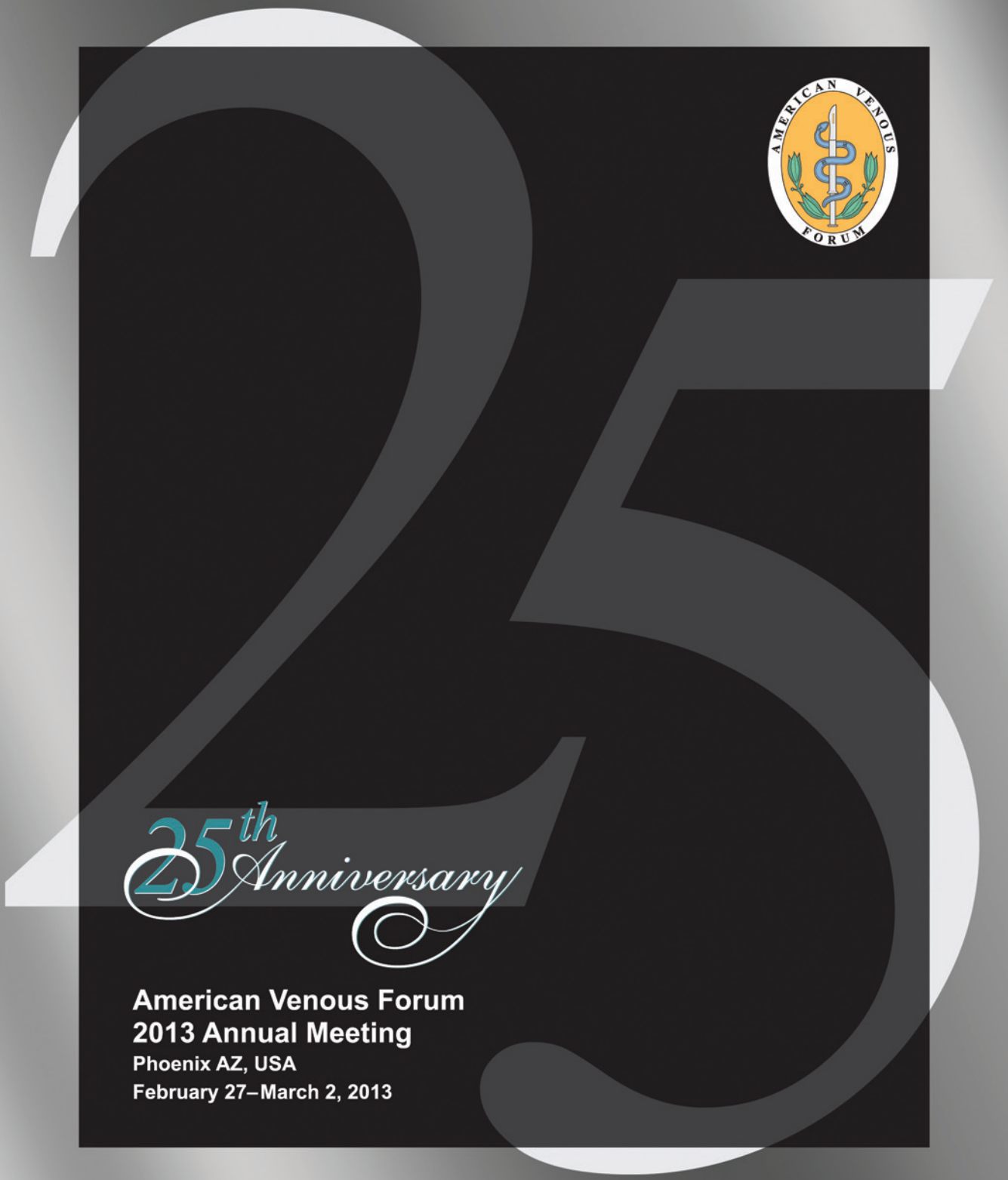


American Venous Forum

FINAL PROGRAM

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.

LEARNING 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 sponsorship of the American College of Surgeons and the American Venous Forum. The American College of Surgeons is accredited by the ACCME to provide continuing medical education for physicians.

AMA PRA CATEGORY 1 CREDITS™

The American College of Surgeons designates this live activity for a maximum of 26 *AMA PRA Category 1 Credits*™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

DISCLOSURE INFORMATION PARAGRAPH

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: Angio Dynamics, Cook Medical, Covidien, SIGVARIS and Volcano Corporation.

MARKETING & EXHIBITOR ACKNOWLEDGEMENT

The American Venous Forum wishes to recognize and thank the following exhibiting companies for their ongoing support: Acamedic Solutions, ACI Medical, LLC, American Board of Phlebology, American College of Phlebology, AngioDynamics, Argon Medical Devices, Inc., Bard Peripheral Vascular, Biolitec, BTG International, Center for Venous Disease, Cook Medical, Cool Touch Inc., Covidien, DJO Global, Doctor QA, Dornier Medtech, EKOS Corporation, GE Healthcare, HK Surgical, InaVein, Intersocietal Accreditation Commission, Interventional Vein Congress, JOBST, a brand of BSN Medical, Juzo USA, Laser Peripherals, LLC, Medi USA - CircAid, Medrad Inc. dba Bayer Interventional, Medstreaming, Merz Aesthetics, Inc., Organogenesis, Inc., Refine USA, Rethink - Covidien, SIGVARIS, Sonosoft, Streamline MD, Tactile Systems Technology, Therafirm, a brand of Knit-Rite, Inc, Total Vein Systems, Vascular Insights, Vein Clinics of America, VEIN Magazine, VeinSpec EMR, LLC, Vein Therapy News, VenX Medical, Volcano Corporation, VQI

American College of Surgeons
Division of Education

Table of Contents

Save the Date

The American Venous Forum

26TH ANNUAL MEETING

February 19-22, 2014 ⚜ The Roosevelt ⚜ New Orleans, LA

New Orleans

Message From The President

Dear AVF Members,

Welcome to the American Venous Forum 25th Silver Anniversary Annual Meeting in Phoenix, Arizona!

This meeting will bring together leaders from around the world in the field of venous and lymphatic health for cutting edge, high-quality scientific presentations of the latest, most relevant research and information. AVF membership and meeting attendance are growing along with the advancement of venous and lymphatic healthcare. Our initiatives focus on scientific research, education of physicians and trainees, and promoting awareness of venous disease to the public through our national venous screening programs. I thank Nicos and the AVF Program Committee for their efforts to develop a first-rate agenda and annual meeting.

This year we celebrate our 25th Silver Anniversary Annual Meeting with outstanding programs and presentations. Some of our special features include:

- The David S. Sumner Venous Summit, presented by AVF President-Elect Peter Henke, MD, will feature seven interactive case studies in venous and lymphatic disease management.
- Concurrent Specialty Symposia on vascular medicine & thrombosis, biomechanics & bioengineering, wound care & compression, and live venous ultrasound.
- The Villavicencio Symposium addresses pelvic congestion syndrome and will be led by AVF Past President Mark Meissner, MD. This annual symposium honors Dr. J. Leonel Villavicencio, an AVF founding member who is noted for his career in treating venous malformation.
- D. Eugene Strandness Memorial Lecture, presented by Susan R. Kahn, MD, Professor of Medicine, McGill University.
- Scientific sessions featuring never-before-presented abstracts from leading scientists on topics including superficial venous disease, deep vein thrombosis and chronic venous insufficiency.
- Oral, quick-shot and poster presentations of scientific abstracts, including a new addition of abstract poster displays.
- 25th Anniversary Gala Celebration featuring a reception, dinner and live entertainment.

Much of the work that has been done in the AVF this year has been about building a renewed solid foundation. Almost one year ago, we hired Executive Director, Inc. to manage our organization with our new Executive Director, Colleen Pedersen. Having the EDI team on board has provided a fresh look by a company that has been in the society management business for over 50 years. Their experience has been pivotal to getting our affairs more organized in order to build upon the incredible energy and programs of the AVF. Colleen and her team at EDI have done an outstanding job and we thank them. Secretary Lowell Kabnick, Treasurer John Blebea, and Vice-President Fedor Lurie have all worked tirelessly to put this solid foundation in place. I am excited to share much of what we have accomplished at the upcoming annual meeting.

Lastly, I have had the pleasure of working along side our President-Elect, Peter Henke, and I am confident that we are in good hands as we move forward. While the year of 2012 was the year of collaboration and getting more organized from an operational standpoint, the year of 2013 will be the year of membership growth, reinvigorating our AVF Foundation, and development of a long-term strategic plan.

It has been an honor and a pleasure to work with you this past year.

Sincerely,

Robert McLafferty, MD
AVF President

TUESDAY, FEBRUARY 26

4:00 PM – 6:00 PM	Registration Open	Sachem Foyer

WEDNESDAY, FEBRUARY 27

7:00 AM – 8:00 AM	Continental Breakfast	Sachem Foyer
7:00 AM – 7:30 PM	Registration Open	Sachem Foyer
7:00 AM – 8:00 AM	Industry Advisory Breakfast	Palo Verde Room
8:00 AM – 12:00 PM	David S. Sumner Venous Summit – Challenging Cases in Venous Disease	Sachem Ballroom
12:00 PM – 7:30 PM	Exhibit Hall Open	Wigwam Ballroom
12:00 PM – 1:15 PM	Lunch On Own	
1:15 PM – 3:15 PM	Specialty Symposia (Concurrent)	
	(A) Vascular Medicine & Thrombosis	Sachem Ballroom
	(B) Biomechanics & Bioengineering	Palo Verde Room
	(C) Wound Care & Compression	Arizona Room
	(D) Live Venous Ultrasound	Mohave West
3:15 PM – 3:45 PM	Coffee Break	Wigwam Ballroom
3:45 PM – 5:35 PM	Scientific Session 1 – Chronic Venous Disease 1: Varicose Veins	Sachem Ballroom
6:00 PM – 7:30 PM	Welcome Reception	Wigwam Ballroom

THURSDAY, FEBRUARY 28

7:00 AM – 8:00 AM	Continental Breakfast	Wigwam Ballroom
7:00 AM – 3:30 PM	Exhibit Hall Open	Wigwam Ballroom
7:00 AM – 7:30 PM	Registration Open	Sachem Foyer
8:00 AM – 9:55 AM	Scientific Session 2 – Deep Vein Thrombosis 1	Sachem Ballroom
9:55 AM – 10:10 AM	American College of Phlebology – Best Paper	Sachem Ballroom
10:00 AM – 7:00 PM	Poster Hall Open	Mohave Ballroom
10:10 AM – 10:50 AM	Coffee Break	Wigwam Ballroom
10:50 AM – 12:20 PM	Scientific Session 3 – Deep Vein Thrombosis 2	Sachem Ballroom
12:20 PM – 12:30 PM	Box Lunch	Sachem Foyer
12:30 PM – 1:30 PM	Villavicencio Symposium	Sachem Ballroom
1:30 PM – 3:00 PM	ACP Symposium - Liquid Agents in the Treatment of Venous Disease	Sachem Ballroom
3:00 PM – 3:30 PM	Coffee Break	Wigwam Ballroom
3:30 PM – 5:30 PM	Scientific Session 4 – Chronic Venous Disease 2	Sachem Ballroom
5:45 PM – 7:00 PM	Poster Presentation Session 1 (Concurrent)	Mohave East Room
5:45 PM – 7:00 PM	Poster Presentation Session 2 (Concurrent)	Mohave West Room
7:00 PM – 8:30 PM	BTG International Symposium – Treatment Outcomes: What Matters to Patients and Payors?	Sachem Ballroom

FRIDAY, MARCH 1

7:00 AM – 8:00 AM	Continental Breakfast	Wigwam Ballroom
7:00 AM – 11:00 AM	Exhibit Hall Open	Wigwam Ballroom
7:00 AM – 1:05 PM	Registration Open	Sachem Foyer
8:00 AM – 9:20 AM	Scientific Session 5 – Chronic Venous Disease 3	Sachem Ballroom
9:20 AM – 10:00 AM	Coffee Break	Wigwam Ballroom
10:00 AM – 12:05 PM	Scientific Session 6 – President's Sessions	Sachem Ballroom
10:00 AM – 10:15 AM	2012 Servier Traveling Fellowship Reports	
10:15 AM – 10:30 AM	2012 BSN Jobst Research Winner – Interim Report	
10:30 AM – 10:40 AM	History of the American Venous Forum	
10:40 AM – 10:50 AM	American Venous Registry & SVS PSO Update	
10:50 AM – 11:00 AM	Journal of Vascular Surgery: Venous and Lymphatic Disorders	
11:00 AM – 11:05 AM	National Venous Screening Update	
11:05 AM – 11:20 AM	Presidential Address Introduction	
11:20 AM – 12:05 PM	Presidential Address	
12:05 PM – 1:05 PM	Member Business Luncheon (AVF Members Only)	Mohave Ballroom
1:05 PM	Open Afternoon	
7:30 PM – 8:00 PM	25th Silver Anniversary Gala Reception	Sachem Terrace & Aztec Foyer
8:00 PM – 10:00 PM	25th Silver Anniversary Gala Dinner	Mohave Ballroom

SATURDAY, MARCH 2

7:00 AM – 8:00 AM	Continental Breakfast	Wigwam Ballroom
7:00 AM – 12:00 PM	Exhibit Hall Open	Wigwam Ballroom
7:00 AM – 3:00 PM	Registration Open	Sachem Foyer
7:00 AM – 8:00 AM	Introduction to the VQI	Arizona Room
8:00 AM – 9:40 AM	Scientific Session 7 – Deep Vein Thrombosis 3	Sachem Ballroom
9:40 AM – 9:55 AM	European Venous Forum – Best Paper 1	Sachem Ballroom
9:55 AM – 10:10 AM	European Venous Forum – Best Paper 2	Sachem Ballroom
10:10 AM – 10:25 AM	Royal Society of Medicine Best Paper	Sachem Ballroom
10:25 AM – 10:50 AM	Coffee Break	Wigwam Ballroom
10:50 AM – 11:40 AM	D. Eugene Strandness, Jr., MD Memorial Lecture – Improving Patient Outcomes After Deep Venous Thrombosis: Where do we go now?	Sachem Ballroom
11:40 AM – 1:00 PM	Lunch On Own	
1:00 PM – 2:50 PM	Scientific Session 8 – Chronic Venous Disease 4	Sachem Ballroom
CONCLUSION		

PURPOSE

The Annual Meeting of the American Venous Forum (AVF) brings together internationally recognized authorities on all aspects of venous disease, diagnosis, pathophysiology and treatment. In addition, researchers' most recent work leading to improved understanding of these topics is presented and discussed.

The full program consists of the half-day David S. Sumner Venous Summit (separate subscription), specialty symposia, scientific sessions and scientific posters to review challenging clinical issues. The scientific sessions are organized around topical areas. The poster session allows a number of scientific presentations to be informally discussed among attendees with special interest. New this year is the addition of a poster display hall, which will allow more presenters to display their research.

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

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

AVF has selected the highest scoring abstract entries for oral presentations within the various meeting sessions. Abstracts presented at the AVF 25th Silver Anniversary Annual Meeting are published in the January 2013 issue of the *Journal of Vascular Surgery: Venous and Lymphatic Disorders*, a new collaborative scientific journal of the American Venous Forum and the Society for Vascular Surgery. The newly released *Journal of Vascular Surgery: Venous and Lymphatic Disorders* is the official journal of the American Venous Forum. Presenting authors of oral presentations will submit the full manuscript for journal publication. All active AVF members will receive a yearly subscription to the Journal as a member benefit!

POSTER ABSTRACTS

Accepted posters for the AVF 25th Silver Anniversary Annual Meeting will be on display in the Mohave East and Mohave West rooms. The top 24 posters will present in two concurrent sessions at the Poster Reception on Thursday, February 28. All posters are available for viewing Thursday, February 28 from 10:00 AM to 7:00 PM. During the presentation times listed below, designated posters are staffed by their respective authors allowing for information exchange and interaction between researchers and attendees. Please see page 36 to view the abstracts for the poster presentations and page 49 to view the poster display abstracts.

POSTER HALL HOURS

Thursday, February 28 in Mohave Ballroom

Poster set-up by Author	8:00 AM - 10:00 AM
Poster Displays	10:00 AM - 7:00 PM
Poster Presentation Session 1: Mohave East Room	5:45 PM - 7:00 PM
Poster Presentation Session 2: Mohave West Room	5:45 PM - 7:00 PM

EVALUATIONS

Please take time to complete the Annual Meeting evaluation form provided in your registration bag. Your input and comments are essential in planning future educational events. Completed evaluations may be returned to the AVF Registration Desk. *Evaluations must be returned if you plan to claim CME credit hours for this program.*

FRIEND OF AVFF RIBBONS

AVF is committed to furthering the field of venous and lymphatic health through the establishment of the American Venous Forum Foundation (AVFF) to support research, training and education. AVF members, attendees and guests can show their support for the Foundation and their commitment to their field by purchasing a "Friend of AVFF" ribbon at the AVF registration desk. The "Friend of AVFF" ribbons are designed to be worn on the name badges of delegates attending the Annual Meeting. Ribbons may be acquired for a minimum donation of $50*.

** The AVFF is a 501(c)(3) organization; donations made to AVFF are tax-deductable as charitable contributions to the extent allowed by law.*

REGISTRATION

Registration packets are ready for pick up at the AVF Registration Desk located in the Sachem Foyer for those pre-registered for the Annual Meeting. On-site registration for the AVF Annual Meeting is accepted, space permitting. Separate registration and fee are required for the David S. Sumner Venous Summit on Wednesday, February 27. The concurrent Specialty Symposia on Wednesday are complimentary for meeting delegates, but does require advanced registration.

Registration: Registration includes all scientific sessions, continental breakfast, coffee breaks, boxed lunch, Exhibit Hall, Welcome Reception and Gala Dinner.

Spouse/Guest Registration: The spouse/guest (non-MD) registration fee includes the Welcome Reception, morning refreshments daily in the Hospitality Suite, Exhibit Hall, and Gala Dinner on Friday evening. This does not include access to the scientific sessions.

REGISTRATION DESK

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

Tuesday, February 26	4:00 PM - 6:00 PM
Wednesday, February 27	7:00 AM - 7:30 PM
Thursday, February 28	7:00 AM - 7:30 PM
Friday, March 1	7:00 AM - 1:05 PM
Saturday, March 2	7:00 AM - 3:00 PM

ANNUAL MEETING FINAL PROGRAM

Following the Annual Meeting, the final program will be posted on the website (www.veinforum.org) by the end of March. Annual Meeting attendees will receive an e-mail with viewing instructions.

25TH ANNIVERSARY GALA CELEBRATION

The event will be held the evening of Friday, March 1, and includes cocktails on the terrace, dinner and live entertainment. All meeting attendees and industry representatives are invited to the Gala Celebration. Celebrate 25 years with the founding members of the American Venous Forum, who began forming the society in 1987. *Seating is limited. You must register in advance to recieve a ticket to the dinner.*

THE WIGWAM

The Wigwam is an Arizona treasure offering a unique blend of nostalgic charm with a modern sense of adventure. Whether you want to relax in the luxurious comfort of the 331 casitas & suites, practice your swing on the 54 holes of golf, cruise down two 25-foot waterslides, unwind at the superb Elizabeth Arden Red Door spa, savor distinctive cuisine or enjoy some fantastic live entertainment. The Wigwam has something for tourists and locals alike! Continuing its rich history as an Arizona treasure, The Wigwam inspires guests to "Make Some History" by creating cherished memories and unrivaled experiences of their very own.

TRANSPORTATION OPTIONS

Transportation service - The Wigwam is pleased to provide transportation to and from the airport or any other offsite destination. For reservations and pricing, please see The Wigwam Concierge.

HOTEL DINING

Litchfield's (signature restaurant)
Litchfield's restaurant, like its namesake, Paul W. Litchfield, past Goodyear Tire & Rubber Executive and founder of Litchfield Park, pays tribute to the local community. Litchfield's supports the community with a menu crafted from farm-to-table and locally sourced produce and date palms seasonally harvested at The Wigwam.

Hours: Monday - Sunday, 5:30 PM - 9:00 PM
Reservations are recommended.

Red's Bar & Grill
In honor of The Wigwam's venerated head golf pro for 42 years, Red's Bar & Grill overlooks the rolling greens of the historic Gold and Patriot golf courses. Red's offers a relaxed vibe and updated comfort food. Soups, sandwiches, burgers, pulled chicken and other timeless favorites are available at both lunch and dinner. Red's is open Monday through Sunday.

Hours: Breakfast, 6:30 AM - 10:30 AM
Lunch, 11:00 AM - 2:30 PM
Dinner, 5:00 PM - 9:00 PM

Wigwam Bar (Lobby Bar)
The Wigwam Bar is The Wigwam's heart and soul – a European-style community courtyard in Litchfield Park that provides delightful beverages from an early morning latté to a late evening of piano jazz and cocktails. The bar provides expansive small bites and appetizer menu, large entrees and a refreshing list of signature fresh fruits and herbs infused cocktails.

Hours: Breakfast, Monday - Sunday, 6:00 AM - 11:00 AM
Lunch/Dinner, Sunday - Thursday, 11:00 AM - 11:00 PM
Lunch/Dinner, Friday - Saturday, 11:00 AM - 12:00 AM

Tower Bar and Grill (Poolside)
Enjoy the Tower Bar and Grill as a getaway after a day full of meetings. Relax at the poolside cabana or take advantage of the dual, 25-foot water slides. The Tower Pool Bar and Grill offers fun food with a healthier twist.

Hours: Monday - Sunday, 11:00 AM - 5:00 PM

THE WIGWAM DIFFERENCE

Every detail of your stay matters at The Wigwam. Please enjoy a long list of complimentary guest room amenities provided by The Wigwam. Refrigerators, microwaves, rollaway beds, and cribs are available upon request.

RECREATION & ENTERTAINMENT

Cultural Adventures: The Wigwam Concierge will be happy to assist you in planning day trips around the state, hot air balloon rides, sunset trail rides, shopping excursions, art walks and much more.

Elizabeth Arden Red Door Spa *(Reservations are recommended.)*

Fitness Center: Hours are Monday - Sunday, 5:00 AM - 11:00 PM

Bike Rentals: Rentals are available Monday - Sunday, 8:00 AM - 6:00 PM at the Tennis Pro Shop

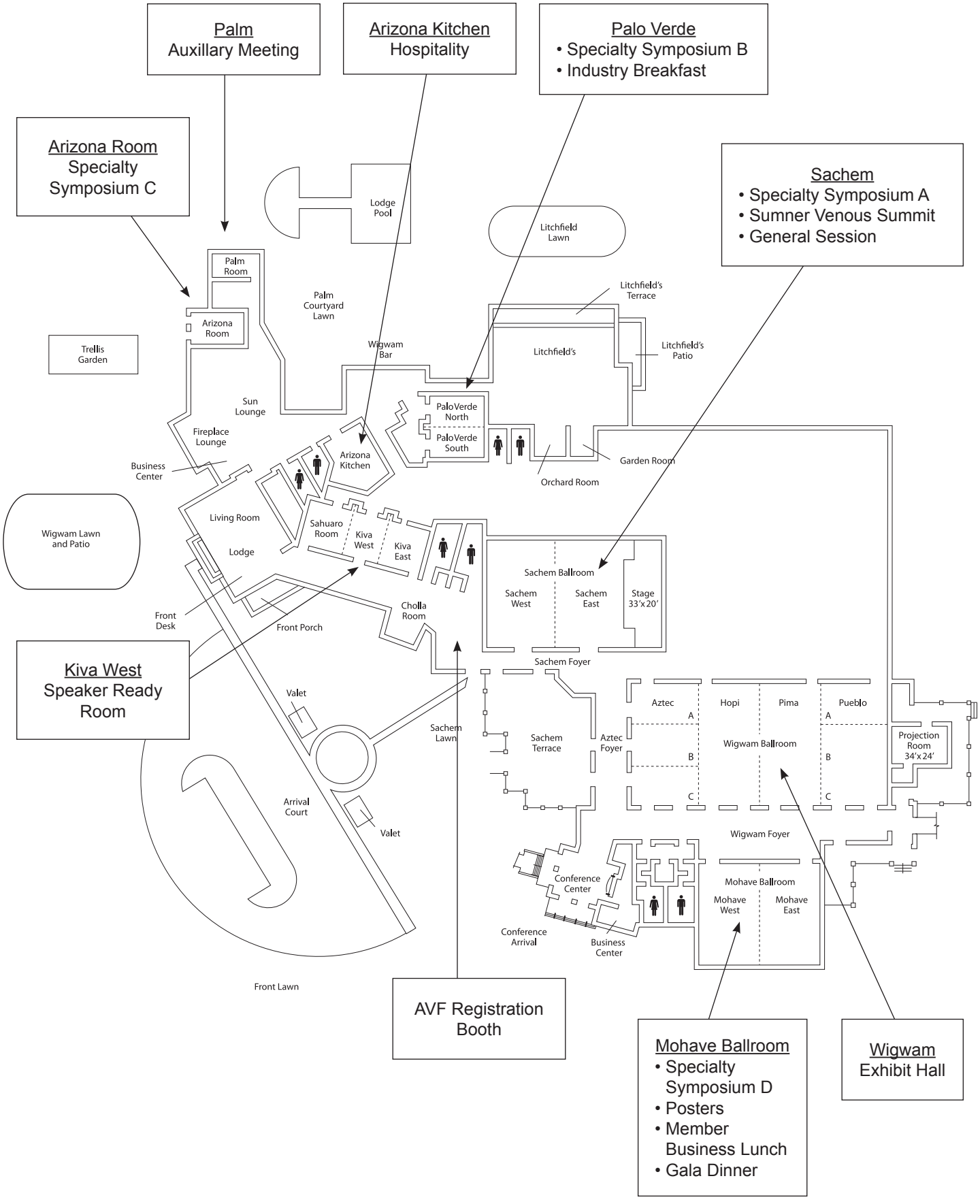
Tennis: Hours are Monday - Friday, 7:00 AM - 8:00 PM, Saturday & Sunday, 7:00 AM - 5:00 PM

Bocce Ball

Pools & Jacuzzis

Wigwam History Tours *(Reservations are recommended.)*

Hotel Map


Palm
Auxillary Meeting
Arizona Kitchen
Hospitality
Palo Verde
• Specialty Symposium B
• Industry Breakfast
Arizona Room
Specialty
Symposium C
Sachem
• Specialty Symposium A
• Sumner Venous Summit
• General Session
Lodge Pool
Litchfield Lawn
Palm Room
Palm Courtyard Lawn
Litchfield's Terrace
Arizona Room
Trellis Garden
Wigwam Bar
Litchfield's
Litchfield's Patio
Sun Lounge
Palo Verde North
Palo Verde South
Fireplace Lounge
Arizona Kitchen
Business Center
Garden Room
Orchard Room
Wigwam Lawn and Patio
Living Room
Sahuaro Room
Kiva West
Kiva East
Lodge
Sachem Ballroom
Sachem West
Sachem East
Stage 33'x20'
Front Desk
Front Porch
Cholla Room
Sachem Foyer
Kiva West
Speaker Ready
Room
Valet
Sachem Lawn
Aztec
Hopi
Pima
Pueblo
A
B
C
Sachem Terrace
Aztec Foyer
Wigwam Ballroom
Projection Room 34'x24'
Arrival Court
Valet
Wigwam Foyer
Conference Center
Mohave Ballroom
Mohave West
Mohave East
Conference Arrival
Business Center
Front Lawn
AVF Registration
Booth
Mohave Ballroom
• Specialty
Symposium D
• Posters
• Member
Business Lunch
• Gala Dinner
Wigwam
Exhibit Hall

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
- Developing the first online venous registry and producing Annual Reports

MISSION STATEMENT

"The Mission of the American Venous Forum is to improve the care of patients with venous and lymphatic disorders by providing a forum dedicated to the clinical practice and education and to the exchange of information concerning basic and clinical research pertaining to the venous and lymphatic systems."

PROGRAMS AND INITIATIVES

Education Programs
- The Fellows Course in Venous Disease
- The Vein Forum: A Comprehensive Hands-On Course for Practicing Clinicians
- Annual Meeting

Publications
- *Journal of Vascular Surgery: Venous and Lymphatic Disorders*
- Educational Brochures
- Handbook of Venous Disorders
- Layman's Handbook of Venous Disorders

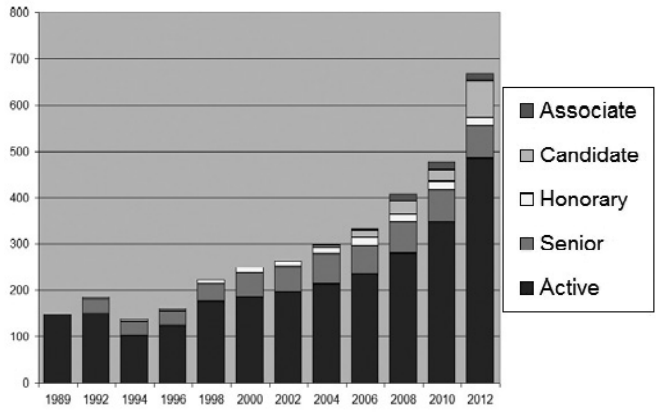
Research
- American Venous Registry & Annual Reports
- Collaboration with SVS PSO
- AVF Surveys

Screening Programs
- National Venous Screening Programs
- Public Online Venous Screening

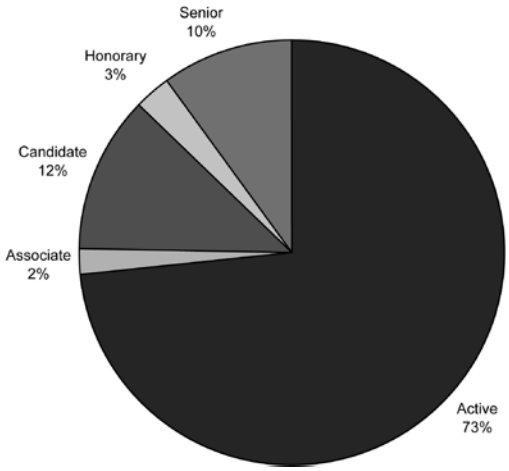
MEMBERSHIP

The AVF continues to grow and now includes more than 650 influential leaders, expert investigators and clinicians in the venous and lymphatic healthcare field. 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.

AVF Membership Growth



2012 Membership Distribution



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2000 Phoenix, AZ..... David S. Sumner, MD
1999 Dana Point, CA..... Thomas F. O'Donnell, Jr., MD
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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

BEST POSTERS

Each year, a formal poster session is held where authors are invited to give a 3-minute synopsis of their work followed by a 2-minute Q & A with the audience in attendance. Posters are scored and prizes are awarded to the top presentations.

2012 WINNERS

Jose Diaz, MD
A Novel Mouse Model to Study Thrombogenesis and Thrombus Resolution with Continuous Blood Flow in the Inferior Vena Cava

Christopher Lattimer, MD
Pulsatile Ante-Grade Great Saphenous Flow is Associated with Severe Chronic Superficial Venous Insufficiency

Fedor Lurie, MD
Interface Pressure Under Compression Bandages: Current Practice and a Way to Consiste

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 2013 recipient of this distinctive honor is Susan R. Kahn, MD, MSc, FRCPC, Professor of Medicine at McGill University.

Improving Patient Outcomes After Deep Venous Thrombosis: Where do we go now?

Susan R. Kahn, MD, MSc, FRCPC
Professor of Medicine, McGill University
Division of Internal Medicine & Center for Clinical Epidemiology, Jewish General Hospital
Montreal, Canada

Dr. Kahn is a clinical epidemiologist based at the Jewish General Hospital in Montreal, a McGill University teaching hospital, and is appointed as Professor with Tenure in the Department of Medicine, McGill University, where she is also Director of the McGill Thrombosis Fellowship and Thrombosis Program. She is Associate Director for Clinical Research at the Lady Davis Institute for Medical Research at the Jewish General Hospital in Montreal.

Dr. Kahn's research interests focus primarily on clinical trials of interventions to prevent, diagnose, treat, and improve outcomes of venous thromboembolism. She holds a National Clinical Research Scholar award from the Fonds de la Recherche en Santé du Québec, has been awarded numerous peer-reviewed research grants from national and provincial funding agencies and has published more than 170 papers in the field of thromboembolism. Dr. Kahn is a founding member of Venous Thromboembolism Clinical Trials Organization (VECTOR), a national collaborative research group, and from 2007-2011 served as Chair of the Canadian Institutes of Health Research Randomized Controlled Trials grant committee. She won the U.S. Vascular Disease Foundation's 2011 Venous Disease Research Award for best published research paper, the 2005 Heart and Stroke Foundation of Quebec Pfizer Award of Research Excellence, and was Panel Chair for the "Prevention of VTE in Nonsurgical Patients" chapter of the ACCP Guidelines on Antithrombotic Therapy and Prevention of Thrombosis, Chest 2012 (9th ed.).

This lecture will be presented on Saturday, March 2 at 10:50 am.

Please plan to attend this featured presentation.

D. EUGENE STRANDNESS, JR., MD MEMORIAL LECTURE

This honor, the highest given by the organization, has been bestowed to the following outstanding recipients in past years:

2012 **Paolo Pandoni, MD, PhD, Padova, Italy**
Venous and Arterial Thrombosis: Is There a Link?

2011 **David C. Zawieja, PhD, College State, Texas**
Microcirculatory and Lymphatic Disorders

2010 **Manuel Monreal Bosch, MD, Madrid, Spain**
RIETE Database and Multiple Clinical Perspectives

2009 **O. William Brown, MD, Bingham Farms, Michigan**
Venous Disease and Medical Malpractice: A Peek Inside the Playbook of a Plaintiff's Attorney

2008 **Thomas O'Donnell, Jr., MD, Boston, Massachusetts**
What's the Evidence for Treating Perforators in Venous Ulcers

2007 **Robert L. Kistner, MD, Honolulu, Hawaii**
Foresight 2020: Creating the Venous Vision

2006 **Pan Ganguly, PhD, Bethesda, Maryland**
The Challenges in Venous Thrombosis

2005 **Michel R. Perrin, MD, Chassieu, France**
The Importance of International Collaboration for the Development of a Scientific Approach to Venous Disease

2004 **Professor Eberhard Rabe, MD, Bonn, Germany**
Prevalence and Risk Factors of Chronic Venous Diseases: The Bonn Vein Study

2003 **Professor Claudio Allegra, MD, Rome, Italy**
Involvement of the Microcirculation in Chronic Venous Insufficiency

2002 **Professor Alfred Bollinger, MD, Zurich, Switzerland**
Microcirculation in Chronic Venous Insufficiency and Lymphedema

2001 **Professor C.V. Ruckley, MD, Edinburgh, Scotland**
Chronic Venous Insufficiency: Lessons from Scotland

2000 **Professor Sir Norman Browse, MD, FRCS, FRCP, Channel Islands, England**
Forty Years On

1999 **David Robinson, PhD, Bethesda, Maryland**
A Journey to Complexity: The Continuing Evolution in Vascular Research

1998 **David Bergquist, MD, PhD, Uppsala, Sweden**
Chronic Leg Ulcer - The Impact of Venous Disease

1997 **Professor Kevin G. Burnand, London, United Kingdom**
Venous Thrombosis and Natural Thrombolysis

1996 **Ermenegildo A. Enrici, MD, Buenos Aires, Argentina**
The Role of the Perforants' System in Deep Venous Chronic Insufficiency in Its Different Stages: Surgical Indications, Tactics and Techniques

1995 **Philip D. Coleridge Smith, MD, FRCS, London, United Kingdom**
Venous Disease and Leukocyte Mediated Microcirculatory Injury

1994 **Andrew W. Nicolaides, MD, FRCS, London, United Kingdom**
Deep Vein Thrombosis - Aetiology and Prevention: The Legacies of the 70's, the Promises of the 80's and the Challenges of the 90's

1993 **Olav Thulesius, MD, PhD, Linkoping, Sweden**
Vein Wall Characteristics and Valvular Functions in Chronic Venous Insufficiency

1992 **G. W. Schmid-Schonbein, MD, La Jolla, California**
Leukocytes as Mediators of Tissue Injury

1991 **Jack Hirsh, MD, Hamilton, Ontario, Canada**
Development of Low Molecular Weight Heparin for Clinical Use

1990 **Hugo Partsch, MD, Vienna, Austria**
Diagnosis of AV Fistulas in Vascular Malformations

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 Grant, Servier 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.

AVFF LEADERSHIP

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AMERICAN VENOUS FORUM FOUNDATION
Funding the Future of Venous Care

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.

The BSN-Jobst Research Grant provides a one-year $50,000 grant to a research fellow chosen through a competitive peer-review selection process. A committee of distinguished vascular physicians, appointed by the American Venous Forum Foundation, determines the fellowship recipient and recognizes its selection during the Annual Meeting Gala Dinner.

The following outstanding BSN-Jobst Research Grant Recipients in past years:

2012 Rabih Chaer, MD, University of Pittsburgh
2011 Marlene Mathews, 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

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 AVFF committee. Two winners will be selected to present their work at the European Venous Forum.

The following outstanding Servier Traveling Fellowship Recipients in past years:

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

7:00 AM – 8:00 AM
Continental Breakfast . . . . . Sachem Foyer

8:00 AM – 12:00 PM
DAVID S. SUMNER VENOUS SUMMIT . . . . . Sachem Ballroom
Challenging Cases in Venous Disease
Chair: Peter Henke, MD

Educational Objectives: 1) The participants will be able to list the absolute indications for inferior vena cava filters and distinguish them from extended and relative indications. They will understand the potential complications associated with long-term use of retrievable inferior vena cava filters. 2) Participants will learn about the different methods of treatment in patients with isolated calf deep vein thrombosis. 3) Participants will learn to evaluate patients with complex venous outflow obstruction, apply endovascular techniques in managing iliocaval obstruction, and learn to use intravascular ultrasound as a guide to endovenous interventions. 4) After the lecture on Complex Venous Disease, the participant is familiar with the different methods and approaches to treat complex superficial venous reflux. 5) Participants will be able to demonstrate multiple factors leading to disrupted wound healing requiring correction in venous leg ulcers and consider options for treatment of venous leg ulcers and appropriate use to accelerate healing. 6) This case will focus on the interventional management of acute iliofemoral DVT. The attendees will be exposed to different techniques for the treatment of complicated iliac vein and caval thrombosis. 7) Participants will learn how to handle the complex nature of lymphatic malformation (LM) safely when combined with venous malformation (VM) avoiding the risk of lymph leak and subsequent sepsis, known as infrequent complication of Klippel Trenaunay Syndrome.

