

Canadian Society for Vascular Surgery
Société canadienne de chirurgie vasculaire

37th Annual Meeting on Vascular Surgery
“Implementing Innovation: Incorporating Advances into Daily Practice”

September 25-26, 2015
Delta Victoria Ocean Pointe
Resort and Spa Victoria, BC

FINAL PROGRAM/PROGRAMME FINAL

CSVS 2015 EXHIBITORS

Please visit the exhibit hall (Harbour Room) and meet the 2015 CSVS sponsors. Exhibiting companies are our benefactors and major resource for our annual meetings. We encourage all our members and guest delegates to visit and support our sponsors.

Exhibit dates and times:

Friday, September 25th

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 26th

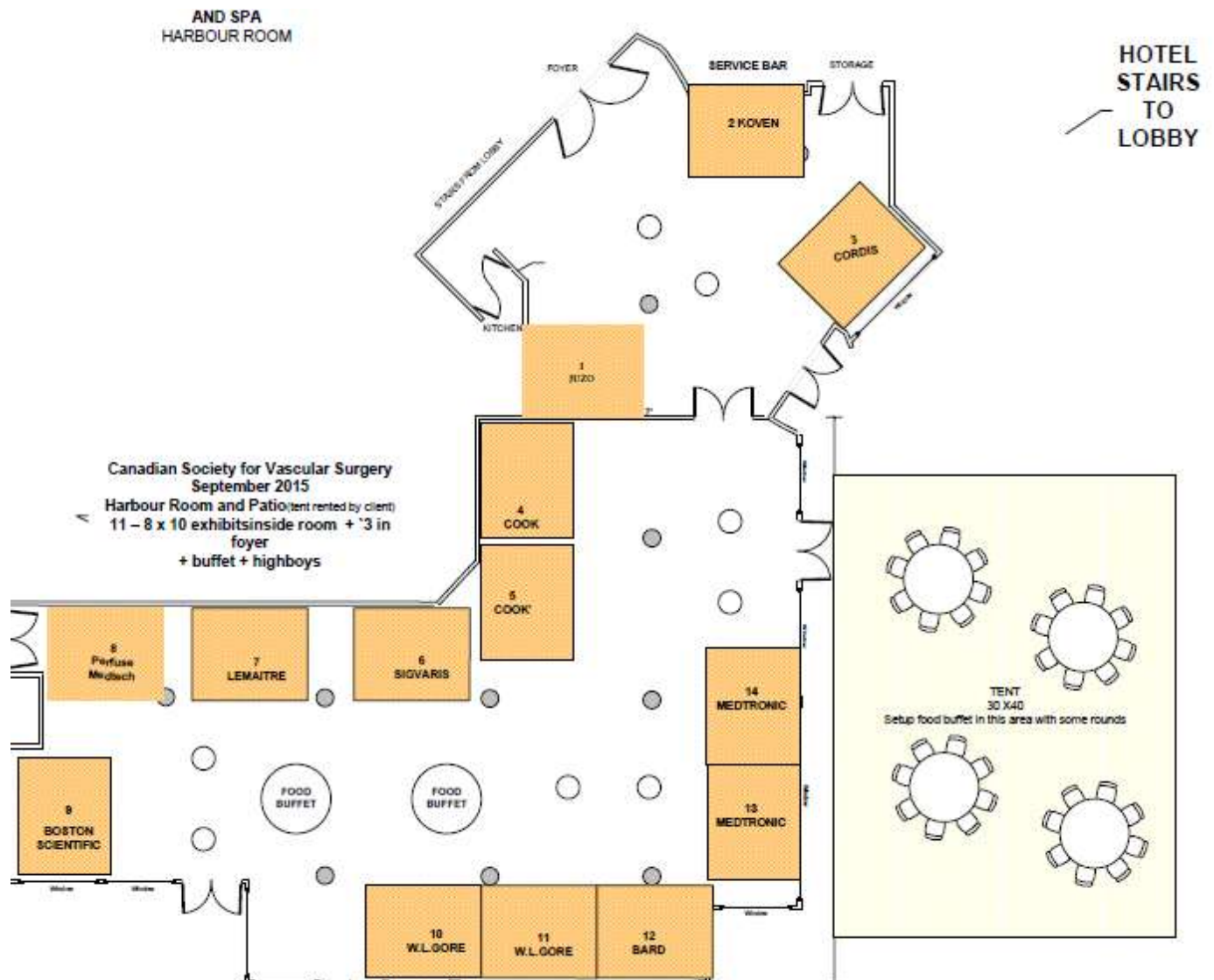
Breakfast – 07:00-07:45

Refreshment break – 10:00-10:30

Lunch buffet – 12:15 – 13:30

Refreshment break – 15:00-15:30

Sponsors: Bard, Boston Scientific, Cook, Cordis, Covidien, Juzo, Koven, LeMaitre, Medtronic, Perfuse Medtec, Sigvaris, W. L. Gore & Associates





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 37th Annual Meeting September 25 - 26, 2015

1. The participant will be able to discuss innovations in vascular surgery and learn how these advances can be implemented into vascular surgery practice.
2. 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.
3. The participant will be able to list and describe contemporary issues in the training and education of vascular surgeons.
4. 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 13.50 hours**”.*

CPD Mission Statement

The Canadian Society for Vascular Surgery strives to provide its members specific opportunities to improve competency relating to vascular and endovascular surgery and vascular medicine through forums which include not only interactive and didactic learning opportunities but also opportunities for dissemination, discussion, and reflection of peer reviewed research. The competencies addressed by the activities will focus on the medical expert and scholar roles, although the roles of professional, communicator, collaborator, health advocate and manager are considered important by the Society and should be included in its activities. The target audience is primarily the membership of the society. This includes active members (surgeons), associate members (persons interested in vascular disease), and candidate members (vascular surgery trainees). It is acknowledged that there may be vascular surgeons and other health care providers that are not members and the Society seeks to engage them as well by encouraging membership.

