal lesion spanning the tibioperoneal trunk and posterior tibial chronic total occlusion.

Results: The lesions were accessed using a triaxial catheter support system made up of a .014" guidewire, an XO Cross 14 microcatheter, and a 5F XO Cross 35 support catheter. The triaxial system was steered through the femoropopliteal artery to first cross the tibioperoneal trunk focal occlusion. The XO Cross was advanced next to the .014" guidewire with the guidewire holding the path of the occluded peroneal while the XO Cross was wirelessly steered to cross the occluded post-tibial lesion. A percutaneous transluminal angioplasty balloon was then advanced over the wire to treat the peroneal occlusion. The procedure resulted in the successful recanalization of both the peroneal and posterior tibial occlusions.

Conclusions: This case demonstrates the successful use of a triaxial catheter approach to navigate to and cross challenging lesions in both the peroneal and posterior tibial arteries during a singular procedure and thus a promising approach for treating below-the-knee lesions to preserve the lower limbs in PAD/CLI patients.

AMP 2022-12

Treatment of Lesions in Iliac and Femoral Arteries Using Low-Pressure Angioplasty With a Novel Scoring Device

K. Himle

Purpose: Treating calcified stenotic lesions in the iliac and common femoral arteries (CFAs) can be difficult and often requires high pressures of greater than 20 atmospheres (ATM) to dilate them adequately. Vessels with tough fibrous or calcified lesions and plaque can be difficult to treat and are prone to high rates of recoil, dissection, and restenosis, often requiring reintervention. The ability to effectively prep these vessels using low pressure helps minimize the risk of these complications.

Materials and Methods: XO Score (Transit Scientific) is a new type of scoring and cutting technology that enables low-pressure lesion dilatation and vessel prep with a broad range of standard off-the-shelf percutaneous transluminal angioplasty (PTA) balloons. The unique 1-piece metal-alloy exoskeleton construction adapts to the size, shape, and length of the physician-selected PTA balloon used inside it and converts it into a scoring and cutting vessel prep device.

Results: The patient presented with high-grade stenosis (80% stenosed) at the start of the right iliac, into the distal iliac and CFAs. Access to the treatment site was gained via retrograde femoral access on the right side using a 7F introducer. A 6-mm x 40-mm balloon was loaded inside of the XO Score and was advanced to the proximal section of the lesion site in the distal iliac. The PTA balloon was inflated to 3ATM, deflated, and then advanced to the second treatment site at the start of the right CFA. The PTA balloon was inflated to 4ATM at the eccentric lesion. The calcified lesions responded well at low 3 to 4ATM pressures using the XO Score device. No waisting or cinching of the balloon were present during either inflation, and no dissection was present post vessel prep. Post vessel prep, 2 stents were placed, 1 in each iliac. The procedure resulted in the successful recanalization of the right iliac and CFA.

Conclusions: This case demonstrates the successful use of low-pressure dilatation to treat challenging lesions in the iliac and CFAs, indicating a promising new approach to effectively revascularize CLI and limb-salvage patients.

AMP 2022-13

Endovascular Limb Preservation: Critical Limb Ischemia From Single-Vessel Runoff to 3-Vessel Flow

J. Yoho, A.L. Valles

Purpose: Critical limb ischemia (CLI) occurs when there is severe blockage of the arteries causing persistent resting pain, nonhealing ulcers, or gangrene. CLI affects approximately 2 million people in the United States. This causes a 60% readmission rate within 6 months of a hospital discharge; most will die or have a major amputation in the first year. This case presentation demonstrates the collaborative approach to limb restoration through advanced endovascular procedures, wound care, and patient education. We present a 65-year-old man with a nonhealing ulcer on the left foot, severe peripheral arterial disease (PAD) with CLI, and a recent digit amputation. The patient was hospitalized and offered only a below-knee amputation; however, he signed out against medical advice to acquire an alternate opinion and attempt on saving his leg.

