

FINAL
PROGRAM



PACIFIC NORTHWEST VASCULAR SOCIETY

PNWVS 2018 ANNUAL MEETING

November 1-2, 2018

Seattle, Washington at The Edgewater Hotel

www.pacificnwvascular.org

CORPORATE PARTNERS - SPECIAL THANKS

PNWVS is gratefully acknowledges the following companies for grants, in kind support and sponsorships:

Abbott St. Jude Medical - Educational Grant

Medtronic - Women in Surgery

Philips - in kind equipment support for the POCUS course

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2018 Annual Meeting

November 1-2, 2018
Seattle, Washington
The Edgewater Hotel

CONTACT INFORMATION

Pacific Northwest Vascular Society

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Anacortes, WA 98221

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(F) 360-261-6077

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www.pacificnwvascular.org

TABLE OF CONTENTS

2	Special Thanks
3	Meeting Information
4	Table of Contents
5	Executive Officers and Councilors
6	Meeting at a Glance
8	New Members
8	Past Meetings
9	Past Officers
13	Invited Lecturer
14	Former Invited Lecturers
15	Intended Audience
15	Learning Objectives
18	Disclosure Statement
19	Accreditation Statement
21	Scientific Session Agenda
35	Abstracts
81	Constitution and Bylaws
93	2018 Membership Listing
106	2018 Save the Date
107	Notes

2018 PNWVS EXECUTIVE OFFICERS AND COUNCILORS

Niten Singh, MD	President
Brian Matteson, MD	Immediate Past President
Nam Tran, MD	President-Elect
Brian Ferris, MD	Secretary-Treasurer
Matthew Sweet, MD	Program Chairman
Glen Roseborough, MD	Senior Councilor (Incoming Secretary Treasurer)
Keith Baxter, MD	Senior Councilor
Christian Hamlet, MD	Middle Councilor
Jeff Pasenau, MD	Middle Councilor
Enjae Jung, MD	Junior Councilor
Sherene Shalhub, MD	Seattle Arrangements Chair

MEETING AT A GLANCE

THURSDAY, NOVEMBER 1, 2018

- 3:00 pm – 8:00 pm **Registration Open – Fourth Floor Foyer**
- 4:30 pm – 5:30 pm **Executive Council Meeting – Cascade Room**
- 5:30 pm – 6:00 pm **Business Meeting – Cascade Room**
- 6:00 pm – 6:30 pm **ePoster Session – Olympic Ballroom**
- 6:30 pm – 7:00 pm **POCUS Didactic Session – Gene Zierler, MD – Rainer Room**
- 6:30 pm – 8:00 pm **Taste of Seattle Reception - Olympic Ballroom Terrace**
- 7:30 pm – 8:30 pm **Personal Branding in Vascular Surgery:
A Women in Surgery Event
Sherene Shalhub, MD - Moderator**
- 7:30 pm – 8:30 pm **Past Presidents Dinner (by invitation only)**

FRIDAY, NOVEMBER 2, 2018

- 7:00 am – 7:45 am **Breakfast Buffet with Exhibits – Terrace Room and Patio**
- 7:00 am – 5:00 pm **Registration Open – Fourth Floor Foyer**
- 7:45 am – 8:00 am **Presidential Welcome – Olympic Ballroom**
- 8:00 am – 9:30 am **SCIENTIFIC SESSION I: AORTIC**
- 9:00 am – 9:30 am **CASE PRESENTATIONS**
- 9:00 am – 10:00 am **POCUS – Hands On Ultrasound Training – Rainer Room (G1)**
- 9:30 am – 10:00 am **Coffee Break and Exhibits - Terrace Room and Patio**

MEETING AT A GLANCE

10:00 am - 11:00 am	POCUS - Hands On Ultrasound Training - Rainer Room (G2)
10:00 am - 11:15 am	SCIENTIFIC SESSION II: PERIPHERAL
11:15 am - 11:30 am	CASE PRESENTATIONS
11:30 am - 12:00 pm	Presidential Invited Lecture - Anton Sidawy, MD
12:00 pm - 1:00 pm	Interactive Discussion: How to Write a Successful Manuscript - Anton Sidawy, MD - Olympic Ballroom
12:00 pm - 1:00 pm	Lunch with Exhibits - Terrace Room and Patio
1:00 pm - 2:00 pm	POCUS - Hands On Ultrasound Training - Rainer Room (G3)
1:00 pm - 2:00 pm	SCIENTIFIC SESSION III: TRAUMA - Olympic Ballroom
2:00 pm - 2:15 pm	CASE PRESENTATIONS
2:15 pm - 3:15 pm	SCIENTIFIC SESSION IV: DIALYSIS/VENOUS
3:15 pm - 3:25 pm	CASE PRESENTATIONS
3:25 pm - 3:45 pm	Coffee Break-Exhibits - Terrace Room and Patio
3:45 pm - 5:15 pm	SCIENTIFIC SESSION V: OTHER
5:15 pm - 5:30 pm	CASE PRESENTATIONS
5:30 pm - 6:30 pm	Resident ePoster and Paper Awards
7:00 pm	Pier 57 Celebration at Crabpot and Seattle Great Wheel

SATURDAY, NOVEMBER 3, 2018

10:00 am	Amazon Spheres Tour
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NEW MEMBERS 2018

Shahram Aarabi, MD
Leo Daab, MD
Daiva Nevidomskyte, MD, RPVI
Brant Ullery, MD
Susanna Shin, MD, FACS

APPLY ONLINE

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
Seattle, WA	2015
Vancouver, BC	2016
Portland, OR	2017

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

PAST OFFICERS

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
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

PAST OFFICERS

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
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

PAST OFFICERS

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 Erica Mitchell, MD, Secretary-Treasurer Niten Singh, MD, Program	2014
Benjamin Starnes, MD, President Erica Mitchell, MD, Secretary-Treasurer Nam Tran, MD, Program	2015
Erica Mitchell, MD, President Brian Ferris, MD, Secretary Treasurer Nam Tran, MD, Program	2016
Brian Matteson, MD, President Brian Ferris, MD, Secretary Treasurer Nam Tran, MD, Program	2017

PRESIDENTIAL GUEST LECTURER



Vascular Centers Certification: An Idea Whose Time has Come!

Friday, November 2, 2018
11:30am - 12:00pm

Anton Sidawy, M.D., M.P.H., F.A.C.S.
*Professor and Lewis B. Saltz Chair
Department of Surgery
George Washington University*

Having served the vascular community as a leader on every level most recognize him in his role as Editor-in-Chief, *Journal of Vascular Surgery* (2009-2016) Founding Editor-in-Chief, *Journal of Vascular Surgery-Venous and Lymphatic Disorders* (2012-2016) and *Journal of Vascular Surgery-Cases* (2015-2016).

His current position is the President and Chair of the Board of Trustees, GW Medical Faculty Associates, Chair, Department of Surgery, George Washington University (2010-Present) Professor of Surgery with Tenure, George Washington University

His interests also include work as a Regent, American College of Surgeons (2015-Present) and the historian of the Eastern Surgical Society.

FORMER 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 Glociczki, 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
Bruce Gewertz, MD, Cedars Sinai Health System	2015
Bruce Perler, MD, MBA, Johns Hopkins, Baltimore, MD	2016
Charles W. Acher, University of Wisconsin	2017

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 wound 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

DISCLOSURE INFORMATION

In accordance with the ACCME Accreditation Criteria, the American College of Surgeons, as the accredited provider of this activity, must ensure that anyone in a position to control the content of the educational activity has disclosed all relevant financial relationships with any commercial interest. Therefore, it is mandatory that both the program planning committee and speakers complete disclosure forms. Members of the program committee were required to disclose all financial relationships and speakers were required to disclose any financial relationship as it pertains to the content of the presentations. The ACCME defines a 'commercial interest' as "any entity producing, marketing, re-selling, or distributing health care goods or services consumed by, or used on, patients". It does not consider providers of clinical service directly to patients to be commercial interests. The ACCME considers "relevant" financial relationships as financial transactions (in any amount) that may create a conflict of interest and occur within the 12 months preceding the time that the individual is being asked to assume a role controlling content of the educational activity.

ACS is also required, through our joint providership partners, to manage any reported conflict and eliminate the potential for bias during the activity. All program committee members and speakers were contacted and the conflicts listed below have been managed to our satisfaction. However, if you perceive a bias during a session, please report the circumstances on the session evaluation form.

Please see the insert to this program for the complete disclosure list.

ACCREDITATION STATEMENT

CONTINUING MEDICAL EDUCATION CREDIT INFORMATION

Accreditation

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

AMA PRA Category 1 Credits™

The American College of Surgeons designates this live activity for a maximum of **7.50** AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Of the AMA PRA Category 1 Credits™ listed above, a maximum of **5.75** credits meet the requirements for Self-Assessment.

**The content of this activity may meet certain mandates of regulatory bodies. Please note that ACS has not and does not verify the content for such mandates with any regulatory body. Individual physicians are responsible for verifying the content satisfies such requirements.*



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Self-assessment question links will be emailed to you post meeting for completion. Meeting evaluations can be completed online using this link: www.pacificnwvascular.org



Scientific Session Agenda

SCIENTIFIC PROGRAM

THURSDAY, NOVEMBER 1, 2018

3:00 pm – 8:00 pm **Registration Open**

4:30 pm – 5:30 pm **Executive Council Meeting**

5:30 pm – 6:00 pm **Business Meeting**

6:00 pm – 7:00 pm **ePoster Session**

Moderator: *Matthew Sweet, MD, PNWVS Program Chairman*

- 6:00 – 6:06 P1. FATE OF THE UNSTENTED SUPERIOR MESENTERIC ARTERY IN FENESTRATED ENDOVASCULAR AORTIC ANEURYSM REPAIR
JR Hurd MD, B Tatum RN, N Singh MD, RE Zierler MD, BW Starnes MD.
University of Washington, Seattle, WA
- 6:06 – 6:12 P2. RADIATION SAFETY IN VASCULAR SURGERY TRAINING AND PRACTICE: A SURVEY OF EXPERIENCE AND EXPOSURE
A Ohlsson MD, N Singh MD, S Shin MD
University of Washington, Seattle, WA
- 6:12 – 6:18 P3. SUPRA CELIAC AORTA TO SUPERIOR MESENTERIC ARTERY AND CELIAC ARTERY BYPASS
A Kaslow, MD, J Rey, MD
University of Miami, Miller School of Medicine, Miami, FL
- 6:18 – 6:24 P4. COMPLICATIONS OF PERCUTANEOUS ENDOVASCULAR REPAIR IN RUPTURED AORTIC ABDOMINAL ANEURYSMS ARE UNCOMMON
R Ur MD, NT Tran MD, BW Starnes MD, N Singh MD, E Quiroga MD
University of Washington, Seattle, WA

SCIENTIFIC PROGRAM

6:24 – 6:30 P5. DELAY IN DISCHARGE FOR PATIENTS UNDERGOING PERCUTANEOUS EVAR
A Fung MD, G Yang MD, J Gagnon MD
University of British Columbia, Vancouver, BC

6:30 pm – 7:00 pm **Ultrasound Didactic Session – Gene Zierler, MD**

6:30 pm – 8:00 pm **Taste of Seattle Reception**

7:30 pm – 8:30 pm **Personal Branding in Vascular Surgery**
Moderator: Sherene Shalhub, MD

SCIENTIFIC PROGRAM

FRIDAY, NOVEMBER 2, 2018

7:00 – 7:45 am **Breakfast with Educational Exhibits**

7:00 am – 5:00 pm **Registration Open**

7:45 am – 8:00 am **Presidential Welcome**
PNWVS President Niten Singh MD

8:00 am – 9:25 am **SCIENTIFIC SESSION I: AORTIC**
Moderators: Matthew Sweet, MD and Brian Ferris, MD

8:00 – 8:15 1. INITIAL EXPERIENCE WITH THE BOLTON TREQ DEVICE FOR FENESTRATED EVAR
BW Starnes MD, N Singh MD, B Tatum RN, B Allen RN
University of Washington, Seattle, WA

8:15 – 8:30 2. FINANCIAL ANALYSIS OF FENESTRATED ENDOVASCULAR AORTIC ANEURYSM REPAIR AT A HIGH-VOLUME MEDICAL CENTER
WB Chow MD, DM Leverentz MBA, B Tatum RN, BW Starnes MD
University of Washington, Seattle, WA

8:30 – 8:45 3. RENAL VOLUME AS IT RELATES TO FENESTRATED EVAR*
J Hurd MD, X Chen MD, B Tatum RN, D Katsman, N Singh MD, BW Starnes MD
University of Washington, Seattle, WA

SCIENTIFIC PROGRAM

8:45 – 9:00 4. DISEASE-BASED OBSERVATIONAL COHORT STUDY OF PATIENTS WITH THORACOABDOMINAL AORTIC ANEURYSM (TAAA)*
PC Kang MD, MA Bartek MD, DP Nathan MD, S Shalhub MD, MP Sweet MD
University of Washington, Seattle, WA
Invited Discussant:
Jason Faulds, MD, University of British Columbia

9:00 am – 10:00 am **POCUS** – Hands On Ultrasound Training – Rainer Room

CASE PRESENTATIONS – 3 min. pres. and 2 min. discussion

9:00 – 9:05 5. ENDOVASCULAR REPAIR OF A TYPE B AORTIC DISSECTION AND KOMMERELL'S DIVERTICULUM REQUIRING STAGED BILATERAL DEBRANCHING
SN Mirahsani BS, JF Hemingway MD, EB Howell MD, N Singh MD
University of Washington, Seattle, WA

9:05 – 9:10 6. CERVICAL DEBRANCHING AND ZONE ZERO TEVAR
N Edman, JR Hurd MD, MP Sweet MD
University of Washington, Seattle, WA

9:10 – 9:15 7. EXPLANT EVAR FOR rAAA
J LoMonaco, TL Nash, JR Hurd MD, N Singh MD
University of Washington, Seattle, WA

9:15 – 9:20 8. LONG TERM DURABILITY OF A PHYSICIAN MODIFIED ENDOGRAPH
JR Hurd MD, B Tatum RN, J Grillo BS, Z Arthurs MD, N Singh MD, BW Starnes, MD
University of Washington, Seattle, WA

