

# ABSTRACTS



## **Endovenous Ablation Procedures for Truncal Venous Insufficiency: A 2019 Update**

Lowell Kabnick

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In 2019, one can conclude that radiofrequency (RF) and laser thermal ablation have clinical equipoise. With regard to applications, there are some minor differences between the two. 1470nm and covered fibers continue to be the standard. Of interest is that there are several RF instruments: Closurefast, Venclose, RFITT, and EVRF (FCare). Closurefast and Venclose are segmental ablative devices where RFITT and FCare are continuous ablative devices. Disadvantages of thermal ablation are the need for tumescent anesthesia and the fear of nerve injury. Although RF and laser thermal ablation have similar efficacies when it comes to perforators closure, laser appears easier and faster.

When we consider non-thermal devices, there are two mechanical-chemical devices (Clarivein and Flebogrif), commercial foam (Varithena), and Cyanoacrylate (Venaseal, Variclose and VenaBlock).

There are significant procedural differences amongst these ablative procedures. Efficacy results appear good to excellent, while quality of life score improvements appear to be excellent in all devices. The disadvantages of non-thermal devices include limited scientific publications, increased disposable cost, procedural limitations, and spotty governmental approval.

Presently close to obtaining a CE mark is a mechanical ablative device. This device is a percutaneous clip occluder designed to stop flow through blood vessels and other structures. At present, the target use is for perforators and CHIVA. This device has potential advantages and disadvantages; however, presently they are all theoretical.

In conclusion: currently, thermal ablation is still the gold standard for most venous truncal ablative procedures.

## **Innovation in Phlebology / The Future of Phlebology**

Johann Christof Ragg

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Background: Venous insufficiency (VI) is one of the most ignored diseases. Physicians' and people's belief is that 1) VI is mainly genetically determined, 2) there is no way to prevent it, 3) invasive therapy should be delayed as long as possible it has relevant risks. The introduction of endovenous modalities reduced the risks, but overall expenses for invasive treatments are rising, and patients are still not offered effective therapy until they show serious problems or at least large varices. Current efforts are on safety and patient comfort of endovenous methods, like with the second and third generation of vein gluing, the combination of sclerotherapy and compression film bandage, perivenous hyaluronan or novel protein-enforced microfoam. While it is good to improve ablation techniques, it may be much better to reduce the need for it, starting with the early stages.

Studies: Newer studies of our clinics, using broad band high-frequency ultrasound (HFU, 16 – 32 MHz) reveal four different mechanisms of VI: First, a high incidence of vein valve defects in children - above 35% in the group of 6 – 8 year-old kids, most probably congenital. These lesions grow during adolescence and determine a primary pattern of vein disease. Repair is the only cause-related therapy. Second, pressure-mediated decompensation of valves is the next mechanism occurring in people's lives. Normalizing local diameter by perivenous fillers seems to become an option. The third component is stasis-related, long-term valve degeneration, well reacting to preventive measures. Our studies on more than 1000 legs showed six different stages, from early hemodynamic disturbance to final loss of valve structures, with a new stage marker called "persistent aggregates". The fourth and final mechanism to occur - phlebitis - is more an accelerator of preexisting valve damage than a primary cause.

Conclusions: By newest ultrasound analysis, there is a clear differentiation which lesions need primary repair, and which deserve proof-based prevention - the earlier the better.

Venous Interventions I, Main Ballroom, May 5, 2019, 8:30 AM - 10:30 AM

**Randomised Controlled Study of EVLA and Foam in the SSV: A study from the SFP (Fovellass study) - 2 year results**

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**Objective:** The objective of this RCT, conducted by the Société Française de Phlébologie: to compare during a 3-year follow up, the rate of occlusion of the small saphenous vein (SSV) and the clinical data, into two groups of randomized patients: one treated by endovenous laser ablation (EVLA) and the other by ultrasound-guided foam sclerotherapy (USGFS).

**Methods:** The inclusion criteria were SSV incompetence with diameter  $\geq 4$ mm, and CEAP classification C2 to C6. Evaluation criteria were: vein occlusion (Duplex-scan), VCSS, CIVIC-14, QOL, specific neuropathic pain questionnaire, with visits done on D0, M6, M12, M24 and M36.

**Results (2-Year FU):** 161 patients enrolled among whom 79 were treated by EVLA and 82 by USGFS; 133 patients were followed at 6 months, 129 patients at 12 months and 124 patients at 24 months. Both groups were homogenous (73.6%female, mean age 59), with equivalent mean trunk diameters (6mm at mid-calf) and a majority of C2s (55%). At Day 8, rate of SSV complete occlusion was 98.7% in EVLA-group vs 93.8% in USGFS-group; at M6, rates were respectively 95.2% vs 74% ( $p < 0.001$ ), at M12, 95.2% vs 60% ( $p < 0.0001$ ) and at M24, 90% vs 53.2% ( $p < 0.0001$ ). By cons, length of occlusion was slightly greater in the USGFS-group (24cm vs 20cm). At M6, 74% were asymptomatic in EVL-group and 70.5% in USGFS-group ( $p$ :NS), these rates were 68.5% and 74.1% at M24 ( $p$ :NS). The VCSS was highly improved ( $p < 0.001$ ) in both groups with no difference between them from D0 to M24. The benefit was gained between D0 and M6 and maintained between M6, M12 and M24. It was the same for the QOL.

**Conclusion:** At M6 and M24, the closure rate of the SSV in the USGFS-group is lower than in the EVLA-group. By cons, the rate of asymptomatic patients, the VCSS and the QOL are significantly and similarly improved in both groups.

Venous Interventions I, Main Ballroom, May 5, 2019, 8:30 AM - 10:30 AM

**Wavelength vs Fiber: Which is More Important Post-operatively**

Lowell Kabnick

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In order to define the relative importance of fiber type as compared to laser wavelength on tissue injury depth, postoperative pain, and bruising during endovenous laser ablation, a study which included 213 limbs that were treated with an 810-, 980-, or 1470-nm laser with bare-tip (BT) or jacket-tip (JT) fibers was conducted. Pain scores (10-point scale) and bruising scores (5-point scale) were recorded. Tissue thermal injury depth (mm) was evaluated in vitro for the 810- and 1470-nm wavelengths with BT and JT fibers.

The JT fibers had lower pain scores as compared to the BT fibers at 810 nm ( $1.69 \pm 1.77$  vs  $3.70 \pm 1.34$ ;  $P < .0005$ ) and at 980 nm ( $1.14 \pm 1.06$  vs  $2.71 \pm 1.80$ ;  $P < .0005$ ). The JT fibers had lower bruising scores as compared to the BT fibers at 980 nm ( $0.89 \pm 1.06$  vs  $2.00 \pm 1.44$ ;  $P < .0005$ ). The in vitro study showed lower thermal injury depths for the JT as compared to the BT fibers at 810 nm ( $0.36 \text{ mm} \pm 0.26 \text{ mm}$  vs  $1.05 \text{ mm} \pm 0.34 \text{ mm}$ ;  $P < .0005$ ) and at 1470 nm ( $0.20 \pm 0.16 \text{ mm}$  vs  $0.71 \pm 0.31 \text{ mm}$ ;  $P < .0005$ ). With regard to wavelength, 980-nm laser had lower pain scores as compared to 810-nm laser with BT fibers ( $2.71 \pm 1.80$  vs  $3.70 \pm 1.34$ ;  $P = .015$ ), and with JT fibers, a similar result trended toward significance ( $1.14 \pm 1.06$  vs  $1.69 \pm 1.77$ ;  $P = .057$ ). The 980-nm JT fiber showed less bruising as compared to the 810-nm JT fiber ( $0.89 \pm 1.06$  vs  $1.42 \pm 1.19$ ;  $P = .019$ ). Similarly, the 1470-nm JT fiber showed less bruising as compared to the 810-nm JT fiber ( $0.94 \pm 1.02$  vs  $1.42 \pm 1.19$ ;  $P = .038$ ). The in vitro study showed thermal injury depths that were less for 1470 nm as compared to 810 nm, with JT fibers ( $0.20 \pm 0.16 \text{ mm}$  vs  $0.36 \pm 0.26 \text{ mm}$ ;  $P = .013$ ) or with BT fibers ( $0.71 \pm 0.31 \text{ mm}$  vs  $1.05 \pm 0.34 \text{ mm}$ ;  $P = .001$ ). All mean differences between JT and BT fibers were greater than between differing wavelengths. The multivariate analysis for the in vitro study showed a mean difference between 1470 nm and 810 nm of 0.26 mm,  $P < .0005$  favoring 1470 nm and a mean difference between JT and BT fibers of 0.61 mm,  $P < .0005$  favoring the JT fibers.

The study concluded that the use of a JT fiber appeared to be more significant in reducing pain and bruising as compared to a longer wavelength. Moreover, the results appeared additive, and the cohort using 1470 nm with a JT fiber produced the best treatment outcomes. Additional study is required to confirm the efficacy and durability of the various iterations evaluated; however, these data should be taken into consideration when undertaking treatment with endovenous laser ablation.



### **“Choosing Wisely” Items for Chemical or Thermal Ablation in the Treatment of the Incompetent Saphenous Veins and Recurrences**

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"Better care without spending more" is one of the priority objectives of our government in terms of public health and doctors must be involved in this project. Varicose veins of the lower limbs represent a major public health issue in France.

This document includes 10 "Choosing Wisely" (CW) items produced by French Vascular Doctors, experts from the National Professional Council of Vascular Medicine (CNPMV); it was initiated following consultation with the French National Health Insurance (CNAMTS) and validated by both Instances.

It aims an improvement of the management of chemical or thermal ablation of saphenous veins and their recurrence on criteria of relevance, optimisation of patient benefit and cost reduction. The various conservative treatments are not discussed in this paper as they are not subject to it.

Among the 10 CW items, the following topics are addressed:

- Mandatory use of Duplex ultrasound for foam Ultrasound guided foam sclerotherapy (UGFS) in pre, per and immediate post procedure; requirement of report and iconography for UGFS procedure; priority use of foam versus liquid;
- Priority use of thermal ablation (EVL, RF) for large-calibre saphenous veins (>8mm) and in patients at high thrombotic risk; priority to EVLA versus RFA for SSV;
- Priority use of UGFS versus thermal ablation for small-calibre saphenous veins (<4 mm)
- Mandatory use of local anaesthesia by tumescence for any thermal ablation, avoiding any combination, with very rare exceptions, of general anaesthesia or any other anaesthesia that prevents the patient from perceiving a painful signal at the time of thermal application;
- High ligation and stripping (conventional method), not recommended with very rare exceptions.
- From now, French vascular doctors must comply with these CW items.

### **Intervention for Reflux Related Pelvic Venous Disorders: Female and Male Varicocele**

Sanjay Nadkarni

Male varicocele-Indications for treatment

- 1 Symptoms- Scrotal Pain, swelling, tenderness, large unsightly visible varicocele, recurrent thrombophlebitis
- 2? Subfertility – Reduced sperm count, motility, DNA fragmentation

Female varicocele

- 1 Symptoms- pelvic pain, pressure, heaviness, dyspareunia often worse during periods, mid cycle.
- 2? Recurrent non-saphenous varicose veins

Intervention

Gonadal vein embolization (+/- Internal Iliac vein embolization) – mechanical (coils, plugs); chemical (sclerosants, cyanoacrylate, alcohol, liquids-onyx, squid, Phil etc)

Challenges

- Access- Jugular, femoral, basilic
- Unilateral or bilateral embolization
- When to embolise internal iliac vein branches
- Nut Cracker, MTS

Ultrasound Insights, Main Ballroom, May 5, 2019, 11:00 AM - 12:30 PM

### **Neck Vein Obstruction: Diagnosis and the role of chronic persistent *Chlamydomphila pneumoniae* infection.**

Paul Thibault  
Central Vein and Cosmetic Medical Centre, Broadmeadow, NSW, Australia

**Background:** The objective of this review is to describe the diagnosis of neck vein obstruction and the possible role of chronic persistent *Chlamydomphila pneumoniae* (Cpn) infection in producing the syndrome of chronic cerebrospinal venous obstruction (CCSVO).

**Method:** The normal patterns of flow in the neck veins is described and guidelines for interpretation of the quantitative duplex ultrasound examination (QDUE) of the extracranial neck veins are developed.

**Results:** An infective cause of neck vein obstruction is proposed and from a literature search of the role of the obligate intracellular bacterium Cpn in vascular and chronic diseases, a diagnostic protocol for confirming chronic persistent Cpn infection which includes the QDUE and specific blood tests is suggested.

**Conclusion:** Further research to validate this diagnostic protocol is required.

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### **UIP Consensus on Venous Mapping**

Kurosh Parsi, Anes Yang, [Mina Kang](#) on behalf of the UIP Consensus Group  
*Dermatology, Phlebology and Fluid Mechanics Research Laboratory, St Vincent's Centre for Applied Medical Research, Darlinghurst, Australia, Department of Dermatology, St Vincent's Hospital, Darlinghurst, Australia, Faculty of Medicine, University of New South Wales, Randwick, Australia*

**Background:** To start a UIP Consensus on standardization of venous mapping.

**Methods:** Review of venous maps from various centres. **Results:** Large number of inconsistencies were found in maps produced by different sonographers and centres. Occasionally the same technician working from different centres produces different maps. Inconsistencies relate to:

1. Structures to be mapped/imaged in every case such as superficial and deep venous system, duplications, agenesis or absence, small saphenous artery, popliteal compression and Baker's cyst.
2. Vessel names
3. Vessel diameters and measurements
4. Graphic notations such as colour, arrows and other notations as it relates to competence, patency and previous treatments (stripped, occluded, sclerosed, thrombosed) and other findings.

**Conclusions:** UIP consensus group should define consistent and standardised guidelines for venous mapping.



### **High Resolution Ultrasound Analysis of Vein Valves: Stages of Acquired Damage**

Johann Christof Ragg  
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**Background:** Using novel high-resolution ultrasound systems (HRU), valvular structures and low-flow microaggregates may be depicted today in a more detailed way. We recently reported the existence of motion-resistant particle aggregations within valve sinus which are neither sludge nor thrombus, called motion-resistant aggregates (MRA). This consecutive prospective study compares valve structures, cusp motility and extent of aggregates, resulting in a new approach to vein damage classification.

**Methods:** In 500 consecutive patients (322 f, 178 m; 24 - 68 yr/o, GSV, SSV; C0-C6) presenting with unilateral epifascial venous insufficiency  $\geq$  C2, more than 6.800 saphenous vein valve locations were examined with high resolution ultrasound (14 - 23 MHz, peak up to 32 MHz, Vevo MD). Video recordings (manual 3-D scans) were collected for review and analysis by five experienced ultrasound investigators.

