the time; two veins, 27.6%; three veins, 4.8%; four veins, 4%; five veins, 0.8%; and six veins, 0.4%. Calculation of potential ablations was performed, excluding superficial reflux in 2.6% of limbs with small diameter, 5.6% with segmental reflux, 4.4% with tributary reflux, and 6.0% with nonsaphenous reflux that would receive adjunct procedures including microphlebectomy or ultrasound-guided foam sclerotherapy. These adjunct procedures would account for 18.6% of therapy, whereas 64.0% would be ablative therapy. Past deep venous thrombosis was found in 7.2%; 2.8% had concurrent superficial and deep venous thrombosis.

Conclusions: From these data, we can assume that the average patient presenting with venous complaints would have symptomatic disease with great saphenous vein reflux and would require one or two ablations based on the prevalence of saphenous reflux in the population. Patients who had at least one saphenous vein with reflux would have an average of 1.6 ablations/patient.

Author Disclosures: J. Crawford: Nothing to disclose; **A. Gasparis:** Nothing to disclose; **N. Labropoulos:** Nothing to disclose.

Continuous Aspiration Thrombectomy of Acute Inferior Vena Cava and Inferior Vena Cava Filter Occlusions—Does It Work and Is It Safe?

Mark Broering, Brent Robertson, Aaron Kulwicki, Brian Kuhn, Matthew Recht, **Patrick Muck**. Vascular Surgery, TriHealth-Good Samaritan Hospital

Objective: Acute thrombosis of the inferior vena cava (IVC) and IVC filters has significant morbidity. Traditional endovascular management is pharmacomechanical with varying amounts of thrombolytics. Hemorrhagic complications from thrombolytics can be life-threatening. Rheolytic thrombectomy is effective, but complications include blood loss and renal insufficiency. Continuous aspiration thrombectomy (CAT) has recently emerged as a viable option for patients with deep venous thrombosis. Early results suggest that CAT may minimize blood loss, hemorrhagic complications, and renal insufficiency. This study evaluated the safety and efficacy of CAT in treating acute IVC thrombus and acutely occluded IVC filters.

Methods: This is a single-center, retrospective study conducted to analyze patients with acute IVC thrombus and acutely occluded IVC filters undergoing CAT. Patients were treated between December 2015 and September 2018. All patients underwent CAT. The primary end point was the periprocedural success, defined as an antegrade flow after CAT. Secondary end points were total lytic dose, hemorrhagic complications, and blood loss.

Results: A total of 156 vacuum-assisted thrombectomy procedures were performed. Of these, 21 procedures were performed on patients with acute DVT, 8 of whom presented with thrombus in the IVC or had an acute IVC filter occlusion. Antegrade flow was established after vacuum-assisted closure in seven of these patients. The mean preoperative and postoperative blood loss was 12.3/36.6 and 9.8/29.5, respectively. Access site hematomas were reported in two patients. No other complications, such as perforation, intracranial hemorrhage, or retroperitoneal bleeds, were reported. The range of lytic dose was 0 to 35 mg, with an average of 20.5 mg.

Conclusions: CAT is an emerging technology for arterial and venous thromboembolism. This is the first study analyzing CAT for acute IVC thrombus and occluded IVC filters. The study results suggest that CAT is safe and promising for the treatment of acute IVC thrombosis and acutely occluded IVC filters. Further investigation is necessary to establish a protocol for CAT in patients with IVC disease.

Author Disclosures: M. Broering: Nothing to disclose; **B. Robertson:** Nothing to disclose; **A. Kulwicki:** Nothing to disclose; **B. Kuhn:** Nothing to disclose; **M. Recht:** honorarium Penumbra; **P. Muck:** honorarium, stock holder Penumbra.

