



# FINAL PROGRAM



PACIFIC NORTHWEST VASCULAR SOCIETY

# 2015 ANNUAL MEETING

**October 1-2, 2015**  
**Seattle, WA**

*Renaissance Seattle Hotel*

[www.vascularweb.org/pnvs](http://www.vascularweb.org/pnvs)

# CORPORATE PARTNERS - SPECIAL THANKS

Pacific Northwest Vascular Society thanks the following corporate partners for the financial support of the 2015 Annual Meeting:

## **PLATINUM SPONSORS**

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# 2015 Annual Meeting

**October 1-2, 2015**  
**Seattle, Washington**  
*Renaissance Seattle Hotel*

## CONTACT INFORMATION

**Pacific Northwest Vascular Society**

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Anacortes, WA 98221

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[www.vascularweb.org/pnvs](http://www.vascularweb.org/pnvs)

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# 2015 PNWVS EXECUTIVE OFFICERS AND COUNCILORS

<b>Benjamin Starnes, MD</b>	President
<b>James C. Watson, MD</b>	Immediate Past-President
<b>Erica Mitchell, MD</b>	President-Elect, Secretary Treasurer
<b>Nam Tran, MD</b>	Program Chairman, Middle Councilor
<b>Brian Ferris, MD</b>	Middle Councilor
<b>Timothy Liem, MD</b>	Senior Councilor
<b>Niten Singh, MD</b>	Senior Councilor
<b>Keith Baxter, MD</b>	Junior Councilor
<b>Glen Rosenborough, MD</b>	Junior Councilor
<b>Charles McQuinn, MD</b>	Junior Councilor
<b>Leonard Su, MD</b>	Junior Councilor
<b>Heather Roderick</b>	Administrator

# MEETING AT A GLANCE

## Thursday, October 1

- 3:00pm – 8:00pm **Registration Open** - Federal Superior Foyer
- 4:30pm – 5:30pm **Executive Council Meeting** – Penthouse Presidential Board Room
- 6:00pm – 7:00pm **Business Meeting** – Federal Superior Room
- 7:00pm – 9:00pm **Welcome Reception with Industry Technology Showcase & Digital ePoster Session**

## Friday, October 2

- 6:00am – 12:30pm **Registration Open** - Federal Superior Foyer
- 7:00am – 8:00am **Breakfast Buffet with Exhibits** – Municipal Room
- 7:00am – 12Noon **Exhibits Open** – Municipal Room
- 7:45am – 8:00am **Presidential Welcome by Benjamin Starnes, MD**
- 8:00am – 9:00am **SCIENTIFIC SESSION I: Cerebrovascular & Surgical Education/Simulation**
- 9:00am – 9:30am **Debate One: Carotid Endarectomy for Management of Asymptomatic Extracranial Carotid Artery Disease in the Modern Era. (For: Ted Kohler MD; Against: Andrew Huffer MD)**
- 9:30am – 10:00am **Coffee Break & Exhibits** – Municipal Room

# MEETING AT A GLANCE

- 10:00am – 11:00am **SCIENTIFIC SESSION II: Open Surgical and Endovascular Techniques of the Aorta and Aortic Branches**
- 11:15am – 11:30am **Memorable Patient Experience: Greta Sedlock**
- 11:30am – 12:00pm **Debate Two: Approaches to the Aortic Arch:  
Are We Ready for a Total Endovascular Approach  
(For: Matthew Sweet MD; Against: Jay Pal MD)**
- 12:00pm – 12:30pm **Invited Lecture “Sustaining Fulfillment in Work and Life”  
Bruce L. Gerwertz, MD**
- 12:30pm – 1:00pm **Box Lunch & Visit Exhibits – Municipal Room**
- 1:00pm – 1:15pm **VQI PNW Region Update – Benjamin Starnes, MD.  
Pacific NW Vascular Study Group Regional Director**
- 1:15pm – 2:30pm **SCIENTIFIC SESSION III: Peripheral Vascular Disease**
- 2:30pm – 2:45pm **Coffee Break with Sponsors**
- 2:45pm – 3:45pm **SCIENTIFIC SESSION IV: Acute and Chronic Venous  
Disease Treatment, Hemodialysis Access, &  
Non-atherosclerotic Vascular Diseases**
- 3:45pm – 4:00pm **Mini Break with Exhibits – Municipal Room**
- 4:00pm – 5:30pm **SCIENTIFIC SESSION V: Case Presentations**
- 5:30pm – 6:00pm **Closing Reception and Resident Paper Awards – Vista Lobby**
- 6:00pm – 8:30pm **Presidential Banquet – Vista Room**



# WELCOME TO THE 2015 PNWVS NEW MEMBERS

**Enjae Jung, MD**

**Adnan (Addi) Z. Rizvi, MD, FACS**

**Elina Quiroga, MD**

[Learn more and apply  
for membership here.](#)

## PAST MEETINGS

Seattle, WA	1984
Portland, OR	1985
Tacoma, WA	1986
Vancouver, BC	1987
Coeur D'Alene, ID	1988
Victoria, BC	1989
Seattle, WA	1990
Portland, OR	1991
Tacoma, WA	1992
Vancouver, BC	1993
Coeur D'Alene, ID	1994
Victoria, BC	1995
Seattle, WA	1996
Portland, OR	1997
Tacoma, WA	1998
Vancouver, BC	1999
Coeur D'Alene	2000
Victoria, BC	2001
Seattle, WA	2002
Portland, OR	2003
Tacoma, WA	2004
Vancouver, BC	2005
Spokane, WA	2006
Victoria, BC	2007
Portland, OR	2008
Seattle, WA	2009
Kelowna, BC	2010
Seattle, WA	2011
Vancouver, BC	2012
Coeur D'Alene, ID	2013
Portland, OR	2014



# PAST OFFICERS

Toshio Inahara, MD, President Kaj H. Johansen, MD, Secretary-Treasurer Kaj H. Johansen, MD, Program	1983
Toshio Inahara, MD, President Kaj H. Johansen, MD, Secretary-Treasurer George A. Berni, MD, Program	1984
Toshio Inahara, MD, President Kaj H. Johansen, MD, Secretary-Treasurer John W. Kenagy, MD, Program	1985
Richard N. Kleaveland, MD, President Leland J. Harris, MD, Secretary-Treasurer Kenton C. Bodily, MD, Program	1986
Henry K. Litherland, MD, President Leland J. Harris, MD, Secretary-Treasurer Henry D. Hildebrand, MD, Program	1987
John W. Kenagy, MD, President Leland J. Harris, MD, Secretary-Treasurer Charles A. Anderson, MD, Program	1988
Henry D. Hildebrand, MD, President Kenton C. Bodily, MD, Secretary-Treasurer R. Eugene Zierler, MD, Program	1989
Lloyd Taylor, MD, President Kenton C Bodily, MD, Secretary-Treasurer Gregory L. Moneta, MD, Program	1990
D. Eugene Strandness, MD, President Kenton C. Bodily, MD, Secretary-Treasurer Henry K. Litherland, MD, Program	1991
George A. Berni, MD, President Milton H. Brinton, MD, Secretary-Treasurer Charles A. Anderson, MD, Program	1992
John M. Porter, MD, President Milton H. Brinton, MD, Secretary-Treasurer Gregory L. Moneta, MD, Program	1993

# PAST OFFICERS

Joseph G. Sladen, MD, President Milton H. Brinton, MD, Secretary-Treasurer R. Eugene Zierler, MD, Program	1994
Kaj H. Johansen, MD, President Terence M. Quigley, MD, Secretary-Treasurer Gregory L. Moneta, MD, Program	1995
Gregory L. Moneta, MD, President Terence M. Quigley, MD, Secretary-Treasurer Ted R. Kohler, MD, Program	1996
Charles A. Anderson, MD, President Terence M. Quigley, MD, Secretary-Treasurer David C. Taylor, MD, Program	1997
Milton H. Brinton, MD, President David C. Taylor, MD, Secretary-Treasurer James M. Cook, MD, Program	1998
Eugene Zierler, MD, President David C. Taylor, MD, Secretary-Treasurer York N. Hsiang, MD, Program	1999
Terence M. Quigley, MD, President David C. Taylor, MD, Secretary-Treasurer Mark H. Meissner, MD, Program	2000
Edmond J. Raker, MD, President James M. Cook, MD, Secretary-Treasurer Jerry Chen, MD, Program	2001
David Taylor, MD, President James M. Cook, MD, Secretary-Treasurer Stephen Murray, MD, Program	2002
Gary Matsumoto, MD, President James M. Cook, MD, Secretary-Treasurer James Watson, MD, Program	2003
York N. Hsiang, MD, President Mark H. Meissner, MD, Secretary-Treasurer Mark H. Meissner, MD, Program	2004

# PAST OFFICERS

Jay Cook, MD, President Mark H. Meissner, MD, Secretary-Treasurer Jeff Gilbertson, MD, Program	2005
James Peck, MD, President Mark H. Meissner, MD, Secretary-Treasurer Gregory J. Landry, MD, Program	2006
Mark Meissner, MD, President Gregory J. Landry, MD, Secretary-Treasurer Gerrit Winkelaar, MD, Program	2007
Stephen Murray, MD, President Gregory J. Landry, MD, Secretary-Treasurer Benjamin Starnes, MD, Program	2008
Gerrit Winkelaar, MD, President Gregory J. Landry, MD, Secretary-Treasurer Erica Mitchell, MD, Program	2009
Jeffrey Gilbertson, MD, President Benjamin Starnes, MD, Secretary-Treasurer Benjamin Starnes, MD, Program	2010
Gregory J. Landry, MD, President Benjamin Starnes, MD, Secretary-Treasurer Benjamin Starnes, MD, Program	2011
Daniel Pepper, MD, President Benjamin Starnes, MD, Secretary-Treasurer Benjamin Starnes, MD, Program	2012
Jerry Chen, MD, President James C. Watson, MD, President Elect Erica Mitchell, MD, Secretary Treasurer	2013
James Watson, MD, President Benjamin Starnes, MD, President Elect Erica Mitchell, MD, Secretary Treasurer	2014

# INVITED LECTURER



## **“Sustaining Fulfillment in Work and Life”**

### **Bruce L. Gerwertz, MD**

Bruce L. Gerwertz, MD is Surgeon-in-Chief, Chair of the Department of Surgery, Vice-President for Interventional Services and Vice-Dean of Academic Affairs at Cedars-Sinai Health System in Los Angeles. He also holds the H & S Nichols Distinguished Chair in Surgery. Dr. Gerwertz is the author of more than 250 original articles, book chapters and books including *The Atlas of Vascular Surgery*, *Surgery of the Aorta and Its Branches* and a recent book on physician leadership, *The Best Medicine*. His principal clinical and research interests include human factors research, cerebrovascular disease and mesenteric ischemic syndromes.

[Get the eBook here.](#)

# PAST GUEST LECTURERS

Robert Barnes, MD, University of Arkansas	1986
K. Wayne Johnston, MD, University of Toronto	1987
Richard Kempczinski, MD, University of Cincinnati	1988
Brian L. Thiele, MD, Pennsylvania State University	1989
Jonathan B. Towne, MD, Medical College of Wisconsin	1990
Paul M. Walker, MD, University of Toronto	1991
Dennis F. Bandyk, MD, University of South Florida	1992
Robert L. Kistner, MD, Straub Clinic, Honolulu	1993
Allan R. Downs, MD, University of Manitoba	1994
Ralph B. Dilley, MD, Scripps Clinic, La Jolla	1995
Peter Gloviczki, MD, Mayo Clinic, Rochester	1996
Frank Veith, MD, Montefiore Medical Center, Bronx	1997
Kenneth Cherry, MD, Mayo Clinic, Rochester	1998
Robert Zwolak, MD, Dartmouth-Hitchcock, Lebanon	1999
Jerry Goldstone, MD, Case Western Reserve, Cleveland	2000
Carlos Donayre, MD, Harbor UCLA, Torrance	2001
Ronald Dalman, MD, Stanford University	2002
Dennis Bandyk, MD, University of South Florida	2003
Thomas Lindsay, MD, University of Toronto	2004
Joseph L. Mills, MD, University of Arizona	2005
Wesley Moore, MD, UCLA School of Medicine	2006
David Gillespie, MD, Walter Reed Medical Center, Bethesda	2007
David Cossman, MD, Cedar-Sinai Medical Center, Los Angeles	2008
Cherrie Z. Abraham, MD, McGill University, Montreal	2009
Mark Fillinger, MD, Dartmouth-Hitchcock Medical Center, Hanover	2010
Joseph L. Mills, MD, University of Arizona	2011
Daniel F. Bandyk, MD, University of California - San Diego School of Medicine	2012
Thomas L. Forbes, MD, Professor of Surgery, Western University, Chief of Vascular Surgery, London Health Sciences Centre	2013
Donald Trunkey, MD, Oregon Health and Science University	2014

# INTENDED AUDIENCE

The PNWVS meeting is designed for:

- Vascular Surgeons
- Fellows/residents in vascular surgery and general surgery programs
- Physicians in related specialties
- Interventional radiologists working in the vascular imaging and intervention field
- Physician assistants and nurses involved in the care of vascular surgical patients
- Vascular technologists and vascular lab administrators
- Medical students interested in vascular surgery or vascular surgery related research
- Researchers, administrators, practice managers and allied health professionals

# PROGRAM LEARNING OBJECTIVES

At the end of this program, participants should be able to:

## **Cerebrovascular Disease**

- Describe the clinical and technical management principles for asymptomatic carotid artery disease
- Describe the clinical and technical management principles for symptomatic carotid artery disease
- Describe current management principles for carotid and vertebral artery dissection
- Identify new methodologies for the diagnosis and treatment of vascular disease as it relates to cerebrovascular disease

## **Open Surgical and Endovascular Techniques of the Aorta and Aortic Branches**

- Describe the clinical and technical management principles for thoracic aortic aneurysms and great branch vessels
- Describe the clinical and technical management principles for abdominal aortic aneurysms and visceral vessels
- Describe the clinical and technical management principles for aortic and branch vessel dissection
- Identify key features in the clinical and technical management of complications related to repair of thoracic and abdominal aortic aneurysms
- Explain the surgical approaches for both occlusive and aneurysmal visceral artery disease
- Identify new methodologies for the diagnosis and treatment of vascular disease as it relates to aortic aneurysm disease
- Analyze opportunities for system improvement in managing patients with acute and chronic aortic syndromes

## **Peripheral Vascular Disease**

- Describe the clinical and technical management principles for patients with Peripheral Artery Disease and claudication
- Identify useful adjunctive treatment modalities to assist in healing chronic wounds associated with Peripheral Artery Disease
- Analyze opportunities for system improvement in managing patients with vascular disease and chronic wounds to improve limb preservation

## **Acute and Chronic Venous Disease Treatment**

- Apply techniques of venous recanalization to their current practice
- Evaluate various quality of life measures and calculate what is most meaningful for their practice
- Describe the current therapy for acute VTE and evaluate which treatment is most appropriate for a given clinical setting
- Assess the current state of IVC filter use/retrieval and surveillance strategies
- Identify new methodologies for the diagnosis and treatment of vascular disease as it relates to acute and chronic venous disease

## **Hemodialysis Access**

- Apply techniques of fistula creation to their current practice
- Describe factors influencing surgical and endovascular outcomes after fistula creation
- Identify new methodologies for the diagnosis and treatment of vascular disease as it relates to end-stage renal disease
- Describe new technologies for dialysis access
- Analyze opportunities for system improvement in managing patients with dialysis access needs

## **Non-atherosclerotic Vascular Disease**

- Identify clinical presentation, risk factors and clinical and technical management principles for vascular graft infections
- Describe management strategies and techniques for exposing and repairing traumatic vasculature injuries

## **Surgical Education**

- Describe new research and innovative teaching methodologies in vascular education



# ACCREDITATION STATEMENT

This program has been reviewed and approved under Section 1 (Accredited Group Learning Activities) of the Framework of CPD Options of the Maintenance of Certification program for a total of 7.25 hours. This event is an Accredited Group Learning Activity (Section 1) as defined by the Maintenance of Certification program of The Royal College of Physicians and Surgeons of Canada. This activity is under review by the Canadian Society for Vascular Surgery. Through an agreement between the Royal College of Physicians and Surgeons of Canada and the American Medical Association, physicians may convert Royal College MOC credits to *AMA PRA Category 1 Credits™*. Information on the process to convert Royal College MOC credit to AMA credit can be found at [www.ama-assn.org/go/internationalcme](http://www.ama-assn.org/go/internationalcme).

