



SCIENTIFIC PROGRAMME  
AND BOOK OF ABSTRACTS

**22<sup>nd</sup>**  
**ANNUAL**  
**MEETING**  
**of the European**  
**Venous Forum**

**June 30<sup>th</sup>-**  
**July 2<sup>nd</sup>**  
**2022**  
**Venice - Italy**

In collaboration with the  
Italian College of Phlebology





**22<sup>nd</sup> Meeting of the  
European Venous Forum  
in collaboration with the  
Italian College of Phlebology**

**30 June – 2 July 2022  
Mestre, Venice, Italy**

**SCIENTIFIC PROGRAMME  
AND BOOK OF ABSTRACTS**



**EDIZIONI MINERVA MEDICA**

**Under the auspices of:**

International Union of Angiology  
Union Internationale de Phlébologie – International Union of Phlebology

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## WELCOME MESSAGE

### Welcome address to the 22<sup>nd</sup> European Venous Forum Congress

Dear Phlebologists from all over the world, the last Congress of the European Venous Forum took place only in virtual form due to the pandemic. Despite the absence of personal contact, we were able to present and discuss practically everything new in phlebology. An excellent organization made it possible to carry out lively discussions, according to the mission of the European Venous Forum.

Currently, despite the attenuation of the epidemic spread in several countries, the problem is still not behind us. Unfortunately, in many countries, both European and non-European, the incidence of infection is still high and any forecast for the next year is quite impossible. That is why we have decided to organize the next Congress in a hybrid form. In this way everyone who may participate directly will be able to benefit from the advantages of the face-to-face meeting while all the others who cannot participate due to trip limitations, will nevertheless be able to participate in a virtual way. Simultaneous translation will be provided.

Regardless of live or virtual participation, we look forward to your precious contribution. The fact that the Congress also takes place in hybrid form represents an undoubtedly advantage as it will allow a greater number of delegates to look at your presentation. In addition to the classic Abstract Sessions and the large time dedicated to discussion which represents the soul of the Congress, interesting Didactic and Industry Sessions will be provided and a Keynote lecture not to be missed by Professor Ismail Elalamy about “Virus and thrombosis”. Of particular interest as usual will be the joint session between EVF and AVF.

Let me now say a few words about the venue: Venice, one of the most beautiful cities all over the World and unique in its history.

Venice represents an example of human struggle in creating and preserving an amazing city against great adversities.

It seems rather curious in this pandemic period that the term “quarantine” was created in Venice almost seven centuries ago.

Moreover, did you know that one of the most famous greetings in the world “ciao” was born in Venice?

It is therefore to say “Ciao” to each of you that the European Venous Forum awaits you with your valuable contribution in Venice in June 2022.

*Oscar Maleti*  
EVF President and Local Chairman

*Andrew Nicolaides*  
Chairman of the EVF Board

## COMMITTEES

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Professor Oscar Maleti  
President, European Venous Forum

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Professor Roger Greenhalgh (UK)

Dr John Hobbs (UK)

Dr Christina Jeanneret (Switzerland)

Professor Lowell Kabnick (USA)

Professor Robert Kistner (USA)

Professor Dinos Lazarides (Greece)

Professor Miltos Lazarides (Greece)

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Professor Ioannis Tsolakis (Greece)

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Professor Zoltan Varady (Hungary)

Dr Thomas Wakefield (USA)



### **ANNUAL MEETINGS/PAST PRESIDENTS**

|                                          |                       |                            |
|------------------------------------------|-----------------------|----------------------------|
| Inaugural Meeting, 29 June – 1 July 2000 | Lyon, France          | Michel Perrin              |
| 2nd Meeting, 13-14 September 2001        | Rome, Italy           | Claudio Allegra            |
| 3rd Meeting, 14-16 June 2002             | Berlin, Germany       | Ulrich Schultz-Ehrenburg   |
| 4th Meeting, 27-29 June 2003             | Lisbon, Portugal      | Jose Fernandes e Fernandes |
| 5th Meeting, 25-27 June 2004             | Warsaw, Poland        | Arkadiusz Jawien           |
| 6th Meeting, 24-26 June 2005             | Crete, Greece         | Asterios Katsamouris       |
| 7th Meeting, 29 June-1 July 2006         | London, UK            | Alun Davies                |
| 8th Meeting, 29 June-1 July 2007         | Istanbul, Turkey      | Mehmet Kurtoglu            |
| 9th Meeting, 26-28 June 2008             | Barcelona, Spain      | Marc Cairols               |
| 10th Meeting, 5-7 June 2009              | Copenhagen, Denmark   | Neils Baekgaard            |
| 11th Meeting, 24-26 June 2010            | Antwerp, Belgium      | Marianne DeMaeseneer       |
| 12th Meeting, 30 June-3 July 2011        | Ljubljana, Slovenia   | Pavel Poredos              |
| 13th Meeting, 28-30 June 2012            | Florence, Italy       | Giovanni Mosti             |
| 14th Meeting, 27-30 June 2013            | Belgrade, Serbia      | Dragan Milic               |
| 15th Meeting, 26-28 June 2014            | Paris, France         | Jean-Luc Gillet            |
| 16th Meeting, 2-4 July 2015              | St Petersburg, Russia | Evgeny Shaydakov           |
| 17th Meeting, 7-9 July 2016              | London, UK            | Andrew Bradbury            |
| 18th Meeting, 29 June – 1 July 2017      | Porto, Portugal       | Armando Mansilha           |
| 19th Meeting, 28-30 June 2018            | Athens, Greece        | Athanasis Giannoukas       |
| 20th Meeting, 27-29 June 2019            | Zurich, Switzerland   | Dominik Heim               |
| 21st Meeting, 24-26 June 2021            | Virtual               | Imre Bihari                |

### **EUROPEAN VENOUS FOUNDATION**

The European Venous Foundation, a UK registered charity (number 1100372) has been established to promote research into the causes, effects, treatment and management of venous disease and to support the work of the European Venous Forum. Further details can be found from the EVF Office.

### **TRUSTEES**

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 Michel Perrin  
 Arkadiusz Jawien  
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### **EVF SECRETARIAT**

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 Email: admin@europeanvenousforum.org

### **EVF SECRETARIAT**

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 UB6 9ZN (UK)  
 Tel/Fax: +44 (0)20 8575 7044  
 Email: exhibition@europeanvenousforum.org

### **LOCAL SECRETARIAT**

Womblab Srl  
 Corso Giacomo Matteotti 38, 10121,  
 Torino, Italia  
 Direzione: Elena Sanguinetti  
 Amministrazione: Adalgisa Benvenuto  
 Direzione dell'evento: Giorgia Prono  
 Comunicazione digitale e web: Francesca Giordano, Ivan Menzio  
 E-mail: evf@womblab.com  
 T +39 011 4336307

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Sandeep Shah (UK)  
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Ramesh Tripathi (New Zealand)  
Dimitrios Tsiris (Greece)

Jean-Francois Uhl (France)  
Thomasz Urbanek (Poland)

Marianne Vandendriessche (Belgium)  
Spyros Vasdekis (Greece)  
Frederic Vin (France)

Kenneth Robert Ward (UK)  
Dean Wasserman (USA)  
Cees Wittens (The Netherlands)  
David Wright (UK )

Claudia Liliana Yattara-Baratti (Switzerland)

Mohamed Zahran (UK)  
Paolo Zamboni (Italy)  
Zaki Anas Zarka (UK)  
Krzysztof ZIAJA (Poland)  
Francesco Zini (Italy)  
Santiago Zubicoa (Spain)

## CONGRESS INFORMATION

### CONGRESS DATES AND TIMES

Thursday 30 June – Saturday 2 July 2022

### REGISTRATION

*Registration includes:*

- Admission to all areas of the meeting, including exhibition area and ePosters
- Access to Virtual platform
- Certificate of attendance with CME credits
- Access to recordings for six months

### CONGRESS LANGUAGE

The official language of the congress is English.

### CERTIFICATE OF ATTENDANCE

A certificate of attendance will be available upon completion of the Evaluation Form. CME points are also available for sessions viewed up to three months after the congress.

### ACCREDITATION

The conference has been accredited by the European Accreditation Council for Continuing Medical Education (EACCME®) for a maximum of 16 European CME credits (ECMEC®s).

### CHANGES

The Organisers reserve the right to adjust or change the programme as necessary.

## SCIENTIFIC PROGRAMME INFORMATION

### Short overview of the programme

The scientific programme commences on Thursday 30 June with a Video Session at 08.00 followed by the first abstract session on Venous Thromboembolism.

There are four didactic sessions organised jointly with the Italian College of Phlebology. The Prize winning papers from the American Venous Forum, American Vein and Lymphatic Society and the Japanese Society of Phlebology will take place on Friday 1 July at 17.30. Thirty abstracts of high scientific quality will be presented over 5 sessions. These were selected from over 110 abstracts submitted. In addition to the oral presentations, there are 40 ePoster presentations. The presentations will be available to view on screens situated in rooms B, C, E and F on the first floor of the venue.

The joint session, a Debate, between the European Venous Forum and the American Venous Forum will take place on Friday 1 July at 15.00.

We are pleased to welcome Profesor Ismail Elalamy, EVF Invited Lecturer 2022. His presentation “COVID-19 and Thrombosis: basis and management of an incendiary duality” will be given on Friday 1 July at 12.00.

### Information for presenters

All presentations must be formatted using PowerPoint. All presenters must bring their PowerPoint presentations on memory stick to the Slide Preview Desk, situated near the Registration Desk, at least 4 hours prior to presentation (or the previous evening for morning presentations).

Floor microphones are available in the Lecture Theatre. Delegates wishing to join in the discussion should stand by the nearest microphone and wait to be acknowledged by the Chairmen.

The official language of the symposium is English. All presentations, questions and discussion will be held in English. Translation to Italian is available.

Abstracts of the presentations can be found at the rear of the book page 1.

### Information for the EVF PRIZE

The EVF prize will be awarded to the best 10 minute communication according to originality and quality. Prizes will be awarded to 1st, 2nd and 3rd place.

The winner of the 1st prize is awarded a travelling grant to attend the annual meeting of the American Venous Forum in 2023. The top abstract will also present their paper at the forthcoming AVLS meeing and will receive a grant to attend. The three abstracts of the winners are sent to the Japanese Society of Phlebology who will select one and award a grant for presentation at the meeting in 2023.

### EVF ePoster Prize

The ePoster Prize will be awarded to the 3 best Poster presentations.

## FACULTY

|                          |             |                           |             |
|--------------------------|-------------|---------------------------|-------------|
| Agus, Giovanni           | Italy       | Lipari, Giovanni          | Italy       |
| Avgerinos, Efthymios     | Greece      | Longhi, Matteo            | Italy       |
| Baccellieri, Domenico    | Italy       | Lugli, Marzia             | Italy       |
| Baekgaard, Niels         | Denmark     | Maccio, Alberto           | Italy       |
| Bazzan, Mario            | Italy       | Maleti, Oscar             | Italy       |
| Benhomou, Albert Claude  | France      | Mansilha, Armando         | Portugal    |
| Bihari, Imre             | Hungary     | Mendoza, Erika            | Germany     |
| Black, Stephen           | UK          | Mosti, Giovanni           | Italy       |
| Boccardo, Francesco      | Italy       | Munari, Elisa             | Italy       |
| Branisteau, Daciana      | Romania     | Nicolaides, Andrew        | Cyprus      |
| Carrafello, Gianpaolo    | Italy       | O'Sullivan, Gerard        | Ireland     |
| Cavezzi, Attilio         | Italy       | Osvath, Kathleen          | USA         |
| Elalamy, Ismail          | France      | Pesavento, Raffaele       | Italy       |
| Giannoukas, Athanasios   | Greece      | Quarto, Gennaro           | Italy       |
| Gohel, Manjit            | UK          | Santoliquido, Angelo      | Italy       |
| Gutierrez, Lourdes Reina | Spain       | Stillo, Francesco         | Italy       |
| Heim, Dominik            | Switzerland | Urbanek, Tomasz           | Poland      |
| Kakkos, Stavros          | Greece      | van Rijn, Marie Josee     | Netherlands |
| Labropoulos, Nicos       | USA         | Vandendriessche, Marianne | Belgium     |
| Lanza, Gaetano           | Italy       | Viani, Marco              | Italy       |
| Lichtenberg, Michael     | Germany     | Villalta, Sabina          | Italy       |

## SCIENTIFIC PROGRAMME

### Oral Presentations

### THURSDAY 30 JUNE 2022

- 08.00-08.30 **Industry Video Session: See page XXIII**  
 (5 minute presentation, 5 minute discussion) 3 presentations
- 08.30-10.30 **Abstract Session 1: Venous Thromboembolism**  
 (10 minute presentation, 10 minute discussion)  
 Chairs: Oscar Maleti, Andrew Nicolaides
- 08.30-08.50 1.1 **Predictive value of cellular indices for adverse outcomes in VTE patients. Study from RIETE (Registro Informatizado Enfermedad tromboembólica) Registry.**  
 Fakiha Siddiqui<sup>1\*</sup>; Alfonso Tafur<sup>2</sup>; Mushtaq Hussain<sup>3</sup>; Alberto García-Ortega<sup>4</sup>; Pablo Demelo-Rodríguez<sup>5</sup>; José Antonio Nieto<sup>6</sup>; Esther Usandizaga<sup>7</sup>; Jawed Fareed<sup>8</sup>; Manuel Monreal<sup>9</sup>  
<sup>1</sup>Loyola University Chicago, Maywood, USA; <sup>2</sup>NorthShore University Health Systems, Skokie, USA; <sup>3</sup>Dow University of Health Sciences, Karachi, Pakistan; <sup>4</sup>Hospital Universitari i Politècnic La Fe, Valencia, Spain; <sup>5</sup>Hospital General Universitario Gregorio Marañón, Madrid, Spain; <sup>6</sup>Hospital General Virgen de la Luz, Cuenca, Spain; <sup>7</sup>Hospital Sant Joan Despí-Moïses Broggi, Barcelona, Spain; <sup>8</sup>Cardiovascular Research Institute, Loyola University Chicago, Maywood, USA; <sup>9</sup>Hospital Universitari Germans Trias i Pujol, Barcelona, Spain  
*Submitted for the EVF Prize*
- 08.50-09.10 1.2 **Treating acute, subacute, and chronic deep vein thrombosis using mechanical thrombectomy: Six-month outcomes from The United States CLOUT Registry.**  
 Nicolas Mouawad\*.  
 McLaren Health System, Bay City, USA
- 09.10-09.30 1.3 **High incidence of thrombosis in patients with severe COVID 19 infection: LMWH at intermediate doses does not reduce the risk of thrombosis but is associated with lower mortality.**  
 Marta Camats Terré<sup>\*</sup>; Teresa Solanich Valldaura; Granada Perea Duran; Luz Muñoz Marin; Rita Subirana Bofill; Anna Valle Beltran; Anna Artigas Soler; Kinu Reyes Kim; Anna Gasulla Rodríguez; Juan Gabriel Castro Ríos; Juan Carlos Oliva Morera  
 Parc Taulí Hospital Universitari, Sabadell, Spain
- 09.30-09.50 1.4 **The effects of post-thrombotic venous outflow obstruction on cardiac function during exercise.**  
 Rachael Morris<sup>1\*</sup>; Bram Ruijsink<sup>1</sup>; Richard Bruce<sup>1</sup>; Philip Marino<sup>2</sup>; Bhushkar Mukherjee<sup>2</sup>; Aimee Brame<sup>2</sup>; Reza Razavi<sup>1</sup>; Alberto Smith<sup>1</sup>; Stephen Black<sup>1</sup>  
<sup>1</sup>Kings College London, London, UK; <sup>2</sup>St Thomas' Hospital, London, UK  
*Submitted for the EVF Prize*
- 09.50-10.10 1.5 **Long-term results of tinzaparin for the treatment of superficial vein thrombosis of the lower limbs.**  
 Chrysanthi Papageorgopoulou<sup>\*</sup>; Konstantinos Nikolakopoulos; Spyros Papadoulas; Stavros Kakkos. University Hospital of Patras, Patras, Greece
- 10.10-10.30 1.6 **Development of an international standard set of outcome measures for patients with venous thromboembolism: A Report of The International Consortium For Health Outcomes Measurement (ICHOM) Venous Thromboembolism Working Group.**  
 Adam Gwozdz<sup>1\*</sup>; Cindy de Jong<sup>2</sup>; Luz Fialho<sup>3</sup>; Frieda Sossi<sup>3</sup>; Theerawich Likitabhorn<sup>4</sup>; Stephen Black<sup>1</sup>; Frederikus Klok<sup>2</sup>.  
<sup>1</sup>Academic Department of Vascular Surgery, School of Cardiovascular Medicine and Science, King's College, London, UK; <sup>2</sup>Department of Medicine, Thrombosis and Haemostasis, Leiden University Medical Center, Leiden, Netherlands; <sup>3</sup>International Consortium for Health Outcomes Measurement, London, UK; <sup>4</sup>International Consortium for Health Outcomes Measurement, Boston, USA  
*Submitted for the EVF Prize*

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10.30-11.00 | <b>Refreshments.</b><br><b>View ePoster Presentations.</b><br><b>Visit Exhibition</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 11.00-13.00 | <b>Abstract Session 2: Venous Thromboembolism</b><br>(10 minute presentation, 10 minute discussion)<br>Chairs: Stavros Kakkos, Raffaele Pesavento                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 11.00-11.20 | <b>2.1 Sulodexide as a complimentary drug on the management of acute deep venous thrombosis.</b><br>Erasto Aldrett Lee <sup>*1</sup> ; Nora Enid Lecuona Huet <sup>2</sup><br><sup>1</sup> Hospital Lomas de San Luis, San Luis Potosí, Mexico; <sup>2</sup> Hospital Lomas de San Luis, Mexico City, Mexico                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 11.20-11.40 | <b>2.2 Implementation of a direct oral anticoagulant perioperative interruption protocol and accuracy of the DOAC urine dipstick.</b><br>Guillermo Tafur <sup>*1</sup> ; Luis Paz Ríos <sup>2</sup> ; Thomas Gniadek <sup>3</sup> ; Jeanine Walenga <sup>4</sup> ; Jawed Fareed <sup>4</sup> ; Marisa Durante <sup>3</sup> ; Job Harenberg <sup>5</sup> ; Alfonso Tafur <sup>2</sup><br><sup>1</sup> Northwestern University, Evanston, USA; <sup>2</sup> Massachusetts General Hospital, Boston, USA; <sup>3</sup> NorthShore University Health System, Evanston, USA; <sup>4</sup> Loyola University Medical Center, Maywood, USA; <sup>5</sup> DOASENSE GmbH, Heidelberg University, Heidelberg, Germany<br><i>Submitted for the EVF Prize</i>                                       |
| 11.40-12.00 | <b>2.3 Readability of patient educational materials in venous thrombosis. Analysis of the 2021 ESVS guidelines and comparison with other medical societies information.</b><br>Enrique San Norberto <sup>*1</sup> ; Álvaro Revilla <sup>1</sup> ; José-Antonio Brizuela <sup>1</sup> ; Manuel Diez <sup>1</sup> ; James Taylor <sup>2</sup> ; Carlos Vaquero <sup>1</sup><br><sup>1</sup> Valladolid University Hospital, Valladolid, Spain; <sup>2</sup> Valencia General University Hospital, Valencia, Spain                                                                                                                                                                                                                                                                         |
| 12.00-12.20 | <b>2.4 Predictive role of blood cellular indices and endogenous glycosaminoglycans as determinants of inflammatory biomarkers in acute pulmonary embolism.</b><br>Fakiha Siddiqui <sup>*</sup> ; Bülent Kantarcıoglu; Amir Darki; Joseph Lewis; Trent Reed; Omer Iqbal; Walter Jeske; Jawed Fareed<br>Loyola University Chicago, Chicago, USA                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 12.20-12.40 | <b>2.5 Systematic review and meta-analysis of venous thromboembolism prophylaxis after endovenous varicose vein surgery.</b><br>Benedict Turner <sup>*</sup> ; Matthew Machin; Sara Jasionowska; Alun H Davies<br>Charing Cross Hospital, Imperial College London, London, UK<br><i>Submitted for the EVF Prize</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 12.40-13.00 | <b>2.6 Impact of standard catheter directed thrombolysis versus ultrasound assisted thrombolysis on total or subtotal pulmonary arterial occlusions in patients with pulmonary embolism. A secondary analysis of the SUNSET Trial.</b><br>Efthymios Avgerinos <sup>*1</sup> ; Elizabeth Andruska <sup>1</sup> ; Riyaz Bashir <sup>2</sup> ; Wisam Jaber <sup>3</sup> ; Joan Lacomis <sup>1</sup> ; Michael McDaniel <sup>3</sup> ; Charles Ross <sup>4</sup> ; Rabih Chaer <sup>1</sup><br><sup>1</sup> University of Pittsburgh Medical Center, Pittsburgh, USA; <sup>2</sup> Division of Cardiovascular Disease, Lewis Katz School of Medicine at Temple University, Philadelphia, USA; <sup>3</sup> Emory University, Atlanta, USA; <sup>4</sup> Piedmont Heart Center, Atlanta, USA |
| 13.00-14.00 | <b>View ePoster Presentations</b><br>Chair: Andrew Nicolaides, Erika Mendoza, Efthymios Avgerinos, Attilio CavezzI<br><b>Lunch</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 13.00-14.00 | <b>Industry Workshop: See page XXIII</b><br><b>Visit Exhibition</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 13.15-14.00 | <b>“Meet the Experts” Session</b><br>Chairs: Efthymios Avgerinos, Domenico Bacchellieri                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

**Iliac stenting: how I do it.**

Stephen Black (UK)

**Thermal vs Non-thermal ablation: when and how I do it.**

Manjit Gohel (UK)

14.00-15.00

**Industry Session 1: See page XXIII**

15.00-16.00

**Didactic Session 1: Advances in the management of acute DVT**

Chairs: Niels Baekgaard, Gianpaolo Carrariello

15.00-15.15

**Early Thrombus Removal: who, when and how.**

Gerard O'Sullivan (Ireland)

15.15-15.30

**Acute DVT complicating MT syndrome.**

Michael Lichtenberg (Germany)

15.30-15.45

**Why to be aggressive in young patient affected by DVT.**

Marzia Lugli (Italy)

15.45-16.00

**Which compression in acute DVT and how to apply.**

Giovanni Mosti (Italy)

16.00-16.30

**Refreshments.****View ePoster Presentations.****Visit Exhibition**

16.30-17.30

**Didactic Session 2: Advances in the management of chronic venous insufficiency**

Chairs: Athanasios Giannoukas, Giovanni Agus

16.30-16.45

**Hypodermitis, skin inflammation: how to treat.**

Lourdes Reina Gutierrez (Spain)

16.45-17.00

**How to measure PTS disease and outcomes after operative treatments.**

Sabina Villalta (Italy)

17.00-17.15

**Which pharmacological therapy after stenting.**

Mario Bazzan (Italy)

17.15-17.30

**Chronic venous disease and diabetic microangiopathy: pathophysiology and commonalities.**

Marie Josee van Rijn (Netherlands)

17.30-18.30

**Industry Session 2: See page XXIII**

## FRIDAY 1 JULY 2022

- 08.00-08.30      **Industry Video Session: See page XXIV**  
                       (5 minute presentations, 5 minute discussion) 3 presentation
- 08.30-10.30      **Abstract Session 3: Iliac occlusion and pelvic congestion syndrome, Epidemiology**  
                       (10 minute presentation, 10 minute discussion)  
                       Chairs: Dominik Heim, Gennaro Quarto
- 08.30-08.50      3.1 **Patency rates and predictors for re-intervention after stenting for acute or chronic deep vein thrombosis: a retrospective observational study.**  
                       Jay M. Bakas\*; Adriaan Moelker; Catherine van Montfrans; Marie Josee E. van Rijn  
                       Erasmus Medical Center, Rotterdam, Netherlands  
                       Submitted for the EVF Prize
- 08.50-09.10      3.2 **Identification of patients with outflow obstruction most likely to benefit from iliac stenting.**  
                       Fedor Lurie\*. Jobst Vascular Institute, Toledo, USA
- 09.10-09.30      3.3 **Hybrid ilio-femoral recanalization after injection for drug abuse obstruction: a single centre experience.**  
                       Elisa Munari\*; Marzia Lugli; Matteo Longhi; Oscar Maleti.  
                       Hesperia Hospital, Modena, Italy  
                       Submitted for the EVF Prize
- 09.30-09.50      3.4 **Endovascular treatment of pelvic congestive syndrome, literature review. Is pharmacomechanical ablation of gonadal veins an alternative to classic embolization?**  
                       Eliseo Candela Beltran\*.  
                       Hospital de Manises, Valencia, Spain  
                       Submitted for the EVF Prize
- 09.50-10.10      3.5 **Evolution of the epidemiology and management of chronic venous disease in the UK.**  
                       Safa Salim\*<sup>1</sup>; Mahsa Mazidi<sup>1</sup>; Roberto Fernandez Crespo<sup>1</sup>; Estelle Collin<sup>2</sup>; Sarah Onida<sup>1</sup>;  
                       Joanna Chiro<sup>1</sup>; Alun H Davies<sup>1</sup>.  
                       <sup>1</sup>Imperial College London, London, UK; <sup>2</sup>Servier, Paris, France  
                       Submitted for the EVF Prize
- 10.10-10.30      3.6 **Correlation amongst transvaginal and transabdominal duplex and CT angiogram for pelvic venous insufficiency and leg varicosties**  
                       Lourdes Reina Gutierrez\*<sup>1</sup>; Angel Sanchez Guerrero<sup>2</sup>; Luis Albeniz<sup>1</sup>; Jose Ignacio Fernandez Solares<sup>1</sup>; Agnieszka Nowak Tarnawska<sup>1</sup>; Carlos Barrio Rodriguez<sup>1</sup>; Angela Miguel Morrondo<sup>1</sup>; Aurora Florez-Gonzalez<sup>1</sup>; Alfonso Sanjuanbenito-Reina<sup>3</sup>; Jose Antonio Gonzalez-Fajardo<sup>2</sup>  
                       <sup>1</sup>Hospital Central de la Cruz Roja, Madrid, Spain; <sup>2</sup>Hospital Universitario <sup>12</sup> de Octubre, Madrid, Spain; <sup>3</sup>Universidad Autonoma, Madrid, Spain
- 10.30-11.00      **Refreshments.**  
**View ePoster Presentations.**  
**Visit Exhibition**
- 11.00-12.00      **Industry Session 3: See page XXIV**
- 12.00-12.30      **EVF Invited Lecture**  
                       Chair: Oscar Maleti (Italy)  
                       Introduction by Oscar Maleti
- 12.30-13.00      **COVID-19 and Thrombosis: basis and management of an incendiary duality.**  
                       Ismail Elalamy (France)
- 12.30-13.00      **Didactic Session 3: Guidelines of Chronic Venous Disease**  
                       Chairs: Tomasz Urbanek, Niels Baekgaard



|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12.30-12.45 | <b>Comparison of recent guidelines for Chronic Venous Disease.</b><br>Dominik Heim (Switzerland)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 12.45-13.00 | <b>What is not in the Guidelines.</b><br>Imre Bihari (Hungary)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 13.00-14.00 | <b>Lunch</b><br><b>View ePoster Presentations</b><br>Chairs: Andrew Nicolaides, Erika Mendoza, Eftymios Avgerinos, Attilio Cavezzi<br>See separate page for programme.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 13.15-14.00 | <b>Industry Workshop: See page XXIV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 13.00-14.00 | <b>Visit Exhibition</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 14.00-15.00 | <b>EVF Annual General Meeting (Members Only)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 15.00-16.00 | <b>Joint EVF/AVF Session Debate:</b><br>Chairs: Marianne Vandendriessche, Lugli Marzia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 15.00-15.30 | <b>Evaluation of patients with CVI should include pelvic venous imaging in addition to lower extremity imaging.</b><br>For: Kathleen Ozsvath (USA), AVF<br>Against: Armando Mansilha (Portugal) EVF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 15.30-16.00 | <b>Venoactive drugs are useful in the management of patients with chronic venous disease in all stages of CEAP.</b><br>For: Andrew Nicolaides, EVF<br>Against: Nicos Labropoulos (AVF)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 16.00-16.30 | <b>Refreshments</b><br><b>Visit ePoster Presentations</b><br><b>Visit Exhibition</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 16.30-17.30 | <b>Industry Session 4: See page XXIV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 17.30-18.30 | <b>Prize winning papers from the Japanese Society of Phlebology, American Venous Form and American Vein and Lymphatic Society</b><br>(10 minute presentation, 10 minute discussion)<br>Chairs: Erika Mendoza, Angelo Santoliquido                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 17.30       | <b>Pr1 Incidence and Clinical Features of Venous Thromboembolism in Hospitalized Patients with COVID-19 in Japan</b><br>Yugo Yamashita: Department of Cardiovascular Medicine, Graduate School of Medicine, Kyoto University, Kyoto, Japan<br>Norikazu Yamada: Department of Cardiology, Kuwana City Medical Center, Kuwana, Japan<br>Mo Makoto: Department of Cardiovascular Surgery, Yokohama Minami Kyosai Hospital, Kanagawa, Japan<br><i>JSP Prize paper</i>                                                                                                                                                                                                                                                                        |
| 17.50       | <b>Pr2 Is Oedema Underrecognized in Superficial Venous Disease Patients?</b><br>Sophia C. Weldon, Christopher Pittman, Stachyse Stanis, Anna M. Wright.<br>Vein911 Vein Treatment Centers, Tampa, Florida, USA<br><i>AVLS Prize Paper</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 18.10       | <b>Pr3 Markers of pulmonary hypertension in patients with submassive pulmonary embolism undergoing catheter thrombolysis compared to anticoagulation alone: a secondary analysis of the SUNSET sPE trial.</b><br>Andraska EA <sup>1</sup> , Bonaroti J <sup>2</sup> , Zhang Y <sup>3</sup> , Rivera-Lebron B <sup>3</sup> , Chaer RA <sup>1</sup> , Avgerinos ED <sup>1</sup><br><sup>1</sup> UPMC, Department of Surgery, Division of Vascular Surgery; Pittsburgh, Pennsylvania, United States, <sup>2</sup> UPMC, Department of Surgery; Pittsburgh, Pennsylvania, USA; <sup>3</sup> UPMC, Department of Medicine, Division of Pulmonary, Allergy and Critical Care Medicine; Pittsburgh, Pennsylvania, USA<br><i>AVF Prize paper</i> |

## SATURDAY 2 JULY 2022

- 08.30-10.30      **Abstract Session 4: Compression, microcirculation, telangiectasia, varicose veins**  
 (10 minute presentation, 10 minute discussion)  
 Chairs: Imre Bihari, Marco Viani
- 08.30-08.50    4.1    **A randomized trial of moderate (class 2), high (class 3) and very high (class 4) elastic compression in the prevention of recurrence of venous ulceration.**  
 Dragan Milic<sup>\*1</sup>; Sasa Zivic<sup>2</sup>; Milan Lazarevic<sup>1</sup>; Dragan Bogdanovic<sup>3</sup>; Bekim Ademi<sup>4</sup>; Isidora Milic<sup>5</sup>.  
<sup>1</sup>University Clinical Centre Nis, Medical school University of Nis, Nis, Serbia; <sup>2</sup>University Clinical Centre Nis, Nis, Serbia; <sup>3</sup>University of Novi Pazar, Novi Pazar, Serbia; <sup>4</sup>Clinical Centre Pristina, Kosovo\*; Presevo, Serbia; <sup>5</sup>Medical school University of Nis, Nis, Serbia
- 08.50-09.10    4.2    **COmpressioN Following Endovenous Treatment of Incompetent Varicose Veins (CONFETTI).**  
 A Belramman<sup>\*</sup>; R Bootun; TRA Lane; CV Riga; C Aylwin; J Shalhoub; U Jaffer; C Bicknell; AH Davies  
 Imperial College London, London, UK  
*Submitted for the EVF Prize*
- 09.10-09.30    4.3    **Microcirculatory alterations in chronic venous disorder -- Observation in C0s patients (CEAP Classification).**  
 Eliete Bouskela<sup>\*1</sup>; Bernardo Cunha Senra Barros<sup>2</sup>; Carlos Eduardo Virginio Magalhães<sup>1</sup>; Daniel Alexandre Bottino<sup>1</sup>.  
<sup>1</sup>State University of Rio de Janeiro, Rio de Janeiro, Brazil; <sup>2</sup>Federal University of Rio de Janeiro State, Rio de Janeiro, Brazil
- 09.30-09.50    4.4    **Prevalence of chronic venous disease in primary care centers in Azerbaijan: The VEINSCOPE Study.**  
 Farhad Aghayev<sup>\*</sup>  
 Baku Phlebological Center, Baku, Azerbaijan
- 09.50-10.10    4.5    **Frequency of postoperative neuropathies after phlebectomy and minimal invasive treatment methods for varicose veins**  
 Anna Üdre<sup>\*1</sup>; Solvita Berzina<sup>2</sup>; Patricija Ivanova<sup>3</sup>; Ints Üdris<sup>3</sup>  
<sup>1</sup>Riga East Clinical University Hospital, University of Latvia, Riga, Latvia; <sup>2</sup>Riga East Clinical University Hospital, Riga, Latvia; <sup>3</sup>Riga East Clinical University Hospital, Baltic Vein Clinic, University of Latvia, Riga, Latvia  
*Submitted for the EVF Prize*
- 10.10-10.30    4.6    **N-butyl-2-cyanoacrylate glue ablation as a single-catheter procedure for the great saphenous vein insufficiency treatment - 5-years follow-up.**  
 Michał Juszynski<sup>\*</sup>; Jan Wawszcak; Grzegorz Madycki.  
 Centre of Postgraduate Medical Education, Warsaw, Poland  
*Submitted for the EVF Prize*
- 10.30-11.00      **Refreshments. View ePoster Presentations and visit Exhibition**
- 11.00-13.00      **Abstract Session 5: Congenital malformation, lymphatics, complications of thrombolysis, obesity, AI Guidance**  
 (10 minute presentation, 10 minute discussion)  
 Chairs: Armando Mansilha, Francesco Stillo
- 11.00-11.20    5.1    **Remote expert DVT triaging of novice-user compression sonography with AI guidance.**  
 Jonas Oppenheimer<sup>1</sup>; Ramin Mandegaran<sup>2</sup>; Sven Mischkeiwitz<sup>2</sup>; Fouad Al Noor<sup>2</sup>; Andrea Adler<sup>4</sup>; Stephan Singöhl<sup>4</sup>; Matthias Heinrich<sup>5</sup>; Bernhard Kainz<sup>6</sup>; Stavros Spiliopoulos<sup>7</sup>; George Geroulakos<sup>7</sup>; Efthymios Avgerinos<sup>\*8</sup>  
<sup>1</sup>ThinkSono GmbH, Potsdam, Germany; <sup>2</sup>Central Alberta Medical Imaging Services, Red Deer, Canada; <sup>3</sup>ThinkSono GmbH, London, UK; <sup>4</sup>Klinikum Magdeburg, Magdeburg, Germany;  
<sup>5</sup>University of Lübeck, Lübeck, Germany; <sup>6</sup>FAU Erlangen-Nürnberg, Erlangen, Germany; <sup>7</sup>Attikon University Hospital, National and Kapodistrian University of Athens, Athens, Greece

