

thrombosis (no EHIT, three gastrocnemius thrombosis, one popliteal thrombosis), and there were three inflammatory response treated/resolved with Bactrim-DS. The VCSS score preoperatively was 5.97, at 2 weeks was 3.03, and at 6 months was 2.34. Cost savings of \$178/procedure (total \$70,666) was realized in 12 months.

Conclusions: Similar performance outcomes are seen using the single use Covidien ClosureFAST catheter and the NES-reprocessed ClosureFAST catheters, with significant cost savings using RC.

The Effects of Altitude, Temperature, Gas to Sclerosant Ratio, Air Versus 50:50 Mixture of CO₂ and O₂, Foam Volume, Presence of Silicone, and Consecutive Uses of Syringes on the Longevity of Tessari-Made Foam for Sclerotherapy

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Background: Tessari-made foam sclerotherapy is a popular treatment of varicose veins. This procedure is performed around the world in variety of clinics differing in methods, equipment, temperatures, and altitudes. We investigated how the following factors affected the foam longevity: silicone vs nonsilicone syringes, the volume of foam made, the ratio of gas:sclerosant, the use of air vs 50:50 mixture of CO₂ and O₂, temperature, altitude, and 10 consecutive reuses of the syringes. To study the effect of altitude (and hence pressure), we performed experiments at several stations at different altitudes on a mountain.

Methods: Sclerosant foam was made using the Tessari double syringe technique. To calculate the longevity, the time was taken for half of the original volume of sclerosant to settle. Half-lives were compared when using silicone and silicone-free syringes to make the foam. We investigated how the volume (5 mL vs 2 mL) and different ratios affected the foam by observing the half-life of 4:1, 3.5:1, and 3:1 ratios of gas to sclerosant. Air and a 50:50 mixture of CO₂ and O₂ were both used as the gas when changing the ratio and volume, to see which produced better foam. These experiments were conducted at room (23.9°C) and refrigerated temperatures (3°C) with a constant pressure. The different ratio, volume, and silicone vs nonsilicone syringe experiments were all repeated at 9314, 7460, 4575, and 2326 feet above sea level in addition to the baseline experiment which took place at 236 feet above sea level. To test how consecutive uses of syringes affected the foam, we made consecutive batches of foam reusing each pair of syringes 10 times; this was repeated five times with silicone syringes and twice with nonsilicone.

Results: Switching to nonsilicone syringes can increase longevity by 70%. A larger volume of foam and a 3:1 ratio produced longer half-lives at all temperatures and altitudes. The lower (3°C) temperature increased the longevity of foam in all instances as did the use of air. A high altitude (low pressure) had a detrimental effect on the foam longevity. Ten consecutive syringe uses had no significant impact on the foam half-life (silicone syringe mean between first five and last five uses; $P = .95$).

Conclusions: The optimum conditions for making foam are non-silicone syringes, a 3:1 air:sclerosant ratio, and low temperatures. Silicone syringes can be reused until friction becomes a burden. Temperature has a bigger effect than altitude on foam longevity. Making foam in larger volumes would allow the foam to last longer. To compensate for high altitudes (low pressures), decreasing the temperature will increase the foam longevity.

Short-Term Clinical Experience with a Dedicated Venous Stent

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Background: Deep venous stenting has become the primary treatment option for chronic venous obstructive disease, both for iliac vein compression syndromes and post-thrombotic venous lesions, during the last decade. Until recently only arterial-designed materials were available; no dedicated venous stents were available. These venous stents are characterized by increased length, diameter, flexibility, and radial force. Recently, three such stents have become available. We report our early experience with one such device; the Sinus Venous stent (OptiMed, Ettlingen, Germany).

Methods: Between March 2012 and July 2013, 48 patients were treated with the Sinus Venous stent. These included six cases of stenting after thrombolysis for acute DVT, 11 cases of stenting for isolated iliac vein compression syndrome (May-Thurner), and 31 cases of stenting for chronic venous obstruction in post-thrombotic syndrome patients. Diagnosis of relevant obstruction was made by use of clinical evaluation combined with duplex ultrasound, magnetic resonance venography, and periprocedural

venography. Patency control during follow-up was assessed with duplex ultrasound.

