

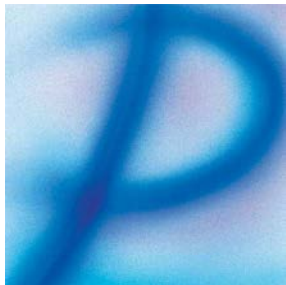
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UIP Chapter Meeting

105

Seoul, Korea, August 27-29, 2015



16th EVF Annual Meeting

161

St. Petersburg, Russia, July 2-4, 2015



Phlebology

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Phlebology is an international scientific journal entirely devoted to venous and lymphatic diseases.

The aim of *Phlebology* is to provide doctors with updated information on phlebology and lymphology written by well-known international specialists.

Phlebology is scientifically supported by a prestigious editorial board.

Phlebology has been published four times per year since 1994, and, thanks to its high scientific level, is included in several databases.

Phlebology comprises an editorial, articles on phlebology and lymphology, reviews, news, and a congress calendar.

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Medical Reporters' Academy

The report from the *Union Internationale de Phlébologie* chapter meeting, August 27-29, 2015, Seoul, Korea, under the Presidency of Professor Dong-ik Kim,

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wrote the summary of the 16th European Venous Forum, July 2-4, 2015, St. Petersburg, Russia.

Foreword

The 2015 *Union Internationale de Phlébologie* chapter meeting, which was held in Seoul, Korea, hosted 800 participants from 56 countries. The 16th annual European Venous Forum, which was held in St. Petersburg, Russia, welcomed 770 attendees who were mostly European phlebologists, angiologists, dermatologists, vascular surgeons, and interventional radiologists.

International meetings, such as the *Union Internationale de Phlébologie* chapter meeting and the European Venous Forum, represent one of the most important ways to transmit information and knowledge. These meetings brought together renowned venous experts and young professionals from around the world, providing a great opportunity to exchange ideas, explore strategies for vein care, and discuss the latest trends in the field.

The goals of these meetings are to keep all venous specialists fully informed, facilitate communication between all societies and specialties, and offer training and continuing medical education. These goals met the main concern of the Medical Reporters' Academy, a group of young reporters from different countries, who are invited by Servier to report on important congresses in the field. Together with the Chairman, they perused the congress program and made an initial selection of the events and presentations likely to represent breakthroughs or new findings, and then wrote short reports on the selected presentations.

The writing of this report would not have been possible without their deep commitment.

We would like to extend our gratitude and thanks to Andrew Nicolaides, Evgeny Shaydakov, and the Medical Reporters' Academy for their work in updating venous disease specialists.

**Happy reading,
The Daflon International Team**



I UIP Chapter Meeting



Seoul, Korea, August 27-29, 2015

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I. *Union Internationale de Phlébologie* Presidential Address, Awards, and Consensus Documents

Presidential address

Angelo Scuderi, Brazil

The *Union Internationale de Phlébologie* is the largest international organization devoted to the investigation and management of venous disorders and they have contributed many consensus documents to provide guidelines for vascular specialists and others worldwide on the management of patients with various venous problems. The *Union Internationale de Phlébologie*'s executive board commissioned expert groups from certain fields, including venous hemodynamics, sclerotherapy, venous ulcers, pelvic congestion syndrome, and rehabilitation of patients with chronic venous insufficiency to undertake these tasks.

In 2015, one document about venous ulcers was prepared and published in *International Angiology* (Mosti et al. *Int Angiol.* 2015;34(3):202-218). The working group produced comments and suggestions for updating the recent guidelines on the management of venous leg ulcers by the Society for Vascular Surgery and the American Venous Forum (SVS-AVF). The SVS-AVF guidelines include 75 recommendations. The *Union Internationale de Phlébologie* experts have changed the grade of recommendation in 6 cases, summarized 4 recommendations into 1, added 3 new recommendations, and even reversed 3 others. For example, the *Union Internationale de Phlébologie* working group was against routine laboratory evaluation for thrombophilia for patients with chronic recurrent venous leg ulcers, while the recommendation of American experts suggested such testing if patients had a history of recurrent venous thromboembolism. The most important conclusion from the consensus is that only 60% of the guidelines do not contain any recommendations, just suggestions that are supported by very weak evidence. Grade 1A was allocated to only 1 recommendation regarding compression over no compression when treating venous leg ulcers. This highlights existing problems when preparing modern guidelines because many aspects of venous disease are still poorly investigated or even unknown.

Other *Union Internationale de Phlébologie* consensus documents are now being prepared on hemodynamic concepts, pelvic varicose veins, rehabilitation, and foam sclerotherapy, which are challenging topics that have never been discussed in any guidelines.

Union Internationale de Phlébologie awards session

Servier award 2013-2015

Chronic venous disease of the lower limbs in a Sub-Saharan African setting

Marcus Fokou, Cameroon

For the first time, the pattern of chronic venous disease in a Sub-Saharan African setting was investigated. Specifically, the study was designed to determine the characteristics of patients suffering from chronic venous disease, describe the extent of chronic venous disease according to the clinical, etiological, anatomical, pathophysiological (CEAP) classification, and assess both the venous clinical severity score and venous disability score.

During a 12-month period, a cross-sectional study was conducted on all patients with evidence of chronic venous disease, who were >18 years old and attending the outpatient clinic of the Yaoundé General Hospital in Cameroon. The method of examination was adapted from the method used in the San Diego population study¹ and the full CEAP classification was used.² A structured interview recorded information on demographics, relevant medical history, with a special consideration for information suggesting the etiology of the venous disease (primary, secondary, congenital), family history, symptoms potentially related to venous disease (aching, itching, heaviness, nighttime cramping, restless and tired legs), and lifestyle. A comprehensive standardized examination was conducted by one of the two vascular surgeons to determine the magnitude of visible disease according to the CEAP classification. A duplex ultrasound, performed by the radiologist following the standardized protocol, investigated the functional disease at various anatomical sites (superficial, deep, and perforator veins) and the pathophysiology (normal, reflux, and obstruction) to define the CEAP classification. The venous disability score and the revised venous clinical severity score were used to grade the severity of the chronic venous disease.

The study started in November 2013 and ended in July 2015. A total of 210 patients (238 affected legs) with chronic venous disease and 100 healthy controls were enrolled. Chronic venous disease patients were mostly men (54.3%) and the age ranged from 18 to 85 years with a mean of 44.5 years. Risk factors, such as obesity (body mass index >30), were found in 33% of patients and a family history of chronic venous disease in 18% of patients (53% from the maternal side, 42% from the paternal side, and 5% for both parents). Most of the patients (66%) had a lifestyle that required long periods of standing (>8 hours/day). Only 8% were tobacco consumers and all smokers were men. For women, 68% had not gone through menopause. Among the women, only 15% were taking birth control pills and the parity ranged from 1 to 13 with a mean of 3.7 deliveries per woman. None of the postmenopausal women were using hormone replacement therapy. Out of the 43% of the chronic venous disease patients, 34% had been previously treated with venoactive drugs, 16% with compression hosiery, 2% with surgery, and only 1 patient had been treated with sclerosants.

Affected legs with chronic venous disease were symptomatic in 73% of the cases and had the following symptoms: leg heaviness (47%), sensation of swelling (47%), leg pain (39%), sensation of “pins and needles” in the legs (22%), nighttime cramps (18%), and itching (13%). The severity of the disease using the revised venous clinical severity score³ ranged from 1 to 21 with a mean of 4.62. Regarding the CEAP classification, chronic venous disease patients were assigned in the following classes:

- C: Clinical presentation: C_{0s} (6.1%), C₁ (345.4%), C₂ (39.6%), C₃ (42.7%), C_{4a} (11.9%), C_{4b} (4.9%), C₅ (1.5%), C₆ (10.1%).
- E: Etiology: primary (88.7%), secondary (9.8%), congenital (1.5%; 3 cases had Klippel-Trenaunay syndrome).
- A: Anatomical location: superficial (71%), deep (43.3%), perforators (4.3%), no location identified (6.1%).
- P: Physiopathology: reflux (62%), obstruction (9.2%), both (4.6%), none (24.3%).

Quality of life was assessed in the majority of patients. Cross results and comparisons of all variables between chronic venous disease and healthy patients will bring new views on the epidemiology of chronic venous disease, in general, and of an African presentation, in particular. This is the first time that such a survey was performed in Africa. The comparison between the results found in the present survey with those of the main population-based surveys performed in the Western World remains to be done and should bring additional information.

References

1. Criqui MH, Jamosmos M, Fronck A, et al. Chronic venous disease in an ethnically diverse population: the San Diego population study. *Am J Epidemiol.* 2003;158:448-456.
2. Eklöf B, Rutherford RB, Bergan JJ, et al; American Venous Forum International Ad Hoc Committee for Revision of the CEAP Classification. Revision of the CEAP classification for chronic venous disorders: consensus statement. *J Vasc Surg.* 2004;40:1248-1252.
3. Vasquez MA, Rabe E, McLafferty RB, et al; American Venous Forum Ad Hoc Outcomes Working Group. Revision of the venous clinical severity score: venous outcomes consensus statement. *J Vasc Surg.* 2010;52(5):1387-1396.

Servier award 2015-2017

Metabonomic profiling for the identification of novel biomarkers in deep vein thrombosis

Joseph Shaloub, UK

The purpose of the study is to verify the hypothesis that biofluid (blood and urine) metabolite profiles of patients with deep vein thrombosis are significantly different from both the biofluid metabolite profiles of patients with similar symptoms, but no deep vein thrombosis, and the metabolite profiles of healthy volunteers. The methodology consists of identifying new biological biomarkers of deep vein thrombosis using a nontargeted metabonomic analysis. The identification of a new diagnostic biomarker or biomarker signature that can be measured easily in biofluids, with a relatively low cost and a high sensitivity and specificity for deep vein thrombosis would contribute to the improved management of patients with deep vein thrombosis.

The study is an observational case-control study, including 200 patients and 40 healthy subjects. A total of 200 patients presenting with a suspicion of deep vein thrombosis will be recruited. These patients will be divided into three groups: (i) patients with deep vein thrombosis confirmed by duplex ultrasound; (ii) patients with similar symptoms, but where deep vein thrombosis has been excluded by duplex ultrasound; and (iii) 40 healthy volunteers. According to the recommendations of the National Institute for Health and Care Excellence, patients presenting to the emergency department or ambulatory care units with a high suspicion of deep vein thrombosis should undergo venous duplex imaging to confirm the diagnosis. If the duplex scan cannot be carried out within 4 hours, an interim 24-hour dose of a parenteral anticoagulant will be given and the duplex scan will be performed within 24 hours.

Metabolic profiling is sensitive to environmental and external factors; therefore, blood and urine sampling will be repeated before and after parenteral anticoagulation is administered. The subjects enrolled in the study will have their full medical history recorded, including medication details, examination of the lower limbs, and blood and urine sampling data. An additional blood sample will be stored for future DNA analysis to compare with the findings of the metabolite profile. The patients in group 1 will repeat the duplex ultrasound 3 weeks after the end of their treatment (treatment usually lasting 3 to 6 months) and a further blood and urine sample will be collected for metabonomic analysis.

Detection and quantification of metabolites in human blood serum and urine will be completed using state of the art untargeted mass spectrometry and nuclear magnetic resonance metabolic profiling approaches. The mass spectrometry and nuclear magnetic resonance spectra from the samples will be analyzed in order to identify metabolite features whose quantities are significantly different between the three groups. These metabolites will be classified and identified. Metabolite identification will be performed by consulting with in-house and online metabolite databases. The primary outcome is to identify metabolites that are sensitive and specific for deep vein thrombosis. Secondary outcomes will include: (i) correlating the results with the extension and chronicity of the thrombus; and (ii) investigating the effect of parenteral anticoagulation on the metabonomic profile.

Kreussler award 2013-2015

Detergent sclerosants activate endothelial cells at low concentration in vitro

David Connor, Australia

Sodium tetradecyl sulphate and polidocanol are two detergent sclerosants that are routinely injected during sclerotherapy for the treatment of varicose veins and venous malformations. The ultimate aim of such injections is to induce endothelial cell lysis and eventual closure of the vessel. It is acknowledged that detergent sclerosants induce endothelial cell lysis at high concentrations (>0.3%), but the effect of sublytic concentrations is unknown. The current project is testing the hypothesis that in vitro incubation of endothelial cells with low concentrations of detergent sclerosants will result in cellular activation and an increase in both the surface expression of activation markers and release of endothelial microparticles.

Cultures of human umbilical vein endothelial cells were incubated with sodium tetradecyl sulphate and polidocanol at different concentrations for 15 minutes. Detergent sclerosants release endothelial CD31⁺/Lactadherin⁺ microparticles and proinflammatory cytokines, such as activation markers (ICAM-1 and E-Selectin) and constitutive markers (PECAM-1, endoglin, VE-Cadherin, MCAM-1).

Previous work has shown that in vitro incubation of cultured endothelial cells with low concentrations of detergent sclerosants stimulates the activation of platelets and the release of procoagulant platelet-derived microparticles (*Figure 1*).^{1,2} When low concentrations of detergent sclerosants (0.075% sodium tetradecyl sulphate and polidocanol) were incubated with endothelial cells, microparticle release increased, but then started to gradually decrease as the sclerosant concentrations increased. The next stage will be to test for platelet activation, leukocyte adhesion, and endothelial cytokine release with low concentrations of sodium tetradecyl sulphate and polidocanol.

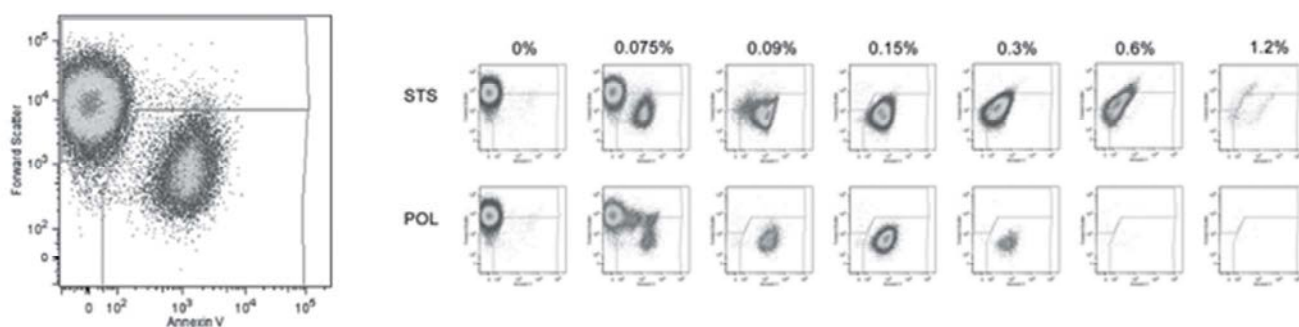


Figure 1. Flow cytometric analysis of platelet activation and release of procoagulant platelet-derived microparticles from cultured endothelial cells incubated with various concentrations of detergent sclerosants (sodium tetradecyl sulphate and polidocanol).

References

1. Parsi K, Exner T, Connor DE, Ma DD, Joseph JE. In vitro effects of detergent sclerosants on coagulation, platelets and microparticles. *Eur J Vasc Endovasc Surg.* 2007;34:731-740.
2. Parsi K, Exner T, Connor DE, Herbert A, Ma DD, Joseph JE. The lytic effects of detergent sclerosants on erythrocytes, platelets, endothelial cells and microparticles are attenuated by albumin and other plasma components in vitro. *Eur J Vasc Endovasc Surg.* 2008;36:216-223.

Kreussler award 2015-2017

Effect of compression therapy in patients receiving endovenous treatment for varicose veins using foam sclerotherapy

Roshan Bootun, UK

The 2015 winning project will look at the effect of compression therapy in patients receiving endovenous treatment for varicose veins using ultrasound-guided foam sclerotherapy. As uncertainty remains about the use of compression stockings following treatment of varicose veins, the 2013 National Institute for Health and Care Excellence guidelines on varicose veins recommends further research to evaluate both the clinical effectiveness and cost-effectiveness of this postprocedural intervention.¹ At the same time, the *Union Internationale de Phlébologie* recommended using compression for certain indications, including postoperative treatment of varicose veins.²

Hamel-Desnos et al previously conducted a randomized controlled trial studying the effect of compression in patients undergoing ultrasound-guided foam sclerotherapy of the saphenous veins.³ They reported that patients with compression had similar pain and quality of life scores than patients without compression; however, only 60 patients were recruited in the trial; therefore, it could be hypothesized that the population was not large enough to demonstrate a difference.

Based on power calculations, the sample size has been estimated at 350 patients. The project will examine the effect of compression therapy after ultrasound-guided foam sclerotherapy. In this trial, patients will be randomized to either group with compression (group A) or a group without compression (group B). Adults with varicose veins suitable for ultrasound-guided foam sclerotherapy will be included in the study. Patients will be excluded from the trial if they present with current deep vein thrombosis or peripheral arterial disease.

The primary objective of the study will be patient's pain score for the first 10 days postprocedure, which will be determined using a validated visual analogue scale. Secondary objectives will be to compare the two treatment groups with respect to quality of life scores, clinical scores, degree of phlebitis, time to return to normal activities, and occlusion rate at 6 months. Recruitment will require 12 months and the follow-up will last 6 months.

The results will be presented at the 2017 *Union Internationale de Phlébologie* meeting in Melbourne, Australia

References

1. National Institute for Health and Care Excellence (NICE) guidelines [CG168]. Varicose veins in the legs: the diagnosis and management of varicose veins. <https://www.nice.org.uk/guidance/cg168>. Published July 2013. Accessed September 9, 2015.
2. Partsch H, Flour M, Smith PC; International Compression Club. Indications for compression therapy in venous and lymphatic diseases: consensus based on experimental data and scientific evidence. Under the auspices of the IUP. *Int Angiol*. 2008;27(3):193-219.

3. Hamel-Desnos CM, Guias BJ, Desnos PR, Mesgard A. Foam sclerotherapy of the saphenous veins: randomised controlled trial with or without compression. *Eur J Vasc Endovasc Surg.* 2010;39(4):500-507.

Bauerfeind award 2013-2015

Outflow performance of different stockings in the treatment of lymphedema and postthrombotic syndrome using air plethysmography

Christopher Lattimer, UK

Manufacturers extensively test compression stockings to quantify compression strength, pressure graduation, surface contour, and knit. Despite this testing, compression stockings are not tolerated by some people and they could even cause harm. Furthermore, compliance is a major issue. These factors may be related to how stockings augment the venous return. This study compared the in vivo performance of elastic compression stockings in healthy controls with patients with varicose veins, postthrombotic syndrome, and lymphedema.

Stocking ejection force was tested by measuring the reduction in calf volume of a congested calf after sudden deflation of a thigh-cuff (outflow fraction). The ability of a stocking to resist increases in calf volume after incremental thigh-cuff inflations was tested by measuring the incremental thigh-cuff pressure causing the maximal increase in calf volume (IPMIV). Venous filling index was assessed when the patients stood up in order to verify the presence of reflux (high venous filling index, >2.5 mL/s). Venous drainage index was measured after leg elevation (low venous drainage index, <10 mL/s). A slow decrease in calf volume after elevation implies venous obstruction.

A total of 12 legs were tested in each group using no compression, knee-length class 1 (18 to 21 mm Hg) compression, and then class 2 (23 to 32 mm Hg) compression.

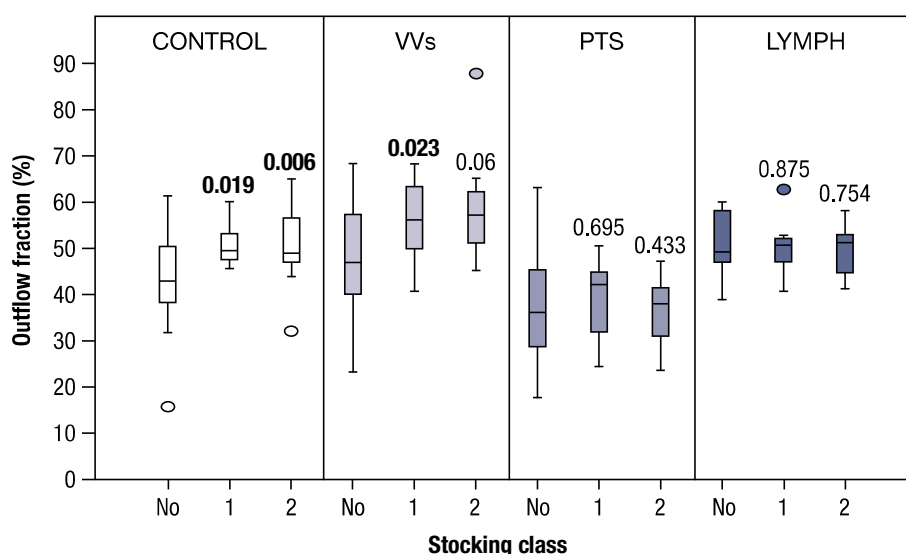


Figure 1. Stocking ejection force is tested by measuring the reduction in calf volume of a congested calf after sudden deflation of a thigh cuff (outflow fraction).

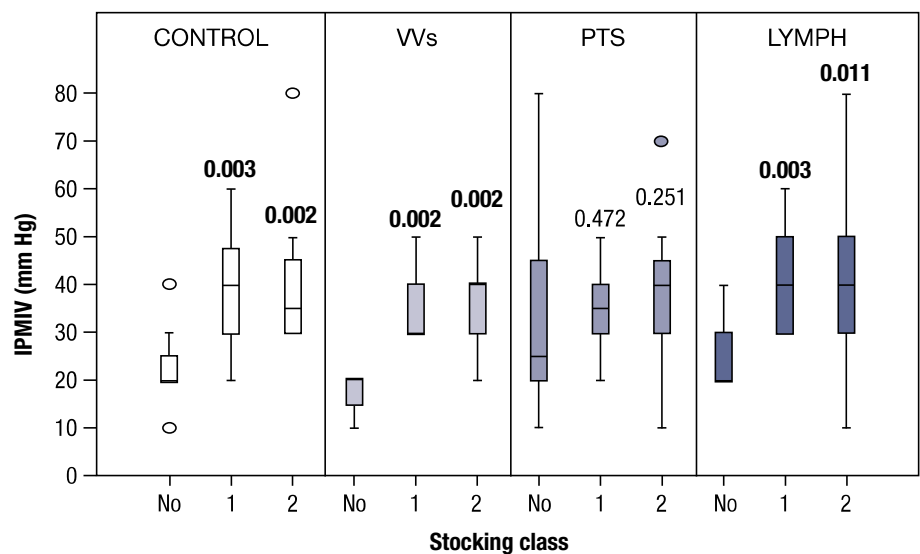


Figure 2. The performance of a stocking to resist increases in calf volume after incremental thigh-cuff inflations was assessed using the incremental thigh cuff pressure causing the maximal increase in calf volume (IPMIV).

Stocking interface pressures (mm Hg) were measured in the supine position at 2 points using the PicoPress®. The values of the outflow fraction, IPMIV, venous filling index, and venous drainage index were quantified in each of the four groups. In particular, stockings significantly improved the outflow fraction and IPMIV both in controls and patients with varicose veins (*Figures 1 and 2*). The venous filling index improved significantly in patients with varicose veins. There was a 6-fold improvement in the venous drainage index in the only postthrombotic syndrome patient with an iliac occlusion from 2.3 (none) to 14.3 and 13.3 with class 1 and 2 stockings, respectively.

In conclusion, stocking performance tests measuring acute volume changes in vivo in response to provocation maneuvers may explain why the legs of some patients improve with stockings and why other legs may not benefit to the same extent.

Bauerfeind award 2015-2017

Elastic compression elicited beneficial cardiovascular effects: a complex clinical study in healthy, lymphedematous, and lipedematous individuals

Gyöző Szolnoky, Hungary

Research on compression therapy is mostly focused on venous and lymph flow; however, the effects of medical compression stockings on cardiovascular responses have been poorly studied, which means that the systemic effects of elastic compression still needs further clarification. Medical stockings with mild compression improved pulse wave velocity, which is the gold-standard measurement of aortic elastic properties. Sports stockings are considered efficient at improving running capacity, but their mode of action remains to be elucidated. Nongraduated stockings exert remarkable venous hemodynamic effects, but their systemic cardiovascular effect has never been measured. Recent studies showed high aortic stiffness in the legs of

patients with secondary lymphedema and lipedema. Sustained compression with elastic material is the cornerstone of controlling limb volume, despite the fact that its cardiovascular impact has been poorly investigated.

This project will test the hypothesis that sports and nongraduated knee stockings for healthy individuals and compression hosiery for patients with lymphedema and lipedema may provide beneficial cardiovascular effects. Patients eligible for the research will undergo blood pressure assessment, two-dimensional echocardiography, and pulse wave velocity measurements to determine aortic elastic properties before and after the use of compression garments.

Consensus document

Hemodynamics of chronic venous disease and clinical significance

Andrew Nicolaides, Cyprus

Venous hemodynamic concepts are useful in understanding the pathophysiology of chronic venous disease, the significance of the results of different investigations, and the hemodynamic changes associated with symptoms and different methods of treatment. Venous hemodynamic changes consist of changes in pressure, volume, velocity, flow, resistance, venous compliance or elasticity, function of the calf muscle pump, and changes in microcirculation. Velocity and flow are the only hemodynamic changes that can be measured using duplex ultrasound scanning. Hemodynamic testing was routine practice in the 1970s and 1980s until duplex ultrasound scanning was invented. Subsequently, routine hemodynamic measurements were abandoned in favor of duplex ultrasound scanning. Since then, it has been repeatedly stated that there is a poor correlation between hemodynamic measurements and the clinical severity of chronic venous disease.

Nicolaides addressed three questions: (i) what is the relationship between hemodynamic measurements (changes in volume, pressure, and flow) and severity of chronic venous disease?; (ii) what is the significance of this relationship?; and (iii) do hemodynamic changes affect our practice? Venous hypertension is the key hemodynamic abnormality that underlies the development of symptoms and signs of chronic venous disease. In the 1990s, it was shown that patients presenting with venous symptoms had prevalent skin changes, increased rates of ulceration, and increased ambulatory venous pressure. If the ambulatory venous pressure is <40 mm Hg, the prevalence of ulceration in patients with symptomatic chronic venous disease is less than 10%; however, if the ambulatory venous pressure is >90 mm Hg, the prevalence increases linearly to almost 100%.

Two protective mechanisms tend to improve the effects of increased ambulatory venous pressure: (i) lymphatic drainage can increase up to 10 times in normal individuals, but only 2 times in some individuals and not at all in patients with lymphedema; and (ii) the high fibrinolytic activity in the blood and extracellular compartment found in some individuals, can effectively remove extravascular fibrin deposits and other proteins. For patients with moderately raised ambulatory venous pressure (35 to 65 mm Hg), measurements of global fibrinolysis (expressed in mg of fibrin lysed per hour), which were made in the late 1980s, showed that, if fibrinolytic activity was low, 90% of

patients had skin changes and ulcerations. However, if fibrinolytic activity was normal or high, only 16% of patients had an ulcer. The variable response of the lymphatic and fibrinolytic systems can explain most of the variability in clinical severity found among different patients with the same hemodynamic abnormality.

Reflux, measured as mL/min using the volume flow facility of duplex scanners or as mL/sec using air plethysmography, has the highest correlation with clinical severity. Peak reflux velocity has a moderate correlation and reflux time. In one study using air plethysmography, reflux venous filling index was 0.5 to 0.8 mL/sec in normal controls; 0.7 to 1.8 mL/sec for the clinical, etiological, anatomical, physiological (CEAP) classification C_1 ; 2.8 to 4.5 mL/sec in classes C_2 to C_3 ; and 4.0 to 10.1 mL/sec in classes C_4 to C_6 . Axial reflux, ie, reflux extending from the common femoral vein to the calf veins, is associated with high clinical severity, which is even higher when associated with outflow obstruction. However, the presence of competent popliteal valves, even in the presence of outflow obstruction, result in a normal or an almost normal leg, which is asymptomatic, even in the presence of outflow obstruction.

The effect of high saphenous ligation, stripping, and phlebectomies in limbs with varicose veins and normal deep veins ($n=1756$) at 1 month have been shown to decrease venous volume, venous filling index, and residual venous volume by 25%, 71%, and 30%, respectively, and increase the ejection fraction by 20%. The effect of high saphenous ligation, stripping, and phlebectomies in limbs with varicose veins and reflux in deep veins ($n=102$) at 3 months have been shown to decrease venous filling index from 8.4 ± 6.3 to 2.7 ± 2.6 mL/sec, increase the ejection fraction from 44% to 54%, and decrease residual venous volume from 48% to 35%. The prevalence of femoral vein reflux decreased from 65% to 32%. These changes were associated with ulcer healing in 97% of patients at 6 months.

In patients with axial reflux in the deep veins ($n=140$), valvuloplasty decreased venous filling index from 4.1 ± 2.8 mL/sec to 3.1 ± 2.8 mL/sec. In another study, it was shown that patients with a venous filling index >4.0 mL/sec have a 43% and 60% risk of ulcer recurrence at 1 year and 2 years, respectively. These patients benefit from deep venous valve reconstruction. However, patients with deep venous reflux and a venous filling index <4.0 mL/sec do not benefit from valvuloplasty.

The measurement of venous filling index (reflux [mL/sec]), outflow resistance (mm Hg/mL/min), and their combined parameter hemodynamic index has a linear relationship with the venous clinical severity score ($r=0.83$). These quantitative measurements of venous filling index and outflow resistance indicate whether the main hemodynamic abnormality is reflux, outflow obstruction, or both, and subsequently assist in the development of a rational plan for management.

A list of anatomic and hemodynamic factors associated with increased severity of chronic venous disease has been produced and include an increase in the anatomic extent of reflux, reflux involving 2 or more systems (superficial, deep, or perforating veins), reflux >5 mL/sec on air plethysmography, severe obstruction with an outflow resistance >0.03 mm Hg/mL/min, and reflux >4 mL/sec combined with an ejection fraction $<40\%$.

This work has five main conclusions: (i) there is a high correlation between the venous clinical severity score and the combined measurements of reflux and resistance; (ii) the statement “there is a poor correlation between hemodynamic measurements and clinical severity of chronic venous disease” should be modified to “there is a poor correlation between duplex scanning measurements and clinical severity of chronic venous disease”; (iii) duplex scanning provides information on the presence and anatomic extent of the reflux or obstruction; (iv) if quantitative information is needed (how much reflux or obstruction is present) for clinical decisions, duplex scanning should be complimented by air plethysmography; and (v) resistance outflow and reflux venous filling index should be measured before and after stenting, so the baseline readings can be correlated with those that derive clinical benefit. This should provide a better selection of patients for stenting.

II. Primary chronic venous disease

Epidemiology

Prevalence and incidence of chronic venous disease and lymphedema

Felizitas Pannier, Germany

The Bonn Vein Study I was conducted in 2000 on 3072 participants who were selected using a simple random sampling from the registries of residents of Bonn, Germany plus two rural townships. The study aim was to determine the prevalence of venous disorders in urban and rural populations, the frequency of its signs and symptoms, and the risk factors. Participants, at that time, were aged 18 to 79 years (1350 men, 1722 women).

The Bonn Vein Study II was a follow-up study, which occurred 6.6 years later on the same population. The aim was to identify the incidence of newly developed chronic venous disorders and progression of preexisting chronic venous disease. From May 2007 to September 2008, all participants of the Bonn Vein Study I were invited for a reinvestigation. The participants answered a standardized questionnaire and had a clinical examination and duplex ultrasound as was done in the Bonn Vein Study I. In addition to the questionnaire and the phlebological investigations, a skin fold test at the dorsum of the second toe was performed. The so-called Stemmer's sign was slightly positive (Stemmer's I) when the skin fold was between 0.5 and 1 cm. Stemmer's II and Stemmer's III occurred when the skin fold was >1 cm and when the skin fold was extremely enlarged, respectively.

The Bonn Vein Study I results showed the following clinical, etiological, anatomical, pathophysiological (CEAP) classification distribution: C₀ (9.6%), C₁ (59.0%), C₂ (14.3%), C₃ (13.4%), C₄ (2.9%), C₅ (0.6%), and C₆ (0.1). The response rate after 6.6 years was 84.6% (1978 participants). The prevalence of varicose veins rose from 22.7% to 25.1% and for chronic venous insufficiency from 14.5% to 16%. The incidence for new varicose veins was 13.7% and for new chronic venous insufficiency 13.0%, which increased with age. Participants with a C₂ classification during the Bonn Vein Study I increased to higher C classes in 19.8% and 31.8% for nonsaphenous and saphenous varicose veins, respectively. A total of 1.5% of the men and 2% of the women had clinical lymphedema represented by Stemmer's sign II and III. The prevalence of a positive Stemmer's sign II and III was markedly higher in the urban population (2.4%) compared with the rural population (0.7%) and increased with the clinical stages of chronic venous diseases according to the CEAP-classification.

The prevalence of lymphedema increased significantly with age (odds ratio, 5.4), obesity (odds ratio, 4.9), female sex (odds ratio, 2.1), urban living (odds ratio, 2.8), and sitting professions (odds ratio, 1.6). The incidence reached 0.8% per year for a slightly positive Stemmer's sign and 0.3% per year for an increased positive Stemmer's sign.

Prevalence and incidence of venous leg ulcer and lymphedema in the general population

Eberhard Rabe, Germany

The Bonn Vein Study I was a population-based cross-sectional study with participants chosen using simple random sampling from population registers (18 to 79 years of age). A total of 3072 patients were included (43.9% were male and 56.1% were female). Edema, leg ulcer, and lymphedema at any time in the past were observed in 30.7% (16.2% men and 42.1% women), 1.1% (1.2% men and 1.0% women), and 1.8% (1.1% men and 2.4% women) of patients, respectively. The clinical, etiological, anatomical, pathophysiological classification distribution was as follows: C_{0s} (20%), C₁ (21.6%), C₂ (16%), C₃ (14.6%), C₄ (7.1%), C₅ (1.4%), and C₆ (0.5%).

The Bonn Vein Study II was conducted using the same population and procedure as in the Bonn Vein Study I. Follow-up was started in August 2007 (6.6 years after the end of the Bonn Vein Study I, with an 84.6% response rate [n=1978]) and the investigations finished in October 2008. The incidence of varicose veins was 13.7% overall, 7.1% in patients <39 years, 13.2% in patients between 40 and 59 years, and 18.5% in patients >59 years. The incidence of a C₃ to C₆ classification was 3.9% in patients <39 years, 10% in patients between 40 and 59 years, and 22% in patients >59 years.

The increased risks for ulcerations include the severity of the clinical venous disease (especially with the presence of skin changes), history of deep vein thrombosis, higher body mass index, smoking, reflux in the deep veins, low pumping function in photoplethysmography, and limited range of ankle movement (not wholly due to the effects of an active ulcer). The other increased risks of venous ulceration include lipodermatosclerosis, corona phlebectatica, and eczema.

Regarding the lymphedema incidence (looking for Stemmer's sign [enlargement of skin fold between the first and second toe]), the Bonn Vein Study I found that 15.8% of the total population had a positive Stemmer's sign, with 25.2% in the patients between the ages of 60 and 69 and 35.75% in the patients between the ages of 70 and 79. A positive Stemmer's sign was found in 65.4% and 73.7% of the patients in the C₆ and C₅ class, respectively. The Bonn Vein Study II found a positive Stemmer's sign in 2.4% of the patients <39 years, 4.8% in the patients between 40 and 59 years, and 6.2% in patients >59 years.

According to this study, lymphedema has a prevalence of 1.8% for the total population and an incidence of 0.3% per year, with an increased risk due to age, obesity, sitting professions, urban population, and female sex.

Varicose veins

In the introduction, two keynote seminars were presented. **Albert Granados** (El Salvador) focused on his results with endovenous laser ablation in 285 patients and **Imre Bihari** (Hungary) highlighted the risk factors for recurrences after endovenous laser surgery in 43 cases. Double saphenous veins, extremely dilated veins, high body mass index, and redo surgery were the most frequently mentioned risk factors. **Imre Bihari** showed a lower recurrence rate in his series and postulated that it was due to the distance of the ablated vein from the saphenofemoral junction: 0.5 cm compared with the 2 cm that is accepted by other surgeons.

Alexander Kantarovsky (Israel) presented his work with endovenous laser ablation and showed a positive financial aspect of this procedure in public hospitals. Using low power and a slow pull back rate, **Svatopluk Kaspar** (Czech Republic) showed that the limits of the endovenous laser procedure extend down to extremely dilated truncal varicose veins. **Hong Hwang** (Korea) investigated the safety and efficacy of total endovenous laser ablation without any phlebectomy or sclerotherapy in 554 symptomatic legs with saphenous vein incompetence. Recanalization occurred in 21 legs during the follow-up period. There were few side effects and the patients' level of satisfaction was either good or very good. **Philippe Desnos** (France) presented the results of the EVTA study (EndoVenous Thermal Ablation), which explored the feasibility and tolerability of the thermal ablation of incompetent saphenous veins in patients older than 75 years. This was a prospective observational multicenter study conducted under the aegis of the French and Swiss Societies of Phlebology. Occlusion was achieved in 100% of the saphenous veins after 3 months, and paresthesia occurred with a lower proportion when local tumescent anesthesia was performed vs general anesthesia. Endovenous thermal ablation can be considered safe and effective in an elderly population under local tumescent anesthesia. **Daniele Camilli** (Italy) presented the results of a procedure that restores the competency of the great saphenous vein by external valvuloplasty. This procedure can save the saphenous vein from further grafts. **André Cornu-Thenard** (France) proposed improving the clinical, etiological, anatomical, pathophysiological (CEAP) classification by adding an "a" or a "b" to each C class, as has already done for the C₄ class (C_{4a}, pigmentation or eczema; C_{4b}, lipodermatosclerosis or white atrophy).

Kasuo Miyake (Brazil) evaluated the viscosity and flow hydrodynamics of the most commonly used sclerosing agents in a rabbit model (dextrose, ethanolamine oleate, sodium tetradecyl sulfate). Vessel size and the viscosity and strength of the sclerosant are responsible for ulceration during sclerotherapy, not extravasation.

Adel Kamhavy (Egypt) presented his work using combined surgical and foam sclerotherapy approaches for the management of acute bleeding from reticular varicose veins in 125 patients. Until now, there were no reports on the use of foam sclerotherapy during surgery in such cases, and yet, this technique is simple, safe, and effective.

Interim results of the multicenter, randomized controlled trial comparing mechanochemical ablation with radiofrequency ablation were presented by **Roshan Bootun** (UK). A total of 170 patients undergoing truncal ablation were randomized to either group. The end point was an assessment of pain using a visual analogue

scale and quality of life using the Aberdeen Varicose Veins Questionnaire. The previously reported results showed that mechanochemical ablation is less painful than radiofrequency ablation. However, after 6 months of follow-up, the clinical scores and quality of life scores were similarly improved in both treatment groups.

A new gluing method for treating varicose veins was presented by **Johan Ragg** (Germany). The method combines point-wise gluing for vein wall adhesion and catheter sclerotherapy for rapid endothelium denaturation ("scleroglue technology"). The objective of this new method is to bridge some disadvantages of the gluing method alone. Preliminary results on 21 patients are promising as this method provides reliable denaturation and economical gluing.

Makoto Mo (Japan) presented the rate of venous thromboembolic complications after endovenous thermal ablation in Japan. Data on 43 203 cases were obtained from 143 institutions. The total reported Endovenous Heat Induced Thrombosis (EHIT) included: EHIT class 2 (318 cases; 1%); EHIT class 3 (51 cases; 0.1%); EHIT class 4 (7 cases; 0.013%); pulmonary embolism (2 cases; 0.0067%); and any other venous thrombosis event (24 cases; 0.06%). Venous thrombosis complications after endovenous laser ablation were rare.