Materials and Methods: The patient underwent an angiogram, which revealed extensive disease of the superficial femoral artery with 20% stenosis with calcification, 60% stenosed popliteal, 80% peroneal, and 100% occluded anterior tibial (AT) and posterior tibial (PT). There was an ostial occlusion of the PT artery with reconstitution at the plantar arch. Given the patient's nonhealing ulcer, in addition to severe PAD and CLI, the decision was made to proceed with intervention for limb restoration. A catheter was advanced to the AT and across the entire occlusion and into the distal vessel, the wire then was advanced around the arch and retrograde up the PT vessel. The wire was advanced across the CTO of the ostial PT. At this aspect, a second wire with catheter was advanced to the PT artery and across the lesions into the distal vessel in an antegrade fashion for support; IV ultrasound was performed.

Results: Atherectomy was performed using the Auryon laser 0.9-mm device (AngioDynamics). Balloon angioplasty was done to the AT, PT, popliteal, and peroneal arteries. There remained a flow-limiting dissection in the mid-AT and popliteal arteries. Given the prior amputation and nonhealing ulcer, the decision was made to stent the vessels to provide maximum opportunity for wound healing and limb preservation. There was now excellent 3-vessel flow down into the foot and filling both the dorsal and plantar arch.

Conclusions: After successful revascularization, the patient is healing. This case demonstrates the importance of quick follow-up and diagnostics to determine appropriate methods for limb restoration. The patient in-clinic education on PAD signs and symptoms saved life and limb.

AMP 2022-14

Treating High-Risk, Complex, and Severe Lower-Extremity PAD-CLI via Brachial Access

K. Goel, L. Kelly, K. Armstrong, A. Naghian, C. Pollina, M. Ramon, A. Arvandi, M.M. Ansari

Introduction: As peripheral arterial disease (PAD) and critical limb ischemia (CLI) continue to rise in prevalence and complexity, early treatment of PAD-CLI is encouraged to mitigate the occurrence of limb amputation, and further, patient mortality. Patients with PAD-CLI most commonly develop the condition due to atherosclerosis of the lower limb arteries, often requiring resolution via endovascular intervention if PAD-CLI symptoms interfere with daily living. The arteries most affected by PAD-CLI are the superficial femoral and popliteal arteries, and thus, chronic insufficiency to the lower limbs may lead to muscular necrosis, causing great discomfort to PAD-CLI patients. These patients may require bilateral lower-limb angioplasty and stent placement, for which brachial access can be utilized if radial artery access is unsuccessful. The transradial approach (TRA) for femoral and popliteal interventions has been proven to be equally safe and effective when compared with the transfemoral approach (TFA). Here, we present a case in which a patient with bilateral lower-extremity PAD-CLI was treated in 1 procedure using brachial access to undergo 2 percutaneous treatments.

Case Presentation: A 61-year-old woman with an extensive medical history of PAD, paroxysmal atrial fibrillation, multivessel coronary artery disease, moderate-severe mitral stenosis, hypertension, recent pulmonary embolism, hyperlipidemia, hemorrhagic stroke, Chiari malformation, and type II diabetes presented with right lower extremity (RLE) swelling and numbness. Computed tomography imaging conducted prior to emergency department admission revealed both common femoral and mid-superficial femoral artery occlusion in the RLE. Arterial duplex was performed and displayed moderate stenosis in the right mid-superficial femoral and popliteal arteries, left common femoral, proximal, and mid-superficial femoral arteries. Tibial arteries showed decreased velocities in the arterial duplex and no flow was detected in the right peroneal artery. Selective limb angiography was conducted on both lower extremities with repositioning of the catheter more easily achieved due to the brachial approach. Percutaneous transluminal angioplasty was conducted in the right external iliac, common femoral, and superficial femoral arteries, followed by stent placement of the right external iliac and common femoral artery with excellent results. Significant improvements were noted in the lesion at the end of the procedure via angiography. Following the procedure, the patient was discharged on the next day to follow-up care.