Results: Cumulative patency rate at 3 months was 83%, 84%, and 97% for primary, primary assisted, and secondary patency, respectively. Differences in patency rate between the subgroups of acute thrombotic, post-thrombotic, and nonthrombotic exist, with the latter fairing significantly better. All reocclusions were treated by ancillary treatment modalities, including catheter directed thrombolysis, rePTA, and restenting. Morbidity was low, no clinically relevant pulmonary embolisms occurred, and mortality was nil.

Conclusions: Short-term clinical results using the Sinus Venous stent are excellent, with acceptable morbidity rates, and no mortality. As already reported in other venous stenting series, thrombotic lesions have lower patency rates compared with nonthrombotic lesions.

Treatment of Nutcracker Syndrome with Open and Endovascular Interventions

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Background: Nutcracker syndrome (NS) is rare cause of hematuria, left flank pain, and renal venous hypertension due to external compression of the left renal vein (LRV). We reviewed our experience to better define the role of open surgery (OS) and endovascular interventions (ENDO).

Methods: Retrospective review of all patients treated for NS with OS and ENDO at our institution between January 1994 and September 2013. Primary outcomes were operative morbidity and mortality. Secondary outcomes included primary and secondary patency, freedom from reintervention, and resolution of symptoms.

Results: Thirty-four patients (27 females) with a mean age of 27.5 years (range, 14-62 years) were treated. The most frequent symptoms were flank pain (94%) and hematuria (71%). NS was confirmed with duplex ultrasound with measurement of LRV diameters and flow velocities (80%), computerized tomography or magnetic resonance venography (88%), and contrast venography with measurement of pressure gradients (68%). Initial treatment was OS in 33 patients and ENDO in one. Distal transposition of the LRV was performed in 24 patients. Adjuncts to optimize renal venous outflow included saphenous vein (SV) cuff in six patients, SV patch in four, and both SV cuff and patch in one patient. Five patients had SV patch alone and two had transposition of the left gonadal vein (LGV) into the inferior vena cava (IVC). Two patients had anterior reimplantation of retroaortic LRV. There were no major early complications, renal failure, or mortality. Three patients underwent early reinterventions including stenting (2) and open revision (1). All LRVs were patent at discharge. Follow-up was 36.3 ± 50.3 months. Late reinterventions were performed in nine patients due to LRV stenosis (7), LRV occlusion (1), and recurrence of varicocele (1). Three had LRV angioplasty alone, three LRV angioplasty with stenting, two had open revision, and one had coiling of LGV. Six patients underwent additional endovascular reinterventions; three due to LRV stenosis, two due to LRV in-stent restenosis, and one due to LGV stenosis. All had angioplasty with stenting. One patient had stent migration into the inferior vena cava that required emergent endovascular stent removal. Primary and secondary patencies at 24 months were 97% and 100%, respectively. Freedom from reintervention at 12 and 24 months were 73% and 60% respectively. Resolution of symptoms occurred in 26 patients (77%).

Conclusions: OS, mostly LRV transposition, remains a safe and effective treatment for patients with NS, and ENDO may be useful to treat restenosis or recurrent symptoms. However, the safety and durability of currently available stents need to be established. Further improvement in patient selection and treatment options in this challenging, young patient population are warranted.

Clinical Correlation of Anatomical Location of Nonthrombotic Iliac Vein Lesion

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Background: Nonthrombotic iliac vein lesions (NIVL) is an active area of research. Advantages of intravascular ultrasound (IVUS) allows exact localization of these lesions. We chose to use IVUS to explore the anatomical location of NIVL and correlate it with clinical findings.

Methods: Over the course of 7 months, we have performed 217 iliofemoral IVUS assisted studies. The average age of examined population was 68 years old (range, 22-96 years old; standard deviation ± 14 years), with females (n = 141) and males (n = 76). Intraoperatively, we have used IVUS to measure and record the area of involved iliofemoral veins. The