Vein Surgery Practice Patterns Differ Between Vascular Surgeons and Other Physicians

John Vossler,[1] **Elna Masuda**[2]. [1]Department of Surgery, University of Hawaii; [2]Department of Vascular Surgery, University of Hawaii

Objective: A dramatic increase in utilization of venous procedures has occurred during the past decade. Significant variation in practice pattern among physicians has become apparent. Given the destructive nature of these procedures, this variation has the potential to lead to large disparities in the quality of care delivered to patients with venous disease. The aim of this study was to determine the variation in vein surgery practice patterns between vascular surgeons and other physicians.

Methods: A retrospective review of a health insurance procedure claims database for the years 2014 to 2016 was conducted. All ablation, sclerotherapy, and phlebectomy procedures were included. Physicians were classified as vascular surgeon or other physician based on American Board of Surgery vascular surgery board eligibility. Indications for each procedure were classified as "neither symptoms nor complications," "symptoms only," "complications only," or "both symptoms and complications" based on the diagnosis codes associated with each procedure. Procedures performed on the same date were assumed to be part of the same case. The number of procedures and cases per patient was calculated. Distribution of indications for procedure and average procedures and cases per patient were compared between vascular surgeons and other physicians by χ^2 test and Welch *t*-test, respectively.

Results: A total of 368 procedures performed for 219 cases on 135 patients by 6 vascular surgeons and 11 other physicians were analyzed. The distribution of indication for procedures for vascular surgeons (neither symptoms nor complications, 0; symptoms only, 27; complications only, 97; both symptoms and complications, 71) was significantly different from that for other physicians (neither symptoms nor complications, 10; symptoms only, 81; complications only, 61; both symptoms and complications, 21; $P < .0001$; Fig 1). Vascular surgeons performed the

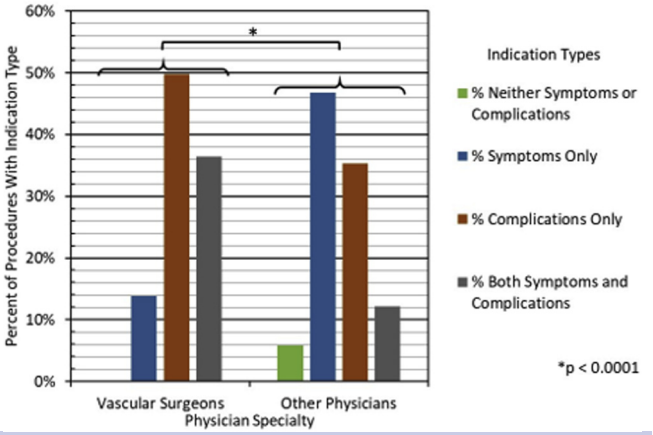

Fig 1. Indications for procedure by specialty.

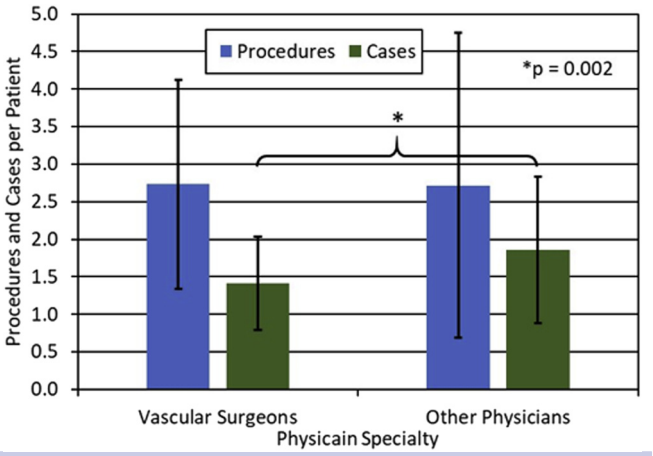

Fig 2. Procedures and cases per patient.

same number of procedures per patient as other physicians (2.37 ± 1.39 vs 2.73 ± 2.03; $P = .964$) but did this for fewer cases (1.41 ± 0.62 vs 1.86 ± 0.97; $P = .002$; Fig 2).