Case # 1 IVC Filter Use and Management
John Rectenwald, MD

Case # 2: Tibial DVT Management
Elna Masuda, MD

Case # 3: COMPLEX Non DVT System Disease Requiring Intervention
Antonios Gasparis, MD, FACS

Case # 4: Complex Superficial Venous Disease Requiring Intervention
Lowell Kabnick, MD

Case # 5: Wound Management of Venous Stasis Ulceration
William Marston, MD

Case # 6: Complex Acute DVT Intervention
Rabih Chaer, MD

Case # 7: Lymphatic Disease Management
Thom W. Rooke, MD, FSVM

12:00 PM – 1:15 PM
Lunch On Own

1:15 PM – 3:15 PM
SPECIALTY SYMPOSIA (CONCURRENT)
(Limited Seating - Registration Required)

Time: 1:15 PM – 3:15 PM
(A) VASCULAR MEDICINE & THROMBOSIS . . . . . Sachem Ballroom
Chair: Thom W. Rooke, MD, FSVM

EDUCATIONAL OBJECTIVES: 1) understand the role of new, novel anticoagulants in clinical practice; 2) appreciate the way(s) in which varicose veins might be GOOD for individuals; 3) recognize the various ways in which lymphedema can affect subjects; 4) learn about different types/etiologies of skin/leg ulcers; and, 5) appreciate the various approaches for treating saphenofemoral junction thrombosis after catheter vein ablation.

New Anticoagulants for VTE: The Off-Label Talk
James B. Froehlich, MD, MPH, FSVM

Benefits and Caveats of Warfarin Alternatives: They're Here! But Are They Worry Free?
James B. Froehlich, MD, MPH, FSVM

A New Way to Look at Varicose Veins
Thom W. Rooke, MD, FSVM

Lymphedema and Overlap Syndromes - Diagnosis and Management
Raghu Kolluri, MD, RVT, FSVM

Differential Diagnosis of an Ankle Ulcer
Raghu Kolluri, MD, RVT, FSVM

Work-Up of Sapheno-Femoral Junction Thrombus after Ablative Therapy
Raghu Kolluri, MD, RVT, FSVM

1:15 PM – 3:15 PM

(B) BIOMECHANICS & BIOENGINEERING . . . . . Palo Verde Room

Co-Chairs: Roger D. Kamm, PhD, Seshadri Raju, MD, FACS

EDUCATIONAL OBJECTIVES: The symposium will provide a basic understanding of microvascular pathophysiology underlying venous disease. Pressure rather than flow (perfusion) is the critical element in venous stenosis. Mechanotransduction is the process by which venous hypertension is signaled into biological responses. Microvascular network adaptation to venous hypertension and other challenges will be described. Possible mechanisms that follow microvascular injury causing venous pathologies such as varicoscities and reflux will be discussed. Finally, future possibilities in network regeneration for repair will be explored.

1:15 PM Hemodynamic Parameters for Critical Venous Stenosis
Seshadri Raju, MD, FACS

1:35 PM Structural Adaptation in the Vascular System
Timothy W. Secomb, PhD

1:55 PM Role of Flow Reversal on Oxidative Stress: Implications for Venous Reflux
Ghassan S. Kassab, PhD

2:15 PM Role of Mechanotransduction of Venous Hypertension in Varicose Vein Formation
Hussein M. Atta, MD, PhD

2:35 PM Microfluidic Technologies for Growing Vascular Networks
Roger D. Kamm, PhD

2:55 PM Discussion

1:15 PM – 3:15 PM

(C) WOUND CARE & COMPRESSION. . . . . Arizona Room

Chair: William Marston, MD

EDUCATIONAL OBJECTIVES: The symposium will discuss causes of venous inflammation and pathways leading to venous ulceration; consider options for compression and other standard components of a treatment protocol for ulcer healing based on current care guidelines; and, introduce adjunctive methods which may accelerate wound healing in addition to standard care.

Joseph Raffetto, MD

William Ennis, MD

1:15 PM – 3:15 PM

(D) LIVE VENOUS ULTRASOUND . . . . . Mohave West

Chair: Nicos Labropoulos, PhD, DIC, RVT

EDUCATIONAL OBJECTIVES: 1) understand how to optimize imaging of superficial and deep veins; 2) learn ultrasound venous anatomy; and, 3) recognize different patterns of reflux and obstruction.

Antonios Gasparis, MD, FACS

3:15 PM – 3:45 PM

Coffee Break . . . . . Wigwam Ballroom

3:45 PM – 5:35 PM

Scientific Session 1

Chronic Venous Disease 1: Varicose Veins . . . . . Sachem Ballroom

Moderators: Lowell Kabnick, MD, Fedor Lurie, MD, Alun Davies, DM

3:45 PM – 4:00 PM

1-1 Management Trends For Chronic Venous Insufficiency Across The United States: A Report From The American Venous Registry

J. Almeida[1], L. Kabnick[2], T. Wakefield[3], J. Raffetto[4], R. McLafferty[5], P. Pappas[6], J. Rectenwald[3], J. Blebea[7], D. Gillespie[8], U. Onyeachom[9], R. Kinsman[10], B. K. Lal[10]; [1]Miami Vein Center, Miami, FL, [2]NYU, New York, NY, [3]University of Michigan, Ann Arbor, MI, [4]Veterans Affairs Boston Medical Center, Boston, MA, [5]Southern Illinois Medical Center, Springfield, IL, [6]Brooklyn Hospital Center, New York, NY, [7]Univ of Oklahoma College of Medicine, Tulsa, OK, [8]University of Rochester, Rochester, NY, [9]American Venous Forum, Milwaukee, WI, [10]University of Maryland School of Medicine, Baltimore, MD.

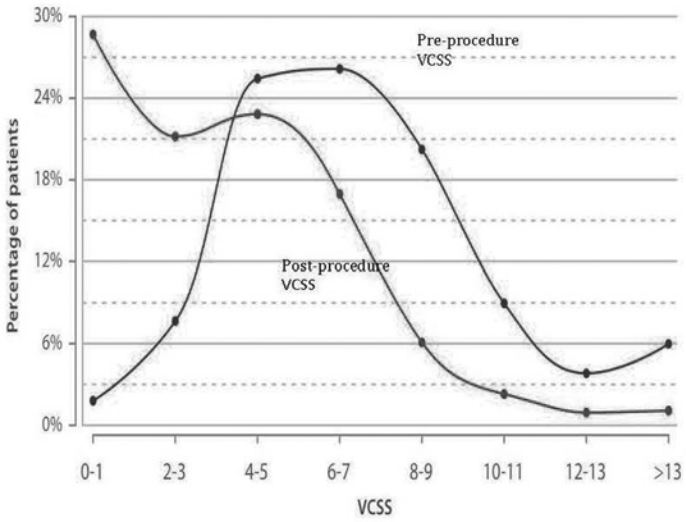
OBJECTIVE: Minimally invasive procedures for the treatment of symptomatic saphenous vein reflux have been rapidly adopted as an alternative to saphenous vein stripping across clinical centers in the United States during the past decade. There is limited information however, on the proportionate use of the various available vein ablation methods. We analyzed data from the Varicose Vein (VV) module of the American Venous Registry (AVR) to identify the relative frequency of techniques used for the treatment of symptomatic saphenous vein reflux and their associated outcomes, based on standardized measures of clinical severity scores.

METHODS: De-identified data from the VV module of the AVR was reviewed on patients treated by 41 physicians from 37 sites in a web-based registry and database. Patient data collected included baseline and post-procedural venous clinical severity score (VCSS), type of procedure, and any complications resulting from the procedure. Follow-up was measured at 3, 6, and 12 months post-procedure.

RESULTS: A total of 4,014 procedures were entered into the database between 2007-2011, on 3,930 patients. Most interventions involved either surgery, sclerotherapy, radio-frequency ablation (RFA) or endovenous laser ablation (ELA), although a significant proportion of legs (38% of left legs and 36% of right legs) underwent a combination of therapies. Laser ablation was the most-frequently used treatment (60%) followed by phlebectomy (34%), RFA (33%), and sclerotherapy (16%). Preoperative VCSS scores ranged from 4 to 9 (median 7) with a significant improvement to a median of 4 (figure) one month after treatment ($p<0.001$). The overall rates of immediate post-procedural

complications (defined as: bleeding requiring intervention, blister of the skin, deep vein thrombosis, hematoma, paresthesia, pigmentation of the skin, superficial thrombophlebitis, ulcer, and wound infection) were low. Local complications occurred after 1.1% of interventions (right lower extremity) and 0.6% of procedures (left). Bilateral procedures incurred a higher complication rate of 3.6%. Even when minor complications such as paresthesias were included in a Kaplan-Meier analysis, the projected 3-year complication-free rate was 85%.

CONCLUSIONS: Endovenous laser ablation is the most frequently performed procedure for treatment of symptomatic saphenous vein relux. Minimally invasive ablation using ELA, RFA and sclerotherapy with or without concomitant phlebectomy are effective treatments for chronic venous insufficiency and result in a significant reduction in disease severity scores after treatment. The procedures are safe, with low complication rates reported in the short-term. Long-term follow-up will enable an assessment of the durability of the procedure.



4:00 PM – 4:15 PM

1-2 Pelvic Venous Reflux Is A Major Contributory Cause Of Recurrent Varicose Veins In More Than A Quarter Of Women

A. M. Whiteley, D. C. Taylor, M. S. Whiteley; The Whiteley Clinic, Guildford, United Kingdom.

BACKGROUND: Recurrence is a common problem following varicose vein surgery. The causes are usually identified as neovascular regrowth, incompetent perforating veins, missed or "de novo" venous reflux, inadequate surgery and deep venous reflux. There has been increasing awareness that leg varicose veins are associated with pelvic venous reflux in approximately 20% of women who have had children. However most venous units do not routinely look for pelvic venous reflux nor treat it. The aim of this study is to investigate what proportion of recurrent varicose veins in patients who have had previous open surgery have pelvic venous reflux as a major contributing cause.

METHODS: A retrospective study was performed on all patients referred in the previous year with recurrent varicose veins or venous reflux disease, who had previously had open surgery performed elsewhere. All patients had lower limb venous duplex ultrasonography performed routinely and, those found to have a contribution of reflux arising from the pelvis into their recurrent varicose veins, underwent transvaginal duplex ultrasonography. Each case was assessed by a consultant vascular surgeon and the major cause, or causes, of the recurrent varicose veins was noted.

RESULTS: Results from 109 patients with recurrent varicose veins in 172 legs were analyzed. Male to female ratio was 97:12. Clinical severity was uncomplicated varicose veins (C2) in 103 legs (59.9%), oedema (C3) in 30 (17.4%), skin damage (C4) in 32 (18.6%) with healed ulcer (C5) in 3 (1.7%) and open ulcer (C6) in 2 (1.2%). Two legs had profuse thread veins only on investigation (C1).
Patients were divided into four groups:
Group 1 - all patients
Group 2 - females
Group 3 - females with children
Group 4 - females with children who hadn't had hysterectomy.
Pelvic venous reflux was found to be a major contributing cause of recurrent varicose veins in 44/172 legs (25.6%). In group 2, this rose to 43/154 legs (27.9%), 40/131 legs (30.5%) in group 3 and 37/111 legs (33.3%) in group 4.

CONCLUSIONS: Pelvic venous reflux is a major contributing cause in recurrent varicose veins after open surgery that has rarely been reported previously.

	Group 1 (n=172)	%	Group 2 (n=154)	%	Group 3 (n=131)	%	Group 4 (n=111)	%
Neovascular tissue	99	57.6%	86	55.8%	78	59.5%	63	56.8%
Incompetent Perforating Veins (IPV)	72	41.9%	54	35.1%	39	29.8%	36	32.4%
Missed or "De Novo" vein reflux	51	29.7%	49	31.8%	41	31.3%	35	31.5%
Pelvic Veins	44	25.6%	43	27.9%	40	30.5%	37	33.3%
Inadequate operation	24	14.0%	21	13.6%	18	13.7%	12	10.8%
Previously untreated veins	11	6.4%	10	6.5%	7	5.3%	7	6.3%

4:15 PM – 4:30 PM

1-3 Big Veins, Big Deal - Vein Diameter Affects Disease Severity Not Quality Of Life

T. R. A. Lane, A. C. Shepherd, M. Gohel, I. J. Franklin, A. H. Davies; Academic Section of Vascular Surgery, Imperial College London, London, United Kingdom.

BACKGROUND: Symptom assessment in varicose veins is complex, and vein diameter has been used as a tool for rationing reimbursement by healthcare providers and insurers. The aim of this study was to examine the relationship between vein diameter, clinical severity and disease specific quality of life in patients with venous disease.

METHODS: Duplex scans from patients with truncal vein reflux awaiting intervention were assessed and the maximal vein diameter (VD) was recorded. The Aberdeen Varicose Vein Questionnaire (AVVQ), the Venous Clinical Severity Score (VCSS) and clinical CEAP grade was recorded.

RESULTS: Data were available for 339 patients, of whom 59% were female, 10% obese, mean (SD) age was 49.6 (16.2) and 55% were C1-C3. The mean (SD) AVVQ was 21.1 (11.7) median (IQR) VCSS 6 (4-8) and clinical CEAP 3 (2-4). Mean (SD) VD was 8.4 mm (3.9 mm). A weak but significant correlation was found between CEAP and VD (Spearman's 0.145, p=0.008), and VD and VCSS (Spearman's 0.145, p=0.008). No correlation was found between VD and AVVQ (Spearman's 0.077, p=0.160). Vein diameters >6mm had a significantly greater quality of life impairment (AVVQ 22.06 versus 19.00, p=0.029) and clinical disease severity (VCSS 6 versus 5, p<0.001). Male patients had higher AVVQ (p=0.001) and CEAP (p=0.026) with a larger VD (p=0.008), but there was no significant difference in VCSS scores between genders (p=0.140).

CONCLUSIONS: Patients with larger vein diameters presented with worse clinical disease severity (CEAP and VCSS) but not with a worse quality of life. Male patients suffered worse clinical stage and quality of life scores. A maximum vein diameter >6mm was associated with a significantly greater quality of life impairment and clinical disease severity.

4:30 PM – 4:45 PM

1-4 Influence On Chronic Venous Insufficiency Of Primary Absence Of The Great Saphenous Vein In The Saphenous Compartment At The Thigh

P. Pittaluga, S. Chastanet; Riviera Veine Institut, Nice, France.

BACKGROUND: In patient with no history of saphenous ablation the absence of the great saphenous vein (GSV) within the saphenous compartment in an intrafascial situation at the thigh (SCT) is not rare. However it is unclear if this anatomic situation has an influence on the hemodynamic and clinical status of the patients with chronic venous insufficiency.

METHODS: We reviewed the clinical, anatomical and hemodynamic data of patients who consulted in our center between January 2010 and July 2012 and who never had any saphenous ablation procedure. We considered two different anatomic situations:
- Absence of the GSV within the SCT below the upper third of the thigh (GSV1)
- Presence of the GSV within the SCT below the upper third of the thigh (GSV2)
We also reviewed the treatments performed and the number of zones treated by phlebectomy (NZT) in these patients.

RESULTS: We included in the study 1,433 patients among whom 1,950 lower limbs were assessed for signs or symptoms of venous insufficiency. A GSV1 was present at least in one LL in 208 patients (14.5%) and it concerned 299 LLs (15.3%). Patients with GSV1 were younger (47.4 vs. 50.0 yrs P< .05) and had a higher BMI (27.8 than 24.6 P< .05) than patients with GSV2. In presence of varicose veins with GSV1 the frequency of C3 and C4 was higher (16.1% and 6.2% vs. 8.1% and 2.4% P< .05), the presence of symptoms was more frequent (81.0% vs. 55.3% P< .05), the sapheno-femoral junction was more frequently refluxing (66.7% vs. 30.1% P< .05) and as well as the upper third of the GSV (95.2% vs. 69.1% P< .05) with a larger mean diameter (7.6 vs. 5.0 P< .05). A saphenous ablation by stripping or radiofrequency was more frequently carried out in LLs with GSV1 than in LLs with GSV2 (22.3% vs. 6.0% P< .05) with a higher NZT (7.0 vs. 6.2 P< .05).

CONCLUSIONS: We observed that the absence of the GSV in the saphenous compartment at the mid-thigh was associated with a younger age and a higher BMI, with a higher frequency of symptoms, edema and skin changes in patients with chronic venous insufficiency. This anatomic situation was also correlated with a worse hemodynamic and anatomical status of the proximal GSV, leading to a more frequent saphenous ablation in patients with varicose veins.

4:45 PM – 5:00 PM

1-5 The European Multicenter Study On Cyanoacrylate Embolization Of Refluxing Great Saphenous Veins Without Tumescent Anaesthesia And Without Compression Therapy

T. M. Proebstle[1], J. Alm[2], L. Rasmussen[3], S. Dimitri[4], J. Lawson[5], M. Whiteley[6], I. J. Franklin[7], A. H. Davies[7]; [1]University of Mainz, Mainz, Germany, [2]Dermatoligikum, Hamburg, Germany [3]The Danish Vein Center, Naestved, Denmark, [4]Veinsolutions Center, Spire Cheshire, United Kingdom, [5]Vein Center, Ouderkerk, Netherlands, [6]The Whiteley Clinic, Guildford, United Kingdom, [7]Imperial College, London, United Kingdom.

BACKGROUND: Current endothermal saphenous vein ablation techniques are based on perivenous injection of tumescent local anesthesia. An embolization technique for abolition of saphenous vein reflux requiring neither tumescent local anesthesia nor post-interventional compression therapy could significantly facilitate treatments.

METHODS: A prospective observational multicenter study was conducted in seven European vein centers between December 2011 and July 2012. Study treatment consisted of endovenous embolization of incompetent Great Saphenous Veins (GSVs) with a unique endovenous cyanoacrylate (CA) adhesive implant delivered with a proprietary trans-catheter-based administration system. Perivenous tumescent anesthesia, sedation and post-interventional routine use of compression stockings were not used. Varicose GSV tributaries remained untreated during the first 3 months after study treatment. Duplex ultrasound and clinical examination were performed immediately, at 2 days, and at 1, 3 and 6 months after the procedure. During the first month after treatment patients recorded pain and side-effects in a diary.

RESULTS: 69 GSVs in 69 patients were treated; median follow-up was 3 months [range 1 to 6]. Average (+/- SD) CA volume was 1.3 +/- 0.4 ml, [range 0.4 - 2.2]. At 2 day follow-up all 69 patients (100%) showed complete occlusion of the GSV. No full recanalization occurred during follow-up. Partial recanalizations were observed at 3 months in 2 of 40 and at 6 months in 1 of 19 patients at risk. According to life table analysis, complete occlusion rates were 95% at 3 months (95%-CI: 0.885 - 1.0) and 90% at 6 months (95%-CI: 0.789 - 1.0). During follow-up, no SAEs were observed. Side effects included phlebitis in 6 cases (8.7%), 5 of whom received NSAIDs for an average period of 7 days. One patient (0.7%) had 0.5 mm thrombus extension into the common femoral vein. VCSS improved from 4.4 +/- 2.3 at baseline to 1.8 +/- 1.6 at 1 month (mean +/- SD).

CONCLUSIONS: Transcatheter endovenous CA adhesive for closure of insufficient GSVs proved to be feasible, safe and effective without the use of sedation, tumescent anesthesia or compression stockings.

5:00 PM – 5:07 PM

Q1-1 Foam Washout Sclerotherapy A New Technique Geared Toward Reducing Short & Long Term Complications Of Regular Foam Sclerotherapy, And Comparison With Existing Foam Sclerotherapy Method

K. Fattahi; Vein Specialty Medical Clinic Inc, Campbell, CA.

Foam sclerotherapy (FS) has proven itself to be a valuable treatment method for small & large varicose veins (VV) of the lower extremities. However, it is associated with a number of complications such as visual disturbance, transient neurological deficits, migraines, deep vein thrombosis (DVT), & superficial phlebitis. The author developed Foam Washout Sclerotherapy (FWS) to remove all or most of the injected foam from the targeted varicosity within seconds after the foam comes in full contact with the endothelium of the targeted vein, and optimal damage to the endothelium was attained.

In FWS the treating physician has control over duration of foam contact with the endothelium. The active application of negative pressure at the site of removal of foam prevents it from entering the deep veins via perforating veins and guides the flow of foam in the desired direction within the varicosity. 727 subjects were selected, of which 612 completed the study having 852 cases of greater (GSV) & short saphenous (SSV) & antero-lateral tributary (ALT) varicosities. Cases were randomly selected to receive either the current popular foam sclerotherapy or foam-washout sclerotherapy over a 6-month period. Patients were evaluated for short & long-term complications by phone interview in 24 hours, followed by in-office visits including ultrasound & Doppler studies in 2 weeks and then at 2 & 6 months.

Treatment efficacy, judged by occlusion of varicosity, was similar in both groups. However, the combined short & long-term complications were less than 2% in foam-washout group as compared to near 20% in regular foam sclerotherapy group. In patients who experienced both treatment methods, patient satisfaction was much higher in the foam-washout group related to no pain during the injection and lower frequency and intensity of problems related to trapped blood (superficial phlebitis).

CONCLUSION: Foam-washout sclerotherapy is a simple technique, with many advantages, that can be performed and mastered by physicians experienced in foam sclerotherapy. While it provides results similar to the current foam sclerotherapy method, its level of patient satisfaction & significantly lower rate of serious complications make it a preferred method of foam sclerotherapy of varicosities, where technically can be applied.

5:07 PM – 5:14 PM

Q1-2 Negotiations With Health Insurers Can Lead To Positive Changes In Policies Towards Venous Disease

H. J. Welch[1], T. F. O'Donnell, Jr.[2], M. Iafrati[2], D. R. Gorin[3], M. Merport[4]; [1]Lahey Clinic, Burlington, MA, [2]Tufts Medical Center, Boston, MA, [3]Cape Cod Hospital, Hyannis, MA, [4]Southcoast Hospitals Group-St. Luke's Hospital, New Bedford, MA.

BACKGROUND: Almost all practitioners in the United States are affected by the policies of health insurance plans (HIP); particularly for delivering care to patients with chronic venous insufficiency (CVI). Many of these policies are outdated, formulated by administrators with the advice of physicians unfamiliar with CVI, and are not evidence based. Denial of appropriate care by the HIP is frustrating to both the patient and provider, leading to delays in care and much time and effort in the appeals process.

METHODS: Four vascular surgeons (three AVF members) and an interventional radiologist, representing four institutions, all high volume CVI specialists, had serial meetings with two of the three major HIPs in Massachusetts, outlining the problems with their CVI policies. Through education of the HIP medical staff and reviewers, the specialists were then asked to review the policies and recommend changes.

RESULTS: As a result of the collegial communications with the HIPs, a number of changes were made in their documents regarding treatment of CVI. These include: 1) proper nomenclature for the venous systems, 2) the elimination of the need for chronic analgesic medication, 3) treatment for non-axial varicose veins, 4) decrease in the required length of conservative (i.e. elastic compression stockings) treatment prior to surgery from 12 weeks to 6 weeks, 5) diagnostic ultrasound testing (i.e. for reflux) is to be performed with the patient standing with a reflux time of > 1 second defined as abnormal, 6) open *or healed* ulcer, *or lipodermatosclerosis* as an eligibility criteria for surgery.

CONCLUSIONS: While HIPs seek to reduce expenses and maximize operating margins, they are also tasked with facilitating appropriate access to necessary medical care for their members. Cooperation amongst physicians can lead to a dialogue between payers and providers, and lead to positive changes in HIP policies toward the treatment of CVI.

5:14 PM – 5:21 PM

Q1-3 Reflux In The Below Knee Great Saphenous Vein Can Be Safely Treated With Endovenous Ablation

S. M. Gifford, M. Kalra, P. Gloviczki, J. Friese, H. Bjarnason, A. Duncan, G. Oderich, M. Fleming, T. Bower; Mayo Clinic, Rochester, MN.

BACKGROUND: Intervention on the great saphenous vein (GSV) has traditionally been limited to the above knee (AK-GSV) segment for fear of saphenous neuralgia in spite of incompetence demonstrated in the below knee (BK-GSV) segment. Ignoring the refluxing BK-GSV is reported to result in residual symptoms and need for re-intervention in nearly half the patients. Experience with endovenous ablation of the BK-GSV at the time of AK-GSV treatment is sparsely reported in the literature. The aim of this study is to evaluate the safety of endovenous ablation of the refluxing BK-GSV.

METHODS: Data from consecutive patients treated with superficial venous ablation over a 30-month period from January 2010 until August 2012 were retrospectively reviewed. Demographic and procedure related outcome and complication data were analyzed specifically for patients undergoing BK-GSV interventions.

RESULTS: A total 387 patients were treated with superficial venous ablation during the study period. Of those, 38 (47 limbs) underwent BK- GSV ablation for reflux at this site. There were 22 females and 16 males (mean age 51 years). Median CEAP score was 3; 27 limbs were treated for symptomatic varicose veins (C 1-3) and 20 for advanced venous insufficiency (C 4-6). Five (10.6%) limbs were treated following prior failed intervention with AK-GSV ablation, sclerotherapy, or stripping. Comorbidities included obesity (41.7%) with mean body mass index of 31.4 (range 19 to 52), obstructive sleep apnea (13.2%), pulmonary hypertension (2.6%), and congestive heart failure (2.6%). Ablation was performed in 45 limbs (97%) utilizing the VenaCure EVLT™ laser vein treatment (AngioDynamics, Queensbury, NY) and 2 limbs using RFA (radiofrequency ablation) with ClosureFAST® system (VNUS Medical Technologies, San Jose, CA) . Mean GSV length ablated was 51.6 cm (range 26 to 65 cm). Endovenous ablation was performed concomitantly on 18 accessory GSVs (38.3%) and 4 incompetent perforators (8.5%). Ambulatory stab phlebectomy of branch varicosities was performed simultaneously in 37 (79%) limbs. All veins treated were evaluated with ultrasound on post procedure day 1, and no evidence of endovenous heat induced thrombosis (EHIT) was detected. Seven patients (14.9%) went on to have pre-planned sclerotherapy treatment for small branch varicosities. Postoperative hyperesthesia occurred in 1 patient (2.1%) and resolved within 2 weeks. No patient required repeat endovenous ablation during this period. Wound infection in 2 (4.3%) stab phlebectomy wounds resolved with oral antibiotic therapy.

CONCLUSIONS: Endovenous ablation of the refluxing below knee great saphenous vein segment can be performed safely with minimal complications. Consideration should be given to concomitant ablation of the BK-GSV when treating patients with varicose veins with reflux extending below the knee to improve long-term outcomes.

5:21 PM – 5:28 PM

Q1-4 Venous Center Accreditation - An Initiative For Improving Patient Care

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BACKGROUND: Venous disease affects up to 2 million Americans with an associated cost of $5 billion in health care costs each year. With the advent of minimally-invasive procedures, interventions for venous disorders have been increasing dramatically. Many of these procedures are performed in outpatient centers, by physicians of multiple specialties with varying degrees of training and experience. There is a need for accreditation of vein centers that includes evaluation of the training and experience of physicians treating venous disease and the facilities in which procedures are performed to assure high quality patient care.

METHODS: The Intersocietal Accreditation Commission (IAC) was first established in 1990 for the purpose of accrediting non-invasive vascular laboratories. Standards and guidelines were established for the performance of vascular testing and qualifications for vascular technologists and interpreting physicians. More than 7500 vascular laboratory applications have been submitted since IAC's inception and there are currently over 2500 accredited vascular facilities. Additional accrediting divisions have also been established by IAC for echocardiography, nuclear medicine, CT and MRI facilities, and carotid stenting. A similar need has been identified in the care of patients with venous disorders. The process has now begun for the accreditation of vein centers.

RESULTS: Under the IAC model, nine professional organizations have sent 14 representatives as the founding members of the Board of Directors of IAC -Vein Centers. These include the American Academy of Dermatology, American College of Phlebology, American Venous Forum, Society for Vascular Surgery, Society for Vascular Ultrasound, Society of Interventional Radiology, American College of Surgeons, Society for Clinical Vascular Surgery, and Society for Vascular Medicine. After an initial in-person meeting of all representatives to establish the bylaws and organizational structure for the new organization, bi-weekly teleconferences have been held this year to develop the accreditation standards for the centers, which include the required qualifications of participating physicians and personnel. The primary focus is on accreditation for the treatment of superficial venous disease to be followed by standards for deep venous disease and lymphatic disorders. It is anticipated that these standards will be completed by the first quarter of 2013 and applications for accreditation will become available at that time.

CONCLUSION: With such a broad prevalence, high cost, and diversity of treating specialists, an accreditation process for vein centers needs to be established to improve patient care. This process has begun and its implementation should be supported by all physicians and professional societies involved in the treatment of venous disease.

5:28 PM – 5:35 PM

Q1-5 Value Of A Diagnostic Score Ascribing Leg Symptoms To Chronic Venous Disorders In Patients Undergoing Surgery For Varicose Veins

P. Pittaluga, S. Chastanet; Riviera Veine Institute, Nice, France.

BACKGROUND: A diagnostic score ascribing leg symptoms to chronic venous disorders has been described by Carpentier associating four combined criteria (A: heaviness; B: itching/restless syndrome/phlebalgia; C: worsened by hot/improved by cold; D: not worsened by walking), each criteria varying from 0 to 1 (total score 0 to 4), with a threshold level > 3 showing a high specificity and a fair sensibility for chronic venous disorders (CVD). The aim of this study was to evaluate the preoperative clinical and hemodynamic relevance of this venous symptoms ascribing score (VSAS), and its postoperative evolution in patients undergoing surgery for varicose veins.

METHODS: This prospective study has included during 7 months consecutive patients with unilateral varicose veins without deep venous insufficiency, treated by surgery. We gathered the clinical, anatomical and hemodynamic preop data of the patients. The VSAS have been routinely evaluated pre and postoperatively. The importance of the varicose reservoir (VR) was evaluated through the number of zones treated by phlebectomy (NZT).

RESULTS: We included 149 patients (123 females, 26 males, mean age 55.1 years) for whom 149 lower limbs (LLs) have been operated on. The frequency of CEAP class C2 was at 95.9%, symptoms were present in 83.8% of the cases, and a reflux on the saphenous vein (SV) was observed in 65.7% of the LLs. The preop VSAS was > 3 in 68% of the cases. The surgical treatment was done by isolated phlebectomy in 88.6% of the cases and by stripping of the SV in 11.4%. Patients with a preop VSAS > 3 were significantly younger (53.23 yrs vs. 59.08 yrs P=0,016), with a more frequent CEAP class C2 (95.8% vs. 55.1% P 3 was not correlated to the presence or not of a reflux on the SV (40.6% vs. 48.17% NS) or to the extension of the VR (NZT=8.1 vs. 7.0 NS). The VSAS was significantly reduced after the surgery (VSAS < 3: 17% at 1 month postop vs. 68% in preop). A VSAS=0 has progressively increased during the first year of follow-up (47% at 1 month, 59% at 3 months and 85% at 1 year).

CONCLUSIONS: This scoring system showed that the preoperative symptoms were highly ascribable to CVD in patients operated on for varicose veins. After the surgical treatment the score was significantly reduced, reflecting the efficacy of the surgery for symptoms. This scoring system could be helpful for ascribing the symptoms to the CVD preoperatively and forecast the efficacy of the surgical treatment for symptoms.

6:00 PM – 7:30 PM

Welcome Reception . . . . . Wigwam Ballroom

7:00 AM – 8:00 AM
Continental Breakfast . . . . . **Wigwam Ballroom**

8:00 AM – 9:55 AM
Scientific Session 2
Deep Vein Thrombosis 1 . . . . . **Sachem Ballroom**
Moderators: Joseph Caprini, MD, David Gillespie, MD

8:00 AM – 8:20 AM
2-6 Creation Of A Simple VTE Risk Stratification Tool For Inpatient Surgical Procedures
C. Pannucci[1], S. Laird[2], D. Campbell[1], J. Dimick[1], P. Henke[1]; [1]University of Michigan, Ann Arbor, MI, [2]Michigan Surgical Quality Collaborative, Ann Arbor, MI.

BACKGROUND: Risk assessment models (RAMs) for venous thromboembolism (VTE) allow surgeons to estimate risk based on patient-level risk factors. Although aggregate scores produced by existing RAMs are known to predict post-operative VTE risk, the contributions of individual risk factors which comprise these RAMs have not been examined. Here, we used an existing surgical quality database to create a simple, 5-risk factor VTE risk tool that effectively predicts VTE risk.

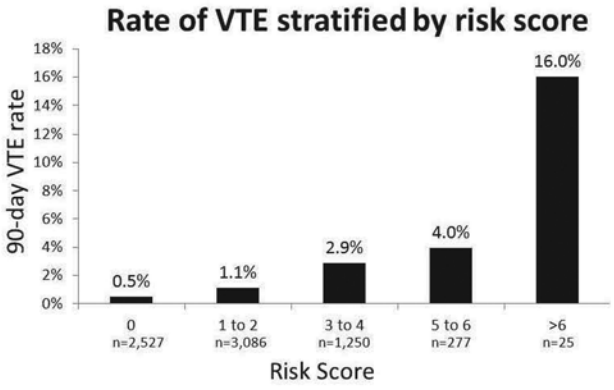
METHODS: We implemented a VTE-specific data collection tool at 10 hospitals that participate in a state-wide surgical quality collaborative. This project was limited to inpatient, non-traumatic, non-emergent surgical cases in adults. Trained clinical reviewers collected risk factor data and made mandatory patient contact on post-operative day 90 to identify VTE complications managed at other sites. External audits of data quality and reliability are regularly performed. Independent variables included age, BMI, gender, ethnicity, smoking, diabetes, dialysis, COPD, pneumonia, CHF, history of stroke, PVD, SIRS/sepsis, CAD, operation within 30 days, quad/paraplegia, varicose veins, clotting disorder, personal/family history of VTE, IBD, leg immobilization, central venous catheter (CVC), history of major trauma, current cancer, pregnant/post-partum, and OCP/HRT use. Patients with CVC-associated DVT were not included. Patients with a CVC who developed non-CVC associated DVT were kept. The dependent variable was 90-day VTE, including patients with DVT or PE. Forward stepwise logistic regression identified independent risk factors. ß-coefficients for independent predictors were used to derive a weighted risk-scoring model.

RESULTS: Data were available for 7,165 patients. The 90-day VTE rate was 1.37%. When controlling for all other variables, including procedural complexity, multivariable logistic regression identified five independent predictors of VTE. These included age ≥ 60 (OR 1.37, 95% CI 1.09-1.73), current cancer (OR 1.75, 95% CI 1.11-2.78), personal history of VTE (OR 1.90, 95% CI 1.10-3.28), family history of VTE (OR 2.63, 95% CI 1.17-6.21), and central venous catheter (OR 2.52, 95% CI 1.48-4.30). Log odds were used to derive a weighted risk scoring model. The AUROC of this 5-risk factor model was 0.70, meaning that it explained 70% of the variability in VTE outcome. Of note, previous studies of the 40-point Caprini score showed an AUROC of 0.68.

CONCLUSION: Our novel risk scoring system predicts 90-day VTE risk as well as the current gold standard. Our model predicts risk based on 5 risk factors, making it more user-friendly than existing RAMs. Future work will validate this risk score in a separate group of patients.

One Point Factors	Two Point Factors	Three Point Factors
☐ Age ≥60	☐ Current cancer ☐ Personal history of VTE	☐ Central venous line ☐ Family history of VTE

TOTAL_____



8:20 AM – 8:40 AM
2-7 Galectin-3 Binding Protein And Galectin-3: Novel Factors Promoting Venous Thrombosis
J. A. Diaz, A. E. Hawley, S. K. Wrobleski, E. Shea, E. DeRoo, R. Al-Khalil, D. D. Myers, Jr., T. W. Wakefield; University of Michigan, Ann Arbor, MI.

BACKGROUND: Previous studies showed that Galectin-3 binding protein (Gal3-BP) is present in microparticles from patients with venous thrombosis (VT). However, the role that Gal3-BP and its ligand, Galectin-3 (Gal-3), play in the pathophysiology of thrombosis is unknown. We hypothesize that Gal-3BP and Gal-3 are critical to thrombus formation.

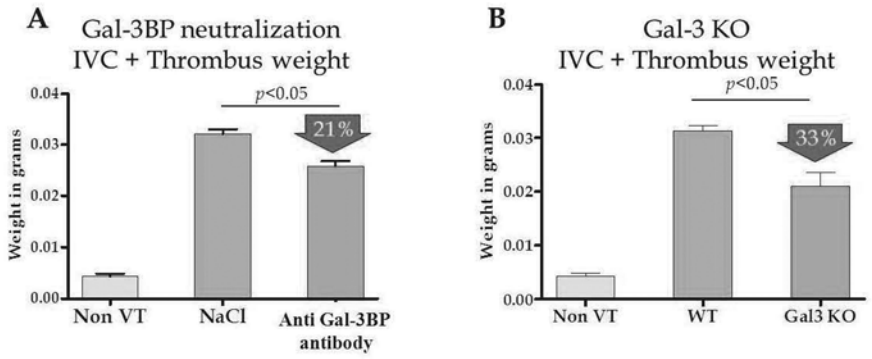
METHODS: Mice: Samples were obtained from non-thrombosed (non-VT) or thrombosed (VT) wild type (WT) mice using the inferior vena cava ligation model. A) *To determine if the absence of Gal-3BP or Gal-3 affects thrombogenesis:* In some instances, Gal-3BP was neutralized using an antibody. Saline was administered to control mice. In other instances, Gal-3 knock-out (Gal-3KO) mice were utilized and compared to WT mice. We evaluated thrombus weight (TW) and inflammatory cell counts. B) *To determine the cellular sources of Gal-3BP and Gal-3*: Platelets, leukocytes, and microparticles were isolated from non-VT and VT mice by centrifugation and the levels of Gal-3BP and Gal-3 were determined using Western Blots. C) *To determine murine levels of Gal-3BP and Gal-3 in plasma:* Blood was obtained using cardiac puncture from non-VT and VT WT mice. Gal-3BP and Gal-3 levels were determined by ELISA.

PATIENTS: D) *To determine human levels of Gal-3BP and Gal-3 in microparticles and plasma:* Blood from patients with or without VT, as determined by duplex ultrasound, was tested for Gal-3BP and Gal-3 by ELISA.

RESULTS: Mice: A) Two days after thrombosis, mice treated with an anti-Gal-3BP antibody displayed significantly reduced TW (21%) (p=0.0024) [Figure 1A] and vein wall inflammatory cell counts (p=0.0369) compared to controls. Gal-3KO mice displayed significantly reduced TW (33%) compared to controls (p=0.0061) [Figure 1B]. B) Western Blots from non-VT mice showed Gal-3BP to be located in microparticles and platelets, and Gal-3 to be located in monocytes. In VT mice, Gal-3BP remained present in microparticles and platelets, while Gal-3 was up-regulated in microparticles and platelets, and remained the same in monocytes. C) ELISAs demonstrated that Gal-3BP was elevated and Gal-3 was significantly elevated in the plasma of VT mice (p=0.0016) compared to non-VT mice. Patients: D) In patients with VT, Gal-3BP and Gal-3 were significantly elevated in microparticles (p=0.0495; p=0.0034) and plasma (p=0.0231; p=0.0167) as compared to patients without VT.

