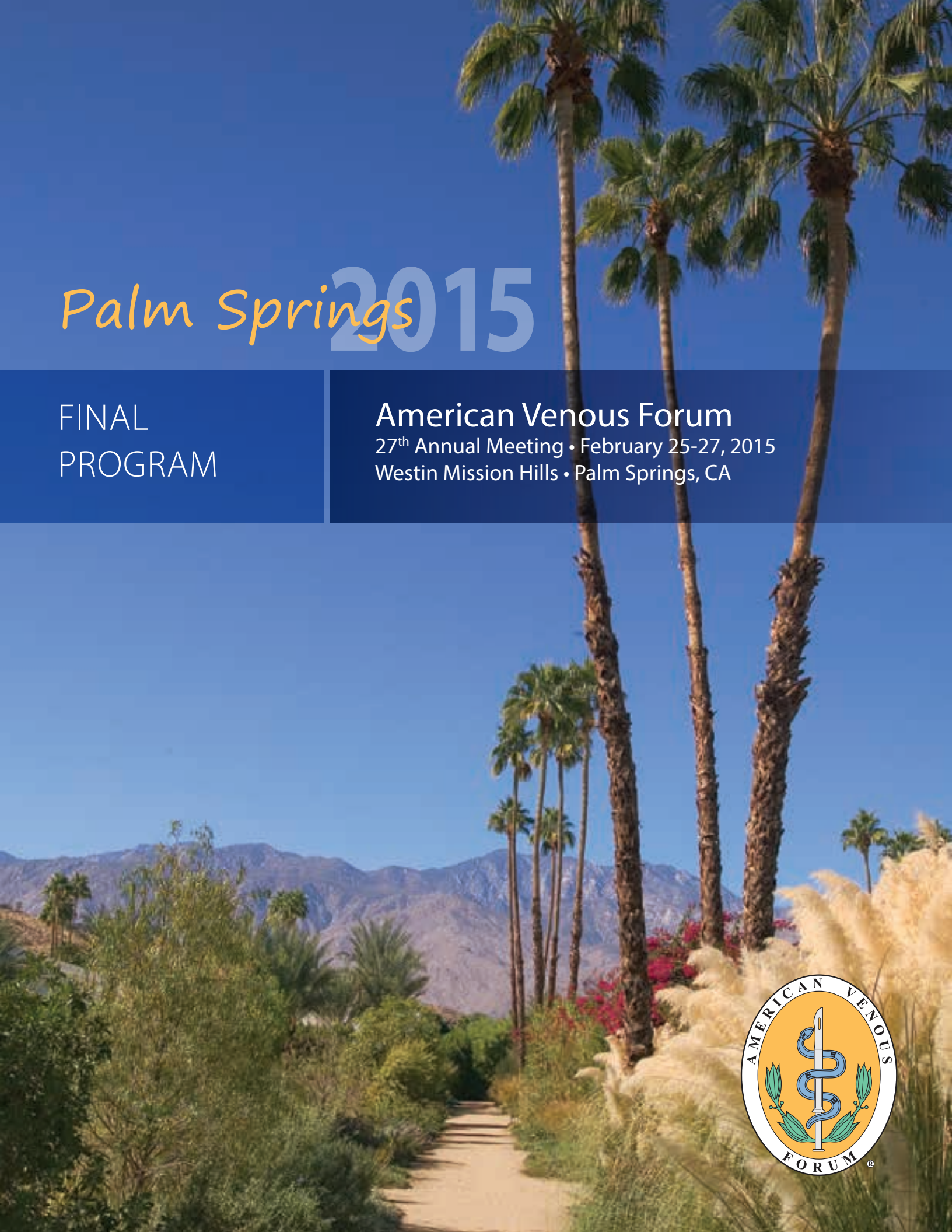

Palm Springs 2015

FINAL PROGRAM

American Venous Forum

27th Annual Meeting • February 25-27, 2015
Westin Mission Hills • Palm Springs, CA

About AVF

The American Venous Forum (AVF) is dedicated to improving the care of patients with venous and lymphatic disease. Founded in 1987, AVF fosters cutting edge research and clinical innovation and educates health care professionals, patients and policy makers about venous and lymphatic diseases. AVF's leadership and membership are recognized internationally as thought leaders, expert investigators and clinicians in venous and lymphatic disease.

Program Objectives

The objective of this comprehensive meeting is to provide those attending knowledge of current thinking in effective clinical management of venous disease and insight into future directions from critical analysis of investigative findings.

Accreditation Statement

This activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education through the joint providership of the American College of Surgeons and the American Venous Forum. The American College Surgeons is accredited by the ACCME to provide continuing medical education for physicians.

AMA PRA Category 1 Credits™ and Self-Assessment Credits

The American College of Surgeons designates this live activity for a maximum of 17.25 *AMA PRA Category 1 Credits*™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Of the *AMA PRA Category 1 Credits*™ listed above, a maximum of 15.75 credits meet the requirements for Self-Assessment.

Evaluations

Please take time to complete the Annual Meeting evaluation form provided online on the AVF website. Your input and comments are essential in planning future educational events. *Evaluations must be completed if you plan to claim CME credit hours for this program.*

Disclosure Information

In compliance with ACCME Accreditation Criteria, the American College of Surgeons, as the accredited provider of this activity, must ensure that anyone in a position to control the content of the educational activity has disclosed all relevant financial relationships with any commercial interest. All reported conflicts are managed by a designated official to ensure a bias-free presentation. Please see the insert to this program for the complete disclosure list.

Grant Acknowledgement

The American Venous Forum wishes to recognize and thank the following companies for their ongoing support through annual meeting educational grants: Boston Scientific, Cook Medical, Medtronic, Vascular Insights, and Volcano.

Marketing & Exhibitor Acknowledgement

The American Venous Forum wishes to recognize and thank the following exhibiting companies for their ongoing marketing support: ACI Medical, LLC; American Board of Venous and Lymphatic Medicine; American College of Phlebology; AngioDynamics, Inc.; Boston Scientific; BSN medical; BTG; Cardiovascular Credentialing Consultants; Carolon; Center for Vein Restoration; Cook Medical; Cool Touch, a Syneron Candela Corporation; DJO Global; Dr. Scholls Compression Hoisery; Hokanson; Incredible Marketing; International Vein Congress; Intersocietal Accreditation Commission; Juzo; Laser Peripherals; LeMaitre Vascular; medi USA/circaid; Medstreaming; Medtronic; Merz Aesthetics, a division of Merz North America, Inc.; Primus Pharmaceuticals, Inc.; SIGVARIS, Inc.; SVS VQI; Tactile Medical; Total Vein Systems; Translite, LLC; Vascular Insights; VEIN Magazine; Vein Therapy News; Volcano Corporation

American College of Surgeons
Division of Education

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Message From The President

Dear AVF Members and Meeting Attendees,

Welcome to the American Venous Forum 27th Annual Meeting in Palm Springs, California.

The Annual Meeting of the AVF is a unique opportunity to learn about the latest research results and innovative practical solutions from the very people who move forward the field of venous and lymphatic healthcare. World-renowned experts will participate in discussion panels, sharing their views and experiences while critically assessing recent developments in the field.

The highlights of the 27th Annual Meeting include:

- The David S. Sumner Venous Summit, presented by AVF President-Elect John Blebea, MD, MBA will address abroad range of important practical issues from the use of social media for marketing to accreditation of vein clinics, from financial aspects of venous practice to ensuring patient safety in office procedures.
- The Villavicencio Symposium, co-chaired by Lowell Kabnick, MD and Peter Lawrence, MD will focus on the future of venous care, recent changes in reimbursement, and the role of professional societies in addressing current challenges.
- D. Eugene Strandness Memorial Lecture, presented by Andrei L. Kindzelski, MD, PhD, the NIH program director in the Division of Blood Diseases and Resources. In his lecture and the following discussion, we will learn how AVF and its members can become more successful in working with the NIH to address burning issues of venous and lymphatic health.
- Scientific sessions featuring never-before-presented abstracts from leading scientists on topics including superficial venous disease, venous thromboembolism/IVC filters, and chronic venous obstructions.
- Specialty Symposia on Deep Venous Disease, Vascular Medicine & Thrombosis, Wound Care, Lymphedema & Compression, Animal Models in Venous Research, and Biomechanics and Bioengineering.
- Allied Health Session will address issues related to venous and lymphatic practice from perspectives of vascular technologists, nurse practitioners and physician assistants.
- A panel discussion of quality measures, bundled payments and changing physician payments in wound care.
- Poster displays and poster presentations

This year was marked by increasing collaboration with other societies to address important issues of venous and lymphatic care. We will have a unique opportunity to learn about these collaborations and the future plans at the President's session.

Our society is growing in numbers and activities. This year opens new opportunities to get involved and make a difference. I am looking forward to join the AVF Board in welcoming our new members at the New Member Breakfast, where these opportunities will be discussed.

Most importantly, do not miss the golf tournament, and the gala! There will be a number of very special presentations and awards, and unmatched opportunity to spend quality time with friends and families of the AVF.

I would like to thank the AVF Board of Directors, the Foundation Board of Directors, and the AVF staff for all of their hard work and dedication this year. It has been a pleasure working with our President-Elect, John Blebea, the Vice President Lowell Kabnick, and we look forward to their continuous leadership and guidance in 2015 and 2016.

It has truly been an honor to work with you this past year.

Sincerely,

Fedor Lurie, MD
AVF President

Meeting At A Glance

✪ *Outdoor Event*

Tuesday, February 24		
4:00 pm – 8:00 pm	Registration Open	Ambassador Foyer
Wednesday, February 25		
6:30 am – 6:30 pm	Registration Open	Ambassador Foyer
7:00 am – 8:00 am	Continental Breakfast	Ambassador East Patio ✪
7:00 am – 8:00 am	Industry Symposium*	Celebrity A-C
8:00 am – 11:00 am	Guest Hospitality	Polo
8:00 am – 12:00 pm	David S. Sumner Venous Summit	Ambassador Ballroom
10:00 am – 10:30 am	Break	Ambassador East Patio ✪
12:00 pm – 1:00 pm	Lunch Break	
12:00 pm – 1:00 pm	Industry Symposium*	Celebrity A-C
12:00 pm – 7:30 pm	Exhibit Hall Open	Celebrity D-H
1:00 pm – 6:00 pm	Poster Hall Open	Celebrity Foyer
1:00 pm – 1:05 pm	President & President-Elect Welcome	Ambassador Ballroom
1:05 pm – 3:05 pm	Scientific Session 1: Chronic Venous Obstruction	Ambassador Ballroom
3:05 pm – 3:30 pm	Coffee Break	Celebrity D-H
3:30 pm – 4:50 pm	Scientific Session 2: Basic Science	Ambassador Ballroom
5:00 pm – 6:03 pm	Poster Presentations	Ambassador Ballroom
6:00 pm – 7:30 pm	Welcome Reception	Celebrity D-H
7:30 pm – 9:00 pm	Industry Symposium*	Celebrity A-C
Thursday, February 26		
6:00 am – 7:00 pm	Registration Open	Ambassador Foyer
6:30 am – 7:30 am	Continental Breakfast	Celebrity D-H
6:30 am – 7:30 am	New Member Breakfast with the Board	Ambassador East Patio ✪
6:30 am – 7:30 am	Industry Symposium*	Celebrity A-C
7:30 am – 7:00 pm	Poster Hall Open	Celebrity Foyer
8:00 am – 11:00 am	Guest Hospitality	Polo
9:00 am – 1:00 pm	Exhibit Hall Open	Celebrity D-H
7:30 am – 9:25 am	Scientific Session 3: Venous Thromboembolism/IVC Filters	Ambassador Ballroom
9:30 am – 10:00 am	Coffee Break	Celebrity D-H
9:30 am – 10:00 am	Demonstration of the VQI® Varicose Vein Registry	Celebrity A-C
10:00 am – 10:30 am	Best Paper Session	Ambassador Ballroom
10:00 am – 11:30 am	ACP Symposium: Recurrent Varicose Veins - Comparison of Various Treatment Modalities - What Have We Learned	Oasis Ballroom
10:30 am – 11:30 am	Villavicencio Symposium: Present and Future of Venous Health Care	Ambassador Ballroom
11:30 am – 12:20 pm	D. Eugene Strandness Memorial Lecture: Venous Disease Research Support by the National Institutes of Health	Ambassador Ballroom
12:20 pm – 1:30 pm	Lunch Buffet	Celebrity D-H
12:20 pm – 1:30 pm	Industry Symposium*	Celebrity A-C
12:20 pm	Open Afternoon	
12:30 pm – 5:00 pm	Venous Open Golf Outing *Reception to Follow*	Westin Mission Hills Diabolically Dye Golf Course ✪

Meeting At A Glance

Friday, February 27		
6:00 am – 10:00 am	Exhibit Hall Open	Celebrity D-H
6:00 am – 5:30 pm	Registration Open	Ambassador Foyer
6:00 am – 8:00 am	Continental Breakfast	Celebrity D-H
6:30 am – 8:00 am	Industry Advisory Breakfast	Ambassador East Patio ✪
7:00 am – 10:00 am	Specialty Symposia	
	(A) Biomechanics & Bioengineering	Oasis 1-3
	(B) Wound Care, Lymphedema & Compression	Oasis 4
	(C) Deep Venous Disease	Celebrity A-C
	(D) Vascular Medicine & Thrombosis	Oasis 5-7
8:00 am – 10:00 am	Poster Hall Open	Celebrity Foyer
8:00 am – 11:00 am	Guest Hospitality	Polo
8:00 am – 9:30 am	Scientific Session 4: Compression/Wound Care/Lymphedema	Ambassador Ballroom
9:30 am – 10:00 am	Coffee Break	Celebrity D-H
10:00 am – 12:00 pm	President's Session	Ambassador Ballroom
12:10 pm – 1:10 pm	Member Business Luncheon	Master's Plaza ✪
12:10 pm – 1:10 pm	Industry Symposium	Rancho/Mirage
1:10 pm – 3:10 pm	Scientific Session 5: Superficial Venous Disease	Ambassador Ballroom
1:10 pm – 4:10 pm	Specialty Symposia	
	(E) Allied Health Session	Oasis 1-3
	(F) Wound Care, Lymphedema & Compression + Healthcare Roundtable	Oasis 4
	(G) Superficial Venous Disease	Celebrity A-C
	(H) Animal Models in Venous Research	Oasis 5-7
3:10 pm – 3:40 pm	Coffee Break	Ambassador Foyer
3:10 pm – 3:40 pm	Demonstration of the VQI® Varicose Vein Registry	Rancho/Mirage
3:40 pm – 5:10 pm	Scientific Session 6: Diagnostic Testing/Imaging	Ambassador Ballroom
6:30 pm – 10:00 pm	Forum Finale	Master's Plaza ✪

*Industry Symposia are not part of the official program of the AVF 27th Annual Meeting. See the Industry Symposium schedule on page 21.

General Meeting Information

MEETING OVERVIEW

The 27th Annual Meeting of the American Venous Forum spotlights recent advances and research in venous disease through expert presentations that are relevant and innovative. The scientific program will provide panel presentations and discussions on all aspects of venous disease, diagnosis, pathophysiology and treatment.

TARGET AUDIENCE

The target audience for this program is vascular and general surgeons, interventional radiologists, interventional cardiologists, phlebologists, plastic surgeons, physician assistants, vascular nurse practitioners, technicians, technologists and other medical professionals who are currently treating venous disease.

ABSTRACTS

Oral presentations will be given by the authors of the highest scoring abstracts. Abstracts presented at the AVF 27th Annual Meeting are published in the January 2015 issue of the *Journal of Vascular Surgery: Venous and Lymphatic Disorders*, the official journal of the AVF. AVF is pleased to provide a yearly subscription to the journal to active members.

POSTER PRESENTATIONS

The top 21 posters will be presented in the Ambassador Ballroom on Wednesday evening from 5:00 pm – 6:03 pm. Abstracts selected as poster presentations and displays will be viewable in the Celebrity Foyer and Plazas Wednesday afternoon through Friday morning.

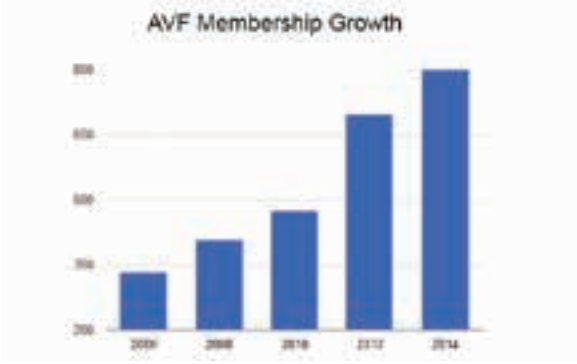
POSTER DISPLAY HOURS

Wednesday, February 25	Poster Set-up	8:00 am – 1:00 pm	Celebrity Foyer and Plazas
	Poster Hall Open	1:00 pm – 6:00 pm	Celebrity Foyer and Plazas
	Poster Presentations	5:00 pm – 6:03 pm	Ambassador Ballroom
Thursday, February 26	Poster Hall Open	7:30 am – 7:00 pm	Celebrity Foyer and Plazas
Friday, February 27	Poster Hall Open	8:00 am – 10:00 am	Celebrity Foyer and Plazas
	Poster Tear-down	10:00 am – 12:00 pm	Celebrity Foyer and Plazas

MEMBERSHIP

The AVF continues to grow and now includes close to 800 influential leaders, expert investigators and clinicians in the field of venous and lymphatic healthcare. Membership in the AVF is a mark of professional distinction and denotes a dedication to understanding and treating the entire spectrum of venous and lymphatic disorders. All non-members are invited to complete a membership application available online at www.veinforum.org.

New AVF members, who have joined since the 2014 Annual Meeting, are invited to attend the New Member Breakfast with the Board on Thursday morning to give new AVF members an opportunity to learn more about the association and engage with some of the AVF Board of Directors and leadership.



General Meeting Information

REGISTRATION

Registration packets are ready for pick up at the AVF Registration Desk located in the Ambassador Foyer for those pre-registered for the Annual Meeting. Onsite registration for the AVF Annual Meeting is accepted, space permitting.

David S. Sumner Venous Summit: Registration is by separate subscription and includes the David S. Sumner Venous Summit on Wednesday, February 25. The David S. Sumner Venous Summit is eligible for 3.5 *AMA PRA Category 1 Credits*™ and 3.5 Self-Assessment Credits. A post test must be completed by the designated deadlines in order to receive the Self-Assessment Credits.

Annual Meeting Registration: Registration includes all scientific sessions, Specialty Symposia, continental breakfasts, coffee breaks, lunch buffet, Exhibit Hall and Welcome Reception.

Specialty Sessions Only: Specialty Sessions Only registration includes two Specialty Symposium sessions on Friday, February 27. Registration is accepted onsite, space permitting. Note: Specialty Symposia are included in Annual Meeting Registration.

Spouse/Guest Registration: The spouse/guest registration fee includes daily breakfast in the Hospitality Suite, Welcome Reception, and access to the Exhibit Hall. This does not include access to the scientific sessions or the Forum Finale.

Forum Finale: The Forum Finale on Friday evening will feature a cocktail reception, awards ceremony, dinner, live entertainment and an exclusive silent auction. Tickets are available for Annual Meeting registrants and their guests for $75.00 each. Tickets for corporate guests and industry representatives are $175.00. Tickets to the Forum Finale are available for purchase during advance registration and onsite but cannot be guaranteed same-day. The Forum Finale will be held outside in the Master's Plaza.

Registration Desk:

The Registration Desk will be located in the **Ambassador Foyer** and will be open during the following hours:

Tuesday, February 24	4:00 pm - 8:00 pm
Wednesday, February 25	6:30 am - 6:30 pm
Thursday, February 26	6:00 am - 7:00 pm
Friday, February 27	6:00 am - 5:30 pm

Hotel Information

Westin Mission Hills
71333 Dinah Shore Drive
Rancho Mirage, CA 92270 United States
Phone: 760-328-5955
Hotel Reservations: 877-253-0041

Transportation Options

The Westin Mission Hills is located only six miles from the Palm Springs International Airport (PSP). Major airlines including Alaska Airlines, American Airlines, Delta Airlines, Frontier Airlines, United Airlines, US Airways and Virgin America fly into PSP. Non-stop routes include Calgary, Chicago, Dallas/Fort Worth, Denver, New York (JFK), Seattle and others across the U.S. and Canada. To arrange transportation to the Westin Mission Hills, please call 760-328-5955 for assistance.

Hotel Dining

Pinzimini Restaurant
Pinzimini provides the guest with an experience of dining in a modern, energetic atmosphere while enjoying an Italian menu featuring a variety of high-quality grilled meats, exceptional salads, and simple pastas containing accents of Tuscan-style cuisine.

Daily Happy Hour from 4:00pm to 6:00pm
50% off drinks (domestic beer, house wine and well drinks) and an expanded appetizer menu

Cuisine: Italian
Hours: Daily from 7:00am-12:00am

Fireside Lounge
Pause and drink in the magnificent view of the lushly landscaped 18th hole of the Pete Dye Golf Course - the perfect setting for relaxing conversation or a casual meeting. View more information on the Fireside Lounge. Please note hours of operation vary based on business levels and private events.

Cuisine: American
Hours: Friday and Saturday from 4:00pm-12:00am. Please call for current hours.

Dilbert's Diner & Take-Out
Discover your family favorites of pizza, fish tacos, salads, date shakes and more! Find your way to the Dilbert's for a fast and tasty experience.

Cuisine: American
Hours: Daily from 6:00am-10:00pm
Atmosphere: Casual
Setting: Outdoor order window, patio seating

Las Brisas Cafe And Caliente Bar
You won't miss a single ray of warm desert sun when you grab a bite at this popular Palm Springs Restaurant.
Learn more about Las Brisas Café and Caliente Bar.

Cuisine: Cocktails, fresh salads, sandwiches, burgers & much more
Hours: Friday-Sunday from 10:00am-4:00pm
Atmosphere: Enchanting poolside bar and patio

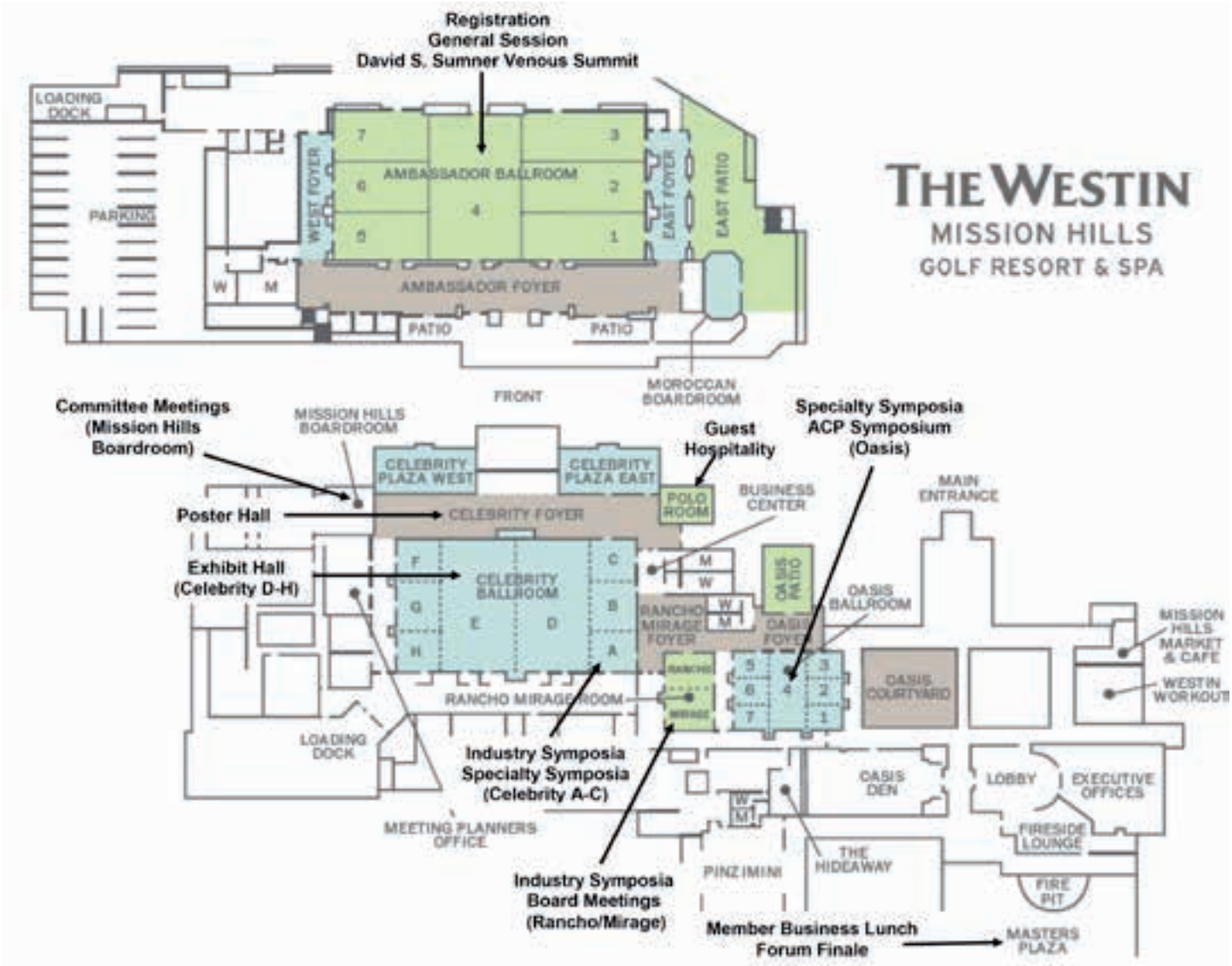
Mission Hills Market Cafe
Have a seat and relax at the Mission Hills Market & Cafe. Proudly brewing Starbucks Coffee you may also enjoy fresh pastries, salads, and sandwiches are prepared daily by our very own Executive Chef, Joel Delmond. The Market is fully stocked with newspapers, magazines, sundries and more for your ultimate shopping experience.

Hours: Daily from 6:00am-11:00pm

Season's Grill
Season's Grill Palm Springs restaurant features seasonally-inspired menus that take culinary creativity to the next level. Even dishes that may be considered "standard" go a little "off to the left" - in a good way! Fresh, fun, familiar. Learn more about Season's Grill.

Hours: Daily from 7:00am-9:00pm
Atmosphere: Cozy indoor seating or pation overlooking the Paradise Pool

Hotel Map


Registration
General Session
David S. Sumner Venous Summit
THE WESTIN
MISSION HILLS
GOLF RESORT & SPA
LOADING DOCK
PARKING
WEST FOYER
AMBASSADOR BALLROOM
EAST FOYER
EAST PATIO
AMBASSADOR FOYER
PATIO
PATIO
MOROCCAN BOARDROOM
FRONT
Committee Meetings (Mission Hills Boardroom)
MISSION HILLS BOARDROOM
Guest Hospitality
Specialty Symposia ACP Symposium (Oasis)
CELEBRITY PLAZA WEST
CELEBRITY PLAZA EAST
POLO ROOM
BUSINESS CENTER
MAIN ENTRANCE
Poster Hall
CELEBRITY FOYER
Exhibit Hall (Celebrity D-H)
CELEBRITY BALLROOM
OASIS PATIO
OASIS BALLROOM
RANCHO MIRAGE FOYER
OASIS FOYER
MISSION HILLS MARKET & CAFE
WESTIN WORKOUT
OASIS COURTYARD
RANCHO MIRAGE ROOM
LOADING DOCK
Industry Symposia Specialty Symposia (Celebrity A-C)
OASIS DEN
LOBBY
EXECUTIVE OFFICES
FIRESIDE LOUNGE
MEETING PLANNERS OFFICE
THE HIDEAWAY
PINZIMINI
FIRE PIT
Industry Symposia Board Meetings (Rancho/Mirage)
Member Business Lunch Forum Finale
MASTERS PLAZA

About American Venous Forum

The American Venous Forum (AVF) is dedicated to improving the care of patients with venous and lymphatic disease. Founded in 1987, AVF fosters cutting edge research and clinical innovation and educates health care professionals, patients and policy makers about venous and lymphatic diseases. AVF's leadership and membership are recognized internationally as thought leaders, expert investigators and clinicians in venous and lymphatic disease.

As the field of venous and lymphatic disease grows, the AVF continues to lead by:

- Providing interactive and hands-on education to physicians and fellows
- Building multi-specialty coalitions to advocate for improvements in venous and lymphatic disease
- Increasing its patient outreach through expansion of its screening program

AVF LEADERSHIP

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David S. Sumner, MD
J. Leonel Villavicencio, MD
James S.T. Yao, MD

AVF PAST PRESIDENTS & ANNUAL MEETING LOCATIONS

2015	Palm Springs, CA	Fedor Lurie, MD, PhD
2014	New Orleans, LA	Peter K. Henke, MD
2013	Phoenix, AZ	Robert B. McLafferty, MD
2012	Orlando, FL	Seshadri Raju, MD
2011	San Diego, CA	Peter J. Pappas, MD
2010	Amelia, FL	Joseph A. Caprini, MD
2009	Phoenix, AZ	Joann Lohr, MD
2008	Charleston, SC	Mark H. Meissner, MD
2007	San Diego, CA	Michael C. Dalsing, MD
2006	Miami, FL	Thomas W. Wakefield, MD
2005	San Diego, CA	Bo G. Eklöf, MD
2004	Orlando, FL	Frank T. Padberg, MD
2003	Cancun, Mexico	Peter Gloviczki, MD
2002	La Jolla, CA	Gregory L. Moneta, MD
2001	Fort Myers, FL	Anthony J. Comerota, MD
2000	Phoenix, AZ	David S. Sumner, MD
1999	Dana Point, CA	Thomas F. O'Donnell, Jr., MD
1998	Lake Buena Vista, FL	D. Eugene Strandness, Jr., MD
1997	San Antonio, TX	James S. T. Yao, MD
1996	San Diego, CA	Robert L. Kistner, MD
1995	Fort Lauderdale, FL	Robert Hobson, MD
1994	Maui, HI	James A. DeWeese, MD
1993	Orlando, FL	George Johnson, Jr., MD
1992	Coronado, CA	Michael Hume, MD
1991	Fort Lauderdale, FL	Lazar J. Greenfield, MD
1990	Coronado, CA	Norman M. Rich, MD
1989	New Orleans, LA	John J. Bergan, MD

2014 BEST PAPER WINNER
Muzaffar Anwar, MBBS, MRCS

2014 BEST POSTER WINNER
Katherine Gallagher, MD

D. EUGENE STRANDNESS, JR., MD MEMORIAL LECTURE

On January 7, 2002, the American Venous Forum was saddened by the passing of one of its founding members and past presidents, Dr. D. Eugene Strandness, Jr. Dr. Strandness was a friend, mentor, colleague and leader in all aspects of vascular surgery. He held several NIH grants and wrote numerous publications on the etiology and non-invasive diagnosis of deep vein thrombosis. One of his most notable accomplishments was the development of duplex ultrasound scanning. His tireless pursuit of knowledge led to a better understanding of the natural history of venous disease and its diagnosis and treatment, for which our patients and we are forever indebted to him.

Each year, the D. Eugene Strandness, Jr., MD Memorial Lecture recognizes the significant contributions of an individual in research, education or clinical investigation in the field of venous diseases. Chosen by the president of the American Venous Forum and confirmed by the Forum's Executive Committee, the 2015 recipient of this distinctive honor is Andrei L. Kindzelski, MD, PhD, who is currently a Medical Officer/Program Director in the Division of Blood Diseases and Resources at the National Heart, Lung, and Blood Institute.

Venous Disease Research Support by the National Institutes of Health

Andrei L. Kindzelski, MD, PhD
Medical Officer/Program Director in the Division of Blood Diseases and Resources
National Heart, Lung, and Blood Institute
Bethesda, MD, United States

Dr. Kindzelski earned his M.D. degree in 1987 at the National Medical University, Kyiv, Ukraine. He received a Ph.D. in Immunology from Postgraduate Medical Academy, Kyiv, in 1989. He completed clinical Hematology/Oncology fellowship and continued research activities throughout his 20 years in academia as a faculty at Wayne State University and then University of Michigan Medical School. He has more than sixty peer reviewed publications in the areas of clinical hematology, leukocyte and tumor cell biology, and immunology. Prior to joining the National Heart, Lung, and Blood Institute (NHLBI) in 2007 he also served as a Medical Consultant for NICHD.

Dr. Kindzelski is currently a Medical Officer/Program Director in the Division of Blood Diseases and Resources (DBDR). He directs a large portfolio of basic, translational, and clinical research projects in thrombosis, hemostasis and vascular disorders, and serves as a Project Officer for a number of national and international clinical trials. Dr. Kindzelski serves on multiple Trans-NIH committees as well, as DoD and Food and Drug Administration (FDA) steering committees.

This lecture will be presented on Thursday, February 26 at 11:30 am.
Please plan to attend this featured presentation.

About American Venous Forum Foundation

The American Venous Forum Foundation was organized in 1987 to support the charitable, educational and scientific purposes of the American Venous Forum. The Foundation provides the BSN-Jobst Research Grant, Servier Traveling Fellowship Award and other significant educational grants to stimulate and recognize excellence in published writing on laboratory and clinical research in the study of venous diseases.

AMERICAN VENOUS FORUM FOUNDATION®
Funding the Future of Venous Care

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AWARDS & RECOGNITION

BSN-Jobst Research Grant In Venous And Lymphatic Disease

In 1995, the American Venous Forum Foundation announced the establishment of the BSN-Jobst Research Grant in Venous and Lymphatic Disease. From 1995-2014 the grant provided a one-year, $50,000 grant to residents, fellows, and young faculty of less than 5 years from the end of their vascular training chosen through a competitive selection process. In 2015 the BSN-JOBST Research Grant will award a two-year, $100,000 grant to the winning recipient. The AVF Research Committee scores the applications to determine the grant recipient and announces its selection during the Annual Meeting.

BSN-Jobst Research Grant Recipients:

2014 Harry Ma, MD, University of Oklahoma
2013 Xzabia Calista, MD, University of Rochester
2012 Rabih Chaer, MD, University of Pittsburgh
2011 Marlene Matthews, MD, University of Rochester
2010 Yanjie Qi, MD, University of Rochester
2009 Carolyn Glass, MD, University of Rochester
2008 K. Barry Deatrick, MD, University of Michigan
2007 Danny Vo, MD, Mayo Clinic
2006 Stephanie K. Beidler, MD, University of North Carolina
2005 Allesandra Puggioni, MD, Mayo Clinic
2004 John Rectenwald, MD, University of Michigan
2003 Charles Fields, MD, Mayo Clinic
2002 Susan O'Shea, MD, Duke University Medical Center
2001 Brajesh K. Lal, MD, UMDNJ New Jersey Medical School
1999 Joseph D. Raffetto, MD, Boston Medical Center
1998 Klaus See-Tho, MD, Stanford University Medical Center
1997 Andrew C. Stanley, MD, Burlington, VT
1996 Jae-Sung Cho, MD, Mayo Clinic, Rochester, MN
1995 Peter J. Pappas, MD, UMDNJ New Jersey Medical School

About American Venous Forum Foundation

Servier Traveling Fellowship

The Servier Traveling Fellowship provides two fellows an opportunity to travel to the European Venous Forum to present his or her scientific research. Four finalists are identified through a competitive peer-review process, and are invited to present their science during the AVF Meeting. Travel and accommodations for the four finalists are reimbursed as part of the grant. The finalists are judged by an appointed AVF committee. Two winners will be selected to present their work at the 2015 European Venous Forum Annual Meeting in St Petersburg, Russia.

The following outstanding Servier Traveling Fellowship Recipients:

2014 Rafael Malgor, MD, Stony Brook University Medical Center
Adam Ring, MD, Penn State University

2013 Carson Oostra, MD, University of Toledo College of Medicine
Andrea Obi, MD, University of Michigan

2012 Frank Vandy, MD, University of Michigan
Emily Wood, MD, Stony Brook University

2011 Faisal Aziz, MD, Jobst Vascular Center
Robert Meisner, MD, Stony Brook University Hospital

2010 K. Barry Deatrick, MD, University of Michigan
Christopher Pannucci, MD, University of Michigan

2009 Atul Rao, MD, University of Pittsburgh Medical Center
Axel Thors, MD, Good Samaritan Hospital

2008 David Paolini, MD, Toledo Hospital
Jorge Martinez, MD, Toledo Hospital

2007 Brian Knipp, MD, University of Michigan
Reagan Quan, MD, Walter Reed Army Medical Center

2006 Charles Stonerock, MD, Indiana University School of Medicine
Gustavo Oderich, MD, Mayo Clinic

David S. Sunmer Venous Summit

Office-Based Vein Centers – The Next Generation

Chair: John Blebea, MD, MBA

Educational Objectives:

1. To learn the steps necessary to open an office-based vein center
2. To understand the financial implications of running a vein center
3. To develop marketing strategies using both the internet and social media
4. To gain an understanding of the patient benefits of price transparency
5. To be able to identify and select appropriate procedures for the treatment of superficial and deep venous disease
6. To develop an understanding of the importance of venous center accreditation

Office-based interventional procedures, particularly in the case of patients with venous insufficiency and varicose veins, are becoming increasingly more frequent. If done correctly, this is associated with improved patient and physician satisfaction and at less cost for both patients and the health care system. During the David S. Sumner Venous Summit, a panel of world-renowned experts and physicians experienced in venous office-based interventions will review what is required to set up a successful out-patient venous center, its financial management, marketing opportunities, choice of interventions and how to select between them, future venous procedures and the benefits of vein center accreditation. Presentations will be followed by question and answer sessions to allow audience members the opportunity to ask more detailed questions. The goal of the Summit will be to provide attendees with practical and proven strategies that they can implement immediately in their own practices.

D. Eugene Strandness Memorial Lecture

Venous Disease Research Support by the National Institutes of Health

Keynote Speaker: Andrei L. Kindzelski, MD, PhD

Educational Objectives:

1. To emphasize the importance of venous disease (VD) research and provide examples of currently supported NIH studies
2. To provide overview of overall NIH support structure and NIH committees related to VD and lymphatic research
3. To describe mechanisms of support for investigator-initiated research by NIH
4. To provide an overview of NIH initiatives (RFAs and program announcements)
5. To describe training grants and programs at NIH
6. To review clinical trials supported by the NIH
7. To discuss the role of professional societies in supporting medical research

The National Institutes of Health (NIH) has been historically at the forefront of the support for venous disease (VD) research in the United States. A number of Institutes within NIH have interest in stimulating basic, translational, and clinical efforts to better understand and manage VDs. Studies on venous thrombosis, pulmonary embolism and DVT are within the missions of the National Heart, Lung, and Blood institute (NHLBI). However, knowledge of other Institutes and Offices may be beneficial for a new investigator, as navigation within NIH structure and grant mechanisms may be difficult. This lecture will provide basic overview of the NIH structure related to the VD research areas and the mechanisms of research support as well as the role of professional societies in this process.

Villavicencio Symposium

Present and Future of Venous Health Care

Chairs: Lowell Kabnick, MD; Peter Lawrence, MD

Educational Objectives:

1. To develop an understanding of the status of venous health care now and the future
2. To develop an understanding of the importance of venous accreditation
3. To develop strategies for a National Determination Policy
4. To understand the physician reimbursement system and the RUC
5. To be able to identify criteria for the construction of the CMS Fee Schedule

In a recently published article, *Inequalities of health insurance guidelines for the treatment of symptomatic varicose veins,* the authors address insurers responsibility for improving venous disease outcomes, as well as reducing costs, and the necessity for health-care providers and insurance carriers to work together to achieve optimal venous care. Collaboration between venous providers and insurance carriers to create evidence-based standards for optimal care would be timely and beneficial for patients. This symposium will address these issues and discuss whether US insurers are constructing policies to meet their responsibilities.

Schul M., King T., Kabnick L. Phlebology 2014, 29(4),PP.239-246

ACP Symposium

Recurrent Varicose Veins - Comparison of Various Treatment Modalities - What Have We Learned

Chronic venous insufficiency or disease is an apt description for an all too common process of the lower extremities that defies therapeutic interventions that do not include long term follow. Recurrent varicose veins have been identified in patients following surgery as well as sclerotherapy and endovenous thermal modalities. In 1988, a worldwide collection of vascular experts convened to develop a system of codified guidelines that includes pre-treatment evaluation, treatment methodologies and long term surveillance to identify and standardize patterns of recurrence. At the same time they recommended common international usage for lower extremity venous anatomy. Because recurrent varicose veins are a common, complex and costly problem for patients and their treating physicians, careful analysis is critical. By having consistent, thorough long term evaluation across all the therapies, new insights can be gained in to the natural history and how much influence disease progression plays in chronic venous insufficiency.

Specialty Symposia

The 27th Annual Meeting will have six Specialty Symposium sessions on Friday, February 27 from 7:00 am – 10:00 am and 1:10 pm – 4:10 pm. Attendees will have the opportunity to attend two Specialty Symposium sessions. Attendees may select Specialty Symposia at the time of registration.

Friday, 7:00 am - 10:00 am

(A) Biomechanics & Bioengineering
(B) Wound Care, Lymphedema & Compression
(C) Deep Venous Disease
(D) Vascular Medicine & Thrombosis

Friday, 1:10 pm - 4:10 pm

(E) Allied Health Session
(F) Wound Care, Lymphedema & Compression + Healthcare Roundtable
(G) Superficial Venous Disease
(H) Animal Models in Venous Research

(A) Biomechanics & Bioengineering: Structure-Function Relation of Veins in Health and Disease

Biomechanics relates the function of a physiological system to its structure. The structure-function relation of arteries is well understood using the biomechanics approach. A similar understanding of the venous system, however, lags far behind the arterial system. To address this gap in knowledge and to identify areas of future research, the objective of this session is on review of structure-function relation of veins in health and disease.

The highlight of the session will be a scientific/bioengineering understanding of the venous system in health and disease. The speakers will provide review of the general approach of biomechanics (general principles as applied to blood vessels including scaling laws, stress-strain relations and growth and remodeling laws), boundary conditions (including hemodynamics), material properties of vein wall and blood and their respective interactions in thrombosis, inflammation and remodeling in venous disease.

Following this session participants should be able to:

- Understand the function of the venous system can be deduced based on a biomechanical analysis
- Review the anatomy and geometry of venous system in health and disease
- Describe the material properties of the venous system in health and disease
- Review hemodynamics of venous system and related biomechanics
- Understand the endothelial-blood interactions including thrombosis
- Understand the mechanisms of venous inflammation
- Describe the pathophysiology of veins
- Understand the different etiologies and pathophysiology of chronic lower extremity

(B) Wound Care, Lymphedema & Compression

The goal of this activity is designed to be a comprehensive symposium discussing the diagnosis and treatment of lower extremity wounds, lymphedema and medical compression for venous and lymphatic disorders. It is designed to be clinically relevant to basic and advanced wound care treatment and educate on the current approach to improve outcomes of the vascular patient.

The highlight of the session will be case presentation. Each speaker will start with a case and at the end of each session there will be a lively discussion with the invited experts on how to best manage these cases.

Following this session participants should be able to:

- Develop a rational approach to the evaluation and treatment of a variety of wounds
- Have an increased awareness of the differential diagnosis of cutaneous manifestations of systemic illnesses versus vascular disorders
- Describe the pathophysiology of mixed arterial and deep venous insufficiency of the lower extremity and the approach to treatment
- Understand the different etiologies and pathophysiology of chronic lower extremity lymphedema and the highlights of treatment
- Review the indications, benefits and discuss different compression modalities for venous and lymphatic disorders
- Understand the approach to superficial vein ablation in the face of manifestations of venous insufficiency

(C) Deep Venous Disease

Major recent advances in the care of deep venous disease have included improvements in oral anticoagulant drug therapy, venous imaging, and catheter-based interventions. However, the venous disease provider is often faced with difficult decisions as to when these novel modalities should be used over conventional approaches to diagnosis and treatment. To address these gaps in knowledge, the objective of this session is to update the attendee with new information from clinical trials and informed expert consensus on how best to utilize new oral anticoagulants, invasive venous imaging, and catheter-directed thrombolytic approaches for deep venous conditions.

The session will begin with three lectures on oral anticoagulants, management of iliac vein lesions, and an update on pivotal clinical trials in deep venous disease. This will be followed by two debates on controversial topics – the use of catheter-directed thrombolysis for infrainguinal deep vein thrombosis (DVT) and submassive pulmonary embolism (PE). The session faculty members are from diverse subspecialty backgrounds including vascular medicine, vascular surgery, cardiology, cardiothoracic surgery, and interventional radiology.

This activity is designed for a variety of medical specialties, scientists, bioengineers and healthcare providers focused on understanding patients affected by deep venous disorders.

Pursuant to this session, participants should be able to:

- Summarize the advantages and disadvantages of new oral anticoagulants.
- Determine how to detect and manage thrombotic and non-thrombotic iliac vein lesions.
- Name three completed, ongoing, or upcoming pivotal clinical venous disease trials.
- Describe the risk-benefit ratio for the use of thrombolysis for submassive PE.
- Name three complications of catheter-directed thrombolytic therapy for DVT and PE.
- Understand the differences between the risk-benefit ratio of catheter-directed thrombolysis performed for iliofemoral versus femoropopliteal DVT.

(D) Vascular Medicine & Thrombosis

Speakers will include Susan Kahn from Jewish General Hospital in Montreal, a McGill University teaching hospital, Nicos Labropoulos from Stonybrook Medical Center, Terry Carman from Case Western Reserve and Thomas Wakefield from the University of Michigan Medical Center.

Dr. Kahn is widely recognized for her research interests which primarily focuses on clinical trials of interventions to prevent, diagnose, treat, and improve outcomes of venous thromboembolism.

Dr. Kahn and Dr. Labropoulos will present two different perspectives on the use of compression. Dr. Kahn's presentation will include the results of the SOX Trial which she believes proves that compression is not a key component in treating DVT patients. Dr. Labropoulos has been working on the development and natural history of chronic venous disorders and venous thromboembolism including the inflammatory pathways in both. Dr. Labropoulos' presentation will focus on compression being a main component for treating DVT patients despite the results of the SOX Trial.

Dr. Carman is a well-respected vascular medicine practitioner with a reputation for teaching excellence and a strong interest in thrombotic problems. Her topic, "Does Idiopathic VTE Require Indefinite Anticoagulation?" will address an issue that is gaining wide attention as new, novel oral anticoagulants enter the market. It is precisely the type of talk one expects from a nonsurgical practitioner working in the vascular field, and it will showcase her impressive expertise in this area. Dr. Wakefield is currently studying thrombogenesis, vein wall/thrombus inflammation, the production of procoagulant microparticles and thrombus/vein wall fibrosis with the goal of these studies being to establish new prophylactic and treatment strategies for venous thrombosis. Dr. Wakefield's presentation will discuss the use of the target specific anticoagulants. Dr. Wakefield will present the current problems with new agents including the inability at the present time to reliably reverse the anticoagulant effects of these drugs, and the fact that there is little data available on bridging of these agents when other procedures need to be performed. Dr. Wakefield will present the monitoring parameters, supportive measures and reversal agents for Rivaroxaban, Apixaban, Dabigatran.

The program will also include talks on the ACCESS Trial, chronic post-thrombotic iliofemoral venous occlusion and lymphedema. The program will conclude with a panel discussion and questions and answers from the audience.

(E) Allied Health Session

This session is intended for physicians, non-physician providers (NP/PA), RNs/LPNs, sonographers and other allied health care professionals involved in the diagnosis and management of venous disease.

The goal of this session is to instruct attendees to identify and choose the appropriate testing in order to anatomically and physiologically define venous disease, and enable them to set up a precise treatment plan.

Within this defined goal instructors will:

- Provide a comprehensive review of existing data and any new information regarding the natural history, pathogenesis, and the diagnosis and treatment of commonly encountered venous disorders
- Outline an in-depth clinical and diagnostic examination
- Describe the range of venous disorders and their CEAP classification
- Describe and discuss the various treatments
- Discuss the indications for use of different treatment modalities and the clinical circumstances most appropriate for these different treatments and interventions
- Discuss the advantages and possible disadvantages of these varying treatment modalities
- Manage venous disorders according to current AVF guidelines
- Provide care for venous disease in keeping with recent evidence and recommendations

The discussions are geared to move attendees toward an improvement in their clinical decision making, which hopefully will result in an increase in workplace confidence and performance, with the ultimate goal of improved patient outcomes.

(F) Wound Care, Lymphedema & Compression - Reimbursement of Wound Centers and Venous Treatment Based on Quality and Value: The Future is Now

This activity is broken into two parts. The first part, a healthcare roundtable, will concentrate on reimbursement of wound centers and venous treatment based on quality and value. A representative of the Wound Care Alliance will discuss submitting quality measures for venous ulcer care to CMS.

The healthcare roundtable will provide participants with:

- An overview of the area and discuss alternative quality contracts (AQCs) which have been used in Massachusetts by Blue Cross Blue Shield and have demonstrated to reduce health care cost
- An overview of UCLA's experience with accountable care organizations and wound centers
- An explanation of bundled payments for wound care
- An in-depth look at quality measures for wound care

The second part will provide attendees with several case presentations, which highlight the diagnosis and treatment of lower extremity wounds, lymphedema and medical compression for venous and lymphatic disorders. It is designed to be clinically relevant to basic and advanced wound care treatment and educate on the current approach to improve outcomes of the vascular patient.

(G) Superficial Venous Disease

Superficial venous disease is a common disease process and encompasses a broad spectrum of disease. A significant number of minimally invasive methods of treatment are currently available. The objective of this specialty session is to update the audience on these new techniques for superficial disease treatment, specifically highlighting the procedural key points from a faculty of recognized vein experts.

The first session of the symposium will include video presentations of new techniques with simultaneous commentary by faculty. Audience discussion and questions will occur after each segment. The second part of the session will be case oriented case management. Audience participation will be used to discuss the options of care for each case. Moderators will ensure that the key points of each case are elucidated.

After this session participants should be able to:

- Understand updated techniques in superficial venous disease
- Explain the complications and contraindications of new techniques
- Appreciate the different anatomic processes that are best treated by new techniques
- Integrate new techniques into complex venous pathology treatment
- Appreciate financial considerations and roadblocks involved in incorporating new techniques into a practice

Specialty Symposia, continued

(H) Animal Models in Venous Research

Animal models have played a vital role in venous thrombosis (VT) research and have contributed enormously to the current understanding of VT biology. Thus, researchers from different institutions have developed several models of VT over the last two decades. Oftentimes, investigators from different backgrounds are subject to contradictory debates regarding the same VT animal models. For instance, our laboratory has a vast experience in the IVC ligation model in mice, rats, and the bi-balloon VT model in baboons. Current debate centers on whether any animal model of thrombo-genesis correlates with spontaneous VT formation in humans. Additionally, there is controversy on whether any given model is more accurate or representative of the disease compared to other models of VT. Unfortunately, the uncertainties surrounding the optimal application of animal models of VT have been translated in subjective peer review of manuscripts and grant applications, which ultimately holds up our continuous effort to better understand the pathobiology of VT. This symposium represents a step forward to achieve consensus and create guidelines to the use of current available animal models of VT and to identify gaps in the field where new models may be needed.

The objective of the session will be a scientific understanding of the animal models of VT. The speakers will provide details on the surgical technique, advantages, disadvantages and research applications.

This activity is designed for a variety of medical specialties, scientists, veterinarians, bioengineers and healthcare providers, and any person interested in improving the current understanding on animal models of VT and the biological mechanisms that participates in venous disorders.

Pursuant to this session, participants should be able to:

- Understand how the animal models presented in the section function and serve to the study of VT.
- Punctual description of all advantages (strength) and disadvantages (weakness) of each model.
- Current applications of each model presented in the section.
- Provide a complete update of each model to be discussed and incorporated in the future consensus on VT animal models.

Industry Symposia

Wednesday

AngioDynamics Breakfast Symposium | Vacuum Assisted Venous Thrombectomy: How I do it
7:00 am – 8:00 am | Celebrity A-C

Cook Medical Lunch Symposium | Controversies in Venous Disease
12:00 pm – 1:00 pm | Celebrity A-C

BSN Medical Dinner Symposium | The Continuum of Care: VLU Focus, Advanced Wound Dressings and Compression to Optimize Healing and Recurrence Prevention Techniques
7:30 pm – 9:00 pm | Celebrity A-C

Thursday

Vascular Insights Breakfast Symposium | Challenges of Appropriate Care: Right Doctor, Right Patient, Right Reason
6:30 am – 7:30 am | Celebrity A-C

Friday

Janssen Pharmaceuticals Breakfast Symposium | Exploring Risk Reduction in Thrombosis
6:00 am – 7:00 am | Rancho/Mirage

Medtronic Lunch Symposium | Radiofrequency Ablation: Four Myths Debunked by Compelling Clinical Evidence
12:10 pm – 1:10 pm | Rancho/Mirage

Meeting Program — Wednesday, February 25

6:30 am – 6:30 pm
Registration Open — **Ambassador Foyer**

7:00 am – 8:00 am
Continental Breakfast — **Ambassador East Patio**

8:00 am – 12:00 pm
DAVID S. SUMNER VENOUS SUMMIT — **Ambassador Ballroom**

Office-Based Vein Centers – The Next Generation
Chair: John Blebea, MD, MBA

The Financial Imperative for Office-Based Vein Centers
Robert F. Merchant, MD

Setting up a Vein Center
Krishna M. Jain, MD

Can You Do It In an Academic Practice?
John Blebea, MD, MBA

The Internet: More than just a Web Page
Victor Sirgado

Marketing Opportunities via Social Media
Michael A. Arata, MD

Direct Payment – Skipping the Insurance Middleman: The Business Perspective
Jim Millaway, CRA

Transparent Pricing Directly to Patients – Why I Do It
Sherif Khattab, MD

Sclerotherapy – Cost Effective Protocols to Grow your Practice
Nick Morrison, MD

Venous Ablation – RFA, Laser and Foam: Comparative Choices and Financial Implications
Julianne Stoughton, MD

Non Tumescent Ablative Technologies: Current Status and Future Role
Steven Elias, MD

Deep Vein Interventions – No Longer Just in the Hospital
Antonios P. Gasparis, MD

Vein Center Accreditation – Quality and Differentiation
Ellen D. Dillavou, MD

8:00 am – 11:00 am
Guest Hospitality — **Polo**

10:00 am – 10:30 am
Break — **Ambassador East Patio**

12:00 pm – 1:00 pm
Lunch Break

1:00 pm – 7:30 pm
Exhibit Hall Open — **Celebrity D-H**

1:00 pm – 6:00 pm
Poster Hall Open — **Celebrity Foyer**

1:00 pm – 1:05 pm

President & President-Elect Welcome — Ambassador Ballroom

1:05 pm – 3:05 pm

SCIENTIFIC SESSION 1

Chronic Venous Obstruction — Ambassador Ballroom

Moderators: Fedor Lurie, MD, PhD; John Blebea, MD, MBA

Discussants: 1-1 Mark Meissner, MD; 1-2 Seshadri Raju MD; 1-3 Cees H.A. Wittens, MD, PhD; 1-4 Suresh Vedantham, MD; 1-5, Anthony Comerota, MD

1:05 pm – 1:25 pm

1-1 Randomized Double-blinded Study Comparing Clinical Versus Endovascular Treatment of Iliac Vein Obstruction

F. H. Rossi[1], A. M. Kambara[1], N. M. Izukawa[1], P. B. Metzger[1], C. B. Betelli[1], B. L. Almeida[1], T. O. Rodrigues[1], I. P. Masciarelli[1], A. G. Sousa[1], C. B. O. Rossi[2]; [1]Instituto Dante Pazzanese, Sao Paulo, Brazil, [2]Instituto Dante Pazzanese, São Paulo, Brazil

OBJECTIVE: Post-thrombotic (PIVL) and non-thrombotic iliac vein lesions (NIVL) are frequently treated with endovascular methods. However, outcomes have never been studied by a randomized clinical trial before. The purpose of this study is to compare clinical and endovascular treatment outcomes in symptomatic chronic venous disease (CVD) patients with documented iliac vein obstruction.

METHODS: Patients with CVD (CEAP C3-6) and Visual Analogue Scale for pain (VAS pain) > 5 were considered eligible. We randomly assigned 50 iliac vein obstructions with > 50% area reduction, per IVUS, to undergo angioplasty and iliac vein stenting plus clinical treatment or clinical treatment alone (venoactive drug/Aminaftone or Coumadin (PIVL), plus compression therapy, and Unna boot for active venous ulcer). The patient and the clinical physician were blinded. Primary outcomes included: 1) change from baseline in VAS pain and 2) venous ulcer healing rate at 6 months. Secondary outcomes included changes in Venous Clinical Severity Score (VCSS) and SF-36 Quality of Life Questionnaire, as well as stent integrity, position and patency at 6 months.

RESULTS: Between February 2013 and March 2104, 40 patients with 50 highly symptomatic iliac vein obstructions were studied. The median age was 57 years (range, 19 to 78 years). The female-male ratio was 4,7:1 and the left-right ratio was 3:1. CEAP classification was 3:36%; 4:22%; 5:12% and 6:30%. Iliac vein stenting was 100% successful (PIVL: 42% and NIVL: 52%). The pain level on VAS scale declined from a median of 8,5 to 1,8 following stenting and from 7,5 to 7,0 after clinical treatment (p<0,001). The rate of ulcer healing was higher after stenting (80%) versus clinical treatment group (33.3%) at 6 months (95% CI: 0,74-7,75; OR: 2,4; p = 0,144). The VCSS scale (0 to 30) declined from a median of 19,2 to 11,6 after stenting and from 15,1 to 14,8 after clinical treatment (p<0,001). The SF-36 QOL Questionnaire (0 to 100) improved from a median of 53,9 to 85,0 with stenting and 48,3 to 59,8 after clinical treatment (p<0,001). With a median follow-up of 10, 2 months there was no stent fracture or migration, Primary and Assisted Primary stent patency rates were 96% and 100%, respectively.

CONCLUSIONS: Angioplasty with stenting is a safe and effective treatment. The intervention promotes rapid relief of CVD symptoms and improves quality of life in highly symptomatic patients. Our results reproduce those achieved in numerous non-randomized clinical studies. The data suggest clinical treatment alone should be limited to a very restricted number of patients who cannot undergo endovascular treatment.

1:25 pm – 1:45 pm

1-2 Hemodynamic Consequences of Deep Venous Obstructive Disease

R. L. M. Kurstjens, M. A. F. de Wolf, I. M. Toonder, R. de Graaf, C. H. A. Wittens; Maastricht University Medical Centre+, Maastricht, Netherlands

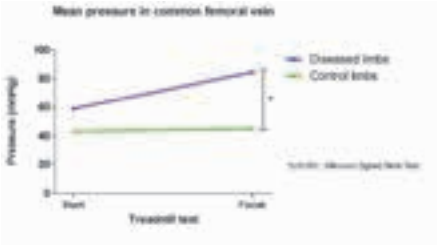
OBJECTIVE: Post-thrombotic iliofemoral venous obstruction can cause debilitating symptoms and can be treated by percutaneous angioplasty (PTA) and stenting with good clinical results. However, little is known about the hemodynamic effects of iliofemoral post-thrombotic obstruction. The aim of this study was to demonstrate the hemodynamic changes in iliofemoral venous obstructive disease in the common femoral vein (CFV), compared to the dorsal foot vein, during ambulation.

METHODS: Sixteen patients with post-thrombotic unilateral iliofemoral deep venous obstruction were included. The dorsal foot vein and CFV were cannulated bilaterally, and patients were instructed to walk on a treadmill until a maximum walking distance was reached (3.2km/h, slope increasing 2% every 2 minutes to a maximum of 26 minutes).

RESULTS: All patients suffered from venous claudication. Mean age was 42±14 years, thirteen patients were female, and two had right-sided complaints. Pressure in the CFV was significantly higher in diseased limbs in erect position (58.8±12.5 compared to 42.1±16.8, p=0.008, Wilcoxon Signed Rank Test), but this difference was not found in the dorsal foot vein (84.9±11.8 versus 87.5±10.5, p=0.386). During walking, pressure significantly increased by 25.6±17.0 mmHg in the CFV of diseased limbs, compared to 1.9±6.4 mmHg in control limbs (p=0.001). (Figure) Pressure decreased by 36.4±21.0 mmHg in the dorsal foot vein of diseased limbs, which was not significant

compared to 40.7±19.5 in controls (p=0.508). Only four patients were able to finish the treadmill test, though all patients developed pain during the test. In the supine position, no significant differences were found.

CONCLUSIONS: This is the first study showing a significant pressure increase at the level of the CFV in erect position and during ambulation in patients with a post-thrombotic deep venous obstruction. This could explain the occurrence of venous claudication in patients with iliofemoral venous obstruction.



1:45 pm – 2:05 pm

1-3 Nonthrombotic Venous Obstructions Cause Pelvic Congestion Syndrome

S. F. Daugherty; Veincare Centers of Tennessee, Clarksville, TN

OBJECTIVE: Pelvic congestion syndrome (PCS) usually is attributed to ovarian and/or internal iliac vein reflux. Until recently, non-thrombotic iliac vein and left renal vein obstruction rarely have been reported as causes of PCS.

METHODS: A total of 3730 new patients were evaluated in a vein center by a single physician from 2008 through August, 2014. Records were reviewed for the patients who underwent treatment for PCS. After a history and physical exam suggested the clinical diagnosis of PCS, the patients were studied with transabdominal venous duplex ultrasound and either CT or MR venography. Subsequent venograms with intravascular ultrasound (IVUS) were utilized to confirm the diagnosis and to direct angioplasty/stenting of the left common iliac vein. Follow-up was performed with clinical exam and transabdominal ultrasound.

RESULTS: Twenty-nine patients were treated with angioplasty/stenting of the left common iliac vein for PCS. Only 12 of these patients presented to the center for pelvic symptoms. The other 17 presented for lower extremity complaints, but it quickly became apparent that their dominant symptoms affecting quality of life were pelvic symptoms. Fifty-six other patients whose primary symptoms were leg symptoms with variable degrees of pelvic symptoms were treated as well for non-thrombotic iliac vein obstruction. Three patients were treated for left ovarian vein reflux with coil embolization techniques. One patient was identified with severe aorto-mesenteric compression of the left renal vein with extensive left ovarian vein reflux causing pelvic congestion symptoms judged severe enough to recommend venous bypass. The mean age of the treated PCS patients was 38 (range 22-53) years. The mean minor diameter of the compressed iliac veins in the PCS group was 3.4 (range 1-6.2) mm. Pelvic symptoms were totally resolved or considerably improved after iliac vein stenting in the PCS group. The mean follow-up is 13 (range 1-71) months. None of the patients are experiencing recurrent pelvic symptoms and none of the stents have developed significant restenosis.

CONCLUSIONS: Moderate to severely symptomatic non-thrombotic iliac vein obstruction is an overlooked cause of PCS and is 10 times as common in this single center population as symptomatic left ovarian vein reflux. Venous angioplasty/stenting provides excellent mid-term relief of pelvic symptoms. One patient with severe aorto-mesenteric compression of the left renal vein was encountered in this series. As imaging techniques and awareness of the abdominal/pelvic venous obstructive lesions improve, more patients will be relieved of their chronic undiagnosed pelvic pain.

2:05 pm – 2:25 pm

1-4 Endovascular Recanalization of the Non-Malignant Chronically Occluded Inferior Vena Cava

Y. Erben, H. Bjarnason, G. Oladottir, P. Gloviczki; Mayo Clinic, Rochester, MN **Servier Traveling Fellowship Award Finalist*

OBJECTIVE: Chronic, most frequently post-thrombotic occlusion of the inferior vena cava (IVC) is rare. Results of endovascular recanalization (ER) with angioplasty and stenting have been encouraging and the aim of this study was to evaluate our experience.

METHODS: Clinical data of 66 patients, who underwent ER for chronic, non-malignant IVC occlusion between January 2001 and August 2014 were retrospectively reviewed. Primary outcomes included morbidity and mortality, secondary outcomes included patency and resolution of symptoms.

RESULTS: Forty-five of 66 patients (68%) were male and mean age was 43 years (range: 17-83 years). Symptoms were present for a mean of 8.1 ± 8.6 years. CEAP score was 3, 4a, 4b, 5 and 6 in 41, 2, 1, 3 and 19 patients, respectively. Forty-seven (71%) had previous deep venous thrombosis (DVT), thirteen (20%) had DVT with pulmonary embolism (PE) and six (9%) had a previous iatrogenic injury or congenital hypoplasia. Twenty five (38%) had an IVC filter in place and 23 (35%) had a thrombophilia. IVC occlusion was infrarenal in 47, suprarenal in 18 and suprahepatic in 1 patient. All patients underwent sequential angioplasty and stenting. One or both iliac veins were stented including the IVC bifurcation. Pre- and post-stenting pressure gradients were 4.3 ± 2.9 and 0.7 ± 1.0 mmHg, respectively ($p<0.001$). Three patients had complications: one IVC hematoma, groin hematoma and femoral vein thrombosis each. There was no mortality. Follow-up

was 41.3 ± 34.2 months. Three patients were lost to follow. Primary patency, primary assisted and secondary patency at 36 months was 80%, 88% and 91% respectively. Resolution of symptoms occurred in 55 patients (83%).

CONCLUSIONS: Endovascular recanalization for non-malignant symptomatic IVC occlusions is technically challenging, however, it is safe and durable. Mid-term patency is excellent and 83% of the patients have partial or complete resolution of symptoms.

2:25 pm – 2:45 pm

1-5 The Diagnostic Value of the Pubic Collateral in Deep Venous Obstructive Disease

M. A. F. de Wolf, R. L. M. Kurstjens, C. W. K. P. Arnoldussen, I. M. Toonder, R. de Graaf, C. H. A. Wittens; Maastricht University Medical Center, Maastricht, Netherlands

OBJECTIVE: Venous collaterals, including prominent superficial branches on the abdominal wall and pubic region, have long been associated with deep venous obstruction, and many view this as a pathognomonic sign. In this study we evaluated the value of this sign in determining which patients require further imaging of the femoro-iliaco-caval venous tracts.

METHODS: Between June 2010 and December 2013 we evaluated 318 patients for deep venous disease by means of physical examination, duplex ultrasonography and magnetic resonance venography in our specialized venous clinic. Demographics, superficial collateralization of the abdominal wall/pubic region, presence or absence of femoral, iliac or caval obstruction and/or occlusion were noted in a prospective database. Diagnostic value of the presence of superficial collateralization on the lower abdomen and in the pubic region in diagnosing proximal deep venous obstruction was evaluated by sensitivity, specificity, positive and negative predictive value (PPV, NPV).

RESULTS: Average age was 44.2±13.8 years (16-78), 61.6% was female. 216 patients (67.9%) had a history of DVT. In 98 (30.8%) iliac vein compression was found, 64 (65.3%) of which also suffered from post-thrombotic changes. Superficial collaterals were found in 103 (32.4%) cases, in 98 (95.1%) of these cases deep venous obstruction was identified on imaging. Sensitivity was 46.5% (95% CI: 39.6% - 53.4%), specificity was 89.4% (95% CI: 76.9% - 96.4%), PPV was 95.1% (95% CI: 89.0% - 98.4%) and NPV was 27.1% (95% CI: 20.3 % - 34.8%). In the 5 patients with superficial collateralization, but without deep venous obstruction, either gonadal vein insufficiency or extensive groin varicosities were present.

CONCLUSIONS: The presence of superficial collaterals on the lower abdomen and in the pubic region is highly predictive for the presence of deep venous obstructive disease (PPV 95%). It is therefore recommended that all patients presenting with this, almost pathognomonic, sign of deep venous obstruction undergo further imaging of the femoral, iliac and caval venous tracts. The absence of these superficial collaterals does not rule out pathology, it is therefore not recommended as a screening tool.

2:45 pm – 2:50 pm

Q1-1 Effects of Venous Stent Placement on Cutaneous Microvascular Function in Iliocaval Venous Obstruction

C. Koksoy, Y. Sevim, Z. Unal, E. Y. Demirel; Ankara University, Ankara, Turkey

OBJECTIVE: Cutaneous microvascular dysfunction has an important role for the development of venous disease. However, the effects of venous obstruction on microcirculation have not been well investigated. The aim of the present study was to assess cutaneous microvascular function in patients with iliocaval venous obstruction before and after venous stent placement.

METHODS: Endothelial-dependent and -independent vasodilator responses to iontophoretic administration of incremental-doses of acetylcholine (Ach) and sodium nitroprusside (SNP) were evaluated using a laser Doppler scanner in the perimalleolar region in the supine and sitting positions in patients with iliocaval venous obstruction (n: 11) and healthy controls (n:15). Following cutaneous microvascular function evaluation, patients with iliocaval obstruction underwent iliocaval venous stent placement. Treatment effects were assessed using Venous Clinical Severity Score (VCSS) and CEAP (clinical, etiological, anatomical and pathological elements) score before and after intervention. Cutaneous microvascular function was re-evaluated at the third month following the stent placement in patients with patent stents.

RESULTS: The responses to Ach and SNP in the cutaneous microcirculation were lower in patients with iliocaval obstruction as compared to healthy subjects in sitting position ($P < 0.05$). Recanalization and stent placement were successful in all patients. CEAP and VCSS showed a significant decrease in the severity of venous disease signs and symptoms ($P < 0.01$). Stent placement in patients with iliocaval venous obstruction resulted in a significant increase in vasodilatation response to both Ach and SNP in supine position ($p<0.05$).

CONCLUSIONS: Iliocaval venous obstruction impairs the endothelial-dependent and -independent vasodilatation in the perimalleolar region. Iliocaval venous stent placement may recover in microvascular dysfunction.

2:50 pm – 2:55 pm

Q1-2 The Short Term Outcomes of Neovalve Deep Venous Reconstructive Surgery

Y. Hoshino[1], S. Hoshino[2]; [1]Saiseikai Fukuoka General Hospital, Fukuoka, Japan, [2]Fukushima Diichi Hospital, Fukushima, Japan

OBJECTIVE: Deep venous reflux arises from three aetiologies, postthrombotic syndrome (PTS), primary deep valve incompetence (PDVI), and congenital valve aplasia. According to the aetiologies, several surgical techniques have been used to correct deep venous reflux reconstructing the valves. The main procedures described are internal or external valvuloplasty, femoral transposition, axillary vein transfer, or artificial venous valve. Overall, the results vary based on the technique used, the surgeon's expertise, and postprocedure care. The Neovalve technique is obtained by dissecting the vein wall to create a flap, which is positioned as a monocuspid or bicuspid valve.

Since the principle of this surgery is creating a new valve in the deep venous system, this technique can be employed in not only PTS but PDVI and valve aplasia. This study reports our first case series and the short-term outcomes of the Neovalve surgery in the patients with deep venous insufficiency (DVI) affected by PTS and PDVI.

METHODS: The indications for this surgery were the patients who had DVI and persistent active ulcers (CEAP classification class C6) even after performing superficial vein surgery, perforator surgery and compression treatment. From July 2013 to April 2014, the Neovalve surgery was performed in 4 limbs on 4 patients (2 PTS and 2 PDVI). The monocuspid valves were created by dissecting the venous wall on the femoral veins in all 4 limbs. In the postthrombotic lesion, the neovalve was created by using the intraluminal septum after endophlebectomy.

RESULTS: Ulcer healing was observed in 4 limbs within 2 and 12 weeks after surgery (median, 6.5 weeks) with no recurrent symptoms with a mean follow-up of 8 months (range, 6-14 month). Postoperative evaluations (descending venography and duplex scanning) were performed at 1 month after the operation, and showed the venous patency and the Neovalve competence in 4 limbs.

CONCLUSIONS: Neovalve technique seems to be feasible and effective in the patients with DVI affected by PTS or PDVI. Although these results are encouraging, a larger patient volume and long-term outcomes are warranted to validate the technique.

2:55 pm – 3:00 pm

Q1-3 Reintervention in Patients Undergoing Ilio-femoral Venous Stenting

*D. I. Fremed, R. O. Tadros, M. Lee, R. A. Ravin, M. L. Marin, P. L. Faries, W. Ting; Icahn School of Medicine at Mount Sinai, New York, NY *Servier Traveling Fellowship Award Finalist*

OBJECTIVE: Venous stenting is increasingly being utilized as a treatment of chronic proximal venous outflow obstruction (PVOO) in the abdomen and pelvis. We observed that some patients underwent a secondary intervention after the initial vein stent procedure. This retrospective study was undertaken to identify the clinical and technical factors associated with the need for secondary interventions among patients who had previously undergone vein stent placement for chronic PVOO.

METHODS: A retrospective, single-institution review of 107 patients who previously underwent venous stenting for chronic PVOO between December 2012 and June of 2014 was conducted. The indications for the primary and secondary procedures were reviewed. Secondary procedures that were part of a staged contralateral procedure or endovenous thermal ablations were excluded from this study.

RESULTS: Of the 107 patients, 64% of patients were male and the mean age was 62 years (range 31-90). The indications for the primary vein stent procedure included: varicose veins (with/without ulcer) 41 patients (38.3%), post-thrombotic syndrome (with/without ulcer) 19 patients (17.6%), and isolated lower extremity edema 47 patients (43.9%). A total of 11 patients (10.2%) required a secondary reintervention. The need for reintervention was prompted by a recurrence of pre-procedure symptoms in all 11 patients. Average length-of-time from the initial procedure to secondary intervention was 5.5 months. Of these 11 patients, 7 patients (63%) had a remote history (>6 months) of deep vein thrombosis (DVT) and presented with post thrombotic syndrome during their initial procedures. Seven (63%) presented with CEAP class IV or higher. Two (18%) presented with acute DVT after discontinuation of anticoagulation. Four (36%) patients tested positive for hypercoagulable disorders. Findings during secondary procedures included: iliofemoral stenosis distal to the prior stents (6/11), in-stent restenosis or occlusion (5/11), and malposition of stent (3/11). Secondary interventions included new stent placement (9/11), balloon angioplasty alone (2/11), and need for catheter-directed thrombolysis (1/11) Follow-up at 30 days showed resolution of symptoms in 5 patients, improvement of symptoms in 4, and unchanged symptoms in 2.

CONCLUSIONS: Reintervention should be considered in any patient with recurrence of symptoms after vein stent placement for chronic PVOO. These patients may have findings that are amenable to secondary interventions with a reasonable chance of symptom resolution or improvement. Longer follow-up and a larger sample size will help assess the long-term efficacy and durability of vein stent placement in chronic PVOO and any secondary interventions.

3:00 pm – 3:05 pm

Q1-4 Iliac Vein and IVC Stenting: Experience with Post-thrombotic Obstruction Causing C5/C6 Leg Ulceration

R. K. Tripathi, H. Verma; Narayana Institute of Vascular Sciences, Bangalore, India

OBJECTIVE: IVC and Iliac Vein Obstruction are a major cause for lower extremity venous hypertension resulting in CEAP C5 and C6 disease.

METHODS: A retrospective analyses of prospective data of the author's experience of 375 patients (483 limbs) presenting with C5 and C6 disease over a period of 2005 – 2010 was undertaken to look at clinical presentation according to CEAP classification, duplex findings before and after treatment, MR/CT Venography and treatment modalities with a follow up of 36 months. End points included freedom from ulceration and stent patency.

RESULTS: A clinical history of DVT was seen in only 59 (15.73%) patients. Two hundred and eighty nine limbs (59.8%) were identified to have C5/6 Chronic venous disease of >6 months duration as having obstructive IVC and or Iliac disease. Diagnosis was based on clinical data, Duplex scanning, CT / MR and Digital Subtraction ascending / descending Venography. One hundred and three limbs (21.3%) had purely superficial or deep refluxive disease and 92 limbs (18.85%) had combined deep and superficial venous reflux in Femoral / popliteal / saphenous veins with Iliac / Femoro – popliteal vein obstruction/stenosis. In the IVC and or Iliac vein obstruction group (n=289), isolated Iliac vein obstruction was seen in 257 limbs, combined Iliac vein and IVC obstruction in 32. IVC/Iliac Vein stenting was feasible in

266 (92.0%) cases overall. Concomitant IVC stenting was performed in 26 (9.78%) cases. Failure to cross the lesion was recorded for IVC obstruction in 4/32 (12.5%) and Iliac lesion in 19/257 (7.39%) limbs. Primary patency of stents for IVC/ Iliac veins at 36 months was 71.3%. Secondary patency at 36 months was 77.8%. Nitinol eLuminexx (Bard Medical, Tempe, AZ, USA) and Niti (Taewoong Medical, Seoul, South Korea) stents were used in all cases. Common Femoral Endovenectomy or extension of stents in CFA or profunda was performed in 53 (18.39%) cases. Stent fracture was seen in 2 cases. Freedom from ulceration was seen at 36 months was achieved in 78.9% legs with non-healing ulcers.