Conclusions: Vein surgery practice patterns differ between vascular surgeons and other physicians. This study found that vascular surgeons perform surgery for more severe venous disease than other physicians. It also found that vascular surgeons do so in a more cost- and time-efficient fashion by performing a similar number of procedures in a smaller number of cases per patient. Further study is necessary to determine the impact of this difference in practice patterns on patient outcomes.

Author Disclosures: J. Vossler: Nothing to disclose; **E. Masuda:** Nothing to disclose.

AMERICAN VENOUS FORUM INTERNATIONAL SESSION

Initial Results of a Clinical Feasibility Study for Endovenous Deep Venous Valve Formation to Treat Chronic Venous Insufficiency

Thodur Vasudevan,[1] Ramon L. Varcoe,[2] David A. Robinson,[3] Andrew A. Hill,[4] Andrew Holden[5]. [1]Vascular Surgery, Waikato Hospital; [2]Vascular Surgery, University of New South Wales and Prince of Wales Hospital; [3]Royal Prince Alfred Hospital; [4]Vascular Surgery, Auckland City Hospital; [5]Interventional Radiology, Auckland City Hospital

Background: Chronic venous insufficiency (CVI), due to superficial and deep venous reflux (DVR) and venous obstruction, is widespread and associated with significant morbidity. DVR correlates with increased symptoms. Historically, therapeutic approaches to DVR involved difficult and morbid surgical procedures or unsuccessful attempts to implant valves. The study objective was to assess the safety and effectiveness of endovenous formation of autogenous deep vein valves in patients with DVR and significant associated symptoms. The study is ongoing, and results are presented for the first 10 treated patients.

Methods: Patients with DVR and correlating symptoms of CVI (Clinical, Etiology, Anatomy, and Pathophysiology [CEAP] class C4-C6) were treated with an endovenous autogenous valve formation system in four centers in New Zealand and Australia. Patients with outflow obstruction were excluded. Retrograde percutaneous access was obtained through the common femoral vein, and contrast venography and intravascular ultrasound were used to assess reflux and to identify potential treatment sites. If the patient was deemed eligible, the 16F study device was introduced and used to form monocuspid valves in femoropopliteal vein segments spanning 7 to 11 mm in diameter. Intravascular ultrasound and venography were used to assess valve functionality. Postprocedurally, patients were prescribed 7 days of low-molecular-weight heparin injections, followed by 6 months of anticoagulation. Follow-up included duplex ultrasound scan, physical examination, and questionnaires. Deep venous thrombosis (DVT) was defined as a treated vein found to be noncompressible with visible echogenic thrombus or dilated with decreased flow by ultrasound. Mural thrombus was a deposition that did not fit the DVT criteria.

Results: The patients were clinical class C4 (n = 3), C5 (n = 2), and C6 (n = 5) and of both primary (n = 8) and secondary (n = 2) etiology. One or more monocuspid valves were successfully formed in 9 of 10 patients. One valve formation was completed in four patients, two formations in four patients, and three formations in one patient; the anatomy did not accommodate successful valve formation in one patient. Follow-up ranged from 30 to 210 days with a median of 30 days. During this time, no occlusive DVTs were reported, and adverse events related to the device or procedure included access site-related events (n = 7) and mural thrombus (n = 3). All mural thrombi resolved by 90 days. At 30 days, there was a median change in reflux time (seconds) in the proximal femoral vein of 0.3 (−1.9 to 4.3), in the distal femoral vein of 0.4 (−1.4 to 5.6), and in the mid popliteal vein of 0.2 (−3.3 to 6.7). Seven of 10 patients had a ≥4-point improvement in the Venous Clinical Severity Score.

Conclusions: Endovenous valve formation in the deep venous system is feasible. Initial experience suggests that it may be safe and effective for treatment of CVI.