CSVS Executive Committee

President: Dr. Thomas Forbes
President Elect: Dr. Greg Browne
Past President: Dr. Jacques Tittley
Past Past President: Dr. Gerrit Winkelaar
Secretary: Dr. April Boyd
Treasurer: Dr. Rafik Ghali
Program Chair 2015: Dr. Matthew Robinson
Assistant Program Chair 2015: Dr. Min Lee
Local Arrangement Chair 2015: Dr. Shung Lee
RCPSC Representative: Dr. Thomas Lindsay
Research Committee Chair: Dr. Graham Roche-Nagle
Education Committee Chair: Dr. Guiseppe Papia
Member at Large – Central: Dr. Jonathan Cardella
Member at Large – West: Dr. David Kopriva
Member at Large – East: Dr. Pat Casey
Website: Dr. Karim Alibhai

Previous Executive Committees for the CSVS Annual Meetings (1979 to 2014)

CSVS Invited Guest Lecturers

1980 Charles Rob	2004 James May
1981 Robert Rutherford	2005 Robert Hobson II
1982 Lazar Greenfield	2006 Eric L. Verhoeven
1983 H.H.G. Eastcott	2007 Timothy A.M. Chuter
1984 John Bergan	2008 Michel Makaroun
1985 John Mannick	2009 Peter A. Schneider
1986 Allan Callow	2010 Gregory Moneta
1987 Robert Courbier	2011 Benjamin Starnes
1988 D. Eugene Strandness Jr.	2012 Daniel Clair
1989 Edward Diethrich	2013 Ronald Dalman
1990 Ronald Stoney	2014 Janet Powell
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 Whittemore	
2002 Jack Cronenwett	
2003 Wesley Moore	

Previous meetings (1979 to 2014)

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
2014 Toronto

Future meetings

2016 Halifax
2017 Banff
2018 Montreal

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.

Canadian Society for Vascular Surgery Société canadienne de chirurgie vasculaire

Program at a Glance 37th Annual Meeting

“Implementing Innovation: Incorporating Advances Into Daily Practice”

Thursday, September 24, 2015

12:00pm-4:00pm	CSVS Executive Committee Meeting (closed) <i>Hudson Room</i>
4:30pm-9:00pm	RCPSC Vascular Surgery Specialty Committee Meeting (closed) <i>Pacific Suite</i>
6:00pm-8:00pm	CSVS Registration Desk opens – <i>Arbutus Ballroom Foyer</i>

Friday, September 25, 2015

7:00am	CSVS Registration Desk Opens – <i>Arbutus Ballroom Foyer</i>
7:00am-7:45am	Continental Breakfast & Exhibits – <i>Harbour Room</i>
7:45am-8:00am	Welcome and Opening Remarks – <i>Arbutus Ballroom</i> President: Dr. Thomas Forbes Program Chair: Dr. Matthew Robinson Secretary: Dr. April Boyd
8:00am-9:30am	Paper Session I: Endovascular Aortic Interventions I: Innovations - <i>Arbutus Ballroom</i> Moderator: Dr. Andrew Dueck <i>Objectives: Upon completion of this session, attendees will be able to:</i> 1) Describe advances in endovascular treatment of aortic pathology. 2) Understand the healthcare economic implications of implementation of advanced endovascular technologies 3) Identify areas for possible quality improvement in endovascular follow-up 0800-0815 In Situ Laser Fenestration during TEVAR: Innovation in practice Presenter: J. Panneton 0815-0830 Budget impact of percutaneous endovascular abdominal aorta aneurysm repair (PEVAR) compared to standard endovascular repair in Canadian hospitals Presenter: G. Roche-Nagle 0830-0845 Short term outcomes of introducing percutaneous endovascular aneurysm repair in comparison to open endovascular aneurysm repair at an academic institution Presenter: B. Chan 0845-0900 Direct high resolution angioscopic imaging during endovascular surgery Presenter: P. McVeigh

0900-0915 The in hospital cost of treating thoracoabdominal and juxtarenal AAAs with EVAR in a high risk patient population

Presenter: E. Osman

0915-0930 Development and implementation of EVAR follow-up guidelines: A quality improvement project through the IDEAS Ontario Program

Presenter: N. Eisenberg

9:30am-10:00am

Refreshment Break & Exhibits – Harbour Room

10:00am-11:00am

Paper Session II: Stroke and Extracranial Cerebrovascular Disease - Arbutus Ballroom

Moderator: Dr. Randy Guzman

Objectives: Upon completion of this session, attendees will be able to:

- 1) Identify the role of public health initiatives in improving stroke outcomes*
- 2) Understand how plaque morphological features may identify individuals at higher risk of stroke*
- 3) Identify how the implementation of multidisciplinary stroke rapid assessment systems improves stroke outcome*

1000-1015 Public health initiatives and stroke awareness

Presenter: M. Metias

1015-1030 Plaque echodensity and textural features are associated with carotid plaque instability

Presenter: R.J. Doonan

1030-1045 Implementation and adherence to stroke guidelines for treatment of extracranial carotid occlusive disease through a multidisciplinary team: Review of 1895 carotid endarterectomies in a single health authority from 2006-2014

Presenter: J. Dooner

1045-1100 Hospital Process redesign leading to wait-time improvements in delivery of stroke- prevention surgery to patients with symptomatic carotid artery stenosis

Presenter: P. