

A panoramic view of the Toronto skyline from across the water, featuring the CN Tower prominently in the center. The sky is clear blue, and the water is dark blue with some small boats visible.

**CANADIAN SOCIETY FOR VASCULAR SURGERY
SOCIÉTÉ CANADIENNE DE CHIRURGIE VASCULAIRE**

36th ANNUAL MEETING ON VASCULAR SURGERY

"Aneurysm Treatment: Bench to Bedside"

September 26-27, 2014

Hyatt Regency Hotel

Toronto, Ontario

FINAL PROGRAM/PROGRAMME FINAL

CSVS 2014 EXHIBITORS

Please visit the exhibit hall (Regency DEF) and meet the 2014 CSVS sponsors

Exhibiting companies are our benefactors and major resource for our annual meetings. Members and guest delegates are invited and encouraged to visit and support our sponsors.

Exhibit dates and times:

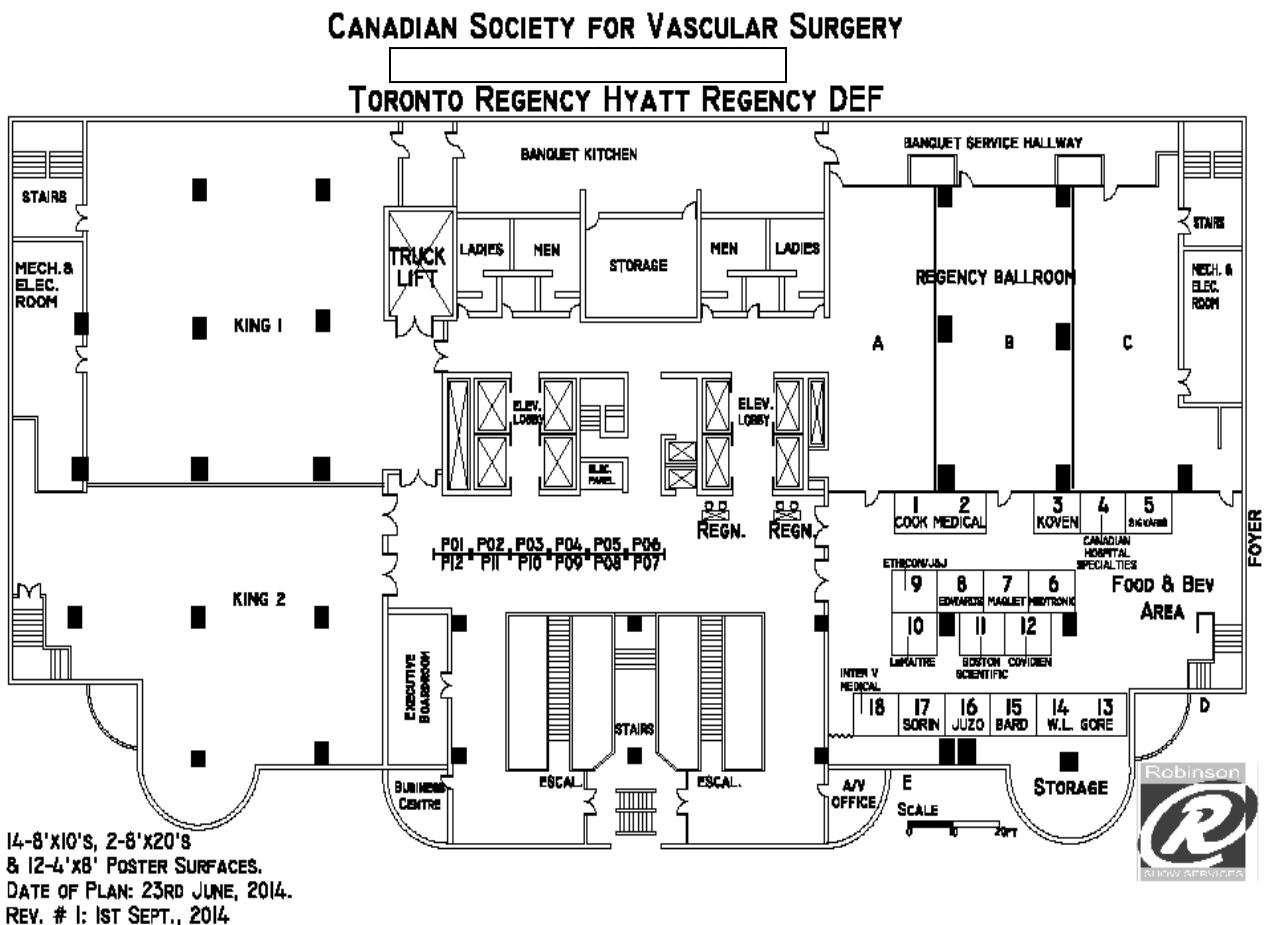
Friday, September 26th

Breakfast – 07:00-07:45
 Refreshment break – 09:30-10:00
 Lunch buffet – 11:30 – 13:00
 Refreshment break – 14:45-15:00

Saturday, September 27

Breakfast – 07:00-07:45
 Refreshment break – 09:45 -10:15
 Lunch buffet – 12:15 – 13:30
 Refreshment break – 14:30 -15:00

Bard, Boston Scientific, Cook, Covidien, Canadian Hospital Specialties, Edwards, Ethicon, Juzo, Koven, LeMaitre, Maquet, Medtronic, Sigvaris, Sorin, Gore & Associates



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Past Past President - Dr. James Dooner

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Previous Executive Committees for the CSVS Annual Meetings

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		2013	President Gerrit Winkelaar Secretary Greg Browne Treasurer Rafik Ghali Program Chair Karim Alibhai

Our sincere thanks for their efforts

CANADIAN SOCIETY FOR VASCULAR SURGERY INVITED GUEST LECTURERS

1980 Charles Rob
1981 Robert Rutherford
1982 Lazar Greenfield
1983 H.H.G. Eastcott
1984 John Bergan
1985 John Mannick
1986 Allan Callow
1987 Robert Courbier
1988 D. Eugene Strandness Jr.
1989 Edward Diethrich
1990 Ronald Stoney
1991 Roger Greenhaigh
1992 Thomas O'Donnell
1993 Jonathan Towne
1994 James Yao
1995 Robert Leather

1996 Bruce Gewertz
1997 Peter Gloviczki
1998 Kaj Johansen
1999 John W. Hallet
2000 Peter Harris
2001 Andrew Whittamore
2002 Jack Cronenwett
2003 Wesley Moore
2004 James May
2005 Robert Hobson II
2006 Eric L. Verhoeven
2007 Timothy A.M. Chuter
2008 Michel Makaroun
2009 Peter A. Schneider
2010 Gregory Moneta
2011 Benjamin Starnes
2012 Daniel Clair
2013 Ronald Dalman

PREVIOUS MEETINGS

1979 Montreal
1980 Ottawa
1981 Toronto
1982 Quebec
1983 Calgary
1984 Montreal
1985 Vancouver
1986 Toronto
1987 Winnipeg
1988 Ottawa
1989 Edmonton
1990 Toronto
1991 Quebec
1992 Ottawa
1993 Vancouver
1994 Toronto
1995 Montreal
1996 Halifax
1997 Vancouver
1998 Toronto
1999 Quebec City
2000 Banff
2001 Ottawa

2002 Halifax
2003 Victoria
2004 Quebec City
2005 Toronto
2006 Calgary
2007 Montreal
2008 Saskatoon
2009 Ottawa
2010 Vancouver
2011 St. John's
2012 Quebec City
2013 Edmonton

FUTURE MEETINGS

2015 Victoria
2016 Halifax
2017 Banff

A History of the Canadian Society for Vascular Surgery
Allan R. Downs, Anthony J. Salvian (Original Publication – 2003)

Founding of the Canadian Society for Vascular Surgery

Following discussions with Dr. R. B. Salter, President of the Royal College of Physicians and Surgeons of Canada, in the spring of 1976, an open meeting was held during the Royal College Annual Meeting in Toronto, January 28, 1977. A mailing list had been developed through Dave Stronach of Brent Surgical and over 100 General, Thoracic, and Cardiac Surgeons were invited to the open meeting. There was an excellent attendance and Wayne Johnston and Allan Downs received a mandate to proceed with the proposal for a Canadian Vascular Society. A nucleus committee was formed with representation from all provinces. The members were Wally Chung (British Columbia), George Bondar (Alberta), Danny McFadden (Saskatchewan), Allan Downs (Manitoba), Wayne Johnston (Toronto), John Provan (Toronto), Walter Waddell (Ottawa), Fernand Laurendeau (Montreal), Doug Miller (New Brunswick), Hugh Simms (Nova Scotia), James Symes (Montreal), and Earl Wright (Newfoundland).

The founding meeting was held on January 26, 1978, during the Royal College meeting in Vancouver. Unfortunately, Earl Wright of Newfoundland was unable to attend, but all other provinces were represented. The bylaws, drafted by Wayne Johnston, were passed. The objectives were outlined and agreed upon. There was no mention of the certificate of competence at this founders' meeting. The objectives of the Society were as follows:

- To provide a forum for Canadian Surgeons treating patients with Vascular Disease
- To maintain and improve standards of care to patients with Vascular Disease
- To monitor standards of care for patients with Vascular Disease through a National Registry
- To establish educational standards for training programs in Vascular Disease
- To provide continuing education programs in Vascular Disease
- To promote research programs in Vascular Disease
- To represent the views of Vascular Surgeons of Canada

The executive was appointed: Allan Downs, President; Wayne Johnston, Secretary; John Provan, treasurer; Danny McFadden was appointed Archivist. Walter Waddell was the program chair for our first scientific meeting with the Royal College in February 1979 in Montreal. After the founding meeting, a membership application was sent to all General and Cardiovascular and Thoracic (CVT) Surgeons with Royal College qualifications. By the time of the February 1979 meeting in Montreal, there were 124 paid members. The Canadian Society for Vascular Surgery had been born. Professor Charles Rob was the first Invited Guest Lecturer.

Accomplishments of the Society

Twenty-five years ago a group of dedicated, forward-thinking academic and clinical surgeons saw the need for a society that would allow for the collegial association of surgeons interested in the investigation and treatment of patients with peripheral vascular diseases. They felt this was necessary to promote development of core groups that could gain clinical expertise in the

management of this difficult group of patients, share and nurture basic and clinical research, and develop training programs for those who would go on to practice this rapidly developing and challenging area of medicine. As a result of their efforts, the Society has become an internationally respected association providing a forum for cutting edge research and has promoted studies that are widely respected and quoted in the international literature. The Society has allowed for crosspollination of ideas and indeed migration of Surgeons throughout Canada and has directly led to the development of Royal College examinations leading to a Certificate of Special Competence in Peripheral Vascular Surgery.

There are now ten Royal College certified training programs in Canada spread out across the country training highly respected academic and clinical Vascular Surgeons. Vascular Surgery continues to evolve and maintains its unique role as a specialty that encompasses not only the surgical management of atherosclerosis but also provides conservative therapy and non-operative endovascular therapies in this very challenging group of patients. The Canadian Society for Vascular Surgery continues to be the Canadian forum where these specialists can present their work, consult with their colleagues, and remain abreast of the current and most up-to-date management of these patients.



CSVS VISION

To Lead Vascular Care in Canada

CSVS MISSION

The Canadian Society for Vascular Surgery is dedicated to excellence in the promotion of vascular health for Canadians through education, research, collaboration and advocacy

Educational Objectives of the CSVS 36th Annual Meeting September 26 - 27, 2014

1. The participant will be able to discuss new knowledge and advances in vascular surgery and learn how these advances can be incorporated into vascular surgery practice.
2. The participant will have an understanding of a variety of factors that promote/delay aortic aneurysm growth and rupture.
3. The participant will be able to describe factors affecting procedure and patient outcomes for a variety of vascular conditions including carotid disease, aortic aneurysm, aortic and peripheral arterial occlusive disease and surgery for dialysis access.
4. The participant will be able to list and describe contemporary issues in the training and education of vascular surgeons.
5. The participant will be able to list his/her own gaps in knowledge by participating in the VSEP Jeopardy contest.

The program will provide scientific or clinical presentations by the general membership and will provide the opportunity for the participant to discuss and contribute opinions and evaluations. Authors of accepted abstracts are encouraged to submit manuscripts for peer-reviewed publication.

This event is an Accredited Group Learning Activity (Section 1) as defined by the Maintenance of Certification program of The Royal College of Physicians and Surgeons of Canada, approved by the Canadian Society for Vascular Surgery. **The maximal CME credit is 12.25 hours.**



Canadian Society for Vascular Surgery

36th Annual Meeting

Aneurysm Treatment: Bench to Bedside

September 26-27, 2014, Hyatt Regency Hotel

Toronto, Ontario

PROGRAM AT A GLANCE

Thursday, September 25 | jeudi le 25 septembre 2014

12h00 13h00	CSVS Executive Committee Luncheon <i>(closed) Studio B</i>
13h00- 17h00	CSVS Executive Committee Meeting <i>(closed) Studio B</i>
16h30 20h00	RCPSC Vascular Surgery Specialty Committee Meeting <i>(closed) Studio C</i>
18h00 20h00	CSVS Registration Desk Opens <i>Colonnade</i>

Friday, September 26 | vendredi le 26 septembre 2014

07h00	CSVS Registration Desk Opens <i>Colonnade</i> Ouverture du bureau d'inscription de la SCCV
07h00 07h45	Continental Breakfast <i>Regency DEF</i> Petit Déjeuner
07h45 08h00	Welcome and Opening Remarks <i>Regency ABC</i> President: Dr. Jacques Tittley Program Chair: Dr. April Boyd Secretary: Dr. Greg Browne
08h00 09h30	Paper Session I: Endovascular Aortic Interventions - <i>Regency ABC</i> <i>Moderators: Dr. Tom Forbes, Dr. Andrew Dueck</i> <i>Objectives: Upon completion of this session, attendees will be able to:</i> <ol style="list-style-type: none"> 1. Describe issues related to endovascular aortic aneurysm repair 2. Understand complications and pitfalls associated with endovascular repair of aortic pathology 0800-0815 The Use of Fenestrated Endovascular Grafts for the Treatment of Juxtarenal and Suprarenal Abdominal Aortic Aneurysms <i>Presenter: A. Altoijry</i>