** Denote Resident and ePoster competition

SCIENTIFIC PROGRAM

- 9:20 – 9:25 9. REPAIR OF A MYCOTIC AORTIC ANEURYSM CAUSED BY FUSOBACTERIUM NUCLEATUM
JA Matthews MD, MS, RE Heneghan, MD, N Singh, MD, BW Starnes, MD
University of Washington, Seattle, WA
- 9:25 am – 10:00 am **Coffee Break and Exhibits**
- 10:00 am – 11:00 am **POCUS – Hands On Ultrasound Training – Rainer Room**
- 10:00 am – 11:30 am **SCIENTIFIC SESSION II: PERIPHERAL**
Moderators: Niten Singh, MD and Enjae Jung, MD
- 10:00 – 10:15 10. RISK FACTORS OF MAJOR AMPUTATION IN HEEL ULCERS *
B Palanuk, N Vatankhah MD, Jeffrey D Crawford MD, Gregory J Landry MD
Oregon Health and Science University, Portland, OR
- 10:15 – 10:30 11. EVALUATION OF PERIOPERATIVE ANTICOAGULATION IN ACUTE LIMB ISCHEMIA *
A Kahn, N Vatankhah MD, V Kottapalli MD, D Wilson MD, S Ganesan MD, E Jung MD, G Landry MD, G Moneta MD, T Liem MD
Oregon Health and Science University, Portland, OR
- 10:30 – 10:45 12. Paper withdrawn

- 10:45 – 11:00 13. PREDICTING REAMPUTATION RISK IN PATIENTES UNDERGOING DYSVASCULAR LOWER EXTREMITY AMPUTATION *
- J Czerniecki MD**, ML Thompson PhD, EJ Boyko MD MPH, G Landry MD, AJ Littman PhD, WG Henderson PhD, AP Turner PhD, C Maynard PhD, KP Moore PhD, DC Norvell PhD
Oregon Health and Science University, Portland, OR
- Invited Discussant:**
Stephan Mostowy, Kelowna General Hospital, Kelowna, BC
- 11:00 – 11:15 14. FACTORS ASSOCIATED WITH INFRA-INGUINAL PROSTHETIC VASCULAR GRAFT INFECTIONS *
- H Elshoni MD**, D Kopriva MDCM, J St. Onge PhD
University of Saskatchewan, Regina, SK

CASE PRESENTATIONS

- 11:15 – 11:20 15. THE ROLE OF TIBIAL ARTERY STENTING IN CRITICAL LIMB ISCHEMIA: A CASE REPORT AND LITERATURE REVIEW
- A Ohlsson MD**, J Rollo MD
University of Washington, Seattle, WA
- 11:20 – 11:25 16. ISCHEMIC TOE ULCERATION DUE TO FOREIGN BODY EMBOLUS FROM HYRDOPHILIC POLYMER COATED ENDOVASCULAR CATHETER: A CASE REPORT HIGHLIGHTING AN UNDER-DOCUMENTED CAUSE OF MORBIDITY
- B French MD**, R Ranguelov MD, SL Tan MD, K Johansen MD
Swedish Medical Center, Seattle, WA

SCIENTIFIC PROGRAM

- 11:25 – 11:30 17. SHAPE SHIFTING WAVEFORMS: A TRAUMATIC STORY
A Sander BS RVT, N Tran, MD
University of Washington, Seattle, WA
- 11:30 am – 12:00 pm **Vascular Centers Certification:
An Idea Whose Time has Come! – Anton Sidawy, MD**
- 12 – 1:00 pm **Lunch Interactive Discussion:
How to Write a Successful Manuscript – Anton Sidawy, MD**
- 1:00 pm – 2:00 pm **POCUS** – Hands On Ultrasound Training – Rainer Room
Physicians Only
- 1:00 pm – 2:00 pm **SCIENTIFIC SESSION III: TRAUMA**
Moderators: Jeff Pasenau, MD and Christian Hamlat, MD
- 1:00 – 1:15 18. THE ROLE OF VASCULAR SURGEONS IS INCREASING
IN THE MANAGEMENT OF TRAUMA *
JF Hemingway MD SD Desikan MD, M Dasari MD,
CD Tran, RS Hoffman, A Gobble, A Spurlock, N Singh MD,
BW Starnes MD
University of Washington, Seattle, WA
- 1:15 – 1:30 19. IMPLEMENTATION AND RESULTS OF A PRACTICAL
GRADING SYSTEM FOR THORACIC BLUNT AORTIC
INJURY
E Quiroga MD, BW Starnes MD, NT Tran MD, N Singh MD
University of Washington, Seattle, WA
Invited Discussant:
Gerrit Winkelaar, MD, University of Alberta

- 1:30 – 1:45 20. LIMB SALVAGE AND FUNCTIONAL LIMB OUTCOMES AFTER REVASCUARIZATION FOR TRAUMATIC ACUTE LIMB ISCHEMIA*
M Dasari MD, JR Hurd MD, DF Emanuels, S Aarabi MD, BW Starnes MD, E Quiroga MD, NT Tran MD, N Singh MD
University of Washington, Seattle, WA
- 1:45 – 2:00 21. UPDATING 0.9: LOWERING THE ANKLE BRACHIAL INDEX THRESHOLD IN BLUNT LOWER EXTREMITY TRAUMA MAY PREVENT UNNECESSARY IMAGING *
JF Hemingway MD, SK Desikan MD, JA Gross MD, NT Tran MD, N Singh MD, E Quiroga MD
University of Washington, Seattle, WA
- 2:00 pm – 2:15 pm **CASE PRESENTATIONS**
- 2:00 – 2:05 22. IATROGENIC PSEUDOANEURYSM OF THE SUPERIOR GLUTEAL ARTERY AFTER TRANSCATHETER AORTIC VALVE REPLACEMENT
S Harris, MD, E Jung MD, K Kolbeck MD, TK Liem MD, CZ Abraham MD, GL Moneta MD, GJ Landry MD, R Schenning, MD
Oregon Health and Science University, Portland, OR
- 2:05 – 2:10 23. MANAGEMENT OF A RUPTURED INTRAHEPATIC ARTERY ANEURYSM
E Robinson BS, N Singh MD
University of Washington, Seattle, WA
- 2:10 – 2:15 24. DELAYED PRESENTATION OF BLUNT INFERIOR VENA CAVA INJURY FOLLOWING HIGH SPEED MOTOR VEHICLE COLLISION
B French MD, S Reiter MD, G Hayes MD
Swedish Medical Center, Seattle, WA

SCIENTIFIC PROGRAM

2:15 pm – 3:25 pm

SCIENTIFIC SESSION IV: DIALYSIS/VENOUS

Moderators: Dr. Brian Matteson and Dr. Sherene Shalhoub

2:15 – 2:30

25. FOLLOW-UP OF INCOMPLETE LOWER EXTREMITY VENOUS DUPLEX ULTRASOUND SHOULD BE A TARGET FOR QUALITY IMPROVEMENT *

R Samuel RN, K Nguyen MD, J Weber, D Louie, R Samuel, RN Saephan, T Liem MD, G Moneta MD
Oregon Health and Science University, Portland, OR

Invited Discussant:

John Rollo, MD, University of Washington

2:30 – 2:45

26. OPEN SURGERY FOR INFERIOR VENA CAVA FILTER PERFORATION

J Smolevitz MD, DW Wilson MD, GJ Landry MD, EL Mitchell MD, AF Azarbal MD, JA Kaufman MD, GL Moneta MD, TK Liem MD
Oregon Health and Science University, Portland, OR

2:45 – 3:00

27. IMMEDIATE EFFECTS OF HEMODIALYSIS ON UPPER EXTREMITY AND COGNITIVE FUNCTION *

D Louie, JB Campiche MD, V Kottapalli MD, S Ganesan MD, GJ Landry MD
Oregon Health and Science University, Portland, OR

3:00 – 3:15

28. FERUMOXYTOL- ENHANCED MAGNETIC RESONANCE IMAGING (FE-MRI) AS A NOVEL BIOMARKER OF POST THROMBOTIC SYNDROME *

A Abedini, MD, KP Nguyen MD, EA Neuwelt, M Hinds, A Abedini MD, G Toth, C Wyatt
Oregon Health and Science University, Portland, OR

SCIENTIFIC PROGRAM

3:15 pm – 3:25 pm **CASE PRESENTATIONS**

3:15 – 3:20 29. BRANCHED SUBSCAPULAR ARTERIAL GRAFT FOR HAND OCCLUSIVE DISEASE IN A DIALYSIS PATIENT WITH A FUNCTIONING FISTULA
SC Mostowy MD, JR Harris MD, JS Williamson MD
Kelowna General Hospital, Kelowna, BC, Canada

3:20 – 3:25 30. SUCCESSFUL ASPIRATION THROMBECTOMY FOR THE TREATMENT OF ILIOFEMORAL DEEP VENOUS THROMBOSIS USING THE ANGIOVAC SYSTEM: A CASE REPORT
TL Nash BS, JF Hemingway MD, S Bommareddi MD, FD Vladimir MD, MH Meissner MD
University of Washington, Seattle, WA

3:25 pm – 3:45 pm **Coffee Break-Exhibits**

3:45 pm – 5:15 pm SCIENTIFIC SESSION V: OTHER

Moderators: Nam Tran, MD and Glen Roseborough, MD

3:45 – 4:00 31. THORACIC AORTIC DISSECTION AND ANEURYSM RELATED MORTALITY REMAINS UNCHANGED IN WASHINGTON STATE BETWEEN 1996 and 2016 *
MA Bartek MD, MP Sweet MD, S Khor MS, J Nguyen BA, GS Aldea MD, L Kessler ScD, S Shalhub MD
University of Washington, Seattle, WA

4:00 – 4:15 32. INTEGRATED RESIDENCY IS ASSOCIATED WITH AN INCREASE IN WOMEN AMONG VASCULAR SURGERY TRAINEES
SH Shin MD, S Shalhub MD
University of Washington, Seattle, WA

- 4:15 – 4:30 33. VASCULAR RECONSTRUCTION IN RETROPERITONEAL AND LOWER EXTREMITY SOFT TISSUE SARCOMA RESECTION: A CASE SERIES AND SYSTEMATIC REVIEW OF THE LITERATURE *
KA Arsenault MD, J Faulds MD, A Salvian MD
University of British Columbia, Vancouver, BC
- 4:30 – 4:45 34. PROGNOSTIC IMPLICATIONS OF DIAGNOSING FRAILITY AND SARCOPENIA IN VASCULAR SURGERY PRACTICE: FORM VERSUS FUNCTION *
AA Ghaffarian MD, WT Foss MD, LW Kraiss MD, BK Smith MD, CL Griffin MD, MR Sarfati MD, BS Brooke MD PHD
University of Washington, Seattle, WA
Invited Discussant:
Amani Politano, MD, Salem Health, Salem, Oregon
- 4:45 – 5:00 35. ASSESSMENT OF THE COMMUNICATION INFRASTRUCTURE AND INTEREST IN RESEARCH COLLABORATION AMONG PATIENTS WITH VASCULAR EHLER-DANLOS SYNDROME
S Shalhub, MD, L Kellogg MD, PH Byers MD,
The Vascular Ehlers-Danlos Syndrome Research Collaborative
University of Washington, Seattle, WA
- 5:00 – 5:15 36. OUTCOMES OF TRANSCAROTID ARTERY REVASCULARIZATION (TCAR) IN THE FIRST TWENTY PATIENTS: A SINGLE CENTER CONSECUTIVE CASE SERIES
J Rollo MD, University of Washington, Seattle, WA

SCIENTIFIC PROGRAM

- 5:15 pm – 5:30 pm **CASE PRESENTATIONS**
- 5:15 – 5:20 37. RADIAL ARTERY ANEURYSM IN A PATIENT WITH MOSAICISM FOR A NOVEL GENE MUTATION
L Hysa, M Ferreira MD, PH Byers MD, S Shalhub MD
University of Washington, Seattle, WA
- 5:20 – 5:25 38. RENAL ARTERY ANEURYSMS: LITERATURE REVIEW AND PRESENTATIONS OF EX VIVO ANEURYSM RESECTION, AUTOTRANSPLANTATION AND AORTO-RENAL BYPASS IN A SOLITARY KIDNEY WITH FIBROMUSCULAR DYSPLASIA
G Sarwal MD Med, HL Brotherhood MD, ECP Chedgy MBBS MSc, DC Taylor MD, AG Kavanagh MD MPH
University of British Columbia, Vancouver, BC
- 5:25 – 5:30 39. CASE REPORT: VASCULAR GRAFT INFECTION PRESENTING 40 YEARS AFTER INDEX OPERATION
AD Politano MD MS, EL Mitchell MD Med
Oregon Health and Science University, Portland, OR
- 5:30 pm – 6:30 pm **Closing Reception, Resident ePoster and Paper Awards**
- 7:00 pm **Pier 57 Dinner at the Crabpot and Seattle Great Wheel**
(tickets \$30 at the registration desk)

SATURDAY, NOVEMBER 3, 2018

- 10:00 am **Tour of the Amazon Spheres**
(sold out)



Abstracts

P1 FATE OF THE UNSTENTED SUPERIOR MESENTERIC ARTERY IN FENESTRATED ENDOVASCULAR AORTIC ANEURYSM REPAIR

Presenter: JR Hurd MD, University of Washington, Seattle, WA

Authors: JR Hurd MD, B Tatum RN, N Singh MD, RE Zierler MD, BW Starnes MD.

Objective: 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 or crossing struts were identified from a database of patients who underwent F-EVAR at our institution between 2011 and 2017 as part of an Investigational Device Exemption clinical trial (NCT 01538056). Mesenteric DUS and CTA data were obtained at baseline and at 30-days, 6-months, and annually out to 5 years of follow-up. The DUS parameter of SMA peak systolic velocity (PSV) >275 cm/s was used to detect $>70\%$ SMA stenosis. CTA was used to evaluate the patency of the SMA when DUS PSV was elevated, or if DUS was not performed.

Results: 107 patients underwent endograft placement involving the SMA in association with F-EVAR. There were 87 fenestrations for and 20 bare metal struts crossing the SMA. 79 patients had baseline and at least 30-day follow-up DUS SMA PSV measurements (64 fenestrations, 15 struted). Mean follow-up was 18.6 months (range, 30 days-5 years). SMA Velocities are listed in Table 1. Mean PSVs remained well below the threshold velocity of 275cm/s for native atherosclerotic $>70\%$ SMA stenosis. Nine patients had at least one SMA PSV > 275 cm/s during follow up. All were observed and showed no subsequent clinical sequelae. All patients had at least 30-day follow-up with CTA, and all had widely patent SMAs at last follow-up. There was a single secondary intervention for asymptomatic SMA stenosis requiring stent placement one year after F-EVAR. There were no endoleaks related to SMA fenestrations. Five patients (4.7%) required SMA stenting at the index procedure. Three of these patients had prior EVAR (N=2) or open repair (N=1), One patient had a pre-existing critical SMA stenosis and underwent planned SMA stenting and in one patient the graft was deployed imprecisely and low and was successfully stented from a brachial approach.

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 when patients are carefully selected. The need for adjunctive SMA stenting may be related to prior aortic intervention and case complexity. Follow-up DUS and CTA surveillance confirms that SMA patency remains in the normal or $<70\%$ stenosis range after F-EVAR.