Retrospective analysis of an ultrasound study done on female patients for varicose veins

Devendra Dekiwadia, India

The primary goal of the presented study was to investigate concomitant associated pelvic vein refluxes in patients with chronic venous disease. From September 2013 to September 2014, 126 female patients with varicose veins were studied using linear ultrasound while standing and a transvaginal probe for ovarian vein reflux. The author observed that 28.57% (n=36) of the patients with varicose veins had associated pelvic vein refluxes. An increased suspicion of refluxing pelvic veins, mainly the ovarian and hypogastric veins, were observed where varicosities were noted in the medial and posterior thigh, gluteal region, and vulvar varicosities. Only 30% of these patients complained of pelvic pain, while the rest had typical symptoms of edema in the lower calf, ankle, and foot, night cramps, eczema, and visible varicose veins.

Patients with a refluxing great saphenous vein at the saphenofemoral junction or any level toward the ankle with ovarian reflux were primarily treated with thermal ablation and bunch phlebectomy \pm sclerotherapy of the great saphenous vein and then kept for follow-up. A second group of patients with no great saphenous vein varicosity, but multiple varicosities in the lower limbs with a normal saphenofemoral junction, underwent coil deployment and were kept for follow-up.

Venous leg ulcer

AVF–SVS guidelines for the management of venous ulcer

Fedor Lurie, USA

Venous leg ulcers have a major socioeconomic effect that is related to several factors: (i) the prevalence, which ranges between 0.06% and 2%; (ii) the common occurrence, representing up to 80% of all leg ulcers; and (iii) the predilection for recurrence of 50% to 70% within 6 months. As a result, the current direct cost of treatment for venous leg ulcers in the US is between \$10 000 and \$12 000 per year per patient, which is comparable with Germany. Thus, the direct expenditures for the treatment of venous leg ulcers may amount to 1% of the health-care budgets for some European countries. The indirect costs are also significant due to the lost productivity from work for the patient and the family members, out-of-pocket expenses (copays), transportation, and premature disability.

Guidelines should develop “best practices” to achieve the best health outcomes for the most reasonable health care dollar. As the treatment of venous leg ulcers uniquely involves all health care providers, the American Venous Forum and Society for Vascular Surgery (AVF–SVS) guidelines should address primary care physicians, surgeons, dermatologists, wound care specialists, and nurse- and physical therapist-dependent care.

During the presentation, the following recommendations were stressed:

1. Guideline 1.1: Venous leg ulcer definition
We suggest using a standard definition of venous ulcer as an open skin lesion of the leg or foot that occurs in an area affected by venous hypertension. (Best practice)
2. Guideline 2.1: Venous anatomy nomenclature
We recommend using the International Consensus Committee on Venous Anatomical Terminology for standardized venous anatomy nomenclature. (Best practice)
3. Guideline 2.2: Venous leg ulcer pathophysiology
We recommend having a basic practical knowledge of venous physiology and venous leg ulcer pathophysiology for all practitioners caring for venous leg ulcers. (Best practice)

Clinical Evaluation:

4. Guideline 3.1: Clinical evaluation
We recommend that a clinical evaluation for evidence of chronic venous disease be performed for all patients with suspected leg ulcers fitting the definition of a venous leg ulcer. (Best practice)
5. Guideline 3.2: Nonvenous causes of leg ulcers
We recommend identifying the medical conditions that affect ulcer healing and other nonvenous causes of ulcers. (Best practice)
6. Guideline 3.3: Wound documentation
We recommend measuring and documenting serial venous leg ulcer wounds. (Best practice)

7. Guideline 3.4: Wound culture
We suggest against taking routine cultures from venous leg ulcers and recommend only obtaining wound cultures when clinical evidence of an infection is present. (Grade 2; Level of evidence, C)
8. Guideline 3.5: Wound biopsy
We recommend conducting a wound biopsy for venous leg ulcers that do not improve with standard wound and compression therapy after 4 to 6 weeks of treatment and for all ulcers with atypical features. (Grade 1; Level of evidence, C)
9. Guideline 3.7: Arterial testing
We recommend conducting an arterial pulse examination and measuring the ankle brachial index on all patients with venous leg ulcers. (Grade 1; Level of evidence, B)
10. Guideline 5.4: Compression – arterial insufficiency
In a patient with a venous leg ulcer and underlying arterial disease, if the ankle brachial index is ≤ 0.5 or if the absolute ankle pressure is < 60 mm Hg, we do not suggest compression bandages or stockings.

Investigation:

11. Guideline 3.9: Venous duplex ultrasound
We recommend comprehensive venous duplex ultrasound examination of the lower extremity in all patients with suspected venous leg ulcers. (Grade 1; Level of evidence, B)
12. Guideline 3.10: Venous plethysmography
We suggest selectively using venous plethysmography to evaluate patients with suspected venous leg ulcers, if the venous duplex ultrasound does not provided definitive diagnostic information. (Grade 2; Level of evidence, B)

Compression:

13. Guideline 5.1: Compression – ulcer healing
In a patient with a venous leg ulcer, we recommend compression therapy to increase the healing rate of venous leg ulcers. (Grade 1; Level of evidence, A)
14. Guideline 5.2: Compression – ulcer recurrence
In a patient with a healed venous leg ulcer, we suggest compression therapy to decrease the risk of ulcer recurrence. (Grade 2; Level of evidence, B)

Intervention:

15. Guideline 6.1: Superficial venous reflux and active venous leg ulcer – ulcer healing
In a patient with a venous leg ulcer (C_6) and incompetent superficial veins that have an axial reflux directed to the bed of the ulcer, we suggest ablation of the incompetent veins in addition to standard compressive therapy to improve ulcer healing. (Grade 2; Level of evidence, C)
16. Guideline 6.2: Superficial venous reflux and active venous leg ulcer – prevent recurrence
In a patient with a venous leg ulcer (C_6) and incompetent superficial veins that have an axial reflux directed to the bed of the ulcer, we recommend ablation of the incompetent veins in addition to standard compressive therapy to prevent recurrence. (Grade 1; Level of evidence, B)

17. Guideline 6.3: Superficial venous reflux and healed venous leg ulcers
In a patient with a healed venous leg ulcer (C_3) and incompetent superficial veins that have an axial reflux directed to the bed of the ulcer, we recommend ablation of the incompetent veins in addition to standard compressive therapy to prevent recurrence. (Grade 1; Level of evidence, C)
18. Guideline 6.4: Superficial venous reflux with skin changes at risk of venous leg ulcers (C_{4b})
In a patient with skin changes at risk of venous leg ulcers (C_{4b}) and incompetent superficial veins that have an axial reflux directed to the bed of the affected skin, we suggest ablation of the incompetent superficial veins in addition to standard compressive therapy to prevent ulceration. (Grade 2; Level of evidence, C)

Considering the most recent AVF–SVS guidelines, the treatment of venous ulcers requires a multispecialty approach, involving compression, local wound care, sclerotherapy, stenting, reconstruction, ablation, phlebectomy, or drug therapy.

For the complete AVF–SVS guidelines, please refer to the original publication by O'Donnell Jr.¹

Reference

1. O'Donnell TF Jr, Passman MA, Marston WA, et al. Management of venous leg ulcers: clinical practice guidelines of the Society for Vascular Surgery® and the American Venous Forum. *J Vasc Surg.* 2014; 60:3S-59S.

Surgical management of venous ulcers

Mark Malouf, Australia

Treating the cause of venous hypertension and addressing the ulcer or wound are two considerations that require surgical management in patients with venous ulcers. In the local vicinity of venous ulcers, there are often obvious varicosities that can be associated with nearby incompetent perforating veins (>40% of C_6) or saphenous trunk reflux. Deep vein reflux and obstruction at different levels may also be present and should be considered, especially for a nonresponding ulcer.

When treating a venous ulcer, the role played by the calf muscle pump and the possibility of coincidental arterial disease in the affected limb must not be ignored. Comorbid illnesses, such as diabetes, anemia, vasculitis, obesity, cardiac failure, or immobility, may be just as important as the diseased veins themselves. Detailed venous duplex mapping is essential to develop a tailored treatment plan to reduce the venous hypertension. Depending on the mapping results, several surgical and minimally invasive treatment options are available to treat the venous pathology, similar to the options available for C_2 patients.

Meanwhile, treatment strategies for C_6 patients may need to be modified because of the severity and tortuous or recurrent nature of the superficial varicosities and the increased incidence of coexisting perforator or deep vein reflux/obstruction. The availability of thermal ablation is increasing and the cost is going down; therefore, worldwide use is growing. Meanwhile, sclerotherapy is cheap, repeatable, and a very

good option, especially in developing countries. The worldwide frequency of open surgery on superficial veins is going down, but this option may still be preferable in some countries. Ambulatory phlebectomy under local anesthesia is very effective in reducing local venous hypertension around a venous ulcer, often combined with sclerotherapy. We must never lose sight of the fact that there may also be proximal venous obstruction, especially for ulcers that are difficult to manage, which can be treated with endovascular techniques.

Deep vein surgery is being performed in selected centers around the world for certain patients who have had both the superficial venous disease and perforators corrected and still suffer from ulcers. Deep vein surgical procedures include endovenectomy, creation of new vein valves, or if valve cusps do exist, restoration of deep vein competence using external or open valvuloplasty. Adequate treatment of superficial venous reflux is expected by many practitioners to speed the healing rate of the venous ulcers, to reduce its recurrence, and to extend the ulcer-free intervals, which is also supported by some data.

In terms of the venous ulcer itself, surgical debridement is commonly required to remove necrotic and/or infected tissue and to stimulate regeneration from the base and epithelialization from the ulcer edge. Skin grafting for large or recalcitrant ulcers is commonly performed, but only after treating the underlying venous hypertension and excluding the malignancy or vasculitis on biopsy. Methods of skin grafting include a split thickness graft, which may or may not require meshing, or pinch grafting under local anesthesia to stimulate healing.

The management of venous leg ulcers is still a challenge. Nevertheless, areas of venous reflux or obstruction should be treated with whatever methods are available in the office, clinic, or operating room; the functional factors and lifestyle should be improved; the wounds should also be treated, with surgery, if necessary; and the recommended guidelines should be observed.

Therapeutic alternatives for venous ulcers

Fernando Vega Rasgado, Mexico

Venous ulcers are estimated to affect 10% to 35% of the entire US population, and $\approx 4\%$ of people >65 years old have active ulcers. Many ulcers can have a multifactorial etiology. In 354 leg ulcers, Koerber et al showed that 5.3% were venous leg ulcers, 3.7% were arterial leg ulcers, 14.7% were ulcers of mixed venous and arterial origin, and 13.5% were vasculitic ulcers, ie, diabetic leg ulcer.¹ The ulcers with an inflammatory border and skin necrosis are often associated with chronic inflammatory diseases, such as ulcerative colitis or rheumatoid arthritis. Leg ulcers may also occur in patients with Klinefelter's syndrome. Malignant conditions must be excluded to make a differential diagnosis.

Compression improves the healing of ulcers, multicomponent compression systems are more effective than single-component compression systems, high compression is more effective than lower compression, and medical compression stockings are more effective than short-stretch bandages. So far, the Unna boot is considered the "gold-standard bandage" in compression therapy of venous ulcers.

Additionally, the author discussed a paper showing that the 24-week healing rate was significantly reduced in patients with poor ankle motility: 13% in legs with an ankle motility <35 degrees compared with 60% in legs with an ankle motility >35 degrees; ankle motility was an independent risk factor for the healing rate of chronic venous ulcers when adjusted for age, ulcer chronicity, and popliteal vein reflux ($P=0.001$).²

Several adjunctive therapies may help heal venous ulcers. As such, negative wound pressure treatment that creates a negative pressure on the ulcer bed favors granulation tissue and shortens healing time. Leg elevation for 10 minutes every 24 hours produces significant fluid drainage from the legs, promoting tissue dryness and blood flow to the skin around the ulcer. Nadroparin may play an adjuvant role in treating venous ulcers because it favors pain relief and improves quality of life, even if it does not improve healing. The application of an autologous platelet-rich gel in nonhealing vascular ulcers can be helpful. Connexin 43 (α -connexin carboxyl-terminal peptide) appears to accelerate both fibroblast migration/proliferation and wound re-epithelialization.

Compression remains the most useful and effective method of treating venous ulcers and a multilayer technique is the most effective. The Unna boot remains the gold-standard treatment, and differential diagnoses and new methods should be considered, especially for poorly healing ulcers.

References

1. Koerber A, Schadendorf D, Dissemmond J. Genese des ulcus cruris. *Hautarzt*. 2009;60:488.
2. Barwell R, Taylor M, Deacon J, Davies C, Whyman MR, Poskitt KR. Ankle motility is a risk factor for healing of chronic venous leg ulcer. *Phlebology*. 2001;16:38-40.

Laser ablation of perforating veins in C₅ patients with postthrombotic syndrome does not prevent ulcer recurrence

Igor Zolotukhin, Russia

A randomized controlled trial to establish whether laser ablation of perforators decreases the recurrence rate of postthrombotic ulcers at a 1-year follow-up was presented. For the study, 63 patients were randomly assigned to either endovenous laser ablation of incompetent calf perforating veins with subsequent compression treatment using class 3 stockings or to compression alone.

There were 91 incompetent calf perforating veins on 31 limbs with diameters ranging from 0.2 to 0.85 cm (mean, 0.4) in the study group and 87 incompetent calf perforating veins with diameters ranging from 0.2 to 0.86 cm (mean, 0.41) in the control group. Laser ablation was performed with a 940 nm device and the amount of energy delivered depended on the perforator caliber (from at least 75 J for 0.2 to 0.3 cm veins to 325 to 600 J for veins >0.6 cm). Number of ablated veins ranged from 1 to 7 per leg.

Duplex ultrasound showed that 77% of perforators had been successfully occluded 3 to 5 days postprocedure. Ulcer recurrence during 12 months occurred in 32%

of patients in the study group and 34% of patients in the control group ($P=0.859$). Mean venous clinical severity score after follow-up was 12 in both groups. Only 24% of the perforators remained occluded after 1 year.

Laser ablation of incompetent calf perforating veins performed with the usual amount of energy does not prevent either the incompetent perforating veins from recanalizing or the ulcer from reoccurring in patients with a clinical, etiological, anatomical, physiological (CEAP) class of C_5 and a postthrombotic syndrome.

Free paper session on venous ulcers: new concepts in venous ulcer treatment

The keynote address titled "Abolishing most distal reflux: does it count?" was presented by **Wassila Taha Elkashishi** (Egypt), where the term "ulcer veins" was mentioned. The results show that 88% of ulcers were healed within 1 year after foam sclerotherapy.

Ernesto Nieves (Colombia) discussed the results of a prospective, randomized clinical trial comparing conventional treatment of venous ulcers with conventional treatment plus ultrasound-guided foam sclerotherapy. The healing rate within the group receiving sclerotherapy was 83.3% at 6 months and 12.5% within the group receiving conventional local therapy only. **Ernesto Nieves** also presented "Prospective clinical trial on the rapid healing of venous ulcers with thermal, axial, and perforator interruption of the reflux source (TAPIRS) plus multilayer bandage," where it was shown that such techniques lead to a faster healing. **Istvan Rozsos** (Hungary) focused on measuring transcutaneous oxygen tension before and after treating ulcers with ultrasound-guided foam sclerotherapy.

Atsushi Tabuchi (Japan) discussed the traditional surgical approach of using subfascial endoscopic perforator vein surgery for treating venous stasis ulcers. Contrary to general belief and guideline recommendations, subfascial endoscopic perforator vein surgery was combined with stripping or endovenous laser ablation in almost 80% of incompetent saphenous trunks in 51 limbs with venous ulcers. The healing rate for the ulcers was 90.4% after 6 months and the cumulative recurrence-free rate was 97.5%. No side effects were reported. Venous filling index, venous volume, and residual volume fraction were assessed pre- and postoperatively and improvements were observed 24-months postprocedure.

Francine Heatley (UK) introduced the trial design of the EVRA ulcer trial (Early Venous Reflux Ablation), a randomized clinical trial comparing early with delayed endovenous treatment of superficial venous reflux in patients with chronic venous ulcers. The objective of the trial is to clarify the controversy surrounding the timing of superficial venous intervention. This study will be the first large, randomized, multicenter trial to report on the clinical efficacy, quality of life changes, and cost-effectiveness of treating ≈2500 patients with venous ulcers by early superficial venous intervention.

Conservative treatment of primary chronic venous disease: compression therapy

The in vivo performance of compression stockings using air plethysmography

Christopher Lattimer, UK

Manufacturers extensively test compression stockings to quantify compression strength, pressure graduation, surface contour, and knit. Despite this testing, compression stockings are not tolerated by some people and they could even cause harm. Furthermore, he stressed that compliance is a major issue. These factors may be related to how stockings augment venous return. This study compared the in vivo performance of elastic compression stockings between healthy controls and patients with varicose veins, postthrombotic syndrome, and lymphedema using air plethysmography.

Stocking ejection force was tested by measuring the reduction in calf volume of a congested calf after sudden deflation of a thigh cuff (outflow fraction). The ability of a stocking to resist increases in calf volume after incremental thigh-cuff inflations was tested by measuring incremental thigh-cuff pressure causing maximal increase in calf volume (IPMIV). Reflux and gravitational drainage were tested in mL/s using dependency (venous filling index) and elevation (venous drainage index) maneuvers, respectively.

A total of 12 legs were tested in each group using no compression, knee-length class 1 (18 to 21 mm Hg) compression, and then class 2 (23 to 32 mm Hg) compression. Stocking interface pressures (mm Hg) were measured in the supine position at two points using the PicoPress® (this device measures the pressure exerted by elastic compression in both static and dynamic conditions). The values of the outflow fraction, IPMIV, venous filling index, and venous drainage index were quantified in each of the four groups. Stockings significantly improved the outflow fraction and IPMIV both in controls and patients with varicose veins. The venous filling index improved significantly in patients with varicose veins. There was a 6-fold improvement in the venous drainage index in the only postthrombotic syndrome patient with an iliac occlusion from 2.3 (none) to 14.3 and 13.3 with a class 1 and 2 stockings, respectively.

Results of stocking performance tests that measure acute volume changes in vivo in response to provocation maneuvers may explain why the legs of some patients improve with a stocking and why other legs may not benefit to the same extent. The hemodynamic performance of stockings could be quantified in vivo, and as such, the overall results show that patients with postthrombotic syndrome gained the least benefit from using stockings, but others showed significant hemodynamic improvements. For patients with postthrombotic syndrome, stockings should perhaps be prescribed after air plethysmography has been performed to identify which patients will definitively benefit.

Pressure and stiffness: the two sides of the compression coin

Eberhard Rabe, Germany

Compression therapy of the lower limbs is a fundamental component in the management of acute and chronic venous disease and lymphatic diseases. The treatment can be performed using compression bandages, compression stockings, and intermittent pneumatic compression devices. Medical compression stockings are made of elastic textiles. According to the exerted pressure, different compression classes are available. The pressure profile of each compression class responds to the resting pressure in the ankle region. The pressure exerted on the leg should compress the veins and improve the function of the muscle pumps. This can be demonstrated in the supine position; however, in the upright position, even 30 to 40 mm Hg elastic compression stockings may not be able to sufficiently compress the veins.

A second mode of action is the pressure changes during muscle contraction or walking. The ability to withstand the circumference enhancement of the leg during muscle activity or simply after changing from the supine to the upright position depends on the stiffness of the material. Stiffness is defined as pressure increases with an increase in leg circumference. The static stiffness index (SSI) is measured as the in vivo pressure while standing upright minus the pressure in the supine position. A high SSI means that the pressure under the stocking will rise significantly in the upright position and it will be able to improve the venous function better than material with a low SSI. Some indications, such as chronic venous insufficiency with skin changes or venous ulcers, benefit more from a high SSI than other indications, such as symptomatic varicose veins without chronic venous insufficiency.