**Please plan to participate in the polling during the debates of the meeting. Make your vote count by downloading the app to your mobile device here.**

**Self Assessment Test using the link that was emailed to you.  
Ask at registration desk for more information.**



# Scientific Session Agenda

## OCTOBER 2, 2015

7:00am – 5:00pm

### **ePoster Session and Exhibits Open**

7:45 – 8:00am

### **Presidential Welcome**

Benjamin Starnes, MD

8:00 – 9:00am

### **SCIENTIFIC SESSION I: Cerebrovascular & Surgical Education/Simulation**

(10 minute talk & 5 minutes for discussion). Session moderated by **Benjamin Starnes, MD**, President, Professor of Surgery, UW.

8:00 – 8:15am

#### **#1\* The Selection of Transverse or Vertical Incision for Carotid Endarterectomy**

M Deck MD Candidate, D Kopriva MDCM, FRCSC

Presenter: Megan Deck, University of Saskatchewan

8:15 – 8:30am

#### **#2\* Patterns of Care in Vascular Surgery Patients at End of Life During Hospitalization**

D Wilson MD, G Moneta MD

Presenter: Dale Wilson, MD, Oregon Health and Sciences University

8:30 – 8:45am

#### **#3\* Needs Assessment Survey for the Optimal Design of Integrated Vascular Surgery Residency Program Curriculum: A Survey of Members of the Society for Vascular Surgery and Program Directors**

SK Desikan MD, C Thompson MD, G Tang MD

Presenter: Sarasi Desikan, MD, University of Washington

8:45 - 9:00am

## #4\* **Learning Curve for Fenestrated EVAR (FEVAR)**

JR Hurd MD, N Singh MD, ZM Arthurs MD, MT Caps MD, BW Starnes MD  
Presenter: Jason Hurd, MD, University of Washington

9:00 - 9:30am

## **Debate One: Carotid Endarterectomy for Management of Asymptomatic Extracranial Carotid Artery Disease in the Modern Era. (For: Ted Kohler MD; Against: Andrew Huffer MD)**

9:30 - 10:00am

## **Coffee Break and Exhibits**

10:00 - 11:15am

## **SCIENTIFIC SESSION II: Open Surgical and Endovascular Techniques of the Aorta and Aortic Branches**

(10 minute talk & 5 minutes for discussion). Session moderated by **Nam T. Tran, MD**. Middle Councilor & Associate Professor of Surgery & **Brian Ferris, MD**. Middle Councilor & Vascular Surgeon Lake Washington Vascular.

10:00 - 10:15am

## #5\* **Revisiting Epidural Analgesia for Aortic Surgery: Is it Worthwhile?**

A Ohlsson MD, GA Wallace MD, A Ben-Ari MD, GL Tang MD  
Presenter: Anna Ohlsson, MD, University of Washington

10:15 - 10:30am

## #6 **Ruptured Abdominal Aortic Aneurysm - Knowing When Not to Operate**

BT Garland MD, P Danaher PhD, S Shin MD, NT Tran MD, E Quiroga MD, N Singh MD, BW Starnes MD  
Presenter: Susanna Shin, MD, University of Washington

10:30 - 10:45am

**#7\* Physician Modified Endovascular Grafts for Treatment of Juxtarenal Aortic Aneurysms: Midterm Results From an Investigational Device Exemption (IDE) Clinical Trial**

RE Heneghan MD, B Tatum CCRN, BW Starnes MD

Presenter: Rachel E Heneghan, MD, University of Washington

10:45 - 11:00am

**#8\* Aortic Outflow Occlusion Predicts Rupture of Abdominal Aortic Aneurysm**

J Crawford MD, N Vatankhah MD, VK Chivukula PhD, S Haller BS, E Mitchell MD, G Landry MD,

Presenters: Jeffrey Crawford, MD, Oregon Health & Science University and Stephen J. Haller, Research Assistant II, Department of Biomedical Engineering

11:00 - 11:15am

**#9 Superficial Femoral Vein as a Solution to the Challenging Problems of the Primarily Infected Aorta and Infected Grafts - Kelowna General Hospital Experience over the Last 8 Years**

SC Mostowy MD, DK Lawlor MD, JR Harris MD, JEH Pasenau MD

Presenter: Stephan Mostowy, MD, Kelowna General Hospital

11:15 - 11:30am

**Memorable Patient Experience: Greta Sedlock**

11:30am - 12:00pm

**Debate Two: Approaches to the Aortic Arch: Are We Ready for a Total Endovascular Approach (For: Matthew Sweet MD; Against: Jay Pal MD)**

12:00 - 12:30pm

**Invited Lecture: "Sustaining Fulfillment in Work and Life"**

**Bruce Gewertz, MD**

Cedar Sinai, Los Angeles, CA

12:30 - 1:00pm

**Lunch**

1:00 – 1:15pm

**VQI PNW Region Update – Benjamin Starnes, MD. Pacific NW Vascular Study Group Regional Director**

1:15 – 2:30pm

## **SCIENTIFIC SESSION III: Peripheral Vascular Disease**

(10 minutes talk & 5 minutes for discussion). Session moderated by **Niten Singh, MD**. Senior Councilor, Associate Professor of Surgery, UW.

1:15 – 1:30pm

### **#10 Saving Life and Limb: FES for the Elderly with PAD**

Felix G Vladimir MD, David G Embrey PT PhD

Presenter: Felix G Vladimir, MD, University of Washington

1:30 – 1:45pm

### **#11\* Characterization of Tibial Velocities by Duplex Ultrasound in Severe Peripheal Arterial Disease and Controls**

JD Crawford MD, NG Robbins BS, LA Harry PharmD, Dale G. Wilson MD, VJ Santo MD, RB McLafferty MD, EL Mitchell MD,

Presenter: Jeffrey D. Crawford, MD, Oregon Health & Science University

1:45 – 2:00pm

### **#12\* Normal Lower Extremity Duplex Findings in Patients with Left Ventricular Assist Devices: A Basis for Vascular Laboratory Interpretation**

SK Harris MD, M Roos MD, JD Crawford MD, EL Mitchell MD, TK Liem MD, GJ Landry MD, RB McLafferty MD, GL Moneta MD

Presenter: Sheena Harris, MD, Oregon Health and Science University

2:00 – 2:15pm

### **#13\* Major Amputations in the Elderly: Outcomes and Recommendations**

AL Rodriguez MD, E Quiroga MD, R Heneghan MD, N Singh MD

Presenter: April Rodriguez, MD, University of Washington

2:15 - 2:30pm

**#14\* Assessment of Peripheral Intervention Using Smart Phone Based Thermal Imaging: A Feasibility Study.**

GA Wallace MD, E Quiroga MD, N Singh MD, NT Tran MD  
Presenter: Gabriel Wallace, MD, University of Washington

2:30 - 2:45pm

**Coffee Break**

2:45 - 3:45pm

**SCIENTIFIC SESSION IV: Acute and Chronic Venous Disease Treatment, Hemodialysis Access, & Non-atherosclerotic Vascular Diseases**

(10 minute talk & 5 minutes for discussion). Session moderated by **Timothy K. Liem, MD**. Senior Councilor, Associate Professor Surgery, OHSU.

2:45 - 3:00pm

**#15 Venous Stenting for Lower Extremity Chronic Venous Occlusive Disease: The Vancouver General Hospital Experience**

JC Chen MD, J Gagnon MD, YN Hsiang MD, K Arsenault MD  
Presenter: Jerry Chen, MD, University of British Columbia

3:00 - 3:15pm

**#16 Introduction of an In-Hospital Swing Room Model for Radiofrequency Ablation of Varicose Veins in the Canadian Health Care System**

GK Yang PhD MD, R Sidhu MD, JDS Reid MD, PS MacDonald MD  
Presenter: Gary Yang, MD, St. Paul's Hospital

3:15 - 3:30pm

**#17\* 25 Years Later: MESS (Mangled Extremity Severity Score) Revisited**

S Aarabi MD, Y Kavousi MD, JB Friedrich MD, EM Bulger MD, N Singh MD  
Presenter: Shahram Aarabi, MD, University of Washington/Harborview Medical Center

3:30 - 3:45pm

**#18\* Blunt Aortic Injury: A Call for a New Classification System and Treatment Strategy**

RE Heneghan, MD, S Aarabi, MD, N Singh, MD, M Gunn, MD, E Quiroga, MD, N Tran, MD, BW Starnes, MD

Presenter: Rachel E. Heneghan, MD, University of Washington

3:45 - 4:00pm

**Mini Break**

4:00 - 5:30pm

**SCIENTIFIC SESSION V: Case Presentations**

(7 minute talk with 3 minutes discussion). Session moderated by **Erica Mitchell, MD**. President-Elect & Professor of Surgery, OHSU

4:00 - 4:10pm

**#19\* Novel Use of Nexfintm for Real-time Assessment of Cardiac Output During Endovascular Stenting in a Patient with Chronic Inferior Vena Cava Occlusion**

J Misskey MD, R Earle BSc, H Vaghadia MD, J Gagnon MD, Y Hsiang MD

Presenter: Jonathon Misskey, MD, University of British Columbia

4:10 - 4:20pm

**#20\* Repair of a Mycotic Aortic Aneurysm Caused by Fusobacterium Nucleatum**

J Matthews MD, J Heneghan MD, N Singh MD, B Starnes MD

Presenter: Jamil Matthews, MD, University of Washington Medical Center

4:20 - 4:30pm

**#21\* Repair of Type IIIB Endoleak in Branched TAAA Endograft Using Sandwich Technique and Chimney Graft**

J Culig MD, J Misskey MD, Y Hsiang MB ChB MHS Sc FRCSC, J Gagnon MD DEC FRCSC

Presenter: Jennifer Culig, MD, University of British Columbia



4:30 – 4:40pm

**#22\* Expanding the Options for Treating Aorto-esophageal Fistula: A Case Report of Tubularized Extracellular Matrix Graft as a Novel Aortic Conduit**

MG Roos MD, EL Mitchell MD, C Abraham MD, E Jung MD, GJ Landry MD, TK Liem MD, GL Moneta MD, VM Rodriguez MD

Presenter: Matthew Roos, MD, Oregon Health and Sciences University

4:40 – 4:50pm

**#23\* IVC Filter Penetration Into Duodenum Presenting with Hypotension and GI Bleeding**

SK Harris MD, WK Williamson MD, JW Wiest MD, Providence St. Vincent Medical Center

Presenter: Sheena Harris, MD, Oregon Health and Science University

4:50 – 5:00pm

**#24 False Lumen Embolization with Covered Stent And Endoanchor Following Stent-Graft Therapy for Chronic Type B Dissection with Aneurysmal Degeneration**

DP Nathan MD, BW Starnes MD, University of Washington

Presenter: Derek Nathan, MD, Virginia Mason Medical Center

5:00 – 5:10pm

**#25\* Juxta-articular Myxoma Associated with a Popliteal Artery Aneurysm and Acute Limb Ischemia**

MG Roos MD, J Fortune MD, GJ Landry MD, TK Liem MD, A Mansoor MD, GL Moneta MD, EL Mitchell MD

Presenter: Matthew Roos, MD, Oregon Health and Science University

5:10 – 5:20pm

**#26\* Panel Graft Repair of Femoral Vein in a Patient with Femoral Vein Cystic Adventitial Disease**

J Culig MD, A Salvian MD

Presenter: Jennifer Culig, MD, University of British Columbia

5:20 - 5:30pm

**#27\* Familial Internal Mammary Artery Aneurysms in Two Patients with SMAD-3 Mutation**

D Nevidomskyte MD, S Shalhub MD MPH, BW Starnes MD

Presenter: Daiva Nevidomskyte, MD, University of Washington

5:30 - 6:00pm

**Closing Reception; Awards Announcement**

6:00 - 8:30pm

**Buffet and Networking Dinner**

*\* denotes a resident competition paper*

Poster #1: **Quantifying the Impact of Gantry Angle Correction During Thoracic Endovascular Aneurysm Repair.**

MP Sweet, MD, University of Washington, Seattle, Washington

Poster #2: **Developing a Simulation-Based Training Program to Teach Vascular Surgery in Argentina.**

E Quiroga MD, AL Rodriguez MD, R Trapani MD, A Ferreres MD  
University of Washington, Seattle, Washington

Poster #3: **Persistent Left Superior Vena Cava – A Challenge for Venous Access.**

SC Mostowy MD, Kelowna General Hospital, Kelowna, British Columbia

\*Poster #4: **The Fate of the Unstented Superior Mesenteric Artery in Fenestrated Endovascular Aortic Aneurysm Repair.**

RE Heneghan MD, RE Zierler MD, BW Starnes MD, University of Washington, Harborview Medical Center, Seattle, Washington

\*Poster #5: **Renal Duplex Ultrasound Findings in Fenestrated Endovascular Aortic Aneurysm Repair (FEVAR) for Juxtarenal Aortic Aneurysms.**

RE Heneghan MD, RE Zierler MD, BW Starnes MD, University of Washington, Harborview Medical Center, Seattle, Washington

Poster #6: **Endovascular Repair of a Bleeding Common Carotid Pseudoaneurysm Using a Covered Stent.**

SC Mostowy MD, WT Tonogai MD, JR Harris MD, Kelowna General Hospital, Kelowna, British Columbia

\*Poster #7: **Mycotic Abdominal Aortic Aneurysm After Bacille Calmette-Guerin Therapy for Bladder Carcinoma.**

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# Abstracts

## **#1 THE SELECTION OF TRANSVERSE OR VERTICAL INCISION FOR CAROTID ENDARTERECTOMY**

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The utility of carotid endarterectomy has been demonstrated in preventing TIA and stroke in patients with symptomatic and asymptomatic carotid artery stenosis. Although this operation is very common, there is debate among surgeons as to the appropriate orientation of the surgical incision. The purpose of this study was to determine whether a transverse neck incision was associated with better late, postoperative wound cosmesis than vertical incision, but a greater postoperative prevalence of marginal mandibular nerve injury.

**METHODS:** Data was collected through a retrospective chart review of all cases of carotid endarterectomy at a single institution between July 1, 2010 and December 31, 2013. Information abstracted from the charts included demographic, clinical, diagnostic and technical variables. Subjects identified in the retrospective chart review who consented to participate in the second phase were examined to identify the presence of persistent marginal mandibular nerve palsy ipsilateral to the index carotid endarterectomy. The cosmetic outcome of the scar was evaluated according to the Patient and Observer Scar Assessment Scale (POSAS). The Students T-test for continuous variables was used to compare the mean Patient and Observer scores between Transverse and Vertical incision types.

**RESULTS:** A total of 236 carotid endarterectomies were performed at the institution during the study period. Nine patients refused the use of their personal health information in this study and were excluded from analysis. Seventy patients were identified with transverse incisions and 87 with vertical incisions. A definite incision orientation could not be determined in 71 patients. There were no differences in the neurologic outcomes of patients based on the incision orientation (perioperative stroke risk 1.4% with transverse incision vs. 0% with a vertical incision;  $p=0.44$ ).