	<p>0815-0830 In-vitro laser aortic and thoracic stent-graft fenestration for urgent treatment of aortopathies <i>Presenter: R. Guidoin</i></p> <p>0830-0845 Bench & Bedside Experience with In Situ Fenestration of Carotid & Subclavian arteries: Lessons Learned from Local Experience <i>Presenter: L.W. Tse</i></p> <p>0845-0900 Pre-Operative Prediction of Spinal Cord Ischemia in Complex Endovascular Aortic Aneurysm Repair <i>Presenter: S.Hanley</i></p> <p>0900-0915 McGill University Sheath-Shunt Technique (MUSST) for Avoiding Lower Limb Ischemia During Complex Endovascular Aneurysm Repair <i>Presenter: S. Hanley</i></p> <p>0915-0930 Effects of Non-Axial Angulated Pullout Forces on Aortic Stent Graft Fixation <i>Presenter: M. Doyle</i></p>
09h30-10h00	Refreshment Break & Exhibits Pause santé et exposants - <i>Regency DEF</i>
10h00-11h00	<p>Paper Session II: Ruptured Abdominal Aortic Aneurysm - <i>Regency ABC</i> <i>Moderators: Dr. Jacques Tittley, Dr. Jonathan Cardella</i></p> <p><i>Objectives: Upon completion of this session, attendees will be able to:</i></p> <ol style="list-style-type: none"> <i>1. Describe issues related to repair of ruptured aortic aneurysms</i> <i>2. Understand complications and factors that affect patient outcome after ruptured aortic aneurysm repair</i> <p>1000-1015 Is Endovascular Aneurysm Repair the New Gold Standard for Ruptured Abdominal Aortic Aneurysms? <i>Presenter: P Ravichandran</i></p> <p>1015-1030 Long term outcomes following repair of ruptured abdominal aortic aneurysms in Younger Patients <i>Presenter: K. Lee</i></p> <p>1030-1045 Ruptured abdominal aortic aneurysm throughout the Province of Quebec: Is there a difference from the rest of Canada? <i>Presenter: P. Nault</i></p> <p>1045-1100 Geographical disparities in the burden of ruptured and unruptured abdominal aortic aneurysms in Saskatchewan <i>Presenter: J. Misskey</i></p>
11h00-11h30	<p>CSVS Invited Guest Lecture I - <i>Regency ABC</i> The Management of Ruptured Abdominal Aortic Aneurysms Following the IMPROVE Trial. Professor Janet T. Powell, MD, PhD, FRCPath, Imperial College, London, England</p> <p><i>Objectives: Upon completion of this session, attendees will be able to:</i></p> <ol style="list-style-type: none"> <i>1. Understand the outcomes of the IMPROVE Trial.</i> <i>2. Understand the role for endovascular repair of ruptured abdominal aortic aneurysms.</i>
11h30-13h00	CSVS Annual General Meeting & Lunch (<u>CSVS members only</u>) <i>King Street Social</i> Assemblée générale annuelle et déjeuner (<u>réservé aux membres de la SCCV</u>)

<p>11h30 13h00</p>	<p>Lunch / déjeuner - Regency DEF</p>
<p>11h30 13h00</p>	<p>Invited Guest Speaker & Residents/Fellows/Students meet and greet - Interesting Cases and Questions - Regency ABC</p>
<p>13h00 14h15</p>	<p>Paper Session III: Management of Thoracic Aortic Pathology Regency ABC Moderators: Dr. Kent MacKenzie, Dr. Thomas Lindsay</p> <p><i>Objectives: Upon completion of this session, attendees will be able to:</i></p> <ol style="list-style-type: none"> 1. Understand the management of traumatic thoracic aortic tears 2. Understand the fate of penetrating aortic ulcers 3. Understand the management of patients following aortic trauma <p>1300-1315 Traumatic Intimal Tear of the Thoracic Aorta: Management and Mortality from the American College of Surgeons Trauma Quality Improvement Program Presenter: C. de Mestral</p> <p>1315-1330 Management of blunt traumatic thoracic aortic injuries compared to clinical practice guidelines Presenter: M.Ingves</p> <p>1330-1345 Predictors of Discharge Disposition Following Repair of Blunt Thoracic Aortic Traumatic Injuries Presenter: M.El-Beheiry</p> <p>1345-1400 Aortic Remodeling after TEVAR for Intramural Hematoma of the Thoracic Aorta Presenter: JM Panneton</p> <p>1400-1415 Penetrating Aortic Ulcers: The Fate of the Untreated Aorta Presenter: M.Ingves</p>
<p>14h15 14h45</p>	<p>Debate 1 - Endovascular Therapy Should be First-Line Treatment of Aortoiliac Occlusive Disease. Regency ABC Moderator : Dr. Matthew Robinson</p> <p><i>Objective: Upon the completion of this session, participants will understand the advantages and disadvantages of open and endovascular management of aortoiliac occlusive disease.</i></p> <p>For : Dr. Mark Nutley Against : Dr. Jerry Chen</p>
<p>14h45- 15h00</p>	<p>Refreshment Break & Exhibits Pause santé et exposants Regency DEF</p>
<p>15h00 16h00</p>	<p>VSEP Jeopardy - Regency ABC Moderator: Dr. Kent Mackenzie</p> <p><i>Objective: Upon completion of this session, participants will be able to elucidate their strengths and weaknesses in knowledge of a variety of vascular topics.</i></p>
<p>16h00 16h36</p>	<p>Rapid 3 minute Poster Presentations: A brief Introduction - Regency ABC Moderator: Dr. April Boyd</p> <p><i>Objectives: Upon completion of this session, attendees will be able to:</i></p>

	<ol style="list-style-type: none"> 1. <i>Describe issues related to and affecting Vascular Surgery</i> 2. <i>Understand advances in various topics in Vascular Surgery</i> <ul style="list-style-type: none"> • Synchrotron Mapping of Carotid Artery Plaque – A Pilot Study <i>Presenter: D. Kopriva</i> • Carotid Endarterectomy in Patients Undergoing Coronary Artery Bypass Grafting in the Regina Qu'Appelle Health Region <i>Presenter: D. Kopriva</i> • Resident Views on Vascular Ultrasonography Education: A Canadian Perspective <i>Presenter: M. Clemente</i> • Factors that Influence Specialty Choice – a Mix Method Survey to Explore Student Choices <i>Presenter: M. Clemente</i> • Exploring the Training Experiences of a Direct Entry Vascular Surgery Resident Cohort Using Focus Groups <i>Presenter: F. Naji</i> • The Wikipedia Medical Student: Comparing the Quality of Vascular Surgery Topics Across Two Commonly Used Educational Resources <i>Presenter: M. Yacob</i> • Anticoagulant Use in Venous Thromboembolic Disease: A Treatment Algorithm Based on an Analysis of Costs and Complications <i>Presenter: D. Wooster</i> • Identification of Patient-Derived Outcomes Following Aortic Aneurysm Repair <i>Presenter: L. Dubois</i> • Trends in the Use of Smart Phones and Medical “Apps” and Evaluation of a Locally Developed App for Peripheral Arterial Disease (PAD) <i>Presenter: A. Lo</i> • Perceived Functional, Social and Emotional Impact of Amputation in Vasculopaths <i>Presenter: N. Eisenberg</i> • Conservative Surgical Approach in the Treatment of Infected Groin Grafts <i>Presenter: S. Jolly</i> • Impact and Culture Change Following the Implementation of a Pre-Procedural Checklist in Interventional Radiology Department <i>Presenter: S. Wong</i>
16h36 18h00	CSVS Poster Viewing <i>Regency ABC</i> <i>Wine & Cheese amongst the posters</i>
18h30	President’s Dinner (Closed - CSVS Executive Committee Members only)
Saturday, September 27 samedi le 27 septembre 2014	
07h00	CSVS Registration Desk Opens <i>Colonnade</i> Ouverture du bureau d’inscription de la SCCV
07h00 07h45	Continental Breakfast / Petit Déjeuner <i>Regency DEF</i>
07h45 08h15	Presentation of 2014 Award Winners - <i>Regency ABC</i> <ul style="list-style-type: none"> • Cook Research Award (presented by Dr. Graham Roche-Nagle) • Gore Research Award (presented by Dr. Graham Roche-Nagle)

	<ul style="list-style-type: none"> • John L. Provan Education Award (presented by Dr. Kent MacKenzie) <p>2013 Cook, Gore and Provan Awards – project updates</p>
<p>08h15 09h45</p>	<p>Paper Session IV: Peripheral Vascular Disease <i>Regency ABC</i> Moderators: <i>Dr. Graham Roche-Nagle, Dr. Keith Baxter</i></p> <p><i>Objectives: Upon completion of this session, attendees will be able to:</i></p> <ol style="list-style-type: none"> 1. <i>Describe issues related to management and treatment of peripheral arterial disease</i> 2. <i>Understand management of arterial disease in the claudicant population</i> 3. <i>Understand improvement in post-amputation pain management.</i> 4. <i>Understand limb sparing options in lower extremity sarcoma resection.</i> 5. <i>Understand the role of toe-brachial index in the diagnosis of peripheral vascular disease.</i> <p>0815-0830 Long Term Effects of an Educational Intervention for Cardiovascular Risk Reduction in Peripheral Arterial Disease <i>Presenter: M. Hussain</i></p> <p>0830-0845 Google Maps Offers a New Way to Assess for Claudication <i>Presenter: H. Khambati</i></p> <p>0845-0900 Perfusion Angiography with Indocyanine Green Fluorescence in Patients with Critical Ischemia <i>Presenter: G. Roche-Nagle</i></p> <p>0900-0915 Continuous Regional Anaesthesia Provides Effective Pain Management and Reduces Opioid Requirement Following Major Lower Limb Amputation <i>Presenter: O. Ayling</i></p> <p>0915-0930 Limb-Sparing Surgery with Vascular Reconstruction for Malignant Lower Extremity Soft Tissue Sarcoma <i>Presenter: L. Davis</i></p> <p>0930-0945 Determining the Toe-Brachial Index in Young Healthy Adults <i>Presenter: W. Quong</i></p>
<p>09h45 10h15</p>	<p>Refreshment Break & Exhibits Pause santé et exposants <i>Regency DEF</i></p>
<p>10h15 11h15</p>	<p>Paper Session V: Hemodialysis <i>Regency ABC</i> Moderators: <i>Dr. Gerrit Winkelaar, Dr. Min Lee</i></p> <p><i>Objectives: Upon completion of this session, attendees will be able to:</i></p> <ol style="list-style-type: none"> 1. <i>Describe issues related to hemoaccess creation</i> 2. <i>Understand differences in staging of Brachio-basilic fistula creation</i> 3. <i>Understand the factors affecting hemoaccess creation in octogenarians.</i> 4. <i>Understand factors that might lead to renal failure post endovascular aneurysm repair</i> <p>1015-1030 Fistula Outcomes in Octogenarians: Is a Fistula First Approach Appropriate? <i>Presenter: J. Misskey</i></p> <p>1030-1045 Suggestion of Better Outcomes with Two-Stage Brachio-Basilic Vein Transposition: A Meta-Analysis <i>Presenter: J. Cooper</i></p> <p>1045-1100 Sepsis Free Survival, a Long-Term Comparison of Catheter Access Versus Synthetic Graft Septic Complications in Hemodialysis Patients <i>Presenter: C. Beauregard-Totaro</i></p> <p>11:00-11:15 Trends in Renal Function Post Aortic Aneurysm Intervention <i>Presenter: A. Elzahabi</i></p>

<p>11h15 11h45</p>	<p>CSVS Invited Guest Lecture II - Regency ABC</p> <p>The Surveillance of Small AAA: Can we stop small aneurysms from getting larger?</p> <p>Professor Janet T. Powell, MD, PhD, FRCPath, Imperial College, London, England</p> <p><i>Objectives: Upon completion of this session, attendees will be able to:</i></p> <ol style="list-style-type: none"> 1. <i>Understand the factors leading to abdominal aortic aneurysm growth.</i> 2. <i>Understand possible pharmacologic interventions to delay abdominal aortic aneurysm growth.</i>
<p>11h45 12h15</p>	<p>Presidential Address - Dr. Jacques Tittley – Regency ABC</p> <p>Introduction by Dr. Thomas Forbes</p>
<p>12h15 13h30</p>	<p>Lunch / déjeuner – Regency DEF</p>
<p>13h30 14h00</p>	<p>Debate II “Endovascular Repair of Thoracoabdominal Aneurysms is Superior to Open Repair” Regency ABC</p> <p><i>Moderator : Dr. Greg Browne</i></p> <p><i>Objective : Upon the completion of this session, participants will understand the advantages and disadvantages of open and endovascular management of thoracoabdominal aortic aneurysms.</i></p> <p>For : Dr. Thomas Lindsay Against : Dr. Thomas Forbes</p>
<p>14h00 14h30</p>	<p>Vascular Education Regency ABC</p> <p><i>Moderator: Dr. Rafik Ghali</i></p> <p>14:00-14:15 An Analysis of Vascular Surgeons’ Use of a Maintenance of Certification Program and Lessons for Future Engagement <i>Presenter: E. Wooster</i></p> <p>14:15-14:30 Future Demands for Vascular Care: A Census-Based Analysis <i>Presenter: D. Wooster</i></p>
<p>14h30 15h00</p>	<p>Refreshment Break & Exhibits Pause santé et exposants - Regency DEF</p>
<p>15h00 16h30</p>	<p>Paper Session VI: - General Topics in Vascular Surgery - Regency ABC</p> <p><i>Moderators: Dr. Karim Alibhai, Dr. Jonathan Cardella</i></p> <p><i>Objectives: Upon completion of this session, attendees will be able to:</i></p> <ol style="list-style-type: none"> 1. <i>Understand factors involved in early hospital discharge post endovascular aortic aneurysm repair</i> 2. <i>Understand methods for management of infected aortic grafts</i> 3. <i>Understand techniques to explant vascular endografts</i> 4. <i>Understand the effect of chemotherapy on abdominal aortic aneurysm growth</i>

	<p>15:00-15:15 Residency Training in Venous Disease Management Fails to Address Practice Needs <i>Presenter: E. Wooster</i></p> <p>15:15-15:30 Fibrinogen Level and Bleeding Risk During Catheter Directed Thrombolysis Using Tissue Plasminogen Activator <i>Presenter: K. Lee</i></p> <p>1530-1545 Feasibility and Outcomes of Outpatient and Short Stay EVAR: a Retrospective Study and Review of the Literature <i>Presenter: A. Lo</i></p> <p>1545-1600 Late Endograft Explantation: A Single Center Case Series and Systematic Literature Review <i>Presenter: S. Crawford</i></p> <p>1600-1615 <i>In Situ</i> Reconstruction with Custom-Made Bovine Pericardial Grafts for Aortic Graft Infections and Infected Aneurysm: A Case-Series <i>Presenter: B. Radovanovic</i></p> <p>1615-1630 The Effect of Chemotherapy for Malignancy on the Natural History of Aortic Aneurysm <i>Presenter: Z. Martin</i></p>
16h30	Meeting Adjournment
16h30 18h00	Exhibits Dismantling
18h30	<p>CSVS 2014 Annual Dinner (<i>Advance registration and dinner ticket required</i>)</p> <p>LUMA - TIFF Bell Lightbox, 2nd Floor - 350 King St. West, Reitman Square Toronto, ON</p> <p>Cocktails @ 18:30 Dinner @ 19:30</p> <p>Presentation of the 2014 Sigvaris President's Award and Josephus C. Luke Award <i>Presenters: Dr. Jacques Titley & Dr. April Boyd</i></p>

CSVS AWARDS

The Sigvaris President's Award

Guidelines: The President's Award recognizes the most outstanding abstract dealing with venous disease presented at the Annual Meeting. Submissions for this award are sought through the annual Call for Abstract Submissions. Submissions are submitted to the CSVS Office and review, prioritization and ratification of the candidates will be made by the CSVS Academic Program Chair. The winner is announced at the Annual Meeting and a cheque in the amount of \$1,500.00 is forwarded to the winner following the Meeting.

Josephus C. Luke Award

Guidelines: The Luke Award will be presented to the best clinical or basic research paper presented at the annual meeting. The originality, science and quality of the presentation will be considered in reaching a decision. A Committee consisting of the visiting Canadian Society for Vascular Surgery Lecturer, the President of the Society who will be Chairman of the Committee and the Chairman of the Program Committee will make the decision. The monetary reward is \$500.00. The recipient will acknowledge receipt of this award in any relevant publication.

John L. Provan Education Award

Guidelines: The John L. Provan Award will be presented to any member of the Canadian Society for Vascular Surgery for any deserving project pertaining to medical education. This award is determined by the Education Committee. The monetary value of this award is \$5,000. Submissions should be sent to the Chairman of the Education Committee. The Education Committee members recommend to the Board of Directors who will decide on the recipient of this award. The recipient will acknowledge receipt of this award in any relevant publication. The successful recipient will be invited to present the results of their research at the Research Forum of the Annual Meeting.