CONCLUSIONS: In this study, we documented that Gal-3BP and Gal-3 are important promoters of VT. Our results suggest that Gal-3BP and Gal-3 may not only be biomarkers for VT, but also potential targets for prophylactic and therapeutic interventions against VT. NIH-HL089407 HL070766.

Figure 1



8:40 AM – 9:00 AM

2-8 Natural History Of Deep Vein Thrombosis In Children

G. Spentzouris, N. Labropoulos, A. Gasparis, A. Tassiopoulos, R. Scriven, T. Lee; Stony Brook University Hospital, Stony Brook, NY.

BACKGROUND: To determine the natural history of deep vein thrombosis (DVT) in children presented with a first episode in the lower extremity veins.

METHODS: Children up to the age of 16 years with objective diagnosis of acute DVT in the lower extremity veins were followed up with ultrasound and clinical examination. The risk factors and clinical presentation were prospectively entered in a database. The prevalence of recurrent DVT and the development of signs and symptoms of chronic venous disease were recorded.

RESULTS: There were 23 children, 13 males and 10 females with acute lower extremity DVT with a mean age of 4 years, range 0.1 to 16 years. Five additional children were excluded as they declined follow-up (n=2), relocated (n=1) or had other serious medical conditions (n=2). The median follow-up was 19 months ranging from 8 months to 5 years. The cause of DVT was a catheter insertion in 15 cases, trauma in 2, idiopathic in 2, neoplasia 1, surgery and sepsis 1, lupus 1 and nephrotic syndrome 1. Of the patients with the catheter insertion, 2 had also neoplasia and 2 had APLAs. The location of thrombosis involved the iliac and common femoral vein in 18 patients, the femoral and popliteal veins in 6. One vein only was affected in 7 children, 2 veins in 13 and >2 veins in 3. Recurrent DVT occurred in 2 patients while no patient had a clinically significant pulmonary embolism. Signs and symptoms of chronic venous disease were present at last follow-up in 11 patients. There were 9 patients with swelling, 2 of whom had also pain, 1 had a pitting edema and 1 had swelling and mild skin discoloration. There were 8 patients with vein collaterals but no patient developed varicose veins. Reflux was found in 17 veins of 10 patients. Failure of recanalization was seen in 7 patients and partial recanalization in 9. Iliofemoral thrombosis (p=0.003) and failure to recanalize (p=0.029) increased significantly the risk for developing signs and symptoms.

CONCLUSIONS: Children with acute proximal DVT develop mild CVD signs and symptoms at mid-term follow-up and are closely related with iliofemoral thrombosis and failure to recanalization.

9:00 AM – 9:20 AM

2-9 Patients Who Are Transferred From Other Hospitals Have Higher Incidence Of DVT

F. Aziz, A. B. Reed; Penn State University, Hershey, PA.

OBJECTIVES: Deep venous thrombosis (DVT) is an important source of morbidity among in-hospital patients. Patients who are transferred to other hospitals have generally complex medical problems, as compared to those patients who are directly admitted from home. The purpose of this study is to look at the incidence of DVT between these two groups of patients.

METHODS: Data was collected from American College of Surgeons-National Surgical Quality Improvement Program (ACS-NSQIP) database on patients undergoing any operation during years 2005-2010. All patients who developed DVT during hospital stay were identified. Data was then analyzed to find the transfer status of these patients.

RESULTS: A total of 1,334,886 patients were identified. 9335 (0.69%) patients developed DVT. 1,286,206 (96%) patients were directly admitted from home, while 48680 (4%) patients were transferred from outside institutions. Incidence of DVT was 0.64% among patients admitted directly from home, while it was 2.4% among patients who were transferred from outside hospitals. Sub-analysis of transferred patients showed that the incidence of DVT was the highest among those who were transferred from acute care hospitals (3%), followed by those who were transferred from chronic care facilities (1.8%) and it was 1.5% among patients transferred from other locations.

CONCLUSIONS: Patients who are transferred from other institutions have a higher risk of developing DVT as compared to those who are directly admitted from home. It may be advisable to screen all transferred patients for DVT.

	2005	2006	2007	2008	2009	2010	Total
N	33930	118560	211407	271368	336190	363431	1334886
Female	19747	68708	120875	155327	192551	206336	763544
Male	141783	49852	90532	116041	143639	157095	571342
Age (Years)	53.7	54	54.9	55.1	55.5	55.6	
Number of DVTs	251	908	1525	1978	2193	2480	9335
Incidence of DVT (%)	2.9%	3.5%	1.6%	3.8%	2.9%	3.2%	0.69%
Admitted from home	32738	114542	204118	262324	3249595	347525	1286206
Admitted from home – Incidence of DVT	214	789	1438	1708	1922	2097	8168
Admitted from home – Incidence of DVT (%)	0.65%	0.68%	0.7%	2.24%	0.59%	0.6%	0.635%
Transferred from Acute Care Hospital	796	2455	4093	4821	5919	6452	24536
Transferred from Acute Care Hospital –Incidence of DVT	23	85	67	187	175	205	742
Transferred from Acute Care Hospital –Incidence of DVT (%)	2.9%	3.5%	1.6%	3.8%	2.9%	3.2%	3.02%
Transferred from Chronic Care Facility	292	1097	2546	3301	4016	4758	16010
Transferred from Chronic Care Facility – Incidence of DVT	12	27	14	74	72	97	296
Transferred from Chronic Care Facility – Incidence of DVT (%)	4.1%	2.5%	0.55%	2.24%	1.8%	2.04%	1.84%
Other	104	466	650	922	1296	4696	8134
Other – Incidence of DVT	2	7	6	9	24	81	129
Other – Incidence of DVT (%)	1.9%	0.9%	1.1%	1.1%	1.9%	1.7%	1.5%

9:20 AM – 9:40 AM

2-10 Vitronectin Gene-deletion, Pai-1 Gene-deletion And Lmwh Treatment: Effect On Thrombus Resolution And Vein Wall Remodeling In A Mouse Model Of Dvt

A. T. Obi, J. A. Diaz, D. M. Farris, K. J. Roelofs, N. Ballard-Lipka, P. K. Henke, T. W. Wakefield; University of Michigan, Ann Arbor, MI.

BACKGROUND: Plasminogen Activator Inhibitor-1 (PAI-1) is the primary inhibitor of plasminogen activators and is stabilized by binding vitronectin (Vn). Both represent potential therapeutic targets for DVT treatment, with mechanism of action distinct from the current standard of care, low molecular weight heparin (LMWH). We have previously shown PAI-1-/- mice to demonstrate improved venous thrombus (VT) resolution, decreased vein wall (VW) MMP activity, but no improvement in vein wall fibrosis. In this study, we hypothesize that Vn-/- mice will demonstrate improved VT resolution similar to PAI-/- mice. We hypothesize that treatment of PAI-1-/- mice with LMWH will act synergistically to accelerate VT resolution and improve vein wall fibrosis.

METHODS: Wild-type (WT) (n=166), WT + LMWH (n=92), PAI-1-/- (n=113), PAI-1-/- + LMWH l (n=87) and Vn-/- (n=93) mice underwent inferior vena caval ligation to generate a thrombus. IVC, thrombus and blood samples were harvested from true controls and at 2, 6 and 14 days post-procedure. The IVC and thrombus were assessed for thrombus weight (TW) and samples collected for zymography (MMP-2/MMP-9) and histology.

RESULTS: Vn-/- mice had TW comparable to WT at all time points. Compared to no treatment, LMWH resulted in significantly smaller thrombus size (all $p<0.05$) at 2 days (WT and PAI-1-/-), 6 days (WT only) and 14 days (PAI-1-/- only). Vein wall MMP-9 and 2 activity was significantly decreased in PAI-1-/- and Vn-/- mice compared to WT ($p<0.05$). LMWH treatment diminished MMP activity in WT mice ($p<0.05$). A similar trend of decreased MMP activity was seen in PAI-1 mice treated with LMWH, although this did not reach statistical significance. Intimal fibrosis was significantly diminished in Vn -/- mice ($p=0.02$). LMWH diminished vein wall fibrosis in the WT mice ($p=0.007$), but did not have the same effect in the PAI -/- mice (p=ns).

CONCLUSIONS: 1. Vn-/- mice do not have improved VT resolution. Vn-/- mice exhibit diminished VW MMP activity and fibrosis post-thrombosis, suggesting a potential role for Vn in wall remodeling.
2. Treatment of PAI-1-/- with LMWH resulted in decreased thrombogenesis (day 2) and improved thrombus resolution (day 14). Whereas WT mice treated with LMWH had significantly diminished MMP activity and vein wall fibrosis, this effect was not seen in PAI-1-/- mice.
3. Targeted inhibition of vitronectin may be useful in decreasing vein wall fibrosis, whereas inhibition of PAI-1 may serve to improve thrombus resolution. LMWH in combination with PAI-1 inhibition might work synergistically to improve thrombus resolution, but the beneficial effects of LMWH on vein wall fibrosis as seen with WT may not be seen with concurrent PAI-1 inhibition.

9:40 AM – 9:45 AM

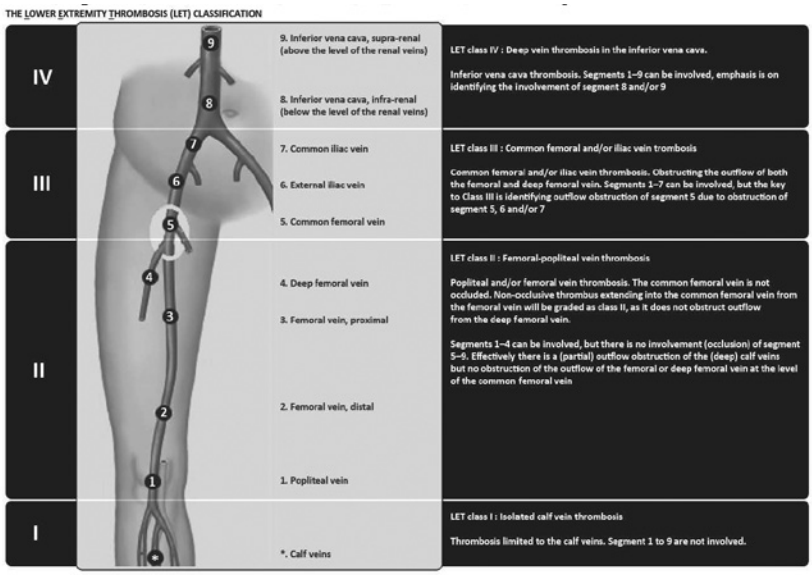
Q2-6 The Let-classification For Deep Vein Thrombosis Treatment

C. H. A. Wittens, C. Arnoldussen; Maastricht University Medical Centre, Maastricht, Netherlands.

BACKGROUND: Acute deep vein thrombosis (DVT) of the lower extremity is a disease which has life impairing consequences in the majority of those affected. Under the current standard treatment regime (systemic anticoagulation and compression), the outcome is far from optimal, with up to 30% recurrence rate of DVT within 5 years and 40% risk of post-thrombotic syndrome (PTS) within 2 years. This highlights the need for improvement of treatment outcomes, which can potentially be achieved with minimally invasive treatments such as catheter-directed thrombolysis (CDT).

METHODS: The traditional classification of DVT offers two options: distal or proximal. The threshold location is the popliteal vein. Numerous studies have reported on outcome after “proximal” or “distal” DVT. Reviewing these studies showed that there is a wide variety and inconsistency on reporting on DVT with regard to the location and extend of DVT. Therefore the published data are not adequately comparable and the current medical reporting will not allow stratification to different therapeutic options based on the location and extend of DVT, which we consider crucial. This is reflected in the interpretation of the available evidence by the ACCP in their DVT treatment guidelines: “More invasive treatment options remain an option in selective cases, but the evidence is not strong enough to support a routine approach of DVT treatment with these techniques.” We continue to compare heterogeneous groups that all consist of patients who potentially benefit from additional treatment and patients who do not. This is supported by a meta-analysis we performed on the literature on catheter-directed thrombolysis. With the current diagnostic imaging tools, visualization of the entire deep venous system is possible, allowing routine identification of potential underlying causes and accurate assessment of the location and extend of DVT.

CONCLUSIONS: In order to validate additional treatment options in specific subgroups of DVT patients, standardized reporting on DVT location and extend combined with accurate stratification of patients is required. Therefore we created the Lower Extremity Thrombosis Classification (LET-classification) to support a structured and clear delineation of what we believe are hemodynamically different groups of DVT patients who will have significantly different outcomes when treated with anti-coagulation and compression alone vs. anti-coagulation and compression with additional thrombus removal strategies.



Author	Year	Definition used	Included DVT's		Primary outcome measurement
			IVC / ILIAC / CFV (+ VF / VP)	VF / VP alone (no IVC / IIIAC / CFV)	
Semba	1996	Iliofemoral DVT	Yes	Not described	Safety, efficacy
Bjarnason	1997	Iliofemoral DVT	Yes	Yes	Vein patency
Mewissen	1999	Lower Extremity DVT	Yes	Yes ***	Safety, efficacy
Mewissen	2001	Iliofemoral DVT	Yes	Yes	Safety, efficacy
Antani	2001	Iliofemoral DVT	Not described	Not described	Vein patency
Elsharawy	2002	Iliofemoral DVT	Yes	Yes	Vein patency
Markevicius	2004	Proximal DVT	Not described	Not described	Vein patency
Lin	2006	Lower Extremity DVT	Not described	Not described	Reduction in procedure time and hospital stay **
Baekgaard	2010	Iliofemoral DVT	Not described	Not described	Both vein patency and clinical outcome
Jeon	2010	Lower Extremity DVT	Not described	Not described	Clinical improvement, PTS
Gao	2011	Proximal DVT	Yes	Yes	Cloth burden reduction, efficacy
Enden	2012	Iliofemoral DVT	Yes	Yes	PTS
CAVA Trial	Ongoing	Iliofemoral DVT	Yes	No	PTS
ATTRACT Trial	Ongoing	Iliofemoral DVT and Femoropopliteal	Yes	Yes *	PTS

* the ATTRACT trial is the only randomized clinical trial that investigates the iliofemoral and femoro-popliteal DVT groups as seperate entities
** This study comparison CDT and PMT, all other studies focussed on CDT
*** Mewissen reports on iliofemoral DVT and mentions the femoro-popliteal DVT's seperately, but the analysis involves all DVT's

9:45 AM – 9:50 AM

Q2-7 Three Dimensional Ultrasound Assessment Of DVT Volume: A Clinical Protocol And Description Of The Time-course Of Thrombus Resolution

L. Zhao[1], S. J. Prior[1], M. Kampmann[1], J. D. Sorkin[2], K. Caldwell[1], M. Braganza[1], S. McEvoy[1], A. Goldberg[2], B. K. Lal[1]; [1]University of Maryland School of Medicine, Baltimore, MD, [2]Veterans Affairs Geriatric Research Education and Clinical Center, Baltimore, MD.

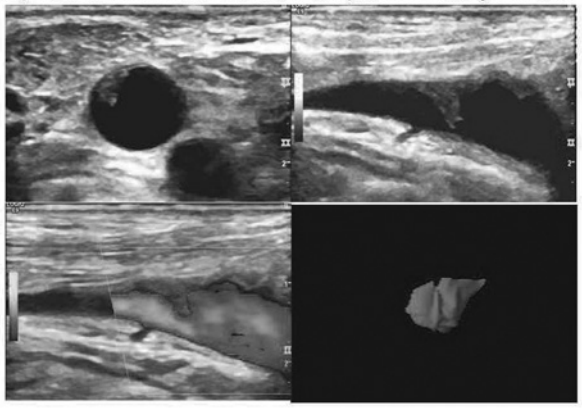
BACKGROUND: Current imaging techniques are limited in their ability to quantify thrombus burden, progression, resolution, and organization over time in patients with acute deep vein thrombosis (DVT). These assessments are critical measures of therapeutic success when thrombolytic or thrombectomy treatment protocols are utilized for DVT. We evaluated the reliability of a new, commercially available method of acquiring and analyzing 3-dimensional (3D) ultrasound images of DVTs that measures thrombus volume and echogenicity.

METHODS: We studied 25 consecutive hospital in-patients (17 male, 8 female, age range 37-87 years) with a first episode of acute DVT. Treatment decisions were not influenced by the study protocol. Scanning was performed independently by two sonographers; and then the first sonographer repeated the scan a third time. A combination of routine imaging in grayscale, color-flow, and power-Doppler modes (2D transducer) along-with volumetric imaging (3D transducer) was performed. Patients underwent imaging at baseline and at one or more follow-up days 7, 14, 21 and 30. Image-processing software loaded on the ultrasound machine was used to obtain thrombus volume (figure), and echogenicity measurements.

RESULTS: Thrombus volume was reliably determined by our protocol. Mean inter- and intra-observer differences in volume measurements were 0.006 ± 0.26 cm^3 and -0.118 ± 0.29 cm^3, respectively (mean ± SD). The median volume of thrombus at baseline was 0.4 cm^3. Thrombus resolved over time at a rate of -0.042 cm^3/day ± 0.012 cm^3/day, $p<0.003$. The mean echogenicity of thrombus at baseline expressed as the GSM value was 62.96 ± 22.03 (mean ± SD). There was a trend for thrombus organization (measured as echogenicity) to increase with time, +0.36 ± 0.23 GSM units/day, $p<0.13$. Multivariate adjustment for the use of anticoagulation, sex of subject, or location of in the upper versus lower extremity did not alter the relation between time and volume or time and echogenicity in our results.

CONCLUSIONS: We describe a 3D imaging protocol that reliably measures thrombus volume and organization over time, and can be utilized in routine clinical practice. Acute DVT was associated with a reduction in thrombus size over 1 month. Thrombus also demonstrated a trend for increased echogenicity over the same time. The deleterious effects of residual thrombus after DVT are serious and disabling. This protocol will be valuable for measuring residual thrombus and thrombus resolution during thrombus removal treatments for acute DVT.

Grayscale images in cross- and longitudinal section, along with power Doppler images of an acute deep vein thrombus are used to outline its borders to develop a 3-D volumetric image of the clot.



9:50 AM – 9:55 AM

Q2-8 Vein Wall And Circulating P-selectin Promote Venous Thrombogenesis During Aging In A Rodent Model

D. D. Myers, D. Culmer, J. Diaz, A. Hawley, T. Jackson, K. Shuster, R. Sigler, T. Wakefield; University of Michigan, Ann Arbor, MI.

BACKGROUND: The incidence of deep venous thrombosis (DVT) significantly increases ≥45 years of age. Our objective was to identify the direct relationship between aging and adhesion molecule activation during venous thrombosis in mice of varying ages. A mixed patient population was also evaluated for age related effects during DVT.

METHODS: DVT was induced in 4 and 18 month old C57BL/6 mice using the electrolytic inferior vena cava model (EIM). Mice were euthanized at baseline (non-thrombosed, TC), 6 hours (6H), and 2 days (2D) post-thrombosis. Blood and tissue samples were collected for the following analysis: thrombus weight (TW), soluble P (sP) and soluble E-selectin (sE) by ELISA, vein wall P- and E-selectin protein by ELISA, vein wall P- and E-selectin gene expression , vein wall inflammatory cell analysis by light microscopy, and hematology. In a patient population (n335), the relationship between patients with and without DVT, sP levels, and age (above and below 45 years) was evaluated.

RESULTS: Older mice had significantly larger venous thrombi vs. younger mice at the 6H and 2D (x10-3 grams, $p<0.01$) [Figure 1]. These same mice had significantly higher sP-selectin levels vs. younger mice at the 6H and 2D (ng/mg, $p<0.01$). Older mouse sE levels were significantly lower vs. younger animals at baseline (pg/mg, $p<0.05$). Older animals had significantly elevated vein wall P-selectin vs. younger mice at 6H and 2D post-thrombosis ($p<0.01$). Post-thrombosis, significantly increased vein wall E-selectin in younger mice vs. older animals at 6H ($p<0.05$). All mice showed active vein wall inflammatory cell extravasation post thrombosis. Older animals had significantly more circulating platelets vs. younger mice at baseline, 6H, and 2D post-thrombosis (K/µL, $p<0.01$). DVT positive patients greater than 45 years (n=135) of age had significantly higher levels of soluble P-selectin vs. patients positive for DVT less than 45 years (n=51) of age (ng/mL sP, $p<0.05$) [Figure 2].

CONCLUSIONS: Aging significantly increased vein wall P-selectin, sP, and circulating platelets that amplified venous thrombosis in mice. For the first time, we have documented the translational role of soluble P-selectin as a biomarker for thrombosis in aged rodents and DVT positive patients. These important findings will provide supporting evidence for the use of selectin targeted therapeutics in future clinical trials for the prophylaxis and treatment of DVT in the aged population.

Figure 1: Thrombus Weight Comparisons.

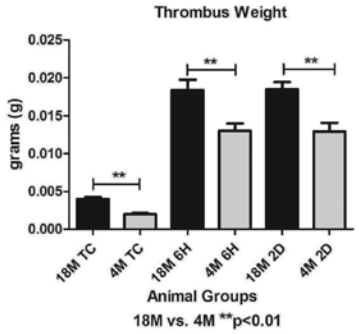
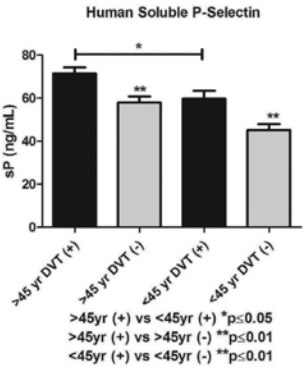


Figure 2: Patient Age and Soluble P-selectin (sP) Comparison.



9:55 AM – 10:10 AM

ACP Best Paper . . . . . Sachem Ballroom

Randomized Clinical Trial Comparing Endovenous Laser Ablation and Stripping of the Great Saphenous Vein with Clinical and Duplex outcome after 5 years

Rasmussen LH, Lawaetz M, Bjoern L, Blemings A and Eklöf B; The Danish Vein Centres – Åreknudeklinikken, and Surgical Centre Roskilde, Denmark.

OBJECTIVE: This is the first RCT with five-year follow-up comparing endovenous laser ablation (EVLA) with high ligation and pin-stripping in patients with great saphenous vein (GSV) incompetence.

METHODS: 121 consecutive patients (137 legs) with GSV incompetence were randomized to EVLA (980 nm bare fibre) or high ligation and stripping using tumescent local anaesthesia with light sedation. Miniphlebectomies were performed in all patients. The patients were examined with duplex scanning before treatment and after 12 days, and then after 1, 3 and 6 months, and yearly thereafter for up to 5 years. The primary endpoint was an open and refluxing GSV. Secondary endpoints were recurrent varicose veins, frequency of reoperations, Venous Clinical Severity Score (VCSS) and quality of life (QOL) (Aberdeen Varicose Vein Symptoms Severity Score (AVVSS) and SF-36).

RESULTS: In the EVLA and stripping group: 9 (KM estimate 17,9%) and 4 (KM estimate 10,1%) of GSV´s had open refluxing segments of 5 cm. or more (ns). Clinical recurrence was recorded in 24 (KM estimate 46,6%) and 25 (KM estimate 54,6%), whereas reoperations were performed in 17 (KM estimate 38,6%) and 15 (KM estimate 37,7%) legs (ns). VCSS and AVVSS improved while SF-36 QOL score improved in several domains in both groups with no difference between the groups.

CONCLUSION: 5-year follow-up of our RCT comparing EVLA with open surgery in patients with GSV incompetence did not show any significant difference between the two groups in primary or secondary endpoints, maybe related to too small sample size. EVLA seems to be a valid alternative to open surgery.

10:10 AM – 10:50 AM

Coffee Break . . . . . Wigwam Ballroom

10:50 AM – 12:20 PM

Scientific Session 3

Deep Vein Thrombosis 2 . . . . . Sachem Ballroom

Moderators: John Blebea, MD, MBA, Cees Wittens, MD, PhD

10:50 AM – 11:10 AM

3-11 Iron Processing Mechanisms Are Responsible For Changes In MRI T1 Relaxation In Venous Thrombosis

P. Saha, M. Andia, J. Jenkins, S. Grover, A. Phinikaridou, C. Evans, A. S. Patel, B. Modarai, M. Waltham, A. Smith; King's College London, London, United Kingdom.

BACKGROUND: Absolute quantification of Magnetic Resonance (MR) longitudinal (T1) relaxation time (T1-RT) has been postulated as a method to characterize the age and structure of venous thrombosis. The biological mechanisms that affect MR signal during thrombus propagation and its subsequent resolution are poorly understood. In this study, we used an established model of thrombosis to investigate the mechanisms that affect thrombus T1-RT in vivo.

METHODS: An MRI 3D T1-mapping protocol was used to image vena caval thrombi induced in male BALB/C, iNOS-/-, and CCR2-/- mice (n=88). T1-RT and water diffusibility (ADC sequence) were quantified 1-28 days after thrombus induction. The total iron (mass spectrometry) and Fe3+ content (Quantichrome) of thrombus was analysed. Fibrin and red cell content was assessed by MSB histology and scanning electron microscopy. Monocyte phenotype was characterised by flow cytometry (FACS) and in vivo activity visualized by intravital microscopy (IVM) using Rag2-/-/γc-/-/CX3CR1+/GFP mice.

RESULTS: Mean T1-RT change as the thrombus resolves. Total iron content was greatest at 1d (P<0.001), which reflected early red cell trapping by fibrin. As red cells lysed, the concentration of paramagnetic Fe3+ increased until maximal at 7d (P<0.001). T1-RTs were shortest when the levels of Fe3+ and water diffusibility were greatest. T1-RTs were significantly longer in iNOS-/- mice than wild-type controls (P<0.001), and remained persistently short in CCR2-/- mice (P<0.001), which have an absence of inflammatory monocytes. FACS analysis revealed macrophage heterogeneity during thrombus resolution. IVM showed an exponential increase in thrombus macrophage numbers with time.

CONCLUSIONS: This is the first study to show that T1-RT depends on both accumulation of Fe3+ and water diffusibility. iNOS and CCR2 positive macrophages appear to regulate iron metabolism and affect T1-RT.

11:10 AM – 11:30 AM

3-12 Characterization Of Chronic Postthrombotic Intraluminal Venous Obstruction

C. Oostra[1], A. J. Comerota[2], W. T. Gunning[1], A. Lynn[2], Z. Fayad[2]; [1]University of Toledo Medical Center, Toledo, OH, [2]The Toledo Hospital, Toledo, OH.

BACKGROUND: Acute deep venous thrombosis (DVT) managed with anticoagulation undergoes an evolution resulting in a spectrum of changes, ranging from complete recanalization to luminal obstruction. Long-term follow-up imaging of residual intraluminal pathology often reports that “chronic thrombus” remains. The concept that thrombus is present has therapeutic implications. The purpose of this investigation is to accurately characterize the intraluminal pathology existing in the lower extremity deep veins long after acute DVT.

METHODS: Specimens from all patients who underwent endovenectomy for chronic postthrombotic venous obstruction were examined visually and microscopically. Microscopic study included Hematoxylin and Eosin (H&E) to characterize tissue structure, Masson’s trichrome to indicate presence of collagen, von Kossa staining for calcium, and Immunhistochemical analysis to characterize specific tissue antigenicity, specifically collagen subtypes. The avidin-biotin complex (ABC) method was used for immunostaining.

RESULTS: Seventeen specimens from 15 patients who underwent endovenectomy for chronic postthrombotic iliofemoral occlusion were examined. Time from acute DVT to operation was 6.8 years (7 months-20 years). Morphologic characteristics based upon light microscopic observations demonstrated variable recanalization with endothelium lining recanalization channels, chronic inflammation characterized by lymphocytic infiltration, calcification, myofibroblasts, and neovascularization with arterioles, venules, and undifferentiated neovessels. Calcium salts were present within the collagen matrix, indicating a dynamic process. The overwhelmingly predominant intraluminal content was collagen. Immunohistochemistry showed types I and III collagen. Notably, there was no thrombus within any specimen.

CONCLUSIONS: Chronic postthrombotic venous obstruction is a dynamic process resulting from fibrosis due to collagen production from myofibroblasts. Variable recanalization, chronic inflammation, and the spectrum of neovascularization were uniform findings. Thrombus was not present in any specimen. These findings have therapeutic implications. The term “chronic thrombus” applied to imaging findings in veins months to years after acute DVT is misleading.

11:30 AM – 11:50 AM

3-13 Anticoagulation Treatment For Catheter Associated Upper Extremity Deep Venous Thrombosis (CA-UEDVT): Assessment Of Risk And Benefits.

A. Akinrinlola, M. Amendola, F. Albuquerque, M. Levy; Virginia Commonwealth University, Richmond, VA.

BACKGROUND: Per *Chest 2008* guidelines, anticoagulation (AC) is the currently recommended treatment for all UEDVTs, to decrease the risk of thrombus propagation and prevent pulmonary embolism (PE). With increasing evidence that AC fails to speed CA-UEDVT resolution, we sought to assess the efficacy of AC to dampen PE incidence, by sampling a large single-institution series of CA-UEDVT patients. In addition, we sought to analyze our institutions’ overall use of AC to treat CA-UEDVT, and detail any associated hemorrhagic complications among these fragile patients.

METHODS: Between April 2005 and July 2010, 403 consecutively encountered patients with CA-UEDVT were identified in our vascular lab registry. A retrospective analysis of prospectively collected patient demographics, and clinical outcomes was performed. Clinical outcomes among patients who received AC (heparin and/or warfarin) versus those that were not anticoagulated (NAC) were compared.

RESULTS: Among the 403 CA-UEDVT patients, 237 were AC’d (59%), while 166 patients were NAC’d (41%). There were no significant differences in the two groups related to diabetes, coronary artery disease, trauma/post-operative status, renal failure, or obesity. There was a trend to AC younger patients with less associated malignancy, and there was a lower mortality rate observed in the AC’d group compared to the NAC’d group (p <0.001). This higher mortality was not due to an increased incidence of PE, as only 6 patients suffered PE subsequent to their CA-UEDVT diagnosis (1.5%), with no associated mortality. Five PEs were observed among the 237 AC’d patients (2%), while only one PE was observed among the 166 NAC’d patients (0.6%).Following hospital discharge, 4 patients treated with AC developed fatal intracranial hemorrhage, and 7 additional patients were readmitted for transfusion due to hemorrhagic complications.
Most CA-UEDVT patients had multiple named venous segments involved, and patients who were AC’d had more affected UEDVT segments (see Table).

Patient / CA-UEDVT Characteristics	AC (n = 237)	NAC (n = 166)	P-Value
Patient Age	50 +/- 18	54 +/- 17	0.08*
Malignancy	79/237 (33.5%)	63/166 (37.9%)	0.39**
Mortality at 6 months	47/237 (19.8%)	55/166 (33.1%)	0.003**
No of named CA-UEDVT segments	2.1 +/- 1.1	1.8 +/- 1.0	0.0005*
Symptomatic CA-UEDVT	211/237 (89.0%)	141/166 (84.9%)	0.23**
*Chi-Square **Students T-test			

CONCLUSIONS: Despite current treatment guidelines, the use of AC therapy to treat CA-UEDVTs is inconsistent. We observed that clinicians tended to AC younger patients, with greater life expectancy, and more extensive DVTs. Notably, the risk of PE subsequent to a CA-UEDVT diagnosis remained very small whether AC therapy was used or not. Given the equal incidence of severe hemorrhagic complication associated with AC in these fragile patients, and absent evidence that AC dampens PE risk, we currently do not support routine AC for CA-UEDVT patients.

11:50 AM – 12:10 PM

3-14 Validation Of The Villalta Scale In Assessing Post-thrombotic Syndrome Using Clinical, Duplex And Hemodynamic Comparators

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

BACKGROUND: The Villalta scale (VS) was conceived by Prandoni and introduced as an abstract in 1994 as a disease specific assessment questionnaire to diagnose and classify the severity of post-thrombotic syndrome (PTS). Whilst validation using quality of life assessments and reproducibility have been reported as good, limited data exists as how the VS compares against generalized assessment tests in defining the severity of PTS. The aim of this study was to compare the VS against the venous clinical severity score (VCSS), the C of the CEAP classification, the venous segmental disease score (VSDS) and the venous filling index (VFI) of air-plethysmography.

METHODS: Baseline data generated from a recent single centre prospective clinical trial comparing MEDI graduated elastic compression stocking performance on 40 legs in 34 patients with PTS were analyzed. Ancillary data from this study was used to assess the measurement properties of the VS to help improve its validity. All the legs had PTS defined as persisting leg symptoms at least 6 months after a DVT with evidence of deep venous obstruction and/or deep venous reflux on duplex ultrasound. None of the legs had popliteal, femoral or iliac vein occlusion. The CEAP classification was C_0=2, C_2=1, C_3=3, C_{4a}=12, C_{4b}=7, C_5=12, C_6=3. The median (inter-quartile range) of age, VS, VCSS, VSDS and VFI were 62 (52-73) years, 10 (5-14), 8 (5-10), 5 (4-6.5) and 4.9 (2.8-7.9) mL/s, respectively.

RESULTS: As shown in Table 1, the VS had a highly significant and moderate-to-good correlation (Spearman) with the VCSS and the C of CEAP. When the VFI was used as a hemodynamic benchmark the VS outperformed the other assessment tests. Also, the VCSS correlation was highly significant. Surprisingly, the VSDS did not correlate with any of the assessment tests. Furthermore, no correlation could be detected within the VS between the patients' symptoms and their clinical signs (P=.175 and r=.219).

CONCLUSIONS: These results indicate that the VCSS and the C of CEAP may also be useful in the assessment of PTS severity and that the VFI may provide a clinically meaningful hemodynamic evaluation. These results also confirm that the VS remains the gold standard disease specific assessment in the evaluation of PTS.

Table 1. Cross-tabulation summary correlating the Villalta scale (VS) against other assessments

	CEAP	VCSS	VSDS	VFI
VS	r = .556	r = .609	r = .046	r = .499
	P< .0005	P< .0005	P= .779	P= .001
CEAP	x	r = .822	r = .147	r = .279
	x	P< .0005	P= .365	P= .082
VCSS	x	x	r = .181	r = .480
	x	x	P= .264	P= .002
VSDS	x	x	x	r = .219
	x	x	x	P= .175

12:10 PM – 12:15 PM

Q3-9 Assessment Of The Post Thrombotic Syndrome Using Mr-venography And Dus: The Correlation With Clinical Scoring Systems Vcss, Villalta And Ceap

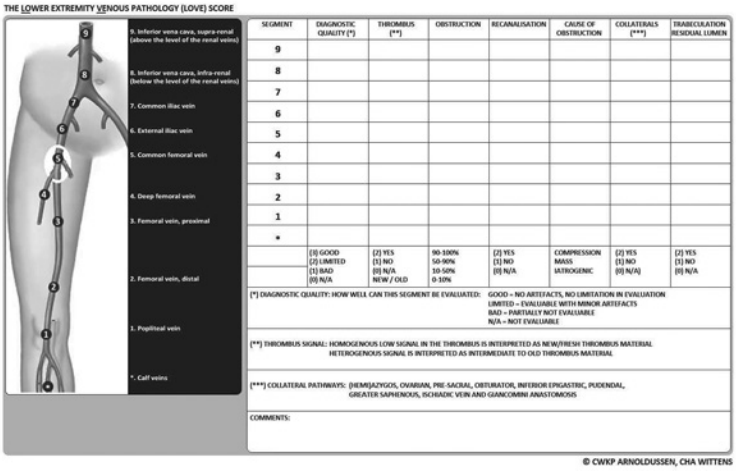
C. W. K. P. Arnoldussen, C. H. A. Wittens; Maastricht University Medical Centre, Maastricht, Netherlands.

BACKGROUND: Chronic venous disease (CVD) and/or the post-thrombotic syndrome(PTS) are common and important complications of deep venous thrombosis(DVT). Unfortunately there still is no objective test to establish its presence, and in particular PTS is diagnosed primarily on the presence of symptoms and clinical signs in limbs that have been affected by a DVT in the past. Therefore accurately identify chronic venous pathology with imaging (MR-Venography/Duplex-US) could be an objective assessment tool to identify patients with PTS due to chronic venous occlusion(CVO) or reflux disease.

METHODS: 90 patients referred to the vascular surgery department with clinical symptoms suggestive of PTS were prospectively evaluated with MR-Venography and Duplex-US using the 'LOwer-Extremity-VEnous-Pathology'-score(LOVE-score). Clinical assessment was performed using the CEAP, VCSS and Villalta scales. The LOVE-score assesses the deep vein system from the level of the popliteal vein up to the inferior vena cava entering the heart. Obstruction, collateralisation, external compression and residual changes such as remnant thrombus or trabeculation were scored for each anatomical vein segment. Additionally DUS was used for hemodynamic evaluation of the individual segments (in particular for evaluation of reflux / signs of insufficiency).

RESULTS: 73 of 95 patients showed changes in the deep vein system on MR-Venography attributable to CVD. Most patients with high clinical scores (Villalta>15, VCSS with high scores for cramp, heaviness, ulcera, skin changes, total score>10) showed clear signs of CVO of deep veins at the level of the IVC, iliac veins and/or the common femoral vein. Isolated obstructions below the level of the common femoral vein were not seen in patients clinically highly suspect of extensive PTS. The intermediate clinical score cases (Villalta>5<15) were very heterogenous in the amount of venous abnormalities on the MR-Venography examination. Those patients with low clinical scores (Villalta<5) mostly had no signs of venous occlusive disease in the pelvis on MR-Venography. In 22 cases DUS identified signs of deep reflux disease, this however did not clearly correlate with the group of patients with high clinical scores.

CONCLUSIONS: MR-Venography allows for accurate assessment of CVD in the deep vein system associated with PTS, in particular CVO. Further investigations are required to identify other causes of clinically suspected PTS where there are no identifiable signs of CVD/CVO on imaging studies.