Author Disclosures: T. Vasudevan: Nothing to disclose; **R. L. Varcoe:** Nothing to disclose; **D. A. Robinson:** Nothing to disclose; **A. A. Hill:** Nothing to disclose; **A. Holden:** Nothing to disclose.

A Randomized Trial of Moderate (Class 2), High (Class 3), and Very High (Class 4) Elastic Compression in the Prevention of Recurrence of Venous Ulceration

Dragan Milic,[1,2,3] Sasa Zivic,[2] Dragan Bogdanovic[3]. [1]Medical School, University of Nis; [2]Clinic for Cardiovascular and Transplant Surgery, Clinical Centre Nis; [3]Department of Biomedical Sciences, State University of Novi Pazar

Background: Venous leg ulcers (VLUs) are an important health problem because of their high prevalence and associated high cost of care. Despite many available contemporary treatment modalities (surgery, endovenous thermal ablation, foam sclerotherapy, compression), recurrence rates remain high and range between 25% and 70% according to different studies. Numerous studies have suggested that regular use of compression stockings reduces VLU recurrences. However, there are limited data concerning two important questions: How long should compression hosiery be worn after ulcer healing, and which class of compression hosiery achieves better results in the prevention of VLU recurrences? The aim of this study was to establish the efficacy of three different strengths of compression (class 2, class 3 and class 4) in the prevention of VLU recurrences.

Methods: An open, prospective, randomized, single-center study with a 10-year follow-up was performed. There were 477 patients (240 men, 237 women; mean age, 59 years) with recently healed venous ulcers and no significant arterial disease, rheumatoid disease, or diabetes mellitus who were randomized into three groups: group A, 149 patients who were wearing a class 2 elastic stocking (Rudo, Nis, Serbia); group B, 167 patients who were wearing a heelless open-toed elastic class 3 compression device knitted in tubular form (Tubulcus; Laboratoires Innothera, Arcueil, France); and group C, 161 patients who were wearing a multilayer compression system composed of Tubulcus compression device and one elastic bandage 15 cm wide and 5 m long (Niva, Novi Sad, Serbia). The main outcome measures were recurrence of leg ulceration and compliance with treatment.

Results: There were 117 patients (24.52%) who did not comply with the randomized compression class: 24 (16.1%) in class 2, 34 (20.36%) in class 3, and 59 (36.65%) in class 4 ($P < .05$). Overall, 65% (234/360) of patients had recurrent leg ulceration by 10 years. Recurrence occurred in 120 (96%) of 125 class 2 compression cases, in 89 (66.9%) of 133 class 3 compression cases, and in 25 (24.5%) of 102 class 4 compression cases ($P < .05$; graph; Kaplan-Meier survival analysis showing ulcer recurrence at 10 years).

Conclusions: The results obtained in this study suggest that compression systems with the higher compression class provide a statistically significant lower recurrence rate compared with elastic compression of lower class.

Author Disclosures: D. Milic: Nothing to disclose; **S. Zivic:** Nothing to disclose; **D. Bogdanovic:** Nothing to disclose.

Stationary Blood Particle Aggregates and Vein Valve Shape: A New Classification of Vein Damage

Johann Chris Ragg. Interventional Phlebology, Angioclinic Vein Centers

Background: By use of novel high-resolution ultrasound systems, valvular structures and low-flow microaggregates may be depicted today in a more detailed way. The existence of particle aggregations within a valve sinus that are neither sludge nor thrombus, detected by high-resolution ultrasound (American Venous Forum Servier Travel Award 2017), was recently reported. This consecutive study of 180 single-vein valves showing motion-resistant aggregates compares valve structures, cusp motility, and extent of aggregates, resulting in a new approach to vein damage classification.

Methods: In 100 consecutive patients (68 female, 32 male; 42-64 years old) presenting with unilateral epifascial venous insufficiency, a total of 180 saphenous vein valves with motion-resistant aggregates were selected for closer high-resolution ultrasound analysis (14-16 MHz, peak