Gore Research Award

Guidelines: The Gore Award will be presented to any member of the Canadian Society for Vascular Surgery for any deserving project in clinical or basic science research. This award is determined by the Research Committee. Submissions should be sent to the Chairman of the Research Committee. The monetary value of this award is \$5,000.00. The Research Committee members recommend to the Board of Directors who will decide on the recipient of this award. The recipient will acknowledge receipt of this award in any relevant publication. The successful recipient will be invited to present the results of their research at the Research Forum of the Annual Meeting.

Cook Award for Endovascular Therapy Research

Guidelines: The Cook Award will be presented to any member of the Canadian Society for Vascular Surgery for any deserving project in clinical or basic science research pertaining to Endovascular Surgical therapeutic strategies. This award is determined by the Research Committee. The monetary value of this award is \$5,000.00. Submissions should be sent to the Chairman of the Research Committee. The Research Committee members recommend to the Board of Directors who will decide on the recipient of this award. The recipient will acknowledge receipt of this award in any relevant publication. The successful candidate will be invited to present the results of their research at the Research Forum of the Annual Meeting.

National Student Research Award

Guidelines: The Canadian Society for Vascular Surgery (CSVS) is committed to encouraging medical student research and interest in vascular surgery. The CSVS has established a Vascular Surgery National Student Research Award to support medical students engaging in any area of vascular research under the supervision of a CSVS member. A maximum of four awards of \$2,000.00 each are available. The Research Committee of the CSVS will be responsible for selection of recipients. It is expected that the research will be conducted either over the summer or longitudinally over one year (maximum). The supervisor must be a CSVS member who agrees to provide the necessary supervision of the student from study design to submission of a final report. A final report is to be jointly submitted by the supervisor and the student upon completion of the project.

**CANADIAN SOCIETY FOR VASCULAR SURGERY
ABSTRACTS
Annual Meeting – September 26-27, 2014
Toronto Ontario Canada**

Friday, September 26th, 2014

PAPER SESSION I: ENDOVASCULAR AORTIC INTERVENTIONS

The Use of Fenestrated Endovascular Grafts for the Treatment of Juxtarenal and Suprarenal Abdominal Aortic Aneurysms

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Objectives: To report the clinical outcomes of our experience in the use of fenestrated endovascular grafts (FEVAR) for the treatment of juxtarenal and suprarenal aortic aneurysms in patients at high risk for open repair over a 9 year period.

Methods: A retrospective cohort study was conducted on a consecutive series of patients at two university hospitals who had undergone FEVAR for juxtarenal or suprarenal aneurysms with fenestrated grafts between 2004 and 2013. Preoperative risk factors and preoperative aortic anatomy were retrieved from patient medical imaging and records. Evaluated outcomes included procedure details, postoperative complications, length of hospital stay and follow-up, mortality, endoleak and secondary interventions..

Results: Over the study period, 59 patients were treated with FEVAR. The mean age was 75 years, 84.7% were male. Most of the treated aneurysms were juxtarenal (77.9%) with a median aneurysm diameter of 6 cm. Initial technical success was achieved in 58 of 59 cases (98%) with one open conversion. The 30-day mortality rate was 8.4%. Acute renal failure represented the most common postoperative morbidity (16.9%) followed by myocardial infarction (10%). The median length of hospital stay was 6 days. The median postoperative follow up including imaging with either CT angiogram or ultrasonography was 11.5 months. The overall mortality rate was 15% in the series and myocardial infarction was the most common cause of death (60%). Fifteen patients (25.4%) had endoleaks identified during follow up imaging. Secondary intervention was performed in 5 cases (8.4%) of our cohort, with four of them for endoleak treatment.

Conclusions: The short and intermediate term results of FEVAR for juxtarenal and suprarenal abdominal aortic aneurysm repair were acceptable in this population at high-risk for open repair.

In-Vitro Laser Aortic and Thoracic Stent-Graft Fenestration for Urgent Treatment of Aortopathies

¹Jing Lin, ²Nayalkishor Udgiri, ³Robert Guidoin, ²Jean Panneton, ¹Xiaming Guan, ⁴Hélène Crépeau, ³Maxime Guillemette, ³Bin Li, ¹Lu Wang, ¹Jia Du, ³Mark Nutley, ³Ze Zhang, ³Yvan Douville. ¹Key Laboratory of Textile Science & Technology, Of Ministry of Education and College of Textiles, Donghua University, Shanghai, PR China, ²Division of Vascular Surgery, Eastern Virginia Medical School, Sentara Heart Hospital Norfolk, VA USA,

³Department of Surgery, Faculty of Medicine, Laval University and Axe Médecine Régénératrice, Centre de Recherche CHU, Québec (QC), Canada, ⁴Service de Consultation Statistique, Faculty of Sciences and Engineering, Laval University, Québec (QC), Canada, ⁵Division of Vascular Surgery and Department of Diagnostic Imaging, University of Calgary, Peter Lougheed Center, Calgary (AB), Canada

Objectives: To demonstrate that in-situ fenestration of stent-grafts will soon allow patients presenting with most life threatening aortic pathologies to be amenable to emergent “off the shelf” percutaneous treatments.

Methods: Three types of thoracic stent-grafts Cook Zenith TX2 (stainless steel stents and multifilament woven fabric), Medtronic Valiant (Nitinol stents and monofilament woven fabric) and Vascutek Anaconda (Nitinol stents and multifilament woven fabric) were subjected to laser fenestration in-vitro in a physiological saline solution followed by balloon angioplasty of an 8, 10 or 12mm in diameter non-compliant balloon. The fenestrations were observed non-destructively (gross observations and light microscopy) and destructively (SEM).

Results: The creation of fenestrations was shown to be feasible in each of the three devices. Each device demonstrated varying degrees of fraying and/or tearing. The monofilament twill weave (Medtronic Valiant) tore in two directions (warp and weft) while the multifilament weave fenestrations showed more fraying (Anaconda Vascutek and Zenith TX2 Cook). The size and directions of tearing were more predictable with the 8mm diameter balloon whereas the results obtained with the 10 and 12mm diameter balloons were more unpredictable. The fenestrations were free of melting of the yarns and blackening of the filaments.

Conclusions: The in-situ fenestration is feasible but the observed damage caused to the fabric constructions must be carefully considered. This procedure must currently be limited to urgent and emergent life threatening cases. It is preferable not to use balloons more than 8mm diameter. Further study is required to evaluate the effects of either balloon expandable or self-expanding covered stents which would need to be placed into the adjacent vessels through these fenestrations in-vivo.

Bench & Bedside Experience with In Situ Fenestration of Carotid & Subclavian Arteries: Lessons Learned from Local Experience

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Objectives: Review of local bench studies on in situ fenestration of aortic endografts to identify clinical applicability of lessons learned. Review of early local experience with clinical cases of carotid and subclavian in situ fenestration, and identification of risk factors for failure.

Methods: The results of local experimental bench studies were used as guidance for clinical cases of in situ fenestration of the aortic arch (for example, conventional balloons for Medtronic endografts, but cutting balloons for Cook endografts). We then reviewed our institution’s clinical attempts at in situ fenestration of the aortic arch, with a particular focus on failure mechanisms.

Results: Between June 2011 and Nov 2013, we had planned nine cases of left subclavian artery fenestration and one case of left common carotid artery fenestration. Technical success was achieved in six cases. Of the remaining four cases, two did not require revascularization, one received a chimney instead of attempt at fenestration, and one was unsuccessfully attempted, requiring carotid-axillary bypass. There were no fenestration-related complications, but overall surgical complications included one paraparesis that resolved with spinal drain; one elevated troponin; one transient creatinine elevation; one gout; and one death from an esophageal fistula that eroded through the distal anastomosis of a previous open repair of type B aortic dissection (remote from TEVAR site).

Conclusions: Bench studies suggest a) that conventional angioplasty balloons cannot create an adequately-sized fenestration with the Cook Zenith fabric and adjunctive methods are needed b) caution should be used with the Medtronic Talent; and c) that conventional radiofrequency wire cannot penetrate PTFE. Early clinical results suggest feasibility and ease of use in favorable anatomy, but difficulties with the type III arch. The ability to alternate from “barrel view” and “open-arch view” is an important imaging guide.

Pre-Operative Prediction of Spinal Cord Ischemia in Complex Endovascular Aortic Aneurysm Repair

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¹Division of General Surgery, McGill University Health Centre, ²Division of Vascular Surgery, Jewish General Hospital, ³Division of Vascular Surgery, McGill University Health Centre

Objectives: Endovascular repair has revolutionized the treatment of aortic aneurysms. While the risks of endovascular aortic aneurysm repair (EVAR) are significantly less than those of open repair, the associated morbidity may still be high, as is the case with spinal cord ischemia. Identifying patients at highest risk of spinal cord ischemia may allow for the application of more aggressive prophylactic techniques. We sought to establish a simple scoring system to predict the risk of spinal cord ischemia.

Methods: We conducted a retrospective analysis of all patients who underwent complex EVAR at our institution. Patient and operative variables were compared using Student's t-test and chi-square tests. Significant variables on univariate analysis were entered into a stepwise logistic regression to establish a simple predictive model to estimate the risk of spinal cord ischemia.

Results: A total of 109 patients underwent complex EVAR, with twelve (11%) having documented spinal cord ischemia. The highest rate of spinal cord ischemia was documented in thoracoabdominal aneurysm repair. History of peripheral vascular disease, proportion of aortic coverage, number of aortic stent-graft components and total number of stent-graft components were significantly associated with spinal cord ischemia. A weighted scoring system was devised using history of peripheral vascular disease and total number of stent-graft components to stratify patients into low (<5%), medium (5-10%), high (10-20%) and very high (>20%) risk of spinal cord ischemia.

Conclusions: Patients undergoing complex EVAR can be stratified for the risk of spinal cord ischemia based on variables available pre-operatively. Knowledge of a patient's individualized risk allows for a more personalized discussion of operative risks and benefits, as well as identifying patients who stand to benefit the most from novel techniques designed to reduce the risk of spinal cord ischemia.

McGill University Sheath-Shunt Technique (MUSST) for Avoiding Lower Limb Ischemia During Complex Endovascular Aneurysm Repair

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Objectives: Complex aortic aneurysms are being repaired by endovascular techniques with increasing frequency. While endovascular aortic aneurysm repair (EVAR) is generally associated with a reduction in complications as compared to open repair, complex EVAR requires the use of a large diameter introducer sheath that can occlude arterial flow to the lower limb. This fact, along with longer procedure times, suggests that complex EVAR techniques may increase the risk of lower limb ischemia and reperfusion injury.

Methods: We have adopted a technique whereby an additional 6 or 7 Fr introducer sheath is placed distal to the stent-graft introduction site in antegrade fashion. This sheath is then connected to the side-arm of one of the introducer sheaths placed in the contralateral limb, allowing continuous perfusion of the limb distal to the stent-graft introduction site. Arterial perfusion distal to the stent-graft introduction site, both before and during shunting, was assessed by duplex ultrasonography, while shunt flow was measured by transit-time flow measurement.

Results: In our initial experience with seven patients undergoing complex EVAR, with confirmed occlusion of the native arterial system by the stent-graft introduction site, occlusion time was 169 ± 55 minutes. Use of the sheath-shunt technique resulted in pulsatile flow in all cases, with an average flow of 45 ± 10 mL/min. There were no complications related to the use of this technique.

Conclusions: In patients undergoing complex EVAR who are at increased risk of lower limb ischemia and reperfusion injury, MUSST results in continued perfusion of a limb that would otherwise be ischemic for a significant amount of time. Given the limited risk of this technique, coupled with the potential benefit, we propose its use in all patients undergoing complex EVAR.

Effects of Non-Axial Angulated Pullout Forces on Aortic Stent Graft Fixation

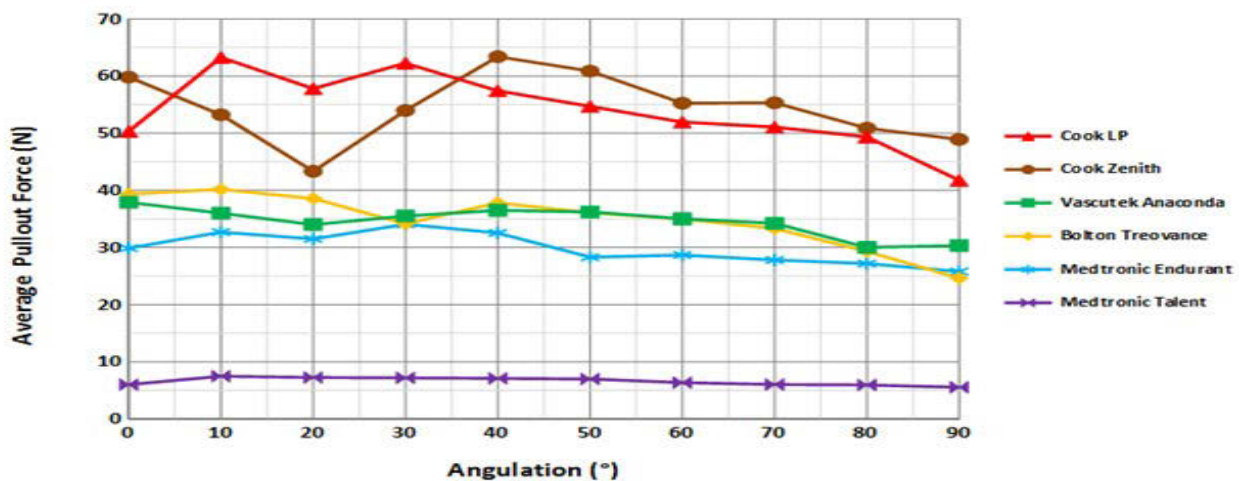
¹Sara Rahmani, ²Inderraj S. Grewal, ³Aydin Nabovati, ⁴Matthew G. Doyle, ¹Graham Roche-Nagle, ¹Leonard W. Tse; ¹Division of Vascular Surgery, Toronto General Hospital, PMCC, UHN, University of Toronto, ²MacDonald Dettwiler Space and Advanced Robotics (MDA), ³Advanced Micro Devices (AMD) Inc., ⁴Department of Mechanical and Industrial Engineering, Faculty of Applied Science and Engineering, University of Toronto.

Objectives: Experimentally-measured pullout forces for stent grafts (SGs) are used in clinical discussions and as reference values in bench studies and computer simulation. However, available benchmarks in the literature have only been obtained straight along the axial direction, while studies suggest displacement forces are directed more anteriorly. We hypothesize that increasing angulation of the displacement force results in decreasing pullout force.

Methods: Sixty bifurcated SGs (10 new specimens for each of 6 devices: Bolton Treovance, Cook Zenith Flex, Cook Zenith LP, Medtronic Endurant, Medtronic Talent, & Vascutek Anaconda) were deployed in fresh bovine aortas, then pulled out using an electronic motor at 1 mm/s, while tension force was measured continuously using a digital load cell. The SG off-axis angulation was changed from 0° to 90° in increments of 10°. The test system was submerged in a custom-built saline bath at 37°C. At least 3 tests were performed for each device at each angle (except for the Cook Zenith Flex that experienced plastic deformation of its barbs). Each aortic specimen was only used once, and then discarded. Hand-sutured graft anastomoses were also tested at 0° for reference.

Results: A total of 415 specimens of aorta were tested. 67 of the tests were excluded due to failure of the aortic specimen or of the apparatus before device pullout. The remaining 348 pullouts are included in Figure 1, which shows decreasing trends for the pullout forces for increasing angles for all six SGs. The mean pullout force for the hand sewn anastomoses was 63 N (testing above 70 N limited by apparatus failure). **Conclusions:** This study supports the hypothesis that pullout forces generally decrease with increasing SG device angulation.