For these reasons, it is recommended to consider both the compression class and the stiffness of the material used. Stiffness is probably a more relevant parameter of practical interest than compression when prescribing compression stockings. Consequently, for clinical, etiological, anatomical, physiological (CEAP) classes C_{1s} to mild C_{3r} , leg swelling after prolonged standing, thromboprophylaxis, and diabetic edema, an SSI <5 is recommended; for CEAP classes C_3 (severe) to C_{4a} , deep vein thrombosis, and arm lymphedema, a medium stiffness stocking (SSI = 5-7) is recommended; and for CEAP classes C_{4b} to C_6 and lymphedema, a high stiffness stocking (SSI >7) is recommended.

Elastic compression elicited beneficial cardiovascular effects: a complex clinical study in healthy, lymphedematous, and lipedematous individuals

Győző Szolnoky, Hungary

Research on compression therapy is mostly focused on venous and lymph flow; however, the effect of medical compression stockings on cardiovascular responses have been poorly studied, which means that the systemic effect of compression still needs further clarification. Medical stockings with mild compression improve pulse wave velocity, which is the gold-standard measurement of aortic elastic properties. Sports stockings are considered efficient at improving running capacity, but their mode of action remains to be elucidated. Nongraduated stockings exert remarkable venous hemodynamic effects, but their systemic cardiovascular effect has never been measured. Recent studies showed that secondary lymphedema and lipedema patients present with a high aortic stiffness. Sustained compression with elastic material is the

cornerstone of controlling limb volume, despite the fact that its cardiovascular impact has been poorly investigated.

The goal of this research was to determine whether measurable beneficial effects on aortic function could be attributed to knee-high leg sport stockings or nongraduated stockings in healthy individuals or medical compression stockings in patients with lymphedema and lipedema. Aortic elastic properties were determined before and after using compression garments in eligible subjects, and included blood pressure assessment, two-dimensional echocardiography, and pulse wave velocity measurements. The whole study was conducted under static circumstances, except for the group who were performing sports with nongraduated stockings for which dynamic measurements with treadmill exercises were obtained.

According to the working hypothesis, sports and nongraduated knee-high stockings for healthy individuals and stockings for patients with lymphedema and lipedema should positively influence cardiovascular outcomes.

Free paper session on venolymphatic disorders and compression therapy

Jaroslav Strejcek (Czech Republic) gave the keynote seminar titled "Comparison of the hemodynamic effects of different compression systems for the treatment of venous leg ulcers." He presented an historical overview on using external compression for leg ulcers, from the beginning until the latest advancement, in compression therapy. The impact of certain types of compression tools on venous hemodynamics, as measured by calibrated photo plethysmography (D-PPG), was demonstrated.

Christopher Lattimer (UK) presented the study "Performance of compression stockings in venous insufficiency using air plethysmography." The effect of compression therapy was assessed using the venous filling index, incremental thigh-cuff pressure causing the maximal increase in calf volume (IPMIV), outflow fraction, and ejection fraction. The control group was compared with both a group of patients with varicose veins and a group of patients with postthrombotic syndrome. Stockings significantly resisted calf volume increases and enhanced the venous return in controls and patients with varicose veins. They had a positive hemodynamic effect only in selected postthrombotic patients.

Johann Ragg (Germany) presented new eccentric compression tools in his presentation "Cartridge-applied silicone pads for eccentric compression of varicosities after sclerotherapy: saphenous, popliteal, and spider vein application." Results of the study comparing eccentric and concentric compression showed a high satisfaction and a low rate of local complications, but the product is not on the market yet.

Lymphedema problems were covered by **Shashi Gogia** (India) and **Young Ki Shim** (Korea). The first presentation focused on the treatment possibilities from a tropical point of view. Lymphedema treatment can have satisfactory outcomes, but it has to be managed as a chronic disease and patient compliance is the key. **Young Ki Shim** discussed a microsurgery technique using free vascularized normal lymph node transfer, which was based on his experience in 14 cases. This technique can be applied under very specific indications and complete normalization of lymphedema

may not be possible with this technique due to the number of transferred normal lymph nodes that may not sufficiently drain all of the lymphatic fluid from the affected limb.

Chang Shu (China) presented the results of a retrospective analysis of the treatment of congenital vascular malformations using a multidisciplinary approach. He presented his 12-year work on 2926 patients in a single center, where the efficacy and safety of their imaging protocol and therapeutic strategy were evaluated. Management included conservative care, sclerotherapy, embolization, surgical resection, and/or combinations of these therapies. A multidisciplinary approach can result in favorable outcomes with an acceptable complication rate. Another two presentations were dedicated to the same topic. During the discussion, **Byung Boong Lee** (USA) stressed the importance of using the webpages of the International Society for the Study of Vascular Anomalies (www.issva.org), where up-to-date classifications are available.

Compression therapy in venolymphatic disorders

Jean-François Uhl (France) discussed the effect of compression therapy on the anatomy of leg veins and provided several beautiful images to support the discussion. When a 22 mm Hg compression is applied in a standing position, this narrows the deep veins, but not the superficial system—the action of compression on the varicose veins is done mainly by effects on the muscles and deep veins. Compression enhances the intramuscular pressure; therefore, it has a direct effect on the muscular compartments and veins (calf pump). This finding reinforces the idea that compression must be applied mainly at the calf.

Fedor Lurie (USA) presented “Hemodynamic aspects of intermittent pneumatic compression.” Intermittent pneumatic compression affects systemic hemodynamics and increases venous flow velocity and flow rate during compression. Hemodynamic effects depend on the device, the patient’s position, and other factors. The relationship between clinical benefits and the hemodynamic effects of intermittent pneumatic compression remains to be defined.

In the presentation “Application of compression bandages: do types and skills matter?” by **Ji Hye Hwang** (Korea), the differences between stockings and bandages were discussed, and an overview of the science behind compression bandaging for chronic venous edema, ulcers, and lymphedema was introduced.

The role of compressive dressing of the elastic leg stocking and bandage

Soo-Kyung Bok, Korea

Compression therapy has been an effective treatment for the management of venous and lymphatic diseases for “thousands” of years. There are three types of compression therapy: compression bandages, compression stockings, and intermittent pneumatic compression. When pressure is applied to the human body, the liquid is not compressed. When the tissue pressure increases, liquid flows into the blood vessels or other regions. The mechanism of action proposed in compression therapy is to

reduce the ultrafiltration pressure of the capillary by increasing interstitial pressure and improving venous and lymphatic circulation by decreasing the diameter of vessels.

The indications for compression therapy include the following: (i) prevention and therapy of edema; (ii) after active treatment of varicose veins; (iii) lipodermatosclerosis; (iv) maintenance treatment after leg ulcers; (v) after deep vein thrombosis to prevent a postthrombotic syndrome; and (vi) management of lymphedema.

The difference between resting pressure and working pressure was clarified. Resting pressure is the pressure measured under static conditions and it is increased with strong stockings and bandages. Working pressure is the pressure measured during muscle contraction and it promotes muscular pumping. Material with a lower elasticity promotes a larger working pressure. Inelastic bandages maintain their hemodynamic effectiveness over time despite a significant loss of pressure, which is important for the management of leg ulcers.

The indications according to medical compression stocking pressure include:

1. Light compression stockings (<20 mm Hg)
 - a. Improvement in venous symptoms
 - b. Prevention of leg swelling related to prolonged sitting and standing
 - c. Prevention of deep vein thrombosis in bedridden patients
2. Medical compression stockings (30 to 40 mm Hg)
 - a. Improved healing of venous leg ulcers
 - b. Prevention of ulcer recurrence
 - c. Prevention of postthrombotic syndrome after a proximal deep vein thrombosis
 - d. Maintenance therapy in lymphedema

Venous compression plays a major role in reducing the incidence of postthrombotic syndrome, especially in severe cases.

Adjustable Velcro compression devices are more effective than inelastic bandages to reduce venous edema: a randomized, controlled pilot study.

Giovanni Mosti, Italy

The aim of this study was to assess if the treatment phase with readjustable Velcro® devices could be as effective as or more effective than inelastic bandages and easier to handle compared with both bandages and elastic stockings. A total of 40 legs from 36 patients (17 males and 19 females) aged 71.4 ± 10.2 years (range, 52 to 85 years) were included. All of the patients had been affected for more than 3 months with chronic leg edema due to primary and/or secondary chronic venous disease. The patients were randomized into one of two different compression systems—inelastic bandages or Circaid Juxtafit®—and compression was applied for 1 week. The exclusion criteria were patients with skin changes due to venous insufficiency (clinical, etiological, anatomical, physiological classification of C_4 to C_6), clinical signs of lymphedema (positive Stemmer's sign), cardiac and renal failure, conditions requiring diuretics, corticoids, and/or Ca^{2+} antagonists, compression therapy in the last 3 weeks, and an ankle brachial pressure index <0.8.

The treatment with Velcro® devices was performed with inelastic bandages for 1 week, which were changed after 1 day; subsequently the patients were moved to a knee-length stocking adjusted to the reduced leg size. Circaid Juxtafit® was used chronically and patients were allowed to readjust the device depending on their perception of looseness. The patients reported no worsening of symptoms in any case, that application and reapplication was quite easy, that there was an improvement in cosmetic appearance, that it was easier to put on shoes with the adjustable Velcro® devices, and, in some cases, a desire to move from Velcro® devices to elastic stockings after the edema disappeared.

Circaid Juxtafit® is more effective than inelastic bandages for the treatment of edema. The maintenance of pressure over time may be the deciding advantage for a better effect, good tolerability, and an absence of unwanted effects for both devices, but some problems were found with the long-term use of CircAid Juxtafit® after the edema disappeared.

Compression treatment in lymphedema

Attilio Cavezzi, Italy

Lymph transport, not venous capillary reabsorption, is the main process responsible for interstitial fluid balance. Lymphedema is a clinical manifestation of lymphatic system insufficiency and deranged lymph transport. The central disturbance is a low output failure of the lymphatic system, meaning that there is an overall reduction in lymphatic transport. According to the author, lymphatic decongestive therapy consists of a daily inelastic bandage (subbandage pressure >45 mm Hg), exercise and movement, skin care with questionable use of drugs, and pneumatic therapy. The effects of compression therapy in lymphedema include an increase in the interstitial pressure, a reduction in capillary filtration, a shift of fluid into noncompressed parts of the body, an increase in lymphatic reabsorption, stimulation of lymphatic transport, improvement in the vascular-muscle pump, breakdown of fibrosclerotic tissue, and protection of the skin. In compression therapy, bandages achieve a result in the intensive phase and elastic garments (stockings and sleeves) maintain the results in the chronic phase.

The pressure exerted by the bandage decreases over time, which is mainly caused by a reduction in volume in the extremities resulting in an immediate effect (even in healthy legs) that is more pronounced in patients with massive edema. In the lymphedema "maintenance phase," it is important to achieve clinical improvement by using custom-made flat-knitted compression stockings, self-compression elastic bandages, and adjustable Velcro devices and pumps (at home), if possible. The proper pressure of the elastic garments (eg, gloves, sleeves, and stockings) is 30 to 50 mm Hg. Optimal lower limb compression is about 40 mm Hg and optimal upper limb compression around 20 to 30 mg Hg. The limits and side effects of compression treatment in lymphedema include low patient compliance, abnormally shaped limbs, and the necessity to redo the nonadhesive bandage on a daily basis. Contraindications include local infections, arterial diseases, and side effects or complications, such as pain, tissue ischemia, allergy, paresthesia, and skin lesions.

Multilayer, multicomponent, inelastic, and low-stretch bandages that provide high pressure in the lower limbs and lower pressure in the upper limbs during the therapy phase may be more effective and tolerable than adjustable Velcro devices. Custom-made elastic stockings, self-applied elastic bandages, and adjustable Velcro devices are indicated in the maintenance phase.

Compression after invasive treatment of varicose veins

Thomas Noppeney, Germany

A previous publication by Melrose et al highlighted the importance of compression therapy after stripping surgery for varicose veins.¹ This was a randomized trial comparing patients with or without compression treatment in the postoperative period. Compression therapy was shown to result in a significant reduction in postoperative pain, length of hospital stay, and an improvement in wound healing. A French study, published by Rastel et al, reported results from a survey questionnaire sent to 675 surgeons regarding their practice of using compression therapy after surgery.² Results were as follows: (i) a 41.5% return rate; (ii) 97.1% used compression after varicose vein surgery; (iii) 38.8% used compression bandages <8 days and 24.5% used compression bandages for 8 to 15 days; (iv) 12.7% and 84.6% used compression stockings after the compression bandages for an additional 8 to 15 days or 15 to 30 days, respectively; (v) and the total time for compression was 2 to 6 weeks.

Huang et al recently published a meta-analysis on four randomized controlled trials from 1999 to 2009 involving 686 patients. The study evaluated different durations of compression therapy after varicose vein surgery and their outcomes on postsurgery pain and leg volume and the complications of short-term compression (3 to 10 days) vs long-term compression (3 to 6 weeks).³ The results indicated that there were no benefits of long-term compression therapy after varicose vein surgery regarding postoperative pain, leg volume, incidence of complications, and duration of absenteeism from work.

Compression therapy is able to reduce postoperative hematomas (Grade 1B), pain (Grade 1B), and leg volume (Grade 1B), but the ideal length and pressure of compression is unclear.

References

1. Melrose DG, Knight MT, Simandl E. The stripping of varicose veins: a clinical trial of intermittent compression dressings. *Br J Surg.* 1979;66:53-55.
2. Rastel D, Perrin M, Guidicelli H. Compressive therapy after varicose vein surgery: results of a French national inquiry [in French]. *J Mal Vasc.* 2004;29:27-34.
3. Huang TW, Chen SL, Bai CH, Wu CH, Tam KW. The optimal duration of compression therapy following varicose vein surgery: a meta-analysis of randomized controlled trials. *Eur J Vasc Endovasc Surg.* 2013;45:397-402.

Surgical treatment of primary chronic venous disease

World's first interventional technique to restore venous valve function

Johann C. Ragg, Germany

Building on the data obtained from more than 1000 venous punctures after ultrasound-guided tumescent anesthesia in the great saphenous junction, Johann Ragg proposed injecting a hyaluronic gel, which is used by dermatologists as a filler for the saphenous proximal fascia junction, to provide effective compression that reduces the caliber and the reflux. A special needle was developed to avoid intraluminal injections. In a pilot study, 23 patients with proximal incompetence of the great saphenous vein (diameter, 7.0 to 11.5 mm; mean, 8.6 mm) were selected to receive a diameter reduction by circumferential injection of a 2% solution of hyaluronic gel (crosslink degree, 2%). The injections were performed with a safety system consisting of a relocatable sharp cannula and a flexible blunt outer metal catheter using continuous ultrasound monitoring until there was an absence of reflux. The follow-up was performed by ultrasound after 12, 26, and 52 weeks. An orthograde flow could be established in 15 of 22 cases after 52 weeks (68.2%). In conclusion, valvuloplasty by ultrasound-monitored hyaluronic gel injection is feasible, safe, and effective, and clinical applications with low rates of supplementary injections seem to be achievable.

Isolated phlebectomy leads to the disappearance of great saphenous vein reflux. Experience with ASVAL principles in Russia

Igor Zolotokhin, Russia

The ascending theory of developing primary varicose veins claims that pathological processes start in the tributaries and then reflux develops in the saphenous trunk. The ambulatory selective varices ablation under local anesthesia (ASVAL) method consists of isolated phlebectomies without any intervention on an incompetent saphenous trunk. A study was conducted to estimate the impact an isolated phlebectomy may have on the great saphenous vein diameter and reflux. A total of 51 limbs from 43 patients (35 women and 8 men) with great saphenous vein incompetence and varicosities underwent operations. A total of 82%, 4%, and 4% of the patients in this study had a clinical, etiological, anatomical, physiological classification of $C_{2'}$, $C_{3'}$, and $C_{4'}$, respectively. The C_5 and C_6 patients, where the great saphenous vein diameter was >15 mm and the reflux was below the upper one-third of the calf, were excluded from the study. The follow-up occurred at 7 days and at 1, 3, 6, and 12 months postsurgery. Disappearance of the reflux was observed in 61% of the patients 1-year posttreatment and a great saphenous vein thrombosis was observed in 5.6% of the patients. In conclusion, the ASVAL method could be applied safely, but there is a need to establish the patients that could be selected for this technique.

Endovenous treatment of primary chronic venous disease: cyanoacrylate adhesive

Use of cyanoacrylate adhesive for treatment of an incompetent great saphenous vein: 12-month results of the VeClose trial

Nick Morrison, USA

Endovenous laser ablation has been used successfully to treat incompetent saphenous veins. One disadvantage is the need for tumescent anesthesia, which involves multiple punctures along the length of the target vein. In the present study, the use of cyanoacrylate adhesive was tested for its ability to occlude the saphenous vein. Ideal venous adhesives should have a high viscosity, prevent embolization, provide adequate contact with the intimal surface, undergo rapid polymerization, remain soft and imperceptible after implantation, prevent recanalization, and require a low dose. A total of 222 patients with symptomatic great saphenous vein reflux were divided into two groups—cyanoacrylate adhesive (108 patients) and radiofrequency ablation (114 patients). The follow-up was performed at 3 days, and at 1, 3, 6, and 12 months postprocedure using duplex ultrasound. Complete vein occlusion was observed after 12 months in 96.8% of the patients administered radiofrequency ablation and in 96.8% of the patients administered cyanoacrylate adhesive. A significantly lower rate of ecchymosis was observed in the cyanoacrylate adhesive group. In conclusion, there is a noninferiority for closure rates using cyanoacrylate adhesive when compared with radiofrequency ablation at 12 months, making cyanoacrylate adhesive a safe and effective method for treating incompetent saphenous veins.

Endovenous treatment of primary chronic venous disease: sclerotherapy

Detergent sclerosants are consumed and deactivated by circulating blood cells and proteins

David Connor, Australia

Initially, a study was presented showing that deep vein thrombosis and systemic side effects are quite low, even if sclerosants enter in the deep veins. Then, a study from David Connor's center investigating the deactivating effects of circulating blood cells and lymphatic fluid on the lytic activity of detergent sclerosants was discussed. Samples of whole blood, platelet-rich plasma, and isolated leukocytes were incubated with various concentrations of sodium tetradecyl sulphate or polidocanol, and after, they were added to human umbilical vein endothelial cells, which were then counted using a fluorescent plate reader. Full blood counting was performed using a hematology analyzer. Platelet lysis and microparticle formation was assessed using lactadherin binding in flow cytometry.

Detergent sclerosant activity was decreased in whole blood when compared with plasma and saline controls. There was a 23- and 59-fold increase in sclerosant lytic activity on endothelial cells for sodium tetradecyl sulphate and polidocanol, respectively, in saline compared with whole blood. At high concentrations, sclerosants lysed erythrocytes, leukocytes, and platelets. Platelets were more sensitive to the lytic activity of sclerosants than other cell types, but neutrophils were the most susceptible. The presence of erythrocytes and leukocytes decreased the lytic activity of sclerosants. Sclerosants, at all concentrations, induced erythrocyte-derived microparticle formation.

In conclusion, detergent sclerosants are consumed and deactivated by circulating blood cells. This deactivating effect is beyond the neutralizing effects of plasma proteins and contributes to the overall neutralizing effect of blood. Different types of blood cells exhibit varying levels of vulnerability to the lytic activity of sclerosants, with platelets being the most vulnerable and erythrocytes the least vulnerable (platelets > leukocytes > erythrocytes).

Complications of foam sclerotherapy: is it safe?

Kurosh Parsi, Australia

Foam sclerotherapy may result in drug- and/or gas-related complications of a generalized or localized nature. Anaphylaxis and anaphylactoid reactions are serious complications following foam sclerotherapy and may even result in life-threatening anaphylaxis. Anaphylaxis is usually an IgE-mediated type I hypersensitivity reaction occurring after reexposure to an antigen, but it can also occur through type II and III hypersensitivity reactions. Anaphylaxis is an immune-mediated, dose-independent reaction, whereas anaphylactoid reactions are nonimmune-mediated, dose-dependent reactions that result from direct activation of mast cells and complement.