Conclusion: High risk lower extremity PAD-CLI treatment may utilize brachial access when radial or femoral access cannot be successfully established. Catheterization from upper-extremity access sites has been noted to cause significantly fewer incidents of site-related bleeds when compared with transfemoral catheterization. Transradial access has additionally become more favorable for PAD interventions with the introduction of tools of greater length (~200 cm) and documentation of patient preference. Reductions in site-related complications and overall length of hospital stay in patients undergoing PAD-CLI interventions through TRA when compared with TFA highlight the safety and cost-efficiency of alternative approaches to TFA. This case demonstrates that brachial artery access is another access tool that interventionalists can use to treat patients with severe, complex lower-extremity PAD-CLI. Brachial access was favored initially in the past but with the advent of radial access or ultrasound-guided femoral access, brachial access lost its ground.

However, with the extreme of disease in the ever-growing population with calcified radial and femoral arteries, brachial artery access for iliac approach appears a favorable comeback.

AMP 2022-15

Femoral Vein Approach for Treating Superior Vena Cava Syndrome With Occlusion and Atretic Innominate Vein and Inferior Vena Cava

C. Pollina, G. Thomas, R. Rusy, K. Holder, B. Couch, M. Ramon, A. Arvandi, M.M. Ansari

Introduction: Superior vena cava syndrome (SVCS) is a collection of signs and symptoms caused by a mechanical obstruction of the SVC. Obstruction of the SVC can be acute or chronic, with the most common cause being malignancy. Typically, masses around the SVC will externally compress the vessel, leading to collateral diversion of blood flow. Rarely, large thrombi can form and lead to SVCS.

Case Presentation: This is a case report of a 26-year-old man with SVCS secondary to thrombi formation, successfully treated with balloon angioplasty after attempting to recanalize the SVC with a stent. He had a history of DiGeorge syndrome status post surgical correction of a congenital heart defect, hypertension, and depression. He presented to an outside emergency center with facial swelling of 1 week. Swelling started solely on his face and progressed to both of his arms during this period. Imaging was done 1 week later at the outside emergency center, which showed evidence of SVCS with occlusion and atretic innominate vein and inferior vena cava. The patient was transported to our institution for a higher level of care. An attempt to recanalize the SVC via right inferior jugular vein approached for SVC stent placement was unsuccessful, so the patient underwent SVC recannulation via a femoral approach. The SVC stenosis/compression was about 90% to 95%. By the end of the recannulation, the stenosis was reduced to 30% using wire crossing and balloon angioplasty. Postoperatively, the patient experienced resolution of presenting symptoms and was discharged the next day.

Conclusion: In conclusion, the most common symptoms of SVCS are dyspnea, cough, dilated chest veins, and swelling of the face, neck, and arm. Patients presenting with clinical features suspect of SVCS should undergo chest radiography followed by computed tomography of the chest to delineate the cause of SVCS. Method of management will often revolve around the etiology that is causing the compression of the SVC, such as recanalization with a stent. A femoral approach for SVC recannulation may be more superior than internal jugular vein approach recannulation for patients with SVCS with thrombotic occlusion of the IVC. It appears from our case and case series that our approach demonstrates efficiency in treating SVCS utilizing fewer devices, radiation, and contrast when compared with the published data.

AMP 2022-16

Complex Manifestations of PAD: Treatment of an Elaborate CFA-SFA-Pop-PT CTO Lesion Utilizing Various Intervention Modalities in Patients Deemed High Risk for Surgical Bypass

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Introduction: Peripheral artery disease (PAD) is one of the most underdiagnosed clinical manifestations of atherosclerosis in the United States and worldwide, affecting upwards of 200 million people. Primarily involving the peripheral vasculature in the lower extremities, PAD presents initially as a silent disease but later evolves to significant leg pain, claudication, cramps, muscle atrophy, and eventual limb loss if not treated appropriately. Understanding the basic pathophysiology of PAD has led to an increase in novel techniques/development of effective treatments and interventions for this chronic illness as a notable rise in patients presenting with complex variations has been observed. For a significant number of patients, this may involve chronic total occlusion (CTO) of a vessel in the lower extremity, leading to gangrene and eventual amputation if not treated promptly. In this case study, we explore the utilization of multiple intervention modalities to restore normal function to existing vasculature affected by a long complex left superficial femoral artery (SFA) CTO lesion in a patient deemed high risk for surgical bypass.