- 11.20-11.40 5.2 **Benefit of an adjustable compression system for the reduction of oedema (AKRO study) - preliminary results.**  
 Gabriele Faerber<sup>\*1</sup>; Birgit Kahle<sup>2</sup>; Tobias Hirsch<sup>2</sup>; Andrzej Szuba<sup>4</sup>  
<sup>1</sup>Zentrum für Gefäßmedizin, Hamburg, Hamburg, Germany; <sup>2</sup>Universitäts-Klinikum Schleswig-Holstein Campus Lübeck, Luebeck, Germany; <sup>3</sup>Praxis für Innere Medizin und GEfaesskrankheiten, Halle, Germany; <sup>4</sup>Uniwersytecki Szpital Kliniczny im.Jana Mikulicza-Radeckiego we Wrocławiu, Wroclaw, Poland
- 11.40-12.00 5.3 **Effect of ruscus extract, hesperidin methyl chalcone and vitamin C on human lymphatic smooth muscle cells contraction.**  
 Nicolas Monjotin<sup>\*1</sup>; Guillaume Tenca<sup>2</sup>  
<sup>1</sup>Castres, France; <sup>2</sup>QIMA Life Sciences, Gencay, France
- 12.00-12.20 5.4 **Peri-operative management of anticoagulation and bleeding in patients undergoing CDT for acute iliofemoral DVT.**  
 Katherine Creeper<sup>\*</sup>; Katie White; Stephen Black; Narayanan Thulasidasan; Karen Breen. Guy's and St Thomas' NHS Foundation Trust, London, UK
- 12.20-12.40 5.5 **A systematic review of compression following treatment of superficial venous incompetence**  
 Abduraheem Mohamed<sup>1</sup>; Sundus Mohamed<sup>2</sup>; Simran Thadani<sup>3</sup>; Misha Sidapra<sup>1</sup>; George Smith<sup>1</sup>; Ian Chetter<sup>1</sup>; Daniel Carradice<sup>1</sup>  
<sup>1</sup>Hull University Teaching Hospitals, Hull, UK; <sup>2</sup>Leeds University Teaching Hospitals, Leeds, UK;  
<sup>3</sup>Hull York Medical School, Hull, UK  
*Submitted for the EVF Prize*
- 12.40-13.00 5.6 **Stenting of non-thrombotic iliac vein lesions: long-term patency rate**  
 Matteo Longhi<sup>\*</sup>; Marzia Lugli; Elisa Munari; Oscar Maleti  
 Hesperia Hospital, Modena, Italy  
*Submitted for the EVF Prize*
- 13.00-14.00 **Didactic Session 4: Management of lymphatic disorders**  
 Chairs: Oscar Maleti, Albert Claude Benhomou,
- 13.00-13.15 **Quality of life after vascularised lymph node transfer or lymphovenous anastomosis in patients with lower limb lymphoedema - a systematic review.**  
 Sarah Onida (UK)
- 13.15-13.30 **Lymphoscintigraphic pattern in CEAP 0s: Role Of deep lymphatic circulation.**  
 Alberto Macciò (Italy)
- 13.30-13.45 **Role of the vein in the long-term patency of microsurgical lymphatic-venous bypass (LVB) surgery in lymphedema treatment.**  
 Francesco Boccardo (Italy)
- 13.45-14.00 **Differential diagnosis of venous ulcer. If it is not a venous ulcer, what is it?**  
 Daciana Branisteau (Romania)
- 14.00 **Presentation of EVF Prizes.**  
 Oscar Maleti
- Presentation of 2023 Meeting.**  
 Erika Mendoza
- End of meeting**

## ELECTRONIC PRESENTATIONS

### ePOSTERS

Room: B, C, E, F – first floor

Chairperson(s):

Andrew Nicolaides, Cyprus, Efthymios Avgerinos, Greece, Erika Mendoza, Germany, Attilio Cavezzi, Italy

**eP01 Minimally invasive procedures for pelvic origin varicose veins**

Aleksandra Jaworucka-Kaczorowska\*

Jaworucci Surgery and Gynecology Center, Gorzów Wlkp., Poland

**eP02 Time driven activity based costing for capturing the complexity of healthcare processes: the case of management of patients with deep vein thrombosis and leg ulcers**

Carla Rognoni<sup>1\*</sup>; Alessandro Furnari<sup>1</sup>; Marzia Lugli<sup>2</sup>; Oscar Maleti<sup>2</sup>; Alessandro Greco<sup>3</sup>;

Rosanna Tarricone<sup>4</sup>

<sup>1</sup>SDA Bocconi School of Management, Milan, Italy; <sup>2</sup>National Reference Training Center in Phlebology (NRTCP), Vascular Surgery - Cardiovascular Dept., H, Modena, Italy; <sup>3</sup>Centro Ulcere Cutanea, ASL Frosinone, Frosinone, Italy, Frosinone, Italy; <sup>4</sup>Department of Policy Analysis and Public Management, Bocconi University, Milan, Italy, Milan, Italy

**eP03 Risk of recurrent thromboembolic events in patients with superficial vein thrombosis treated with intermediate doses of Tinzaparin**

Christos Karathanos<sup>1\*</sup>; Konstantinos Spanos<sup>1</sup>; Vasilios Saleptsis<sup>1</sup>; Christos Ioannou<sup>2</sup>; Spiridon Vasdekis<sup>3</sup>;

Stavros Kakkos<sup>4</sup>; Athanasios Giannoukous<sup>1</sup>

<sup>1</sup>University General Hospital of Larissa, Larissa, Greece; <sup>2</sup>University Hospital of Heraklion, Heraklion, Greece;

<sup>3</sup>University Hospital Attikon, Athens, Greece; <sup>4</sup>University Hospital of Patra, Patra, Greece

**eP04 Effectiveness of Cryo-Laser and Cryo-Sclerotherapy (CLACS) compared with micro sclerotherapy for telangiectasia**

Dmitrii Rosukhovskii\*

FSBSO Institute of Experimental Medicine, St Petersburg, Russia

**eP05 Radiofrequency ablation for axial reflux associated with foam sclerotherapy for varicosities in one-step approach: a prospective cohort study comprising large diameters saphenous veins**

Douglas Poschinger-Figueiredo\*, Monica Rochedo Mayall; Clovis Bordini Racy Filho; Yanna Thomaz;

Eduardo de Oliveira Rodrigues Neto; Lívia Ramos Carvalho Marchon; Cristiane Ferreira Araujo-Gomes;

Carlos Eduardo Virginio-Magalhães

Rio de Janeiro State University (UERJ - HUPE), Rio de Janeiro, Brazil

**eP06 The nature of the varicose vein disease recurrence after endovasal thermal ablation interventions.**

Elena Burleva<sup>\*1</sup>; Sergey Belentsov<sup>2</sup>; Maria Onokhina<sup>1</sup>; Sergey Tyurin<sup>3</sup>

<sup>1</sup>Ural State Medical University, Yekaterinburg, Russia; <sup>2</sup>Angioline Medical Center, Yekaterinburg, Russia;

<sup>3</sup>OLMED Medical Center, Yekaterinburg, Russia

**eP07 Endovenous thermal ablation for treatment of symptomatic varicose veins during summer time: hot or not**

Elisa Teruzzi<sup>\*1</sup>; Patricia Boesch<sup>2</sup>; Manuel Hofer<sup>3</sup>; Daniel Staub<sup>4</sup>; Hak Hong Keo<sup>5</sup>; Heiko Uthoff<sup>3</sup>

<sup>1</sup>Gefaesspraxis am See - Lakeside Vascular Center Lucerne, Lucerne, Switzerland; <sup>2</sup>Gefässpraxis am See - Lakeside Vascular Center, Lucerne, Switzerland; <sup>3</sup>Gefaesspraxis am See - Lakeside Vascular Center, Lucerne, Switzerland; <sup>4</sup>University Hospital Basel, Basel, Switzerland; <sup>5</sup>Vascular Institute Central Switzerland, Aarau, Switzerland

**eP08 9-Year-long analysis of adverse events of sclerotherapy in a single center (2013-2022).**

Enric Roche<sup>\*1</sup>; Cristina Marqués<sup>2</sup>

<sup>1</sup>Hospital Universitari Sagrat Cor, Barcelona, Spain; <sup>2</sup>Clinica vascular Barcelona, Barcelona, Spain



- eP09 **The simulator for elastic bandage applying skills development**  
Ernest Shcheglov<sup>\*1</sup>; Natalia Alontseva<sup>2</sup>  
<sup>1</sup>Petrozavodsk State University, Petrozavodsk, Russia; <sup>2</sup>First Aid Hospital, Petrozavodsk, Russia
- eP10 **The single center investigation of knee phleboarthrosis patients quality of life**  
Ernest Shcheglov<sup>\*1</sup>; Natalia Alontseva<sup>2</sup>  
<sup>1</sup>Petrozavodsk State University, Petrozavodsk, Russia; <sup>2</sup>First Aid Hospital, Petrozavodsk, Russia
- eP11 **Utilization of glue adhesives for obliteration of the principal protuberant varicosities. The multicenter comparative investigation**  
Evgeny Shaidakov<sup>\*1</sup>; Alexander Sannikov<sup>2</sup>; Sergey Belentsov<sup>3</sup>  
<sup>1</sup>National Investigation Center, Saint Petersburg, Russia; <sup>2</sup>University, Vladimir, Russia; <sup>3</sup>MC Angio Line, Ekaterinburg, Russia
- eP12 **Emerging mechanisms of sulodexide as anti-etiota agent in vascular biology: a modulator of the thrombotic, inflammatory and proteolytic processes**  
Ferdinando Mannello<sup>\*</sup>; Rosanna Maniscalco; Sabrina Burattini; Chiara Della Franca; Daniela Ligi  
University of Urbino Carlo Bo, Urbino, Italy
- eP13 **Endovenous thermal ablation for treatment of symptomatic varicose veins - occupational effects on procedure outcomes**  
Manuel Hofer<sup>\*1</sup>; Patricia Boesch<sup>1</sup>; Elisa Teruzzi<sup>1</sup>; Daniel Staub<sup>2</sup>; Hak Hong Keo<sup>3</sup>; Heiko Uthoff<sup>1</sup>  
<sup>1</sup>Gefaesspraxis am See - Lakeside Vascular Center, Lucerne, Switzerland; <sup>2</sup>University Hospital Basel, Basel, Switzerland; <sup>3</sup>Vascular Institute Central Switzerland, Aarau, Switzerland
- eP14 **Long-term results of minimally invasive deep venous reflux correction in patients with post-thrombotic syndrome**  
Igor Suchkov<sup>\*</sup>; Roman Kalinin; Nina Mzhavanadze; Ruslan Khashumov; Ivan Shanaev  
Ryazan State Medical University, Ryazan, Russia
- eP15 **Duplex ultrasound parameters associated with the severity of clinical manifestations in patients with varicose veins**  
Igor Suchkov<sup>\*1</sup>; Roman Kalinin<sup>1</sup>; Nina Mzhavanadze<sup>1</sup>; Victor Korbut<sup>2</sup>; Ivan Shanaev<sup>1</sup>  
<sup>1</sup>Ryazan State Medical University, Ryazan, Russia; <sup>2</sup>Ryazan Regional Clinical Cardiological Dispensary, Ryazan, Russia
- eP16 **The effect of pregnancy on laser crossectomy results**  
Imre Bihari<sup>\*</sup>  
Semmelweis University St Rokus Clinical Block, Budapest, Hungary
- eP17 **The association between duration of anticoagulation therapy and the risk of venous thromboembolism in patients with lower limb superficial venous thrombosis: a systematic review and meta-analysis**  
Kirill Lobastov<sup>\*</sup>; Ilya Schastlivtsev; Astanda Bargandzhiya  
Pirogov Russian National Research Medical University, Moscow, Russia
- eP18 **Caprini score predicts endothermal heat-induced thrombosis, but not symptomatic venous thromboembolism after superficial vein ablation**  
Maria Shaldina<sup>\*1</sup>; Athena Matveeva<sup>2</sup>; Anna Kovalchuk<sup>2</sup>; Denis Borsuk<sup>3</sup>; Ilya Schastlivtsev<sup>2</sup>; Leonid Laberko<sup>2</sup>; Alexey Fokin<sup>1</sup>; Kirill Lobastov<sup>2</sup>  
<sup>1</sup>South Ural State Medical University, Chelyabinsk, Russia; <sup>2</sup>Pirogov Russian National Research Medical University, Moscow, Russia; <sup>3</sup>Clinic of phlebology "VenoClinica", Chelyabinsk, Russia
- eP19 **Development of end-to-end vein anastomosis technology with high-frequency electric current**  
Victor Chernyak<sup>\*1</sup>; Kostiantyn Karpenko<sup>2</sup>  
<sup>1</sup>Taras Shevchenko National University, Kyiv, Ukraine; <sup>2</sup>National Military Medical Center, Kyiv, Ukraine
- eP20 **Technique, safety, and early efficacy of endovenous laser ablation for morphologically complex recurrences of the small saphenous vein (SSV)**  
Lars Müller<sup>\*</sup>; Syrus Karsai; Jens Alm  
Dermatologikum Hamburg GmbH, Hamburg, Germany

- eP21 **Characteristics and outcomes of catheter-directed thrombolysis protocols for deep venous thrombosis of the lower extremities - a systematic review and meta-analysis**  
 Luis Duarte-Gamas<sup>\*1</sup>; Filipa Jácome<sup>1</sup>; Lara Dias<sup>1</sup>; João Rocha-Neves<sup>1</sup>; Kak K. Yeung<sup>2</sup>; Niels Baekgaard<sup>3</sup>; Marina Dias-Neto<sup>4</sup>  
<sup>1</sup>Centro Hospitalar Universitário São João, Porto, Portugal; <sup>2</sup>Amsterdam University Medical Center, Amsterdam, Netherlands; <sup>3</sup>Gentofte Hospital and Rigshospitalet, Copenhagen, Denmark; <sup>4</sup>Faculty of Medicine of Porto, Porto, Portugal
- eP22 **Comparison of radiofrequency ablation (RFITT) and glue chemical ablation (GCA) for incompetence of vena saphena magna et parva: a single center experience.**  
 Maria Rosa Dassatti; David Mazzoni; Stefan Haumer\*  
 Krankenhaus Schlanders, Schlanders (Bz), Italy
- eP23 **Epigenome-wide changes in the cell layers of the vein wall, when exposing the venous endothelium to oscillatory shear stress**  
 Mariya A. Smetanina<sup>\*1</sup>; Valeria A. Korolenya<sup>1</sup>; Alexander E. Kel<sup>2</sup>; Ksenia S. Sevostyanova<sup>1</sup>; Konstantin A. Gavrilov<sup>1</sup>; Andrey I. Shevela<sup>1</sup>; Maxim L. Filipenko<sup>1</sup>  
<sup>1</sup>Institute of Chemical Biology and Fundamental Medicine (ICBFM) SB RAS; Novosibirsk State University, Novosibirsk, Russia; <sup>2</sup>geneXplain GmbH, Wolfenbüttel, Germany
- eP24 **Patients' and physicians' perspectives about the impact of chronic venous disease (CVD) on quality of life**  
 Fabricio Rodrigues Santiago<sup>\*1</sup>; Jorge Ulloa<sup>2</sup>; Catherine Régnier<sup>3</sup>; Emilie Braund<sup>4</sup>; Sergio Gianesini<sup>5</sup>  
<sup>1</sup>Federal University of Goiás, Goiás, Brazil; <sup>2</sup>Vascular Foundation, Santa Fé de Bogota, Bogota, Colombia; <sup>3</sup>Servier International, Suresnes, France; <sup>4</sup>Research Partnership Ltd, London, UK; <sup>5</sup>University of Ferrara, Italy
- eP25 **A clinical trial in chronic venous disease comparing MPFF 500 mg twice daily to a new once daily chewable tablet. the CHEWY study.**  
 Armando Mansilha<sup>\*1</sup>; Arnaud Lucien<sup>2</sup>; Alexandre Kirienko<sup>3</sup>  
<sup>1</sup>University of Porto - Faculty of Medicine, Porto, Portugal; <sup>2</sup>Institut de Recherches Internationales Servier, Suresnes, France; <sup>3</sup>N.I. Pirogov's Russian National Research Medical University, Moscow, Russia
- eP26 **Effect of different treatment options on biomarkers of venous inflammation in patients with varicose veins**  
 Igor A Suchkov; Roman E Kalinin; Aleksey A Kamaev; Nina Mzhavanadze\*  
 Ryazan State Medical University, Ryazan, Russia
- eP27 **Beneficial effect of micronized purified flavonoid fraction (MPFF) in an experimental model of chronic venous disease associated with reduction in vein wall tension**  
 Eliete Bouskela<sup>\*1</sup>; Vanessa Blanc-Guillemaud<sup>2</sup>; Fatima Z.G.A. Cyrino<sup>1</sup>; Eric Mayoux<sup>2</sup>  
<sup>1</sup>Universidade do Estado do Rio de Janeiro (UERJ), Rio de Janeiro, Brazil; <sup>2</sup>Institut de Recherches Internationales Servier, Suresnes, France
- eP28 **Sulodexide improves capillary blood flow and the quality of life in patients with Raynaud's syndrome.**  
 Michał Juszynski\*; Grzegorz Madycki; Piotr Glinicki  
 Centre of Postgraduate Medical Education, Warsaw, Poland
- eP29 **Segmental occlusion after cyanoacrylate adhesive closure for saphenous vein reflux prevents the recurrence of symptoms**  
 Naoki Sakakibara<sup>\*1</sup>; Rie Yagi<sup>2</sup>; Tomohiro Imai<sup>3</sup>; Minoru Tabata<sup>2</sup>  
<sup>1</sup>Edogawa Hospital, Tokyo, Japan; <sup>2</sup>Juntendo University graduate school of Medicine, Tokyo, Japan; <sup>3</sup>Tokyo Vascular & Vein Clinic, Tokyo, Japan
- eP30 **Impact of surgical deprogramming and containment on the outcome of chronic venous disease during the Covid-19 containment period in the year 2020.**  
 Nicolas Néaume<sup>\*1</sup>; Matthieu Josnin<sup>2</sup>  
<sup>1</sup>Société Française de Phlébologie, Toulouse, France; <sup>2</sup>Société Française de Phlébologie, La Roche sur Yon, France



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- eP31 **The use of parnapanarin sodium for treatment of superficial vein thrombosis during pregnancy.**  
Olga Dzhenina<sup>\*1</sup>; Vadim Bogachev<sup>2</sup>  
<sup>1</sup>First Phlebological Centre, Moscow, Russia; <sup>2</sup>Russian National Research Medical University Named After N.I.Pirogov, Moscow, Russia
- eP32 **Perforator veins cyanoacrylate obliteration in the mesofascial segment in the treatment of long standing venous ulcers.**  
Pavel Turkin<sup>\*</sup>; Boris Boldin; Vadim Bogachev; Anna Slesareva  
Pirogov Russian National Research Medical University (Pirogov Medical University), Moscow, Russia
- eP33 **Minimally invasive techniques for the treatment of venous malformation**  
Sergey Sapelkin<sup>\*</sup>; Natalya Druzhinina; Andrey Chupin; Irina Timina  
The National Medical Research Center of Surgery n.a. A.V. Vishnevsky, Moscow, Russia
- eP34 **Features of the clinical course of chronic venous insufficiency in patients with morbid obesity (BMI >40kg/m<sup>2</sup>)**  
Alexander Khitaryan<sup>\*1</sup>; SS Burtsev<sup>2</sup>; AA Orekhov<sup>2</sup>; KS Veliev<sup>2</sup>; AA Ledenev<sup>2</sup>  
<sup>1</sup>Rostov State Medical University, Rostov-on-Don, Russia; <sup>2</sup>Clinical Hospital Railway-Medicine, Rostov-on-Don, Russia
- eP35 **Radial laser therapy with 1940 nm compared to 1470 nm - what makes the difference?**  
Thomas Weiler<sup>\*</sup>  
Venenzentrum Pforzheim, Pforzheim, Germany
- eP36 **Venous disorders as an occupational disease: data, pathophysiology, and modification strategies**  
Tobias Hirsch<sup>\*1</sup>; Uwe Wahl<sup>2</sup>  
<sup>1</sup>Practice for Internal Medicine and Vascular Diseases, Halle, Germany; <sup>2</sup>BG Hospital Bergmannstrost Halle, Halle, Germany
- eP37 **Angioscopic evaluation after venous stents.**  
Yuji Hoshino<sup>\*</sup>; Hiroyoshi Yokoi  
Fukuoka Sanno Hospital, Fukuoka, Japan
- eP38 **Prevalence of deep vein disease in patients with chronic venous insufficiency: a pragmatic clinical study**  
Viswanath Atreyapurapu<sup>\*</sup>; Rahul Agarwal; Pradeep Burli; Prem chand Gupta; Gnaneswar Atturu  
Care Hospitals , Hyderabad, India
- eP39 **Withdrawn**
- eP40 **Bull-Horn venous injuries in popular celebrations: a 40-years retrospective analysis**  
Enrique San Norberto<sup>\*1</sup>; Álvaro Revilla<sup>1</sup>; José-Antonio Brizuela<sup>1</sup>; Manuel Diez<sup>1</sup>; James Taylor<sup>2</sup>; Carlos Vaquero<sup>1</sup>  
<sup>1</sup>Valladolid University Hospital, Valladolid, Spain; <sup>2</sup>Valencia General Hospital, Valencia, Spain

## INDUSTRY SUPPORTED SESSIONS

### THURSDAY, JUNE 30, 2022

08.00-08.30

#### **Industry Video Session.**

(5 minute presentation, 5 minute discussion)

3 presentations

Chair: Marzia Lugli

**An innovative mechano-chemical device for saphenous insufficiency ablation:  
how to do it**

Presenter to be confirmed (Balmed)

**Double independent heating elements in a single RF catheter in saphenous  
ablation**

Luca Scaramuzzino (Bard)

**Saphenous Laser ablation: technical evolution in 1470 nm**

Paolo Tamellini (Eufoton)

13.00-14.00

#### **Inari Workshop. Room H, level 1**

Treating the full range of DVT Chronicity - the international experience with the ClotTriever® System.

14.00-15.00

#### **Servier**

Symptoms' relief for better quality of life in CVD: Patients' and Physicians' perspectives

Chair: Oscar Maleti (Italy)

**Listening to the patient's voice.**

Oscar Maleti (Italy)

**Assessing quality of life in CVD: An innovative approach.**

Fabricio Santiago (Brazil)

**Improving CVD patient care: New evidence from clinical trials to real life.**

Fedor Lurie (USA)

Daciana Branisteanu (Romania)

**Optimizing the decision making in CVD management.**

Jorge H. Ulloa (Colombia)

17.30-18.30

#### **Boston Scientific**

Interventional options for Venous patients: an interactive case based session

Chair: Marzia Lugli (Italy)

**Diagnostic and treatment dilemmas in Venous - How and when to Intervene**

Mert Dumantepe

**Importance of IVUS in Venous treatment.**

Matteo Longhi (Italy)

**Economic Impact of Treatment**

Carla Rognoni (Italy)



## FRIDAY, JULY 1, 2022

08.00-08.30

### Industry Video Session.

(5 minute presentation, 5 minute discussion)

3 presentations

Chair: Giovanni Lipari (Italy)

#### Cava confluence reconstruction: how to do it

Matteo Longhi

#### Wireless air-plethysmography: a new technique of examination

Marzia Lugli

#### Stenting below the inguinal ligament: how to do it

Elisa Munari

11.00-12.00

### Alfasigma

#### Comorbidities in Venous Diseases

Chair: Andrew Nicolaides, Armando Mansilha

#### Diabetic challenge in CVD and PTS

Tomasz Urbanek (Poland)

#### Comorbidities impact on thrombotic risk: the netosis factor.

Ferdinando Mannello (Italy)

#### Long COVID in Venous Diseases

Alejandro Gonzalez Ochoa (Mexico)

13.15-14.00

### Cardinal Health

#### The Role of Intermittent Pneumatic Compression in the Prevention of VTE

Chair: Eleftheria Pervolaraki

13.15

#### Current practice and guidelines on the use of IPC

Andrew Nicolaides (Cyprus)

13.27

#### The value of combined modalities in the latest Cochrane meta-analysis

Stavros Kakkos (Greece)

13.39

#### Discussion

16.30-17.30

### Pierre Fabre

#### What's new in CVD management : from early-stage to advanced disease

Chair Marzia Lugli (Italy)

#### New features in CVD diagnosis:

#### How plethysmography can complement Ultrasound

Andrew Nicolaides (Cyprus)

#### How to evaluate microcirculatory changes in CVD

Eliete Bouskela (Brazil)

#### Treatment innovations:

#### Innovation in venous leg ulcer treatment

Arkadiusz Jawien (Poland)

#### Updated recommendations of venous guidelines on the pharmacological treatment for CVD patients

Stavros Kakkos (Greece)

#### Discussion



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## BOOK OF ABSTRACTS

## 1.1 PREDICTIVE VALUE OF CELLULAR INDICES FOR ADVERSE OUTCOMES IN VTE PATIENTS. STUDY FROM RIETE (REGISTRO INFORMATIZADO ENFERMEDAD TROMBOEMBOLICA) REGISTRY

Fakiha Siddiqui<sup>1\*</sup>; Alfonso Tafur<sup>2</sup>; Mushtaq Hussain<sup>3</sup>; Alberto García-Ortega<sup>4</sup>; Pablo Demelo-Rodríguez<sup>5</sup>; José Antonio Nieto<sup>6</sup>; Esther Usandizaga<sup>7</sup>; Jawed Fareed<sup>8</sup>; Manuel Monreal<sup>9</sup>

<sup>1</sup>Loyola University Chicago, Maywood, USA;

<sup>2</sup>NorthShore University Health Systems, Skokie, USA;

<sup>3</sup>Dow University of Health Sciences, Karachi, Pakistan;

<sup>4</sup>Hospital Universitari i Politècnic La Fe, Valencia, Spain;

<sup>5</sup>Hospital General Universitario Gregorio Marañón, Madrid, Spain;

<sup>6</sup>Hospital General Virgen de la Luz, Cuenca, Spain;

<sup>7</sup>Hospital Sant Joan Despí-Moïses Broggi, Barcelona, Spain;

<sup>8</sup>Cardiovascular Research Institute, Loyola University Chicago, Maywood, USA;

<sup>9</sup>Hospital Universitari Germans Trias i Pujol, Barcelona, Spain

**AIM** Blood cell counts and cellular indices have been reported to predict the adverse outcome in venous thromboembolism (VTE). Such indices as the neutrophils to lymphocyte ratio (NLR), platelets to lymphocytes ratio (PLR) and systemic immune inflammation index (SII as neutrophils x platelets/ lymphocytes) are currently validated for their predictive value for adverse outcomes, such as VTE recurrence, bleeding, and all-cause mortality.

The aim of this study is to investigate the relationship between blood cellular indices (NLR, PLR and SII) and adverse outcomes in a sub cohort of patients recruited in the RIETE registry.

**MATERIALS AND METHODS** In this study, the data of 3020 patients with VTE from RIETE (Registro Informatizado Enfermedad TromboEmbolica) database were collected retrospectively. Baseline cell counts, clinical characteristics, risk factors for VTE, concomitant disorders, laboratory parameters and 90-day outcomes (VTE recurrence, major bleeding, and mortality) were compiled. Degree of association between the cellular ratios with other variables were analyzed by univariate analysis including chi-square and binary logistic regression analysis by SPSS software.

**RESULTS** In the cohort of 3020 patients, 1428 (43.7%) were female and 1592 (52.7%) were male, with mean age  $65.39 \pm 16.45$ , weight  $77.41 \pm 16.64$  kg, mean NLR  $5.89 \pm 7.45$  ( $\times 1000/\text{mm}^3$ ), mean PLR  $190.22 \pm 160.06$  ( $\times 1000/\text{mm}^3$ ) and SII  $1470.56 \pm 2169.39$  ( $\times 1000/\text{mm}^3$ ). In the outcome analysis (at 90 days), the proportion of VTE recurrence is (N=54, 1.8%), major bleeding (N=99, 3.3%) and mortality (N=321, 10.6%). Patients with significant association in the univariate analysis were included in the logistic regression model. In the final model, age >median (adjusted odds ratio [aOR]: 0.86; 95%CI: 1.28-4.37), and SII (aOR: 0.97; 95%CI: 1.20-5.82) showed predictive power for VTE recurrence. Weight >90 percentile (aOR: 0.55; 95%CI: 0.96-3.14), NLR (aOR: 1.06; 95%CI: 1.79-4.68) and unprovoked VTE (aOR: 0.65; 95%CI: 1.22-3.00) showed predictive ability for major bleeding. For mortality, age >90 percentile (aOR: 0.58; 95%CI: 1.22-2.59), NLR (aOR: 0.81; 95%CI: 1.47-3.47), SII (aOR: 0.52; 95%CI: 1.08-2.63) and unprovoked VTE (aOR: 1.06; 95%CI: 2.16-4.00) showed predictive capability.

**CONCLUSION** In this cohort, patients with elevated NLR values at baseline were determined to be at increased risk for major bleeding and death. Patients with high SII value were also at high risk of increased risk of death. The PLR did not demonstrate any relevance to outcome.

Submitted for the EVF Prize.

## 1.2 TREATING ACUTE, SUBACUTE, AND CHRONIC DEEP VEIN THROMBOSIS USING MECHANICAL THROMBECTOMY: SIX-MONTH OUTCOMES FROM THE UNITED STATES CLOUT REGISTRY

Nicolas Mouawad\*

McLaren Health System, Bay City, USA

**AIM** Deep vein thrombosis (DVT) can develop over the course of days or weeks without symptoms, obscuring thrombus chronicity. Additionally, patients may delay treatment, further increasing the chronicity of thrombus. The prospective, all-comer, multi-center CLOUT registry (NCT03575364) assesses the safety and effectiveness of the treatment of lower extremity DVT with mechanical thrombectomy in the United States. This sub-analysis was performed to investigate the effects of thrombus chronicity on CLOUT patient outcomes.

**MATERIALS AND METHODS** The CLOUT registry follows up to 500 real-world DVT patients for 2 years post-intervention. Patients may be enrolled regardless of bleeding risk, cancer diagnosis, pregnancy, thrombus age, or prior history and treatment of DVT. Primary effectiveness was assessed from complete or near complete ( $\geq 75\%$ ) thrombus removal as determined by independent core-lab-adjudicated Marder score. For this analysis, safety outcomes, procedure data, and clinical assessments were collected and available through 6 months. Thrombus age was determined by oldest thrombus per limb as measured by medical history, intraprocedural imaging, and visual inspection of thrombus.

**RESULTS** Of the 250 patients enrolled at the time of analysis, 62 years was the median age, 52% were male, and 40% were contraindicated to thrombolytics. Procedures were predominantly single-session (99.6%) and had a median blood loss of 50 mL. No patients required thrombolytics. The median post-procedure hospital stay was 1-day, and the adjudicated 30-day device-related serious adverse event rate was 0.4%.

Analysis of patients by thrombus chronicity revealed 33%, 35%, and 32% with acute, subacute, and chronic thrombus, respectively. Complete or near-complete thrombus removal was successfully achieved in a majority of patients across chronicity groups (91% acute; 82% subacute; 84% chronic;  $P<0.0001$  from baseline;  $P=0.2435$  between groups). Likewise, stents were placed in nearly half of cases, regardless of chronicity (47% acute; 41% subacute; 49% chronic;  $P=0.5285$ ).

At 6 months, duplex ultrasound confirmed flow (86% acute; 89% subacute; 96% chronic;  $P=0.2978$ ) and vessel compressibility in most patients (84% acute; 90% subacute; 91% chronic;  $P=0.8814$ ). Compared to baseline, there was a statistically significant reduction in PTS severity across all chronicity groups for those presenting with moderate or severe post-thrombotic syndrome (PTS;  $P<0.0001$ ); 91% had no moderate or severe PTS (94% acute; 88%; subacute; 91% chronic;  $P=0.5702$ ). Significant improvements in the numeric pain rating (NPRS), revised venous clinical severity (rVCSS), and EuroQoL group 5-D (EQ-5D) scores were also observed for all groups ( $P<0.001$  from baseline).

**CONCLUSION** Mechanical thrombectomy effectively removes acute, subacute, and chronic thrombus as demonstrated in this real-world 6-month registry data. Significant and durable improvements in clinical and quality-of-life outcomes were observed across all categories of thrombus chronicity.



## 1.3 HIGH INCIDENCE OF THROMBOSIS IN PATIENTS WITH SEVERE COVID 19 INFECTION: LMWH AT INTERMEDIATE DOSES DOES NOT REDUCE THE RISK OF THROMBOSIS BUT IS ASSOCIATED WITH LOWER MORTALITY

Marta Camats Terré\*, Teresa Solanich Valldaura; Granada Perea Duran; Luz Muñoz Marin; Rita Subirana Bofill; Anna Valle Beltran; Anna Artigas Soler; Kinu Reyes Kim; Anna Gasulla Rodríguez; Juan Gabriel Castro Ríos; Juan Carlos Oliva Morera  
*Parc Taulí Hospital Universitari, Sabadell, Spain*

**AIM** SARS-CoV-2 infection (COVID 19) is associated with coagulation activation and thrombotic complications, particularly in critical patients. Intermediate doses of low molecular weight heparin (LMWHID) to prevent thrombosis is controversial. This study analysed the incidence of thrombosis in COVID 19 patients admitted in ICU and evaluated the value of the D-dimer (DD) and the effect of LMWHID on thrombosis and mortality.

**MATERIALS AND METHODS** All patients admitted to ICU due to COVID 19 between March and May 2020 have been included. All received prophylaxis with LMWH from admission and treatments according to protocols. From April, patients with DD>3000 ng/mL (DD>3000) received LMWHID (enoxaparin 0.5 mg/12 hours or every 24 hours if renal failure). Incidence of thrombosis and mortality has been compared between patients with DD>3000 who received LMWHID and those who did not.

**RESULTS** 124 patients (94 men/30 women) were included. Mean age: 61 years (31-82). Median days of admission to the ICU: 12 days (1-99). Cardiovascular risk factors: 50% HTA, 18% diabetes, 42% dyslipidaemia and 27% obesity. 21% of patients had no cardiovascular risk factors. 80% (N.=99) of patients had DD>3000 and 94% DD>1500.

Mortality was 38% (N.=47), thrombosis incidence was 26.6% (N.=33). Total thrombotic events: 39 (5 patients presented more than one). Venous thrombosis represented 79% and arterial thrombosis 21%. Venous thrombosis: PE (N.=15, 53% segmental/subsegmentary), catheter thrombosis (N.=11) and LLMM CVT (N.=5). Arterial thrombosis: IAM (N.=2), ischemic stroke (N.=3), distal necrosis (N.=2) and 1 intestinal ischemia. Mean number of days between admission and thrombosis: 11 (1-46).

No patients with DD<1500 presented thrombosis or exitus. Two (8%) patients with DD<3000 presented thrombosis vs. 31 (31%) with DD>3000 ( $P=0.018$ ); mortality was 16% and 44% respectively ( $P=0.01$ ). 57% of patients with DD>3000 received LMWHID. Compared to patients with DD>3000 who received only prophylactic doses, no differences were observed in the incidence of thrombosis. Mortality in patients treated with LMWHID was significantly lower than that of patients with DD>3000 treated with prophylactic doses, 31% vs. 62% ( $P=0.01$ ). In multivariate analysis, variables associated with higher mortality were diabetes ( $OR= 17.7$ ; 95% CI=[1.02-1.18]), age ( $OR=1.1$ ; 95% CI=[1.02-1.18]), high DD (1.007; 95% CI=[1.002-1.012]). Probability of death was 20 times higher in patients who did not receive LMWHID ( $OR = 19.5$ ; 95% CI=[3.2-111,1]). Bleeding complications related to LMWHID were 8%.