Fifty-two patients agreed to present for follow-up scar assessment. Thirty-three had a transverse incision and 19 had a vertical incision. Patient Scale scores were significant in favouring the appearance of a transverse incision ( $p=0.04$ ). Patient and observer POSAS scores were further divided into two groups and evaluated on the basis of demographic data, risk factors, operative indications, and incision orientation. Group 1 consisted of scores  $<15$ , while Group 2 consisted of scores  $\geq 15$ . Vertical incision orientation alone was found to be associated with POSAS scores of greater than 15 on patient ( $p=0.01$ ) or observer ( $p=0.02$ ) scales.

**CONCLUSION:** These results suggest that incision orientation is the main determinant of scar cosmesis in carotid endarterectomy. A transverse incision may be favoured over vertical in terms of patient evaluated scar outcome.

## #2 PATTERNS OF CARE IN VASCULAR SURGERY PATIENTS AT END OF LIFE DURING HOSPITALIZATION

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**BACKGROUND:** There is limited literature reporting circumstances surrounding end of life care in vascular surgery patients. Despite improved education and awareness of advanced directives and implementation of palliative care teams, the decision, to withhold or withdraw care for a hospitalized patient remains challenging. We examined the circumstances, which surround these decisions to identify ways to potentially better serve our patients at end of life.

**METHODS:** We conducted a retrospective EMR chart review of all vascular surgery patients at our tertiary care university hospital that died during their hospitalization from 2005 to 2014. Patient, family, and hospitalization variables potentially important in influencing end of life decisions were examined.

**RESULTS:** 109 patients died during their hospitalization on the vascular surgery service. 79 (72.5%) patients had presented as an emergency hospitalization. Age ranged from 24-94 years median 75 years. There were 67 (61.5%) males and 42 females. 79 (72.5%) patients died after being transitioned to comfort care. 14 (12.8%) patients had an advanced directive. 27 of 79 (34.1%) patients transitioned to comfort care had an end of life palliative care consult ( $p=0.009$ ). Family was present or involved at hospitalization for 80 (73.4%) patients. Presence and/or involvement of family at hospitalization correlated with patient transition to comfort care ( $p<0.001$ ), as did a palliative care consult ( $p=0.009$ ). Patients transitioned to comfort care had a greater number of ventilator days ( $p=0.017$ ). Those patients with palliative care consults were more likely to be on a ventilator ( $p=0.007$ ) and had a greater number of ventilator days ( $p=0.003$ ).

**CONCLUSION:** Patients transitioned to comfort care had greater number of ventilator days. Family involvement at hospitalization strongly correlated with transition to comfort measures in vascular surgery patients dying during inpatient hospitalization. The study shows limited use of advance directives and potential under utilization of palliative care consults at end of life in vascular surgery patients at our institution. Given the frequent occurrence of transition to comfort care at end of life in vascular surgery patients, who die during hospitalization, high risk vascular surgery patients should have early conversations regarding advance directives and palliative care consultation, should end of life decisions subsequently become necessary.

## **#3 NEEDS ASSESSMENT SURVEY FOR THE OPTIMAL DESIGN OF INTEGRATED VASCULAR SURGERY RESIDENCY PROGRAM CURRICULUM: A SURVEY OF MEMBERS OF THE SOCIETY FOR VASCULAR SURGERY AND PROGRAM DIRECTORS OF TRAINING PROGRAMS**

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**BACKGROUND:** The 0+5 integrated vascular surgery residency represents a novel and accelerated training paradigm. The optimal curriculum structure required to produce clinically competent vascular specialists has yet to be determined. We queried members of the Association of Program Directors in Vascular Surgery (APDVS) and active United States Society for Vascular Surgery (SVS) members to determine the ideal rotation structure and content for integrated vascular residencies.

**METHODS:** An anonymous, voluntary web-based survey was distributed via e-mail to members of the APDVS and to active United States members of the SVS using the UW Catalyst survey instrument. Data was analyzed to determine the optimal educational content for integrated vascular residency programs.

**RESULTS:** There was a significantly higher response rate from APDVS members (44, 39%) than from active SVS members (108, 3%). The majority (n=114, 75%) believed the requirement for 24 months of core surgical rotations should be concentrated within the first two-three years of residency rather than distributed over all five years. ICU and trauma surgery were viewed as the most beneficial rotations for learning clinical principles, while trauma surgery and acute care surgery ranked highest for surgical techniques and skills. Foregut/bariatric and hepatobiliary surgery rotations were seen as the least beneficial in terms of clinical principles and surgical technique. Vascular medicine and vascular radiology were the highest rated nonsurgical rotations. APDVS members were more likely to favor a separate didactic curriculum from general surgery for integrated residents than SVS members (p=0.047). Only 44 (29%) of responders advocated for dedicated research time within residency. Finally, 99 (65%) supported dedicated vascular laboratory training.

**CONCLUSION:** Although the integrated vascular surgery residency remains a relatively new paradigm, there is some consensus regarding the optimal structure to produce clinically and technically competent vascular surgeons. Standardization of some of these rotations and experiences may provide for a more cohesive and uniform training experience.

## #4 LEARNING CURVE FOR FENESTRATED EVAR (FEVAR)

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**BACKGROUND:** Learning curve effects (LCEs) for complex surgical procedures have been reported. FEVAR represents a complex endovascular procedure, and no good data exist to describe the case volume required to achieve “expertise”.

**METHOD:** Data were collected prospectively on all FEVAR procedures between June 2007 and January 2015. Performance measures included both continuous variables; Demographics, Length of Procedure (LOP), Fluoro Time (FT), Contrast Usage (CON), EBL and ICU/Hospital Lengths of Stay, and dichotomous variables; peri-operative death and major complications. Lowess smoothing was used to assess the underlying shape of trends between continuous variables and cumulative case experience. Trends identified were stratified based on number of fenestrations (FENS) per case.

**RESULTS:** During the study period, 137 FEVARs were performed. Evidence for a LCE was demonstrated in regard to LOP with FEVAR involving 3 FENS ( $p=.0001$ ). In this group, LOP was halved from approximately 300 to 150 minutes over the study period that correlated precisely with significant procedural changes. In regard to FT, a LCE was demonstrated for 2 and 3 FEN cases (60 to 20 min and 75 to 25 minutes,  $p=.006$  and  $<.001$  respectively) over the study period. The LCE for CON was significant for the first 60 cases ( $p=.02$ ) in all groups but then showed no change. There was no LCE for EBL or ICU LOS for any group. 3 FEN cases increased from 29% to 72% of the total cohort over the study period. LOP, FT and CON for 3 FEN cases are depicted in Figure 1. Overall morbidity and mortality were not different over the study period.

**CONCLUSION:** There was evidence for a learning curve effect in FEVAR performance as measured by Length of Procedure, Fluoro Time, and Contrast Usage that was strongest for cases involving 3 fenestrations. The shape of the learning curve was “step-like,” and appeared to be driven by specific procedural improvements rather than cumulative experience. Our findings suggest that adoption of these procedural improvements will steepen the learning curve (i.e., allow rapid improvement) for surgeons performing FEVAR in the future.



## **#5 REVISITING EPIDURAL ANALGESIA FOR AORTIC SURGERY: IS IT WORTHWHILE?**

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**BACKGROUND:** When successful, epidural analgesia is more effective than patient controlled analgesia (PCA) after open aortic surgery. However, inadequate epidural analgesia exposes patients to procedural risk and uses resources without return. This review was initiated to determine the effectiveness of epidural analgesia in open aortic surgery patients following recognition of a prevalence of inadequate epidurals at our institution.

**OBJECTIVE:** To determine: 1) how often epidural analgesia was inadequate and 2) whether epidural analgesia is the most effective postoperative pain control strategy for VA patients undergoing open aortic surgery.

**METHODS, DESIGN, AND SETTING:** Retrospective single institution review of patients undergoing open aortic surgery at the VA Puget Sound Health Care System from 2007-2013.

**PARTICIPANTS:** All patients who underwent open aortic surgery (n=169). Nineteen patients were excluded because of complicated postoperative courses resulting in the use of opioids for sedation rather than pain and prolonged intubation resulting in inability to assess pain scores.

**EXPOSURE:** Patients were categorized into groups: 1) successful epidural (epidurals were the primary strategy for pain control until transitioned to oral opioids); 2) inadequate epidural, (inadequate pain control with the epidural only as determined by the Acute Pain Service); 3) PCA only, (patients with a PCA who did not have an epidural placed).

**MAIN OUTCOME MEASURES:** Systemic opioid consumption and pain scores.

**RESULTS:** Epidural utilization rate was 85%, and 78% of these were determined to be inadequate. Opioid consumption and median pain scores were similar between patients with successful epidurals or PCA only and between patients with inadequate epidurals or PCA only ( $p>0.05$ ). Pre-operative opioid use history was predictive of an inadequate epidural, (Odds Ratio (OR) 4.6, Confidence Interval (CI) 1.0-21).

**CONCLUSIONS AND RELEVANCE:** The majority of epidurals used for post-operative pain control were inadequate in this series. PCAs alone were as effective as successful epidurals, and adding a PCA to an inadequate epidural did not decrease opioid consumption over the PCA only group. Individual institution level data should be reviewed to assess epidural analgesia as a postoperative pain control strategy, and to determine if changes in epidural management are needed to decrease the prevalence of inadequate epidurals.

## #6 RUPTURED ABDOMINAL AORTIC ANEURYSM - KNOWING WHEN NOT TO OPERATE

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**BACKGROUND:** Even in the rEVAR first era, there are still patients who will not survive their ruptured abdominal aortic aneurysm (rAAA). All previously published mortality risk scores include intraoperative variables and are not helpful with the decision to operate or in providing preoperative patient and family counseling. The purpose of this study was to develop a practical preoperative risk score to predict mortality following repair of rAAA, and compare it to other previously published scores.

**METHOD:** Data on all patients with rAAA presenting between Jan 1, 2002 and Oct 31, 2013 were collected. Linear discriminate analysis was used to train and test multiple predictive algorithms consisting of preoperative patient variables from which the rAAA mortality risk score was derived. Comparison was made to other predictive models by calculating the area under the receiver operating characteristic curves.

**RESULTS:** 303 patients presented during the study period. Fifteen patients died either in the ED, en route to surgery, or after choosing comfort care. Preoperative variables most predictive of mortality were preoperative SBP <70mmHg (OR 2.7, p<.05), pH <7.2 (OR 2.6, p<.05), age >76 (OR 2.1, p<.05) and creatinine >2 (OR 3.7, p<.05). Assigning one point for each variable, patients were stratified according to the preoperative rAAA mortality risk score (range, 0-4). For all repairs, patients with 1 point suffered 22% mortality, 2 points 70% mortality and 3 points 80% mortality. All patients with 4 points died. While there was a mortality benefit for rEVAR across all categories, patients with 4 points still had 100% mortality. While the VSGNE score, Glasgow aneurysm score and Edinburg score were validated in our contemporary EVAR-first dataset, our preoperative risk score was most predictive with AUC of 0.67.

Table 1: Mortality following Repair rAAA Stratified by Preoperative Risk Score

Preoperative Risk Score:	1 point	2 points	3 points	4 points
All patients	22%	70%	80%	100%
rEVAR	7%	37%	70%	100%
rOpen Repair	30%	80%	82%	100%

**CONCLUSION:** Existing scoring systems predict mortality after rAAA repair in our cohort but rely on intraoperative variables rendering them obsolete in preoperative decision-making. Our rAAA mortality risk score is based on four variables readily assessed in the emergency department, allows for accurate prediction of in-hospital mortality following repair of rAAAs in the EVAR-first era and does so more accurately than those previously described.

## **#7 PHYSICIAN MODIFIED ENDOVASCULAR GRAFTS FOR TREATMENT OF JUXTARENAL AORTIC ANEURYSMS: MIDTERM RESULTS FROM AN INVESTIGATOR-INITIATED INVESTIGATIONAL DEVICE EXEMPTION (IDE) CLINICAL TRIAL**

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**BACKGROUND:** To determine if a physician-modified endovascular graft (PMEG) is a safe and effective method for treating patients with juxtarenal aortic aneurysms who are deemed unsuitable for open repair.

**METHODS:** A non-randomized, prospective, consecutively enrolling investigational device exemption (IDE) clinical trial was used. Data collection began in April 2011 and data-lock occurred on December 1, 2014. The primary safety and primary efficacy end-points were used to measure treatment success.

**RESULTS:** During the 44-month study period, 56 patients were enrolled and 49 patients underwent PMEG. Aneurysm anatomy, operative details, and length of stay were recorded and included aneurysm diameter (mean 64.5mm, range 49-94mm), proximal neck length (mean 40.8mm, range 18.9-72.2mm), graft manufacture time (mean 56.5 minutes), procedure time (mean 165.5 minutes), fluoroscopy time (mean 41.8 min), and length of hospital stay (mean 4 days).

There were 122 fenestrations made for 91 renal arteries and 31 superior mesenteric arteries (SMA). One patient had an SMA stent placed, and renal arteries were stented whenever possible (91%). There were no open conversions or explants. There were no unanticipated adverse events. Thirty-day mortality was 6.1% (3/49). The primary efficacy end point was achieved in 91.8 % of patients (91.8 % technical success, freedom from migration, rupture, or conversion, type I or III endoleaks, or sac enlargement = 100%, 100%, 100%, 93.8%, 100%)

**CONCLUSIONS:** These midterm results are favorable and continue to verify our early report that endovascular repair with PMEG is safe and effective for managing patients with juxtarenal aortic aneurysms. PMEG has acceptable midterm rates of morbidity, mortality, and endoleak. In patients who are poor open surgical candidates who present with symptomatic or ruptured aneurysms, PMEG continues to be an extremely appealing option as reliable off-the-shelf solutions are not widely available.

## **#8 AORTIC OUTFLOW OCCLUSION PREDICTS RUPTURE OF ABDOMINAL AORTIC ANEURYSM**

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**OBJECTIVES:** Peak wall stress (PWS) of abdominal aortic aneurysms (AAA) has been demonstrated to be a better predictor of rupture than AAA diameter alone. However, PWS calculations are time-intensive and not widely available. We sought to identify surrogates of increased PWS and decreased aortic wall strength to better predict rupture risk.

**METHODS:** Patients treated at our institution from 2001-2014 for ruptured AAA (rAAA) were retrospectively identified. Patients with large (>60mm) non-rAAA with a preoperative contrast computed tomography scan were sequentially collected from 2009 for comparison. Demographics, vascular risk factors, infrarenal aortic calcification scoring using the Agatson's method, maximal aortic diameter and aortic outflow were recorded. Aortic outflow occlusion (AOO) was defined as complete total occlusion of the common, internal or external iliac artery. Computational fluid dynamics and finite element analysis (FEA) simulations were performed using a custom program in MATLAB for preliminary PWS calculations.

**RESULTS:** We identified 61 patients with rAAA with 15 patients rupturing at diameter of <60mm (small rAAA group, Table 1). Patients with small rAAA were more likely to have AOO compared to non-ruptured AAAs >60mm (26.7% v 8.2%,  $p=0.047$ ). Among all patients with rAAAs, those with AOO ruptured at smaller mean AAA diameters than patients without AOO (62.1  $\pm$  11.8mm v. 72.5  $\pm$  16.4mm,  $p=0.024$ ). Peripheral arterial disease (PAD) and chronic obstructive pulmonary disease (COPD) were more common in patients with small rAAA than in non-ruptured AAAs >60mm. Small rAAAs had similar mean Agatson's calcium score compared to large, non-rAAA (3022.8  $\pm$  2162.9 v 7409.9  $\pm$  5376.0,  $p=0.08$ ). PWS by FEA of a representative aorta modeled with AOO and without AOO constraints showed negligible change in PWS (Figure 1).