**Results:** Comparing repetitive patterns of valve formation, six different stages of valve changes were determined: 1) Alteration of sinus hemodynamics, marked by reduction of flushed sinus volume, was the most frequent finding (59.4%). 2) Restriction of cusp function due to aggregates but maintained valve closure was seen in 34.5% of the cases. Rare findings, correlating with short periods of occurrence, were 3) total fixation of cusps without reflux (3.1%), followed by stage 4 with initial onset of reflux (4.2%). Cases with increased reflux showed reduction of aggregates and progressive valve degeneration (5) and finally loss of valve structures.

**Conclusions:** Motion-resistant blood cell aggregates at the valve sinus indicate successive stages of venous insufficiency, correlating with specific conditions of cusp motility, shape and flow. According to the integrity of cusps, stages 1 - 4 might be reversible. Knowledge of these consecutive stages provides a new basis to evaluate the effectivity of preventive measures and vein preserving strategies.

### **Microvenous Reflux in the Skin of Limbs with Superficial Venous Incompetence.**

Andre Van Rij, G Hill, D Govind, M Curtis, Kate Thomas  
*Department of Surgical Sciences, Otago University, New Zealand*

Experimental studies have demonstrated that superficial vein reflux may occur out into the very small veins and venules of the skin. This study describes the efforts to confirm whether this occurs using different modes of ultrasound technology and whether this relates to the severity of CVI. While reflux can be shown in microvenules at the dermis using colour flow and contrast enhancement it was best demonstrated with SMI (Canon Medical Systems) into vessels of 150-100 microns in size. With foot augmentation the intensity and duration of the small vessel response was greater with C4-6 disease compared to C2-3 and was not seen in C0 limbs. Conclusion: Microvenous reflux can be demonstrated in patients with CVI and warrants further evaluation for clinical use.

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### **Ultrasound Imaging of Common MSK Pathologies**

Frederick Joshua

*Associate Professor Macquarie University, Director Rheumatology Specialist Care, Director Australian Musculoskeletal Ultrasound, President Australasian Society for Ultrasound in Medicine*

Ultrasound is an increasingly used modality by rheumatologists. This session will show the use of ultrasound for evaluation of musculoskeletal disease encompassing both mechanical and inflammatory causes that are commonly encountered by rheumatologists. The lecture will also illustrate changes in management that occur due to the use of ultrasound.

Ultrasound Insights, Main Ballroom, May 5, 2019, 11:00 AM - 12:30 PM

### **Ultrasound Probe Disinfection: Challenges and Potential Solutions**

Jocelyne Basseal

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As ultrasound technology rapidly evolves and is used more frequently in every area of medical diagnosis, it can be overlooked as a potential vector in the transmission of a health care associated infection. The infectious status of a patient is not often disclosed prior to an ultrasound examination and if the ultrasound probe involves contact with blood or bodily fluids, this can pose a risk of transmission of potential pathogens from patient to patient, or patient to operator. An overview of recent research studies relating to infection prevention around ultrasound will be highlighted along with potential solutions.



## Contemporary Management of Venous Thromboembolism

Anthony Comerota

This overview will include Pulmonary Embolism and Deep Vein Thrombosis, balancing strategies of reduction of thrombus burden and anticoagulation.

### PULMONARY EMBOLISM:

Patients presenting with PE should be risk stratified into one of the three clinical categories:

Low Risk: No hemodynamic instability, no right ventricular dilation and no increase of biomarkers.

Submassive: Hemodynamically stable, but dilation of the RV (RV/LV ratio  $>0.9$ ) and increased biomarkers.

Submassive – low risk: increased RV/LV ratio, increased proBNP but normal troponins

Submassive – High risk: same as submassive low risk with increased Troponins.

Massive: Hemodynamically unstable, increase of RV/LV, and increased biomarkers.

Massive PE: Requires intervention to decrease thrombus burden to diminish the associated 50% mortality. Stein PD et al., (Am J Med 2012) published the largest analysis of the management of Massive PE to date, reporting on a multi-year National Inpatient Sample of  $>70,000$  patients. Mortality of treatment with anticoagulation alone was 51%. Patients receiving IVC filters and anticoagulation had a 33% mortality. Those receiving systemic lytic therapy had a 15% mortality and those who had an IVC filter and lytic therapy, an 8% mortality.

Catheter based techniques to reduce thrombus burden and surgical embolectomy are also important treatment modalities.

Submassive PE: Low risk submassive PE is well managed with anticoagulation. Patients with high risk submassive PE should be evaluated for catheter based removal or systemic thrombolysis. The results of the PEITHO Trial demonstrated significant clinical benefit from systemic thrombolysis with Tenecteplase. However, there was a 10X increased risk of ICH (0.2 – 2.0%) with Tenecteplase, which considerably dampened enthusiasm for systemic thrombolysis for PE. Tenecteplase is the most highly fibrin bound plasminogen activator, which would increase the risk of distant bleeding with systemic therapy. It should be recognized that the majority of patients who developed an ICH were  $>70$  yrs old. ICHs were clustered in older patients. If lytic therapy is considered an option, adding a head CT to the CTA of the chest will help evaluate the risk of ICH in patients with massive and high risk submassive PE.

An extended duration of anticoagulation with a low dose DOAC should be considered in all massive and submassive PE patients.

### DEEP VEIN THROMBOSIS:

Iliofemoral DVT: Randomized trials support strategies of thrombus removal in patients with IFDVT. The most recent ATTRACT Trial, which randomized the largest group of IFDVT patients to date (N=391) to either PCDT plus anticoagulation or anticoagulation alone (Comerota et al., Circulation 2019) showed significant reduction in moderate and severe Post-Thrombotic Syndrome, significant reduction of pain and swelling and significant improvement in disease specific quality of life. These data compliment the results of the CaVent Trial. (Enden T., et al., Lancet 2012).

Femoral-popliteal DVT is best treated with anticoagulation alone in the majority of patients. If however, the distal popliteal vein is thrombosed, obstructing the venous drainage of the calf and is associated with severe symptoms, I suggest percutaneous catheter-directed thrombolysis from a posterior tibial vein approach.

Patients with unprovoked and large thrombus burden DVT should have an extended course of anticoagulation. Low dose DOACs are safe and effective for extended treatment.

Calf Vein Thrombosis: Unless there is a reason not to treat with anticoagulation, I recommend a 3 month course of anticoagulation with a DOAC.

Venous Thromboembolism I, Main Ballroom, May 5, 2019, 1:30 PM - 3:00 PM

### **Iliocaval Reconstructions: Patency and Safety**

Patrik Tosenovsky

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**Introduction:** The aim of the study was to assess results of interventions for ilio caval obstruction or compression in patient with acute and chronic venous disease.

**Methods:** Patients with chronic venous insufficiency (CVI) C3-C6 (CEAP classification), Pelvic Congestion Syndrome (PCS) caused by iliac vein compression, and acute DVT were assessed by ultrasound scan, CT, venography and/or IVUS, and if an obstruction in their ilio caval or iliofemoral segments were confirmed, they underwent venoplasty and stenting. Acute DVT cases were treated with pharmaco-mechanical and/or catheter-directed thrombolysis and residual obstruction was then stented.

**Results:** 118 consecutive limbs were treated between October 2011 and December 2017. Thirty-two limbs had an active ulcer (27%), 27 limbs had healed ulcer or advanced skin changes (23%), 39 limbs had swelling with or without other symptoms of CVI (33%), 15 limbs had acute symptomatic DVT (13%), and the residual 5 iliac vein cases were causing PCS (4%). Patency of the stents was 94%, 92%, 92% and 90% in 1, 3, 6 and 12 months, respectively. A relief of symptoms was achieved in 81.5 % of limbs at some stage during the first 12 months (most of them within the first 3 months). There was no limb loss and no mortality within 30 days from the intervention.

**Conclusion:** Iliocaval and iliofemoral venoplasty and stenting in both acute and chronic obstruction cases can be performed safely with good patency rates and improvement of symptoms of CVI, and also symptoms associated with PCS and acute iliofemoral DVT.

Venous Thromboembolism I, Main Ballroom, May 5, 2019, 1:30 PM - 3:00 PM

### **What is the Proper Duration of Anticoagulation for Acute Venous Thromboembolism?**

Anthony Comerota

Recurrent venous thromboembolism is associated with significant morbidity and mortality. Recurrent ipsilateral DVT increases risk of PTS 2.4X, and recurrent PE is associated with a 13% - 18% case-fatality rate. Therefore, prevention of recurrence is crucial, which is predominantly governed by the duration of anticoagulation.

Recurrent VTE is associated with its type of onset and the underlying thrombus burden. The larger the clot burden, the greater likelihood of recurrence. If a patient has an unprovoked thromboembolic event, recurrence (after a full course of anticoagulation, 6-12 mos.) can be as high as 13% in the first year and 50% at 8 – 10 years. Surgical provocation is associated with a low recurrence risk and medical provocation associated with an intermediate risk.

Guidelines recommend that patients with unprovoked VTE be considered for indefinite anticoagulation. If one wishes to fine-tune therapy, a venous duplex exam or d-Dimer studies can be obtained. A 40% or more post-thrombotic luminal obstruction or a d-Dimer level of >250 ng/dl is associated with a 300% increased risk of recurrence after anticoagulation is discontinued.

Randomized trials of low-dose Apixaban (2.5 mg bid) or Rivaroxaban (10 mg/day) demonstrated effective prophylaxis following a full course of therapeutic anticoagulation (6-12 mos.) with excellent safety.

Large studies evaluating statins have demonstrated significant protection from recurrence in patients taking statins, with a 70% reduction in recurrence risk in patients taking maximal dose statins.



## **Deep vein thrombosis present thinking, techniques over the last decade**

Devendra Dekiwadia

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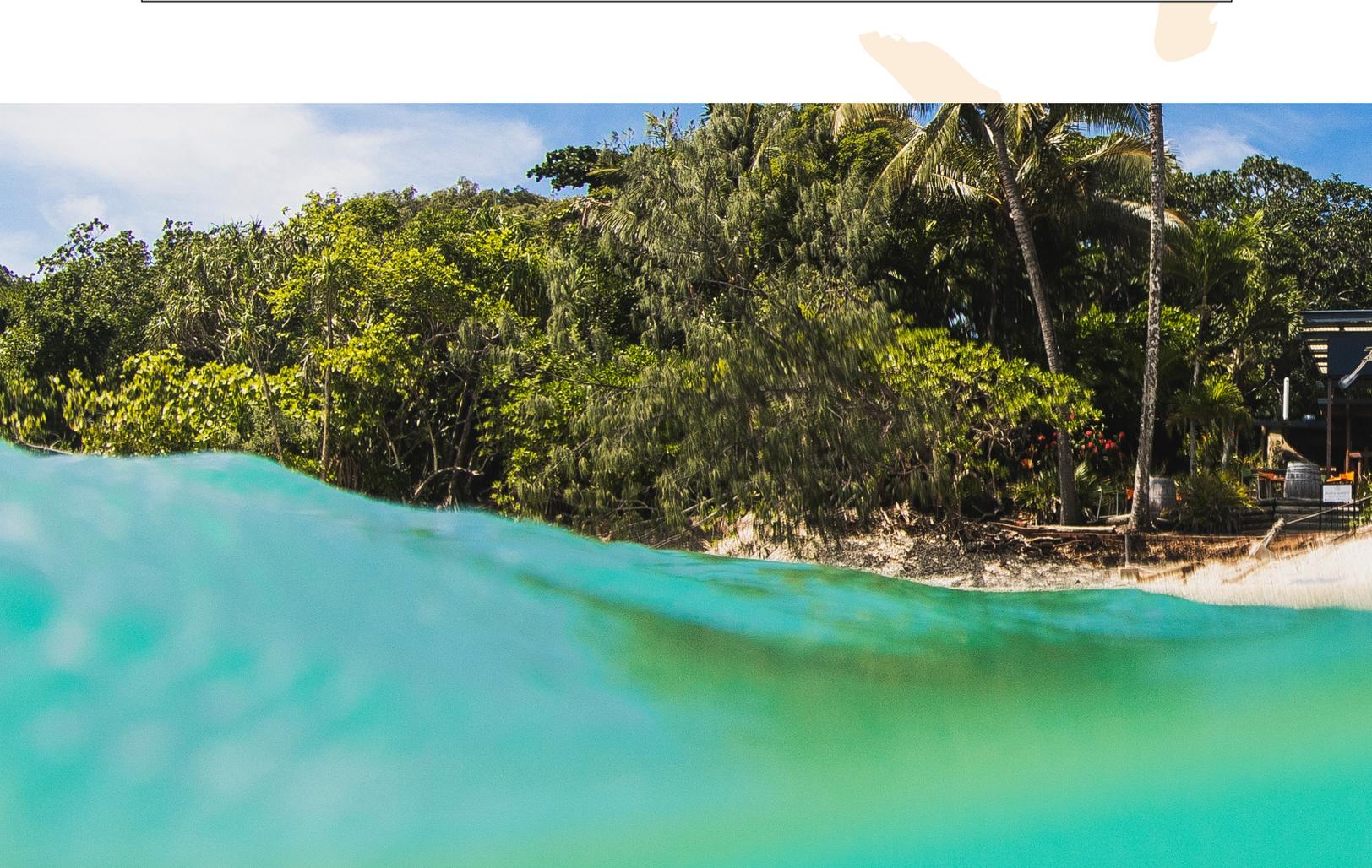
Introduction: Deep Vein Thrombosis (DVT) is recognized clinically by painful edema of the leg, tender calf thigh and iliac fossa and tense superficial veins.

Vascular Ultrasonography clinches the diagnosis. Untreated DVT may result in pulmonary embolism (PE), pulmonary hypertension or Post thrombotic syndrome. Immobility, Surgery, tumor, pregnancy certain medicines, protein abnormality and air travel are the assessed risk factors. Commonly practiced treatment is Heparin therapy. Surgery is uncommon. In CATHETER DIRECTED THROMBOLYSIS a Tissue Plasminogen activator (TPA). (Urokinase, r-tpa or streptokinase) is directly delivered In The Thrombus And Most Effective Clot Lyses Is Achieved.

Methods: A retrospective analysis of 243 CASES OF DVT, treated with urokinase was done. This included 150 males and 93 females between the age of 18 years to 80years with duration of symptoms from 1 week to 4 months. USG guided puncture of Popliteal or PTV was done with surgical exposure of ptv in selected cases to place the sheath. Multihole catheter was fixed in the thrombus and thrombolysis done with urokinase with 250000units/hr. Check fluoroscopy was done at 12 hourly intervals and catheter repositioned. Adjuvant heparin was given .Procedure was terminated at complete resolution or a maximum of 1 million unit infusion. Post procedure oral anticoagulant was given with INR set at 2.50.

Results: Complete Resolution: 206 Cases, Partial Resolution 33 Cases. Rethrombosis: 2 Cases. No Result: 2 cases. Follow-up: 8 YRS. Post Thrombotic Syndrome five, Secondary Varicose Veins: 02

Conclusion: TPA delivered intrathrombus gives optimum results in DVT, preserves valves and prevents post thrombotic syndrome.