In anaphylaxis, symptoms can be continuous for 5 to 32 hours or they can be biphasic in 20% of patients (symptoms return after resolution of the initial presentation, usually within 1 to 8 hours). Manifestations can be cutaneous (flushing, pruritus, urticaria, angioedema), respiratory (laryngeal edema, dyspnea, wheezing, respiratory arrest), gastrointestinal (nausea, vomiting, abdominal cramping, diarrhea), cardiovascular (tachycardia, hypotension, cardiac arrhythmias, cardiovascular collapse), renal (acute tubular necrosis), and hematological (diffuse intravascular coagulation). Differential diagnosis should be performed with the most common manifestations, such as vasovagal reaction, acute anxiety, hypoglycemia, asthma, and transient ischemic attacks/stroke. Determining the serum tryptase levels in mast cells should be performed 1 to 4 hours after the onset of anaphylaxis to confirm the diagnosis. Additionally, skin testing should be done 4 to 6 weeks after the reaction to confirm the agent because other substances, such as latex, local anesthetic agents, or antiseptic can be involved in the reaction. The initial treatment is an intramuscular injection of 0.5 mg adrenaline (1 mg/mL), which can be repeated every 5 minutes as clinically needed, ventilator support, and IV fluids as needed.

Another possible local complication of foam sclerotherapy is the venoarteriolar reflex (VAR) vasospasm, which can result in skin stellate necrosis. In a VAR vasospasm, a vein is rapidly dilated, resulting in a reflex vasospasm of the associated arteries and arterioles. Vasoconstriction occurs due to an increase in transmural pressure and distension of the veins. VAR vasospasms have three immediate stages: white, red, and blue (where the pathophysiology is similar to the Raynaud phenomenon). It is more likely to occur after rapid injections or if a lumen or dead space within a previously treated vein is being injected. Treatment may include: (i) topical vasodilators, such as topical nitrates; (ii) antiplatelet agents or nonsteroidal anti-inflammatory drugs; (iii) systemic anticoagulants; and (iv) systemic steroids.

Intra-arterial injection is a rare, but potentially destructive, complication of foam sclerotherapy that is less likely to occur when the procedure is performed under

ultrasound guidance. The danger areas include the small saphenous artery adjacent to the small saphenous vein, the septocutaneous arteries in the medial thigh and knees, recent case of superficial varicosities that are collateral for an occluded popliteal artery, and true arteriovenous malformations (rare). An immediate intramuscular or intravascular injection of hydrocortisone 100 mg or a subcutaneous injection of enoxaparin 1.5 mg/kg is necessary.

Further information can be found in the following publication: Cavezzi A, Parsi K. Complications of foam sclerotherapy. *Phlebology*. 2012;27(1 suppl):46-51.

New data supporting safety of foam sclerotherapy

Lorenzo Tessari, Italy

Considering that sclerosing agents are blood inactivated, the interaction between sclerosing agents and blood was investigated to identify blood ligands. First, an electrophoretic assessment of plasma proteins was done to identify the proteins involved in binding sclerosing agents. Blood samples (n=31) were collected from patients with chronic venous disease and tested by capillary and agarose gel electrophoresis. The electrophoretic runs were performed with the addition of polidocanol or sodium tetradecyl sulphate. A second investigation was then performed to identify the binding strength between the plasma proteins and sodium tetradecyl sulphate after sclerotherapy. Free sodium tetradecyl sulphate and total protein-bound sodium tetradecyl sulphate were measured. Patients undergoing saphenous vein sclerotherapy (n=6) were divided into two groups. In group A (4 patients), a blood sample was obtained from the brachial vein before injecting a 3% sodium tetradecyl sulphate solution into the great saphenous vein (TO). Blood samples were obtained at 1, 3, 5, and 10 minutes postinjection. In group B (2 patients), the procedure was performed with the same method, but on the ipsilateral femoral vein.

Polidocanol mainly binds to β -globulins, while sodium tetradecyl sulphate binds to albumin and α -globulins. In the brachial vein, the average protein-bound sodium tetradecyl sulphate concentrations were 0, 0.568, 5.98, 6.91, and 7.2 $\mu\text{g/mL}$ at TO, 1, 3, 5, and 10 minutes, respectively, and the free sodium tetradecyl sulphate concentration was 0 $\mu\text{g/mL}$. In the femoral vein, the average protein-bound sodium tetradecyl sulphate concentrations were 0, 1.62, 13, 24.6, and 8.67 $\mu\text{g/mL}$ at TO, 1, 3, 5, and 10 minutes, respectively, and the free sodium tetradecyl sulphate concentration was 0 $\mu\text{g/mL}$.

The origin of the sclerotherapy complications could not be linked only to the direct drug effect along the systemic circulation. High productions of endothelin-1, histamine, and serotonin after foam sclerotherapy could be responsible, at least in part, for the neurovascular, respiratory, and visual disturbance complications.

Balloon control of the saphenofemoral junction during foam sclerotherapy

Nick Morrison, USA

The following questions were addressed during the talk: (i) what happens to foam when it is injected into a leg vein?; (ii) is it necessary to occlude the saphenofemoral

and saphenopopliteal junctions during foam sclerotherapy of calf tributaries?; and (iii) are we trying to prevent active sclerosant, foam, or vasoactive compound dispersal with an occlusive balloon?

Some have advocated balloon occlusion of the saphenofemoral junction during foam sclerotherapy to prevent foam from entering the deep vein system. The idea that such a maneuver might be successful is simply not justifiable in the author's point-of-view. In fact, his group performed intraoperative duplex examination of the deep vein system, simultaneous transthoracic echocardiography, and transcranial Doppler monitoring during injection, demonstrating that foam progresses not only into the deep vein system, but into the central circulation and indeed into the cerebral circulation in some patients with right-to-left shunts (estimated to be >25% of the normal population).

Further, occlusion of the proximal saphenous vein, rather than preventing progression of foam into the deep vein system, actually encourages flow into the deep vein system, because it is prevented from gradually progressing through the saphenofemoral junction and is forced into perforator veins. Additionally, after releasing the balloon, there will be an immediate bolus of foam entering the deep vein system, which progresses to the heart. It is more likely that a bolus of foam will be degraded less quickly than smaller amounts, and it will more likely progress through a right-to-left shunt, such as a patent foramen ovale, than smaller amounts that will gradually migrate to the heart following foam injection of a nonoccluded great saphenous vein. It is precisely for this reason that an occlusion balloon-tipped catheter is rarely used. Finally, using simultaneous transthoracic echocardiography and/or transcranial Doppler monitoring of the middle cerebral artery during ultrasound-guided foam sclerotherapy, it has been shown that using any of the suggested methods to prevent migration of some foam bubbles from the injected superficial vein into the deep vein system and beyond (eg, leg elevation, small volume of foam, postinjection rest) is simply ineffective. Complications, such as deep vein thrombosis and systemic symptoms, will continue to occur at a certain rate, even if the values are low. Meanwhile, there are still insufficient data to determine the role of differing methods of foam production, different gases, volume restriction, type of veins being treated, and possible measures to eventually avoid complications.

Prevention of visual and neurologic disturbances after sclerotherapy

Alessandro Frullini, Italy

Neurological disturbances occur at an average rate of 1.4% (0% to 14%).¹ A possible cause of sclerotherapy complications may be due to the release of vasoactive molecules from the damaged endothelium, such as endothelin-1.² Endothelin-1 is associated with retinal vasospasms, migraines, and cerebral ischemia. Neurological complications may be more frequent with foam sclerotherapy due to a longer and more efficient induction of endothelium injury.³ Consequently, the anti-endothelin-1 action of aminaftone in an animal model was investigated. Three groups of rats were treated with polidocanol sclerotherapy alone (group 1) or with 30 mg/kg/day and 150 mg/kg/day of aminaftone 15 days before sclerotherapy with polidocanol (group 2 and group 3, respectively). Rats showed an early mortality rate of 40%, 13.3%, and 20% in group 1, group 2, and group 3, respectively. After pretreatment

with aminafnone, the cellular release of endothelin-1 was significantly lower after 6 ($P<0.01$) and 12 hours ($P<0.05$) compared with controls. As a result of this experimental study, the PROCOMET study (PREvention of neurOlogiCal and visual disturbances after sclerOtherapy with aMinaphtonE prophylacTic measures), to evaluate the potential influence of aminafnone on reducing neurological disturbances after sclerotherapy of telangiectasias in humans, was started. The preliminary results confirm that aminafnone may reduce neurological disturbances and support further inclusion of patients.

References

1. Jia X, Mowatt G, Burr JM, Cassar K, Cook J, Fraser C. Systematic review of foam sclerotherapy for varicose veins. *Br J Surg*. 2007;94:925-936.
2. Frullini A, Felice F, Burchielli S, Di Stefano R. High production of endothelin after foam sclerotherapy: a new pathogenetic hypothesis for neurological and visual disturbances after sclerotherapy. *Phlebology*. 2011;26:203-208.
3. Frullini A, Barsotti MC, Santoni T, Duranti E, Burchielli S, Di Stefano R. Significant endothelin release in patients treated with foam sclerotherapy. *Dermatol Surg*. 2012;38:741-747.

Endovenous treatment of primary chronic venous disease: thermal ablation

Endovenous thermal ablation technique

Today, endovenous laser ablation and radiofrequency ablation are the standard treatments for varicose veins. In many countries, surgical methods have been completely replaced by these techniques; however, many controversies on their clinical effects remain. Published studies have reported very different technical (ie, occlusion rates) and clinical (eg, frequency of varicose vein recurrence) results. The possible reasons for this discrepancy could be related to using slightly different methodologies and/or to the skill level of the operator. The goal of this symposium was to learn some tips and tricks from colleagues who have extensive experience in this field.

Imre Bihary (Hungary) presented a technique that was introduced and developed by a group of colleagues from Hungary, Slovakia, Serbia, and the Czech Republic. Their endovascular method involves placing the laser tip no further than 0.5 cm from the femoral vein, using a high linear endovenous energy density (LEED) of 100 J/cm, thoroughly compressing the saphenofemoral junction with a cooled anesthesia (40°C), and treating insufficient perforators at the same time. With this method, the reported recurrence rate was 2.3% over 5 years.

Uldis Maurins (Latvia), a well-known supporter of endovenous laser ablation, recommended conducting ablation procedures with a 1470 nm laser and a 10W power LEED (=vein diameter x 7 for a radial two-ring fiber), placing the tip as close to the saphenofemoral junction as possible, and performing cooled tumescent anesthesia. He does not use compression after the procedure and advises waiting 3 months before treating tributaries of the ablated trunk because they may almost disappear. A 96% occlusion rate has been reported at 1 year.

Kürşat Bozkurt (Turkey) discussed the good results that can be achieved by both laser ablation and radiofrequency ablation and a possible role for a new method of glue ablation that has generated promising early results which look quite promising. **Juan Antonio Orrego** (Chile) discussed how to obtain excellent results with ablation techniques and stated that precise mapping with duplex ultrasound before thermal ablation and a good awareness of the different variants of the superficial venous network are necessary.

The patient's opinion of outcomes 1 year after endovenous laser ablation of the great saphenous vein or small saphenous vein

Anders Lundell, Sweden

In this study, the patients' opinion on the outcomes after undergoing endovenous laser ablation at the Venous Centre in Malmö, Sweden were registered anonymously and separately on a touch screen by the patient using a web-based program. From January 1, 2013 through December 31, 2013, 1086 patients were treated with endovenous laser ablation, and in most cases, simultaneous phlebectomies were made under light sedation and tumescent anesthesia. The follow-up appointment was attended by 87% of the treated patients (749 women and 337 men). A total of 42.7% of patients were classified as C₂ according to the clinical, etiological, anatomical, pathological classification, 8.9% were C₃, 34% were C₄, 3.5% were C₅, and 3% were C₆. At 1-year posttreatment, 92% of patients described a significant reduction in their symptoms, 7.5% felt the same, and 5% felt worse. The discrepancy between ultrasound data and patient survey data could indicate that patients' expectations regarding the treatment result were not met in 8% of patients 1 year after the endovenous laser ablation, which highlights the need to perform a thorough preoperative examination and gather the patient's information.

Cryolaser and cryosclerotherapy (CLaCS) guided by augmented reality to treat telangiectasias, feeder veins, and small varicosities: a 10-year experience

Kasuo Miyake, Brazil

A new technique to treat the combination of telangiectasia and the associated causative reticular veins ("feeder veins") of the leg (CLaCS - Cryo Laser Cryo Sclerotherapy) was presented. The CLaCS technique employs the following features: (i) augmented reality viewing of the feeder veins; (ii) application of transdermal laser energy to the feeder veins and overlying telangiectasias; (iii) injection of the feeder veins and surface telangiectasias with a sclerosant; and (iv) skin temperature protection and numbing of the skin with application of cold-air flow throughout the procedure. Photodocumentation was performed before and after the procedure in all patients.

A 1064 nm Nd:YAG transdermal laser was set to a 6 mm spot size, an average fluency of 70 J/cm², and a 15 ms pulse width. The laser was then directed at the feeder veins, which were identified through augmented reality (VeinViewer), and the overlying and nearby telangiectatic vessels. Feeder-vein sclerotherapy was then performed, with telangiectatic vessels being injected with a sclerosing solution containing 75% dextrose.

This method does not result in anaphylaxis or skin ulcers due to the high viscosity of the dextrose solution. During the 10 years of using this procedure, hyperpigmentation was as low as 0.48% due to the synergy between the thermal lesion and the osmotic lesion, and burning was rare (0.24%) due to the low-energy fluency. The laser damages the endothelium and causes edema and internal diameter reduction. The edema generates a trapping effect for the dextrose solution, which leads to a longer contact time between the sclerosant and the vein; thereby, resulting in an increase in the effectiveness of sclerotherapy and a reduction in the rates of pigmentation. There was a 75% average clearance after two sessions.

There is a synergy between the CLaCS technique and augmented reality because the dextrose effect is increased by the laser thermal damage. This synergistic effect leads to less clot formation and less hyperpigmentation. Thus, the CLaCS technique for treating telangiectasias of the legs appears to be superior to both sclerotherapy and laser ablation. Visualization and treatment of feeder veins are important for producing optimal resolution and preventing recurrences.

Effect of topical lidocaine and prilocaine cream on pain scores for endovenous laser ablation (EVLA) as an outpatient procedure

Ranjish Vijayan, India

An innovative anesthetic technique in patients undergoing endovenous laser ablation under tumescent anesthesia was presented. The effect of topical Toplap® cream (eutectic mixture of 2.5% lidocaine and 2.5% prilocaine) was tested using pain scores. A total of 100 consecutive varicose vein patients requiring laser ablation for truncal veins were included in the study. Topical Toplap® cream was applied 60 to 90 minutes prior to the procedure over the whole length of the vein to be ablated and over the superficial varicosities planned for hook phlebectomy. Endovenous laser ablation and hook phlebectomy were performed under tumescent anesthesia. A total of 78% of the patients underwent both hook phlebectomy and endovenous laser ablation. The pain score was analyzed using the visual analogue scale immediately postprocedure, with an average pain score of 2.72. During a postprocedural questionnaire, all patients indicated that they would opt for endovenous laser ablation under the same type of anesthesia if they needed the procedure for the other limb. The use of a topical anesthetic cream during endovenous laser ablation under tumescent anesthesia appears to reduce the pain score and improve patient's acceptance of the procedure.

Steps to avoid nerve damage during endovenous laser ablation for the small saphenous vein

Jean-Luc Gerard, France

Detailed anatomic data on avoiding nerve damage during endovenous laser ablation for the small saphenous vein were presented. In fifteen studies on the treatment of small saphenous vein reflux using endovenous laser ablation, paresthesia rates between 1.6% and 11% (mean, 4%) were observed, which were exclusively related to lesions in the sensory fiber, but were not related to lesions in the nerve motor. Mapping the nerves along the path of the small saphenous vein is very important to avoid nerve damage, and it is also highly recommended to mark the saphenous-

popliteal junction using duplex scanning prior to surgery. It is recommended to use only local tumescent anesthesia with or without light sedation, as the patient should be conscious, but never general anesthesia or spinal anesthesia. Finally, the lower one-third of the leg should be avoided.

III. Secondary chronic venous disease

Plenary lecture: Contemporary management of acute and chronic iliofemoral venous obstruction

Anthony Comerota, USA

Since acute deep vein thrombosis is the leading cause of severe chronic venous disease and postthrombotic syndrome, the 2008 guidelines by the American College of Chest Physicians (ACCP) recommend a strategy for thrombus removal, correction of the underlying lesion, compression and ambulation with extension of the duration of anticoagulation to prevent recurrence. Thrombus removal can be achieved by operative thrombectomy or catheter-directed thrombolysis. A randomized controlled trial conducted in Sweden by Plate et al, with a 5- and 10-year follow-up, compared standard anticoagulation with thrombectomy.^{1,2} They reported an improvement in patency, a reduction in ambulatory venous pressures and leg swelling, and fewer patients with postthrombotic syndrome ($P<0.05$) in the thrombectomy group. By combining 10 series, involving 605 patients who had a thrombectomy and a mean follow-up of 41 months, the reported iliac vein patency was 76%. Based on the available data, the 2008 ACCP guidelines recommended "in patients with extensive deep vein thrombosis, operative venous thrombectomy may be used to reduce acute symptoms and postthrombotic morbidity (Grade 2B)." In addition, "following thrombectomy we recommend the same intensity of anticoagulant therapy as those who did not undergo venous thrombectomy (Grade 1C)."

Subsequently, in the CaVenT study (Catheter-directed Venous thrombolysis in acute iliofemoral vein Thrombosis) performed in Norway by Enden et al, 209 patients were randomly assigned to conventional anticoagulation or catheter-directed thrombolysis followed by anticoagulation.³ At completion of the 24-month follow-up, 37 patients (41.1%; 95% CI, 31.5-51.4) allocated to additional catheter-directed thrombolysis presented with postthrombotic syndrome compared with 55 patients in the control group (55.6%; 95% CI, 45.7-65.0; $P=0.047$). The difference in postthrombotic syndrome corresponded to an absolute risk reduction of 14.4% (95% CI, 0.2-27.9) and the number needed to treat was 7 (95% CI, 4-502).⁴ Iliofermal patency after 6 months was reported in 58 patients (65.9%; 95% CI, 55.5-75.0) with catheter-directed thrombolysis vs 45 (47.4%; 95% CI, 37.6-57.3) with the control treatment ($P=0.012$).⁴ There were 20 bleeding complications related to catheter-directed thrombolysis (3 were major and 5 were clinically relevant).

At least 50% of the patients in the CaVenT study did not have thrombosis in the iliofemoral segment and no pharmacomechanical techniques were used. In patients with true iliofemoral deep vein thrombosis, who applied contemporary pharmacomechanical techniques, there will be substantially more benefit vs anticoagulation alone, and the number needed to treat to prevent severe postthrombotic syndrome should be no more than 2 or 3. Following acute deep vein thrombosis, wearing compression stockings (30 to 40 mm Hg at the ankle) for 2 years reduces postthrombotic syndrome by 50%, which has a Grade A recommendation in the 2008 ACCP guidelines.

Once patients develop chronic postthrombotic iliofemoral venous obstruction, plasminogen activators are no longer effective since the tissue causing luminal

obstruction is no longer the thrombus, but collagen type I and III. Such patients improve significantly, if unobstructed venous drainage from the profunda femoris vein to the iliofemoral vein can be restored. Operative endovenectomy of the common femoral vein with endoluminal recanalization of the ilio caval segment is a procedure designed to restore proximal venous drainage and reduce the severity of the postthrombotic syndrome.