**CONCLUSION:** We demonstrate that AOO, PAD and COPD in AAA are associated with rAAA at smaller diameters. AOO and PAD appear to indicate systemic atherosclerotic burden rather than increase PWS and therefore, along with COPD may be markers of decreased aortic wall strength. Aortic calcium scoring may be unrelated to rupture risk. We therefore recommend consideration of early, elective AAA repair in patients with AOO and COPD.

## **#9 SUPERFICIAL FEMORAL VEIN AS A SOLUTION TO THE CHALLENGING PROBLEMS OF THE PRIMARILY INFECTED AORTA AND INFECTED GRAFTS- KELOWNA GENERAL HOSPITAL EXPERIENCE OVER THE LAST 8 YEARS**

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**BACKGROUND:** The primarily infected aorta and infected graft (including aortic tube graft, bifurcated graft, mesenteric bypass, cross femoral graft, and ileo-femoral patch) are challenging problems. There are different approaches to deal with these difficult issues: removal of infected material and replace with new antibiotic soaked graft, removal with extra-anatomical bypass, endovascular solutions with a stent graft, and removal of infected tissue with in situ replacement using superficial femoral vein (SFV). These problems are associated with high morbidity and mortality with all of the options. We would like to present and discuss our experience using the SFV for helping patients when dealing with the infected aorta and infected graft material.

**METHOD:** Review of patient charts since July 1, 2007 until present using electronic medical records and hospital medical records. Review of the medical literature and vascular journals was performed using keywords 'superficial femoral vein', 'primary infected aorta', and 'infected aortic grafts'.

**RESULTS:** Over the past 8 years, we have 22 cases utilizing SFV in situ reconstruction in infected areas - (13 infected aortic tube, mesenteric bypass or bifurcated grafts; 2 primarily infected aortas; 6 infected cross femoral bypasses; and 1 infected ileo-femoral patch). We have used single or bilateral SFVs in multiple configurations (tube graft, spatulated graft, and panel graft). Overall 30 day mortality is 5% (1/22) and there have been no limbs lost.

**CONCLUSION:** The SFV is a solution to the challenging problems of the primarily infected aorta and infected grafts with acceptable morbidity and mortality.

## **#10 SAVING LIFE AND LIMB: FES FOR THE ELDERLY WITH PAD**

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**BACKGROUND:** The Center for Disease Control estimates 8 million Americans and 200 million worldwide elderly adults are diagnosed with peripheral arterial disease (PAD). A classic symptom of PAD is intermittent claudication (IC). IC causes patients to walk less, become more sedentary, and experience a spiraling decline in overall cardiovascular health. Research has shown that exercise, vascular surgery and medications may provide benefits for patients with PAD. Research has shown that electrical stimulation to the muscles may increase perfusion to affected muscles and decrease IC. This NIH investigation is designed to assess if functional electrical stimulation (FES) to the plantar flexors (PF) and dorsiflexors (DF) while the patient is walking will decrease claudication, improve walking, and improve quality of life.

**METHODS:** This single blinded randomized controlled trial will assess 40 patients who have ABI scores of 0.40-0.90 and are 50-85 years old. This study will measure patients before and after 8 weeks of intervention and after an 8 week follow-up to assess any carry over effects. The experimental group (FES) patients receive electrical stimulation while walking up to 1 hour per day/ 6 days a week. The control group (WALK) patients are encouraged to walk a comparable amount but without FES. Walking distance will be measured using a 6 minute walk test. Time walked per day is measured by a daily log reported to the investigator each week. Claudication will be measured using a perceived pain intensity scale of 0-100 after the 6 minute walk test. Quality of life will be measured using the Peripheral Artery Disease Quality of Life (PAD-QOL) and Intermittent Claudication Questionnaire (ICQ).

**RESULTS:** Early findings have been completed with 7 patients (4 FES and 3 WALK). Mean ABI is 0.59 (FES = 0.59 and WALK = 0.60) in the patient's most involved leg. The mean age is 68 (FES = 70 and WALK = 66). Although this early sample size is extremely small, findings show a statistically significant ( $p < .05$ ) improvement in two measures. First, reduced claudication showed a difference of 29/100 points between the FES vs. WALK groups. A statistically significant improvement is also seen in the mean time walked per day during the eighth week of walking (FES = 53 minutes vs. Walk = 27 minutes).

**CONCLUSION:** Early findings are encouraging and show a statistically significant reduction in claudication and improved walking time per day for the FES group compared to the WALK group.

## **#11 CHARACTERIZATION OF THE TIBIAL VELOCITIES BY DUPLEX ULTRASOUND IN SEVERE PERIPHERAL ARTERIAL DISEASE AND CONTROLS**

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**INTRODUCTION:** The relationship between tibiopopliteal velocities (TPV) and peripheral arterial disease (PAD) severity is not well-understood. We sought to characterize TPV in severe PAD and non-PAD control patients.

**METHODS:** Patients with an arterial duplex ultrasound (DUS) with PAD evaluated over a 5 year period were retrospectively compared to non-PAD controls. Control DUSs were collected sequentially over a 6 month period, retrospectively. PAD patients included those with lifestyle limiting claudication (LLC) warranting revascularization and patients with critical limb ischemia (CLI) defined as ischemic rest pain, gangrene or a non-healing ischemic ulcer. For each tibial and popliteal artery peak systolic velocity (PSV; cm/s) was measured at the proximal, mid and distal segment of each artery and a mean PSV for each artery calculated. Mean PSV, ankle brachial indices (ABI), peak ankle velocity (PAV), average ankle velocity (AAV), mean tibial velocity (MTV) and ankle-profunda index (API) were compared using independent t-tests. PAV is the maximum PSV of the distal peroneal, posterior tibial (PT) or anterior tibial (AT) artery; AAV is the average of the distal PSV of the peroneal, PT and

AT; MTV is calculated by first averaging the proximal, mid and distal PSV for each tibial artery and then averaging the three means together; API is the AAV divided by proximal PSV of the profunda.

**RESULTS:** Preoperative DUS was available in 103 patients with PAD (68 CLI, 35 LLC) and 68 controls. Mean ABI in the PAD group was 0.64  $\pm$  0.25 compared to 1.08  $\pm$  0.09 in controls ( $p=0.006$ ). Mean PSV in PAD patients were significantly lower than controls at the popliteal (64.6  $\pm$  42.2 v 76.2  $\pm$  29.6,  $p=0.037$ ), peroneal (34.3  $\pm$  26.4 v 53.8  $\pm$  23.3,  $p<0.001$ ), AT (43.7  $\pm$  31.4 v 65.4  $\pm$  25.0,  $p<0.001$ ), PT (43.4  $\pm$  42.3 v 74.1  $\pm$  30.6,  $p<0.001$ ) and higher at the profunda (131.5  $\pm$  88.0 v 96.2  $\pm$  44.8,  $p=0.001$ ). Tibial parameters including PAV (52.6  $\pm$  45.0 v 86.9  $\pm$  35.7,  $p<0.001$ ), AAV (37.4  $\pm$  26.4 v 64.5  $\pm$  21.7,  $p<0.001$ ), MTV (41.7  $\pm$  30.4 v 65.4  $\pm$  21.7,  $p<0.001$ ) and API (0.43  $\pm$  0.45 vs 0.75  $\pm$  0.30,  $p<0.001$ ) were significantly lower in the PAD group than controls. Non-overlapping 95% confidence interval reference ranges were established for severe PAD and non-PAD controls.

**CONCLUSIONS:** This is the first study to characterize lower extremity arterial PSVs and ankle parameters in severe PAD and non-PAD controls. These early criteria establish reference ranges to guide vascular lab interpretation and clinical decision-making.

## **#12 NORMAL LOWER EXTREMITY DUPLEX FINDINGS IN PATIENTS WITH LEFT VENTRICULAR ASSIST DEVICES: A BASIS FOR VASCULAR LABORATORY INTERPRETATION**

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**BACKGROUND:** Left ventricular assist devices (LVADs) are increasingly used to prolong survival in patients with end stage heart failure and provide a bridge to cardiac transplantation. Continuous axial flow LVADs are preferred due to lower stroke incidence and device durability. Hemodynamic changes from continuous axial flow affect carotid duplex waveforms with diminished peak systolic velocity (PSV) and prolonged acceleration time. To date, however, lower extremity arterial duplex (LEAD) findings in patients with LVADs have not been characterized. Interpretation of LEAD studies poses a challenge when normal LEAD values for LVAD patients have not been reported. We sought to characterize normal LEAD findings in patients with LVADs to serve as a basis for vascular laboratory interpretation.

**METHODS:** A retrospective review was performed of all patients at a single institution with LEAD obtained after LVAD implantation from February 2003 to August 2014. Reason for LEAD in LVAD patients was examined and extremities categorized as symptomatic or asymptomatic. PSVs of common femoral (CFA), superficial femoral (SFA), popliteal, and tibial arteries in asymptomatic extremities of LVAD patients were recorded and compared to those of patients without LVADs who had received LEAD at our institution for nonischemic indications. Acceleration times were also measured of the CFA waveforms.

**RESULTS:** There were 248 patients with LVADs, 29 had LEAD of at least one lower extremity (34 extremities, 22 asymptomatic, 12 symptomatic) while their LVAD was present and 304 control non-LVAD patients in whom LEAD was performed for reasons other than PAD. Mean acceleration times of the CFA was 97 msec in the controls and 207 msec in the LVAD patients,  $p < 0.001$ . Mean PSVs (cm/s) in the CFA, mid SFA, popliteal, and posterior tibial arteries were 127.6 +/- 4.5, 103.7 +/- 5.0, 63.7 +/- 2.6, and 53.6 +/- 2.6 for the controls, and 49.5 +/- 4.9, 40.6 +/- 3.7, 27.2 +/- 2.2 and 25.5 +/- 2.3 for the LVAD patients;  $p < 0.001$  for all comparisons. Compared to controls, CFA, mid SFA, and popliteal PSVs were also decreased in asymptomatic extremities of LVAD patients (40.1 +/- 3.7, 40.7 +/- 4.3, 29.9 +/- 3.6,  $p < 0.001$  for all comparisons).

**CONCLUSIONS:** This is the first study to fully characterize duplex derived velocity waveforms in lower extremity arteries in patients with LVADs. PSV is significantly decreased throughout all lower extremity vessels, and common femoral artery acceleration time increased. This data serves as a basis for interpreting normal findings in lower arterial extremity duplex exams in patients with LVADs.



## **#13 MAJOR AMPUTATIONS IN THE ELDERLY: OUTCOMES AND RECOMMENDATIONS**

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**BACKGROUND:** As our population ages the very elderly patients (age 80 and older) constitute an increasing portion of a vascular surgery practice. These patients will often present with critical limb ischemia that results in a major amputation. The aim of this study is to evaluate the outcomes of patients 80 years and older that had a major amputation at our institution.

**METHOD:** All patients that were greater than 80 years old and underwent a major amputation from September 2009 to March 2014 were identified. Baseline demographics and revascularization procedures that were attempted prior to amputation were identified. The level of amputation was noted and classified as above knee (AKA) or below knee (BKA). Length of stay (LOS), Palliative Care (PC) consult, discharge status (to home or skilled nursing facility (SNF)) and short-term (30-days) as well as long-term mortality (1 year) were reviewed.

**RESULTS:** During this study period we identified 22 patients (13 females and 9 males) that were greater than 80 years old and underwent a major amputation. The mean age at amputation was 84.7 (range 80-92) and 6 patients underwent a revascularization procedure prior to amputation. A AKA was performed in 16 patients and a BKA was performed in 6 patients. Of the 22 patients, 3 died during the initial hospitalization. Of remaining 19 patients, only one patient was discharged home; the remainder were discharged to a skilled nurse facility. Four patients (18%) were fitted with prosthesis. Only three patients (14%) were counseled by PC before amputation. The mortality rate at one month was 27% and at one year was 59%. On multivariate regression, age, gender, level of amputation and indication for amputation did not correlate with mortality.

**CONCLUSION:** Major amputations are associated with a high short-term and 1 year mortality in the very elderly population. As the proportion of our population who will reach this age group increases steadily we will need to identify how best to counsel our patients as well as provide them with appropriate resources. This should be tailored to this vulnerable population and should be dedicated to early identification of disease, prevention of progression, appropriate intervention and early palliative care discussions.

## **#14 ASSESSMENT OF PERIPHERAL INTERVENTION USING SMART PHONE BASED THERMAL IMAGING: A FEASIBILITY STUDY**

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**OBJECTIVE:** Ankle brachial index (ABI) is a reliable quantitative determination of peripheral perfusion but requires specialized training, equipment, may be painful to patients, and requires sterilizing equipment between uses. Smart phone based thermal imaging utilizing a specialized camera, or forward looking infrared imaging (FLIR), is a portable device that can easily determine temperature. This study reports on the feasibility of using smart phone based FLIR to assess the outcome of peripheral vascular interventions by measurement of extremity temperature as compared to ABI.

**METHODS:** Patients who underwent lower extremity arterial revascularization procedures between March and June 2015 were evaluated. Patients who had both preoperative and postoperative ABI and thermal imaging were included in the analysis. For each patient, color spectrographs were obtained and surface temperature of each extremity was determined and recorded. Comparison between ABI and extremity temperature was performed. Thermal ankle brachial index (tABI) was calculated by dividing the temperature of the lower extremity by that of the greatest upper extremity.

**RESULTS:** Ten patients were identified who had both preoperative and postoperative ABI and thermal imaging in the study period. All were male. Mean age was 67 years (range 56-80). Four patients had diabetes. Mean preoperative ABI was 0.47 (n=8, range 0.15-0.76). 2 patients had preoperative toe-brachial indices, the mean was 0.23 (range 0-0.46). Mean preoperative extremity temperature was 77.6 degrees fahrenheit (63-92) . Mean postoperative ABI was 0.79 (n=8, 0.52-1.04). Mean postoperative TBI was 0.22 (n=2, range 0.2-0.23). Mean postoperative extremity temperature was 87 degrees fahrenheit (range 78.4-92.1).

**CONCLUSION:** This feasibility study has demonstrated that smart phone based FLIR thermal imaging may be useful to determine the outcome of vascular interventions in an efficient, low cost manner that promotes infection control. Further studies are needed to determine if this method is reliable enough to replace traditional ABI and TBI.

## **#15 VENUS STENTING FOR LOWER EXTREMITY CHRONIC VENOUS OCCLUSIVE DISEASE: THE VANCOUVER GENERAL HOSPITAL EXPERIENCE**

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Resident Competition Paper

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**ABSTRACT:** Introduction: Endovenous stenting of proximal central veins (EndoVS) has become a popular option for treatment of chronic venous disease of the lower extremity. We reviewed our initial experience with this procedure to assess results.

**METHODS:** Retrospective review of all EndoVS performed by vascular surgeons was included in this study. Patient demographics, procedure details, complications and follow-up data were all collected on to an Excel spreadsheet. Telephone interviews were conducted to assess whether patient experience any symptom improvement with the EndoVS and whether there are significant post-procedural pain.

**RESULTS:** EndoVS was performed in 14 patients from February 2013 to present. 12/14 (86%) of the patients had a prior history of DVT. Two of these patients had recent DVT due to May-Thurner Syndrome. Preoperative CEAP classification was C3,4,5 or 6 in 3,5,3 and 3 patients respectively. 13/14 patients had obstructive symptoms of venous claudication. All procedures were performed percutaneously in the operating room with mobile fluoroscopy, duplex US and IVUS guidance. Four patients had complete occlusion of the IVC requiring recanalization and IVC stenting. Post-procedure, 12/14 patients (86%) had clinical improvement in their symptoms. 4/14 patients had significant pain attributable to the procedure. None of the patients had worsening of their symptoms. Complications include one case of proximal stent migration requiring piecemeal retrieval of the misplaced stent endovenously.