THE LOWER EXTREMITY VENOUS PATHOLOGY (LOVE) SCORE

SEGMENT	DIAGNOSTIC QUALITY (*)	THROMBUS (**)	OBSTRUCTION	RECANALISATION	CAUSE OF OBSTRUCTION	COLLATERALS (***)	TRABECULATION RESIDUAL LUMEN
9							
8							
7							
6							
5							
4							
3							
2							
1							
*							
	(3) GOOD (2) LIMITED (1) BAD (0) N/A	(2) YES (1) NO (0) N/A NEW / OLD	90-100% 50-90% 10-50% 0-10%	(2) YES (1) NO (0) N/A	COMPRESSION MASS IATROGENIC	(2) YES (1) NO (0) N/A)	(2) YES (1) NO (0) N/A

(*) DIAGNOSTIC QUALITY: HOW WELL CAN THIS SEGMENT BE EVALUATED: GOOD – NO ARTEFACTS, NO LIMITATION IN EVALUATION
LIMITED – EVALUABLE WITH MINOR ARTEFACTS
BAD – PARTIALLY NOT EVALUABLE
N/A – NOT EVALUABLE

(**) THROMBUS SIGNAL: HOMOGENEOUS LOW SIGNAL IN THE THROMBUS IS INTERPRETED AS NEW/FRESH THROMBUS MATERIAL
HETEROGENEOUS SIGNAL IS INTERPRETED AS INTERMEDIATE TO OLD THROMBUS MATERIAL

(***) COLLATERAL PATHWAYS: (HEMI)AZYGOS, OVARIAN, PRE-SACRAL, OBTURATOR, INFERIOR EPIGASTRIC, PUDENDAL, GREATER SAPHENOUS, ISCHIADIC VEIN AND GIANCOMINI ANASTOMOSIS

COMMENTS:

© CWKP ARNOLDUSSEN, CHA WITTENS

Villalta * LOVE Crosstabulation

Count

		LOVE			
		1	2	3	Total
Villalta	1	18	3	1	22
	2	15	24	1	40
	3	8	3	17	28
Total		41	30	19	90

VCSS * LOVE Crosstabulation

Count

		LOVE			
		1	2	3	Total
VCSS	1	33	19	6	58
	3	8	11	13	32
Total		41	30	19	90

Values used for analysis

Villalta
1 Low (<5)
2 Intermediate (>5<15)
3 High (> 15)

LOVE
1 Low (no occluded segments, no deep system collaterals deemed significant
2 Intermediate (No pelvic occlusion or collateralisation in groin, pelvis, abdomen)
3 High (IVC and or iliac occlusion with collateralisation)

VCSS
1 "Low" (total score < 10)
3 High (signs of cramp, heaviness of leg, ulcera, skin changes, total score>10)

12:15 PM – 12:20 PM

Q3-10 The Thrombotic Reactivity Of Endothelial Cells From Deep Vein And Pulmonary Artery Venous Beds In Response To Thrombin

X. A. Caliste, E. Roztocil, A. L. Clark, J. P. Cullen, D. L. Gillespie; University of Rochester Medical Center, Rochester, NY.

BACKGROUND: Pulmonary embolism (PE) is thought to occur largely due to deep venous thrombosis of the lower extremities. A portion of PEs however may result from primary pulmonary artery thrombosis. The thrombotic activity of different venous vascular beds has not been fully elucidated and there are several factors known to influence hemostatic balance. Thrombin which binds to the protease activated receptor-1 (PAR-1), and whose activity is inhibited by endothelial protein C receptor (EPCR) and thrombomodulin (TM), plays an integral role in clot formation by catalyzing the conversion of fibrinogen to fibrin. Plasmin, which is formed by the action of urokinase and tissue plasminogen activator (uPA and tPA), is responsible for the enzymatic degradation of the fibrin clot, a process known as fibrinolysis. The goal of this study was to determine the thrombotic reactivity of the pulmonary artery and iliac vein endothelial beds.

METHODS: Human iliac vein endothelial cells (HIVEC) and human pulmonary artery endothelial cells (HPAEC) were incubated at 37° C in the presence or absence of thrombin (1nM, 10nM, 25nM and 100nM) for 24 hours. Plasminogen activator inhibitor-1 (PAI-1), uPA, tPA, EPCR, PAR-1 and TM expression in cell lysates were evaluated by Western blot analysis.

RESULTS: While thrombin had no effect on the expression of uPA in HPAEC, there was a ~20% decrease in uPA expression in HIVEC in the presence of both 1nM and 100nM thrombin. Similarly, when tPA expression was examined, there was no change in HPAEC and a marked increase in HIVEC in response to thrombin. In contrast, thrombin stimulation caused a decrease in PAI-1 expression in HPAEC while having no effect on HIVEC. There was no change in EPCR expression in HPAEC, however after stimulation with 25nM and 100nM thrombin there was >20% decrease in expression of EPCR in HIVEC. HPAEC demonstrated decreased expression of PAR1, in the

presence of 25nM and 100nM thrombin and in contrast an almost 40% increase in PAR1 expression was observed in HIVEC. Thrombin produced no change in HIVEC recombinant TM expression, however, 10nM and 100nM thrombin produced >20% increased expression of recombinant TM in HPAEC. In addition, there was also ~20% increase in the expression of pre-cursor TM in both HPAEC and HIVEC after stimulation with 25nM thrombin.

CONCLUSION: Endothelial cells from the deep vein and pulmonary artery venous beds differentially express markers of the fibrinolytic and coagulation pathways, and this variance in expression may play a role in the thrombotic reactivity of these vascular beds. This data may aide in the prevention and treatment of patients with pulmonary emboli.

12:20 PM – 12:30 PM

Box Lunch . . . . . **Sachem Foyer**

12:30 PM – 1:30 PM

Villavicencio Symposium . . . . . **Sachem Ballroom**

Chair: Mark Meissner, MD

Educational Objectives: To develop an understanding of the pathophysiology of pelvic reflux; define and understand the pathways of pelvic reflux; describe and understand the modern treatment options for the treatment of pelvic reflux; and, to demonstrate an understanding of the diagnostic modalities available for the diagnosis of pelvic venous disorders.

12:30 PM Introduction
Mark Meissner, MD

12:35 PM Anatomy and Pathophysiology of Pelvic Venous Reflux
Mark Meissner, MD

12:50 PM Diagnosis of Pelvic Venous Pathology
Nicos Labropoulos, PhD, DIC, RVT

1:05 PM Treatment of Pelvic Venous Reflux
Antonios Gasparis, MD, FACS

1:20 PM Question and Answer

1:30 PM – 3:00 PM

ACP Symposium . . . . . **Sachem Ballroom**

Chair: Melvin Rosenblatt, MD

Liquid Agents in the Treatment of Venous Disease

Educational Objectives: The symposium will provide a basic understanding of the different sclerosants used to treat small skin veins; the treatment of the GSV with foam, BTG and Saphion glue and Claravein; the use of liquid and foam agents for this purpose; and the use of liquid agents to treat venous malformations and pelvic venous reflux.

Use of Liquid Agents in the Treatment of Telangiectasia
Steven E. Zimmet, MD

Use of Liquid Based Agents to Treat Saphenous Reflux
Kenneth Todd, MD

Use of Liquid Based Agents to Treat Saphenous Tributaries and Perforators
Suman Rathbun, MD

Use of Liquid Agents to Treat Venous Malformations and Pelvic Venous Reflux
Melvin Rosenblatt, MD

3:00 PM – 3:30 PM

Coffee Break . . . . . **Wigwam Ballroom**

3:30 PM – 5:30 PM

Scientific Session 4

Chronic Venous Disease 2 . . . . . **Sachem Ballroom**

Moderators: Peter Pappas, MD, Steve Elias, MD

3:30 PM – 3:50 PM

4-15 American Venous Registry - The First National Registry For The Treatment Of Varicose Veins

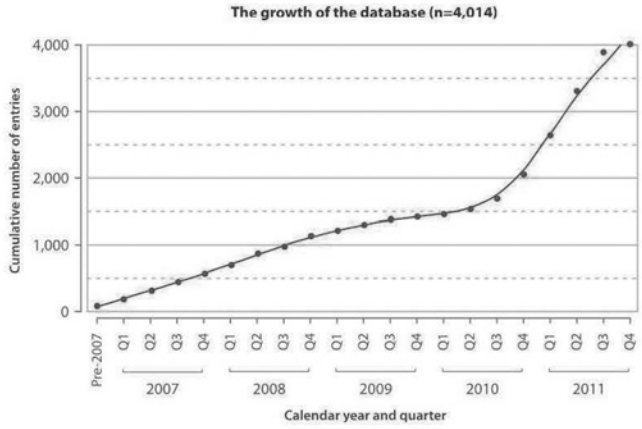
B. K. Lal[1], J. I. Almeida[2], L. Kabnick[3], T. W. Wakefield[4], R. B. McLafferty[5], P. J. Pappas[6], J. J. Raffetto[7], S. Raju[8], J. Blebea[9], M. C. Dalsing[10], M. Meissner[11], J. Rectenwald[4], D. L. Gillespie[12], U. Onyeachom[13], R. Kinsman[14]; [1]University of Maryland School of Medicine, Baltimore, MD, [2]Miami Vein Center, Miami, FL, [3]NYU, New York, NY, [4]University of Michigan, Ann Arbor, MI, [5]Southern Illinois Medical Center, Springfield, IL, [6]Brooklyn Hospital Center, New York, NY, [7]Veterans Affairs Boston Medical Center, Boston, MA, [8]River Oaks Hospital, Flowood, MS, [9]Univ of Oklahoma College of Medicine, Tulsa, OK, [10]Indiana University, Indianapolis, IN, [11]University of Washington, Seattle, WA, [12]University of Rochester School of Medicine, Rochester, NY, [13]American Venous Forum, Milwaukee, WI, [14]University of Maryland, Baltimore, MD.

BACKGROUND: Chronic venous diseases affect 1/3rd of all adults and are more common than coronary, carotid and peripheral artery diseases combined. However, their effect on public health remain understudied and under-estimated. These challenges are compounded by the fact that these patients are treated by numerous professionals with non-standardized training and variable outcomes. There is a need for identifying practice patterns across specialties and geographic boundaries in a standardized fashion. This report describes the development and initial results from the first national venous registry, the American Venous Registry (AVR).

METHODS: The AVR was developed to facilitate collection and analysis of information on venous diseases in the US. It has a web-based, multi-modular, interactive design to accommodate the wide variety of venous disorders. The varicose vein module is the first of these modules begun in February 2011. De-identified patient data was entered for patients treated by participating physicians. Information collected for each patient included demographics, clinical severity-score, non-invasive testing results, treatment details, and short and longer-term outcome details. The Registry is managed by a Steering Committee appointed by the AVF. Data integrity is monitored by a dedicated registry administrator. It is free and available to all physicians treating varicose veins. Sponsored by the American Venous Forum, it has been endorsed by the American College of Phlebology, American College of Surgeons, and the Society for Vascular Surgery.

RESULTS: A total of 4,014 venous ablation procedures were entered in the database spanning the calendar years 2007-2011, comprising 3,930 patients (figure). 41 physicians from 37 hospitals or clinical practices from 27 states entered data. 71% of patients were Caucasian; 77% were female, and the median age was 54 years. 75% of treated legs were graded as CEAP-2 or -3 at presentation; 3% as class 6, while only 1% of treated patients had class 1 disease. 99% of treated legs were of primary (non-thrombotic) etiology, 99% had superficial system involvement, 98% presented with reflux alone and 2% with combined reflux and obstruction. Seventy nine percent of treatment procedures involved the great saphenous vein, 15% the small saphenous vein, and 15% the anterior accessory saphenous vein.

CONCLUSIONS: This report describes the development of the first ever, nationwide registry for the sampling of demographics, disease profile, diagnostics, treatment, and outcome of chronic venous insufficiency management across the United States. This is an important step towards improving the care of venous disease by standardized collection and analysis of clinical information.



3:50 PM – 4:10 PM

4-16 The Real Costs Of Treating Venous Ulcers In A Contemporary Vascular Practice

H. Ma, N. A. Rosen, M. D. Iafrati, T. F. O'Donnell; Tufts Medical Center, Boston, MA.

BACKGROUND: Venous leg ulcers (VLU) are a prevalent and morbid disease that consumes considerable resources. Estimates place the total costs of treating VLU at 1% of healthcare budgets in industrialized countries. Unfortunately, there is little contemporary information on total cost of treating VLU, in a vascular surgery practice.

PURPOSE: Define the actual cost of treating VLU and identify factors influencing costs.

METHODS: A cohort of 84 patients with active VLU (CEAP VI disease), treated in a wound center by 5 vascular surgeons with a minimum follow up of 6 months and up to a year (median 368 days, 336-483) were retrospectively studied. Actual costs (not charges) were obtained for out patient and inpatient facility, visiting nurse services, and our physician practice group to yield true cost. The proportion and time to complete healing of VLU was determined to calculate time to healing as well as ulcer-free intervals. Cost/ulcer free days and cost to complete healing for the entire follow up period were carried out and as well as univariate analysis of factors affecting cost.

RESULTS: The median Total Cost (TC) of treating VLU during this follow up period was $10,976. A total of 50 patients (60%) healed their VLU without recurrence in a median time of 91 days (6-379 days) at a cost of$8,183 ($430-$50,967). This translated to $80/day to heal and $29/ulcer free day. In comparison the TC was 3-fold higher at $26,280 ($390-$132,730) for the patients (N=17, 20%) who did not heal their VLU. Significant contributing factors were outpatient facility fees ($4,354) and visiting nurse services ($12,600), related to extended treatment of the open VLU. Patients who recurred but re-healed their VLU (N=7, 8%) had aTC of $10,867. Those who recurred but did not re-heal during follow up (N=10, 20%) had a TC of $10,244. Inpatient admission increased TC to $27,487. Nearly two thirds of admissions were for treatment of cellulitis with IV antibiotics. VLU treated with surgical intervention did not significantly increase TC ($8,604 vs. $12,893 P>0.05) but significantly reduced recurrence rates (34% vs. 5%). Patients treated for outflow obstruction had a 2-fold increase in TC ($21,891 vs. $10,404). However, in 3 patients treated for outflow obstruction, complications occurred that dramatically increased the TC to $50,967.

CONCLUSIONS: This economic analysis with true costs show the importance of early aggressive treatment of infection can reduce costly inpatient admissions. Careful selection of outflow stenting candidates may reduce TC by preventing complications.

4:10 PM – 4:30 PM

4-17 Prolonged Mechanical Stretch Alters The Metabolic Profile In Rat Inferior Vena Cava

M. A. Anwar[1], P. Vorkas[1], J. Li[1], O. Resslan[2], E. Want[1], J. D. Raffetto[2], R. A. Khalil[2], E. Holmes[1], A. H. Davies[1]; [1]Imperial College London, London, United Kingdom, [2]Harvard Medical School, Brigham and Women's Hospital, Boston, MA.

BACKGROUND: Varicose vein tissues have been shown to have differential metabolic profiles as compared to non-varicose veins, suggesting a metabolic component of the disease. Vein wall stretch has been suggested as a potential etiological factor in the development of varicose veins. However, the relation between vein wall stretch and the metabolic profile of the vein wall is unclear.

AIM: The aim of the study was to determine whether vein wall stretch alters the metabolic profile of the vein wall.

METHODS: Segments of male rat inferior vena cava (IVC) were suspended in tissue bath under 0.5 g basal tension for 1 hr, and a control contraction to phenylephrine (PHE, 10^{-5}M) and KCl (96 mM) was elicited. The veins were then exposed to normal 0.5 g or high 2 g tension for short 4 or prolonged 18 hrs (5 vein segments in each group). The veins were frozen, then hydrophilic and organic metabolites were extracted using a bilayer extraction method. Aqueous and organic extracts obtained from stretched (2 g tension) and non-stretched (0.5 g basal tension) IVC segments were run on 1-dimensional ^{1}H Nuclear Magnetic Resonance (NMR) spectroscopy (800 MHz) and liquid-chromatography coupled to Mass Spectrometry (LC-MS) LCT QTOF premier (Waters MS Tech., USA), respectively. Spectra acquired from NMR and chromatograms from LC-MS were mathematically modelled and statistically analyzed using multivariate statistical models including MATLAB (Mathworks™) and SIMPCA-P + 12.0 (UMETRICS™ Sweden). 2-Dimensional NMR and tandem MS experiments were performed on selected samples for structural elucidation of molecules.

RESULTS: ^{1}H NMR spectra of aqueous extracts of stretched and non-stretched veins for 4 hrs revealed the presence of several metabolites including leucine, isoleucine, valine, creatine, myo-inositol, choline, glucose and aspartate. There was no significant difference in aqueous or lipid metabolic profiles of non-stretched and stretched IVC segments for 4 hrs. Univariate analysis revealed increased concentrations of leucine, isoleucine and valine metabolites in IVC segments stretched as compared to non-stretched for 18 hrs (p value range 0.01-0.004).
Orthogonal partial least square-discriminatory (OPLS-DA) identified triglycerides moieties as a differentiating markers and were present in higher concentrations in stretched segments as compared to non-stretched vein segments for 18 hrs (p-value range 0.01-0.003).

CONCLUSION: We have shown for the first time a complete metabolic profile of aqueous and organic extracts from rat veins subjected to normal (0.5 g) and high (2 g) mechanical stretch. Elucidation of cellular pathways linked to these differential metabolites may disclose cellular mechanisms affected by stretch and may improve our understanding about varicose veins disease.

4:30 PM – 4:50 PM

4-18 Endovenous Laser Ablation Versus Conventional Surgery In The Treatment Of Small Saphenous Vein Incompetence: Short Term Results Of A Multicenter Randomized Controlled Trial

A. D. Roopram[1], M. Y. Lind[2], J. P. Van Brussel[1], L. C. Terlouw-Punt[3], E. Birnie[1], A. A. E. A. De Smet[3], A. C. Van der Ham[1]; [1]Sint Franciscus Gasthuis, Rotterdam, Netherlands, [2]Polikliniek De Blaak, Leidschendam, Netherlands, [3]Maasstad Ziekenhuis, Rotterdam, Netherlands.

BACKGROUND: In this multicenter randomized controlled trial, endovenous laser ablation is compared with conventional surgery for the treatment of varicose veins based on incompetence of the small saphenous vein (SSV) and the saphenopopliteal junction (SPJ).

METHODS: In two Dutch hospitals, 189 patients were enrolled and randomized to receive endovenous laser ablation (EVLA) (810nm Laser) or ligation of the SPJ. Endpoints were success rate measured with duplex ultrasound (6 weeks post-treatment), peri-operative pain, quality of life, duration of surgery, difficulty of surgery, complications, cosmetic results and number of days to resume work and normal activities. Pain was measured on a Visual Analogue Scale (VAS). Quality of life was assessed using the Aberdeen Varicose Vein Questionnaire (AVVQ) and EuroQol-5D. The follow-up duration in this article is 6 weeks.

RESULTS: 175 Patients have been treated and analyzed. 118 Patients (67%) underwent endovenous laser ablation, 57 patients (33%) underwent ligation of the SPJ. The patient characteristics were similar in both groups. In the surgery-group, 21·2% residual incompetence of the SPJ was seen after six weeks, compared to 0·9% in the laser-group. Both treatment modalities reduced pain after 6 weeks. One week post-treatment patients in the EVLA-group temporarily experienced more pain compared to the surgery-group (31 vs. 18 on a VAS-scale from 0-100). There were no significant differences between the two groups with respect to quality of life. Both treatments did show improvement in quality of life. Also with regards to the cosmetics, there were no differences, aside from the fact that patients rated their scar as more beautiful after EVLA. After EVLA, patients could return to work more quickly. The operation time was longer in the surgery-group. After 2 weeks there were significantly more neurological complications in the surgery-group: 18 (31·4%) versus 16 (16·5%) patients in the laser-group. 9·8% of patients in the surgery-group developed a surgical site infection versus 0% in the laser-group.

CONCLUSIONS: EVLA provides an excellent alternative to conventional surgery in the treatment of symptomatic varicosis due to an incompetent SSV with SPJ. EVLA has a superior immediate success rate, is easier, faster and has fewer complications.

4:50 PM – 5:10 PM

4-19 Measurements Of Calf Muscle Oxygenation During Standing And Exercise In Patients With Chronic Venous Insufficiency

T. Yamaki, H. Konoeda, A. Osada, A. Hamahata, M. Nozaki, H. Sakurai; Tokyo Women's Medical University, Tokyo, Japan.

BACKGROUND: Despite the established role of the calf muscle pump for preventing chronic venous insufficiency (CVI), hemoglobin flow in the calf muscle is poorly understood. Near-infrared spectroscopy (NIRS) provides continuous noninvasive monitoring of changes in tissue oxyhemoglobin (O2Hb) and deoxyhemoglobin (HHb) levels. The purpose of this study was to investigate the changes in calf muscle HbO2 and HHb levels during standing and exercise in patients with CVI.
METHODS: Seventy-four limbs in 73 patients with various clinical stages of CVI were enrolled. Patients were divided into early (C0-C3) and advanced (C4a-C6) according to the CEAP classification. NIRS was used to measure changes in the calf muscle HbO2 and HHb levels, and oxygenation index (HbD; HbD=O2Hb-HHb) while lying spine, standing, and then subsequently performing 10 tiptoe movements.

RESULTS: Among the 74 limbs evaluated, 47 had early and 27 had advanced CVI. Standing caused increases in both O2Hb and HHb levels. However, there were no significant differences in these increases, or HbD, between early and advanced CVI. In contrast, the time elapsed until the maximum increase in O2Hb concentration was significantly reduced in patients with advanced CVI in comparison with patients showing early CVI (55.5 ± 44.2, 32.6 ± 12.6 s, P=.025). During 10 tiptoe movements, a decrease in O2Hb concentration was observed, and there was no significant difference in the reduction of O2Hb values between early and advanced CVI. In contrast, 10 tiptoe movements produced venous emptying (HHbE) and subsequent retention (HHbR), and the HHbR was significantly increased in patients with advanced CVI compared with those with early CVI (6.0 ± 7.0, 9.0 ± 6.2 µmol/L, P=0.021). Furthermore, HbD falls were more pronounced in patients with advanced CVI (7.4 ± 11.5, -5.9 ± 15.7 µmol/L, P=0.002).

CONCLUSIONS: Changes in O2Hb and HHb concentrations differ between early and advanced CVI during standing and exercise. Detailed investigation of the interrelationship between O2Hb and HHb during calf muscle pump function would lead to a better understanding of the various clinical stages of CVI.

5:10 PM – 5:30 PM

4-20 Relationship Between Tissue Pressures And Disease Severity In Venous Disease

J. T. Christenson; University Hospital of Geneva, Venous Center, Geneva, Switzerland

BACKGROUND: Raised venous pressure directly influences the microcirculation and leads to increased vessel wall permeability resulting in extravasation and increased interstitial tissue pressure. Since both primary and secondary varicose vein disease as well as chronic venous obstruction leads to increased venous pressure this study was undertaken to evaluate the relationship between tissue pressures and various venous pathologies and their severity.

METHODS: Tissue pressures were measured in both subcutaneous and intramuscular compartments of the lower limb in 10 healthy legs, Group A, 18 legs with primary varicose veins (C 2-4), Group B, 45 legs with primary varicose veins (C 5-6), Group C, 12 limbs with secondary varicose veins, PTS (C 2-4),Group D, 26 limbs with secondary varicose veins, PTS (C 5-6), Group E, and 8 legs with chronic iliac vein obstruction, Group F, prior to any treatment. Measurements were performed in standing position and in the non-weight bearing limb. A 19-gauge needle was connected via a saline-filled tubing to a pressure transducer and recorder. The needle was first introduced into the subcutaneous tissue, 25cm below the knee joint. Pressures were measured at rest during 4 minutes (steady state) and thereafter pushed into the posterior muscle compartment and intramuscular tissue pressures were recorded.

RESULTS: Results are shown in the table below.

Table 1. Subcutaneous and intramuscular tissue pressures, mmHg, in normal lower limbs, limbs with primary and secondary varicose veins and chronic iliac vein obstruction. Subcutaneous tissue pressures were higher in all groups compared to healthy limbs, p<0.001. The more severe the disease the higher was the s.c. tissue pressure. The intramuscular tissue pressure was significantly higher in Group C-F, p<0.001 and Group E had significantly higher i.m. pressures compared to Group C. Group F had the highest i.m. pressures of all groups.

CONCLUSIONS: The subcutaneous tissue pressure is significantly elevated in limbs with symptomatic varicose veins, and increases with disease severity. The highest i.m. tissue pressure was seen in obstructive venous disease, but was also significantly increased in C 5-6 patients more importantly in the C5-6 post-thrombotic limbs. An excellent correlation between tissue pressures and disease severity was documented.

Subcutaneous and intramuscular tissue pressures, mmHg						
Groups/tissue pressures	A Normal limbs	B Primary vv (C1-4)	C Primary vv (5-6)	D Secondary vv (C2-4)	E Secondary vv (C5-6)	F Chronic iliac vein obstruction
N, limbs	10	18	45	12	26	8
Subcutaneous tissue P, mmHg	0.2 ± 1.2	7.8 ± 3.2	9.4 ± 2.7	14.2 ± 4.3	17.2 ± 9.1	15.6 ± 8.1
Intramuscular tissue P, mmHg	9.2 ± 4.9	12.2 ± 4.2	21.0 ± 4.0	15.9 ± 4.9	28.4 ± 6.2	34.1 ± 8.1

POSTER PRESENTATIONS

5:45 PM – 7:00 PM
Two Poster sessions will be held concurrently. Poster sessions are open to all meeting attendees.

SESSION 1. . . . . Mohave East Room
Moderator: Joseph Raffetto, MD

P1 A Study To Compare Disease Specific Quality Of Life Scoring Systems In Patients With Varicose Veins
M. Kuet, T. R. A. Lane, I. J. Franklin, A. H. Davies; Academic Section of Vascular Surgery, Imperial College London, London, United Kingdom.

BACKGROUND: Quality of life is an important outcome measure in the treatment for varicose vein disease. The choice of a valid assessment tool is crucial. The Aberdeen Varicose Vein Questionnaire (AVVQ) and the more recent Chronic Venous Insufficiency quality of life Questionnaire (CIVIQ-14) are two validated disease specific quality of life questionnaires.
Different studies have utilized either of these quality of life questionnaires, making it challenging for the clinician to make direct comparisons between studies. The aim of this study is to evaluate the relationship between the AVVQ and the CIVIQ-14 to enable better comparison between studies.

METHODS: Adults attending the vascular clinic at our Institution for management of their varicose veins were prospectively invited to complete the AVVQ, CIVIQ-14 and EuroQol-5D (EQ-5D). Clinical data (CEAP classification and the revised varicose vein severity score (VCSS)) was collected. The relationship between the AVVQ and CIVIQ-14 scores was analyzed using Spearman's correlation. Correlation was analyzed separately for patients with less severe disease (C1-3) disease and more severe (C4-6) disease. The AVVQ and CIVIQ-14 scores were analyzed with a generic quality of life assessment tool (EQ-5D). Both the AVVQ and CIVIQ-14 were analyzed with the VCSS.

RESULTS: Fifty patients, mean age 58 (21 males; 29 females), were enrolled in the study. The mean AVVQ score was 22.7 (range 0-65; SD 14.9) and the mean CIVIQ-14 score was 31.8 (range 0-86; SD 20.6). There was a strong correlation between the AVVQ and CIVIQ-14 scores (r= 0.8; p<0.0001) (figure 1). Strong correlation was maintained for patients with C1-3 disease (r= 0.8; p<0.0001) and C4-6 disease (r= 0.7; p=0.0006).
Both the AVVQ and CIVIQ-14 scores correlated with the EQ-5D score (r=-0.5; p=0.0034 and r=-0.7; p<0.0001 respectively). The VCSS correlated strongly with the AVVQ and CIVIQ-14 scores (r=0.7; p<0.0001 and r=0.7; p<0.0001 respectively).

CONCLUSIONS: This study demonstrates that there is a strong and significant linear correlation between two of the main disease specific quality of life questionnaires for varicose veins (AVVQ and CIVIQ-14) across the whole spectrum of disease severity. This should enable better comparisons between studies using either disease specific quality of life questionnaire.

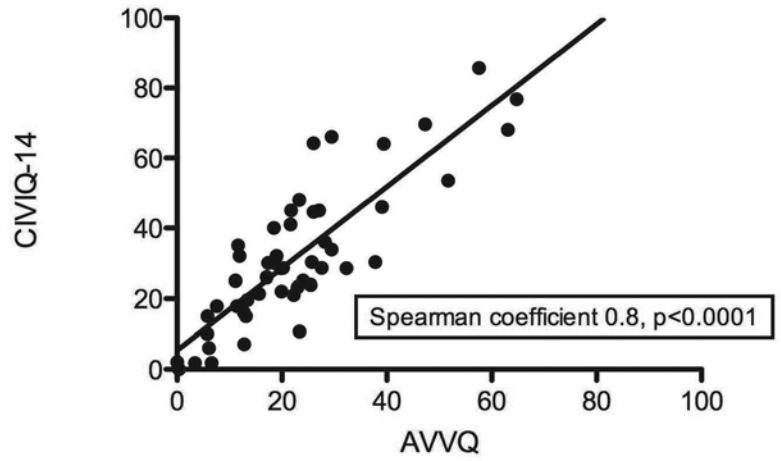


Fig. 1 Relationship between the Aberdeen Varicose Vein Questionnaire (AVVQ) and the Chronlc Venous Insufficiency quality of life Questionnaire (CIVIQ-14)

P2 Diverse Management Of Superficial Venous Thrombosis In Primary And Secondary Care
T. R. A. Lane, K. Sritharan, I. J. Franklin, A. H. Davies; Imperial College London, London, United Kingdom.

BACKGROUND: Superficial venous thrombosis (SVT) is a common condition but its treatment is often unclear. This study aimed to establish attitudes towards management of superficial venous thrombosis (SVT) in primary and secondary care.

METHODS: A 19-question survey evaluating referral and management patterns for SVT was designed and validated. General Practitioners (GPs - Primary Healthcare Physicians) and Consultant members of the Vascular Society (VCs) and Vascular Surgery Trainees in the UK were invited by e-mail to complete the online survey.

RESULTS: 369 surveys have been completed, including 165 VCs, 172 GPs and 32 vascular trainees. 70% saw <10 patients with SVT annually, with 84% of GPs <10 and 69% of VCs 6-20. 97% of VCs and 65% of GPs managed patients themselves. Overall, 70% felt that there was an association between SVT and Deep Vein Thrombosis (DVT) (63% of GPs and 74% of VCs, a significantly different proportion, p=0.007) and 42% between SVT and Pulmonary Embolus (34% of GPs and 47% of VCs, p=0.005). GPs and VCs agreed on

POSTER PRESENTATIONS

the association between varicose veins and SVT (97% versus 99%, p=0.057), but responses were significantly different for deep venous incompetence (80% versus 33%, p<0.001), Cancer (64% vs. 95%, p<0.001) and Infection (72% versus 48%, p=0.005). Venous duplex investigation was used by 21% of GPs and 91% of VCs, but 72% of GPs performed no investigations. 15% felt no treatment is needed, and 36% prescribe antibiotics. Indications for surgery were widespread and inconsistent. 9% of GPs and 45% of VCs treat patients with anticoagulation, with treatment duration varying from 2-12 weeks. Follow-up imaging is performed by 10% of GPs with 35% providing no review, compared to VCs who reviewed patients in 86%, with venous duplex being performed by 67%, a significant difference between clinician groups (p<0.001).

CONCLUSIONS: There is a marked disparity in management by primary and secondary care, and within the sectors. More clearly defined guidelines and further education on the management of SVT is required to help with the management of this common condition.

P3 Fluid-structure Interaction And Design Optimization Of Venous Valves

H. Y. Chen[1], W. Tien[2], Z. Berwick[1], G. S. Kassab[1]; [1]Indiana University School of Medicine, Indianapolis, IN, [2]University of Washington, Seattle, WA.

BACKGROUND: Computational and experimental investigations on venous valve design and associated hemodynamics will undoubtedly advance prosthesis design and treatments. The objective of the current study is to investigate the effect of venous valve design on the leaflet fluid and solid mechanics. The hypothesis is that the optimal solid and fluid dynamics will improve clinical outcome by reducing thrombosis and hyperplasia.

METHODS: Fully dynamic Fluid-structure Interaction (FSI) models were developed. The complete cycle of valve opening, closing and full closure were simulated. The flow experiments were conducted using a pulse duplicator flow loop designed and fabricated for the purpose of venous valve testing.

RESULTS: Reasonable agreement between the output of FSI simulations and output of pulse duplicator experiments was observed. The simulated high cost region at the leaflet base correlated with the disease location of vast majority of explanted venous valves (see Figure). The optimization study found that the reduced valve height and leaflet dome shape resulted in optimal performance by reaching the lowest cost (combination of solid stress and fluid shear).

CONCLUSIONS: This study creates the scientific platform for correlation with clinical pathological development and effective design of venous prosthesis. This approach can be further applied in performing virtual experiments and evaluations using the validated and predictive computational models.

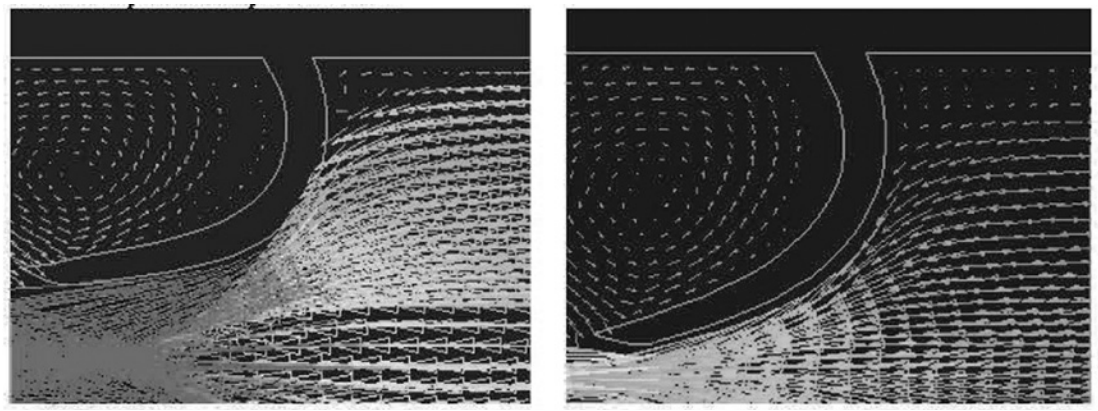


Figure. The flow field during opening and closing stages. Behind the leaflets, vortices form which promote shear stress on leaflet surfaces.

P4 Increased Calf Muscle Deoxygenation During Light-intensity Exercise Predicts Nonresponse To Compression Therapy For Chronic Leg Edema Of Unclear Origin

T. Yamaki, H. Konoeda, A. Osada, A. Hamahata, M. Nozaki, H. Sakurai; Tokyo Women's Medical University, Tokyo, Japan.

BACKGROUND: Chronic leg edema is a multifactorial condition that affects patients with various diseases. For patients with leg edema of uncertain origin, compression therapy is a basic treatment option. However, clinicians often encounter patients with chronic leg edema that fails to subside within three months, despite compression therapy. The aim of this study was to identify non-responders to standardized compression therapy by measuring calf muscle deoxygenated hemoglobin (HHb) during light-intensity exercise.

METHODS: Thirty-four patients with chronic leg edema who had no evidence of deep vein thrombosis, chronic venous insufficiency, chronic lymphedema, peripheral arterial disease, chronic heart failure or chronic renal disease were included. Near-infrared spectroscopy (NIRS) was used to measure the calf muscle HHb level before treatment. The calf venous blood filling index (FI-HHb) was calculated on standing, and then the calf venous ejection index (EI-HHb) was obtained after one tiptoe movement and the venous retention index (RI-HHb) after 10 tiptoe movements. All patients were instructed to wear inelastic compression bandages followed by compression stockings, and encouraged to walk. The primary endpoint of this study was the disappearance of cobblestone-like subcutaneous edema on ultrasonographic imaging at 3 months.

POSTER PRESENTATIONS

RESULTS: Among 34 patients evaluated, 21 (62%) showed disappearance of the cobblestone appearance on ultrasound, and their chronic leg edema subsided within 3 months. There were no significant differences in age, gender or body mass index between responders and non-responders. There were also no significant differences in the values of NIRS-derived FI and EI between the two groups. However, the NIRS-derived RI was significantly increased in patients who did not respond to compression therapy (2.4 ± 1.9, 19.1 ± 16.1, P = 0.003). Using receiver operating characteristic curve analysis, an optimal RI cut-off point of >5.1 showed the strongest ability to predict non-response to compression therapy at 3 months (area under the ROC curve 0.93; 95% confidence interval, 0.79-0.99; P <0.0001, respectively).

CONCLUSIONS: Increased calf muscle deoxygenation during light-intensity exercise can predict non-response to compression therapy for "functional" leg edema. Future studies comparing different compression devices, pressures and duration of application are needed.

P5 Ten Year Results Of Radiofrequency Ablation (vnus Closure®) Of The Great Saphenous And Anterior Accessory Saphenous Veins, In The Treatment Of Varicose Veins

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

BACKGROUND: In March 1999 we started using radiofrequency ablation (RFA) (VNUS Closure®) to treat duplex proven reflux in the Great Saphenous and Anterior Accessory Saphenous veins, replacing ligation and stripping in the treatment of varicose veins. The aim of this study is to investigate the results of this treatment after 10 years.

METHODS: Patients who had undergone RFA 10 years ago at our clinic were sent a letter to invite them for review. Duplex ultrasound was performed by an experienced vascular technologist and any reflux in the treated vein was noted. The source of any recurrent varicose veins was also identified.

RESULTS: In total, 361 patients were invited for review of which 114 (188 legs) attended and 44 replied as being unable to attend; a response rate of 158/361 (43.8%). Female to male ratio was 88:26. The age of patients at the time of the operation ranged from 26 to 78 with a mean of 52.7 years.
Of 188 legs treated, only one vein (0.5%) was completely open and 6 (3.2%) had partially patent segments that gave rise to recurrent varicose veins. One of these 6 legs had both a patent stump and a segment of patent trunk, 3 had just a patent trunk and 2 had a patent stump, all giving rise to recurrent varicose veins.
Successful RFA treatment was found in 181 out of 188 (96.3%) legs where the treated veins were either closed completely or did not cause any clinically significant manifestations. Complete atrophy of the treated veins was found in 136 out of 188 legs (72.3%), partial atrophy in 23 out of 188 legs (12.2%) and there were patent stumps with no clinical significance in 4 out of 188 legs (2.1%).
In the 188 legs there were 56 legs (29.8%) that showed de novo varicose vein formation arising from veins separate to those treated with RFA that had been competent on the diagnostic scan 10 years previously.

CONCLUSIONS: At 10 years, we found successful closure of treated veins in 96.3%. Clinical recurrence from veins treated with RFA was 3.72% and de novo reflux arising from elsewhere was found in 29.8%. These figures compare very favorably to a recurrence rate of up to 70% for surgical stripping and ligation at 10 years.

P6 Initial Experience With A New Pharmacomechanical Thrombectomy Device In Deep Venous Thrombosis

C. Koksoy, U. Sanlidilek; Ankara University, Ankara, Turkey.

BACKGROUND: The potential for thrombolysis to improve outcomes for patients with deep venous thrombosis (DVT) seems to be strong. The development of pharmacomechanical thrombolysis techniques has enhanced the ability to efficiently remove large thrombus burden. We report a case series of successful DVT management with pharmacomechanical thrombectomy utilizing a new rotational thrombectomy device.