CONCLUSIONS: Iliac vein and IVC stenting can result in significant ulcer healing in limbs with severe venous hypertension leading to non-healing ulceration. Nitinol stents perform well in the iliac and caval systems with good long-term results. Extension of stents below inguinal ligament or endovenectomy may be required to improve inflow.

3:05 pm – 3:30 pm

Coffee Break — **Celebrity D-H**

3:30 pm – 4:50 pm

SCIENTIFIC SESSION 2

Basic Science — **Ambassador Ballroom**

Moderators: Joseph Raffetto, MD; Thomas Wakefield, MD

Discussants: 2-6 Peter Pappas, MD; 2-7 Ruth L. Bush, MD; 2-8 Peter K. Henke, MD; 2-9 Paul Pittaluga, MD

3:30 pm – 3:50 pm

2-6 Recurrent DVT Is Pathologically Different Than Primary DVT: Characterization of the First Mouse Model of Recurrent Venous Thrombosis in the Inferior Vena Cava

E. A. Andraska, P. K. Henke, C. E. Luke, M. A. Elfline, S. P. Henke, S. S. Madapoosi, T. W. Wakefield, J. A. Diaz; University of Michigan, Ann Arbor, MI

OBJECTIVE: Patients who suffer a deep vein thrombosis (DVT) have at least a 30% recurrence rate over 10 years. Current murine models of inferior vena cava (IVC) DVT all model primary thrombosis and not recurrent thrombosis. The aim of this project was to create and characterize the first murine model to study recurrent DVT in the IVC.

METHODS: Recurrent DVT was modeled in 8 week old male C57BL/6 mice via two mechanisms: For recurrence groups, an initial DVT was induced using the Electrolytic IVC Model (EIM). A second DVT was induced 21 days later using either EIM or an IVC ligation stasis model. In the control groups, mice received a sham surgery and 21 days later, they received either EIM or IVC ligation. Vein wall was harvested 2 days after the second insult and analyzed for size (weight/length). Western blot analysis was performed on the thrombi for fibrin content. Real time PCR was performed on the IVC wall for TGF beta, Elastin, MMP2, and MMP9. Student's t-test was used for comparison between controls and thrombosis groups. A $P < .05$ was considered significant.

RESULTS: A secondary thrombi was produced in all IVC with a previous EIM thrombogenic insult, while no shams produced DVT. The first insult using the EIM model left an anatomical channel that allowed room for the second insult as confirmed by duplex imaging. Compared to sham control, recurrent groups produce a clot that integrates itself into the vein wall, producing heavier IVC walls. Recurrent groups also have higher levels of fibrin, TGF-β, elastin, MMP9, and MMP2 gene expression in the IVC wall. (See Table)

CONCLUSIONS: We successfully produced recurrent thrombi in all primarily thrombosed IVC. Experimental recurrent thrombi are structurally and compositionally different than the primary DVT, with a greater profibrotic remodeling vein wall profile. This work provides a novel DVT recurrence model in the IVC that will help to improve the current understanding of the biological mechanisms and directed treatment of recurrent DVT.

Table: Molecular profile of thrombus and vein wall of experimental groups

	Group	2d IVC wall (g/cm)	Fibrin	TGF-β	Elastin	MMP9	MMP2
Control	21d Sham EIM + 2d EIM	0.390 ± 0.037	0.856 ± 0.127	0.718 ± 0.255	0.457 ± 0.080	0.213 ± 0.069	0.453 ± 0.115
Recurrent	21d EIM + 2d EIM	0.970 ± 0.037*	4.809 ± 0.450*	2.621 ± 0.340*	0.610 ± 0.087	0.400 ± 0.067	1.460 ± 0.302*
Control	21d Sham EIM + 2d Ligation	0.358 ± 0.047	0.419 ± 0.090	0.898 ± 0.364	0.423 ± 0.098	0.165 ± 0.034	0.447 ± 0.113
Recurrent	21d EIM + 2d Ligation	0.866 ± 0.074*	2.415 ± 0.246*	3.472 ± 0.367*	0.690 ± 0.080	0.486 ± 0.113	1.930 ± 0.371*

Mean SEM, n=4-8 in each group. DVT and vein wall size were quantified using weight to length ratios. Weight was measured in grams and length in centimeters. Fibrin content was measured with the 59d8 antibody and standardized to β-actin. TGF-β, Elastin, MMP9 and MMP2 DNA levels were also standardized to β-actin. *$P \leq 0.05$, compared to respective control.

3:50 pm – 4:10 pm

2-7 Blood Sampled Directly From Varicose Veins Reveals Activation of Inflammatory Processes

E. Kalodiki[1], J. Fareed[2], D. Syed[2], G. Geroulakos[3], D. Hoppensteadt[2], C. R. Lattimer[3]; [1]Josef Pflug Vascular Laboratory, Imperial College London & Thrombosis Haemostasis Research Laboratory, Loyola University Medical Centre, Maywood, IL, [2]Thrombosis and Hemostasis Research Laboratory, Loyola University Medical Centre, Maywood, IL, [3]Josef Pflug Vascular Laboratory, Imperial College, London, United Kingdom

OBJECTIVE: Previously we have reported that venous arm blood is different from leg blood and varicose veins (VVs) blood is different from control blood, regarding prothrombotic biomarkers. The aim of this study was to test for the presence of inflammatory markers in blood taken from VVs compared to an antecubital blood sample of the same patient, and in samples from both arm and leg from a control group.

METHODS: Using the Cytokine Array I of a multiplex biochip method (Randox, UK), the following were measured in citrated plasma samples drawn from arms and legs of 24 controls and 24 patients with VVs: Epidermal growth factor (EGF), interferon gamma (IFNγ), the interleukins IL1α, IL1β, IL-2, IL-4, IL-6, IL-8, IL-10, monocyte chemotactic protein-1 (MCP-1), tumor necrosis factor alpha (TNFα) and vascular endothelial growth factor (VEGF). The cytokine levels were compared between arm and leg samples of each patient within the control and VVs groups and reported as medians and interquartile range [IQR]. Wilcoxon matched pair tests were employed to detect differences between arm and leg samples within the same group. The Mann-Whitney U-test detected % differences between groups. A P<.05 was considered significant.

RESULTS: No differences were observed between leg and arm samples of controls and VVs patients in the levels of: EGF, IFNγ, IL1α, IL1β, IL-2, IL-4, IL-10, TNFα and VEGF. Leg samples from VVs patients had higher levels of IL-8 (P=.023) and MCP-1 at 114.4[84.3-139.1] compared to their own arm samples 103.6[79.8-126.4] pg/mL (Figs 1 and 2). This significance was not observed in the control samples. Leg samples from both VVs patients 1.67[.82-4.48] and controls 1.26[.83-1.7] had higher levels of IL-6 compared to their own arm samples 1.24[.58-3.26] and 1.03[.70-1.52], respectively (pg/mL) (Fig 3). Furthermore, a greater % difference was observed in VVs patients 38.3[20-69] than in controls 10.13[-.74-20.9], P=.001.

CONCLUSIONS: This is the first study demonstrating that blood taken from the site of varicose veins shows significantly increased levels of IL-6, IL-8 and MCP1 when compared to the same patient's arm blood. This confirms the hypothesis that inflammation is activated at the site of varicose veins.

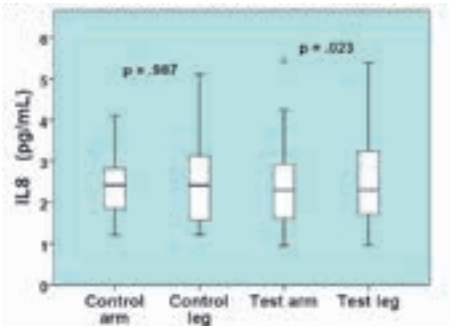


Fig 1. Leg samples from varicose veins patients (Test leg) had higher levels of IL-8 compared to their own arm samples (Test arm). This significance was not observed in the control samples.

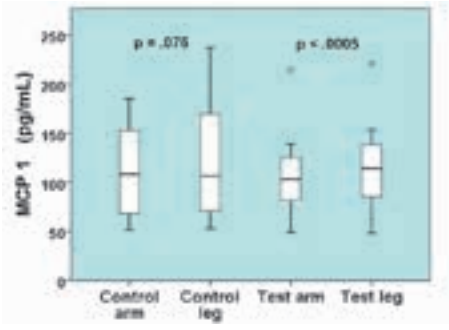


Fig 2. Leg samples from varicose veins patients (Test leg) had higher levels of MCP-1 compared to their own arm samples. This significance was not observed in the control samples.

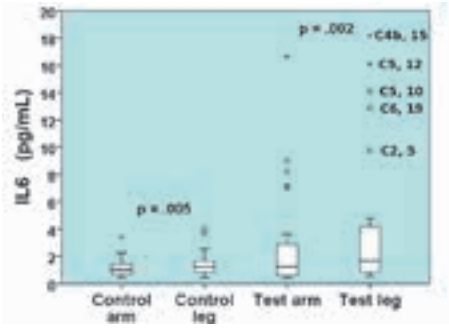


Fig 3. Leg samples from both varicose veins patients and controls had higher levels of IL-6 compared to their own arm samples.

4:10 pm – 4:30 pm

2-8 Matrix Metalloproteinase Profiles In Chronic Venous Ulcer Wound Fluid of Inflammatory and Granulating Venous Leg Ulcers

J. D. Raffetto[1], G. Mosti[2], M. Santi[3], D. Ligi[3], F. Mannello[3]; [1]VA Boston HCS, West Roxbury, MA, [2]Angiology Department, Lucca, Italy, [3]University "Carlo Bo" of Urbino, Urbino, Italy

OBJECTIVE: Chronic venous ulcer wound fluid (CVUWF) is known to contain matrix metalloproteinases (MMP), and associated with pathophysiology of venous leg ulcers (VLU). It is unclear which MMPs are expressed in VLU during the inflammatory (INFL) versus the granulating (GRAN) phases of wound healing. This study evaluated MMPs in patients with either an INFL or GRAN VLU, and the pain level with relation to these different VLU stages.

METHODS: Patients with VLU were subdivided into INFL (n=32) or GRAN (n=16), based on the clinical exam of an active INFL wound with sloughing, tissue necrosis, lack of granulating ulcer base, or active GRAN wound base . CVUWF was collected by applying cotton gauze to the ulcer bed until saturated, the CVUWF was transferred in a collecting tube without additives or antiproteases, centrifuged at 10,000xg and the supernatant stored at -80°C. Aliquots were then tested in duplicate, the concentration of MMP-1 (collagenase-1), MMP-2 (gelatinase A), MMP-3 (stromelysin-1), MMP-7 (matrilysin-1), MMP-8 (collagenase-2), MMP-9 (gelatinase B), MMP-10 (stromelysin-2), MMP-12 (metalloelastase), and MMP-13 (collagenase-3) quantified by Multiplex ELISA. MMP concentration was expressed in pg/ml as mean±sem. To determine pain in INFL and GRAN, a visual analog scale (VAS) was utilized. Nonparametric statistical tests were used to determine significance at P<.05.

RESULTS: The mean age of the INFL was 69.1±14.8 years (aged 43-91 years) and the GRAN was 77.8±6.5 years (aged 65-85 years). The CVUWF from INFL VLU contained significantly higher levels of MMP-2, MMP-9 and MMP-12, that is characteristic of MMPs in a degrading wound; however, the CVUWF from GRAN VLU contained higher levels of MMP-1, MMP-7, and MMP-13 which are characteristic MMPs of a reparative and fibroblast proliferating wound (Table). There were no statistically significant differences in MMP-3, MMP-8, or MMP-10. VAS of INFL VLU was significantly higher than that in GRAN VLU (5.0±0.24 vs 3.4±0.29, p=0.0003).

CONCLUSIONS: These data suggest the identification of different kinds of VLU microenvironments consisting of a harmful inflammatory phase with high expression of degrading MMPs, and a reparative microenvironment dominated by a granulating phase with expression of proliferating and remodeling MMPs. Consistent with INFL VLU stage, higher pain levels were observed. These results suggest a potential use of MMP panels as useful biomarkers to determine VLU wound condition and guide best medical treatment. Further research on MMPs in CVUWF is needed to determine how MMPs profiles change in the microenvironment of healing versus non-healing VLU.

Levels of different MMPs in INFL and GRAN VLU

MMP types	Inflammatory VLU	Granulating VLU	P value	MMP Wound Function
MMP-2	943900±119600	414700±65300	.0026	Degrading
MMP-9	483100±68190	173900±47170	.0025	Degrading
MMP-12	67550±12350	22780±7478	.037	Degrading
MMP-1	79460±26370	142800±26730	.0016	Reparative
MMP-7	1212±609	3072±1076	.0004	Reparative
MMP-13	3093±930	10290±3775	.0016	Reparative

4:30 pm – 4:50 pm

2-9 Lower Limbs Venous Kinetics and Consequent Impact on Drainage Direction

S. Gianesini, F. Sisini, G. di Domenico, E. Menegatti, M. Vannini, P. Spath, P. Dalla Caneva, S. Occhionorelli, M. Tessari, M. Gambaccini, P. Zamboni; Ferrara University, Ferrara, Italy

OBJECTIVE: There is still a lack of literature concerning lower extremity venous hemodynamics. The interpretation of physiological order of venous emptying indicates the direction of drainage is from the most superficial to the deepest veins. Nevertheless, there is no

evidence concerning the different venous systems kinetics: the deep venous network (N1), the saphenous system (N2), the tributaries network (N3).Aim of the present study is to assess these velocities and to find clues for a physical model identification.

METHODS: Venous Doppler investigations were performed in 18 healthy subjects (mean age 25 + 5 yo, M/F 1/1) for a total of 36 lower limbs. Diameters, peak systolic velocity (PSV) and time average velocity (TAV) of the following were assessed:- N1 external iliac vein (IL), common femoral vein (CFV) above the sapheno-femoral junction (SFJ), middle thigh femoral vein (MFV), popliteal vein (PV), posterior tibial vein (PTV).- N2 great saphenous vein (GSV) at the SFJ, mid-thigh GSV (MTGSV), mid-leg GSV (MLGSV), small saphenous vein (SSV) at its confluence with the popliteal vein (SPJ), mid-leg (SSV).- N3 (whatever flow detectable GSV and/or SSV tributary).The flow was elicited both by active foot dorsiflexion, (AFD) and passive manual compression/relaxation, (C/R) maneuvers.

RESULTS: The detailed values have been reported in table 1. A TAV increase was demonstrated from the most superficial N3 to the progressively deeper N2 and N1 compartments (p<0.0001).Inside the single compartments no statistical differences were reported among the different segments. TAV andPSV showed a direct correlation with TAV following C/R (r2=0,91; p<0.0001) and AFD (r2=0,95; p<0.0001).The comparison among TAV following C/R and AFD showed no statistically significant differences (p=ns), except in IL (p<0.0005) and in N3 (p<0.0005).A diameter decrease was reported from N1 to N3 (p<0.0001). A direct correlation has been found among diameter and TAV both by C/R (r2=0,8; p<0.0005) and AFD (r2=0,9; p<0.0001).

CONCLUSIONS: The present investigation provides preliminary evidences of the velocity decrease from the deepest to the most superficial compartments. These data introduce the Venturi effect as potential factor in the flow aspiration from the tributary to the deeper veins. This work is to be considered preliminary. Nevertheless the reported data represent a first step toward an objective evaluation of the hemodynamics governing the lower limb drainage. Moreover, these values can constitute the basis for further investigations in pathological and post-procedural scenarios.

Table 1. Venous Networks Velocities and Diameters

	N1					N2				N3
	IL	CVF	MCFV	PV	PTV	SFJ	MTGSV	MLGSV	SSV	TRIBUTARY
PSV$_{C/R}$ cm/sec	111,2±46,2	111,2±26,3	112,8±36,9	85,5±32,3	46,8±24,5	36,9±26,2	49,29±32,5	39,7±14,3	19,8±7,7	11,0±3,8
PSV$_{AFD}$ cm/sec	111,5±37,2	103,9±35,5	83,3±27,6	83,6±28,9	48,1±24,1	32,0±15,8	35,1±23,9	29,3±12,2	25,5±11,2	19,2±13,0
TAV$_{C/R}$ cm/sec	39,6±16,6	41,8±11,2	43,2±15,0	40,1±21,6	29,4±19,4	18,1±12,3	21,6±17,4	16,8±5,0	10,8±3,1	5,1±2,12
TAV$_{AFD}$ cm/sec	41,4±20,8	38,9±14,6	37,2±21,0	30,4±10,7	25,6±16,7	15,2±8,8	18,9±8,5	14,5±7,8	14,4±7,2	10,7±7,8
DIAM mm	13,9±2,7	12,4±2,8	9,7±2,5	8,5±2,3	4,2±0,7	3.75±0.8	2.78±0.7	2.32±0.3	2.7±0.61	1,1±0,3

5:00 pm – 6:06 pm

POSTER PRESENTATIONS

Ambassador Ballroom

Moderators: Marc Passman, MD, John Rectenwald, MD

P1 Venous Thoracic Outlet Syndrome: Single Admission Compared With Staged Treatment

J. P. Knepper, E. Criado; University of Michigan, Ann Arbor, MI

BACKGROUND: The treatment of venous thoracic outlet syndrome (VTOS) includes lysis of the axillo-subclavian venous stenosis and thrombus and decompression of the thoracic outlet (TO). Our study aimed to assess the results of the treatment of VTOS using venous thrombolysis and surgical decompression of the TO during the same hospital admission, and to compare these results with those in patients who were treated in a staged fashion during separate hospital admissions.

METHODS: A prospectively collected database including demographic, outcome and procedural details of patients treated for VTOS during a nine year period was retrospectively reviewed. Survival analyses, propensity matched logistic regression, descriptive statistics, and cost estimates were obtained.

RESULTS: 69 patients underwent treatment during the study period. 23 patients underwent staged endovascular management of venous occlusion followed by rib resection during a separate admission, while 46 underwent both procedures during a single hospital stay. The average patient age was 27.5 years and 53% were female. Complications were not significantly different between groups. The average follow-up time was 11 months. Resolution of arm symptoms was accomplished in 75% of patients in the staged group compared with 91.2 % in the single admission group (p=0.02). During follow-up, residual arm symptoms were more likely in patients who underwent staged treatment, than in patients treated during a single admission (OR of 3.5 (P<0.01)) , and venous patency by ultrasound evaluation was 70% in the staged group and 88.2 % in the single admission group (OR of 2.5 (p<0.01)). Single stage treatment reduced hospitalization cost by $8,000 per patient.

CONCLUSIONS: The treatment of VTOS including venous thrombolysis and rib resection during the same hospital admission appears to have superior patient outcomes, compared with staged procedures. The treatment of VTOS during a single admission appears to be associated with higher rates of arm symptom resolution, and a significant cost savings. While this is a retrospective analysis; this relationship appears to be strong and may warrant further study.

P2 Let Classification As Predictor For Severe Post Thrombotic Syndrome (PTS)

R. H. W. Strijkers[1], M. de Maeseneer[2], C. Baas[1], P. Nelemans[1], C. W. K. P. Arnoldussen[1], A. J. ten Cate-Hoek[1], C. H. A. Wittens[1]; [1]Maastricht University Medical Center, Maastricht, Netherlands, 2Erasmus Medical Centre, Rotterdam, Netherlands

BACKGROUND: The incidence of PTS after initial deep vein thrombosis (DVT) is as high as 50% of all DVT patients. However simple selection tools to predict patients at risk for severe PTS are lacking. The Lower Extremity Thrombosis (LET) classification for DVT is based on the initial thrombus extent: Let 1 corresponds with calf vein thrombosis, LET 2 with DVT in the popliteal or femoral segments regardless of thrombus extent more distally, LET 3 with DVT in the common femoral or iliac vein, regardless of distal thrombus extent. We hypothesized that the LET classification would be useful to predict which DVT patients will have a higher risk to develop severe PTS than others.

METHODS: Between March 1991 and July 2013 thrombus location and extent of all consecutive DVT patients (n = 1338) had been recorded in a standardized fashion, based on duplex ultrasound findings. These records had been converted into the LET classification for all patients. For the present study, a questionnaire was sent to 660 of these patients, still alive according to the files and < 80 years old. Questions concerned quality of life (Veines qol score), self-reported Villalta scale, use of stockings, anticoagulation and comorbidities. Differences in Villalta scale and quality of life between LET classes were calculated and a multivariate logistic regression analysis was performed. We corrected for the following confounding parameters: age, body mass Index, diabetes mellitus, arterial disease, orthopedic disease, ipsilateral DVT recurrence, contralateral DVT recurrence, current use of stockings, current use of anticoagulation, and gender.

RESULTS: We received 315 (47.7%) responses. Of these, 100 had been classified as LET class 1, 108 LET class 2 and 107 LET class 3. Median time after DVT was 6 years (3-9). Median Villalta score (IQR) for the LET classes 1, 2, and 3, were 4 (2-9), 7 (3-12) and 6.5 (3-12.5), respectively. Percentage of patients with severe PTS was 10%, 18.5% and 25.2%. According to multivariate logistic regression analysis LET 2 predicted development of severe PTS compared to LET 1, with an OR of 2.175 (0.879-5.382), p=0.093. LET 3 showed an OR of 3.246 (1,312-8.030) p=0,011 for predicting severe PTS, compared to LET 1. VEINES-qol scores significantly decreased with higher LET classes (p=0.003).

CONCLUSIONS: Patients with an initial thrombus extent corresponding to a LET class 3 have a threefold higher risk for developing severe PTS compared to LET class 1. The LET classification provides a useful tool to identify patients at high risk for severe PTS and decreased quality of life after DVT.

P3 Electrical Stimulation of The Foot Pump: A Pilot Randomised Control Trial In Patients With Chronic Venous Insufficiency

R. Ravikumar[1], A. H. Davies[2]; [1]Imperial College London, London, United Kingdom, [2]Academic Section of Vascular Surgery, Imperial College London, London, United Kingdom

BACKGROUND: Activation of the lower limb muscle pumps is an underutilized mechanism of reducing ambulatory hypertension in patients with venous insufficiency. Electrical stimulation has been shown to improve venous haemodynamics in healthy individuals. This randomised control trial aims to examine the effect of a foot electrical stimulation device in individuals with chronic venous insufficiency.

METHODS: Twenty two patients with venous insufficiency (CEAP 2-4) were randomized to a sham or real electrical foot stimulation device. The sham device had electrical stimulation disabled and the real device administered electrical stimulation at an intensity to achieve muscle contraction but not to cause pain. Venous haemodynamics were recorded from the femoral vein of the affected limb at baseline, and every 5 minutes over a 30 minute period (in accordance with the manufacturers instructions) of device usage and a 10 minute recovery period. Laser Doppler fluxmetry was recorded from foot and hand of the most affected limb. Results were compared to baseline as percentage change. Pre and post stimulation limb swelling (perometer) and venous refilling time (digital photoplethysmograph) were measured.

RESULTS: The mean age of the patient was 62 (range 38 to 84), BMI 29 (range 18 - 41). Thirteen patients were female. Five patients were C2, fourteen C3 and three C4. There was a significant difference in time averaged mean velocity (TAMV) in patients receiving electrical stimulation ($p<0.01$) compared to sham, which was sustained until the second minute of recovery but not the 5th and 10th minute. Peak velocity similarly was significantly ($p<0.001$) different with electrical stimulation, but this effect was reduced during recovery ($p<0.01$ at 2 minutes, $p<0.03$ at 5 minutes and NS at 10 minutes). Volume flow was significantly better in patients receiving electrical stimulation ($p<0.05$), but not at the 15th and 20th minutes. There was a significant difference in microcirculatory blood flow of the foot as measured by laser Doppler fluximetry (median percentage change -1.79% for sham vs 265.1% for real device; $p<0.006$). There was no significant difference in foot or hand temperature in both groups. There was a significant difference in limb swelling in patients receiving electrical stimulation compared to the sham device (median 0.686 vs 2.167, $p<0.008$). There was no significant difference in venous refill time between both groups ($p=0.78$).

CONCLUSIONS: Electrical stimulation improves venous haemodynamics, microcirculatory blood flow and lower limb oedema significantly in patients with chronic venous insufficiency by activating the calf muscle pump. Electrical stimulation may be an important adjunct in treating patients with venous insufficiency, resistant to conventional therapy.

P4 Microbubble Detection In The Right Heart During Mechanochemical And Radiofrequency Ablation Of The Great Saphenous Vein

B. Dharmarajah, K. H. Moon, R. Bootun, C. S. Lim, T. R. A. Lane, H. M. Moore, K. Sritharan, A. Davies; Academic Section of Vascular Surgery, Imperial College London, London, United Kingdom

BACKGROUND: Mechanochemical ablation (MOCA) is a novel technique for ablation of varicose veins utilising liquid sclerosant and mechanical vein wall irritation. Ultrasound Guided Foam Sclerotherapy (UGFS) has been reported to have caused 13 strokes, as well as transient neurological symptoms including visual disturbances (1.4%) and hemiparesis (2%). Air emboli have been implicated as a cause and bubbles in the heart during UGFS have been demonstrated. There is only one report of stroke after endothermal treatment in the literature. This study investigated the presence of bubbles during varicose vein ablation by MOCA and radiofrequency ablation (RFA).

METHODS: Ethical approval was obtained to recruit patients undergoing Great Saphenous Vein ablation by MOCA or RFA. Participants' hearts were assessed using transthoracic echocardiogram for bubble presence during treatment. Offline blinded image quantification was performed using International Consensus Criteria grading guidelines. Patients were assessed for neurological symptoms immediately and 30 minutes post procedure.

RESULTS: From 32 recruited patients, 28 data sets were analysed. 11 underwent MOCA and 17 underwent RFA. There were no neurological complications. In total 39% (11/28) of patients had Grade 1 or 2 bubbles detected. Thirty-six percent (4/11) of MOCA patients and 29% (5/17) of RFA patients had bubbles with no significant difference between the groups (p=0.8065).

CONCLUSIONS: A comparable prevalence of bubbles between MOCA and RFA both of which are lower than that previously reported for UGFS suggests that MOCA does not confer the same risk of neurological events as UGFS for treatment of varicose veins.

P5 Magnetic Resonance Imaging In Proximal Venous Outflow Obstruction

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BACKGROUND: Proximal venous outflow obstruction (PVOO) in the abdomen and pelvis is increasingly recognized as an important contributor to venous disease of the lower extremity. There are currently no guidelines regarding a non-invasive screening tool for PVOO, though magnetic resonance venography (MRV) is commonly used in many practices. The objective of this study was to determine the value and utility of MRV in diagnosis and screening for PVOO.

METHODS: This retrospective study consisted of 46 consecutive patients, all of whom presented with signs and/or symptoms of PVOO and were evaluated with MRV followed by intravascular ultrasound (IVUS) and venography. Of these 46 patients suspected to have PVOO based on clinical evaluation, 24 patients had PVOO confirmed with IVUS and venography and PVOO was not observed on IVUS and venography in the remaining 22 patients. The MRV of these 46 patients was retrospectively reviewed in a blinded fashion and then correlated with IVUS and venography by one vascular surgeon. A scoring system was developed to define the types of radiography findings that were observed: normal, suspicious, abnormal.

RESULTS: When compared to IVUS and multi-plane venography, the interpretation of MRV had a sensitivity of 100% and a specificity of 22.7%. The positive predictive value of MRV was 58.5% and the negative predictive value was 100%.

CONCLUSIONS: The high sensitivity (100%) and low specificity (22.7%) of MRV suggests that it can be a screening tool at best, used only to rule out PVOO; it cannot be used to confirm PVOO, given its a 41.5% false positive rate. Thus, the development of a different, non-invasive diagnostic test that can more accurately assess patients with suspected PVOO during the initial evaluation of their lower extremity venous disease should be explored.

P6 Pilot Trial Of Neuromuscular Stimulation In The Management Of Chronic Venous Disease

K. J. Williams, A. Babber, R. Ravikumar, A. H. Davies; Imperial College London, London, United Kingdom

BACKGROUND: Neuromuscular stimulation (NMES) has been shown to improve peripheral blood flow in healthy people. We investigated the effect of bilateral leg neuromuscular stimulation (NMES) on the symptoms of chronic venous disease.

METHODS: 40 subjects were recruited from four groups: healthy, superficial insufficiency, deep insufficiency, and deep obstruction. Haemodynamic venous measurements were taken from the right femoral vein with ultrasound; laser doppler fluximetry from the left hand and foot. Devices were then worn for 4-6 hours per day, for 6 weeks. Haemodynamic measurements were repeated at week 6. Quality of life questionnaires were taken at week 0, 6 and 8.

RESULTS: The mean age was 48.7, BMI 28.6kg/m2, and maximum calf circumference 39.0cm. 24 subjects were men. NMES increased femoral vein peak velocity, TAMV and volume flow by 55%, 20%, 36% at 20 minutes (all $p<0.05$). This rose to 60%, 27%, and 51% in subjects with venous disease ($p<0.05$). Gains were enhanced at week 6 (PV and TAMV $p<0.05$). Mean increases in arm and leg fluximetry were 71% and 194% (both $p<0.01$). Leg swelling was reduced by mean 252.7ml (13%, $p<0.05$) overall; 338.9ml (16%, $p<0.05$) in venous disease. In those with venous pathology, scores for disease specific and generic quality of life questionnaires improved. Those with C4-6 disease benefitted the most, with improvements in VDS score of 1, AVVQ of 6, and SF-12 of 10.

CONCLUSIONS: NMES improves venous haemodynamic parameters in chronic venous disease, which is enhanced by regular use. NMES reduces leg oedema, improves blood supply to the skin of the foot, and may positively affect quality of life.

P7 Effect Of Vasoactive Drugs On The Regulation Of Venous Blood Flow In Wistar Rats

A. C. Fioretti[1], M. A. Sato[1], R. L. Almeida[2], C. A. Ogihara[1]; [1]Faculdade De Medicina ABC, Sao Paulo, Brazil, [2]Faculdade de Medicina ABC, Santo Andre, Brazil

BACKGROUND: The primary function of the venous system is the venous return, nevertheless, the one can undergo several influences, either increasing or decreasing the cardiac preload. The major density of adrenergic fibers is directed to the splanchnic and skin beds, however, their control is modulated by arterial baroreceptors. Very few is known about how the hemodynamic regulation of venous beds, particularly upon the action of vasoactive drugs. Aim: To investigate the effect of phenylephrine and sodium nitroprusside on venous flow regulation in visceral and muscular vascular beds in Wistar rats.

METHODS: Adult male Wistar rats (~350 g) were anesthetized with 2% isoflurane in 100% O2 and underwent the cannulation of the right femoral artery and vein. Miniaturized Doppler flow probes were placed around the left renal artery and vein and also around the left femoral artery and vein. Under isoflurane anesthesia, the i.v. infusion of α-cloralose 60 mg/kg was carried out, and only at the end of infusion the isofurane was removed. After baseline mean arterial pressure (MAP) and heart rate (HR) recordings in a Power Lab 16 SP system and also baseline flow (F) (Iowa Doppler Instrum) recordings in the renal and femoral vascular beds, a bolus injection of phenylephrine 3 µg/kg (PHE, α-1 adrenergic agonist) was performed and after 15 min, after recovery of the cardiovascular variables to baseline, it was accomplished the injection of sodium nitroprusside 30 µg/kg (SNP, a nitric oxide donor). The hemodynamic data is expressed as percent change of conductance (%DC) from baseline, and the conductance was calculated as the ratio of F and MAP. The results are expressed as mean±SE and were submitted to paired Student t-test ($p<0.05$).

RESULTS: We observed the rats who showed MAP 104+6 mmHg and HR 395+6 bpm decreased the renal artery (-39.9±5.4%), renal vein (-118.7±30.9%), femoral artery (-41.1±8.0%) and femoral vein (-136.0±39.0%) conductance to PHE injection. In addition, PHE evoked a pressor response (24±5 mmHg) and reflex bradycardia (-109±29 bpm). Nevertheless, SNP injection only increased the femoral artery conductance (305.2±91.9%), and elicited no changes in the other vascular beds. The SNP also induced hypotension (-52±4 mmHg) and reflex tachycardia (41±18 bpm).

CONCLUSIONS: Infusions of PHE produced vasoconstriction in the renal artery and vein, and also in the femoral artery and vein, but the SNP elicited vasodilation only in the femoral artery with no changes in femoral vein neither in renal artery nor in renal vein. Therefore, the visceral and muscular arterial and venous vascular beds can undergo different actions by vasoactive drugs as PHE and SNP.

P8 The Global Prevalence Of Chronic Venous Ulceration Of The Lower Limb

S. Halim, R. Velineni, A. H. Davies; Academic Section of Vascular Surgery, Imperial College London, London, United Kingdom

BACKGROUND: Chronic venous ulceration (CVU) of the lower limb represents a significant physical, psychological and social burden to patients, carers and healthcare providers worldwide. However, the prevalence of CVU is incompletely understood despite significant effort. Knowledge of prevalence is important to establish the burden of disease, allowing appropriate allocation of finite healthcare resources. The aims of this systematic review are twofold: (1) Assess the prevalence of venous ulcers (2) Evaluate the literature for evidence of heterogeneity to consider the value of a pooled prevalence

METHODS: A systematic review was conducted, following the Meta-Analysis of Observational Studies in Epidemiology (MOOSE) guidelines. Eligible studies were assessed for quality and heterogeneity, and the results summated using meta-analytical statistics.

RESULTS: Initial search identified 2,177 papers, of which 55 were eligible. Only 29 full-texts provided sufficient data for quantitative analysis. The data covered 26 countries over 1959-2010. Study methodology varied, and sample size ranged widely from 41 to 13 million. The estimated pooled prevalence of venous ulcers was 1.85% (CI, 1.42-2.32), and stable between countries and over time (Figure 1). There was high-level heterogeneity between studies, as calculated by the Higgins statistic ($I2=99\%$, $p<0.05$). Prevalence remained stable over time, with minor fluctuations between the periods pre-2000, 2000-2007 and 2008-onwards being due to high-level heterogeneity. If CVU detection has improved over the years, this implies a parallel advancement in treatment. More data is required to assess the relation between prevalence and evolving risk factors such as gender, age and obesity.

There has been previous implications that prevalence and etiology of CVU could differ between countries. The data covered 21 Western and 5 Eastern countries. Although there is a need for more primary data, especially from Eastern countries, current analysis suggests no significant differences in prevalence between countries.

CONCLUSIONS: Prevalence was estimated to be just under 2%, and stable between countries and over time. However, the results were limited by high-level heterogeneity, relatively few studies investigating venous ulcer prevalence and potentially flawed methodology of included studies. Therefore, more and better primary data will be needed to confirm the findings. To achieve this, a future study has been proposed in the form of an international, multi-center, prospective cohort study with the primary aim of investigating the prevalence of CVU.

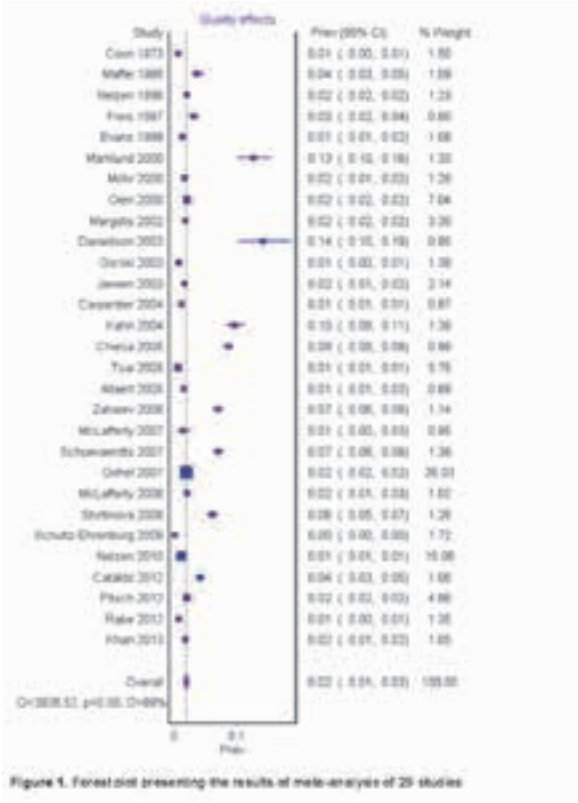

Figure 1. Forest plot presenting the results of meta-analysis of 29 studies

P9 A Novel Technique For Perforator Closure Using The Clarivein® Infusion Catheter

R. Tadros, K. Reynolds, S. Y. Kim, A. Vouyouka, W. Beckerman, D. Fremed, M. Marin, P. Faries, W. Ting; The Icahn School of Medicine at Mount Sinai, New York, NY

BACKGROUND: Perforator vein treatment using surgery, endovenous laser or radiofrequency ablation have been well described, however, they require either general and/ or tumescent anesthesia. This need increases patient risk or discomfort. The ClariVein Infusion Catheter when used for venous closure does not require thermal energy, relying on mechanical and chemical mechanisms for occlusion. Without thermal energy, there is no need for tumescent. When clinically indicated, we have treated incompetent perforators in addition to or subsequent to the Great Saphenous Vein (GSV).

METHODS: Our vascular database was reviewed to identify patients undergoing Mechanical-Occlusion-Chemically-Assisted (MOCA) for saphenous insufficiency who also had perforator treatment. CEAP classification, indications for treatment, technical details, and follow-up data were recorded. Endpoints included technical success, symptom resolution, wound healing, and deep venous thrombosis (DVT) rates. Inclusion criteria were symptomatic patients with CEAP>4, a perforator diameter of at least 4mm, and reflux evidenced by Duplex.

RESULTS: Of 131 MOCA cases performed, 4 had incompetent perforator treatment during the past 24 months. The clinical classifications were: C4 disease in 2-patients, C5 and C6 disease with 1-patient in each. (Table) The etiology was primary disease in all cases. One patient had GSV closure prior to perforator closure and three patients had the GSV and perforator closure in the same sitting. One perforator was accessed directly. This patient had a prior GSV closure and an active ulceration. The ulcer healed in three weeks after failing two months of conservative care. One perforator was accessed in an antegrade fashion via the GSV. Two were accessed in a retrograde fashion via the GSV after occluding the more proximal GSV. The intrinsic angle of the catheter was used to cannulate the perforator in all cases approached from the GSV with the aid of ultrasound guidance. Closure of the perforators was completed in all cases using only the mechanical component without the use of sclerosant. Technical success was achieved in all cases. Follow-up duplex confirmed perforator closure in all cases with no reported DVT. Symptom resolution was seen in all cases.