**CONCLUSION** Incidence of thrombotic complications is high in critical COVID 19 patients (26.6%). DD elevation >3000 ng/mL correlates with increased thrombosis and mortality. Treatment with LMWHID did not reduce risk of thrombosis but was associated with lower mortality.

## 1.4 THE EFFECTS OF POST-THROMBOTIC VENOUS OUTFLOW OBSTRUCTION ON CARDIAC FUNCTION DURING EXERCISE

Rachael Morris<sup>\*1</sup>; Bram Ruijsink<sup>1</sup>; Richard Bruce<sup>1</sup>; Philip Marino<sup>2</sup>; Bhashkar Mukherjee<sup>2</sup>; Aimee Brame<sup>2</sup>; Reza Razavi<sup>1</sup>; Alberto Smith<sup>1</sup>; Stephen Black<sup>1</sup>

<sup>1</sup>Kings College London, London, UK;

<sup>2</sup>St Thomas' Hospital, London, UK

**AIM** Post-thrombotic venous obstruction (PTVO) develops in up to half of patients after ilio-ocaval deep venous thrombosis (DVT). Limitation in exercise tolerance may occur due to pain and swelling in the legs, and patients with exertional dyspnoea may be investigated for chronic thromboembolic pulmonary hypertension (CTEPH). However, insufficient venous return may lead to an impairment in stroke volume which could limit cardiac output (CO). This study aimed to quantify cardiac function during exercise in patients with PTVO and to evaluate changes after endovascular recanalization.

**MATERIALS AND METHODS** Patients with PTVO without evidence of CTEPH and age and sex matched healthy controls underwent cardiopulmonary exercise testing (CPET) and exercise cardiac MRI (ExCMR) using an MR-compatible supine cycle-ergometer. A real-time image acquisition and post-processing framework was used to obtain ECG and respiratory gated 2D-flow and cine images at rest and during exercise, allowing for dynamic measurement of flow in the aorta and vena cava and quantification of end-systolic and end-diastolic volumes. These measurements were used to calculate stroke volume (SV) and cardiac output (CO). Patient-specific workloads for supine cycle exercise inside the scanner were determined from CPET performance (watts at anaerobic threshold +10%). Patients undergoing stenting repeated the tests 6-8 weeks after intervention.

**RESULTS** Fourteen patients (10 males 4 females, age  $43.5 \pm 14.24$ ) and 10 controls (7 males 3 females, age  $44 \pm 13.5$ ) completed CPET and exCMR. Participants were matched for body mass index ( $29.8 \pm 5.7$ , vs.  $27.6 \pm 4.3$ ,  $P=0.33$ ) and physical activity levels (General practice Physical Activity Questionnaire Score  $3.14 \pm 0.86$  for patients,  $3.4 \pm 0.5$  for controls,  $P=0.4$ ). Peak VO<sub>2</sub> was impaired in patients (median  $17.9$  mL/min/kg, 66% predicted) and lower than controls ( $30.65$  mL/min/kg, 100% predicted,  $P<0.0001$ ) despite maximal tests being achieved (RER  $>1.1$ , >80% predicted heart rate). Anaerobic threshold, peak workload and VO<sub>2</sub>/HR ratio were also lower than controls ( $P<0.0002$ ,  $P<0.05$ ,  $P<0.0007$ ). Seven patients repeated testing after stenting of the inferior vena cava and iliofemoral veins. Peak VO<sub>2</sub> improved by 29% ( $P<0.002$ ), anaerobic threshold by 24% ( $P<0.002$ ), workload by 10% ( $<0.001$ ) and VO<sub>2</sub>/HR ratio by 14% ( $P<0.001$ ). The increase in stroke volume and cardiac index during ExCMR was significantly lower in pre-stent patients vs. controls (0.8% vs. 16.5%  $P<0.01$ ; and  $5.5$  L/min/m<sup>2</sup> vs.  $8.6$  L/min/m<sup>2</sup>,  $P<0.05$  respectively) despite similar heart rates (~135 bpm).

On post-op testing, patients were able to increase stroke volume significantly from rest to exercise (15% increase,  $P<0.01$ ), leading to improvement in cardiac index ( $5.5$  L/min/m<sup>2</sup> pre-stent to  $7.1$  L/min/m<sup>2</sup> post stent,  $P<0.05$ ).

**CONCLUSION** PTVO can limit peak VO<sub>2</sub>, stroke volume and cardiac output during exercise. Significant functional improvements are observed after stenting.

*Submitted for the EVF Prize.*

## 1.5 LONG-TERM RESULTS OF TINZAPARIN FOR THE TREATMENT OF SUPERFICIAL VEIN THROMBOSIS OF THE LOWER LIMBS

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**AIM** Superficial vein thrombosis (SVT) of the lower limbs is associated with an increased risk of recurrent venous thromboembolism (VTE), but long-term risks beyond three years are largely unknown. The aim of our study was to identify the frequency of recurrent VTE in patients with lower limb SVT during a follow-up through five years following initial presentation.

**METHODS** Consecutive patients with SVT were treated with subcutaneous tinzaparin (InnohepT, LEOPharma, Denmark). Patients were stratified into three groups by the duration of treatment: group 1 ( $\leq 30$  days) and group 2 (31-60 days), which run in parallel and patients received mostly an intermediate or therapeutic dose and also a subsequent group 3 where patients received an intermediate dose (131 IU/kg) for 90 days. The composite primary endpoint of this prospective cohort study was recurrent VTE, defined as occurrence of clinically evident SVT recurrence, deep-vein thrombosis or pulmonary embolism.

**RESULTS** A total of 147 patients with a median age of 58.2 years were treated (group 1, N=60, group 2, N=38 and group 3, N=49). Four patients died, two were lost to follow-up and the remaining 141 patients were followed-up for five years. Recurrent VTE occurring in 27/147 patients (five-year rate 18.5%, Fig. 1), including 18 events of recurrent SVT, 7 events of deep-vein thrombosis and 2 events of pulmonary embolism.

Fifteen events occurred early (during the first three months) and the remaining 12 late. Five-year recurrent VTE-free rates were significantly better with prolonged anticoagulation for the initial SVT event. These rates were 71.5% in group 1, 84.1% in group 2 and 91.7% in group 3 (Fig. 2, P for trend = 0.005).

Figure 1.

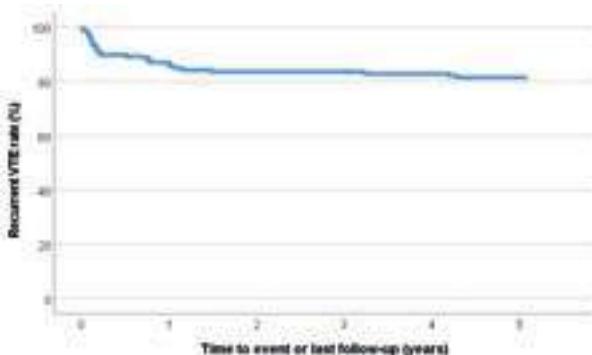
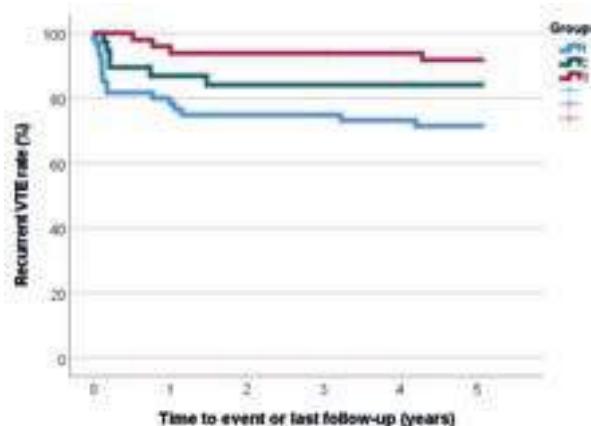


Figure 2.



**CONCLUSION** Long-term recurrent VTE rates in patients presenting with SVT are not negligible, supporting the notion that SVT is not a benign disease. Anticoagulation for three months, a duration similar with VTE, may improve patient outcomes.



## 1.6 DEVELOPMENT OF AN INTERNATIONAL STANDARD SET OF OUTCOME MEASURES FOR PATIENTS WITH VENOUS THROMBOEMBOLISM: A REPORT OF THE INTERNATIONAL CONSORTIUM FOR HEALTH OUTCOMES MEASUREMENT (ICHOM) VENOUS THROMBOEMBOLISM WORKING GROUP

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**AIM** There is increasing recognition that health systems need to measure and improve the value of care they provide patients by measuring outcomes that matter most to them. To support the shift towards value-based health care in venous thromboembolism (VTE), the International Consortium for Health Outcomes Measurement (ICHOM) assembled an international working group of 31 clinical VTE experts, researchers, and patient representatives from 15 countries to develop a standardised minimum set of outcomes for benchmarking care delivery in supporting clinical decision-making and facilitating quality improvement and research.

**MATERIALS AND METHODS** Potential outcomes for consideration were sourced from 3 key domains: existing ICHOM standard sets; international patient focus groups; and multiple systematic publication and registry searches. Using an online-modified Delphi process, outcomes important to patients and health professionals were selected and relevant measurement instruments were evaluated. A risk adjustment model was created using case-mix variables that takes into consideration the effects of different risk profiles that impact outcomes when compared across different populations, modalities, and institutions. The process occurred over 12 months, employing 8 international teleconferences. Measures were appraised for their feasibility in routine clinical practice (*i.e.*, brevity, free availability, validation, and language translation) and psychometric performance (*i.e.*, validity, reliability, and sensitivity to change).

**RESULTS** A systematic scoping review identified 83 possible outcomes and 42 relevant measurement tools. Following a three-round Delphi study, 15 core outcomes important to patients and health professionals were selected and categorized into 4 domains: 1) patient-reported outcomes; 2) long-term consequences of disease; 3) disease-specific complications; and 4) treatment-related complications. These measures were designed to include patients  $\geq 16$  years old with VTE. The working group agreed that all outcomes were relevant for all patient categories, without the need for specific adjustment for certain subgroups. The standard set contains a selection of 4 core outcome tools and predefined time points (index event, 3 months, 6 months, and 1 year) for outcome measurement. A cascade opt-in system allows for further assessment if required and ensures that a minimum number of items captures all core outcomes.

**CONCLUSION** Implementation of a minimum standard set of patient-centred outcomes for VTE could help institutions to monitor, compare and improve the quality and delivery of VTE care. Standardization of outcomes and measures could also improve the implementation of more patient-centric clinical outcomes research in VTE.

*Submitted for the EVF Prize.*

## 2.1 SULODEXIDE AS A COMPLIMENTARY DRUG ON THE MANAGEMENT OF ACUTE DEEP VENOUS THROMBOSIS

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**AIM** Sulodexide represents an antithrombotic agent with multiple sites of action on blood coagulation and related inflammatory vascular processes found on DVT. This drug certainly possesses anti-inflammatory actions acting directly on the endothelial lining. Sulodexide has been demonstrated as an antithrombotic and anticoagulant agent, also the anti-inflammatory effect is well known as it is an agent that helps to repair damaged endothelial glycocalyx. Recent data suggest DVT is part of a pro inflammatory vascular condition. During the venous thromboembolism, devastating damage is done to the venous endothelial layer. The glycocalyx is seriously damaged during this inflammatory process. Sulodexide is a potent endothelial anti-inflammatory agent and a promoter of the glycocalyx recovery. The concomitant use of sulodexide and one of the new oral anticoagulants, rivaroxaban, during the acute phase of venous thromboembolism seems to significantly accelerate the natural process of recovery and recanalization of the deep vein thrombosis process.

**MATERIALS AND METHODS** We made a study comparing two groups, 106 patients were included on the study. All patients had femoral, popliteal or below the knee DVT, confirmed by compression ultrasound. 46 patients received conventional treatment with Rivaroxaban 15 mg BID for the first 30 days plus 20 mmHg thigh high compression, the other group, 66 patients received same treatment plus Sulodexide 250 LRU BID for the first 30 days. Control ultrasound performed at 10, 20 and 30 days to evaluate progress of the thrombus process. We also measured circumference of the affected leg on 3 points at 10, 20, and 30 days, and QOL was measured thru CIVIQ-20 questionnaire.

**RESULTS** Both groups matched age, sex, and site of DVT. The group that received Sulodexide significantly reduced leg circumference at 20 days average of 2.6 cm above the control group, venous ultrasound was similar on both groups and CIVIQ-20 questionnaire was significantly better on the Sulodexide group 91 points pretreatment and 42 points at 20 days *versus* 93 points pretreatment and 52 points at 20 days on the Rivaroxaban only group.

**CONCLUSION** Sulodexide is an agent that has multiple antithrombotic, anti-inflammatory and anticoagulant actions, as well as reparative effects on venous endothelium and endothelial glycocalyx. This agent seems to significantly accelerate the thrombolytic process after the acute period of DVT and have some influence on the appearance and severity of post thrombotic syndrome. It is a secure adjuvant to new oral anticoagulants accelerating the recovery process of the patients with this problem.



## 2.2 IMPLEMENTATION OF A DIRECT ORAL ANTICOAGULANT PERIOPERATIVE INTERRUPTION PROTOCOL AND ACCURACY OF THE DOAC URINE DIPSTICK

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**AIM** Adoption of Direct Oral Anticoagulants (DOAC) for a growing number of chronically anticoagulated patients demands institutional implementation of interruption protocols. Most of the literature on safety and bleeding predictors stems from Atrial Fibrillation (AF) patients, and less is known about those anticoagulated for venous thromboembolism (VTE). Moreover, the value of preoperative DOAC levels is not confirmed and limited by the speed and availability of results. Nonetheless, a novel urine based DOAC dipstick may bridge logistic constraints to implementation in high-risk scenarios. We aimed to describe the implementation of a DOAC interruption protocol, to validate proposed perioperative bleeding predictors, and pilot the use of a DOAC urine dipstick.

Table I. Baseline patient characteristics.

| Variables                             | <i>Cohort (N.=320)</i> |       |
|---------------------------------------|------------------------|-------|
| <i>Patient related variables</i>      | N.                     | %     |
| Age (mean, SD)                        | 73.6                   | 10.6  |
| Sex                                   |                        |       |
| Female                                | 131                    | 40.9  |
| Male                                  | 188                    | 58.8  |
| BMI (mean, SD)                        | 28.5                   | 6.5   |
| Race                                  |                        |       |
| Caucasian                             | 274                    | 85.6  |
| African American                      | 12                     | 3.8   |
| Asian                                 | 16                     | 5.0   |
| Other                                 | 14                     | 4.4   |
| <i>Comorbidities</i>                  |                        |       |
| Cancer                                | 7                      | 2.2   |
| Hypertension                          | 201                    | 62.8  |
| Diabetes                              | 73                     | 22.8  |
| Bleeding history                      | 31                     | 9.7   |
| Cardiomyopathy                        | 16                     | 5.0   |
| Coronary artery disease               | 90                     | 71.9  |
| Chronic kidney disease                | 10                     | 3.1   |
| Hyperlipidemia                        | 163                    | 50.69 |
| Peripheral artery disease             | 8                      | 2.5   |
| Chronic obstructive pulmonary disease | 25                     | 7.8   |
| Orthostatic sleep apnea               | 64                     | 20.0  |
| Cerebrovascular disease               | 25                     | 7.8   |

Table II. Indication for anticoagulation and medications.

| Variables                             | Cohort (N. 320) |      |
|---------------------------------------|-----------------|------|
|                                       | N.              | %    |
| <i>Anticoagulation indication</i>     |                 |      |
| Atrial fibrillation                   | 263             | 82.2 |
| Paroxysmal                            | 174             | 54.4 |
| Persistent                            | 82              | 25.6 |
| VTE                                   | 91              | 28.4 |
| DVT                                   | 30              | 9.4  |
| PE                                    | 15              | 4.7  |
| DVT & PE                              | 29              | 9.1  |
| <i>Medications and anticoagulants</i> |                 |      |
| Clopidogrel                           | 41              | 12.8 |
| Aspirin                               | 97              | 30.3 |
| Statin                                | 217             | 67.8 |
| Atorvastatin                          | 145             | 45.3 |
| Pravastatin                           | 13              | 4.1  |
| Rosuvastatin                          | 35              | 10.9 |
| Simvastatin                           | 21              | 6.6  |
| DOACs                                 |                 |      |
| Apixaban                              | 255             | 79.7 |
| Rivaroxaban                           | 59              | 18.4 |
| Dabigatran                            | 6               | 1.9  |

set. The blood laboratory values were not available at interruption and were blindly analyzed in a centralized multi-institutional collaboration along with a segment of the positive and negative controls. A blinded DOAC urine dipstick was interpreted by a physician within 30min of collection. DOAC levels were also measured on positive and negative controls. A level <0.50 ng/dL was considered negative. All statistical analyses were performed using SPSS.

**RESULTS** | A total of 320 patients (Age 73.6 (SD=10.6), Male (58.8%), VTE (28.4%), AF (82.2%)) underwent DOAC interruption following the institutional protocol. Peri-procedural events included VTE (0.6%), 95% CI [0.001 - 0.022], Stroke (0.6%), and Major Bleeding (1.3%). Urine samples from 55 patients were analyzed using the urine dipstick. Specificity for the DOAC urine dipstick was 0.9 (86%), and sensitivity was 0.5 (46%). The average time to interpretation was 10:03 minutes. There were no bleeding predictors.

**CONCLUSION** | The institutional adaptation of DOAC interruption protocol was safe and valid among patients with VTE or AF. There were no predictors of bleeding. Our results do not favor routine use of DOAC level testing for elective procedures. A DOAC urine dipstick result would be rapidly available. This pilot study informs logistical feasibility to consider use of a urine DOAC level to aid decision making in chronically anticoagulated patients needing urgent surgeries.

Table III. Surgical bleeding risk and periprocedural events.

| Variables                                 | Cohort (N.=320) |      |
|-------------------------------------------|-----------------|------|
|                                           | N.              | %    |
| <i>Surgical bleeding risk</i>             |                 |      |
| Low risk                                  | 289             | 90.3 |
| <i>Thromboembolic events (90-day F/U)</i> |                 |      |
| Stroke                                    | 2               | 0.6  |
| VTE                                       | 2               | 0.6  |
| <i>ISTH bleeding (90 day F/U)</i>         |                 |      |
| Major bleeding                            | 4               | 1.3  |
| Clinically relevant non-major             | 15              | 4.7% |

**MATERIALS AND METHODS** | An institutional task force adapted an interruption protocol anchored on literature review. We used an estimate-talk-estimate multidisciplinary approach to develop a final internal protocol, which was disseminated to program leaders. We prospectively collected demographics and 3 month - bleeding and thromboembolic outcomes of patients chronically anticoagulated on DOACS undergoing elective procedures. The local IRB approved the project. We collected preoperative blood and Urine in a sub-



## 2.3 READABILITY OF PATIENT EDUCATIONAL MATERIALS IN VENOUS THROMBOSIS. ANALYSIS OF THE 2021 ESVS GUIDELINES AND COMPARISON WITH OTHER MEDICAL SOCIETIES INFORMATION

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**AIM** In order for patients to comprehend health related information, it must be written at a level that can be readily understood by the intended population. During 2021 the European Society for Vascular Surgery (ESVS) published a sub-section about information for patients into its Guidelines on the Management of Venous Thrombosis.

**MATERIALS AND METHODS** Nine readability measures were used to evaluate the patient educational material regarding venous thrombosis published by seven medical societies: ESVS, Society for Vascular Medicine (SVM), Society for Vascular Surgery (SVS), Vascular Society for Great Britain and Ireland (VS), Australia and New Zealand Society for Vascular Surgery (ANZSVS), Canadian Society for Vascular Surgery (CSVs) and American Heart Association (AHA).

**RESULTS** The mean reading grade level (RGL) for all the 58 recommendations was 10.61 (range 6.4-14.5) and the mean Flesch Reading Ease (FRE) was 56.10 (51.3-62.9), corresponding to a “fairly difficult” reading level. The mean RGL of the ESVS recommendations (11.45, 95% CI, 9.90-13.00) was significantly higher than the others. Post-hoc analysis determined a significant difference between the ESVS and the SVS (10.86, 95% CI, 9.84-11.91) recommendations ( $P=0.005$ ). All the patient’s education information published by the medical societies presented a RGL higher than recommended. The fifteen sub-sections of the information for patients included into the ESVS clinical guidelines presented a mean RGL above 9.5 points, revealing that no one (0%) was written at or below the recommended GRL. The mean FRE was 47.63 (28.2-61.6), corresponding to a “difficult” reading level.

**CONCLUSION** Venous thrombosis patient educational materials produced by leading medical societies have readability scores that are above the recommended levels. The innovative patient’s information included into the ESVS venous thrombosis guidelines represents an important advance in the amelioration of the medical information for patients but their readability should be improved to adapt the understanding to the general-population.

## 2.4 PREDICTIVE ROLE OF BLOOD CELLULAR INDICES AND ENDOGENOUS GLYCOSAMINOGLYCANAS AS DETERMINANTS OF INFLAMMATORY BIOMARKERS IN ACUTE PULMONARY EMBOLISM

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**AIM** Blood cellular indices are novel and widely available biomarkers that provide information on immune/inflammatory status, however their predictive role in acute pulmonary embolism (PE) remains unclear. In this study, we sought to determine the relationship between blood cellular indices, endogenous glycosaminoglycans (GAGs) and inflammatory biomarkers in a cohort of PE patients.

**MATERIALS AND METHODS** Whole blood samples (N.=101) were drawn from patients within 24 hours of confirmed diagnosis of acute PE under an IRB approved protocol. Samples were processed for platelet-poor plasma which was stored at -80 °C prior to analysis. Normal human samples drawn from healthy volunteers (N.=50) were used as control. All samples were tested for various biomarkers of thromboinflammation, including D-dimer, CRP and MMP-9 with ELISA, endogenous GAGs with Heparin Red and inflammatory biomarkers with biochip assay. Blood cellular indices including neutrophil lymphocyte ratio (NLR), platelet lymphocyte ratio (PLR) and systemic immunoinflammatory index (SII) and other information including demographic data, collected through the review of patient electronic medical records. P<0.05 was considered statistically significant.

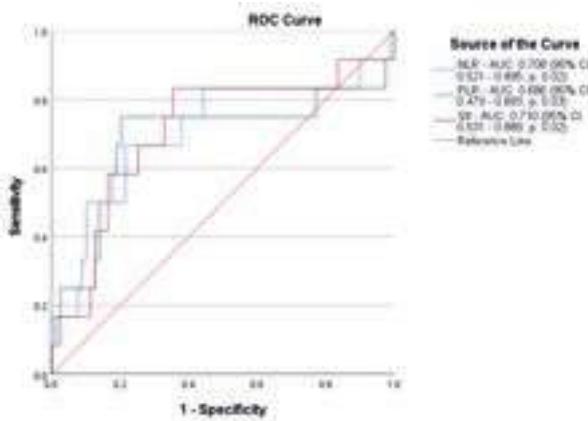
Table I. The levels of inflammatory biomarkers, heparin red and MMP-9 in PE patients.

| Biomarker   | PE patients (Mean ± SEM) | Healthy controls (Mean ± SEM) | P value |
|-------------|--------------------------|-------------------------------|---------|
| TNF-α       | 2.69 ± 0.33              | 1.88 ± 0.15                   | 0.04    |
| IFN-γ       | 0.3208 ± 0.04            | 0.1693 ± 0.04                 | 0.0062  |
| IL-1α       | 0.19 ± 0.01              | 0.09 ± 0.01                   | <0.0001 |
| IL-1β       | 1.47 ± 0.19              | 0.79 ± 0.19                   | 0.0022  |
| IL-2        | 1.28 ± 0.23              | 1.02 ± 0.27                   | 0.04    |
| IL-4        | 1.80 ± 0.06              | 1.31 ± 0.18                   | <0.0001 |
| IL-6        | 70.64 ± 14.25            | 1.26 ± 0.19                   | <0.0001 |
| IL-8        | 47.57 ± 11.17            | 2.67 ± 0.14                   | <0.0001 |
| IL-10       | 4.30 ± 1.55              | 0.64 ± 0.04                   | 0.0010  |
| MCP-1       | 165.60 ± 15.04           | 89.56 ± 4.13                  | 0.0002  |
| VEGF        | 25.46 ± 3.33             | 4.75 ± 0.2231                 | <0.0001 |
| EGF         | 29.22 ± 3.37             | 1.42 ± 0.19                   | <0.0001 |
| D-dimer     | 7063.00 ± 624.50         | 190.90 ± 34.83                | <0.0001 |
| CRP         | 51.25 ± 5.983            | 0.6278 ± 0.1651               | <0.0001 |
| Heparin red | 2.603 ± 0.23             | 0.7328 ± 0.37                 | <0.0001 |
| MMP-9       | 343.3 ± 54.13            | 55.23 ± 2.04                  | 0.0317  |

Table II. The levels of cellular indices in PE patients and healthy controls.

| <i>Cellular Index</i> | <i>PE patients (Mean ± SEM)</i> | <i>Healthy controls (Mean ± SEM)</i> | <i>P value</i> |
|-----------------------|---------------------------------|--------------------------------------|----------------|
| WBC                   | 10.09 ± 0.44                    | 7.43 ± 0.48                          | 0.02           |
| Neutrophil            | 7.19 ± 0.37                     | 4.32 ± 0.33                          | <0.01          |
| Lymphocyte            | 1.76 ± 0.16                     | 2.31 ± 0.24                          | 0.01           |
| Monocyte              | 0.73 ± 0.03                     | 0.57 ± 0.06                          | 0.17           |
| Eosinophil            | 0.11 ± 0.01                     | 0.16 ± 0.02                          | 0.04           |
| NLR                   | 16.69 ± 6.26                    | 2.03 ± 0.23                          | 0.0002         |
| PLR                   | 706.30 ± 400.1                  | 108.60 ± 10.88                       | 0.0070         |
| PNR                   | 43.48 ± 3.42                    | 33.44 ± 2.65                         | 0.48           |
| ELR                   | 0.09 ± 0.015                    | 0.07 ± 0.011                         | 0.72           |
| EMR                   | 0.166 ± 0.025                   | 0.288 ± 0.033                        | 0.0018         |
| SII                   | 2523 ± 448.30                   | 456.8 ± 52.78                        | 0.0014         |
| Hemoglobin            | 12.21 ± 0.26                    | 14.11 ± 0.45                         | 0.0153         |
| Hematocrit            | 36.87 ± 0.7420                  | 43.40 ± 2.091                        | 0.0085         |
| Platelet              | 238.60 ± 11.27                  | 233.60 ± 18.16                       | 0.9939         |

Figure 1. The ROC curve analysis of NLR, PLR and SII for 30-day mortality.



**RESULTS** As shown in Table I and Table II, the inflammatory biomarkers and blood cellular indices were significantly elevated in acute PE patients compared to normal healthy individuals (N=50) ( $P<0.05$ ).

IL-2, MCP-1, TNF- $\alpha$  and IL-10 were significant predictors of NLR, IL-2 was significant predictor for PLR and IL-1 $\beta$  and IL-2 were significant predictors of SII ( $P < 0.05$ ). None of the inflammatory biomarkers have shown a significant predictive role for PNR, ELR and EMR. In ROC curve analysis, while NLR, PLR and SII had predictive ability for 30-day mortality, PNR, ELR and EMR did not have predictive ability for this outcome ( $P > 0.05$ ) (Figure 1).

Among the inflammatory biomarkers within the sample population, IL-8, IL-10, EGF and IL-4 were significant predictors of endogenous GAGs, IL-1 $\beta$ , TNF- $\alpha$  and IL-1 $\alpha$  were significant pre-

dictors of MMP-9, IL-10 was a significant predictor of D-dimer and IL-1 $\alpha$ , IL-2, EGF and MCP-1 were significant predictors of CRP levels.

Among the blood cellular indices within the sample population, none of the cell count or indices have shown a significant predictive role for endogenous GAGs, D-dimer or CRP levels. However neutrophil count and eosinophil count were significant predictors of MMP-9 levels.

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**CONCLUSION** In conclusion, our findings support that blood cellular indices and endogenous GAGs have a predictive role as a determinant of inflammatory biomarkers in acute PE.

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## 2.5 SYSTEMATIC REVIEW AND META-ANALYSIS OF VENOUS THROMBOEMBOLISM PROPHYLAXIS AFTER ENDOVENOUS VARICOSE VEIN SURGERY

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**AIM** A systematic review and meta-analysis was performed to elucidate the rate of deep venous thrombosis, pulmonary embolism and overall rate of thrombotic complications with pharmacological and mechanical thromboprophylaxis compared to mechanical thromboprophylaxis alone.

### MATERIALS AND METHODS

#### *Data sources*

MEDLINE, Embase, the Cochrane Controlled Trials Register, Clinicaltrials.gov, European Union Clinical Trials, International Standard Randomised Controlled Trial Number Registry.

#### *Review methods*

The review followed PRISMA guidelines using a registered protocol (PROSPERO: CRD42021274963). Databases were searched in December 2021 and included published articles with 30 patients or more that reported the rate of deep venous thrombosis after endovenous treatment of superficial venous incompetence. Data were pooled with a fixed effects model via a meta-proportions analysis.

**RESULTS** Two-hundred and twenty-one studies (476,266 participants) were included in the quantitative analysis. For randomised trial arms, the rate of DVT with dual prophylaxis was 0.52% (95% CI 0.23-1.19%) (9 studies; 1095 patients; 2 events), compared to 2.26% (95% CI 1.81-2.82%) (37 studies; 6951 patients; 69 events) with mechanical prophylaxis alone. Across all prospective study designs, the rate of DVT in mechanical plus pharmacological prophylaxis was 0.73% (95% CI 0.52-1.02%) (31 trial arms, 6151 participants, 23 events), *versus* 1.31% (95% CI 1.16-1.48%) (123 trial arms, 36,418 participants, 214 events). Due to high heterogeneity in the combined prospective and retrospective studies, data pooling was precluded. The rate of PE in randomised trial arms was 0.45% (95% CI 0.09-2.35) (5 studies, 460 participants, 1 event, I<sup>2</sup>=0%) *versus* 0.23% (95% CI 0.1-0.52%) (28 studies, 4834 participants, 3 events) for mechanical prophylaxis alone. The rate of EHIT grade III-IV was 0.35% (95% CI 0.09-1.40) (3 studies, 822 participants, 5 events) *versus* 0.88% (95% CI 0.28-2.70%) (11 studies, 48,177 participants, 155 events). There was one VTE-related mortality and one instance of major bleeding following antithrombotic and non-steroidal anti-inflammatory co-administration.

**CONCLUSION** The rate of VTE after endovenous varicose vein procedures may be significantly higher than estimates from previous studies. This meta-analysis demonstrates a significant reduction in the rate of DVT with mechanical plus pharmacological prophylaxis and supports the routine prescription of pharmacoprophylaxis following endovenous varicose vein surgery. The review is limited by the lack head-to-head comparisons from randomised trials and confounding from observational trials, highlighting the acute need for interventional studies to answer this clinical question.

*Submitted for the EVF Prize.*

## 2.6 IMPACT OF STANDARD CATHETER DIRECTED THROMBOLYSIS VERSUS ULTRASOUND ASSISTED THROMBOLYSIS ON TOTAL OR SUBTOTAL PULMONARY ARTERIAL OCCLUSIONS IN PATIENTS WITH PULMONARY EMBOLISM - A SECONDARY ANALYSIS OF THE SUNSET TRIAL

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**AIM** Following acute pulmonary embolism (PE), loss of distal pulmonary vascular perfusion has been shown to predict mortality at one year. It is very likely that total and subtotal PA occlusions will lead to loss of pulmonary vascular perfusion. The purpose of this study was to assess the comparative effect of standard catheter-directed thrombolysis (SCDT) *versus* ultrasound assisted thrombolysis (USAT) on segmental PA occlusions and correlate the change with right ventricular function.

**MATERIALS AND METHODS** This is a secondary analysis of the SUNSET sPE randomized trial comparing SCDT to USAT in patients presenting with acute intermediate risk PE. Computed tomography angiography (CTA) before and 48-hours after thrombolysis were assessed by the core laboratory to identify the number of segmental PA branches with total and/or subtotal occlusion. The primary endpoint of this analysis was resolution of total and subtotal occlusion of the segmental PAs at 48-hour. Secondary outcomes included correlation of right to left ventricular (RV/LV) ratio improvement to the reduction in these segmental artery occlusions.

**RESULTS** Amongst a total of 81 patients randomized, 71 patients ( $52.7 \pm 13.5$  years) had evaluable CTAs before and at 48 hours. 38 underwent SCDT and 33 USAT, and there were no differences between groups in baseline demographic, physiologic and thrombus characteristics except for RV/LV ratio which was significantly higher in the SCDT group ( $1.7 \pm 0.4$  vs.  $1.5 \pm 0.3$ ,  $P=0.022$ ). Mean total dose of alteplase for SCDT was  $17.5 \pm 5.7$  mg and  $18.6 \pm 7.7$  mg in USAT ( $P=0.519$ ) infused over  $12.9 \pm 5.4$  hours and  $14.1 \pm 5.6$  hours respectively ( $P=0.391$ ). In the SCDT group there was a 53.9% reduction of total and subtotal segmental occlusions (from  $14.1 \pm 2.8$  to  $6.5 \pm 3.7$ ,  $P<0.001$ ) and in the USAT group a 51.3% reduction (from  $11.7 \pm 3.7$  to  $5.7 \pm 3.6$ ,  $P<0.001$ ). There was no significant difference between the two groups ( $P=0.996$ ). The magnitude of reduction in total and subtotal occlusion was associated with a significant improvement in RV/LV ratio ( $r=0.3779$ ,  $P=0.0136$ ).

**CONCLUSION** In acute sPE catheter directed thrombolysis with or without ultrasound assistance leads to a significant reduction in total and subtotal occlusion of the segmental PA branches at 48 hours. This improvement has a positive impact on right ventricular function.



### 3.1 PATENCY RATES AND PREDICTORS FOR RE-INTERVENTION AFTER STENTING FOR ACUTE OR CHRONIC DEEP VEIN THROMBOSIS: A RETROSPECTIVE OBSERVATIONAL STUDY

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**AIM** Patency outcomes are promising after stenting for acute and chronic deep vein disease, but less is known about long-term results. Recent guidelines recommend endovascular treatment in symptomatic patients, which emphasizes the need to identify those who benefit most of venous stents. We studied patency rates after stenting for acute deep venous thrombosis (DVT) and post-thrombotic syndrome (PTS) and identified predictors for re-intervention.

**MATERIALS AND METHODS** Patients stented for acute DVT or PTS with iliofemoral obstruction between May 2006 and November 2021 at the Erasmus Medical Center Rotterdam were included. After obtaining informed consent, stent patency was collected prospectively; patients were either still attending our outpatient clinic on a regular basis, or were asked to return to the EMC for duplex imaging for our study. All other data were collected retrospectively. Binary logistic regression was used to identify predictors for re-intervention. Potential predictors were age, female gender, PTS, stent across the inguinal ligament, dedicated venous stents, stent length, stents since the start of a multidisciplinary team and stents for the May-Thurner syndrome. Re-intervention free survival was calculated using Kaplan-Meier methods.