P2 RADIATION SAFETY IN VASCULAR SURGERY TRAINING AND PRACTICE: A SURVEY OF EXPERIENCE AND EXPOSURE

Presenter: A Ohlsson MD, University of Washington, Seattle, WA

Authors: A Ohlsson MD, N Singh MD, S Shin MD

Background: Radiation exposure in interventional specialties presents a real and foreseeable health risk. Radiation safety education and practice has not been standardized across specialties. We sought to evaluate radiation safety education and practices in vascular surgery (VS), interventional radiology (IR), and interventional cardiology (IC) in order to identify areas for improvement.

Methods: A voluntary, anonymous survey was distributed to members of the departments of VS, IR, and IC at a single institution with traditional fellowship (IR, IC, and VS) and integrated residency (VS) training programs. Responses were collected and analyzed for trends, proportions, and free response answers.

Results: A total of 27 responses were collected from faculty members and trainees in each department (Table 1). Twelve (41%) of the participants were women. All respondents agreed that radiation safety was important and endorsed usually or always wearing protective equipment. The majority of respondents (87%) owned personal lead but only 59% of respondents reported always wearing a dosimeter and turned them in regularly. A minority of the VS group endorsed wearing and turning in their dosimeter compared to the majority of the IR and IC groups. Conversely, the majority of the VS group endorsed use of full lead and glasses compared to a minority of the IR and IC groups. Almost all of the respondents endorsed radiation safety training. Respondents cited issues of convenience and ease as significant barriers to dosimeter usage.

Conclusions: Radiation safety and the use of protective lead is valued by all the groups but there are barriers to consistent radiation safety, including the regular use of dosimeters. The majority of vascular procedures are now endovascular or hybrid in nature and continued efforts to improve radiation safety are important.

P3 SUPRA CELIAC AORTA TO SUPERIOR MESENTERIC ARTERY AND CELIAC ARTERY BYPASS

Presenter: A Kaslow, MD, Department of Surgery, Division of Vascular Surgery, Miami, FL

Authors: A Kaslow, MD, J Rey, MD, University of Miami, Miller School of Medicine

Background: Since being first described in 1952, the open repair of an abdominal aortic aneurism has been the gold standard of care. However, with newer endovascular procedures (EVAR) being less invasive, the use has decreased. Chronic mesenteric ischemia, while not as common as aneurysmal disease, is more frequently being addressed with endovascular approaches. By 2020 vascular trainees are expected to do half of the open aortic reconstruction cases that were done in 2010. In 2011 Desai et al raised concerns that the current volume of open aneurysmal repairs is not adequate to train the newer generation vascular surgeons.

Methods: While endovascular techniques to re-vascularize the mesentery show less 30 day morbidity and mortality rates when compared to open bypass, restenosis within the first year is much higher. In the setting of endovascular failure, there will always exist the need to confidently perform an open mesenteric bypass.

Results: The decreased number of open aorta cases performed by trainees will necessitate novel training techniques. The purpose of this video presentation is to keep newer vascular surgeons in touch with this classic, open procedure. This presentation demonstrates the surgical technique for an open supra celiac aorto-mesenteric bypass in a video made with a high definition Loupe Cam which can aid trainees to remember the step by step procedure in a more approachable manner.

P4 COMPLICATIONS OF PERCUTANEOUS ENDOVASCULAR REPAIR IN RUPTURED AORTIC ABDOMINAL ANEURYSMS ARE UNCOMMON

Presenter: R Ur MD, University of Washington, Seattle, WA

Authors: R Ur MD, NT Tran MD, BW Starnes MD, N Singh MD, E Quiroga MD

Background: Percutaneous access and repair of femoral arteries (Preclose technique) for EVAR has been described; however, its role in the management of ruptured aortic abdominal aneurysm (rAAA) is yet to be defined. The aim of this study is to evaluate if percutaneous access and repair of femoral arteries for ruptured EVAR (rEVAR) can be safely performed.

Methods: This is a single center, prospective study of rAAA repair between 2005-2013. Patients who underwent percutaneous access were reviewed. Those who underwent open repair, aorto-uni-iliac repair or died during the index procedure were excluded. Demographics, operative time, and type of procedures performed were analyzed. Outcome measures included percutaneous closure device success rate, access site complications and need for reintervention.

Results: A total of 226 rAAA presented to our institution during this time period and 76 patients underwent successful rEVAR, for a total of 152 common femoral arteries analyzed. There were no differences in the Baseline characteristics of those who had an attempted percutaneous access vs. those who did not (Table 1). Preclose technique was attempted in 74% of patients and was successful in 87.5% of patients. 67% of the Perclose failures were treated with a primary repair and 33% required a patch angioplasty. Complications after percutaneous repair were rare (6%) and included the following: one patient required a thrombectomy and fasciotomy on postoperative day #1, two patients developed femoral arteries pseudoaneurysms, one resolved without intervention and one was repaired 3 months after rAAA. None of the percutaneous access or repair patients developed wound infections. Operating time was significantly shorter in patients that had percutaneous repair (136 min vs 221 min, $p=0.04$). Hospital length of stay was not different between successful perclose, failed perclose, or no attempted perclose (9 vs. 16.9 vs. 15.8 days respectively, $p=0.071$). Mortality was not different as well (18.4% vs. 25% vs. 23.8% respectively, $p=0.885$).

Conclusion: The Preclose technique of common femoral artery for rEVAR is feasible and can be performed with excellent results. Furthermore, Preclose technique leads to shorter operative times which can be crucial in these acutely ill patients. Complications are few and did not impact length of stay. We recommend an aggressive percutaneous first approach for the management of these patients

P5 DELAY IN DISCHARGE FOR PATIENTS UNDERGOING PERCUTANEOUS EVAR

Presenter: A Fung MD, University of British Columbia, Vancouver, BC

Authors: A Fung MD, G Yang MD, J Gagnon MD

Background: The advent of endovascular aneurysm repair (EVAR) significantly reduced the post-operative stay for patients undergoing aneurysm repair compared to open repair. Ever since, vascular surgeons have strived to reduce post-operative length of stay and even completely avoid intensive care unit stay by employing techniques such as percutaneous EVAR (pEVAR) over cutdown EVAR. There is heavy interest in selecting the appropriate patients for pEVAR to facilitate timely discharges. The literature has reported on inability of void as a cause for delay of discharge post pEVAR, which could potentially be exacerbated by catheterization during surgery. Thus, we seek to identify complications that lead to delay in discharges in patients undergoing pEVAR at our centre.

Methods: A retrospective analysis was performed on all pEVAR repairs at a single centre from January 2013 to December 2017. Cutdowns on one side or conversions for closure device failure were excluded. The primary outcomes of interest were days to discharge, reason for delay of discharge greater than 2 days, foley catheter reinsertion. Other variables collected included incidence of urinary tract infection and hematuria, referral to urology, 30-day survival, post-operative opioid or epidural usage, renal function and length of surgery.

Results: 365 pEVAR cases were identified through vascular surgery QI files and 186 were exclusively pEVARs without any cutdown procedures or conversions. 60 (32%) were discharged greater than 2 days after procedure. The average age (78.3 vs 75.9, $p=0.059$) and percentage of males (83% vs 90%, $p=0.23$) were not different between the groups. The delayed group had greater proportion of patients experiencing urinary retention (11.7% vs 2.4%, $p=0.0019$), but there is no significant difference for patients requiring reinsertion of catheter (8.9% vs 2.5%, $p=0.058$). However, the average day of foley removal is different between the two groups (1.4 days vs 0.86 days, $p=0.0001$). There was only one mortality within 30 days, which is in the delayed group for ruptured AAA, and one lost to follow up in the non-delayed group.

Conclusion: The data suggests that urinary retention is a significant cause of delay in discharge for patients undergoing pEVAR. Future studies could explore the need for prophylactic medical treatment to prevent retention.

#1 INITIAL EXPERIENCE WITH THE BOLTON TREO DEVICE FOR FENESTRATED EVAR

Presenter: BW Starnes MD, University of Washington, Seattle, WA

Authors: BW Starnes MD, N Singh MD, B Tatum RN, B Allen RN

Objective: The Bolton TREO Device (Figure 1) is an endograft with unique features that lends itself to fenestrated EVAR (FEVAR) due to low device profile, wide amplitude stent design and increased inter-stent distance, providing for a large amount of “real estate” for individual fenestration placement. We sought to describe initial experience with this device for FEVAR to treat short neck and juxtarenal AAAs.

Methods: As part of an ongoing PS-IDE (#NCT01538056), subjects were prospectively enrolled and underwent elective FEVAR using a variety of devices. Demographics and procedural details were collected. Data from subjects treated with the TREO device were compared to patients undergoing elective FEVAR with other commercially available devices.

Results: 112 patients were enrolled in the study and 20 subjects underwent elective FEVAR with the Bolton TREO device. Demographics are listed in Table 1 and procedural details are listed in Table 2. Mean aneurysm size was 63.5mm. Mean pre-op neck length was 5.3mm and mean final seal zone length 45.7mm. Average hospital and ICU lengths of stay were 3.8 and 2.6 days respectively. There were 59 fenestrations created for 19 SMA's and 40 renal arteries (2.95 FENS/pt). Treatment success, defined as successful implantation of the device with all target vessels preserved, was 95% (19/20) with only one renal artery not successfully preserved (1.7%). Mean follow up was 402 days (14.4 mos). There were six endoleaks detected on follow up (T1a = 0, T1b = 0, T2=5, T3=1) requiring one re-intervention. Two subjects died within 30 days, one due to an intracranial hemorrhage and one due to respiratory failure. Compared with other commercially available devices, the TREO device performed favorably in terms of treatment success. Graft modification time was significantly shorter for TREO (41.6m) when compared to Zenith (54.9m) or Medtronic (54.1m) $p < 0.0001$, one-way ANOVA.

Conclusions: Our institution has exclusive world-wide experience using the Bolton TREO device for FEVAR. This device provides for a highly efficient and technically successful procedure in the majority of patients. Procedural and fluoroscopy times are low even in the setting of high complexity. Technical success rates and simplification of the FEVAR procedure make this approach a preferred technique for a majority of patients.

#2 FINANCIAL ANALYSIS OF FENESTRATED ENDOVASCULAR AORTIC ANEURYSM REPAIR AT A HIGH-VOLUME MEDICAL CENTER

Presenter: WB Chow MD, University of Washington, Seattle, WA

Authors: WB Chow MD, DM Leverentz MBA, B Tatum RN, BW Starnes MD

Objectives: To examine hospital finances and physician reimbursement associated with fenestrated endovascular aortic aneurysm repair (FEVAR) for complex aortic disease at a high-volume aortic center. To compare costs and reimbursement for FEVAR with open repair, and their trends over time.

Methods: Clinical and financial data were retrospectively collected from electronic medical and administrative records. Data for each patient included inpatient and outpatient encounters three months prior to and twelve months following the index operation.

Results: Between 2007 and 2017, 157 and 71 patients underwent physician-modified endograft (PMEG) and Cook Zenith Fenestrated (ZFEN) repair, respectively. Twenty-one additional patients evaluated for FEVAR underwent open repair instead. The 228 FEVAR patients provided an overall positive contribution margin (CM, reimbursement minus direct cost) of \$3.25 million. The index encounter for operation and hospitalization accounted for the majority (74%) of the overall CM. The largest component (50.3%) of direct cost (DC) for FEVAR at index encounter was implant/graft expenses. The average DC of FEVAR and of open repair for index encounter were \$34.6K and \$35.0K, respectively. The average CM for FEVAR vs. open repair were approximately \$10.5K vs. \$21.2K, attributable to differences in reimbursement. The average DC of FEVAR trended down over time as cumulative experience increased. Average reimbursement per FEVAR increased after Centers for Medicare & Medicaid Services approved reimbursement with the Investigational Device Exemption (IDE) trial for PMEG in 2011, and a new technology add-on payment in 2012. These trends resulted in a transition from negative to positive average CM in 2012. The average physician payments for PMEG increased from \$128 before to \$5,848 after the start of the IDE trial. The average physician payments for ZFEN and open repair between 2011-2017 were \$7,597 and \$7,781, respectively.

Conclusions: FEVAR can be performed at a high-volume aortic center with positive CM and comparable physician reimbursement to open repair. At this institution, hospital and physician payments improved for PMEG with the onset of the IDE trial, while hospital DC declined for both PMEG and ZFEN with increased experience.

#3 RENAL VOLUME AS IT RELATES TO FENESTRATED EVAR

Presenter: JR Hurd MD, University of Washington, Seattle, WA

Authors: JR Hurd MD, X Chen MD, B Tatum RN, D Katsman, N Singh MD, BW Starnes MD

Objective: Renal volume has been shown to decline in the sixth decade of life and beyond. We sought; 1) to assess the inter-rater reliability for manually measuring renal volume using computed tomography and 2) to assess changes in renal volume over time as it relates to Fenestrated EVAR (FEVAR).

Methods: This study was conducted as part of a physician-sponsored IDE (#NCT01538056).

1) 30 consecutive kidneys of pre-operative FEVAR subjects were randomly measured by two independent raters using manual segmentation and TeraRecon (Foster City, CA) software (Figure 1). Renal volumes were calculated and compared. Cohen's Kappa was calculated for differences in renal volume of 1, 3, 5 and 10%.

2) Renal volumes were then recorded for 100 subjects undergoing FEVAR with follow up out to five years and then normalized by dividing the value by the subjects Body Surface Area (DuBois formula; $BSA = (W0.425 \times H0.725) \times 0.007184$). Kidneys were divided into three groups and two sub-groups. Group A kidneys were those that were fed by a renal artery that had no fenestration and no stent. Group B were those kidneys fed by an artery with a fenestration but no stent and Group C were those kidneys fed by renal arteries that were stented through a fenestration. Finally, Group C was further sub-divided into those kidneys that had additional accessory renal arteries that were covered by the stent graft (Group C.1) and those kidneys without accessory renal arteries (Group C.2).

Results: 1) Inter-rater reliability (kappa) for manual renal volume measurement was 0.19, 0.63, 0.84 and 1.00 for renal volume differences of 1, 3, 5, and 10% respectively.

2) There were 10 kidneys in Group A, 7 kidneys in Group B and 172 kidneys in Group C. Group C.1 included 11 kidneys and Group C.2 included 161 kidneys. Scatterplots comparing Groups A, B and C AND C.1 and C.2 are shown in Figure 2.

Conclusions: Manual renal volume measurements are highly reliable and reproducible to within a 5% difference between raters. Renal volume decreases over time, regardless of whether the renal artery is stented or not. It appears that renal volume does not decline as rapidly when renal arteries are stented as part of FEVAR. Coverage of accessory renal arteries appears safe and does not significantly lead to decline in renal volume.