CONCLUSIONS: MOCA of the GSV combined with mechanical perforator closure (without sclerosant) is our preferred approach to treating patients with concomitant GSV and perforator insufficiency. The technical success is high and several approaches in using this technique

are feasible. No DVTs were seen in this series and all patients had symptom resolution and/ or wound healing. Larger series are necessary to verify these findings.

Table 1. Patient and Procedure Characteristics

PATIENT	AGE	GENDER	CEAP CLASS	CEAP ETIOLOGY/ PATHOPHYSIOLOGY	INDICATION	APPROACH	1 WEEK FOLLOW UP	1 MONTH FOLLOW UP
1	67	M	C4	PRIMARY/ REFLUX	INFLAMMATORY SYMPTOMS	RETROGRADE	PERFORATOR CLOSED /NO DVT	SYMPTOM RESOLUTION
2	57	M	C5	PRIMARY/ REFLUX	PRIOR ULCER/ INFLAMMATORY SYMPTOMS	RETROGRADE	PERFORATOR CLOSED /NO DVT	SYMPTOM RESOLUTION
3	72	M	C4	PRIMARY/ REFLUX	INFLAMMATORY SYMPTOMS	ANTEGRADE	PERFORATOR CLOSED /NO DVT	SYMPTOM RESOLUTION
4	67	F	C6	PRIMARY/ REFLUX	ACTIVE ULCER/ INFLAMMATORY SYMPTOMS	DIRECT	PERFORATOR CLOSED /NO DVT	ULCER HEALED /SYMPTOM RESOLUTION

P10 Effects On Quality Of Life In C1-6 Superficial Venous Disease Before And After Invasive Treatment

F. S. Catarinella, F. Nieman, I. Wittens, C. Wittens; Maastricht University Medical Centre, Maastricht, Netherlands

BACKGROUND: Previous studies have been published comparing clinical and patient-reported QoL scores of the various C(EAP) classes. The QoL effects of individual techniques and interventions are extensively described. Until now no study has yet assessed the combined effects on QoL within the complete range of superficial disease (C1-C6) before and after treatment. This study compares the QoL and standardized psychological scales of C1 up to C6 patients, while it at the same time evaluates the effects of the several current treatment modalities.

METHODS: We set up a prospective cohort study intending to include 1000 patients from 5 specialized venous clinics in the Netherlands. Inclusion criteria were: 16 years of age or older, Dutch language, C1 to C6 class of venous disease and intention to be treated with a form of either laser, RF, phlebectomy or sclerocompression therapy (SCT). Patients were asked to complete a number of QoL and socio-psychological questionnaires (CIVIQ-20, AVVQ, SF-36v2, HADS, Pain score, EQ-5D-5L, Loneliness scale) before treatment(T0), at 6 months after treatment and at 1 year after treatment.

RESULTS: Preliminary results up to 1 sept. 2014 show that before treatment (T0) 442 patients (44.2%) have completed the AVVQ and CIVIQ-20 completely. Mean age is 53.4 (13.3), range: 17-90, and 81.1% are females. Univariate ANOVA and Tukey-b tests based on mean T0 AVVQ scores (n=431) show no significant difference between C1,2,3 , but a significant difference is found between the lower classes and C4 and C5&6 scores. (Figure 1) Average 6 months improvement for all C class AVVQ scores combined after interventional treatment is -5.41 points (p=<.001). Repeated measures ANOVA comparing treatment types shows the largest AVVQ score improvement for endovenous laser and VNUS treatments which show between them no difference(p=.384). Compared to VNUS Muller phlebectomy (p=.002) and SCT (p=.005) showed significantly less improvement. Similar results apply for the pain, physical and social scales of the CIVIQ-20. As yet, socio-psychological scales tend to show less such sensitivity to differ and/or change.

CONCLUSIONS: Mean AVVQ and CIVIQ T0 scores within C1-3 CEAP classes are not significantly different, but means of C4 and C5-6 are significantly different from those of the C1-3 classes. Invasive treatment of superficial venous disease leads to significant improvement in QoL scores for all CEAP C classes. At 6 months VNUS and laser show significantly more improvement than Muller phlebectomy and SCT.

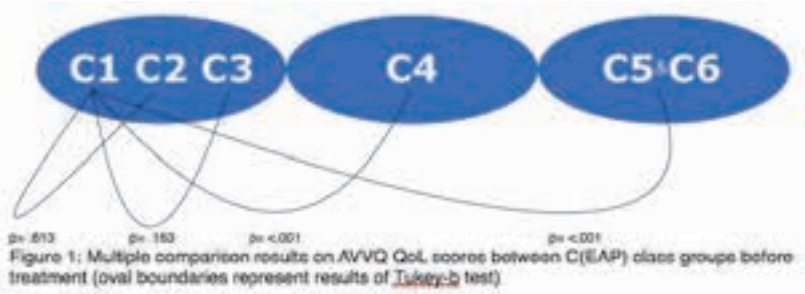

Figure 1: Multiple comparison results on AVVQ QoL scores between C(EAP) class groups before treatment (oval boundaries represent results of Tukey-b test)

P11 Outcome Of Ultrasound Detected Recurrence In The Groin Following Sapheno-femoral Treatment: A 5-year Prospective Study

A. M. van Rij, M. P. T. Versteeg, J. MacFarlane, G. B. Hill; University of Otago, Dunedin, New Zealand

BACKGROUND: Ultrasound detected reflux in the groin following treatment of varicose veins is an early and often subtle indication of recurrence. The long-term significance of these ultrasound findings and their relationship to subsequent clinical and functional measures of recurrence are not defined.

METHODS: A cohort of patients were followed prospectively following saphenofemoral ligation surgery in 130 limbs. Assessments with Duplex Ultrasound, air plethysmography and clinical evaluation were done at one, 6, 12 and 36 months. At 60 months a far more detailed ultrasound assessment of the recurrent vessels in the groin was included to identify patterns, diameters and reflux velocities to relate these to the clinical and functional outcomes. Multivariate analysis, which adjusted for other variables such as BMI, gender and prior treatment was used to confirm critical US based determinants of patient based relevant recurrence.

RESULTS: Over five years there was a continuing gradual deterioration in all measures of clinical and functional recurrence but US reflux appeared earliest and most had occurred by one year. Any appearance of reflux in the groin that could be shown to connect with adjacent superficial veins was associated with visible varicose veins at year 5. Junctional connected vessels were larger than nonjunctional (2.8, 1.5 – 4.3 mm vs. 1.7, 0.4 – 3.8 mm; P = .04). and responded more to valsalva augmentation. US features of groin recurrence that were associated with clinical outcomes are shown in the table as Adjusted Odds ratios with 95% CI

US features	Visible Veins Severity 2-3	P	VCSS-S > 3	P
Multiple connections	5.41 (1.50 - 19.4)	0.01	3.25 (0.86 - 12.4)	0.08
Junctional reflux	2.65 (1.13 - 6.18)	0.02	1.67 (0.58 - 4.79)	0.34
Diameter	3.32 (1.33 - 8.29)	0.01	1.70 (0.55 - 5.20)	0.35
GSV knee reflux	3.44 (1.51 - 7.84)	0.003	1.96 (0.74 - 5.20)	0.17

CONCLUSIONS: US detected reflux in the groin following treatment for varicose veins invariably leads to the re-appearance of visible varicose veins. There are distinctive ultrasound appearances of recurrence at one year that are associated with more severe recurrence at 5 years and which may be surrogates for longer-term outcomes.

P12 Successful Treatment Of Chronic Venous Ulcers With A 1320nm Endovenous Laser Combined With Other Minimally Invasive Venous Procedures: A Prospective Case Series

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BACKGROUND: Chronic venous ulceration is a debilitating condition associated with high healthcare resource utilization. To date, very few treatment modalities have shown significant cure rates. The purpose of this study is to report the closure rate and clinical characteristics of active venous ulcers in a vein clinic utilizing endovenous laser ablation (EVLA) with a 1320nm laser.

METHODS: A prospective database was kept consisting of patients with an active venous ulcer (C6 CEAP classification) at the time of consultation in a single-practitioner academic vein clinic from March 2007 through May 2014. Data was kept and charts were reviewed with attention to the length of time the patient reported having the ulcer, procedures performed, and time to ulcer healing (C6 to C5).

RESULTS: Thirty-one patients were identified at consultation with venous ulceration ranging from 2 months to 20 years in duration. One patient's ulcer was healed with conservative medical management prior to receiving treatment. The remaining thirty patients were treated with a combination of endovenous laser ablation of the great and/or short saphenous veins, foam sclerotherapy of insufficient varicose and reticular veins, and phlebectomy as appropriate. Two patients were lost to follow-up after partial treatment, but were included in the analysis as persistent ulcers for the most conservative estimate. The average age of patients was 67 years and 70% were male (21/30). The majority of patients had C6EpAsPr disease, however, four patients also had anatomic involvement of deep veins with two having a clinical history of DVT and Pr,o pathophysiologic classification. Ulcer healing occurred in over 93% (28/30) of patients with a median healing time of 55 days (range 7-351 days) from the time of first treatment. The median follow-up time after treatment was 448 days (range 1 month to almost 7 years).

CONCLUSIONS: Endovenous laser ablation with a 1320nm laser in combination with foam sclerotherapy and phlebectomy as appropriate, is effective treatment for chronic venous ulcers and should be considered as a treatment option for patients with C6 venous insufficiency. To our knowledge, this is the largest, prospective series of chronic venous ulcers treated with EVLA. Further randomized, controlled studies are needed to confirm these findings.

P13 Intra-procedural Pain Score In A Randomised Controlled Trial Comparing Mechanochemical Ablation To Radiofrequency Ablation - The Multicentre Venefittm Versus Clarivein® For Varicose Veins (vvcvv) Trial

R. Bootun[1], T. R. A. Lane[1], B. Dharmarajah[1], C. S. Lim[1], M. Najem[2], S. Renton[2], K. Sritharan[1], A. H. Davies[1]; [1]Imperial College London, London, United Kingdom, [2]North West London Hospitals NHS Trust, London, United Kingdom

BACKGROUND: Endovenous techniques are currently the recommended choice for truncal vein treatment. However, thermal techniques require tumescent anaesthesia, which can be uncomfortable during administration. Non-tumescent non-thermal techniques would therefore have potential benefits. This randomised controlled trial is being carried out to compare the degree of pain patients experience while receiving mechanochemical ablation (MOCA) or radiofrequency ablation (RFA).

METHODS: Patients attending for primary varicose vein treatment were randomised to receive MOCA (ClariVein®) or RFA (Covidien® Venefit™). The most symptomatic limb was randomised. The primary outcome measure was intra-procedural pain using a validated visual analogue scale. Secondary outcome measures were change in quality of life and clinical scores, time to return to normal activities as well as the occlusion rate.

RESULTS: One hundred and seventy patients have been randomised (51% in the MOCA group). Except for an age difference (MOCA: 55.5 ± 18 years compared to 49.9 ± 16 years in the RFA group; P=0.038), baseline characteristics were similar. Maximum pain score was significantly lower in the MOCA group (24.3mm±22mm) compared to the RFA group (35.4mm±24mm; P=0.005). Average pain score was, however, similar in the MOCA group (17.8mm±21mm) and the RFA group (23.9mm±18mm; P=0.053). Sixty-five percent attended follow-up at one month and the complete or proximal occlusion rates was 93% for the MOCA group and 89% for the RFA group. At 1 month, the clinical and quality of life scores for both groups had similar improvements.

CONCLUSIONS: Early results show that MOCA is less painful than RFA procedure. Clinical and quality of life scores were similarly improved at 1 month. The long-term data including occlusion rates at 6 months and quality of life scores is being collected.

P14 Post Thrombotic Syndrome in Children

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BACKGROUND: The incidence of paediatric deep vein thrombosis (DVT) is rising. Post-thrombotic syndrome (PTS) is a common long-term complication of paediatric DVT. This study aims to summarise existing research related to paediatric PTS.

METHODS: A Medline search was performed to identify articles for review. Search terms employed were "post thrombotic syndrome", "post phlebitic syndrome", "paediatrics" and "children". The references of articles reviewed were also assessed to expand the search.

RESULTS: In total, 56 references were included for analysis.

DVT occurs in up to 1:200 paediatric admissions, usually in children with predisposing conditions such as malignancy and sepsis. PTS develops in 26% of DVT patients through a combination of venous reflux and venous obstruction (Figure 1), but the condition differs markedly between children and adults (Table 1).

	Adults	Children
Epidemiology of VTE	>1:100 hospital admissions(29)	1:2000 to 1:200 hospital admissions
Primary thromboprophylaxis	Routinely considered for inpatients(30)	Not routineUsed in some select groups
Treatment of DVT	Anticoagulation Compression stockings Thrombolysis in select group of patients(31)	Thrombolysis more likely to be used than in adults(32)
Total annual cost of VTE	$13.5-27.22 billion (33)	$90 million (28)
Treatment of PTS	Supportive, occasional interventional or surgical	Supportive, limited evidence
PTS prognosis	Progressive	Variable

Table 1 - Summary of differences between adult and childhood VTE

Paediatric PTS morbidity is significant with limited treatment options comprising predominantly supportive measures, thus prevention is paramount. PTS preventative strategies include thromboprophylaxis to avert DVT, but no general guidelines exist for primary thromboprophylaxis in children. Prompt treatment is necessary to minimise the risk of PTS following a diagnosis of DVT. Various questionnaires have been designed to aid PTS diagnosis in children, the modified Villalta scale and Manco-Johnson instrument being the most widely used and the best validated.

CONCLUSIONS: PTS is a significant problem in the paediatric population. While there is improved understanding regarding the pathophysiology of disease, current evidence on appropriate management is limited. Increased awareness, together with paediatric-specific research into PTS is required to allow for development of evidence-based guidelines for the management of this condition.

Figure 1: The pathophysiology of PTS

P15 Complete Varicose Vein Surgery Improves Vcss - Advantages Of Ablation Plus Tipp

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BACKGROUND: Patients who present with painful varicose veins and venous insufficiency can be treated in two ways: eliminate axial reflux only, or eliminate axial reflux and perform phlebectomy. The success of these options must be balanced by the risk of thrombotic complications. We hypothesize that ablation of axial reflux plus transilluminated powered phlebectomy (TIPP) will produce a greater positive change in VCSS, without an increase in thrombotic complications, in the setting of routine thrombosis prophylaxis.

METHODS: We performed a retrospective evaluation of prospectively collected data from 1056 limbs undergoing procedures for significant varicose veins and venous insufficiency from 3/31/2008-6/4/2014. All patients underwent peri-operative thromboprophylaxis with 5,000IU heparin and if exhibiting a 2006 Caprini risk score > 8, a standard protocol of one week post-operative daily enoxaparin prophylaxis (40 mg). Patients were encouraged to ambulate immediately post-operatively and were compressed for at least 2 weeks. All patients were imaged at 7 days, 3 and 12 months, then yearly. Comparisons between groups were performed using Chi-squared, Student's t-test, or ANOVA, and risk of thrombotic complications was assessed using multivariable logistic regression.

RESULTS: During the study period a total of 399 isolated RFA, 580 combined procedures with RFA plus TIPP, and 77 TIPPs alone were performed. As there were no thrombotic complications for TIPP alone, only the RFA and RFA + TIPP groups were compared. Patients in the RFA group were statistically older (54 vs 51 years, p<.001) and heavier (BMI 31 vs 29.6, p=.006), but no statistical differences in gender, pre-op Caprini score, and largest treated vein diameter were observed. Patients' overall pre-op VCSS (8.8+3.8) and CEAP (3.2+1.1) scores reflected the significant advanced disease status of our patients. See table for complications/VCSS change.

Regarding DVT, 4/6 (67%) following RFA and 17/19 (89%) were infra-popliteal following RFA + TIPP. Significant VCSS improvements in RFA + TIPP were primarily due to a decrease in varicose veins, pain, and edema; compression stockings increased VCSS scores. SVTs were mostly asymptomatic findings noted on post-operative duplex imaging. On multivariable analysis, no pre-operative variables predicted thrombotic complications.

CONCLUSIONS: These data suggests that ablation of axial reflux with TIPP produces improved outcomes in VCSS and should be first-line therapy when patients present with significant varicose veins and venous insufficiency. Use of a standardized thromboprophylaxis system results in a low thrombotic complication rate, obviating need for routine post-operative duplex surveillance.

Complications and VCSS Change

	RFA	RFA + TIPP	p value
DVT/PE	6 (1.5%)	19 (3.3%)	.084
EHIT (2-4)	8 (2.0%)	19 (3.3%)	.233
SVT	11 (2.8%)	37 (6.4%)	.010
VCSS Improvement	3.2 ± 3.1	3.8 ± 3.4	.019

P16 Greater Saphenous Vein Aneurysms: A Rare Cause Of Groin Swelling And Pulmonary Embolism

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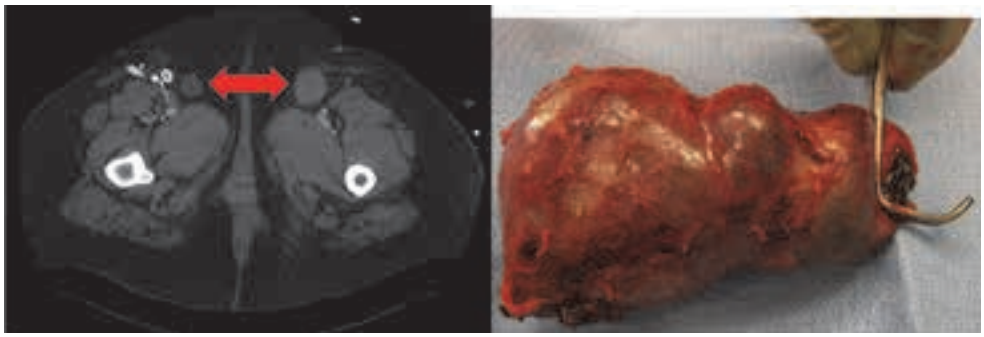
CASE REPORT: Greater saphenous vein aneurysms (GSVA) are a rare clinical entity often misdiagnosed as a lipoma, inguinal lymphadenopathy or inguinal hernia only to be correctly diagnosed at the time of operation. Rarely, an unrecognized GSVA may result in complications such as greater saphenous vein thrombosis, deep vein thrombosis (DVT), pulmonary embolism (PE), or death. We describe the case of a 38 year-old female who initially presented to a referring institution with bilateral groin swelling diagnosed as bilateral hernias. She was taken to the operating room for an elective left inguinal hernia repair with intraoperative diagnosis of GSVA. No intervention was performed, the procedure was aborted and she was discharged home. Fourteen hours later the patient presented to the emergency room in extremis. The diagnosis of PE was made based on history and electrocardiogram findings. She was treated with immediate administration of tissue plasminogen activator, cardiopulmonary resuscitation, and extracorporeal membrane oxygenation (ECMO). Computed tomography angiogram of the chest demonstrated saddle embolus and venous duplex ultrasound diagnosed bilateral GSVA. She was treated with an IVC filter, therapeutic anticoagulation, weaned from ECMO and taken to the operating room for ligation of bilateral GSVAs. The patient had a full recovery following the procedure and discharged to home 14 days after admission. This dramatic case presentation and review highlight key concepts relevant to the management of GSVA: 1) GSVA are commonly misdiagnosed until operative exploration and 2) Venous aneurysms, including GSVA below the diaphragm are a significant risk factor for development of DVT and PE. Venous aneurysm should be considered in the differential diagnosis of groin masses especially with findings such as varicose veins, unusual location of the mass and ease of compressibility. Duplex ultrasound is the preferred diagnostic modality and once the diagnosis confirmed we recommend ligation and removal of the saphenous vein aneurysm to minimize risk of DVT and PE.



P17 The Use Of Inferior Vena Cava Filters During Percutaneous Endovascular Treatment For Proximal Deep Venous Thrombosis

A. Busuttil, K. J. Williams, A. H. Davies; Imperial College London, London, United Kingdom

BACKGROUND: Iliofemoral deep vein thrombosis places the subject at high risk of post-thrombotic syndrome. This can be reduced with the use of percutaneous endovascular intervention (PEVI). There is a theoretical increased risk of peri-procedural pulmonary embolism (PE). Using the published literature, we look to establish the associated risk profile, specifically PE rates, and if this is decreased with the use of an inferior vena cava, IVC, filter

METHODS: EMBASE and MedLine were interrogated for articles pertaining to PEVI management of acute proximal DVT. This was limited to full articles from 1990, in English. Case series with less than 5 cases were excluded. These results were screened according to STROBE guidelines.

RESULTS: 250 articles were returned, 60 studies were used for data extraction. Methods of PEVI included catheter directed thrombolysis, pharmaco-mechanical thrombectomy, pulsed-spray thrombolysis, and manual aspiration thrombectomy. PE reporting standards/ diagnostic criteria varied widely. Of the 4633 patients included in this literature search, 430 had an IVC filter placed, 296 patients did not have a IVC filter in situ, 3213 patients had a filter placed at the discretion of the treating physician and in 708 cases the use of IVC filtration was not reported. 24 patients suffered a documented PE (1 in the filter group, 9 in the non filter group and 7 when IVC filters were used discretionally), leading to an overall PE risk 0.58%. Use of IVC filtration during PEVI led to a relative risk reduction of 0.92 when used indiscriminately and 0.93 when used at the discretion of the treated physician.

CONCLUSIONS: The PE rate in patients undergoing PEVI is significantly lower than the recognised PE rate in patients treated with anticoagulants alone, and can be lowered further with the use of IVC filters. The results derived from this data would suggest that the treating physician should consider use of IVC filter during PEVI. Adequately powered multi-centre randomised controlled trials are lacking.

P18 The Incidence of Primary Venous Insufficiency In Patients With Deep Venous Thrombosis: A Prospective Study

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BACKGROUND: Deep and superficial vein valve incompetence is frequently found as part of the postthrombotic syndrome and is often attributed to the inflammatory and fibrotic consequences of acute thrombosis. However, contralateral deep vein valve incompetence had been found in a third of patients treated with iliofemoral DVT. In patients with malignancy, the presence of primary chronic venous disease (CVD) is associated with an increased risk of DVT. The prevalence of primary valve incompetence in patients with DVT has not been established. The purpose of this study is to examine the association of CVD, manifested by primary superficial and/or deep vein valve incompetence, with acute DVT.

METHODS: 1204 consecutive patients with symptoms suggesting lower extremity DVT were prospectively evaluated during the 12 month period of September 2013-August 2014. Patients underwent venous duplex ultrasound as part of a comprehensive clinical evaluation for venous thrombosis and vein valve function. DVT was diagnosed in 57 extremities of 57 patients (Study Group). The remaining 1147 patients who did not have DVT formed the Control Group.

RESULTS: Superficial venous reflux in the contralateral leg was found in 28% (16/57) of DVT patients compared to 4.4% (50/1147) in the control group (P<.0001). Contralateral deep venous reflux was present in 33% (19/57) of patients and in 10% (115/1147) of the control group (p<.0001). Patients with DVT also demonstrated a higher incidence of ipsilateral superficial reflux (14% vs 3.6%, P=.001). In patients with symptoms of acute DVT, contralateral superficial reflux was associated with a significantly increased risk of DVT (OR-6.6; 95% CI 4.5-16.3). A similar relationship was found for contralateral deep vein reflux (OR-4.5; 95% CI 2.5-8.0), and for ipsilateral superficial reflux (OR-4.5; 95% CI 2.0-10.1).

CONCLUSIONS: Primary superficial and deep venous insufficiency was significantly more prevalent in patients with acute DVT compared to the non-DVT control group. These findings suggest that primary CVD increases the risk of DVT. These findings carry implications for understanding postthrombotic syndrome as well as data interpretation regarding valve function following treatment strategies of

thrombus removal. A population based prospective cohort study is necessary to confirm these findings, and to investigate whether treatment of primary chronic venous disease decreases the risk of subsequent DVT.

P19 Metabolic Profiling of Patients with Differing Severity of Venous Disease

K. Spagou, R. Velineni, J. Penn, A. H. Davies; Imperial College London, London, United Kingdom

BACKGROUND: Superficial venous disease lies within a spectrum of clinical severity based on the presence and severity of skin changes and the CEAP classification (C1-6) documents this. Although disease progression is most likely a function of sustained elevation of venous pressure, the intermediate translational steps leading to skin changes remain unclear.

Metabolic profiling has been established as technique that aims to define the end products of cellular function in a given biological system using the established platforms of nuclear magnetic resonance (NMR) and mass spectrometry (MS) and the analysis of complex data sets using multivariate statistical analysis with reference to genomic and proteomic data in a systems biology paradigm.

Previous work has successfully demonstrated differential distinctive metabolic profiles when comparing tissue from normal and varicose veins. We have sought to determine if there are any differences between vein, urine and serum from patients with varying clinical severity of venous disease.

METHODS: With ethical approval and written informed consent, patients with venous disease (C2- C5) attending our institution for treatment were recruited. Vein tissue was obtained from avulsions whilst serum and urine were obtained pre-procedure. All samples were examined using MS and NMR analytical platforms. Data were analysed in a multivariate statistical environment. For the purposes of data intrepretation, two groups of patients were formed; Group 1: No venous skin damage and Group 2: Venous skin damage present.

RESULTS: 44 participants were recruited (group 1 - 20 subjects, group 2 - 24 subjects). Sphingomyelines (d18:2/24:1) and (d18:0/24:0), phosphatidylcholine (18:0/20:3) and phosophorylethanolamine (20:4/18:2) were detected in vein tissue and were also identified in serum in this both groups of this cohort of patients whilst taurine was present in urine.

However multivariate statistical analysis demonstrated no significant difference between the metabolic profiles of the two groups in vein tissue, urine or serum.

CONCLUSIONS: Previously implicated compounds that have been detected in tissue have now been identified in the serum and urine of patients with varicose veins, which may further support a systemic component in patients presenting with venous disease. However, in this study there was no difference in the metabolic profile dependent on the severity of the venous disease as judged by skin changes.

P20 Modelling Vein Wall Thickness Under Tumescence and The Implications for Endovenous Thermoablation Devices

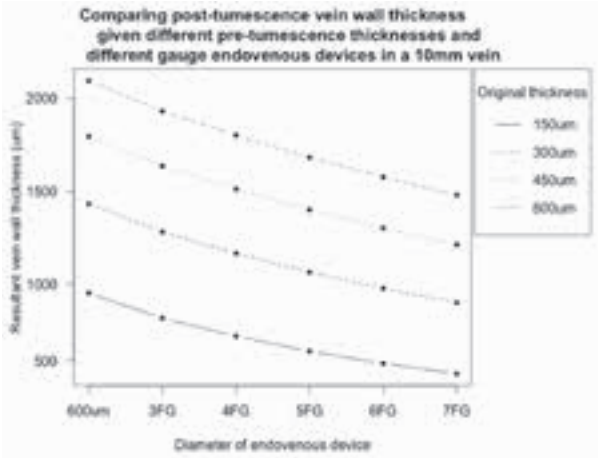
T. J. Fernandez-Hart, M. S. Whiteley; The Whiteley Clinic, Guildford, United Kingdom

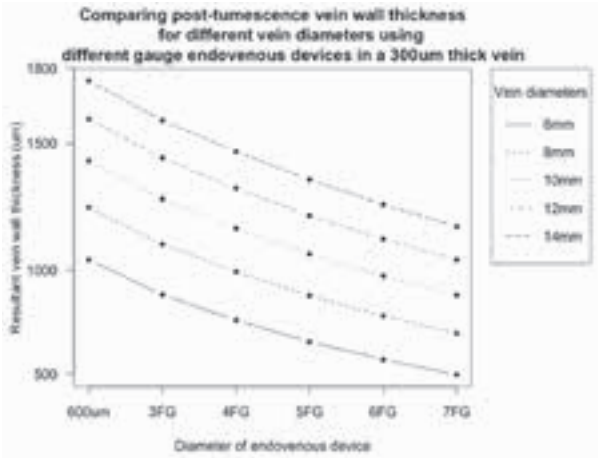
BACKGROUND: Catheter based Endovenous Thermal Ablation (ETA) under tumescent anaesthesia has become a standard treatment for truncal venous reflux. The Linear Endovenous Energy Density (LEED) measures the energy applied per cm of vein. However the conduction of thermal energy across the vein wall depends on the thickness of the vein wall is when it is being treated ie; contracted around the ETA device under tumescence. The aim of this study was to construct a mathematical model determining the resultant vein wall thickness at the time of treatment for a series of veins of different diameters, with different wall thicknesses and using different sizes of endovenous device.

METHODS: The mathematical model was constructed to consider truncal veins with initial diameters of 6mm, 8mm, 10mm, 12mm and 14mm. Each size of vein was modelled with initial wall thicknesses of 150um, 300um, 450um and 600um. Each combination of these initial measurements was modelled when constricted around devices sized 600um diameter, 3FG, 4FG, 5FG, 6FG and 7FG.

RESULTS: The model predicted that when contracted, vein walls thickened considerably over their initial state and there was a marked increase in wall thickness the smaller the size of the endovenous device (Figure 1). As would be expected, the thicker the vein wall initially, the thicker it became upon contraction (Figure 1). Moreover, the larger the initial diameter of the vein, the thicker the resultant vein wall after tumescence (Figure 2).

CONCLUSIONS: Adequate treatment of a vein using ETA requires sufficient thermal energy both to be applied and to be conducted adequately through the vein wall. Generally the larger the volume of tissue, the more energy will be needed. The thicker the vein wall, the further the thermal energy needs to penetrate to ensure complete treatment. This model has shown that for a range of different sized veins, the thickness of the vein wall increases significantly with decreasing size of ETA device. The current trend to make ETA devices thinner may be disadvantageous, as the resultant vein wall will be thicker under tumescence and hence adequate thermal penetration of the whole vein wall harder to achieve.





P21 **Effect Of Number of Passes And Gauge of Needle on The Longevity of Tessari Foam for Sclerotherapy**

A. M. Whiteley, S. J. Dos Santos, A. L. Cleese, J. Wojnicka, C. Walters, M. S. Whiteley; The Whiteley Clinic, Guildford, United Kingdom

BACKGROUND: Foam Sclerotherapy made using the Tessari method has become a cornerstone of venous treatments. The aim of this study was to determine how the longevity of foam made with different detergent sclerosants and concentrations could be optimised by the number of passes between the two syringes and how the resulting foam would be affected by the gauge of the needle used for its injection.

METHODS: Foam was made using our standard and previously proven technique, using 2 silicone free syringes (5ml and 3ml) connected with a 3 way stop cock, 1 ml of detergent sclerosant and 3 mls of air at room temperature and pressure. Longevity was measured by the time taken for half of the foam to revert to the liquid phase. The detergents studied were Sodium Tetradecyl Sulphate (STS) 1% and 3% and Polidocanol (POL) 1% and 3%. Effect of number of passes: The constituents were mixed by passing them from one syringe to the other for a range of passes from 1 to 23.Effect of gauge of needle: Foam made with 11 passes was passed into a measuring syringe through a 21G, 23G, 25G or 30G needle.

RESULTS: Foam made with both STS 1% and 3% showed no significant improvement in longevity after 9 passes. However POL 1% needed 13 passes and POL 3% needed 11 passes to achieve this.STS 1% showed no significant difference in foam longevity regardless of which needle was used. STS 3% showed a significant reduction of longevity when a 25G or 30G needle was used, compared to a 21G needle. Both POL 1% and 3% showed significant reduction of foam longevity when a 30G needle was used (see Table).

CONCLUSIONS: When making Tessari foam using detergent sclerosants in a 1:3 mixture with air and silicone free syringes, STS 1% and 3% requires a minimum of 9 passes, POL 1% 13 passes and POL 3% 11 passes. The gauge of needle used for injecting the foam is not

significant for STS 1%. However for STS 3% 25G and 30G needles result in foam with significantly reduced longevity, as does POL 1% and 3% when injected through a 30G needle.

	Detergent Sclerosant							
	STS				POL			
	STS 1%		STS 3%		POL 1%		POL 3%	
Needle Gauge (Colour)	Mean(n=5)	SD	Mean(n=5)	SD	Mean(n=5)	SD	Mean(n=5)	SD
21G (Green)	132.80	2.17	148.20	9.04	101.40	15.48	136.15	25.04
23G (Blue)	134.20	4.66	143.40	11.52	101.40	12.30	135.60	25.84
25G (Orange)	133.40	8.47	126.20*	6.98	96.00	8.32	126.50	21.87
30G (Yellow)	128.80	15.14	106.40*	16.43	50.60*	16.48	105.45*	37.50

* = Denotes significant reduction of foam longevity from the 21G needle ($p<0.05$)

6:00 pm – 7:30 pm

Welcome Reception — **Celebrity D-H**

6:00 am – 7:00 pm
Registration Open — **Ambassador Foyer**

6:30 am – 7:30 am
Continental Breakfast — **Celebrity D-H**
Breakfast with the Board (New Members Only) — **Ambassador East Patio**

7:30 am – 7:00 pm
Poster Hall Open — **Celebrity Foyer**

8:00 am – 11:00 am
Guest Hospitality — **Polo**

7:30 am – 9:30 am
SCIENTIFIC SESSION 3
Venous Thromboembolism/IVC Filters — **Ambassador Ballroom**

Moderators: Glenn Jacobowitz, MD; Suresh Vedantham, MD
Discussants: 3-10 Julianne Stoughton, MD; 3-11 Haraldur Bjarnason, MD; 3-12 Thomas Wakefield, MD; 3-13 Teresa Carman, MD; 3-14 Rabih Chaer, MD

7:30 am – 7:50 am

3-10 Equivalent Outcomes between Ultrasound-Assisted Thrombolysis and Standard Catheter-Directed Thrombolysis for the Treatment of Acute Pulmonary Embolism

N. L. Liang, E. D. Avgerinos, L. K. Marone, M. J. Singh, M. S. Makaroun, R. A. Chaer; University of Pittsburgh Medical Center, Pittsburgh, PA **Servier Traveling Fellowship Award Finalist*

OBJECTIVE: The objective of this study is to compare the outcomes of patients undergoing ultrasound-assisted thrombolysis (USAT) and standard catheter-directed thrombolysis (CDT) for the treatment of acute pulmonary embolism (PE).

METHODS: The records of all patients having undergone CDT or USAT for massive or submassive PE were retrospectively reviewed. CDT was performed using multi-sidehole catheter directed t-Pa infusion, and USAT was performed using the EkoSonic Endovascular system (EKOS Corporation, Bothell, WA). Standard statistical methods were used to compare subgroup characteristics as well as assess for longitudinal change in outcome measures.

RESULTS: Sixty-three patients, 27 CDT and 36 USAT, were treated for massive (12.7%) or submassive (87.3%) PE. 96.8% were treated for bilateral PE. Patients in the CDT group were more likely to carry a diagnosis of previous deep venous thrombosis (DVT) and PE. Baseline demographics, PE subtype, echocardiographic parameters, and biomarkers of cardiac injury such as troponin-I and BNP did not differ between the two treatment groups. There was no difference in total dose of lytic administered (23.2±13.7mg, CDT v. 27.5±12.9mg, USAT, p=0.2). The CDT group had significantly longer hospital stay (11.4±8.1d v. 6.3±4.4d, p=0.002) and trended toward lengthier ICU stays. 2 patients in the CDT and 1 in the USAT groups required conversion to surgical thrombectomy (7.4% v. 2.8%, p=0.6). Rates of major and minor bleeding complications (11.0% v. 13.9%), PE-related mortality (0.0% v. 2.8%), and 90-day all-cause mortality (7.4% v. 5.6%) did not differ significantly between the CDT and USAT groups. Mortality rate at one year was 13.6% for the total cohort; estimated survival at one year by Kaplan-Meier analysis was 86.4% overall, 90.2% for CDT and 78.8% for USAT respectively (p=0.8). Both groups had significant improvement in oxygen requirement at discharge and follow up (p<0.001), and the number of patients requiring oxygen on discharge did not differ between groups. All echocardiographic parameters improved significantly from baseline to 1-year follow-up; though there were no significant differences between the two groups, the CDT group showed a trend toward greater percentage improvement in RV dilation and estimated pulmonary artery pressure (Table).

CONCLUSIONS: This study demonstrates no statistical difference in clinical and hemodynamic outcomes or procedural complication rates between USAT and standard CDT for treatment of acute PE. Prospective studies are needed to determine the comparative and cost effectiveness of different interventions for acute massive and submassive PE.

Table. Baseline to 1-year Improvement in Echocardiographic Parameters

	CDT % of Patients Improved		USAT % of Patients Improved		p
RV Dilation	90.0%		53.8%		0.06
RV Systolic Dysfunction	90.0%		83.3%		0.65
RV Hypokinesis	100%		88.9%		0.28
	CDT Avg. Improvement ± SE		USAT Avg. Improvement ± SE		p
Tricuspid Regurgitant Jet Velocity (m/s)	0.7	±0.3	0.9	±0.5	0.43
Estimated Pulmonary Arterial Pressure (mmHg)	20.4	±8.3	12.7	±5.6	0.07

7:50 am – 8:10 am

3-11 Prospective Long Term Comparison of Anticoagulation Treatment versus Thrombolysis in Patients with Acute Iliofemoral Thrombosis

*G. Spentzouris[1], N. Labropoulos[1], P. Foegh[2], A. Gasparis[1], A. Tassiopoulos[1], N. Bækgaard[2]; [1]Stony Brook University Hospital, Stony Brook, NY, [2]Vascular Clinic, Gentofte Hospital and Rigshospitalet, University of Copenhagen, Copenhagen, Denmark *Servier Traveling Fellowship Award Finalist*

OBJECTIVE: This prospective study was designed to determine the long term effects of iliofemoral thrombosis in patients treated with anticoagulation and those treated with thrombolysis.

METHODS: Patients with documented diagnosis of acute thrombosis involving at least the external iliac vein who were treated with anticoagulation (AC group) were included. They were followed-up with clinical examination and duplex ultrasound for a minimum of 5 years. Patients with shorter follow-up, thrombolysis, previous history of thrombosis or chronic venous disease, peripheral arterial disease, vascular interventions were excluded. The CEAP classification and the VCSS were used to monitor the status of the lower limbs. These data were compared to patients from another center that had thrombolysis (CDT group) and at least 5 year follow-up.