**RESULTS** A total of 129 limbs were included after a median follow-up of 151 weeks: 53 (41.1%) for acute DVT and 76 (58.9%) for PTS. Primary and secondary patency patency were 66.7% and

Table I. Acute deep vein thrombosis and post-thrombotic syndrome.

| Patient and procedural characteristics | Acute deep vein thrombosis (N.= 53) | Post thrombotic syndrome (N.= 76) | P-value |
|----------------------------------------|-------------------------------------|-----------------------------------|---------|
| Age in years                           | 41 ± 17.1                           | 46 ± 15.2                         | 0.046   |
| Female gender (%)                      | 30 (56.6)                           | 58 (76.3)                         | 0.018   |
| Body Mass Index *                      | 26 ± 4.7                            | 28 ± 5.1                          | 0.041   |
| Smoking * (%)                          | 11 (22.9)                           | 30 (41.7)                         | 0.034   |
| Thrombophilia * (%)                    | 6 (18.8)                            | 26 (60.5)                         | 0.008   |
| Anticoagulation (%)                    | 11 (20.8)                           | 44 (57.9)                         | 0.000   |
| Oral contraceptives † (%)              | 16 (53.3)                           | 10 (17.2)                         | 0.000   |
| Primary patency (%)                    | 38 (71.7)                           | 48 (63.2)                         | 0.311   |
| Secondary patency (%)                  | 52 (98.1)                           | 70 (92.1)                         | 0.239   |
| Stent across inguinal ligament (%)     | 14 (26.4)                           | 45 (59.2)                         | 0.000   |
| Stent for May-Thurner (%)              | 38 (71.7)                           | 47 (61.8)                         | 0.245   |
| Length of stents in millimeter *       | 176 ± 120.1                         | 214 ± 100.6                       | 0.019   |
| Dedicated venous stents (%)            | 47 (88.7)                           | 38 (50.0)                         | 0.000   |
| Since multidisciplinary team (%)       | 39 (73.6)                           | 25 (32.9)                         | 0.000   |
| Imaging follow-up in weeks             | 118 — IQR 119                       | 272 — IQR 369                     | 0.000   |

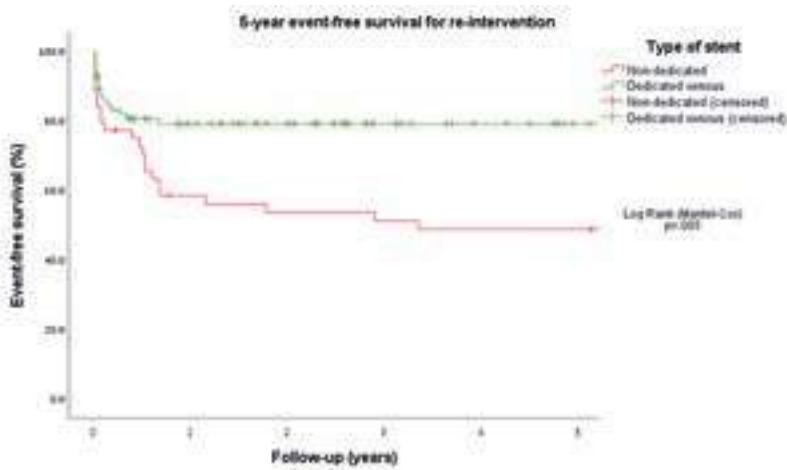
Data presented as count (%), mean ± SD or median with IQR. \* missing data excluded. † males excluded.

Table II. Primary patency, secondary patency and occluded stents.

| Patient and procedural characteristics | Primary patency (N.= 86) | Secondary Patency (N.= 36) | Final Occlusion (N.= 7) |
|----------------------------------------|--------------------------|----------------------------|-------------------------|
| Age in years                           | 46 ± 16.2                | 42 ± 15.6                  | 31 ± 14.7               |
| Female gender (%)                      | 58 (67.4)                | 25 (67.4)                  | 5 (71.4)                |
| Body Mass Index *                      | 27 ± 4.7                 | 27 ± 5.1                   | 29 ± 7.8                |
| Smoking * (%)                          | 26 (32.1)                | 13 (36.1)                  | (28.6)                  |
| Thrombophilia * (%)                    | 18 (46.2)                | 8 (38.1)                   | 6 (100.0)               |
| Anticoagulation (%)                    | 38 (44.2)                | 13 (36.1)                  | 4 (57.1)                |
| Oral contraceptives † (%)              | 17 (29.3)                | 7 (19.4)                   | 2 (28.6)                |
| Post thrombotic syndrome (%)           | 48 (55.8)                | 22 (61.1)                  | 6 (85.7)                |
| Stent across inguinal ligament (%)     | 33 (38.4)                | 21 (58.3)                  | 5 (71.4)                |
| Stent for May-Thurner (%)              | 57 (66.3)                | 24 (66.7)                  | 4 (57.1)                |
| Length of stents in millimeter *       | 192 ± 105.9              | 210 ± 127.0                | 210 ± 34.1              |
| Dedicated venous stent (%)             | 67 (77.9)                | 16 (44.4)                  | 2 (28.6)                |
| Since multidisciplinary team (%)       | 48 (55.8)                | 14 (38.9)                  | 2 (28.6)                |

Data presented as count (%), mean ± SD or median with IQR. \* missing data excluded. † males excluded.

Figure 1. Re-intervention free survival for dedicated and non-dedicated stents.



No. at risk for debut of re-intervention

| Stent                    | Baseline | 1 year  | 2 years | 3 years | 4 years | 5 years |
|--------------------------|----------|---------|---------|---------|---------|---------|
| * Dedicated venous stent | 85 (0)   | 51 (17) | 41 (23) | 23 (15) | 15 (13) | 8 (10)  |
| Re-intervened            | 0        | 17      | 17      | 17      | 17      | 17      |
| • Non-dedicated stent    | 44 (0)   | 24 (2)  | 22 (2)  | 21 (2)  | 20 (2)  | 20 (2)  |
| Re-intervened            | 0        | 18      | 20      | 21      | 22      | 22      |



94.6% respectively within the whole cohort, while 5.4% of the stents remained occluded. Forty-two stents were re-intervened at least once, most commonly within the first year 35 (83.3%). Stents for PTS were significantly longer and more frequently placed across the inguinal ligament than those for acute DVT (OR 4.04, 95%CI: 1.89-8.67, P=0.00). Risk for re-intervention was significantly lower for dedicated venous stents compared to non-dedicated stents in a multivariate analysis (adjusted OR 0.15, 95% CI: 0.04-0.54, P=0.003). Re-interventions after one year were lower for dedicated venous stents (5.6%) than for non-dedicated stents (25.0%).

**CONCLUSION** Re-intervention after one year of primary patency seems uncommon, even more so for dedicated venous stents, who were found to be overall predictive for preserving patency. Stenting in acute DVT might be preferred to prevent extensive procedures later on.

*Submitted for the EVF Prize.*

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## 3.2 IDENTIFICATION OF PATIENTS WITH OUTFLOW OBSTRUCTION MOST LIKELY TO BENEFIT FROM ILIAC STENTING

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**AIM** Current assessment of the venous obstruction is based mainly on anatomical information from imaging studies, including IVUS. Although pressure gradient across the stenotic area provides some physiological assessment, the usage of this criterion is limited to cases of iliac vein compression, or a defined stenosis. The need for physiological assessment of venous outflow and for use of such assessment for refining the indications to venous stenting is well recognized. The aim of this study is to identify predictors for clinical success of iliac vein angioplasty and stenting in patients with outflow obstruction.

**MATERIALS AND METHODS** Prospective experimental design with pre- and post- intervention measures that include assessment of functional collateralization by digital APG (dAPG) and clinical assessment of disease severity by VCSS score and QOL scores. Stepwise increasing and decreasing obstruction pressures were used in dAPG. Resistance to outflow was calculated as a range estimate from the hysteresis curve at occlusive pressures from 20 mmHg to 80 mmHg. The study groups were 10 healthy volunteers, 20 patients with iliofemoral obstruction treated conservatively, and 30 patients who underwent iliac vein angioplasty and stenting. Testing was performed at the baseline, 30 days after stenting, or 30-60 days after the baseline test in patients without interventions.

**RESULTS** Two distinct patterns of resistance changes in patients with iliofemoral obstruction were identified. Lower resistance at occlusive pressure of 30 mmHg compared to 20 mmHg (Type 1) was associated with less prominent collateralization. Equal resistance at 20 mmHg and 30 mmHg (Type 2) was associated with the presence of large collaterals. Post-stenting resistance levels were decreased at 20 and 30 mmHg, but increased at 80 mmHg. Patients with Type 1 resistance had better clinical outcomes at 1 month follow-up compared to patients with Type 2. One-year follow up was completed only in 2 patients. The results of additional 20 patients will be available at the time of the meeting.

**CONCLUSION** Initial results indicate that dAPG is capable of differentiating between presence and absence of significant collateral flow in patients with iliofemoral venous obstruction. Continuous investigation should show if these types of flow can be used as predictors of clinical success of iliac vein angioplasty and stenting.

### 3.3 HYBRID Ilio-femoral recanalization after injection for drug abuse obstruction: A single centre experience

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**AIM** Drug abusers frequently utilize femoral vessel for drug injection. The acute complications are bleeding, pseudoaneurysm and infection, often requiring emergent treatment. However, despite rarely mentioned, the long-term complications of drug injection are significant and reduce severely the quality of life of ex-addictive patients.

The most frequent problem is chronic venous insufficiency (CVI) usually at CEAP class C5 and 6, resulting from the development of post-thrombotic syndrome (PTS). Moreover, due to the cause of PTS, those patients do not develop collateral pathways and consequently are affected by disabling leg edema.

Iliofemoral recanalization in these patients is particularly complex, due to scars and fibrotic reaction in the groin area and massive damage of the vein wall itself, thus requiring an hybrid approach. We developed over years a specific technical approach to these peculiar vein lesions, consisting in hybrid reconstruction of iliofemoral axiality by endophlebectomy and stenting.

**MATERIALS AND METHODS** This is an observational single-center retrospective study carried out between January 1, 2013 and December 31, 2020. 26 patients (33 limbs) affected by CVI class CEAP C5-6, due to drug injection were submitted to iliofemoral recanalization/stenting. The main exclusion criteria was continuation of drug addiction. Preoperative assessment includes US examination, venography and dynamic air-plethysmography.

The procedure is performed in hybrid room, under general anesthesia. As first step, a guidewire is positioned in the femoral vein by percutaneous ultrasound-guided access at mid-thigh. A jugular access is provided, giving that normal anatomy is usually altered by fibrotic reactions. A longitudinal incision at the inguinal level is performed, in order to proceed to common femoral and distal external iliac veins control, which is the most difficult part of the procedure. Frequently the vein wall is completely absent and a bovine pericardium reconstruction has to be done beside endophlebectomy (68% of cases). Once the axiality is restored a direct stenting is performed, using braided stents. No pre- or post-dilatation should be done in these patients in order to avoid bleeding. Iliofemoral ballooning should be performed at least 2 weeks after the operation. No AV fistula is required.

**RESULTS** All patients treated presented clinical improvement after treatment. Edema proved significantly reduced and all ulcers healed within 3 months. Patency rate at 6 months was 88%. The most frequent complication is lymphocele (38%). Non major complications were detected.

**CONCLUSION** PTS in ex-drug addicted patients is a disabling disease, also by a psychologic point of view. Their treatment is highly complex but leads to significant results, allowing those patients to benefit from a normal lifestyle.

*Submitted for the EVF Prize.*

### 3.4 ENDOVASCULAR TREATMENT OF PELVIC CONGESTIVE SYNDROME, LITERATURE REVIEW. IS PHARMACOMECHANICAL ABLATION OF GONADAL VEINS AN ALTERNATIVE TO CLASSIC EMBOLIZATION?

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**AIM** Pelvic congestion syndrome (PCS) is a common and underdiagnosed cause of pelvic pain in premenopausal and fertile age women. Chronic pelvic pain can be up to 40% of gynecological ambulatory consultations, of which 30-40% are due to PCS. According to the clinical guidelines of the Society for Vascular Surgery and the American Venous Forum, “embolization of ovarian veins and pelvic varices is the *Gold Standard* treatment of PCS, with a grade of recommendation 2B.

**MATERIALS AND METHODS** A systematic review was carried out, using the pubmed search engine, the keywords used for the search were: pelvic congestion syndrome, embolization. 51 articles were obtained. 15 publications were selected for the final review after applying inclusion and exclusion criteria, to select modern articles and publications with the greatest scientific evidence. We also present a series of 6 cases of PCS treated in our center by pharmacomechanical ablation of gonadal veins and their results.

**RESULTS** 15 articles published between 2006-2019 were reviewed, N.=4617 patients with PCS treated by embolization techniques are analyzed. The technical success of the gonadal vein embolization procedure was close to 100% of the procedures, with a clinical symptomatic improvement of 5-7 points on the VAS scale in more than 80% of the treated patients and maintaining the symptomatic improvement during follow-up, even in series with long follow-ups of more than 5 years. The mean follow-up was 50 months. The complication rate was 1.5-2% (coil migration). In our series, 6 cases were treated with pharmacomechanical ablation of gonadal veins, we obtained technical success in 100% of cases, improvement or disappearance of symptoms in 100% of patients, and no complications were reported. In 100% of the patients, the pelvic varices disappeared in the post-procedure CT performed at 30 days, 83.33% of the treated gonadal veins were occluded, the non-occluded gonadal veins after treatment had presented a significant reduction in their diameter (<6 mm) and recovered antegrade flow. Mean follow-up 5.8 months.

**CONCLUSION** Endovascular treatment by embolization of gonadal veins, with coils and occlusive microfoam, is a minimally invasive technique, which has demonstrated safety, technical success close to 100%, and sustained symptomatic improvement in more than 80% of cases with low incidence of complications. There are embolization techniques, such as pharmacomechanical ablation, which could be a non-inferior alternative to classic embolization with coils, with the same rates of technical success, disappearance or reduction of symptoms, low complications rate and much lower cost.

*Submitted for the EVF Prize.*



### 3.5 EVOLUTION OF THE EPIDEMIOLOGY AND MANAGEMENT OF CHRONIC VENOUS DISEASE IN THE UK

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<sup>2</sup>Servier, Paris, France

**AIM** Previous epidemiological estimates for Chronic Venous Disease (CVD) suggest that 19% of the adult population have Varicose Veins (VV) whilst 0.4% have a history of Venous Leg Ulceration (VLU). However, since studies generated these estimates, there have been initiatives to improve venous care. Initiatives in the UK include national guidelines for venous disease in 2014 and subsequent changes to national healthcare commissioning criteria. Longitudinal studies are required to evaluate the impact of such initiatives with respect to trends in the management and epidemiology of CVD.

To investigate changes in both the epidemiology and management of CVD in the UK.

**MATERIALS AND METHODS** This is a retrospective, longitudinal study evaluating routinely collected data from electronic healthcare records (Clinical Practice Research Datalink/CPRD). Participants aged 18 years or over, with anonymised research quality data in CPRD were eligible for inclusion. Electronic diagnostic codes (Read codes) were used to identify participants with the clinical manifestations of CVD, as described in the Clinical Etiology Anatomy Pathophysiology (CEAP) classification. Primary and secondary care data were used to delineate the management of CVD with respect to prescriptions, referrals, and operative procedures.

During the 10-year study period, from 2008-2018, the number of eligible participants ranged from 2.3-4.2 million annually. For each year, an annual period prevalence and incidence were calculated. Descriptive statistics were used to evaluate the management of the CVD cohort.

**RESULTS** The annual period prevalence of symptomatic VV, was 2.02% and 1.94% in 2008 and 2018 respectively. This is reflected in the annual incidence rate of VV per 100,000 which decreased from 1632 to 1575 in 2008 and 2018 respectively.

Conversely, the annual period prevalence of active VLU decreased from 0.76% to 0.43% in 2008 and 2018 respectively. The annual incidence of active VLU decreased from 451 to 241 new cases per 100,000 in 2008 and 2018.

Over the 10-year interval, the use of compression in the CVD cohort increased from 1.24% in 2008 to 3.27% in 2018. During this time, the proportion of those with venous skin changes undergoing surgical/endovenous ablation increased from 3.11% in 2008 to 4.09% in 2018, with a peak of 5.19% in 2015.

**CONCLUSION** Previous estimates have indicated that 19% of the population have VV, however 2% of people in this cohort had VV with symptoms severe enough to seek out care. The epidemiology of VV has remained static over this 10-year period whilst VLU has decreased. Concomitantly, use of compression and surgical/endovenous ablations increased. The current reduction in VLU may relate to a peak in surgical/endovenous ablations in 2015, possibly because of changes in national guidance.

### 3.6 CORRELATION AMONGST TRANSVAGINAL AND TRANSABDOMINAL DUPLEX AND CT ANGIOGRAM FOR PELVIC VENOUS INSUFFICIENCY AND LEG VARICOSITIES

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 Jose Ignacio Fernandez Solares<sup>1</sup>; Agnieszka Nowak Tarnawska<sup>1</sup>; Carlos Barrio Rodriguez<sup>1</sup>;  
 Angela Miguel Morrondo<sup>1</sup>; Aurora Florez-Gonzalez<sup>1</sup>; Alfonso Sanjuanbenito-Reina<sup>3</sup>;  
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**AIM** To evaluate the sensibility of selected criteria of lower limbs duplex (LLD), transvaginal duplex (TVD), transabdominal duplex (TAD), and CT abdominal angiogram (CTA) in differentiating the pelvic venous disorders (PVDs).

**MATERIALS AND METHODS** Observational study from 1/2018 to 10/2021 evaluated the number of positive selected direct and indirect criteria of Cruz Roja diagnosis protocol in patients with atypic location varicose veins in lower limbs and/or pelvic origin extrapelvic symptoms treated by endovascular procedures.

**RESULTS** A total of 184 patients with atypic location varicose veins and/or pelvic origin extrapelvic symptoms patients were evaluated by LLD. Seventeen patients with symptoms of PVDs that affected the quality of life and in conditions to be treated by endovascular procedures were evaluated by TVD, TAD, and CTA. There were 6 patients with primary gonadal incompetence (PGI), 7 with left renal vein compression (LRVC), 2 with left iliac vein obstruction (LIVO), and 2 with miscellanea. All patients were females with a median of 3 pregnancies. Five of six patients with PGI and 6 of 7 patients with LRVC had chronic pelvic pain, which was absent in patients with LIVO. Renal compression pain and venous claudication were found only in patients with LRVC and LIVO, respectively. Three of six PGI and 5 of 7 LRVC presented recurrent varices. All patients had atypic location varices. Fourteen patients (82,3%) had indirect signs of extrapelvic escape points in LLD. All 17 patients presented positive direct criteria of pelvic varicose veins incompetence in TVD and CTA. All patients with PGI showed positive direct criteria in TAD and CTA. Six of 7 patients with LRVC (86%) had positive direct criteria in TAD and indirect criteria in TAD, TVD, and CTA, and 5 of 7 (71%) had positive direct criteria in CTA. All 2 patients with LIVO had positive direct criteria in TAD and CTA and indirect criteria in CTA. Ten of 17 patients were treated by endovascular procedure with good results with a follow-up of at least six months with no reintervention. Three patients with PGI were treated, 2 with unilateral gonadal embolization (UGE) and 1 with bilateral gonadal embolization (BGE). Seven patients with LRVC were treated, 4 with UGE, 1 with BGE, and 2 with UGE first and a second stage renal vein stent. Two patients with LIVO were treated with iliac vein stent.

**CONCLUSION** Selected non-imaging criteria correlated with clinical symptoms could distinguish the different PVDs. This diagnosis and management protocol produced good results. Considering the lack of defined criteria in the PVDs diagnosis and management, it seems advisable to verify our local protocols.



## PR1 INCIDENCE AND CLINICAL FEATURES OF VENOUS THROMBOEMBOLISM IN HOSPITALIZED PATIENTS WITH COVID-19 IN JAPAN

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**AIM** Several studies reported a high prevalence of venous thromboembolism (VTE), including pulmonary embolism (PE) in COVID-19. However, the prevalence of VTE seemed to widely vary according to reports, which might be due to the different study population, ethnic differences and distinct resource availability. Actually, a recent surveillance questionnaire in Japan has reported the small number of patients diagnosed as VTE in COVID-19. Further studies have been warranted to clarify the current status of VTE among patients with COVID-19 who were evaluated with imaging examination, where under-diagnosis of VTE could be avoided.

**MATERIALS AND METHODS** The VTE and COVID-19 in Japan Study is a retrospective, multicenter cohort study enrolling hospitalized patients with COVID-19 who were evaluated with contrast-enhanced computed tomography (CT) examination among 22 centers in Japan between March 2020 and October 2020. We divided the entire cohort into 2 groups according to the presence or absence of VTE diagnosis during hospitalization and compared the patients' characteristics, thromboprophylaxis management, and outcomes of the 2 groups.

**RESULTS** Among 1236 patients with COVID-19, 45 patients (3.6%) patients were evaluated with contrast-enhanced CT examination. VTE events occurred in 10 patients (22.2%), and the incidences of VTE in mild, moderate, and severe COVID-19 were 0%, 11.8%, and 40.0%, respectively. COVID-19 patients with VTE showed a higher body weight (81.6 kg *versus* 64.0 kg, P=0.005) and body mass index (26.9 kg/m<sup>2</sup> *versus* 23.2 kg/m<sup>2</sup>, P=0.04). The proportions of patients who required mechanical ventilation and extracorporeal membrane oxygenation were significantly higher among the patients with VTE (80.0% *versus* 34.3%, P=0.01; 40.0% *versus* 2.9%, P=0.006, respectively). In the current study population, 24 patients (53.3%) received compression stockings or intermittent pneumatic compression, and 30 patients (66.7%) received anticoagulants. Among the patients with anticoagulant treatment, 46.7% received unfractionated heparin at a prophylactic dose, 30.0% of patients received unfractionated heparin at a therapeutic dose, and 13.3% of patients received low-molecular-weight heparin. There were no recurrent VTE events during hospitalization. Among the 45 patients, there were 8 bleeding events (17.8%) including 5 major bleeding events (11.1%). There was no significant difference in the proportion of patients alive at discharge between patients with and without VTE (80.0% *versus* 88.6%, P=0.48). Among 8 PE patients, all of them were low-risk PE.

**CONCLUSION** Among a relatively small number of patients with contrast-enhanced CT examination in Japanese real-world clinical practice, there were no VTE patients among mild COVID-19 patients, whereas the incidence of VTE seemed to be relatively high among severe COVID-19 patients, although all of PE events were low-risk PE events without significant impact on mortality risk.

## PR2 IS EDEMA UNDERRECOGNIZED IN SUPERFICIAL VENOUS DISEASE PATIENTS?

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**AIM** Introduction: the 2020 revision of CEAP states that “the C3 category is overly broad and does not include potentially important subcategories of edema. The C3 class does not quantify the degree or extent of edema”. For many years, we evaluated edema using ultrasound (US) while performing US evaluation of superficial venous disease patients. We concomitantly evaluated ankle edema by palpation using a pitting scale. Based on these examinations we were impressed that the prevalence of ankle edema was higher than generally recognized in a self-selected population of venous disease patients.

Purpose: to formally study the prevalence of edema in consecutive patients presenting to an outpatient vein clinic and the relationship between clinical detection of edema and US detection of edema.

**MATERIALS AND METHODS** We retrospectively reviewed 138 consecutive new patient encounters presenting for evaluation of chronic venous disease between August 1, 2019 and October 4, 2019. We omitted 12 patients with unilateral disease and 4 patients with incomplete clinical data. All 122 patients subsequently underwent an US study for the investigation of suspected superficial venous disease. Both clinical and US studies of edema were conducted in a blinded fashion. On initial clinical evaluation, pitting edema (see scale below), CEAP, & rVCSS were determined and documented by providers independent and blinded of US findings, while subsequent US findings of edema (see scale below) were determined and documented by US technologists independent of clinical findings. Each patient had the following data collected: demographics of age and gender; CEAP; total rVCSS (2004 revision); varicose veins rVCSS; edema rVCSS; presence of clinical edema and severity of edema using a pitting scale; and, presence of edema on US and severity of edema using a standard scale.

**RESULTS** A total of 244 limbs were consecutively evaluated.

- Mean patient age  $59.5 \pm 13.7$
- Gender 95 female (77.9%) 27 male (22.1%)
- Ankle Pitting Scale: 0 = 62 (25.4%),  $\frac{1}{2}$  = 53 (21.7%), 1 = 56 (23.0%), 2 = 50 (20.5%), 3 = 16 (6.6%), 4 = 7 (2.9%)
- US Edema Scale: None = 61 (25.0%), Trace = 123 (50.4%), Mild = 36 (14.8%), Moderate = 13 (5.3%), Severe = 11 (4.5%)
- CEAP: C0 = 0 (0.0%), C1 = 11 (4.5%), C2 = 40 (16.4%), C3 = 85 (34.8%), C4a = 85 (34.8%), C4b = 18 (7.4%), C5 = 2 (0.8%), C6 = 3 (1.2%)
- Total rVCSS: Mean  $\pm$  SD =  $6.2 \pm 3.5$
- Edema rVCSS: 0 = 49 (20.1%), 1 = 101 (41.4%), 2 = 79 (32.4%), 3 = 15 (6.1%)
- Varicose Veins rVCSS: 0 = 37 (15.2%), 1 = 88 (36.1%), 2 = 66 (27.0%), 3 = 53 (21.7%)

Correlation with CEAP C stage: Of 51 C1 and C2 limbs, 24 were found to have at least trace edema on US. Thus, 47% of C1 and C2 patients were found to have objective evidence of edema on US that was unrecognized by the clinical, pitting exam. Based on US exam, these patients should have been classified C3.



| Ankle pitting rating | Dermal depression depth (mm) | US Edema rating | Edema thickness (mm) |
|----------------------|------------------------------|-----------------|----------------------|
| 1/2                  | <2                           | None            | 0                    |
| 1                    | ≥2                           | Trace           | <5                   |
| 2                    | ≥4                           | Mild            | 5 - 1                |
| 3                    | ≥6                           | Moderate        | 1 - 1.5              |
| 4                    | ≥8                           | Severe          | >1.5                 |

Figure 1. Pitting and US Edema Scales & US Image of Peri-GSV Trace Edema.



Of 85 C3 limbs, 67 were found to have at least trace edema on US. Thus, 79% of C3 patients were found to have edema detected by US exam. Conversely, 21% were found to not have edema on US exam. We evaluate clinical pitting edema by very firmly compressing the dermis for 20 seconds, 3 fingers above the medial malleolus. The false positive of 21% might be explained by overly aggressive compression. However, it is possible that US technologists underrecognized trace edema when actually present.

Association between ankle pitting rating and ultrasound edema rating using Spearman's rank correlation: 0.3563,  $P = <0.0001$

Association between CEAP Class and ultrasound edema rating using Spearman's rank correlation: 0.4359,  $P = <0.0001$

Association between total VCSS and ultrasound edema rating using Spearman's rank correlation: 0.5069,  $P = <0.0001$

We also note that patients with phlebolymphedema and/or lipodermatosclerosis are less likely to demonstrate pitting on clinical exam and we found US to be more sensitive for detection of sub-clinical edema. Thus, clinical evaluation alone may be inadequate to identify edema in mild and advanced disease states.

**CONCLUSION** We conclude that the prevalence of edema is underrecognized in C1 and C2 patients, clinical exam for edema in C3 has a false positive rate of 21%, and US detection of edema appears more sensitive than clinical detection of edema.

## PR3 MARKERS OF PULMONARY HYPERTENSION IN PATIENTS WITH SUBMASSIVE PULMONARY EMBOLISM UNDERGOING CATHETER THROMBOLYSIS COMPARED TO ANTICOAGULATION ALONE: A SECONDARY ANALYSIS OF THE SUNSET SPE TRIAL

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**AIM** Chronic thromboembolic pulmonary hypertension (CTEPH) is a morbid complication following acute pulmonary embolism (PE). The optimal treatment to prevent this sequela remains unknown. We aimed to compare the biomarker profile and short-term functional outcomes in patients who received catheter directed thrombolysis (CDT) vs. anticoagulation alone.

Figure 1. CTEPH biomarker data for patients who received anticoagulation *versus* those who underwent catheter directed thrombolysis at initial diagnosis, at discharge, and 3 months after initial PE diagnosis.

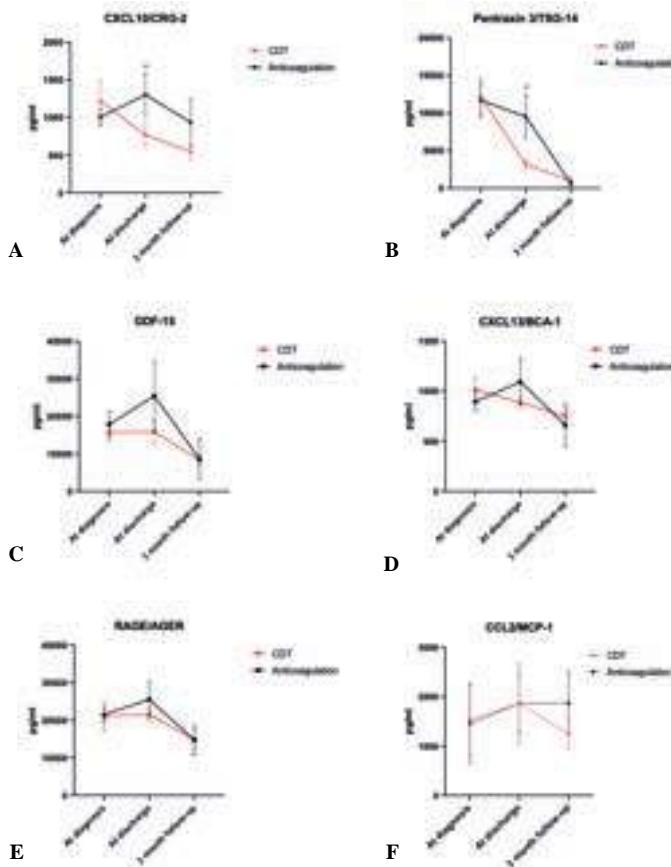
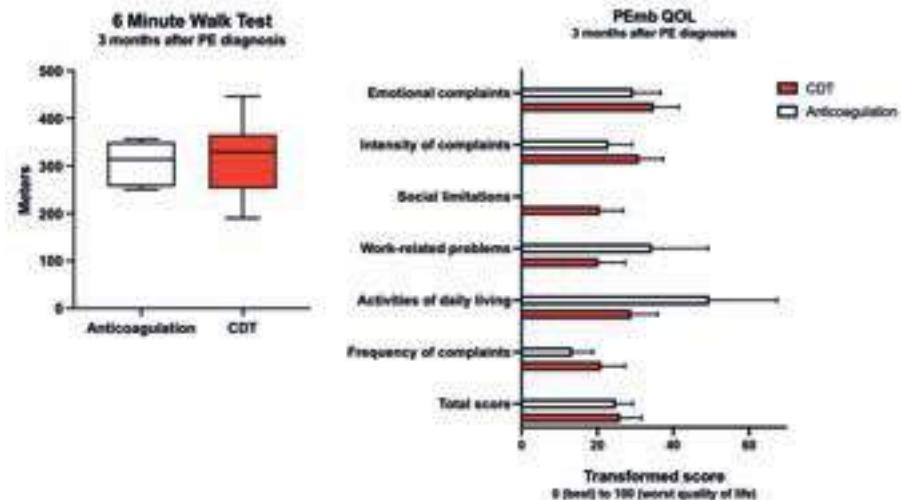


Figure 2. 6-minute walk test and PEmb QOL survey data for patients who received anticoagulation versus those who underwent catheter directed thrombolysis 3 months after initial PE diagnosis.



**MATERIALS AND METHODS** This is a secondary analysis of the SUNSET sPE randomized trial comparing standard catheter directed thrombolysis to ultrasound assisted thrombolysis in patients presenting with submassive PE. As part of this study, patients who did not receive an intervention were enrolled in a medical (anticoagulation only) arm. Blood was collected from each of the study participants and biomarkers that have been associated with CTEPH in the literature (CCL2/MCP-1, CXCL10/CRG-2, pentraxin 3/TSG-14, GDF-15, RAGE/AGER, CXCL13/BLC/BCA-1) were measured at diagnosis, at discharge, and at three-month follow-up. All patients underwent a 6-minute walk test and answered quality of life questionnaires (PEmb, UCSD health, SF36) 3 months after diagnosis. Comparisons were made using student's t-tests. Nonparametric tests were used when the distributions were not normal. Significance was set at  $P \leq 0.05$ .

**RESULTS** 72 patients ( $56 \pm 15$  years; 40.3% female) were included in the analysis. 53 of these patients underwent CDT as part of the SUNSET sPE trial. 19 additional patients were included in the medical arm of the study (heparin transitioned to apixaban, rivaroxaban, or warfarin). Baseline RV/LV ratios were similar between groups (ratio 1.8 in CDT group, 1.7 in medical group). Mortality, adverse events, and hospital stay were similar between groups. At time of discharge, CXCL10/CRG-2 ( $P=0.04$ ) and Pentraxin 3/TSG-14 ( $P=0.03$ ) were lower in the CDT group, and the difference normalized by 3-month follow-up (Figure 1A-B). This trend, while not significant, was seen in most of the other biomarkers as well (Figure 1C-E). Oxygen requirements at time of discharge and at three-month follow-up were 15.1% and 0% for CDT group vs. 26.3% and 5.3% for anticoagulation group ( $P=0.31$ ). At three months, 6-minute walking distance (Figure 2A) and quality of life scores (Figure 2B) were similar between the two groups.

**CONCLUSION** In patients with submassive PE, biomarkers of CTEPH normalize earlier with catheter thrombolysis compared to anticoagulation alone. At 3 months both groups demonstrated similar biomarker levels, 6-minute walking distance, and qualitative metrics.

## 4.1 A RANDOMIZED TRIAL OF MODERATE (CLASS 2), HIGH (CLASS 3) AND VERY HIGH (CLASS 4) ELASTIC COMPRESSION IN THE PREVENTION OF RECURRENCE OF VENOUS ULCERATION

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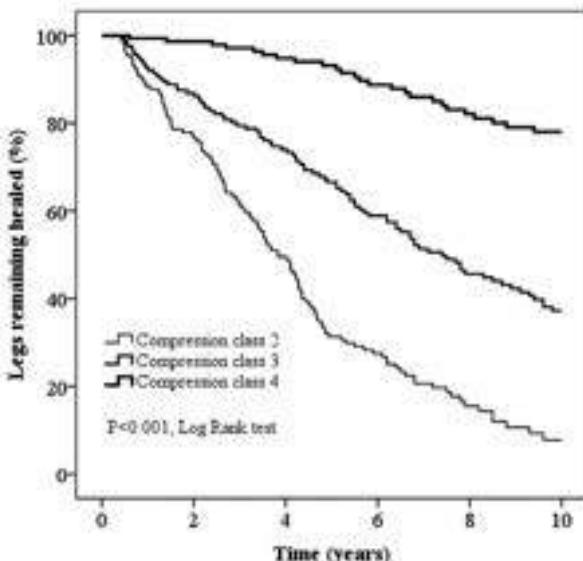
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**AIM** Venous leg ulcers (VLU) are an important health problem because of their high prevalence and associated high cost of care. Despite many available contemporary treatment modalities (surgery, endovenous thermal ablation, foam sclerotherapy, use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

**MATERIALS AND METHODS** An open, prospective, randomized, single-center study, with a 10-year follow-up was performed. Four hundred and seventy-seven patients (240 men, 237 women)

Figure 1. Kaplan-Meier survival analysis showing ulcer recurrence at ten years.





en; mean age 59 years) with recently healed venous ulcers and no significant arterial disease, rheumatoid disease, or diabetes mellitus, were randomized into 3 groups:

- Group A) 149 patients who were wearing a class 2 elastic stocking - (Rudo, Nis, Serbia);
- Group B) 167 patients who were wearing a heelless open-toed elastic class III compression device knitted in tubular form - Tubulcus® (Laboratoires Innothera, Arcueil, France), and
- Group C) 161 patients who were wearing a multilayer compression system comprised of Tubulcus® compression device and one elastic bandage 15 cm wide and 5 meters long (Niva, Novi Sad, Serbia).