Figure 1. Plot of average pullout forces at different degrees of angulation for six different SGs.



Friday, September 26th, 2014

PAPER SESSION II: RUPTURED ABDOMINAL AORTIC ANEURYSM

Is Endovascular Aneurysm Repair the New Gold Standard for Ruptured Abdominal Aortic Aneurysms?

Pranavi Ravichandran, Dalibor Kubelik, Sudhir Nagpal, Tim Brandys, Andrew Hill, Georges Hajjar, Prasad Jetty; Division of Vascular Surgery, University of Ottawa, Ottawa, ON

Objective: To compare outcomes of open aortic repair (OAR) versus endovascular aortic repair (EVAR) for ruptured abdominal aortic aneurysms (RAAA) in a single high-volume centre.

Methods: A historical cohort analysis of all RAAAs treated at the Ottawa Hospital over the past 10 years with either OAR or EVAR. Pre-operative, intra-operative, and post-operative data points were obtained. Outcome measures included perioperative and long-term mortality, complications, and reintervention rates.

Results: 264 consecutive patients (55 female; mean age 73±9) with RAAA underwent EVAR (n=57) or OAR (n=207) from 2003 to 2013. The overall 30-day mortality rate was 33%. Univariate analysis yielded a decreased 30-day mortality with EVAR compared to OAR (21.1% and 35.7%, respectively; $P=0.02$). However, EVAR was not an independent predictor of improved survival after multivariate analysis. EVAR has been performed more frequently for RAAA in later years, with 75% of EVARs in this series performed during or after 2009, accounting for 36% of all RAAA repairs during this period. In contrast, OAR accounted for 81% of interventions between 2003 and 2008, inclusive. Mortality rates before and after 2009 remained comparable (35.14% and 30.17%, respectively).

Conclusions: EVAR is being performed more frequently for RAAA repair due, in part, to observed perioperative mortality and morbidity benefits. However, the presumed advantage of this minimally invasive modality may reflect a selection bias, as this contemporary series and other ongoing trials have not detected any improvement in clinical outcomes with EVAR vs. OAR when correcting for patient factors. Further research is required to identify a reproducible subset of patients in whom EVAR may indeed be superior to OAR, as well as to assess the influence of training and technological advances on relative endovascular outcomes.

Long Term Outcomes Following Repair of Ruptured Abdominal Aortic Aneurysms in Younger Patients

Kevin Lee, Elaine Tang, Luc Dubois, Adam H. Power, Guy DeRose, Thomas L. Forbes; Division of Vascular Surgery, London Health Sciences Centre & Western University London, ON

Objectives: The purpose of this study is to determine the short and long term outcomes and reintervention rates in patients 60 years of age or younger who underwent ruptured abdominal aortic aneurysm repair.

Methods: Retrospective review of prospectively collected vascular surgery database at a university affiliated medical center to identify all patients 60 years of age or younger who underwent emergent repair between 2000 and 2013.

Results: Twenty seven patients younger than 60 (mean age: 55.3±11.2) underwent emergent repair (24 open, 3 EVAR). Majority of patients were male (96.3%) with history of hypertension (68.2%) and current or past smoking (68.2%). The incidence of previous cardiac revascularization (9.1%) and chronic obstructive pulmonary disease (4.5%) was low in these young patients. Mean maximum diameter of aneurysm was 7.5±0.4cm. In hospital 30 day mortality rate was 21.4%. The most common cause of in hospital mortality was cardiac arrest (60%). There was one in hospital reintervention requiring decompressive laparotomy for abdominal compartment syndrome. Mean length of hospital stay was 14±12.1days. Overall mean life expectancy was 8.9 years. One year, 5 year and 10 year survival rate was 76%, 67% and 61% respectively. There were 3 reinterventions (16.7%) during a mean follow up of 57.7 months. Two patients underwent incisional hernia repair and one patient underwent further endovascular repair of iliac artery aneurysm. There was no late aneurysm rupture or aneurysm related deaths during follow up.

Conclusion: Younger patients following ruptured aneurysm repair have lower perioperative mortality rates than older patients. These younger patients have reasonable 10 year survival rate with low reintervention rate which needs to be considered when deciding on method of repair.

Ruptured Abdominal Aortic Aneurysm Throughout the Province of Quebec: Is There a Difference From the Rest of Canada?

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Objectives: Better survival for ruptured abdominal aortic aneurysm (RAAA) has been associated with the use of endovascular aneurysm repair (EVAR) compared to open surgical repair (OSR), high case volume and young age. Is this also true in Quebec?

Methods: This was a retrospective review of data obtained from the Quebec hospital discharge database for RAAA repaired operatively between April 1, 2006 and March 31, 2012. OSR was compared to EVAR with two hospital volumes (low: <40 surgeries versus high: ≥40 surgeries). Logistic and log-binomial regression analyses identified the risk of 30-day mortality with age, hospital volume and surgical groups as variables.

Results: For ≥65 years, 772 RAAA were found with 725 (93.9%) OSR and 47 (6.1%) EVAR. The rate of RAAA repair declined over the study period, from 11.57 to 9.66 per 100,000. The 30-day mortality was 36.6% for OSR compared to 19.2% for EVAR, (p=0.0157). Low (39.5%) versus high hospital volume (33.6%) had similar 30-day mortality (p=0.108). The relative risk (RR) for OSR was 1.94, p=0.0289 and for patients ≥80 years the RR was 1.54, p<0.0001. Hospital volume was not statistically significant.

Conclusions: Only the surgical group and age were significantly associated with 30-day mortality. EVAR was used only in 6% of the time for RAAA in Quebec, however, the RR of 30-day mortality is lower compared to OSR. Furthermore, hospitals with a low volume of OSR are not associated with a higher mortality. There is a trend towards a reduction of RAAA in Quebec.

Geographical Disparities in the Burden of Ruptured And Unruptured Abdominal Aortic Aneurysms in Saskatchewan

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Introduction: The province of Saskatchewan presents unique challenges for ruptured abdominal aortic aneurysms (AAA) including variable access to health care resources and large transportation distances to tertiary vascular care. The goal of this study was to assess the rates of ruptured and unruptured aneurysms to determine whether there are areas of high aneurysm incidence that would benefit from further study and the possible implementation of a targeted screening protocol to improve management and prevention of aneurysm rupture.

Methods: All diagnoses of AAA from 2001 – 2011 in the province of Saskatchewan were reviewed, with patients grouped by health region of residence. Diagnosis of both ruptured and unruptured AAA were obtained from the Saskatchewan Discharge Abstract Database, Medical Services Billings Claims data and Vitals Stats data. ICD-9 and ICD-10 codes were used to identify specific patients with the diagnosis of AAA.

Results: A total of 6 163 AAAs were diagnosed and 1 667 AAAs were repaired over the study period. Mean age at diagnosis was 71.7, with 68% of all aneurysm diagnoses in men and only 2% of patients were aboriginal. The provincial age adjusted rate of AAA was 54.5 per 100 000; 95% CI: 53.18 - 55.91). The highest age adjusted

rate of AAA was found in the Five Hills Health Region (FHHR) (63.1 per 100 000; 95% CI: 57.63 – 69.03), which was significantly higher than the provincial average ($p < 0.05$). The rate of ruptured aneurysms in FHHR was nearly two-fold higher than the provincial average (65.8 vs. 32.1 per 100 000, respectively). The lowest aneurysm rates were found in the north of the province (age adjusted rate 44.6 per 100,000; CI: 34.17 – 57.32).

Conclusions: There are significant geographical variations in the incidence of ruptured and unruptured AAA in the province of Saskatchewan, with the highest incidence of unruptured and ruptured aneurysms localized to the FHHR. It is unclear why there is a preponderance of aneurysms in this area but it suggests targeted screening may help reduce the number of aneurysms treated emergently for rupture.

Friday, September 26th, 2014

PAPER SESSION III: MANAGEMENT OF THORACIC AORTIC PATHOLOGY

Traumatic Intimal Tear of the Thoracic Aorta: Management and Mortality From the American College of Surgeons Trauma Quality Improvement Program

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Objectives: SVS guidelines recommending initial non-operative management of traumatic intimal tears of the thoracic aorta. However, the evidence basis for this recommendation is limited to single centre case series of small sample size. We sought to characterize current management and attributable mortality of intimal tears across a range of trauma centres.

Methods: This is a retrospective cohort study using the American College of Surgeons Trauma Quality Improvement Program, which includes data from over 150 level 1 and 2 trauma centers across North America. Adults (age \geq 16) sustaining an intimal tear of the thoracic aorta following blunt trauma were identified in years 2010 and 2011. Patient demographics, injury severity, frequency, timing and approach of surgical repair as well as in-hospital mortality were examined.

Results: A total of 195 patients were identified across 56 centres. Motor vehicle crash was the dominant mechanism of injury (94%) and nearly three quarters (N=140) of patients were very severely injured (Injury Severity Score $>$ 25). Only one third (N=65) of patients were treated operatively during the index hospitalization. Aortic repair was most often undertaken using an endovascular approach (N=54 of 65, 83%) and 75% of repairs (N=50 of 65) took place within 48 hours of presentation. In-hospital mortality was 15% with only 2 of 30 deaths occurring in patients treated with aortic repair (both endovascular). Nearly half of deaths (N=14 of 30, 46%) occurred within the first two admission days.

Conclusions: Half of patients with a traumatic intimal tear of the aorta survive to hospital discharge without aortic repair. The high proportion of repairs occurring soon after presentation may reflect early injury progression or, alternatively, deviation from SVS guidelines due to a perceived high morbidity risk of non-operative management.

Management of Blunt Traumatic Thoracic Aortic Injuries Compared to Clinical Practice Guidelines

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Objectives: In 2011 the Society for Vascular Surgery (SVS) published practice guidelines for blunt thoracic aortic injuries (BTAI) recommending treatment of Grade 2-4 injuries. The objective of this study is to review adherence to these guidelines, prior to and subsequent to their publication.

Methods: Retrospective review of patients presenting with a BTAI to our trauma centre between 1999 and 2013. Demographics, treatment and outcomes were recorded.

Results: As previously reported, before 2011 52 of 59 patients with BTAI had imaging available for review. Injury distribution was 14 (27.0%) Grade 1, 1 (1.9%) Grade 2, 35 (67.3%) Grade 3, 2 (3.8%) Grade 4. One Grade 1 injury was repaired, while 1 Grade 2, and 12 Grade 3 injuries were not repaired (8 early deaths), representing 6 of 52 patients and 11.5% retrospective deviation from SVS guidelines. Since publication of the guidelines there have been 5 patients with BTAI. Mean age and ISS were 39.8 years (range 18-76) and 43 (SD=8.8), respectively. All 5 patients were identified as Grade 3 injuries (pseudoaneurysm) and 4 out of 5 BTAs were treated within 24 hours of presentation. Due to small size and stability, the remaining injury was initially managed medically, but ultimately required surgery for pseudoaneurysm progression. All patients underwent endovascular repair with intentional left subclavian artery coverage in 4 patients. There were no mortalities or perioperative complications and the median follow-up duration was 4 months (range 1 to 26 months). No patients were lost to follow-up. One patient was found to have a juxtarenal aortic dissection on follow-up. There was no reported upper limb claudication.

Conclusions: Since their publication, the SVS clinical practice guidelines for BTAI were followed in all patients presenting to our trauma centre. There were no mortalities and complications were minimal in the short term.

Predictors of Discharge Disposition Following Repair of Blunt Thoracic Aortic Traumatic Injuries

¹Mostafa H. El-Beheiry, ¹Biniyam Kidane, ¹Meaghan Zehr, ¹Neil G. Parry, ¹Richard A. Malthaner ²Thomas L. Forbes, ¹Trauma Services & ²Division of Vascular Surgery, London Health Sciences Centre & Western University, London, ON

Objectives: Blunt thoracic aortic injury (BTAI) can be a highly lethal injury but in the last decade major advances have been made in diagnostic accuracy, injury grading, and therapy. Traditionally, emphasis has been on studying survival post-injury with a paucity of studies examining the discharge characteristics of patients that survive a BTAI. The purpose of this study is to define the epidemiology and predictors of disposition in patients with BTAI in a provincial database.

Methods: Using the Ontario Trauma Registry (OTR), all patients were identified who were hospitalized with a BTAI between 1999 -2009. Trends in therapy and discharge disposition were determined.

Results: We identified 264 cases of BTAI. Of these, 157 were discharged from hospital with 36% (n=56) going directly home and 64% (n=101) going to continuing care facilities. There was no difference in disposition in those with BTAI treated operatively or non-operatively (p=0.48) In those that had repair of BTAI, there was no difference in discharge home between open and endovascular repair (p=1.00). Univariate analyses identified younger age, male sex, lower injury severity score (ISS) and lower Charlson comorbidity indices as being predictors of discharge home. On adjusted multivariate regression analysis, lower ISS (OR=0.91, 95%CI: 0.87-0.95, $p<0.001$) and male sex (OR=2.89, 95%CI: 1.02-8.23, $p=0.047$) were the only independent predictors of discharge home.

Conclusions: Our findings suggest that the only independent predictors for discharge home for patients who survive is the overall severity of all their injuries as well as male sex irrespective of their condition on admission or management of their BTAI. It is unclear why being female is associated with lower rates of discharge home. Further study is required to investigate and address this disparity between sexes.

Aortic Remodeling After TEVAR for Intramural Hematoma of the Thoracic Aorta

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Objectives: Our goal was to investigate the extent of aortic remodeling after TEVAR for intramural hematoma (IMH) of the thoracic aorta.

Methods: A retrospective review from 2006 to 2012 was conducted on consecutive patients who underwent TEVAR for IMH. CT scans were analyzed using TeraRecon digital workstation and primary data points included IMH thickness, diameter and volume measurements for aortic true lumen (TLD, TLV) and for total aorta (TAD, TAV) at site of maximal pathology. Aortic remodeling was evidenced by a TAD/TLD ratio closest to 1.0.

Results: 44 patients underwent TEVAR for IMH. 25 patients had an IMH with concomitant PAU. Mean age was 71 years \pm 11, with 57% female patients. Operative indications included intractable pain in 31 (70%), rapidly progressing IMH or conversion to dissection in 13 (30%), rupture in 10 (23%), and uncontrolled HTN in 6 (14%). Technically successful TEVAR was performed in all patients with 42 (95%) reporting complete relief of symptoms. The 30 day mortality rate was 5% with a 5% rate of paraplegia or paraparesis. At a mean follow up of 26 months, there were no additional aortic related deaths and the reintervention rate was 11%. At a mean CT scan follow up of 13 months, all measured data points were statistically improved from pre to post TEVAR: thickness of IMH (12mm vs. 4mm, $P=.01$), mean TLD (35mm vs. 37mm, $P=.04$), mean TAD (47mm vs. 42mm, $P=.02$), TAD/TLD ratio (1.35 vs. 1.14, $P<.01$) and IMH volume (103 cm³ vs 14 cm³, $P<.01$). The mean Δ in TAD/TLD ratio pre to post-operative for the reintervention group was $\Delta 0.14$, while the mean Δ in TAD/TLD ratio for non reintervention group was $\Delta 0.29$ ($P=.05$).

Conclusions: TEVAR is safe and effective in treating IMH and based on longitudinal CT scan analysis, aortic remodeling is evidenced by normalization of all measured indices.