References:

1. Plate G, Akesson H, Einarsson E, Ohlin P, Eklöf B. Long-term results of venous thrombectomy combined with a temporary arterio-venous fistula. *Eur J Vasc Surg.* 1990;4(5):483-489.
2. Plate G, Eklöf B, Norgren L, Ohlin P, Dahlström JA. Venous thrombectomy for iliofemoral vein thrombosis--10-year results of a prospective randomised study. *Eur J Vasc Endovasc Surg.* 1997;14(5):367-374.
3. Enden T, Sandvik L, Kløw NE, et al. Catheter-directed Venous Thrombolysis in acute iliofemoral vein thrombosis--the CaVenT study: rationale and design of a multicenter, randomized, controlled, clinical trial (NCT00251771). *Am Heart J.* 2007;154(5):808-814.
4. Enden T, Haig Y, Kløw NE, et al; CaVenT Study Group. Long-term outcome after additional catheter-directed thrombolysis versus standard treatment for acute iliofemoral deep vein thrombosis (the CaVenT study): a randomised controlled trial. *Lancet.* 2012;379(9810):31-38.

Venous thromboembolism

The prevalence of venous thromboembolism in patients with malignant tumors is considered much higher than in other patients, which was confirmed in the data from the French national database and presented by **François-André Allaert** (France). Venous thromboembolisms occurring in patients hospitalized for cancer was 4.95% vs 1.09% in patients with no malignancy, emphasizing the need for quality and effective prevention of venous thromboembolism in this patient population.

The risks of distal deep vein thrombosis and the desirability of its treatment are now being debated. **Kazuhiko Hanzawa** (Japan) discussed the role of distal deep vein thrombosis as a possible source of pulmonary embolism in residents in earthquake-prone areas. A total of 21 isolated deep vein thromboses of the calf were identified in 67 residents who had slept in their small cars every day after the earthquake in the Niigata prefecture. More than 1400 people were examined 8 years after the earthquake and pulmonary embolism developed in 2.7% of the people affected by distal deep vein thrombosis vs 0.09% in those without. Surprisingly, multivariate analysis confirmed that distal deep vein thrombosis was a risk factor for other vascular events, such as ischemic stroke and ischemic heart disease, long after the earthquake.

Fausto Passariello (Italy) presented a novel score to assess thrombus extension after thermal ablation of the great saphenous vein. His classification, called X-PASTE (postablation superficial thrombus extension), is wider than the EHIT score (endovenous heat-induced thrombosis) that is usually used in practice and research. In addition, the

X-PASTE score is able to include postablation thrombosis and spontaneous superficial vein thrombosis.

Three presentations were devoted to the review of the efficacy of retrievable inferior vena cava filters in preventing pulmonary embolism and the assessment of the complication rate and success of their retrieval. **Jinisha Pankaj Bhanushali** (India) reported a successful 73% retrieval of the inferior vena cava filters and **Yu Jae Seung** (Korea) reported a 68% retrieval rate, whereas **Mari Chiyoya** (Japan) reported only a 15.9% to 26.3% retrieval rate. These data demonstrate the controversial role of inferior vena cava filters, plus their ability to prevent pulmonary embolisms is not well evidenced. While many are theoretically retrievable, they often become practically permanent, which increases the possible risk of complications and venous thromboembolism recurrence.

Benchet's disease, a rare multisystem vasculitis, is characterized by skin-mucosa lesions, multiorgan damage, and major vessel involvement; however, data on venous disease in these patients are lacking. **Hasan Tuzun** (Turkey) presented data on venous claudication in Benchet's disease. A total of 101 patients with Benchet's disease were examined and 61 patients had a history of venous thrombosis of the lower limbs, which developed a median of 3.6 years after the onset of Benchet's disease and affected both limbs in 66% of patients and recurred in 38% of cases at 5 years. Using the treadmill, venous claudication was found in 34% of patients, while in 10% of cases, there was a limited walking capacity.

Mark Meissner (USA) focused on early thrombus removal to avoid the development of postthrombotic syndrome (from 20% to 50%). Evidence for the strategies to prevent postthrombotic syndrome were obtained from natural history records, observational studies, and clinical trials (eg, CaVenT study [Catheter-directed Venous thrombolysis in acute iliofemoral vein Thrombosis], ATTRACT trial [Acute venous Thrombosis: Thrombus Removal with Adjunctive Catheter-directed Thrombolysis], etc). According to all of these sources, thrombus removal (rapid recanalization) potentially prevents reflux and relieves obstruction. Patients with a short duration of symptoms of the first episode of iliofemoral deep vein thrombosis are the most likely to benefit.

Jang Yong Kim (Korea) presented different types and devices for catheter-directed thrombolysis of acute deep vein thrombosis and promoted catheter-directed thrombolysis as a first-line therapy. In some cases, pharmacomechanical thrombectomy could be considered over catheter-directed thrombolysis alone. Pharmacomechanical thrombectomy is a short-duration procedure that has a low consumption of the thrombolytic agent and it is potentially safer than catheter-directed thrombolysis. More pharmacomechanical thrombectomies will be available for extended treatment indications in the near future.

Neil Khilnani (USA) provided an overview on the management of occlusions of the chronic iliac vein and inferior vena cava. Stenting has become the procedure of choice with percutaneous access, good clinical improvement, and good patency rates, but the technique is not standardized (stent choices, patient selection) and reintervention rates are still high (25% overall). Procedural success is higher with stenotic vs occluded veins.

Symposium on venous thromboembolism

Antony Comerota (USA) opened the symposium with a presentation on iliofemoral deep vein thrombosis during pregnancy, which is a problem of great importance as there are no high-grade guidelines on this aspect and pulmonary embolism remains one of the most frequent causes of maternal mortality in many countries. The approach to treating pregnant women with deep vein thrombosis should be the same as for other patients. Therefore, catheter-directed thrombolysis was suggested as a safe option for both the woman and the fetus. If ineffective, open thrombectomy may be an alternative. Incredible results were obtained with catheter-directed thrombolysis in 15 women, leading to 14 successful deliveries and no cases of postthrombotic syndrome in 10 women.

Current trends in the management of deep vein thrombosis in Japan were discussed by **Toshiyuki Miyata** (Japan). He stressed the growing incidence of venous thromboembolism in Asia, which has been confirmed in several recent studies, and it is due to stated that both the changing lifestyle of Asians and the increasing awareness of the problem by specialists and patients. In Japan, very aggressive strategies are used in the acute phase of the disease; 20% of patients underwent thrombolysis and inferior vena cava filters were implanted in 40% of patients. In the past, the most commonly used anticoagulant for extended therapy was warfarin. The targeted international normalized ratio (1.5 to 2.5 in Japan), is successfully maintained in about 90% of patients. Nevertheless, the recurrence rate is 4.0% per patient-year and that seems too high.

The final presentation by **Fedor Lurie** (USA) on the changing paradigm of deep vein thrombosis management discussed future changes in diagnostic strategy, initial treatment, and its duration. There are some data confirming poor adherence to evidence-based venous thromboembolism guidelines in real-world practice. Many people with suspected deep vein thrombosis underwent duplex ultrasound, which provides a false positive in 5.8% of cases. Thus, many patients without deep vein thrombosis receive potentially harmful treatments. Using a clinical score, such as the Wells score system, and measuring the levels of D-dimer are recommended by current guidelines, which might make duplex investigation unnecessary for patients with a low clinical probability of deep vein thrombosis. The main goal of the initial treatment is not to prevent pulmonary embolisms because at least two-thirds are not fatal, but to prevent mortality because 65% of patients with a pulmonary embolism die within 1 hour and 80% within 2.5 hours. Thus, anticoagulation has to be administered as soon as deep vein thrombosis is confirmed. Duration of treatment is also very important because the majority of patients die from recurrent venous thromboembolism.

The postthrombotic syndrome: factors associated with the development of postthrombotic syndrome in patients with deep vein thrombosis

Takashi Yamaki, Japan

The initial treatment of deep vein thrombosis includes preventing thrombus propagation and pulmonary embolism development. Meanwhile, the relevance of preventing the development of a postthrombotic syndrome and the late complications of deep vein thrombosis was emphasized. Postthrombotic syndrome has been reported in 20% to

40% of patients who have deep vein thrombosis, with severe cases in 5% to 10% of the patients. Recent studies have identified ipsilateral recurrent deep vein thrombosis as a risk factor for postthrombotic syndrome. However, most patients with no apparent history of recurrent deep vein thrombosis may also develop severe symptoms of postthrombotic syndrome over time. For this reason, it is difficult to reliably predict which patients are likely to develop postthrombotic syndrome in the acute phase of deep vein thrombosis.

While objective evidence of venous incompetence by duplex ultrasound helps to confirm the diagnosis, postthrombotic syndrome should not be diagnosed if clinical symptoms are absent. At this moment, the Villalta scale has been validated in several studies, showing a good correlation with disease-specific quality of life. It has been demonstrated that iliofemoral deep vein thrombosis (odds ratio [OR], 3.4; 95% CI, 1.4-8.6) was highly associated with the development of a postthrombotic syndrome. Moreover, venous occlusion combined with reflux (OR, 4.4; 95% CI, 2.9-20.7), peak reflux velocity >29.7 cm/s (OR, 13.7; 95% CI, 4.1-45.7), and mean reflux velocity >8.6 cm/s (OR, 4.4; 95% CI, 1.5-12.9) in the popliteal vein detected by duplex scanning at 6 months after deep vein thrombosis were strong predictors of postthrombotic syndrome. Recently, changes in calf-muscle oxygenation during standing and exercise, which were measured by near-infrared spectroscopy, were significantly different between patients with and without postthrombotic syndrome.

The relationship between changes in oxygenated and deoxygenated hemoglobin levels during calf-muscle exercise might become an important indicative parameter reflecting the progression of postthrombotic syndrome; thereby, introducing new insights into calf-muscle hemodynamics at the microcirculation level.

Pulmonary embolism probability based on the location of thrombi in legs

Sang Jun Park, Korea

A study analyzing the relationship between the location of leg thrombi and pulmonary embolism was presented. All patients who were diagnosed with deep vein thrombosis in the author's center during 2006 were enrolled in the study. Pulmonary embolisms were classified and scored according to the affected arteries: main (4), lobar (3), segmental (2), and subsegmental (1) arteries. The deep vein thromboses were grouped according to their laterality (right/left/bilateral) and level of thrombi (iliac/femoral/popliteal/calf).

Overall, 388 patients were enrolled, 52% were female, with a mean age of 64. Pulmonary embolism was detected in 57.1% of the deep vein thrombosis patients. Pulmonary embolism from a right, left, or bilateral deep vein thrombosis was 62.9%, 52.2%, and 79.0% ($P=0.050$), respectively, and the mean pulmonary embolism severity score was 1.750, 1.293, and 2.474 ($P=0.004$), respectively. Pulmonary embolism from an iliac, femoral, popliteal, or calf vein was 48.5%, 66.4%, 60%, and 57.6% ($P=0.039$), respectively, and the mean pulmonary embolism severity score was 1.170, 1.942, 1.600, and 1.242 ($P=0.001$), respectively. Pulmonary embolisms were more frequent when the deep vein thrombosis occurred in the femoral vein. The main pulmonary artery embolism was also more frequent after femoral vein deep vein thrombosis (30.7%; $P=0.001$).

Deep vein thrombosis on the left side was more frequent than on the right side, but the probability of a pulmonary embolism was higher with deep vein thrombosis on the right side. The probability and severity of pulmonary embolisms were highest in the presence of deep vein thrombosis in the femoral vein among the leg thrombi.

Exercise versus immobilization in the treatment of acute deep vein thrombosis during different clot-organized stages: an animal experiment

Fuxian Zhang, China

An animal study to evaluate the corresponding influence on the incidence of pulmonary embolisms between immobilization and exercise in different stages of thrombus after acute deep vein thrombosis was presented. New Zealand rabbits (n=48) were randomly divided into 3 groups depending on the different organized stage of the thrombus: early, middle, and late stage. Each group was subdivided into 2 subgroups: immobile and mobile. Rabbit modeling of deep vein thrombosis was completed by ligating the right femoral vein. In the early stages, the rabbits were either allowed to move or not for 3 days; in the middle stages, the rabbits were either not allowed to move for 7 days or allowed to move for 3 days after being immobile for 4 days; and in the late stages, the rabbits were either not allowed to move for 14 days or allowed to move for 7 days after being immobile for 7 days. After the treatment phase, the rabbits were euthanized and the lungs were extracted to examine them for pulmonary embolisms. The incidence of pulmonary embolisms among the immobile rabbits in the early, middle, and late stages was 37.5%, 25%, and 37.5%, respectively, and the incidence among the mobile rabbits in the early, middle, and late stages was 50%, 37.5%, and 35.7%, respectively. There were no statistical differences between the mobile/immobile subgroups at the different stages. In conclusion, early ambulation does not increase the incidence of pulmonary embolisms after acute deep vein thrombosis in the lower extremities of rabbits.

Management of superficial vein thrombosis of the legs: update and current recommendations (French Society of Phlebology)

Jean-Luc Gillet, France

For a long time, superficial vein thrombosis was considered a benign disease; however, recent studies have shown their potential seriousness. In fact, in the studies POST (Prospective Observational Superficial Thrombophlebitis) and OPTIMEV (OPTimisation de l'Interrogatoire pour la Maladie thromboEmbolique Veineuse), a concomitant deep vein thrombosis was identified in 23% to 26% of patients at presentation, and a pulmonary embolism in 4% of patients, leaving isolated superficial vein thrombosis at a 74% frequency. Subsequent venous thromboembolisms (eg, superficial vein thrombosis, deep vein thrombosis, and pulmonary embolism) were reported in 3% to 20% of superficial vein thrombosis patients.^{1,2,3} The author argued that superficial vein thrombosis cannot be considered a benign condition anymore and that an ultrasound should be performed every time to rule out concomitant deep vein thrombosis (present in 25% of the cases) and to determine the precise location and extent of the superficial vein thrombosis (high level of evidence).

Until recently, although numerous anticoagulation strategies have been tested, none of them have clearly demonstrated a clinical benefit. Recently, the Calisto study validated a protocol based on fondaparinux 2.5 mg daily for 45 days, leading to an update in the recommendations. On the basis of the data in the literature and in agreement with both the latest American College of Chest Physicians recommendations and the conclusions of the last Cochrane review, it is prudent to recommend, in patients with symptomatic superficial vein thrombosis of at least 5 cm, the use of a prophylactic dose of fondaparinux or low-molecular-weight heparin for 45 days vs no anticoagulation (Grade 2B). Wherever the cost of treatment with fondaparinux is acceptable, we suggest fondaparinux 2.5 mg daily over a prophylactic dose of low-molecular-weight heparin (Grade 2C).

The recommendations and guidelines are still based on low-grade evidence. Some questions remain concerning the management of superficial vein thrombosis. Some risk factors for subsequent development of venous thromboembolisms have been identified, but further research is needed to clearly define subgroups of patients with a higher incidence of venous thromboembolism after superficial vein thrombosis.

References

1. Decousus H, Quéré I, Presles E, et al; POST Study Group. Superficial venous thrombosis and venous thromboembolism: a large, prospective epidemiologic study. *Ann Intern Med.* 2010;152:218-224.
2. Dewar C, Panpher S. Incidence of deep vein thrombosis in patients diagnosed with superficial thrombophlebitis after presenting to an emergency department outpatient deep vein thrombosis service. *Emerg Med J.* 2010;27:758-761.
3. Galanaud JP, Genty C, Sevestre MA, et al; OPTIMEV-SFMV Investigators. Predictive factors for concurrent deep-vein thrombosis and symptomatic venous thromboembolic recurrence in case of superficial venous thrombosis. The OPTIMEV study. *Thromb Haemost.* 2011;105:31-39.

Rivaroxaban: simplifying effective treatment for venous thromboembolism

Sang Hoon Na, Korea

Venous thromboembolism is a clinical condition with significant levels of mortality and morbidity. Until recently, anticoagulant therapy was centered on vitamin K antagonists and low-molecular-weight heparins. Despite proven efficacy of the conventional therapeutic approach, the narrow and unpredictable therapeutic index, the need for frequent monitoring of the international normalized ratio, genetic heterogeneity in pharmacokinetic response, the risk of multiple interactions (drugs and food), and the need for initial parenteral administration entails real difficulties in implementing adequate treatment over time. A new option has emerged with the development of direct oral anticoagulants, such as rivaroxaban. These new drugs allow comparable efficacy with increased convenience and safety. As a result, direct oral anticoagulants offer greater compliance and increased treatment efficacy, and at the same time, facilitate the therapeutic approach, which may possibly change the approach for the secondary prevention of thromboembolisms.

These drugs act as direct inhibitors of a specific coagulation factor (thrombin inhibition with dabigatran or factor Xa inhibition with rivaroxaban, apixaban, and edoxaban).

They are taken orally and have an early pharmacological action and a short half-life (which increases the safety), few predictable drug interactions, no dietary restrictions, and no monitoring requirements. Rivaroxaban was compared with conventional anticoagulant therapy (enoxaparin + vitamin K antagonists) in two randomized, open, noninferiority trials: Einstein-DVT (n=3449 patients with symptomatic deep vein thrombosis with or without asymptomatic pulmonary embolism) and Einstein-PE (n=4832 patients with symptomatic pulmonary embolism with or without deep vein thrombosis). The results were then gathered in a prespecified joint analysis (n=8281 patients). Overall, noninferiority in efficacy of rivaroxaban has been consistently demonstrated, with increased safety compared with conventional therapy, and a significant reduction in major bleeding, which is more pronounced in elderly patients (>75 years old) and patients with a CrCl <50 mL/min.

The initial dose of rivaroxaban is 15 mg twice daily for the first 3 weeks (21 days), followed by 20 mg once daily during the prolonged phase of venous thromboembolism treatment. Rivaroxaban is contraindicated when there is active liver disease (with increased international normalized ratio and decreased albumin serum), pregnancy, and breastfeeding. No dosage adjustment is necessary in patients with minor renal impairment (CrCl >50 mL/min), but, in patients with moderate renal impairment (CrCl =30 to 50 mL/min), rivaroxaban should be used with caution and patients kept under close vigilance for any signs or symptoms of blood loss. Rivaroxaban should not be used in patients with severe renal impairment (CrCl <30 mL/min). Additionally, rivaroxaban should be discontinued if acute renal failure develops. The decision to extend the oral anticoagulant therapy beyond the initial 3 months can be difficult and must take into account the probability of a new thromboembolic event (depending on the clinical context of the first occurrence), the bleeding risk, and associated comorbidities.

The EINSTEIN-Extension study (n=1197), a randomized, double-blind trial, evaluated the efficacy and safety of prolonged treatment with rivaroxaban (20 mg, once daily) vs placebo in patients who completed at least 6 to 12 months of anticoagulation. The treatment with rivaroxaban caused an 82% relative risk reduction (number needed to treat =15) for preventing a thromboembolic event (primary outcome). Clinically relevant bleeding (5.4% vs 1.2%) and major bleeding (0.7% vs 0%; $P>0.05$) was more frequent with rivaroxaban. Compared with placebo, rivaroxaban provided a significant improvement in terms of net clinical benefit. A prespecified secondary end point was defined as the composite of the primary efficacy end point and major bleeding, which occurred in 2.0% of patients receiving rivaroxaban and in 7.1% of patients receiving placebo (hazard ratio, 0.28; 95% CI, 0.15-0.53; $P<0.001$).

For the time being, there is still no antidote to reverse the steady-state anticoagulation activity of rivaroxaban. Yet, rivaroxaban appears safer than conventional therapy. Meanwhile, an antibody-based antidote is being developed and will be available soon. In conclusion, rivaroxaban has arrived to simplify the acute therapeutic approach of treating venous thromboembolisms with potentially more consistent and safe results, and may change how the secondary prevention of thromboembolisms is performed.

Anticoagulant and venoactive drugs

Ahmed Kursat Bozkurt (Turkey) presented an overview of new anticoagulants (ie, apixaban, dabigatran, edoxaban, and rivoraxaban) with respect to major bleeding complications. **Antony Comerota** (USA) discussed the proper duration of anticoagulation for acute venous thromboembolism, focusing on extended therapy. Results from the benefit-risk analysis are awaited. Patients at a high risk of recurrence are those with unprovoked deep vein thrombosis and a residual venous obstruction and/or elevated D-dimer. New oral anticoagulants appear very helpful, especially at reduced doses.