RESULTS: There were 33 patients in the AC group with a mean age of 49 years ranging from 19 to 77. The 33 (34 limbs) patients in the CDT group were significantly younger with a mean age of 29 years, range 15 to 55 ($p<0.01$). The median follow-up was 71 months, range 60-107 and 73 months, range 60-100 respectively. In the CDT group 22 patients (67%) underwent stenting. Ipsilateral recurrent DVT was found in 29% in the AC group and in 9.1% in the CDT group ($p=0.1$). At the long term follow-up 29 patients had reflux in the AC group and only 2 in the CDT group ($p<0.0001$). In the AC group obstruction alone was found in 3 patients and reflux and obstruction in 21 whereas in the CDT group 1 patient had iliac stenosis and 3 other patients had residual thrombus ($p<0.0001$). CVD signs and symptoms were present in 29 patients in the AC group vs. 7 in the CDT ($p<0.0001$). Venous claudication was found in 6 patients only in the AC group ($p=0.024$).

CONCLUSIONS: Patients with DVT involving the iliac veins iliofemoral thrombosis treated with anticoagulation have poor long term outcome. Ipsilateral recurrent DVT and the presence of combined reflux and obstruction are important contributors for the clinical deterioration. Patients treated with CDT have much better outcome than those treated with AC.

8:10 am – 8:30 am

3-12 Contrast Enhanced Ultrasound for Thrombus Dissolution in an In-vitro Model of Acute Deep Vein Thrombosis

B. Dharmarajah[1], T. A. McKinnon[2], C. Keravnou[3], M. A. Averkiou[3], E. L. S. Leen[4], A. H. Davies[1]; [1]Academic Section of Vascular Surgery, Imperial College London, London, United Kingdom, [2]Department of Haematology, Imperial College London, London, United Kingdom, [3]Department of Mechanical and Manufacturing Engineering, University of Cyprus, Nicosia, Cyprus, [4]Division of Experimental Medicine, Imperial College London, London, United Kingdom

OBJECTIVE: Anticoagulation is being superseded by acute thrombus removal to treat extensive deep vein thrombosis (DVT) and prevent post thrombotic syndrome. However, catheter-directed and pharmacomechanical thrombolysis confer a hemorrhage risk of up to 20%. Sonothrombolysis is a novel method of thrombus dissolution using ultrasound (US) and ultrasound contrast microbubbles (MBs).

METHODS: Using a parallel plate flow chamber coated with tissue factor, an in-vitro clot model of DVT was formed under venous shear stress. Treatment groups included: control, US only and US & MBs (each n=8). US was applied via a Philips iU-22 platform with a C5-1 transducer producing a triggered mechanical index pulse of 1.31 every 1500 milliseconds. SonoVue microbubbles were infused at 0.2% concentration. Video microscopy of fluoroscopically tagged fibrin provided validated blinded offline image quantification of surface area coverage with statistical analysis performed using a one-way ANOVA.

RESULTS: Mean surface area coverage of the clot ± SD after treatment was 85.8 ± 5.6% in the control group, 52.7 ± 7.6% in the US only group and 10.7 ± 12.37% in the US & MBs group. Whilst there was a significant difference of US alone over control ($P<0.05$), a further significant effect was displayed by US & MBs ($P<0.0001$). Qualitative video microscopy analysis revealed maintenance of the fibrin scaffold

with areas of porosity with US only whilst complete dissolution of the fibrin structure with restoration of flow was observed with US & MBs.

CONCLUSIONS: This pilot study identifies sonothrombolysis as a feasible non-invasive, non-irradiating technique for dissolution of DVT. This novel technique may confer less hemorrhage and irradiation risks than current thrombus removal strategies.

8:30 am – 8:50 am

3-13 Prevalence and Clinical Outcome of Free-floating Thrombus Formation in Lower Extremity Deep Veins

T. Yamaki, H. Konoeda, A. Osada, Y. Hasegawa, H. Sakurai; Tokyo Women's Medical University, Tokyo, Japan

OBJECTIVE: Most published guidelines for treatment of acute and subacute deep vein thrombosis (DVT) recommend early ambulation over initial bed rest. However, formation of free-floating thrombus in the lower extremity deep veins carries a high risk of fatal pulmonary embolism (PE) during ambulation. Furthermore, the natural history of free-floating thrombus in this patient population is not known. The purpose of this study was to identify the prevalence and outcome of free-floating thrombus among patients with acute deep vein thrombosis.

METHODS: Between January 2013 and December 2013, 427 patients were diagnosed as having DVT using compression ultrasound (CUS). The anatomic distributions of the thrombi were divided into ilio-femoral, femoro-popliteal, and calf DVT. The ultrasound features of the thrombi were classified as firmly or loosely attached and free-floating. PE was confirmed with CT angiography.

RESULTS: Among 427 patients with DVT, 7 (1.7%) were found to have free-floating thrombus. The risk factors for DVT included recent knee surgery in 2 (28.5%), recent hip surgery in 1 (14.3%), immobilization in 1 (14.3%), malignancy in 1 (14.3%), hormone replacement therapy in 1 (14.3%) and stroke in 1 (14.3%). Initial treatment for these patients included bed rest and anticoagulation therapy. Two of these patients underwent temporary insertion of an inferior vena cava filter. The thrombus was located predominantly in the femoro-popliteal segment (5 patients, 71.4%), and the prevalence of femoro-popliteal DVT was significantly higher in patients with free-floating thrombus than in these without (P=0.0002). PE was found in 3 patients (42.9%), and the incidence of PE was significantly higher in patients who had free-floating thrombus than in those who did not (P=0.0001). The free-floating thrombus resolved spontaneously in 4 patients (57.1%) within a mean period of 19 days. On the other hand, the thrombus became firmly attached to the vein wall in the remaining 3 patients (42.9%) within a mean period of 9 days, leading to secondary thrombus recanalization. No further thromboembolic complications were encountered in these patients.

CONCLUSIONS: Although the prevalence of free-floating thrombus formation is low among patients with DVT, it can be detected by CUS in daily practice. Our data show that the natural history of free-floating thrombus treated by anticoagulation can be largely classified into two patterns: early spontaneous thrombus resolution and initial adhesion to the vein wall with secondary thrombus recanalization. Insertion of an inferior vena cava filter can be reserved for patients in whom anticoagulation is contraindicated.

8:50 am – 9:10 am

3-14 Novel Endovascular Grasper for Challenging Inferior Vena Cava Filter Retrieval

D. Rathbone[1], J. Zinter[1], L. Ghandour[2], T. Sarac[3], A. Dardik[4], C. Ochoa Chaar[3]; [1]Yale Department of Mechanical Engineering and Materials Science, New Haven, CT, [2]American University of Beirut, Department of Epidemiology and Population Health, Beirut, Lebanon, [3]Yale School of Medicine, Department of Surgery, Section of Vascular Surgery, New Haven, CT, [4]VA Connecticut Healthcare system, Department of Surgery, Division of Vascular Surgery, West Haven, CT

OBJECTIVE: Inferior Vena Cava (IVC) filters are commonly retrieved using a snare. The procedure becomes difficult and sometimes impossible when the IVC filter is tilted and scarred. As such, several techniques have been described sometimes requiring off-label use of devices. This abstract proposes a novel reticulating endovascular grasper designed to retrieve permanent as well as retrievable IVC filters in any configuration.

METHODS: A prototype device was developed by the engineering team. An in vitro testing model was constructed using a 2.5cm inner diameter flexible plastic tube to simulate the IVC. Hot-melt adhesive fixed the struts of the filter to the tube wall, simulating fibrosis. In the tilted configuration, the tip of the filter was fixed to the tube wall, making snare retrieval impossible. (Figure1)A camera with high-contrast back lighting mimicked the two-dimensional visual conditions of retrieval under fluoroscopy. Retrieval devices were introduced through a 12 French sheath. (Figure2) The time from the introduction of the retrieval device to the camera field until total retrieval of the IVC filter was measured in seconds. The control experiment consisted of retrieving a retrievable IVC filter with a snare. There were four experimental groups involving retrieval with the grasper: 1- retrievable filter centered (non-tilted) configuration, 2- retrievable filter, tilted configuration, 3- permanent filter, centered configuration, 4- permanent filter, tilted configuration. Retrieval in the control and each of the

experimental groups was repeated 5 times. The Mann-Whitney- Wilcoxon test was used to compare the time of retrieval of each of the experimental groups to the control. P value < 0.05 was considered statistically significant.

RESULTS: Compared to the control (79s), the retrieval time was not statistically significantly different for the tilted permanent (51s) or tilted retrievable (85s) IVC filters. However, removing a centered permanent filter with the grasper (29s) required significantly less time than in the control (p=0.009). (Figure 3)

CONCLUSIONS: The novel grasper is effective in retrieving different types of IVC filters in different configurations and compares favorably with a snare in the current in vitro model. Additional testing is needed to ensure effectiveness in vivo.

Fig 1- Permanent IVC filter in a tilted position

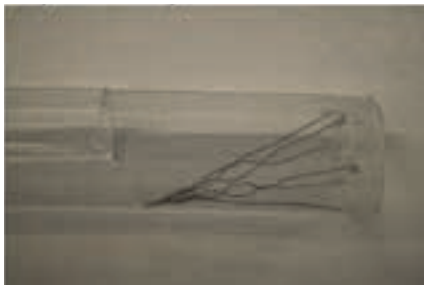


Fig 2 – Diagram of in vitro model for IVC filter retrieval

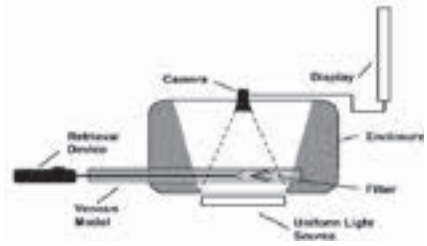
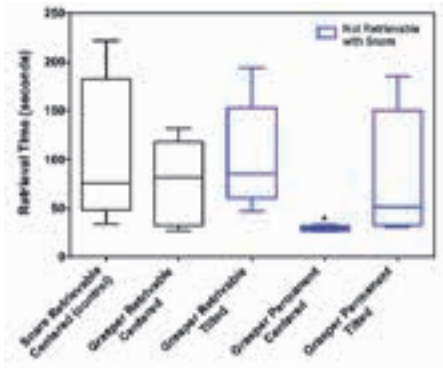


Fig 3 – Time to retrieval of IVC filters using grasper compared to a snare



9:15 am – 9:20 am

Q3-5 Accuracy of VTE Assessment and Compliance to Prophylaxis

P. Kim, A. Gasparis, K. Probeck, D. Elitharp, A. Tassiopoulos, N. Labropoulos; Stony Brook Medicine, Stony Brook, NY

OBJECTIVE: Proper assessment of venous thromboembolism (VTE) risk level is vital in hospitalized patients for providing adequate prophylaxis for VTE. Electronic medical record (EMR) VTE programs have been used by institutions to improve assessment and prophylaxis. As such, this study was conducted after implementing such a program to compare admitting service assessment (ASA) of VTE risk level to the VTE consult service assessment (CSA). In addition, compliance of ordered prophylaxis based on ASA was evaluated.

METHODS: At a tertiary care center, we performed a prospective analysis of randomly selected patients assessed within 24 hours of admission for VTE risk over a five month period. There were a total of 104 patients evaluated, four of which were excluded because of VTE presence on admission. Patients were assessed for VTE risk independently, first by the admitting service, followed by the VTE consult service. VTE prophylaxis orders were then reviewed based on ASA and compliance to ACCP guidelines was evaluated.

RESULTS: All patients underwent assessment within 24 hours from admission. Among medical patients, there was no statistically significant difference between ASA and CSA. However, among surgical patients, we found that ASA under-assessed VTE risk level (p=0.001). Overall there were 8 patients that did not receive appropriate prophylaxis. There were four patients in the medical group and

four patients in the surgical group. All 8 patients were either moderate or high risk, with 5 having mechanical prophylaxis only and 3 patients with no prophylaxis ordered.

CONCLUSIONS: Despite the use of EMR VTE programs there continues to be a significant number of patients that are being under-assessed and under-prophylaxed for VTE. Quality programs need to be instituted to further improve VTE assessment and prophylaxis.

9:20 am – 9:25 am

Q3-6 Outcomes of Ultrasonic Accelerated Thrombolysis for Inferior Vena Cava Thrombosis

L. Lajoie[1], A. Lee[2], M. Wilderman[3], M. Napolitano[3], G. Simonian[3], D. O'Connor[3]; [1]Rutgers New Jersey Medical School, Newark, NJ, [2]Palisades Medical Center, North Bergen, NJ, [3]Hackensack University Medical Center, Hackensack, NJ

OBJECTIVE: The clinical experiences and outcomes of ultrasonic accelerated transcatheter thrombolytic therapy for symptomatic IVC thrombosis have not been widely reported. We describe our experience using the EkoSonic Endovascular System (EKOS) for endovascular management of caval thrombosis.

METHODS: All patients diagnosed with symptomatic IVC thrombosis who were treated with EKOS from March 2008 to March 2014 were included for review. Patient data including clinical presentation, thromboembolic risk factors, treatment details, initial and follow up imaging, and clinical outcomes were recorded.

RESULTS: Sixteen patients (8 male, 8 female, mean age 58 years) presented with acute symptomatic IVC thrombosis. Risk factors for thromboembolism included malignancy (4), recent surgery (3), trauma (3), inherited hypercoagulability (3), obesity (7), and smoking (2). Twelve patients had previous DVT and eleven of these patients had IVC filters in-situ. Ultrasound imaging revealed bilateral proximal DVT on presentation in 8 patients, the remaining 8 presented with unilateral DVT. All patients were treated with systemic anticoagulation, limb elevation, and compression. The indication for thrombolysis was phlegmasia in two patients and persistence of significant symptoms in 14 patients. Confirmation of caval thrombosis was by contrast venography prior to EKOS treatment. Ultrasound guided access was via the popliteal vein in 11 patients (3 bilateral), greater saphenous vein in 1 patient, and common femoral vein in 4 patients (3 bilateral). EKOS catheters were placed with the working length extending from the distal extent of the thrombus in the extremity to patent IVC. TPA via the EKOS catheter and heparin via the sheath was given for an average of 24 hours (range 12-48 hours) with follow up venography performed after exchange of the thrombolysis catheter. Adjunctive mechanical thrombectomy was performed in 14 patients. There were no complications. At median follow up of 13 months (range 1-41 months), all but one patient had improvement or complete resolution of symptoms. Two patients had recurrent lower extremity DVT (1 after warfarin held for lumbar puncture, 1 after knee replacement).

CONCLUSIONS: This is the largest reported series of ultrasonic accelerated thrombolysis for acute IVC thrombosis. These results suggest that this modality may be helpful in treating patients with significant symptoms without significant complication.

9:25 am – 9:30 am

Q3-7 Hybrid Operative Thrombectomy (HOT) For the Treatment of Symptomatic Iliofemoral Deep Venous Thrombosis: Initial Experience and Mid-term Results

L. E. Rodriguez, F. Aponte-Rivera, R. Figueroa Vicente, J. L. Martinez Trabal; St. Luke's Memorial Hospital, Ponce, PR

OBJECTIVE: In this report, we describe a novel technique for the treatment of iliofemoral deep vein thrombosis (IFDVT) known as the hybrid operative thrombectomy (HOT), which employs a direct infrainguinal approach (via single incision) with concomitant retrograde advancement of a balloon catheter via femoral venotomy. The purpose of our study is to assess the feasibility, safety, perioperative, and intermediate outcomes associated with this technique.

METHODS: From July 2011 to May 2014, 32 consecutive patients with symptomatic acute/subacute IF and/or fem-pop DVT were treated with HOT. Exclusion criteria included symptomatic bilateral IFDVT and/or caval involvement at the time of diagnosis (n=4). The primary end points were as follows: 1) angiographic evidence of restored venous patency at completion of the procedure, 2) duplex findings at intermediate follow up (≥3 months to 3 years), and 3) clinical follow up using Villata's and CEAP scales.

RESULTS: The symptomatic DVT was located at the left limb in 22/28 (78.6%) of the cases, the right limb in 6/28 (21.4%). The inferior vena cava (IVC), IF, fem-pop, tibial, and greater saphenous (GSV) were involved in 0%, 27/28 (96.4%), 19/28 (67.9%), 7/28 (17.9%), and 3/28 (10.7%) of the patients, respectively. Balloon angioplasty was completed in 19/28 (67.9%) patients and stent placement in 15/28 (53.6%). Mean operative time was 100 min (range 40-190 min). Complete (> 95%) thrombus removal was obtained in 21/28 (75%) limbs, and partial (between 80-90%) resolution in 7/28 (25%). At a mean follow up time of 378 days (range: 94-799 days) duplex ultrasound showed chronic non-occlusive DVT at the surgical IF, fem-pop, tibial, GSV segments in 16/20 (80%), 7/20 (35%), 4/20 (20%), 4/20 (20%) limbs (8/28 patients lost to follow-up), respectively. Venous reflux at the surgical IF segment was found to be non-significant (reflux time 0-0.9 sec), mild (1-2 sec), moderate (2-3 sec), severe (>3 sec) in 15/20 (75%), 4/20 (20%), 0%, 1/20 (5%), respectively. Venous reflux at the surgical fem-popliteal segment was found to be non-significant, mild, moderate, severe in 10/20 (50%), 5/20 (25%), 2/20 (10%), 3/20 (15%), respectively. Acute IFDVT developed in one patient in the early postoperative and required take back for revision. At a mean follow up time of 504 days (range 100-921 days) the clinical CEAP and Villata's scores were 0.85 (range: 0-3) and 2.25 (0-4), respectively. No patients had venous ulcers at follow up.

CONCLUSIONS: When used as a standalone procedure, the HOT technique can successfully remove venous thrombus safely and effectively, and is associated with excellent clinical results at intermediate follow up.

9:00 am – 1:00 pm

Exhibit Hall Open — Celebrity D-H

9:30 am – 10:00 am

Coffee Break — Celebrity D-H

9:30 am – 10:00 am

Demonstration of the VQI® Varicose Vein Registry (sponsored by the AVF and SVS) — Celebrity A-C

10:00 am – 11:30 am

ACP SYMPOSIUM

Recurrent Varicose Veins – Comparison of Various Treatment Modalities – What Have We Learned?

Chair: Mark Forrestal, MD, FACPh

Intro: Recurrent Varicose Veins - Comparison of Various Treatment Modalities - What Have We Learned
Mark Forrestal, MD, FACPh

Diagnostic Imaging - Patterns
Diana Neuhardt, RVT, RPhS

What We Have Learned Post Sclerotherapy (Endovenous Chemical Ablation)
Mark Forrestal, MD, FACPh

Surgery and Endovenous Therapies - Similarities and Differences in RVVs
Armen Roupenian, MD, FACS, RVT, RPVI

Does Compression Play a Role in Reducing RVVs?
Lisa Pavone, MD

What Do We Know About RVV Prevention - Is it Disease Progression?
Kathleen Gibson, MD

10:00 am – 10:30 am

Best Papers — Ambassador Ballroom

Moderators: Robert McLafferty, MD; Joanne Lohr, MD

10:00 am – 10:10 am

European Venous Forum - Best Paper 1

Rates of Duplex-Detected Recanalisation 5 Years After Ultrasound-Guided Foam Sclerotherapy and Relationship With Clinical, Haemodynamic and Patient-Reported Outcomes

K. A. L. Darvall, G. R. Bate, A. W. Bradbury; University of Birmingham Department of Vascular Surgery, Birmingham, UK

OBJECTIVES:
To assess:

- rates of duplex-detected recanalisation following ultrasound-guided foam sclerotherapy (UGFS)
- the relationship between recanalisation and clinical, haemodynamic and patient-reported outcomes (PROMs)

METHODS: Consecutive patients undergoing UGFS between April 2004 and May 2007 were invited for review after 5 years. Patients underwent duplex ultrasound (DUS) to assess occlusion of treated veins. Degree of occlusion was graded as "fully-occluded" (no areas of recanalisation/reflux), "partially-occluded" (<50% of treated length of vein recanalised with or without reflux) or "open" (>50% of treated length of vein recanalised with reflux). Veins were considered to be secondarily occluded when further successful treatment had been undertaken for previous recanalisation. CEAP clinical grade, venous clinical severity score (VCSS) and venous refilling time (VRT) on digital photoplethysmography were recorded. Disease-specific quality of life (AVSS) and satisfaction questionnaires were completed.

RESULTS: 381 limbs (278 patients) were reviewed (80% response) at a median (IQR) of 71 (67-78) months following UGFS. Primary and secondary occlusion rates of the GSV (n=318) were 58% and 67% respectively; 26% were "partially-occluded" with reflux; and 6% were "open". In addition, two GSVs were "partially-occluded" without reflux. For the SSV (n=78), primary and secondary occlusion rates were 51% and 62%, 18% were "partially-occluded" with reflux, 15% were "open", and four were "partially-occluded" without reflux.

Mean (SD) CEAP C improved from 2.75 (1.12) pre-treatment to 1.68 (1.42) at 5 years (P<0.0005, paired t-test); VCSS improved from 5.12 (2.66) to 1.83 (2.16) (P<0.0005); and VRT improved from 16.9 (11.67) to 31.9 (13.62) (P<0.0005). Limbs with recanalisation had worse CEAP C, VCSS, VRT and AVSS than "fully-occluded" limbs. However, even in the limbs with recanalisation at 5 years there was significant

(P<0.0005, paired t-test) improvement from baseline in these parameters. "Partially-occluded" or "open" limbs had significantly worse disease at baseline than "fully-occluded" limbs. Mean change in VRT from baseline was the same regardless of recanalisation. AVSS improvement from baseline was higher in patients with recanalisation. CEAP C and VCSS were significantly worse in limbs with recanalisation, mainly due to the presence of visible VV. Mean patient satisfaction was slightly lower as degree of recanalisation worsened (8.8 "fully-occluded" to 7.9 "open"; P=0.006, ANOVA).

CONCLUSIONS: Recanalisation is present in 42% of GSV and 49% of SSV 5 years after ultrasound-guided foam sclerotherapy. However, the majority of the recanalisation seen affects <50% of the treated length of vein and appears to be less severe (CEAP C, VCSS), less haemodynamically significant (VRT), and less symptomatic (AVSS) than the original venous disease. Patient satisfaction was still high despite recanalisation. Patients with "worse" disease at baseline appear more likely to get recanalisation.

10:10 am – 10:20 am

European Venous Forum - Best Paper 2

Validation of the Caprini Risk Score for Venous Thromboembolism (VTE) in High Risk Surgical Patients

K. Lobastov, V. Barinov, L. Laberko, V. Boyarintsev; The Pirogov Russian National Research Medical University, Moscow, Russia

OBJECTIVES: The aim was to validate the Caprini VTE risk assessment score in high risk surgical patients and determine whether patients at extremely high risk can be identified despite standard prophylactic measures.

METHODS: This was a prospective observational study involving 140 high risk patients having abdominal (with sepsis) (48%) or cranial/spinal (52%) surgery. Age of the patients was 40-83 years (mean: 62.9±12.2), 68 men and 72 women. All patients were assessed with the Caprini model and had a mean score of 9.5±2.7 (range: 5-15). Our standard prophylaxis for VTE consisted of above knee graduated compression stockings with pressure 18-21 mm Hg and low dose subcutaneous unfractionated heparin (LDUH) 8-hourly, starting on 1st or 2-5th postoperative day depending on the risk of bleeding.

Duplex ultrasound was performed at baseline, during the first 12 hours after surgery and then every 3-5 days until discharge to assess the lower limb venous system up to the inferior vena cava. The endpoint of the study was ultrasound verification of fresh DVT.

RESULTS: Fresh postoperative DVT was found in 39 (28%) patients. The incidence of DVT was 1.9% in the lowest tertile of the Caprini score (5-8); it was 26.1% in the middle tertile (score 9-11) and 65% in the upper tertile (score 12-15) (P for trend < 0.001). The area under the ROC curve was 0.87 (95% CI 0.81 to 0.94) and Caprini score 11 was a cut-off point that provided the highest sensitivity combined with highest specificity. In the 77 patients with a score of less than 11, DVT occurred in 2 (2.6%). In contrast, in the 63 patients with a score of 11 or more DVT occurred in 37 (58.7%) (P < 0.001).

CONCLUSIONS: There is a moderate correlation between Caprini scores and the incidence of postoperative DVT in high risk surgical patients. The Caprini score is valid in high risk surgical patients and a score of 11 or more can identify a subgroup of patients at extremely high risk. These patients need a more effective prophylactic regimen.

10:20 am – 10:30 am

American College of Phlebology - Best Paper

Incidence of Venous Leg Ulcer Healing and Recurrence after Treatment with Endovenous Laser Ablation

W. Marston; University of North Carolina School of Medicine, Chapel Hill, NC

OBJECTIVES:

1. Determine healing rate of venous ulcers after endovenous laser ablation

2. Identify long term rate of recurrent ulceration in CEAP clinical class 5 and 6 patients treated with EVLA

3. Determine effect of concomitant phlebectomy on healing and recurrence of venous ulcers

METHODS: We retrospectively reviewed all CEAP class 5 or 6 patients treated with EVLA to define the incidence of ulcer healing and recurrence. Patients with active ulcers were managed weekly in a comprehensive wound center until healed. After healing, patients were treated with compression stockings and returned at 6-month intervals for follow-up. Time to healing and time to ulcer recurrence were determined by Kaplan-Meier survival analysis. Risk factors were assessed to determine their association with ulcer recurrence.

RESULTS: EVLA of the GSV (n=101), SSV (n=7), or both (n=4) was performed on 112 limbs with active (n=40) or healed (n=72) ulcers. Deep venous insufficiency was present in 41 cases (36.6%). Concomitant phlebectomy was performed in 44 limbs (39.3%). Median follow-up time was 27.1 months after EVLA. Venous ulcers healed within 3 months of EVLA in 67% of cases, 77% at 6 months, and 91%

at 18 months. Ulcer recurrence occurred in 7% of patients at 1 year after EVLA, 16% at 2 years, and 29% at 4 years of follow-up. The Table illustrates the relationship of selected risk factors to ulcer recurrence.

CONCLUSIONS: Ulcer recurrence occurred in a minority of CEAP clinical class 5 and 6 patients after EVLA of the saphenous veins. Ulcer recurrence was less frequent in patients without concomitant deep venous reflux and in those treated with phlebectomy of varicose veins at the time of EVLA. Additional study in a patient cohort with a larger sample size is required to confirm these findings.

	Risk factor	Patients at risk (n)	Recurrence (%)	log rank P val
Deep Reflux	Yes	41	27.8%	.09
	No	71	14.3%	
Phlebectomy	Yes	44	11.6%	.07
	No	68	23.8%	

10:30 am – 11:30 am

VILLAVICENCIO SYMPOSIUM

Present and Future of Venous Health Care — Ambassador Ballroom

Chairs: Lowell Kabnick, MD; Peter Lawrence, MD

Introduction: What now? What Later?
Peter Lawrence, MD

Vein Center Accreditation: Significance Now? Significance Later? National Determination Policy?
Lowell Kabnick, MD

Physician Reimbursement System: Now and Future
Glenn Jacobowitz, MD

How Can/Should the AVF Influence Venous Health Care?
Fedor Lurie, MD, PhD

11:30 am – 12:20 pm

D. EUGENE STRANDNESS MEMORIAL LECTURE

Venous Disease Research Support by the National Institutes of Health — Ambassador Ballroom

Keynote Speaker: Andrei L. Kindzelski, MD, PhD

12:20 pm – 1:30 pm

Lunch Buffet — Celebrity D-H

12:20 pm

Open Afternoon

12:30 pm – 5:30 pm

Venous Open Golf Outing

The annual Venous Open golf outing will provide golfers of all levels with an afternoon on the beautiful Westin Mission Hills golf course, the chance to win several prizes, play a "beat the pro" contest with LPGA Hall-of-Famer Amy Alcott, and enjoy an evening reception with colleagues and friends. Sign up to play at the AVF Registration Booth.

Golf Outing: Thursday, February 26, 2015, 12:30 pm - 5:30 pm
Lunch: 12:30 pm - 1:00 pm
Tee Time: 1:00 pm set up; 1:15 pm tee time sharp (shotgun start, play own ball)
Post Golf Reception: Immediately following completion of play

Support for Venous Open provided by AngioDynamics, BTG Interntional, Primus Pharmaceuticals, Inc., SIGVARIS, Stony Brook Vein Center, Tactile Medical, and Vascular Insights.

Meeting Program — Friday, February 27

6:00 am – 5:30 pm
Registration Open — **Ambassador Foyer**

6:00 am – 8:00 am
Continental Breakfast — **Celebrity D-H**

6:00 am – 10:00 am
Exhibit Hall Open — **Celebrity D-H**

6:30 am – 8:00 am
Industry Advisory Breakfast — **Ambassador East Patio**

7:00 am – 10:00 am
SPECIALTY SYMPOSIA

(A) Biomechanics & Bioengineering: Structure-Function Relation of Veins in Health and Disease — Oasis 1-3

Chairs: Michael Dalsing, MD; Ghassan Kassab, PhD

Biomechanics of Veins
Ghassan Kassab, PhD

Controversies in IVC Flow
Seshadri Raju, MD

Are Gene Expression Patterns in Venous and Arterial Endothelial Cells Highly Plastic and Interchangeable?
Mervin Yoder, MD

Venous Thrombosis – Convergence of Thrombosis and Inflammation with Special Emphasis on Endothelial Barrier
Thomas Wakefield, MD

Vascular Remodeling and the Dynamic Adjustment of Arterial/Venous Identity
Zorina Galis, PhD

Interactions of Matrix Metalloproteinases on Venous Wall Function and Remodeling: Implications on Chronic Venous Disease
Joseph Raffetto, MD

Clinical Venous Growth and Remodeling
Michael Dalsing, MD

(B) Wound Care, Lymphedema & Compression — Oasis 4

Chairs: Joseph Caprini, MD; Alessandra Puggioni, MD

Develop a Rational Approach to the Evaluation and Treatment of a Variety of Wounds
William Marston, MD

Cutaneous Manifestations of Vascular Disease
Thom Rooke, MD

An Overview of Lymphedema for the Vascular Surgeon
Caroline Fife, MD

Mixed Arterial and Deep Venous Insufficiency of the Lower Extremity
Alessandra Puggioni, MD

Review the Indications, Benefits and Discuss Different Compression Modalities for Venous and Lymphatic Disorders
Joseph Caprini, MD

Understand the Approach to Superficial Vein Ablation in the Face of Manifestations of Venous Insufficiency
Thomas O'Donnell, MD

(C) Deep Venous Disease — Celebrity A-C

Chairs: Suresh Vedantham, MD; Luis Leon, MD

When Should a New Oral Anticoagulant be Used for Acute DVT
Raghu Kolluri, MD

Which Venogram-occult Iliac Vein Lesions Should be Treated?
Paul Gagne, MD

Update on Pivotal Clinical Trials in Deep Venous Disease
Riyaz Bashir, MD

Catheter-directed Thrombolysis for Submassive PE: Use it – It Improves Cardiac Hemodynamics
Tod Engelhardt, MD

Catheter-directed thrombolysis for submassive PE: Not Ready for Prime Time
Akhilesh Sista, MD

Catheter-directed thrombolysis for femoropoliteal DVT: Use it Regularly
Akhilesh Sista, MD

Catheter-directed thrombolysis for femoropoliteal DVT: Don't Use It
Riyaz Bashir, MD

(D) Vascular Medicine & Thrombosis — Oasis 5-7

Chairs: Teresa Carman, MD; Anthony Comerota, MD

The Greatest Paradox in Medicine
Theodore Warkentin, MD

New Observations with IVC Filters
John Rectenwald, MD

Compression is Not a Key Component of Treating DVT Patients: The SOX Trial
Susan Kahn, MD

Compression Remains Important for DVT Patients: Despite the Results of the SOX Trial
Nicos Labropoulos, PhD

Does Idiopathic VTE Require Indefinite Anticoagulation?
Teresa Carman, MD

Insightful Use of the Target Specific Oral Anticoagulants
Thomas Wakefield, MD

The ACCESS Trial: Catheter Based Therapy for Post-Thrombotic Venous Disease
Mark Garcia, MD

What is Chronic Post-Thrombotic Iliofemoral Venous Occlusion: Is it Avoidable? Can it be Corrected?
Anthony Comerota, MD

So my Patient has Lymphedema … Now What?
Thom Rooke, MD

8:00 am – 10:00 am
Poster Hall Open — Celebrity Foyer

8:00 am – 11:00 am
Guest Hospitality — Polo

8:00 am – 9:30 am

SCIENTIFIC SESSION 4

Compression/Wound Care/Lymphedema — Ambassador Ballroom

Moderators: William Ennis, MD; Kathleen Ozsvath, MD

Discussants: 4-15 Frank Padberg, MD; 4-16 Lois A. Killewich, MD; 4-17 Michael Dalsing, MD; 4-18 Manju Kalra, MD

8:00 am – 8:20 am

4-15 Is Superficial Venous Surgery in C6 Patients Justified from a Cost/Benefit Viewpoint

S. Luis, T. F. O'Donnell, Jr., E. Tangney, M. Iafrati; Tufts Medical Center, Boston, MA

OBJECTIVE: The SVS/AVF Venous Leg Ulcer (VLU) Guidelines recommended endovenous ablation (EVA) of superficial venous reflux to prevent recurrence with a strong recommendation (Grade 1, level of evidence B). Although EVA has not been shown to improve healing rates, when viewed as a continuum of care, recurrence contributes to the more clinically relevant measure of ulcer free days. The ESCHAR trial reported that on average, over a 3 year period, the surgery group had 15 more ulcer free weeks than the compression group. We have previously shown that EVA increased the cost of care in C6 patients compared to compression alone in the first year. We sought to estimate the mid-term costs of EVA and Compression, extrapolating our one year data using the rates of ulcer healing and recurrence in years 2-3 from the ESCHAR trial.

METHODS: We retrospectively identified all C6 patients (n=36) seen in our wound/vein clinic with a minimum of 12 months of f/u. Of these C6 patients, 15 received EVA and 21 did not, based on standard guidelines. We recorded total cost of care associated with VLUs during one year including wound center fees, Visiting Nurse (VNA) costs, relevant inpatient costs, and EVA global reimbursement. All "costs" are dollars received, not charges. Total costs over one year were compared between the two treatment groups. Financial data was then modeled forward using outcome data on healing/recurrence derived from the 500 patient ESCHAR trial.

RESULTS: Ulcer healing and recurrence rates during year 1 were similar in our cohort and ESCHAR (80% healed in the surgery group in both reports; however compression alone healed 61% in our series vs. 82% in ESCHAR. Our actual total costs for the first year of treatment were $9214 for Compression and $15,075 for EVA and Compression. We applied the healing and recurrence rates in years 2 and 3 in the ESCHAR trial to our data (TABLE)

CONCLUSIONS: EVA employed in the treatment of C6 patients resulted in increased total cost in the first year. However our data extrapolated to three years, based on ESCHAR healing and recurrence rates, showed that the cost difference disappeared. These data demonstrate that the clinical benefit of EVA in C6 patients does NOT result in any net increased costs over a 3 year period. EVA treatment of C6 patients appears justified on a cost/benefit basis.

Table title: Mid term medical costs for treating VLU patients with or without EVA.

Primary Data	% healed (1st year)	Total cost (1st year)	Cost/person (1st year)			
EVA + compression (n=15)	80.0%	$226,110	$15,074			
Compression (n=21)	61.9%	$198,954	$9,474			
Extrapolated data	% healed (3 years)	% recurred (years 2-3)	Cost to treat ulcers in years 2-3		Total Cost (years 1-3)	Cost/person (years 0-3)
			Ongoing	Recurrent		
EVA + compression(n=15)	93.3%	11.0%	$30,258	$16,284	$272,653	$18,177
Compression (n=21)	66.7%	19.0%	$193,653	$39,377	$431,985	$20,571

8:20 am – 8:40 am

4-16 A Randomized Trial of Elastic Compression Systems with High and Very High Sub-bandage Pressure Values in the Prevention of Recurrence of Venous Ulceration

D. J. Milic[1], S. Zivic[1], D. Peric[1], J. Petrovic[1], D. Bogdanovic[2]; [1]Clinic for vascular surgery, Clinical Centre Nis, Nis, Serbia, [2]Medical school Nis, Nis, Serbia

OBJECTIVE: Venous leg ulcers (VLU) are a major health problem because of their high prevalence and associated high cost of care. An estimated 1.5% of European adults will suffer a VLU at some point in their lives. Despite the widespread use of compression stockings recurrence rates are high and range 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 should compression hosiery be worn after ulcer healing and which class of compression hosiery achieves better results in the prevention of VLU recurrences.

METHODS: An open, prospective, randomized, single-center study, with a 5-year follow-up, was performed in order to determine the efficacy of two different strengths of compression systems (with high and very high sub-bandage pressure values) in the prevention of VLU recurrences. One hundred and fifty eight patients (76 men, 82 women; mean age 55 years) with recently healed venous ulcers and no significant arterial disease, rheumatoid disease, or diabetes mellitus, were randomized into 2 groups: Group A) 78 patients who were wearing a heelless open-toed elastic compression device knitted in tubular form - Tubulcus® (Laboratoires Innothera, Arcueil, France), and Group B) 80 patients who were wearing a compression system consisted of Tubulcus® compression device and one elastic long stretch bandage (15cm x 5m) (Niva, Novi Sad, Serbia). Patients were instructed to wear compression systems during day and night. One pair of Tubulcus® compression device was changed every six months and elastic bandage was changed every three months. The main outcome measures were recurrence of leg ulceration and compliance with the treatment.

RESULTS: Fourteen patients did not comply with their randomized compression class (9 (5.69%) in group B and 5 (3.16%) in group A) while additional 12 patients dropped out from the study for various reasons (7.59%). Overall, 132 patients completed the study (66 in group A and 66 in group B). Mean sub-bandage pressure value in group A and B was 32 mm Hg and 58 mm Hg, respectively. Recurrent leg ulceration by 5 years occurred in nine patients (6.82%). Recurrence occurred in 7 patients (10.6%) in group A and in 2 patients (3.03%) in group B.

CONCLUSIONS: The results obtained in this study suggest that compression systems with high and very high sub-bandage pressure values provide low recurrence rate of venous leg ulcers.