**CONCLUSION:** Our initial experience with EndoVS is favorable. Routine use of IVUS was very helpful for these procedures. Long-term follow up is required to properly assess the durability of these procedures.

## **#16 INTRODUCTION OF AN IN-HOSPITAL SWING ROOM MODEL FOR RADIOFREQUENCY ABLATION OF VARICOSE VEINS IN THE CANADIAN HEALTH CARE SYSTEM**

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Presentation Type: Oral Presentation

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**BACKGROUND:** Venous insufficiency can significantly impair the quality of life of affected patients. Traditional surgical treatment of varicose veins runs a significant chance of short-notice cancellation due to the need of operating room facilities for higher acuity cases. Minimally invasive techniques, such as radiofrequency ablation (RFA) have evolved to rival traditional surgical approaches in efficacy, while minimizing operative morbidity. Although formal vein stripping of symptomatic varicose veins is a scheduled benefit under the British Columbia Medical Services Plan, the treatment of varicose veins using RFA is not yet formally recognized. We have established a first in Canada in-hospital swing room system to treat insufficiency of the greater saphenous vein (GSV), anterior accessory greater saphenous vein (AAGSV), and short saphenous vein (SSV) using lower acuity facilities to improve the efficiency and predictability of patient throughput and to reduce post-operative recovery time.

**METHOD:** This swing room model employs 2 adjacent procedure rooms dedicated to accommodate lower acuity outpatient cases. One anesthesiologist, 2 vascular surgeons, 3 circulating nurses, and 1 anesthetic aid are required. Each room is equipped with an ultrasound (US) machine while a radiofrequency generator is shuttled between rooms as required. Cases are performed under tumescence analgesia, with the option for intravenous sedation. Procedures are staggered such that vein mapping, patient preparation and US-guided venous access are gained in one room while RFA of similarly prepared venous segments are completed in the other. Patients with large varicose veins received US-guided foam sclerotherapy upon completion of the RFA. Compression stockings are applied to each treated leg before patients are discharged home directly from the procedure rooms, bypassing a recovery room. This model allowed up to 8 patients treated in a 7-hour procedure day, often each with multiple venous segments addressed.

**RESULTS:** Between April 2014 to July 2015, 108 patients were treated with RFA of the GSV, AAGSV and SSV for venous insufficiency. Repeat US on post-operative day 3 demonstrated successful thromboses of all treated segments. Difficult venous access resulted in conversion to open access in 1 patient and precluded treatment in another. Deep venous thromboses were identified in 3 patients, all of which were treated with anticoagulation with heparin and warfarin, with prompt resolution noted on follow-up US. No pulmonary embolisms were diagnosed. One scheduled case was cancelled due to time constraints.

**CONCLUSION:** This in-hospital swing room model offers efficient delivery of RFA for venous insufficiency while addressing the issue of short-notice patient cancellations due to higher acuity cases in the traditional operating room environment. Further evaluation is required to assess the feasibility of adapting this model for a wider scale in the public health care system.

## **#17 25 YEARS LATER: MESS (MANGLED EXTREMITY SEVERITY SCORE) REVISITED**

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**BACKGROUND:** Mangled Extremity Severity Score (MESS) was developed at our institution 25 years ago and has been a widely used scoring system for prediction of lower extremity amputation after trauma. Here we re-evaluate MESS using a contemporary cohort of patients at our institution, in order to evaluate its continued usefulness given the many changes in clinical care over the past three decades. Further, we look the prognostic value of MESS with regards to cost and resource utilization.

**METHOD:** A retrospective review of all trauma patients >18 years of age admitted to our institution with extremity injury and ischemia requiring revascularization between 2011 and 2014. Data sources included direct chart review, institutional trauma registry, and institutional financial records. Logistic and linear regression analyses were performed to evaluate the correlation of MESS with need for eventual amputation (primary outcome) as well as with length of stay, number of inpatient procedures, hospitalization cost, and discharge status (secondary outcomes). Statistical analyses were performed using JMP 11.0 software (SAS International Inc., Cary NC).

**RESULTS:** Between April 2011 and October 2014, a total of 48 trauma patients with lower extremity injury requiring revascularization were identified (mean age 37 years, range 18-87 years). 85% of patients were male and 46% had blunt mechanism of trauma. Of the 48 extremity injuries, 39 (81%) were ultimately salvaged (mean MESS 4.8  $\pm$  1.3) and 9 (19%) required amputation (mean MESS 9.1  $\pm$  1.3). Mean MESS between these groups showed statistically significant difference ( $p < 0.0001$ ) and  $MESS \geq 8$  predicted amputation in 100% of patients. For amputated patients, definitive amputation occurred at a range of 1 to 14 days after injury. Furthermore, MESS was an independent direct predictor of cost of hospitalization ( $p = 0.0195$ ), hospitalization length ( $p = 0.0039$ ), and number of inpatient procedures performed ( $p = 0.0020$ ). Finally, patients with  $MESS \geq 8$  who did not undergo early amputation, went on to delayed amputation with average 4.4 day longer hospitalization ( $p = 0.0053$ ), 4.9 more inpatient procedures performed ( $p = 0.0065$ ), and a trend towards increased hospital costs compared with controls.

**CONCLUSION:** MESS remains a clinically reliable yet simple scoring system to assist with early prognosis of trauma patients with serious extremity injuries. Over the past 25 years, mean MESS for salvaged and amputated limbs has not changed. However, the threshold for MESS predicting 100% need for eventual amputation has increased, possibly due to improvements in clinical care. Further, we find that MESS is an independent direct predictor of hospitalization cost and resource utilization in our contemporary cohort. Patients with high MESS who do not undergo early amputation, go on to delayed amputation with increased morbidity and cost of care.

## **#18 BLUNT AORTIC INJURY: A CALL FOR A NEW CLASSIFICATION SYSTEM AND TREATMENT STRATEGY**

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**OBJECTIVE:** The current SVS classification scheme for blunt aortic injury, while descriptive, does not guide therapy. We propose a simplified classification scheme based on our prior publication and robust experience with blunt aortic injury (BAI) that is descriptive and guides therapy.

**METHODS:** Patients presenting with blunt aortic injury from January 1999 to September 2014 were identified from our institution's trauma registry. We divided patients into the following groups; Group 1: prior to the first FDA-approved thoracic endovascular device (1999-2005); Group 2: FDA approved TEVAR devices (2005-2010); and Group 3: FDA approved BAI specific devices (2010-present). Our classification scheme was the following: "minimal" SVS Grade 1 and 2; "moderate" SVS Grade 3 and "severe" SVS Grade 4.

**RESULTS:** We identified 226 patients with a diagnosis of BAI (group 1-75 patients, group 2-84 patients, and group 3-67 patients). Mean injury severity score was 39.5 (range 16-75). BAI related in hospital mortality was significantly higher prior to endovascular introduction, 14.6% vs 4.8% ( $p=0.03$ ), but was not significantly different before and after BAI specific devices were introduced ( $p=0.43$ ).

146 patients (64.6%) underwent operative intervention (91 patients TEVAR and 55 patients open repair), with the majority (94%) sustaining a grade 3 or 4 injury. Survival in groups 2 and 3 was higher versus group 1 (86.4% vs. 73.8%), but was not significant ( $p=0.38$ ). The majority of patients (45 of 47 patients, 96%) in groups 2 and 3 with a "minimal" aortic injury (MAI) were managed non-operatively with no BAI related deaths. After 2007, follow up imaging was obtained in 38 (80%) patients with MAI and progression of the BAI was not observed. Twelve patients had stable appearing CT scans, 19 had complete resolution, and six had a decreasing size of injury noted.

**CONCLUSION:** Our experience confirms that BAI related mortality is now 5%. We propose simplification of the SVS grading criteria of BAI into "minimal", "moderate" and "severe" based on treatment differences between the three groups. MAI can be successfully managed non-operatively without followup imaging. "Moderate aortic injury" can be managed semi-electively with TEVAR and "severe aortic injury," requires emergency TEVAR.

## **#19 NOVEL USE OF NEXFIN™ FOR REAL TIME ASSESSMENT OF CARDIAC OUTPUT DURING ENDOVASCULAR STENTING IN A PATIENT WITH CHRONIC INFERIOR VENA CAVA OCCLUSION**

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**ABSTRACT:** The end point of endovascular stenting used in the treatment of inferior vena cava (IVC) occlusion is determined by venographic flow criteria. Improved venous return post stenting improves cardiac preload and hence cardiac output (CO), an outcome which may provide additional assessment of stenting efficacy. Continuous monitoring of CO typically requires invasive pulmonary arterial monitoring. We report the novel use of Nexfin™ as a non-invasive, reliable and safe method to continuously monitor CO in patients undergoing endovascular stenting for IVC occlusion. Monitoring of CO by Nexfin™ may provide a valuable intra-operative and real-time guide for surgeons on the therapeutic effectiveness of IVC stenting procedure.

## **#20 REPAIR OF A MYCOTIC AORTIC ANEURYSM CAUSED BY FUSOBACTERIUM NUCLEATUM**

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**BACKGROUND:** Mycotic aneurysms are a serious clinical condition with significant morbidity and mortality. Current therapies include aggressive debridement of the infected tissue, antibiotic therapy and if necessary, vascular reconstruction. A number of organisms have been implicated in this disease, however, Staphylococcus and Salmonella remain the most common. We report for the first time, repair of a mycotic aortic aneurysm caused by Fusobacterium Nucleatum.

**METHODS:** The patient is a 67-year-old male who was transferred from an outside hospital with 24 hours of general malaise, multiple falls without loss of consciousness and back pain. His past medical history is significant for giant cell arteritis on chronic prednisone, insulin dependent diabetes mellitus, hyperlipidemia and hypertension. His CTA from the outside facility demonstrated a dense inflammation and mycotic aneurysm of the left common iliac artery extending to the infrarenal aorta.

**RESULTS:** Upon admission, his exam was significant for atrial fibrillation with rate into the 120's and he was afebrile and normotensive. His laboratory studies were significant for leukocytosis of 20,000, creatinine 1.6, ESR 136, CRP 313.6. Blood cultures were all negative. After receiving cardiac and neurologic clearance, the patient underwent an open resection of the infrarenal and common iliac mycotic segment with placement of an aortobifemoral rifamin-soaked Dacron graft. Cultures of the tissue were positive for Fusobacterium nucleatum. His post-operative course was benign and he was discharged on long term IV antibiotic therapy and anticoagulation therapy for new onset atrial fibrillation.

**CONCLUSION:** A detailed review of the recent medical and procedural history of a patient who presents with a mycotic aneurysm is essential prior to repair. It is also prudent to consider timing of recent invasive procedures in patients when planning elective endovascular placement of stents or stent graft to avoid possible graft seeding and infection.



## **#21 REPAIR OF TYPE IIIB ENDOLEAK IN BRANCHED THORACOABDOMINAL ENDOGRAFT USING SANDWICH TECHNIQUE AND CHIMNEY GRAFT**

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**BACKGROUND:** We describe a technique consisting of deployment of standard off the shelf grafts to treat a type IIIb endoleak in a patient with a previous branched thoracoabdominal aneurysm repair. Herein we describe a case of a 79-year-old female with previous repair of a Crawford type II TAAA. The patient returns two years later with a type IIIb endoleak. This case describes endovascular repair to preserve the celiac artery and seal of the endoleak using a combined chimney sandwich technique.

**METHOD:** Case Report

**CASE SUMMARY:** A 79-year-old female presents with abdominal pain and a pulsatile abdominal mass. Two years earlier this patient underwent endovascular branch graft repair of a 6.6cm type II TAAA. CTA at presentation showed enlarged aneurysm and an SMA stent lying free in the aortic sac. The patient was treated with a Viabahn bridge stent of the SMA.

At three months a followup CTA demonstrated possible endoleak at the celiac/SMA level. Angiogram confirmed a large defect in the graft at the celiac axis (type IIIb endoleak) with no arterial collaterization between celiac artery and SMA. An 8 x 38 atrium stent was deployed in the celiac artery using transaxillary access. Via femoral artery access a 26 x 55 proximal aortic extension cuff was deployed proximal to the SMA branch. Due to residual endoleak a second 32 x 55 proximal extension cuff was deployed along with another 8 x 38 atrium stent to extend the celiac stent as a chimney. Completion angiogram demonstrated sealing of the endoleak and a patent celiac artery.

**CONCLUSION:** Using a combined chimney- sandwich technique appears to be effective for endovascular repair of type IIIb endoleak and preservation of visceral vessels. Longterm follow-up is required to determine performance and durability of this technique.

## **#22 EXPANDING THE OPTIONS FOR TREATING AORTOESOPHAGEAL FISTULA: A CASE REPORT OF TUBULARIZED EXTRACELLULAR MATRIX GRAFT AS A NOVEL AORTIC CONDUIT**

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**BACKGROUND:** Aorto-esophageal fistulas (AEF) are rare and life threatening. Endovascular stent grafts have provided technically feasible options to temporize the imminent threat of fatal hemorrhage and current methods for definitive aortic replacement include antibiotic-impregnated prosthetic grafts, cryopreserved homografts and extra-anatomic graft configurations. In this case report, we present a novel conduit option for aortic reconstruction in contaminated surgical fields and review various treatment strategies for AEF.

**CASE:** A 48-year-old male presented with hematemesis after undergoing chemoradiation for lung cancer. He underwent emergent thoracic endovascular aortic repair (TEVAR) for exclusion of an AEF and descending thoracic aortic pseudoaneurysm (PSA) noted on pre-operative CTA. Within 1 month of AEF exclusion the patient represented with a GI bleed and was found to have an aortic PSA proximal to the aortic stent graft. He was emergently transferred to our institution for definitive treatment which included temporary TEVAR exclusion of this PSA, esophageal diversion via cervical esophagostomy and esophageal ligation at the gastroesophageal junction, feeding jejunostomy tube placement and interval explant of aortic endograft with thoracic aortic reconstruction with tubularized extracellular matrix graft (TECMG), and esophageal debridement under hypothermic circulatory arrest.

**DISCUSSION:** While TEVAR improves 30-day mortality compared to open surgery for AEF, a durable survival advantage is not seen without concomitant aortic resection and reconstruction. Reduction of long-term infection risk is paramount. There are several reported graft options that have been used for aortic reconstruction in the setting of AEF. TECMG provides a bioscaffold for cellular ingrowth and tissue regeneration which may decrease the infection nidus compared to conventional and antibiotic-impregnated prosthetic grafts.

**CONCLUSION:** TECMG is a viable and safe reconstruction option for AEF.

## **#23 IVC FILTER PENETRATION INTO DUODENUM PRESENTING WITH HYPOTENSION AND GASTROINTESTINAL BLEEDING**

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**BACKGROUND:** The inferior vena cava (IVC) filter was developed as a device to prevent pulmonary embolisms in patients with contraindications to or who have failed systemic anticoagulation. Though prophylactic placement of removable IVC filters has increased, retrieval rates do not correlate. As a result, the prevalence of indwelling IVC filters is growing, as is the number of long-term complications of IVC filters. One of the most potentially serious complications includes filter penetration of the IVC. Most patients remain asymptomatic, but those that have penetration into nearby structures such as the aorta, duodenum, retroperitoneal space or ureter often become symptomatic and require intervention. Of the structures injured, the duodenum is involved nearly a quarter of the time. With patients exhibiting vague symptoms such as abdominal pain and GI bleeding, a thorough workup is required to correctly identify and manage patients with IVC filter penetration into the duodenum.