Andrew Nicolaides (Cyprus) presented the talk "Effects of venoactive drugs in chronic venous disease." Indications for venoactive drugs include treating: (i) symptoms and edema that likely have a venous origin; and (ii) symptoms of pelvic congestion syndrome and adjunctive treatment in venous leg ulcer healing. Venoactive drugs may be used in association with sclerotherapy, endovascular treatment, or surgery. Diosmin/hesperidin (micronized purified flavonoid fraction [MPFF])* was assigned a Grade 1B recommendation in the last international guidelines on the management of chronic venous disorders for its ability to relieve symptoms of chronic venous disorders and accelerate the healing of venous ulcers. In ulcer healing studies, pentoxifylline and sulodexide are also mentioned.

Doyeun Oh (Korea) mentioned the current guidelines in the management of deep vein thrombosis, and highlighted the present role of thrombolysis and inferior vena cava filters (only in special situations). Most deep vein thrombosis can now be treated in outpatient clinics. Direct oral anticoagulant drugs are preferable over vitamin K antagonists for the secondary prevention of deep vein thrombosis due to a lower rate of bleeding complications. Various models to predict bleeding and recurrence of deep vein thrombosis were introduced. Bleeding associated with direct oral anticoagulant drugs is a new concern with their increasing use. Elastic stockings have now been proven to not be useful in the prevention of a postthrombotic syndrome.

**Also registered as Daflon 500 mg, Alvenor, Ardium, Arvenum, Capiven, Detralex, Variton, Venitol*

IV. Venous malformation

Arteriovenous malformations and Stewart-Bluefarb syndrome

Alicia O'Connor, Australia

The evolution of the classification of vascular anomalies and the pathophysiology, evolution, and types of arteriovenous malformations were presented, the seminar concluded with an introduction to the 2015 Yakes arteriovenous malformation classification.¹

Stewart-Bluefarb syndrome, a rare angioproliferative disorder that was first described in 1967, is characterized by an acroangiokeratosis that is associated with an underlying arteriovenous shunt. Acroangiokeratosis is a benign, uncommon angioproliferative disease characterized by violaceous macules, papules, or plaques on the dorsum of the feet. The malleolus pathogenesis is poorly understood, but it may be the result of an angiogenesis response to high perfusion rates.

A series of 5 patients was presented, where all underlying arteriovenous communications were initially diagnosed on duplex ultrasound and confirmed with magnetic resonance angiography. Congenital arteriovenous malformations were found in 4 patients, while 1 patient was diagnosed with a postthrombotic arteriovenous fistula. In 1 female and 2 male patients, the diagnosis was delayed as the acroangiokeratosis closely resembled other conditions. Management included observation and intervention using a variety of techniques, including percutaneous or transcatheter embolization, endovenous laser ablation, radiofrequency ablation, and ultrasound-guided foam sclerotherapy.

In conclusion, the presented case series highlights the challenges involved in the diagnosis and management of the Stewart-Bluefarb syndrome. Given the local and systemic sequelae of high-flow shunts, correct diagnosis and early detection of the underlying arteriovenous abnormalities are crucial for the long-term management of these patients and for preventing the associated complications.

Reference

1. Yakes WF. Yake's AVM classification system [abstract 521]. *J Vasc Interv Radiol.* 2015;26:S224.

Klippel-Trenaunay syndrome: treatment with endovenous laser therapy

Roberto Simkim, Argentina

In this presentation, the management of Klippel-Trenaunay syndrome was discussed. Intraoperative ultrasound-guided endovenous laser therapy was performed in 11 patients with Klippel-Trenaunay syndrome (3 cases treated with a 980 nm laser diode and 8 cases with a 1470 nm laser diode). In all cases, a preoperative lower-limb arteriography was performed. Previously, a person with Klippel-Trenaunay syndrome who had been treated with a skeletization technique was shown to have recurrence of the microarteriovenous fistulae 18 years later, as demonstrated

by digital arteriography. Based on lower-limb arteriography, in the present cases where endovenous laser therapy was performed, there was a decrease in the microarteriovenous fistulae, showing that endovenous laser therapy could decrease the microarteriovenous fistulae present in patients with Klippel-Trenaunay syndrome.

Regional segmentary skeletization is a good technique that reduces the arteriovenous fistulae present in the lower limbs; however, the recurrence of varicose veins in these cases can be $\approx 30\%$. Endovenous laser therapy is a good technology for the treatment of varicose vein recurrences, which could apparently decrease the microarteriovenous fistulae in patients with Klippel-Trenaunay syndrome.

Sclerotherapy in venous malformation

Yong Soo Do, Korea

Venous malformations represent 37.7% of the congenital vascular malformations. The symptoms include pain, presence of a mass in the body, and swelling due to venous hypertension. Consumption coagulopathy, cosmetic deformity, functional impairment (combined with abnormal bone growth), and pulmonary embolisms can be observed. Venous malformations, with combined abnormal bone growth, occurs in about 5% of cases. Abnormal bone growth may be due to hypertrophy (4%) or hypotrophy (1%). In cases of bone hypertrophy, there is an increase in the vascularization of the growth plate due to high oxygen tension and elevated temperature. In bone hypotrophy, there is a pressure reduction on the bone's metaphysis due to venous hypoplasia. Venous malformations may cause a length discrepancy of more than 2 cm between both legs, which may be accompanied by pelvis tilting and spine lordosis.

Venous malformations are diagnosed by physical examination (soft compressible, palpable mass, and phleboliths), radioisotope imaging (Tc-99m labeled red blood cells), and magnetic resonance imaging (high-signal intensity lesion on T2-weighted imaging with fat suppression). Most venous malformations remain stable and quiescent without spontaneous regression. Often venous malformations grow slowly, but a growth spurt can occur at puberty or during the adolescent period. A second expansion can be observed around pregnancy.

The treatment consists of compression stockings, surgical resection, sclerotherapy, and low-molecular-weight heparin for consumption coagulopathy. The surgical treatment of venous malformations is limited with high recurrences, and the lesions can expand to a size that is larger than the initial size of the venous malformation and reapposition is almost impossible. Preoperative emboloscclerotherapy is often performed to reduce intraoperative hemorrhages. Better results are observed when using sclerotherapy with polidocanol or sodium tetradecyl sulphate, which improves symptom relief in 74% of cases. The complication rate is around 10% to 30% with some injury (blisters and necrosis), nerve damage (transient or permanent), deep vein thrombosis, and fatal cardiac arrest.

In conclusion, ethanol or foam sclerotherapy with polidocanol or sodium tetradecyl sulphate are effective treatments for symptomatic localized venous malformations, with an acceptable rate of minor complications, but the patients need to be carefully selected.

Clinical course and management of vascular anomalies

Kurosh Parsi, Australia

The vascular anomalies are classified in vascular tumors and congenital vascular malformations. The diagnosis can be difficult and may require various imaging modalities (ultrasound and magnetic resonance). Hemangiomas are the most common vascular tumors, which can be either congenital or appear during infancy. The most common vascular tumor is the hemangioma in infancy (HOI), which occurs in approximately 10% of Caucasians and more frequently in females. HOI has three stages, initial proliferation and growth, a rest stage, and involution. HOIs are self-limited and benign. Vascular malformations that are present at birth do not involute.

The modified Hamburg classification is the most utilized classification system and this classification sorts the congenital venous malformations into extratruncular and truncular. Truncular malformations are more hemodynamically significant than extratruncular malformations. Extratruncular malformations (previously called angioma or angiomatous lesions) are present as lesions that are more primitive and occur at earlier stages of vasculogenesis. Truncular malformations arise from preexisting vascular structures in later stages of vasculogenesis and can present as ectasia, hypoplasia, agenesis, obstruction, or aneurysm of mature vessels (eg, popliteal vein aneurysm, persistent embryonic marginal vein, and embryonic sciatic vein).

Correct diagnosis is the most important part of managing venous malformations. Diagnosis starts by obtaining a detailed history, performing a clinical examination, and determining the presence of the lesion at birth (growth proportionate or disproportionate to the child's growth and family history). The doctor should examine the lesion and the contralateral normal side to look for asymmetry. Ultrasound imaging and magnetic resonance imaging are mandatory for the diagnosis. B-mode ultrasound tests for compressibility (venous malformation) or noncompressibility (lymphatic malformation, arteriovenous malformation, and thrombosed or treated venous malformation). Lymphatic malformations show no flow on Doppler flow analysis, venous malformations show low or no flow (if thrombosed or sclerosed), and arteriovenous malformations show slow resistance, high diastolic flow, turbulence, and aliasing at the nidus. Magnetic resonance imaging is mandatory to evaluate the extension of the lesion and may eventually be complemented by using computed tomography angiography. When appropriate, a baseline evaluation may include whole-body blood pool scintigraphy, magnetic resonance imaging, and a biopsy of individual lesions.

It is essential to assess the extent, severity, and progression of the lesion prior to treatment. Early aggressive treatment may be required to prevent life- or limb-threatening complications. It is essential to ensure that the benefits from the intervention exceed the morbidity from the treatment since ill-planned interventions can stimulate explosive growth of the lesion.

Arteriovenous malformations and venous malformations are as different as apples and oranges

Byung Boong Lee, USA

Arteriovenous malformations and venous malformations are two different types of congenital vascular malformations. Congenital vascular malformations are a group of various birth defects developed anywhere throughout the entire peripheral vascular system, following the developmental arrest during various stages of embryogenesis. Therefore, congenital vascular malformations are not one disease entity, but a mixture of various defects with different characteristics and behaviors, often affecting more than one vascular system—capillary, arterial, venous, or lymphatic system.

Arteriovenous malformations result from a defective development that affects both the arterial and venous systems, but venous malformations represent a defective development that only affects the venous system, with no arterial involvement. Arteriovenous and venous malformations have entirely different clinical courses with different prognoses. Subsequently, the management principle and strategy of both conditions are fundamentally different, with both being as different as apples and oranges, although both are classified together as a congenital venous malformation.

Arteriovenous malformations are relatively rare among various congenital venous malformations, but they are the most destructive of all congenital venous malformation lesions. They have the highest risk of progression with a more destructive potency due to complicated central, peripheral, and local hemodynamic impacts on the entire cardiovascular system (arterial, venous, and lymphatic). In general, an early approach to the treatment of all arteriovenous malformation lesions, either macro- or microarteriovenous shunting, is mandated. Whenever and wherever possible, it is necessary to reduce the impact and consequence of the arteriovenous malformation lesion.

Aggressive control of the nidus of the lesion itself is essential to prevent recurrence and/or a first deterioration of the arteriovenous malformation lesion and to minimize the complicated hemodynamic consequences. Treating the arteriovenous malformation with a strategy to stop the feeding artery and leave the nidus intact made the condition worse, provoking more aggressive neovascular recruitment to the primitive lesion without exception.

On the contrary, venous malformations seldom become a limb- or life-threatening condition, except in a few cases involving the structure of vital organs. Venous malformations are the most common congenital venous malformations and the majority exists as an independent lesion that has a relatively benign course unless other congenital venous malformations are present. Therefore, not all (extratruncular) venous malformation lesions are indicated for therapy and they should be treated according to a discriminating selection based on new guidelines and new treatments modalities.

V. Pelvic disorders

Diagnosis and pelvic disorders

The session started with a keynote lecture by **Wassila Taha Elkashishi** (Egypt) on duplex criteria and patient selection in modern vein therapy. This talk provided an excellent review of the potential of duplex ultrasound in skillful hands and the role of this examination in modern phlebology. Today, this is a mandatory diagnostic tool for planning venous procedures in both chronic and acute conditions. **Vimalin Samuel** (India) discussed the anatomical variations of the saphenous fascia in the Indian population. In 72% of legs, the saphenous fascia belongs to the so-called I-type, and the great saphenous vein lies completely between two layers of the fascia (saphenous eye). These findings are valuable for local practitioners who use endovenous ablation.

Pier Luigi Antignani (Italy) presented his work using transbrachial endovascular foam sclerotherapy of incompetent gonadal veins with 10 mL of 3% sodium tetradecyl sulphate foam in 59 women with chronic pelvic venous pain and pelvic varicose veins. The treatment showed an excellent success with complete resolution of symptoms in 58 patients. After 12 months, further treatment was required in only 1 patient.

An interesting study using air plethysmography was presented by **Yosuke Shiraishi** (Japan). In some cases, there was an inaccuracy observed in the venous filling index (VFI) due to the arterial inflow rate. VFI is a very precise tool to assess hemodynamic disorders in patients with chronic venous disease. The author invented a more accurate, original, and pure regurgitation index (RI) that can be calculated as: $RI \neq (\text{standing VFI} - \text{supine VFI}) / \text{body mass index}$.

Stenting of the superior vena cava obstruction is a very rare procedure. **Ravul Jindal** (India) has performed 40 such interventions on patients undergoing hemodialysis who developed central venous obstruction. Technical success was 82% and the primary patency rates were 90%, 80%, and 52% at 3, 6, and 12 months, respectively. Stent placement in such patients provides excellent results and helps preserve vascular access for a substantial period.

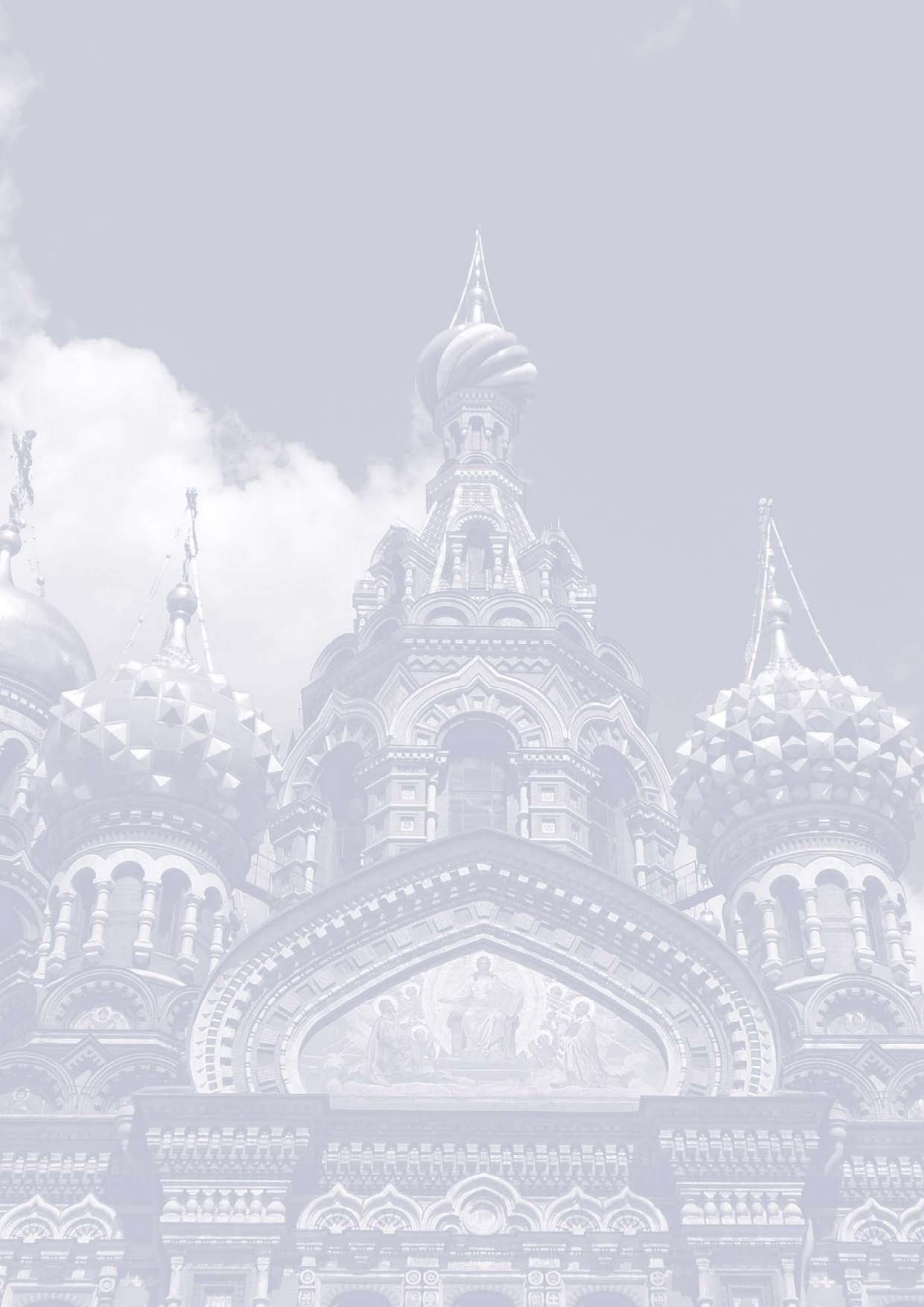
Diagnosis of pelvic venous insufficiency

Mark Meissner, USA

The diagnosis of pelvic venous insufficiency is not simple. Chronic pelvic pain (>6 months) represents 10% of all outpatient gynecology visits. The most common causes of chronic pelvic pain is endometriosis (39%), pelvic congestion syndrome (31%), pelvic inflammatory disease (11%), and adhesion (10%). A high prevalence of depression (25% to 50%) and anxiety (10% to 20%) is observed in association with chronic pelvic pain. Pelvic venous disorders have two clinical manifestations—pelvic congestion syndrome and pelvic varices. In the pelvic congestion syndrome, the patient complains of pain, dyspareunia, and dysuria, and in pelvic varices, the patient relates the presence of varices in gluteal, perineal, and vulvar regions.

For a correct diagnosis, an understanding of the anatomy of the ovarian veins, internal iliac veins, and saphenous femoral junctions, and the connection between them, is very important. The ultrasound must be applied with a low-frequency transducer (2-4 mHz) in a reverse Trendelemburg position to evaluate ovarian reflux and diameter (>6 mm) and internal iliac reflux and diameter. In addition, a transvaginal ultrasound should be done to observe the presence of crossing veins (>5 mm). The ultrasound diagnosis must exclude iliac venous compression and aortomesenteric renal vein compression. The definitive diagnosis is composed of selective venography (left renal vein, bilateral ovarian veins, and bilateral internal iliac veins), intravascular ultrasound to exclude renal and iliac compression, and measurements of pullback pressure.

It is important to treat any obstruction first (via angioplasty and stenting) and then treat pelvic reflux with selective embolization and sclerotherapy. In the management of pelvic venous disease, we must be aware of the interconnected venous systems, ovarian veins, internal iliac veins, and saphenous femoral junction.



II

16th EVF Annual Meeting



St. Petersburg, Russia, July 2-4, 2015

A summary by **Evgeny Shaydakov** and **Olga Porembskaya**

At the beginning of July 2015, St. Petersburg was the center of events in the European phlebology community. More than 800 participants of the European Venous Forum came to St. Petersburg from 60 countries around the world and 67 regions of Russia. It was the first time in the 16 years of the European Venous Forum that Russia had the honor of organizing the largest European phlebology conference.

Evgeny Shaydakov, who has been the chair of the phlebology association of St. Petersburg and the northwest region of Russia for many years, was elected as the 2015 President of the European Venous Forum.

An intensive scientific program, which dealt with practically all aspects of modern phlebology, occurred hand in hand with various cultural events that introduced delegates from different countries to the rich historical heritage of Russia. A fabulous dinner in Peterhof, the imperial palace near St Petersburg, was highlighted with a ceremony of the big cascade fountains, which made the setting of the 16th European Venous Forum unforgettable.