## Should the Results of the ATTRACT Trial Change Patient Care?

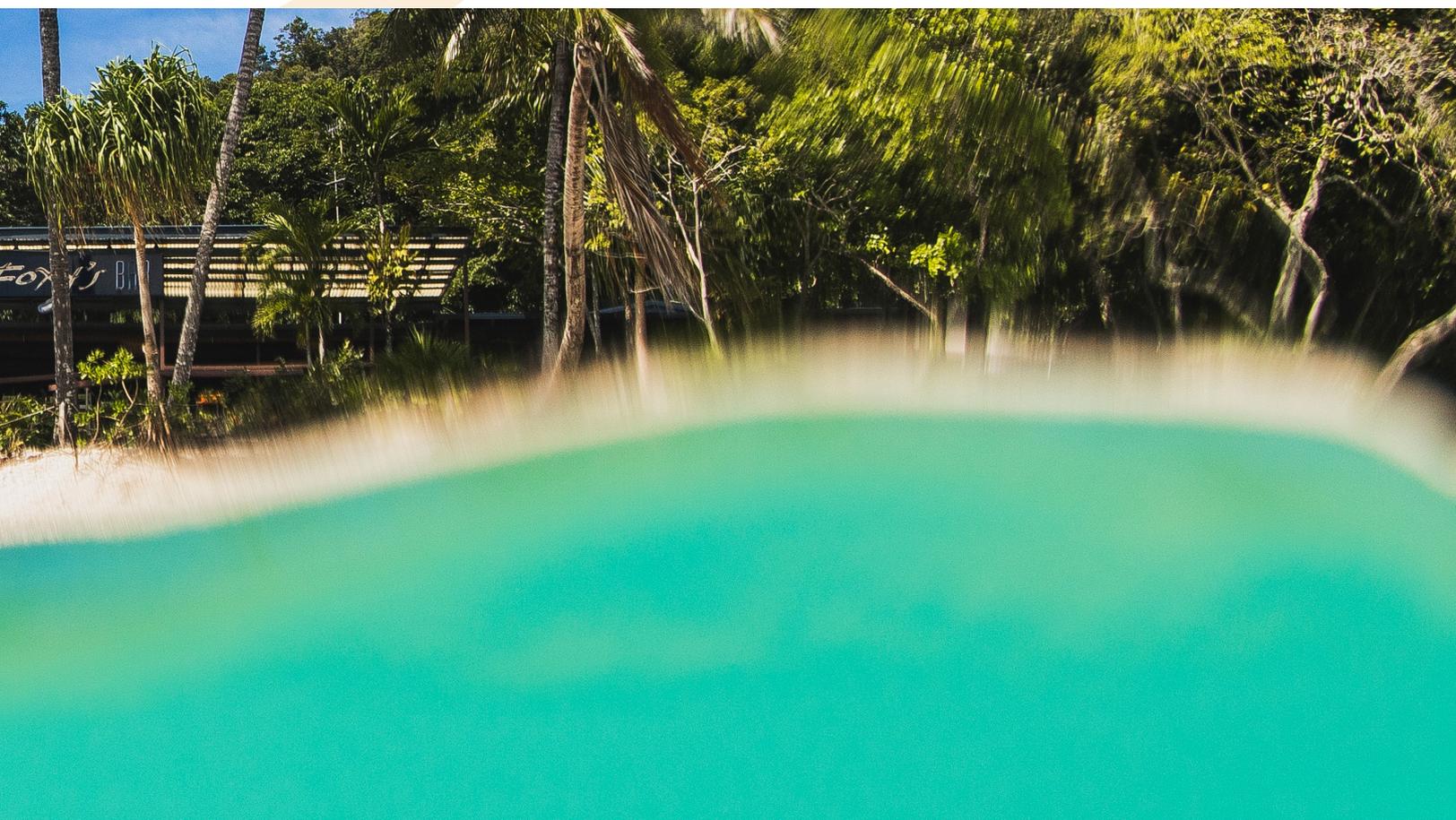
Anthony Comerota

**Background:** The ATTRACT Trial was sponsored by the National Institutes of Health of the United States. It was designed to answer the question: "Does pharmacomechanical thrombolysis plus anticoagulation reduce Post-Thrombotic Syndrome (PTS) compared to treatment with anticoagulation alone in patients with acute proximal DVT?" (Vedantham S. et al., NEJM Dec. 2017)

**Methods:** Patients with acute proximal DVT <15 days duration were eligible to be randomized to PCDT plus anticoagulation or anticoagulation alone. Patients with femoral popliteal DVT (FPDVT) and iliofemoral DVT (IFDVT) were identified as separate patient groups, and were stratified by group prior to randomization. The primary endpoint of any PTS was defined by a Villalta Score >4 during 24 mos. of followup. Secondary endpoints were; Moderate-Severe PTS, pain at 10 and 30 days, swelling at 10 and 30 days, Quality of Life (disease specific and general) and recurrent events. The primary safety endpoint was major bleeding.

**Results:** 692 patients were randomized. Outcomes demonstrated no difference in PTS between PCDT and anticoagulation, 47% and 48% respectively. There were more major bleeding events with PCDT than anticoagulation alone, 1.7% vs. 0.3% respectively,  $p=0.049$ . There was no significant difference in venous thromboembolism during follow up between groups. Moderate-Severe PTS was reduced with PCDT vs anticoagulation, 18% vs. 24%  $p=0.04$ . Severity scores were lower in the PCDT group at 6, 12, 18, and 24 mos. with PCDT,  $p<0.01$  at each timepoint. The improvement in quality of life did not differ between groups. Patients with FP-DVT were analyzed separately from those with IFDVT (Kearon C. et al., Coag. and Fibrinolysis 2019). Those with FPDVT demonstrated no difference of any PTS, Moderate-Severe PTS, severity of PTS scores, general or disease specific quality of life, leg pain or swelling between the PCDT and anticoagulation groups. There was a trend to more major bleeding ( $p=0.06$ ) and a significant difference with any bleeding ( $p=0.032$ ) with PCDT. Patients with IFDVT (N=391) were likewise analyzed as a separate group (Comerota AJ et al, Circulation 2019). There was no difference in the primary endpoint of any PTS between PCDT and anticoagulation alone, 49% and 51% respectively. However, the clinically meaningful, pre-specified secondary endpoints showed significant differences. PCDT lead to reduced PTS severity ( $p<0.01$ ), fewer patients with moderate ( $p<0.021$ ) or severe PTS ( $p=0.048$ ). From baseline PCDT led to greater reduction in leg pain and swelling at 10 and 30 days ( $p<0.01$ ) and a greater improvement in disease specific quality of life (VEINES-QOL)  $p=0.029$ . PCDT was associated with a non-significant increased risk of major bleeding,  $p=0.32$ .

**Conclusions:** The overall results of ATTRACT failed to meet the primary endpoint of any PTS, which is defined by a Villalta Score of >4. The FPDVT group and IFDVT group likewise failed to show that PCDT reduced "any" PTS. However, the patients with IFDVT showed across the board better secondary outcomes, which are more clinically meaningful to patients, at an historically low risk of major bleeding. Clinicians generally choose patients with IFDVT having significant symptoms of acute venous obstruction for PCDT. The outcomes of the ATTRACT Trial support that practice. Therefore, there is no reason for physicians to change patient care based upon the results of the ATTRACT Trial.



### **Thrombosed Dialysis Fistula Management: Do We Need Pharmacological Thromboprophylaxis**

Sanjay Nadkarni

Thrombosed Dialysis Fistula Management - Do we need pharmacological thrombolysis?

RARELY

#### Incidence

Arterio venous grafts (AVGs) 0.5-2 x /year

Arterio venous fistulas (AVFs) 0.1-.5 x/year

#### Options

Open Surgical – Thrombectomy +/- Re do

#### Endovascular

1 Aspiration Thrombectomy, Mechanical disruption +/- PTA/Stent

2 Thrombolysis + above

Devices available- Anglo jet, Cleaner, Suction aspiration thrombectomy catheters.

#### Precautions

Large R-L shunts,

Poor cardio pulmonary reserve,

Pulmonary Hypertention,

Infected grafts/fistula access sites,

Surgical revision 30 days prior

#### Challenges

Access- antegrade, retrograde, both (Fistula vs Graft)

Equipment on the shelf – mechanical devices, balloons including cutting balloons, Drug coated balloons, stents, stent grafts

Radiation times

### **Lipoedema, Lymphatic Failure and Lymphoedema**

Neil Piller

*Flinders University, Adelaide, Australia*

Lipoedema is a genetic disorder of the microcirculation and adipose tissue mainly affecting the legs. In its latter stages it's accompanied by significant fluid accumulation and termed lipo-lymphoedema. Secondary lymphoedema occurs when lymph transport is reduced by surgery, radiotherapy, tissue trauma, while primary lymphoedema is associated with lymphatic malformation. Secondary lymphoedemas may have an underlying primary component. The main exacerbating factors are BMI, mobility and infection related to poor skin care.

Lipoedema, phleboedema, myxoedema, acute/chronic oedema can appear like lymphoedema and may occur together or underlie them. A medical/family/surgical history and medication review will confirm/eliminate these and allow targeted treatment.

The most accurate measurement of initial lymphatic failure/related fluid accumulation is gained from Bio-impedance Spectroscopy/Tissue Dielectric Constants. Tissue compositional changes are determined using Indurometry/Ultra-sound. Each of the 4 lymphatic territories of the legs may show different changes so all should be examined. Lymphatic function can be assessed by Lymphoscintigraphy and ICG.

We often ignore the fact that lymph from the legs must pass through the abdominal/thoracic areas before exiting at the junction of subclavian/jugular at the left shoulder. Events in the abdominal area (bloating, constipation, visceral fat, prior surgery/radio-therapy) or thoracic area (diaphragmatic hernias, lung diseases) may compromise this flow.

We also ignore that diet can be a factor for lymphatic loading of the mesenteric lymphatics with longer chain fats passing into the lymphatics. We are also often unaware that lymphoedemas/lipoedemas have an inflammatory basis and so a diet which is inflammatory (omega 6 rich) may exacerbate them while one rich in omega 3's may help their management. The key to optimally deal with lymphoedema/lipoedema is differential diagnosis, early detection, a functional assessment and targeted/sequenced treatment holistic management, and an acknowledgement of the patient as an individual.

We all often are more concerned about limb size rather than functional issues/structural changes while patients often are concerned about functionality and progression.

The Swollen Leg, Main Ballroom, May 5, 2019, 3:30 PM - 4:45 PM

### **The Impact of Varicose Veins on Lipoedma and Lymphoedma**

Chris Lekich

*Vein Doctors Group, Miami, Queensland, Australia*

When managing patients with swollen legs in a specialised lipoedema practice, the experienced phlebologist is able to make a detailed analysis of the patient with ultrasound in hand. Methodical sonographic assessment of the swollen leg adds to the clinical diagnosis of lipoedema and is a powerful tool to determine the impact that comorbidities such as venous disease and lipoedema have on the lymphatics and the overall combined severity compromising the health of the leg/s.

A case study is presented to highlight the assessment and management matrix for both conservative management, venous intervention as well as lipoedema surgery in a patient with significant lipoedema, varicose veins and lymphoedema.

The Swollen Leg, Main Ballroom, May 5, 2019, 3:30 PM - 4:45 PM

### **Rheumatologic and Inflammatory Causes**

Frederick Joshua

*Associate Professor Macquarie University, Director Rheumatology Specialist Care, Director Australian Musculoskeletal Ultrasound, President Australasian Society for Ultrasound in Medicine*

The swollen leg is common problem that is encountered by rheumatologists. During this session, clinical cases that illustrate a variety of causes of swollen legs seen by the rheumatologist will be reviewed.



### **Septic Thrombophlebitis with abscess formation after Endovenous Radiofrequency Ablation of Great Saphenous Vein**

Preshy Varghese  
Grace Medical Skin & Vein Centre, East Bundaberg, Australia

**Introduction:** Endovenous Radiofrequency (RF) Ablation is considered to be an effective and safe option in the treatment of varicose veins. Reported postoperative complications are bruising, induration, superficial thrombophlebitis, deep vein thrombosis, paraesthesia due to nerve injuries, ischemic skin ulcers due to arterial/arteriolar injuries, infection etc. This is a case report of septic thrombophlebitis after Radiofrequency ablation of Great Saphenous Vein resulting in abscess formation that was treated by surgical drainage.

**Case Details:** 80 yr old lady presented with complaints of aching both legs with visible varicose veins and leg swellings. Clinically she is C3EpAsPr according to CEAP classification. Duplex Ultrasound examination confirmed incompetent Great Saphenous Vein with varicose branches on the right lower limb. Radiofrequency ablation done for the Great Saphenous Vein followed by compression stockings. Subsequently she developed thrombophlebitis, which turned into abscess. Surgical drainage and adequate antibiotic treatment resolve the abscess with satisfactory healing.

**Conclusion:** The septic thrombophlebitis with abscess formation is a rare complication of endovascular thermal ablation. It is more common in elderly and immunosuppressed patients with other co morbid medical conditions. Early surgical intervention by drainage of abscess and appropriate antibiotic treatment will resolve the symptoms with satisfactory healing.

### **Pyoderma gangrenosum: Case report.**

Jarrod Newell  
Vein And Skin Clinic, New Zealand, Wellington, New Zealand

**Introduction:** Pyoderma gangrenosum is a rare neutrophilic dermatosis resulting in tissue necrosis and ulceration. It can be precipitated by minor trauma typically in patients with a preexisting immune system disorder. This paper examines a case of extensive pyoderma gangrenosum lesions which emerged three weeks after ultrasound-guided sclerotherapy.

**Case details:** Demographics: 76 year old male, European. Patient was booked for routine ultrasound guided sclerotherapy (UGS) to the left leg on the 12th May 2018. The treatment session was unremarkable with 4mls of sodium tetradecyl sulfate (STS) foamed at a 1:4 ratio with room air.

**Venous treatment history:**

- 2005: Bilateral ultrasound-guided sclerotherapy
- 2011: Endovenous laser ablation (EVLA), R GSV and L SSV. UGS to tributaries
- 2014: Bilateral UGS

**Medical history:** Polycythemia Rubra Vera/Myelofibrosis (not reported when patient documented his medical history). Three weeks post treatment, the patient presented to the Emergency Department with multiple painless ulcerating lesions over the left leg. Bloods were unremarkable and a deep vein thrombosis was ruled out. The patient was discharged to the care of his GP. One week later the patient presented to Dr Henryk Poczwa (treating Phlebologist), with lesions that were now painful, bigger and further multiplying. Dr. Poczwa started the patient on antibiotics and prednisone, plus sought help from the Phlebology community. Following this interaction, the diagnosis of pyoderma gangrenosum secondary to UGS was made and high dose steroids initiated with good effect.

**Conclusion:** Pyoderma gangrenosum is a very rare condition that can be precipitated by minor trauma such as injections from UGS. It is typically associated with an underlying immune system dysfunction. This case study informs us that pyoderma gangrenosum is a rare but possible complication of UGS and that high dose steroids are an effective treatment.