Penetrating Aortic Ulcers: The Fate of the Untreated Aorta

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Objectives: Diffuse atherosclerotic disease increases the risk of penetrating atherosclerotic ulcer (PAU) development; however, much of the literature has classified and studied PAUs as a localized pathology. This study examined the changes in the anatomic characteristics throughout the aorta along with outcomes in patients who underwent TEVAR for a PAU.

Methods: Retrospective review of patients who underwent TEVAR for a PAU from 2000-2012. Standardized anatomic assessment protocol of the untreated aorta (diameter, thrombus, calcification, ulcer) in pre-operative and post-operative scans was recorded as well as clinical outcomes.

Results: Of 196 TEVARs, 7 of 8 patients who underwent TEVAR for a PAU had follow-up imaging available. The mean age was 74 \pm 5.5 years and 42.9% were male. The majority of patients had a single PAU (5 of 7), and 2 patients had 3 PAUs. The locations were aortic arch (2), descending thoracic aorta (8), and infrarenal aorta (1). The mean PAU neck diameter and depth were 16.09 \pm 3.0mm and 12.9 \pm 1.5mm, respectively. Six patients were symptomatic and 3 had ruptured. Four patients had a concomitant intramural hematoma and there were 2 pseudoaneurysms. The mean length of aortic coverage was 122mm. One postoperative stroke occurred. The median follow-up duration was 27 months. Two patients underwent a second TEVAR: one for pseudoaneurysm expansion, and one for stent migration; one postoperative death occurred. The mean maximal calcification index of the aorta (0.51 \pm 0.12) did increase slightly by 0.04 \pm 0.02 ($p=0.06$). Overall, there was no significant change in mean maximal diameter throughout the aorta. Lastly, no new PAUs developed.

Conclusions: This study suggests that PAUs are a localized pathologic process with no further development of PAUs or significant change in aortic anatomy during follow-up in the untreated segments of aorta. Aortic reinterventions were relatively common in this small series, although they reflected progression of disease at the treatment site, not elsewhere in the aorta.

Synchrotron Mapping of Carotid Artery Plaque – A Pilot Study

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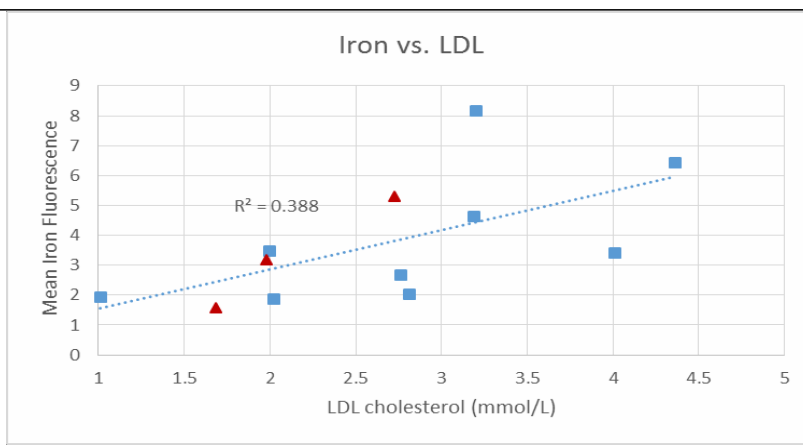
Objectives: To compare the characteristics of symptomatic and asymptomatic carotid plaques using X-ray fluorescence maps of key elements, including calcium, zinc, iron, sulfur, and potassium.

Methods: Patients undergoing carotid endarterectomy in the Regina Qu'Appelle Health Region between April 2012 and May 2013 were recruited. Clinical data was collected on study participants, including age, gender, diabetes, ethnicity, smoking status, blood pressure, cholesterol (total, HDL, LDL), symptomatic status of the carotid plaque, date of last ipsilateral neurologic symptoms, and date of surgery. Carotid plaques from subjects were frozen, sectioned in 10µm slices, and desiccated onto Thermanox cover slips. Sections from the most active portion of each carotid plaque were selected for synchrotron imaging. X-ray fluorescence maps were obtained at the Stanford Synchrotron Radiation Lightsource, using an energy of 13.45 KeV, with 40µm resolution and 200msec dwell time. Bright light microscopy was also performed to correlate synchrotron images with plaque location.

Results: Zinc, calcium, potassium and sulfur co-localized in areas of plaque mineralization, both in symptomatic and asymptomatic carotid plaques. The intensities of zinc, calcium, potassium, and sulfur fluorescence were unrelated to the symptomatic status of the plaque. Iron localized in areas of plaque away from zinc and calcium. Iron rich areas were sub intimal and were present in both symptomatic and asymptomatic plaques. Microscopy suggests that iron deposits could be related to areas of previous plaque hemorrhage. The intensity of iron fluorescence did not correlate with the symptomatic status of the carotid plaque. A correlation between iron fluorescence in the plaque and LDL cholesterol in the source patient's blood was noted (Figure 1).

Conclusions: Synchrotron imaging of zinc, calcium, sulfur, potassium and iron did not show differences between symptomatic and asymptomatic carotid plaques. Plaque iron content appears to be related to the source patient's LDL cholesterol.

Figure 1: Mean iron X-ray fluorescence within carotid plaque plotted against the source patient's LDL cholesterol in symptomatic (blue squares) and asymptomatic (red triangles) carotid plaques. $R^2 = 0.388$. Two tailed $p=0.03$.



Carotid Endarterectomy in Patients Undergoing Coronary Artery Bypass Grafting in the Regina Qu'Appelle Health Region

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Background: The timing of carotid endarterectomy in patients who have severe asymptomatic carotid stenosis, and who are undergoing coronary artery bypass grafting (CABG), is controversial. This study compares the postoperative neurologic outcomes in patients undergoing CABG with and without concomitant carotid endarterectomy (CEA) for severe asymptomatic carotid stenosis.

Methods: Between 2002 and 2012 inclusive, 5248 patients underwent CABG in our centre. Of these, 438 were identified with carotid stenosis and their charts reviewed. Patients with 70-99% asymptomatic internal carotid stenosis identified prior to cardiac surgery formed the basis of this study. Data was abstracted from the hospital chart.

Results: Seventy-one patients were identified with asymptomatic 70-99% stenosis of at least one internal carotid artery at the time of CABG. Of these, 48 patients had CABG only. The remaining 23 patients (CABG/CEA) underwent CEA prior to CABG under the same anesthetic. There were no differences between the groups in age, gender, diabetes, smoking or hypercholesterolemia. Patients undergoing CABG only were more likely to have preoperative hypertension (97.9% CABG only vs. 82.6% CABG/CEA, $p=0.04$). There were no differences between groups in post-operative atrial fibrillation, or the use of heparin/warfarin. The duration of the surgical procedure was significantly longer in the CABG/CEA group (291 minutes vs. 217 minutes CABG only, $p<0.01$), although there were no differences in heart-lung bypass or aortic cross clamp times between the groups. There were two fatal strokes, one non-fatal stroke, and one non-stroke death in the CABG only group (6.3% mortality, 6.3% stroke, 8.3% stroke or death). All strokes were ipsilateral to the index carotid stenosis. There were no strokes or deaths in the CABG/CEA group ($p=ns$).

Conclusions: We demonstrate an ipsilateral stroke rate of 6.3% in patients with asymptomatic severe carotid stenosis undergoing CABG without prior CEA. Patients undergoing combined CABG/CEA had no strokes, but the trend did not reach statistical significance.

Resident Views on Vascular Ultrasonography Education: A Canadian Perspective

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Objectives: With the requirement to obtain RPVI certification as of 2014 in American vascular surgery programs, formal vascular ultrasound (VUS) training is expected in vascular surgery training. Canadian programs, however, do not have the same credentialing requirements and not all programs have formal VUS training. We sought to determine whether Canadian trainees desire additional VUS training, how this training should be delivered and what role they see VUS playing in their future practice.

Methods: An online questionnaire was sent to all residents and fellows in vascular surgery programs in Canada. Qualitative and quantitative analysis was performed on the data.

Results: 20 out of 50 trainees (40%) participated, representing 9 of 10 schools (90%). 95% indicated being either "interested" or "extremely interested" in VUS. Most anticipate that VUS will play a large role in their future practice, including the being able to understand/interpret VUS data and images (90%), practicing as an interpreting physician (90%), acting as lab medical director (75%), physically performing scans (75%), and owning/operating a vascular lab (75%). 60% of respondents plan on obtaining RPVI certification, 10% already have their RPVI and 30% plan to obtain RVT certification. Most trainees have obtained some informal VUS training (75%); 45% have had formal VUS training in some format. Onsite training (30%), specialty rotations

(25%), and e-learning (10%) were less common resources. 80% indicate that they have not had enough exposure to VUS in their training. 95% also see a need for additional VUS training resources, with hands-on training (100%) and interactive modules (68%) being the preferred modalities. Didactic lectures (26%), videos (26%) and textbooks (16%) were seen as less favourable resources.

Conclusions: There is a strong interest in vascular ultrasonography among current trainees; however, there is a need for additional training resources. In response to this, the planning of the CSVS Vascular Ultrasound Curriculum is currently underway.

Factors that Influence Specialty Choice—A Mix Method Survey to Explore Student Choices

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Introduction: Information regarding the process by which students choose a medical specialty remains cloudy. Research has demonstrated that various factors influence specialty choice; however the exact process and the timing by which the choice is made is still unclear. The process by which students gather the necessary data to make their choice is also one that is not completely understood.

Objectives: The aim of our study was to gather additional information regarding these factors.

Methods: An electronic survey was distributed to medical students in a major Canadian school. The survey consisted of both closed and open ended questions. Roll out for distribution at additional locations continues.

Results: We had a 26% response rate; respondents were almost evenly split between male and female. Respondents were evenly split over the four years of medical school and 60% had not yet decided on a specialty. Of those who had decided; only 6% selected a surgical specialty and 76% made the decision either during medical school or clerkship. 86% believed information should be received during medical school. The most popular sources of information were an aggregate website (67%) and subscription emails (56%) even though students make daily use of multiple forms of social media.

Conclusions: Medical students wish to have access to multiple forms of information sources. Use of social media is prevalent; however it is not a preferred source of information. The majority have not reached a specialty decision prior to medical school and wished to receive information regarding specialties during this time.

Exploring the Training Experiences of a Direct Entry Vascular Surgery Resident Cohort Using Focus Groups

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Objectives: Training in vascular surgery is currently undergoing a transition in paradigm from a 5+2 fellowship pathway to a 0+5 direct-entry pathway following medical school. Given the unique positions of the first PGY-1-3 vascular surgery trainees in Canada, they are ideal candidates for soliciting insight and first impressions of this new training paradigm. Very few studies have explored or evaluated resident satisfaction and experiences during surgical training, and, to our knowledge, none have specifically looked at the Canadian vascular surgery training programs. The aim of this study is to qualitatively explore the experiences of PGY-1-3 vascular residents currently in the 0+5 pathway, so as to provide insights regarding the current status of vascular surgery programs as well as aid with future program design and development.

Methods: We will explore the experiences of current PGY 1-3 residents by the way of interactive online focus group comprised of 3-5 residents each. Participants include all residents in Canadian vascular surgery programs as well as cohorts from established American Centers (Stanford University and Cleveland Clinic) as comparator groups. Online focus group discussions are recorded, transcribed, anonymized, then analyzed for

recurrent themes and patterns, culminating into a codebook. Various qualitative methods will be employed to ensure methodological rigour, including triangulation and member checks.

Results: Currently a work in progress. A pilot study with an initial group of residents was conducted. Themes generated from the focus groups include: increasing levels of responsibility, time constraints in the operating room, collegiality amongst staff and residents, lack of academic structure, open communication routes, and increasing acceptance.

Conclusions: By exploring factors such as resident satisfaction, program performance, and residents' overall opinions of the direct entry option, we can ultimately provide insight into curriculum development and ideal methods of incorporating a 0+5 program into existing traditional 5+2 academic training centers.

The Wikipedia Medical Student: Comparing the Quality of Vascular Surgery Topics Across Two Commonly Used Educational Resources

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Purpose: Medical students commonly refer to Wikipedia.org as their preferred online resource for medical education. To date, the quality and readability of common vascular disorders on Wikipedia has not been evaluated or compared against a standard textbook of surgery. The aims of this study are to (1) assess the quality of Wikipedia.org articles against the equivalent chapters in a standard medical school textbook of surgery; (2) identify any errors of omission; (3) compare the readability of both resources using ease-of-reading and grade-level tools.

Methods: Eight fundamental topics in vascular surgery were analyzed. The articles were accessed from Wikipedia.org through its native search engine; equivalent chapters from Schwartz Principles of Surgery 9th-edition (SPOS) were compared. Quality was evaluated using the DISCERN tool, errors of omission were evaluated using a proprietary scoring system designed by author(s), and readability was evaluated using the Flesch-Reading-Ease test, Gunning-fog score, Coleman-Liau Index, SMOG Index, Automated-Readability-Index, and the Flesch-Kincaid grade level.

Results: SPOS scored highest in quality with perfect DISCERN scores of 5 and had the lowest errors of omission, while Wikipedia.org scored best for readability being, on average, understandable by most Grade 12 educated students. Inter-observer concordances validate these results.

Conclusions: SPOS is superior to Wikipedia.org when critiquing quality, and errors of omission, while Wikipedia.org is superior to the textbook when considering the ease of reading. This study recommends the use of surgical textbooks as a primary learning resource for medical students, and cautions the use of Wikipedia.org due to its significant rate of omissions.

Anticoagulant Use in Venous Thromboembolic Disease: A Treatment Algorithm Based on an Analysis of Costs and Complications

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Background: Routine management of thromboembolic disease (VTE) relies on the use of low molecular weight heparin (LMWH) transitioned to defined-term oral warfarin (H/W). The introduction of alternative direct anticoagulants (direct Xa inhibitors (DXa)) has led to the need for a cogent treatment algorithm balancing cost, risk and effectiveness.

Methods: 60 consecutive patients with VTE were assessed for management with each anticoagulation modality. Indications, contraindications, risks and potential benefits were collated for each patient. Costs

were assigned based on medication, tests, indirect and social capital costs of treatment. An algorithm was established for discussion for shared decision making treatment choice.

Results: Patient demographics showed 35 female: 25 male; acute DVT 30, acute SVT 16, chronic DVT on anticoagulation 11, known coagulopathy 3. Overall, rivaroxiban (DXa) was used by 22 and H/W by 38. # by indication, # switched. Medication errors occurred in DXa 3, H/W 4 and Complications occurred in 7 patients – minor bleeding 2 DXa, 3 H/W; severe bleeding 1 DXa; rash 1 DXa. Average costs per pt – Dxa, H/W = medication (\$800, \$310); tests costs (\$0,); physician costs (\$135, \$475); indirect costs (\$90, \$480); social capital (4, 16 visits).

Conclusions: Various protocols are appropriate for the treatment of VTE. Although medication costs are higher for DXa, total costs are higher for H/W; medication errors and complications are similar. Balanced discussion for decision making is appropriate for selection of management.

Identification of Patient-Derived Outcomes Following Aortic Aneurysm Repair

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Objectives: Relatively few outcomes have been examined in randomized comparisons of endovascular and open aortic aneurysm repair, and no patient input was obtained in the selection of these outcomes. The aim of this study was to identify patient-derived, potentially novel, outcomes that may be used to guide future clinical trials in aneurysm surgery.

Methods: Focus group interviews were conducted with patients that had undergone endovascular or open aortic aneurysm repair. The discussions were transcribed and the transcript analyzed by two indexers using constant-comparison analysis and grounded theory in order to identify potentially novel, patient-derived, outcomes. Other potential themes relating to the patient's experience and their decision making were also sought.