Case Presentation: A 64-year-old man with a history of hypertension, dyslipidemia, heavy tobacco habituation, stage IVa laryngeal cancer, and Rutherford class IV PAD in the left lower extremity s/p common iliac and SFA stents presents with severe left leg pain that has progressed for the past 4-6 weeks. Review of left leg arterial doppler was suggestive of his left SFA stent reocclusion and limited flow in the posterior tibial (PT). A peripheral angiogram was performed, revealing a substantial CTO of the left ostial SFA, with thrombus throughout the stent, stretching into the popliteal artery and below-the-knee vasculature. After adequate assessment, 2 separate interventions were performed using multiple techniques including laser atherectomy, mechanical atherectomy, percutaneous transluminal angioplasty (PTA), and placement of 12-hour EKOS device (Boston Scientific) and 5 Viabahn stents (Gore) throughout the long lesion. In conclusion to the various intervention strategies performed, severe CFA-SFA-popliteal artery with thrombotic lesions s/p mechanical thrombectomy and PTA displayed significant improvement. Additionally, there was successful stenting of the distal SFA-proximal popliteal artery and PTA of the severe PT disease was excellent.

Conclusion: By and large, the prevalence of complex PAD cases has greatly increased over the years as the chronic illness continues to remain historically underappreciated by health care professionals and patients. Though new interventional modalities are key to successfully treating complex PAD as seen in this patient with an elaborate SFA CTO, early detection and prevention of PAD are crucial to combat the increasing numbers of complex manifestations. This seemed to be a viable option in patients deemed to be at high risk for surgical bypas

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Gender And Racial Disparities: The Impact on Diagnosis and Treatment of Peripheral Arterial Disease

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Background: Research over disparities in peripheral arterial disease (PAD) have largely been focused on racial and gender differences between White and Black Americans. However, it is unclear whether disparities are present among other minorities, especially within the Hispanic population. The goal of this study is to determine whether racial and gender differences exist between Hispanic and non-Hispanic Americans regarding access and treatment for PAD care.

Methods: We identified patients who were previously diagnosed with PAD and collected nonidentifying information from patient records including demographics, social history, and coexisting comorbidities/risk factors. Additionally, participants were asked to complete a self-reported survey regarding their perceptions on various determinants of care. Nonparametric $\chi 2$ tests and Fisher's exact tests were performed to assess the association of PAD risk factors/comorbidities to gender and ethnicity. Two-sample T-tests comparing mean results from each question on the survey were used to investigate statistical differences in responses between the gender and ethnic groups.

Results: Of the 79 patients examined for PAD, a majority had a history of tobacco usage (70.9%), hypertension (91.1%), diabetes (64.6%), alcohol usage (59.5%), hyperlipidemia (68.4%), and coronary artery disease (55.7%). On average, comorbidities among men were more prevalent than women (tobacco usage: 80% men vs 58.8% women; alcohol usage: 71.1% men vs 44.1% women; coronary artery disease: 66.7% men vs 41.2% women). Moreover, non-Hispanic men had higher rates of tobacco and alcohol consumption and coronary artery disease (CAD) compared with Hispanic men. Regarding barriers to care, Hispanic men and women reported that language represented a major barrier to care compared with non-Hispanic men and women. Furthermore, Hispanic women reported transportation barriers as an obstacle to care to a greater degree than non-Hispanic women.

Conclusion: Though the "Hispanic Paradox" suggests that Hispanics have a lower rate of CAD and PAD yet a high burden of cardiovascular risk factors compared with non-Hispanics, the reasons for it are unclear. One possibility is that Hispanics may have a higher rate of undiagnosed PAD due to the present barriers affecting their access to healthcare. This is especially possible given the transportation and language barriers noted in our study. As such, public health and policy strategies are needed to mitigate these barriers that affect Hispanics from receiving treatment and diagnosis for PAD.