Poster Session, May 5, 2019, 5:00 PM - 5:40 PM

**A case report of varicose veins associated with a rare congenital vascular disorder**

Gaorui Gary Liu

*Westmead Specialist Vascular Services & The University of Sydney, Sydney, Australia*

**Introduction:** Cutis Marmorata Telangiectatica Congenita (CMTC) is a rare congenital vascular malformation. Skin anomalies associated with CMTC are usually observed at birth and spectrum of skin anomalies includes cutis marmoratus, telangiectasia and phlebectasia, which generally improve or spontaneously resolve in early life. CMTC may contribute to early development and progression of chronic venous insufficiency owing to dilatation of capillaries and venules.

**Case Details:** A 34 year old lady presented at vascular laboratory for assessment of venous insufficiency of the left lower limb. Duplex ultrasound examination revealed the source the reflux and extent of varicosities. This is an exceptional case of varicose veins in a patient diagnosed with CMTC involving telangiectasia and cutis marmorata.

**Conclusions:** Clinicians in phlebology and dermatology need to be aware of the nature of CMTC when treating varicose veins and telangiectasia. Until now, there is a lack of medical literature pertinent to the association between CMTC and chronic venous disorder (CVD), therefore, a longitudinal prospective study is necessary to investigate the causal mechanism linking these two disorders.

Poster Session, May 5, 2019, 5:00 PM - 5:40 PM

**A Case Study of 'Centripetal Venous Flow ≠ Competence'**

Gaorui Gary Liu

*Westmead Vascular Laboratory, Australia*

**Case Details:** A 71 yo. man presented at Westmead vascular laboratory for chronic venous insufficiency. Ultrasound was performed in the afternoon by an experienced sonographer with patient standing. Reverse flow was elicited by Valsalva, calf squeeze and toe elevation. Testing was initiated with a modified deep vein study aiming to exclude DVT, obstruction and reflux. Reverse flow in superficial veins were evaluated in a topographical order. Prominent tributary veins and visible perforators were also tested for competence on PW and CF. Reflux was defined as reverse flow lasting longer than 1s for deep veins, 0.5s for superficial veins and 0.35s for perforators.

Normal phasic flow was demonstrated in the deep veins with no evidence of reflux. The TV and PTV at the SFJ both demonstrated normal valvular closure in response to Valsalva. Reflux was seen in the SEPV; however, the most cranial segment of the GSV was competent. The GSV became incompetent from the level immediate below the confluence of PASV that was associated with Giacomini's vein. Despite competence of the SSV, reverse flow was evident at the SPJ in both systolic and diastolic phase. Similar venous waveforms were observed in Giacomini's vein and Doppler analysis with measurement taken above and below the confluence of the PASV confirmed the presence of 'Paradoxical Reflux' in Giacomini's vein.

**Conclusion:** Determination of competence of Giacomini's vein should be made on the basis of integrity of venous haemodynamics. Recognition of paradoxical reflux is important as it may change clinical course and treatment decision-making



### **Lower Limb Deep Vein Thrombosis: how long after acute DVT diagnosis can my patient fly?**

Zachariah Kidman  
*Skin Institute, Auckland, New Zealand*

**Introduction:** Deep vein thrombosis (DVT) is a complication that can occur after treatment of varicose veins with surgery, endovenous thermal ablation (ETA) or ultrasound guided foam sclerotherapy (UGFS). After the formal diagnosis of acute DVT patients will often seek clarification on the safety of subsequent air-travel.

**Case Details:** This case report of a DVT occurring in a patient after varicose vein UGFS treatment will be used as an opportunity to assess the current evidence and guidelines for when a patient can commence air-travel after the initial diagnosis of an acute DVT and commencement of appropriate DVT treatment.

**Conclusion:** There is a lack of strong evidence guiding clinicians advising patients on timeframes for commencing air-travel after a diagnosis of acute DVT. Patients require stable and full anticoagulation before being fit to fly. Complete thrombus resolution does not necessarily need to be confirmed if the patient is fully anticoagulated.

### **Detergent Sclerosants cause apoptosis of squamous cell carcinoma cells in vitro**

Anes Yang<sup>1,2</sup>, Pranita Dhanji<sup>1,2</sup>, Marlene Wijaya<sup>1,2</sup>, Osvaldo Alfredo Cooley Andrade<sup>1,2</sup>, David Connor<sup>1,2</sup>, Kurosh Parsi<sup>1,2</sup>  
<sup>1</sup>*Dermatology, Phlebology and Fluid Mechanics Research Laboratory, St Vincent's Centre for Applied Medical Research, Darlinghurst, Australia,* <sup>2</sup>*Faculty of Medicine, University of New South Wales, Australia*

**Background:** To investigate the lytic effects of detergent sclerosants sodium tetradecyl sulphate (STS) and polidocanol (POL) on squamous cell carcinoma (SCC) cells in vitro.

**Methods:** The effects of varying concentrations (0-0.6%) of STS and POL were studied on incubated SCC cells. Cell viability was assessed using trypan blue. Cell proliferation was assessed using and MTS (3-(4,5-Dimethylthiazol-2-yl)-5(3-carboxymethinyphenol)-2-(4-sulfophenyl)-2Htetrazolium, inner salt) assay. Apoptosis/Necrosis and Bax/Caspase expression was assessed using flow cytometry using Lactadherin/propidium iodide staining along with anti-Bax and anti-caspase antibodies respectively.

**Results:** Cell viability and proliferation significantly decreased with increasing sclerosant concentrations. Cells undergoing late apoptosis and necrosis increased with increasing concentrations. BAX (BCL-2 like protein 4), caspase-3 and caspase-9 increased following incubation with high concentrations of sclerosants.

**Conclusion:** STS and POL induce apoptosis and necrosis in SCC cells while decreasing their proliferation rate and viability. The increased expression of BAX, caspase-9 and caspase-3 suggests that apoptosis occurs via the intrinsic pathway followed by the execution phase. POL was more effective in inducing apoptosis, cell death and reducing proliferation and viability than STS in all tests.

Poster Session, May 5, 2019, 5:00 PM - 5:40 PM

**Melanin and Haemosiderin are both present in pigmentation secondary to chronic venous insufficiency.**Anes Yang<sup>1,2</sup>, Kate Ng Tan Wei<sup>1,2</sup>, Joanne Jia Wei Ang<sup>1,2</sup>, David Connor<sup>1,2</sup>, Kurosh Parsi<sup>1,2</sup><sup>1</sup>Dermatology, Phlebology and Fluid Mechanics Research Laboratory, St Vincent's Centre for Applied Medical Research, Darlinghurst, Australia, <sup>2</sup>Faculty of Medicine, University of New South Wales, , Australia

**Introduction:** Pathological cutaneous hyperpigmentation can be due to an endogenous or exogenous increase in melanin in the epidermal layer or pigment incontinence in the dermal layer by macrophages. Other causes for abnormal hyperpigmentation include deposition of microparticles of haemosiderin which stain skin a brownish discolouration. Though the pathogenesis and pigment type is well documented for conditions such as post inflammatory hyperpigmentation there is limited evidence in the literature describing the pigment type in various vascular skin disorders. Since the treatment options for melanin and haemosiderin based hyperpigmentation differ, it is important to understand the different pathogenesis of hyperpigmentation in different skin conditions. To determine the type of pigment (melanin and haemosiderin) in post sclerotherapy pigmentation (PSP), post inflammatory pigmentation (PIH), pigmentation secondary to chronic venous disease (CVD), livedo vasculopathy (LV) and acroangiodermatitis (AAD) using skin biopsy samples.

**Methods:** Fifteen patients were recruited with various skin conditions with hyperpigmentation of the lower limbs. Biopsies were taken of the areas of pigmentation, along with normal skin as a control. Biopsies were stained with Hematoxylin and Eosin for histology, and Perl's Prussian Blue and Schmorl's stain to visualise haemosiderin and melanin respectively.

**Results:** Haemosiderin was notably present in all biopsy cases of PSP, AAD and LV. No haemosiderin was present in all biopsy cases of PIH but epidermal melanin was prominent compared to the controls. Angioproliferation is observed in all cases of AAD. A mixed picture of haemosiderin and melanin was present in CVD.

**Conclusions:** Hyperpigmentation of different aetiologies have different levels of melanin and haemosiderin. Clinicians should be aware of these differences to help guide preventative measures and treatment of hyperpigmentation.

17:00, Sunday 5<sup>th</sup> May

### **Adjustable Compression Wraps in Venous Ulcers**

Giovanni Mosti  
*Clinica MD Barbantini, Italy*

**Introduction:** Compression therapy by inelastic bandages (IB) is highly effective in achieving venous leg ulcer (VLU) healing. Inelastic bandages may be expensive as they need to be changed and discarded at every dressing change. In addition, correct application is difficult in the clinical practice, even by expert healthcare personnel. Aim of our work was assessing if adjustable compression wraps (ACW) may be more cost effective and more effective than IB to achieve VLU healing.

**Methods:** sixty-six VLU patients were randomized to be treated by ACW (CircAid® JuxtaCure®) (n=33) and IB (Coban 2 Layer□) (n=33). Study duration was 12 weeks. During weekly visits the ulcers were cleansed and dressed with the same products and the only variable was the compression device. Ulcer size, ulcer pain, patient's perception of compression systems and compression pressure were assessed during the visits and the material cost was evaluated at the 12th week.

**Results:** ACWs were significantly cheaper than bandages ( $p < 0.0001$ ) and were also more effective (not significantly) in achieving ulcer healing. To heal one ulcer patient 228 € had to be spent when applying an ACW and 381 € if IB were used. 26/33 (78,8%) patients in the ACW group were healed after 12 weeks vs 23/33 (69,7%) in the IB group (n.s.). Ulcer pain was reduced by both compression devices. Patient perception of compression pressure was similar with both compression devices. Compression pressure was similar at application but better maintained by ACW over time.

**Conclusions:** ACWs are significantly cheaper and more effective (not significantly) in achieving VLU healing. Self-applicable, adjustable compression wraps are therefore a powerful, cost-effective alternative to inelastic bandages in treating VLU.

### **An Innovative Device Adapting Compression Pressure to Body Position**

Giovanni Mosti  
*Clinica MD Barbantini, Italy*

**Background:** The applied pressure is usually inadequate to exert an effective impact on the veins in different body positions for presently used compression therapy.

**Aim:** assessing the venous ejection fraction achieved by a new compression device automatically adjusting interface pressure to body position in acute experimental setting.

**Methods:** a new portable, battery driven compression device providing a pressure adjusted to the body position and connected to a less stiff or a very stiff calf cuff, was tested. In patients with superficial venous incompetence, the ejection fraction (EF) of the calf pump was measured by strain gauge plethysmography. Values achieved without compression, with the two cuffs and with compression stockings exerting 23-32 mmHg, applied in a randomized sequence, were compared. The applied compression pressures were simultaneously recorded in supine and standing position, and during walking. Comfort was assessed by a Visual Analogue Scale being 0 very low comfort and 10 very comfortable.

**Results:** In 16 patients in the CEAP clinical stage C3-C6, EF without compression was 37%, increased to 46.9% by stockings, to 64.8% ( $p < 0.0001$ ) by less stiff and to 75.5% ( $p < 0.0001$ ) by stiffer wraps.

Median interface pressure (supine/standing) was 31/56 mmHg for the less stiff device, 32/68 mmHg for the stiffer device and 23/26 mmHg for the stockings. Static stiffness index and the walking pressure amplitudes were significantly higher compared to the stocking. The highest values were found with the stiffer wrap material. Comfort of the device was high both in supine and standing position (VAS 8 □ 2).

**Conclusions:** The tested devices were comfortable at rest and hemodynamically effective during walking by automatically adjusting compression pressures to body position. They are significantly more effective than elastic stockings in improving EF. The system is able to overcome the problems of fast pressure loss by continuously re-adjusting the compression pressure.

Innovations in Compression, Main Ballroom, May 6, 2019, 8:30 AM - 10:30 AM

### **Accurate Application of a Pressure Gradient Using a Unique Pressure Sensing Device**

Neil Piller, Luke Parkinson, Malou van Zanten, John Arkwright  
*Flinders University, Adelaide, Australia*

**Back ground:** Compression is the core of oedema treatment. Good compression means applying pressure in an acceptable range for nature/location of the swelling, the creation of a good pressure gradient and ensuring areas of functional lymphatics or high curvature are not compressed more than their surrounds. Inappropriate pressure can lead to distal swelling and/or compression related wounds.

**Methods:** This study used a fibre optic based high resolution sub-bandage pressure strip with 30 sensors. We measured the achievement to a target pressure and pressure gradient. Forty-six health professionals (all being familiar with lymphoedema treatment) applied a standard pressure bandage (10 cm x 3.8 m short stretch compression) to a manikin and aimed to get a pressure at the ankle of 40 mm and 20 mm at the proximal calf. This was undertaken in a blinded situation and with pressure sensor feedback.

**Results:** The mean pressures across all 30 sensors approximated the target mean of 30 mm. The blinded group maximum mean was 44 +/- 4mm hg close to the mid-calf. The sensor guided group maximum was 36.1 +/- 1 mm hg 5 cm proximal to the ankle. Linear regression curve for the sensor guided group approximated the target curve but the blinded group showed a slope of opposite sign to the target slope! The fit to the target slope improved from .62 +/- 0.05 to .93 +/- 0.01 (p<.001) with sensor feedback

**Discussion:** The results show that professional bandagers achieved a pressure gradient different from the prescribed one but that accuracy was improved using the sensor strip feedback. The issue of concern is the higher pressures in the calf compared to the ankle and this impact on optimal fluid drainage and on foot oedema development. Pressure sensors such as these can train and also help in the achievement of optimal pressures and gradients.

Innovations in Compression, Main Ballroom, May 6, 2019, 8:30 AM - 10:30 AM

### **Compression use in Ehlers-Danlos Syndrome**

Frederick Joshua  
*Associate Professor Macquarie University, Director Rheumatology Specialist Care, Director Australian Musculoskeletal Ultrasound, President Australasian Society for Ultrasound in Medicine*

Ehlers Danlos syndrome and hyper mobility syndromes have multiple manifestations that will be discussed. These complex patients have limited therapeutic options and a new approach to management using compression wear that has been tested in a small pilot study will be discussed.



### **Compression Pressure or Compression Stiffness for the Best Efficacy in Venous Disease?**

Giovanni Mosti  
*Clinica MD Barbantini, Italy*

**Background:** Stiffness is considered an important characteristic of compression devices and the determinant of their hemodynamic and clinical effectiveness. Actually, a compression device exerting a low or relatively low pressure in supine position together with a strong pressure in standing position is comfortable (low pressure while resting) and hemodynamically and, as a consequence, clinically effective as able to counteract the high intravenous standing pressure. Some recent studies seem to contradict this common belief.

**Methods:** Review of personal and published data on compression in edema, lymphedema and venous ulcers considering only studies where compression pressure and stiffness are reported.