#4 DISEASE-BASED OBSERVATIONAL COHORT STUDY OF PATIENTS WITH THORACOABDOMINAL AORTIC ANEURYSM (TAAA)

Presenter: PC Kang MD, University of Washington, Seattle, WA

Authors: PC Kang MD, MA Bartek MD, DP Nathan MD, S Shalhub MD, MP Sweet MD

Background: Most studies of thoracoabdominal aortic aneurysms (TAAA) are limited to operative series. Little is known about the non-operative patients, and even less about the patient cohort as a whole. This study addresses this gap by describing a disease-based cohort of patients with TAAA. We hypothesize that (1) many patients with TAAA do not receive an operation and survival among this group is poor, and (2) there is a difference between one-year survival and patient-centered outcomes among operative patients.

Methods: An academic multi-hospital institutional database was screened by diagnosis codes for TAAA from 2009 to 2017 using the International Classification of Diseases (ICD) versions 9 and 10. Diagnosis was then confirmed or rejected by chart review and the CT finding of aneurysmal degeneration > 3.2 cm of the paravisceral aorta in continuity with aneurysmal aorta meeting standard criteria for repair. Patients under age 18 and those with mycotic aneurysm were excluded. Patients underwent four broad categories of repair: (1) open, (2) endovascular with branched grafts, (3) hybrid, defined as visceral debranching followed by TEVAR, and (4) partial repair in which the paravisceral segment was intentionally left unaddressed. The primary outcome measures were estimated survival and "good" outcome defined as successful aneurysm exclusion, return to pre-operative functional status at 6-18 months, and freedom from permanent loss of organ system function.

Results: 429 patients met inclusion criteria. Nearly half (47%) the cohort did not undergo an operation and one-year survival for this group was 65%. The percentage of patients with a good outcome was less than that of patients alive at one year—and in some cases—the difference was large (open, 70% vs 78%; endovascular, 81% vs 88%; hybrid, 59% vs 66%, partial, 59% vs 80%). Overall, roughly two-thirds (64%) of operative patients had a good outcome and apparent survival benefit was seen in all operative groups over the nonoperative group except for the patients who underwent hybrid repair.

Conclusions: This inclusive cohort study shows that nearly half of patients with TAAA do not undergo repair despite access to all treatment options. Advanced medical comorbidities are common among these patients, and survival among those deemed ineligible for surgery was poor. Survival does not fully capture patient goals for an operation and more attention should be given to patient-centered outcomes given the morbidity associated with TAAA repair.

#5 ENDOVASCULAR REPAIR OF A TYPE B AORTIC DISSECTION AND KOMMERELL'S DIVERTICULUM REQUIRING STAGED BILATERAL AORTIC DEBRANCHING

Presenter: SN Mirahsani BS, University of Washington, Seattle, WA

Authors: SN Mirahsani BS, JF Hemingway MD, EB Howell MD, N Singh MD

Background: We describe the hybrid management, including staged bilateral subclavian to carotid artery transpositions, of a type B aortic dissection (TBAD) arising from an aneurysmal Kommerell's diverticulum associated with an aberrant right subclavian artery.

Method: A 51-year-old male presented with chest pain with interscapular radiation and dysphagia. Imaging revealed a TBAD and an aberrant right subclavian artery arising from an aneurysmal Kommerell's diverticulum. Pre-operative imaging suggested the need for bilateral subclavian to carotid artery transpositions, the left for proximal landing zone extension and the right to exclude retrograde flow into the aneurysmal diverticulum. Given the concern for airway collapse from bilateral laryngeal nerve dysfunction that can occur following bilateral neck dissection, only the left subclavian to carotid artery transposition was performed initially. Immediately following the transposition, the thoracic aorta was repaired endovascularly using the TAG device (WL Gore, Flagstaff, AZ). Following deployment, arteriography revealed complete exclusion of the Kommerell's diverticulum and proximal aberrant subclavian artery, good aortic wall apposition of the stent graft, and a widely patent transposition. Although an upper extremity systolic pressure differential of approximately 50 mmHg was noted, revascularization of the right subclavian artery was not performed given the absence of obvious ischemia. The patient was discharged two days later with oral anti-hypertensive medications after an uneventful hospital course.

Results: The patient developed hoarseness 24 hours after discharge, with direct laryngoscopy by Otolaryngology revealing moderate left vocal cord immobility without aspiration. This was treated conservatively. On subsequent Vascular Surgery follow-up, the patient reported exertional right arm pain and fatigue. Repeated imaging revealed persistent retrograde flow into the aberrant subclavian artery. Although concerning for effort ischemia, given his ongoing left-sided vocal cord dysfunction at that time, immediate right subclavian revascularization with the risk of concomitant right recurrent laryngeal nerve injury was deferred. Following improvement in the patient's hoarseness, he underwent a successful right subclavian to carotid artery transposition with full symptom resolution. Follow-up imaging demonstrated complete exclusion of the aberrant subclavian artery.

Conclusion: We present a case in which bilateral subclavian to carotid artery transpositions were required in the management of an acute TBAD associated with an aberrant right subclavian artery arising from a Kommerell's diverticulum. Despite careful carotid dissection, delayed unilateral vocal cord paresis occurred. As such, in cases requiring bilateral subclavian revascularization, a staged approach for aortic debulking should be considered to prevent the devastating complication of bilateral laryngeal nerve paralysis.

#6 CERVICAL DEBRANCHING AND ZONE ZERO TEVAR

Presenter: N Edman, University of Washington, Seattle, WA

Authors: N Edman, JR Hurd MD, MP Sweet MD

Background: The advent of thoracic endovascular repair for aneurysmal aortic disease has provided a viable option for patients unable to tolerate an open repair. When the aneurysmal segment extends proximally across the arch vessels, hybrid debranching approach or experimental branched thoracic endografts become necessary. We present a successful case of total cervical debranching and Zone 0 TEVAR.

Methods: A 55-year-old gentleman with a connective tissue disorder, prior thyroidectomy and CAD was referred to our clinic with asymptomatic aneurysmal degeneration of a previous type A aortic dissection. One year prior, he underwent emergent open repair of his ascending aorta, with innominate debranching and concurrent CABG. Despite revascularization, due to ischemic cardiomyopathy his EF remained 30%. He was not a candidate for open repair. In order to prevent death from rupture, we discussed a hybrid approach, involving debranching of his aortic arch, and Zone 0 placement of a TEVAR graft.

Results: The operation started with bilateral supraclavicular incisions into a re-operative field. We exposed the right common carotid and left subclavian artery, performing a right-to-left, retropharyngeal carotid-subclavian bypass with 8mm Dacron graft. The left subclavian stump was ligated, and the distal left common carotid artery was anastomosed end-to-side to the Dacron graft. The left common carotid artery stump was similarly ligated. Having finished our cervical debranching, we turned attention to placement of the TEVAR graft. After gaining bilateral common femoral artery access, we selected the true lumen and confirmed wire placement with intravascular ultrasound. A Cook Alpha stent graft was inserted to zone zero and extended to one centimeter above the celiac artery. After ballooning the mid-graft, we obtained reassuring pull-back pressure gradients. Completion angiogram showed no endoleak, and the groins were successfully closed in a percutaneous fashion. The neck incisions were closed, and the patient transferred to the ICU after showing intact neurologic function.

Conclusion: We present a case of successful cervical debranching and Zone 0 TEVAR one year after open ascending aortic repair. With proper patient selection, this technique is a safe viable option for patients unfit for open aortic repair.

#7 EXPLANT EVAR FOR rAAA

Presenter: J LoMonaco, University of Washington, Seattle, WA

Authors: TL Nash, JR Hurd MD, N Singh MD

Background: Despite the proven durability of EVAR in correctly selected patients with infrarenal AAA, there remains a small subset of patients who eventually require explantation and open repair. We present a case involving a chronic type II endoleak that progressed to contained rupture, necessitating laparotomy and open conversion eight years after the initial operation.

Methods: A 78-year-old male who underwent EVAR in 2009 presented to our emergency department with recurrent abdominal pain three days after negative aortogram to evaluate a suspected type II endoleak. Of note, he had undergone multiple secondary interventions at another facility after his initial operation. Computed tomography revealed evidence of a large retroperitoneal hematoma and active type II endoleak. Out of concern for impending rupture, he was taken to the operating room emergently for exploratory laparotomy.

Results: A generous midline incision was carried out, and the retroperitoneum exposed. Upon inspection, we noticed that a type II endoleak had blown out a small portion of the aortic sac. There was no pulsation of the sac. We obtained proximal control just below the renal arteries, and entered the sac. His graft was intact. The proximal portion was removed in its entirety, and the iliac limbs divided with wire cutters. A 20x10mm bifurcated Dacron graft was used to reconstruct his aorta. Friable tissue at the proximal anastomosis necessitated a circumferential pledget. The iliac limbs were then sewed to the iliac limbs of the stent graft, taking care to also incorporate the arterial wall. The retroperitoneum and abdomen were closed, and the patient transported to the ICU intubated. He was extubated on POD#2, and returned home two days later.

Conclusion: Explant of a previously placed endograft is a challenging but sometimes necessary measure. The vascular surgeon may be presented with a thin, friable aorta once the endograft is removed. We present a successful case using a circumferential Dacron pledget and full endograft removal to the level of the common iliac arteries.

#8 LONG TERM DURABILITY OF A PHYSICIAN MODIFIED ENDOGRAFT

Presenter: JR Hurd MD, University of Washington, Seattle, WA

Authors: JR Hurd MD, B Tatum RN, J Grillo BS, Z Arthurs MD, N Singh MD, BW Starnes MD

Background: Endovascular repair of complex abdominal aortic aneurysm (AAA) has become increasingly common. Concurrently, we are presented with increasing numbers of frail patients who cannot tolerate open repair and have unsuitable anatomy or need urgent operative intervention. We have developed off-the-shelf endograft fenestration for juxtarenal AAA using physician modified endovascular grafts (PMEGs). We sought to evaluate long-term durability of a PMEG on post-mortem examination.

Methods: We received an intact specimen, containing thoracic and abdominal aorta with preserved visceral arterial branches. First, micro-computed tomography was performed. Then, we performed necropsy with fine dissection of the specimen. Investing retroperitoneal tissue was gently dissected off the aorta, and the stent-graft carefully extracted. All remaining tissue was degraded from the fabric with 3% hydrogen peroxide, and final cleansing performed with 50% sodium hypochlorite. High-definition photography was used to document each step.

Results: Micro-CT was performed first, with the specimen folded into a container on arrival and fit into the scanner for analysis. These images revealed that visceral vessel alignment remained intact out to seven years. Micro-CT analysis showed a single strut fracture that had not been noted during the first five years of clinical follow-up. Review of all previous CT scans and plain films revealed no evidence of this fracture. On post-mortem necropsy, there was no evidence of graft fabric compromise relating to this stent fracture. Examination of the SMA fenestration showed perfect alignment and stability. There was no evidence of corrosion or degradation, and the Prolene sutures remained intact. Intraluminal photography revealed wide patency of the SMA. Both renal fenestrations and stents showed similar alignment and stability, with a robust and intact branch stent-fenestration interface. The endograft and renal stents had no evidence of corrosion or degradation. Intraluminal examination confirmed stable and continued covered stent interaction with the fenestrated main body.

Conclusion: We present the first report confirming long-term graft durability after PMEG. This post-mortem analysis confirmed no evidence of stent graft corrosion or degradation to our custom fenestrations out to seven years. A single strut fracture was not associated with graft compromise. The graft appeared well-incorporated into the healthy aortic neck, leading to a successful outcome.

#9 REPAIR OF A MYCOTIC AORTIC ANEURYSM CAUSED BY FUSOBACTERIUM NUCLEATUM

Presenter: JA Matthews MD, University of Washington, Seattle, WA

Authors: JA Matthews MD, RE Heneghan, MD, N Singh, MD, BW Starnes, MD

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.

#10 RISK FACTORS OF MAJOR AMPUTATION IN HEEL ULCERS*

Presenter: B Palanuk MD, Oregon Health and Science University, Portland, OR

Authors: N Vatankeh MD, Jeffrey D Crawford MD, Gregory J Landry MD

Background: Heel ulcers are associated with poor healing and high rate of limb loss despite aggressive management. We evaluated our eight-year experience to determine risk factors of major amputation.

Method: The outcomes of 144 heel ulcers in 126 patients referred to our clinic from 2006-2014 were examined retrospectively. The ulcers were observed until complete healing, major amputation, or last clinical follow-up without healing. Eighteen ulcers with no healing and and <6 months follow-up were excluded from analysis. Demographic, ulcer-specific and treatment variables were analyzed. Univariate Cox proportional hazard models were applied to assess risk factors of major amputation. Proportional hazard assumption was evaluated, and variables with significant time interaction were considered time varying.

Results: The median age of patients was 64.8 years and 62% was male. During follow-up period 57 ulcers healed (39.6%) and 24 (16.7%) required major amputations. 45 wounds (43.7%) neither healed nor underwent major amputation during 6 months. Median follow-up period for the whole cohort was 7.8 months. Ulcers with infection (HR: 5.23, P=0.003), osteomyelitis (HR: 2.70, P=0.016), large (versus. small) wound (HR: 5.36, P=0.004), occluded posterior tibialis (HR: 3.08, P=0.033) or peroneal artery (HR: 2.85, P=0.046) had higher hazard of major amputation. Vacuum-Assisted Closure (VAC) dressing, among other treatment modalities, was more likely to prevent amputation (HR: 0.02, P=0.029).

Conclusion: Most heel ulcers do not heal by six months. Infection, osteomyelitis, larger size, occlusion of direct angiosome inflow (posterior tibialis or peroneal arteries) are associated with higher hazard of major amputation; and Vacuum-assisted closure dressing was associated with a decreased hazard of amputation.

#11 EVALUATION OF PERIOPERATIVE ANTICOAGULATION IN ACUTE LIMB ISCHEMIA*

Presenter: A Kahn MS, Oregon Health and Science University, Portland, OR

Authors: N Vatankeh MD, A Kahn, V Kottapalli MD, D Wilson MD, S Ganesan MD, E Jung MD, G Landry MD, G Moneta MD, T Liem MD

Background: Acute limb ischemia (ALI) is a common vascular surgical emergency characterized by abrupt reduction in limb perfusion. Most often, these patients will receive immediate administration of therapeutic intravenous (IV) heparin anticoagulation, prior to surgical or endovascular intervention. However, the choice for postoperative anticoagulation frequently is more variable, with physicians having to balance risk for rethrombosis versus postoperative bleeding. At present, an optimal postoperative dosing protocol has not been established. Two main strategies are commonly utilized during the immediate postoperative period: full therapeutic versus sub-therapeutic anticoagulation. Examples of the latter include fixed low-dose IV heparin or prophylactic dose low-molecular-weight heparin (LMWH). The present study aims to evaluate the 30-day efficacy and safety of immediate postoperative anticoagulation dosing in patients with acute limb ischemia.