METHODS: Patients with lower limb DVT that underwent pharmacomechanical thrombectomy utilizing Cleaner thrombectomy device (Argon Medical Devices Inc. Plano, TX USA) were enrolled for the study. Following diagnosis of acute or subacute lower extremity DVT, using popliteal or tibial access the device was inserted and pharmacomechanical thrombolysis was applied as "single-session" technique. At the end of the procedure patency was confirmed by contrast venography.

RESULTS: Five patients, 2 males and 3 females, mean age 49.8 (23-73) years underwent pharmacomechanical thrombolysis for DVT. One patient had tibio-femoral, four patients had popliteo-iliac venous thrombosis. Duration of symptoms was 13 (7-23) days. A temporary vena cava filter was inserted in all patients except one. Access site for thrombolysis was posterior tibial vein in one patient and popliteal vein was in others. Mean amount of tissue plasminogen activator, a thrombolytic agent, was 17 (10-22) mg and duration of procedure was 75 (50-110) minutes. All patients had complete thrombus resolution at the end of the procedure. There was were no complications in terms of pulmonary embolism or bleeding. Symptomatic relief was obtained in all patients and patients were discharged next day with anticoagulant therapy.

CONCLUSIONS: This device can be safely and effectively used for treating acute and subacute DVT in a single session of pharmacomechanical thrombolysis providing with results of improved functional outcome. The technique has the potential to minimize morbidity and duration of hospital stay.

P7 Avulsions - Now Or Later? A Meta-analysis

T. R. A. Lane, S. Onida, M. Gohel, I. J. Franklin, A. H. Davies; Imperial College London, London, United Kingdom.

BACKGROUND: With the advent of outpatient based ambulatory varicose vein treatment under local anaesthetic, the optimal treatment of branch varicosities has become an area of debate. Concomitant phlebectomies with endovenous ablation offers a one-stop treatment for patients, but may require a longer procedure with higher anaesthetic requirements. This meta-analysis aims to assess the current literature and evaluate outcomes after endovenous ablation with simultaneous or delayed phlebectomies.

POSTER PRESENTATIONS

METHODS: Searches using EMBASE and MEDLINE (from 1948 to date) were performed using the keywords varicose veins AND Phlebectomies OR Avulsions OR Secondary Interventions Concomitant AND Phlebectomies OR Avulsions OR Secondary Interventions. Articles examining the timing of phlebectomies in the context of endovenous ablation were examined. Methodology was assessed using Cochrane collaboration tools, and analysis completed.

RESULTS: 462 articles were identified on title search, refined to 51 articles following abstract review and 5 after full text review. The need for further procedures after endovenous ablation was evaluated from 3 articles (2 Randomised Controlled Trials, RCTs and 1 case series). No significant difference was found between simultaneous or delayed treatment pathways (12% versus 22%; Odds Ratio for simultaneous treatment - 0.734, p=0.339). Quality of life outcomes were assessed in 2 RCTs and a significant early improvement (6 weeks) was seen in simultaneous phlebectomy treatments (AVVQ improvement 8.14 versus 7.22; Odds Ratio for simultaneous treatment - 0.460, p=0.029). At 12 weeks there was no significant difference in quality of life outcomes (AVVQ improvement 11.98 versus 10.13; Odds Ratio for simultaneous treatment - 0.688, p=0.283). In 3 case series the incidence of deep venous thrombosis (DVT) was significantly lower in patients treated with delayed phlebectomy (1.8% versus 4.9%; Odds Ratio for simultaneous treatment - 1.613, p=0.043).

CONCLUSIONS: Little evidence exists to guide clinicians as to the optimum time to treat varicosities. Delayed and simultaneous varicosity treatment are equivalent in terms of the need for adjunctive procedures, but simultaneous treatment offers improved early quality of life improvement at the expense of higher DVT rates.

P8 Varicose Veins - An Evaluation Of Management Outcomes Between Endovenous Therapy And Open Surgical Ligation Using The American College Of Surgeons' National Surgical Quality Improvement Program Database

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BACKGROUND: When symptomatic varicose veins, or complications of varicose veins, fail to respond to traditional conservative therapy, intervention may be indicated. Current treatment involves either surgical ligation with or without venous stripping in the treatment of venous dysfunction of the great and/or small saphenous veins, or through minimally invasive techniques with the use of endovenous ablation, notably through endovenous radiofrequency therapy (EVRT) or endovenous laser therapy (EVLT). Our hypothesis is that endovenous ablative techniques such as EVRT and EVLT are associated with less short term post-operative complications, including infection, than open surgical ligation and stripping of varicose veins.

METHODS: Retrospective analysis of data submitted by over 350 hospitals to the American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP) was accessed from 2005 to 2010 inclusive. Defined by their unique common procedural terminology (CPT) codes, all cases of endovenous ablation techniques in the form of EVRT (CPT 36475, 36476) and EVLT (36478, 36479) as well as open surgical ligation (37700, 37718, 37722, 37735, 37780) were evaluated for the primary outcomes of incidence of DVT and incidence of superficial surgical site infection, and the secondary outcomes of operative time and estimated blood loss. Using a propensity score model based on a selected list of covariates to create matched groups, each group was compared to the other two (in pairs), i.e. open versus laser, open versus RFA, and laser versus RFA. A logistic regression analysis was performed to determine the independent risk factor of these covariates to the primary and secondary outcomes.

RESULTS: Inclusion criteria were met by 9399 cases. 3803 (40.5%) underwent open surgical ligation and 5596 (59.5%) underwent endovenous therapy. EVLT represented 1607 (17.1%) of endovenous cases with EVRT encompassing 3989 (42.4%). The occurrence of DVT following open surgery was 28 cases as compared to 76 with endovenous therapy (OR 8.3, p<.05). EVRT had a greater propensity for the primary outcome than EVLT. In addition, open surgical ligation had 70 cases of surgical site infections compared to 15 in the EVLT group and 25 in the EVRT group (OR 25.6, p<.001). Logistic regression analysis for independent risk factor association will be presented.

CONCLUSION: In this analysis of a large patient cohort from a validated database, open surgical ligation is associated with more postoperative complications than endovenous therapy, and minimally invasive techniques should be the primary treatment modality in appropriately selected patients with varicose veins.

P9 Increase Incidence Of Deep Vein Thrombosis In Patients With Lower Extremity Ulcers Undergoing Surgery For Varicose Veins

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BACKGROUND: Few studies have evaluated the association between lower extremity ulcers and deep vein thrombosis (DVT) after varicose vein surgery.

METHODS: The National Surgical Quality Improvement Program database (NSQIP, 2005-2010) was used to identify patients who underwent venous surgery for varicose veins such as endovenous laser or radiofrequency ablation and open ligation, division and stripping of great or small saphenous vein. The primary outcome variable was the incidence of post-operative lower extremity DVT. Multivariate logistic regression analyses were performed to compare the incidence of DVT between patients with and without ulcers.

RESULTS: A total of 13,216 patients underwent surgery for varicose veins. Four-hundred and forty-nine (3.4%) patients had advanced disease with lower extremity ulceration. Patients with ulcers were more likely to be older (57.9y vs. 51.3y, P<0.0001), male (50.8% vs. 28.6%, P<0.0001), obese (55.1% vs. 35.1%, P<0.0001), and to have undergone endovenous ablation procedures (54.5% vs. 41.7%, P<0.0001) compared to patients without ulcers. No differences in the use of general anesthesia (66.8% vs 65.8%, P=0.61) or for the duration of the procedure (68.7min vs. 66.4min, P=0.23) were seen between groups. In unadjusted models, patients with lower extremity ulcers had a significantly higher incidence of DVT (2.45% vs. 1.11%, P=0.01) compared to those without ulcers. After adjusting for patient demographics and procedure characteristics, patients presenting with lower extremity ulcers were 2 times more likely to develop postoperative DVT compared to those without ulcers (OR=2.05, 95%CI=1.10-3.83, P=0.02).

CONCLUSION: Current practice guidelines for the management of patients with varicose veins recommend the use of thromboprophylaxis in high-risk patients undergoing venous surgery. As shown in our study, patients with varicose disease and ulceration should be considered high risk, and thromboprophylaxis should be used.

POSTER PRESENTATIONS

P10 Closurefast Radiofrequency Ablation Versus 1470-nm Endovenous Laser Ablation: A Prospective Comparative Nonrandomized Multicenter Study

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BACKGROUND: The data comparing the effectiveness of both ClosureFAST radiofrequency ablation (RF ablation) and 1470 nm endovenous laser ablation (EVLA) for the treatment of varicose veins are scarce. The aim of the present study was to discover main differences between these endovenous techniques.

METHODS: A prospective comparative nonrandomized multicenter study. Sample size calculation required to attain the needed power was performed based on primary endpoint data from the pilot study. Inclusion criteria: 1) age over 18 years, 2) GSV diameter < 2 cm, 3) CEAP: C2-C3. 192 patients underwent either 1470 nm EVLA (bare-tip fiber) (84 patients) or ClosureFAST RF ablation (108 patients). Demographic parameters and diameters of veins in groups were similar. Primary endpoint was a pain level on the 1-st day after the intervention by Numerical Rating Scale (NRS). Secondary endpoints were assessed following a year: target vein ablation/ obliteration/ recanalization rate, quality-of-life (QOL) dynamics was determined by CIVIQ 2 questionnaire and clinical improvement was assessed by VCSS (Venous Clinical Severity Score) questionnaire. Nonparametric statistical methods were used: Mann-Whitney U test for independent groups and Wilcoxon test for dependent groups. Outcome rates were assessed using χ 2 test, relative risk of recanalization between groups was calculated.

RESULTS: The median pain score in a thigh segment at the 1-st day after the intervention appeared to be significantly lower in the RF ablation group (Me = 1) than in the EVLA group (Me = 3), p=0.00001. Ablation rate proved to be higher in the EVLA group (p=0.05), the differences between recanalization rate (p = 0.53) and ablation rate (0.07) were quite insignificant. Recanalization relative risk was RR = 1.02 95% CI (0.96-1.08). Statistically significant QOL improvement and disease severity decrease was found both in the RF ablation group and the EVLA group 1 year following the procedure (p< 0.00001). The degree of QOL improvement and disease severity decrease were more pronounced in the RF ablation group (p=0.0002 and p=0.0000001 respectively).

CONCLUSION: 1.ClosureFAST RF ablation is associated with less pronounced postprocedural pain syndrome compared with 1470 nm EVLA when using bare-tip fibre; 2.Ablation rate and recanalization rate for the target vein are not significantly different by 1-year follow-up; 3.Pronounced improvement of QOL scores and clinical severity scores was noted after treatment with ClosureFAST RF ablation compared with 1470 nm EVLA procedure, though clinical significance of this difference is quite low.

P11 Incidence And Quality Implications Of Deep Venous Thrombosis After Peripherally Inserted Central Venous Catheter

S. T. Greathouse, J. N. Gilstrap, R. Garza, III, K. Reinart, V. Deacon, H. Tavianini, R. X. Murphy, Jr.; Lehigh Valley Health Network, Allentown, PA.

BACKGROUND: Since the Surgeon General's 2008 "Call to Action to Prevent Deep Vein Thrombosis (DVT) and Pulmonary Embolism," venous thromboembolism has been targeted by payers and policymakers as a patient safety issue and a potentially preventable condition. Peripherally inserted central catheters (PICCs) are known to be associated with upper extremity thrombosis, yet are being used more frequently. This study's purpose was to examine our experience with PICCs and their associated indications and complications.

METHODS: We conducted a retrospective review of all catheters placed between 2006 and 2011 by the nurse-run PICC team in our health network. All patients with ultrasound-proven DVT were identified and assessed for age, co-morbidities, admitting diagnosis, history of prior thrombus, presence of thrombotic risk factors, type and size of catheter, location of thrombus, presence of symptoms, and dose and type of prophylaxis.

RESULTS: A total of 21,641 nurse-placed PICCs were identified during the study period. Long-term intravenous antibiotic infusion was the most common indication for catheter placement. In 28 (9.6%) patients who later developed a DVT, catheters were placed without clear indication. Overall thrombus rate was 2.3% (n = 497), of which 58.8% (n = 292) were DVTs, most commonly associated with an admitting diagnosis of sepsis (n=39, 13.4%), followed by cancer (n=33, 11.3%). Median number of days between placement and thrombus formation was eight. Histories of cancer and tobacco use were the predominant risk factors identified within this population; the most frequently cited co-morbidity was hypertension. Three patients were diagnosed with pulmonary embolus. Patients already fully anticoagulated with warfarin or intravenous unfractionated heparin did not receive additional prophylaxis. In 29 (19.5%) of the patients in this series who received prophylaxis, inadequate or inconsistent DVT prophylaxis was utilized.

CONCLUSIONS: Although PICC placement is a common procedure in our network, it is not without risk of patient morbidity and the potential for mortality. The rate of DVT in our series after PICC placement was 1.3%. Adherence to clear indications for PICC placement, identification of DVT risk factors, and utilization of appropriate anticoagulation prophylaxis are essential in providing appropriate care and limiting poor outcomes.

P12 Venous Duplex And Pathologic Differences In Thrombus Characteristics Between Denovo Deep Vein Thrombi And Endovenous Heat-induced Thrombi

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BACKGROUND: Since 2000, endovenous techniques to treat superficial venous reflux disease have become increasingly common. The complication rate of this procedure is reported from 1-16%, most are often related to bruising and self-limited paresthesias. DVT development in the postoperative period can be concerning, especially if extension into the deep femoral venous system occurs. Treatment of this sequelae remains controversial. In spite of the few studies regarding the ultrasound differentiation between EHIT and DVT, there remains a paucity of literature regarding the evaluation of the ultrasound examination reviewers and the pathologic differentiations.

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METHODS: Six Yorkshire cross swine were randomized to undergo femoral vein thrombosis by either suture ligation or endovenous radiofrequency ablation. At one-week post procedure, all veins were imaged by ultrasound and subsequently harvested for histologic examination. A blinded pathologist evaluated the thrombi for evidence of hypercellular and fibroblastic reaction, presence of neovascularization, edema, and age of clot. The recorded Duplex ultrasound scans were blinded and reviewed by a combination of vascular surgery faculty, fellows, and residents. Each reviewer classified the visualized thrombus into 11 categories including echogenecity, clot characteristics, and degree of occlusion.

RESULTS: The endovenous ablated veins demonstrated more prolific hypercellular responses, evidence of fibroblastic reaction, and presence of neovascularization. Denovo DVTs resulted in more collagen production corresponding to a more profound trichrome stain on histologic examination. The pathologist accurately predicted the etiology of the thrombi in 92% of cases. The absence of color flow on ultrasound was the most often (95%) concurrent finding on duplex examination. Stationary clots were corroborated by 91% of reviewers followed by vein retraction (82%) and echogenicity patterns (78%). The least likely characteristics to be agreed upon were compressibility (25%) and vein distension (47%). In subgroup (DVT vs EHIT) analyses, the percent agreement was greatest amongst the vascular surgery fellows compared to residents and faculty (76%/85% vs 67%/66% and 63%/63%, respectively).

DISCUSSION: The results suggest histologic examination can accurately differentiate a DVT from EHIT 92% of the time. This carries possible implications in discovering the etiology for mortality in patients following RFA and sudden death. The comparison analysis of ultrasound interpretation by blinded reviewers suggests that there is significant variability in characterizing acute thrombi. Vascular surgery fellows tended to have greater degree of agreement in defining clots which maybe related to the increased volume of study interpretations completed during this focused training period. Unfortunately, there is no ultrasound criterion that was able to accurately differentiate the etiology of the thrombus. Clinical implications for management result in all thrombi being treated based on thrombus extent through the saphenofemoral junction.

POSTER PRESENTATIONS

SESSION 2 . . . . . .Mohave West Room

Moderator: Marc Passman, MD

P13 Changes In Calf Venous Volume With Increasing Outflow Resistance

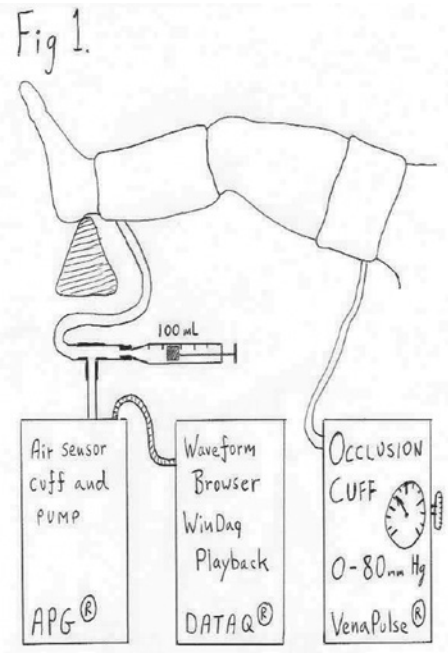
C. R. Lattimer[1], M. Azzam[2], G. Geroulakos[1], E. Kalodiki[1]; [1]Ealing Hospital & Imperial College, Middlesex, United Kingdom, [2]Ealing Hospital, Middlesex, United Kingdom.

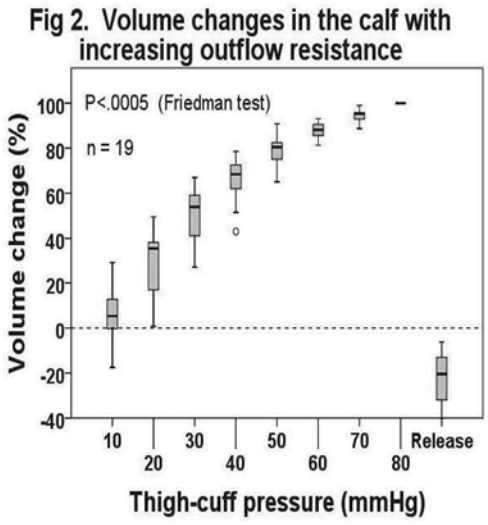
BACKGROUND: Improvements in data acquisition software and occlusion cuff performance have provided an opportunity to re-evaluate the effect of increasing outflow resistance on venous volume and outflow curves using air-plethysmography (APG). A study is presented in healthy volunteers where the effects of increasing pressures in a thigh-cuff are recorded using the air-sensor calf-cuff of APG. The aim of this study was to determine how much external pressure is required to cause a significant increase in calf volume.

METHODS: The right legs of 19 consecutive subjects (14 male), median age 31 (25-56) years, without evidence of venous disease, were studied. Each subject was tested supine with the leg slightly elevated, externally rotated with the heel on a support cushion. The calf-cuff was connected to an air-pump/pressure transducer unit from which the data was transferred electronically into a specialized recording software program (DATAQ). A high thigh-cuff, 12 cm wide, was inflated in incremental steps of 10 mmHg, from 0-80 mmHg (Fig 1). After inflation, the increase in calf volume was allowed to plateau and the resulting volume change was recorded. At 80 mmHg the thigh-cuff was released suddenly with the outflow curve continuing until a steady baseline was reached. Outflow fraction (OF), defined as a % volume change during the first second/total outflow volume, was calculated with the time taken to empty 90% of the total outflow volume, the VET90.

RESULTS: The test lasted a median (range) of 7.6 (5.6-10.9) minutes per subject. There was a stepwise increase in the venous volume of the calf with each incremental rise in thigh-cuff pressure up to the maximum of 80 mmHg (P<.0005, Friedman), as depicted in Fig 2. The maximum increase was observed between 10-20 mmHg from a median (inter-quartile range) % of 5.3 (-1 to 14.7) to 35.4 (15.3 to 38.4), respectively (P<.0005, Wilcoxon). The median (range) of venous volume at 80 mmHg, OF, VET90 and % change below original baseline following cuff release was 86.7(35.5-140.2) mL, 39(1-59)%, 13(3.9-66.6) seconds and 20.5(6.3-60.1)% (P<.0005 Wilcoxon), respectively.

CONCLUSIONS: External pressures of only 20 mmHg cause significant changes in venous volume. Venous volume, OF and VET90 all show great variation in normal subjects. External pressure significantly improves the venous emptying of the leg after cuff-release.





P14 Impact Of A Vascular Specialist On The Proper Work-up Of Venous Disease In An Urban Wound Care Center

N. Awad, R. Choudry, R. Solit, J. Durinka, E. Tobin, F. Karipineni, H. Simms; Albert Einstein Medical Center, Philadelphia, PA.

BACKGROUND: The popularity and growth of wound care centers (WCC) across the globe has likely resulted in significantly improved outcomes for patients, largely as a function of care afforded by specialized practitioners. WCC may be staffed by a wide range of specialists including podiatrists, orthopedic, plastic, general, or vascular surgeons. Diagnostic skill in identifying the correct etiology behind the development of a wound is paramount towards therapy selection and healing.

METHODS: We retrospectively reviewed patient data collected through our WCC from July 2008 to June 2011 following the addition of two staff vascular specialists. Data points included general demographic information, the number of revisits and new patients, and the type of vascular testing ordered per patient.

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RESULTS: In the three consecutive years reviewed, the number of total visits steadily increased from 1922 to 2638 to 2884, a 150% increase. The number of new patients also increased, from 204 to 220 to 244, a 120% increase. All forms of vascular testing, including venous and arterial duplex sonography, at the WCC increased significantly. However, the most significant increase was in noted in venous studies performed which increased from 99 to 294 to 443, an overall 447% increase. (Table 1)

Table 1: Revisits, new patients, and venous studies performed by year at our WCC

Year	Revisits	New Patients	Venous Studies Performed
2008-2009	1922	204	99
2009-2010	2638	220	294
2010-2011	2884	244	443

CONCLUSIONS: WCCs inherently require multidisciplinary coordination for effective treatment of complex wounds. The introduction of vascular specialists to WCCs is integral in increasing the scope of practice and aiding in the appropriate diagnosis of the etiology of chronic wounds. Since the introduction of two staff vascular specialists to our WCC, an influx of patient visits and venous investigations has steadily occurred with each successive year, possibly reflecting a more thorough approach to diagnosis and treatment of our patients.

P15 Positive Predictive Value Of Icd-9 Cm Codes For Identifying Venous Ulcer Patients: An Analysis From The Olmsted County Venous Ulcer Study

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BACKGROUND: The current prevalence of VU is uncertain. To address this issue, the Olmsted County Venous Ulcer Study will estimate the current and future annual prevalence of VU in Olmsted County, MN. The aim of this study was to estimate the PPV of VU ICD-9 codes in correctly identifying VU patients.

METHODS: The Rochester Epidemiology Project and 18 VU ICD-9 codes were used to identify unique Olmsted County residents with possible VU over the two-year period, 2010-2011. For a random sample, the complete medical records were reviewed and data abstracted on demographic and clinical characteristics using a pre-specified data collection instrument. Based on prespecified VU criteria (typical VU anatomic location; absence of arterial disease [ABI > 0.8]; absence of neuropathic cause; presence of venous stasis dermatitis or varicose veins; documented venous valvular incompetence or venous outflow obstruction) patients were categorized as a VU case or non-case. Continuous and categorical variables were compared between groups using the two-sample t-test and Chi-square test, respectively. The PPVs for VU ICD-9 codes were estimated.

RESULTS: 1551 residents were identified as possible VU cases. From a 7.5% random sample (n=117) of these, 35 (30%) were categorized as definite VU cases after medical record review. For the remainder, the distribution of other diseases was non-venous ulcers (ischemic, diabetic and others; n=55); venous stasis dermatitis (n=19), venous varicosities (n=7), superficial phlebitis (n=1), and other dermatitis (n=5) without VU. The mean ± SD (range) for VU patient age was 73 ± 15 (38-97) years and 15 (43%) were women; 10 (29%) had prior venous thromboembolism. The prevalence and PPV of four ICD-9 codes differed significantly among VU cases vs. non-cases (Table).

CONCLUSIONS: In general, the 18 VU ICD-9 codes operated poorly in identifying true VU cases. While code 454.0 had a 100% PPV, only 31% of true VU cases were identified making this code inadequate for estimating VU prevalence. Alternative approaches for identifying true VU cases will be pursued, including natural language processing of the electronic health record.

Venous ulcer cases and non-cases with respective PPV for 4 ICD-9 codes.

ICD-9 Code	VU Case (n)	VU Non-Case (n)	ICD-9 Code PPV (%)
454.0	11	0	100
454.1	4	26	13
707.15	3	20	13
707.9	1	11	8
Total	19	57	25

P16 Diagnostic Value Of The Absence Of Respiratory Variation In The Femoral Flow For Detection Of Chronic Iliocaval Venous Obstruction

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BACKGROUND: Management and identification of iliocaval obstruction has always been difficult due to the lack of a reliable noninvasive screening technique. It has been reported that absence of respiratory variation in femoral flow during duplex ultrasound examination of the common femoral vein may provide evidence for outflow obstruction. The purpose of this study was to establish the diagnostic value of absence of respiratory variation in the femoral flow in detection of chronic iliocaval venous lesions.

METHODS: Patients with chronic venous disease (CEAP -C3 and above) were prospectively enrolled in the study. Following a standard lower extremity duplex ultrasound examination, both common femoral veins were examined for presence or absence of respiratory variation in the femoral flow. All patients underwent contrast venography and intravascular ultrasonography (IVUS) examination for vena cava, bilateral common and external iliac veins. The results were compared in terms of diagnostic value and accuracy.

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RESULTS: Seventy-one patients, 53 males and 18 females, mean age 40.3 ±1.5 years, were enrolled in the study. Forty-three (60.6%) patients had active or healed venous ulcer. Using contrast venography and IVUS examination venous obstruction in the inferior vena cava, right iliac vein and left iliac vein was detected in 15.5%, 31% and 77.5% of patients, respectively. The left iliac vein compression either non-thrombotic or thrombotic was detected in 46.5% of patients. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy of absence of respiratory variation in the femoral flow for the diagnosis of iliac venous obstruction based on degree of obstruction are shown in table.

CONCLUSIONS: Iliocaval venous obstruction is a frequent feature of chronic venous disease. Absence of respiratory variation in the femoral flow using duplex ultrasound may indicate a possible iliocaval venous obstruction, however defining the hemodynamic significance of degree of venous obstruction and its relationship to anatomic findings remains unclear.

Condition	Sensitivity	Specificity	PPV	NPV	Accuracy
Any degree of obstruction	51%	97%	95%	62%	80%
>50% stenosis	64%	95%	90%	77%	65%
Occlusion	81%	80%	44%	96%	46%

P17 The Treatment Of Symptomatic Central Venous Stenosis May Be Targeted To The Hemodynamically Significant Lesion

M. Sadek, L. S. Kabnick, T. L. Berland, H. Rana, N. S. Cayne, T. S. Maldonado, C. B. Rockman, G. R. Jacobowitz, P. J. Lamparello, M. A. Adelman; New York University Langone Medical Center, New York, NY.

BACKGROUND: Central venous stenosis is a potential cause of severe chronic venous insufficiency. Previous reports have demonstrated the safety and efficacy of iliac vein stenting that extends to the common femoral vein. This study sought to evaluate an approach whereby in patients with severe chronic venous insufficiency only the hemodynamically significant lesion is treated.

METHODS: The data for this study were derived from a retrospective review of a prospectively maintained database from 10/2011 to 9/2012. Consecutive patients undergoing iliac vein stenting for symptomatic central vein stenosis were evaluated. Preoperative duplex imaging was performed universally; however, preoperative MRV was performed selectively, and a clinical picture consistent with central vein stenosis was sufficient for proceeding to the hybrid room. Superficial venous insufficiency was ruled out or treated prior to evaluation for central venous stenosis. Stents were placed only in the areas of significant stenosis (i.e. > 50% surface area reduction) as identified by intravascular ultrasound (IVUS). Patients were placed on Clopidogrel postoperatively. The primary outcome evaluated was clinical improvement (edema reduction or ulcer healing). Secondary outcomes included stent-patency, hematoma, and DVT/PE.

RESULTS: Twenty-one procedures were performed with an average follow-up of 42.3days (range 9-227days). Demographics were as follows: age (55.8±11.9years), gender (48% women), right-sided (62%), history of DVT (14%), average CEAP (3.6), C3 (N=15), C4 (N=2), C6 (N=4). Preoperative MRV was performed in 52% of patients. A preoperative diagnosis of common iliac vein stenosis was noted in 64% of patients who underwent a preoperative MRV, and in 33% of the study population as a whole. In the hybrid room, IVUS was used universally except in one case where an EIV occlusion could not be crossed. The average contrast load was 25.8mL, and the average fluoroscopy time was 10.5min. The average percentage stenosis identified was 63.1±36.5%. Treatment was performed in 62% of cases. There was no correlation between preoperative MRV findings and intraoperative intravascular ultrasound findings. The average number of stents used was 1.5±0.8 stents with an average coverage of 128±59mm. 85% of the treatments were restricted to the IVC, CIV, or EIV and did not extend into the CFV. With regards to the primary outcome, 91% of patients who underwent treatment demonstrated a clinical improvement in edema or ulcer healing. All of the stents were patent on follow-up, and there were no hematomas, DVTs or PEs.

CONCLUSIONS: This study suggests that targeting the hemodynamically significant lesion in a patient with symptomatic central venous stenosis is a safe and effective approach. Additional evaluation is required to validate these results in the long-term.

P18 A Randomized Placebo Controlled Trial Of Endovenous Thermal Ablation With Or Without Polidocanol Endovenous Microfoam Treatment In Patients With Great Saphenous Vein Incompetence And Visible Varicosities

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BACKGROUND: Thermal ablation of trunk veins does not treat the superficial varicose tributaries that may need subsequent treatment with a second procedure; it remains an open question whether these tributaries should be treated simultaneously or sequentially. This study set out to determine if the addition of polidocanol endovenous microfoam (PEM) 0.5% and 1.0%, when administered immediately following endothermal ablation (ETA) in patients with saphenofemoral junction (SFJ) and great saphenous vein incompetence improved outcomes when compared with ETA+placebo.

METHODS: 117 patients underwent ETA (laser or radiofrequency) for proximal GSV incompetence followed by randomized treatment with PEM 0.5%, PEM 1.0% or placebo for visible varicosities and incompetent distal GSV. Endpoints: absolute change in appearance at Week 8 measured by: 1) Independent Photographic Review panel (IPR-V^3) and 2) patient self-assessment of varicose vein appearance (PA-V^3). Safety included scanning for venous thrombosis and adverse event (AE) monitoring.

RESULTS: Patients were typical of a varicose vein population; characteristics were evenly distributed. 117/118 completed. IPR-V^3 scores improved by 58% for ETA+PEM compared with only 35% for ETA alone (p=0.0011) at Week 8. PA-V^3 scores from baseline improved in both groups (53% for ETA+PEM; 46% for ETA alone; difference not statistically significant). Of PEM-treated patients, 81% experienced an AE and most were mild or moderate (53.2% and 25.3%) compared with 53% of ETA alone patients; the majority were considered related and 67% resolved without sequelae. Most common AEs were superficial thrombophlebitis, pain in extremity, and bruising. The addition of PEM to ETA treatment resulted in statistically fewer additional treatments between Week 8 and Month 6 for residual varicose veins in the treated leg of study patients (p<0.05). Almost 1 in 4 of patients (23.7%) treated with ETA + placebo received additional treatment, while 13.9% of patients treated with ETA + PEM 0.5% and 1.0% (pooled) had additional treatment.

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CONCLUSIONS: ETA plus PEM at doses of 0.5% and 1.0% provided improvement in VV appearance (measured by IPR-V^3) compared with ETA+placebo. The addition of PEM to ETA resulted in greater elimination of SFJ reflux and reduced need for subsequent treatments than ETA+placebo. ETA followed by PEM treatment was demonstrated in this study population to be generally safe and well-tolerated at both dose-concentrations.

P19 Incidence, Progression And Risk Factors For Endovenous Heat Induced Thrombosis After Laser Ablation Vs Radiofrequency
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BACKGROUND: This study evaluated the incidence of endovenous heat induced thrombosis (EHIT), its progression and risk factors that may contribute to its formation, after endovenous laser ablation (EVLA) and compared it to our published data after radiofrequency ablation (RFA).

METHODS: This was a prospective evaluation of all the patients who had EVLA of the great saphenous vein (GSV), accessory saphenous vein (AGSV) and small saphenous vein (SSV) in 4 of our vein centers using a1470nm wavelength laser. All patients who had EHIT at the saphenous junctions were included. Demographic data, history of venous thrombosis, body mass index, vein diameter, reflux time, catheter tip position, EHIT progression, number of phlebectomies, and venous clinical
severity scores (VCSS) were analyzed. Duplex ultrasound was done in all patients preoperatively, and 2-3 days postoperatively. If EHIT was diagnosed imaging was done every 1-2 weeks till resolution.

RESULTS: EVLA was performed in 2168 limbs, of which 57% had GSV, 13% AGSV and 30% SSV ablation. EHIT was found in18 limbs for an incidence of 0.9% or 0.5% for >class 2. EHIT after RFA was 3% or 1.25% for class >class 2 ($p<0.001$). The median age for those with EHIT was 59.6 compared to 55.6 for those without ($p=0.021$) similar to RFA group (59 vs. 56, $p=0.02$). GSV/AGSV diameter 10 cm distal to the SFJ in the EVLA with EHIT was 8.0 vs. 7.0 mm for those without and for SSV was 5.7 cm and 5.3 mm respectively ($p>0.17$ for both). In the RFA group the diameter for those with EHIT was larger for GSV and SSV (10.2 and
6.2, $p<0.001$ for both). Multiple concomitant phlebectomies were performed in 55.6% of the EHIT patients compared to 37% in non EHIT ($p<0.001$) which was similar to RFA group (68% vs. 39.4%, $p<0.0001$). All other parameters were similar in patients with and without EHIT after EVLA and RFA. EHIT resolution occurred in 16 cases at 2-4 weeks with only 2 progressing from class 1 to 2. Mean VCSS score for EHIT patients preoperatively was 5.6 and at one month improved to 2.8 which was similar to the RFA EHIT patients who improved from 5.9 to 2.1.

CONCLUSIONS: EVLA induced EHIT incidence was significantly less than with RFA. This can be attributed in part to the larger diameter veins in the latter. Risk factors associated with EHIT formation both for EVLA and RFA were vein size, male gender and multiple phlebectomies. EHIT resolves in 2-4 weeks in most patients but it may worsen in few that will
require further follow-up until they resolve.

P20 Incidence Of Ulcer Healing And Ulcer Recurrence After Endovenous Laser Ablation In CEAP Clinical Class 5 And 6 Limbs
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BACKGROUND: The Eschar trial previously provided information on patient oriented outcomes for patients with venous leg ulcers treated with saphenous stripping indicating a significantly reduced incidence of ulcer recurrence. Most patients with leg ulcers and saphenous insufficiency are currently treated with endovenous ablation but little information is available on the long-term results after ablation in CEAP clinical class 5 and 6 patients.

METHODS: We retrospectively reviewed all patients treated with endovenous saphenous ablation using laser (EVLA) presenting in CEAP clinical class 5 or 6 to define the incidence of ulcer healing and recurrence. Patients with active ulcers were managed weekly in a comprehensive wound center with compression bandaging. After healing, patients were treated with compression stockings and were asked to return at 6-month for follow-up. Time to healing and time to ulcer recurrence were determined by Kaplan-Meier survival analysis with log-rank testing to assess differences in survival curves. Risk factors were assessed to determine their association with ulcer recurrence with hazard ratios and 95% confidence intervals.

RESULTS: EVLA was performed on 112 limbs in 108 patients with active (n=40) or healed (n=72) ulcers. Seventy of the patients were females and the average age was 59.2. Deep venous insufficiency was present in 41 cases (36.6%). In 101 cases the GSV was ablated, 7 required SSV ablation, and 4 cases required both GSV and SSV ablation. Concomitant phlebectomy was performed in 44 limbs (39.3%). Median patient 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. Studied risk factors and their association with ulcer recurrence are listed in the following table:

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	Recurrence		
Risk factor	Patients at risk	Recurred (%)	Log-rank p-value
	(n)		
Gender			
Male	39	7 (18.0)	
Female	67	13 (19.4)	0.88
Side			
Left	57	11 (19.3)	
Right	49	9 (18.4)	0.79
Age			
< 50	26	7 (26.9)	
50-59	32	7 (21.9)	
60-69	24	2 (8.3)	
> 70	24	4 (16.7)	0.46
CEAP clinical class			
6	34	7 (20.6)	
5	72	13 (18.1)	0.71
Deep venous reflux			
Yes	36	10 (27.8)	
No	70	10 (14.3)	0.09
Phlebectomy			
Yes	43	5 (11.6)	
No	63	15 (23.8)	0.07

CONCLUSIONS: Ulcer recurrence occurred in a minority of CEAP clinical class 5 and 6 patients after EVLA of the saphenous veins. Ulcers recurrence was less frequent in patients with no concomitant deep venous reflux and in those treated with phlebectomy of varicose veins at the time of EVLA. Further study in a patient cohort with a larger sample size is required to determine the statistical significance of these findings.

P21 Treating Varicose Veins Improves Depression Scores, Quality Of Life And Disease Severity

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BACKGROUND: Depression is common and costs the UK economy more than £9 billion per year. We evaluated the incidence of depression in patients with symptomatic varicose veins before and following intervention.

METHODS: Patients referred to the Vascular Clinic for management of varicose veins, were invited pre- and post-operatively to complete a validated questionnaire relating to quality of life and depressive symptoms, utilizing the Centre of Epidemiological Studies Depression Scale (CES-D). Demographic and clinical data was also collected. Questionnaires were collated and analyzed.

RESULTS: 228 patients, mean age 50 years and 59% female were recruited. 26.3% had CES-D scores suggestive of depression (>15). Depression scores were not affected by age (p=0.694, r=-0.026) or gender (12.23 vs. 10.02, p=0.087). A weak correlation between depression scores and VCSS (p=0.030, r=0.144) was seen, but no difference seen with CEAP stage (p=0.667, r=0.500). Depression scores correlated with AVVQ (p=0.003; r=0.199), EQ-5D (p<0.001; r=-0.405) and EQ-VAS (p<0.001; r=0.365).
Following vein treatment, significant improvements in improvements were seen in depression scores (11.9 vs. 7.6; p<0.001), clinical severity (VCSS 7.32 vs. 2.84, p<0.001) and quality of life: AVVQ (21.61 vs. 11.81; p<0.001), EQ-5D-5L (0.72 vs. 0.84; p<0.001) and EQ-5D-VAS (75.8 vs. 81.2; p<0.001).

CONCLUSIONS: Depression is common in patients with symptomatic varicose veins and negatively impacts on quality of life. Treatment improves depressive symptoms and quality of life in addition to clinical severity.

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P22 Accuracy Of Duplex Ultrasound Vein Mapping For Dialysis Access

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BACKGROUND: Although widely recommended in current guidelines, Duplex Ultrasound Vein Mapping (DUVM) for dialysis access has not been universally adopted by access surgeons. The purpose of DUVM is to increase the use of autogenous access procedures. However, the accuracy of measurements made by DUVM, or those made on Physical Exam (PE) have not been rigorously tested. The aims of this study were to compare the accuracy of DUVM and PE when compared to intraoperative vein measurements, and to evaluate the functional results of this approach.