**METHODS:** In this case report, we discuss the open removal of a retrievable IVC filter from a 32 year-old male presenting with abdominal pain, anemia, and bloody stools. He was hypotensive and tachycardic, requiring fluid resuscitation. His past medical history included an episode of cavernous sinus thrombosis, after which he was placed on lifetime anticoagulation with warfarin. Five years prior to presentation, after sustaining a DVT from left lower extremity trauma, a temporary IVC filter was placed. Retrieval was not pursued by the patient due to lack of insurance. The IVC filter penetration into the duodenum was discovered upon esophagogastroduodenoscopy, and computed tomography was used to further characterize the extent of penetration. Management initially included a conservative approach; however, upon continued blood loss and hemodynamic instability, decision was made to undergo open cavotomy and repair of duodenal perforation through a retroperitoneal approach.

**RESULTS:** On post operative day 2, the patient was taken back to the operating room for evacuation of retroperitoneal hematoma, where no active bleeding source was found. Following this procedure, the patient did well, and was discharged on post operative day 8. He was discharged on warfarin and has been followed by hematology. He remains in good health without evidence of further adverse bleeding events.

**CONCLUSION:** Abdominal pain and GI bleed in a patient with previous IVC filter placement should prompt evaluation for filter perforation. EGD and CT were useful in establishing the diagnosis. In this case report, we demonstrate that open IVC filter extraction through a retroperitoneal approach is a safe and effective method of removal.

## **#24 FALSE LUMEN EMBOLIZATION WITH COVERED STENT AND ENDOANCHOR FOLLOWING STENT-GRAFT THERAPY FOR CHRONIC TYPE B DISSECTION WITH ANEURYSMAL DEGENERATION**

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**INTRODUCTION:** Stent-graft therapy has emerged as a safe and effective therapy for dissection related aneurysmal degeneration of the descending thoracic aorta (DRAD DTA). However, it is not uncommon for there to be persistent retrograde perfusion and expansion of the aneurysmal false lumen following stent-graft therapy.

**METHODS:** We report the case of a 64 year old woman with DRAD DTA who underwent stent-graft therapy in 2010. Follow-up computed tomography in 2012 demonstrated retrograde perfusion and expansion of the aneurysmal false lumen. At this time, the patient underwent re-intervention consisting of false lumen embolization with covered stent and iliac plug, in addition to embolization with coils. The patient had no expansion of her aneurysmal false lumen for several years. In 2015, however, follow-up computed tomography again demonstrated recurrent retrograde perfusion and expansion of the aneurysmal false lumen in the setting of proximal migration of the embolized covered stent. The patient returned to the endovascular suite for repeat false lumen embolization using covered stent and iliac plug with EndoAnchor therapy to prevent stent migration. Intraoperative DynaCT did not demonstrate evidence of retrograde perfusion of the aneurysmal false lumen.

**RESULTS:** Postoperative imaging confirmed lack of retrograde perfusion of the aneurysmal false lumen and stability of the aneurysmal false lumen. The patient remains clinically well at last clinical follow-up.

**CONCLUSION:** Stent-graft therapy of DRAD DTA has a not insignificant rate of continued retrograde perfusion and expansion of the aneurysmal false lumen. In this context, false lumen embolization with covered stent and EndoAnchor may enhance thrombosis and shrinkage of the aneurysmal false lumen. Further long-term study of this treatment strategy is warranted.

## **#25 JUXTA-ARTICULAR MYXOMA ASSOCIATED WITH A POPLITEAL ARTERY ANEURYSM AND ACUTE LIMB ISCHEMIA**

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Juxta-articular myxoma (JAM) is a rare soft tissue mass most frequently found in proximity to the knee, but not previously described to involve major vascular structures. Surgical resection is the only effective treatment and local recurrence is common, occurring in 34% of patients with follow-up in the largest case series.

The case is a 59-year old male who presented with acute ischemia caused by thrombosis of a popliteal artery aneurysm and embolization to all of the runoff vessels. After catheter-directed thrombolysis he underwent surgical bypass. At exploration he was found to have a gelatinous mass encasing the below-knee popliteal artery that was diagnosed as a JAM on final histology. The paucity of reported JAM cases in the literature leaves questions about the association of this tumor to our patient's presentation: causative or incidental.

## **\*#26 PANEL GRAFT REPAIR OF FEMORAL VEIN IN A PATIENT WITH FEMORAL VEIN CYSTIC ADVENTITIAL DISEASE**

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**BACKGROUND:** Adventitial cystic disease is a rare disease with only about 500 cases reported worldwide. About 80-85% of cases involve the popliteal artery. Few cases describe femoral vein involvement.

Herein we describe a case of a 31-year-old male with lower leg swelling found to have a cystic mass in the left groin. This patient underwent surgical resection of the cystic mass with panel reconstruction of the right common femoral vein with great saphenous vein and AV fistula creation.

**METHOD:** Case Report

**CASE SUMMARY:** A 31 year old, otherwise healthy, gentleman presents to the emergency room with a three-week history of progressively worsening right leg swelling. Ultrasound imaging showed an irregular 4.3 x 2.6 x 2.2 cm lobulated mass medial to the right common femoral vein suspicious of lymphocele or sarcoma that extrinsically compressed the common femoral vein. No flow was seen through the common femoral vein. A CT scan was subsequently done showing a 4.2 cm lesion with surrounding stranding in the medial aspect of the right femoral canal. A core biopsy was done describing soft tissue myxomatous changes and lymph node tissue negative for neoplasm. Soft tissue included macrophages filled with myxoid vesicles.

He was brought to the operating room by both general surgery and vascular surgery for resection of the right groin cystic mass and reconstruction of femoral vein. The cystic structure was identified and measured about 6 cm in size. The cyst was dissected from the sartorius laterally and adductor structures. The mass involved the anterior surface of the common femoral vein. No cystic components were left in the venous wall. 75% of the venous wall was removed. Saphenous vein from the ipsilateral leg was harvested and a panel graft was created for reconstruction. Three separate panels of vein were used to obtain adequate size for repair. A small arteriovenous fistula was also created. After reconstruction good flow was obtained from the fistula with doppler signals and flow to the reconstructed femoral vein. Perioperative anticoagulation was given to the patient. Calf compression devices were used postoperatively. Pathology of the specimen showed a large size vein with myxoid degenerative changes in the wall and destruction of elastic tissue consistent with cystic adventitial degeneration.

**CONCLUSION:** Cystic adventitial disease of the femoral vein is a rare vascular condition and should be suspected in patients with acute onset of leg swelling. Complete resection of cystic mass and reconstruction of the vessel is an effective treatment strategy in cystic adventitial disease; using greater saphenous vein panel graft for large reconstruction of vein produces excellent results.

## **#27 FAMILIAL INTERNAL MAMMARY ARTERY ANEURYSMS IN TWO PATIENTS WITH SMAD - 3 MUTATION**

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**BACKGROUND:** True aneurysms of the internal mammary artery are exceedingly rare and have been described in association with vasculitis or connective tissue disorders. SMAD-3 is an autosomal dominant mutation in the transforming growth factor- signaling pathway that is associated with aortic aneurysms, dissections of the arterial tree, as well as early onset osteoarthritis. Herein we describe two cases of familial internal mammary artery aneurysms in female siblings with SMAD-3 mutation.

**RESULTS:** A 49-year old woman presented with a ruptured 11x13mm left internal mammary artery (LIMA) aneurysm, 2 years following a Debakey type I aortic dissection that required a Bentall procedure and mechanical aortic valve replacement. The aneurysm was successfully embolized through left brachial artery access using Nester coils measuring 8mm, 4mm and 4mm in diameter. Follow-up CTA at 3 years demonstrated occlusion of the LIMA aneurysm.

The patients' older sister also suffered from a Debakey type I aortic dissection at the age of 46 and similarly underwent Bentall procedure with mechanical aortic valve replacement. At the age of 54, she was incidentally found to have an asymptomatic right internal mammary artery (RIMA) aneurysmal degeneration with four sequential aneurysms measuring 12x14mm, 9x8mm, 10x12mm and 14x14mm. The patient underwent successful endovascular coil embolization of her RIMA via left common femoral artery access using Nester 4mm, 8mm and Azure 6mm and 8mm diameter coils.

Both sisters have a known diagnosis of identical single nucleotide substitution in one allele of the SMAD-3 gene. The patients' younger brother also carries the same SMAD-3 mutation and suffered a Type B aortic dissection at the age of 49. He was successfully treated with thoracic endovascular aneurysm repair (TEVAR) and later required hybrid repair for aneurysmal degeneration of the visceral abdominal aorta. The patient has no known peripheral arterial aneurysms.

**CONCLUSIONS:** To our knowledge this is the first time familial internal mammary artery aneurysms have been described in two female siblings with SMAD-3 mutation. In our experience endovascular repair is a feasible and a safe option for peripheral aneurysm exclusion in patients with connective tissue disorders. Surveillance of the entire arterial tree is recommended in patients and family members with SMAD-3 mutations.

## #1 QUANTIFYING THE IMPACT OF GANTRY ANGLE CORRECTION DURING THORACIC ENDOVASCULAR ANEURYSM REPAIR

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**BACKGROUND:** Successful thoracic endovascular aneurysm repair (TEVAR) is contingent upon seal and fixation of the proximal graft. The aortic arch has a wide range of anatomic variability, and understanding that anatomy may impact optimization of device deployment. The purpose of this study was to quantitate the impact of gantry angle correction on proximal seal zone for patients with proximal descending thoracic aortic disease.

**METHOD:** 45 patients with descending thoracic aortic pathology that would require TEVAR with a Zone 2 or 3 deployment were evaluated. Demographic and imaging data were retrospectively reviewed. CT scans were evaluated using a 3-D workstation for centerline and angle analyses. The optimal gantry angle was determined to be the perpendicular side view of the leading (proximal) edge of the seal zone. Measurements were then taken of the seal zone at -10 and -20 degrees from optimal view to assess the impact of imperfect gantry angle correction.

**RESULTS:** The study included 29 men (64%) with mean age 68 years +/- 11. Thirty-four (76%) would require zone 2 deployment. Mean seal zone length was 26.1 mm +/- 9.1 along the centerline, with inner/outer curvature lengths of 19.1 +/- 6.5 and 33.4 +/- 12 mm, respectively. Primary measurements are shown in Table 1. Zone 2 seal zones were shorter and required less gantry angulation for an optimal view. Incomplete gantry angle correction affected both zone 2 and 3 seal zones similarly. At 10 and 20 degrees from optimal gantry angle, the loss in seal zone length is estimated to be 2.4 +/- 1.1 and 5.8 +/- 1.9 mm, respectively. These results were not different for men or women, nor were they influenced by age, BMI or height.

Table 1

All patients	Zone 2	Zone 3	p	Optimal Gantry angle
49.5 +/- 17	42.8 +/- 14	61.7 +/- 14	0.0003	
Diameter	30.0 +/- 4.5	30.8 +/- 4.9	28.9 +/- 3.1	0.23
Mean centerline length @ optimal view				
26.1 +/- 9.1	24.0 +/- 7.3	29.8 +/- 10.9	0.497	
MCL @ -10 degrees (% change)				
10.3 +/- 5.7	10.2 +/- 4.8	10.6 +/- 7.1	0.83	
MCL @ -20 degrees (% change)				
25.2 +/- 12.4	26.5 +/- 11.2	22.8 +/- 14.8	0.38	

**CONCLUSIONS:** Optimal gantry angle correction should be the goal of any TEVAR procedure. Zone 2 seal zones are shorter and require less gantry angulation than are zone 3 seal zones. Correction for optimal gantry angle impacts the expected proximal seal zone for zone 2 and 3 TEVAR. These data suggest that correction within 10 degrees of optimal is unlikely to significantly impact successful seal and fixation for most patients. At 20 degrees, however, substantial loss of seal zone can be expected.



## **#2 DEVELOPING A SIMULATION-BASED TRAINING PROGRAM TO TEACH VASCULAR SURGERY IN ARGENTINA**

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University of Washington, Seattle, Washington

**BACKGROUND:** Simulation-based training is now an integral part of residents training in the United States, however, it is not yet widely utilized in low and middle-income countries (LMIC). Residents in LMIC sometime have minimal exposure to vascular surgery and as the burden of vascular disease increases as the population ages, the need for well trained vascular surgeons also increases. We aimed to develop a novel vascular surgery training curriculum that incorporates simulation-based training for use with general surgery residents in Argentina. Our goal was to determine the efficacy of such a curriculum and its impact on the residents surgical skills and knowledge.

**METHOD:** A observational cohort study was conducted in order to evaluate a vascular surgery simulation-based training curriculum. This consisted of a course with two nine-hour sessions that included didactics as well as proctored skills stations. The skills stations included simulation-based training, using low cost simulators, and hands-on ultrasound training. General surgery residents from two hospitals in Buenos Aires, Argentina participated in the course, which was directed by a US board certified surgeon and a local vascular surgeon. The residents received questionnaires, pertaining to prior experience, knowledge and confidence with regards to vascular surgery, before and after the course.

**RESULTS:** Residents from the two hospitals included, completed the course between November 2014 and July 2015. Median scores pertaining to confidence in performing a vascular anastomosis (1-6 scale) improved from 1.7 to 5.1 ( $p=.003$ ). Residents overwhelmingly agreed with statements that learning vascular surgery skills in a simulated environment will improve their general surgery training experience and will make them better residents.

**CONCLUSION:** A vascular surgery training course incorporating didactic sessions and proctored skills stations, including hands-on ultrasound training and simulation-based surgical skills training, can improve self-efficacy and confidence among surgical residents. Collaboration across institutions from different countries is feasible and positively impacts the learning experience of surgical trainees.

### **#3 PERSISTENT LEFT SUPERIOR VENA CAVA- A CHALLENGE FOR VENOUS ACCESS**

SC Mostowy MD, Kelowna General Hospital, Kelowna, British Columbia

**BACKGROUND:** Persistent left Superior Vena Cava (SVC) is the most common variation of the thoracic venous system, occurring in 0.3% of the general population. It can be a challenge when confronting this anatomic variant during venous access. A case of a pacemaker insertion encountering this situation will be presented.

**METHOD:** A 69 year old woman with second degree AV block required a pacemaker. Standard approach via the left side was attempted. It was clear that the wires would not cross over to the right side of the heart despite many attempts with different catheters and wires. Venography demonstrated a left sided SVC.

**RESULTS:** The left sided access was aborted and then the right side was accessed. The dual chamber pacemaker was inserted without any difficulty using the right venous system to access the right ventricle.

**CONCLUSION:** Persistent left SVC can be a challenge for any type of venous access that requires positioning at the SVC/right atrial junction- such as perm-catheters for hemodialysis, Hickman lines, and port-a-catheters. This case of a pacemaker insertion illustrates the challenges that thoracic venous anatomy presents.

### **#4 THE FATE OF THE UNSTENTED SUPERIOR MESENTERIC ARTERY IN FENESTRATED ENDOVASCULAR AORTIC ANEURYSM REPAIR**

Rachel E Heneghan MD, R Eugene Zierler MD, Benjamin W Starnes MD,  
University of Washington, Harborview Medical Center, Seattle, Washington

**OBJECTIVES:** To evaluate the patency of the unstented superior mesenteric artery (SMA) after fenestrated EVAR (F-EVAR) using duplex ultrasound (DUS) and/or computed-tomography angiography (CTA).

**METHODS:** Patients with SMA fenestrations, scallops, or struts were identified from a database of patients who underwent F-EVAR at our institution between 2010 and 2014. Mesenteric DUS and CTA data were obtained at baseline and at 30-day, 6-month, 1, 2, and 3-year follow-up. The DUS parameter of SMA peak systolic velocity (PSV)  $\geq 275$  cm/s was used to detect  $\geq 70\%$  SMA stenosis. CTA was used to evaluate the patency of the SMA when DUS PSV was elevated, or if DUS was not performed.