**Results:** In two recent papers on treatment of venous leg edema comparing elastic stocking with inelastic bandages and adjustable compression wrap (ACW) with inelastic bandages both elastic stockings and ACW were as or more effective compared to inelastic bandages in reducing leg edema. The same occurred in another study comparing ACW and inelastic bandages in lymphedema treatment. Common characteristic in all these studies was a much lower stiffness of elastic stockings and ACWs compared to inelastic bandages but a much better pressure maintenance overtime. In a new study comparing inelastic bandages and ACW in venous leg ulcer treatment ACW were more effective than inelastic bandages. Once again ACW were characterized by a lower stiffness and a better pressure maintenance overtime when compared with inelastic bandages.

**Conclusions:** Stiffness remains an extremely important feature of compression device from a comfort point of view. The combination of a low supine pressure and a strong standing pressure that characterizes a high stiffness is, at the same time, comfortable and effective. Nevertheless, in the clinical practice very good outcomes can be achieved by more elastic materials with low stiffness. Outcomes were always better than that achieved by inelastic materials in the reported studies. The old concept of a higher clinical effectiveness of stiff materials, especially when a hemodynamic effect is necessary, can be questioned when considering these new data.

### **Two Layers of Graduated Compression Stockings Can Reduce Healthy Saphenous Vein Diameters in the Standing Position**

Anes Yang<sup>1,2</sup>, Bahar Yasaman<sup>3</sup>, Yana Parsi<sup>3</sup>, Mina Kang<sup>1,4</sup>, David Connor<sup>1,2,3,4</sup>, Kurosh Parsi<sup>1,2,3,4</sup>

<sup>1</sup>*Dermatology, Phlebology and Fluid Mechanics Research Laboratory, St Vincent's Centre for Applied Medical Research, Darlinghurst, Australia,* <sup>2</sup>*Department of Dermatology, St Vincent's Hospital, Darlinghurst, Australia,* <sup>3</sup>*Sydney Skin and Vein Clinic, Chatswood, Australia,* <sup>4</sup>*Faculty of Medicine, University of New South Wales, Randwick, Australia*

**Introduction:** Previous studies reported graduated compression stockings (GCS) can reduce the calibre of deep veins in the standing subjects. However, the literature has been inconclusive on the effect of GCS on superficial veins in standing subjects. The aim of this study was to assess the effect of two layers of GCS on the diameter of saphenous veins in healthy subjects.

**Methods:** In 17 legs of nine healthy subjects, we studied the effect of single layering and double layering of GCS (23-32mmHg, thigh High Belted Sigvaris, Switzerland) on the diameter of the great saphenous vein (GSV) mid-thigh, GSV mid-calf and small saphenous vein (SSV) mid-calf. The measurements were taken using duplex ultrasound (Toshiba Aplio XG 500, 18-7 MHz transducer), through the fabric using a generous amount of ultrasound gel, on subjects both supine or prone and standing.

**Results:** Two layers of Class II GCS reduced the calibre of GSV mid-thigh from (4.1mm to 3.3mm,  $p < 0.05$ ), GSV mid-calf (2.8mm to 2.2mm,  $p < 0.01$ ) and SSV (2.7mm to 1.9mm,  $p < 0.01$ ) in the standing position. In the supine or prone position, GSV showed narrowing but there was no measurable change in the calibre of the SSV. The degree of narrowing was measurable, but insufficient to approximate the vein walls.

**Conclusion:** Superimposition of two Class II GCS reduced the calibre of the saphenous veins in the standing position but did not approximate the vein walls. In the supine or prone position, the addition of a second layer of GCS did not result in further narrowing of the saphenous veins.

Venous Interventions II, Main Ballroom, May 6, 2019, 11:00 AM - 12:30 PM

**UIP Consensus on Contraindications to Sclerotherapy**

Kurosh Parsi, on behalf of the UIP Consensus Group

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**Background:** Sclerotherapy is a safe and effective procedure commonly used to treat incompetent veins, vascular malformations and gastro-oesophageal varices. Serious complications of sclerotherapy are rare and include anaphylaxis, venous thromboembolic and ischemic neurological events. A small group of patients may be at a higher risk of complications.

**Objectives:** To define indications and contraindications to the procedure of sclerotherapy procedures based on current experience and evidence.

**Methods:** A panel of phlebologists including vascular, general and plastic surgeons, interventional phlebologists, dermatologists, vascular physicians and research scientists systematically reviewed the available data on sclerotherapy and shared personal experience with the procedure. The reviewed material included bibliographic and biomedical data, product information sheets and data requested and received from manufacturers.

**Results and Recommendations:** Sclerotherapy is a safe and effective procedure to treat small to medium size peripheral veins. We recommend the following to be defined as absolute contraindications to sclerotherapy: 1) known anaphylactic or anaphylactoid reaction to the selected sclerosant, 2) acute venous thromboembolic events (VTE) including deep vein thrombosis, pulmonary embolism and superficial venous thrombosis, 3) Ischemic neurological or myocardial events complicating previous sclerotherapy, 4) severe local or widespread infection or acute systemic illness, and 5) chronic limb threatening ischemia. Practitioners should proceed with caution in the following patients or conditions: 1) pregnancy, 2) postpartum period, 3) breast-feeding, 4) known patent foramen ovale (PFO), 5) past history of VTE, 6) hypercoagulable states including documented inherited or acquired thrombophilia, immobility and active cancer, 6) long-haul travel (> 5 hours) before and after sclerotherapy of truncal veins, 7) chronic renal or hepatic disease and 8) special patient groups including the morbidly obese, patients on minocycline, tamoxifen or disulfiram and patients with specific psychosocial factors.

Venous Interventions II, Main Ballroom, May 6, 2019, 11:00 AM - 12:30 PM

**Skin Necrosis Following Sclerotherapy: Classification of Pathogenic Mechanisms and Review of Management Strategies**Anes Yang<sup>1,2</sup>, Patricia Hannaford<sup>1,3</sup>, Mina Kang<sup>1,4</sup>, Kurosh Parsi<sup>1,2,3,4</sup>*<sup>1</sup>Dermatology, Phlebology and Fluid Mechanics Research Laboratory, St Vincent's Centre for Applied Medical Research, Darlinghurst, Australia, <sup>2</sup>Department of Dermatology, St Vincent's Hospital, Darlinghurst, Australia, <sup>3</sup>Sydney Skin and Vein Clinic, Chatswood, Australia, <sup>4</sup>Faculty of Medicine, University of New South Wales, Randwick, Australia*

Skin necrosis is a significant but uncommon complication of sclerotherapy that may result in extensive tissue necrosis. Currently, there are no guidelines on optimal management of this adverse event.

We present four pathways that can lead to tissue necrosis following sclerotherapy: 1) extravasation 2) an intra-arterial injection, 3) an intra-venous injection resulting in arteriolar vasospasm and 4) persistently open arterio-venous (AV) shunts. The intra-venous pathway is probably the most common but the least understood and poorly recognized cause.

Tissue necrosis following extravasation is most likely to occur with osmotic and irritant sclerosants and least likely with detergents and in particular with foam sclerosants. Inadvertent intra-arterial injection of sclerosants is arguably the most feared complication of sclerotherapy but occurs less frequently with the advent of ultrasound guided sclerotherapy. Intra-arterial injection has resulted in substantial tissue loss requiring digit or limb amputation.

When using detergent sclerosants, tissue necrosis is far more likely to follow an intravenous injection of sclerosants. The mechanism involves a physiologic phenomenon termed veno-arteriolar reflex vasospasm (VAR-VAS) where the rapid and high-pressure dilation of the venule results in a reflex spasm of the accompanying arteriole, closure of the pre-capillary sphincters and opening of cutaneous arteriovenous (AV) shunts. This allows the entry of the sclerosant into the arteriolar circulation resulting in arteriolar occlusion and subsequent necrosis. VAR-VAS is clinically detected as a stellate (star-like) patch that undergoes sequential colour change in a matter of few minutes: blanching (indicating arteriolar spasm), cyanosis (indicating ischemia) and a dusky erythema indicating re-perfusion. The subsequent necrosis of both VAR-VAS and an intra-arterial injection adopts the stellate pattern that confirms the arterial nature of the necrosis and distinguishes the event from a simple extravasation.

Advanced stages of chronic venous hypertension can result in persistent opening of AV shunts, providing another pathway for direct entry of sclerosants from the injected veins into arteriolar circulation.

Here, we review and classify the pathogenic mechanisms implicated in post-sclerotherapy tissue necrosis and discuss the available management strategies.



### **Biomatrix Sclerofoam for Large Recurrent Varices**

Ragg JC, El-Chamali S, Despa OR, Stoyanova-Videv K, Volkovaia V, Kreis S, Kobilke T  
*angioclinic® vein centers, Berlin, Germany*

Background: Common sclerofoams are inferior to thermo-occlusion regarding primary and long-term results. A novel microfoam using a biomatrix based on denatured autologous blood proteins is currently in evaluation for various targets. By view from physics, its properties of increased density and viscosity while maintaining fast solubility should allow better replacement of blood and therefore more precise and more effective foam sclerotherapy.

Methods: In a prospective pilot study, 400 patients (275 f, 125 m, 31 – 79 y.) with large and tortuous recurrent varices (5 – 18 mm Ø, mean 8.9; 1085 targets) after previous vein surgery (1 – 12 y. ago, mean 6.8 y.), originating from the junctions (SFJ, SPJ), perforators or saphenous residuals were selected in bail-out situations (refusal of surgery) to receive biomatrix sclerofoam (BSF, prototype, Venartis, laboratory-prepared). BSF consisting of 40% Aethoxysklerol 2%, 20% biomatrix and 40% filtrated air was deployed via catheter (PhleboCath, 2.0 – 2.3 mm Ø, or Microcaths 1.6 mm Ø). Follow-up including ultrasound was performed after 2 weeks, 2 months and one year.

Results: Primary total occlusion of all segments intended to treat was obtained in 382/400 cases (95.6%). 18 cases (5.4%) required a second foam application (GSV: n = 6, SSV n = 3, tributaries: n = 4, perforators: n = 6, superficial recurrences n = 2). There were no complications, in particular no DVT. After one year, there was no case of total recanalization. Partial and focal reperfusion was observed in 46 cases (11.5%). All were easy to fix with supplementary foam injections.

Conclusions: Viscous biomatrix sclerofoam, as a new modality, seems to be safe and effective for use in large recurrent varices. One-year data are clearly superior to reported results of Tessari-type sclerofoams. Comparative studies will follow after the manufacturer's definition of the final product.

### **Sclerotherapy and transdermal laser altogether assisted by Virtual Reality and High Frequency Ultrasound for the treatment of feeder veins and telangiectasia.**

Alvaro Orrego

Telangiectasias have a very high prevalence in population. They not only generate an aesthetic problem, but they produce a wide range of symptoms. Quality of life surveys have revealed a significant difference between women with and without telangiectasias.

Telangiectasias and reticular varicose veins are formed from a vascular complex were the superficial and deep dermal and subdermal plexus intervene.

We only see what's on the surface of the skin. To reach the reticular veins in the deep dermal or subdermal plexus, we use high frequency ultrasound or AVIN (Active Vascular Imaging Navigation) system.

Best results can be achieved with Polidocanol foam and 1064 nm Laser radiation at the same time. Modern studies have demonstrated long term better results and higher clearance rates. The combined treatment also entails more satisfaction of the patients.

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### **Causes and Sources of recurrent varicose veins**

Devendra Dekiwadia

*Dekiwadia Institute of Vascular Sciences, Rajkot, India*

**Introduction:** Varicose veins are an early manifestation of chronic venous insufficiency. Although the risk factors associated with varicose veins are well described, the basic pathophysiology leading to venous valvular incompetence, and thus, varicosities are less well known.

**Aim:** To identify the possible causes and patterns of recurrent varicose veins.

**Methods:** Patients with recurrent varicose veins were enrolled in this study. Full detailed history, examination, and investigations were done.

Written consents were obtained from all patients before the study. The steps of the study; the aims and the potential benefits were discussed with each individual patient. Our descriptive prospective study was carried out over 36 months with history of previous varicose veins surgery to assess the possible causes of recurrent varicose veins after surgery and different patterns of recurrence. All patients of both sexes regardless to age with recurrent varicose veins with history of previous varicose veins surgery at the same limb were included. Full detailed history, examination and duplex ultra sound was made over the superficial and deep venous system of patients of this study.

**Conclusion:** Recurrent varicose veins should be peacefully assessed by a vascular specialist. An expertise in vascular ultrasonography is a must. CTV and MRV are reconstructed images and are not real time. Also they are done in lying down position. A reflux cannot be generated during the procedure nor can it be repeated. USG if made the main stay and an expertise developed will avert the need of these procedures, which at the end will remain inconclusive for recurrence. CTV and MRV have a distinct place in the venous disease assessment but not for recurrence unless a missed PTS has to be demonstrated.

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### **A Very Rare Reaction to Sodium Tetradecyl Sulfate**

Niloofer Yazdani Boroujeni

*ACP, Ashburton, Australia*

**Introduction:** Treating physicians need to be aware of very rare, rare and uncommon as well as common side effects of sclerotherapy agents which they utilize in treating incompetent varices. There is little information regarding rare complications and side effects of STS (Sodium Tetradecyl Sulfate).

**Method:** Real case presentation as well as utilizing SAGE articles, Books and Product Information of the manufacturer.

**Case Details:** This is about a 63 year old patient who underwent foam STS sclerotherapy for incompetent tributary varices and developed fever and malaise post treatment. One of the very rare (less than 1 in 10 000) complications of STS is fever and malaise. By knowing the very rare side effects clinicians could potentially avoid unnecessary investigations and management.

**Conclusion:** There is little known about this very rare complication of STS. Lack of knowledge can lead to over investigation, inappropriate management, anxiety and financial burden.



### **Preliminary experience with Cyanoacrylate Closure**

Stefania Roberts

*Victoria Vein Clinic, East Melbourne, Australia*

Introduction: Adhesive closure is an innovative modality in the treatment of varicose veins. It is as effective as the current endothermal technologies with a safer side effect profile. Preliminary results from a single centre observational study with technical success from life table analysis, QOL and clinical outcome will be presented.

Case details: Three year ultrasound follow up of over 250 veins treated by the Venaseal system and 18 month ultrasound follow up post Venablock Adhesive closure of more that 800 veins will be presented.

Conclusions: Adhesive closure has a number of advantages. From the patient's perspective there is no pain associated with tumescent anaesthesia, no compression stockings, no downtime and good results. From the doctor's perspective it is a quick, easy to perform procedure with minimal complications.

### **Deep Venous Complications following Cyanoacrylate Embolisation**

Peter Paraskevas

Deep Venous Complications are an uncommon occurrence following Catheter directed Cyanoacrylate Embolisation. In this talk , we will examine several cases of Deep Vein Sclerosis (6-12 month follow up) and Glue Extension into the Main Junctions following Needle Directed Cyanoacrylate Embolisation. The 3 cases of Glue Extension into the deep system are still persistent following 12 month observation, with no further complications or thromboembolic events. The cases of Deep Vein Sclerosis were all followed up with serial scans over 6-12 months, with no thromboembolic extension or migration. All patients were treated with an initial 12 week course of Clexane on a tapering dose. These cases and their significance will be discussed.