A committee of experts, under the guidance of the European Venous Forum chairperson, selects the most important and interesting abstracts from a scientific and practical point of view for oral and poster presentations. A total of 250 abstracts were submitted, and in the end, the best 35 were selected. Several pre-sessions were held before the main program of the conference. One session was devoted to the problems and the place of compression therapy in the treatment of various forms of chronic venous insufficiency. The latest investigations from a group of European specialists, including **Susan Kahn** and others, cast doubt on the effectiveness of using elastic compression stockings after acute deep vein thrombosis to prevent the development of a postthrombotic syndrome. Interesting reports by **Giovanni Mosti**, **Hugo Partsch**, **Joseph Caprini**, which were based on the results of international research and their own experience, resulted in a lively discussion that provided answers to many questions. The INNOVATE program, which was successfully started in December 2014 in St. Petersburg at the 7th St. Petersburg's Venous Forum, aroused great interest. The main objective of this international program is to implement the standards of venous thromboembolic prophylactics, treatment, and practical implementation. During the discussion, a group of leading Russian experts, in the sphere of diagnostics and treatment of acute venous thrombosis, outlined a concrete program of practical implementation of these tasks in Russia.

One session was devoted to the problem of diagnostics and treatment of patients with clinical, etiological, anatomical, and physiological classification C_{0s} (symptoms of the disease are present without signs) was organized under the unanimous resolution of the Forum program committee. To emphasize the importance of the problem, **Andrew Nicolaides** (Cyprus) and **Eberhard Rabe** (Germany) presented the results of the Bonn Vein Study, which was carried out on 1800 volunteers. According to the data, 50% of all people examined showed symptoms typical of chronic venous insufficiency. Venous reflux in the saphenous vein by the end of the day in patients showing signs of chronic venous insufficiency occurred in 63% of the patients with C_{0s} , whereas 30% revealed venous blood flow acceleration with the increase in

venous filtration at the ankle. During the discussion, **Yuriy Tsoukanov** (Russia) shared his point of view based on his recent work devoted to treating C_{0s} patients.

The discussion of chronic venous disease pathogenesis started with **Armando Mansilha** (Portugal) stating: "We are just at the beginning of our understanding of the principles of venous deficiency development." There is still an obvious dissonance between the data on the morphological changes in the venous wall and the data about the hemodynamic aspects of the veins. Further research, including estimation of the microvascular changes, is necessary to form a complete picture of the changes in the venous system.

With all the unique possibilities of the modern instrumental examination, we still do not have the opportunity to quantitatively measure hemodynamic shifts in the venous system and assess their role in the hierarchy of the changes leading to venous insufficiency (**Marzia Lugli**, Italy). Many speakers mentioned the necessity of acquiring this kind of knowledge. **Andrew Nicolaides** (Cyprus) noted that laser dopplerography of microvessels with an estimation of the CO_2 and PCO_2 content in the skin of lower extremities, capillaroscopy, and orthogonal polar spectral methods can help answer a number of questions. **Eliete Bouskela** (Brazil) widely uses capillaroscopic methods in her work, and she showed that a reduction in the density of functioning microvessels, an increase in skin papillae diameter, and an increase in capillary diameter accompanies disease progression. The different morphological changes are shown as an increase in pathologic capillary percent correlation. The same type of instrumental examination is indispensable when estimating the effectiveness of venoactive drugs at various stages of chronic venous disease, including the C_{0s} stage (**Carlos Virgini-Magalhaes**, Brazil). Capillaroscopic information shows the effective use of venoactive remedies in chronic venous disease therapy. Measuring cytokine levels, ie, interleukin 1, tumor necrosis factor, and vascular endothelial growth factor, reveals the authentic fluctuation in their concentrations during treatments containing micronized purified flavonoid fraction (**Vadim Bogachev**, Russia).

On the initiative of the President, a joint session of the European Venous Forum with the Deep Venous Reconstructive Surgery club (DVRS club), a community of specialists dealing with reconstructive venous surgery, recently organized by **Robert Kistner** (USA), was held for the first time this year. In April and May 2015, two master classes of the DVRS club were successfully held in Modena, Italy (chaired by **Oscar Maleti** and **Marzia Lugli**). Their reports and the presentations by **Michel Perrin**, **Anthony Comerota**, and **Evgeny Shaydakov** summed up the possibilities of deep vein surgery. They showed that specialists from different countries are interested in acquiring skills on manipulating the deep veins. As **Oscar Maleti** mentioned in his presentation, a decrease in the interest to conduct deep vein reconstructive surgery in the 1970's and 1980's has been changed by the current increase in interest. This is definitely connected with the new possibilities of diagnostics to determine the state of deep veins, the appearance on intravascular ultrasound, and new treatment methods.

Anthony Comerota (USA), Director of Jobst Vascular Institute in Toledo, Ohio, spoke about the methods currently available to surgeons for preventing postthrombotic syndromes. Long-term results of open thrombectomy and thrombolysis in numerous randomized investigations exceed the possibilities of anticoagulant therapy alone in preserving venous patency. The CaVenT study (Catheter-directed Venous thrombolysis

in acute iliofemoral vein Thrombosis) confirms patency preservation of the iliofemoral venous segment 6 months after catheter-directed thrombolysis with a significant 66% preservation rate, whereas anticoagulation alone is only 47%. At 1-year posttreatment, the difference between the long-term results of catheter-directed thrombolysis and anticoagulation were still significant: 56% and 41%, respectively. The data presented by **Niels Baekgaard** (Denmark) on prospective research comparing long-term results of anticoagulation therapy and catheter-directed thrombolysis are also in favor of thrombolytic therapy.

The retention of venous obstruction inevitably leads to the development of postthrombotic syndrome. Deep vein obstruction is responsible for one-third of the cases of postthrombotic syndrome, whereas the combination of deep vein obstruction and venous reflux is responsible for two-thirds of the cases (**Marzia Lugli**). Stenting of the deep veins is the only way to eliminate venous obstruction in such situations, and the guidelines have assigned a Grade 1B level of recommendation for stenting in patients with severe symptoms of postthrombotic syndrome and a Grade 2B recommendation for moderate cases. Stenting preserves the patency of the deep veins in 90% to 100% of cases with nonthrombotic obstruction and in 74% to 89% in cases of postthrombotic syndrome, saving patients from pain in 86% to 94% of cases, from edema in 66% to 89% of cases, and healing of venous ulcers in 58% to 89% of cases. There are many problems discussed concerning the time of deep vein stenting and the choice of a proper stent. Currently, technologies are being developed to create an ideal venous stent by obtaining all the necessary characteristics, including flexibility, resistance against compression and high hoop strength, low adhesiveness for thrombocytes, tolerable radius curvature without protrusion of metallic components into the cell structure (**Athanasios Giannoukas**, Greece). Any remaining deep vein reflux that causes symptoms should be corrected after stenting to increase the patient's quality of life. Possible approaches include transposition, valve transplantation, or neovalve creation.

During the last day of the conference, a didactic session introduced a variety of experimental studies on venous disease pathogenesis. It is obvious that further development of modern phlebology is impossible without such research. The session opened with a presentation by **Thomas Wakefield** (USA), one of the directors of the Samuel and Jean Frankel Cardiovascular Centre at the University of Michigan, where he summed up recent research on the increasing possibility of accurate diagnostics for deep vein thrombosis and its recurrence using the combination of D-dimer levels, soluble P-selectin levels, and the Wells score.

Currently, research is being conducted on the use of galectine-3 as a biological marker for venous thromboembolism and the first promising results were published in 2013 in *Blood*. **Al Shevela** (Russia) discussed genetic markers for varicose veins. The high-frequency matrix metalloproteinase (MMPs) gene combinations (MMP-3 1171 dupA 5A/6A; MMP-12 82 A/G) and vascular endothelial growth factor determine the phenotype that is typical for people suffering from varicose veins. **Andreas Fiebig** (Germany) and **F. Matthys** (Belgium) spoke about the influence of heredity and age on the development of chronic venous diseases. **Jawed Fareed** (UK) reviewed the biomarkers for chronic venous insufficiency and acute thromboses. The laboratory of **Anthony Comerota** (USA) also delivered a very interesting presentation on the subject. **Evgeny Shaydakov** and **Fedor Lurie** (USA) showed that deep venous valve

insufficiency is one of the predictors of acute deep vein thrombosis. These authors were awarded the first prize of the American Venous Forum for the best poster report showing the preliminary results of this research.

The Russian section of the European Venous Forum presented works by leading Russian specialists. **Sergey Sapelkin** (Russia) presented the work of the group headed by **Anatoly Pokrovsky**, concerning the results of endovascular radiofrequency treatment of inborn vascular malformations and the demonstrated effectiveness in treating vascular tumors of the limbs and soft tissue of the head that comprises the combination of afferent vessel embolization, radiofrequency obliteration following resection of the tumors. **I. Serebriysky** (Russia) presented the current research on thrombodynamics. The insufficiency of anticoagulant therapy, which results in recurrent deep vein thrombosis, can develop due to low doses of medicine and peculiarities in the coagulation system. Therefore, thrombodynamic tests can aid in the implementation of individual doses of anticoagulants. **T. Vavilova** (Russia) discussed the necessity of regularly monitoring anticoagulant in blood plasma while taking anticoagulants for safer therapy and for reducing the risk of thrombosis. The rivaroxaban and dabigatran concentrations found in the plasma in many patients often do not correspond to the expected concentrations, which can result in reduced efficacy. **Olga Porembskaya** (Russia) summed up the results of the enormous work by **Evgeny Shaydakov** (Russia) and **O. Alukhanyan** (Russia) on the technical aspects of venous valve reconstruction in patients with a combined reflux of deep and superficial veins. **Robert Kistner's** suggested method of valvuloplastics involves using a different access than the generally accepted one to avoid cutting valve commissures and to help remove deep venous reflux in the majority of cases in the immediate and long-term postsurgical periods. The problems of incompetent perforating vein treatment and the possibilities of implementing various surgical methods were discussed by **Sergey Belentsov** and **Aleksej Fokin** (Russia). For transverse reflux elimination, perforating vein subfacial dissection (SEPS) with radiofrequency ablation had comparable results to laser ablation with foam sclerotherapy. Therefore, the aggressive method of treatment (SEPS), which is accompanied with a greater number of complications, can be rejected in favor of less invasive endovenous procedures.

The European Venous Forum traditionally discusses the problems associated with compression therapy. Existing data show equal possibilities for class 1 and 2 compression devices in treating venous symptoms; however, only 2 classes of elastic devices diminish venous reflux in the lower limbs (**Werner Blatter**, Switzerland). **Joseph Caprini** (USA) discussed the importance of compression stockings in preventing deep vein thrombosis. The increase in the compression of knitted wear with effective use is possible by adequately controlling the pressure they create (**Hans Thomae**, Germany). The results of research show that compression stockings have no advantages compared with knee-high compression stockings. If prophylactic measures using compression are combined with other methods, including intermixing pneumocompression and neuromuscular stimulation, better results can be obtained in deep vein thrombosis and preventing venous thrombolysis (**Ramaswamy Ravikumar**, UK). According to **Kirill Lobastov** and **V. Barinov** (Russia), anticoagulant therapy is an absolute leader in preventing deep vein thrombosis, and in combination with intermixing pneumocompression, it is the safest way to prevent the disease, even in patients at a high risk of deep vein thrombosis.

Evi Kalodiki (UK) reported the results of experiments designed to find a treatment for the hemorrhagic bleeding that occurs while taking the anticoagulant therapy with rivaroxaban, dabigatran, and apixaban. The combination of a concentrated complex of prothrombin, a Feiba preparation (an anti-inhibitor coagulation complex containing several coagulation factors), and Σ -aminocaproic acid shows promise for treating hemorrhagic bleeding after anticoagulant therapy. **Joseph Caprini** (USA) stated that while there are no antidotes for the mentioned preparations, the data seem to be extremely important, considering the widespread use of anticoagulation therapy and the accompanying 3.4% risk of bleeding.

Christopher Lattimer (UK) and **Andrew Nicolaides** (Cyprus) conducted research confirming the importance of the changes in venous wall elasticity during postthrombotic processes, which results in a number of hemodynamic changes. These changes were confirmed using air plethysmography and show a reduction in the venous drainage index, which is caused by a reduction in the emptying of deep veins due to a reduction in their wall resistance. Air plethysmography estimates the influence of all three PTC components of venous hemodynamics of the lower limbs: venous wall obstruction, reflux, and elasticity. **George Geroulakos** (UK) reported on treatment algorithms for subclavian vein thrombosis. Thrombolysis was suggested as the main approach. According to this algorithm, in partial subclavian vein stenosis after thrombolysis with moderate-to-severe symptoms, the second stage of treatment should be a first rib resection. In unsuccessful thrombolysis with further development of severe symptoms, a subclavian-jugular bypass may be performed.

Many delegates from different countries presented the results of their research on the modern methods of treatment. Endovascular methods have become the main approach for treating postthrombotic syndrome (**Mehmet Kurtoglu**, Turkey) and managing the pelvic venous congestion syndrome (**V. Ryzhkov**, Russia). Ultrasound thrombolysis, a recently available technology, eliminates the venous thrombus present as thromboembolic complications with high effectiveness compared with catheter-directed thrombolysis (**Nathan Liang**, USA); this work was conducted by the American Venous Forum prizewinners **Nathan Liang** and **Rabih Chaer**, who were delegates of the European Venous Forum.

In pediatric practice, the formation of lymphatic venous anastomosis for generalized lymphatic dysplasia is successfully being conducted by **Makoto Mihara** (Japan), who was one of the prizewinners from the Japan Phlebological Society. **Hitoshi Inafuku** (Japan), another prizewinner from the Japan Phlebological Society, demonstrated the wide possibilities of surgical treatment for the Budd-Chiari syndrome, where the dilation of the retrohepatic inferior vena cava with a pericardium patch and opening of the hepatic veins increases the life expectancy for these patients. **Nick Morrison** (USA) reported on the successful results obtained using recently introduced methods for endovascular varicose vein ablation, including cyanoacrylate-based medical glue. The work of the group headed by **Yury Shevchenko** and **Y. Stoiko** (Russia) showed a higher effectiveness after increasing the number of radiofrequency cycles in saphenous vein ablation.

In addition to the delegates of American Venous Forum and Japanese Phlebological Society, **Marlin Schul**, the prizewinner of the American College of Phlebology, also became a delegate to the European Venous Forum. His work is devoted to the

clinical severity of the refluxing anterior accessory saphenous vein compared with the refluxing great saphenous vein.

The first-place European Venous Forum prize was awarded to the **Joseph El-Sheikha** (UK) and coauthors who presented the results of a 5-year observational clinical, technical, randomized study comparing endovenous laser ablation (810 nm) with open surgical methods for the treatment of varicose veins. The results showed an equal effectiveness of both approaches, but revealed two different reasons for recurrent varicose veins—saphenofemoral junction reflux and neovasculogenesis, respectively. **Caitlin Latimer** was awarded the second-place prize for his work devoted to the correlation of thigh compression pressure with the venous drainage index. The third-place prize was awarded to **Prakash Saha** (UK) who presented the results of the 1-year observational study on postthrombotic obstruction stenting. Russian delegate **R. Bredikhin** was awarded the prize for the best poster presentation.

The festive dinner became one of the most unexpected moments of the 2015 European Venous Forum. The main reason was the intrigue, as the location was kept secret throughout the European Venous Forum. This year, the 2015 President of the European Venous Forum **Evgeny Shaydakov** started a new tradition by the awarding gold medals for outstanding contributions in phlebology. All participants supported the idea of awarding annual gold medals to the most eminent surgeons and scientists, whose work has led to further developments in the field of phlebology all over the world. The first gold medals of St. Petersburg's Phlebology Association were awarded to people whose contribution to "the art of phlebology" is beyond estimating: **Bo Eklöf** (Sweden) and **Michel Perrin** (France). The 22nd honorable member of the European Venous Forum, **Y. Soiko** (Russia) was elected during the Gala Diner. The crowning point of the 2015 European Venous Forum was the ceremony that launched the Peterhof fountains, which appeared as a magical mix of music, fountains, and fireworks.



Figure 1. One of the buildings at Peterhof, the imperial palace in the suburbs of St. Petersburg.

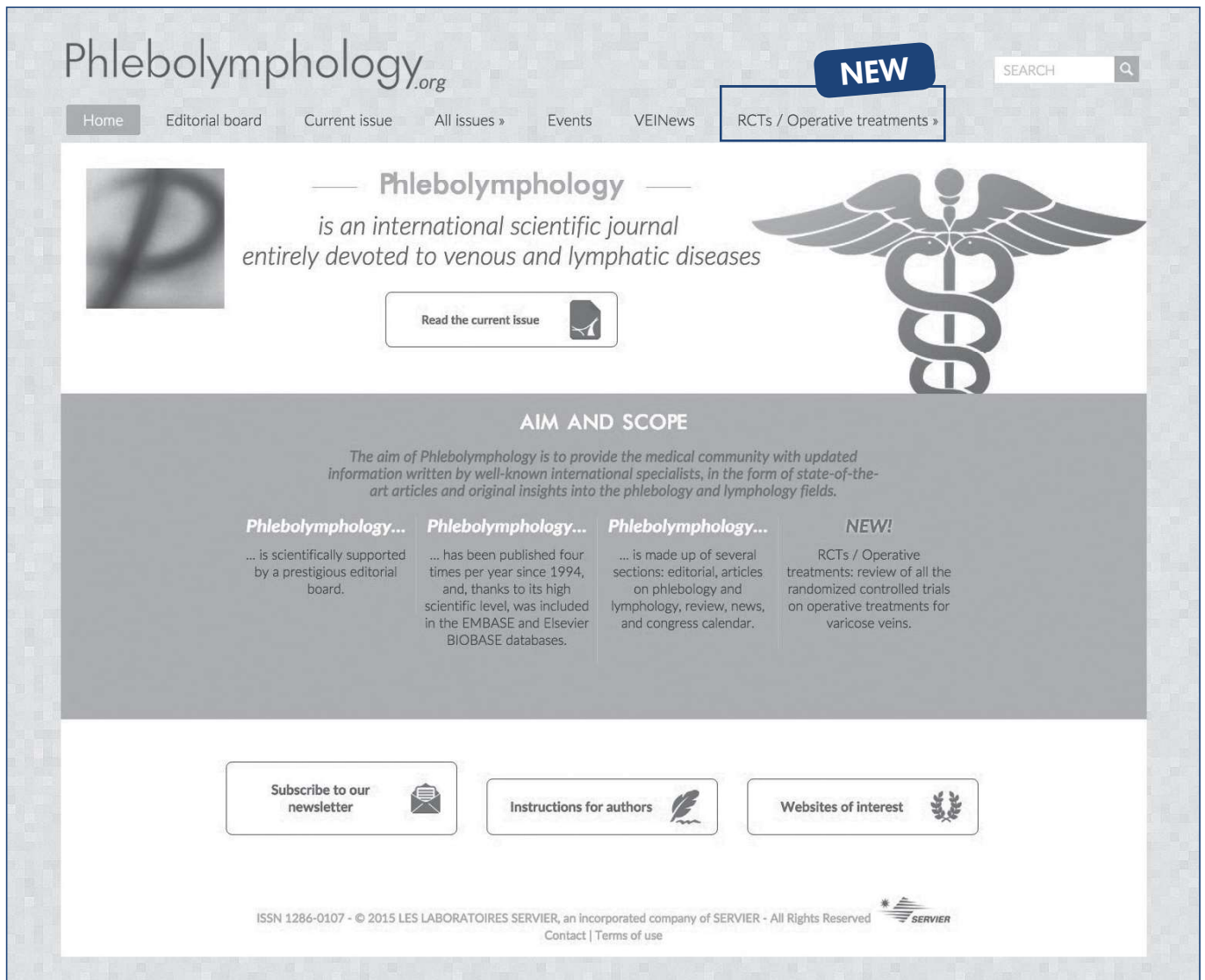


Figure 2. The famous fountains at the imperial palace at Peterhof.



Figure 3. Evgeny Shaydakov (left) and Andrew Nicolaides (right) during one of the numerous sessions organized during the European Venous Forum.

For updates on venous and lymphatic diseases...



NEW rubric

“RCTs/Operative treatments”:
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