The main outcome measures were recurrence of leg ulceration and compliance with the treatment.

**RESULTS** One hundred and seventeen patients (24.52%) did not comply with their randomized compression class, 24 (16.1%) in class 2, 34 (20.36%) in class 3 and 59 (36.65%) in class 4 ( $P<0.05$ ). Overall, 65% (234/360) of patients had recurrent leg ulceration by 10 years. Recurrence occurred in 120 (96%) of 125 class 2 elastic compression cases, in 89 (66.9%) of 133 patients of class 3 compression cases and in 25 (24.5%) of 102 patients of class 4 compression cases ( $P<0.05$ ) (Figure 1).

**CONCLUSION** The results obtained in this study suggest that compression systems with the higher compression class provide statistically significant lower recurrence rate compared to elastic compression of lower class. The patients should apply the highest degree of compression that they can tolerate and feel comfortable with.

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## 4.2 COMPRESSION FOLLOWING ENDOVENOUS TREATMENT OF INCOMPETENT VARICOSE VEINS (CONFETTI)

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**AIM** The aim of this prospective, randomised controlled trial was to assess the impact of wearing or not wearing compression stocking after foam sclerotherapy of varicose veins.

**MATERIALS AND METHODS** Patients who were suitable for foam sclerotherapy were consented and randomly assigned to receive either compression stocking or no compression. Patients in the compression group were provided with the thigh-length class II compression stockings to wear for 7 days. No routine post-procedural analgesia was prescribed. Patient follow-up was scheduled at 2 weeks and 6 months. The primary outcome was patient pain score for the first 10 days, measured with a 0-100 mm Visual Analogue Scale. Secondary outcome measures were degree of ecchymosis, compliance with the intervention in the compression stocking group, time to return to normal activities or work, varicose vein occlusion rates at 6 months, and changes in clinical severity and quality of life scores. Intention-to-treat analysis was performed.

**RESULTS** 139 patients were randomised. 53% of the patients were women with a mean age 57.7 ( $\pm 14$ ) years. Both groups were comparable at baseline. Patients in the compression stocking group experienced significantly less pain than those in the no compression stocking group over the 10 days post-procedure, with median of 7mm (IQR 1-9 mm) after compression stocking compared to 19mm (IQR 15-28 mm) after no compression stocking (Mann-Whitney U,  $P < 0.001$ ). Patients in the compression group wore compression for a median of 8 days (IQR 5-10 days). No significant differences were observed in the degree of ecchymosis, or time to return to normal activities or work at 2 weeks. Clinical and quality of life scores improved in both groups. Both groups had similar occlusion rates. No major complications were observed.

**CONCLUSION** Wearing a compression stocking for 7 days following foam sclerotherapy leads to a reduction in post-procedure pain when compared to not wearing compression hosiery.

*Submitted for the EVF Prize.*



## 4.3 MICROCIRCULATORY ALTERATIONS IN CHRONIC VENOUS DISORDER -- OBSERVATION IN C0S PATIENTS (CEAP CLASSIFICATION)

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**AIM** The hemodynamic hallmark of chronic venous disorder (CVD) is an increased ambulatory venous pressure causing both symptoms of long-standing varicose veins and trophic changes around the ankle, presumably by an effect on the microcirculation. Despite the knowledge about the existence of microcirculatory changes in CVD, its importance in the severity and progression of the disease is not well defined, especially in earlier stages such as C0 symptomatic (CEAP classification) young women.

The aims of this study were to evaluate using venous duplex-scan, photoplethysmography and images of the cutaneous microcirculation C0s patients and compare the data with findings in healthy subjects (C0a – control group).

**MATERIALS AND METHODS** We have analyzed 100 young female patients with CVD, C0a (controls, N.=50,  $22.9 \pm 2.8$  years,  $22.9 \pm 4.0$  kg/m<sup>2</sup>) and C0s (N.=50,  $23.4 \pm 2.8$  years,  $23.5 \pm 4.7$  kg/m<sup>2</sup>). Eco-color Doppler and CytoCam (visualization of the cutaneous microcirculation) examinations of the lower limbs were held in the morning as well as the evaluation of the venoarteriolar reflex (VAR) using photoplethysmography (PPG) and Laser Doppler. The 2 groups were evaluated once after a 30 min rest in a climatized ambient.

**RESULTS** The C0s group presented significantly larger diameter of the dermal papilla in the left leg ( $151.0 \pm 21.4$   $\mu$ m) compared to C0a ( $141.0 \pm 21.2$   $\mu$ m, P=0.026). On the right leg, the diameter of the dermal papilla was also larger in the C0s group ( $149.8 \pm 23.5$   $\mu$ m) compared to C0a ( $142.1 \pm 21.0$   $\mu$ m, P=0.095). The analysis of the genetic influence on our findings showed that 59.6% of the C0s group had one or no close relative with CVD compared to C0a 76.9% of the control group (P=0.063). The diameter of the saphenous vein  $\leq 4$  mm was present in 53.2% of the C0s group and in 78.8% of the control group (P=0.006). The response to VAR was considered normal/satisfactory in 98.1% of the control group and in 78.3% of the C0s one in the left leg (P=0.003).

**CONCLUSION** Early stage of CVD and patients with C0s should be properly diagnosed, investigated, and treated and the microcirculatory dysfunction is likely to be the first place for its onset. The initial outcome seems to related to a decrease/dysfunction of the venoarteriolar reflex (VAR), confirming the presence of the disease and its hemodynamic impairment.

## 4.4 PREVALENCE OF CHRONIC VENOUS DISEASE IN PRIMARY CARE CENTERS IN AZERBAIJAN: THE VEINSCOPE STUDY

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**AIM** Estimates of Chronic Venous Disease (CVD) prevalence vary widely among studies (15–80%) due to differences in study design and target population, and there is evidence that CVD is underdiagnosed and undertreated. The objective of the VEINSCOPE study was to evaluate the prevalence of CVD in primary care centers in Azerbaijan and to describe the population with this condition.

**MATERIALS AND METHODS** This multicenter cross-sectional observational study was conducted from April to October 2021 at 50 primary care centers. Consecutive adult patients seeking medical help, regardless of cause, were eligible for the study. The investigators were randomly selected general practitioners. Demographic data, frequency of disease signs and symptoms, associated risk factors and therapeutic management practices were collected through questionnaires. CVD stage was assessed based on symptoms detected by questioning and physical assessment. CVD was categorized using the clinical CEAP classification.

**RESULTS** A total of 3100 patients were included, of whom 2777 were diagnosed with CVD (CEAP categories C0s-C6), corresponding to a prevalence of 85%. Patients affected were more often women (74.3%) than men (25.7%). Mean age ( $\pm SD$ ) was  $50.1 \pm 2.2$  years: 4.1% were less than 30 years-old, 38.3% were in the 31-50 years range, 51.4% in the 51-70 years range and 6.2% more than 71 years old. The most frequent symptoms were the sensation of leg pain (76.1%), heavy legs (71.4%), swelling (63.7%), tired legs (56.4%) and sensation of burning (42.7%). A large majority of patients (80%) had 3 or more CVD symptoms. The distribution of patients according to the CEAP categories was as follows: C0: 10.2%, C1: 12.4%, C2: 20.5%, C3: 50.2%, C4: 4.8%, C5: 1.5%, C6: 0.4%. Most patients (85%) were prescribed a treatment initiation by the physician, 34.9% were prescribed an ultrasound examination and 15.0% were referred to a specialist.

**CONCLUSION** The VEINSCOPE study provides new data about CVD prevalence in Azerbaijan, where very little data is available. CVD was found to be highly prevalent among patients seen in primary care clinics in Azerbaijan, highlighting the need for greater awareness of CVD and its consequences in order to ensure timely diagnosis and treatment.

## 4.5 FREQUENCY OF POSTOPERATIVE NEUROPATHIES AFTER PHLEBECTOMY AND MINIMAL INVASIVE TREATMENT METHODS FOR VARICOSE VEINS

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**AIM** Varicose veins are frequently encountered medical condition which extraction is associated with some complications. N.saphenous injury is the most common complication after surgical treatment of varicose veins. It has been associated as a risk factor of v.saphena magna stripping, but sometimes it can also occur during ablation. Injury happens because of the anatomical relationship between the nerve and the vein. The risk of the nerve injury is cited as a reason to avoid stripping and use minimal invasive techniques such as endovenous laser ablation (EVLA) or nonthermal vein ablation with cyanoacrylate adhesive. The aim of our study is to share our experience of frequency of postoperative neuropathies after different type of surgical treatment of varicose veins.

**MATERIALS AND METHODS** A retrospective study of patients with chronic venous disease who had undergone primary varicose veins extirpation or ablation. Patients were divided into 4 groups depending on the treatment method they underwent- phlebectomy, EVLA with 1470 nm or 1940 nm wavelength laser or n-butyl cyanoacrylate adhesive. All the patients had neurography of n.saphenous, n.suralis, n.peroneus superficialis, n.tibialis before and one month after the surgery. The study is continuing since November 2018. The data was analysed using IBM SPSS 22.0.

**RESULTS** Altogether 128 patients were included in the study. The mean age was 51,68 (SD 15,225, range 21-80). 32 patients underwent phlebectomy, 30 had EVLA 1470 nm laser, 34 EVLA 1940nm laser and 32 had treatment with cyanoacrylate glue. In one patient nerve transmission abnormalities were detected before surgery and he was excluded from the study. In 40 patients statistically significant ( $P<0,05$ ) n.spahenous or s.suralis lesion was identified one month after surgery. Out of those who underwent phlebectomy injury of nerve was caused in 62,5% of patients, 40% of patients who underwent EVLA 1470 nm and 23,5%-EVLA 1940 nm had nerve injury, however, those who underwent procedure with cyanoacrylate adhesive-0 of them had neuropathy.

**CONCLUSION** Neuropathy can be caused by all of the treatment methods, but mostly signs, symptoms and neurophysiological findings of nerve injury are common after phlebectomy. However, frequency of damage does not only depend on treatment method, but also wave length of diode laser might be the determining factor. Neurography findings may suggest that treatment with cyanoacrylate glue closure system gives the best results where no statistically significant consequences of nerve injury were detected. Injury to nerve seems not likely to happen during this procedure. The risk of nerve injury should be considered as a reason to choose, if possible, minimal invasive treatment for varicose veins.

*Submitted for the EVF Prize.*

## 4.6 N-BUTYL-2-CYANOACRYLATE GLUE ABLATION AS A SINGLE-CATHETER PROCEDURE FOR THE GREAT SAPHENOUS VEIN INSUFFICIENCY TREATMENT – 5-YEARS FOLLOW-UP

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**AIM** N-butyl-2-cyanoacrylate glue ablation as a single-catheter procedure for the great saphenous vein insufficiency, achieving immediate and permanent vein closure without any side symptoms during the vein regression. Furthermore, no tumescent anesthesia is required for the procedure. This study aims to present the results of the use of N-butyl-2-cyanoacrylate glue for the treatment of patients with insufficiency of the great saphenous vein and subsequent varices of the lower limbs.

**MATERIALS AND METHODS** 184 patients (143 women, 41 men; 37-76 years old) with the great saphenous vein insufficiency and its diameters from 5 to 17 mm (mean 7,8 mm) assessed by the ultrasound examination in the standing position, underwent N-butyl-2-cyanoacrylate glue ablation as a single-catheter procedure. Clinical class of the venous insufficiency was from C2 to C5 (CEAP classification) and great saphenous vein reflux was lasting longer than 0.5s in each of the patients. N-butyl-2 cyanoacrylate non tumescent endovenous ablation with a guiding light of the great saphenous vein was performed in all of the patients. All patients were treated with Low-Molecular-Weight Heparin in prophylaxis doses (subcutaneously) for 5 days following the procedure. There were no external compression device used after the treatment (neither stockings nor bandages). Five-years clinical follow-up was performed among all of the patients. Duplex-Doppler ultrasound imaging assessments of the veins of the treated limbs were performed in the 1<sup>st</sup>, 3<sup>rd</sup>, 6<sup>th</sup>, 12<sup>th</sup>, 24<sup>th</sup>, 36<sup>th</sup>, and 60<sup>th</sup> month after the procedure in each of the patients.

**RESULTS** The mean length of the ablation of the insufficient great saphenous vein was  $27.3 \pm 4.2$  cm and the average n-butyl-2 dose delivered was  $1.4 \pm 0.6$  mL. The mean procedure time was  $8.7 \pm 3.4$  min. There was no deep venous thrombosis, pulmonary embolism, phlebitis or paresthesia observed during the whole follow-up period. Procedural success ratio was 94,47%, and complete occlusion of the treated vein was observed in 169 patients during the first month follow-up Duplex Doppler ultrasound assessment. 15 patients with saphenous vein diameters of 12-17 mm had the procedure repeated after the first month from the previous treatment with the full therapeutic success. Kaplan-Meier analysis yielded with overall clinical recurrence-free rate after a whole five-years follow-up period was 89.28%.

**CONCLUSION** N-butyl-2-cyanoacrylate-based nontumescent endovenous ablation is efficient and safe procedure for the treatment of the insufficiency of the great saphenous vein. It should be considered in future studies to introduce restrictions of the diameter of the insufficient great saphenous vein treated. Moreover, the usefulness of the compression therapy introduced after the procedure remains to be assessed. Performance of large-cohort studies and the extension of the follow-up period should also be considered.

*Submitted for the EVF Prize.*



## 5.1 REMOTE EXPERT DVT TRIAGING OF NOVICE-USER COMPRESSION SONOGRAPHY WITH AI GUIDANCE

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**AIM** Compression ultrasonography of the leg is established for triaging proximal lower extremity deep venous thrombosis (DVT) when performed by a certified operator. It can be associated with long waiting times and high resource utilization. AutoDVT, a machine-learning software, provides a tool for non-specialists in acquiring appropriate compression sequences. These can be reviewed by an expert to triage patients. The purpose of this study was to test image acquisition and remote triaging in a clinical setting.

**MATERIALS AND METHODS** Patients with a suspected DVT were recruited at two tertiary centers, Magdeburg, Germany and Athens, Greece. Enrolled patients underwent an AutoDVT scan by a non-ultrasound-qualified healthcare professional prior to the standard duplex scan. The nurse used a handheld device with proprietary image-acquisition software to perform a two-point-compression examination in the inguinal crease and popliteal fossa. Images collected by the software were uploaded to a cloud-based platform for blind review by two to four external qualified physicians. All reviewers, based on these images only, rated all sequences on the ACEP image quality scale (score 1-5, a rating of 3 or above defined as sufficient diagnostic-quality) and made a triaging decision: low or high risk for DVT. High risk patients were those with either: a) incomplete scans, b) insufficient image quality, or c) incompressible veins. Categorization was compared to DVT diagnosis by the standard duplex scan. Primary endpoints were qualitative judgment of image quality and comparison of triage and diagnostic scan.

**RESULTS** 37 patients ( $63.70 \pm 17.01$  age,  $28.62 \pm 5.90$  BMI, 32% females) were scanned by 3 nurses. 34 (97.14%) scans were judged to be of diagnostic quality. Average ACEP scores were  $3.88 \pm 0.43$ . There was no significant difference in the proportion of diagnostic quality scans between reviewers or scanners.

Of 13 patients triaged as high risk, 5 were positive for DVT. Of 22 patients triaged as low risk, all were negative. Triaging resulted in a sensitivity of 100% and specificity of 75.86% for DVT-diagnosis.

The standard of care pathway resulted in 5 patients with confirmed DVT from a total of 37 patients (13.5%). With AutoDVT included in the pathway 13 patients were considered “high-risk” and required a scan, of which 5 had confirmed DVT (38.5%).

**CONCLUSION** Machine learning software was able to aid non-experts in acquiring valid ultrasound images of venous compressions and allowed safe and efficient remote triaging. Such a triaging strategy allows faster diagnosis and treatment of high-risk patients and can spare the need and cost of multiple unnecessary duplex scans.

## 5.2 BENEFIT OF AN ADJUSTABLE COMPRESSION SYSTEM FOR THE REDUCTION OF OEDEMA (AKRO STUDY)-PRELIMINARY RESULTS

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**AIM** Adaptive compression systems are increasingly used to treat chronic oedema due to their flexibility and ease of use. They enable patients or family members to efficiently apply compression without either risking insufficient decongestion or even deterioration due to inadequate bandaging skills or having to depend on professional healthcare. Moreover, because they can be adjusted during the course of the day, thus providing consistent compression and avoiding slipping or loosening, they can ensure an efficient decongestion therapy. The compression system used in this study can be donned and doffed with one hand, which facilitates its use for obese or otherwise handicapped patients.

This observational study aims to evaluate the efficacy and ease of use of adjustable compression systems as well as patients' compliance and adherence to the compression therapy. Primary endpoint is the independent use of the adaptive compression system by the patient, secondary endpoints are patients' satisfaction with the compression system, improvement of symptoms, and reduction of leg volume.

**MATERIALS AND METHODS** Inclusion criteria: patients with a medical indication for compression therapy due to chronic leg oedema (lymphoedema, chronic venous oedema, phlebolymphoedema, who have not tolerated compression so far or would otherwise depend on professional healthcare.

Exclusion criteria: PAD (ABI<0.5), phlegmasia coerulea dolens, congestive heart failure, neuropathy, age <18 years, lack of consent.

So far 91 consecutive patients have been included in 4 centres, 3 in Germany, 1 in Poland. Patients are clinically assessed for oedema and fitted with the compression system after contactless measurement of the leg volume. Patients are reassessed (measurements, questionnaires) after 3 days and six weeks.

**RESULTS** 69 patients have completed the study so far. 91% of patients were able to don the compression system independently without help. After 6 weeks the compression system fit correctly in 98.4%. Compliance was very good: 94% of the patients wore the compression system for more than 8 hours per day, 97% were satisfied with wearing it, only 1 Patient (1.6 %) did not want to go on wearing it after the end of the study. Lymph-ICF UG Score improved significantly in all domains after 6 weeks. Leg volume was reduced in all patients.

**CONCLUSION** Adaptive compression systems allow patients with chronic leg oedema to administer an efficient compression therapy during the primary decongestion phase as well as long term and thus to become self-sufficient and independent of professional healthcare. Leg volume is reduced after 6 weeks. Patient satisfaction, compliance and therapy adherence are high.



## 5.3 EFFECT OF RUSCUS EXTRACT, HESPERIDIN METHYL CHALCONE AND VITAMIN C ON HUMAN LYMPHATIC SMOOTH MUSCLE CELLS CONACTION

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**AIM** The lymphatic system parallels the circulatory system in vertebrates, and comprises a complex network of vessels, tissues, and organs. The lymphatic system drains almost every organ in the body. Besides actions including their venotonic, anti-inflammatory, and antioxidant effects, vasoactive drugs are expected to act on edema via their action on lymphatics. The objectives of this study were to characterize human primary lymphatic smooth muscle cells (LSMCs) and to evaluate the effect of the combination of Ruscus, hesperidin methyl chalcone and Vitamin C (Ruscus/HMC/Vit C) on intracellular calcium mobilization and contraction of human lymphatic smooth muscle cells (LSMCs) to better characterize the mechanism of its lymphotonic activity in clinical situations.

**MATERIALS AND METHODS** Human primary LSMCs, isolated from lymph node tissue of a healthy 54-year-old man and HMVEC were seeded in 96-well plates and cultured in dedicated cell medium for 72 hours at 37 °C in a 5% CO<sub>2</sub> atmosphere. Cell characterization was performed first by Rt-qPCR on ACTA2, MYL-9, MYH11, SMTN, PDPN, PDGFB, and PDGFRB genes and compared with the GAPDH reference, and secondly by immunofluorescence on aSMA and MCL20 to confirm cells characteristics. For functional assays, LSMCs were incubated in assay buffer for 30 minutes in presence of the FLUO-4 NW probe. Then cells were treated sequentially with reference compounds, test compounds or their respective solvents and Calcium mobilization was evidenced by videomicroscopy analysis of the fluorescence emitted by a specific Ca<sup>2+</sup> sensitive dye.

**RESULTS** Cell characterization results either by Rt-qPCR or by immunohistochemistry demonstrated that LSMCs presented the expected characteristic features of SMCs and a completely different expression profile to that of endothelial cells and that LSMCs are a suitable model

Figure 1. Effect of Ruscus/HMC/Vit C on LSMC contraction.

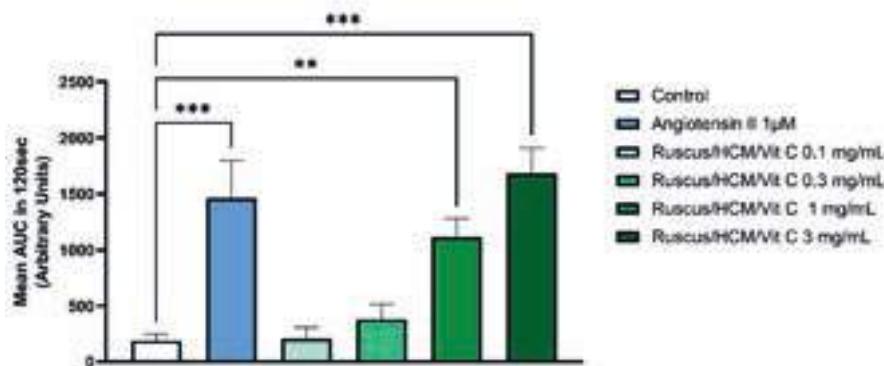
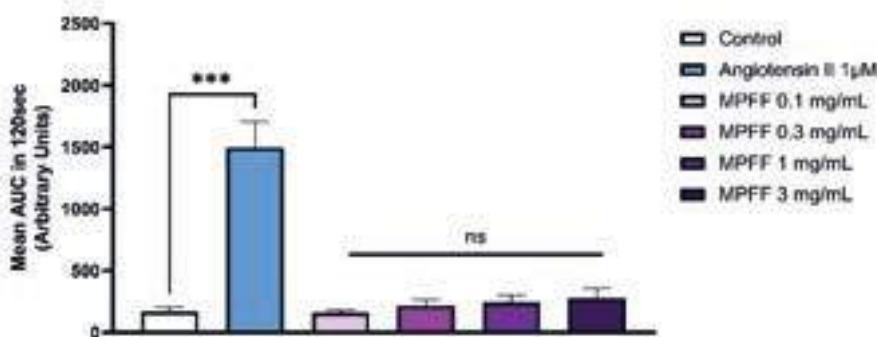


Figure 2. Effect of MPFF on LSMC contraction.



for cellular muscle contraction assays. The four selected contraction-provoking agents, tested as reference compounds induced robust calcium mobilization, validating the experimental model. Moreover, Ruscus/HMC/Vit C induced a strong and reproducible concentration-dependent calcium mobilization in LSMCs. On the contrary, micronized purified bacflavonoid fraction (MPFF), did not induce calcium mobilization whatever the tested concentration.

**CONCLUSION** Although alternative mechanisms of action may result in potential lymphotonic effects, the efficacy of lymphotonic products is nonetheless related to their stimulating effect on the contractile activity of the smooth muscle cells surrounding lymphatic vessels. In the light of the results obtained in this study, the direct effect of Ruscus/HMC/Vit C on LSMC contraction may partially explain its clinical efficacy on lymphotonic activity, as has been observed in terms of objective signs of edema as reported in the recent guidelines on chronic venous disease.



## 5.4 PERI-OPERATIVE MANAGEMENT OF ANTICOAGULATION AND BLEEDING IN PATIENTS UNDERGOING CDT FOR ACUTE ILOFEMORAL DVT

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**AIM** Catheter directed thrombolysis (CDT) is an evolving modality used as an adjunct to anticoagulation in selected patients with acute iliofemoral deep vein thrombosis (DVT). To date, outcomes have primarily focused on vascular patency but there is a paucity of data pertaining to anticoagulation management and bleeding outcomes.

To review the anticoagulation management and incidence of bleeding associated with vascular intervention for acute iliofemoral DVT.

**MATERIALS AND METHODS** A single centre, retrospective audit of chart and laboratory databases for all patients that presented with an acute iliofemoral DVT between December 2019 and November 2021. Data pertaining to patient demographics, vascular intervention, anticoagulation and incidence of bleeding were collated and analysed.

**RESULTS** A total of 79 patients, median age 42 years (range 14-72), with 52% being female were identified. All patients were treated with therapeutic dalteparin pre-procedure and for 6 weeks post intervention. 75 (94.9%) patients underwent CDT with alteplase 0.01 mg/kg/h for a median of 48 hours. 49 (60.8%) also had venous stenting. 53 (70.7%) developed hypofibrinogenemia (fibrinogen <1.0 g/L) and 46 (61.3%) received supplemental cryoprecipitate. Major bleeding was observed in 8 patients (10.7%) and was significantly associated with a fibrinogen  $\leq 0.5\text{g/L}$  ( $\chi^2$  5.92, df = 1, P<0.05). Average drop in haemoglobin was 20 g/L with no associated mortality. 62 (78.4%) patients were switched to a direct oral anticoagulant at 6 weeks. 8 patients underwent repeat intervention with the majority (N=5) performed within one month of initial intervention with no bleeding complications.

**CONCLUSION** The risk of major bleeding with CDT is low and not increased by re-intervention. Hypofibrinogenemia is strongly associated with increased risk of bleeding and is a common complication of CDT; therefore, justifying the recommendation for regular monitoring and consideration of replacement.

## 5.5 A SYSTEMATIC REVIEW OF COMPRESSION FOLLOWING TREATMENT OF SUPERFICIAL VENOUS INCOMPETENCE

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<sup>1</sup>Hull University Teaching Hospitals, Hull, UK;

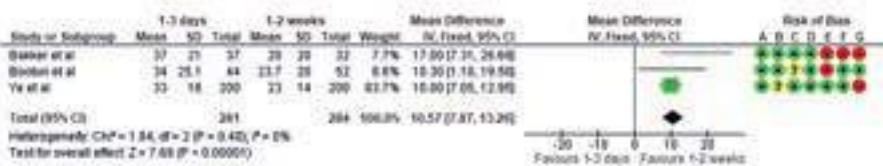
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<sup>3</sup>Hull York Medical School, Hull, UK

**AIM** To investigate the evidence regarding the optimal type and duration of compression following treatment of symptomatic superficial venous incompetence (SVI).

**MATERIALS AND METHODS** The National Institute for Health and Care Excellence's (NICE) Healthcare Databases Advanced Search (HDAS) engine was used to identify all English language randomised controlled trials (RCT) investigating compression strategies following treatment for SVI. Outcomes of interest included postprocedural pain, venous thromboembolism (VTE), Health Related Quality of Life (HRQoL) and anatomical occlusion.

**RESULTS** In total, 18 studies were included comprising some 2550 treated limbs. Compression was compared with no compression in 4 studies, 9 studies compared different durations



**Risk of bias legend:**  
 (A) Random sequence generation (selection bias)  
 (B) Allocation concealment (selection bias)

(C) Blinding of participants and personnel (performance bias)  
 (D) Blinding of outcome assessment (detection bias)  
 (E) Incomplete outcome data (attrition bias)  
 (F) Selective reporting (reporting bias)  
 (G) Other bias

1-3 days versus 1-2 weeks compression: 100mm Visual Analogue Scale post procedural pain comparison



of compression and a further 5 compared different types of compression. A 1-2 week period of compression was associated with a mean reduction of 11 points, 95% CI (8- 13);  $p<0.001$  in pain on a 100 mm Visual Analogue Scale compared with shorter duration of compression. This was associated with improved HRQoL and patient satisfaction. Longer durations of compression did not add further benefit. There was low quality evidence suggesting that 35 mmHg compression with eccentric thigh compression achieved lower pain scores when compared with lower interface pressures. There were no significant differences in VTE rates or technical success detected for any group including no compression.

**CONCLUSION** Postprocedural compression of 1-2 weeks following SVI treatment is associated with reduced pain when compared with shorter duration. Further research is required to identify the optimal interface pressure and type of compression and to understand the impact of compression on VTE.

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## 5.6 STENTING OF NON-THROMBOTIC ILIAC VEIN LESIONS: LONG-TERM PATENCY RATE

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**AIM** Endovascular venoplasty/stenting of iliac veins in patients affected by primary obstruction, Non-thrombotic Iliac Vein Lesions (NIVL), is the operative treatment of choice in chronic venous insufficiency (CVI) patients, determining a significant symptom improvement. Since the preliminary reports about the technique, data regarding stent patency in primary obstruction were significantly better than the ones related to secondary obstruction treatment. Nevertheless, it should be understood that a thrombotic complication in primarily obstructed patients is more severe than in post-thrombotic patients. In fact a stent occlusion in a NIVL case brings the patient to secondary obstruction, with the severe implications typical of this clinical group. Consequently, a particular attention should be given in the treatment of NIVL patients, in terms of selection, correct technique, adequate follow-up. We retrospectively examined the patients submitted in our center to iliac stenting for NIVL to determine the long-term patency.

**MATERIALS AND METHODS** From January 2010 to December 2021, 135 patients affected by chronic venous insufficiency caused by primary obstruction alone (72.6%) or primary deep reflux and obstruction in association (27.4%) were submitted to iliac venoplasty and stenting. Median age was 47 (range 18-78 years), 50.3% were female. IVUS examination has been performed in 100% of case. In 80 cases (59.3%) a braided stent was implanted. Clinical and ultrasound follow up was scheduled at 15 days, 1- 3 - 6 months, then yearly.

**RESULTS** The procedure was successful in 100% of cases. No perioperative major or minor complications were detected.

The median follow up was  $30.8 \pm 8$  months, with a survival curve at 3, 12, 24 e 36 months respectively 100%, 100%, 97.4%, 97.4%. The freedom from reintervention at 3, 12, 24 e 36 months was respectively 100%, 100%, 100%, 91%. The 3 cases who had a clinical worsening underwent IVUS evaluation with evidence of in-stent restenosis and were submitted to venoplasty procedure. The type of stent implanted, old generation or venous dedicated, did not influence significantly the patency rate.

**CONCLUSION** Venoplasty and stenting of NIVL proved a safe and effective technique. No one of the patient in our series developed a thrombosis. The positive risk/benefit rate should be strongly underlined when this type of procedure is proposed to patient affect by CVI at any clinical class.

*Submitted for the EVF Prize.*



## eP1 MINIMALLY INVASIVE PROCEDURES FOR PELVIC ORIGIN VARICOSE VEINS

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**AIM** Pelvic vein incompetence may be responsible for pelvic origin varicose veins (VVs). They result from the transmission of pelvic venous hypertension through the escape points in the pelvic floor to the lower limb, vulvar or scrotum veins. Minimally invasive procedures seem to be effective in treatment of VVs. The aim of this study is to evaluate the safety and efficacy of ultrasound-guided foam sclerotherapy (UGFS) in patient with pelvic origin VVs.

**MATERIALS AND METHODS** This is a 12-month prospective observation of 210 patients (164 women and 46 men) with pelvic origin VVs treated with UGFS. Demographic information, distribution and extent of venous reflux, clinical and procedural data, treatment complications were collected on a customized database and analyzed. Prior to and 1, 6, 12 and 24- months after treatment patients underwent clinical and duplex assessment to evaluate the occlusion and recurrence rates. Patients clinical improvement and satisfaction were assessed by CEAP classification, venous clinical severity score (VCSS) and on Visual Analogue Scale (VAS:1-10).

**RESULTS** Of 210 patients included at baseline, 78% were females, with median age of 45 years (IQR 25-77). Patients were divided into four groups base on the distribution of pelvic reflux into non-saphenous VVs (42%), saphenous VVs (30.5%), isolated vulvar VVs (19%) and isolated scrotum VVs (8.5%) groups. 78% of patients in the saphenous VVs group had performed additional endovenous laser ablation for the dilatated incompetent great saphenous vein and 21% of patients with scrotum VVS had additional 1064 nm Nd:YAG laser for angiokeratoma. The 1-month, 6-month, 12-month follow-up rates were 100%, 96.7%, 91.9%, respectively. The complete occlusion of pelvic escape points and related varicosity was achieved after one sclerotherapy session in 73.3% (154/210) of patients and all patients after two sessions. The occlusion rates were 96% and 93.8% at 6- and 12- month follow-up, respectively. The reported adverse events at 1-month follow-up included abdominal, vulvar or scrotum pain for 2 days (19%), visual disturbance (2.9%), hyperpigmentation (13.8%), superficial thrombophlebitis (2.4%) and were mostly transient. Permanent hyperpigmentations were found in 2.1% at the 12-month follow-up. There was significant improvement in CEAP and VCSS ( $P<0.001$ ) for all time intervals. Patient satisfaction of the treatment was high, with a median satisfaction of 9.5 on a VAS:0-10 scale. 98.4% said they would like to have this procedure again.

**CONCLUSION** Minimally invasive procedures including UGFS for pelvic escape points and related varicosity are safe and acceptable method of treatment of pelvic origin VVs with high occlusion rate and low mid-term recurrence rate.



## eP2 TIME DRIVEN ACTIVITY BASED COSTING FOR CAPTURING THE COMPLEXITY OF HEALTHCARE PROCESSES: THE CASE OF MANAGEMENT OF PATIENTS WITH DEEP VEIN THROMBOSIS AND LEG ULCERS

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<sup>2</sup>National Reference Training Center in Phlebology (NRTCP), Vascular Surgery - Cardiovascular Dept., H, Modena, Italy;

<sup>3</sup>Centro Ulcere Cutanee, ASL Frosinone, Frosinone, Italy, Frosinone, Italy;

<sup>4</sup>Department of Policy Analysis and Public Management, Bocconi University, Milan, Italy, Milan, Italy

**AIM** The framework “value-based healthcare” considers “health outcomes achieved per unit cost expended over the entire care delivery value chain”. Time driven activity-based costing (TDABC) represents the best way to capture the complexity of healthcare processes and translate them into costs. The aim of the study was to apply TDABC methodology for the management of patients with deep vein thrombosis (DVT) and leg ulcers from the societal perspective in Italy. Two options were analyzed: venous endovascular stenting and standard of care (SOC) consisting in compression devices and anticoagulants.

**MATERIALS AND METHODS** Implementing TDABC requires to identify the steps of the investigated event. A process mapping of surgery for stenting procedure has been performed through patient observation at Hesperia Hospital (Italy) to assess all time and resources absorbed. Interviews with clinicians allowed to refine data collection also for the follow-up (ulcer healing process and recurrences). The capacity cost rate has been then calculated for each capacity resource, allowing to determine the full cost of care cycle.

**RESULTS** The process mapping for stenting identified 9 macro-phases, from patient hospital access to discharge, detailed in 36 micro-phases and 76 activities accounting for a total of 3,072 minutes. Total costs for personnel and healthcare resources were 1,257€ (28%) and 3,272€ (72%), respectively. For SOC, the cost for the initial management (first visit/treatments) was 243.86€, the monthly cost for the ulcer management was 444.83€, while the final cost in case of ulcer healing was 313.45€; considering a healing time of 3 months this leads to a total cost of 1,892€, of which 302€ (16%) sustained by the patient for purchasing drugs/compression stockings.

**CONCLUSION** The hospital cost for stenting (4,529€) is similar to the DRG reimbursement (4,742€), anyway the analysis did not consider general and some initial investment costs for the surgical unit, so the total cost of the procedure may be underestimated. Concerning SOC, the different ambulatory activities, for a patient with an ulcer healing in 3 months, correspond to a reimbursement of about 1,132€. TDABC methodology applied to stenting and SOC showed that reimbursement rates may not cover the real costs of hospitals/clinical centers. Moreover, the cost for the management of leg ulcers is partially sustained by the patients themselves. However, the study underlines how this approach allows to support managing complex costing of hospital settings to create value in health care. In a health economics perspective, it permits to overcome the difference between “costs” and “public expenditure”.

A more efficient policy for covering the real costs may be beneficial for both clinical centers and patients.

## eP3 RISK OF RECURRENT THROMBOEMBOLIC EVENTS IN PATIENTS WITH SUPERFICIAL VEIN THROMBOSIS TREATED WITH INTERMEDIATE DOSES OF TINZAPARIN

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<sup>3</sup>University Hospital Attikon, Athens, Greece;

<sup>4</sup>University Hospital of Patra, Patra, Greece

**AIM** | The aim of this study is to evaluate the risk of recurrence in patients with superficial vein thrombosis (SVT) treated with intermediate doses of tinzaparin.

**MATERIALS AND METHODS** | Retrospective analysis of consecutive patients treated with Tinzaparin (131 IU/kg), once daily. Treatment duration was at the treating physician's discretion. All patients were followed up for at least 3 months. The primary outcomes were any venous thromboembolism (VTE) adverse events including deep vein thrombosis (DVT) or pulmonary embolism (PE) or recurrence of SVT and extension of thrombotic process up to 3 months. The principal safety outcome was bleeding complications. Secondary outcomes were the evaluation of treatment duration.

**RESULTS** | 956 patients (65% female, mean age 58.7±13.7 years) were included. Median duration of treatment was 30 days (14-120). More than half of the patients (562, 58.8%) received treatment for more than 30 days. History of deep vein thrombosis (DVT) (HR 3.30; 95% CI=1.66-6.56; P=0.0006), location of SVT above the knee (HR 1.98; 95% CI=1.50- 2.61; P=0.0001) and palpable skin induration (HR 2.70; 95% CI=1.63-4.47; P=0.0001) were independent factors associated with prolonged treatment duration. Primary outcomes (thrombotic events and bleeding) occurred in 39 (4.1%) patients and their median treatment duration was 33 days (range, 14-200 days). Recurrent VTE events occurred in 33 patients (SVT recurrence- 22 pts; DVT- 8 pts; pulmonary embolism -1 pt) and the median time to the event was 30 days (6-113). Total adverse events (thrombotic and bleeding) were not related to treatment duration, as occurred in 17 patients (43.6%) treated up to 30 days and in 22 patients (56.4%) received prolong treatment (P=0.48).

**CONCLUSION** | Tinzaparin at intermediate dose is an effective and safe treatment for SVT. Past history of VTE episode, thrombus location above knee and palpable skin induration are factors associated with longer treatment duration. Adverse events were not related to treatment duration. Future randomized studies are needed to provide robust evidence.



## eP4 EFFECTIVENESS OF CRYO-LASER AND CRYO-SCLEROTHERAPY (CLACS) COMPARED WITH MICRO SCLEROTHERAPY FOR TELANGIECTASIA

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**AIM** Micro Sclerotherapy (MS) is frequently used for the esthetic treatment of reticular veins and telangiectasia of the lower limbs. After this procedure, compression stockings are usually prescribed for 3 weeks. Although simple, MS often leads to low patients satisfaction with the immediate result of the treatment and the frequent appearance of hyperpigmentation and matting. The main alternative for MS is transdermal laser treatment. The combined method of Crio-Laser And Cryo-Sclerotherapy (CLACS) has gained popularity in recent years. CLACS has a synergistic effect on veins of laser flashes after skin cooling and sclerosant injections.

The aim was to compare the effectiveness of MS and CLACS results.

**MATERIALS AND METHODS** After skin cooling all dilated veins were treated with Microsecond NdYAG 1064 nm laser for CLACS therapy with energy density range 50-90 J/cm<sup>2</sup>. Then MS of the same vessel was performed with a Sodium Tetradecyl Sulfate 3 mg/mL (STS3% ex tempora was mixed with a Glucose 40% in a 1:9 ratio to increase the viscosity of the solution). MS was performed according to a similar technique in the control group.

Consecutive 188 adults patients dissatisfied with their appearance of dilated veins in the legs (C1 class according to the CEAP), were included in the study. Saphenous or deep vein reflux was the exclusion criteria. The effectiveness of the procedures was evaluated by an independent expert on a 5-point scale by comparing photos before, after 1-2 weeks and after 6-10 weeks. Immediate results after one week were traced in 147 (89.6%) after CLaCS and 41 (86.7%) after MS. Long-term results of CLaCS were assessed in 121 (74.2%), and after MS in 22 patients (51.1%).

**RESULTS** The average age was  $42.62 \pm 10.47$  years (mode 51y.o.) in CLaCS and  $43.05 \pm 8.92$  (mode 38y.o.) in MS group. Most of the patients were between 31 and 40 y.o. (42%), 96% were women. The groups were comparable in age ( $P=0.584$ ) and gender ( $P=0.69$ ).

The average effectiveness score on a five-point scale for evaluating 1-2 weeks after the CLaCS and MS were  $3.9 \pm 0.6$  and  $2.3 \pm 0.8$ , respectively.

| 5-point scale/<br>procedure | 1 - decline<br>(matting) | 2 - at the same<br>level | 3 - reduction of<br>less than 50% | 4 - reduction of<br>more than 50% | 5 - reduction of<br>more than 75% |
|-----------------------------|--------------------------|--------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| CLACS, N.=147               | 2 (1,4%)                 | 4 (2,7%)                 | 36 (24,5%)                        | 72 (49,0%)                        | 33 (22,4%)                        |
| MS, N.=41                   | 9 (22,0%)                | 16 (35,6%)               | 12 (26,7%)                        | 3 (6,7%)                          | 1 (0,5%)                          |

Severe matting was found in two patients (1.4%) after CLaCS and in 9 (22%) after MS ( $P<0.0001$ ). The average score in the groups 6-10 weeks after the procedures was ( $4.5 \pm 0.4$ ) CLaCS and ( $3.8 \pm 0.7$ ) MS ( $P<0.0001$ ).

**CONCLUSION** Improvement of the appearance of the skin after CLaCS treatment occurred faster, with a decrease in the likelihood of hyperpigmentation and matting, compared with sclerotherapy. These differences remained significant after 6-10 weeks.

## eP5 RADIOFREQUENCY ABLATION FOR AXIAL REFLUX ASSOCIATED WITH FOAM SCLEROTHERAPY FOR VARICOSITIES IN ONE-STEP APPROACH: A PROSPECTIVE COHORT STUDY COMPRISING LARGE DIAMETERS SAPHENOUS VEINS

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**AIM** This study assessed the outcomes and impact on the quality of life following one-step outpatient radiofrequency ablation (RFA) for large great saphenous veins (GSV) with reflux and ultrasound guided foam sclerotherapy (USGFS) for varicosities.

**MATERIALS AND METHODS** It is a retrospective, single-centre, analytical cohort. Thirty symptomatic patients having reflux in the GSV and varicosities (CEAP C3 to C6) were treated with RFA and USGFS simultaneously, in a single-step procedure, from March 2016 to December 2016. They were followed up at 1 week, 6 months, 1 and 3 years. Clinical outcomes, changes in the Quality of Life (QOL) questionnaires SF-36T, VCSS and AVVQ, evolutive vein occlusion rates were assessed by duplex ultrasound, and ulcer closure was checked.

**RESULTS** The sample was divided into two groups (Group 1) GSV diameter  $\geq 13.0$  mm (median 19.0 [14-24]), 17 subjects, and (Group 2) GSV diameter  $\leq 12.9$  mm (median 10.3 [10-12]), 16 subjects. No major adverse event was observed, and the postoperative minor adverse event rates were similar between the two groups. A significant improvement was observed in VCSS and AVVQ from the preoperative levels to the sixth month and the third-year follow-up. Twelve of 13 ulcers had healed at 1 year and remained closed until 3 years. The entire sample had a significant increase in all short form 36 domains, except for mental health in the Group 2 (GSV  $\geq 13.0$  mm). Overall first week occlusion rate for the whole sample was 90.9% and 69.7% at the 3-year follow-up. No difference in occlusion rate was observed between the two groups at any time.

**CONCLUSION** In this study, the outpatient combined technique was safe and feasible in this population with no major adverse events, despite the large diameters of GSV and a considerable proportion of leg ulcers. Within the third year, the total sample and both saphenous vein diameter range subgroups showed equivalent improvement in VAS, VCSS, and AVVQ quality of life questionnaires, satisfactory axial occlusion, and maintained ulcer closure.



## eP6 THE NATURE OF THE VARICOSE VEIN DISEASE RECURRENCE AFTER ENDOVASCAL THERMAL ABLATION INTERVENTIONS

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**AIM** The aim was to identify the nature of varicose vein disease recurrence after endovasal thermal ablations in the great saphenous vein system (GSV).

**MATERIALS AND METHODS** A retrospective analysis of the documentation of largest phlebological centers of the city for the last 8 years (2002-2013) was carried out. All patients had a history of thermoablative endovascular interventions for lower extremities varicose veins in the GSV system, CVD class 2-4. Radiofrequency ablation (RFA) of the GSV trunk on the thigh was performed in 1979 cases, endovasal laser coagulation (EVLC) - in 1671 cases. EVLC of perforating veins on the lower leg was performed in 80% of cases. Recurrence of the disease was detected in 271 cases (7.4%). Among these patients, there were 67 men (24.7%) (average age - 54 years); 204 women (75.3%) (average age - 56 years). Recurrence after EVLC was registered in 159 cases (140 - in the GSV system, 19 - in the SSV system), total recurrence rate - 9.5%. Recurrence after RFA was in 112 cases (99 - in the GSV system, 13 - in the SSV system), total recurrence rate - 5.6%. All types of recurrence were ranked by the nature of changes in the venous bed, developed after previous interventions.

**RESULTS** The average terms of recurrence progression were: the recanalization of GSV on the thigh (in the ablation zone) - 4.3 years; the recurrence on the lower leg (outside the ablation zone) - 5.1 years, in the SSV system - 4.8 years. Table I presents the nature of recurrences for RFA and EVLC.

Table I. The nature of varicose veins recurrence after RFA and EVLC in the GSV system.

| <i>The nature of recurrence</i>                                          | <i>EVLC N. (%)</i> | <i>RFA N. (%)</i> |
|--------------------------------------------------------------------------|--------------------|-------------------|
| <i>Recanalization of the GSV bed on the thigh (in the ablation zone)</i> |                    |                   |
| • new flows                                                              | 41 (25.8)          | 36 (32.1)         |
| • new perforating veins                                                  | 49 (30.8)          | 31 (27.7)         |
| • reset by SFA                                                           | 2 (1.3)            | 1 (0.8)           |
| • neovasculogenesis in the SFA zone                                      | 1 (0.65)           | 1 (0.8)           |
| • undetected double GSV trunk                                            | 0                  | 1 (0.8)           |
| <i>Recurrence on the lower leg (outside the ablation zone)</i>           |                    |                   |
| • new flows                                                              | 27 (17.0)          | 14 (12.5)         |
| • new perforating veins                                                  | 20 (12.5)          | 15 (13.4)         |
| Disability of the SSV                                                    | 19 (11.9)          | 13 (11.6)         |

**CONCLUSION** More than a half of varicose vein disease recurrences after thermal ablations were associated with the appearance of new overflows and new perforating veins on the thigh in less than 5 years. Within this study, statistically significant differences in the nature of recurrence between RFA and EVLC were not found.

## eP7 ENDOVENOUS THERMAL ABLATION FOR TREATMENT OF SYMPTOMATIC VARICOSE VEINS DURING SUMMER TIME: HOT OR NOT

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**AIM** Traditionally, surgical varicose vein treatment is predominately performed during the cold winter season in order to avoid complications such as wound infections at the groin incision, increased haematoma especially after concomitant phlebectomies, superficial thrombophlebitis and last but not least to improve patients comfort wearing the compression bandages after the operation. However, this practice is driven by personal experience rather than by robust scientific data. Endovenous thermal ablation (ETA) is reported to be less invasive and has replaced crossectomy/stripping as first line treatment in many guidelines.

However, whether ETA performed during the hot summer season is safe or associated with a higher complication rate and/or impaired patients' comfort has not been studied.

Thus, it is the aim of the present study to analyze whether higher outside temperatures affects the outcome and/or complication rate of ETA for treatment of symptomatic varicose veins.

**MATERIALS AND METHODS** In this observational study the medical records of all patients who had ETA of the great saphenous vein (GSV), accessory saphenous vein (ASV), or small saphenous vein (SSV) between September 2017 and October 2020 were reviewed. All patients signed a written informed consent agreeing to use of their medical data anonymously for publication. Demographic data, vein characteristics, procedural data including concomitant phlebectomies and sclerotherapy and outcome data including ultrasound findings and complications were assessed.

For each intervention, the local peak outside temperature at the day and the day after the intervention were collected using the data of the proximate meteorological station (idaweb-MeteoSwiss). Days with a peak temperature >25 °C are defined as summer days, days with a peak temperature >30 °C are defined as very hot summer days.

**RESULTS** Between September 2017 and October 2020 in total 846 ETA interventions with 1241 treated truncal veins were performed in 679 patients. In 839 (99.2%) cases a concomitant phlebectomy with an average ( $\pm$ SD) treatment length of 69 $\pm$ 36 cm and in 182 (21.5%) cases a concomitant foam sclerotherapy was performed.

The mean peak temperature on the day of intervention was 14.0 °C (SD $\pm$ 8.2 °C) with a minimum and maximum temperature of -1 °C and 32.9 °C, respectively. In 109 (12.9%) of the cases the peak temperature was >25°C and in 11 (1.3%) of the cases >30 °C.

The highest temperature recorded within the first 14 days after treatment was on average 19.0 °C (SD $\pm$  7.2 °C) with a minimum and maximum of -1°C and 35.9 °C. In 261 (30.9%) of the cases the peak temperature was >25 °C and in 78 (8.4%) of the cases >30 °C.

No significant association of the peak temperature at the day of intervention as well as of the peak temperature within the first 14 days after intervention with successful truncal vein ablation, minor or major bleeding, days of work loss, pain during the intervention and at day 1 and 7 after the intervention on visual analog scale, thrombophlebitis, infection, unplanned additional consultations or satisfaction with the intervention during was observed.



**CONCLUSION** Higher outside temperatures during and within 14 days after ETA with micro-phlebectomies seem not to be associated with adverse outcomes *i.e.* prolonged inability to work or more post-procedural pain. Given the minimal invasive nature of ETA, our results can reassure clinicians and patients that ETA varicose vein treatment is possible and safe throughout the year, even on hot or very hot summer days.

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## eP8 9-YEAR-LONG ANALYSIS OF ADVERSE EVENTS OF SCLEROTHERAPY IN A SINGLE CENTER (2013-2022)

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**AIM** Even foam sclerotherapy has been reported with a low rate of complications, most of which are potentially preventable. This is an audit of AEs over a 9-year-long period, in order to identify causes and/or potential risky practices.

**MATERIALS AND METHODS** Review of a prospective database of patients treated with foam sclerotherapy between the years of 2013 and 2021. Data were analysed globally, as well as separately in two periods: 2013-2016 and 2017-2021. An analysis with descriptive statistics was conducted. For the procedures, polidocanol foam was prepared with a magnetic stirrer and room air. AEs analysed included visual disturbances, neurologic symptoms, chest pain and anxiety and deep vein thrombosis. Aesthetic results were not included.

**RESULTS** From January 2013 to December 2021, 3171 sessions were performed on 740 patients (611 women [82,5%] and 129 men [17,7%]). A total of 32 AEs were registered for 23 patients, 1 man and 22 women (average age: 50,3, Range 30-74). Incidence of AE of 1,01% of sessions (3,1% of patients). 68,75% (22/32) of events were registered in aesthetic veins treatments and 31,35% in other type of varicose veins. Out of all AEs, patients reported 12 visual disturbances (0,38%), 9 neurological events (0,28%), 7 events of chest discomfort/anxiety (0,22%), 2 cases of DVT (0,06%), 1 case of cellulitis (0,03%) and 1 Tako-Tsubo (0,03%). Medical history of migraine was reported in 7/23 patients, (30,4%). PFO 3 positive of 5 checked. Neurological events were diverse with immediate recovery. AEs differed during the first half and second half of study, so data was analysed in two periods. The 1<sup>st</sup> period (2013-2016) included 355 patients/1162 treatments. The 2nd period (2017-2021) included 385 patients/2009 treatments. During the 1<sup>st</sup> period, AEs were reported for 2,07% of sessions (4,2% of patients), compared to 0,4% of sessions (2,08% of patients) for the 2<sup>nd</sup> period ( $P<0,05$ ). Comparative type of AE in 1<sup>st</sup> period vs. 2<sup>nd</sup> period goes as follows: visual disturbances, 8 events (0,69%) vs. 4 events (0,20%) ( $P<0,05$ ); neurologic symptoms, 9 events (0,77%) vs. 0 events ( $P<0,05$ ); chest discomfort, 7 events (0,60%) vs. 0 events ( $P<0,05$ ). The average volume in global series was 10,2 cc with average% Pol 0,4%. For the 1<sup>st</sup> period, the volume was 11,6cc and Pol 0,26%; for the 2<sup>nd</sup> period it was 7,5cc and Pol 0,65% ( $P<0,05$ ). Ten patients with previous AEs followed treatment using O2CO2 without any AE.

**CONCLUSION** A self-audit of AE is advisable to analyse own results. A higher volume of foam injected was related to higher adverse events. Migraine history should be asked routinely to identify a risk group.

## eP9 THE SIMULATOR FOR ELASTIC BANDAGE APPLYING SKILLS DEVELOPMENT

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**AIM** Elastic compression is one of the most important parts of venous diseases treatment. Compression stockings can be successfully used in most cases. But in cases, when the edema is unstable and the leg circumference is noticeably changing, the use of stockings is onerously. In such cases we must use the elastic bandage.

This study aims to create and evaluate the special simulator for developing the skills of elastic bandage applying.

**MATERIALS AND METHODS** The simulator consists of a foot dummy with 5 piezoelectric transducers. Transducers evaluate the bandage pressure. The result is visible on a special screen. We can evaluate either the pressure on the separate transducer or the pressure difference between two of them.

We evaluated the basic compression near the ankle, which must be the biggest. We also evaluated the foot pressure distribution.

At the first stage we evaluated the elastic bandage applying skills of 100 medical students. They were divided in two equal groups. In the first group we didn't describe the rules of elastic bandage applying and the students did as they thought right. The second group students passed a detailed briefing of the elastic bandage applying and they knew what the graduated compression means.

At the second stage we combined all the students in one group, then we had a lesson of elastic bandaging, explained errors and the students passed the special training.

**RESULTS** Basic compression (ankle pressure). Only 16% of the first group students achieved the right result. In 36% the pressure was higher than necessary and in 48% it was smaller. In the second group the correct result was in 46%. In 28% it was higher and in 24% smaller than necessary (Figure 1). Generally 70% of students didn't pass the task.

Figure 1. Results (basic compression – ankle pressure).

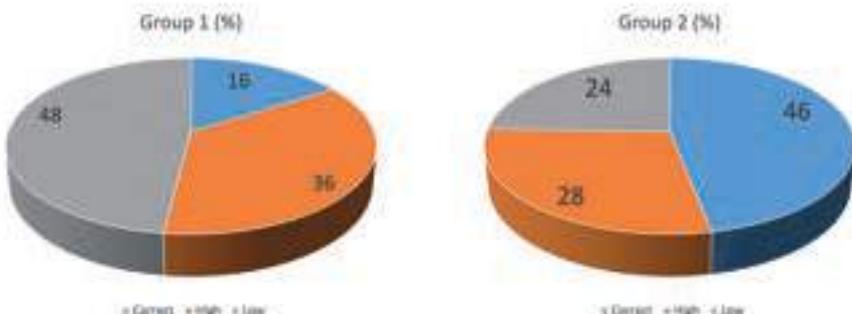


Figure 2. Results (pressure distribution).

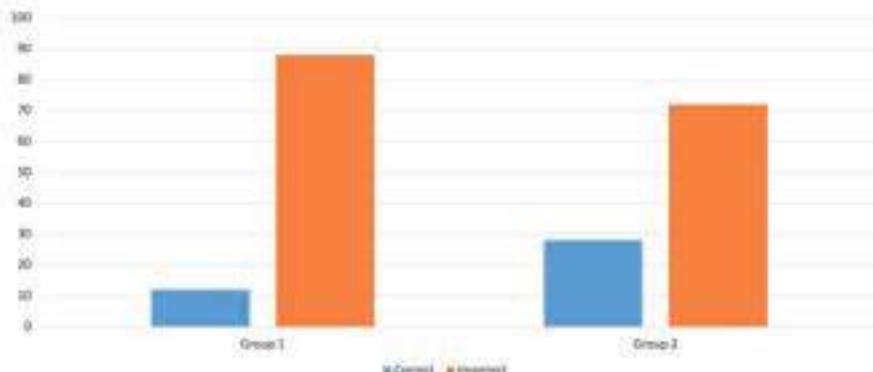
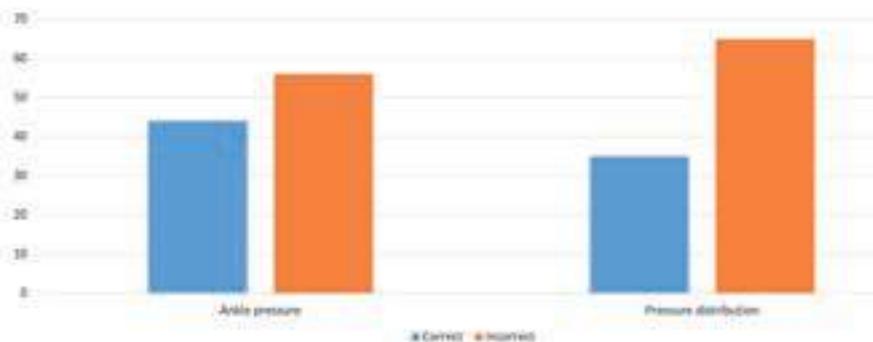


Figure 3. Results (after the training).



**Pressure distribution.** In the first group it was correct in 12% and in the second one it was correct in 28%. The most common mistake was the middle pressure near the ankle, the highest was near the knee and the smallest on the top of the leg (Figure 2). Generally only 20% of students passes this task.

After the training the ankle pressure was correct in 44% and the pressure distribution was correct in 35% of students (Figure 3).

**CONCLUSION** Students, who didn't receive any information about elastic bandaging are making a lot of mistakes during this procedure. It can do harm to the patient.

Just the simple description improves the bandaging skills. After the special training these skills became much better.

We must teach the students how to apply the elastic bandage correctly.

## eP10 THE SINGLE CENTER INVESTIGATION OF KNEE PHLEBOARTHROSIS PATIENTS QUALITY OF LIFE

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**AIM** The combination of lower extremities varicosity with knee osteoarthritis is called Phleboarthrosis. This combination is widely spread, extremely in older people. One of the biggest problem is the decrease of quality of life (QoL). That is why it is very important to evaluate the QoL dynamics, when we evaluate the treatment results.

**MATERIALS AND METHODS** The research objective was to evaluate the QoL in patients with phleboarthrosis before treatment and its dynamics during the treatment. In order to do it we used:

- Chronic Venous Insufficiency Questionnaire-2 (CIVIQ 2), which is validated for patients with chronic venous diseases;
- The Knee injury and Osteoarthritis Outcome Score (KOOS), specially its QoL part;
- Lequesne Index, it is so called knee arthroscopy severity index.

We investigated 116 patients with knee phleboarthrosis. They passed the clinical and instrumental examination in order to be included into the investigation. The instrumental examination included knee X-Ray, knee ultrasonography, venous ultrasonography. All examinations were made before the investigation, 6 and 12 months later. Exclusion criteria were chronic arterial insufficiency level 2B and more after Pokrovsky-Fontaine iliac or femoral artery occlusion. We compared the QoL results with the results of 20 healthy volunteers.

The treatment consists of:

- venous insufficiency treatment: elastic compression and phleboactive drug use;
- arthroscopy treatment: non-steroid anti-inflammatory drugs and disease modifying medications (so called chondroprotectors). All the patients strictly continued the pre-investigation scheme of non-steroid anti-inflammatory drugs and disease modifying medications applying.

**RESULTS** The results of QoL investigation by CIVIQ-2 were  $47,6 \pm 2,9$  points in phleboarthrosis patients and  $25,9 \pm 1,7$  points in healthy patients before treatment. After 6 months the results in phleboarthrosis patients group was  $37,58 \pm 1,74$  points and after 12 months it was  $33,46 \pm 1,72$ .

The same situation was with the KOOS Scale. Before treatment the result was  $32,15 \pm 9,17$  points, 6 months later  $46,29 \pm 7,11$  points and 12 months later  $55,44 \pm 8,03$  points.

Evaluating the Lequesne Index we found that before treatment it was  $10,49 \pm 1,12$  points, that means "severe osteoarthritis", 6 months later it decreased to  $9,14 \pm 0,97$  points and 12 months later to  $7,85 \pm 0,83$  points "moderate osteoarthritis".

**CONCLUSION** The combination of lower extremities varicosity with knee osteoarthritis leads to severe decrease of patients Quality of Life.

Venous insufficiency treatment increase the Quality of Life not only connected to varicose disease, but also to knee osteoarthritis.

Venous insufficiency treatment in such patients can also decrease the severity of knee osteoarthritis from severe to moderate.

## eP11 UTILIZATION OF GLUE ADHESIVES FOR OBLITERATION OF THE PRINCIPAL PROTUBERANT VARICOSITIES. THE MULTICENTER COMPARATIVE INVESTIGATION

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**AIM** Comparative analysis of immediate and short-term results of clinical utilization of cyanoacrylate glue junctions “VenaSeal” and “Sulfacrylate” for obliteration of the principal protuberant varicosities.

**MATERIALS AND METHODS** Adhesive obliteration of the target veins was performed in 2 ways: for 73 patients of C2-C3 clinical groups (according to CEAP) was used a foreign VenaSeal adhesive (group 1) and for 75 other patients – local adhesive substance “Sulfacrylate” (group 2). The technique of cyanoacrylate obliteration with ultrasound control was standard. The intensity of pain response (VAS), the occlusion degree of the segment of the principal saphenous vein (according to the results of ultrasound duplex angiography) and the change in the life quality (CIVIQ-2 scale) were evaluated in the postoperative period.

**RESULTS** 78 (52.7%) patients had a low-intensity pain syndrome (2-3 points on the VAS scale) in the occluded venous segments at rest and on palpation after 24-48 hours. This pain syndrome occurred in 46.6% of cases (34 patients) in the first group and in 58.7% of cases (44 patients) in the second one. Moderate pain (4-5 points on the VAS scale) was observed in 4 patients (5.5%) in group 1 and in 6 patients (8%) in group 2. 3 patients (4.1%) of the first group and 2 patients (2.7%) of the second one had the significant levels of pain (6-7 points on VAS) with development of the true picture of phlebitis (local skin hyperemia with the paravasal edema). After cyanoacrylate occlusion in various periods of observation (from 24 hours to 1 year using Ultrasound duplex scanning) the vein was occluded properly along its entire length from the place of its puncture to the segment free of glue. Anatomical success was noted up to a year in 100% of cases for “VenaSeal” and in 96% cases for “Sulfacrylate” (in the absence of blood flow in the lumen of the vein). According to the CIVIQ-2 enquirer before and after the procedure, the life quality of patients plotted against time was  $8.63 \pm 2.03$  and  $5.60 \pm 1.27$  in group 1 and  $8.05 \pm 1.69$  and  $5.61 \pm 1.29$  in group 2.

**CONCLUSION** Cyanoacrylate obliteration of varicose veins is the safe and highly effective procedure. The Russian adhesive “Sulfacrylate” do not cede to the adhesive substance “VenaSeal” in terms of its effectiveness for obliteration of varicose veins. In order to answer all the questions, it is necessary to continue the research and monitoring process of patients in a distant prospect.



## eP12 EMERGING MECHANISMS OF SULODEXIDE AS ANTI-ETOSIS AGENT IN VASCULAR BIOLOGY: A MODULATOR OF THE THROMBOTIC, INFLAMMATORY AND PROTEOLYTIC PROCESSES

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Daniela Ligi

*University of Urbino Carlo Bo, Urbino, Italy*

**AIM** Extracellular trap (ET) release is a mechanism used by blood cells to respond to different stimuli, such as infections, platelet activation, and inflammatory conditions. ETs are tridimensional web-like structures composed of extracellular DNA, histones, and enzymes, eliciting an innate human response. Scientific evidence proposed an emerging role of ETosis in several pathologies, including cardiovascular diseases and thrombotic events. Noteworthy, negative-charged molecules (*e.g.* glycosaminoglycans) have been suggested as possible modulators of ET. We hypothesize that sulodexide, a glycosaminoglycan mixture used as an anti-thrombotic and profibrinolytic agent, could modulate the extrusion of ETs, the proteolytic network and the inflammatory storm orchestrated by human monocyte cells triggered with two main ETosis stimuli.

**MATERIALS AND METHODS** Human THP-1 cells (monocytes and Phorbol Myristate Acetate [PMA]-differentiated macrophages) have been treated with increasing doses of calcium ionophore A23187 (5  $\mu$ M and 25  $\mu$ M) and PMA (25 and 250 ng/mL), in presence/absence of sulodexide (0.12 LSU/mL). After incubations, cells were stained with Acridine Orange (a fluorescent nucleic acid binding dye) and observed through confocal microscopy. Supernatants were used for the quantification of 27 inflammatory mediators and 8 Matrix Metalloproteases (MMP) through multiplex immunomagnetic assay. Statistical analyses were performed through Kruskal-Wallis test followed by post-hoc Dunn's multiple comparison test, and Mann-Whitney test according to variable characteristics.

**RESULTS** Morphological analyses showed a dose-dependent nucleic acid release following ETosis stimulation, suggesting the release of a more disorganized ET with the highest trigger dose. Sulodexide treatment was associated with a reduced number of monocytes that underwent ETosis and a compacting effect on ETs. The stimulation of monocytes and macrophages with increasing doses of both PMA and A23187 were able to significantly induce the release of both inflammatory and proteolytic mediators, jointly to the evidence of extracellular extrusion of dismantled nucleic acids. Sulodexide treatment was able to significantly reduce the inflammatory and proteolytic markers release, mainly when used in macrophages triggered by PMA and in monocytes stimulated with both A23187 and PMA.

**CONCLUSION** We demonstrated that human monocytes and macrophages stimulated with ETosis triggers produced a severe inflammatory and proteolytic response with consistent extracellular release of dismantled nucleic acids, which can be modulated by glycosaminoglycan sulodexide treatment, providing novel evidence on the potential mechanisms of sulodexide as anti-Etosis agent, with possible therapeutic effects on arterial and venous thrombosis and vascular inflammation.

## eP13 ENDOVENOUS THERMAL ABLATION FOR TREATMENT OF SYMPTOMATIC VARICOSE VEINS -- OCCUPATIONAL EFFECTS ON PROCEDURE OUTCOMES

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**AIM** To study whether the occupational activity affects the effectiveness and safety of endovenous thermal ablation for treatment of symptomatic varicose veins.

**MATERIALS AND METHODS** In this observational study the medical records of all patients who had ETA of the great saphenous vein (GSV), accessory saphenous vein (ASV), or small saphenous vein (SSV) between September 2017 and October 2020 were reviewed. All patients signed a written informed consent agreeing to use of their medical data anonymously for publication. Demographic data, vein characteristics, procedural data including concomitant phlebectomies and sclerotherapy and outcome data including ultrasound findings and complications were assessed.

**RESULTS** Between September 2017 and October 2020 in total 846 ETA interventions with 1241 treated truncal veins were performed in 679 patients. In 839 (99.2%) cases a concomitant phlebectomy with an average ( $\pm SD$ ) treatment length of  $69\pm36$  cm and in 182 (21.5%) cases a concomitant foam sclerotherapy was performed.

429 (55.6%) of the cases the patient were employed (E), in 64 (8.3%) self-employed (SE), in 42 (5.4%) unemployed (UE) and in 237(30.7%) retired (R). Profession data were missing in 74(8.7%) of the cases. 240 patients reported to work predominately (>80%) in the standing and 189 patients reported to work predominately in the sitting position.

The reported pain at day 1 was slightly lower in R patient than in the other groups ( $1.1\pm1.1$  vs.  $1.5\pm1.3$ ,  $P<0.01$ ) but no difference was observed at 7 days and 6 weeks after the intervention. The mean duration of analgesics intake was  $2.7\pm2.4$ days and did not differ between groups. However self-reported days of inability to work was significantly longer in the E group as compared to the other groups ( $3.9\pm2.6$  [E],  $2.8\pm1.9$  [SE],  $3.5\pm3.0$  [UE] and  $2.9\pm2.1$  [R]). Patients with predominately standing during work were significantly longer incapable to work than patients with predominately sitting workplace ( $4.5\pm2.9$  vs.  $2.7\pm1.6$  days,  $P<0.001$ ).

No significant association with successful truncal vein ablation, minor or major bleeding, thrombophlebitis, infection, unplanned additional consultations or satisfaction with the intervention was observed.

**CONCLUSION** Given the minimal invasive nature of ETA days of work loss are low. However, predominately working in the standing position is strongly associated with more days of work loss after ETA and employed patients were longer incapable to work than self-employed patients.



## eP14 LONG-TERM RESULTS OF MINIMALLY INVASIVE DEEP VENOUS REFLUX CORRECTION IN PATIENTS WITH POST-THROMBOTIC SYNDROME

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**AIM** Treatment of post-thrombotic syndrome (PTS) may include surgical correction of severe deep venous reflux. External femoral vein plication in the lower third of the thigh with a capron sling using the technique proposed by a Russian phlebologist professor P.G. Shvalb is one of the possible options. The aim of this study was to assess the long-term results of the external femoral vein plication in the lower third of the thigh.

**MATERIALS AND METHODS** From 2012 to 2013, thirty patients (20 males and 10 females), mean age  $52 \pm 6$  years, with PTS of the lower extremities, class C4-C6 CEAP, underwent a surgical correction of the severe deep venous reflux using the Shvalb technique. 23 patients additionally underwent phlebectomy for varicose veins. Duplex ultrasonography (DUS) was performed in all subjects with quantitative analysis of the deep venous reflux (antegrade and retrograde velocities ratio). Additionally, valvular insufficiency of the popliteal and tibial veins was assessed using the Psatakis reflux index.

**RESULTS** The beneficial effect of the procedure was observed in 96.7% of cases by the end of the 4-year follow-up period. At 8 years, the number of subjects with favorable results decreased to 60.7% with recurrent trophic ulcers occurring in 39.3% of subjects. However, recurrent ulcers were smaller in size as compared to baseline. According to DUS data, incompetent perforator veins were detected in 16 patients, among them 9 subjects with recurrent ulcers and 7 patients without trophic ulcers. Venous diameter, maximum, and average velocities of retrograde blood flows were greater in patients with recurrent ulcers as compared to those without ulceration:  $4.2 \pm 0.5$  mm,  $91.2 \pm 19.8$  cm/s,  $90.5 \pm 18.5$  cm/s, and  $2.9 \pm 0.5$  mm,  $39 \pm 15.6$  cm/s,  $35 \pm 9$  cm/s, respectively ( $P < 0.05$ ). In addition, one of the patients was found to have a valvular insufficiency of the deep femoral vein.

**CONCLUSION** External femoral vein plication using the Shvalb technique in PTS patients with severe deep venous reflux has good clinical results in 96.7% of cases within a 4-year follow-up period, and in 60.7% of cases after 8 years.

Valvular insufficiency of the deep femoral vein may be a contraindication for the external femoral vein plication.

Isolated correction of the deep venous reflux with the preservation of insufficient perforator veins may lead to recurrence of trophic ulcers.

## eP15 DUPLEX ULTRASOUND PARAMETERS ASSOCIATED WITH THE SEVERITY OF CLINICAL MANIFESTATIONS IN PATIENTS WITH VARICOSE VEINS

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**AIM** The aim of this study is to evaluate duplex ultrasound parameters of the lower extremity veins in association with the severity of clinical manifestations in patients with varicose veins (VVs) according to the CEAP classification.

**MATERIALS AND METHODS** The study included 579 patients (194 males and 385 females) with VVs, mean age  $53 \pm 13$  years. The severity of symptoms was assessed using the CEAP basic classification. All subjects underwent duplex ultrasonography (DUS) of the lower extremity veins. During the study, Valsalva and Siegel tests were used. Venous diameter, velocity of the antegrade and retrograde blood flows were calculated in both superficial and deep veins. Venous diameter, maximum and average velocities of the retrograde blood flows were calculated in the perforator veins (PVs).

**RESULTS** Statistically significant differences in the diameter of the great saphenous vein (GSV) were obtained between CEAP classes C2 and C4, C2 and C5/6, C4 and C5/6; GSV diameter over  $8.9 \pm 2.8$  mm was associated with the presence of trophic ulcers. We also found a statistically significant difference in the diameter of the PVs between CEAP classes C2 and C3, C3 and C4, C4 and C5; PV diameter greater than  $4.3 \pm 1.3$  mm was associated with the presence of trophic ulcers ( $P < 0.05$ ). Deep venous reflux was detected in 6.1% of patients with CEAP classes C5/6. When assessing hemodynamics in PVs, we found a statistically significant difference in the average velocity of the retrograde blood flow through the PVs between CEAP classes C2 and C5/6 ( $P < 0.05$ ). Maximum and average velocities of the retrograde blood flows through incompetent Cockett III PVs over  $66.1 \pm 28$  cm/s and  $52 \pm 19.7$  cm/s, respectively, were associated with trophic ulcers ( $P < 0.05$ ).

**CONCLUSION** Larger diameter of the great saphenous vein and perforator veins as well as higher velocities of the retrograde blood flows in the perforator veins are associated with severe clinical symptoms (trophic ulcers) in patients with varicose veins.



## eP16 THE EFFECT OF PREGNANCY ON LASER CROSSECTOMY RESULTS

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**AIM** Epidemiological studies show the significance of pregnancy on the development of varicosity. It was also found that pregnancy after surgery can make recurrent varicosity. It seems the strongest pathogenic factor.

**MATERIALS AND METHODS** Between October 2008 - October 2020, 38 legs of women were operated on who became pregnant and later came back for an US check-up. Before pregnancy none of them had any recurrent varicosity. Interval between varicose vein surgery and pregnancy were mean 20.48 ( $\pm 3.24$ ) months. Treated veins were GSV 32, GSV and perforator vein 4, SSV 2 cases. Diameters of veins were mean 6.3 ( $\pm 3.24$ ) mm.

Main points of laser crossectomy technique are: 1) tip of the laser fibre is 0.5 cm from the femoral vein; 2) more tumescent solution is injected to the SFJ than to the stem, this means 10 mL/cm; 3) more laser energy is delivered to the first 3 cm than to the stem this means 200 J/cm; 4) LMWH is given to every patient without selection.

**RESULTS** Before pregnancy there were flush closures of the SFJ with the femoral vein in 26 cases. In 12 cases there were stumps mean  $7.5 \pm 3.73$  mm.

After delivery there were recurrent C2 varicosities in 18 cases. Pathology of them were as follows: neovascularisation - 6; acc. ant. varicosity - 5; perforator vein insufficiency - 4 and recanalisation - 3 cases. This means that in 14/38 cases (36.8%) SFJ became insufficient which participated in recurrencey.

**CONCLUSION** Few studies are available about impact of pregnancy on recurrencey after varicose vein surgery. We couldn't find any techniques which could influence the very strong varicogenic factors of pregnancy. Our results show that recurrent varicosity percentage is acceptable after laser crossectomy.

## eP17 THE ASSOCIATION BETWEEN DURATION OF ANTICOAGULATION THERAPY AND THE RISK OF VENOUS THROMBOEMBOLISM IN PATIENTS WITH LOWER LIMB SUPERFICIAL VENOUS THROMBOSIS: A SYSTEMATIC REVIEW AND META-ANALYSIS

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**AIM** To determine the association between the duration of systemic anticoagulation therapy (ACT) and the risk of further venous thromboembolism (VTE) in patients with superficial venous thrombosis (SVT).

**MATERIALS AND METHODS** A systematic review and meta-analysis were performed using searches Medline and Cochrane Library databases in September 2021. Papers that provided VTE incidence within mid-term follow-up of  $\geq 45$  days in patients who received any systemic anticoagulation were included. Patients were categorized into subgroups according to the course of treatment: 1) no ACT (0 days); 2) ACT of  $\leq 14$  days; 3) ACT of 15-30 days; 4) ACT of 31-45 days, and 5) ACT of  $\geq 45$  days. Reported events were transformed to events per 100 patient-years, and a random-effects model was used to calculate pooled rates for proportions. The primary outcome (VTE) was a combination of SVT progression or recurrence and/or the occurrence of deep vein thrombosis (DVT) or pulmonary embolism (PE).

**RESULTS** Twenty-one studies (ten randomized clinical trials and 11 cohort studies) of 12,272 patients were included in the quantitative synthesis. Minimum rates of VTE and SVT recurrence or progression were observed with the ACT duration of 31-45 days were 16.2 and 9.1 events per 100 patient-years, respectively. Minimum rates of DVT and PE that were observed with the treatment duration of 15-30 days were 6.0 and 0.9 events per 100 patient-years, respectively. Short-term treatment of  $\leq 14$  days was associated with the highest VTE rates even when compared with no ACT. The most common risk factors for VTE included male sex, malignancy, personal history of DVT, PE, or SVT, and thrombosis of non-varicose veins.

**CONCLUSION** Prolonged systemic anticoagulation is associated with the tendency to cause a decrease in VTE rates in patients with lower limb SVT.



## eP18 CAPRINI SCORE PREDICTS ENDOTHERMAL HEAT-INDUCED THROMBOSIS, BUT NOT SYMPTOMATIC VENOUS THROMBOEMBOLISM AFTER SUPERFICIAL VEIN ABLATION

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**AIM** The Caprini Score in Venous Surgery study (CAPSIVS, NCT03041805) is an ongoing prospective registry study that aims to identify the incidence of symptomatic and asymptomatic venous thromboembolism (VTE) after modern varicose vein surgery and to assess the predictability of the Caprini score.

**MATERIALS AND METHODS** This study uses the Russian Registry of Treatment of Chronic Venous Diseases (NCT03035747). Patients aged more than 18 years and undergoing varicose vein surgery were included. Other inclusion criteria were any Caprini score before intervention and a duplex ultrasound scan (DUS) 2 to 4 weeks after an intervention to detect asymptomatic deep vein thrombosis (DVT). The primary outcome was a combination of asymptomatic and symptomatic DVT or imaging-confirmed pulmonary embolism (PE) and endothermal heat-induced thrombosis (EHIT) class 2 to 4 via DUS within 4 weeks of intervention.

**RESULTS** The study began in January 2017. In February 2022, 1878 records with outcomes were identified and extracted. The mean (SD) age of patients was 46.9 (13.3) years; 1243 (66%) were female. The CEAP clinical class was C1 for 0.3% of the sample, C2 for 72.5%, C3 for 14.9%, C4 for 8.8%, C5 for 0.9%, and C6 for 0.8% with unidentified class in 1.8%. Patients primarily underwent laser ablation (88%), were treated at the great saphenous vein (84.9%), underwent local anesthesia (97%), and attended outpatient facilities (71.7%). Varicose tributaries were treated in 40.1% of the patients via miniphlebectomy (22.5%), sclerotherapy (22%), or combination.

Caprini score ranged from 1 to 12, yielding a mean (SD) of 4.0 (1.5). Most patients (97.1%) were prescribed elastic compression for a mean of 4 weeks. Prophylactic anticoagulation was used in 386 (20.4%) patients for 1 to 35 days (median, 3 days).

The primary endpoint was reported in 63 patients (3.4%; 95% CI, 2.7-4.3%), comprising asymptomatic (N=30, 1.6%) or symptomatic (N=9, 0.5%) DVT or EHIT (N=28, 1.6%). EHIT was combined with distal DVT in 4 cases. No PE was reported.

Caprini score was significantly correlated with the primary outcome. The reported incidence was 2.2%, 2.3%, 5.1%, 6.5%, 9.1% and 25% in the subgroups of patients with Caprini score of 0-2, 3-4, 5-6, 7-8, 9-10, and 11-12, respectively ( $P=0.001$ ). Under logistic regression, Caprini score was associated only with the risk of EHIT (OR, 1.4; 95% CI, 1.2-1.7), but not symptomatic or any DVT. Other attributes significantly associated with VTE risk were treatment of tributaries, type, and duration of anticoagulation.

**CONCLUSION** The incidence of symptomatic VTE after ablation of superficial veins is less than 0.5%, and EHITs are strongly predicted by Caprini score.

## eP19 DEVELOPMENT OF END-TO-END VEIN ANASTOMOSIS TECHNOLOGY WITH HIGH-FREQUENCY ELECTRIC CURRENT

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**AIM** To develop the electrosurgical connection of veins technology on the type of “end to end”.

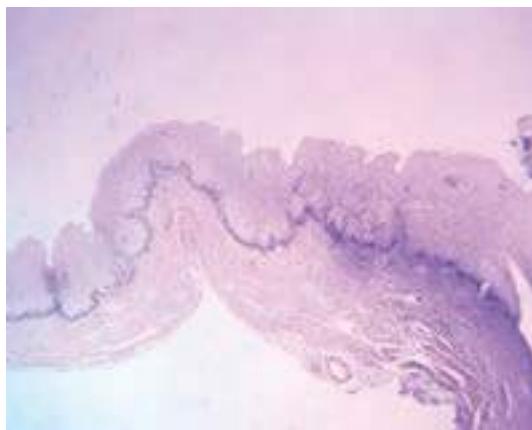
**MATERIALS AND METHODS** During the experiment, the original device for electric welding of vessels with a chain (garland) principle of switching current around the perimeter and the electric power generator of own design was used. Herewith, free vein sites of bioimulators (vessels of animal origin with preserved viability) were welded end to end. Temperature regimes in contact electric welding, histological examinations of anastomoses, and weld tightness were studied. 3D model, components of the device, and samples of experimental devices from plastic and metal had developed by 3D printing.

**RESULTS** The weld can withstand a pressure of about 200 mmHg. art., which indicates the sufficient reliability of the anastomosis of the vessel welded with the help of the developed device. Optimistic results of morphological studies were obtained: after venous welding, a coagulation site characterized by thickening of the vessel wall, disorganization of vascular structural elements, the appearance of homogeneous cell-free cell-matrix in the vascular wall. The largest volume of destruction was received by the muscular membrane (tunica media) with total loss of cellular elements in this area. The contour of the adventitious membrane was also poorly traced.

Figure 1.



Figure 2.



**CONCLUSION** Welding of vessels occurs with a significant pressure of the electrodes of electrosurgical instruments, while the temperature in the welding zone did not exceed 115 °C. The applied pressure causes deformation of welding tissue before the beginning of heating by welding current and, consequently, changing their electrical characteristics.

During compression of veins walls by welding electrodes occur their considerable deformation – depending on a kind of vessel (magistral or peripheral) in 4,5-10 times at a pressure of 11 kg/cm<sup>2</sup>. The strength of the seam depends on the degree of homogenization of the tissues that form its substance.

The zone of coagulation necrosis appears with the preservation of the character of cellular and fabric structural organization. This zone is directly adjacent to the electrodes and extends 1-2 mm to the periphery, area of partial coagulation necrosis and dystrophic changes extends distally to the previous zone to a depth of 0.5 cm.

Histological and mechanomanometric studies showed the stability of the electric weld of blood vessels due to changes in the structure of proteins and dehydration of tissues; such a seam can withstand a pulse pressure of 40 mmHg to 200 mmHg, depending on the diameter, condition of the vessel, and the structure of its wall.

## eP20 TECHNIQUE, SAFETY, AND EARLY EFFICACY OF ENDOVENOUS LASER ABLATION FOR MORPHOLOGICALLY COMPLEX RECURRENCES OF THE SMALL SAPHENOUS VEIN (SSV)

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**AIM** The treatment of recurrences in varicose vein disease, particularly those originating from the saphenopopliteal junction (SPJ), remains a major technical challenge. In contrast to primary truncal varicose veins, where endovascular thermal procedures are common and supported by guidelines, their application in recurrent varicose veins is limited for technical reasons. In particular, ablation of short or tortuous stumps requires their direct puncture and cannulation, which is not yet considered a routine procedure.

**MATERIALS AND METHODS** Based on a retrospective chart review, all consecutive patients with recurrent varices of the small saphenous vein (SSV) treated over a period of 30 months were analysed. This included 58 limbs treated in 47 patients (25 female, 22 male). The morphology of the recurrence was characterized by duplex sonography. Ablations were performed with radial emitting 1470 nm or 1940 nm laser fibers. Technical success, side effects, and occlusion rate during follow-up were evaluated. Clinical and ultrasound examinations were performed at 7-14 days, at 1 month, and at regular intervals thereafter. The mean follow-up time was 116 days.

**RESULTS** Treated recurrences were classified according to a morphology definition proposed in the literature: a largely intact saphenopopliteal junction and a preserved SSV (type 1, N=4); varices of the popliteal fossa communicating with the popliteal vein via a prominent, short or tortuous stump (type 2, N=33); a residual vein segment of the SSV communicating with the popliteal vein via tortuous or neovascularization-like veins (type 3, N=12); and recurrences in which a distal refluxing segment of the SSV remains that has no obvious connection to the popliteal vein (type 4, N=9). Initial technical success was achieved in 55/58 sessions (94.8%). During the follow-up period, endovenous laser retreatment was indicated in 7 cases (12.1%) and performed in 5 of them. These included two instances with complex findings classified as morphologic type 2, where reinterventions were scheduled at short-term due to an inadequate ablation result already at the first follow-up. Concomitant or subsequent sclerotherapies with polidocanol foam were performed in 19 cases (32.8%). Otherwise, no complications requiring special intervention or drug therapy occurred. Thrombotic side effects, such as endothermal heat-induced thrombosis (EHIT), also did not arise. Lesions of sensory nerves were not observed.

**CONCLUSION** Endovascular thermal ablation of recurrent SSV varicose veins is feasible and safe, but technically challenging, especially when short or twisty venous stumps are punctured directly. The likelihood that such treatment will not succeed initially is probably higher than for primary treatment. Further establishment of the method, also in comparison to other interventional methods such as surgery or sclerotherapy, would be of interest.



## eP21 CHARACTERISTICS AND OUTCOMES OF CATHETER-DIRECTED THROMBOLYSIS PROTOCOLS FOR DEEP VENOUS THROMBOSIS OF THE LOWER EXTREMITIES - A SYSTEMATIC REVIEW AND META-ANALYSIS

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**AIM** Catheter directed thrombolysis (CDT) is a widely used treatment modality for deep venous thrombosis (DVT) of the lower extremities (LE), aiming to reduce the risk of post-thrombotic syndrome (PTS).

The aim of this study is to summarize features, success rates and complications of different CDT protocols for the treatment of LE-DVT.

**MATERIALS AND METHODS** A systematic review using electronic databases (MEDLINE, Scopus and Web of Science) was performed to identify observational studies and randomized controlled trials (RCT) related to LE-DVT treated with CDT. A random-effect model meta-analysis was performed to obtain the pooled proportions of major and minor bleeding, pulmonary embolism, death and PTS.

**RESULTS** Forty-six studies met the inclusion criteria reporting 49 regimens in a total of 3,028 participants, 43±10% male, with 55±8 years-old. In studies that addressed the thrombus location (N.=37), DVT had iliofemoral involvement in 90±23% of the cases. Thrombus age ranged from 2 to 14 days in 92% of the studies and was older in 8%. Urokinase (N.=35), tissue plasminogen activator (N.=12) or both (N.=2) were used in the protocols, with a mean treatment duration of 45 hours (95% Confidence Interval [95%CI] 44-47 hours). Continuous infusion was the main regimen in 87% of the series, pulse-spray in 6% and non-continuous micro-pumping in 6%. Ultrasound-CDT was used in 4%. The dosages were high in 18% of the regimens, low in 75% and variable in 7%. As for later adjunct interventions, 41% received some type of thrombectomy (manual, surgical, aspiration or pharmaco-mechanical) and 85% used stenting as deemed necessary. Only 4 series described CDT as the solely intervention for DVT.

Definition of venogram success was highly variable, being the Venous Registry Index the most used method (N.=19). Among those, minimal thrombolysis rate (<50% lysed thrombus) was 0-53%, partial thrombolysis (50-90% lysis) was 10-71% and complete thrombolysis (90-100%) was 0-88%. The remaining studies used Marder and Yamada scores (N.=2), Porter score (N.=3) or some definition of venographic success instead of a score (N.=25). Pooled outcomes were 8.7% (95%CI 6.6-10.7) for minor bleeding, 1.2% (95%CI 0.8-1.7%) for major bleeding, 1.1% (95%CI 0.6-1.6) for pulmonary embolism and 0.6% (95%CI 0.3-0.9) for death. Pooled incidences of PTS were 17.6% (95%CI 11.8-23.4) at one year, 27.0% (95%CI 14.7-39.2) at 2 years and 24.4% (95%CI 14.2-34.6) beyond 2 years of follow-up.

**CONCLUSION** Assessment of the evidence is hampered by the heterogeneity of protocols, which maybe is reflected in the variation of PTS rates. Despite this, CDT is a low-risk treatment for LE-DVT.

## eP22 COMPARISON OF RADIOFREQUENCY ABLATION (RFITT) AND GLUE CHEMICAL ABLATION (GCA) FOR INCOMPETENCE OF VENA SAPHENA MAGNA ET PARVA: A SINGLE CENTER EXPERIENCE

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**AIM** Endovascular techniques are well-known and safe procedures for the treatment of reflux in great and small saphenous vein and provide benefits in comparison to open surgery, such as reduced invasiveness, less postoperative pain and shorter sick leave. After a long time using radiofrequency ablation (RFITT) we started in 2017 a new experience with the glue chemical ablation (GCA). The aim of this survey was to compare the efficacy of GCA with the efficacy of RFITT using a personal protocol. A specific excel spreadsheet with data on postoperative pain, residual varicose, recidivism was used in order to obtain homogenous data. Secondary outcomes such improvements in the quality of life and cost-effectiveness were taken into account in the comparison.

**MATERIALS AND METHODS** Adult patients with saphenofemoral or saphenopopliteal junction incompetence and reflux were included and followed-up with color-Doppler ultrasonography. Contraindications to the participation were pregnancy and n-butyl-2-cyanoacrylate (NBCA) allergy in the case of glue procedure. Patients were evaluated at time 0, 1 week, 6 months and yearly after the procedures with CEAP (Clinical, Etiological, Anatomical and Pathophysiological classification of venous disorders). Pain, residual varicose, recidivism and other side effects were also evaluated.

**RESULTS** Between 2009 and 2021, in Schlanders's Hospital, 1713 patients (2568 veins) were enrolled - 1274 radiofrequency ablation (RFITT, 2009-2017) and 639 glue chemical ablation with n-butyl-2-cyanoacrylate (GCA, 2017-2021). RFITT was performed in general anesthesia with laryngeal mask, GCA in local anesthesia (lidocaine). Mean procedure times was 17,02 for radiofrequency and 15,25 minutes for glue. Three-year occlusion rates were 89% and 84,5% for RFA and GCA respectively. Complications were similar for both procedures: pain, ecchymosis, pruritus and phlebitis. Specifically, after RFITT we observed nerve lesions and post cyanoacrylate occlusion PATE (2,6%). PATE patients were treated with enoxaparin for 2 weeks and they were controlled after the therapy. There was no evidence of deep venous thrombosis in any of the patients.

**CONCLUSION** In our experience the learning process for GCA required less time and it is easier than radiofrequency ablation. Our protocol shows that patient's satisfaction was high and the quality of life improved with both techniques, in accordance with clinical results (CEAP evaluation), but compliance for GCA was higher (local anesthesia, no anticoagulation and no compression after the procedure). The cost-effectiveness analyses data proves that GCA is more expensive, but to perform it we don't need the anesthesiologist and it's an ambulatory procedure. Nowadays we performed successfully 937 GCA in 740 patients and, in December, we will have the first results after 5 years of follow-up.



## eP23 EPIGENOME-WIDE CHANGES IN THE CELL LAYERS OF THE VEIN WALL, WHEN EXPOSING THE VENOUS ENDOTHELIUM TO OSCILLATORY SHEAR STRESS

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**AIM** The aim of the study was to reveal epigenomic (methylation) changes in the cells-representatives of the venous wall layers in response to oscillatory shear stress towards endothelium, which may result in consolidation of gene expression alterations upon vein wall remodeling during varicose transformation, in order to identify potential drug targets.

**MATERIALS AND METHODS** The study was approved by our institutional committee and conducted according to the principles written in the Declaration of Helsinki. Primary culture cells (endothelial cells, smooth muscle cells, and fibroblasts that represent tunica intima, tunica media, and tunica adventitia of the vein wall, correspondingly) were obtained out of non-varicose vein segments left after surgery of 3 patients (C2-C3 CEAP clinical classes) by growing the cells in selective media after magnetic immunosorting. Endothelial cells were either exposed to oscillatory shear stress for 1 day or left at the static condition. Then, smooth muscle cells were treated with conditioned media from endothelial cells, and fibroblasts were subsequently treated with conditioned media from smooth muscle cells. After every exposure, the cells were harvested and subjected to DNA isolation and further processing according to the manufacturer's instructions (Illumina, Inc.). Differential methylation (hyper- or hypomethylation of CpG sites) affected by shear stress was measured for each cell type using microarrays (HumanMethylation DNA Analysis Bead Chips). The results were first analyzed with GenomeStudio Software (Illumina) and Microsoft Excel, then the software package "Genome Enhancer" of geneXplain platform was applied to a data set analyzed (including FDR) in order to identify potential drug targets in the molecular network that governs the studied pathological process.

**RESULTS** When exposing the endothelial cells to oscillatory shear stress, each cell layer was affected in terms of CpG methylation changes. A detailed analysis of the promoters of activated genes revealed a number of transcription factors that most likely play an important role in the regulation of these genes. The most targetable master regulators appeared to be the following: *AR*, *PDGFB*, and *YY1* that control activity of *SNAI2*, *TP63* and *TRIM28* transcription factors on promoters of differentially methylated genes – for endothelial cells; *ZNRF1* and *CHFR* that controls activity of *SNAI1*, *RELA* and *TFAP2A* transcription factors on promoters of differentially methylated genes – for smooth muscle cells; *PPP1CC*, *DUSP4*, *EGLN3*, *SYK*, and *ZNRF1* that control activity of *STAT3*, *TP73* and *BCL3* transcription factors on promoters of differentially methylated genes – for fibroblasts.

**CONCLUSION** Some of the master regulators identified may serve as promising druggable targets for treating varicose veins in the future.

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## eP24 PATIENTS' AND PHYSICIANS' PERSPECTIVES ABOUT THE IMPACT OF CHRONIC VENOUS DISEASE (CVD) ON QUALITY OF LIFE

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**AIM** This physician and patient survey was conducted to further understand the impact of C0-C4 CVD on patients' quality of life (QoL), offering a unique perspective from patients and physicians of different nationalities.

**MATERIALS AND METHODS** This cross-sectional survey was conducted in Brazil, China, Czech Republic, Italy and Russia. Vascular specialists and patients aged  $\geq 18$  years with lower limb CEAP C0-C4 CVD were included. A qualitative standardized interview was conducted with patients and physicians who were asked to quantify the impact of CVD on QoL on a scale from 1 (very low impact) to 5 (very high impact) across four dimensions: physical, aesthetics/appearance, emotional and relational impact. Moreover, patients were asked to complete the 14-item CIVIQ (CIVIQ-14) and to quantify how satisfied they were about the way their physicians managed their QoL on a scale from 1 (dissatisfied) to 5 (very highly satisfied) while physicians were asked to quantify on the same scale how satisfied they thought their patients were with how they were managing their QoL.

**RESULTS** 100 patients (69 females, 31 males, mean $\pm$ SD age  $48.7\pm 11.5$  years and BMI  $26.2\pm 7.2$  kg/m $^2$ ) and 60 physicians were recruited in the survey (20 patients and 12 physicians per country). The impact of CVD was present on all dimensions of QoL regardless of age and sex, whatever the country. The four dimensions global analysis showed an impact on QoL subscores from  $2.7\pm 1.2$  for the emotional impact to  $3.3\pm 1.4$  for the aesthetic impact. Compared with C0-C1 and C2-C3 patients, mean QoL scores for the four dimensions (physical, aesthetics/appearance, emotional and relational impact) were significantly higher for C4 patients ( $P<0.05$ ), and those with BMI  $>30$  kg/m $^2$  had a higher negative impact. On CIVIQ-14 psychological burden, most patients reported embarrassment on showing their legs (39%) and on the physical aspects, impairment at work was the most reported one (26%). Globally, the mean score was  $4.1\pm 0.7$  for physician-perceived patient satisfaction with physician management of QoL and  $3.5\pm 1.4$  for patient satisfaction with physician management of QoL.

**CONCLUSION** CEAP class C0-C4 CVD impacts negatively patients' QoL, both on physical and emotional dimensions, and on patients' relational due to aesthetic aspects. The impact on QoL is even greater for C4 CEAP stages. Physicians and patients perceive the impact of C0-C4 CVD on QoL differently. Patients tended to be less satisfied with the management of their QoL than physicians perceived them to be. Healthcare professional awareness of the overall impact of CVD on QoL needs to be improved, to propose to patients a more complete management.



## eP25 A CLINICAL TRIAL IN CHRONIC VENOUS DISEASE COMPARING MPFF 500 MG TWICE DAILY TO A NEW ONCE DAILY CHEWABLE TABLET. THE CHEWY STUDY

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**AIM** Patients with chronic venous disease (CVD) complain of leg symptoms and may have impaired quality of life (QoL). The efficacy and safety of MPFF 1000 mg 1 or 2 tablets/day have been established in clinical studies for the treatment of CVD signs and symptoms. The CHEWY study aimed to assess the non-inferiority of MPPF 1000 mg one chewable tablet/day versus MPFF 500 mg 2 tablets/day on lower limb discomfort (LLD).

**MATERIALS AND METHODS** This was an international, double-blind, double dummy, randomized, 2 parallel groups, non-inferiority phase III study. Eligible patients, 20-75 years, suffering from symptomatic CVD (from C0s to C4s) were randomly allocated to either MPFF chewable tablet 1000 mg/day (MPFF CHEW) or MPFF tablet 2x500 mg/day (MPFF TAB) treatment. The primary efficacy endpoint was LLD assessed by a 10 cm electronic visual analogue scale (eVAS), expressed as change from baseline (W0) to 8 weeks (W8). Secondary endpoints included leg pain and leg heaviness (using eVAS) and QoL using eCIVIQ-14 questionnaire. Mean changes from baseline were compared between treatment groups using an analysis of covariance and 1.0 cm as pre-defined non-inferiority margin. Treatment safety was assessed in patients who had at least one dose of study drug.

**RESULTS** A total of 611 patients were included either in the MPFF CHEW (N.=309) or in the MPFF TAB (N.=302) group. LLD decreased in both groups: mean change from baseline to W8 was  $-3.6 \pm 2.4$  cm in the MPFF CHEW group versus  $-3.6 \pm 2.5$  cm in the MPFF TAB group. The estimate of the difference (SE) between groups was 0.00 (0.18) cm, 95% CI [-0.35; 0.35] and  $P < 0.0001$ , demonstrating the non-inferiority of the chewable tablet on the improvement of LLD. The changes were similar for leg pain and leg heaviness (0.00 (0.18) cm (95% CI [-0.34; 0.34] and  $-0.02 (0.21)$  cm with 95% CI [-0.44; 0.39], respectively). Improvements in QoL were observed in both treatment groups overall and in each of the subscore components. The percentage of patients with at least one treatment-emergent adverse event and the type of events were similar in both groups, and the majority of these events were of mild intensity.

**CONCLUSION** The CHEWY study demonstrated the non-inferiority of MPFF chewable tablet 1000 mg/day versus MPFF tablet 2x500 mg/day on the improvement of LLD after 8 weeks of treatment in patients with CVD. Clinically relevant improvements were also observed for leg pain, leg heaviness and QoL, with similar results in both groups. A chewable MPFF tablet may be of value in patients who dislike or have difficulty swallowing tablets.

## eP26 EFFECT OF DIFFERENT TREATMENT OPTIONS ON BIOMARKERS OF VENOUS INFLAMMATION IN PATIENTS WITH VARICOSE VEINS

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**AIM** The aim of this study was to evaluate changes in biochemical markers of vein-specific inflammation and endothelial dysfunction (E-selectin, MCP-1, VEGF, MMP-2) in patients with varicose veins of the lower extremities (VVLE) receiving different treatments.

**MATERIALS AND METHODS** In this prospective single-centre cohort study, patients with VVLE, classes C2-C3 (CEAP) were allocated into 4 groups according to the physician's and patients' preferences: administration of micronized purified flavonoid fraction (MPFF) for 2 months (group 1), compression therapy (group 2), endovenous laser ablation (group 3), or endovenous laser ablation followed by a 2-month treatment with MPFF (group 4). At baseline and after two months, serum concentrations of E-selectin, MCP-1, VEGF, and MMP-2 were measured by enzyme-linked immuno-sorbent assay.

**RESULTS** 95 subjects (64 females, 31 males), mean age  $42.1 \pm 7.2$  years, were included. Results are presented in Table I.

Table I. Biomarkers of venous inflammation: mean values ( $\pm SD$ ) at baseline (M0) and after two months (M2).

|                       |    | 1 MPFF<br>(N.=26)  | 2 Compression<br>Therapy (N.=25) | 3 Laser ablation<br>(N.=22) | 4 Laser ablation<br>+MPFF (N.=22) |
|-----------------------|----|--------------------|----------------------------------|-----------------------------|-----------------------------------|
| E-selectin<br>(ng/mL) | M0 | $52.3 \pm 6.1$     | $54.5 \pm 7.7$                   | $51.7 \pm 5.8$              | $53.1 \pm 5.3$                    |
|                       | M2 | $39.7 \pm 4.8^*$   | $41.4 \pm 5.3^*$                 | $44.5 \pm 4.9^*$            | $33.9 \pm 4.3^*$                  |
| MCP-1<br>(pg/mL)      | M0 | $211.5 \pm 14.2$   | $216.4 \pm 13.6$                 | $207.4 \pm 13.2$            | $213.8 \pm 13.4$                  |
|                       | M2 | $152.3 \pm 11.6^*$ | $218.3 \pm 14.8$                 | $163.9 \pm 12.4^*$          | $115.5 \pm 9.7^*$                 |
| VEGF<br>(pg/mL)       | M0 | $103.8 \pm 10.6$   | $107.5 \pm 11.3$                 | $104.8 \pm 11.7$            | $109.6 \pm 10.1$                  |
|                       | M2 | $84.1 \pm 9.4^*$   | $103.2 \pm 10.8$                 | $102.1 \pm 9.6$             | $52.6 \pm 7.3^*$                  |
| MMP-2<br>(ng/mL)      | M0 | $346.2 \pm 15.7$   | $339.4 \pm 13.6$                 | $342.5 \pm 14.8$            | $353.5 \pm 14.4$                  |
|                       | M2 | $341.3 \pm 13.6$   | $341.3 \pm 13.6$                 | $243.2 \pm 12.1^*$          | $222.7 \pm 11.3^*$                |

\*: P<0.05 vs. M0

In all groups, the treatment was associated with a reduction in the studied parameters after 2 months. In group 1, serum levels of E-selectin decreased by 24%, MCP-1 by 28%, VEGF by 19% (P<0.05). In group 2, E-selectin level decreased by 24% (P<0.05). In group 3, E-selectin, MCP-1, and MMP-2 levels decreased by 14%, 21% and 29%, respectively (P<0.05). In group 4, we observed a statistically significant decrease in all the studied parameters: E-selectin by 36%, MCP-1 by 46%, VEGF by 52%, MMP-2 by 37% (P<0.05).

**CONCLUSION** Different treatments in VVLE patients were associated with a decrease in E-selectin, MCP-1, VEGF, and MMP-2 levels, with the best results in patients who received MPFF on top of endovenous laser ablation. Our findings support the use of MPFF for the treatment of varicose veins, as the drug has beneficial effects on the vein-specific inflammation and endothelial dysfunction, both as a part of conservative therapy and invasive treatment.



## eP27 BENEFICIAL EFFECT OF MICRONIZED PURIFIED FLAVONOID FRACTION (MPFF) IN AN EXPERIMENTAL MODEL OF CHRONIC VENOUS DISEASE ASSOCIATED WITH REDUCTION IN VEIN WALL TENSION

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**AIM** Chronic Venous Disease (CVD) is a common pathology of the circulatory system arising from venous hypertension in the lower extremities. Increased vein wall hydrostatic pressure activates endothelial and smooth muscle cells that promote leukocyte infiltration and inflammation, leading to reduced capillary perfusion, increased venous permeability, and venous remodeling into varicosity or tortuosity. According to Laplace's law, vein wall tension (T) is equal to the product of the internal radius (*r*) and venous pressure (P):  $T = P \times r$ .

The aim of this work is to assess how MPFF, a cornerstone therapy for CVD patients, impacts venous wall tension in a preclinical model of chronic venous hypertension.

**MATERIALS AND METHODS** Ligation of the external right iliac vein induced an increase in venous pressure in the hamster lower limb. 6 weeks after the surgical procedures, ligated animals received orally either MPFF 100 mg/kg or vehicle, and sham-operated animals received vehicle (10 animals/group). At the end of 6-week treatment, epigastric vein pressure was measured by placing a catheter connected to a force transducer. Using an intravital microscope, venous diameter was measured as well as functional capillary density and number of adherent leukocytes. Means are presented with standard deviations (SD) and compared between groups using one-way analysis of variance.