METHODS: Patients undergoing new upper extremity access procedures were prospectively evaluated; exclusions included intravenous drug use, body mass index ≥30, prior ipsilateral arm access procedure or trauma, and prior stroke. The patency and diameter of cephalic and basilic veins were evaluated at eight fixed sites in the forearm and upper arm in a temperature controlled room with and without tourniquets (±T) using the following methods: PE performed by two physicians with calipers, DUVM performed by two sonographers, and direct measurements with calipers of target veins after exposure in the operating room (OR, with and without proximal occlusion). Measurements were performed by individuals blinded to the other's findings. Operative plans were determined independently from each set of measurements based on standardized guidelines (i.e. patent veins ≥2.5mm in diameter). Primary and assisted primary functional patency of the actual access procedure performed by the operating surgeon was determined over 6 months of follow-up.

RESULTS: 96 patients were screened and 59 were enrolled in the study. The mean age was 42.4 years, mean BMI 24.9, and 35.6% were female. Vein diameter measurements performed in the OR with proximal occlusion (anatomic gold standard) correlated poorly with those performed on PE (correlation coefficient, r^2=0.25 (+T) and 0.15 (-T)). They correlated much better with measurements made on DUVM (r^2=0.75 (+T) and 0.57 (-T). Based on the different methods of preoperative evaluation, autogenous access was considered feasible in the following percentage of patients: PE (-T), 21.2%; PE (+T), 34.8%; DUVM (-T), 76.3%; and DUVM (+T), 96.6%. Ultimately, based on intra-operative observations, 56/59 (95%) of all accesses performed were autogenous. The 6-month primary functional patency of the 56 autogenous accesses was 86.4%; assisted primary functional patency was 89.8%.

CONCLUSIONS: This is the first study to provide direct anatomic and functional evidence that duplex ultrasound vein mapping for dialysis access provides a more accurate and consistent assessment of venous anatomy compared to physical examination. DUVM must be a mandatory component of dialysis access procedure planning. Its use translates into an increased performance of autogenous access procedures with improved functional patency.

P23 The Prohibitive Cost Of Diagnosing Lower Extremity DVT By Venous Duplex

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BACKGROUND: Duplex ultrasonography (DU) has been used ubiquitously for a wide spectrum of lower extremity symptoms in the diagnosis of deep venous thrombosis (DVT). The purpose of this study is to determine our incidence of DVT among of DU performed, to examine the more prevalent indications for the study, and to calculate the overall cost of diagnosing DVT.

METHODS: A prospectively maintained database of 45,923 venous duplex ultrasound (VDU) studies were performed in outpatient and inpatient settings from 2005-2012 at seven vascular laboratory sites affiliated with a single, tertiary institution. Sensitivity (SEN), predictive value positive (PVP), Odds Ratio (OR) with each given indications, and costs for the study were analysed.

RESULTS: Among all the VDUs, 22,276 were right lower extremity (LE) and 23,527 were left LE. The occurrence of right sided DVT was 4.38% (979/22,376) and left sided DVT was 1.67% (394/23,547). The most common indications for the study are swelling, limb pain, and shortness of breath. Swelling has the highest sensitivity because it has the highest prevalence, but had a low PVP (4.69 on right; 1.76 on left, OR 1.41 and 1.25, respectively). Diagnosis of 1,373 DVTs among 45,923 venous duplexes translates to $13,746 spent for each DVT diagnosed ($411 per unilateral duplex scan).

CONCLUSIONS: At our institution, the increasing use of DU and the declining rate of positive DVT partially explained the rising costs to the health care system. In the era of cost effectiveness and cost containment efforts, we believe an application of appropriate indications and pre-test probability for the ordering of VDU will reduce unnecessary testing without compromising patient care.

Indications of LE Duplex Scan

	RLE	RLE	RLE	RLE	LLE	LLE	LLE	LLE
Indication	SEN	PVP	OR	p-value	SEN	PVP	OR	p-value
Swelling	81.21	4.69	1.41	0.001	80.20	1.76	1.25	0.078
Limb pain	54.95	4.04	0.83	0.003	42.13	1.19	0.49	0.001
Shortness of breath	4.09	3.84	0.87	0.390	10.15	3.81	2.48	0.001

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P24 Lymphovenous Reconstructions And Peritoneovenous Shunts For Management Of Refractory Chylous Effusions

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BACKGROUND: Chylous effusions are uncommon but life-threatening conditions. Repeated paracentesis/thoracentesis result in malnutrition, electrolyte abnormalities, immunocompromised state and contribute to increased mortality. The purpose of this study was to define early and long-term outcomes after lymphovenous reconstructions (LVR) and peritoneovenous shunts (PVS) for management of refractory chylous effusions.

METHODS: Clinical data of patients with chylous effusions treated either with microsurgical LVR or with PVS between 1988 and 2012 were retrospectively reviewed. Primary endpoints were early and long-term clinical benefit and need for postoperative para/thoracentesis, secondary endpoints were complications, recurrence and number of reinterventions. Descriptive statistics and Kaplan-Meier method with log-rank tests were used.

RESULTS: Eighteen patients, 10 females, 8 males, mean age 48 years (range: 18-77 years) were studied. Etiology of chylous effusion was primary lymphatic disease in 15 (83%) and iatrogenic lymphatic injury in 3 (17%). Eleven (61%) had both chylous ascites and pleural effusions. Thirteen patients (72%) were treated with PVSs using LeVeen (n=11) or Denver shunts (n=2). Concomitant laparotomy and oversewing of ruptured mesenteric lymphatics was performed in 7 patients, with sclerotherapy in 3. Five patients (28%) were treated with LVR, 4 had thoracic duct reconstructions for chylothorax (n=3) and chylopericardium (n=1); one had retroperitoneal LVR combined with resection of lymphatic cysts. Early mortality and morbidity were 5.56% (1/18) and 16.67% (3/18), respectively; they were 7.69% (1/13) and 15.38% (2/13) for PVSs and 0 and 20% (1/5) for LVRs. Early reintervention rate was 11.11% (2/18); 7.69% (1/13) for PVS due to recurrent ascites and 20% (1/5) for LVR due to chylothorax. Two patients with PVS had early recurrent ascites (15%, 2/13), one had reintervention and the other required both thoracentesis and paracentesis. Mean follow-up was 3.36 years (range: 30 days - 18.7 years), 6-month, 1-year and 3-year recurrent rates of chylous effusions were 25.26%, 47.68% and 60.76%, respectively, they were 34.73%, 62.70% and 75.14% for patients with PVS and 0 for LVR. Of the 13 PVS patients, 5 needed no additional intervention and no para/thoracentesis; of the remaining 8 patients, two had 1, two had 2 replacement of PVS, one patient had PVS replaced 9 times. There was one early and three late deaths in this group. Of the 5 LVR patients, 3 needed no additional intervention and no para/thoracentesis; one had intervention for contralateral chylothorax and one had paracentesis.

CONCLUSIONS: LVRs and PVSs can be performed in patients with refractory chylous effusions with low mortality, morbidity and palliation of symptoms. Frequent reinterventions are done to replace occluded PVSs. Improvement in technology in this challenging field of medicine is urgently needed.

POSTER DISPLAY SESSION

Poster Display Session . . . . . Mohave Ballroom

PD1 Technical Factors Associated With Thromboembolism After Inferior Vena Cava Filter Placement In Trauma Patients

L. Lajoie, A. Maglunog, A. Hendrzak, M. Song, R. Schulze; SUNY Downstate, Brooklyn, NY.

*BACKGROUND:*Inferior Vena Cava (IVC) filters are placed to reduce the risk of pulmonary embolism after trauma. The purpose of this study was to determine whether technical factors of IVC filter placement, including filter model, type (permanent or retrievable) or introducer sheath size are related to subsequent incidence of thromboembolic events of deep vein thrombosis (DVT) or pulmonary embolism (PE).

METHODS: We performed a retrospective review of all 277 adult trauma patients with IVC filters placed at an urban trauma center over 4 years.

RESULTS: The average age of trauma patients receiving IVC filters was 44 years, and 72% were male. Median injury severity score for these patients was 22. Filter models deployed were: Vena Tech (46%), Bard G2 (29%), Trap Ease (21%), Celect (2.9%), Bird's Nest (1.4%), Option (0.7%) and Simon Nitinol (0.4%). Retrievable filters were placed in 32% of patients. Introducer sheath sizes ranged from 6.5 - 12 French, with the majority of filters (77%) introduced via a 10 French sheath. After a median follow-up of 5 months, 10.1% of patients developed DVT and 2.2% developed PE. Statistically significant correlations were found between IVC filter introducer sheath size and subsequent DVT formation ($p = 0.027$), and placement of retrievable filter and subsequent PE ($p = 0.014$). There was no statistically significant difference in incidence of thromboembolic events by filter model, in development of DVT after placement of retrievable versus permanent filters, or subsequent PE by introducer sheath size.

CONCLUSIONS: The basic theory of thromboembolism formation, Virchow's Triad, involves endothelial injury, stasis, and hypercoagulability. Trauma patients are thought to be at higher risk for thromboembolic events due to hypercoagulability observed after trauma, stasis associated with bed rest, and traumatic endothelial injury (particularly in patients with long bone fractures). While IVC filters have been shown to reduce the incidence of fatal PE in these patients, our data suggests that retrievable filters may be less effective than permanent filters at preventing pulmonary embolism. Additionally, this data suggests that the endothelial injury associated with IVC introduction via larger introducer sheaths may predispose the venous system to subsequent clot formation. Therefore it may be prudent in trauma patients to utilize permanent filters with the smallest introducer sheath size to minimize risk of subsequent thromboembolic events.

PD2 Comparison Of Heat Profiles For Different Greater Saphenous Vein Ablation Modalities

D. K. Recinella; Veniti, Inc, St Louis, MO.

BACKGROUND: Since the late 1990's energy based systems for Greater Saphenous Vein ablation have been researched and employed in a clinical setting. Different modalities create different temperature profiles depending on the mechanism for heat creation. The purpose of this study was to investigate the difference in temperatures generated by two common modalities; laser and RF, and a new method, steam.

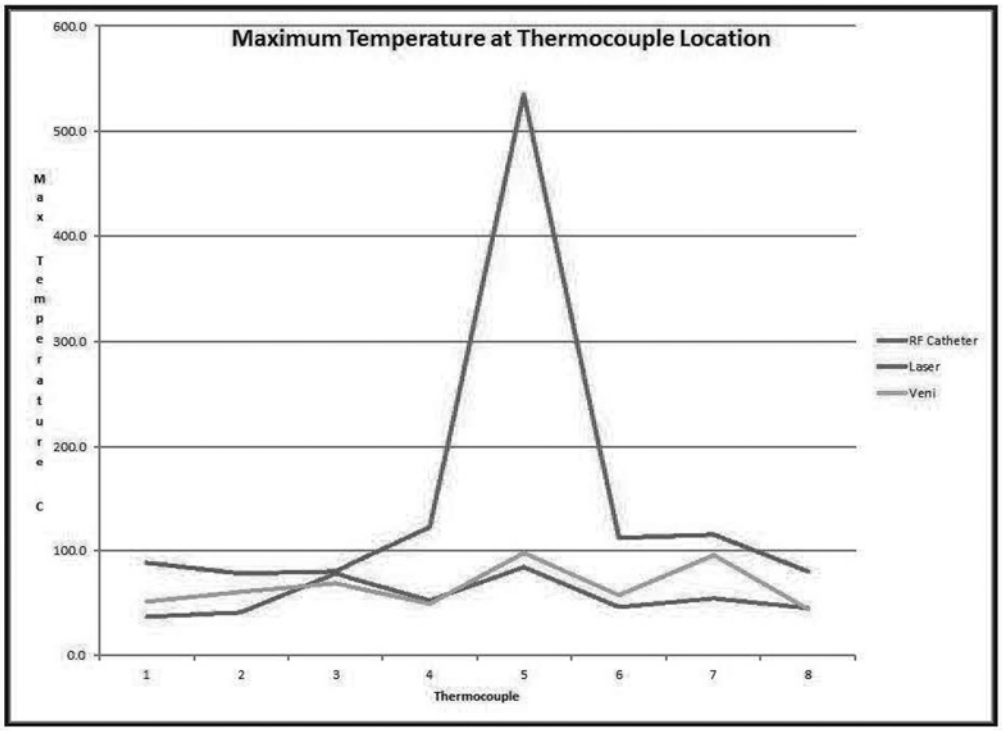
METHODS: Testing was performed in a 20cm long "hamburger" model used to represent a "vein". Thermocouples were seated in pairs along the length with each pair being set so that one (1) was at the "vein" surface and one (1) placed 2mm inside the wall. Four (4) pairs were used for a total of 8 thermocouples. A sample of a laser fiber, RF catheter and vapor catheter were inserted into the model. For the laser, the wavelength used was 980nm. A new model was used for each sample. Delivery of energy was done in a way to simulate clinical use. Temperature data was collected by data acquisition at a rate of 2 Hz.

RESULTS: Results are shown in Figure 1. Different heat profiles were seen with the three modalities. RF had the lowest temperature profile followed by vapor and laser with laser having the highest profile. Temperatures for RF and vapor were higher at the wall then at the inner location.

Figure 1. Maximum temperature vs. thermocouple location

CONCLUSION: RF and vapor modalities generate lower temperatures with vapor potentially being self-limiting due to the inherent temperature of water vapor. Laser has the potential to be variable in its temperature generation with some temperatures reaching levels over 200 degrees C.

POSTER DISPLAY SESSION



PD3 Clinical Results Of 369 Prospective Trivex Patients: Enhanced Patient Outcomes In Treating Branch Varicosities

A. T. Obi, T. Rooke, S. Arya, F. C. Vandy, J. E. Rectenwald, D. M. Coleman, T. W. Wakefield; University of Michigan, Ann Arbor, MI.

BACKGROUND: Transilluminated Powered Phelbectomy (TIPP, TriVex) has gained increased popularity as a minimally invasive method for the treatment of varicosities. This study was undertaken to evaluate patient characteristics, operative data, and surgical outcomes following TIPP.

METHODS: Retrospective evaluation of a single institution prospective registry for patients undergoing phlebectomy (TIPP and stab phlebectomy) and anti-reflux procedures was performed. All patients were screened with pre- and post-operative venous duplex. Parasthesia evaluation and VCSS was completed by healthcare professionals at each visit. Multivariate logistic regression analysis identified independent predictors of VCSS improvement.

RESULTS: From 1/1/2008 to 6/1/2012 369 patients (478 limbs) underwent TIPP alone (n=53) or in combination with a venous antireflux procedure (n=425), all performed by the senior author. Distribution of patients by CEAP class was: 38.7% C2, 34.1% C3, 24.1% C4, 1.3% C5, 1.9% C6. Average number of incisions was 8.4 ± 4.3 and punches were 26.9 ± 13.8. 76% of patients undergoing TIPP experienced improvement in VCSS ≥ 35 days post-operatively. If compression therapy is excluded, 88% of patients experience improvement in VCSS. VCSS improved by an average of 40%, (60% with compression excluded): 90% of patients experienced improved varicosities, 58% decreased edema, 55% improvement in pain and 17% improved pigmentation. In patients undergoing concurrent RFA and phlebectomy, patients receiving TIPP had 3.5 increased odds of VCSS score improvement (95% CI 1.14-10.7, p=0.028) compared to those undergoing stab phlebectomy. Severity of disease (≥C4, OR 1.7, 95% CI 1.03-2.78, p=0.037) also predicted VCSS improvement. Twelve patients were diagnosed with DVT (2.5%): none occurred in patients undergoing TIPP as sole procedure. 75% of DVTs diagnosed were below the popliteal vein and 83% resolved. Parasthesia persisting > 14 days was reported in 26% patients; most were peri-incisional, mild (70%) and resolved over time (52%). Other complications included: superficial thrombophlebitis (9.4%), EHIT (2.9%), surgical site infection (4.8%) and hematoma (11.6%).

CONCLUSIONS:

• Patients undergoing TIPP, alone or in combination with an anti-reflux procedure, experienced improvement in VCSS in majority of cases. Severity of disease (≥C4) was an independent predictor of improved outcome.
• In patients undergoing RFA and concurrent phlebectomy, TIPP is independently associated with significant improvement in VCSS score compared to stab phlebectomy.
• All cases of venous thrombosis (2.6% of patients with DVT and 2.9% with EHIT) on surveillance duplex imaging occurred in patients undergoing TIPP in combination with a venous antireflux procedure, underscoring the importance for consideration of thromboprophylaxis and duplex imaging in this population.
• Parasthesias (26%) were comparable to published rates in stab phlebectomy (4-30%) and tended to be mild (70%) and self-resolving (52%).

POSTER DISPLAY SESSION

PD4 Meta-analysis Of The Association Between Multiple Sclerosis And Chronic Cerebrospinal Venous Insufficiency

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BACKGROUND: Chronic cerebrospinal venous insufficiency (CCSVI) is implicated as a possible pathophysiological mechanism responsible for multiple sclerosis (MS). CCSVI is a newly described entity characterized by abnormalities of the principal pathways of extracranial venous drainage, especially in the internal jugular veins (IJVs), azygous vein (AZY), and vertebral veins (VVs). Five diagnostic criteria, using transcranial and extracranial echo color-Doppler (ECD), are described; according to Dr. Zamboni, who pioneered the concept, the presence of two out of five establishes the diagnosis of CCSVI. The ECD criteria include: reflux in the internal jugular veins (IJV) and/or vertebral veins (VV), reflux in the deep cervical veins (DCV), evidence of IJV stenosis, occlusion in the IJVs and/or VVs, and reverted postural control of the main cerebral venous outflow pathways. Studies have shown conflicting results of the utility of the diagnostic criteria. To better evaluate the association between CCSVI and MS, a review of the current literature and a meta-analysis of the available data were performed.

METHODS: A systematic search of studies reporting the prevalence of chronic cerebrospinal venous insufficiency in multiple sclerosis was performed from 2005-2012 using the following databases: Medline/PubMed, CINAHL, Proquest, Up to Date, Database of Abstracts of Reviews of Effects (DARE), ClinicalTrials.gov, the Cochrane Central Register of Controlled Trials and the Cochrane Database of Systematic Reviews. The search included published papers, abstracts, and presentation in all languages. Studies evaluated patients with and without MS using ECD criteria. The primary outcome was the association between MS and CCSVI. Assessment of homogeneity was performed using the Q test. The odds ratio was calculated using random effects ratio; $P < .05$ was considered statistically significant.

RESULTS: Ten cohort studies from 2005-2012 were included. The studies reported on 1,328 patients; 674 with MS and 654 without MS. The odds ratio for two of the studies could not be calculated because zero patients fulfilled CCSVI criteria in both MS and control groups. Therefore, the odds ratio of eight studies was calculated. Chronic cerebrospinal venous insufficiency, diagnosed by ECD criteria, was associated with multiple sclerosis (OR 6.192, 95% CI, 1.6-23.4, P=0.007) (Table 1). The I-squared value for heterogeneity was 81%.

CONCLUSIONS: Our meta-analysis demonstrates an association between MS and CCSVI, but does not imply causation. Further investigation is necessary to elucidate the significance of CCSVI and to possibly guide decisions related to invasive interventions.

PD5 A New Surgical Debulking Procedure for Chronic Massive Disabling Lymphedema

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BACKGROUND: Approximately 10 percent of lymphedema patients present with massive limb enlargement and are unable to control extremity size with conventional medical management including Comprehensive Manual Decompression Therapy, pneumatic and elastic compression. Intractable edema, trophic verrucous and or papillomatous skin changes, and brawny induration results in functional impairment and an inability to lead a productive lifestyle. Patients with massive lymphedema face limited physical activity and mobility, restricted job opportunities, negative self image and an overall diminished quality of life.

METHODS: Surgical debulking operations, including Charles, Thompson and Homan procedures have had limited success and have been fraught with high rates of post-operative infection and prolonged convalescence. Three patients underwent radical surgical excision employing a Ligashure (© Ethicon) device and post operative negative pressure wound therapy.

RESULTS: We reviewed the results of a new technique for radical surgical debulking for patients with massive medically refractory lymphedema. An average 7.6kg of lymphedematous tissue and skin was removed. All three patients returned to a normal productive life style following recovery. The average follow-up was 11 months. There were no major complications.

CONCLUSIONS: An attempt to identify a successful debulking method resulted in a series of patients with positive outcomes who reported improved quality of life. The procedure is supported by multispecialty care including a vascular surgeons, certified lymphedema specialists, and care specialists and physiotherapists. Appropriate patient selection and careful pre and postoperative care are essential for positive outcomes.

PD6 Cell Death Pattern Of A Varicose Vein Organ Culture Model

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BACKGROUND: Varicose vein (VV) organ cultures have been used to study the effects of various exogenous factors including potential pathological stresses and therapeutic agents on diseased veins. Although several non-VV organ culture models have been validated, the viability of VV organ culture has never been reported. Therefore, the aim of the study is to investigate the viability of a VV organ culture model that may be used in *in vitro* studies of VV wall behavior and changes by assessing the organ culture cell death pattern.

METHODS: Primary VVs were retrieved from patients who underwent phlebectomies with or without open surgery or endovenous treatment. VV organ cultures were prepared based on a non-varicose saphenous vein organ culture model previously described by Soyombo and colleagues with some modifications. To assess the pattern of cell death with time, VV organ cultures from 14 patients were incubated in normoxia at 37ºC for up to 14 days with culture medium changed every 48 hours. To demonstrate that the VV organ culture model contained viable cells, cell death of VV organ cultures from 4 patients treated with sodium azide 10 mM and their untreated counterparts was assayed. Cell death was assayed with Cell Death Detection ELISA Plus®.

RESULTS: Increased cell death was measured in tissue and culture medium of VV organ cultures from day 0 to day 2. The amount of cell death decreased gradually after day 2 and plateaued off from day 8 to day 14. VV organ cultures that were treated with sodium azide 10mM on day 1 onwards demonstrated significantly more cell death in tissue lysate (P=0.001; two-way ANOVA with Bonferroni post-tests). The cell death measured in tissue lysate of VV organ cultures that were treated with sodium azide on day 1 onwards continued to increase until day 7. Whereas, the cell death measured in tissue lysate of VV organ cultures that were not treated with sodium azide did not seem to increase after day 1. The cell death measured in the culture medium of VV organ cultures, both treated and untreated with sodium azide, appeared similar; increased from day 1 to day 3 and then declined from day 3 to day 7. Sodium azide also seemed to cause cell death in VV organ culture through apoptosis rather than necrosis.

CONCLUSIONS: This study demonstrated the viability of a VV organ culture model with most cell death occurred within the first two days of the culture. The cell death then declined to a relatively low level and remained more or less the plateau until at least day 14.

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PD7 Open Surgical Removal Of Retained And Dislodged Inferior Vena Cava Filters.

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BACKGROUND: Complications of retained inferior vena cava (IVC) filters due to migration, thrombosis, perforation of the IVC walls and adjacent structures, or fractures with embolization are being encountered with increasing frequency. Most can be retrieved with endovenous techniques but some require open surgical removal.

METHODS: Indications, procedural details and outcome of 6 patients who underwent open removal of complicated IVC filters were retrospectively reviewed. A minimally invasive technique without need for IVC clamping was used in 3 patients. Descriptive statistics were used because of the small numbers.

RESULTS: Four males and two female patients, with a mean age of 53.5±13.2 years, underwent open removal of 4 temporary and 2 permanent IVC filters. The filters were in for a mean of 19 months (range 6-35). Five filters had IVC perforation, 2 cases had aortic penetration, one had duodenal perforation with resultant enteric hemorrhage, one had gallbladder wall penetration and in 2 cases prongs penetrated into the vertebral bodies. Four cases had multiple attempts at endovenous filter removal. The IVC was explored through right subcostal (4) or midline (2) abdominal incisions. The duodenum was kocherized in 5 of 6 cases. One case where the filter was partially removed endovenously, the fractured infected tine of the filter was extracted from the vertebral body. In 2 cases of permanent filters, IVC clamping was needed and a longitudinal cavotomy with direct closure was used to extract the filter. In 3 cases with temporary filters a minimally invasive technique was used: only a segment of the caval wall or lumbar vein with the nose of the filter was dissected. A 4-0 prolene purse-string suture was placed around the nose of the filter and the collapsed filter was then removed from the cava through a small stab wound made in the middle of the purse-stringed IVC. The prolene suture was subsequently tied down with minimal blood loss and no clamping of the IVC. Mean hospital stay was 3.6 days and no early or delayed complications or DVT was encountered in any of the 6 cases with a mean follow-up of 5.3 months (range 0.5-8.7 months).

Types, placement/removal indications, and duration of implant of surgically removed IVC filters.

Age of patient / Gender	Filter Type	Indication for Placement	Duration of Implantation	Attempts at Endovenous Removal	Proximal Dislodgement	Fracture	Indication for Removal
58 / male	Cordis Trap Ease	Unprovoked deep venous thrombosis (DVT) & Pulmonary embolism (PE)	6 months	2	Yes	No	IVC perforation, duodenal perforation, intestinal hemorrhage
50 / female	Bard Eclipse	Provoked DVT	7 months	3	Yes	No	IVC perforation, duodenum, aorta and gallbladder penetration
30 / male	Cook Celect	Provoked DVT	23 months	1	Yes	Yes	IVC perforation, duodenum, ileum, L4 vertebral body penetration, psoas abscess
63 / female	Cook Celect	Prophylaxis after trauma	33 months	1	Yes	Yes	IVC & renal vein perforation, fracture with tine in lung, fracutred tine in L2 vertebral body
73 / male	Cordis Trap Ease	Provoked DVT & PE	9 months	0	No	No	Prevent IVC thrombosis
49 / male	Bard G2	Unprovoked DVT & PE	35 months	0	Yes	Yes	IVC & renal vein perforation, obliterated distal IVC, aortic penetration

CONCLUSIONS: Open surgical removal with minimal IVC manipulation is feasible for extraction of complicated temporary and permanent IVC filters that cannot be removed with endovenous approach. Open removal is associated with minimal morbidity and excellent outcomes.

PD8 Prevalence Of Symptomatic Dysautonomia In Patients Presenting For CCSVI Treatment.

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BACKGROUND: The FDA recently stated, “The criteria used to diagnose CCSVI have not been adequately established. Therefore, data to support CCSVI as a clinical entity on its own or its relationship with MS are inconclusive and at times, contradictory.” Patients seeking treatment for CCSVI present with a number of symptoms that vary from patient to patient. However, after extensive review of patients’ symptoms, an observation was made that there are symptoms reliably present which are consistent with autonomic dysfunction.

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METHODS: Prior to consultation patients were asked for the presence of seven symptoms associated with autonomic dysfunction. The symptoms were, fatigue, interrupted sleep, thermal intolerance, bladder/bowel dysfunction, cognitive impairment, and headache upon awakening. A total of 489 patient questionnaires were evaluated. Relative prevalence of each symptom and exploratory factor analysis was carried out.

RESULTS: Among those symptoms, brain fog cognitive impairment is highly relate to fatigue and headache, with the presence of cognitive impairment, the odds of having fatigue and headache are OR (95% CI) 4.88 (7.44, 3.2) and 2.98 (4.49, 1.97) time higher than those without cognitive impairment. When having headache, the chance of having fatigue, poor sleep, cold hand and/or feet are significantly higher than those not with OR of 1.88 (2.88, 1.23), 2.14 (3.14, 1.45), and 1.66 (2.54, 1.08) respectively. When having poor sleep, the chance of having fatigue, cognitive impairment and cold hand and/or feet are significantly higher than those not with OR of 1.76 (2.62, 1.18), 1.84 (2.67, 1.26) and 1.86 (2.79, 1.24) respectively. Bladder bowel disturbances are more likely a stand along symptom which is only related to poor sleep with OR of 1.66 (2.53, 1.08). The prevalence rate of symptomatic dysautonomia are the following: bladder bowel disturbances: 76.89%, brain fog cognitive impairment: 63.6%, fatigue: 72.19%, headache: 39.06%, poor sleep: 59.92%, cold hand and/or feet: 73.21%. Exploratory factor analysis suggests three latent factors based on dysautonomia symptoms. Factor 1 has heavy weight on presence of fatigue and cognitive impairment; factor 2 has heavy weight on presence of poor sleep, cold hand and/or feet and headache; factor 3 has heavy weight on bladder bowel disturbances and absence of headache. The result from factor analysis suggests that the symptom grouped within each latent factor may share common physiological/pathological mechanism.

CONCLUSIONS: Based on presenting symptoms, dysautonomia appears highly prevalent among patients undergoing CCSVI treatment. Further study of the condition and its treatment should include assessment of autonomic dysfunction.

Standardized Scoring Coefficients

	FACTOR 1	FACTOR 2	FACTOR 3
FATIGUE	.27548	.01788	.09542
INTERRUPTED SLEEP	.02449	.32008	.08998
BOWEL/BLADDER	.02674	.14171	.35836
THERMAL	-.02892	.21826	.05541
COGNITIVE	.58326	-.04135	-.04477
AWAKENING HEADACHE	.06089	.34099	-.39293

PD9 Venous Outlet Syndrome Of Hunter Canal-- A Major Cause Of Femoral DVT

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BACKGROUND: "Adductor canal syndrome" (also called "Jogger's syndrome") has been described as an unusual cause of acute arterial occlusion in younger men. It is also been identified as a cause of compressive neuropathy of the saphenous nerve. Nevertheless, femoral vein compression in the canal has never been described.

OBJECTIVE: To describe the anatomy and physiology of Hunter's canal, and to show that the femoral vein is much more exposed than the artery to compression inside the adductor hiatus, particularly at the outlet.

MATERIAL AND METHODS: Fifty fresh cadavers were used to surgically expose the adductor hiatus for anatomical study. A series of 200 phlebographies and 100 CT venographies were also used to study the morphology of the adductor hiatus.

RESULTS: The anatomical dissections and cadaveric simulations showed that contraction of the adductor longus closes the hiatus, and the adductor magnus opens it. Our hypothesis is that Hunter's canal prevents femoro-popliteal axis reflux by synchronizing with calf pump ejection during ambulation. Anatomically, in all cases where an abnormal musculotendinous band arose from the adductor magnus muscle, and joined the adductor tendon to the vastus medialis, that the femoral vein was located more posteriorly and was frequently narrowed at this level. This was particularly true when the artery was calcified. The resultant anatomical structure created a notch with venous stenosis frequently occurring at the lower part of the hiatus. In a majority of cases where such a stenosis was found, it was at the lower part of the canal, 13 to 15 cm above the femoral condyle.

CONCLUSION: The action of the adductor muscles is mainly to open and close the hiatus during ambulation. In addition, compression of the femoral vein in the adductor canal is an underestimated cause of venous obstruction and deep vein thrombosis. Ultrasound investigation of both limbs should systematically be carried out at this precise level to prevent future venous obstruction from occurring here

PD10 Venous Angioplasty And Stenting Improve Pelvic Congestion Syndrome Caused By Outflow Obstruction

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BACKGROUND: Ovarian vein reflux (OVR) is known to be a cause of chronic pelvic pain and dyspareunia. Outflow obstruction of the iliac veins or vena cava has been reported to cause lower extremity (LE) pain and edema, but is not widely known to be a prime cause of pelvic pain and dyspareunia. We reviewed our experience with venous angioplasty and stenting for venous outflow obstruction to treat chronic pelvic congestion syndrome.

METHODS: We reviewed records from two institutions of patients with venous outflow obstruction and symptoms of pelvic congestion syndrome. All patients were treated with venous angioplasty and stenting.

RESULTS: From October 2008 through June 2012 four patients were identified with symptoms of pelvic congestion syndrome and severe venous outflow obstruction. Patient ages ranged from ages 22 to 48. Venous outflow obstruction resulted from left common iliac vein (LCIV) obstruction in three patients and from suprarenal inferior vena cava obstruction (IVC) in one. All patients had significant pelvic heaviness or abdominal pain requiring the use of analgesics. Lower extremity pain and edema ranged from none to continuous. CEAP clinical scores

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were C0, C1, and C3. CT showed moderate to severe compression of the LCIV in 3 patients and high grade stenosis of the suprarenal IVC in the other. Extensive pelvic varices were identified in all patients. Venography confirmed outflow obstruction in all patients with extensive cross-pelvic venous collaterals. Each patient was treated with venous angioplasty and stenting of the LCIV or IVC using self expanding Wallstents with significant resolution of collaterals and improved lower extremity venous outflow on venography. Follow-up of 6 weeks to 23 months reveals complete resolution of pelvic pain in all patients, dyspareunia in one patient, minimal dyspareunia in 2 patients, and one patient is sexually-inactive. Follow-up US shows the stents to be widely patent with antegrade flow in all 4 patients at 6 weeks to 5 months post-op.

CONCLUSION: In addition to venous reflux, pelvic congestion syndrome may result from outflow obstruction of the iliac veins or vena cava. Venous angioplasty and stenting may be used to treat such patients with resolution of chronic pelvic pain and dyspareunia.

PD11 Recent Trends In Vena Cava Filters: Too Much Of A Good Thing?

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BACKGROUND: Inferior vena cava filter (IVC-F) placement has increased exponentially over the past decade, in part due to the development of retrievable IVC-F and expanded indications for placement. More liberal use of IVC-F has raised FDA concern, given the risk of adverse events such as maldeployment, migration, caval thrombosis, and recurrent DVT.

METHODS: Data was retrospectively collected on all IVC-F placed over a 2-year period at a nonacademic regional hospital system. This study was designed as part of a quality improvement project in standardizing care and minimizing variation in utilization. Indications were defined in three categories: (1) prophylactic placement = patients at high risk for venous thromboembolism (VTE), (2) traditional use = patients with pulmonary embolism (PE) on anticoagulation or VTE with contraindication to anticoagulation, (3) expanded indications = free-floating iliofemoral or IVC thrombus, PE with limited cardiac reserve, poor compliance with anticoagulation, protection during venous thrombolysis, or undergoing surgery with active deep venous thrombosis (DVT).

RESULTS: Between Jan 2010 and Dec 2011, 230 patients had 231 IVC-F placed (76 permanent, 155 retrievable). Mean patient age was 68 (range 22-97). Indications were (1) prophylactic in 7%, (2) traditional in 57%, (3) expanded in 25%, and (4) other indications in 11%. Overall, 30% of all IVC-F were placed in patients with active cancer. Acute VTE was present in 84% of patients undergoing IVC-F placement: PE (21%), DVT (60%), or both (19%). One permanent IVC-F was maldeployed in an iliac vein requiring a second IVC-F. In the subset where anticoagulation was initially contraindicated, 21% of patients were ultimately discharged on anticoagulation.
The 30-d mortality rate was 16%. No death was attributed to pulmonary embolism or IVC-F complications. 67 patients died during the study period, and two-thirds of these patients (40/67) had active cancer. No caval thromboses were identified in follow-up. One IVC-F was dislodged during central line placement and migrated into the innominate vein. Duplex follow-up was performed selectively and identified a 15% rate of recurrent acute DVT.

CONCLUSION: In this study, 43% of IVC-F were placed outside of traditional indications. A significant number of these patients were in the terminal months of life where benefits of a filter may be marginal and where palliative care may be appropriate. We encourage all hospital systems to look critically at their current use of IVC filters as their first step in improving and standardizing VTE care.

PD12 Low Rate Of Recurrent Varicosities Following Complete Varicose Vein Treatment Utilizing Radiofrequency Ablation With Or Without Phlebectomy

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BACKGROUND: Ablation of a refluxing great saphenous vein (GSV) with or without phlebectomy has become the standard of care for the treatment of venous varicosities. We sought to identify the incidence and etiology of recurrent varicosities requiring re-intervention following radiofrequency ablation (RFA) of the GSV with or without phlebectomy utilizing our institutional data from the American Venous Forum's Venous Varicosity Registry.

METHODS: A retrospective review of a prospectively maintained, single-institution venous varicosity registry was performed. Primary outcome variables including anatomic recurrence and recurrent venous varicosities resulting in re-operation were analyzed. Multivariate analyses were performed to confirm the existence of any significant risk factors associated with anatomic or clinical failure.

RESULTS: 661 limbs of 505 patients were treated with GSV RFA for venous varicosities associated with superficial venous insufficiency between 4/2008 and 6/2012. There was a female predominance (68%) and median age at treatment was 52 years (range 16-95). Distribution of patients by CEAP class was: 31% C2, 31% C3, 25% C4, 2% C5, and 11% C6. Accessory superficial veins were ablated in 20% of limbs (N=131) including the small saphenous vein (SSV) (N=69), anterior accessory saphenous vein (AASV) (N=30), posterior accessory saphenous vein (N=7), a 'lateral branch' of the great saphenous vein (N=15), a perforator vein (N=8) and combined SSV + AASV (N=2). Simultaneous phlebectomy was performed in 55% of limbs (N=363). The mean improvement in VCSS score postoperatively was 32% (P <.001) (from 8.8 +/-4.4 to 5.8 +/-4.1). During a mean follow-up of 11 months 41 limbs (6%) required re-intervention for recurrent varicosities secondary to accessory superficial venous reflux including great saphenous reflux caudad to the site of previous ablation (80%), anatomic failure (10%), or a combination of these two factors (7%). Independent variables associated with recurrent varicosities included: younger age (P=0.026, OR 0.96/year), female gender (P=0.02), and history of previous superficial venous intervention for varicosities (P=0.001). Importantly, concomitant phlebectomy was not associated with varicosity recurrence. Additionally, patients treated for a CEAP classification of C4 exhibited a lower incidence of recurrent varicosities postoperatively (P=0.04). Notably, anatomic recurrence by postoperative duplex was not associated with recurrent varicosities as only 7 of the 31 limbs exhibiting anatomic recurrence by duplex required re-intervention for varicosity recurrence.

CONCLUSION: Accessory superficial venous reflux is a more important contributor to recurrent venous varicosities following RFA of the GSV than anatomic recurrence. Additionally, younger female patients and those undergoing re-operation for venous varicosities should be counseled preoperatively about their risk for recurrence.

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PD13 Endosaphenous Ablation In Patients With Acute Isolated Superficial-vein Thrombosis: A Single Center Experience

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BACKGROUND: The CALISTO study established the safety and efficacy of fondaparinux in patients presenting with isolated superficial-vein thrombosis (SVT), but the safety and efficacy of endosaphenous ablation (ESA) in patients with acute SVT and saphenous reflux have not been described. Possible benefits include (1) definitive treatment of the underlying pathology and (2) removal of the saphenous vein as a path for pulmonary emboli, which (3) may eliminate the need for anticoagulation.