Results: Six focus groups were conducted (three with EVAR patients and three with open patients), with a median of 6 participants, 2-12 months from surgery. Functional outcomes were most commonly mentioned and emphasized by patients. Recovery time and energy level were most frequently verbalized as important in the decision making process between endovascular and open aneurysm repair. Other potential outcomes identified as important to patients included: post-operative pain, time to walking normally, loss of appetite, extent/location of incisions, impact on cognition, being able to go home after surgery, and impact on caregivers. In addition to these outcomes, we identified three themes relating to the patient experience: undervaluing or underappreciating the risk of death during surgery, differing informational needs and level of involvement in decision making, and unrealistic patient expectations about the risks and recovery after the procedure.

Conclusions: Functional outcomes emerged as most important during qualitative analysis of patients' experiences with aneurysm repair. Perceived differences in recovery time were identified as an important consideration for aneurysm patients when deciding between open and endovascular repair. More work needs to be done clarifying the concept of recovery and other related functional outcomes in order to develop methods to assess and evaluate these in prospective clinical trials.

Trends in the Use of Smart Phones and Medical "APPS" and Evaluation of a Locally Developed APP for Peripheral Arterial Disease (PAD)

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Objectives: To determine smartphone and medical app usage patterns amongst medical students, in the clinical setting. 2. To evaluate a locally developed smartphone application on peripheral vascular disease ("*Peripheral Vascular Disease for Health Professionals*").

Methods: An online survey was distributed to 500 third and fourth year medical students at the University of Toronto. The first part of the survey asked participants regarding their patterns of smartphone usage in their clinical practice. The second part of the survey obtained evaluative data on a PAD smartphone application developed by the author, from medical students, vascular residents, fellows and staff (N=35).

Results: A total of 201 (68.5% year III, 31.5% year IV) students responded to the survey. Sixty-two percent of the respondents were female, and 95% were between 20 and 30 years old. Most respondents (97.5%) used a smart phone, the most common being an iPhone (74.4%). Forty-nine point four percent (49.4) used medical apps frequently, 42.6% used them sometimes. The major usage patterns centered around looking up definitions and general medical knowledge followed by referencing patient management guidelines and medication dosages. The majority found the apps useful, giving a rating of 4.12/5 on the Likert scale (1= not useful at all and 5 = very useful). Seventy-nine percent of respondents thought the PAD app was useful and achieved its purpose. Eighty percent thought the app was easy to follow. Eighty-one percent thought the app would be helpful in guiding clinical decision making in primary care; 76% stated they would recommend the app. Most of the narrative comments suggested improvements to the navigation and aesthetics of the app as well as the inclusion of more graphics and clinical algorithms.

Conclusions: The use of smartphones is becoming increasingly prevalent in the clinical setting as demonstrated above. There is greater demand for quality point-of-care mobile references; this study demonstrates the ability for vascular specialists to create effective clinical resource materials aimed at medical students, trainees, primary care providers and other healthcare professionals.

Perceived Functional, Social and Emotional Impact of Amputation in Vasculopath

²Carly Charach, ¹Naomi Eisenberg, ²Sherry Harburn, ³Katrina Lehrner-Bennett, ³Dorina Baston, ⁴Rima Styra, ¹Graham Roche-Nagle, ¹Divisions of Vascular Surgery, ²Allied Health, ³Nursing, ⁴Psychiatry, Toronto General Hospital.

Objectives: To explore vascular patients' perceptions of the functional, social and emotional outcomes of lower-limb amputation.

Methods: Qualitative research methodology was used to explore the perceived impact of lower-limb amputation. A convenience sample of 13 elective amputation patients was used, with 11 being interviewed. Data was collected through semi-structured interviews five to ten days post-amputation. The analysis was performed by multi-disciplinary team. Interviews were analysed in accordance with Braun and Clarke's guidelines for thematic analysis. An inductive approach to thematic analysis was employed, whereby the data itself, rather than a pre-existing theoretical framework drove the emerging themes.

Results: Three key themes were identified in terms patient impact: 1) breaking point 2) meaning attributed to amputation and 3) trust in the health care team. Participants anticipated that amputation would relieve them from some of the hardships of peripheral vascular disease and improve their quality of life. They were able to forecast their vision of living as an amputee, which provided insight into the meaning they attributed to the amputation. This depended on the length of time they had been living with the disease and how they were able to cope. Patients identified that their trust and regard for the health care team was particularly important; this included timeliness of services, transparency in communication, and compassion from clinicians.

Conclusions: The findings of this study indicate that patients are in crisis prior to amputation due to physical and psychological stressors. Participants identified that their individual breaking point, the meaning they attributed to amputation and regard for healthcare have a significant bearing on their psychological status

when preparing for amputation patients and family seldom receive adequate psychological assessment and support. Pre-operative assessment and support is the responsibility of the entire interdisciplinary team. This presents an opportunity for all healthcare team members, to focus on the pre-operative stage in supporting this change of life event.

Conservative Surgical Approach in the Treatment of Infected Groin Grafts

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Objectives: Infected groin vascular graft is a serious complication offering significant therapeutic challenges with associated morbidity. We explore a less aggressive approach with promising results

Methods: 6 patients presented to our Hospital with infected groin and exposed grafts. The grafts were 1 ePTFE, 2 Dacron and 3 vein bypasses. Because of the morbidity associated with removing the graft and compromising the ischemic leg we adopted a more conservative approach: Aggressive local wound debridement with negative pressure wound therapy (NPWT) and antibiotics.

Results: Five out of the six treated patients had complete healing of their wounds. One patient required surgical removal of the infected graft with vascular reconstruction; another patient thrombosed his graft months after complete healing of the groin wound and required an amputation.

Conclusions: Management of early groin wound infections with exposed graft using aggressive debridement, antibiotics, and NPWT is safe and enables graft preservation in the majority of patients with minimal morbidity or mortality.

Impact and Culture Change Following the Implementation of a Pre-Procedural Checklist in Interventional Radiology Department

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Objectives: It has been accepted that implementation of the pre-procedural surgical checklist can reduce peri-operative morbidity and mortality in the Operating Suite. Following on from this success, there has been focus on applying this intervention to other clinical areas of care. Interventional radiology (IR) is more complex with invasive and endovascular procedures. The objective of this study was to evaluate the effect of the implementation of a pre-procedural checklist in the IR suite. We wished to investigate the uptake, impact and change in cultural attitude following its implementation by surveying IR staff across three major teaching institutions.

Methods: We created and implemented an IR checklist for both vascular and non-vascular interventions across three separate teaching centers. An analysis was performed of the rate of completion of the checklist. A survey was also conducted one and 12 months after implementation. The aim of this was to reveal the attitudes and perceptions of the checklist by the staff (Interventional Radiologists, Nurses, and Radiology Technicians) with responses based on a Likert scale.

Results: The internal audit found that the checklist was completed in greater than 90 percent of cases. The post-implementation survey was completed by 40 staff at one month and 36 staff at 12 months. The post-implementation survey indicated most staff agreed that the checklist served as an important communication tool (mean 4.4/5 at 1 month, 4.6/5 at 1 year), was in the patient's best interest (mean 4.7/5 at 1 month, 4.9/5 at 1 year). The checklist was seen to improve collaboration among staff (mean 4.1/5 at 1 month, 4.2/5 at 1 year) and reduce medical errors (mean 4.4/5 at 1 month, 4.6/5 at 1 year). Finally, the checklist was generally regarded as having little effect on time delay between cases (mean 1.8/5 at 1 year). These changes appeared to be well sustained at 1 year post implementation of the checklist.

Conclusions: Prior to the introduction of a formalized safety checklist, there was a less structured approach to peri-procedural patient safety management. In this setting the checklist has become a useful and consistent safety measure to ensure relevant patient data is brought to the forefront before intervention. As a secondary benefit, it also serves as an important communication tool and improves collaboration among team members.

Saturday, September 27th, 2014

PAPER SESSION IV: PERIPHERAL VASCULAR DISEASE

Long Term Effects of an Educational Intervention for Cardiovascular Risk Reduction in Peripheral Arterial Disease

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Objectives: To assess the long-term effects of an educational intervention for cardiovascular risk factor modification in patients with peripheral arterial disease (PAD).

Methods: A prospective cohort of 391 patients with confirmed PAD were enrolled between 2004 to 2006 at a single center in Toronto. Each underwent a detailed cardiovascular risk profile assessment and one-time, written risk factor optimization suggestions made to both the patient and their primary physicians at the time of enrollment. Follow-up visits, initiated July 2013, reassessed the patient risk profile.

Results: A total of 280 (71.6%) patients were identified for follow-up, with a 7-year mortality of 35.3% (99/280). An interim analysis of 72 patients is reported, with others awaiting follow-up (76/181) or have withdrawn (33/181). Mean age at 7-year follow-up was 73.3, and 37.5% were women. The pre and post intervention patient risk factor profile is presented in Table 1. Medication usage and risk factor control improved at follow-up, except for diabetic glycemetic control.

Conclusions: The strategy of providing PAD patients and their physicians with a one-time, individualized plan for risk factor modification improves risk factor control. Other studies have reported minimal improvement in risk factor control with usual medical care or another intervention, although the literature is limited and based on short-term follow-up. The impact on cardiovascular events and limb outcomes remains to be determined.

Table 1. Risk factor profile of patients at baseline and post intervention 7-year follow-up.

	Proportion of patients post intervention (n = 72)	Proportion of patients pre intervention (n = 391)	P value Chi-square t test
Antiplatelet agents	86.1%	78.3%	0.12
Statin usage	88.9%	61.0%	<0.001
ACE Inhibitors	76.4%	44.8%	<0.001
Hypertension	92.8%	56.8%	<0.001
BP control	60.0%	35.3%	<0.001
LDL <2.50 mmol/L	82.1%	46.6%	<0.001
Non-smokers	83.8%	67.3%	0.006
BMI <25.0 kg/m ²	37.5%	27.6%	0.11
Diabetes mellitus	38.6%	35.0%	0.57
HbA1c <7.0% in DM	41.7%	49.0%	0.43

Google Maps Offers a New Way to Assess for Claudication

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Purpose: Accurate determination of walking capacity, specifically, Maximal Walking Distance (MWD), is important for the clinical diagnosis and management plan for patients with peripheral arterial disease. The current gold-standard for measuring MWD is walking distance on a treadmill. However, treadmill testing is neither reflective of natural patient walking conditions, nor is fully accessible in every vascular clinic. *The widespread availability of GPS-enabled mapping systems provides new quantitative and qualitative methods of assessing claudication.*

Methods: Fifteen patients were enrolled in a prospective pilot study at the Ottawa Hospital. Participants were identified as true claudicants by an experienced Vascular Surgeon. They were then required to undertake treadmill testing, answer the Walking Impairment Questionnaire (a validated measure of MWD), and report the maximal walking distance as determined by the Google Maps-based tool at www.runningmap.com.

Results: Determination of MWD using Google Maps proved to be more accurate and reliable than the previously validated WIQ, where patients generally underreported their claudication distances. Not only did Google Maps help capture the subjectivity of individual walking environments and elevations, comparisons with the gold standard treadmill testing revealed an expected linear relationship (slope = 1.03) and relatively higher precision than the WIQ ($R^2=0.566$ vs 0.374). Additionally, the time taken to report MWD using Google Maps was, on average, 1-minute less than the WIQ.

Conclusion: Google Maps combines the objective strengths of the treadmill test with the qualitative advantages of the WIQ, and appears to be a promising new tool that offers an efficient and reliable way to assess MWD in claudicants.

Perfusion Angiography with Indocyanine Green Fluorescence in Patients With Critical Ischemia

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Background: Perfusion, or the steady state nutritive delivery of blood to the tissue capillary bed, is vital for the survival of tissue. Accurate perfusion measurement can provide important diagnostic and prognostic information. Precise measurement of functional tissue perfusion is needed for preventive measures, early diagnosis, and adequate treatment, especially in the patients with peripheral vascular diseases. Higher rates of tissue salvage not only improve the patient's quality of life but also positively impact the closure and healing rates of an open wound from a partial amputation or incision. The SPY **Elite**[®] System (Novadaq Technologies, Ontario, Canada; LifeCell, Branchburg, NJ) allows perfusion evaluation by using the fluorescent properties of indocyanine green dye (ICG). Although this technology has been used for decades in ophthalmology, its introduction to plastic reconstructive surgery and vascular surgery is relatively recent. It can be used in the intraoperative or postoperative setting to visually assess superficial blood flow. The ICG dye is administered and the device's infrared laser stimulates the fluorescent properties of the dye, allowing real-time, dynamic images to have an angiogram-like character, making them clear and easy to read.

Methods: We present pilot case studies (n=5), where the SPY Fluorescence Imaging Device was used to determine real-time perfusion analysis following angiographic intervention in patients with critical ischemia.

Results: These prospective case studies demonstrate feasibility and utility of Laser-assisted fluorescent angiography in the peri-procedure evaluation of patients with critical ischemia. Qualitative and quantitative fluorescent images provide real-time and objective assessments of pedal tissue perfusion. Laser-assisted fluorescent angiography derived peak pedal perfusion and ingress slope provide objective measurements of tissue perfusion that correlate with conventional methods using ABIs.

Conclusions: This technology continues to see new promising applications in many areas of surgery, including colorectal surgery, surgical oncology, and microvascular lymphedema treatment to name a few. To date there has been a paucity of literature published on how this technology can be used in vascular surgery. With further study, we anticipate that this technology may be a helpful adjunct for intra-procedural decision making and predicting wound healing capacity.

Continuous Regional Anaesthesia Provides Effective Pain Management and Reduces Opioid Requirement Following Major Lower Limb Amputation

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Objectives: Postoperative stump pain after major lower limb amputation is a significant impediment to the recovery of amputees. The vast majority of patients require opioid analgesics following surgery, which are associated with opioid-related side effects. Here, we investigate whether intraoperative placement of a peripheral nerve stump catheter followed by continuous infusion of local anesthetic is as effective at pain control as current analgesic practices. If beneficial, this procedure could potentially reduce post-amputation opioid consumption and opioid-related adverse effects.

Methods: A retrospective chart review was conducted of 198 patients over a four year period who had undergone a major lower limb amputation for indications related to peripheral vascular disease. Postoperatively, 102 patients that received a stump catheter were compared to 96 patients who did not. The primary outcomes of this study were the amount of morphine equivalents used in the first 72 hours postoperatively and postoperative pain intensity in the first 24 hours.

Results: 198 lower-limb amputations were selected for analyses. Multiple regression analyses indicated that perineural catheter use was associated with a lower cumulative postoperative opioid consumption over the first 72 hours but not postoperative pain scores at 24 hours. Stump catheter use led to a 40% reduction in opioid use during the first 72 hours postoperatively. Mixed model repeated measures analysis demonstrated that this opioid reduction was consistent over time. Other variables related to total opioid use included age, pre-surgical chronic pain, pre-surgical opioid use, patient controlled analgesia.

Conclusions: Continuous stump infusions of local anesthetic are a safe and effective method for reducing post-amputation opioid analgesic medications after major lower limb amputation.

Limb-Sparing Surgery with Vascular Reconstruction for Malignant Lower Extremity Soft Tissue Sarcoma

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Objectives: The aim of the current study is to evaluate the clinical outcome of patients requiring vascular reconstruction in limb sparing surgery during treatment for lower extremity soft tissue sarcoma (STS).

Methods: A total of 274 patients were diagnosed with malignant lower extremity STS between 2005 and 2013, and underwent medical management (n = 3), limb-sparing surgery without vascular reconstruction (n = 262), and limb-sparing surgery with vascular reconstruction (n= 9). Clinic notes, intra-operative records, and follow up visits with functional status and quality of life questionnaires were reviewed.