8:40 am – 9:00 am

4-17 Variability in Compression Provided By Commercial Stockings

H. Ma, J. Blebea; The University of Oklahoma, Tulsa, OK

OBJECTIVE: Compression stockings are commonly prescribed by physicians for lower extremity edema and venous insufficiency. However, there is no data available for clinicians to assess the relative quality of various brands, particularly low-cost generics now available directly to consumers via the internet. We examined the actual compression provided by stockings from multiple manufacturers.

METHODS: A total of 36 class 2 (20-30mmHg) men's medium sized below knee compression stockings from six different manufacturers (n=6 of each brand) with approximately the same quality and materials were chosen to be studied. Identifying brand names were removed and they were randomly and blindly tested by a technician in accordance to accepted industry standards. A calibrated constant rate of extension tensile instrument (Zwick Z010, Germany) was utilized and the tension generated by the stockings at the ankle and calf was measured using average circumference sizes. All measurements were done in duplicate and data expressed as mean + standard error of the mean.

RESULTS: The compression pressures generated by the stockings were all within the stated range of 20-30 mmHg, but they were significantly different from each other both at the ankle and calf (ANOVA P<0.0001; Table 1). The expected pressure gradient between the two locations varied but one stocking, brand A, had only a minimal 2 mmHg (8%) gradient which was significantly less then all of the other tested brands. Cost analysis demonstrated that brands D and F were significantly lower in price but they provided similar absolute compression and pressure gradients as the more expensive brands.

CONCLUSIONS: Although all the stockings provided the advertised degree of ankle compression, there is a significant variability both in the absolute pressures and in the pressure gradients generated from the ankle to the calf, felt to be functionally important for venous flow. The cheaper stockings offered the same degree of compression as the more expensive brands. These results suggest the need for such data to be made available to clinicians so that they may properly advise patients when prescribing this therapy.

Table 1. Brand comparison of compression pressures, gradients and prices.

Brand	Ankle Pressure (mmHg)	Calf Pressure (mmHg)	Pressure Gradient	Pressure Gradient Reduction	Price (per pair)
A	23.22 ± 0.34	21.21 ± 0.26	**2.01 ± 0.50***	**-8%#**	$61.80
B	23.66 ± 0.29	15.62 ± 0.22	8.04 ± 0.39	-34%	$63.96
C	23.30 ± 0.27	13.98 ± 0.16	9.31 ± 0.26	-40%	$62.38
D	25.72 ± 0.21	16.38 ± 0.35	9.34 ± 0.40	-36%	**$26.04†**
E	27.74 ± 0.32	16.29 ± 0.22	11.45 ± 0.40	-41%	$62.39
F	26.85 ± 0.44	16.15 ± 0.16	10.70 ± 0.49	-40%	**$19.95†**

* P < 0.0001 Compared to pressure gradient among all brands.
# P<0.001 Compared to the pressure gradient reduction among all brands.
† P<0.001 Compared to the price per pair of stockings among all brands.

9:00 am – 9:20 am

4-18 Vascularized Lymph Node Transfer for Lymphedema: Anatomic Comparison of the Supraclavicular and Thoracodorsal Lymph Node Flaps

C. Pannucci[1], P. A. Gerety[2], M. N. Basta[2], A. R. Wang[2], C. Mies[2], P. Zhang[2], S. K. Kanchwala[2]; [1]University of Utah, Salt Lake City, UT, [2]University of Pennsylvania, Philadelphia, PA

OBJECTIVE: Microvascular transfer of lymph nodes has recently re-emerged as a treatment option for lymphedema. Little has been reported about the anatomy of the supraclavicular (SC) and thoracodorsal-based axillary (TD) flaps. This study describes the anatomy of these flaps including pedicle characteristics, lymphatic contents, and harvest technique.

METHODS: Five adult female fresh cadavers were used. Bilateral SC and TD flaps were dissected from each cadaver. The pedicle characteristics and lymph nodes were quantified by the surgeon in each flap and then verified by a pathologist grossly and microscopically. Statistical comparisons were performed using student's t-test.

RESULTS: 10 SC flaps (Figure 1) and 10 TD flaps (Figure 2) were harvested and quantified. The SC flap pedicle (transverse cervical) had an artery and vein caliber of 3.1mm and 2.8 mm with a pedicle length of 3.3cm. The external jugular vein was included and was 7.9 mm in diameter. There were no statistical differences between the right and left sides. The senior author found 2.5 lymph nodes (range 0-5) while the pathologist found 2.6 grossly and 3.0 microscopically (range 1-8). All SC flaps were found microscopically to have at least one lymph node. The left SC flap had critical anatomic variability and the thoracic duct was not readily identifiable. SC and TD flaps were not significantly different in vessel caliber or lymph node count. The TD flap has significantly longer pedicle and higher weight. One TD flap was found to contain no lymph nodes. There were no significant differences between the number of nodes noted by the surgeon and the pathologists. Gross micro images (Figure 3) show lymph nodes in the supraclavicular specimen (left) and thoracodorsal specimen (right).

CONCLUSIONS: The SC flap harvested with a skin island has lower weight and similar number of nodes as the TD flap giving it a higher nodal density. Both flaps have pedicles that readily allow microvascular transfer. The SC flap has the additional advantage of avoiding iatrogenic limb lymphedema. Importantly, a surgeon's assessment of the lymph nodes in a flap is concordant with a pathologic examination.

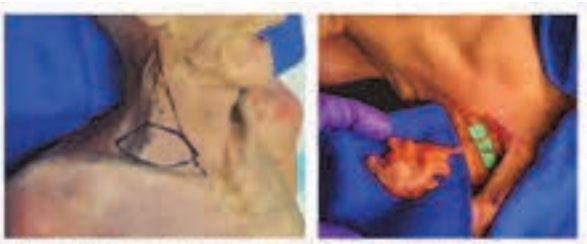


Figure 1. Supraclavicular (SC) flap design (left) and after harvest (right) with pedicle demonstrated (transverse cervical artery and vein).

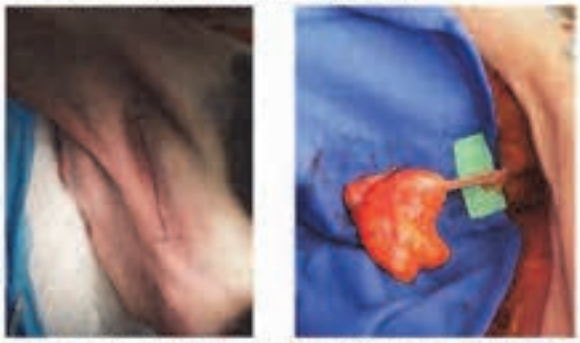


Figure 2. Thoracodorsal-based axillary flap (TD) incision design (left) and after flap harvest (right) with pedicle demonstrated (thoracodorsal artery and vein).

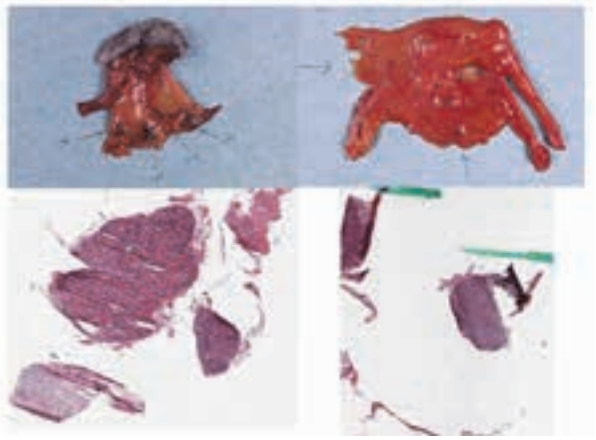


Figure 3. Gross-micro photos of lymph node specimens

9:20 am – 9:25 am

Q4-9 Use of Compression Stockings in Chronic Venous Disease: Validation of a New Device to Assess Patient Compliance

J. Uhl[1], J. Benigni[2], M. Chahim[2], A. Cornu-Thendard[2]; [1]University Descartes, Trielsur seine, FRANCE, [2]University Descartes, Paris, France

OBJECTIVE: Medical Compression stockings (MCS) are considered the cornerstone of treatment in chronic venous disorders (CVD). However, they fail in many patients for varied reasons: pressure applied or the size could be inaccurate or inappropriate, unsuitable temperature, or acceptance may be difficult in the elderly. But more commonly patients are simply unable or unwilling to apply the stockings on a regular daily basis - poor patient compliance.

The few studies regarding compliance have shown it to be surprisingly low, even in the case of leg ulcers: According to Raju, Erickson and Heinen, only about one third of their patients wore the prescribed stockings on a regular basis. We believe that the major issue is the lack of a means to assess compliance in the wearing of the MCS: the real wearing time of the MCS cannot be controlled or monitored adequately, and we must rely on the testimony of the patients. The objective of this study is to validate the use of a new device, the thermotrack®, to accurately assess the compliance of the wear of MCS. This is the only way to know the real compliance of wearing MCS.

METHODS: Ten healthy students (5 male and 5 females) average age 27 y were asked to put MCS (providing an interface pressure of 15-20 mmHg at point B1) every day for one week and to complete a daily questionnaire regarding the exact schedule of their use , including precise times of putting the stockings on, removal and washing of the stockings.

All the stockings were fitted with a thermotrack device (Progres plus, France), sewn into the

hem of the MCS. It is a small disk the size of a watch battery (7 mm diameter, 2 mm thickness) continuously recording the temperature (every 10 minutes, accuracy of 1 °C) during the whole week of use. The recorded data were then analysed by a dedicated reader and software to provide a thermal curve.

RESULTS: We found a perfect concordance of the recorded temperature with the daily events reported by the subjects on the questionnaire: 100% of the events (donning, removing, washing) were identified by the temperature curve.

Conclusion: the thermotrack® device is accurate in tracking patients' compliance with applying MCS. Measurement of patient compliance using this device in larger studies with CVD patients we believe will lead to better efficacy of compression therapy.

9:25 am – 9:30 am

Q4-10 The Visible Lymphatic Vessels of the Lower Extremities - A Preliminary Study by the Contrast Ultrasonography

S. Matsubara[1], J. Maegawa[1], S. Kitayama[1], T. Mikami[2], K. Hirotomi[2], E. Adachi[2], S. Kagimoto[2], Y. Sasaki[3], Y. Maruyama[3], Y. Yabuki[2]; [1]Yokohama City Univ, Kanagawa, Japan, [2]Yokohama City Univ., Kanagawa, JAPAN, [3]KKR Tokai Hospital, Aichi, Japan

OBJECTIVE: Lymphoscintigraphy (LS) is a standard diagnostic imaging for the limbs in patients with lymphedema, and also a good modality for functional assessment of lymphatic flow. However, this modality could not reveal individual lymphatic vessels, which are candidate for lymphaticovenous anastomosis. We report a preliminary study to detect the lymphatic vessels and observe its flow in real time in the lower extremities of the healthy volunteer, using the contrast-enhanced ultrasonography (ce-USG).

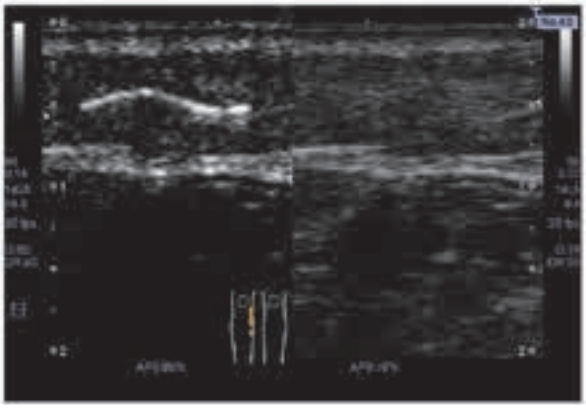
METHODS: The lymphatic vessels of the lower extremities were examined in 10 limbs of 10 healthy volunteers. The all was female and had a mean age of 42.5 years. First, the superficial lymphatic vessels identified and marked by the ICG fluorescence lymphography (ICG-LG). Next, the contrast agent, Perflubutane (PFB) was injected to the dorsum, the lymphatic vessels and lymph flow with contrast agent were

observed by ce-USG at the marked area. To investigate the optimal condition of visualization, the number of injection points was varied in 1, 2 and 4 sites, and the volume of agents in 0.1, 0.2 and 0.8 ml in total.

RESULTS: No remarkable side effect was encountered in this study. The lymphatic vessels were well visible along the line marked by ICG-LG in the all cases when the contrast agent injected 0.8 ml. The lymphatic vessels run through superficial subcutaneous layer around the GSV in a continuous fashion from the dorsum to the groin [figure]. No lymphatic vessel perforating the fascia was noted. On the inguinal region, some lymphatic vessels come into the lymphatic node (LN) and the LN was enhanced clearly. More lymphatic vessels could be found depend on the number of the injection points. The lymphatic flow moved clearly in rhythm to manual lymph drainage.

CONCLUSIONS: The study shows that the ce-USG could be useful diagnostic modality to detect clearly normal lymphatic vessels and evaluate its functional flow in real-time fashion in the normal limbs. In lymphaticovenous anastomosis treatment for lymphedema in the selected patients, it is important to detect functional lymph vessels for the long-term patency and decreasing volume of diseased limb. As the lymphatic flow could be changed from superficial dominant to deep dominant in lymphedema patients, further study to investigate the relation between superficial lymphatic flow and deep lymphatic flow is necessary in patients with lymphedema.

The lymphatic vessel



9:30 am – 10:00 am

Coffee Break — Celebrity D-H

10:00 am – 12:00 pm

PRESIDENT'S SESSION — Ambassador Ballroom

10:00 am – 10:05 am
Recognition of John Bergan, MD
Peter Gloviczki, MD

10:05 am – 10:15 am
2014 Servier Traveling Fellowship Reports
Rafael Malgor, MD
Adam Ring, MD

10:15 am – 10:20 am
2014 BSN Jobst Research Grant Winner - Interim Report
Harry Ma, MD

10:20 am – 10:35 am
AVFF Update
Peter Pappas, MD

10:35 am – 10:45 am
VLU Guidelines
Marc Passman, MD

10:50 am – 10:55 am
VQI Update
Jose Almeida, MD

10:55 am – 11:00 am
JVS-VL Status Report
Bruce Perler, MD

11:00 am – 11:15 am
Presidential Address Introduction
John Blebea, MD, MBA

11:15 am – 12:00 pm
Presidential Address
Fedor Lurie, MD, PhD

12:10 pm – 1:10 pm
Member Business Luncheon — Master's Plaza

1:10 pm – 3:10 pm
SCIENTIFIC SESSION 5
Superficial Venous Disease — Ambassador Ballroom

Moderators: Antonios Gasparis, MD; Harold Welch, MD
Discussants: 5-19 Kathleen Gibson, MD; 5-20 Steven Elias, MD; 5-21 Thomas O'Donnell, MD; 5-22 Brajesh Lal, MD; 5-23 Daniel Monahan, MD; 5-24 Lowell Kabnick, MD

1:10 pm – 1:30 pm
5-19 The Effect of Obesity on Long-term Outcomes After Ultrasound-guided Foam Sclerotherapy
K. Darvall, H. Davies, G. Bate, A. Bradbury; Birmingham University Department of Vascular Surgery, Solihull, United Kingdom

OBJECTIVE: To examine whether body mass index (BMI) affects long-term outcomes, both physician- and patient-reported (PROMs), after ultrasound-guided foam sclerotherapy (UGFS).

METHODS: BMI was calculated in 116 consecutive patients undergoing UGFS between April 2005 and September 2006. Patients were reviewed after 5y and underwent clinical examination, duplex ultrasound, and completed quality-of-life questionnaires.

RESULTS: 95 patients (135 legs) attended follow-up (82%). 29 patients (41 legs) were normal-weight (BMI <25); 48 patients (69 legs) were overweight (BMI 25-29.9); 18 patients (25 legs) were obese (BMI >30). More obese patients than normal-weight patients had visible VV at 5y (56% vs. 15%, P<0.0005; X2 trend). CEAP C and venous clinical severity score (VCSS) were worse in overweight and obese patients than in normal-weight patients pre-treatment (both P<0.0005; Jonckheere-Terpstra test) and at 5y (P=0.004 and P=0.002 respectively). Mean CEAP C improvement was unaffected by BMI, however, VCSS improvement was better in overweight and obese patients (P=0.027).

AVSS and SF12-PCS scores were worse in overweight and obese patients pre-treatment (P=0.003 and P=0.010 respectively; J-T test); but by 5y there were no significant differences across the groups. Mean AVSS improvement was better in overweight and obese patients (P=0.019). There was no difference in satisfaction across groups. More obese patients than normal-weight patients had recanalisation of treated veins at 5y (60% vs. 29%, P<0.0005; X2 trend). They were also more likely to have required re-treatment by 5y (28% vs. 7%, P=0.026).

CONCLUSIONS: Despite more severe venous disease at baseline, overweight and obese patients had greater symptomatic improvement after UGFS than normal-weight patients. Although more likely to have recanalisation and recurrence, their long-term satisfaction remained high.

1:30 pm – 1:50 pm
5-20 Three-year Follow-up of First Human Use of Cyanoacrylate Adhesive for Treatment of Saphenous Vein Incompetence
J. I. Almeida[1], J. J. Javier[2], E. G. Mackay[3], C. Bautista[4], D. Cher[5], T. M. Proebstle[6]; [1]Miami Vein Center, Miami, FL, [2]Vein Center at Physicians Regional, Naples, FL, [3]Mackay Vein Institute, Largo, FL, [4]Canela Clinic, La Romana, Dominican Republic, [5]Wild Iris Consulting LLC, Palo Alto, CA, [6]University Clinic of Mainz, Mannheim, Germany

OBJECTIVE: To evaluate the mid-term safety and efficacy of endovenous cyanoacrylate (CA) embolization of incompetent great saphenous veins (GSVs).

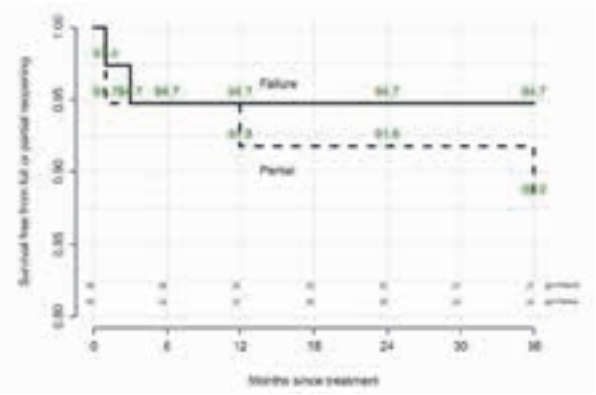
METHODS: Incompetent GSVs in 38 patients with signs and symptoms of chronic venous disease were embolized by CA bolus injections under ultrasound guidance without perivenous tumescent anesthesia or graduated compression stockings. Treatment success was defined as occlusion of the treated vein segment as assessed with duplex ultrasound. Partial recanalization was reported if flow was

observed in a vein segment 5 cm. Venous Clinical Severity Score (VCSS) assessments were performed preoperatively and at each follow-up visit (1, 3, 6, 12, 24 and 36 months).

RESULTS: Kaplan-Meier analysis demonstrated successful venous occlusion in 94.7% [95% CI 87.9 - 100%] at 36 months follow-up; 2 failures and 4 partial recanalizations were observed (Fig. 1). The mean diameter of the treated veins was 6.7mm, the mean treatment length was 33.2 cm. The VCSS improved in all patients from a mean of 6.1 at baseline to 1.8, 1.7, 1.3, 1.5, 2.5 and 2.2 at 1, 3, 6, 12, 24 and 36 months, respectively (p<.0001). The sample size was too small to detect whether partial or complete recanalization impacted VCSS. Threadlike thrombus or glue extensions across the SFJ were seen at the 48-hour follow-up in 21.1% of patients, but resulted in no thromboembolic sequelae. At 30 months post-procedure, one iliofemoral deep vein thrombosis in the index leg required anticoagulation and was judged unrelated to saphenous closure; this patient refused further work up for a May-Thurner lesion.

CONCLUSIONS: The first human use of endovenous CA for GSV closure proved feasible, safe and effective. Thrombus or glue extensions seen initially were of no consequence and resolved spontaneously without anticoagulation. Clinical efficacy was maintained over a period of 36 months and is comparable to thermal technologies reported to date.

Fig. 1 Saphenous Vein Occlusion With Cyanoacrylate Adhesive At 3-Years Follow-up



1:50 pm – 2:10 pm

5-21 Factors That Influence Immediate Perforator Vein Closure Rates Using Radiofrequency Ablation, Laser Ablation or Foam Sclerotherapy

E. Hager[1], A. Steinmetz[1], C. B. Washington[1], T. Wu[1], M. J. Singh[1], T. S. Kenkre[2], E. Dillavou[1]; [1]University of Pittsburgh Medical Center, Pittsburgh, PA, [2]University of Pittsburgh, Pittsburgh, PA

OBJECTIVE: Perforator vein closure for the treatment of advanced chronic venous insufficiency has been shown to be effective using radiofrequency (RF), endovenous laser therapy (EVLT) or ultrasound-guided foam sclerotherapy (UGFS). Variables that influence the initial perforator closure rates have yet to be defined.

METHODS: This retrospective analysis was performed on a prospectively managed database of perforator vein treatments performed at a single institution from February 2013 to July 2014. A Duplex scan was performed at 2 weeks following the procedure. Standard statistical methods were used to compare subgroup characteristics. Univariate and multivariate analyses were performed using SAS v9.3.

RESULTS: 296 perforator ablations were performed on 112 patients. Prior to perforator ablation, if present, superficial venous reflux was appropriately treated. The majority of patients had advanced chronic venous insufficiency and included: C2- 1%, C3- 14.2%, C4- 17.6%, C5-14.2% and C6-53%. Of the 296 procedures, 62 (21%) underwent EVLT, 93 (31%) RFA and 141 (48%) UGFS. The average perforator size was 4.9 ± 1.5 mm prior to treatment. At two weeks, closure rates were statistically lower for UGFS (57.1%) when compared to RFA (72.2% P = .05) but failed to reach significance when compared to EVLT (61.3%, P = .26). Overall perforator vein closure rates based on CEAP classification ranged between 45.1% (C 4) to 69.1% (C 3), with CEAP 6 patients having a 65.6% closure rate (P=0.42). Subgroup analysis failed to show an impact of deep vein reflux, anticoagulation, obesity or perforator size on vein closure. Factors that negatively affected vein closure rates on univariate analysis were pulsatility in treated vein (P=0.06), diuretic use (P=.05) and COPD (P=.03). Failed UGFS perforator closure was successful with subsequent heat ablation (P = .0008), but repeat UGFS failed to prove successful (Table 1 (P>.10)). There were 13 post-procedure deep venous thromboses found (4.4%), with 5/13 in muscular calf veins and 8/13 occurring in isolated tibial veins.

CONCLUSIONS: Thermal ablation of perforating veins appears to be more successful than UGFS by the data presented here. Factors that lower pathologic perforator closure rates include: venous pulsatility, diuretic use and COPD. Recanalized vein segments after UGFS have a significantly higher chance of closure with subsequent heat ablation. CEAP 6 patients have similar closure rates compared to other CEAP categories.

Table 1: Closure rates of pathologic perforating veins by modality as a stand alone treatment and after failed UGFS Variable

Variable	Total (N=296)	EVLT (N=62)	RFA(N=93)	UGFS(N=141)	P Value
Closure after single treatment	62.7%	61.3%	72.2%	57.1%.	.05*
Closure after previous failed UGFS	75.3%	84.6%	89.1%	50%	.0008

*RFA vs Foam

2:10 pm – 2:30 pm

5-22 Venous Drainage in Controls and Patients with Chronic Venous Insufficiency

C. R. Lattimer[1], E. Kalodiki[1], E. Mendoza[2]; [1]Ealing Hospital & Imperial College, Middlesex, United Kingdom, [2]Venenpraxis, Wunstorf, Germany

OBJECTIVE: The venous filling index (VFI) of air-plethysmography (APG) provides a global measurement of venous filling in mL/s following an elevation to dependency manoeuvre. It is responsive to treatments on reflux. However, the venous drainage index (VDI) following a dependency to elevation manoeuvre has never been investigated. The aim was to establish normal venous drainage values in healthy controls and compare them to patients with superficial venous insufficiency (SVI).

METHODS: Filling and drainage manoeuvres using APG (Fig 1) were performed 48 times on healthy legs (16 controls) and 41 times on legs (15 patients) with SVI awaiting intervention. Tests were performed 3 times/leg for reproducibility. The VFI (mL/s) was calculated in the usual way, by dividing 90% of the venous filling volume (90VV) by the venous filling time (VFT90), therefore VFI = 90VV/VFT90. The VDI (mL/s) was calculated in the same way: 90% of the venous drainage volume (VDV90) divided by the venous drainage time (VDT90), therefore VDI = 90VDV/VDT90.

RESULTS: Controls: median (inter-quartile range) age 47(33-53) yrs, weight 70(57-87) Kg, height 170(162-173) cm, competent proximal thigh saphenous diameter 4(3.1-4.6) mm. Patients: age 58(53-69) yrs, weight 85(65-96) Kg, height 174(166-183) cm, refluxing proximal thigh saphenous diameter 6.2(5.6-7.1) mm, VCSS 4(3-7), clinical CEAP (C2=8;C3=1,C4=6). The median (inter-quartile range) VFI and VDI in the controls were 1(.8-3) mL/s and 33(22.3-54.9) mL/s, respectively. The VFI and VDI in the patients were significantly faster at 7.7(3.5-11.9) mL/s and 51.4(34-65) mL/s, respectively (Fig. 2). Although the drainage rate (VDI) was faster in the patients the drainage time (VDT90) took slightly longer: controls VDT90 2.4(2.1-3.9)s versus patients VDT90 3.1(2.7-3.5)s, P=.037. This was because the patients had more venous volume to drain. Adjusted to a standard mean for each leg, the reproducibility limits (x3) of the VDI was 40.5(95%CI;36.9-44.1) mL/s in controls and 51.8(95%CI;48.5-55) mL/s in patients.

CONCLUSIONS: Sequential orthostatic manoeuvres using APG are able to measure the contributions of reflux and obstruction (filling and drainage) in patients with chronic venous disorder. This is the first study to evaluate venous drainage using the VDI. It was significantly faster in patients with CVI. The responsiveness of a reduced VDI in patients with chronic venous obstruction to stenting has yet to be determined.

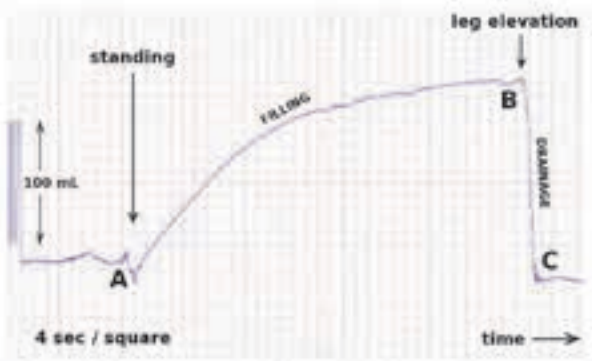


Fig 1. Volume against time APG trace in a normal control leg demonstrating filling (A to B) and drainage (B to C).

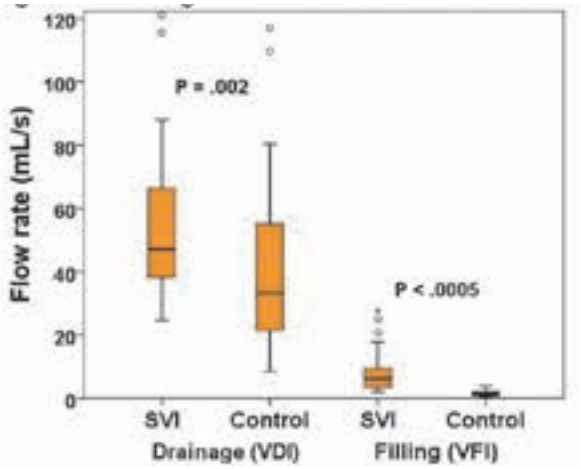


Fig 2. Boxplots comparing the rate of venous filling and drainage (mL/s) in controls and patients.

2:30 pm – 2:50 pm

5-23 The Impact of Race on Advanced Chronic Venous Insufficiency

A. Dua[1], S. S. Desai[2], J. A. Heller[3]; [1]Medical College of Wisconsin, Milwaukee, WI, [2]Southern Illinois University, Springfield, IL, [3]Johns Hopkins Vein Center, Baltimore, MD

OBJECTIVE: The study aimed to determine the association between race and patient variables, hospital co-variates and outcomes in patients presenting with advanced chronic venous insufficiency.

METHODS: The National Inpatient Sample (NIS) was queried for all Caucasian and African American (AA) patients with a primary ICD-9 diagnosis code for venous stasis with ulceration, inflammation, or complications (454.0, 454.1, 454.2) from 1998 to 2011. CEAP scores were correlated with ICD-9 diagnosis. Demographics, CEAP classification, management, length of stay (LOS), and in-hospital mortality were compared between races. Cost differential attributions for procedures were compared using 2014 USD. Statistical analysis was via descriptive statistics, Students t-tests, and Fisher exact testing.

RESULTS: A total of 20,648 patients were identified of which 85% were Caucasian and 15% were AA. Debridement procedures had the highest costs at $6,096 followed by skin grafting cost at $4,089. Table 1 compares the demographics, diagnosis, procedures, and hospital covariates, and charges for these groups. There was an overall decrease in the number of ulcer debridements, vein stripping,

and sclerotherapy procedures between 1998 and 2011 (P<0.05) for both groups. However, AA patients had significantly more ulcer debridements than their Caucasian counterparts.

CONCLUSIONS: AA patients with a primary diagnosis of venous stasis present with more advanced venous disease at a younger age compared to their Caucasian counterparts. This is associated with increased ulcer debridements, DVT rates and hospital charges in the AA cohort. There are no differences in sclerotherapy or skin grafting procedures, LOS or in-hospital mortality between races.

Comparison of demographics, diagnosis, procedures, hospital covariates, and charges for Caucasian and African American Patients

Variable	Caucasian (N=17541)	African American (N=3107)	Significance
Age	68.2 ± 15.8	61.5 ± 16.7	P<0.001
Female	54.5%	50.3%	P<0.001
Number of chronic conditions	4.9 ± 3.0	4.5 ± 2.8	P<0.05
Leg varicosity with ulcer (454.0; CEAP 5, 6)	5952 (34%)	1329 (43%)	P<0.001
Leg varicosity with inflammation (454.1; CEAP 4)	3185 (18%)	327 (11%)	P<0.001
Varicosity of the leg with ulcer and inflammation (454.2; CEAP 5, 6)	6648 (38%)	1249 (40%)	P<0.05
Number of procedures	1.0 ± 1.5	1.2 ± 1.6	P<0.001
Length of stay (median)	5	5	NS
In-hospital mortality	184 (1.1%)	25 (0.8%)	NS
Total costs (2014 USD)	$6,281	$7,116	P<0.001
Elective admission	75.0%	80.0%	P<0.001
DVT (acute or chronic)	819 (4.7%)	202 (6.5%)	P<0.001
Debridement	1817 (10.4%)	457 (14.7%)	P<0.001
Skin graft	33 (0.2%)	7 (0.2%)	NS
Stripping or ligation	1424 (8.1%)	162 (5.2%)	P<0.001
Sclerotherapy	33 (0.2%)	2 (0.1%)	NS

2:50 pm – 3:10 pm

5-24 One Year Outcome of Endovenous Micro-pulsed Laser Ablation for Incompetent Great Saphenous Vein

N. Sakakibara[1], R. Kansaku[1], H. Akashi[1], H. Yamaoka[1], A. Amano[2]; [1]Edogawa Hospital, Edogawa-Ku, Tokyo, Japan, [2]Juntendo University School of Medicine, Bunkyo-Ku, Tokyo, Japan

OBJECTIVE: In vitro experiment; laser emission with micro-seconds pulse width prevents thermal blood coagulation in blood because of thermal relaxation. Initial experience of endovenous micro-pulsed laser ablation (EMPLA) shows acceptable outcome. The aim of this study is to evaluate efficacy and safety of EMPLA after one year follow-up.

METHODS: 1320-nm Nd:YAG micro-pulsed laser with bare fiber was used in 89 limbs (89 patients). Power parameters were pulse width of 100 micro-seconds, peak power of 4000 W, 12 W output, pulse frequency of 30 Hz and LEED of 120 J/cm by using automatic pull-back system. Patients demographics are average age of 67 years old, female 63 patients, and average GSV 3 cm distal SFJ was 9.3 mm. CEAP class was C2: 26, C3: 45, C4: 15, C5: 2, C6: 1. 5 tablets of analgesic were prescribed for occasional postoperative pain. Efficacy evaluation: GSV occlusion rate, GSV shrinkage rate 3 cm distal of SFJ, and CIVIQ2 were evaluated at 1, 3, 6, 12 months. Safety evaluation: EHIT within 2 days, and bruising at 1 week, pain score by VAS (0-100) at 1 week and 1 month, average number of analgesic tablets intake, analgesic free rate were evaluated.

RESULTS: (1) Procedure: Average LEED was 122.7 J/cm. Total energy of 3028 J and total pulse number of 7378 were applied. (2) Efficacy evaluation: GSV occlusion rate was 100% until 12 months. GSV shrinkage rate was 39%, 52%, 66% and 66%, and inner lumen was invisible compressed by thick vein wall after 3 months. CIVIQ2 was 35.1 preoperatively and 27.7, 27.3, 28.2, 24.5 respectively. (3) Safety evaluation: EHIT (class 1-4) was 0%, and bruising appearance rate was 2.2% (2 patients). Average VAS was 2.4 and 0.4. Average analgesic intake was 0.2 tablets, and analgesic free rate was 97% (86 patients).

CONCLUSIONS: EMPLA after 1 year follow-up shows acceptable and promising clinical outcome. This micro-pulsed system could be the next generation of safe and effective endovenous thermal ablation in the near future.

1:10 pm – 4:10 pm

SPECIALTY SYMPOSIA

(E) Allied Health Session — Oasis 1-3

Chairs: Linda Antonucci, RPhS, RVT, RDCS; Jean White-Melendez, RVT, RPhS, FSVU

Introduction and Welcome
Linda Antonucci, RPhS, RVT, RDCS

The Complexities of Venous Anatomy & Physiology Unraveled
Jean White-Melendez, RVT, RPhS

Thorough Evaluation of the DEEP System
Gail Size, BS, RVT, RVS, RPhS, FSVU

Generating an Accurate and Comprehensive Vein Mapping
Jean White-Melendez, RVT, RPhS

Correlating the Ultrasound Findings with the Clinical Picture and Creating a Well-Defined Treatment Plan
Cindy Felty, RN-CNP, FCCWS

Treating the Patient NOT the Diagnostic Findings
Cindy Felty, RN-CNP, FCCWS

Non-saphenous Superficial Vein Reflux: Typical Patterns, What and When to Treat, Complications, Treatment Modalities, and Outcomes
Kandy Hammond, RN, BSN, MBA/HCM

Post Intervention Evaluation: Unearthing the Source of Recurrence
Linda Antonucci, RPhS, RVT, RDCS

Perioperative Duplex Ultrasound Following Endothermal Ablation of the Saphenous Vein: Is it Worthless?
Lowell S. Kabnick, MD, RPhS, FACS, FACPh

Managing Patient Expectations and Improving Patient Outcomes
Cindy Felty, RN-CNP, FCCWS

Perioperative Anticoagulation Management and Outcomes for Endothermal Ablative Surgery
Glenn R. Jacobowitz, MD, FACS, RVT

(F) Part 1: Reimbursement of Wound Centers and Venous Treatment Based on Quality and Value: The Future is Now — Oasis 4

Chair: Thomas F. O'Donnell, MD

Introduction and Overview
Thomas F. O'Donnell, MD

Accountable Care Organizations and Wound Centers
Peter Lawrence, MD

Alternative Quality Contracts: Evidence for Bending the Healthcare Cost Curve
Thomas F. O'Donnell, MD

Bundled Payments for Wound Care
William A. Marston, MD

Quality Measures for Wound Care
Carolyn Fife, MD

Alliance of Wound Care Stakeholders
Marcia Nusgart, R.Ph

Discussion-Questions & Answers

Part 2: Wound Care, Lymphedema & Compression Challenges

Chairs: Joseph Caprini, MD; Alessandra Puggioni, MD

Case Presentations
William Marston, MD
Thom Rooke, MD
Alessandra Puggioni, MD
Thomas O'Donnell, MD

Letterman Top Ten Compression Principles
Joseph Caprini, MD

Discussion – Questions & Answers

(G) Superficial Venous Disease — Celebrity A-C

Chairs: Ellen Dillavou, MD; Steven Elias, MD

RF Ablation
Kathleen J. Ozsvath, MD

Laser Ablation
Jose Almeida, MD

Visual Sclero
Jennifer Heller, MD

Foam
Kathleen Gibson, MD

Cyanoacrylate Glue
Nick Morrison, MD

Phlebectomy – All Types
Mark Passman, MD

Mechanical Occlusion Chemically Assisted/MOCA 1
Anthony Carabasi, MD

(H) Animal Models in Venous Research — Oasis 5-7

Chair: Jose Diaz, MD

Introduction, Animal Models of VT, Where We Are
Jose Diaz, MD

The Use of Flow-mediated Thrombus Resolution Using a Modified IVC Thrombosis Model in Venous Research
Brajesh Lal, MD

The Use of Femoral Vein Electrolytic Injury with Intravital Fluorescence Imaging in Venous Thrombosis Research
Brian C. Cooley, PhD

The Use of a New IVC Recurrence Model in Venous Research
Peter Henke, MD

The Use of a New IVC Stenosis Model in Venous Research
Julia Geddings

The Use of EIM to Create New Models in Venous Research
Jose Diaz, MD

3:10 pm – 3:40 pm

Coffee Break — Ambassador Foyer

3:10 pm – 3:40 pm

Demonstration of the VQI® Varicose Vein Registry (sponsored by the AVF and SVS)

Rancho/Mirage

3:40 pm – 5:10 pm

SCIENTIFIC SESSION 6

Diagnostic Testing/Imaging

Ambassador Ballroom

Moderators: Nicos Labropoulos, PhD; Colleen Moore, MD
Discussants: 6-25 Harry Ma, MD; 6-26 Elna Masuda, MD; 6-27 Joann Lohr, MD; 6-28 Harold Welch, MD

3:40 pm – 4:00 pm

6-25 Real Time Visualization of Lymphatic Dysfunction in Venous Ulcer Patients

E. Sevick-Muraca[1], E. A. Maus[2], R. Guilliod[3], J. C. Rasmussen[3], I. Tan[3], M. B. Aldrich[3], C. E. Fife[2]; [1]University of Texas Health Science Center, Montgomery, TX, [2]Memorial Hermann Hospital, Houston, TX, [3]University of Texas Health Science Center, Houston, TX

OBJECTIVE: Patients with chronic venous insufficiency (CVI) frequently develop lymphedema by an unclear mechanism. Pneumatic compression devices (PCDs) have been shown to benefit venous ulcer healing, presumably by enhanced venous return, but their effect on the lymphatic system is unknown. This pilot study was designed to assess the lymphatic function of patients with venous stasis ulcers including the impact of PCDs on lymphatic function.