Venous Interventions: Cyanoacrylate Closure, Main Ballroom, May 7, 2019, 9:00 AM - 10:30 AM

### **Granuloma Formation following Cyanoacrylate Glue Injection in Peripheral Veins and Arteriovenous Malformation**

Mina Kang and Kurosh Parsi  
*University of New South Wales, Australia*

**Background:** Cyanoacrylate adhesive closure (CAC) is a technically simple alternative to endothermal ablation of peripheral veins. N-butyl cyanoacrylate (n-BCA) is delivered via catheters or by percutaneous injection resulting in occlusion of target veins. The systemic immune response or the local tissue reaction that follows has not been characterised.

**Aim:** To characterise the late local tissue reaction to n-BCA glue injected in peripheral vessels.

**Methods:** Biopsies were obtained from two patients. In patient one, distal tributaries of the GSV were injected with VenaBlock™ glue under ultrasound guidance. Ultrasound-guided incisional biopsies were performed at one week, six weeks and 12 months. In patient two, a peripheral arterio-venous malformation (AVM) was injected with Venablock™ and biopsy was performed at 12 months. Histological analysis was performed using haematoxylin and eosin and immunofixation with CD4, CD31, CD34, CD68 and D2-40.

**Results:** Echogenic material with a strong shadow artefact consistent with the injected n-BCA was observed on ultrasound on all follow-up occasions. Biopsies taken at one week showed intravascular glue without histiocytes. Biopsy at six weeks showed isolated foreign body histiocytes coating intravascular fibrillary glue spicules were present but with no intra or extra-vascular granulomas. The one-year biopsy showed extravascular changes including fibrosis, lymphoid aggregates, multiple extravascular foreign body granulomas, and histiocytes surrounding central empty cavities outlined by matted spicules of glue. The lumen contained residual spicules of glue but without intravascular granulomas. The extravascular granulomas were deeply located and asymptomatic and were not complicated by clinical ulceration or trans-epidermal elimination.

**Conclusion:** Extra-vascular foreign body granulomas containing spicules of glue with fibrosis and lymphoid aggregates may occur as a delayed finding at one year following the use of n-BCA.

Venous Interventions: Cyanoacrylate Closure, Main Ballroom, May 7, 2019, 9:00 AM - 10:30 AM

### **Filler cyanoacrylate glue for incomplete occlusion after adhesive cyanoacrylate embolization for large and tortuous truncal vein reflux**

Naoki Sakakibara<sup>1</sup>, Rie Yagi<sup>3</sup>, Tomohiro Imai<sup>2</sup>, Kan Kajimoto<sup>3</sup>, Atsushi Amano<sup>3</sup>

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**Introduction:** Tortuous truncal saphenous veins are not usually treated by the catheter-based cyanoacrylate embolization (CAE). On the other hand, the ultrasound guided CAE (UGCE) with needle injections could be an alternative method for those patients. However, large diameter is a risk factor for recanalization with a single use of adhesive glue. Thus, this study addresses the efficacy of a filler glues embolization after incomplete occlusion with adhesive glue.

**Methods:** This is a retrospective observation study of UGCE using the filler glue (Histoacryl®) for large or tortuous vein reflux from November, 2017 to December, 2018. 45 patients were treated with adhesive cyanoacrylate (VariClose®/VenaBlock®); 9 patients were treated with a catheter-based CAE and 36 patients were treated with UGCE. UGCE was performed in patients with vein diameter over 8mm and/or local large varicose sized over 15mm. Filler glue was used only for incomplete occlusion after or in the same session of adhesive CAE. 42 of GSV/ASVs and 3 of SSVs were treated. An average age of patients was 64.9, 24 of them were female (55.8%), and 32 patients (71.1%) were C3 or severer disease. Mean truncal vein diameters of 7.7 mm (range 4.9-16.8) and mean maximum vein diameters of 15.7 mm (range 8.4-33.1) were measured. Patients were observed for three months and assessed by anatomical and clinical success, and also adverse effects.

**Results:** After secondary filler glue injection, all veins were completely occluded for three months. 6 patients showed superficial phlebitis but self-limited, while other adverse effects were not recorded. Clinical success was obtained by improving results from 4.5 to 2.8 with AVVQ (P<0.001), and from 5.0 to 1.8 with VCSS (P<0.001).

**Conclusions:** A new strategy of filler glue embolization was complementary to adhesive glue to obtain the complete anatomical success. Filler glue showed a good performance to prevent recanalization.



### **Treatment of Non-Saphenous Veins with Cyanoacrylate Embolisation and Ultrasound Guided Sclerotherapy**

Peter Paraskevas

Non-Saphenous Veins can form a major portion of the presenting problem in many patients. In many cases, they are the sole presenting pathology. Non Saphenous veins include Lymph Node Venous Networks, Persistent Sciatic Veins and Marginal Veins. In many cases, treatment has involved a combination of Ultrasound Guided Sclerotherapy and thermal ablation but recurrence has been an issue.

In this presentation, we will examine the treatment of Non Saphenous Veins with Cyanoacrylate Embolisation with particular emphasis on the Lymph Node Venous Network and Persistent Sciatic Veins. We will discuss the difficulties, pitfalls and potential complications of Cyanoacrylate embolization of Non -Saphenous Veins and the importance of correct diagnosis and follow up with serial scans.

### **Efficacy of a non-catheter based cyanoacrylate embolization compared with a catheter-based technique**

Naoki Sakakibara<sup>1</sup>, Rie Yagi<sup>3</sup>, Tomohiro Imai<sup>2</sup>, Kan Kajimoto<sup>3</sup>, Atsushi Amano<sup>3</sup>

<sup>1</sup>Edogawa Hospital, Edogawa Ward, Japan, <sup>2</sup>Tokyo Vascular and Vein Clinic, Bunkyo Ward, Japan, <sup>3</sup>Juntendo University School of Medicine, Bunkyo Ward, Japan

**Introduction:** The catheter-based cyanoacrylate embolization (CCA) has become a popular modality for saphenous vein reflux. However, tortuosity or large truncal varicosity would be commonly contraindicated for catheter-based technique. To overcome this limitation, a non-catheter based technique; ultrasound guided cyanoacrylate (UGCE), would be an alternative using the direct glue injection. This study addresses the efficacy of a non-catheter based cyanoacrylate embolization compared with a catheter-based technique.

**Methods:** This is the multiple hospital-conducted, retrospective, observation study of cyanoacrylate embolization for truncal veins with CCA and UGCE from June, 2016 to December, 2018. In 256 patients (292 legs), an average age of 64.8, 196 patients of female (67.1%), 171 patients (66.8%) of C3 or severer disease were recorded. Mean truncal vein diameter of 7.1 mm (range 4.9 -16.8) and the maximum vein diameter of 13.3 mm (range 8.4-33.1) were measured. All legs were treated mainly with adhesive cyanoacrylate; 220 legs by CCA and 72 legs by UGCE. 262 of GSV/ASVs and 31 of SSVs were treated, and UGCE were performed without any anesthesia. Patients were observed over a period up to one year.

**Results:** Several adhesive glues were used for truncal embolization; VariClose® for 260 legs, VenaBlock® for 15 legs, VenaSeal® for 4 legs, Endosealer®/Veinoff® for 2 legs. Histoacryl® was used as a filler for 42legs. Mean glue volumes per session were 2.0±1.5 mL with CCA and 2.4±1.1 mL with UGCE. Superficial phlebitis was recorded in 27 legs (12.3%) and 4 legs (5.1%), while other adverse effects were minimal. Maximum diameters were reduced from 13.1±5.2 mm to 6.8±2.9 mm with CCA and from 14.3±5.8 mm to 11.3±4.2 mm. Recanalization was observed in 19 legs (8.6 %) and 4 legs (5.1%), however VCSS was significantly improved with both procedure.

**Conclusions:** UGCE showed non inferiority to CCA. UGCE would be recommended for large or tortuous veins.

### **ACP Consensus for Cyanoacrylate Closure**

Kurosh Parsi, on behalf of the UIP Consensus Group

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**Background:** Cyanoacrylates (CA) are fast-acting adhesives used in procedural medicine including closure of superficial wounds, embolisation of truncal vessels pre-operatively, vascular anomalies, visceral false aneurysms, endoleaks, gastrointestinal varices and gastrointestinal bleeding. More recently, catheter-directed Cyanoacrylate Adhesive Closure (CAC) was introduced as an alternative to endovenous thermal ablation (ETA) to occlude superficial veins of the lower limbs.

**Objectives:** To formulate policies for the safe and effective delivery of CAC procedures in Australasia, based on current experience and evidence.

**Methods:** A panel of phlebologists including vascular surgeons, interventional radiologists, dermatologists and research scientists systematically reviewed the available data on CA products used in medicine and shared personal experience with the procedure. The reviewed material included bibliographic and biomedical data, material safety data sheets and data requested and received from manufacturers.

#### **Results and Recommendations**

CAC appears to be an effective treatment for saphenous reflux with occlusion rates at 36 months of 90-95%. We recommend a maximum dose of 10mL of CA per treatment session. Serious complications are rare, but significant. Hypersensitivity to acrylates is reported in 2.4% of the population and is an important absolute contraindication to CAC. Post procedural inflammatory reactions, including hypersensitivity-type phlebitis (HTP), occur in 10-20% of patients. In the long-term, CAC results in foreign-body granuloma formation within 2-12 months of the procedure. We recommend against the use of CAC in patients with uncontrolled inflammatory, autoimmune or granulomatous disorders (e.g. sarcoidosis). Caution should be exercised in patients with significant active systemic disease or infection and alternative therapies such as thermal ablation and foam sclerotherapy should be considered.

**Conclusions:** CAC appears to be an effective endovenous procedure, with short term closure rates comparable to ETA and therefore greater efficacy than traditional surgery for treating superficial veins of the lower limbs. Ongoing data collection is required to establish the long-term safety.



### The Hidden Science of Acute DVT

Anthony Comerota

In order to determine whether mechanical clot disruption in addition to catheter drip thrombolysis damaged vein valve function, a retrospective study was conducted comparing vein valve function in patients following pharmacomechanical catheter directed thrombolysis vs. catheter directed thrombolysis by the drip technique alone (Vogel D. *et al.* J Vasc Surgery 2012). Results showed that the pharmacomechanical techniques improved thrombus removal, required less rt-PA and did not cause additional damage to vein valves, as indicated by vein valve reflux. Perhaps the most important finding of the study was that 30% of the uninvolved contralateral legs had venous valvular incompetence, suggesting that vein valve incompetence preceeded the acute DVT. Since this was a relatively small patient sample (41 patients), a larger prospective study was performed to answer the question of whether vein valve dysfunction (valve incompetence) commonly preceeded acute DVT?

A prospective, nested, case-controlled study of patients presenting to the vascular laboratory with signs/symptoms suggestive of acute DVT was performed. In addition to the routine venous duplex for acute DVT, a bilateral venous insufficiency examination was conducted. Results demonstrated that 30% of the patients found to have acute DVT had contralateral vein valve incompetence (asymptomatic leg). (Shaydakov M. *et al.* J Vasc Surg. Venous and Lymphatic Dis. 2016) These observations suggest that there may be venous endothelial dysfunction resulting in valvular incompetence predating the acute DVT. Furthermore, it is possible that if endothelial dysfunction existed, it indeed could prompt venous thrombosis.

Komorow W., *et al.* (Int'l Angiol. 2017) studied endothelial function in patients with chronic venous insufficiency (CVI). He used post-ischemic brachial artery vasodilation as the marker of endothelial function, which evaluates the endothelium of arteries. He examined patients with the spectrum of chronic venous insufficiency (CVI). One can assume that these patients had venous endothelial dysfunction on the basis of their known CVI. It was interesting to see the correlation of arterial endothelial dysfunction in patients with CVI. He found that brachial artery vasodilation was adversely affected in patients with CVI, and that there was a direct inverse relationship of brachial artery vasodilation with the severity of chronic venous disease. This observation suggests that there is a direct relationship of endothelial function (dysfunction) in the arterial and venous systems. It is reasonable to conclude that the endothelial dysfunction occurring in the venous system predisposes to thrombosis, as it predisposes to atherothrombosis in the arterial system. This may be an explanation for the development of "unprovoked" DVT/PE.

One can appropriately ask the question, "If endothelial function can be improved, will that result in a reduction of venous thrombosis?" The answer is YES! Statin drugs are known to improve endothelial function as documented by improvement of brachial artery vasodilation after statins are initiated. The JUPITER Trial randomized healthy patients (no history of cardiovascular disease) to rosuvastatin 20 mg or placebo with the primary endpoint being the first onset of cardiovascular ischemic events. The trial was stopped early because of the significant cardiovascular benefits of the statin. However, R.J. Glynn *et al.* (NEJM 2009) reported that patients in Jupiter randomized to rosuvastatin had a significant reduction in the occurrence of venous thromboembolic disease, especially DVT. A review of the national database of the Netherlands showed a dose-related reduction in recurrence of venous thromboembolic disease of patients taking statins, with a 70% reduction in patients on maximal dose (S. Biere-Rafi *et al.*, Eur Heart J 2013). These data raise the serious question..... "Does the science of acute DVT mandate that statins be part of the treatment of all patients with venous thromboembolic disease?"

Venous Thromboembolism and Venous Obstructions, Main Ballroom, May 7, 2019, 11:00 AM - 12:30 PM

### **Venous Obstructions: Etiology and Pathophysiologic Aspects**

Lowell Kabnick

*Morristown Medical Center, New Jersey*

Venous hemodynamics are vastly different from those in arteries. The elliptical shape and lower velocity of blood flow in veins, in part, account for these differences. Acute iliofemoral venous thrombosis, external compressive forces, and internal restrictive obstruction represent outflow obstruction resulting in upstream pressures and venous hypertension. There are several unknowns which should be researched, including to what degree is an obstruction hemodynamically significant and what test should be performed to assess a significant stenosis. We investigated the relationship of venous cross-sectional area (CSA) and lumen shape at baseline and after iliofemoral venous stenting to assess the relationship between these factors and later symptom improvement. The feasibility phase of the VIRTUS study of the VICI venous stent (Veniti Inc., Fremont CA) enrolled 30 subjects with symptomatic iliofemoral venous obstruction in the US and Europe. Subjects underwent baseline and post-stenting IVUS. CSA and vein eccentricity were measured along the course of the involved iliofemoral veins. Eccentricity was expressed as the ratio of the major to minor axes of the vein and, as such, was an index of the elliptical shape of the vessel lumen. Symptom improvement was assessed by the change in venous clinical severity score (VCSS) from pre-procedure to 12 months. Correlations between lumen measurements and clinical improvement were assessed with Pearson correlation coefficients. The 30-patient study population comprised 24 females and 6 males (median age, 43). Non-thrombotic and post-thrombotic indications were present in 11 (37%) and 19 (63%), respectively. The obstruction involved the common iliac vein (CIV) alone in 11 cases, the external iliac vein (EIV) alone in 4 cases, and both the CIV and EIV in 6 cases. In 9 cases, the lesion involved the CIV, EIV, and common femoral vein (CFV). Twenty-seven patients had 12-month VCSS assessment and were eligible for correlation analysis. Baseline vein CSA was not significantly correlated with 12-month symptom improvement ( $r = .22$ ,  $P = .28$ ); in contrast to vein shape, where greater lumen eccentricity at baseline predicted later clinical improvement ( $r = .57$ ,  $P = .002$ ). There was a moderate correlation between post-procedural lumen shape change and improvement on the VCSS: patients exhibiting greater change in the direction of the lumen becoming rounder were more likely to experience later VCSS improvement ( $r = .50$ ,  $P = .008$ ). Conversely, change in CSA showed no significant relationship with later clinical improvement ( $r = -.25$ ,  $P = .21$ ). It was concluded that vein shape may predict symptom improvement after stenting to a greater degree than vein area. Highly elliptical veins and veins with transitions to a more circular shape after stenting were associated with the greatest improvement in symptoms; area was not found to be a significant factor. Further analyses with the full pivotal trial population will be conducted to more precisely assess the relationship of lumen shape and area to later clinical improvement.