METHODS: A ten-year (2002-2012) review of 112 limbs (107 patients; 4.5% bilateral) presenting with acute isolated SVT. A single physician in private practice evaluated and treated all patients. Sixty-eight (61%) limbs with saphenous reflux were further eligible for division into two cohorts based on the patient's choice of treatment following an explanation of the risks and benefits of each. The interventional cohort (ESA) comprised endosaphenous ablation using RF or laser with or without phlebectomy if performed within 45 days of diagnosis. Routine post-treatment anticoagulation was not given. The conservative treatment cohort (NONESA) generally comprised either compression/re-Duplex within one week, or anticoagulants if saphenous vein thrombus extended into the thigh. The primary efficacy outcomes were death, symptomatic deep vein thrombosis or pulmonary embolus, or severe bleed in the immediate follow-up period.

RESULTS: In the ESA cohort of 38/68 limbs [mean age 54.6; 22 females (59%)] 1 primary event (DVT) was noted. Mean interval from diagnosis to treatment was 12.1 ± 9.9 days. Three of 38 (8%) limbs underwent ESA for recurrent varices in late follow-up ending in mid-2012. In the NONESA cohort of 30/68 limbs [mean age 55.3; 16 females (53%)] 7 patients received anticoagulants and no primary events were noted. Of the NONESA limbs for which late follow-up was available, 12/28 (43%) underwent ESA after the 45 day initial treatment period [range 2.4-79.7 months] with no primary events and no recurrences noted. Overall, 50/68 (77%) of limbs with saphenous reflux, offered an option for ESA as primary treatment, eventually underwent ESA.

CONCLUSIONS: In this small series the safety and efficacy of ESA appear indistinguishable from conservative treatments. The majority of eligible patients chose definitive treatment of saphenous reflux despite the need for intervention. ESA may be offered as primary treatment to patients with SVT and saphenous reflux if further experience confirms these results.

PD14 Compression Therapy And The National Venous Screening Program

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OBJECTIVE: To determine the differences in venous disease as stratified by the use of compression stockings from the participants in the National Venous Screening Program (NVSP)

METHODS: Utilizing the prospectively maintained database from the NVSP, statistical analysis was performed to examine differences between participants according to the use of compression stockings. Data points for comparison included thromboembolic (VTE) risk assessment, venous quality of life (CIVIQ2), duplex evaluation, CEAP classification and venous clinical severity score (VCSS). A p-value of less than 0.05 was considered statistically significant.

RESULTS: From 2005 to 2010, the NVSP has screened 7227 American, Stocking use was assessed as not used (79.22%), intermittent use (13.40%), used on most days (4.20%) and continuous use (3.18%). Seventy-six percent of those that reported no use of compression stockings. Venous quality of life scores were incrementally increased from 21.74 in the no use group to 28.14 in the continuous use group. CEAP Classification scores increased incrementally as well from 1.6 in the no use group to 5.63 in the continuous use group. In the no use group, 25.71% had demonstrable common femoral vein reflux on screening duplex ultrasonography compared to 38.06% in the continuous use group. Saphenofemoral reflux could be seen in 38.72% of the no use group and in 56.77% of the continuous use group.

CONCLUSIONS: Compression stocking use is associated with improved venous quality of life scores. Moreover, this group had higher VTE risk, CEAP Classification, and VCSS scores, thereby justifying their use. A substantial number of participants in the no use group had reflux which may justify compression. These findings highlight the continued need for programs such as the National Venous Screening Program to bridge this educational gap for both patients and providers.

PD16 Laparoscopic Enteromesenteric Bridge Procedure For Lymphodema

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BACKGROUND: Physiological operations for lymphodema, in which an attempt is made to restore or improve the return of lymph from the limb, can improve a select group of patients. Our institution has previously developed a surgical technique to relieve lymph obstruction using an enteromesenteric bridge. We now present the first description of this technique using laparoscopic adjuncts.

METHODS: Formal contrast lymphangiography was performed to demonstrate features of proximal (hypoplastic) primary lymphodema with absence of iliac lymphatic vessels. Drainage up to the femoral lymph nodes was present. Under general anaesthetic, three laparascopic ports were inserted. A 10cm segment of small bowel was mobilised intraperitoneally and patent blue dye was injected into the submucosa to identify the anatomy and distribution of the mesenteric lymphatic vessels. The mucosa of isolated ileum was denuded following submucosal injection of saline and mobilised beneath the inguinal ligament to suture onto deroofed inguinal lymph nodes. The parameters recorded were: length of time for operation, limb size, patient morbidity and satisfaction at six months. A video of the operation was taken for teaching purposes.

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RESULTS: Identification of an appropriate segment of bowel and mobilisation of the enteromesenteric bridge below the ingunal ligament was facilitated by using an intraperitoneal approach. Bowel isolation and anastomoses was successful using conventional laparoscopic equipment. Laparoscopic denuding of the mucosa was technically demanding so the bowel was brought extraperitoneally using a minimally invasive access system device. Operation time was 207 minutes. Post-operative recovery was uncomplicated with good patient satisfaction and no further increase in limb size at 24 months.

CONCLUSIONS: Laparoscopic enteromesenteric bridge surgery for lymphodema represents an evolution of the traditional open technique. Reduced morbidity and rapid mobilisation following surgery makes this technique attractive when a physiological reconstructive operation is being considered.

PD17 A Single Center Experience Of Retrievable Inferior Vena Cava Filters

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BACKGROUND: Although retrievable IVC filters are approved by the FDA for temporary and permanent use, there is limited clinical evidence for the long term safety. The purpose of this study is to evaluate retrievable IVC filters in our institution between 2007 and 2011.

METHODS: All cases of retrievable filter insertions at our institution were reviewed retrospectively between July 2007 and august 2011. Data was analyzed for age, gender, indication, post-procedural complications and retrieval rate. Data was stratified by the type of filter inserted. Statistical analysis was done using SPSS software v19. Chi square was used to compare discrete data and t-test was used to compare continuous data. A p value <0.05 was considered significant.

RESULTS: A total of 484 patients were reviewed. 226 (46.5%) patients were lost to follow up. Only 258 (53.1%) had a complete medical record follow up. A total of 136 (52.7%) filters were used as permanent. 96 (37.2%) filters were intended to be used as permanent at the time of insertion. A decision was later made to keep the remaining 40 (15.5%) filters as permanent. Death was reported in 26 (10%) patients. 96 (37.2%) out of the remaining 258 patients presented for potential retrieval. Retrieval of 73 (28.2%) was attempted, 69 (94.5%) were successful and 4 (5.4%) failed to retrieve. The remaining 23 (8.9%) patients refused to retrieve. Filters used included Celect (38%), Bard (31.4%), Option (26.2%), Tulip (4.1%) and Recovery (0.2%). Bard was more frequently used as a retrievable filter (80.9%) compared to other filters (table1). The Success rate of retrieval on the first attempt was 90.4% (n=66). Of the remaining 7 filters, 5 were attempted to retrieve on the 2nd attempt, 3 were successfully retrieved and 2 failed to retrieve due to filter tilt. The success rates of retrieval for Celect and Tulip were significantly lower than for Bard (p= 0.04 and 0.023 respectively). Long term complications occurred in (2.9%) of patients with DVT (2.1%) being the most common.

CONCLUSION: Our institute based study showed that different types of IVC filters can be retrieved successfully. Bard filters were more commonly retrieved with a significantly higher success rate than other types of filters. Option filters were more commonly deployed as permanent. The majority of retrievable filters stay as permanent or are not retrieved. Retrieval is successfully achieved in most cases once attempted. Data is required to support the permanent use of retrievable filters.

Intended usage of different IVC filters

	Bard	Celect	Option
Permanent	19.1% (n=18)	85.7% (n=30)	87.8% (n=86)
Retrievable	80.9% (n=76)	14.3% (n=5)	12.2% (n=12)

PD18 Factors Influencing Compliance With Compression Stockings: An Observational Study In Community Pharmacies (athens Study)

F. A. Allaert[1], J. L. Gillet[2]; [1]chaire d'évaluation médicale, Dijon, France, [2]Phlebologie, Private office, France

OBJECTIVE: To describe the factors which may have an impact on the compliance with compression elastic stockings.

METHODS: The study was conducted in a representative sample of community pharmacists, each of them including the first 10 patients to whom was delivered elastic compression stockings. Patients were described by the pharmacists and were asked to complete 15 days later a self questionnaire describing their opinion on their compliance, evolution and satisfaction, and to be sent it back.

RESULTS: 2223 patients, average age 54.2, women 77.0%, were included in the study and sent back their self-questionnaire. Symptoms were the following: heaviness 56.7%, swelling 55.0%, pain 48.5%, parenthesis 21.8%, cramps 19.7%. Ceap classification was: C0s: 25.4%, C1: 29.9%, C2: 46.6%, C3: 23.9%, C4: 2.2%, C5/6: 6.4%. Compression stockings were essentially class II: 90.2%.
36.6% wore the compression stockings every day, 31.9% every other day, 31.5% less than every other day. Main reasons for irregular compliance were: an insufficient number of pairs of compression stockings 24.5%, difficulties to bear them 23.8%, difficulties to donning them 14.5%, insufficient effect 9.1%. Multifactorial logistic analysis of this study conducted by pharmacists showed that compliance with elastic compression is significantly influenced by age, venous disease duration, pain and swelling intensity, varicoses, oedema, but also by prescription of the compression stockings by a medical practitioner or not, quality of the explanation given by pharmacists and the number of pairs of compression stockings at the disposal of the patients.

CONCLUSION: Beside the intensity of the symptoms experienced by patients and the difficulties to donning their elastic stockings which are usually described, the quality of the information given by pharmacists and the numbers of pairs of compression stockings at the patients' disposal are also factors strongly influencing the patients' compliance.

PD19 Increased Retrieval Rate After Implementation Of A Standardized Protocol For Follow Up After Inferior Vena Cava Filter Placement

S. E. Koch; Southern Illinois University School of Medicine, Springfield, IL

POSTER DISPLAY SESSION

BACKGROUND: Technological innovation has led to the development of inferior vena cava filters (IVCFs) that can be removed. After placement in individuals at high risk for venous thromboembolic disease, these filters may be removed after the period of increased risk has passed. This strategy may reduce the long-term incidence of adverse, filter-related sequelae. However, reported rates of filter retrieval are low. To better realize the potential benefits of IVCF retrieval, we recently initiated a standardized protocol for patients after placement of these devices. This report reviews our experience with this regimen.

METHODS: A standardized protocol, including an electronic database into which all patients undergoing IVCF insertion, was instituted in October 2010. This database was reviewed at regular intervals to identify appropriate candidates for filter retrieval. The retrieval rate after institution of this regimen was compared to the rate in a historical control group. Additional data collected from the study group include: indication, device type, patient demographics, procedural details of placement and retrieval, and complications.

RESULTS: During the 15-month study period, retrievable IVCFs were placed in 61 patients. Our retrieval rate after initiation of a standardized protocol increased to 39% (24/61), compared to a rate of 13% (4/32) in the control group. In the study group, retrieval occurred at a mean of 135 days after IVCF insertion and was performed without complication. Attempted retrieval was technically unsuccessful in one patient at 163 days after placement. IVCF retrieval was deemed inappropriate in 31 patients. Five patients remain in follow up at study completion.

CONCLUSIONS: The introduction of a standardized protocol has increased our rate of IVCF retrieval.

PD20 Evaluation Of Balneotherapy In Patients With Advanced Chronic Venous Insufficiency: A Multicenter Randomized Controlled Trial

P. H. Carpentier, S. Blaise, B. Satger; CHU Grenoble, Grenoble, France

BACKGROUND: Spa treatment is a popular way to administer physical therapy for chronic venous disorders (CVD) in France but its efficacy has not been scarcely evaluated.

OBJECTIVES: To assess the efficacy of balneotherapy, as performed in the French spa resorts, in patients with advanced chronic venous insufficiency (CEAP clinical classes C4/C5).

Study design: Multicenter randomized controlled trial, spa therapy being administered on the top of the usual medical care. Evaluation by blinded independent investigators, with a pragmatic approach and an intention to treat analysis.

Subjects: Patients with primary or post-thrombotic CVD, with skin changes but no active ulcer (CEAP C4a, C4b or C5), and willing to undergo a spa treatment course in one of the twelve participating spa resorts.

INTERVENTION: The treated group had the usual three weeks spa treatment course, soon after randomization; the control group also had a spa treatment, but starting after day 365. The treatment consisted of four balneotherapeutic sessions per day, six days a week during three weeks.

MAIN OUTCOME CRITERIA: Follow-up was performed at months 6, 12 and 18 months by independent blinded investigators. The year after spa treatment in the treated group was compared to the year before spa treatment in the control group. The main outcome criterion was the incidence of leg ulcers at 12 months. The Venous Clinical Severity Score (VCSS), a visual analog scale (VAS) for leg symptoms and the CIVIQ2 and Euroqol-5D quality of life auto-questionnaires were used as secondary criteria.

Results: 425 subjects were enrolled (214 in the treatment group (T) and 211 in the control group (C)); they were similar at baseline regarding demographic data, severity of CVD and outcome variables. After a one year follow-up, the incidence in leg ulcers did not show statistically significant differences T: 9.3% CI [5.6-14.3]; C: 6.1% CI [3.2-10.4], whereas the VCSS improved significantly in the treatment group (T: -13% [-33; 0]; C: 0% [-22; 8]; P<0.01). Symptoms iwere substantially reduced after one year (T=5.7 + 2.8; C=4.6 + 2.6; P<0.01). Euroqol-5D improved in the treatment group (+4) when it slightly worsened (-1) in the control group (ANOVA: P<0.001), and a similar evolution pattern was found for the CIVIQ2 scale (T=-2.6; C=+2.5; P<0.01). The control patients showed similar improvements after their own spa treatment (day 547).

CONCLUSION: The incidence of leg ulcers was not found reduced after a three weeks spa therapy course in this study, but this treatment provided a significant and substantial improvement of the clinical status, symptoms and quality of life of the patients with advanced venous insufficiency for at least one year.

7:00 AM – 8:00 AM
Continental Breakfast . . . . . Wigwam Ballroom

8:00 AM – 9:20 AM
Scientific Session 5
Chronic Venous Disease 3. . . . . Sachem Ballroom
Moderators: Ashraf Mansour, MD, Harold Welch, MD

8:00 AM – 8:20 AM
5-21 Use Of Compression Therapy In Patients With Chronic Venous Insufficiency Undergoing Ablation Therapy: A Report From The American Venous Registry

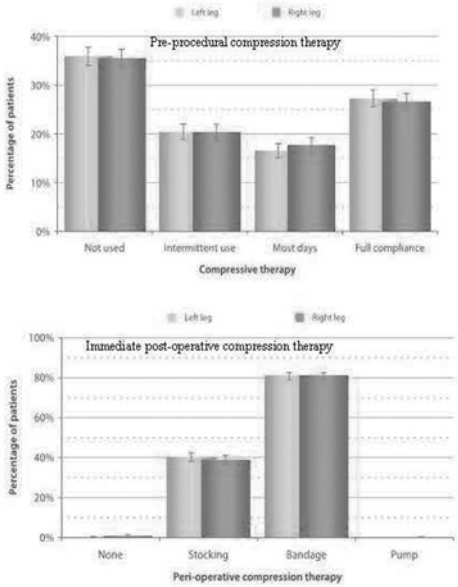
L. Kabnick[1], T. Wakefield[2], J. Almeida[3], J. Raffetto[4], R. McLafferty[5], P. Pappas[6], J. Rectenwald[2], J. Blebea[7], D. Gillespie[8], U. Onyeachom[9], R. Kinsman[10], B. K. Lal[11]; [1]NYU, New York, NY, [2]University of Michigan, Ann Arbor, MI, [3]Miami Vein Center, Miami, FL, [4]Veterans Affairs Boston Medical Center, Boston, MA, [5]Southern Illinois Medical Center, Springfield, IL, [6]Brooklyn Hospital Center, New York, NY, [7]Univ of Oklahoma College of Medicine, Tulsa, OK, [8]University of Rochester, Rochester, NY, [9]American Venous Forum, Milwaukee, WI, [10]University of Maryland, Baltimore, MD, [11]University of Maryland School of Medicine, Baltimore, MD.

BACKGROUND: Compression therapy is an accepted and proven therapy for patients with chronic venous insufficiency. Although widely recommended and commonly used before and following venous ablation procedures, there is limited consensus on the type, duration, and need for such therapy. We analyzed data from the American Venous Registry (AVR) to evaluate the frequency, type and duration of compression therapy utilized before and after endovenous ablation across the United States.

METHODS: The varicose vein (VV) module is a web-based database and registry of the AVR which was begun in February 2011. Data collected included pre- and post-procedural use of compression therapy, baseline and post-procedural venous clinical severity score (VCSS), and type of venous ablation procedure. Information on the type of compression device (multi-layered bandage, elastic, pump), duration of use (day, or day and night), extent (knee, thigh, pantyhose), and strength (<20, 20-30, 30-40, 40-50 mmHg) was also collected and reviewed.

RESULTS: A total of 4,014 procedures were entered into the database by 41 physicians from 37 medical centers, comprising 3,930 patients. The types of procedures included endovenous laser ablation in 60%, phlebectomies in 34%, radiofrequency ablation in 33% and sclerotherapy in 16%, with 37% of treatments involving more than one modality. Only 26% of patients were compliant (daily use) with compression therapy prior to vein ablation. In the perioperative period (within 48 hours post-procedure), 95% of patients used some form of compression therapy both day and night; the majority (80%) used a thigh-high multilayered bandage. Beyond 48 hours post-procedure, 98% of patients used 30-40 mm Hg thigh-high compression during the daytime. Clinical improvement as demonstrated by an increase in the VCSS score of three or more was seen in 62%, while 23% improved their score by 1-2, and the remaining 15% of patients had no improvement in VCSS score after treatment.

CONCLUSIONS: Only a minority of patients undergoing venous ablation therapy use compression therapy on a daily basis before the procedure. Almost all, however, were compliant in the peri-operative and immediate post-surgical time period. Clinical outcomes, as reflected in improved VCSS scores, were excellent.



8:20 AM – 8:40 AM

5-22 The Role Of Duplex Ultrasound In The Pelvic Congestion Syndrome Workup

R. D. Malgor, G. Spentzouris, D. Adrahtas, A. P. Gasparis, A. K. Tassiopoulos, N. Labropoulos;
Stony Brook University Medical Center, Stony Brook, NY.

BACKGROUND: The diagnosis of Pelvic Congestion Syndrome (PCS) is primarily based upon clinical findings that are often confirmed by imaging studies. Up to now, PCS imaging workup algorithms are not well-defined. The purpose of our study is to gauge the impact and accuracy of duplex ultrasound (DU) to assist in the diagnosis of PCS.

METHODS: We reviewed the records of 48 patients with PCS seen at our Vein Center from June 2010 to June 2012. All patients had DU plus either computed tomography venogram (CTV) or conventional venogram (CV). Measurements of the left and right ovarian vein diameter, and the presence or absence of ovarian vein reflux were obtained using DU and compared to either CTV or CV to assess sensitivity and specificity. An ovarian vein diameter > 6mm was considered abnormal. The presence of pelvic varicosities was assessed as well.

RESULTS: All patients were female being 29 caucasians, 18 hispanic and 1 asian. The mean number of children was 3 (range, 1 to 5). All but 3 patients had lower extremity varicose veins and 14 (29%) had vulvar varicosities. Thirty-four (71%) patients reported pelvic pain, 22(46%) dyspareunia, 2 (4%) dysuria and 1 (2%) hematuria. The mean diameter of the left and right ovarian vein measured using DUS compared to either CTV/CV were similar (DUS, 8.6 and 5.6; CTV/CV, 8.3 and 6). The sensitivity and specificity of DU to demonstrate a dilated left and right ovarian vein was 86% and 57%, and 67% and 90%. Pelvic varicosities were identified in all but one patient with perfect correlation between DU and CTV/CV.

CONCLUSIONS: DU has a moderate to high sensitivity and specificity to identify an abnormal ovarian vein diameter. All three imaging modalities are equally accurate to show the presence of pelvic varices. DU has a high accuracy when both pelvic varices and ovarian vein are considered together in selecting patients for treatment.

8:40 AM – 9:00 AM

5-23 Oscillatory Turbulent Flow In Chronic Venous Disease Induces Pro-inflammatory And Reparative Biological Signaling

S. Gianesini, V. Tisato, E. Menegatti, I. Volpi, R. Voltan, S. Occhionorelli, P. Secchiero, P. Zamboni;
Ferrara University, Ferrara, Italy.

BACKGROUND: Despite in vitro studies demonstrated expression of cytokines when endothelial cells are stressed with oscillatory flow, in vivo evaluations are still lacking. Aim of this blinded case-control study is to find correlations between altered venous hemodynamics and induced endothelial signaling, in an in vivo setting.

METHODS: 54 Chronic Venous Disease (CVD) patients (C2-4EpAsPr) who underwent varicose veins surgery were included into the study. Into the venous segments which subsequently were going to be surgically ablated we assessed the followings by echo-color-Doppler (ECD), Peak Systolic Velocity (PSV), End Diastolic Velocity (EDV), Resistance Index (RI), Reflux Time (RT).
The veins samples were sent to the lab, where both an electronic microscopic evaluation and a Vascular Endothelial Cells (VEC) cultivation, with released cytokines quantification and endothelial migration and proliferation characterization, were performed.
Five saphenous vein samples were used as controls.

RESULTS: The hemodynamic assessment provided the followings: PSV (29 + 13 cm/s), EDV (-8 + 6 cm/s), RI (1.31 + 0.19), RT (2.66 + 0.46 s).
The microscopic evaluation demonstrated in CVD a derangement on the endothelium layer directly correlating with the CEAP class severity. An erythrocyte progressive sticking was observed as a possible consequence of increased adhesion molecules expression.
Twentyone VEC samples came out from the purification process. In CVD we assessed a significant increased level of NF-kB, a nuclear transcriptional factor linked with expression of adhesion molecules and several pro-inflammatory cytokines. OPG and VEGF were assessed to be significantly higher both in the supernatants and in the serum assays.
We investigated possible correlation between hemodynamic parameters and cytokines assessed in the VEC.
The spontaneous and TNFα-induced cytokines release quantification highlighted statistical significant correlations with several hemodynamic parameters. The most significant one was between PDGF and RT, both in basal ($r=0.5446$, $p=0.0150$) and TNFα-induced ($r=0.5448$, $p=0.0150$) conditions.
While the VEC migration capacity was lower in CVD than in controls, its proliferation trend was higher ($p<0.05$).

CONCLUSIONS: To our knowledge this is the first study correlating hemodynamic physic parameters with biochemical endothelial signaling, in vivo.
As in vitro demonstrated, PDGF is one of the main actors in smooth muscle cells remodeling, reactive oxygen species production, and venous wall derangement. Our data confirm this action in vivo, adding the correlation with the physic forces expressed by the refluxing flow.
For the first time, several cytokines involved in biochemical signaling demonstrates to be modulated by hemodynamic parameters.
These preliminary results could pave the way for a deeper comprehension of the translation path which, from the oscillatory flow, leads to the morphological and biochemical alterations detected in the CVD endothelial cells.

9:00 AM – 9:20 AM

5-24 Relationship Between Medical Compression And Intramuscular Pressure--explanation Of A Paradox Of Compression

j. Benigni[1], j. Uhl[2]; [1]HIA Begin, St Mandé 94160, France, [2]University Paris Descartes, Paris, France.

BACKGROUND: The method of action of medical compression (MC) is not well understood. We recently showed by MRI that, in the standing position, 22 mm Hg MC significantly reduced the caliber of deep calf veins but, paradoxically, did not affect superficial varicose veins.

OBJECTIVE: To study, 1: the correlation between the interface pressure (IP) exerted by a medical compression device and the pressure in the muscular compartment; and, 2: to compare these results with the literature.

MATERIAL AND METHODS: In ten legs of healthy subjects, we used a pressure cuff to study the effects of different pressures on the intramuscular pressure (IMP) of the medial gastrocnemius muscle. The IP of the cuff manometer was verified by a Kikuhime® device with a small probe. The IMP of the medial gastrocnemius muscle was measured with a 21G needle connected to a manometer (Stryker® quick pressure monitor). Pressure data were recorded in the prone position at rest with cuff pressures of 0, 10, 20, 30, 40 and 50 mmHg.

RESULTS: At rest, an IP of less than 20 mmHg did not significantly change the IMP (median pressure was 11 mmHg with no IP). On the contrary, a perfect linear correlation with the IMP (r=0.99) was observed from an IP of 20 mmHg to 50 mmHg.

DISCUSSION: Testing 11 subjects in 1994, Murthy, et al, found exactly the same results at rest. They also measured IMPs while the subjects were standing, walking, and running, using four different leggings that provided a pressure of 14-27 mmHg at the calf. The leggings had no effect on IMP during walking and running, but there was a significant IMP increase in the standing position for low IPs (15-27 mmHg). This is in accordance with our anatomical study by standing MRI showing that, paradoxically, low pressures can provide a significant reduction of caliber of the deep veins, while the superficial veins are not flattened.

CONCLUSION: At rest, the external pressure exerted by MC produces an IMP increase with a perfect linear correlation from 20 to 50 mm. In the standing position, Murthy found that GCS with an IP of 14-27 produce a significant IMP increase which explains the results of our 3D anatomical study. These IPs are too low, though, to compress the superficial compartment and so reduce the caliber of the varicose veins. This would require a pressure of more than 60 mm Hg. During active muscular contraction (walking or running), MC has no effect on the pressure in the muscular compartment.

9:20 AM – 10:00 AM
Coffee Break . . . . . Wigwam Ballroom

10:00 AM – 12:05 PM
Scientific Session 6
President's Sessions . . . . . Sachem Ballroom
Moderators: Robert McLafferty, MD, Peter Henke, MD

10:00 AM – 10:15 AM
2012 Servier Traveling Fellowship Reports
Frank Vandy, MD
Emily Wood, MD

10:15 AM – 10:30 AM
2012 BSN Jobst Research Winner - Interim Report
Rabih Chaer, MD

10:30 AM – 10:40 AM
History of the American Venous Forum
Patrick Muck, MD
J. Leonel Villavicencio, MD

10:40 AM – 10:50 AM
American Venous Registry and SVS PSO Update
Brajesh K. Lal, MD
Jack Cronenwett, MD

10:50 AM – 11:00 AM
Journal of Vascular Surgery – Venous and Lymphatic Disorders
Anton Sidawy, MD

11:00 AM – 11:05 AM
National Venous Screening Update
Marc Passman, MD

11:05 AM – 11:20 AM
Presidential Address Introduction
Peter Henke MD, President-Elect

11:20 AM – 12:05 PM
Presidential Address
Robert McLafferty, MD
In With The Old, Out With The New: The American Venous Forum Leads the Way

12:05 PM – 1:05 PM
MEMBER BUSINESS LUNCHEON. . . . . .Mohave Ballroom

1:05 PM
Open Afternoon

7:30 PM – 10:00 PM
25th SILVER ANNIVERSARY GALA . . . . . .Sachem Terrace & Mohave Ballroom
Awards, Dinner, Entertainment & More!

7:00 AM – 8:00 AM
Continental Breakfast . . . . . Wigwam Ballroom

8:00 AM – 9:40 AM
Scientific Session 7
Deep Vein Thrombosis 3 . . . . . Sachem Ballroom
Moderators: Patricia Thorpe, MD, Anthony Comerota, MD

8:00 AM – 8:20 AM
7-25 The Importance Of Ivus Assessment In Venous Thrombolytic Regimens
S. Raju, A. Martin, M. Davis; The Rane Center, Jackson, MS.

BACKGROUND: Catheter directed thrombolysis and pharmaco-mechanical thrombectomy (PMT) are increasingly used to resolve current symptoms and possibly reduce future postthrombotic syndrome (PTS) in deep venous thrombosis. Venographic control remains the basic technique used in most institutions with these procedures. Residual thrombosis is likely the key to residual symptoms, recurrent thrombosis and the development of PTS. We present our experience with IVUS use along with venography for aiding lytic procedures to highlight the superiority of IVUS in assessing residual thrombus.

PATIENTS: A total of 65 limbs underwent PMT (Trellis™) for deep venous thrombosis involving the iliac-femoral or femoro-popliteal vein segments over an 8 year period. 33 were new onset of thrombosis in unoperated limbs and 32 limbs had prior iliac vein stents.

RESULTS: Venographic patency was established in 46/61 (75%) limbs. However, IVUS indicated residual thrombus in 53/61 (87%) limbs and a thrombolytic catheter was inserted for lysis over the ensuing days. Complete thrombus resolution was achieved with catheter lysis in 10/53 (19%) of these limbs for a total of 16/61 (26%) limbs resolving their thrombus. Associated stenoses were corrected by stent placement in 51% limbs based on IVUS control. Median follow up was 20 months. Recurrent thrombosis occurred in 9% of limbs. Valve reflux was detectable in 43% limbs and PTS developed in 42% limbs.

CONCLUSION: The very high IVUS incidence (87%) of residual thrombus after PMT, and even after follow-up catheter lysis (74%), is discouraging on the potential efficacy of thombolytic regimens in preventing PTS. Venography is clearly insensitive to residual thrombus. While venography can provide rough information on adequacy of inflow into the lysed segments, IVUS can assess residual thrombus more accurately and identify specific stenotic defects that can be corrected. Routine use of this device in thrombolytic regimens is recommended.

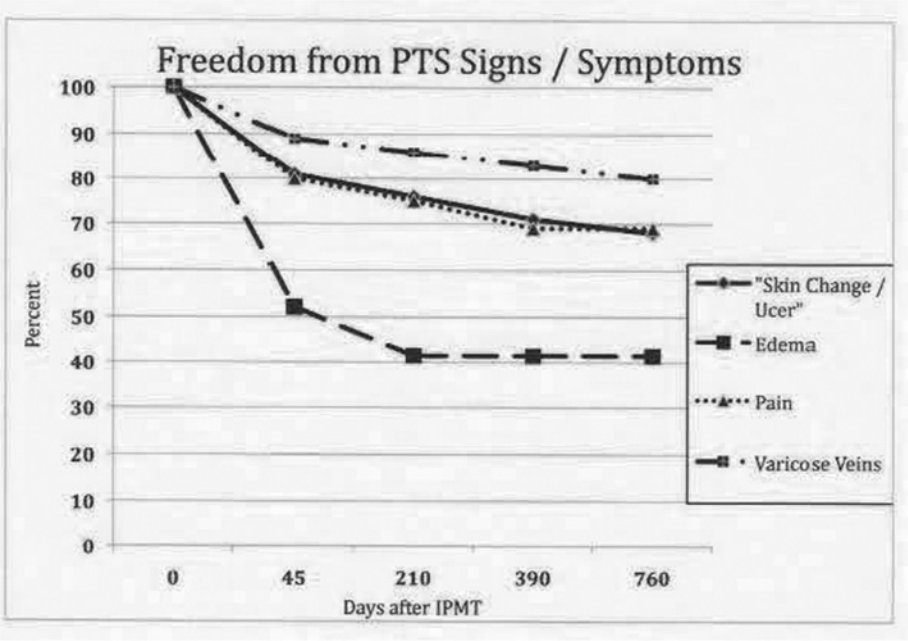
8:20 AM – 8:40 AM
7-26 Isol-8: A Multicenter, Retrospective Study Of The Effectiveness Of The Trellis-8 To Treat Iliofemoral Dvt And Prevent Post-thrombotic Syndrome
P. J. Gagne[1], H. Rajasinghe[2], T. Khoury[3]; [1]Southern CT Vascular Center, Darien, CT, [2]Vascular Group of Naples, Naples, FL, [3]Southern Ohio Surgical Associates, Portsmouth, OH.

BACKGROUND: Compared to anticoagulation alone, removal of acute thrombus in patients with iliofemoral deep vein thrombosis (DVT) decreases the incidence of post-thrombotic complications. Small, single center studies indicate the Trellis™- 8 peripheral infusion system (Covidien, Mansfield, MA) successfully treats acute DVT using isolated pharmacomechanical thrombolysis (IPMT), avoids systemic thrombolysis and may decrease thrombolysis related bleeding. ISOL-8 is a multi-center, retrospective study of patients treated with the Trellis- 8 device for occlusive acute (1-14 days) or subacute (15-28 days), DVT of the iliac (CIV)/(EIV), or common femoral vein (CFV). It was designed to determine 1) DVT treatment efficacy and thrombus removal; 2) incidence of peri-procedure bleeding; and, 3) incidence and severity of post-thrombotic syndrome (PTS) at two years.

METHODS: Data (n=142 patients) were collected retrospectively from six centers with significant Trellis-8 experience. Patient demographics, medical history, procedure outcomes / complications and follow-up (venous duplex, VCSS / CEAP) were collected for 24 months.

RESULTS: 21/142 (14.8%) patients had bilateral DVT (n=163 limbs). Proximal extent of thrombus was recorded for 153 limbs. DVT involved the femoral vein (FV)/CIV/EIV, n=114 (74%); CFV/FV n=18 (11.8%); CIV/EIV n=11(7%); and Inferior Vena Cava (IVC)/CIV/EIV n=10(6%). DVTs were categorized post-intervention as acute n= 63; subacute n=25; acute on chronic, n=47; subacute on chronic, n= 8; and chronic, n= 11 based on ease of clot lysis and angiographic findings. 29% of patients initially diagnosed with acute DVT had some chronic thrombus. Single-session treatment with the Trellis-8 occurred in 101(71%) patients. Mean IPMT procedure time was 119.6 +63.8 minutes (SD). Forty-one (29%) patients underwent subsequent catheter-directed thrombolysis. Thrombus removal was 69 + 26.2% (mean+SD). 87% of limbs with acute DVT achieved stage II or III lysis. No major peri-procedural bleeding occurred. Three (2%) patients during follow-up had major bleeding while on anticoagulation.
Freedom from severe PTS (graph) was high, though follow-up was limited. (limbs @ 1 mos, n=98; 6 mos, n=76; 12 mos, n=60, 24 mos., n=22) Edema was mild to moderate in 70-86% of patients with edema/time point.

CONCLUSION: Patients with acute Iliofemoral DVT can be safely and successfully treated with the Trellis-8 IPMT system, generally with a single intervention. Major procedural bleeding was absent. Severe PTS appears low at 2 years with this approach, though follow-up was variable by center and requires improvement.



8:40 AM – 9:00 AM

7-27 Catheter-directed Thrombolysis For Patients With Massive And Submassive Pulmonary Embolism

H. Akin, M. Al-Jabouri, Z. Assi, R. Acino, D. Sepanski, A. J. Comerota; The Toledo Hospital, Toledo, OH.

BACKGROUND: Massive pulmonary embolism (MPE) is a significant cause of mortality and, with submassive PE (SPE), is associated with chronic thromboembolic pulmonary hypertension, resulting in ongoing patient morbidity. Standard treatment is anticoagulation, although systemic thrombolytic therapy has been shown to reduce early mortality in patients with MPE and improve cardiopulmonary hemodynamics. However, systemic lysis is associated with significant bleeding risk. Early reports of catheter-directed thrombolysis (CDT) suggest favorable outcomes in patients with MPE and SPE with reduced risk of hemorrhage. The purpose of this study is to evaluate efficacy and safety outcomes in MPE and SPE patients treated with CDT.

METHODS: Fourteen patients treated with CDT for MPE and SPE were clinically and hemodynamically evaluated. Six patients had contraindications to systemic thrombolytic therapy. Patients were grouped by severity of PE: MPE (n = 5) or SPE (n = 9). Pre- and post-interventional measures were assessed, including pulmonary artery pressures (PAP), cardiac biomarkers, tricuspid regurgitation, right ventricle (RV) dilatation, and systolic function.

RESULTS: PAP was elevated in 92% at presentation. The average dose of rt-PA was 32 mg, 44 mg in MPE and 25 mg in SPE. Pre and post PAPs were recorded in 11 patients. All demonstrated an acute reduction in posttreatment PAP, averaging 37%. At presentation, all MPE and 7 (78%) SPE patients showed both RV dilatation and reduced function on echocardiography, which normalized in 83% (10/12) and improved in 17% (2/12) post CDT. Patients who demonstrated left ventricle underfilling prior to CDT (2 [40%] MPE and 2 [22%] SPE) normalized post-CDT. All MPE and 8 (89%) SPE patients had tricuspid regurgitation on echocardiography pretreatment, which resolved in 60% and 63% of MPE and SPE patients respectively. One delayed mortality occurred in an MPE patient who was hypotensive and hypoxic at presentation. There was one puncture site bleed.

CONCLUSIONS: CDT was successful in the acute management of patients with MPE and SPE. CDT rapidly restores cardiopulmonary hemodynamics using a modest dose of rt-PA. These observations suggest that CDT should be considered in MPE and SPE patients to rapidly restore cardiopulmonary hemodynamics, reduce acute morbidity and mortality, reduce bleeding complications, and potentially avoid long-term morbidity.

9:00 AM – 9:20 AM

7-28 Using A Fibrin-targeted Molecular Magnetic Resonance Imaging To Identify Venous Thrombi Susceptible To Thrombolysis

P. Saha, M. Andia, S. Grover, A. Phinikaridou, J. Jenkins, A. Patel, B. Modarai, R. Botnar, M. Waltham, A. Smith; King's College London, London, United Kingdom.

BACKGROUND: Venous thrombus composition determines the success of thrombolysis and treatment is based on clinical judgment of thrombus age. Thrombolysis is associated with significant morbidity (bleeding and stroke) and needs to be better targeted. This study aims to investigate a fibrin-specific MRI contrast agent (EP-2104R) to stage venous thrombus organisation and assess suitability for thrombolysis.

METHODS: Venous thrombi were induced in BALB/C mouse vena cava (n=72) and imaged by MRI (3T Philips Achieva) at days 2, 4, 7, 10, 14, 21 after thrombus induction (n=12/gp). Each group was scanned pre- and 2hrs post-injection of EP-2104R (EPIX Pharmaceuticals, 8.0μmol/kg). An inversion recovery 3D segmented gradient echo (TFE) sequence was performed and T1 maps of the thrombus calculated using custom-made software implemented in MATLAB. Fibrin contrast uptake in the thrombus was correlated with fibrin content as assessed by histology using Martius Scarlet Blue (MSB) trichrome (n=6/gp) and Western Blot. A separate group underwent systemic venous thrombolysis (10 mg/kg of tissue plasminogen activator (Actilyse, Boehringer Ingelheim, Germany)) at each time point (n=6/gp). 24 hours after thrombolytic treatment, mice were re-scanned to examine restoration of caval blood flow using a phase contrast sequence.

RESULTS: After injection of EP-2104R, large areas with high signal intensity and short T1 relaxation times were observed. A larger visualized thrombus enhancement volume in post-contrast images was demonstrated in younger thrombi. Contrast uptake positively correlated with the fibrin content of the thrombus (R2=0.97, P<0.01). ROC curve analysis showed that a mean thrombus T1 relaxation time less than 630 ms on post contrast images had sensitivity of 94% and specificity of 99% to predict successful thrombolysis (AUC 0.993 [CI95%: 0.98-1.00]).