METHODS: Included were 12 adult patients with a venous stasis ulcer and CVI. Exclusion criteria included arterial disease and inability to tolerate compression. Near-infrared fluorescence (NIRF) imaging was conducted following an off-label, intradermal administration of indocyanine green (ICG) that is immediately taken up by the lymphatics and subsequently detected with military "night vision" imaging technology After 8 intradermal injections of 25 micrograms of ICG to each leg, baseline imaging was performed. PCD was then applied to one leg for one hour, and imaging continued for 0.5 hr.

RESULTS: CVI patients were noted to have baseline lymphatic abnormalities similar to those in postmastectomy lymphedema, exhibited lymphatic pooling of ICG at ulcer sites, and generally did exhibit contractile, "lymphatic pumping" as seen in normal healthy controls. In response to the PCD, imaging showed new lymphatic vessel recruitment to regions proximal to the wound, lymphatic vessel activation, and enhanced proximal movement of ICG laden lymph.

CONCLUSIONS: This study is the first to demonstrate lymphatic abnormalities are present in CVI, as well as showing that PCDs can enhance lymphatic function among CVI patients. Further research is warranted. This study was approved by the University of Texas IRB and the FDA, and funded in parts by Tactile Systems and the National Institutes of Health.

4:00 pm – 4:20 pm

6-26 Creation and Validation of a Condition-specific Venous Thromboembolism Risk Assessment Tool for Open Ventral Hernia Repair Patients

C. J. Pannucci[1], M. N. Basta[2], J. F. Fischer[2], S. J. Kovach[2]; [1]University of Utah, Salt Lake City, UT, [2]University of Pennsylvania, Philadelphia, PA

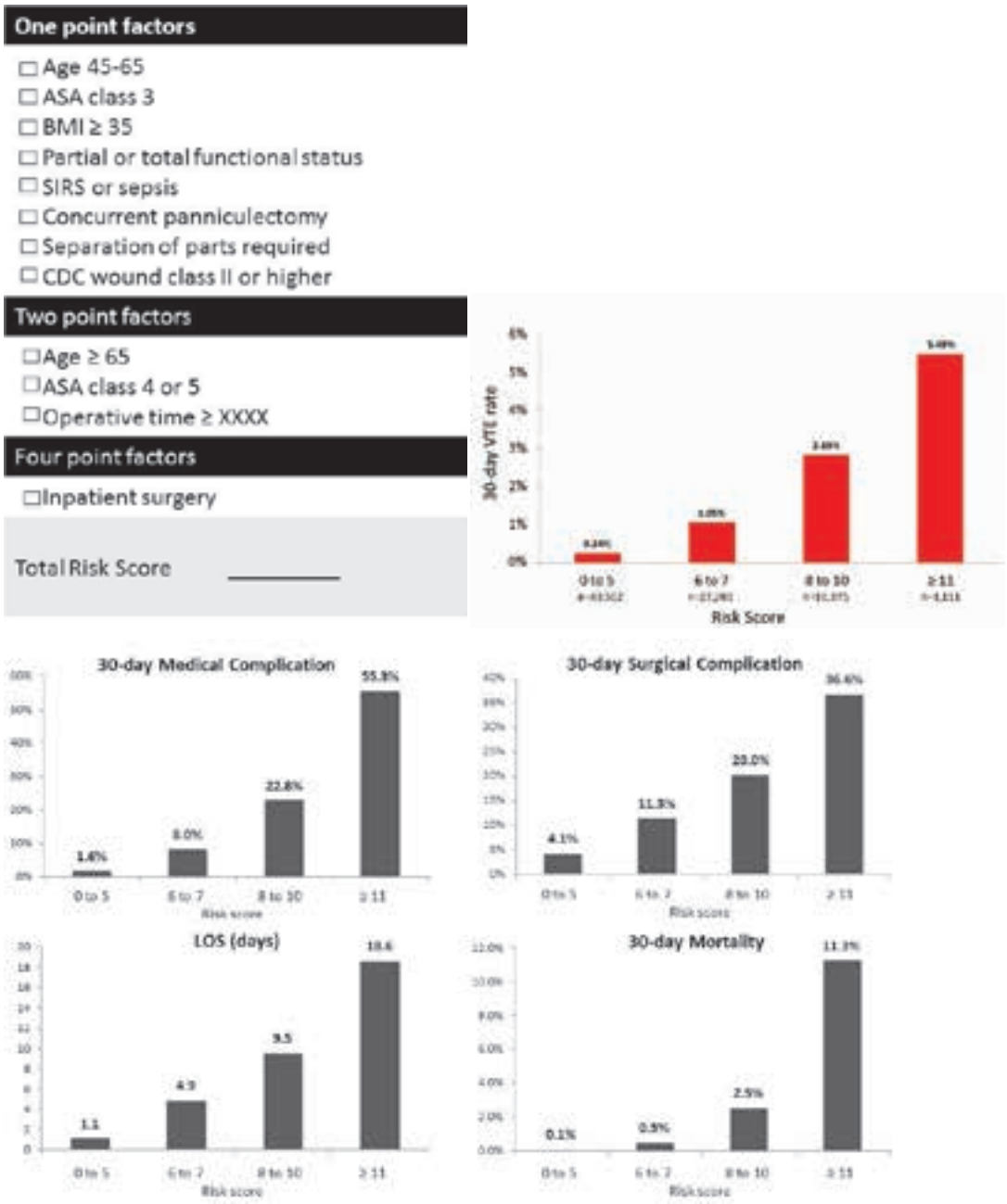
OBJECTIVE: Patients who require open ventral hernia repair (VHR) are at unknown risk of peri-operative venous thromboembolism (VTE) complications. Here, we utilize the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database to identify risk factors for 30-day VTE after open VHR and to create and validate a condition-specific risk assessment tool for open hernia repair patients.

METHODS: Eight years of ACS-NSQIP data were queried using CPT codes to identify patients with open hernia repair. The primary outcome of interest was 30-day VTE, including patients with deep venous thrombosis (DVT) or pulmonary embolus (PE). Regression-based analysis and subsequent bootstrap analysis allowed creation of a weighted, open VHR specific VTE risk assessment model. Risk factor weighting was performed based on beta coefficients. The newly created weighted RAM was then used to risk-stratify patients for both 30-day VTE risk and 30-day risk for other medical and surgical complications.

RESULTS: The ACS-NSQIP database contained 89,935 open hernia repair patients over the queried eight year period. 30-day VTE rate was 1.1%. A twelve factor, weighted risk assessment model (Figure 1) was created using regression-based techniques and validated using bootstrapping. The weighted risk score allowed identification of a 22-fold variability (from 0.24% to 5.49%) in VTE risk among the overall open hernia repair population (Figure 2). Although created to risk-stratify for VTE, the risk score also showed excellent ability to risk-stratify for 30-day medical and surgical complications, inpatient length of stay, and 30-day mortality (Figure 3).

CONCLUSIONS: 30-day VTE risk after open hernia repair is 1.1%, but a large variability (22-fold) in VTE risk exists among the overall hernia population. Here, we have shown that a weighted VTE RAM can quantify VTE risk among the open hernia repair population. Additionally, the calculated VTE risk score can be used to risk-stratify for 30-day medical and surgical complications as well as mortality.

Figure 1: Weighted risk stratification tool



4:20 pm – 4:40 pm

6-27 Increasing the Diagnostic Sensitivity of Non-Invasive Imaging Techniques Before and After Iliac Vein Stenting

E. Murphy, D. Nguyen, E. Varney, C. Stears, S. Raju; The Rane Center at St. Dominic Hospital, Jackson, MS

OBJECTIVE: Intravascular ultrasound (IVUS) is the gold standard to assess iliac vein stenosis. We investigated the diagnostic sensitivity of Duplex Ultrasound (DUS) and Magnetic Resonance Venography (MRV) utilizing area measurements to detect and quantify iliac vein stenosis compared to IVUS. The novel use of area measurements to determine the degree of vessel stenosis varies from traditional duplex methodology which instead relies on visual identification of focal stenosis and local velocity changes. Patient subsets included: symptomatic limbs before stenting to detect native vein stenosis and stented limbs during surveillance to detect stent compression/ restenosis.

METHODS: 109 fresh and 76 stented symptomatic limbs that consecutively underwent IVUS examination during the initial or re-interventional procedure respectively, in the past year were analyzed. To calculate stenosis: With DUS/MRV, the diameter at the narrowest

point in the iliac vein or stent was used to calculate area (πr2); with IVUS, actual stenotic area (planimetry) was used. The degree of stenosis was then calculated from anatomic minimums for the location (CIV=200 mm2; EIV=150 mm2; CFV=125 mm2). Stenosis determined by traditional duplex methodology was also recorded. DUS findings (using traditional method and area method) and MRV findings (area method) were compared to IVUS measurements. An IVUS stenosis of ≥50% was used as the benchmark as this threshold is commonly used in many centers.

RESULTS: Median IVUS stenosis in fresh and stented subjects was 67% (range:25-100%) and 55% (range:28-91%). Traditional DUS demonstrated sensitivity and specificity of 67% and 70%, for detection of native vein stenosis. Similarly poor detection of restenosis was noted in post-stent patients with compression (sensitivity:48%, specificity:86%) and compression/ISR (sensitivity:10.5%, specificity:69%). Conversely, DUS results determined from area pre- and post-stenting compared to IVUS results are presented in Table I, demonstrating improved sensitivity. MRV results are in Table II.

CONCLUSIONS: Diffuse long-segment disease in native iliac veins and stent-compression without focal stenosis in stented limbs, are common findings in patients with iliac vein stenosis/restenosis. Thus, traditional DUS methodology, which relies on identification of focal stenosis with local velocity changes, is unreliable. Using the area method however, DUS becomes a highly sensitive tool to detect vessel stenosis/restenosis. Thus, if DUS suggests stenosis by the area method, IVUS is recommended. If negative, IVUS is likely unnecessary. In this small sample, MRV was not superior to DUS.

Table 1: Sensitivity of DUS Using the Area method for Detection of Stenosis >50% Compared to IVUS

Patients	False Positive	False Negative	Sensitivity	Specificity
Fresh Limbs: Pre-stent n=87	23 (26%)	3 (3%)	95.0%	14.8%
Post Stent: External Compression n=44	20 (45%)	1 (2%)	95.0%	20.0%
Post Stent: Compression + ISR n=32	11 (34%)	2 (6%)	90.4%	15.4%

Table 2: Sensitivity of MRV and DUS using the Area Method Compared to IVUS (n=22)

Criteria	False Positive	False Negative	Sensitivity	Specificity
MRV > 50% stenosis n (%)	6 (27%)	1 (5%)	93.3%	37.5%
DUS > 50 % stenosis n (%)	3 (14%)	0 (0%)	100.0%	25.0%

4:40 pm – 5:00 pm

6-28 The Bull's Eye Sign and Other Femoral and Supra-inguinal Venographic Findings in Patients with Chronic Venous Stasis: A New Classification to Limit the Use of Intravascular Ultrasound (IVUS)

E. Ascher[1], N. J. Bauer[2], J. Eisenberg[2], A. Hingorani[2], N. Marks[2]; [1]Vascular Institute of New York, New York, NY, [2]Vascular Institute of New York, Brooklyn, NY

OBJECTIVE: It is believed that IVUS is mandatory when evaluating common femoral and supra-inguinal veins in venous stasis patients. This is supported by the fact that extrinsic compression of veins does not reproduce images consistent with eccentric stenosis. Yet, IVUS is an expensive device that is often not reimbursed by HMOs.

METHODS: Common femoral and supra-inguinal venograms(110) performed under sedation and local anesthesia in an office setting during 6 months period were randomly selected for analysis. Good quality venographic images were found in 92 cases (78 patients) that also had IVUS data. Of these 60 females (77%) and 18 male (13) patients with ages from 29 to 94 years (mean71±15.4). There were 14(15%) bilateral cases and 47(51%) right-sided. The average CEAP score was 3.27 with CEAP class II-III in 60 cases (65%), class IV-VI in 32(35%). Venograms included visualization of the common femoral, external and common iliac veins and inferior vena cava. These veins were classified as: 1) normal to mild (type I) - vein narrowing or dilatation of ≤ 20% as compared to the adjacent segment, 2) moderate (type II) -≥ 21% - 40%, 3) severe (type III) - ≥ 41% and 5) Bull's eye sign (type IV). The latter was defined as a central circle with minimal or no dye within a dilated vein and forking of the dye around the circle. Gold standard IVUS measurements included the longest and shortest diameters as well as the cross sectional areas of all named vein segments. Area diameter reduction (≥ 50%) or more than double the difference between the 2 diameters measured were considered positive IVUS (PIVUS) exams and an indication for stenting.

RESULTS: In the present series no 1-month mortality or 1-month morbidity was observed in these patients. There was no venographic or IVUS evidence of inferior vena cava stenosis or dilatation in this series. Of the 92 venograms studied, 88 had PIVUS findings and are

distributed in the table 1. The correlation of venographic findings and PIVUS was as follows: Type I cases (26) had 85% PIVUS; Type II (22) had 100% PIVUS; Type III (25) had 100% PIVUS and Type IV (19) had 100% PIVUS.

CONCLUSIONS: Contrary to previous belief there was an almost equal distribution of PIVUS between the left side (43 cases) and the right side (45 cases) in this patient population. If this new proposed classification of venographic findings is confirmed in a prospective evaluation, IVUS may be only required in less than 30% of the cases (28% in this series).

Table 1. Distribution of PIVUS among 88 vein segments with Type I-IV venogram findings:

Venogram	Left Common Iliac Vein	Left External Iliac Vein	Right Common Iliac Vein	Right External Iliac V.	Right Common Fem. V.
Type I	4	4	2	11	1
Type II	6	2	5	9	0
Type III	7	2	5	10	1
Type IV	11	7	0	1	0
TOTALS	28 (32%)	15 (17%)	12 (14%)	31 (35%)	2 (2%)

5:00 pm – 5:05 pm

Q6-11 Patterns of Pediatric Venous Insufficiency

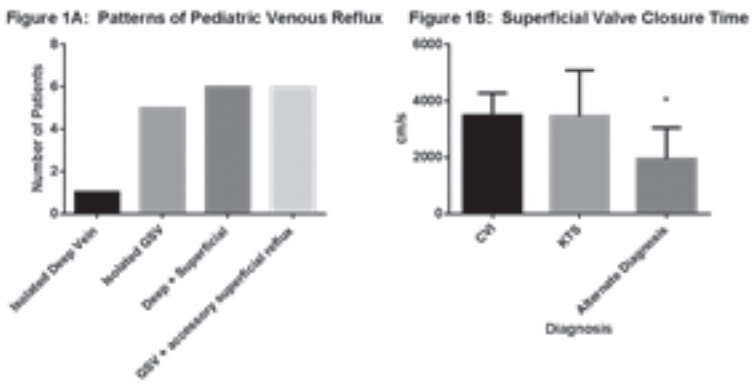
E. A. Andraska, D. Horne, D. Campbell, J. Eliason, T. W. Wakefield, D. M. Coleman; University of Michigan, Ann Arbor, MI

OBJECTIVE: The spectrum of chronic venous insufficiency (CVI) is well documented in adults; clinical guidelines standardize diagnosis and treatment. There is a paucity of data published commenting on pediatric CVI exclusive of Klippel-Trenaunay Syndrome (KTS) and post-thrombotic syndrome.

METHODS: This descriptive study aims to define patterns of pediatric venous insufficiency. All venous reflux studies performed on patients < 18 years of age between 1/2012 and 6/2014 were reviewed. Study indication, patient history, clinical exam, and duplex results were queried and described here. Venous reflux parameters were compared using 1-way ANOVA.

RESULTS: Twenty patients were evaluated. All presented through the vascular surgery or multi-disciplinary venous clinic at a tertiary academic medical center. Indications for referral and study included: swelling (N=10), varicose veins (N=9), and rubor/acrocyanosis (N=3); 2 patients carried a diagnosis of KTS. Mean age at study was 13 years (range 5-17 years). Clinical exam revealed the following: dependent rubor (N=3); edema (N=8); and varicose veins (or venous abnormality concerning for venous malformation) (N=9). There were no stigmata of chronic inflammation, hyperpigmentation or ulceration. 90% of patients (N=18) demonstrated venous reflux by duplex interrogation. Mean right great saphenous vein (GSV) diameter = 0.49cm (range = 0.31-0.66cm); mean left GSV diameter = 0.55cm (range = 0.24-0.93). Figure 1A diagrams the patterns of venous insufficiency. Adjunctive studies were often utilized (including MR-venogram and lymphoscintography). Despite the presence of venous reflux on imaging, an alternate diagnosis was made in 6 of 18 children (33%) including: vascular malformation (N=3), complex regional pain syndrome (N=2), lymphedema (N=1) and acrocyanosis of disuse (N=1). An additional case of KTS was identified. Three cases referred for varicose veins were diagnosed with venous malformation. Maximum GSV diameter, valve closure time and velocity were compared across patients with isolated CVI, KTS or an alternate diagnosis (as above). While there was no significant difference in max GSV diameter or max velocity, superficial valve closure time was significantly increased in the patients with primary CVI and KTS (P=0.0394). (Figure 1B)

CONCLUSIONS: The differential diagnosis for pediatric lower extremity edema and venous varicosities is broad; diagnostic work-up often requires adjunctive studies to secure the appropriate diagnosis. Often there is venous reflux present despite an alternative clinical diagnosis. The clinical significance and natural history of this reflux remains unclear. Ongoing work to expand on venous parameters in healthy pediatric controls is warranted, as is additional follow-up to assess the natural history of pediatric venous insufficiency.



5:05 pm – 5:10 pm

Q6-12 Quantifying Saphenous Recirculation in Patients with Superficial Venous Insufficiency

C. R. Lattimer, M. Azzam, E. Kalodiki, G. Geroulakos; Ealing Hospital & Imperial College, Middlesex, United Kingdom

OBJECTIVE: The great saphenous vein (GSV) in patients with superficial venous insufficiency (SVI) may act as a beneficial conduit for antegrade venous drainage and also as a harmful conduit promoting reflux/recirculation and subsequent skin changes. The aim of this study was to measure the antegrade and retrograde GSV volume displacements during calf compression and release manoeuvres. This was used to quantify harm over benefit with a recirculation index (RCI).

METHODS: Sixteen legs (16 patients, 9 right, 9 male) with SVI were scanned standing, at the upper thigh GSV with duplex. The clinical CEAP was C2=3,C3=2,C4a=6,C4b=4,C5=1. The median (range) age, VCSS and GSV diameter were 63(21-79)yrs, 8(4-16) and 7(5-10)mm, respectively. A manual calf compression and release (MCCR) manoeuvre was performed once, and an automated calf compression and release (ACCR) 3 times for reproducibility. The calf-cuff and inflation/deflation pump (ArtAssist®) provided a cyclical compression pressure of 120 mmHg (3s) with a release time of 16.4s to allow adequate venous refilling (Fig 1.)

RESULTS: Expressed as median [inter-quartile range].1. The ACCR compared to the MCCR resulted in longer reflux duration (16.4[8.2-16.4] s versus 5.7[3.7-6.8]s, P<.0005), higher peak reflux velocities (64.8[38.3-77.4]cm/s versus 58.8[42-68]cm/s, P=.298), higher time averaged mean velocities (TAMV) in reflux (23.5[14.9-27.9]cm/s versus 14.1[9-17.6]cm/s, P<.0005) and greater reflux volume displacements (81.7[38.8-152.8]mL versus 27.3[16.4-53.4]mL, P<.0005).2. Furthermore, there were significant correlations between increasing antegrade volume measurements and increasing reflux volume measurements irrespective of whether ACCR or MCCR was used (Table 1). This implies that the displaced antegrade volume has a large effect on the resulting reflux volume.3. The ratio of reflux volume/antegrade volume (RCI) was 2.14[1.58-2.74] with the ACCR. Adjusted to a standard median for each leg, the reproducibility limits (x3) of the RCI was excellent at 2.14(95%CI: 2.09-2.21).

CONCLUSIONS: This study measured the behaviour of the GSV in terms of harmful reflux over beneficial drainage using the RCI. It recognises that reflux values depend on the type of provocation test and the amount of displaced antegrade volume. This limitation may be overcome by factoring reflux as an expression of antegrade flow using the RCI. Once standardized, a test for quantifying saphenous recirculation may have many clinical applications. The next step will be to correlate the RCI with clinical and quality of life parameters.

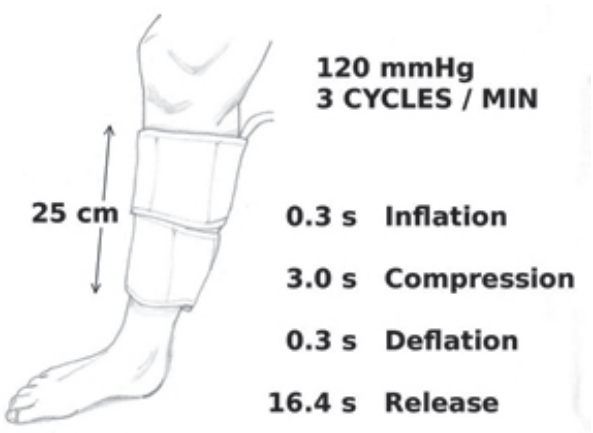


Fig 1. An applied calf-cuff with the automated compression cycle specifications along-side.

Table 1. Correlations between antegrade and reflux flow parameters. Significance is when P<.05.

		ANTEGRADE	REFLUX	r value -Spearman	P value
Manual (MCCR)					
	Duration (s)	1.4 (1.0-1.6)	5.7 (3.7-6.8)	-.189	.483
	TAMV (cm/s)	15.7(10.5-15.7)	14.1(9.0-17.6)	.258	.336
	Volume (mL)	6.0(4.5-17.8)	27.3(16.4-53.4)	.762	.001
Automated (ACCR)					
	Duration (s)	4.0(3.2-5.5)	16.4(8.2-16.4)	-.153	.571
	TAMV (cm/s)	22.4(17.3-25.3)	23.5(14.9-27.9)	.664	.005
	Volume (mL)	37.1(16.3-58.3)	81.7(38.8-152.8)	.841	<.0005

6:30 pm – 10:00 pm

FORUM FINALE

Master's Plaza

The Forum Finale will feature a reception, awards presentation, dinner, live music and an exclusive silent auction. Tickets to the Forum Finale can be purchased at the AVF Registration Booth

POSTER DISPLAYS — Celebrity Foyer and Plazas

PD1 Diagnosis And Treatment Difficulties In The Association Of The Sapheno-popliteal Valve Insufficiency With The Insufficiency Of The Oblique Communicating Vein Of The Calf

V. Ciubotaru; Flebestet Medical Clinic, Bucharest, Romania

BACKGROUND: Over the years we have noticed a particular evolution of the varicose disease: the association of the sapheno-popliteal valve insufficiency with the varicose dilation of the great saphenous vein (GSV) exclusively at the calf level. The particular development that this study aims to observe represents a different type of evolution of the reflux at the small saphenous vein (SSV) level.The popliteo-saphenian reflux causes the SSV to dilate only for 5-10 cm after which it takes the path of the oblique communicating vein of the calf (OCVC) in such way that two distal thirds of the SSV's trunk remain normal (without reflux) while the GSV dilates on the whole length of the calf. This particular evolution of the popliteo-saphenian venous reflux may produce diagnosis and treatment difficulties because the clinic aspect is similar to that of the primary insufficiency of the GSV. The aim of this prospective study is to establish the frequency of those particular cases.

METHODS: The study group consisted in the total number of patients with varices of the inferior limbs treated during 3 years in our clinic. The diagnosis was established after complete clinic and ultrasound examinations. In all these particular cases we performed ambulatory minimal invasive surgical interventions by approaching both saphenian truncks during the same operation.

RESULTS: The total group of patients treated in 3 years: 3304. The particular clinical-anatomical situation described was observed in 357 of the cases (10.8%). The structure according to the gender of the patients: male-209; female-148. The structure according to the age groups: under 20 years: 12; 20-40 years: 184; 40-60 years: 127; over 60 years: 34. The closing-up of the varices occured in 100% of the cases. There was no case of varicose recurrence observed in any post-operatory check-ups (6 month-3 years).

CONCLUSIONS: 1.The popliteo-saphenian reflux transmitted through the OCVC to GSV is quite frequent: 10.8% in our study. 2. The clinical similarity of these particular cases with the primary reflux of the GSV causes diagnosis and treatment difficulties. 3. The correct treatment of such cases: interruption of the popliteo-saphenian reflux; solving of the SSV varices; treatment of the OCVC; approach of the GSV varices. 4. The non-recognition of the popliteo-saphenian reflux and the treatment focused only to the GSV determines a very high rate of recurrence.

PD2 Mechanochemical Ablation For Endovenous Occlusion: The Hungarian Experience

A. Szabo; VP-Med Health and Education Center, Budapest, Hungary

BACKGROUND: New methods for the ablation of varicose veins have changed the treatment concept of the disease. The late results after endothermal ablation or chemical ablation techniques are comparable to coventional surgery, with signifcantly less side effects, less pain, much faster recovery and improvement of the quality of life.

Mechano-chemical ablation uses a rotating wire tip to induce spasm and cause superficial endothelial damage of the varicose vein segment while administering a sclerosant drug to occlude the vessel. The procedure is completely painless, no anesthesia is needed.

METHODS: We treated 116 patients with the mechano-chemical device between 11.05.2013 and 01.09.2014 in Budapest, Hungary. Patients' data: 37 male, 79 female, mean age: 49.4 years. 102 GSV and 14 SSV, CEAP: 2 or 3 in 97% of the cases. Mean vein diameter: 7.1 cm, mean treated segment: 45.7 cm. We used 8.1 ml 2% polidocanol per treatment (0.18 ml/cm) in average. Mean procedure time: 12.8 minutes. All patient received class 2 compression stockings for 2 weeks after the procedure. Patients didn't get anesthetics.

RESULTS: At 1 month control we found partially opened segments in 2 cases (98.3% primary occlusion rate) - both were treated with foam successfully. The measured diameter reduction of the veins were 71% at 1 month, 51% at 3 month. Postoperative phlebitis was found in 7 cases, the symptoms improved quickly with conservative treatment. Patients satisfaction was 100% at 3 months control.

CONCLUSIONS: Mechano-chemical ablation procedure for the treatment of truncal reflux seems to be a reasonable alternative for endothermal procedures with great advantages: does not require anesthesia, eliminates the risk of nerve or skin damage or paresthesia through thermal energy, provides high comfort level and acceptance for the patients.

PD3 Potential Clinical Applications For Electrical Muscle Stimulation In Venous Disease

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BACKGROUND: Venous return to the heart is dependent on a pressure gradient, competent venous valves, and an effective muscular pump. The lower limb muscle pumps have been described as a second heart. Electrical stimulation is a re-emerging mode of therapy that can improve venous blood flow by acting as a pacemaker for these muscle pumps. This systematic review examines the evidence for the use of electrical stimulation in treating venous disease.

METHODS: The MEDLINE and Embase databases were searched to identify all articles relating to application of electrical muscle stimulation in treating venous disease. English language and human limitations were applied.

RESULTS: Forty-six studies met the inclusion criteria. Statistical analysis was not possible due to study heterogeneity. Results are presented in terms of effect on venous haemodynamics, reduction of oedema and thromboprophylaxis. Electrical parameters varied in description of waveform, frequency (1-250Hz), pulse width (200-500µs) and intensity. Electrode placement varied from direct (muscle belly) to indirect (nerve) stimulation, which would affect the muscle bulk activated. Outcome measures include air,

strain gauge and venous occlusion plethysmography and duplex scans. Nonetheless, all studies (n=11) showed an improvement in venous haemodynamics with electrical stimulation. Variations in electrical parameters affect venous haemodynamics. For example, a longer pulse duration (300µs) and higher frequency (35Hz) produced a higher peak venous velocity. However, electrical stimulation only produced up to 60% ejected volume compared to voluntary contraction. Electrical stimulation produced comparable venous haemodynamics to intermittent pneumatic compression. One of the main incentives of early trials on electrical stimulation was as a mode of thromboprophylaxis, but diagnostic tests were a limitation. One of three recent studies reported positive results on the use of electrical stimulation in thromboprophylaxis. Four trials examined the effect of electrical stimulations on induced oedema in healthy individuals; four of which showed improvements. One trial on patients with C3 disease demonstrated a resolution and reduction of oedema in 59.4% and 34.4% of patients, respectively over a 30 day trial.

CONCLUSIONS: The positive effect of electrical stimulation on venous haemodynamics has not translated into clinical practice. A consensus needs to be reached on reporting nomenclature to allow comparison between trials. More research needs conducted on the short (thromboprophylaxis) and long term (venous disease) therapeutic effects of electrical stimulation.

PD4 Pre-operative Cardiovascular Comorbidities Are Independent Predictors Of Venous Thromboembolism Following Total Knee Arthroscopy

K. H. Nagarsheth, J. Schor, J. Deitch; Staten Island University Hospital, Staten Island, NY

BACKGROUND: Total knee arthroscopy (TKA) is the most commonly performed orthopedic procedure in the United States. Our goal was to determine the pre-operative and post-operative risk factors that predispose patients to developing venous thromboembolism (VTE) after TKA.

METHODS: The National Surgical Quality Improvement Program (NSQIP) database was queried, from the years 2006 to 2011, to identify patients who underwent total knee arthroscopy (TKA). The presence or absence of post operative VTE, patient demographics, comorbidities, perioperative data, and outcomes were collected and analyzed.

RESULTS: There were a total of 29,139 TKA performed between 2006 and 2011. There were 503 patients who had VTE (VTE group) and the remainder did not have VTE (N-VTE group). The incidence of VTE after TKA was 1.73%. The VTE group had a higher proportion of patients who were greater than 80 years old (11.3% v. 9.5%, p=0.04), had recent MI (27.4% v. 0.04%, p<0.01), prior PTCA (6.67% v. 4.64%, p=0.03), and rest pain/gangrene (27.4% v. 0.04%, p<0.01). Though the proportion of current smokers was not significantly different (8.35% v. 8.47%, p=0.92), the pack year history was higher in the VTE group (4.82±1.17 pack/yr v. 4.52±0.17 pack/yr, p<0.01). Multivariate regression analysis demonstrated that recent MI and the pre-operative presence of rest pain/gangrene were most significantly associated with VTE after TKA [odds ratio (OR) 901.9, 95% confidence interval (CI) 489.5 to 1661. 6]. In addition recent chemotherapy (OR 5.5, 95% CI 1.65 to 18.6) and presence of SIRS (OR 3.7, 95% CI 1.3 to 10.4) were also determined to be risk factors.

CONCLUSIONS: Pre-operative cardiovascular comorbidities represent important independent risk factors for the development of post-operative VTE in patients undergoing TKA. Randomized prospective studies should be performed to determine if peri-operative VTE prophylaxis is beneficial in these high-risk patients.

PD5 Changes In The Rate Of Prophylactic Vena Cava Filter Insertion At A University Hospital

A. H. Smith, D. Adrahtas, D. Elitharp, A. P. Gasparis, N. Labropoulos, A. K. Tassiopoulos; SUNY Stony Brook School of Medicine, Stony Brook, NY

BACKGROUND: We previously demonstrated a high rate of prophylactic vena cava filter (VCF) insertion at our institution. We have since attempted to restrict the use of VCF to indications supported by Level I evidence. This study was designed to assess the success of our interventions and determine change in clinical practice.

METHODS: All patients receiving VCF between 2007-2009 and 2012-2014 at a university hospital were reviewed. After assessing the use of VCF in the first period a meeting was done among the Departments of Radiology, Vascular Surgery and Trauma. A policy was implemented in order to avoid the inappropriate use of VCF. Data were prospectively collected in the second period to assess the effect of our intervention.

RESULTS: There were 156 patients that underwent VCF placement from 2012 to 2014. VCF placement had an absolute indication in 84%, relative in 9% and prophylactic in 7%. This data strongly contrasts our previous experience from 2007 to 2009. In the earlier series, a total of 244 filters were placed, in which 54% of patients had an absolute indication, 14% relative, and 32% prophylactic. The difference in the total number of filters inserted was mainly attributable to a decrease in use of VCF for prophylaxis and relative indications. Whereas 76 prophylactic filters were placed between 2007-2009, only 11 were placed between 2012-2014; 33 filters were placed for relative indications from 2007-2009, while 14 were placed from 2012-2014. This change in practice was most notable within the department of trauma and surgical critical care (TSCC). 61 prophylactic VCF were placed by TSCC between 2007-2009 (57% of all filters placed by the department), while 4 prophylactic VCF were placed from 2012-2014 (15% of filters placed by TSCC). Two patients had a complication from VCF insertion during the later interval.

CONCLUSIONS: These findings demonstrate a significant change in the attitudes regarding use of VCF for prophylaxis and relative indications between the two study periods. Further investigations must be performed to assess changes in clinical outcomes that may result from the altered practice at our university.

PD6 Clinical Correlation With Results Of Endovenous Therapy For Leg Swelling

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BACKGROUND: Minimally invasive procedures are evolving options for venous insufficiency. While many patients improve with endovenous therapy (vein closure and iliac vein stenting), some patients' symptoms persist. The goal of this study was to identify clinical factors related to persistent symptoms in patients with leg swelling.

METHODS: This observational study analyzed data for patients who underwent both iliac vein stent placement as well as endovenous ablation (either RFA or EVLT) between February 2012 and February 2014. Follow-up was performed after completion of both procedures and inquiring for improvement of swelling. Statistical analysis performed using chi-square and student`s T-test.

RESULTS: Of the total 173 patients who underwent both endovenous closure and iliac vein stent placements, 55 (31.8%) patients were male. 29 patients stated they had no improvement after these procedures. The average age of these patients was 68.8 (± 16.7 SD) years and 66.2(±13.3SD) years for patients who improved. CEAP classification of lower extremity limb demonstrated 25.4 %, 53.2%, 5.8%, and 15.6%, for C3 - C6, respectively.

There was no correlation with age (p=0.435), gender (P=0.332), CEAP (P=0.666), use of calcium channel blockers (p =0.849) ,nitroglycerin (p =0.858), Plavix (p=0.07), aspirin (p=0.553), Synthyroid (P=0.547), Coumadin (p=0.142), angiotensin receptor blocker (p=0.808), B-Blockers (p=0.608), angiotensin converting enzyme inhibitors (p=0.878), furosemide 40mg (p=0.074), hydrochlorothiazide 12.5mg (p=0.073), hydrochlorothiazide 25mg (p=0.482), and EVLT vs RFA(p=0.905). However, the use of 20 mg of furosemide was associated with continued swelling even after these combined endovenous procedures (p=0.012).

CONCLUSIONS: These preliminary data suggest that a history of congestive heart failure treated with furosemide may be associated with failure to relieve extremity swelling despite combined endovascular therapy.

PD7 Modulation Of Matrix Metalloproteinases In Arthroplasty Patients And Their Relevance In Inflammatory And Thrombotic Activation

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BACKGROUND: Vascular complications for arthroplasty procedures include deep vein thrombosis (DVT) and inflammation. Matrix metalloproteinases are known to degrade collagen, gelatin and components of the ECM found in articular joints. An imbalance of Human Pro-MMP-1, human total MMP-3, human MMP-9, and human Pro-MMP-13 with their inhibitors is thought to play a major role in the pathophysiology of bone diseases. The purpose of this study is to provide additional insights on the relevance between MMP elevation in arthroplasty patients with inflammation and thrombosis.

METHODS: De-identified plasma from patients undergoing total hip arthoplasty (THA) and total knee arthoplasty (TKA) are collected prior to surgery, on the first post-operative day, and when possible on post-operative day three and are frozen at -80°C. Sandwich ELISA assays were used to measure TIMP4, TNFα, MMP1, MMP3, MMP9 (R&D Labs, Minneapolis, MN), MMP13 (Abcam, Cambridge, England), and D-Dimer (HYPHEN BioMed, Neuville-Sur-Oise, France). A biochip array was used to profile IL-2, IL-4, IL-6, IL-8, IL-10, VEGF, IFNγ, TNFα, IL-1α, IL-1β, MCP-1, and EGF (Randox, London, UK).

RESULTS: Pro-MMP1 showed significant elevations in pre, post and post3 arthroplasty samples ($\bar{x}$=1.58, 1.40, 1.68 ng/mL) over the normals ($\bar{x}$=0.40 ng/mL). Total MMP3 showed no significant difference between the three arthroplasty patient groups and normals ($\bar{x}$=11.03, 8.91, 13.74, 7.94 ng/mL). MMP9 showed elevations in pre, post and post3 arthroplasty samples ($\bar{x}$=350.7, 443.7, 606.3 ng/mL) when compared to the normal ($\bar{x}$=22.0 ng/mL). MMP13 concentrations in arthroplasty patients ($\bar{x}$=299.2, 269.8, 335.0 pg/mL) were elevated over the normals ($\bar{x}$=57.9 ng/mL). TNFα showed a similar pattern with concentrations of arthroplasty patients ($\bar{x}$=25.10, 28.39, 22.35 pg/mL) significantly higher than the baseline (1.82 pg/mL). D-Dimer concentrations were elevated in pre surgery samples, increased in concentration post surgery and started dropping on post-operative day 3 ($\bar{x}$=1177, 4264, 2366 ng/mL; normal $\bar{x}$=97ng/mL). Significant correlations between MMP9 and TNFα, IL6, IL8, VEGF, and EGF were found along with correlations between MMP9/TIMP4 and D-Dimer.

CONCLUSIONS: Elevated levels of pro-MMP1, MMP9, and MMP13 in pre-surgery samples indicate they play a role in the progression of arthritis. Furthermore, a lack of significant change in these MMPs in the post surgery samples indicates surgery does not significantly affect MMP expression. Correlation results indicate MMP9 may be related to inflammation and thrombosis in arthroplasty patients. Further studies are required to clarify the role of these MMPs in relation to the pathophysiology of vascular complications in arthoplasty patients.