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### **Acute DVT and Chronic Venous Occlusion: What do they look like?**

Anthony Comerota

This presentation reviews pictures of the intra-luminal contents of patients with acute DVT, patient with chronic, post-thrombotic venous occlusion and interesting/unusual patients with persistent major venous obstruction, despite multiple catheter based attempts to clear the vein lumen prior to surgical exposure.

The purpose of this presentation is to correlate ultrasound and venographic images with the actual visualization of the intraluminal contents. Microscopic examination of the chronic, post-thrombotic disease reveals that this obstructing tissue is collagen, predominantly type I (80-90%) with lesser amounts of type III collagen (10-20%) (Comerota AJ *et al*, *Thromb Res* 2015).

Hopefully this pictorial correlation will assist clinicians in their evaluation of patients presenting with acute and chronic venous obstruction, and their choice of appropriate therapeutic measures.



### **Endothermal Heat Induced Thrombosis (EHIT) and Endovenous non-Thermal Induced Thrombosis (EnIT)**

Lowell Kabnick

*Morristown Medical Center, New Jersey*

Endothermal ablation techniques and endovenous non-thermal techniques used to treat superficial venous reflux such as endovenous laser ablation (EVLA) and radiofrequency ablation (RFA) utilize heat to induce endothelial injury; the non-thermal devices such as mechanochemical (MOCA), cyanoacrylate (CA), and commercial foam (CF) also cause endothelial destruction. This results in a combination of thrombosis, fibrosis, subsequent vein contracture, and eventual occlusion of the treated vein. A component of this mechanism involves thrombus formation which may vary depending on the modality or technique employed. The thrombus that forms may propagate into the contiguous deep vein junction and is thus designated as an endothermal heat induced thrombosis, or EHIT (Kabnick et al. 2006) or endovenous non-heat induced thrombosis (EnHIT). EHIT and EnHIT are relatively novel entities that have no equivalent from the era of surgical ligation and stripping.

Both thrombus extensions may be classified according to the extent of central propagation of thrombus into the respective deep vein lumen. The classification scheme was not well delineated initially, and earlier reports used the term of deep vein thrombosis (DVT) but without clear characterization of the pathology being evaluated. Based on a combination of the earlier reports as well as newer reports that specifically referred to the concept of EHIT, the incidence has ranged from 0% to 16% (Hingorani et al. 2004, Proebstle et al. 2013, Sadek, Kabnick et al. 2013). EnHIT has not been extensively reported. There have been isolated reports with extremely small numbers.

The natural history of EHIT and EnHIT remains poorly defined, particularly when one evaluates the subgroups within the classification. Moreover, this is further complicated by taking into account the truncal vein that is being treated. Given the poorly defined natural history, there is little consensus regarding post-procedural surveillance or treatment for thrombus propagation. The American Venous Forum is in the process of completing guidelines for the treatment of these entities. However, prior to the publication my recommendation will be the following:

EHIT 1 = no treatment

EHIT 2 = no treatment, repeat ultrasound weekly until EHIT 1

EHIT 3 = provider's choice – no treatment vs treatment; if treated, repeat ultrasound weekly until EHIT 1, stop anticoagulation

EHIT 4 = treat with anticoagulation, repeat ultrasound weekly until EHIT 1, stop anticoagulation

### **Post Thrombotic Saphenous Vein Treatment with Thermal Occlusion powered by Segmentary Radiofrequency**

Alvaro Orrego

Background:

SVT

57% of varicose veins patients

4-6 fold risk of having DVT or PE

6-44% patients will develop DVT

20-33% have asymptomatic PE; 2-13% are symptomatic

GSV is most commonly affected

Risk of VTE is 6 fold higher

Risk factors: mild risk 9 fold, High risk: 31 fold, High risk and women: 35 fold

So, we may have a time bomb in these patients and we need to treat post thrombotic GSV when the recanalized segments are long. Although there is no available data for a recommendation about the required length. There are therapeutic alternatives: thermal occlusions, ecoguided foam sclerotherapy, surgery and medical treatments. The level of difficulty of these procedures is high. Getting best results require high rate of occlusion techniques.

Intravenous procedures in these vessels may have some technical difficulties because of intravascular bridles, thickness of the veinwall, perisaphenous bridles, inextensible compartments for tumescence and the catheterization itself. RFS catheter's low friction material enables negotiates in post thrombotic veins. Treating postthrombotic GSV is no doubt more difficult than non post thrombotic veins. In our experience has been possible in all cases.

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### **Intervention for Obstructive May-Thurner Syndrome and Nutcracker Syndrome**

Sanjay Nadkarni

MTS – Iliac vein compression syndrome

Indications for treatment

Acute DVT

Post thrombotic syndrome-Unilateral left leg swelling, pain, hyperpigmentation, chronic venous ulcers

Management

Conservative – Compression and? anticoagulation

Invasive – Thrombolysis +/- PTA/Stent

NCS- Renal vein compression syndrome

Indications for treatment

left flank pain, macroscopic/microscopic hematuria, proteinuria, varicocele

Management

Conservative – in young gain, ACE I, Aspirin

Endovascular- Stents can migrate and occlude!

Surgery- in severe symptoms; Open vs Laparoscopic Auto transplantation and renal vein transposition

Lymphatic and Venous Disease, Main Ballroom, May 7, 2019, 1:30 PM - 3:00 PM

### **Lymphoedema: Current Position and New Directions**

Neil Piller

*Flinders University, South Australia*

We are still reactive in terms of the identification/treatment/management of lymphoedemas and associated pathologies. That's fine for our current cohorts but we must move to proactivity in the early identification and treatment of lymphoedema as well as the recognition of associated pathologies (myxoedema, pheboedema, lipoedemas) and their initial management. Why? -they add load to the lymphatics or reduce its transport capacity.

With that proactivity we see an increasing use of Indo Cyanine green (ICG) to image superficial lymphatics, to target treatments, (LVA's) and the focus of MLD/Kinesio-taping on functional lymphatics.

With longer term follow-up studies/improved extracellular fluid detection, we are now aware of an increased incidence of lymphoedema following a surgical/radio-therapeutical intervention

Through the use of Bio Impedance Spectroscopy for whole/segmental fluid determination and Tissue Dielectric Constants use for exploring fluids at various depths combined with ICG and fibrinometry/Indurometry for the detection of subtle changes in fibrous tissues we can intervene earlier and begin treatment when lymphatic failure is starting and tissue changes are minimal.

Treatment-wise we see two important trends, the first being to ensure we have the correct pressure and pressure gradients – and the second being the use of wraps which allow patients to change the pressure.

We now see when the lymphatics are loaded that pressures higher (around 140 mm) than we ever imagined possible are seen. We must load them for optimal function!

We are more strategic about venous/lymphatic proximity relationships in terms of protection and cross utilization. Genetic knowledge shows many secondary lymphoedemas have an underlying primary component, allowing us to better anticipate an issue.

There is a "comeback" of the use of anti-inflammatory/other medications to manage lymphoedemas but most important is the acknowledgement of the patient as an individual!



### **Great Saphenous Vein Diameters in Phlebological Practice in France: A report of the DIAGRAVES Study by the French Society of Phlebology**

Claudine Hamel-Desnos<sup>1,2</sup>, Marianne De Maeseneer<sup>1,3</sup>, Matthieu Josnin<sup>1</sup>, Jean-Luc Gillet<sup>1</sup>, Francois-Andre Allaert<sup>1,4</sup>, DIAGRAVES Study Group

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**Objective:** To evaluate the distribution of the diameter of the great saphenous vein (GSV) at mid-thigh level and to investigate its association with clinical class, symptoms and reflux proximal extent.

**Methods:** Vascular physicians, members of the French Society of Phlebology were invited to participate in a consecutive observational study in patients presenting with symptoms and/or signs of uni- or bilateral chronic venous disorders (CVDs) in previously untreated limbs (CEAP clinical class-classification C0S–C6). Patients were included between January and March 2015. They completed a specially designed venous symptoms questionnaire. Duplex-ultrasound of included limbs was performed with the patient standing to detect reflux in the GSV and to measure the GSV inner diameter at mid-thigh.

**Results:** Between January and March 2015, 35 physicians examined 1245 patients (2450 limbs, after excluding 40limbs): 77% were female, mean age 52±14; 69% of the patients had venous symptoms in one or both legs. Most frequent symptoms were: feeling of heaviness, feeling of swelling and aching. Predominant CEAP clinical classes were C2 (38% of limbs) and C1 (35%). In case of GSV reflux (40% of limbs), the average diameter was 5.6±2mm and the distribution was: 62%<6mm, 30% between 6 and 8 mm and 8%>8mm. The study showed a clear association between clinical class and GSV diameter (the higher the clinical class, the larger the diameter; p<.0001), between venous symptoms and diameter (the larger the diameter, the higher the intensity of symptoms, p<.0001 for overall discomfort) and between reflux proximal extent and diameter(the more proximal the extent of reflux, the larger the diameter, p<.0001).

**Conclusion:** The DIAGRAVES study demonstrated that, in patients consulting for CVDs in France, more than half of the incompetent GSVs had a diameter<6mm, while large diameters were relatively infrequent. This should be kept in mind when considering management strategies in patients with CVDs.

Hamel-Desnos CM, et al., Great Saphenous Vein Diameters in Phlebological Practice in France: A Report of the DIAGRAVES Study by the French Society of Phlebology, *European Journal of Vascular and Endovascular Surgery* (2018), <https://doi.org/10.1016/j.ejvs.2018.09.011>

### **Small Veins and Venous Disease**

Andre Van Rij  
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While most attention has been given to the role of larger superficial veins in the lower limbs in the aetiology of Chronic Venous Insufficiency less attention is given to the role of small veins. Not much is known about the anatomy and function of small veins let alone their pathophysiology. This paper reviews features of small veins in the skin from the postcapillary venules in the dermis to the collecting polygonal network of the subcutaneous layer and the implications for CVI.

Lymphatic and Venous Disease, Main Ballroom, May 7, 2019, 1:30 PM - 3:00 PM

**Congenital or Acquired? Incidence of Vein Valve Damage in Children**

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**Introduction:** Newer studies on the onset of intra- and epifascial venous disease show four major components: 1) congenital valve lesions, 2) stress-induced valve decompensation like seen in heavy workers or athletes, 3) stasis-induced inflammatory valve degeneration, and 4) usually secondary, phlebitis. As congenital vein valve damage is the first to occur in life, it should prepare a primary pattern of individual course of venous disease.

**Methods:** Using high frequency ultrasound systems (Siemens Juniper, Zonare One Pro, Mindray M9, 16 - 23 MHz; Vevo MD, 16 - 32 MHz), we examined 102 children and adolescents aged 6 – 18 (mean 12.5 years), 59 f, 43 m, all asymptomatic. Investigation time was limited to 15 minutes. In case of visible vein changes (protruding, more intense color, increased diameter), ultrasound started here. Otherwise, systematic screening of saphenous veins and typical perforator locations was performed.

**Results:** 71/102 children (58.8%), resp. 60/204 legs (34.8%) showed relevant venous pathology. Lesions were mainly located in the GSV: 60/204 (29.4%), versus primary saphenous side branch varices (3.9%), SSV (3.4%), and perforator veins (1.0%). GSV at the lower leg showed 61.0% of all GSV lesions. In the subgroup of 6-8 y/o kids, 11/23 kids (47.8%) already showed relevant pathology. 42.3% of all cases were related to a single valve failure. Among these, unilateral commissural mismatch was the most frequent pattern (70.0%).

**Conclusions:** The unexpected high incidence of detected valve lesions in children, in particular in the younger ones, should be best explained by congenital disease. It is a merit of today's ultrasound systems that even small lesions now can be detected. Now the challenge is to learn which candidates at which age might have a preventive benefit from early detection, coaching and eventually a cost-effective therapy.

Lymphatic and Venous Disease, Main Ballroom, May 7, 2019, 1:30 PM - 3:00 PM

**Description of Chronic Venous Disease in the Waikato region of New Zealand**

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**Introduction:** In Western countries, chronic venous disease (CVD) affects ~25% of adults, averaging 2% of national resources. There remains a paucity of research in CVD prevalence and severity across New Zealand. This is vital to plan appropriate services and to focus additional efforts to at-risk populations.

**Methodology:** This study was a retrospective analysis of 1070 consecutive patients presenting with CVD to Waikato Vascular outpatient clinic between January 2013 and June 2018. Demographic data, ultrasound results, treatment and CEAP scores were obtained from medical records.

**Results:** Patients commonly presented between 50-79 years (65.5%) and there was a spike in presentation if varicose veins (45.6%) or active ulceration (25.8%) was present. Patients are less likely to seek treatment in early disease or once their venous ulcer healed. Maori patients presenting with CVD totalled 24.4% of all patients, while the national average of Maori persons in the NZ population is 15.8%. Comparing genders, more females suffered varicose veins (C2) (260F vs 228M, p=0.02). However, more males presented due to active ulcers (C6) (116F vs 160M, p=0.005). Primary aetiology occurred in 95% and post thrombotic aetiology in 4.2%. Comparing location, isolated superficial incompetence occurred in 67.4%, combined superficial and deep disease in 17.9% and isolated deep vein incompetence in 2%. Females presented with superficial insufficiency more commonly (356 F vs 323 M, p=0.004), whereas more men suffered from combined insufficiency (64 F vs 110 M, p=0.0003). The pathophysiological cause was reflux in 72.9%. Few patients suffered CVD due to obstruction alone (0.4%), yet this increased to 16.1% with the combination of reflux and obstruction.

**Conclusion:** This data provides a clear description of the abnormalities in CVD in the Waikato region of New Zealand. This research is important to highlight local variation in resourcing for venous disease.