CONCLUSIONS: Fibrin-targeted MRI can be used to stage venous thrombus organization and allow accurate stratification of thrombi amenable to lysis.

9:20 AM – 9:40 AM

7-29 Blood Type And Post Thrombotic Syndrome Early Indication For Endovascular Treatment

F. J. Osse, Sr., P. E. Thorpe; Centro Vascular Sao Paulo, Sao Paulo, Brazil.

BACKGROUND: Blood groups "non-O" have consistently demonstrated a higher incidence of thrombotic disease, when compared to blood group O. Previous studies have demonstrated a clear association between women in use of contraceptives and Non-O blood type. The ability to foresee the severity of post-thrombotic syndrome is limited, and only natural history, recanalization and persistent obstruction are not enough. A connection between Blood Types and Post-Thrombotic syndrome is established by the authors, to further understand the disease and its complications, but also to identify patients that are in need for a more aggressive treatment in their first thrombotic event.

METHODS: Between 1993-2005, 216 patients were treated for symptomatic PTS. Patients with acute deep vein thrombosis (DVT) who failed to clinically improve with conventional therapy were referred for catheter-directed thrombolysis. Patients with chronic signs or symptoms of PTS were referred for endovascular reconstruction. Patients were evaluated with baseline laboratory studies, duplex ultrasound and phlebography prior to intervention. Blood type was documented in all patients at risk for bleeding with thrombolysis. With patient permission, blood type was requested as part of the hypercoagulability workup.

RESULTS: ABO blood type was documented in 110/216(51%) patients, which included 47 men and 63 women with a mean age of 41.8 years (range 12-74 years). Mean duration of symptoms was 32.8 months (range 1-420 months). The distribution of blood type was 70% A (61.8% A+, 8.2% A-). 4.5% B (4.5% B+, O% B-), 6.3% AB (4.5% AB+, 1.8% AB-) and 19.1% O (14.5%O+, 4.5% O-). The reported ABO distribution in the US population is 40% A (34% A+, 6% A-), 11% B, 4% AB and 45% O (38% O+, 7% O-). The incidence of A+ blood type among PTS patients is highly significant (P < .001). The low incidence of O+ blood type among subjects with PTS is also remarkable (P<.001). There was not a significant difference in the relative clinical severity score or CEAP distribution among blood types. The majority of documented hypercoagulability factors 42/52(81%) were in patients with A+ blood type. One or more hypercoagulability factors were identified in 26/70(37%) of A+ subjects.

DISCUSSION: The incidence of A+ blood type among study patients with post-thrombotic syndrome is higher than expected given the prevalence of A+ blood type in the general Euro-American population as well as among patient populations studied in several large anticoagulation clinics. The data suggest that patients with A+ blood may be at greater risk of developing post-thrombotic syndrome, after DVT. Blood-type screening may provide a simple test for determining tailored clinical management of DVT.

9:40 AM – 10:25 AM

Best Paper Session . . . . . Sachem Ballroom

Moderator: Anthony Comerota, MD

9:40 AM – 9:55 AM

EUROPEAN VENOUS FORUM – BEST PAPER 1

Metabolic Profile Of Veins And Their Implications In Primary Varicose Veins Disease

Anwar MA[1], Beckonert OP[2], Shalhoub J[1], Vorkas PA[2], Lim CS[1], Want EJ[2], Nicholson JK[2], Holmes E[2], Davies AH[1]; [1]Academic Section of Vascular Surgery, [2] Section of Biomolecular Medicine, Department of Surgery & Cancer, Imperial College London, UK

BACKGROUND: Varicose veins affect one third of adults in the Western world. Morphological, transcriptional and protein-level differences have been demonstrated between varicose and non-varicose vein walls. Despite this, the pathogenesis of primary varicose vein disease remains unclear. Metabonomics techniques including Nuclear Magnetic Resonance (NMR) spectroscopy is an established tool for metabolic profiling of tissues or biofluids with utility in identifying drug toxicity, disease biomarkers and changes in enzymatic or gene expression.

AIMS: This study aims to compare the metabolic phenotype of varicose and non-varicose vein tissue with a view to promoting the understanding of the pathogenesis of varicose vein formation.

METHODS: Vein tissue was collected from patients undergoing surgery for varicose veins (n=8). Control non-varicose vein great saphenous vein samples were collected; 3 from patients undergoing lower limb amputation and 5 from individuals having peripheral arterial bypass surgery. Intact tissue samples from each vein segment (average weight 10.33 +/- 0.8 milligrams) were analyzed using 1D Magic Angle Spinning (MAS) H^1 NMR (600 MHz) spectroscopy. For selected vein samples, 2D NMR experiments were performed to enable metabolite structure characterization. Differences between spectra from varicose and non-varicose tissues were elucidated using a variety of multivariate statistical analyses (Principal Components Analysis and Orthogonal Partial Least Squares analysis).

RESULTS: The metabolic profiles of varicose vein samples were clearly differentiated from non-varicose vein samples. Lipid metabolites were present at a higher concentration in the non-varicose veins group whilst creatine, lactate, myo-inositol, choline and glutamate metabolites were more characteristic of the varicose veins group.

CONCLUSION: This study demonstrates a differential metabolic profile in varicose veins as compared with non-varicose veins. Cellular pathway linkage analysis of differentially abundant metabolites in varicose veins can further improve our understanding of the biological mechanisms of disease initiation and progression, and aid in identifying any putative therapeutic targets.

9:55 AM – 10:10 AM

EUROPEAN VENOUS FORUM – BEST PAPER 2

The Incidence Of Endovenous Foam Induced Thrombosis (Efit) In 1000 Legs In A Single Vascular Centre.

Kulkarni SR, Messenger DE, Slim FJA, Emerson LG, Bulbulia RA, Whyman MR, Poskitt KR. Cheltenham General Hospital, Cheltenham, UK

AIMS: The incidence of deep vein thrombosis (DVT) following ultrasound-guided foam sclerotherapy (UGFS) varies from 0 to 5.7%. The aim of this study was to assess the incidence of DVT following UGFS in a single vascular centre.

METHODS: Consecutive patients undergoing UGFS between December 2005 and September 2011 attended within 2 weeks of treatment for quality control duplex imaging, performed by a senior vascular scientist independent of the operator. DVT when present was labelled as 'Endovenous Foam Induced Thrombosis' (EFIT) type 1 when thrombus was lining <25% of the lumen of the deep vein; type 2 when thrombus extension was 25-50%; type 3 when thrombus extension was 50-99% and type 4 when the deep vein was occluded.

RESULTS: A total of 1166 UGFS treatments were performed in 1000 legs (776 patients); following which 17 DVTs were detected (1.5%). No DVTs were detected in legs undergoing multiple treatments. Seven DVTs were EFIT type 1, two were type 2, two were type 3 and five were type 4. One DVT was seen in the gastrocnemius vein alone. Two of 1166 treatments (0.2%) resulted in a symptomatic DVT, both of which were EFIT type 4. On regression analysis, there was an increase in the risk of DVT when ≥10mls of foam was injected (OR=4.58, 95% CI=1.42-14.8; p=0.01).

CONCLUSIONS: The incidence of duplex detected DVT following foam sclerotherapy is low and may be associated with the injection of high foam volumes. However, the rationale for routine post-procedure duplex imaging is debatable, given that clinically significant DVTs are rare.

10:10 AM – 10:25 AM

ROYAL SOCIETY OF MEDICINE – BEST PAPER

Molecular regulators of venous valves in development and disease

Lyons.OTA,[1] Sabine.A,[2] Grover.S,[1] Bazigou.E,[3] Vizcay-Barrena.G[4], Brown.NA[5], Petrova.T,[2] Makinen.T,[3] Smith.A[1];[1]Academic Department of Surgery, King's College London, BHF Centre of Research Excellence & NIHR Biomedical Research Centre at King's Health Partners, London, [2]CePO, CHUV, Universite de Lausanne, [3]Lymphatic Development Laboratory, London Research Institute, CRUK, [4]Centre for Ultrastructural Imaging, King's College London, [5]Division of Biomedical Sciences, St George's, University of London

Lymphoedema and venous reflux are associated in rare single-gene disorders but the overall molecular regulators of venous valve (VV) development and maintenance are poorly understood. Recently we compared the expression profile of murine and human VV, characterised normal VV formation in mice and used knockout lines to show that genes required for regulating lymphatic valve development are required for VV development and maintenance (JCI doi:10.1172/JCI58050). More recent developments will be presented and the genetic patterning of venous valves with respect to the genetics of human venous disease will be discussed.

Murine valves were examined by light microscopy, wholemount confocal immunofluorescence and scanning electron microscopy in wildtype mice and genetic reporter lines. Human valves were examined by immunohistochemistry, scanning electron microscopy and transmission electron microscopy. Tissue-specific conditional knockout lines were used to identify roles of genes in valve formation/maintenance.

Murine and human venous valves exhibit a similar structural and expression pattern. Novel regulatory genes were found to be required for valve formation/maintenance.

We have established the use of murine knockout lines in the study of venous valve disease. Venous and lymphatic valves share a common gene-expression profile and some developmental pathways, which explains the shared phenotype of lymphoedema and venous reflux seen in the clinic. Further work should be aimed at defining other genetic and environmental factors required for the development and maintenance of these complex structures, and their role in disease.

10:25 AM – 10:50 AM

Coffee Break . . . . . Wigwam Ballroom

10:50 AM – 11:40 AM

D. Eugene Strandness, Jr., MD Memorial Lecture. . . . . Sachem Ballroom

Chair: Susan R. Kahn, MD, McGill University

Improving Patient Outcomes After Deep Venous Thrombosis: Where do we go now?

Educational objectives: To highlight recent research developments in the prevention and treatment of post-thrombotic syndrome; to propose directions for future research in the field.

11:40 AM – 1:00 PM

Lunch On Own

1:00 PM – 2:50 PM
Scientific Session 8
Chronic Venous Disease 4. . . . . Sachem Ballroom

Moderator: Colleen Moore, MD

1:00 PM – 1:20 PM
8-30 Inferior Vena Cava Endovascular Reconstructions Fifteen Years Of Experience
F. J. Osse, Sr., P. E. Thorpe; Centro Vascular Sao Paulo, Sao Paulo, Brazil.

BACKGROUND: Inferior vena cava syndrome, secondary to thrombosis, responds poorly to conservative therapy. In view of the limitations of these therapies, we evaluated the results of endovascular repair for thrombotic inferior vena cava (IVC) and iliocaval obstruction to see if endovenous reconstruction is a safe, effective and durable treatment option.

METHODS: Symptomatic post-thrombotic syndrome patients underwent baseline pelvic/lower extremity duplex and phlebography to determine the pattern of venous flow and location of venous occlusion. Patients were screened for hypercoagulability status and baseline labs established. Serial calf measurements and lab values were obtained while patients underwent catheter- directed thrombolysis followed by angioplasty. Axial-vein reconstruction was guided with intravascular ultrasound. Self-expanding metallic stents were placed in overlapping-tandem fashion. In cases of bilateral iliac involvement, the criss-cross caval stent configuration was used. Patients were anticoagulated during thrombolysis and then converted to warfarin, for long-term therapy. Completion duplex studies were obtained. Patients were followed at one month and at 6-12 month intervals thereafter. Clinical and disability scores were recorded.

RESULTS: Between Oct 1995-Aug 2010, 46 patients, 29 men/17 women, median age 40 years (range 17-77 years) underwent endovascular repair for iliocaval occlusion. 9/46(19%) patients were younger than thirty. 8/46 (17%) were older than sixty. Five patients (11%) died during follow-up; 7/46 (15%) with malignancy-related caval obstruction were successfully treated, and 2 died of their primary caval malignancy. Mean duration of symptoms was 7.5 years (range 6 mo-41 years). Seven filters were occluded; Greenfield (4), Simon Nitinol (1) Gunther Tulip (1) and Trapese (1). These chronically occluded filters were successfully stented open. The 92 limbs included 2 prior BKAs for venous disease. The entire IVC was occluded in 9/46 (20%) and infrarenal in 37/46 (80%). Bilateral limb involvement 29/46 (63%) was nearly twice as common as unilateral limb thrombosis (5R/12L). Technical success was 98%. There was only one patient, in 15 years, in whom we were unable to traverse the chronic caval lesion. Mean follow-up is currently 5.8 years (range 6 mo-15 years). Primary patency among 40 successfully treated surviving patients is 70 %. 12/40 (30%) have had additional procedures to treat in-stent stenosis (11/12) and thrombosis (1/12). Secondary patency is 98%. Among the study group, 6/46 (13%) patients had a documented thrombophilia. There were no procedure-related deaths and a low incidence (7.2%) of bleeding complications requiring transfusion.
CONCLUSION: Endovenous reconstruction of the chronically thrombosed IVC and iliofemoral veins can be accomplished with a high degree of technical success and low morbidity. Long-term clinical results parallel stent patency. Treatment decreases post-thrombotic syndrome disability and improves quality of life.

1:20 PM – 1:40 PM
8-31 Classification Of Anatomic Involvement Of The Ilio-caval Venous Outflow Tract And Its Relationship To Early Outcomes After Ilio-caval Venous Stenting
J. Crowner[1], W. Marston[1], J. Almeida[2], R. McLafferty[3], M. Passman[4]; [1]University of North Carolina, Chapel Hill, NC, [2]Miami Vein Center, Miami, FL, [3]Southern Illinois University, Springfield, IL, [4]University of Alabama, Birmingham, AL.

BACKGROUND: Ilio-caval venous obstruction (ICVO) is a common cause of severe leg symptoms, contributing to pain, swelling, and leg ulceration in patients with severe venous insufficiency. Primary ICVO usually causes venous stenosis from adjacent arterial compression, whereas secondary (post-thrombotic) ICVO can result in chronic total occlusion. No anatomic criteria have been developed to identify the severity of venous obstruction and its relationship to clinical outcomes.

METHODS: A multi-institutional retrospective evaluation of patients with ICVO was performed to identify the extent of ilio-caval obstruction. The anatomic sites of venous disease were categorized based on CT or MR venography supplemented by percutaneous venography and/or intravascular ultrasound. The 4 categories are outlined in the following table:

Classification Type	Disease severity
Type I	Stenosis of single venous segment
Type II	Stenosis of multiple venous segments
Type III	Occlusion of single venous segment
Type IV	Occlusion of multiple venous segments

Anatomic segments were defined as follows: inferior vena cava, common iliac vein, external iliac vein, common femoral vein. The presence of femoral vein or profunda femoral vein disease, the presence of an IVC filter and bilateral disease were added to the classification system as modifiers when present. All patients underwent attempted stenting to re-establish normal flow through the ilio-caval outflow tract. Outcomes, including initial procedural success and rethrombosis rates within 6 months were determined for each Type of ICVO.

RESULTS: At 2 vascular centers, 120 consecutive patients with ICVO underwent venography and attempted intervention. The type of ICVO studied was well distributed across the categories with the percentages listed in the table below. Procedural success was achieved more often in Types I and II ICVO but the difference did not reach statistical significance. Stent re-occlusion was significantly more frequent in Type IV ICVO than in Types I or II ICVO (p=0.009)

Type	N (%) Of patients	Procedure success (%)	Early failure rate (within 6 months)
I	51 (42.5%)	50/51 (98%)	4/51 (7.8%)
II	23 (19.2%)	23/23 (100%)	1/23 (4.3%)
III	16 (13.3%)	13/16 (81.3%)	2/16 (12.5%)
IV	30 (25%)	24/30 (80%)	8/30 (26.7%)

CONCLUSIONS: ICVO may be classified using anatomic criteria. The severity of ICVO reflects the severity of venous involvement. These criteria relate to the success of intervention as measured by stent patency. Prospective evaluation is required to further validate the utility of this classification system.

1:40 PM – 2:00 PM

8-32 Managing The Iliac-caval Confluence In Iliac Vein Stenting

S. Raju[1], O. Kirk[2], [1]University of Mississippi Medical Center/ River Oaks Hospital, Jackson, MS, [2]The Rane Center, Jackson, MS.

BACKGROUND: Iliac vein stenoses are often located right at the junction with vena cava and may actually involve the vena cava itself in about 10% of cases. Iliac vein stent extension into the IVC is required in both instances to avoid local migration and recurrence. This raises concerns regarding jailing the contralateral iliac vein flow and poses problems with simultaneous or sequential contralateral stenting which is necessary in about 20% of cases. 'Double barrel', Fenestration or end to side techniques in bilateral stenting have technical obstacles that may prevent successful stenting or lead to poor outcome. A technical modification utilizing Gianturco stent for caval extension is described to resolve these problems.

PATIENTS AND METHODS: The Gianturco stent is a 'Z' configuration with wide interspaces between struts diminishing the chances of contralateral iliac vein 'jailing'. It also has greater radial strength than available braided or mesh stents and is less susceptible to compression by 'tight' lesions or by the contralateral stent when used in sequential fashion. It is available in large sizes to be used for caval reconstruction at the iliac confluence. A conventional braided stent was used for the rest of the iliac stent stack.

RESULTS: Gianturco stents have been used in 151 limbs in the past 18 months: A. unilateral stenting in 84 limbs, B. simultaneous bilateral stenting in 48 limbs; C. delayed sequential bilateral stenting in 4 limbs; D. for creating a fenestration in a preexisting contralateral stent in 12 limbs; E. as a 'bridge' over large iliac vein collaterals to avoid their jailing in 1 limb; and F. to reinforce a new or pre-existing mesh or braided stent being compressed by a tight lesion in 2 limbs.
Embolization of 2 stents to below the diaphragm (one intra and one post-operative) occurred in early experience with 15 mm stent; none have occurred since switching to 20 mm stent size. There have been no erosions. Stent thrombosis occurred in 3 limbs involving only the braided stent below in 2 limbs and the entire stent stack in 1 limb. DVT occurred in 7 limbs (5%) not involving the stent. Cumulative 18 month patency is 95%. Pain significantly improved from median VAS of 5 (0-10) to 0 (0-10) ($p < 0.0001$) and swelling as well from median grade 3 (0-3) to 1 (0-3) ($p < 0.0001$).

CONCLUSION: The Gianturco modification described appears to be a useful adjunct to existing technique. It provides greater resistance to stent compression by the lesion and avoids technical problems encountered in simultaneous or staged bilateral iliac vein stenting.

2:00 PM – 2:20 PM

8-33 Hemodynamic Changes In The Femoral Vein With Increasing Outflow Resistance

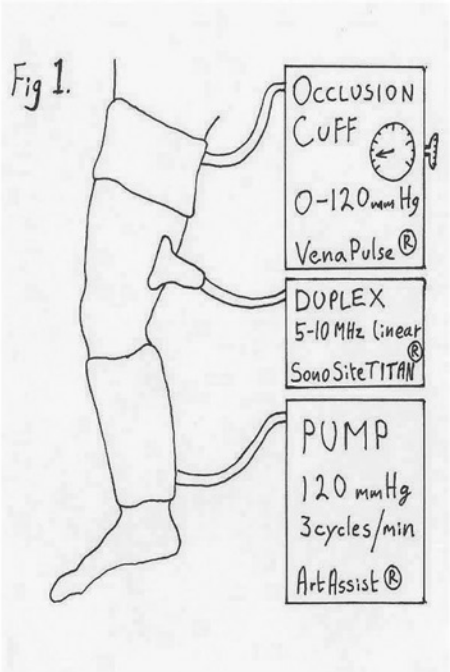
C. R. Lattimer[1], M. Azzam[2], E. Kalodiki[1], G. Geroulakos[1]; [1]Ealing Hospital & Imperial College, Middlesex, United Kingdom, [2]Ealing Hospital, Middlesex, United Kingdom.

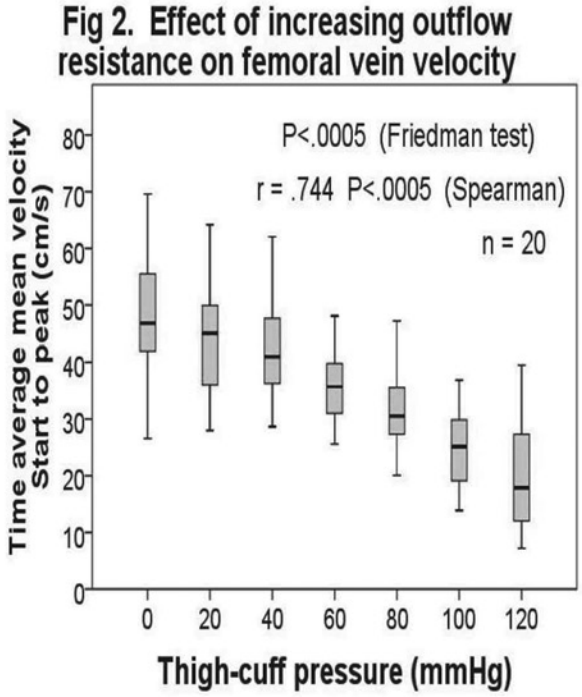
BACKGROUND: In post-thrombotic or May-Thurner syndrome iliac veins may be scarred, compressed or obstructed. Obesity and increased intra-abdominal pressure may also hamper the venous return. Therefore, measurement of Outflow Resistance (OR) impeding venous return may be helpful: clinically to assess the effect of intervention and diagnostically to determine whether OR contributes to venous disease. A proof-of-concept study is presented in healthy volunteers where OR is quantified using duplex assessment of the femoral vein (FV) at mid-thigh following increasing high-thigh tourniquet pressure.

METHODS: Twenty-two consecutive subjects (15 male), without evidence of venous disease, were studied. Two male exclusions were due to bifid FVs. Median (range) baseline characteristics were age=30 (24-57) yrs, height=173 (158-197) cm, weight=72 (50-97) Kg, body-mass-index=24 (19-30) and FV diameter=11.2 (6.8-14.8) mm. Subjects were examined standing with the test leg resting gently on the floor. A 26 cm wide calf-cuff was attached to an intermittent pneumatic compression device that delivered 3 compressions per minute, at 120 mmHg. A high thigh-cuff, 12 cm wide, was inflated before each calf compression in incremental steps of 20 mmHg, from 0-120 mmHg, to provide a standard OR (Fig 1). FV waveform parameters were recorded using duplex at mid-thigh with each thigh-cuff inflation pressure and repeated 3 times. Means were used in the calculations. OR was calculated using Pressure(P)/Flow(Q). Pressure was 120 mmHg minus the additional height to the duplex transducer. Flow was Time Averaged Mean Velocity (TAMV) x pi x diameter (d) squared/4. A 15% FV diameter reduction was assumed with each 20 mmHg rise in thigh-cuff pressure.

RESULTS: Peak velocity, total TAMV and TAMV from initial to peak (Fig 2) all decreased significantly ($P<.0005$, Friedman) with increasing thigh-cuff pressure with $P<.0005$ correlations (Spearman) of $r=.842$, $r=.488$ and $r=.744$, respectively. Furthermore, increasing thigh-cuff pressure at 0, 20, 40, 60, 80, 100, 120 mmHg also caused a gradual and significant increase in mean (+/-SD) OR at 3.8(2.3), 5.2(3.2), 7.4(3.9), 13.5(8.5), 27.2(14.2), 84.2(43), 715(414) resistance units, respectively ($P<.0005$, Friedman and $r=.921$, Spearman).

CONCLUSIONS: Hemodynamic velocity parameters measured using duplex attenuate progressively with increasing venous obstruction. OR can be quantified using duplex. Standardization of these measurements may allow future research on individual patients to determine the extent OR improves after endovenous intervention.





2:20 PM – 2:40 PM

8-34 Prolonged Radiation Exposure In IVC Filter Removal

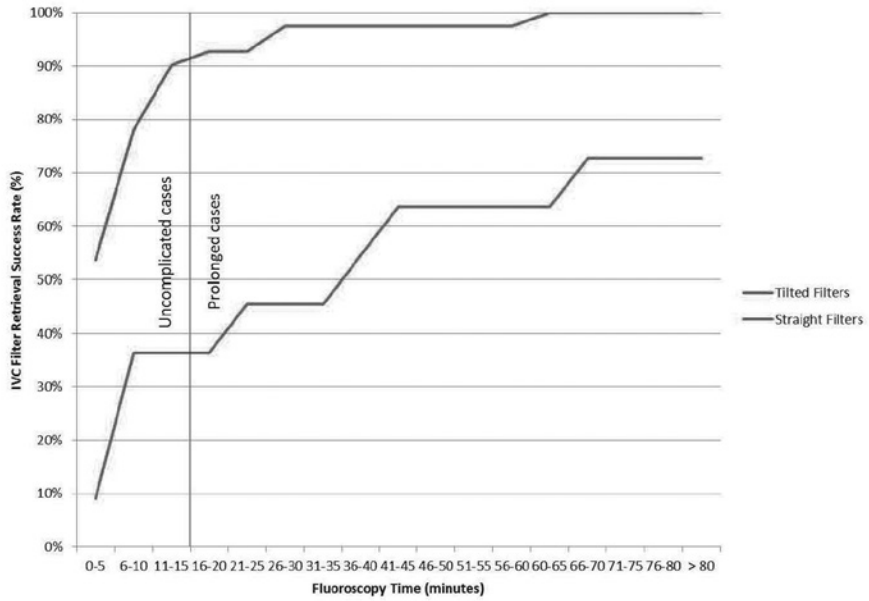
H. Ma, H. Almutairi, L. Lavoie, M. D. Iafrati, N. A. Rosen; Tufts Medical Center, Boston, MA.

INTRODUCTION: As the rate of IVC filter retrieval increases so does radiation exposure. We sought to quantify the range of procedure times and radiation doses and to identify factors that predict procedure difficulty.

METHODS: A single center, retrospective review, of attempted removal of IVC filters from 2005-2012 was conducted. Data analysis included: fluoroscopy time (FT), procedure success, radiation dose, operator experience, time since filter placement, filter tilt, and Body Mass Index (BMI).

RESULTS: 49 of 52 attempted IVC filter removals were successful. Median FT was 6.9 min (1.8- 81.9). Most filters (79%, n=41) were removed in less than 15 min (uncomplicated). These uncomplicated cases (100% success) had median FT= 5.2 min (1.8 – 13.4 min) and estimated skin exposure =111mGy. More prolonged cases (21%, n=11) had FT> 15min, median = 42 min (18.5- 81.9 min), radiation dose = 2516mGy, with three failures (27%, 3/11). The “prolonged cases” had a longer interval since insertion (273 days vs. 140 days, p = NS) and a greater likelihood of filter tilt (64% vs10%, p < 0.0006). Patients with tilted filters received 38.1 min FT vs. properly aligned = 5.4 min (p < 0.000003). At the time of insertion, none of the “prolonged cases” were tilted. Filter type and BMI did not affect FT. Operators included 3 interventional radiologist and 3 vascular surgeons, while specialty training did not correlate with FT it is notable that the most junior member of the team accounted for 17% of total cases and 36% of prolonged cases which were all successful.

CONCLUSION: Most retrievable IVC filters are removed quickly with reasonable radiation exposure. Over time filters can tilt resulting is challenges to retrieval, increasing FT, radiation exposure, and likelihood of failure. Filter removal should be scheduled as soon as medically appropriate. When rapid progress is not made, early use of adjuvant techniques may prevent exposure beyond the FDA suggested 1000 mGy limit.



2:40 PM – 2:45 PM

Q8-11 Radiologic Classification Of Iliac Vein Compression And Patterns Of Pelvic Collateralization In Patients With Chronic Venous Disease

A. S. Gaweesh[1], M. H. Kayed[2], T. Y. Gaweesh[2]; [1]Department of Vascular Surgery, Alexandria Faculty of Medicine, University of Alexandria, Egypt, Alexandria, Egypt, [2]Department of Radiology, Alexandria Faculty of Medicine, University of Alexandria, Egypt, Alexandria, Egypt.

Background: Iliac vein compression is an anatomic variant that has been associated with the development of deep venous thrombosis (DVT) and is increasingly diagnosed in patients presenting with non-thrombotic primary chronic venous disease (CVD). However, different patterns of compression of the iliac vein as well as the nature of compressing agents have been poorly described and inadequately reported. The aim of this study is to:
1- Describe different patterns of iliac vein compression diagnosed in patients with CVD.
2- Demonstrate different collateral pathways that can appear in the presence of iliac vein lesions.

Methods: CVD patients (CEAP2-6) who had undergone direct computed tomography venography (DCTV) with pedal contrast injection from 2009 to 2012 included 31 patients with iliac vein lesions (23 primary; 8 secondary to previous DVT). Two blinded radiologists described different patterns of iliac vein compression in patients with primary lesions. Pathways of venous collateralization were traced in patients with primary or secondary lesions. Vertebral-arterial distance <6mm at site of maximal vein compression was considered significant (denoting at least 50% calibre reduction).

Results: - Five types of iliac vein compression were identified:
Type I(7/23;30%): Compression of LCIV by RCIA (Focal/proximal), classical May-Thurner
Type II(4/23;18%): Compression of LCIV by LCIA ± LEIA ± LIIA (Diffuse/distal)
Type III(9/23;39%): Double focal LCIV compression by RCIA and LCIA
Type IV(2/23;8.5%): Double diffuse LCIV compression by RCIA and LCIA
Type V(1/23;4.5%): Bilateral compression (RCIV by RCIA and LCIV by LCIA)
- Venous collaterals classified into 2 groups:
I- Cross-pelvic collaterals (suprapubic; ilio-hypogastric 'from LCIV to RIIV'; pre-sacral; trans-sacral; peri-uterine/peri-ovarian)
II- Ascending collaterals (lumbar; intraspinal; ilio-caval; ilio-renal; abdominal wall)

Conclusion: DCTV enables satisfactory visualization of pelvic veins, assessment of their surrounding structures, and tracing of contrast flow through abnormal pathways.
RCIA compressing LCIV remains by far the commonest anomaly (77.5%) detected in patients with CVD either alone (Type I) or associated with LCIA compression (Types III & IV).
LCIA may compress LCIV alone (18%) but is more often found in combination with RCIA (47.5%). LCIA compresses the vein more distally and diffusely.
New classification for iliac vein compressions according to the compressing agent will hopefully increase awareness about the condition and improve reporting standards in future studies.

2:45 PM – 2:50 PM

Q8-12 Surgical Desobstruction Of The Common Femoral Vein In Deep Venous Occlusive Disease

M. A. F. de Wolf[1], J. Grommes[2], C. W. Arnoldussen[1], M. W. de Haan[1], R. de Graaf[1], C. H. A. Wittens[3];
[1]Maastricht University Medical Center, Maastricht, Netherlands, [2]Aachen University Hospital, Aachen, Germany, [3]Maastricht University Medical Center, Aachen University Hospital, Maastricht, Aachen, Netherlands.

BACKGROUND: As complete recanalization of the proximal deep venous segments, especially the iliac veins, occurs in a minority of patients after a proximal deep venous thrombosis (DVT), recanalization by endovascular means has emerged as the treatment modality of choice in patients with severe post-thrombotic symptoms. However, rapid reocclusion of treated veins might occur if inflow into these segments shows to be inadequate pre- or per-procedural. Surgical desobstruction (endophlebectomy) of the common femoral vein increases inflow from the profunda femoral, femoral and great saphenous vein, into the treated proximal deep venous tract. In this study we present our clinical experience and surgical technique with this procedure in patients with chronic deep venous occlusions treated in a hybrid approach.

METHODS: Patients with severe venous symptoms and complaints (CEAP score C4-6 and/or severe venous claudication), treated between May 2010 and August 2012, are included in this observational study. Diagnosis of chronic occlusive disease was done with duplex ultrasonography and magnetic resonance venography. Patients were primarily treated with percutaneous transluminal angioplasty (PTA) and stenting or deep venous bypass surgery combined with an endophlebectomy. Primary stenting procedures were performed in a hybrid setting with both an interventional radiologist and vascular surgeon present. Patients were followed at regular intervals and patency of the treated venous segments was performed by duplex ultrasonography.

RESULTS: A total of 22 patients were treated in the study period, 18 underwent primary PTA and stenting and 4 venous bypass surgery. Mean age of patients was 39 years. 12 patients were female. 11 patients presented with skin changes (CEAP score C4-6). Patients were treated a mean of 8.3 years after their initial DVT. Surgical desobstruction was performed in the same session as the primary intervention in 19 cases, in 3 patients the endophlebectomy, combined with PTA and restenting, was performed to treat stent reocclusion. In 16 patients creation of an arteriovenous fistula was performed in the same session. Patency at last control was achieved in 17 patients (77%), during a mean follow-up duration of 7.9 months (range 2 - 20 months).

CONCLUSIONS: Inadequate inflow in venous segments treated with stenting or bypass surgery for chronic venous occlusive disease is one of the most common reasons for treatment failure. Surgical desobstruction of the common femoral vein is an effective ancillary treatment option to secure venous flow in these venous tracts. Hereby, good (midterm) patency rates can be achieved in chronic venous occlusive disease with poor inflow from femoral veins.

CONCLUSION

ALABAMA

Alexander City
Alrefai, Basel

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Isobe, James Hajime
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Lochridge, Stanley K.
Passman, Marc A.

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Delaria, Giacomo A.
Schmid-Schonbein, Geert W.

Laguna Hills
Duensing, Robert A.

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Sandberg, Maja K.

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Harris, Edmund J.

Santa Barbara
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Gorski, Yara

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TUESDAY, FEBRUARY 26		
4:00 pm – 6:00 pm	Registration Open	Sachem Foyer
WEDNESDAY, FEBRUARY 27		
7:00 am – 8:00 am	Continental Breakfast	Sachem Foyer
7:00 am – 7:30 pm	Registration Open	Sachem Foyer
7:00 am – 8:00 am	Industry Advisory Breakfast	Palo Verde Room
8:00 am – 12:00 pm	David S. Sumner Venous Summit – Challenging Cases in Venous Disease	Sachem Ballroom
12:00 pm – 7:30 pm	Exhibit Hall Open	Wigwam Ballroom
12:00 pm – 1:15 pm	Lunch On Own	
1:15 pm – 3:15 pm	Specialty Symposia (Concurrent)	
	(A) Vascular Medicine & Thrombosis	Sachem Ballroom
	(B) Biomechanics & Bioengineering	Palo Verde Room
	(C) Wound Care & Compression	Arizona Room
	(D) Live Venous Ultrasound	Mohave West
3:15 pm – 3:45 pm	Coffee Break	Wigwam Ballroom
3:45 pm – 5:35 pm	Scientific Session 1 – Chronic Venous Disease 1: Varicose Veins	Sachem Ballroom
6:00 pm – 7:30 pm	Welcome Reception	Wigwam Ballroom
THURSDAY, FEBRUARY 28		
7:00 am – 8:00 am	Continental Breakfast	Wigwam Ballroom
7:00 am – 3:30 pm	Exhibit Hall Open	Wigwam Ballroom
7:00 am – 7:30 pm	Registration Open	Sachem Foyer
8:00 am – 9:55 am	Scientific Session 2 – Deep Vein Thrombosis 1	Sachem Ballroom
9:55 am – 10:10 am	American College of Phlebology – Best Paper	Sachem Ballroom
10:00 am – 7:00 pm	Poster Hall Open	Mohave Ballroom
10:10 am – 10:50 am	Coffee Break	Wigwam Ballroom
10:50 am – 12:20 pm	Scientific Session 3 – Deep Vein Thrombosis 2	Sachem Ballroom
12:20 pm – 12:30 pm	Box Lunch	Sachem Foyer
12:30 pm – 1:30 pm	Villavicencio Symposium	Sachem Ballroom
1:30 pm – 3:00 pm	ACP Symposium - Agents in the Treatment of Venous Disease	Sachem Ballroom
3:00 pm – 3:30 pm	Coffee Break	Wigwam Ballroom
3:30 pm – 5:30 pm	Scientific Session 4 – Chronic Venous Disease 2	Sachem Ballroom
5:45 pm – 7:00 pm	Poster Presentation Session 1 (Concurrent)	Mohave East Room
5:45 pm – 7:00 pm	Poster Presentation Session 2 (Concurrent)	Mohave West Room
7:00 pm – 8:30 pm	BTG International Symposium – Treatment Outcomes: What Matters to Patients and Payors?	Sachem Ballroom
FRIDAY, MARCH 1		
7:00 am – 8:00 am	Continental Breakfast	Wigwam Ballroom
7:00 am – 11:00 am	Exhibit Hall Open	Wigwam Ballroom
7:00 am – 1:05 pm	Registration Open	Sachem Foyer
8:00 am – 9:20 am	Scientific Session 5 – Chronic Venous Disease 3	Sachem Ballroom
9:20 am – 10:00 am	Coffee Break	Wigwam Ballroom
10:00 am – 12:05 pm	Scientific Session 6 – President's Session	Sachem Ballroom
10:00 am – 10:15 am	2012 Servier Traveling Fellowship Reports	
10:15 am – 10:30 am	2012 BSN Jobst Research Winner – Interim Report	
10:30 am – 10:40 am	History of the American Venous Forum	
10:40 am – 10:50 am	American Venous Registry & SVS PSO Update	
10:50 am – 11:00 am	Journal of Vascular Surgery: Venous and Lymphatic Disorders	
11:00 am – 11:05 am	National Venous Screening Update	
11:05 am – 11:20 am	Presidential Address Introduction	
11:20 am – 12:05 pm	Presidential Address	
12:05 pm – 1:05 pm	Member Business Luncheon (AVF Members Only)	Mohave Ballroom
1:05 pm	Open Afternoon	
7:30 pm – 8:00 pm	25th Silver Anniversary Gala Reception	Sachem Terrace & Aztec Foyer
8:00 pm – 10:00 pm	25th Silver Anniversary Gala Dinner	Mohave Ballroom
SATURDAY, MARCH 2		
7:00 am – 8:00 am	Continental Breakfast	Wigwam Ballroom
7:00 am – 12:00 pm	Exhibit Hall Open	Wigwam Ballroom
7:00 am – 3:00 pm	Registration Open	Sachem Foyer
7:00 am – 8:00 am	Introduction to the VQI	Arizona Room
8:00 am – 9:40 am	Scientific Session 7 – Deep Vein Thrombosis 3	Sachem Ballroom
9:40 am – 9:55 am	European Venous Forum – Best Paper 1	Sachem Ballroom
9:55 am – 10:10 am	European Venous Forum – Best Paper 2	Sachem Ballroom
10:10 am – 10:25 am	Royal Society of Medicine Best Paper	Sachem Ballroom
10:25 am – 10:50 am	Coffee Break	Wigwam Ballroom
10:50 am – 11:40 am	D. Eugene Strandness Memorial Lecture – Improving Patient Outcomes After Deep Venous Thrombosis: Where do we go now?	Sachem Ballroom
11:40 am – 1:00 pm	Lunch On Own	
1:00 pm – 2:50 pm	Scientific Session 8 – Chronic Venous Disease 4	Sachem Ballroom

Save the Date

New Orleans

The American Venous Forum

26TH ANNUAL MEETING

FEBRUARY 19-22, 2014

The Roosevelt ⚜ New Orleans, LA

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