**RESULTS:** Sixty-nine patients underwent endograft placement involving the SMA in association with F-EVAR. There were 41 fenestrations, 7 scallops, and 21 bare metal struts crossing the SMA. Forty-two patients had baseline and at least 30-day follow-up DUS SMA PSV measurements (28 fenestrations, 14 struts). Median follow-up was 1 year (range 30 days-3 years). Among the 42 patients with follow-up imaging, mean SMA PSV was 151 cm/s at baseline, 159 cm/sec at 30-day follow-up, 184 cm/sec at 6 months, 198 cm/sec at 1 year, 205 cm/sec at 2 years, and 170 cm/sec at 3 years. These differences were statistically significant at 6 months, 1 year, and 2 years when combined, and were significant in the fenestrated SMA group at 1 and 2 years ( $p=0.047$ ,  $p=0.047$ ) when velocities were separated into fenestrated versus strut crossed SMAs. Baseline velocities were not different between cohorts ( $p=0.73$ ). Despite the statistically significant elevation in velocities after F-EVAR, the mean PSVs remained well below the threshold velocity of 275cm/s for native atherosclerotic  $\geq 70\%$  SMA stenosis.

Fifty-four patients had at least 30-day follow-up with CTA, and all had widely patent SMAs at last follow-up. There was one secondary intervention for asymptomatic SMA stenosis requiring stent placement one year after F-EVAR. There were no endoleaks related to SMA fenestrations.

**CONCLUSIONS:** The unstented SMA in association with F-EVAR remains widely patent in the presence of fenestrations or struts and is not associated with endoleaks. Follow-up DUS and CTA surveillance confirms that SMA patency remains in the normal or  $<70\%$  stenosis range after F-EVAR.

### **#5 RENAL DUPLEX ULTRASOUND FINDINGS IN FENESTRATED ENDOVASCULAR AORTIC ANEURYSM REPAIR (FEVAR) FOR JUXTARENAL AORTIC ANEURYSMS**

Rachel E Heneghan MD, Benjamin W Starnes MD, R Eugene Zierler MD  
University of Washington, Harborview Medical Center, Seattle, Washington

**OBJECTIVE:** To characterize duplex ultrasound (DUS) findings and clinical outcomes associated with covered stent placement in renal arteries during fenestrated endovascular aneurysm repair (FEVAR) in order to determine if velocity criteria for native renal artery stenosis can be applied.

**METHODS:** Data from a prospectively maintained database of patients who underwent FEVAR between January 2010 and August 2014 were obtained prior to FEVAR (pre-operative or baseline) and at 30-day, 6-month, 1, 2, and 3 year follow-up. The DUS parameters of renal artery peak systolic velocity (PSV)  $\geq 200$  cm/s or renal-aortic velocity ratio (RAR)  $\geq 3.5$  were used to indicate  $\geq 60\%$  renal artery stenosis.

**RESULTS:** Forty-nine patients underwent placement of 88 covered renal artery stents during FEVAR. Forty-three patients with 80 stents had at least 30-day follow up. A  $\geq 60\%$  stenosis was identified in 7 renal arteries of 6 patients on baseline DUS, and these patients analyzed separately. The remaining 73 renal arteries were classified as normal or  $< 60\%$  stenosis at baseline with median PSV of 121 cm/s (IQR 95.7-142.8) and median RAR of 1.4 (IQR 1.11-1.65). There were no significant differences between the baseline and follow-up PSV at any time point. There were significant differences in the RAR at some time points, although median values remained below the  $\geq 60\%$  stenosis threshold. Some increased RAR values were attributed to low aortic velocities after repair. In 13 patients with 17 covered renal artery stents found to have PSV or RAR exceeding a  $\geq 60\%$  stenosis threshold, there was no evidence of renal artery stenosis by CTA, or renal dysfunction by GFR estimation, or renal volume decrease by three-dimensional analysis, in any of these patients. Of the 7 renal arteries with  $\geq 60\%$  stenosis at baseline, none showed evidence of restenosis at 1, 2, or 3 years.

**CONCLUSIONS:** Covered stent placement in non-stenotic renal arteries during FEVAR is safe and durable, with PSV and RAR remaining in the normal or  $< 60\%$  stenosis range in the majority of cases. When increases in PSV or RAR occur, they are not associated with clinically significant sequelae or in-stent stenosis on CTA. DUS velocity criteria for stenosis in native renal arteries appear to over-estimate the severity of stenosis in covered stents after FEVAR.

## **#6 ENDOVASCULAR REPAIR OF A BLEEDING COMMON CAROTID PSEUDOANEURYSM USING A COVERED STENT**

SC Mostowy MD, WT Tonogai MD, JR Harris MD  
Kelowna General Hospital, Kelowna, British Columbia

**BACKGROUND:** A common carotid false aneurysm is a challenge to repair. One that is bleeding with a presumed infectious etiology is even more difficult to deal with. A covered stent placed endovascularly to stop the bleeding can be a solution.

**METHOD:** A 59 year old man with a history of recurrent laryngeal carcinoma presented to the emergency room with active bleeding from the nose and mouth. He had a previous laryngectomy and radiation multiple times to the area. He had a very rigid neck with thickened soft tissues. Attempts were made by GI and ENT to deal with the extensive recurrent bleeding but were unsuccessful.

**RESULTS:** Angiography demonstrated a pseudoaneurysm of the common carotid artery. Due to the patient's anatomy and hostile neck, there were limited open surgical solutions. A covered stent was placed across the common carotid artery to successfully deal with the bleeding.

**CONCLUSION:** A bleeding infected false aneurysm of the common carotid is a frightening situation for a patient and their family. As well, it is a very difficult problem for physicians to deal with. A covered stent can solve the immediate problem of exsanguination. Realistically this is a temporary solution, however it is a useful one to be in a Vascular Surgeon's armamentarium. It can help stabilize a bleeding patient. Once stable, then appropriate decisions can be made with the patient and family.

### **\*7 MYCOTIC ABDOMINAL AORTIC ANEURYSM AFTER BACILLE CALMETTE-GUERIN THERAPY FOR BLADDER CARCINOMA.**

AL Rodriguez MD, E Quiroga MD

University of Washington, Seattle, Washington

**BACKGROUND:** Mycotic aortic aneurysms must be treated aggressively and expeditiously with a combination of antibiotic therapy and source control. While the most commonly thought causative organisms are Salmonella species or Staphylococcus species, other more rare organisms have been reported. One of those is Mycobacterium bovis, which can be the causal agent for mycotic aneurysms after therapy with BCG for bladder carcinoma.

**METHODS:** We are describing a case, and its management, of a Mycobacterium bovis abdominal aortic aneurysm in a patient who had previously undergone bacille Calmette-Guérin (BCG) therapy for bladder carcinoma.

**RESULTS:** A 77 year old male presented with six months of weights loss, fatigue and malaise and was noted to have a mycotic aortic aneurysm on CT-scan. He had a history of bladder cancer treated with BCG therapy three months before onset of symptoms. He was initially started on broad spectrum antibiotics and underwent a two staged surgical repair. He first underwent a right axillobifemoral bypass and aortic endograft placement. The endograft was done as temporizing measure and the patient subsequently underwent removal of the endograft as well as aortic ligation. Intra-operatively he was noted to have significant peri-aortic inflammation and purulent drainage was noted upon entering the aneurysm sac. Intraoperative cultures grew Mycobacterium bovis. At his ten-month follow-up he had completed a nine month course of Rifampin, Isoniazid and Ethambutol, and had a complete recovery with return to pre-hospitalization level of activity.

**CONCLUSION:** While Mycobacterium bovis is not a common organism involved in mycotic aneurysms, it should be considered in patients who have a history of BCG treatment for bladder cancer.



# Constitution & Bylaws

## Bylaws of Pacific Northwest Vascular Society

A Washington Nonprofit Corporation

*(Revised 10/19/2012)*

### ARTICLE I

#### NAME OF CORPORATION

The name of the corporation shall be the "Pacific Northwest Vascular Society," and it may sometimes be referred to in these Bylaws as the "Corporation."

### ARTICLE II

#### PURPOSES

The purposes for which the Corporation is formed are those set forth in its Articles of Incorporation.

### ARTICLE III

#### PRINCIPAL OFFICE

The principal office of the Corporation shall be the office of the current secretary-treasurer. The Corporation may have such other offices as may, from time to time, be designated by its Board of Directors.

### ARTICLE IV

#### MEMBERSHIP

- A. VOTING RIGHTS. Each active member in good standing shall be entitled to one vote on each matter submitted to a vote of the members.
- B. MEMBERSHIP. Membership shall be limited to physicians having an active practice in vascular disease. Members must meet one of the following requirements
1. Be certified by The American Board of Surgery.
  2. Be a Fellow of The American College of Surgeons, or of the Royal College of Surgeons of Canada.
  3. Hold a Certificate of Added Qualifications in Vascular and Interventional Radiology from the American Board of Radiology (or Canadian equivalent).
  4. Be a member of the Society of Interventional Radiology.



# CONSTITUTION & BYLAWS

5. Hold a Subspecialty Certificate in Cardiovascular Disease from the American Board of Internal Medicine (or Canadian equivalent).
6. Be a Fellow of the American College of Cardiology or the Society for Vascular Medicine and Biology.

Additionally, members must meet the requirements of one of the four classes of membership set out below.

C. CLASSIFICATION OF MEMBERSHIP. The members of the Corporation shall be divided into the following classes and shall be selected for membership based upon the criteria set out in connection with each class.

1. ACTIVE MEMBERS. All active members shall be physicians fulfilling membership requirements residing in the States of Alaska, Idaho, Washington, Oregon, Hawaii, and Montana, or the provinces of Alberta, British Columbia, and Saskatchewan, Canada.

Active members must fulfill at least one of the following criteria:

- a. Hold a certificate of competence in general vascular surgery, vascular and interventional radiology, or cardiology as recognized in the United States or Canada;
  - b. Previous major contribution to the field of vascular disease;
  - c. Membership in the Society for Vascular Surgery, the International Society for Cardiovascular Surgery, the Society of Interventional Radiology, or the Society for Vascular Medicine and Biology;
  - d. Should a person desiring membership meet none of the above criteria, that person may submit a list a major vascular reconstructions or interventions which have been performed, and which should include, but need not be limited to, at least fifty (50) consecutive major vascular reconstructions or interventions, which list will be reviewed by the Membership Committee of the Corporation and if approved by the Membership Committee, the applicant's name shall be in turn approved by the Board of Directors of the Corporation and the membership, pursuant to Paragraph D. of this Article.
2. ASSOCIATE MEMBERS. Associate membership shall be available to those who do not qualify for active membership, but who have an interest in vascular diseases. Candidates for such membership shall be proposed in writing to the Membership Committee through the Secretary-Treasurer and shall be selected pursuant to Paragraph D. of this Article.

# CONSTITUTION & BYLAWS

3. SENIOR MEMBERS. Senior membership status shall be granted to active members who have retired from the active practice of medicine who have requested transfer of their membership status to senior status by submission of such request in writing to the Board of Directors. Senior members shall be excused from paying corporate dues.
4. HONORARY MEMBERS. Honorary members shall consist of individuals who have made significant contributions to the discipline of vascular disease or to the Corporation. Candidates for honorary membership shall be proposed in writing to the Membership Committee of the Corporation through the Secretary-Treasurer and shall be approved by the Board of Directors and the general membership pursuant to Paragraph D. of this Article. Honorary members shall be excused from paying corporate dues and shall not be required to meet the minimum annual meeting attendance requirements.
5. FOUNDING MEMBERS. All members joining the Corporation in the 1983 and 1984, shall be additionally classified as founding members.

D. SELECTION OF MEMBERSHIP. Any physician meeting the general membership requirements for membership may submit an application for membership in the Corporation, which shall be available from the Secretary-Treasurer of the Corporation upon request of any member. Completed application forms signed by the individual requesting membership, one sponsor member and two endorser members shall be delivered to the Secretary-Treasurer of the Corporation at least four (4) months prior to the annual meeting, provided however, the signatures of a sponsor member and two endorser members shall not be required on founding members' applications. A non-refundable application fee determined by the Board of Directors shall be assessed each applicant. Applications received by the Secretary-Treasurer shall be reviewed by the Membership Committee of the Corporation which shall recommend acceptance or denial of the applicant's request for membership in the Corporation. The names of all individuals who are recommended for membership by the Membership Committee shall be submitted to a vote of the Board of Directors and, if approved by the Board of Directors, shall in turn be submitted to a vote of the membership at the Corporation's annual meeting, and shall be accepted as members upon receipt of a three-quarters (3/4) affirmative vote of the members present at the annual meeting.

E. CERTIFICATES OF MEMBERSHIP. Certificates or other evidence of membership in the Corporation may be issued. They shall exhibit the member's name, his class of membership, and shall be signed by the President and Secretary-Treasurer of the Board of Directors of the Corporation.

F. STATUS OF MEMBERSHIP. Membership in the Corporation shall be personal, shall not survive the death of any individual member, and may not be transferred by any means. A member may resign at any time by written notice to the Corporation.

A member may be expelled for unprofessional or unethical conduct under the following circumstances. Charges of unprofessional or unethical conduct against any member of the Corporation which challenge that physician's right to continued membership may be submitted by any member to the Board of Directors of the Corporation. Such charges must set forth specific grounds for such unprofessional or unethical conduct and must be in writing. The member whose conduct is being challenged shall be notified of the charge in writing and shall be provided with an opportunity to reply to the charge. Both the challenge and the member's response shall be submitted to a vote of the Board of Directors who may expel such member by the affirmative vote of two-thirds (2/3) or more of the Directors. The Board of Directors' vote shall be announced at the next annual meeting and may be overruled by a three-fourths (3/4) vote of those members present at the annual meeting.

In the event any active member's dues shall remain unpaid for a period of one (1) year, such member shall be dropped from membership after giving notification to that member at least three (3) months prior to the effective date of lapse of such member's membership.

G. ANNUAL MEETING. The annual meeting of the members shall be held at such time and at such place as shall be determined by the Board of Directors and shall be announced to the membership by written or printed notice stating the place, day and hour of any meeting, which shall be delivered either personally or by mail to the members not less than ten (10) nor more than thirty (30) days prior to the date of such meeting.

The deliberations of the Board of Directors shall be reported by the Secretary-Treasurer to the membership at the annual meeting. The reports of the Nominating Committee and Membership Committee as well as other committees shall also be presented to the membership during the annual meeting.

H. MEMBERSHIP ACTION WITHOUT MEETING. From time to time, other business may be transacted by ballot of the membership tabulated one month from date of mailing, subject to ratification by the full membership at the next annual meeting.

# CONSTITUTION & BYLAWS

- I. SPECIAL MEETINGS. Special meetings of the membership may be held at such time and at such place as shall be determined by the Board of Directors and shall be announced to the membership by written or printed notice stating the place, day and hour of any meeting which shall be delivered either personally or by mail to the members not less than ten (10) nor more than thirty (30) days prior to the date of such meeting.
- J. QUORUM. The members present at a meeting shall constitute a quorum to transact the business of a meeting of the membership except as otherwise provided in the Articles of Incorporation or these Bylaws.
- K. DUES. Initiation fees, dues and assessments shall be levied by the Board of Directors and approved by the membership at the annual meeting of the Corporation provided, however, honorary members and senior members shall be exempt from the payment of dues.
- L. SCIENTIFIC SESSIONS. Corporation may, from time to time, sponsor scientific meetings, which may be attended by any physician, whether or not such physician is a member of the Corporation.

## **ARTICLE V**

### **BOARD OF DIRECTORS**

- A. GENERAL POWERS. The affairs of the Corporation and its business and property shall be managed by its Board of Directors.
- B. NUMBER AND QUALIFICATION OF BOARD OF DIRECTORS. The number of Board of Directors shall be not less than four (4) nor more than ten (10) and shall consist of the President, the President-Elect, the immediate Past President, the Secretary-Treasurer, and six (6) Directors who shall be elected at large from the membership.
- C. TERM OF OFFICE. The members of the Board of Directors who are members by virtue of their office in the Corporation shall serve a term coincident with their term of office. The members of the Board of Directors who are Directors-at-large shall be elected to three-year terms. Initially, three-at-large members of the Board of Directors shall be elected, one to serve a three-year-term, one to serve a two-year-term, and one to serve a one-year-term. Due consideration shall be given to regional representation in electing such Directors. :

# CONSTITUTION & BYLAWS

- D. **REGULAR MEETINGS.** The Board of Directors shall hold an annual meeting at the annual meeting of the membership of the Corporation, which shall be held without any other notice than this Bylaw. The Board of Directors may provide, by resolution, the time and place for holding additional regular meetings without other notice than such resolution. Financial support will be provided for active duty members of American and Canadian Armed Forces. The amount of support will be determined by the Executive Committee.
- E. **SPECIAL MEETINGS.** Special meetings of the Board of Directors may be called at the discretion and pleasure of the President or upon written notice of any two (2) members of the Board of Directors. Such meetings shall be held at the principal office of the Corporation or at such other place as the director or directors calling the meeting of the Board of Directors shall be limited to the purpose or purposes stated in the notice of the meeting provided, however, if all members of the Board of Directors are present, other matters may be taken up by unanimous consent.
- F. **NOTICE.** Notice of all meetings of the Board of Directors, with the exception of the regular annual meeting, shall be given to the Board members and Advisory Board members at least two (2) days before the meeting by written notice delivered either personally or sent by mail or electronic communication to each director at his address as shown on the records of the Corporation. Any director may waive notice of any meeting. The attendance of a director at any meeting shall constitute a waiver of notice of such meeting, except where a director attends a meeting for the express purpose of objecting to the transaction of any business to be transacted at the meeting need not be specified in the notice or waiver of notice of such meeting unless specifically required by law or by the Bylaws.
- G. **QUORUM.** A minimum of one half (1/2) of the Board of Directors shall be required to constitute the quorum for transaction of business at any meeting of the Board of Directors. If less than this number of directors is present at any meeting, the majority of the directors present may adjourn the meeting from time to time without further notice.
- H. **BOARD DECISIONS.** The act of a majority of the directors present at a meeting at which a quorum is present shall be the act of the Board of Directors.
- I. **COMPENSATION.** Members of the Board of Directors shall not receive any stated salaries for their services. Nothing herein contained however shall be construed to preclude any director from serving the Corporation in any other capacity and receiving compensation therefor. By resolution of the Board of Directors, a fixed sum and expenses of attendance, if any, may be allowed for attendance at any regular or special meetings of the Board of Directors.

# CONSTITUTION & BYLAWS

- J. MINUTES. Minutes of all proceedings of the Board of Directors shall be maintained by the Secretary of the Corporation.
- K. COMMITTEES. The President, upon the advice of the Board of Directors, may designate and appoint such committees as he may deem necessary, either as special or permanent committees, to assist him. The following committees shall be permanent committees: Membership Committee, Nominating Committee, Program Committee, Committee on Arrangements for the Annual Meeting, Auditing Committee and Bylaws Committee.

The Membership Committee shall consist of one (1) of the senior-at-large directors, who shall serve as chairman, and one (1) of the junior-at-large directors plus one (1) other member of the Corporation. The Secretary-Treasurer shall be an ex-officio member. The Committee shall recommend individuals to be proposed as members of the Corporation to the Board of Directors.

The Nominating Committee shall consist of the immediate Past President and the one (1) member of the Corporation appointed by the incoming President and shall nominate corporate officers to be submitted to a vote of the membership at the annual meeting. The Secretary-Treasurer shall be an ex-officio member.

The Program Committee, the Committee on Arrangements for the Annual Assembly, and the Auditing Committee shall be appointed annually by the incoming President with the advice of the Board of Directors, and shall serve a term which coincides with the term of the incoming President.

The Auditing Committee shall audit the books of the Corporation and present its report to the Corporation's membership during the business portion of each annual meeting.

The Bylaws Committee shall consist of one (1) of the senior-at-large directors who shall serve as chairman, and one (1) of the junior-at-large directors plus one (1) member of the Corporation. The Secretary-Treasurer shall be an ex-officio member.

All committees shall be chaired by a member appointed by the President with the advice of the Board of Directors.

Chairman of the Membership Committee and the Bylaws Committee shall be appointed by the President from those members of the Board of Directors required by the Bylaws to be members of the respective committee.

- I. GIFTS. The Board of Directors may accept, on behalf of the Corporation, any contributions, gift, bequest, or device for any purpose of the Corporation.

## **ARTICLE VI OFFICERS**

- A. OFFICERS. The officers of the Corporation shall be a President, President-Elect, and Secretary-Treasurer. Such officers shall have the authority and perform the duties as prescribed from time to time by the Board of Directors.
- B. ELECTION AND TERM OF OFFICE. The Nominating Committee shall submit a slate of proposed officers to the membership at the annual meeting and nominations may also be made by active members from the floor of the annual meeting. The officers of the Corporation shall be elected by majority vote of the active members from the active members of the Corporation at the annual meeting of the membership provided a quorum is present. The President-Elect shall be elected for a one (1) year term, and thereafter shall fulfill the office of the President for a one (1) year term. The Secretary-Treasurer shall be elected for a three (3) year term. Each such officer shall hold office until his successor has been duly elected and qualified.
- C. POWERS AND DUTIES OF OFFICERS. The President shall supervise all activities of the Corporation, execute all instruments on its behalf, and preside at all meetings of the Corporation and the Board of Directors at which he may be present. He shall have such powers and shall perform such duties as may, from time to time, be specified in these Bylaws or in resolutions or other directives of the Board of Directors. He shall coordinate the work of the officers and committees of the Corporation in order that the purposes of the Corporation may be promoted and shall perform such duties as are usually inherent in such office. The President shall appoint the members of all standing and ad-hoc committees not otherwise appointed by those Bylaws, and shall serve as an ex-officio member of such committees. Successors to vacated offices of the Corporation shall be appointed by the President until the position is filled at the next annual meeting.

The President-Elect shall perform the duties of the President in the absence of the President, or in the case of the inability of the President to act, and shall perform such other duties as the President may designate. In the absence or incapacity of both the President and the President-Elect, the position shall be assumed by a President Pro-Term, elected by those members of the Board of Directors present at the meeting.

The Secretary-Treasurer shall keep the minutes of all meetings of the Corporation and of the Board of Directors and shall keep all other records of the Corporation. S/he shall be primarily

responsible for giving notice of all meetings held by the Corporation or the Board of Directors, shall conduct all correspondence of the Corporation, and shall issue written reports of the preceding year's transactions to all members which shall be read to the Board of Directors and to the membership at the annual meeting. The Secretary-Treasurer shall have custody of all funds of the Corporation and shall keep a full and accurate account of the receipts and expenditures of the Corporation; shall make disbursements in accordance with the approved budget as authorized by the Corporation, the Board of Directors, or any committee; shall maintain bank accounts in the name of the Corporation in depositories designated by the Board of Directors; and shall render periodic financial annual Treasurer's report for the membership and for audit by the Auditing Committee. The Secretary-Treasurer shall have such other powers and shall perform such other duties as may, from time to time, be specified in resolutions or other directives of the Board of Directors.

- D. REMOVAL. Any officer may be removed by the Board of Directors whenever, in its judgment, the best interests of the Corporation would be served thereby.
- E. VACANCIES. A vacancy in any office because of death, resignation, removal, disqualification, or other cause may be filled by the President of the Corporation for the unexpired portion of the term.

## **ARTICLE VII BOOKS AND RECORDS**

The Corporation shall keep correct and complete books of all proceedings of its membership, Board of Directors and committees having and exercising any of the authority of the Board of Directors, and shall keep, at the principal office of the Corporation, a recording giving the names and addresses of the members of the Corporation entitled to vote.

## **ARTICLE VIII FISCAL YEAR**

The fiscal year of the Corporation shall begin on the 1st day of January of each year and end at midnight on the 31st day of December of such year.



# CONSTITUTION & BYLAWS

## **ARTICLE IX SEAL**

The Board of Directors shall provide a corporate seal which shall be a standard form with the name of the Corporation: "Pacific Northwest Vascular Society."

## **ARTICLE X INDEMNIFICATION**

The Corporation shall indemnify any present or former director, officer, employee, or agent of the Corporation for expenses and costs (including attorney's fees), actually and necessarily incurred by him in connection with the defense or settlement of any pending or threatened action, suit, or proceeding to which he is made a party by reason of his being or having been such official, except in relation to matters as to which he shall be finally judged to be liable for willful misconduct amounting to bad faith. Such indemnification shall not be deemed exclusive of any other right to which such indemnified person may be entitled under the Articles of Incorporation of Bylaws or under any agreement or vote of directors, insurance purchased by the Corporation, or other rights.

## **ARTICLE XI CONSTRUCTION OF TERMS AND HEADINGS**

Words used in these Bylaws shall be read as masculine or feminine gender and as the singular or plural, as the context requires. The captions or headings in these Bylaws are for convenience only and are not intended to limit or define the scope of effect of any provision of these Bylaws.

## **ARTICLE XII WAIVER OF NOTICE**

Whenever any notice is required to be given under the provisions of RCW Section 24.03 et seq., or under provisions of the Articles of Incorporation or the Bylaws of the Corporation, a waiver thereof in writing signed by the person or persons entitled to such notice, whether before or after the time stated therein, shall be deemed equivalent to the giving of such notice. All such waivers shall be filed with the corporate records or be made a part of the minutes of the relevant meeting.

## **ARTICLE XIII AMENDMENTS**

The Bylaws and the Articles of Incorporation of the Corporation may be amended, altered, or repealed at the annual meeting of the Corporation by a two-thirds (2/3) affirmative vote of the members present, provided there is a quorum of the membership present at such meeting. For the purpose of amending, altering, or repealing the Bylaws, a quorum shall consist of one-third (1/3) of the Active members of the Corporation.

KNOW ALL MEN BY THESE PRESENTS: The undersigned Secretary of Pacific Northwest Vascular Society does hereby certify that the above and foregoing Bylaws of said Corporation were duly adopted by the Board of Directors as the Bylaws of the Pacific Northwest Vascular Society and that the same do now constitute the Bylaws of said Corporation.

*Dated this 19th day of October, 2012*

Benjamin W. Starnes, MD  
Secretary-Treasurer



# 2015 Membership

**Bruce A. Adye, MD (Active)**

520 Mary Street  
Suite 520  
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Tel: 812-424-8231  
Fax: 812-464-8352  
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**Charles A. Andersen, MD, FACS (Active)**

Madigan Army Medical Center  
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## NOTES



# IN MEMORIAM



## Alexander Whitehill Clowes, MD

Alexander (Alec) Whitehill Clowes, professor of surgery at the University of Washington and renowned researcher in vascular diseases, died of a brain glioblastoma on July 7, 2015, at the age of 68.

Alec was born into a family with a legacy of medical research. His forbearer, Sir William Clowes, physician to the admiral of the British fleet as it fought the Spanish Armada, published in 1588 one of the earliest textbooks on surgery in the English language. Alec's grandfather was George Henry Alexander Clowes, PhD, the scientist and mastermind behind the purification of insulin for clinical use, and his father, George Henry Alexander Clowes, Jr., was an academic surgeon and researcher at Case Western Reserve and Harvard.

It therefore, is no surprise that Alec's favorite memories were of science classes in high school (Phillips Exeter Academy, 1964) and college (Harvard College, 1968) followed by his own laboratory experience in Sheffield, England, during medical school (Harvard Medical School, 1972). Despite his original intention to restrict his career to research, Alec discovered profound enjoyment in patient care. He switched to concentrate on a career in academic surgery.

He obtained his general surgery training at Case Western Reserve in Cleveland, Ohio, between 1972 and 1979, and advanced training in vascular surgery with Dr. John A. Mannick at the Peter Bent Brigham Hospital in Boston (1979-1980). His thoughts never far from research, he interrupted his general surgery residency to work in the laboratory of Dr. Morris Karnovsky at Harvard Medical School. It was during this period (1974-1977) that Alec developed his life-long interest in vascular biology and arterial wound healing.

In 1980, at the conclusion of his training, Alec departed his native New England for Seattle, joined the faculty of the Department of Surgery at the University of Washington School of Medicine, and never looked back. He rose through the ranks to Professor of Surgery in 1990, Acting Chairman of the Department of Surgery from 1992 to 1993, and Chief of the Division of Vascular Surgery from 1995 to 2007. No offers from other institutions could lure him away. He developed an intense loyalty to the University of Washington where he found a cooperative environment that nurtured innovation, research, and outstanding patient care.

Throughout his years at the UW, Alec's focus remained on his research, the training of physicians for careers in academic vascular surgery, and the care of patients with vascular diseases. Along the way, he assumed leadership responsibilities in numerous national and international professional organizations. The National Institutes of Health funded his research for a third of a century, an astonishing record. His efforts engendered many honors and awards; most recently Alec received a Lifetime Achievement Award from the Society for Vascular Surgery. His collected scientific publications fill over six volumes.

Despite the acclaim of his peers, Alec remained a modest person. Nothing gave him more professional satisfaction than witnessing the success of his students and colleagues. A generation of young vascular surgeons and investigators consider Alec their role model as a leader who inspired with his intellect and with the warmth of his friendship and collegiality. He considered his greatest achievements to be the care he gave his patients and his mentoring of young physicians.

Alec and Susan Detweiler found great happiness together in their marriage in 2000 after Alec was widowed in 1998 (Monika Clowes). Alec delighted in the family life he shared with Susan's children, Aaron and Amanda, as he experienced their college and graduate school years, family vacations and, later, their marriages. Being a grandfather to Aaron's daughters, Charlotte and Claire, and Amanda's daughter, Alice, he said, was "the joy of my life."

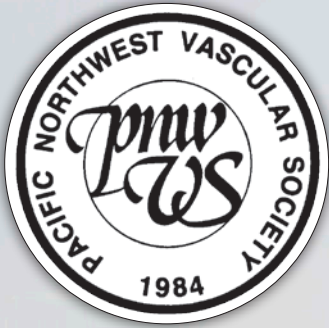
As the Clowes family patriarch and president of The Clowes Fund since 2001, Alec provided leadership for his family's collaboration in philanthropy in Seattle, Indiana, and New England. Alec wrote a biography (forthcoming 2016, Indiana University Press) of his paternal grandfather, George Henry Alexander Clowes, who played a pivotal role in the early history of insulin and established the Fund.

A long-time member of the Board of Trustees of the Seattle Symphony, Alec was particularly proud to have been involved in the building of Benaroya Hall, and more recently, the recruitment of the Symphony's new music director, Ludovic Morlot. Alec, who considered music essential to life, contributed his energy to furthering music education in under-served schools through The Clowes Fund.

Admired by his family and friends for his elegant mind, truly kind nature and generous spirit, Alec leaves a hole in the universe impossible to fill.

Alec is survived by his wife, Susan Detweiler, her children Aaron Patterson (Erin) and Amanda Lovelace (Blake), and granddaughters Charlotte, Claire, and Alice; by his mother Margaret Jackson Clowes; by his sisters Margaret Bowles (Frank) and Edith Clowes (Craig Huneke), and his brother Jonathan Clowes (Evelyn); and by ten nieces and nephews. Alec's brother Thomas Clowes (Markie) died in 2010. This diverse tribe love Alec dearly and will miss him forever.

Please enjoy the Dr. Clowes Lifetime Achievement Award Video [here](#).



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# NOTES