### **Restless Leg Syndrome is Associated with Female Gender, Panic Attacks and can be Successfully Treated with Endovenous Interventions**

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**Introduction:** Restless Leg Syndrome (RLS) is a common disorder that is underreported and undertreated. There is controversy surrounding the aetiology and it is commonly classified as a neurological condition. However, there is a known association with venous insufficiency that is under recognised. The aim of this study was to investigate the profile of venous incompetence in patients with RLS presenting to a phlebology practice and to assess the effect of venous interventions on resolution of this condition.

**Methods:** 167 subjects presenting to a single centre for management of venous disease. Following a full medical history and ultrasound venous incompetence mapping, patients were identified as either RLS-positive or RLS-negative. Patients were offered endovenous laser ablation (EVLA), ultrasound guided sclerotherapy (UGS) or conservative management. RLS-positive subjects were contacted regarding their symptoms post treatment.

**Results:** Sixty eight of the 167 (40.7%) subjects reported symptoms of restless legs. 83.3% of RLS-positive patients reported resolution in their symptoms of restless legs following therapy with either EVLA and/or UGS.

**Conclusion:** There is a higher prevalence of RLS in patients with chronic venous insufficiency (CVI). Patients who present with symptoms of RLS should be evaluated for underlying venous incompetence and treated with endovenous intervention to avoid long term pharmacological therapies that may have doubtful efficacy.

### **Sciatic nerve varices - a form of venous insufficiency - a mimic of sciatica**

Rena X.K. Xu, Joseph Grace, Carlos Tahuil Ochoa, Melissa Lamb  
North Shore Medical Group, Sydney, Australia

**Introduction:** High definition ultrasound machine applications have become one of Phlebology's most used tools; it significantly improves our understanding, diagnosis and treatment of chronic venous insufficiency. It provides information on relevant anatomical pathophysiology enabling more informed, accurate and precise treatments for patients.

**Case Details:** A 32 year old Caucasian man with a history of repeated saphenopopliteal junction ligation and SSV stripping presented at our clinic for review of his recurrent varicose vein engorgement/pain/discomfort and intermittent tingling to the right upper posterior leg. A Doppler Ultrasound routine examination was undertaken with patient in standing position for evaluation of superficial veins and perforating veins. An upper sitting position for deep vein assessment. The GE Logiq 9 Ultrasound machine, with frequency linear-array and curvilinear transducers were used. The calf augmentation, forefoot and plantar flexion techniques were applied. The competency of deep veins, perforating veins, and superficial veins were evaluated for reflux time, colour and doppler waveform analysis.

**Results:** Right leg: all deep veins were demonstrated on both colour and doppler ultrasound with compressibility and competency recorded. SFJ and GSV above knee were presented, patent and competent. SPJ and partial SSV were absent at the calf -consistent with previous surgeries. GSV below knee, plus segments of residuals of SSV and multiple perforating veins were identified as incompetent. A large venous network was traced at the proximal calf upwards to distal thigh leading to identification of the sciatic nerve and an associated varicosity.

**Conclusions:** It's commonly believed that SNV is a rare condition, but it may not be as rare as initially assumed. The sciatic nerve can be easily identified by ultrasound; therefore blood flow at this site can be evaluated systematically. Insufficiency of venous flow will be detected and adequate treatment then can be offered to patient.

Cases and Clinical Puzzles, Main Ballroom, May 7, 2019, 3:30 PM - 5:00 PM

**Management of a Venous Ulcer on a Patient with a Physical Disability**

Carlos Tahuil Ochoa, Joseph Grace, Melissa Lamb, Rena Xu  
 North Shore Medical Group, St Leonards, Australia

**Introduction:** Leg ulcers are very common and their treatment represent 1-3% of the health budget in developed countries. There are different causes for leg ulcers, being the most prevalent venous hypertension. Venous ulcers have a significant impact on patient quality of life. Treatment is complex, with high failure rates. Graded compression and treating the underlying venous reflux are the most important measures to treat venous ulcers, along with adequate wound management.

**Case Details:** a 38 years old man, with a history of epilepsy and right sided hemiplegia, presented to our clinic with a long standing leg ulcer (R) measuring 5x5 cm, not improving with regular wound care and dressings. Initial assessment demonstrated truncal reflux, on the right leg, involving the SFJ, GSV AK and BK. Also, significant tributary vein incompetence affecting the medial aspect of the distal right leg. The patient underwent a course of EVLA and 2 sessions of UGS with STS 3% foam over 5 weeks. The patient reported poor compliance with the compression stockings regime, wearing compression around 3-4 hours daily. Ongoing wound care was carried out twice weekly using a hydrocolloid dressing as the primary dressing. Complete resolution of the defect was achieved within 8 weeks and the patient was instructed to continue wearing graded compression stockings, as tolerated, to prevent recurrence. The patient was reviewed at 1, 3 and 5 years post treatment, incompetent tributary veins, associated to a recurrent ulcer, were diagnosed and treated on the later period of assessment.

**Conclusions:** the treatment of venous ulcers is complex and with high failure rates. Adequate identification of the ulcer's aetiology and treatment of the underlying disease are paramount in promoting ulcer healing. Non-invasive techniques, such as EVLA and sclerotherapy, are the preferred method to treat the underlying venous disease, specially in the high risk population.

Cases and Clinical Puzzles, Main Ballroom, May 7, 2019, 3:30 PM - 5:00 PM

**Insufficient lymph node venous network - source of reflux in the shadow of neovascularisation**

Gaorui Gary Liu  
 Westmead Specialist Vascular Services & The University of Sydney, Australia

**Introduction:** The use of duplex ultrasound has become an essential element in the diagnosis and treatment of chronic venous insufficiency (CVI). In daily routine CVI ultrasound examination, there has been increasing recognition of lymph node venous network (LNVN) in the inguinal area of patients with primary and recurrent varicose veins. LNVN has been described as small, tortuous and subaponeurotic veins, commonly between 1mm and 3mm in diameter located between great saphenous vein (GSV) and anterior accessory saphenous vein (AASV). In addition, LNVN frequently has a translymphodal course with connection to the common femoral vein (CFV) and truncal saphenous system as a conduit for venous recurrence.

**Case Details:** A 69 year-old woman with non-healing wound and history of saphenofemoral junction (SFJ) ligation and GSV stripping presented at vascular laboratory for vein mapping. Location and extent of varicosities were examined by an experienced vascular sonographer prior to scanning. Ultrasound examination was then performed with patient standing using Valsalva maneuver and calf squeeze. Reflux was demonstrated in FV and popliteal vein. The SFJ and GSV in the thigh were not visualised, consistent with previous surgery. AASV was fed by an incompetent LNVN which had communication with the CFV via neo-vessels in the groin.

**Conclusions:** It is believed that LNVN represents the remodelling of dystrophic change of pre-existing network which is distinct from neovascularisation, a term used to define the formation of new, small and tortuous veins in the vicinity of surgery. It has been reported that LNVN is responsible for up to 6% of non-saphenous source of reflux and is often underdiagnosed. Meticulous ultrasound examination enables precise identification of anatomy and coherent venous haemodynamics.



### **Case Report: Ischaemic Complication After Direct Vision Sclerotherapy**

Joseph Grace, Carlos Tahuil Ochoa, Melissa Lamb, Harsh Aggarwal, Rena Xu  
*North Shore Medical Group, St Leonards, Australia*

**Introduction:** intra-arterial injections are one of the most feared complications of sclerotherapy. Fortunately, these are very uncommon with under 100 cases reported in medical literature. Majority of them associated to injections around the ankle and UGS. Here we report a patient who suffered such complication following direct vision sclerotherapy (MSC) with Sodium Tetradecyl Sulfate (STS) 0.5% and 0.12%.

**Case Details:** a 63 year old female, without any significant health concerns, presented to the clinic complaining of bilateral ankle swelling and the cosmetic appearance of the left leg. Colour Duplex Ultrasound of the left leg showed reflux on the GSV from the mid thigh to the ankle, SSV and Tributary veins both AK and BK. Right side ultrasound showed incompetent GSV BK, SSV and tributary veins AK and BK. Prior to the complication the patient underwent course of treatment involving EVLA to the GSV and SSV bilaterally, UGS x3 on the left leg and x2 on the right and MSC x2 on each leg. 1 week after the last MSC session on the right leg the patient presented with a history of 2 days of a patch of stellate purport of 10cm on the right popliteal region. Patient was started on high dose prednisone and Rivaroxaban with weekly reviews. The lesion has been progressing positively, but complete resolution has not yet been achieved.

**Conclusion:** intra-arterial injections are rare complications of sclerotherapy. However, these occurrences create significant distress on both the patient and the practitioner. Prompt recognition and aggressive early treatment with high dose steroids and anticoagulants give the patient a better chance to achieve a good resolution without the need for surgical treatments. Although, there is not enough evidence to generate consensus around a single treatment protocol.

### **Sepsis Following Phlebectomy**

Ganesha Param  
*Australian College of Phlebology, Melbourne, Australia*

**Introduction:** Ambulatory phlebectomy has been performed in outpatient settings since the 1950s when the procedure was refined by Dr Robert Muller. Developing sepsis after this procedure is very rare and the only other related cases of severe infection involves the development of necrotising fasciitis in the wound.

**Case Details:** A female in her late 50's with no past medical history presented with prominent varicose veins noted in both lower limbs. Duplex ultrasound examination revealed anterior accessory vein incompetence with large truncal tributaries extending from the anterior accessory vein in both legs, with the right being worse than the left. Initial treatment involved using cyanoacrylate for both anterior accessory veins proximally. This was then followed by a right phlebectomy, two days later and a left phlebectomy five days after that. One day after the Left phlebectomy, the patient noted pain in the left leg and notified the clinician. She then ended up in ED with what was diagnosed as viral gastroenteritis, due to having a fever, diarrhea and vomiting. She was discharged home and a day later readmitted with sepsis and renal failure, requiring intubation and transfer to a tertiary hospital. Wound exploration and debridement were performed initially to rule out necrotizing fasciitis. Group A streptococcus was isolated from the wound. It was also later found that she had major dental treatment one day after her left phlebectomy.

**Conclusion:** Sepsis following a phlebectomy is very rare. The commonest cause in 60% of cases is entry through the surgical incisions made, but in this case, there is a high possibility that the source could have been from the dental procedure performed. It is important to be very vigilant with patients developing pain however trivial as well as patients having other procedures, including dental, done at the same time.

Cases and Clinical Puzzles, Main Ballroom, May 7, 2019, 3:30 PM - 5:00 PM

**Case Report: Popliteal Venous Entrapment**Carlos Tahuil Ochoa, Joseph Grace, Harsh Aggarwal, Rena Xu  
*North Shore Medical Group, St Leonards, Australia*

**Introduction:** In 1967, the first case of popliteal artery and vein entrapment was reported. The incidence of Popliteal Venous Entrapment (PVE) is very low, partly because of under diagnosing, and so a strong clinical suspicion is essential. Currently, the gold standard test is ascending venography. However, the initial investigation of choice would be a colour duplex ultrasound scan. Surgical release of the popliteal vein (Raju and Neglen 2000) has shown encouraging results. Nevertheless, a case reported by Isner-Horobeti et al (2015) suggested botulinum toxin could help improve Popliteal Artery Entrapment Syndrome haemodynamically and symptomatically. This premise was used in our case.

**Case Details:** a 43 year old man presented to our clinic complaining of left sided leg pain and discomfort, ankle swelling, and ulcers. Symptoms were first noticed 3-5 years prior to the initial consultation, with progressive worsening over the last 2 years. On physical exam there was increased left leg circumference when compared to the right, cellulitis and ulceration. Colour Duplex Ultrasound revealed venous reflux on the left GSV BK distal segment and Giacomini vein. Also, haemodynamic changes with lumen size variation were noted on the popliteal vein, more significant with the knee in full extension due to external compression from the plantaris and popliteus muscles. Using the experience of Isner-Horobeti et al (2015), 25 Units of botulinum toxin were injected under ultrasound guidance into the aforementioned muscles, achieving decompression of the popliteal vein. The following day, sonographic assessment was performed confirming changes were well maintained. Clinically the symptoms improved over the course of 8 weeks and surveillance is ongoing every 3 months.

**Conclusions:** botulinum toxin can be a non-invasive alternative to surgery in the treatment of PVE. Botulinum toxin could reduce functional compression and, consequently, reduce venous pressure and improve the symptoms of venous hypertension and CVD

Cases and Clinical Puzzles, Main Ballroom, May 7, 2019, 3:30 PM - 5:00 PM

**Post-Thrombotic Syndrome Secondary to May-Thurner Syndrome**Amit Lakkaraju, Lisa Marks

**Introduction:** May-Thurner syndrome is a venous entrapment syndrome occurring due to impingement of the left common iliac vein between the right common iliac artery and underlying vertebrae. This is known to cause extensive left lower limb deep vein thrombosis. In some cases, this can also produce post-thrombotic syndrome.

**Case Details:** We present a case of a 45-year-old Afghani male refugee presenting with an 18 month history of lower limb aching, chronic left medial calf skin changes and early ulceration (C6) who showed left lower limb superficial and deep venous post-thrombotic changes and had a well defined May-Thurner impingement diagnosed conclusively on duplex ultrasound.

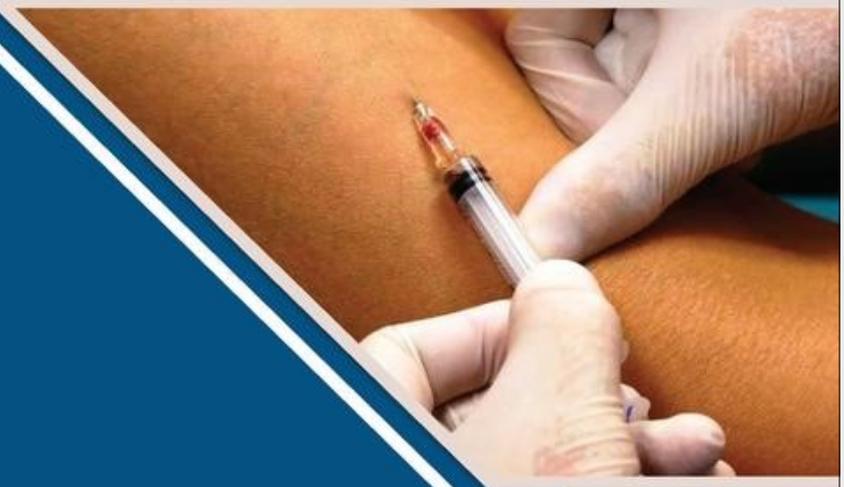
**Conclusion:** May-Thurner syndrome is an important but under-diagnosed cause of left lower limb Deep Venous Thrombosis. Although this diagnosis is mostly seen in women, we must also consider it in the male population. This case illustrates how undiagnosed May-Thurner Syndrome can progress to severe venous hypertension secondary to post-thrombotic syndrome. This case also illustrates the challenges we face as phlebologists in diagnosing venous disease in our refugee population





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