Method: All patients who were treated for acute limb ischemia between January 1st, 2008 and August 1st, 2017 were evaluated in a retrospective chart review. Patient demographics as well as comorbidities, disease characteristics, revascularization modality, and perioperative anticoagulation dosing/timing, and postoperative complications were identified. Anticoagulation dosing within the first 72 hours was classified as therapeutic versus sub-therapeutic. Efficacy was defined as 30-day recurrent ALI and death. Safety was defined as 30-day rate of major hemorrhage. Univariate and multivariate analyses will be conducted using SPSS.

Conclusion: This study will help determine whether or not sub-therapeutic dosing is as effective and safe as therapeutic anticoagulation during the immediate postoperative period.

#12 | Paper withdrawn

Pacific Northwest Vascular Society • 2018 Annual Meeting

#13 PREDICTING REAMPUTATION RISK IN PATIENTS UNDERGOING DYSPASCULAR LOWER EXTREMITY AMPUTATION*

Presenter: J Czerniecki MD, Oregon Health and Science University, Portland, OR

Authors: ML Thompson PhD, EJ Boyko MD MPH, G Landry MD, AJ Littman PhD, WG Henderson PhD, AP Turner PhD, C Maynard PhD, KP Moore PhD, DC Norvell PhD

Background: Surgeons must balance multiple outcomes including risk of failure of healing when arriving at an amputation level recommendation in the patient with peripheral artery disease and/or diabetes. Failure of healing and need for additional amputation has been associated with poorer long term mobility and increased risk of mortality. The objective of this research was to develop a patient and amputation level specific prediction model of 12-month reamputation risk to assist in amputation level decision-making.

Methods: Between 2004 and 2014, 5,260 subjects with incident unilateral transmetatarsal (TM), transtibial (TT), or transfemoral (TF) amputation secondary to diabetes and/or peripheral artery disease that survived 12 months after amputation, were identified in the VA Surgical Quality Improvement Program database. Procedure codes were used to identify subsequent soft tissue revision, and reamputation at the same or higher level, while natural language processing was used to establish laterality. Twenty-eight potential pre-operative risk factors for incorporation into the prediction model were identified based on published literature, clinical utility and frequency of occurrence. A subset of these predictors was selected using stepdown logistic regression. The quality of the model was evaluated using the Hosmer-Lemeshow test for calibration and the area under the receiver operating characteristic curve (AUROC) and the discrimination slope (DS). Optimism in the validation characteristics was assessed using bootstrap sampling.

Results: A total of 1,283 (24%) reamputations occurred in the 12 months following incident amputation. The crude amputation level reamputation risks were 40% (TM), 26% (TT), and 10% (TF). The final prediction model included 11 predictors. Factors that were associated with an increased risk of reamputation included; smoking in TT and TF amputees, excessive alcohol use, rest pain, use of outpatient anticoagulants, COPD, elevated white count, male sex, revascularization in diabetic subjects, diabetes in subjects with TM amputation, and renal failure in TM amputees. Evaluation of the prediction characteristics indicated good model calibration, and good discrimination shown by an AUROC of 0.72 and a DS of 11.2%. Bootstrap resampling showed negligible optimism.

Conclusion: Although prior research has identified risk factors associated with need for reamputation in this patient population, the developed prediction model provides a unique contribution. It allows the risk of failure of primary healing and need for reamputation to be calculated based upon an individual patient's specific constellation of pre-operative risk factors, and how these risk factors modify risk at each amputation level. The model has good prediction characteristics and can be used by surgeons and their patients to make more informed amputation level decisions.

#14 FACTORS ASSOCIATED WITH INFRA-INGUINAL PROSTHETIC VASCULAR GRAFT INFECTIONS*

Presenter: H Elshoni MD, University of Saskatchewan

Authors: D Kopriva MDCM, J St. Onge PhD, H Elshoni MD

Background: Prosthetic vascular graft infection is a serious complication of peripheral arterial bypass surgery. Graft infection increases risk of mortality and morbidity. Limb amputation is a common outcome of graft infection. It is the unvalidated observation of the investigators that infrainguinal prosthetic graft infection is more commonly observed with the use of heparin bonded PTFE grafts. Our objective is to identify risk factors associated with infection of infrainguinal prosthetic grafts used in arterial bypass surgeries. We assessed the risk of infection in heparin bonded PTFE compared with non-heparin bonded PTFE and possible confounding variables. we assessed potential confounding variables including diabetes, age, body mass index, the indication for the bypass (ischemic tissue loss vs. other surgical indications), subcutaneous (vs. deep) graft tunneling, PTFE vs Dacron graft, the level of arterial inflow and outflow, graft thrombosis, and previous ipsilateral arterial bypass. Our aim is to identify potentially modifiable risk factors for graft infection.

Methods: A case-control study evaluated all prosthetic infra-inguinal bypass procedures performed at a single center during the study period 2007-2017. We considered possible associations between graft infection and age, sex, smoking status, pre-operative hemoglobin, pre-operative creatinine, duration of surgery, previous myocardial infarction, congestive heart failure, prior stroke, subcutaneous vs. sub-fascial graft tunneling, level of arterial inflow, level of arterial outflow, choice of heparin bonded vs. non-heparin bonded graft, graft thrombosis, surgical indication (ischemic tissue loss vs. other indications), and previous ipsilateral infra-inguinal bypass. Univariate analysis was performed using a t-test, Mann-Whitney test, Fisher's Exact test and Chi-Square test, as appropriate. Multivariate logistic regression was performed to determine independent factors associated with graft infection.

Results: There were 143 prosthetic graft bypasses performed during the study period. Seventeen (11.9%) acquired a graft infection. The most common organisms were methicillin sensitive *Staphylococcus aureus* (35%) and unknown (24%). Graft infection was seen in 15.4% of heparin bonded PTFE grafts and 9.9% of non-heparin bonded PTFE grafts ($P=0.33$). Graft infection was more commonly seen in thrombosed (25.0%) than non-thrombosed (6.1%) grafts ($P=0.001$). Patients with a previous ipsilateral bypass had more graft infections (21.6%) than first-time bypasses (8.5%) ($P=0.034$). Multivariate analysis showed previous ipsilateral bypass (OR 3.0; 95% CI 1.1-8.4) and graft thrombosis (OR 5.1; 95% CI 1.8-14.9) to have an independent association with graft infection.

Conclusions: Prosthetic vascular graft infections were independently associated with previous ipsilateral bypass surgery and graft thrombosis. The use of heparin bonded PTFE graft was not associated with increased risk of graft infection.

#15 THE ROLE OF TIBIAL ARTERY STENTING IN CRITICAL LIMB ISCHEMIA: A CASE REPORT AND LITERATURE REVIEW

Presenter: A Ohlsson MD, University of Washington, Seattle, WA

Authors: A Ohlsson MD, J Rollo MD

Background: Tibial artery stenting in the management of critical limb ischemia has shown promising results in small non-randomized trials. Drug eluting stents (DES) in short segment (3-5cm) infrapopliteal lesions have been shown to increase vessel patency, decrease target lesion restenosis, and reduce the rate of amputation at 1 year.

Methods: We present a case of a 90-year-old retired physician with multiple medical comorbidities and critical limb ischemia (CLI) with rest pain who underwent SFA drug-coated balloon angioplasty and stenting.

Results: He represented 2 months later with recurrent symptoms of rest pain and patent SFA stent, but worsening of his tibial disease on duplex. He underwent recanalization and angioplasty of his tibial vessels and DES placement in his peroneal artery with restoration of in-line flow and improvement in his rest pain.

Conclusion: Critical limb ischemia in the elderly medically complex patient presents a challenging problem. There is a role for tibial artery stenting in short segment occlusions.

#16 ISCHEMIC TOE ULCERATION DUE TO FOREIGN BODY EMBOLUS FROM HYDROPHILIC POLYMER COATED ENDOVASCULAR CATHETER: A CASE REPORT HIGHLIGHTING AN UNDER-DOCUMENTED CAUSE OF MORBIDITY

Presenter: B French MD, Swedish Medical Center, Seattle, WA

Authors: B French MD, R Ranguelov MD, SL Tan MD, K Johansen MD

Background: Hydrophilic polymer coatings are now widely applied to catheters and other intravascular devices used in neurovascular, cardiovascular and peripheral vascular procedures. Emboli consisting of these materials have been previously identified in biopsies or autopsies following pulmonary infarction, stroke, gangrene or death. We report a case involving a non-healing foot ulcer that appeared following cardiac catheterization, stenting and AICD implantation in a patient without evidence of peripheral artery disease. This case highlights a growing body of evidence of the risk of catheter associated embolism with endovascular intervention.

Methods: The patient's medical record and pathology slides were reviewed.

Results: An 85-year-old woman with chronic atrial fibrillation, aortic valve stenosis and coronary artery disease underwent coronary stenting and AICD implantation for ventricular tachycardia and syncope. Shortly thereafter, she developed ulceration of the right great toe, which did not respond to standard treatment. A histological examination following amputation of the toe found amorphous basophilic material in capillaries adjacent to the edge of the ulcer, which was similar to material associated with hydrophilic polymer coatings.

Conclusion: Ischemia and infarcts following endovascular procedures should not be presumed to result from thrombus or vascular disease, even if intravascular devices appear intact or properly placed after the procedure. To help establish the incidence of ischemia caused by hydrophilic polymer device coatings, all tissue excised from amputation or embolectomy following endovascular procedures should be evaluated microscopically. Furthermore, surgeons should consider the tolerance of distal organs to infarct or ischemia when selecting coated intravascular devices.

#17 SHAPE SHIFTING WAVEFORMS: A TRAUMATIC STORY

Presenter: A Sander BS RVT, University of Washington, Seattle, WA

Authors: A Sander BS RVT

Duplex ultrasonography is an extremely useful imaging modality for both diagnosis as well as characterization of arterial injury due to both blunt and penetrating trauma. However, there are both anatomic and extrinsic factors that can influence the sensitivity and specificity of the exam.

We present a case of traumatic arterial injury in the lower extremity that was initially characterized as normal on duplex ultrasonography. Review of the aberrant anatomy and the arterial waveforms will allow the audience to recognize potential pitfalls of duplex ultrasonography in the diagnose of the trauma patient.

#18 THE ROLE OF VASCULAR SURGEONS IS INCREASING IN THE MANAGEMENT OF TRAUMA*

Presenter: JF Hemingway MD, University of Washington, Seattle, WA

Authors: JF Hemingway MD, SD Desikan MD, M Dasari MD, CD Tran, RS Hoffman, A Gobble, A Spurlock, N Singh MD, BW Starnes MD

Background: Vascular surgeons are called to aid other surgical specialties for complex exposure, hemorrhage control, and revascularization. The changes in training paradigms has led to an increase in vascular surgery participation with trauma patients. This study reviews the incidence, indications, and outcomes of emergent operative vascular consultations at a Level I Trauma Center over a 15-year period.

Method: All operative cases where a vascular surgeon was involved, but not listed as the primary surgeon, were abstracted through Horizon Surgical Manager (HSM) over the study period (2002-2017). HSM is a documentation system used in our operating room to track staff present, type of case, and utilization.

Results: 256 patients were initially identified. 22 patients were excluded because the case was a joint or elective procedure. This left 234 emergent operative vascular consultations. 65% (n=152) were intraoperative consultations requiring an immediate response. The mean patient age was 38 years with a 73% male predominance. The majority of consultations were for trauma (n=189, 81%), followed by iatrogenic injury (n=32, 14%). The most common consulting services were Trauma Surgery (n=103, 44%) and Orthopedic Surgery (n=94, 40%). Frequent indications for consultation were extremity malperfusion, hemorrhage, and concern for arterial injury. Average operative time for the vascular component of the procedures was 2.4 hours. Of patients presenting with ischemia, revascularization was successful in 94% (n=116). Hemorrhage was controlled in 99% (n=122). In hospital mortality was relatively low at 7% (n=17). Overall, there has been a significant trend towards increased vascular operative consultations over the study period.

Conclusions: Vascular surgeons are essential team members at a Level I Trauma Center. Vascular consultation in this setting is often unplanned and requires immediate intervention. When consulted, vascular surgery is effective in quickly gaining control of the situation to provide exposure, hemorrhage control, and revascularization, if warranted. The number of vascular consultations is increasing and it is paramount that hospitals provide adequate staffing to meet rising demand. Declining trauma surgeon experience with vascular trauma may have an influence on this increase in demand.

#19 IMPLEMENTATION AND RESULTS OF A PRACTICAL GRADING SYSTEM FOR THORACIC BLUNT AORTIC INJURY

Presenter: E Quiroga MD, University of Washington, Seattle, WA

Authors: E Quiroga MD, BW Starnes MD, NT Tran MD, N Singh MD

Objectives: We previously proposed a grading system for blunt thoracic aortic injury (BTAI) designed to guide therapy. This study analyzes our outcomes since implementing this system.

Methods: A single center, retrospective study of consecutive patients presenting with BTAI between January 2014 and December 2017. This grading system classified injuries into “minimal”, “moderate”, or “severe” based on CT imaging. Primary endpoints included timing of operation and mortality. Secondary endpoints included associated injuries, aortic anatomy and operative details as well as 30-day follow up.

Results: 87 patients with BTAI were identified during the study period. The majority of patients had a “moderate” injury occurring just distal to the left subclavian artery. 59 patients underwent TEVAR while none of the patients with “minimal” injury (n=24) required surgical treatment. The mean time to repair was 53 hours (1-191 hours) for “moderate” injury and 3.6 hours for “severe” injury (0-7 hours). Operative details are shown in table II. The average diameter and length of the endograft was 26 mm and 112 cm, respectively, and the left subclavian artery (LSA) was covered in 42% of patients. Intravascular ultrasound to confirm sizing was used in 83% of cases. Most patients (92%) received intravenous heparin during TEVAR, while the remainder received only heparin sheath flush due to concern for intracranial hemorrhage. None of the patients underwent LSA revascularization or developed stroke or spinal cord ischemia as a result of the procedure. Operative complications were seen in 6% of patients and included one femoral pseudoaneurysm, one lower extremity compartment syndrome, one type 2 endoleak requiring LSA embolization, and one intracranial bleed. The 30-day mortality was 7% (1 aortic related). On 30-day postoperative follow-up CT imaging uniformly revealed positive aortic remodeling and no secondary aortic intervention was required.

Conclusions: Institutional implementation of our grading system has streamlined treatment of BTAI and our results confirm the following: patients with “minimal” injury do not require surgical treatment, patients with “moderate” injury can safely undergo TEVAR in a semi-elective manner once they are stable from other injuries, and patients with “severe” injury require emergent repair. These procedures are expeditious and can be successfully performed percutaneously with a single endograft. Complications are rare and follow up reveals excellent remodeling of the aorta likely resulting in lengthened interval surveillance requirements for these patients.

#20 LIMB SALVAGE AND FUNCTIONAL LIMB OUTCOMES AFTER REVASCULARIZATION FOR TRAUMATIC ACUTE LIMB ISCHEMIA*

Presenter: M Dasari MD, University of Washington, Seattle, WA

Authors: M Dasari MD, JR Hurd MD, DF Emanuels, S Aarabi MD, BW Starnes MD, E Quiroga MD, NT Tran MD, N Singh MD

Background: Traumatic vascular injury leading to acute limb ischemia (ALI) is an uncommon problem with a potential for high morbidity. We describe a contemporary series of patients with traumatic ALI managed primarily by vascular surgeons at a tertiary referral center, and review factors associated with limb salvage (LS) and functional limb outcomes.

Methods: A retrospective review of all patients with upper extremity (UE) and lower extremity (LE) ALI secondary to trauma and requiring revascularization at a single institution was conducted from 2013-2016. Demographic data, transfer timing, injury severity score (ISS), Rutherford classification (RC), pre-operative imaging, level of occlusion, procedural information, fasciotomy characteristics, and discharge disposition were reviewed. Outcome measures included LS and functional limb outcomes.

Results: We identified 68 patients with traumatic ALI requiring revascularization. The majority of patients had moderate ISS scores, were RC 2 on presentation (65%), were transferred from another institution (53%), and underwent preoperative imaging (62%) with expeditious time to operation (median 4.5h). The most common location of vascular injury for UE was axillary-brachial (88%) and for LE was femoral-popliteal (69%). Open vascular procedures dominated the treatment strategy and the median number of operations was 3. Fasciotomy was performed in 25% of UE and 58% of LE injuries. Shunts were utilized in only 2 patients. Overall LS was 94% for UE and 78% for LE. RC and the number of operations performed were independent predictors of amputation and functional limb at follow-up in our logistic regression model ($p < 0.05$). The median LOS was 11 days and 25% of patients were discharged to a skilled nursing facility. 59% of patients presented for follow-up and for upper extremity injuries 57% of patients had no or minimal functional deficits while 33% had major functional deficits and 10% had undergone amputation. For lower extremity injuries 68% of patients had no or minimal functional deficits while 6% had major functional deficits and 26% had undergone amputation.

Conclusion: Revascularization for traumatic ALI yields high LS in patients with RC 1 and 2 ischemia as well as in patients with UE injuries. However, LS does not necessarily equate to good functional outcomes, likely signifying the complex injuries in these patients requiring multiple operations to attain LS.

#21 UPDATING 0.9: LOWERING THE ANKLE BRACHIAL INDEX THRESHOLD IN BLUNT LOWER EXTREMITY TRAUMA MAY PREVENT UNNECESSARY IMAGING*

Presenter: JF Hemingway MD, University of Washington, Seattle, WA

Authors: JF Hemingway MD, SK Desikan MD, JA Gross MD, NT Tran MD, N Singh MD, E Quiroga MD

Objective: Lower extremity vascular injury due to blunt trauma requires immediate revascularization to achieve limb salvage. In the absence of hard signs of arterial injury, current algorithms suggest further diagnostic imaging, such as computed tomography angiograms (CTAs), if the ankle-brachial index (ABI) is less than 0.9. These recommendations are based on studies predominantly involving penetrating trauma and thus may not apply to blunt trauma, resulting in unnecessary, costly imaging. The aim of this study was to analyze lower extremity CTAs obtained at a level 1 trauma center to determine the incidence and characteristics of patients sustaining vascular injury from blunt lower extremity trauma

Methods: A single center, retrospective review, of all consecutive patients who presented to a level 1 trauma center with blunt lower extremity trauma and received a CTA with runoff in 2017 was conducted. Baseline demographics, clinical features, and outcomes were recorded. Patients who received CTAs for non-diagnostic purposes were excluded.

Results: Of 83 total patients extracted, 78 patients met inclusion criteria, with a mean age of 44 (range 15-89) and a 67% male predominance. The incidence of a vascular abnormality on CTA, including vessel non-opacification, narrowing, occlusion, dissection, transection, extravasation, and pseudoaneurysm, was 35% (n=27). 81% (22) of these patients were managed non-operatively and 19% (5) required intervention (Figure 1). Among examinable patients, all those presenting with the triad of no palpable pulse, motor deficits, and sensory deficits, had injuries requiring revascularization (Figure 2); alternatively, all patients without the above triad of findings and an ABI >0.6 had no vascular injuries identified (Figure 3).

Conclusions: There was a 35% reported incidence of vascular abnormalities among CTAs obtained for blunt lower extremity trauma. The majority of these were not clinically significant and required no intervention. The presence of the deficit triad should alert the clinician to a possible injury requiring immediate intervention. Alternatively, in patients with blunt lower extremity trauma without the deficit triad on exam, an ABI >0.6 may exclude the presence of a clinically significant vascular injury (Figure 1). Using this algorithm (Figure 4), 38 CT angiograms (48%) could have been avoided without missing clinically significant vascular injuries requiring intervention.

#22 IATROGENIC PSEUDOANEURYSM OF THE SUPERIOR GLUTEAL ARTERY AFTER TRANSCATHETER AORTIC VALVE REPLACEMENT

Presenter: S Harris MD, Oregon Health and Science University, Portland, OR

Authors: E Jung MD, K Kolbeck MD, TK Liem MD, CZ Abraham MD, GL Moneta MD, GJ Landry MD, R Schenning, MD

Background: Superior gluteal artery (SGA) pseudoaneurysms are rare and are typically induced by trauma (blunt or penetrating) or by iatrogenic injury. We report the case of a left SGA pseudoaneurysm following transcatheter aortic valve replacement (TAVR) that was initially managed with ultrasound guided thrombin injection and subsequently underwent successful embolization for recanalized and enlarging pseudoaneurysm.

Method: An 84 year old female with severe aortic stenosis, coronary artery disease, atrial fibrillation on chronic anticoagulation and hepatitis C cirrhosis underwent a TAVR. Both common femoral arteries were accessed percutaneously and the left common femoral artery (CFA) was pre-closed with two Perclose Proglide devices. After successful deployment of the aortic valve, the 14 Fr deliver sheath was removed from the left CFA. Hemostasis was not achieved with the Proglide suture system. Initial attempt at balloon occlusion of the left external iliac artery from the right side was unsuccessful and a large sheath was re-inserted into the left CFA for hemostasis and vascular surgery was consulted. The left CFA was repaired with a femoral endarterectomy, and patch angioplasty with bovine pericardium. The patient was discharged on postoperative day 7.

Results: Approximately 4 weeks after her TAVR, the patient presented with sharp radiating pain down her posterior left leg. Computed tomography angiography (CTA) demonstrated a large left pelvic pseudoaneurysm originating from the superior gluteal artery. Review of her intraoperative TAVR images demonstrated wire and balloon within a branch of the left internal iliac artery during the attempted balloon occlusion. The patient underwent successful ultrasound guided thrombin injection that was confirmed with CTA on post-injection day 3. However, symptoms several days after discharge prompted a repeat CTA demonstrating a recanalized and enlarged left pelvic pseudoaneurysm fed by branches of the left superior and inferior gluteal arteries. The patient underwent successful image guided coil embolization of the left superior and inferior gluteal artery and liquid embolization of the pseudoaneurysm lumen. Subsequent CTA follow up demonstrated complete thrombosis of the pseudoaneurysm and interval decrease in pseudoaneurysm size. The patient's sciatic nerve compressive symptoms were nearly resolved.

Conclusion: With increasing percutaneous access for procedures requiring large sheaths and reported complication rates of 1-2%, it is important to maintain wire access and have a methodical way of achieving hemostasis. Consideration of additional Proglide device deployment or reinsertion of the sheath and surgical cutdown when the pre-close sutures fail is recommended. It is also critical to confirm wire location at all times to minimize arterial injury.

#23 MANAGEMENT OF A RUPTURED INTRAHEPATIC ARTERY ANEURYSM

Presenter: E Robinson BS, University of Washington, Seattle, WA

Authors: E Robinson BS, N Singh MD

We present a case of a 39 year old female who was transferred from an outside facility with a large subcapsular hematoma secondary to ruptured intrahepatic aneurysm. It was noted the patient had multiple extrahepatic aneurysms as well. We will describe her treatment as well as review the literature on this uncommon presentation.

#24 DELAYED PRESENTATION OF BLUNT INFERIOR VENA CAVA INJURY FOLLOWING HIGH SPEED MOTOR VEHICLE COLLISION

Presenter: B French MD, Swedish Medical Center, Seattle, WA

Authors: B French MD, S Reiter MD, G Hayes MD

Introduction: Blunt traumatic injuries to the inferior vena cava (IVC) are rare, but have a mortality of 33 to 66%. The cause of mortality is most commonly exsanguination or cardiac tamponade. Infrequent cases of traumatic thrombosis of the IVC have also been documented. We are reporting an interesting case of a patient in a high-speed motor vehicle collision who was diagnosed ten years later with chronic IVC obstruction.

Case: A 27-year-old male with a remote history of high speed motor vehicle crash ten years prior resulting in grade 3 spleen laceration and right kidney and liver contusions presented to our institution with increasing abdominal and back pain for a week following a flu-like-illness. He was worked up and a CT scan was performed showing infrarenal IVC thrombus with extensive collaterals. Vascular surgery was consulted and venogram performed showing chronic clot in the IVC that was unable to be passed with a wire and acute clot in the left renal vein. There were numerous large collateral veins. Thrombolysis was instituted through two catheters, one in the IVC via the femoral vein and one in the left renal vein via the right internal jugular. He was taken back to the angiography suite after 24 hours and the renal and IVC thrombosis had resolved, however the infrarenal IVC remained occluded. His acute symptoms improved, and he was discharged on anticoagulation. He has been followed with serial doppler ultrasound which have continued to show proximal IVC occlusion, but he remains with minimal symptoms.

Discussion: Presentation of IVC thrombus ten years following trauma has never been reported in the literature. A complete coagulopathy work-up was negative, and there is no other explanation for IVC thrombosis other than his trauma. The patient had initial symptoms of exercise intolerance and leg swelling following the crash, but developed extensive collaterals allowing him to live a normal life. An acute illness and likely dehydration led to the acute clot seen in the renal vein and caused his presenting symptoms. There are few reports in the literature about IVC thrombosis following liver injury, but this tended to be in the retro-hepatic IVC, compared to our case of infrarenal IVC thrombosis.

Initial CT was arterial phase trauma protocol with no mention of IVC injury by the radiologist, and a normal IVC on review by our radiologist. Our hypothesis is the patient suffered a shear injury to the infrarenal IVC, leading to endothelial damage resulting in thrombosis. In conclusion this is an unprecedented case of a patient presenting with traumatic IVC occlusion ten years after a high-speed motor vehicle collision.

#25 FOLLOW-UP OF INCOMPLETE LOWER EXTREMITY VENOUS DUPLEX ULTRASOUND SHOULD BE A TARGET FOR QUALITY IMPROVEMENT*

Presenter: R Samuel RN, Oregon Health and Science University, Portland, OR

Authors: K Nguyen MD, J Weber, D Louie, R Samuel MD, N Saephan, T Liem MD, G Moneta MD

Background: DVT positive lower extremity venous duplex ultrasound (LEVDUS) is an indication for anticoagulation. Incomplete examinations that fail to examine all LE veins in patients not otherwise indicated for anticoagulation may be followed by a repeat examination to exclude missed/progressing DVT. This study examined the frequency of follow-up LEVDUS following incomplete LEVDUS and compared the incidence of positive DVT between initial complete LEVDUS and follow-up LEVDUS after an initial incomplete examination to determine if improving rates of follow-up LEVDUS following an incomplete examination is a reasonable target for quality improvement.

Method: From December 2016 to December 2017, incomplete LEVDUS were prospectively identified in patients who did not have an identified indication for anticoagulation. We determined the frequency/demographics of repeat studies performed within 2 weeks following incomplete LEVDUS and DVT rates of initial and repeat LEVDUS.

Results: 4,828 LEVDUS studies (ankle to groin) were performed; 223 (4.8%) were incomplete and did not otherwise identify DVT in the ipsilateral or contralateral leg. 80.3% of incomplete studies were ordered in-hospital, 12.1% from outpatient clinics, 7.6% from the ED, with 9.9% ordered by PCPs, 33.6% by specialists, 29.1% by trauma surgeons and 27.4% by ED providers. Initial indications for incomplete studies were high-risk screening in 52.5%, and LE signs/symptoms in 47.5%. 63.2% of incomplete studies resulted from bandages, wounds, braces, casts or fixation devices, 13.5% from edema, 5.8% from body habitus and 12.1% from patient study intolerance. Deep veins inadequately evaluated on initial LEVDUS included femoral (36.8%), popliteal (40%) and axial calf veins (85.7%). 61 patients (27.3%) with incomplete LEVDUS had repeat examinations. 11.5% had thrombi detected with 6 in deep and 2 in superficial veins. Only 18 of 105 symptomatic patients with an incomplete study had a repeat study with 71% of follow-up studies for screening patients ($p < 0.001$). Repeat LEVDUSs performed after an initial incomplete examination detected DVT at a rate of 8.2%.

Conclusion: Almost half of incomplete LEVDUSs are ordered in symptomatic patients. However, the large majority of patients with incomplete LEVDUS, even those with symptoms, do not have a follow-up examination but patients with repeat studies have a DVT diagnosis rate of 8.2%, suggesting the need for quality assurance programs to ensure repeat studies are performed following incomplete LEVDUS, particularly in symptomatic patients.

#26 OPEN SURGERY FOR INFERIOR VENA CAVA FILTER PERFORATION*

Presenter: J Smolevitz MD, Oregon Health and Science University, Portland, OR

Authors: DW Wilson MD, GJ Landry MD, EL Mitchell MD, AF Azarbal MD, JA Kaufman MD, GL Moneta MD, TK Liem MD

Background: Inferior vena cava (IVC) filter placement rarely may be complicated by perforation of the IVC or adjacent organs, or migration into proximal or distal venous segments. Although most of these may be treated via percutaneous retrieval techniques, some patients require open repair. We review the indications, safety, and efficacy of open surgery for IVC filter-associated perforation or migration.

Methods: All open IVC filter retrievals over an 11-year period were identified, and patients were reviewed for age, indications for filter placement, filter type, prior venous thromboembolism, and prior attempts at percutaneous retrieval. Indications for IVC filter removal, operative technique, blood loss, length of stay, and perioperative complications also were reviewed.

Results: Over an 11-year period, 8 open IVC filter retrievals were performed (with 300 percutaneous retrievals during the same period). In patients undergoing open surgery, average age was 43 years (range, 17-81). 75% (6/8) had venous thromboembolism prior to IVC filter placement, and 50% (4/8) had prior attempts at percutaneous retrieval. Filter types were Cordis Optease (2), Cook Günther-Tulip (2), Cook Celest (1), Cook Bird's Nest (1), Bard Simon-Nitinol (1), and Bard Eclipse (1). Patients presented with abdominal pain in 6, duodenal perforation in 3, aortic perforation in 2, migration and filter fracture in 2, and pancreatic perforation/pancreatitis in 1. 62% had complete filter removal with 50% requiring cavotomy. Two patients had complete filter extraction using an open snare/sheath technique. Median length of stay was 6.5 days (range, 4-49). Two patients developed perioperative complications (1 aortic pseudoaneurysm, 1 incisional hernia), both requiring subsequent repair. There were no perioperative mortalities.

Conclusions: Open IVC filter retrieval, in patients with filter-associated perforation or migration, may be accomplished with low perioperative morbidity and mortality, and it remains a suitable option for patients who fail, or are not candidates for, endovascular attempts.

#27 IMMEDIATE EFFECTS OF HEMODIALYSIS ON UPPER EXTREMITY AND COGNITIVE FUNCTION*

Presenter: D Louie DO, Oregon Health and Science University, Portland, OR

Authors: JB Campiche MD, V Kottapalli MD, S Ganesan MD, GJ Landry MD

Background: Hemodialysis (HD) is a critical renal replacement therapy in patients with end-stage renal disease (ESRD). In the absence of kidney transplantation, HD serves as the primary modality which removes metabolic wastes and restores biological buffers to better facilitate normal renal function. Patients commonly report feelings of “fatigue” following dialysis. In hospitalized patients, this may additionally impact their recovery times leading to longer hospital stays and reduced quality of life. Previous studies have evaluated the effects of HD on single-hand function tests while our study hopes to provide a more comprehensive assessment of upper extremity and cognitive function. The purpose of this study is to quantify functional and cognitive changes associated with HD in hospitalized patients.

Methods: Hospitalized inpatient undergoing HD with upper extremity arteriovenous (AV) fistulas and subclavian catheterizations at Oregon Health and Science University (OHSU) were prospectively enrolled in the study. Both hand function outcomes, using FDA approved devices, and cognitive function outcomes were measured. Data sets were collected at four time points: baseline, immediately after, three hours after, and morning post-HD. The functional hand measurements recorded included: grip strength, pinch strength, dexterity, and sensation. The functional cognitive measurements evaluated cognition, executive function and memory. The quantitative measurements from each patient data set will be compared to analyze changes in motor and cognitive function during the course of recovery from HD.

Conclusion: Our comprehensive study provides a better understanding of the motor and cognitive changes that occur immediately after HD which should be taken into account when patients return to routine daily living.

#28 FERUMOXYTOL-ENHANCED MAGNETIC RESONANCE IMAGING (FE-MRI) AS A NOVEL BIOMARKER OF POST THROMBOTIC SYNDROME*

Presenter: A Abedini MD, Oregon Health and Science University, Portland, OR

Authors: KP Nguyen MD, EA Neuwelt, M Hinds, A Abedini MD, G Toth, C Wyatt

Background: Deep vein thrombosis (DVT) most commonly affects the lower extremities and is associated with significant morbidity and mortality. After DVT, healing occurs through a process termed DVT resolution wherein tissue remodeling results in thrombus resorption and recanalization. Post thrombotic syndrome (PTS), where DVT signs and symptoms persist over months and years, can occur after failure of DVT resolution and cause chronic disability. Immune and inflammatory processes play important roles during DVT resolution as previous studies have shown the critical roles of monocytes and macrophages. The clinical evaluation and accurate diagnosis of PTS is challenging as there is no objective clinical or imaging test standard for diagnosis. Instead, the diagnosis of PTS is based on clinical scores, such as the Villalta score, summarizing descriptive signs and symptoms of PTS. Contrast enhanced MRI with ferumoxytol (Fe-MRI) has the potential to reliably diagnose the severity and progression of PTS, due to its ability to directly assess venous thrombi and vein walls to detect macrophage activity and post-thrombotic inflammation. Using an in-vivo murine model of DVT and PTS, we assessed the ability of Fe-MRI to characterize post thrombotic changes to thrombi and vein walls.

Method: DVT was induced in wildtype CD1 mice by infra-renal inferior vena caval (IVC) constriction. Sham laparotomy with dissection of the IVC without constriction served as controls. T1- and T2- weighted Fe-MRI images were obtained using a 12 Tesla scanner. Using Matlab (Matrix Laboratory, MathWorks), thrombi were segmented on pre-injection T2-weighted images using a recursive region-growing algorithm and the thrombus volume was quantified. At several time points of pre- and post- injection of intravenous ferumoxytol, T2 relaxation maps were acquired and fit using a 2-parameter nonlinear least squares fit. Mean T2 values were obtained in the region of interest over the entire thrombus. Fe-MRI findings were correlated to immunohistochemical analyses of the thrombi and vein walls.

Results: After IVC constriction, histology demonstrated inflammation and fibrosis after DVT. The MRI analysis following IVC constriction indicated that the thrombus volume decreased over time after day 3. Fe-MRI showed a decrease in T2 relaxation time post ferumoxytol injection and at 24 hours post injection compared to pre-injection, which corresponded to recanalization and macrophage activity inside the thrombus on day 4.

Conclusion: PTS remains a challenging clinical and subjective diagnosis based on clinical scores. Therefore, the development of an objective test would be useful to standardize the diagnosis of PTS. Preliminary evaluation of post thrombotic changes in mice after IVC constriction with Fe-MRI suggests that it may be studied as a potential radiographic biomarker for PTS.

#29 BRANCHED SUBSCAPULAR ARTERIAL GRAFT FOR HAND OCCLUSIVE DISEASE IN A DIALYSIS PATIENT WITH A FUNCTIONING FISTULA

Presenter: SC Mostowy MD, Kelowna General Hospital, Kelowna, BC

Authors: SC Mostowy MD, JR Harris MD, JS Williamson MD

Background: Hand occlusive disease resulting in pain and non-healing ulcers in renal dialysis patients on the same side as a functioning fistula is a challenge. We will present a 61 year old patient with a long standing left radiocephalic fistula who developed left hand ischaemia and superficial necrotic ulcers.

Method: The patient underwent an angiogram demonstrating unremarkable ulnar and radial arteries of the forearm. The radiocephalic fistula is widely patent. The majority of blood flow from the radial artery shunts into the fistula, presuming to lead to vascular steal. There is abnormal filling of his hand vasculature with some filling of the deep arch by the radial artery and deep branch of the ulnar artery, but poor filling of the superficial arch and common vessels.

Results: Collaborating with Plastic Surgery with microvascular expertise, a zigzag incision was made over the carpal tunnel and wrist in the palm. The ulnar artery was dissected out which was pulsatile to the level of takeoff branch to the deep palmar arch but distal to that it was occluded- common digital artery up to the bifurcation of the small and ring finger, and the arch in the mid palm. This left a large segmental defect at multiple levels. A subscapular vascular flap was dissected out from the lateral chest wall. It is a branched vascular graft consisting of the thoracodorsal and serratus branch. The free tissue was transferred to the hand and aligned. Microvascular anastomosis was undertaken between the ulnar artery proximally and the thoracodorsal artery; and then distally into the palmar arch. Then the serratus branch was anastomosed to the bifurcation of the 4th web space common digital vessel. Thereafter the palmar skin was closed and a fiberglass splint was applied. Over the next few weeks, the patient's ischaemic pain resolved, the hand is pink and warm and the ulcers healed completely. Plus his fistula flows are maintained and excellent.

Conclusion: This case demonstrates the advantage of a native branch vascular graft. Using a multidisciplinary approach, vascular reconstruction using a subscapular branched graft can bypass occlusive hand disease and thus salvage a hand in a dialysis patient on the same side of a functioning fistula. Thereby the traditional method of ligating the fistula is avoided.

#30 SUCCESSFUL ASPIRATION THROMBECTOMY FOR THE TREATMENT OF ILIOFEMORAL DEEP VENOUS THROMBOSIS USING THE ANGIOVAC SYSTEM: A CASE REPORT

Presenter: TL Nash BS, University of Washington, Seattle, WA

Authors: TL Nash BS, JF Hemingway MD, S Bommareddi MD, FD Vladimir MD, MH Meissner MD

Background: Massive deep venous thrombosis (DVT) remains challenging to manage. Despite treatment with systemic anticoagulation, many patients develop Post-Thrombotic Syndrome (PTS). Though aggressive measures, including thrombolysis, are effective, many patients are not candidates for these therapies due to an elevated bleeding risk. Here, we present a case of thrombus evacuation by percutaneous vacuum assisted thrombectomy in conjunction with Esmarch bandage application.

Method: A 54-year-old female with a history of recurrent temporal lobe astrocytoma presented with acute left leg swelling, pain, and discoloration. Ultrasound revealed an occlusive iliofemoral DVT, extending from the popliteal fossa to the confluence of the inferior vena cava, with cross-sectional imaging suggesting left common iliac vein (CIV) compression. Given her recent gamma knife procedure and intracranial malignancy, she was not a candidate for thrombolytic therapy. Thus, percutaneous thrombectomy using the AngioVac aspiration system was performed.

Under general anesthesia, neck and groin access via the right internal jugular (IJV) and left common femoral veins (CFV) was established using micropuncture technique. Systemic heparin was administered, and venography confirmed complete occlusion of the left CIV. A sheath was introduced into the right IJV, through which the AngioVac aspiration cannula was advanced. A left CFV cannula was placed to complete the return circuit, and de-airing maneuvers were performed. Initial attempts to advance the device into the left CIV were unsuccessful. Following balloon angioplasty, the cannula was successfully advanced. A mechanical thrombectomy device was then used to dislodge the proximal extent of the DVT.

Upon achieving patency, the cannula was advanced into the left CFV over an angioplasty balloon. An Esmarch bandage was applied to the left leg, aiding in removal of any residual thrombus from the left superficial femoral vein. Following thrombus evacuation, a wall stent was placed to treat the left CIV compression.

Results: Imaging demonstrated no residual thrombus, a well-positioned stent, and resolution of iliac vein compression. The patient continued anticoagulation and was monitored for one day. She attained full resolution of her symptoms with a return to baseline functionality. Duplex ultrasound confirmed complete resolution of the thrombus, and the patient was discharged home on lifelong anticoagulation.

Discussion: Early, aggressive treatment of proximal DVT decreases the incidence of PTS. For those patients who are not candidates for thrombolytic therapy, AngioVac suction thrombectomy with Esmarch bandage placement and mechanical thrombectomy is an effective and safe treatment option.

#31 THORACIC AORTIC DISSECTION AND ANEURYSM RELATED MORTALITY REMAINS UNCHANGED IN WA STATE BETWEEN 1996 AND 2016*

Presenter: MA Bartek MD, University of Washington, Seattle, WA

Authors: MA Bartek MD, MP Sweet MD, S Khor MS, J Nguyen BA, GS Aldea MD, L Kessler ScD, S Shalhub MD

Background: Long term outcomes for patients with aortic dissection are difficult to assess due to incomplete follow-up and mortality reporting for dissection is sparse. From 1996 to 2016 there was a significant decline in aortic aneurysm-related mortality rates in Washington State (WA). The aim of this study is to evaluate trends and geographic variation in aortic dissection (AD) and thoracic aortic aneurysm (TAA) related mortality in WA state from 1996 to 2016 with the hypothesis that a similar decline in mortality would be observed.

Methods: Data from death certificates from 1996 to 2016 in WA were analyzed for cases in which AD or TAA was listed as an underlying or contributing cause of death (COD). To account for the state's population growth over time, age-standardization was performed using 10-year age blocks, standardizing to the 2016 population. Mortality trends were evaluated within sex and race strata and compared to abdominal aortic aneurysm mortality using linear regression. Differences in county-specific mortality rates were assessed using the Kruskal-Wallis test.

Results: Of the 1,014,039 total deaths that occurred over the study period, 2048 were AD-related (60% Male, 88% White) and 1,316 were TAA-related (45% Male, 91% White). In 82% of the cases, AD was noted as the underlying COD (Table). The mean AD-related and TAA-related mortality rates were 1.7 ± 0.3 deaths/100,000 and 0.5 ± 0.1 deaths/100,000, respectively, compared to 6.3 ± 1.7 deaths/100,000, the abdominal aortic aneurysm-related mortality. There was no change in AD-related nor TAA-related mortality over time in comparison to a decline in aortic aneurysm-related mortality over the same period ($P < 0.001$). The mean age of death for AD-related deaths was about 10 years greater than for TAA-related deaths ($67.8 + 16.0$ years versus 77.1 ± 12.0 years respectively). While there were no differences in AD-related mortality rates by sex ($P=0.9$), there was a significant increase in mortality rate among individuals who are non-white compared to white (an increase of 0.04 vs. 0.0006 deaths/100,000/year respectively, $P=0.01$). AD-related mortality rates varied significantly across counties (range 0.02-145.9 deaths/100,000, $P < 0.001$) and there was no obvious pattern to this variation. An autopsy was completed in 640 (32%) cases, of which 92% reported AD as underlying COD. Among those, 50.2% had an associated COD of aortic rupture. A higher percentage of hypertensive heart disease was noted among those with rupture (70% vs. 47%, $P < 0.001$).

Conclusion: AD- and TAA-related mortality did not decline over 21 years in WA in contrast to a significant drop in abdominal aortic aneurysm-related mortality during the same period. Significant racial and geographic variations were noted. These observations are first step toward regional population assessments that could potentially change care patterns at the state level.

#32 INTEGRATED RESIDENCY IS ASSOCIATED WITH AN INCREASE IN WOMEN AMONG VASCULAR SURGERY TRAINEES

Presenter: SH Shin MD, University of Washington, Seattle, WA

Authors: SH Shin MD, S Shalhub MD

Background: Over the past decade, the proportion of women within Graduate Medical Education (GME) has increased. Correspondingly, the proportion of women in almost every specialty has increased, including surgical specialties. We sought to evaluate the effect of establishing Vascular Surgery Integrated Residencies (VSIRs) on the proportion of women in VS training programs.

Method: Resident data were obtained from the Accreditation Council for GME (ACGME) Data Resource Book for the academic years 2007-2016. Data were collected on overall ACGME residency numbers as well as on the following surgical subspecialties: Vascular, General, Thoracic, Neurological, Orthopedic, Ear Nose and Throat, Plastic, and Urological surgery. The number and proportion of women per year in VSIRs and VS fellowships were compared to those in the other surgical specialties.

Results: During the study period, the overall the number of women in ACGME accredited residency programs increased from 41% (N=43695/107851) to 44% (N=57130/129720) of residents. Since the advent of the VSIR, the number of trainees within VS has grown by 56% from 221 to 501 trainees. The proportion of women in VS training programs has increased from 12% (N = 27/221) to 33% (N = 164/501) of trainees. This increase over the 9-year study period was greater than in any other surgical subspecialty and greatest within the VSIR. Compared to fellowship training programs, integrated surgical training programs within the same subspecialty had a higher proportion of women though variability between surgical subspecialties remained notable.

Conclusion: While lower than the proportion of women within all GME training programs, an increasing proportion of women have entered VS training during the study period. This appears to be related to the introduction of VSIRs and exceeds the proportion of women entering other surgical subspecialties. Further work to understand surgical specialty preferences and choice of careers after training is warranted.

#33 VASCULAR RECONSTRUCTION IN RETROPERITONEAL AND LOWER EXTREMITY SOFT TISSUE SARCOMA RESECTION: A CASE SERIES AND SYSTEMATIC REVIEW OF THE LITERATURE*

Presenter: KA Arsenault MD, University of British Columbia, Vancouver, BC

Authors: KA Arsenault MD, J Faulds MD, A Salvian MD

Background: Surgical resection remains the primary treatment modality for soft tissue sarcomas of the retroperitoneum and lower extremities. In approximately 5-6%, the vascular supply to the limb may need to be resected and reconstructed in order to achieve R0 resection. This approach has acceptable rates of tumor control and overall survival when compared to primary amputation. Our objective was to review our institutional experience in these patients. Previous studies have used patients that did not require vascular reconstruction as a comparator group. The natural history of these patients are unlikely to be similar. Instead, we performed a systematic review of the literature to compare our results to those of other published series.

Methods: We undertook a retrospective chart review of all patients receiving vascular reconstruction for retroperitoneal or lower extremity soft tissue sarcoma between January 2008 and January 2018. We collected data regarding patient demographics, tumor characteristics, oncologic treatment, vascular reconstruction, and outcomes including mortality, amputation, and patency of vascular reconstruction.

We also undertook a systematic review, searching three major medical databases and references of relevant papers, for studies that reported results of patients undergoing soft tissue sarcoma resection in the retroperitoneum or lower extremity. We selected studies and conducted data abstraction independently and in duplicate.

Results: Final data from our case series is pending and will be presented at the Pacific Northwest Vascular Society Meeting.

Forty-seven studies, involving 962 patients with 592 arterial and 442 venous bypasses, were included in the systematic review. Common tumor pathology was leiomyosarcoma (17.4%), liposarcoma (16.4%), and synovial sarcoma (8.5%). At a median followup of 41.7 months, the weighted mean survival rate was 60.9%. Patency was 88.9% for arterial grafts and 76.5% for venous grafts. Weighted mean amputation rate was 6.8%.

Conclusions: This is the largest systematic literature review of vascular reconstruction in sarcoma resection and demonstrates that this approach is associated with a reasonable patency rate and a low amputation rate. We hypothesize that the data from our case series will show that our results are comparable to the published literature.

#34 PROGNOSTIC IMPLICATIONS OF DIAGNOSING FRAILTY AND SARCOPENIA IN VASCULAR SURGERY PRACTICE: FORM VERSUS FUNCTION*

Presenter: AA Ghaffarian MD, University of Washington, Seattle, WA

Authors: AA Ghaffarian MD, WT Foss MD, LW Kraiss MD, BK Smith MD, CL Griffin MD, MR Sarfati MD, BS Brooke MD PHD

Objectives: Frailty and sarcopenia are related but independent conditions common in older patients that can be used to assess their ability to tolerate the stress of major vascular surgery. However, it is unclear whether frailty or sarcopenia is more predictive of surgical outcomes. We assessed the association between frailty and sarcopenia with long-term survival among patients undergoing surgical and non-surgical management of vascular disease.

Methods: We retrospectively reviewed all patients who underwent prospective frailty assessment during their vascular surgery clinic visit using the Clinical Frailty Scale between December 2015 and August 2017, who also underwent an abdominal CT scan within the prior 12-month period. The cross-sectional area (cm²) of skeletal muscle was measured on a single axial CT-image at the L3 vertebrae. Sarcopenia was defined using established criteria of <52.4 cm²/m² for males and <38.5 cm²/m² for females. After stratifying patients by frailty & sarcopenia diagnoses along with comorbidities, the association with all-cause mortality was analyzed using Kaplan Meier curves and Cox regression models.

Results: A total of 415 patients underwent both frailty and sarcopenia assessment, of which 112 (27%) only met sarcopenia criteria, 48 (12%) only met frailty criteria, 56 (13%) were both sarcopenic & frail, while 199 (48%) controls didn't meet criteria for either condition. A vascular procedure was performed on 167 (40%) patients whereas 248 (60%) were managed non-operatively with a median (IQR) follow-up after CT imaging of 1.5 (1.1-2.2) years. Patients diagnosed with either sarcopenia or frailty were older (mean 65-yrs vs. 59-yrs; P<0.01) and more likely to be male (69% vs. 54%; P<0.01) when compared to control patients. Long-term survival was significantly decreased for patients diagnosed with either frailty alone or both frailty & sarcopenia who underwent both surgical and non-surgical management. In multivariate regression models, frailty was the only independent variable (HR: 7.7, 95%CI: 3.2-18.7; P<0.001) that predicted mortality.

Conclusions: Although frailty and sarcopenia have both been used to predict long-term survival among vascular patients, our data indicate that frailty alone is the only independent predictor associated with mortality.

#35 ASSESSMENT OF THE COMMUNICATION INFRASTRUCTURE AND INTEREST IN RESEARCH COLLABORATION AMONG PATIENTS WITH VASCULAR EHLERS-DANLOS SYNDROME

Presenter: S Shalhub MD, University of Washington, Seattle, WA

Authors: S Shalhub MD, L Kellogg MD, PH Byers MD, The Vascular Ehlers-Danlos Syndrome Research Collaborative

Objectives: Vascular Ehlers-Danlos Syndrome (vEDS) is a rare condition leading to genetically triggered aortic and arterial aneurysms and dissections. We established the vEDS collaborative to prioritize patient-centered outcomes research topics. The initial aim was to assess the information resources available to patients, their experience with the health care system, and willingness to partner with researchers.

Methods: A 28 question survey was created to address the above mentioned aims. Announcement of the collaborative and the survey were disseminated between January and April 2018 via vEDS social media pages, blogs, and advocacy websites.

Results: Of the 300 responses to the survey, 228 were completed on behalf of oneself (64% from the United States, 14% from the United Kingdom). Diagnosis of vEDS was confirmed by genetic testing in 85% of the cases. The internet was the most useful information source for 62% of the patients followed by a geneticist (18%). Of note, 25% answered "No" to "Did a physician explain vEDS to you and how to manage it?" Only half the patients had a PCP coordinating their care and only 32% had a local vascular surgeon. The median annual vEDS related physician visits was 28 (range 0-120). The most commonly reported frustration was "No cure/treatment available" and the "Emergency rooms do not know what vEDS is" (64% and 58% respectively). The majority (90%) are willing to share their medical records for research studies. The most common reason for interest in research partnership was to advance research for a treatment/cure (86%) and helping others learn from their experiences (82%).

Conclusions: This survey was the first step in establishing the collaborative in which vEDS patients are research partners in patient centered research projects. Consequent work includes creation of clinically meaningful care guidelines for physicians caring for patients with vEDS including vascular surgeons. The methodology lessons learned are not only relevant to vEDS but can also be applied to other genetically triggered arterial conditions.

#36 OUTCOMES OF TRANSCAROTID ARTERY REVASCLARIZATION (TCAR) IN THE FIRST TWENTY PATIENTS: A SINGLE CENTER CONSECUTIVE CASE SERIES

Presenter: J Rollo MD, University of Washington, Seattle, WA

Authors: J Rollo MD

Background: The Safety and Efficacy Study for Reverse Flow Used During Carotid Artery Stenting Procedure (ROADSTER) pivotal trial demonstrated the safety and efficacy of trans-carotid artery revascularization (TCAR) in patients with high risk for carotid endarterectomy (CEA) with the lowest reported peri-procedural stroke rate of any prospective carotid stent trial (1.4%). This study led to device approval for all patients who are at high risk for endarterectomy who are symptomatic with stenosis > 50% and asymptomatic with stenosis > 80%. The aim of this study is to report a retrospective review of real-world outcomes in the first 20 cases performed at a single center.

Methods: All patients undergoing TCAR are entered in the Vascular Quality Initiative (VQI) carotid stent module with pre-operative, intra-operative and post-operative data entered as required by the Centers for Medicare and Medicaid services (CMS) post-market analysis. The first 20 patients undergoing TCAR at a single institution, single provider from October 2017 to August 2018 in a consecutive case series were included in this analysis. Demographics, comorbidities, high risk criteria, medical management, peri-operative data, outcomes and post-operative follow-up duplex results were recorded.

Results: TCAR was performed in twenty patients with cervical carotid stenosis. Of these, 15(75%) were symptomatic and 5 (25%) were asymptomatic. TCAR operations were performed under local anesthesia (n=8) and general anesthesia (n=12). Median skin to skin procedural time was 86 minutes, median fluoroscopic time 5.5 minutes, and median flow reversal time 11 minutes. In this cohort, the technical success was 100%. There were no peri-operative major adverse events. There were zero peri-operative 30 day transient ischemic attack (TIA), stroke, death or myocardial infarction (MI). On follow-up, no treated lesions were symptomatic. One patient was noted to have residual stenosis < 50% recorded on follow up duplex. Two patients had peri-incisional hematomas which did not require intervention. Median length of stay was one day.

Conclusion: TCAR is safe and effective for the treatment of cervical carotid stenosis in patients at high risk for CEA. In this cohort of 20 high-risk patients, 75% of whom were symptomatic, the rate of peri-operative stroke, death, MI, TIA was zero.

#37 RADIAL ARTERY ANEURYSM IN A PATIENT WITH MOSAICISM FOR A NOVEL GENE MUTATION

Presenter: L Hysa, University of Washington, Seattle, WA

Authors: L Hysa, M Ferreira MD, PH Byers MD, S Shalhub MD

Background: We report the case of a radial artery aneurysm in the setting of mosaicism for a novel gene mutation.

Methods: The patient was 27 years old when referred for evaluation and treatment of a right radial artery aneurysm present for 2 years. His history was notable for prior repair of a right intracranial carotid artery aneurysm at age 9, a right vertebral artery aneurysm at age 21, and a left main coronary artery aneurysm at age 27. Prior to referral he underwent genetic testing for the common mutations associated with aortic aneurysms and dissections and this was negative. On exam, he had notable skin asymmetry with superficial hemangioma-like skin discoloration predominantly on the right side including the upper and lower extremities as well as soft stretchy skin in the affected areas with minimal fat deposition. Workup for the radial artery aneurysm revealed a previously undiagnosed asymptomatic arteriovenous malformation in the right hand and forearm. Subsequent to his evaluation, analysis of tissue from his most recent intracranial artery aneurysm repair demonstrated a novel gene mutation. This was subsequently confirmed on skin biopsy of his phenotypically affected tissue.

Results: After a follow up period of two years, the radial artery aneurysm continued to gradually enlarge to 3 cm in diameter and was notable for tenderness. He underwent an uneventful repair of the aneurysm with an interposition saphenous vein graft harvested from the unaffected left thigh. His incisions healed without complications.

Conclusions: This case highlights the importance of considering genetic mosaicism tissue testing when evaluating young individuals with arterial aneurysms. This is especially relevant when there are phenotypic findings on exam that suggest mosaicism in the setting of negative routine genetic testing.

#38 RENAL ARTERY ANEURYSMS: LITERATURE REVIEW AND PRESENTATIONS OF EX VIVO ANEURYSM RESECTION, AUTOTRANSPLANTATION AND AORTO-RENAL BYPASS IN A SOLITARY KIDNEY WITH FIBROMUSCULAR DYSPLASIA

Presenter: G Sarwal MD Med, University of British Columbia, Vancouver, BC

Authors: G Sarwal MD MEd, HL Brotherhood MD, ECP Chedgy MBBS MSc, DC Taylor MD, AG Kavanagh MD MPH

Objective: We present a literature review on renal artery aneurysms combined with our multidisciplinary surgical approach for managing multiple complex distal renal artery aneurysms (RAAs) with ex vivo aneurysm resection, autotransplantation and concomitant aorto-renal bypass in a patient with a solitary kidney and fibromuscular dysplasia.

Case Report: In 2010, our patient collapsed as a result of a ruptured left renal artery aneurysm necessitating nephrectomy. In 2017, this now 21-year old represented with right flank pain and was found to have three complex distal RAAs, the largest measuring 5.6 x 4.4 x 3.6cm, with multiple smaller aneurysms involving the internal iliac artery (IIA). To manage the renal aneurysms, the patient underwent a nephrectomy, renal artery resection, ex vivo aneurysm resection and renal autotransplantation combined with a distal aorto-renal bypass to revascularize the kidney. There were no perioperative complications. Serial labs and imaging showed preserved kidney function at a six-month follow-up.

Conclusion: Historically, patients with complex distal RAAs underwent nephrectomy but are increasingly being considered for ex vivo resection and autotransplantation. Our case highlights a safe and feasible technique for managing such aneurysms and the diseased renal artery with a combined vascular and urology approach.

#39 CASE REPORT: VASCULAR GRAFT INFECTION PRESENTING 40 YEARS AFTER INDEX OPERATION

Presenter: AD Politano MD MS, Salem Health, Salem, OR

Authors: AD Politano MD MS, EL Mitchell MD Med

Background: Vascular graft infections can be challenging to manage. Degree of prosthetic involvement, options for reconstruction, bacterial speciation with the need for long-term antibiotics, and associated morbidity are all considerations for vascular surgeons treating patients who present with graft infections.

Method: We present a case report of a chest wall graft infection occurring forty years after the index operation, including the diagnosis, revascularization, and etiology of the infection.

Results: A 73 year-old immunosuppressed, oxygen-dependent woman presented to our clinic with concern for exposed chest wall graft material. Her history was significant for a gunshot wound to the right chest forty years prior with resultant arterial injury, for which she underwent repair via a left-subclavian-to-right-axillary-artery bypass with woven graft. At the time of her presentation, her physical exam demonstrated a mid-sternal wound with exposed graft material. Treatment of the graft infection consisted of a right-carotid-to-right-brachial-artery bypass utilizing cryopreserved great saphenous vein with near total removal of the existing graft material. Intra-operative gram stain of the wound and graft was negative, therefore the tissue was debrided, irrigated with antibiotics, and covered with a wound vac. Post-operative cultures grew *Listeria monocytogenes* requiring removal of all graft material for treatment cure. This required right axillary artery ligation and left subclavian artery vein patch angioplasty. She received intravenous antibiotics for six weeks post-operatively and wound vac management of the sternal wound.

Conclusion: We present a case of an extra-anatomic chest wall vascular graft infection successfully treated with cryovein bypass and graft excision. This case is unique in the nature of the infection, the longevity of the index bypass, and the initially negative intraoperative cultures that guided the initial and subsequent treatment paradigm.



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.

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.

- L. 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

CONSTITUTION & BYLAWS

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.

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.

CONSTITUTION & BYLAWS

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



2018 Membership

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