Results: Between 2005 and 2013, nine (3%) patients with malignant lower extremity STS underwent surgical resection with vascular reconstruction. Of these, Six (67%) underwent resection of femoral and popliteal vessels with subsequent femoro-popliteal bypass, one (11%) underwent resection of femoral vessels with iliac-SFA bypass, one (11%) underwent transection of the femoral and popliteal vessels with re-anastomosis, and one (11%) underwent resection of the superficial femoral vessels with SFA-distal SFA bypass. All bypasses were performed using saphenous vein from the contralateral leg. Four (44%) patients returned to the OR for wound complications requiring incision and drainage. Three (33%) required plastic surgery each for one of the following; VRAM flap, split thickness skin graft, and pedicle gracilis flap. Functional activity was assessed using the criterion 1 of the Musculoskeletal Tumor Society (MSTS) functional assessment forms pre-operatively, and at follow up at 6 months and 1 year. A score of 5 indicates no functional restrictions, whereas a score of 0 indicates total disability. The mean MSTS score pre-operatively and at 6 months and 1 years were 4.1, 3.6, and 3.8, respectively for the vascular reconstruction group, and 4.2, 4.3, and 4.3, respectively for the limb-sparing surgery without vascular reconstruction group.

Conclusions: The need for vascular reconstruction during limb sparing surgery for lower extremity malignant STS is rare in a high volume sarcoma center. Wound morbidity is high and these patients frequently require plastic surgery to achieve wound healing. Post-operative functional status as assessed by the MSTS is acceptable but may be lower than in patients not requiring vascular reconstruction.

Determining the Toe-Brachial Index in Young Healthy Adults

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Objectives: The purpose of this study was to determine the toe-brachial index (TBI) in healthy young adults and compare it with the accepted reference range.

Methods: Medical Students from the undergraduate class were prospectively recruited. Physical measurements (height, weight), health behaviors (physical activity quantity and type, smoking status, alcohol consumption), and medical history (medications, relevant diagnoses, family history) were collected. Bilateral brachial, toe and ankle blood pressures (using both dorsalis pedis and posterior tibial arteries) were measured. TBI was calculated as the mean toe blood pressure divided by the highest systolic brachial blood pressure.

Results: 40 medical students with a mean age of 24.7 ± 2.1 years without any comorbid conditions were studied. There were no current or past smokers. Participants maintained relatively healthy lifestyles (hours of activity per week: 5.1 ± 3.3 ; BMI: 21.7 ± 2.4). Caffeine and alcohol consumption was modest (10.6 ± 8.5 and 1.8 ± 2.7 drinks per week respectively). The mean systolic brachial blood pressure was 121 ± 9 mmHg (right), and 116 ± 9 mmHg (left). The TBI was 0.95 ± 0.11 (right) and 0.97 ± 0.13 (left) for males, and 0.86 ± 0.13 (right) and 0.86 ± 0.20 (left) for females.

Conclusions: The distribution of TBI in this healthy population differs significantly from the referenced normal range of 0.6-1.0. Our findings suggest that the accepted value of 0.6 for the low-normal limit is too low; this level may promote underdiagnosis of peripheral vascular disease, and represent foregone opportunities for early intervention. We recommend that the TBI reference range be modified to increase the clinical utility of this measurement.

Saturday, September 27th, 2014

PAPER SESSION V: HEMODIALYSIS

Fistula Outcomes in Octogenarians: Is a Fistula First Approach Appropriate?

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Background: The fastest growing segment of the dialysis population in Canada is in patients over the age of 75, with an overall increase from 5% in 1980 to 28.2% in 2010. These patients present multiple significant challenges to caregivers including differences in life expectancy, co-morbid health status, goals of care, and supportive care requirements. Currently the National Kidney Foundation KDOQI guidelines do not take age into account in recommendations for hemodialysis access. The goal of our study was to compare failure to mature, overall survival and complication rates for arteriovenous fistulae in octogenarians with non-octogenarians to determine if our standard approach to renal access should be modified to account for advanced age.

Methods: A review of all patients requiring arteriovenous fistulae for hemodialysis access at two teaching hospitals between 2007 and 2012. The study was designed as a retrospective cohort study with patients stratified by age into octogenarians and non-octogenarians. Data was collected from a large, prospectively maintained database of all dialysis and pre-dialysis patients.

Results: A total of 1019 patients had their access created during the study period and were eligible for inclusion. 156 (15.3%) of patients were ≥ 80 at the time of fistula creation. With respect to the primary endpoint, there was no difference between octogenarians and non-octogenarians with respect to failure to mature of the fistula (38.7% vs. 34.0%; $p = NS$). Octogenarians had decreased overall survival and were significantly more likely to expire during the study period (45.8% vs. 23.2%; $p < 0.001$). There were no significant differences between the two cohorts with respect to postoperative incidence of steal syndrome (7.3% vs. 6.3% $p = NS$) or wound complications (5.3% vs. 5.7%; $p = NS$).

Conclusions: The results of this study demonstrate no overall differences in maturation rates within the octogenarian group and that age alone should not preclude placement of an autogenous arteriovenous fistula

in this cohort. These findings demonstrate that an approach that incorporates limited life expectancy should be utilized when planning hemoaccess in this growing demographic.

Suggestion of Better Outcomes with Two-Stage Brachio-Basilic Vein Transposition: A Meta-Analysis

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Objectives: Brachio-basilic vein transposition is recommended in patients who are not candidates for a radial or brachial artery to cephalic vein fistula for dialysis access. Both one-stage and two-stage procedures have their advantages and disadvantages. Which procedure results in improved outcomes remains unclear.

Methods: A systematic review was conducted of the MEDLINE and EMBASE databases for studies that compared one-stage and two-stage brachio-basilic vein transpositions. Abstracts and full text studies were screened independently by two reviewers with data abstraction done in duplicate. Random-effects meta-analysis was used to identify differences in primary failure rates and 1-year primary and secondary patency rates. Study quality was assessed using a previously described tool designed for observational studies reporting on dialysis access outcomes.

Results: 1662 Abstracts were screened with 131 selected for full-text review. Of these, 7 studies (one randomized trial, 6 observational studies) involving 737 patients met the inclusion criteria. The pooled odds ratio (OR) estimate for primary failure was 1.36 (95% CI: 0.92-2.00) suggesting reduced failure rate in patients having undergone two-stage transpositions, although this was not statistically significant (Figure 1). Similarly the estimated OR for 1-year primary 1.71 (95% CI: 0.89-3.28) and 1-year secondary 1.44 (0.49-4.24) patency rates were in favour of the two-stage procedure but again the results were non-significant (Figure 2). Study quality was limited by unclear outcome definitions, minimal control for confounding, and variable selection criteria. The decision to pursue one vs two-stage was often based on size of the basilic vein with a two-stage procedure reserved for patients with smaller veins.

Conclusions: Meta-analysis of the existing literature comparing one-stage and two-stage brachio-basilic vein transposition suggests improved 1-year patency and reduced primary failure rates in the two-stage group, despite the two-stage procedure being used in patients with smaller basilic veins. These findings are limited by the small size, observational design, and inconsistent quality of included studies.

Figure 1. Forrest plot comparing the odds ratio (95% confidence interval) for primary failure of one-stage and two-stage brachio-basilic vein transpositions (OR >1 indicates lower failure rate in two-stage group).

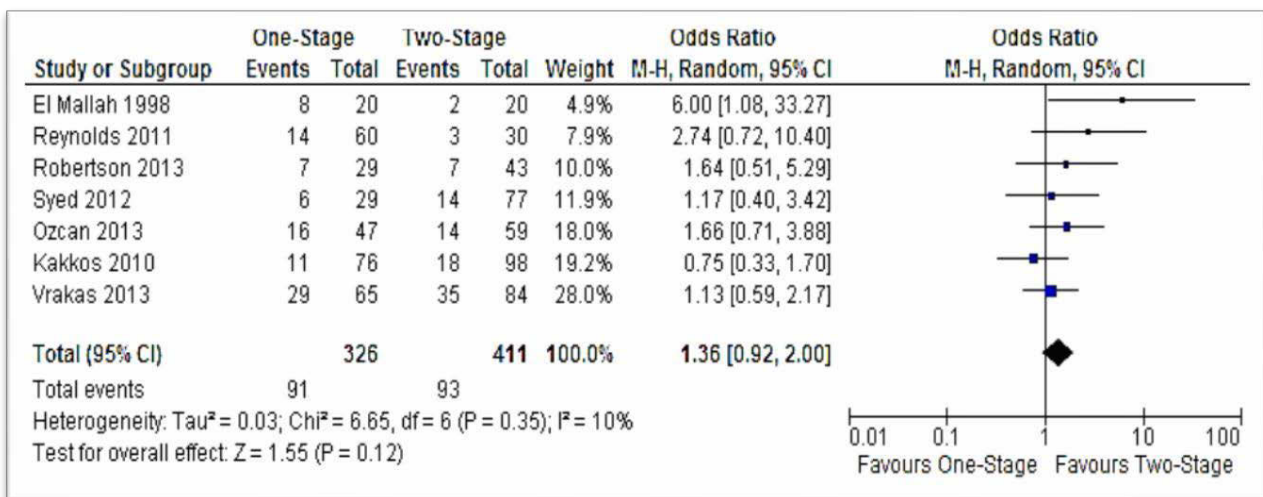
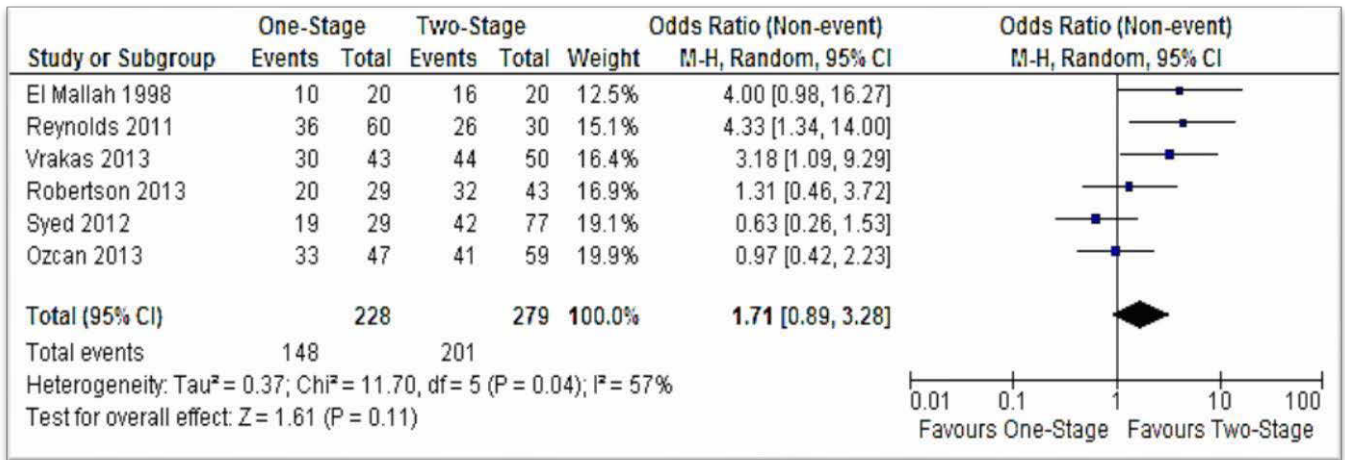


Figure 2. Forrest plot comparing the pooled odds ratio (95% confidence interval) for primary patency at 1-year (OR >1 indicates better primary patency rate in the two-stage group).



Sepsis Free Survival, a Long-Term Comparison of Catheter Access Versus Synthetic Graft Septic Complications in Hemodialysis Patients.

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Objectives: Our aims were to analyse and compare septic complications in graft based and catheter based hemodialysis patients and to study long-term functional permeability and risk factor for non-use of synthetic grafts in our patient population.

Methods: The data were prospectively collected and retrospectively analysed. Our study population was made of 64 consecutives arteriovenous grafts created between January 2000 and January 2013 and 121 patients with tunnelled central venous catheter based hemodialysis installed between June 2005 and January 2013. A Kaplan-Meier life table analysis was done for the sepsis-free survival and for the functional permeability of the grafts. Univariate and multivariate Cox survival regression analysis were constructed to evaluate independent predictors for septic complications.

Results: Patients demographics for arteriovenous graft and catheter-based hemodialysis were similar, except for age (P = .02) and hypertension (P = .04). Catheter-based dialysis suffered from more septic event (33.9% vs 17.2% P = .02). The number of hospitalization required for the septic event were more important in the synthetic graft group (90.9% vs 36.6% P = .001), but the 30 days mortality were similar. Long-term sepsis-free survival was similar in both groups (log rank P = .9). A functional graft is the only independent predictor of synthetic graft septic event (P = .03). Older patient and male gender are independent risk factors for catheter-related sepsis. Warfarin was an independent protective factor for graft functional survival.

Conclusions: Long-term functional permeability of arteriovenous graft is low and the sepsis-free survival is comparable to catheter based hemodialysis patients. In centers where synthetic grafts are used as last resort options, catheter based hemodialysis may yield similar long-term clinical outcomes.

Trends in Renal Function Post Aortic Aneurysm Intervention

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Background: Abdominal Aortic Aneurysm (AAA) constitutes a significant health problem. Endovascular aneurysm repair (EVAR) is a less invasive intervention for AAAs compared to conventional open repair (OR). However, patients undergoing aneurysm repair by any means are at risk of developing acute kidney injury (AKI). This is significant as AKI is associated with high rates of morbidity and mortality in the post-operative period following cardiac surgery, vascular surgery, angiography, and other interventions. Previous studies demonstrate a decline in renal function following EVAR especially in patient with pre-existing renal insufficiency. However, studies comparing the effect of EVAR with OR on renal function have yielded conflicting results. The aim of this study is to retrospectively compare the effect of EVAR with OR on renal function.

Methods: A retrospective review was performed. Preoperative and postoperative renal function was assessed by creatinine levels and estimated glomerular filtration rate (eGFR) calculated by the Chronic Kidney Disease Epidemiology Collaboration equation. Renal dysfunction was defined as (1) acute kidney injury, which is defined as any postoperative rise in creatinine levels of more than 44.2 $\mu\text{mol/L}$ from the preoperative value and the requirement of hemodialysis in patients who did not require dialysis preoperatively.

Results: During the study period, 287 patients were analyzed; 82 (29%) had OR and 205 (71%) had standard EVAR. Males composed most of the cases with 80.5% in the OR group and 84% in the EVAR group. A postoperative creatinine increase was observed during the follow-up in 14.6% of open repairs and 4.4% of EVARs. Two cases required permanent dialysis one each from the OR and EVAR group. There were no cases requiring temporary dialysis. The mean iodinated contrast volume (ml) used in the EVARs was 134.3 ± 60.2 . The clamp position in the OR group was infrarenal in 65.9%, above one renal artery in 14.6%, above two renal arteries in 15.9% and supraceliac in 3.7% of cases. The renal/visceral ischemic time (min) was 8.5 ± 16.1 .

Conclusions: After open or endovascular aortic intervention there is significant percentage of patients with a decline in renal function. This is more common in the OR group. The risk of renal impairment after aortic intervention should be recognized and strategies employed to minimize its incidence.

Saturday, September 27th, 2014

VASCULAR EDUCATION

An Analysis of Vascular Surgeons' Use of a Maintenance of Certification Program and Lessons for Future Engagement.