**RESULTS** Mean venular diameters in sham and vehicle groups were  $80.4 \pm 4.3 \mu\text{m}$  and  $106.8 \pm 8.3 \mu\text{m}$ , ( $P < 0.0001$ ) respectively, highlighting the venular dilatation. The mean diameter in MPFF treated group was significantly smaller compared to vehicle group:  $65.9 \pm 1.4 \mu\text{m}$  ( $P < 0.0001$ ). As expected, the venous pressure in the epigastric vein was significantly elevated in the ligated vehicle group ( $8.07 \pm 0.07 \text{ mmHg}$ ) versus sham group ( $2.14 \pm 0.04 \text{ mmHg}$ ),  $P < 0.001$ . In the ligated MPFF treated animals, the venous pressure was  $7.55 \pm 0.05 \text{ mmHg}$ . The calculated wall tension at the venular level was considerably higher in the ligated vehicle group ( $430 \pm 33 \mu\text{m}^*\text{mmHg}$ ) versus sham group ( $86 \pm 4 \mu\text{m}^*\text{mmHg}$ ),  $P < 0.0001$ . In the MPFF treated group, venular wall tension was significantly lower than in the vehicle group:  $249 \pm 6 \mu\text{m}^*\text{mmHg}$ ,  $P < 0.0001$ . MPFF also significantly reduced the number of sticking leucocytes and improved functional capillaries density when compared to vehicle group ( $P < 0.0001$ ).

**CONCLUSION** These results show that MPFF significantly blunts mechanical forces exerted on the vein by decreasing vein wall tension. This biomechanical effect appears to be associated with improvements in microcirculation and reduction in inflammation. The beneficial mechanical effect of MPFF observed in this experimental study, that could potentially slow down disease progression and the formation of varices, merits further investigation.

## eP28 SULODEXIDE IMPROVES CAPILLARY BLOOD FLOW AND THE QUALITY OF LIFE IN PATIENTS WITH RAYNAUD SYNDROME

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**AIM** Raynaud Syndrome (RS) is one of the most common diseases of microcirculation. Calcium antagonists, ACE inhibitors and α1-blockers are the most commonly used in therapy of RS. The aim of this study was to estimate a potential usefulness of sulodexide in the treatment of RS, by evaluation of the drug influence on capillary blood flow and the quality of life in patients with RS.

**MATERIALS AND METHODS** 34 patients were recruited (24 females and 10 males). Prior to the administration of the drug, a baseline examination of capillary vessels in fingers of both hands was undertaken, and the quality of life (QOL) was assessed with a questionnaire. The dose of 1000 LSU of sulodexide (Vessel Due F, Alfasigma) was administered daily for 20 consecutive days. Between days 20 and 70 of the study, the daily dosage was reduced to 500 LSU. At the end of the day 70 the drug was discontinued. The assessment of capillary flow in middle fingers of both hands and the QOL evaluation were completed on days 1, 20, 70, and 100 of the study in all patients.

**RESULTS** Statistically significant ( $P<0.01$ ) improved blood flow values were found in subsequent measurements at 10 °C. Perfusion in capillary vessels after administration of sulodexide was improved by 193% in the right hand and by 174% in the left one. The improvement of capillary blood flow in both hands was observed at room temperature (R 121%, L 145%) and at +44 °C (R 106%, L 102%). However, differences between subsequent measurements taken at room temperature in both hands and at 44 °C in the left hand were not statistically significant, while differences between measurements taken in right hands at 44 °C were statistically significant ( $P<0.05$ ). The dominating character of the right hand could be the reason. Frequency of RS episodes per week decreased from 2.03 before the first sulodexide dose to 1.47 at the end of the study. A significant QOL improvement (93.5%,  $P<0.05$ ) was observed after 20 days of sulodexide therapy. Despite of the decrease of the drug dose on the day 20 of treatment and its discontinuation at the end of the day 70, the improved QOL (32.3%) was observed on the day 100, compared to baseline values.

**CONCLUSION** Our study indicates that the treatment of RS with sulodexide results in long term improvement of capillary flow and reduces frequency of RS relapses. Moreover, a significant improvement of QOL was observed during the sulodexide therapy, including a decrease in recurrence of RS episodes as well as reduced pain sensitivity.



## eP29 SEGMENTAL OCCLUSION AFTER CYANOACRYLATE ADHESIVE CLOSURE FOR SAPHENOUS VEIN REFLUX PREVENTS THE RECURRENCE OF SYMPTOMS

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**AIM** Although cyanoacrylate adhesive closure (CAC) is not inferior to thermal ablation for incompetent saphenous veins, recanalization was observed to some extent. Most of them were asymptomatic, however it was necessary to revise the recurrence of symptoms for some patients. Vein diameter is the main parameter of anatomical recurrence, but symptomatic recurrence is unknown. The present study aims to elucidate the ultrasound findings suggesting the recurrence of symptoms.

**MATERIALS AND METHODS** This is a multicenter, retrospective, observational study with a chart review of patients who underwent CAC to treat superficial truncal vein insufficiency from June 2016 to February 2022. In a total of 710 legs, complete recanalization (CR) as any blood flow signal detected in the treated length was recorded in 32 legs (4.5%) in a one-year follow-up. According to ultrasound findings, these legs were divided into two groups: segmental occlusion or narrowing with cyanoacrylate cast more than 50% of the cross-sectional area (mild reflux group, N.=21) and CR with minimal narrowing less than 50% of the cross-sectional area (severe reflux group, N.=11). An average vein diameter before CAC was 8.6 mm (SD 3.2). Preoperative truncal vein diameter ( $P=0.215$ ), maximum vein diameter ( $P=0.122$ ), VCSS ( $P=0.052$ ) and cyanoacrylate volume ( $P=0.322$ ) were not significantly different. The recurrence of symptoms and further adjunct treatments were compared between the two groups.

**RESULTS** All patients in the mild reflux group were asymptomatic except for minor residual varicosities. However, the severe reflux group (6 GSVs and 5 SSVs) showed CR with peeled-off cyanoacrylate cast from the vein wall, and massive bloodstreams remained in the widely open channels through the cast. These bloodstreams were mainly bidirectional, and severe leg swelling recurred in two patients. All patients in the severe reflux group underwent the second percutaneous CACs with foam sclerotherapy. Although 9 out of 11 legs were successfully treated, 2 SSV refluxes were recanalized again after three months. These SSV refluxes were associated with popliteal reflux at the junction, and SSV diameters were returned to the preoperative value. After high ligation with foam sclerotherapy was performed, reflux was abolished, resulting in anatomical success.

**CONCLUSION** Segmental occlusion or mild reflux was likely to contribute to no recurrence of symptoms, even CR exists in the proximal trunk. However, severe reflux due to massive bidirectional bloodstreams resulted in the recurrence of symptoms. Large SSV combined with popliteal reflux would cause a risk of clinical failure in our patients. In our hypothesis, pressure overload due to venous hypertension would cause mechanical stress at the adhesion interface between cast and vein wall and result in the peeling off the cast.

## eP30 IMPACT OF SURGICAL DEPROGRAMMING AND CONTAINMENT ON THE OUTCOME OF CHRONIC VENOUS DISEASE DURING THE COVID-19 CONTAINMENT PERIOD IN THE YEAR 2020

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The objective of this survey was to evaluate the impact of deprogramming of thermal endovenous procedures on the evolution of superficial vein disease. This is a prospective national observational study with a descriptive epidemiological aim conducted by the French Society of Phlebology. This observational study was undertaken to collect the real-life data needed to assess the impact on health, and more specifically on venous disease, of the confinements induced by the COVID-19 pandemic in 2020 and 2021, and to implement corrective actions to ensure the continued performance of the healthcare system. This survey planned to include 16 centers (health facilities) distributed throughout the country, likely to describe 250 to 350 patients whose procedure was deprogrammed.

Data were collected at the time of the deprogrammed procedure and at the time of the reprogrammed procedure. 213 subjects were included in the database, 10 subjects did not meet the inclusion and non-inclusion criteria or did not have an assessable record for the day of the deprogramming, 203 subjects were assessable for the description of the day of the deprogramming of the intervention, 117 subjects did not have a record for the reprogramming visit or had a non-assessable record for the reprogramming visit. A total of 86 subjects were evaluable for the description of the day of the reprogramming intervention.

The demographic and clinical characteristics of the patients were as follows: 67.7% female, mean age 59 years, mean BMI 25, 62% active, 63% CEAP2, 52% family history of varicose veins, 84% personal history of thrombotic disease, and 65% never treated for varicose veins of the lower extremities.

Secondary objectives were the clinical course of venous disease, the evolution of symptoms, the occurrence of thrombotic, trophic and/or hemorrhagic complications, the rate of patients lost to follow-up and the reasons if known, as well as the evolution of ulcers in patients with leg ulcers.

The primary end point was the venous clinical severity score.

Secondary endpoints were changes in CEAP classes, symptoms of venous disease (such as leg pain, leg heaviness, leg paresthesia, impatience, burning, nighttime and daytime cramps), complications and adverse events.

This study did not show any significant difference between the day of deprogramming and the day of reprogramming, and tends to suggest that the treatment of varicose veins of the lower limbs can be postponed for more than 3 months, as recommended by international recommendations, if a particular health context such as a pandemic requires it.



## eP31 THE USE OF PARNAPARIN SODIUM FOR TREATMENT OF SUPERFICIAL VEIN THROMBOSIS DURING PREGNANCY

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**AIM** Treatment of superficial vein thrombosis (SVT) during pregnancy is based on extrapolation of data from non-pregnant patients, recommendations for the treatment of deep vein thrombosis (DVT) in pregnant women and description of clinical cases. Often the doctor chooses anti-coagulants and their dose based on personal ideas.

The aim of this study is to assess the efficacy and safety of intermediate and prophylactic doses of Parpanarin sodium for the treatment of SVT in pregnant with varicose veins.

**MATERIALS AND METHODS** From 06.2020 to 12.2021, we observed 36 pregnant with SVT and varicose veins. The age of patients was from 27 to 43 years. At the 1st visit the gestation period was <14 weeks in 6 cases, 14–28 weeks in 13 cases, ≥28 weeks in 15 cases. No women received anticoagulant therapy before visit to our clinic.

The moderate risk of progression to deep veins was in 29 pregnant. In these cases, we used two variants of intermediate dose during 6 weeks: Parnaparin 6400IUaXa once daily in 17 women and 4250 IUaXa twice daily in 12 women. After 6 weeks, the total thrombosis risk was assessed in accordance with the RCOG criteria, taking into account SVT and varicose veins as the independent risk factors.

The 8 pregnant with ≥3 current risk factors continued anticoagulation with Parnaparin 6400IUaXa once daily before delivery and for 6 weeks postnatally. The 21 women with only two risk factors continued Parnaparin 3200IUaXa once daily before delivery and for 6 weeks postpartum.

The 7 pregnant had low risk of thrombus progression and used Parnaparin 6400IUaXa once daily during 6 weeks. After 6 weeks, the 2 women with ≥3 current risk factors continued anticoagulation without changing the dose before delivery and for 6 weeks postnatally. In other, antenatal anticoagulation was stopped. These patients restarted Parnaparin 3200IUaXa once daily for 6 weeks postpartum only.

**RESULTS** The progression of SVT, the development of simultaneous DVT wasn't detected during the initial treatment and prolonged ante- and postpartum anticoagulation. The 2 pregnant complained of nosebleeds on using of Parnaparin 4250IUaXa twice daily, but it didn't require medical attention or interruption of therapy. The 3 patients complained of hematomas after injections. Complications of childbirth and the postpartum period weren't noted.

**CONCLUSION** The intermediate and prophylactic doses of Parpanarin in the treatment of perinatal SVT showed high effectiveness in preventing the progression of SVT and development of simultaneous VTE and the low risk of hemorrhagic complications. At the same time, we didn't see any differences in the effectiveness of intermediate - 6400IUaXa once daily - and increased intermediate - 4250IUaXa twice daily - doses at initial therapy.

## eP32 PERFORATOR VEINS CYANOACRYLATE OBLITERATION IN THE MESOFASCIAL SEGMENT IN THE TREATMENT OF LONG STANDING VENOUS ULCERS

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**AIM** The pathogenesis of most venous ulcers is associated with local hemodynamic disturbances, underlined by insufficiency of perforating veins. Surgical treatment of this condition is extremely difficult due to massive lipodermatosclerosis. This problem prompted researchers to search for a minimally invasive method that would nullify the traumatic impact on trophically altered soft tissues and effectively perform perforating vein occlusion. One of these methods utilizes endovenous cyanoacrylate composite. The purpose of this study is to evaluate the effectiveness of cyanoacrylate obliteration of the mesofascial area of perforating veins in the treatment of venous trophic ulcers with dynamic follow-up of patients.

**MATERIALS AND METHODS** This procedure was carried out in 10 patients with long-term non-healing venous trophic ulcers. Ultrasonic angioscanning of the veins of the lower extremities revealed signs of horizontal venous reflux lasting more than 2 s, the diameter of insufficient perforating veins averaged from 0.5 cm to 1.0 cm. All patients were previously hospitalized in the surgical department, where a course of infusion angioprotective therapy was started. After 5-7 days of treatment cyanoacrylate obliteration of perforators was performed under local anesthesia and ultrasound guidance. In the early postoperative period, patients underwent control ultrasonic angioscanning, dynamic clinical observation was carried out, and elastic compression of the lower extremities was prescribed. During the stay in the hospital, each patient's quality of life was assessed twice using the SF-36 questionnaire (on admission to the hospital and before discharge). After discharge, patients were followed up for 90 days with an interval of 1 week with ultrasound monitoring. After 6 months, patients were again asked to evaluate the dynamics of changes in the quality of life on the SF-36 scale.

**RESULTS** 12 surgical interventions were performed, 2 of which were performed on both lower extremities. During the ultrasound examination, occlusion of the mesofascial area of the perforator vein without pathological horizontal reflux was visualized intraoperatively. None of the patients had pain in the puncture area, no local inflammatory skin changes were noted. The follow-up period ranged from 90 days to 6 months. In the late postoperative period, the percentage of healing of venous trophic ulcers was 100%, the average healing rate was 20 days. Quality of life improved significantly, reaching mean increase by 100% in all patients by day 90 and was constantly better up to 6 months of follow-up.

**CONCLUSION** Cyanoacrylate obliteration of the mesofascial area of the perforator showed promising results, which affect the reduction in the severity of local symptoms, increase the healing rate of venous ulcers, and significantly improve patient's quality of life.



## eP33 MINIMALLY INVASIVE TECHNIQUES FOR THE TREATMENT OF VENOUS MALFORMATION

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**AIM** To compare the results of treatment of patients with venous malformations (VM) using scleroobliteration (SO), laser coagulation (LC) and radiofrequency obliteration (RFO).

**MATERIALS AND METHODS** The study involved patients with VM (156 people). Among them, 111 women aged 18 to 42 years (average age 38.5), and 45 men aged 18 to 56 years (average age 30.2). Pain was assessed using a visual analogue scale. Depending on the performed surgical intervention, all patients were divided into 3 observation groups.

SO was performed in 48 patients, LC - in 56, and RFO - in 54 patients.

The establishment of the diagnosis of VM, clarification of the localization, depth, extent of the lesion was carried out on the basis of duplex scanning (DS) of the vessels and soft tissues. The size of the venous cavities ranged from 5 mm to 42 mm. LC and RFO was not used with a lesion depth of less than 10 mm.

Evaluation of the effectiveness of treatment was carried out according to the results of DS performed after 1 year of observation. In this case, the following were taken into account: obliteration of caverns in the intervention zone, the presence of residual caverns and their sizes.

**RESULTS** In the RFO group, complete closure of the intervention zone by 12 months of observation was achieved in 50 (92.6%) patients. In this case, was observed an occlusion of large cavities, more than 30 mm. In 5.5% (N.=3), there was a partial occlusion of the cavities associated with the diffuse spread of the disease.

In the LC group, 43 (76.8%) patients had complete occlusion of the cavities. The best result was achieved with a cavity size of less than 30 mm. In other cases, according to the examination results, blood flow continued to be recorded in the cavities even in the presence of partial obliteration. In the SO group, positive results were obtained in 44 patients (91.7%). The technical success of the performed procedure in this case can be attributed to the presence of single limited cavities of small and medium diameter (up to 30 mm).

We found that in group of RFO patients had less complications than in other groups (PRFO,LC=0.0038, PRFO,SO=0.004). There were no significant difference between the results of obliteration in all groups but it has been noticed that LC had worse results in comparison with other methods ( $P > 0.05$ ).

**CONCLUSION** Minimally invasive techniques can ease the course of the disease and reduce the recovery time after surgery. This is especially important given the recurrent nature of the disease, when one patient during his life can undergo at least one surgical intervention per year. Despite the fact that all these operations are palliative in nature, their goal is to reduce the initial complaints and improve the quality of life of patients.

## eP34 FEATURES OF THE CLINICAL COURSE OF CHRONIC VENOUS INSUFFICIENCY IN PATIENTS WITH MORBID OBESITY (BMI>40KG/M<sup>2</sup>)

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**AIM** The aim of this study is to determine clinical-hemodynamic outcomes in patients with morbid obesity (BMI >40 kg/m<sup>2</sup>) and chronic venous insufficiency (CVI) with and without bariatric surgery (BS).

**MATERIALS AND METHODS** Our clinic conducted a prospective cohort study involving 121 morbid obese and CVI patients. Patients were assigned to 3 groups. The observation period was 1 year. The first group included 45 patients who underwent BS and endovenous thermal ablation (TA) of great saphenous vein. The second group - 43 patients who had only a BS. In the third group, we included 33 patients who performed only TA. All patients before the operation and 1 year after it determined weight, BMI, CEAP; counted the points CIVIQ-20; on the VCSS; duplex ultrasound scan (DU) of lower extremity veins was performed with determination of femoral vein (FV) diameter, venous peak (Peak V) and minimal venous (MinV), ΔV max - V min, wall shear stress; frequency of venous claudication.

**RESULTS** The mean BMI in group 1 and 2 decreased significantly ( $50.2\pm5.7$  kg/m<sup>2</sup> to  $33\pm4.3$  kg/m<sup>2</sup>, P=0.0001) and  $49.4\pm6.3$  kg/m<sup>2</sup> to  $30.2\pm5.8$  kg/m<sup>2</sup>, P=0.17) respectively. In the third group, BMI increased from  $48.3\pm5.5$  kg/m<sup>2</sup> to  $50.1\pm6.0$  kg/m<sup>2</sup> (P=0.16). The average diameter of the FV after 1 year decreased significantly in group 1 ( $7.4\pm1.4$  mm; P=0.0001) compared to groups 2 ( $8.94\pm1.09$  mm; P=0.0001) and 3 ( $8.91\pm1.08$  mm; P=0.0001). The Peak V after a year was significantly higher in group 1 ( $15.0\pm2.6$  cm/s; group 2 -  $10.8\pm2.1$  cm/s; group 3  $10.9\pm2.2$  cm/s; P=0.0001). A large wall shear stress at the end point of observation was noted in group 1 compared to groups 2 and 3 ( $2.2\pm1.1$  dyn/cm<sup>2</sup> versus  $1.16\pm0.52$  dyn/cm<sup>2</sup> and  $1.2\pm0.6$  dyn/cm<sup>2</sup>, respectively; P=0.0001). The number of patients with venous claudication decreased from 7 to 1 (P=0.035) in the 1st group compared to no changes in group 2 and 3. Patients in group 1 noted the greatest improvement on the CIVIQ-20 questionnaire and VCSS compared to groups 2 and 3.

**CONCLUSION** Morbid obesity is a serious risk factor for the development of severe forms of CVI, which requires appropriate correction of surgical tactics in the treatment of this category of patients.



## eP35 RADIAL LASER THERAPY WITH 1940 NM COMPARED TO 1470 NM - WHAT MAKES THE DIFFERENCE?

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**AIM** Radial laser therapy is a standard procedure in the endovenous treatment of varicose veins. 1470 nm is the most commonly used wavelength and has an absorption maximum in the range of water. Compared to 1470 nm, the photons at 1940 nm are absorbed approximately four times more by water. Whether the use of this wavelength offers advantages is currently unclear and controversial and still be investigated. Furthermore, there is uncertainty about the amount of local energy to be used (LEED). In addition, the therapy safety and the occlusion rate are evaluated differently compared to the currently used wavelength 1470 nm.

**MATERIALS AND METHODS** In our center, 2 generators with wavelengths of 1470 and 1940 nm are available, identical fibers can be used with both generators. The results of 1242 treated truncal veins with 1940 nm, GSV (1050/84,5%) and SSV (192/15,4%) were examined. The maximum used laser power with 1940 nm was 10 W, with a range (4 W to 10 W). Radial fibers with outer diameters 1,25 mm and 1,55 mm were used. The access to the vein was direct puncture (16 G and 14 G). Withdrawal of catheter was sonographic controlled and velocity modified by pullback resistance. Laser power was adjusted to pull back resistance for optimized radiation. The resorption of the truncal veins were investigated and documented. Patients underwent follow-up visits: day one, 6 weeks, 6 months after the procedure, and more frequently if necessary.

**RESULTS** The medium applied local energy for the GSV was 51,41 J/CM and 37,29 J/CM for the SSV. Using the CEAP classification 82% were in C 3, 14% C4 and 4% in C2. The 1940 nm wavelength showed a primary occlusion rate close to 96% with a tendency of faster resorption. Less pigmentation of the skin was observed in the treatment of intracutaneous veins and side branches. Carbonization of the fiber tip occurred less frequently with comparable accumulated energy compared with 1470 nm. Adjustment of laser power improves this effect. Pain during treatment, sensory disturbances and discomfort or pain after treatment occurred less frequently or not at all.

**CONCLUSION** The use of the 1940 nm in endovenous therapy for truncal varicose veins is a safe alternative to the use of the 1470 nm. At comparable energy doses, there was a tendency for faster resorption of the treated truncal veins, less frequent carbonization of the fiber tip and less periprocedural discomfort. Future studies would be useful to determine whether the 1940 nm wavelength has advantages over the shorter wavelengths. A comparably high energy is necessary to produce safe occlusion.

## eP36 VENOUS DISORDERS AS AN OCCUPATIONAL DISEASE: DATA, PATHOPHYSIOLOGY, AND MODIFICATION STRATEGIES

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**AIM** CVD is closely linked to the modern working world. Tasks carried out in a standing or seated position play a role in the development of venous disorders. Though not commonly recognized as an occupational disease, venous disorders must be taken into account in the design of workspaces. This review aims to analyze the literature on the relationship between CVD and occupational exposure.

**MATERIALS AND METHODS** A systematic review through Pubmed and the library of the clinics for occupational medicine identified 306 articles. Full text articles, available in English and German, reporting the point CVD in an occupational context were included.

**RESULTS** 21 articles were identified. Various studies showed that women who spend an average of eight or more hours sitting or standing at work have a significantly higher risk of developing varicose veins than women who spend four or fewer hours in these positions. In contrast, no clear correlation between sedentary work and varicose veins can be established in men. However, there is a correlation between the number of years men worked in a standing position and the severity of CVD. A large observational study of >6000 randomly selected men and women concluded that the relative risk of hospitalization for varicose vein surgery increased 1.8-fold for those whose jobs consisted predominantly of standing or walking. The significance of sitting and standing as occupational cofactors in the development of varicose veins and venous symptoms was highlighted in a study of 2,000 randomly selected French volunteers. While height and a higher BMI had little correlation with the development of ankle edema, there was a significant link with activity (sitting and standing).

Venous pressure varies depending on the position of the body: approx. 5 mmHg when lying down, 80 mmHg when standing, 45-60 mmHg when seated, and 25-30 mmHg when walking. Patients with CVD exhibit muscular changes including atrophy of the myofibrils, dilatation, proliferation of the interfascial veins and inflammatory changes, which further reduce the pumping function. Lack of muscle activity causes endothelial dysfunction, increases vascular permeability of the veins, and activates leukocytes and platelets. Studies show that compression therapy can lessen this effect.

**CONCLUSION** Occupational stress impacts the venous system more than the risk factors of body weight, gender and predisposition. Hence preventive measures - especially in the workplace - have the potential to be highly effective. Optimal venous hemodynamics in the workplace can be achieved through interventional changes to the work environment, the individual, and the organization of work. The three intervention strategies are to be applied in an additive manner. Occupational history is an important diagnostic tool which helps to confirm the diagnosis and is suitable for justifying the use of compression stockings or vasoactive medication.



## eP37 ANGIOSCOPY EVALUATION AFTER VENOUS STENTS.

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**AIM** Venous stenting is increasingly used to manage femoro-ilio-caval venous outflow obstruction/stenosis due to post-thrombotic syndrome (PTS). Although the safety, efficacy, and long-term patency of venous stents have been reported, re-interventions due to stent occlusion and in-stent restenosis (ISR) have also been reported. The mechanism of ISR and the in-stent neointimal growth after venous stenting remains unclear. We performed the angioscopy to evaluate the intraluminal details after the venous stenting, allowing real-time direct visualization of the vessel lumen.

**MATERIALS AND METHODS** Ten angioscopic procedures in 4 PTS patients were performed. All evaluated vessels were stented iliac veins, and their native pathology was chronic post-thrombotic occlusion. Nine procedures in 3 patients underwent serial evaluation of the neointimal changes after stent implantation to study the natural time course of the neointimal proliferation/coverage over the stent. The serial follow-up angioscopic evaluations were performed at the end of the venous stent deployment procedure, 6 months, 12 months, and 24 months. One procedure was performed one month after the stent implantation to evaluate the detail of ISR, which was observed at the first month of routine stent surveillance. A 5.7 F angioscope was used to visualize the target veins. Continuous irrigation was used to displace blood and clear the visual field.

**RESULTS** At 6 months after stent implantation, the stent struts were covered by thin neointima in two of the three patients. The struts were partially covered in one patient, but there was little neointimal growth overall. At 12 months, the stent struts were almost covered in two cases, and the neointimal coverage increased as time passed. There was no significant change between the 12 and 24 months after stent implantation. In the ISR case, angioscopy demonstrated the overgrown thickened neointima was found, and the stent struts were fully embedded and invisible in the entire stented area. In addition, no thrombus and no webs or trabeculae were found in the area evaluated as an ISR lesion.

**CONCLUSION** At 6 months after stent placement, the stent struts were almost covered by neointima, but still in the process of venous repair. The stent struts were completely covered one year after stent implantation. The neointimal coverage grade was unchanged from the one-year follow-up to the two-year follow-up, suggesting that the neointimal proliferation proceeded gradually with subsequent neointimal remodeling up to one year. The cause of ISR might be an overgrown thickened neointima rather than the formation of thrombosis.

## eP38 PREVALENCE OF DEEP VEIN DISEASE IN PATIENTS WITH CHRONIC VENOUS INSUFFICIENCY: A PRAGMATIC CLINICAL STUDY

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**AIM** Chronic venous disease (CVD) is a global healthcare burden. The relative contribution of deep venous system towards the pathogenicity of CVD is not well studied. Failure to recognise deep vein pathology can lead to recurrence and/or progression of disease despite intervention on superficial system. This study aims to understand the prevalence of deep vein lesions in patients with chronic insufficiency using MR venography (MRV) and intra vascular ultrasound (IVUS).

**MATERIALS AND METHODS** All patients who presented with chronic venous insufficiency and underwent MR Venogram between December 2019 and September 2021 were included. MR Venograms were independently reviewed and reported by two radiologists. Descriptive statistics were used, and data was analysed using Microsoft Excel. In patients who underwent both MR Venography and IVUS, their findings were compared, and sensitivity and specificity were calculated.

**RESULTS** 1064 patients with chronic venous insufficiency were seen during the study period. 132 patients underwent MR venography, and 22 patients underwent MR venography and IVUS. The mean age of the study group was 50.46 years (19-82 years), and majority were male (56.8%, N.=75). Left sided disease was more common (41%, N.=54) and most patients belonged to C4 stage of CEAP classification (48.48%, N.=64). More than a third of patients (N.=49) did not have reflux on duplex scan in superficial system and 23.48% (N.=31) had history of surgery for CVD. The overall prevalence of deep vein lesions on MR venogram was 58% (N.=76). Left CIV stenosis was the most common lesion. Prevalence was high in patients with venous ulcers (65.51%), left sided disease (63%) and a history of DVT (87.5%). When MR Venography was compared to IVUS in 22 patients, it had high sensitivity (100%) and negative predictive value (100%) but low specificity (50%).

**CONCLUSION** Within the limitations of the study and MR Venogram, the prevalence of deep vein disease in patients with chronic venous insufficiency is high. MR venography has high sensitivity and can be effective non-invasive screening tool in selecting patients for IVUS.



**eP39 WITHDRAWN**

## eP40 BULL-HORN VENOUS INJURIES IN POPULAR CELEBRATIONS: A 40-YEARS RETROSPECTIVE ANALYSIS

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**AIM** Popular festivals with bulls are usual in Spain, France, Portugal and South-American countries. Poor bibliography related to these types of vascular injuries caused by bull-horns have been published. The aim of this study was to analyze and report the clinical presentation of bull-horn venous injuries (BHVI) in popular celebrations in a single center in the last 4 decades. We set out to investigate BHVI in a high-volume academic center in Spain.

**MATERIALS AND METHODS** All patients with BHVI admitted between January 1980 and January 2021 were prospectively enrolled. Data collection included demographics, injury profile and outcomes. Primary outcome was in-hospital mortality. Hospital and ICU stay, rates of re-intervention and postoperative complications or mortality were also analyzed. Data were collected from electronic/digitalized medical history records.

**RESULTS** We identified 325 vascular lesions (217 arterial lesions, 108 venous lesions, 29 concomitant arterial and venous lesions) for a total of 137 patients with bull-horn injuries enrolled in the present study. Mean age was 34.7 years (range 19-90) and 92.0% were male. Fourteen (10.2%) patients had multiple bull-horn injuries (separate anatomical locations) and were variable in location. The lower extremities were the most commonly affected, accounting for 55.5% (N.=76) of all injuries, followed by pelvis 12.4% (N.=17) and upper extremities 10.9% (N.=15). A total of 44.5% of the patients had a complication and 24 (17.5%) required reoperation. Overall in-hospital mortality was 2.2%. Risk factors for mortality were concomitant arterial injury (OR 8.21, 95%CI 5.23-15.4, P=0.001), abdominal region affected (OR 3.12, 95%CI 1.34-12.87, P=0.004), age >65 years (OR 2.13, 95%CI 1.01-5.89, P=0.022). There were statistical differences between bull-horn venous and venous plus concomitant arterial injuries regarding ICU stay ( $1.7 \pm 1.3$  vs.  $4.9 \pm 3.3$ , P=0.043), hospital stay ( $8.1 \pm 6.5$  vs.  $12.0 \pm 8.2$ , P=0.007), postoperative complications (23.1% vs. 45.2%, P=0.021), and mortality (2.2% vs. 3.4%, P=0.001).

**CONCLUSION** Morbidity and mortality from BHVI remains high in the past 40-years. Popular festivals with bulls are usual in Spain, France, Portugal and South-American countries. Poor bibliography related to these types of vascular injuries caused by bull-horns have been published. Popular celebrations with bulls constitute an etiology of vascular trauma that can have dire consequences.





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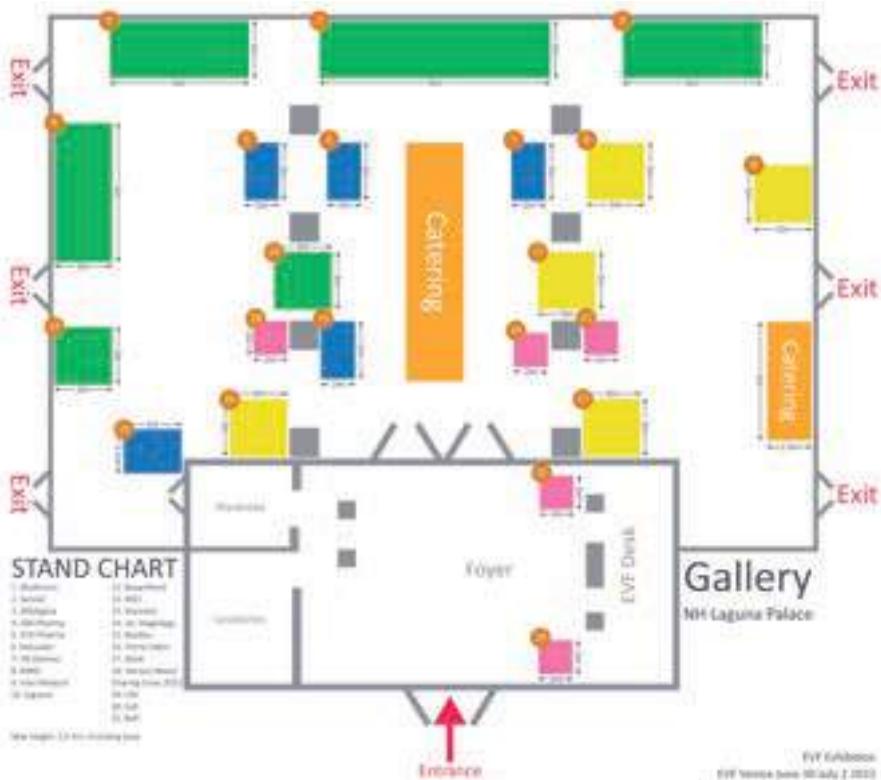
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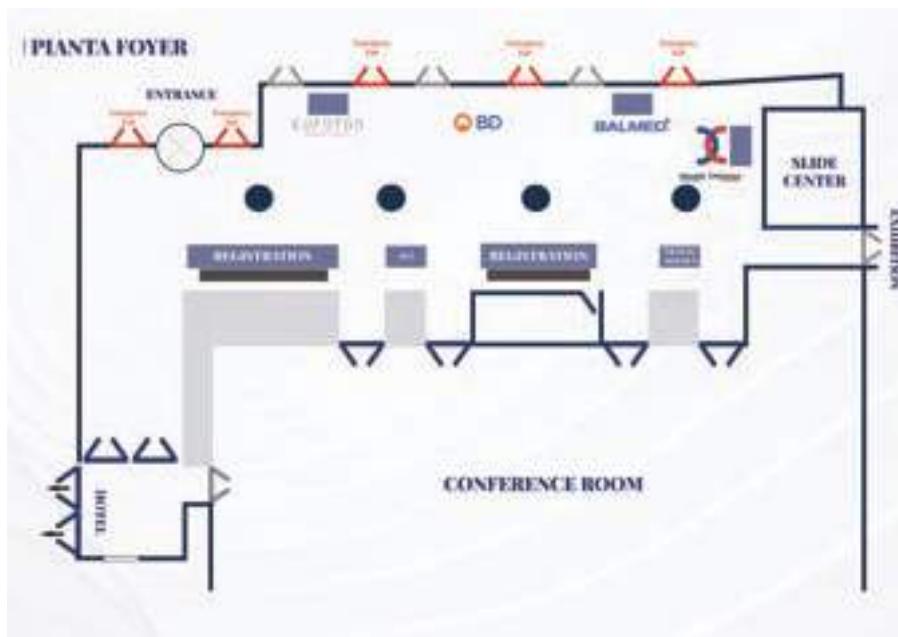
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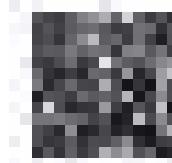
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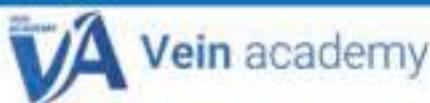


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