PD8 Treatment Of Perforator Vein: Impact On Venous Clinical Severity Score And Clinical Etiology Anatomy Pathophysiology

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BACKGROUND: Varicose vein, a vascular condition, affects 24 million people in United States. Radiofrequency ablation, laser ablation and sclerotherapy are important endovascular procedures for the treatment and management of perforating vein. We examined venous clinical score (VCSS) and Clinical Etiology Anatomy Pathophysiology (CEAP) for patient before and after radiofrequency ablation, laser

ablation and sclerotherapy with specific attention to three perforator veins (Hunter, Boyd and Cocketts). We also identified the differences in the utilization of these treatment procedures among patients.

METHODS: The data of 125 patients (Mean age: 63.9±13.4years) from 7 sites in Venous Patient Outcome Registry (VPOR) were analyzed. The patients and clinicians completed standardized questionnaires with information on demographics, treatments, type of procedures and comorbidities. We collected patient data on post and pre procedural venous clinical severity score (VCSS). CEAP classification was also evaluated for these patients.

RESULTS: The patients had one of these treatments, either sclerotherapy, laser ablation or radiofrequency ablation. Patients went through treatment in both legs (right: 46.3% and left: 53.7%). Sclerotherapy (90.9%) was commonly used procedure compared to radiofrequency (7.55%) and laser ablation (1.5%). Among the patients who performed sclerotherapy, 18.3% was Cockett perforating vein, 15% was Hunter and 16% was Boyd. The most common perforating vein used during radio frequency was Cockett (20-24%) and laser ablation was Hunter (20-40%). The CEAP score for the patients improved after these treatments. Most patients had higher clinical severity of edema (C3: 88.98%). The VCSS score for these patients ranged from 2 to 20 pre-procedure (median, 6) and 1 to 9 post-procedure (median, 6).

CONCLUSIONS: Treatment of perforating veins using sclerotherapy in varicose vein seems to be one of the important procedures. The patients with treatment had lower VCSS score. The improvement in the CEAP grade and scoring system of venous disease among patients with perforator vein insufficiency implies that these treatments are effective.

PD9 Long-term Venous Ulcer Healing And Recurrence After Ultrasound-guided Foam Sclerotherapy

K. Darvall, H. Davies, G. Bate, A. Bradbury; Birmingham University Department of Vascular Surgery, Solihull, United Kingdom

BACKGROUND: To determine the long-term healing and recurrence rates of chronic venous ulcers (CVU) treated with ultrasound-guided foam sclerotherapy (UGFS)

METHODS: UGFS was used to treat 24 CEAP C6 legs and 27 C5 legs (in 48 patients) between February 2005 and April 2007. Patients were invited for review after 5 years. Patients underwent duplex ultrasound (DUS) to assess occlusion of treated veins. Data regarding CVU healing and recurrence, and re-treatments performed were recorded.

RESULTS: 23/24 C6 patients healed within 6 months of treatment. One patient died a few months after treatment from carcinomatosis with an unhealed ulcer.

4/50 limbs developed recurrent ulceration during the follow-up period:

• Two occurred early (6-12 months post-treatment) and were healed again (without further invasive intervention) at long-term follow-up. Both patients had deep venous reflux (DVR); one also had residual superficial venous reflux (SVR).

• Two occurred late (5-7yrs post-treatment). Both patients had extensive recanalisation with SVR, but no DVR; one had not been wearing any compression.

All recurrent ulcers were reportedly much smaller and less symptomatic than pre-treatment. 17 limbs were lost to follow-up before 5 years: 2 after 1yr, 10 after 2yrs, 5 after 3yrs (7 died, 4 moved away, 2 very infirm, 4 DNA); so survival analysis was used. The Kaplan-Meier estimated proportions free from recurrence of CVU at 5yrs and 6yrs were 96% and 92% respectively.

Only 5 limbs had required re-treatment for symptomatic (not ulcers) recanalisation during the study period.

CONCLUSIONS: Although a relatively small study, long-term CVU recurrence rates are better than reported for compression with or without surgery for SVR. Early CVU recurrence appears to be associated with DVR, and late CVU recurrence with recurrent SVR.

PD10 Effect Of Sulodexida In The Treatment Of Venous Ulcer

A. J. Gonzalez, Sr.; Isssteson, San Luis Rio Colorado, Mexico

BACKGROUND: Venous ulcers have been described for many centuries and the treatment with compression almost has long, but there is still lack of good results and patients compliance. we compare two protocols for the treatment of venous ulcers.

METHODS: In a single center study we compare two groups of patients who suffer venous ulcers due to deep or superficial reflux, excluding vein obstruction. ulcer size was done with computer program image J. group A: sulodexide + non elastic compression + flebotonic. group B: non elastic compression + flebotonic. we compare ulcer healing time, pain and edema control, reduction of lipodermasclerosis and Venous severity clinical score (VSCS). we use chi2 and U-Mann-Whitney for statistical analisis.

RESULTS: 58 ulcers in 41 patients, 63% female. pain was less intense at week 2 in grupo A ($p=0.027$). reduction of lipodermatosclerosis was 55% in group A and 44% grupo B at week 2 ($p<0.05$). complete ulcer healing rate at week 6 and 8 was 84 - 93% in group A vs 23 - 57 % in group B ($p<0.05$). the VSCS improve 34% in group A and 18% in group B at week 4 ($p=0.031$).

CONCLUSIONS: The use of sulodexide added to compression and flebotonic drugs improves healing, pain control, reduces lipodermatosclerosis and improves VSCS.

PD11 Hybrid Intervention For Treatment Of Nutcracker Syndrome

A. Jayaraj, P. Gloviczki;Mayo Clinic, Rochester, MN

BACKGROUND: Nutcracker syndrome (NS) is rare and usually presents with flank pain and hematuria caused by compression of the left renal vein (LRV) in the aorto-mesenteric window (AMW). Treatment options include open surgery with transposition of the LRV or an

endovascular approach with stenting of the vein. Open repair can result in persistent compression of the transposed vein while stenting has risk of thrombosis and migration into the inferior vena cava (IVC) or heart. Hybrid technique has potential advantages to decrease complications. We report the instance of such an approach.

METHODS: A 59 year old female presented with gross hematuria. CT venography demonstrated a markedly compressed LRV (2mm), and an aorto-mesenteric angle of 4.9 degrees (Normal >41 degrees). Venous duplex revealed a LRV at AMW velocity (47cm/s) to LRV at hilum velocity (10cm/s) ratio of 4.7.

RESULTS: The patient underwent distal transposition of the LRV into the IVC and enlargement with a saphenous vein patch via a 9 cm mini laparotomy. Successful stenting of the LRV was then performed via the right common femoral vein with a 16x60mm Wallstent (Boston Scientific; Natick, MA). Angioplasty with a 12x40mm Pacific Plus angioplasty balloon (Medtronic; Minneapolis, MN) was performed to eliminate residual waist. Transfixation of the Wallstent to the transposed LRV was carried out to prevent migration using multiple interrupted 5-0 Prolene sutures (Ethicon, Somerville, NJ). Anticoagulation was started in the perioperative period with Xarelto (Bayer HealthCare AG, Leverkusen, Germany). At follow-up she was healing well with significant improvement of her hematuria. Postoperative imaging demonstrated a widely patent stent within the transposed left renal vein without any evidence of migration.

CONCLUSIONS: Hybrid approach of LRV transposition with patch angioplasty and stenting as a one-stage procedure can be successful in select patients with NS. Longer follow up in more patients is necessary to confirm efficacy and durability of this hybrid intervention.

PD12 Monocentric Propective Not Randomized Study Fot Treatment Of The Reflux Of The Short Saphenous Vein (ssv) By Crossectomy And Stripping Versus Thermal Ablation By Radiofrequency (rf): Short And Medium Results *P. H. R. Nicolini; Clinique du Parc, Lyon, France*

BACKGROUND: Historically reserved for the treatment of the reflux of the long saphenous vein because of the neurological risks, the RF is recently proposed in the treatment of the reflux off the SSV.

The purpose of this study is to compare the immediate and short-term results of a group of patients operated by crossectomy-stripping of the SSV to a group of patients treated by RF.

METHODS: From January, 2012 to January, 2013, 141 patients were included in a forward-looking not randomized study: 57 patients (63 legs) in the group surgery, 84 members (99 legs) in the group RF). There is no difference between 2 groups (sex ratio, CEAP, age, weight). 100 % of the patients had associated phlebectomies. The choice of the technique was dictated by the diameter of the vein, the distance between the skin and the vein and the mode of ending of the SSV at the popliteal level. All patients had a post-operative treatment by low molecular weight heparin. All patients had a Duplex scan to J7, M6 and M12, 17 % to M24, with research for a deep venous thrombosis and for an occlusion and/or for a recurrence.

RESULTS: The average follow-up in 2 groups was of 18 months (13-25). There was no failure and recurrence, no deep venous thrombosis in the 2 groups. Paresthesiae was found in 5 % of the cases in 2 groups with disappear of these to M6 except 2 cases of hypoesthésiae minors persisting to M12 in the group surgery. The operating course were significantly faster in the group RF. the score of quality of life and the return to a normal activity are statistically significant in favor of the group RF.

CONCLUSIONS: The RF in the treatment of the reflux of the VPS is a safe and middle term sure technique. It gives results comparable to those of a correctly made surgery, with simpler post-operative course and without additional neurological complication in spite of the theoretical risk of in the closeness of the fibular nerve. A long-term follow-up is necessary to validate its results.

PD13 Comparison Of Dedicated Venous Stent Performance In Deep Venous Reconstructions
R. de Graaf, M. de Wolf, R. Kurstjens, C. Wittens; European Venous Centre, Maastricht, Netherlands

BACKGROUND: Treatment of deep venous obstructions by endovascular reconstruction established its reputation as the primary intervention option. Currently, awareness is growing that dedicated venous materials are needed to minimize early failures. Especially stent design is getting considerable attention, and several dedicated venous stents have entered the market in the last 5 years. Both radial strength and flexibility have been suggested important features of a venous stent. However, clear indicators of what makes an optimal venous stent have not been identified as of yet.

METHODS: We included 40 consecutively patients diagnosed with unilateral obstructive venous disease, restricted to the common and external iliac veins. Patients requiring surgical desobstruction of the common femoral vein and patients with bilateral obstructions were excluded. Four different venous designed stents (self-expandable, nitinol) were routinely implanted (4 groups of 10 patients). Per-procedural cone beam CT was used to evaluate stent position and configuration. At 6 weeks post intervention control X-rays in 4 projections were performed to evaluate changes in stent configuration and stent integrity. Furthermore, ultrasound examination was performed to evaluate stent patency.

RESULTS: Stent configuration data are summarized in table 1. All venous stents were deployed from the ipsilateral femoral vein access without complications. However, on duplex follow-up some stents showed a suboptimal position. 12.5 % of all stents were placed too distally inside the common iliac vein, resulting in a residual compression in 2 cases and requiring re-stenting. In 1 case, a ZV dislocated to the pulmonary artery trunk, however without further action necessary. Average surface area at the level of the CIV was determined with

Cone beam CT (Table 1). Moderate kinking was noticed in 10% of all cases, however none required additional intervention. None of the stents showed fractures. No secondary patency loss was seen.

CONCLUSIONS: This is the first study comparing presently available dedicated venous stents. All stents performed well in the treatment of deep venous obstructive disease. Nevertheless, several drawbacks of the tested stents could be identified at early follow-up. Long-term follow-up will be necessary to relate inconsistencies in stent configuration to primary patency and clinical outcome. These findings might help to optimize venous stent design in the future.

Table 1. Characteristics of dedicated venous stents

Stent	Positioning failure	Surface area (CIV)	Suboptimal apposition*	Straightening	Kinking	Fracture
XF	1/10	1.1±0.2cm²	6/10	7/10	7/10	0/10
SV	4/10	1.2±0.1 cm²	0/10	0/10	0/10	0/10
ZV	1/10	0.8±0.2 cm²	0/10	0/10	0/10	0/10
VV	0/10	1.4±0.1 cm²	5/10	4/10	3/10	0/10

* At least 1 cm of incomplete apposition to the venous wall

PD14 The Staged Treatment Of Varicose Veins After Saphenous Ablation: Late Term Patient Reported Outcomes Does Not Solve The Debate

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BACKGROUND: Patients who have both saphenous vein incompetence and branch varicose veins can be treated with a staged approach (endovenous saphenous vein ablation first) or combined ablation and phlebectomy. Although it has been shown the majority of patients treated with the staged approach do not need subsequent treatment on their branch varicose veins, this approach may not be what the patient desires.

METHODS: A seven-question survey was sent to the patients of two surgeons who performed saphenous RFA or EVLT between 9/06 and 12/09 as an initial procedure in the staged approach to lower extremity varicose veins, thus a minimum of 4 year follow up after the ablation. The patients did not have known subsequent treatment of branch varicose veins by the treating surgeons.

RESULTS: A total of 462 patient surveys were mailed with 173 (31%) received. Not all returned surveys had all questions answered. In response to satisfaction concerning their ablation procedure, 124/168 (73.8%) were satisfied or extremely satisfied, 27/168 (16.1%) were dissatisfied or extremely dissatisfied, and 17/168 (10.1%) were neutral. In response to any subsequent treatment, 138/173 (79.8%) had none, 7/173 (4%) had phlebectomy, 27/173 (15.6%) had sclerotherapy, and 1/173 (.6%) had repeat ablation. In response to possible symptoms, 88/170 (51.8%) had none, 6/170 (3.5%) had severe, 28/170 (16.5%) had moderate, 48/170 (28.2%) had mild symptoms. Asked if they had any blue bulging veins, 57/165 (34.5%) replied no, 70/165 (42.4%) had asymptomatic veins, and 38/165 (23%) replied they had blue veins that were bothering them. In response to stocking use, 120/169 (71%) did not use stockings, 15/169 (8.9%) wore them regularly, and 34/169 (20.1%) wore them sometimes. When asked, in retrospect, how would they have wanted their veins treated, 71/147 (48.3%) preferred the staged approach, an identical 71/147 (48.3%) wished they had them all treated at once, 3/147 (2%) replied nothing done, 2/147 (1.3%) were unsure, and 18 did not respond to the question.

CONCLUSIONS: Although the staged approach of saphenous ablation first has shown to be effective at relieving symptoms, reducing stocking use, and reducing costs by minimizing the need for subsequent phlebectomy or sclerotherapy, it may not necessarily be what the patient wants. Which approach the patient decides upon is likely determined by how the treating physician promotes it. Patient satisfaction is likely determined by how well the patient understands the strategy and their expectations of the strategy. Further study is needed to answer the question.

PD15 Air Embolism Following Sclerotherapy

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BACKGROUND: To report a cerebrovascular accident (CVA) following small volume foam sclerotherapy in a healthy 74 year old woman.

METHODS: Case report and review of a treatment complication.

RESULTS: The patient was a healthy woman with no history of migraine or neurological problems. The incident occurred in association with her seventh direct vision sclerotherapy treatment after injection of 1.1 ml of air based sclerosant foam. While still in the clinic she developed an acute left sided hemiparesis. This resolved quickly but she continued to have some subjective complaints. CT scan demonstrated air in the right middle cerebral artery. Magnetic resonance imaging showed a small acute infarct in the right parietal lobe.

CONCLUSIONS: This case illustrates that very low volumes of sclerosant air foam can lead to significant neurological complications. Elderly individuals may be at greater risk.

PD16 Osseous Origin of Superficial Calf Varices

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BACKGROUND: Varices arising from a lacuna in the cortex of the tibia or fibula has previously been reported in 13 patients, with ultrasound and either MRI, CT scanning or venography used to confirm the diagnosis in each case.

METHODS: Three additional patients (2 females, 1 male; ages 42-53) are reported here. One patient had recurrent varices after two previous phlebectomies. Two had tenderness at the cortical origin of the varices. Ultrasound alone was used to confirm the origin and reflux of the varices in all three. Two of the three demonstrated rare ultrasound artifacts of color-flow mirror imaging and reverberation, each falsely implying visualization of venous flow in the actual bony medulla.

RESULTS: Two patients were treated successfully with phlebectomy and the third patient elected no intervention.

CONCLUSIONS: Varices can rarely arise through a lacuna in the cortex of the tibia. The condition is unassociated with other serious pathology and ultrasound alone appears to be sufficient for diagnosis without the need for advanced imaging. Phlebectomy (and in one reported individual, sclerotherapy) has been curative. An osseous origin of varices should be considered in patients presenting with calf varices in the absence of saphenous or perforator vein reflux.

PD17 Is The Reintroduction Of Bovine Heparin Justified Based On Its Biosimilarity To Porcine Heparin?

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BACKGROUND: In consideration of the limited supply of porcine heparin (PH), which may result in a global shortage, the current discussions on the reintroduction of bovine heparin (BH) are timely and justified. BH was widely used for cardiovascular interventions and surgical indications until the early 80's and was withdrawn due to the belief that its usage was associated with an increased prevalence of heparin-induced-thrombocytopenia (HIT) and viral load such as Bovine Spongiform Encephalopathy. Since then, improved manufacturing processes coupled with advanced quality control methods have provided better quality heparins resulting in viral de-loading and well characterized and defined products. This study compared 5 different batches each of BHs and PHs both of mucosal origin.

METHODS: Commercially available PHs were obtained from various US vendors. BHs were obtained from several Brazilian manufacturers. USP reference standard heparin (Lot F01187) was used to compare the potency of these two groups of heparin utilizing ACT, aPTT, Heptest, Calcium Thrombin Time, anti-Xa and anti-IIa activities, as well as protamine and PF4 neutralization. The interaction with HIT antibodies was studied using a pooled HIT sera preparation. The molecular weight profile was determined by high-performance liquid chromatography (HPLC).

RESULTS: On a gravimetric basis, the anticoagulant activity of PH was 10-30% higher in comparison to BH. PH exhibited higher anti-Xa and anti-IIa activities. The USP cross referenced potency in the anti-Xa assay was 160+20 U/mg for PH vs 132+16 U/mg for BH. Protamine and PF4 titration profiles were comparable. In the HIT assay, there was no difference in platelet aggregation response between the two groups of drugs. The molecular weight profiles of the two groups of drugs were comparable. The molecular weight of BH was 17.1 ± 0.8 kDa, whereas that of PH was 16.6 ± 0.5 k Da ($p>0.05$). The molecular distribution of the oligosaccharide components was similar.

CONCLUSIONS: While PH exhibits relatively stronger anticoagulant and anti-protease activities, in other assays both BH and PH exhibit comparable compositional and functional profiles. Thus, BH may be considered as biosimilar to PH and can be accordingly defined and developed for clinical use.

PD18 Radical Nephrectomy And Thrombectomy For Tumor Thrombus Of Inferior Vena Cava In Renal Cell Carcinoma Patients - Single Institutional Experience

R. Dodla; Northshore Long Island Jewish Health System, Manhasset, NY

BACKGROUND: Inferior vena cava tumor thrombus occurs in approximately 4 to 10% of renal cell carcinoma patients. We evaluated our experience of surgical management of these patients with particular analysis of their clinical outcome.

METHODS: We retrospectively reviewed 25 patients with the mean age of 69, who underwent radical nephrectomy and inferior vena cava tumor thrombectomy between 2007 and 2014. The charts were reviewed for clinical presentation, demographics, medical co morbidities, various pathological parameters including the tumor grade based on Fuhrman grading system, level of inferior vena cava involvement, post operative complications, staging, metastasis both at the time of surgery and post operative, follow up and mortality.

RESULTS: All 25 patients underwent radical nephrectomy and IVC tumor thrombectomy. The average follow up was 19 months. 56% of the patients had level 2 IVC involvement. 24% and 16% of the patients had level 3 and 4 IVC involvement (mayo classification) respectively. 56% of patients had no post operative complications. Only 8% of the patients had major complications based on the Clavien grading system. 3 patients in our cohort died accounting for a 12% mortality rate. One patient died in the immediate postoperative period within 2 days. The other two patients died due to metastasis within 8 months of surgery. Clear cell carcinoma was the most common pathological type and level 3 IVC involvement were noted among the patients who died. Only 2 patients had distant metastasis

at the time of surgery. 16% of patients had recurrences and all of them had distant metastasis. Overall survival at 1, 2 and 3 years were 84%, 81% and 76% respectively. On further analysis metastasis was a strong predictor of mortality.

CONCLUSIONS: Radical nephrectomy combined with IVC tumor thrombectomy as an aggressive surgical approach is the most effective management strategy in patients with renal cell carcinoma and IVC tumor thrombus. This approach offers an acceptable long term survival and reasonable post operative complications mainly among patients with no distant metastasis.

PD19 Ambulatory Selective Varices Ablation Under Local Anesthesia In Patients With Active Ulcer

S. Chastanet, P. Pittaluga; Riviera Veine Institut, Monaco, Monaco

BACKGROUND: In presence of an active ulcer (CEAP Class C6) the treatment of venous insufficiency is usually extensive for the elimination of the venous reflux. However, we wanted to know if it is possible to spare the saphenous vein in C6 patients.

METHODS: We have reviewed the patients operated on in our institute during the last decade for venous insufficiency with an active ulcer and a reflux on the great saphenous vein (GSV). All patients with a deep reflux or an arterial insufficiency have been excluded. We compared the group of patients operated on by the Ambulatory Selective Varices Ablation method (ASVAL) (group 1) and in the group of patients for which a saphenous stripping or ablation has been performed (group 2).

RESULTS: A total of 6125 surgical procedures have been performed in patients with a GSV reflux. The distribution of the CEAP class C classification was the following: C2=4989 (81.5%), C3=554(9%), C4=423(6.9%), C5=81(1.3%), C6=78 (1.3%). Among the 78 surgeries carried out in C6 patients, the type of procedure was an ASVAL procedure in 33 cases (42.3%), and a saphenous stripping or ablation in 45 cases (57.7%). In presence of a refluxing saphenous vein, the frequency of saphenous stripping or ablation was higher in the C6 patients comparing to the C2 patients (57.7% vs 15.9% P<0,05). The comparison between group 1 and group 2 showed :

• A significant higher frequency of female gender in group 1 (72.7% vs 46.6% P<0.05) meanwhile the mean age was not significantly different between the two groups (69.8 yrs 71.1 yrs P=0.68).

• The type of SV reflux was more frequently limited at the thigh for the GSV in group 1 (72.7% vs 13.3% P<0.05).

• All ulcers were healed in both groups and the mean time of ulcer healing was not significantly different in both groups (73.5 vs 66.1 days P=0.38).

• In both groups all patients have worn a 32 mmhg compression stocking until the healing of the ulcer.

• A recurrent ulcer was observed in 2 cases in group 1 and in 3 cases in group 2 (6% vs 6.6% p=NS)

CONCLUSIONS: In presence of an active ulcer our attitude is more aggressive for the saphenous vein with a higher rate of saphenous ablation than for C2 patients, but saphenous sparing technique can be performed if the reflux is not extended below the upper third of the calf with the success of healing, the same average time of healing and with no significant difference for the frequency of ulcer recurrence.

PD20 Surgical Treatment Of Varicose Veins In Elderly Patients: Is It Safe For Cosmetic Or Functional Indications

P. Pittaluga, S. Chastanet; Riviera Veine Institut, Monaco, Monaco

BACKGROUND: We wanted to assess the safety of the surgical treatment of varicose veins in patients over 80 years-old, in order to know if the age is a limit for a treatment performed for cosmetic or functional indications.

METHODS: We have reviewed the surgical procedures performed for varicose veins in our institute since 2004 in patients over 80 years-old. We have excluded the cases of acute superficial thrombosis and the patients from C4 to C6 in the CEAP class C classification.

RESULTS: A total of 239 surgical procedures have been performed in 188 patients from 80 to 97 yrs (average 83,2 yrs). The 239 limbs treated were classified C2 in 218 cases (91.2%) and C3 in 21 cases (8.8%) on the CEAP class C Classification. Symptoms were present in 70.3% of the cases. The patients were under VKA or anti-platelet agent in respectively 2.5% and 5% of the cases only. The hemodynamics assessment showed a reflux on the great saphenous vein in 124 cases (51.9%) on the short saphenous vein in 9 cases (3.8%), an absence of reflux on a saphenous axis in 54 cases (22.6%) and a recurrent reflux after stripping in 52 cases (21.8%). The procedures performed consisted in a stripping of the saphenous vein (15.9%), an endovenous ablation of the saphenous vein (2.5%), a single phlebectomy (59.8%) and a redo surgery after stripping (21.8%). All surgeries were done under tumescent local anesthesia, in an ambulatory fashion in all cases excepted one. A postoperative low molecular weight heparin treatment was prescribed at prophylactic dose in 45 cases (18.8%). The only complication observed was a lympocele on the limb which was spontaneously resolved in 3 months. A relief of the symptoms was observed in 203 cases (84.9%) and a cosmetic improvement in 219 cases (91.6%).

CONCLUSIONS: In our experience the performance of varicose veins surgery under tumescent local anesthesia is safe and efficient for cosmetics and symptoms in selected patients over 80 years-old.

Geographical Membership Roster

Alabama

Alrefai, Basel
Isobe, James Hajime
Kingsley, John R.
Lee, Timothy C.
McPhillips, Frank L.
Passman, Marc A.
Sirk, Rodney A.

Alaska

Roupenian, Armen L.

Arizona

Dragon, Jimmy H.
Elliott, Thomas R.
Favata-Moxley, Kelli R.
Fleck, Robin M.
Giangobbe, Mitchell J.
Greenfield, Lazar J.
Hunter, Glenn C.
Leon, Luis R.
Morrison, Nick
Puggioni, Alessandra
Size, Gail P.
Thorpe, Patricia E.

Arkansas

Ferris, Ernest J.

California

Ahluwalia, Hardeep S.
Altuwaijri, Maraya
Angle, Niren
Arata, Michael A.
Ayers, Joseph D.
Barker, Wiley F.
Bey, Thomas M.
Bickmore, Dan C.
Bui, Trung D.
Cannon, Jack A.
Carson, John G.
Conti, Sebastian
Curry, Fitz-Roy E.
Cushing, Robert D.
De, Ajanta
Delaria, Giacomo A.
Denbo, Howard E.
Donayre, Carlos E.
Duensing, Robert A.
Duffy, David M.
Flanigan, D. Preston
Fogarty, Thomas J.
Gaspar, Max R.
Gelfand, Dmitri V.
Gorski, Yara
Goyal, Anurag
Gradman, Wayne S.
Graves, Michael
Grewal, Prabhjot
Harris, E. John
Harris, Edmund J.
Hedayati, Nasim
Hoffman, Cheryl H.
Hopkins, Stephen J.
Housman, Leland B.
Isaacs, Mark N.
Jurnecka, Jan S.
Kabutey, Nii-Kabu
Kanter, Alan
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Leary, J. Michael
Lee, Christopher C.
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Link, Daniel
Long, John B.
Mckittrick, James E.
Melkonyan, Vahe
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Monahan, Daniel L.
Moshfegh, Amiel
Mowatt-Larssen, Eric
Murray, James D.
Nicholas, Judd Karl
OByrne, Margaret G.
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Sandberg, Maja K.
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Shaheen, Raymond Michael
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Dietzek, Alan
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Goldblatt, Jeffrey S.
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Ochoa Chaar, Cassius Iyad
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Galovich, Justin
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Patel, Shaun
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Samson, Russell H.
Sanchez, Eulogio J.
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St. George, James
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Tapper, S. Scott
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Konigsberg, Stephen
Mangalat, Dev
Methodius-Rayford, Walaya Chiyem
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Rheudasil, J. Mark
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Masuda, Elna M.
Waterford, Robert W.
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Idaho

Tullis, Michael J.
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Durham, Joseph R.
Ennis, William J.
Fareed, Jawed
Forrestal, Mark
Golan, John F.
Hall, Heather A.
King, J. Theodore
McCarthy, Walter J.
Pearce, William H.
Prasad, Keerthi
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Kennedy, Nicole
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Koziarski, John
Lin, Judith C.
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Miller, Jeffrey H.
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Mendel, Herb E.
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Schanzer, Harry R.
Schor, Jonathan A.
Schwartz, Mark A.
Schwartz, Michael L.
Shah, Salman S.
Shapiro, Michael S.
Sharma, Amit Bhushan
Sista, Akhilesh K.
Sullivan, Leo P.
Sundick, Scott A.
Taheri, Syde A.
Tannenbaum, Gary
Tassiopoulos, Apostolos K.
Ting, Windsor
Vasquez, Michael A.

North Carolina

Bell, William H.
Bock, Richard W.
Cicci, Christopher K.
Clark, George T.
Crespo Soto, Hector O.
Crowner, Jason Ryan
Delgado, Gabriel A.
Draughn, David G.
Goudarzi, Kamran
Hannon, Kathleen Marie
Holleman, Jeremiah Henry
Hurie, Justin
Marston, William A.
Moore, Phillip S.
Ozment, Richard V.
Robicsek, Francis
Schmidt, Jeffrey S.
Shortell, Cynthia K.
Subherwal, Sumeet
Tinsley, Ellis A.
Unger, Joshua Mostkoff
Zygmunt, Joseph

Ohio

Aggarwal, Manu
Ansari, Muhammad J.
Balkany, Louis
Beebe, Hugh G.
Bush, Peggy K.
Carman, Teresa L.
Clair, Daniel G.
Comerota, Anthony J.
Dean, Steven M.
Franz, Randall
Gale, Steven S.
Hammond, Kandy
Hardy, David
Joseph, Douglas E.
Kempczinski, Richard
Khoury, Thomas L.
Kocher-Burns, Donna I.
Kong, James A.
Kulwicki, Aaron Donald John
Lohr, Joann M.
Lurie, Fedor
Malhotra, Praveen K.
Mesh, Charles
Miller, Matthew T.
Muck, Patrick E.
Nazzal, Munier M.S.
Nelson, Deanna L.
Paolini, David J.
Parmer, Shane S.
Peralta, Sotero
Prem, Jeffrey
Rahimi, Maham
Rollins, David L.
Russell, Todd E.
Santin, Brian J.
Sudheendra, Rao
Vermilion, Blair D.
Zelenock, Gerald B.

Oklahoma

Blebea, John
Ma, Harry
Malgor, Rafael

Oregon

Deatherage, Mark Frederick
Jones, Andrew D.
Landry, Gregory James
Liem, Timothy K.
McLafferty, Robert B.
Moneta, Gregory L.
Pavcnik, Dusan
Pittman, Rick D.

Pennsylvania

Aziz, Faisal
Calcagno, David
Carabasi, Anthony
Chaer, Rabih A.
Ciacchella, Arthur P.
Collier, Paul E.
DiGiorgio, Carl J.
Dillavou, Ellen D.
Eckroth-Bernard, Kamell Rashad
Ernst, Calvin B.
Fukaya, Eri
Gasparyan, Anna
Girdhar, Sarva
Hager, Eric
Heird, Steven B.
Herdrich, Benjamin James
Jarrett, Fredric
Kerstein, Morris D.
Krysinski, Terrance R.
Marien, Brian J.
Merli, Geno J.
Neuman, Joel D.
Pellecchia, Patrick
Phadke, Yeshwant G.
Plaza-Ponte, Mario T.
Rosenfeld, Joel C.

Geographical Membership Roster

Sigel, Bernard
Solit, Robert W.
Sudheendra, Deepak
Tahara, Robert W.
Topoulos, Arthur P.
Van Bemmelen, Paul S.
Weingarten, Michael S.
Wu, Timothy

Puerto Rico

Joglar, Fernando Luis
Martinez Trabal, Jorge L.
Rodriguez, Agustin A.

Rhode Island

Patterson, Robert B.

South Carolina

Arthur, Ansermo L.
Espinoza, Paul M.
Garg, Nitin
Hallett, John W.
Stanbro, Marcus
Stonerock, Charles

Tennessee

Alperovich, Alexander H.
Daugherty, Stephen Franklin
Davis, Stephen
Funderburk, Jason G.
Kim, Billy J.
Meyers, Cary H.
Schoch, Denny M.
Siragusa, Tif W.
Towne, Randall D.
White, James E.
Yoon, H. Richard

Texas

Alhaddad, Mohsin T.
Apple, Jeffrey M.
Bhalla, Karan
Bohannon, William Todd
Bonawitz, Cara A.
Brazil, Clark W.
Brinton, Milton H.
Bush, Ruth L.
Cianci, Chris B.
Coogan, Sheila M.
Dickerson, Sandra Dee
Dilling, Emery
Fife, Caroline E.
Gutierrez, Charles J.
Hansen, Henry Andrew
Hariz, George M.
Hovorka, John W.
Iglesias, Jose Victor
Katz, Andres U.
Lin, Peter
Martinez, Jeffrey M.
Motta, Angelica J.
Nguyen, Kytai T.
Ortega, Raul E.
Paladugu, Ramesh
Peden, Eric K.
Pester, Thomas L.
Pounds, Lori C.
Rodman, Charles John
Rodriguez, Filiberto
Rutherford, Robert B.
Sevick, Eva M.
Shin, David D.
Silva, Michael B.
Skiendzielewski, John Andrew
Stephanian, Edic
Unruh, Marie E.
Whiddon, Lonnie
Zimmet, Steven E.

Utah

Black, Carl
Ihnat, Daniel Michael
Jensen, Peter E.
Lazarus, Harrison M.
Pannucci, Christopher

Virginia

Cordts, Paul R.
Cox, Chris D.
Delaurentis, Dominic A.
Drougas, James G.
Gopal, Kapil
Gould, Charles F.
Knipp, Brian S.
Owens, Lewis
Purpera, Frank
Rana, Hamza
Sterling, Keith M.
Vadlamani, Lou

Washington

Bernstein, Jeffrey D.
Feied, Craig F.
Ferris, Brian L.
Gibson, Kathleen D.
Meissner, Mark H.
Osborne, Robert W.
Vu, Hao
Wong, Roman
Zierler, R. Eugene

West Virginia

AbuRahma, Ali F.
Boland, James P.
Mousa, Albeir Y.
Rai, Kumar

Wisconsin

Asplund, Mark W.
Azene, Ezana M.
Bartel, Anne
Brown, Kellie R.
Carr, Sandra C.
Gentilli, Barbara J.
Gueldner, Terry L.
Hohenwalter, Eric J.
Hutto, John D.
Matsumura, Jon S.
Pasch, Allan R.
Seabrook, Gary R.
Siddique, Awais

Argentina

Enrici, Ermenegildo A.
Farmache, Alejandro H.
Katsini, Roxana E.
Morales Bazurto, Mariuxi M.
Papendieck, Cristobal M.
Pietravallo, Antonio F.R.
Schapira, Armando E.
Segal Halperin, Boris M.
Simkin, Carlos G.
Simkin, Roberto
Vellettaz, Ruben Felix F.

Australia

New South Wales

Cuzzilla, Luciano
Parsi, Kurosh
Richardson, Graeme D.

Queensland

Tosenovsky, Patrik Joseph

Geographical Membership Roster

Austria
Partsch, Hugo

Belgium
Francois, Olivier G.T.
Vandendriessche-Hobbs, Marianne

Brazil
Duque, Alberto C.
Kikuchi, Rodrigo
Miyake, Kasuo
Osse, Francisco
Sincos, Anna Paula W. B.
Sincos, Igor Rafael
Velleda Pacheco, Samir

Canada

Alberta
Hill, Douglas A.

British Columbia
Hsiang, York N.

Ontario
Hirsh, Jack
Rosenblum, Stan M.

Quebec
Danylewick, Richard W.

Chile
Orrego, Alvaro Esteban

Cyprus
Neglen, Peter
Nicolaides, Andrew N.

Denmark
Rasmussen, Lars H.
Struckmann, Jan R.

France
Carpentier, Patrick H.
Cornu-Thenard, Andre M.
Natali, Jean P.
Perrin, Michel R.
Uhl, Jean-Francois

Germany
Noppeney, Thomas
Rabe, Eberhard
Schultz-Ehrenburg, Ulrich

India
Gupta, Prem C.
Patel, Malay D.
Radhakrishnan, N.
Somaya, Anand C.
Tripathi, Ramesh K.

Ireland
Mzimba, Zola

Israel
Bass, Arie
Markel, Arie

Italy
Allegra, Claudio
Caggiati, Alberto
Campisi, Corradino
di Marzo, Luca
Gianesini, Sergio
Zamboni, Paolo

Japan
Hayashi, Shinobu
Hoshino, Shunichi
Hoshino, Yuji
Iwai, Takehisa
Ogawa, Tomohiro
Sakakibara, Naoki
Sakuda, Hitoshi
Yamaki, Takashi

Korea
Joh, Jin Hyun
Kim, Young-Wook
Suh, Bo Yang

Mexico
Aguila Marquez, Roberto
Ayon, Alejandro
Herrera De Juana, Santiago
Paramo, Marcelo

Monaco
Chastanet, Sylvain
Pittaluga, Paul

Netherlands
Bruijninckx, Cornelis M A
Disselhoff, Ben CVM
Wittens, Cees H.A.

New Zealand
van Rij, Andre M.

Peoples Republic of China
Vanhoutte, Paul M.
Yang, Benxun
Zhao, Haiguang

Poland
Urbanek, Tomasz

Russia
Belentsov, Sergey M.
Bogachev, Vadim Y.
Sapelkin, Sergey
Shaidakov, Evgeny

Spain
Monedero, Javier Leal

Sweden
Arfvidsson, Berndt
Bergqvist, David
Blomgren, Lena
Eklof, Bo G.
Lundell, Anders JB
Thulesius, Olav

Switzerland
Bollinger, Alfred
Christenson, Jan T.
Schepers, Helmut

Taiwan
Wu, Tien-Yu

Trinidad and Tobago
Maharaj, Dale A.

Turkey
Koksoy, Cuneyt
Kurtoglu, Mehmet H.

Ukraine
Khrebtiy, Yaroslav V.
Soloviy, Markiyan

Geographical Membership Roster

United Kingdom

Browse, Norman L.
Burnand, Kevin G.
Coleridge Smith, Philip D.
Davies, Alun Huw
El-Sheikha, Joseph A.
Halim, Sandra
Hobbs, John T.
Kafeza, Marina
Kalodiki, Evi
Nandhra, Sandip J.
Ruckley, C. Vaughan
Whiteley, Mark S.

American Venous Forum

28th Annual Meeting

Buena Vista Palace Hotel
Orlando, Florida

Save the Date, February 24-26, 2016

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