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Introduction: The Royal College of Physicians and Surgeons of Canada introduced a compulsory Maintenance of Certification (MOC) program in 2000 based on a 5 year cycle for all specialists. Modifications to the framework and credit system were introduced in 2010; the program is now in the 3rd cycle.

Objectives: The aims of this study were to identify patterns of MOC use, compare medical to surgical specialties and identify opportunities for improved MOC strategies.

Methods: The 2010 – 2012 database was compared to 2009 to identify general trends. Side-to-side comparisons were done in 2012 database to identify variations in MOC practice across specialties (anesthesia (A), general surgery (GS), gastroenterology (GI), cardiac surgery (CS), cardiology (C) orthopedic (OS) and vascular surgery (VS)).

Results: Overall participation rates remained at 85 – 91 % across specialties and in the different cycles. The overall use of group learning activities (93 %), self-learning (85 %) and self-assessment (30 %) showed no change across cycles or specialties. Specific activities varied in different specialties: conferences (CS 70% to GI 85%), rounds (OS 38% to GI 55%), personal learning projects (OS 33% to GI 50%), patient safety panels (C 13% to GI 22%), internet search (VS 12% to C 22%), practice audits (VS 12% to GI 22%). There were no differences in journal reading (38 – 41%) or self-assessment program (SAP) use (2 – 5%). Overall, despite specialty

differences, traditional group MOC activities continue to represent the majority of credits reported; patient safety, SAP, practice audits and internet-based activities were underrepresented.

Conclusions: Specialist MOC continues in traditional activities. There are variations by specialty. Resource intensive self-learning and practice-assessment activities are not widely used. Strategies to modify program planning, participant orientation and MOC expectations are required to increase uptake in certain, potentially high-value, MOC activities.

Future Demands for Vascular Care: A Census-Based Analysis

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Background: Changing population size and distribution, incidence of disease and risk factors and the likelihood of need-for-care determines in part the demands for health care in the future. The introduction of advanced technology, patient and society's expectations, the growing at-risk population and increased recognition of risk factors have impacted on vascular disease management. Studies in many countries predict a dramatic increase in the need-for-care for vascular issues. A 'business as usual' model predicts a large increase in the medical manpower requirements to meet this.

Objectives: The aims of this study are 1. To identify the population size, 2. Link population to vascular disease data and 3. Link disease data to resource requirements.

Methods: Population data regarding size and distribution of disease was sourced from StatsCan 2012 census data. The epidemiology of vascular risk factors, recognized disease and determinants for intervention was sourced from a variety of academic sources. Resource requirements were inferred from the data with sensitivity analysis applied to variable assumptions. Subgroup selection was applied for Ontario (ON).

Results: Canada's population is approximately 36M; Ontario's population is 12.8M. The population is growing at 5.8%. The vascular target population of patients 55 – 80 years of age is growing more rapidly. In Ontario, the subgroups by 5-year cadres ranges from 375 – 850 K with a total of 3.2M. The prevalence of risk factors ranges from 17 – 52%; the need-for-care ranges from 8 – 32%. Assuming a ratio for vascular specialists (VS) of 1:100-180K, ON would need 71 -126 VS on an on-going basis. Diagnostic and interventional resources will increase by 22 – 52% over time.

Conclusions: Increasing population, population at risk, disease prevalence and triggers for intervention will lead to dramatic increases in vascular related resources. Changes in VS scope of practice, involvement of other specialties and non-physician practitioners and changing technology will all impact on assumptions regarding manpower and other resources for the care of vascular patients.

Saturday, September 27th, 2014

PAPER SESSION VI: GENERAL TOPICS IN VASCULAR SURGERY

Residency Training in Venous Disease Management Fails to Address Practice Needs

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Background: Previous surveys have shown that 91% of Canadian vascular surgeons maintain a venous management component in their practice; 53% have seen an increasing demand over the past 5 years. The spectrum of venous disease that is treated is wide and vascular surgeons recognize only a limited group of fellow specialists as expert venous practitioners (41%).

Objectives: The aim of this study was to compare training objectives and practice requirements to training experiences in venous disease management in Canadian vascular training programs.

Methods: The curriculum objectives were collected from the Royal College training guidelines and individual program outlines. A survey of trainees and practicing vascular surgeons was done to assess the training opportunities and practice parameters relevant to venous management.

Results: Program objectives include training in venous disease management. However, most programs do not have specific venous rotations or access to dedicated venous centres. Trainees are seldom exposed to patients with venous issues in clinic, emergency care, or rounds; nor do they attend major venous meetings. MOHLTC have further limited opportunities in Ontario-based programs. Training correlates with practice better for conservative management (78%) than specific management (sclerotherapy 50%, foam sclerotherapy 42%, ambulatory phlebectomy 55%, endovenous ablation 50%). Thrombolysis training approximates practice (75 – 100%) but IVC filter placement (34%) and venous angioplasty (22%) do not.

Conclusions: Despite the importance of venous management in practice and its inclusion in the training curricula, training generally fails to address most venous management issues and meet practice needs.

Fibrinogen Level and Bleeding Risk During Catheter Directed Thrombolysis Using Tissue Plasminogen Activator

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Objectives: Our objective was to evaluate if low fibrinogen levels during catheter directed thrombolysis is associated with an increased risk of bleeding.

Methods: We retrospectively reviewed vascular surgery patients undergoing thrombolysis between 2005 and 2013. Patients were allocated to either the low fibrinogen group if their fibrinogen level was less than 1.5g/L during treatment or the high fibrinogen group. Demographics, bleeding complications, and technical and clinical success were statistically analyzed between the groups.

Results: A total of 49 patients (22 arterial and 27 venous) were included with a mean age of 52.0±18.4. 16 patients were allocated to the low fibrinogen group and 26 to the high fibrinogen group (7 patients did not have fibrinogen levels measured; none of these patients had any bleeding complications). Patients were significantly younger (41.1±17.3 vs 56±15.7, p=0.006) and had a proportionately higher number of venous occlusive events (87.5% vs 42.6%, p=0.004) in the low fibrinogen group compared to high fibrinogen group. Other baseline characteristics including gender, extremities affected, prothrombotic risk factors, contraindications to thrombolysis, baseline fibrinogen, INR, PTT, and platelets were similar between the groups. The low fibrinogen group used a larger total dose of tPA (40.7 ± 24.6mg vs 21.9 ± 10.5mg, p = 0.009) and had longer duration of tPA infusion (26.8 ± 12.9hrs vs 16.9 ± 6.6hrs, p = 0.010). The rates of major and minor bleeding were not significantly different between the low fibrinogen versus high fibrinogen groups (2 vs 0 cases of major bleed, respectively, p = 0.139; 1 vs 4 cases of minor bleed, respectively, p = 0.633). Secondary outcomes including technical and clinical success rate, in-hospital mortality, length of hospital stay, and secondary procedures were similar between groups.

Conclusions: A fibrinogen level less than 1.5g/L during thrombolysis was not associated with an increased risk of bleeding complications. This was despite a larger total dose and longer duration of tPA infusion used.

Feasibility and Outcomes of Outpatient and Short Stay EVAR: A Retrospective Study and Review of the Literature

¹Aaron Lo, ^{1,2}Ivica Vucemilo, ¹Sean Crawford, ^{1,2}Chris Werneck, ^{1,2}William Johnson, ^{1,2}Marc Pope, ⁽¹⁾Division of Vascular Surgery, University of Toronto, ⁽²⁾Trillium Health Partners, Mississauga Hospital

Objectives: The aim of this study was to determine the length of stay in our cohort of patients who underwent endovascular aortic aneurysm repair (EVAR) and to identify patient characteristics suitable for same day or short-term discharge. We also conducted a review of the literature examining the evidence for safety and efficacy of ambulatory and short-stay EVAR.

Methods: A retrospective analysis of consecutive patients who underwent elective EVAR by three vascular surgeons in our institution since April 2011 until March 2013 was conducted. Patient demographics, co-morbidities, aneurysm anatomy, length of stay and complications were analyzed. On review of the literature, 4 articles on outpatient or short-stay EVAR were identified.

Results: 162 patients underwent elective EVAR during the study period. 138 patients were included in the analysis (24 patients were excluded due to insufficient data, aneurysm rupture or TEVAR). Seven patients (5.1%) were discharged the same day (SD) of procedure, 81 (58.7%) patients were discharged on post-operative day 1 (POD1), and 50 (36.2%) patients were discharged on post-operative day 2 or longer (standard group). The standard group was significantly older (78.44 \pm 8.32 years) than the POD1 and SD groups (72.9 \pm 8.41, 71.3 \pm 11.2, respectively. $p=0.0004$). Mean aneurysm size was 54mm (\pm 2.98) for the SD group, 57mm(\pm 9.57) for POD1 group and 59mm (\pm 11.29) for the standard group. 30-day mortality was zero in all three groups. All (100%) patients in the SD group, 70 (86%) patients discharged on POD1 and 26 patients (52%) in the standard group had their procedures performed fully percutaneously ($p<0.0001$). Percutaneous arterioplasty device failure, thus necessitating a femoral cutdown, occurred in 8 (9.8%) patients in the POD1 group and in 8 (16%) patients in the standard group ($p=0.33$). All groups had similar baseline co-morbidities (hypertension, hyperlipidemia, chronic renal failure, diabetes mellitus, chronic obstructive pulmonary disease; not significant (NS)). Ninety-six percent of all procedures were performed with a spinal anesthetic. Reasons for prolonged hospital stay included urinary retention, post-implantation syndrome, symptomatic aneurysm or insertion of aorto-uni-iliac stent with cross-femoral bypass. Re-admission to hospital within thirty days of EVAR was zero in SD group patients, 4(5%) patients in the POD1 group and 3(6%) patients in the standard group (NS). 30-day complication rate was 5% in the POD1 group and 20% in the standard group ($p=0.0069$).

Conclusions: Discharging patients the same day or overnight post elective EVAR is feasible and safe in patients with acceptable medical risk, good baseline functional capacity and who have undergone uncomplicated aneurysm repair. The literature shows that discharge within 24-hours post-EVAR is feasible in one-third of patients. Future prospective studies, including cost analysis, will be undertaken to validate this encouraging data.

Late Endograft Explantation: A Single Center Case Series and Systematic Literature Review

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Objectives: Over the last decade the use of endografts for the repair of abdominal aortic aneurysm has steadily increased. Despite improvements in endograft device technology, we continue to see complications that require re-intervention. Here we present a systematic literature review of the indication for late endograft explants as well as a small case series of late endograft explants.

Methods: We conducted a retrospective case series of 3 endograft explants at a single centre over a 3 year period. Additionally, systematic literature review of the PubMed database with the search terms (explant OR late conversion) AND (endograft OR EVAR) was undertaken, with interest in indications for explantation and overall outcome following explantation.

Results: We present three cases of late surgical conversion following EVAR repair of AAA: 1) An 88-year old female with a late type I endoleak and proximal graft migration 18 months post-EVAR; 2) A 66-year old male with an MRSA infected endograft 2 years post-EVAR; 3) A 64-year old male with an acute occlusion of his endograft 6 years post-EVAR.

A systematic review of the literature revealed 478 reported cases of late endograft explantation. The predominant indication for explantation was endoleak, representing 58%(277) of endograft explants (Type I-106; Type II-59; Type III-41; Type V-5; multiple endoleaks-5, undefined-62). Other indications for explant included infection 21%(100), occlusion 5.2%(25), aortoenteric fistula 2.7%(13) and claudication 1% (5). Of the reported cases, 11% presented as ruptured AAA. Where reported, elective 30-day mortality ranged from 0-10% and non-elective 30-day mortality ranged from 19-53%.

Conclusions: The primary reported indication for late open conversion was Type I endoleaks, followed closely by infection. While these can be technically challenging procedures, elective open conversion comes with a low mortality rate relative to urgent procedures. Non-adherence to manufacturers recommendation for endograft use and late aortic remodeling could explain large number of endoleaks noted.

***In Situ* Reconstruction With Custom-Made Bovine Pericardial Grafts for Aortic Graft Infections and Infected Aneurysm: A Case-Series**

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Background: Prosthetic vascular infection is an uncommon but devastating event, occurring after \approx 0.1% to 5% of operations and developing months to years after initial implantation. Similarly, mycotic aneurysms occur rarely, but still carry a 25% mortality rate. Both entities may be challenging to eradicate. Therapeutic options are limited. Complex surgical procedures with wide debridement are often required, and outcomes are variable.

Objectives: Evaluate the use of *in-situ* reconstruction with custom-made bovine pericardial grafts as an alternative to *in-situ* autologous vein graft, prosthetic grafts, and cryopreserved arterial homografts for the treatment of aortic graft infections and infected aortic aneurysm.

Methods: Between 2009 and 2014, 8 patients (age range 51 – 84, 50% men) with prosthetic graft infection (n=6) or thoraco-abdominal mycotic aneurysm (n=2) were treated with either complete prosthesis or aneurysm resection, together with wide local debridement and arterial reconstruction with custom-made tube grafts constructed from bovine pericardial sheets.

Results: Patients selected for bovine pericardial tube grafting had previously documented infection that occurred between 1 month to 6 years following initial prosthesis implantation. One patient had recurrent graft re-infection, which was attributed to recurrent aorto-duodenal fistula. The patient eventually underwent a second pericardial tube graft with resolution of the infection. Follow-up imaging did not reveal any signs of infection in the other patients. Overall thirty-day perioperative mortality rate was 12.5% (n=1), and occurred in relation to severe underlying pulmonary disease and not as a consequence of graft failure.

Conclusions: Pericardial tube grafting is a potential alternative to conventional surgical methods for the treatment of aortic graft infections and infected aortic aneurysm. Further investigation of long-term outcomes is required.

The Effect of Chemotherapy for Malignancy on the Natural History of Aortic Aneurysm

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Objectives: Surgical dogma holds that chemotherapy increases risk of aneurysm growth and rupture. We sought to determine the effect of cytotoxic chemotherapy on the growth of aortic aneurysms.

Methods: All patients undergoing chemotherapy for malignancy with coexisting aortic aneurysms at our institution between 2000 and 2011 were identified. Review of electronic medical records and re-review of serial cross-sectional imaging was performed. An additional cohort of patients undergoing aneurysm

surveillance during the same period was identified and demographic and anatomic variables collected. Planned analysis included descriptive analysis, change in aneurysm diameter over time, and association of growth or need for intervention with type of chemotherapy and type of malignancy.

Results: Between 2000 and 2010, there were 125 patients at our institution with a concurrent diagnosis of aortic aneurysm and malignancy requiring cytotoxic chemotherapy. Cross-sectional imaging was available for 91/125 patients. The predominant malignancy type was lung cancer (34/91, 38%), followed by lymphoma (21/91, 23%) and colorectal cancer (10/91, 11%). The majority of aneurysms were infrarenal (53/91, 58%). Most patients were treated with more than one class of chemotherapeutic agent over 267 days (IQR 144, 469), the majority having at least one cycle of alkylating agents (73/91), in addition to anti-metabolites (42/91) and plant alkyloids/terpenoids (40/91). Chemotherapy regimens included steroids in 92% (84/91) of patients. The baseline aneurysm diameter for patients on and not on chemotherapeutic agents was 41.4 mm (IQR 34.9, 51.3) and 46.0mm (IQR 40, 52), respectively. Aneurysm repair during chemotherapy occurred in 9% (8/91) of patients, but only 2/8 required urgent repair due to aneurysm rupture. The annual rate of aneurysm growth for patients on and not on chemotherapy was similar (2.3mm/year vs. 2.4mm/yr) ($p=0.69$).

Conclusions: In 91 patients over 10 years at our institution, chemotherapy did not increase aneurysm growth compared with patients not undergoing treatment for malignancy.

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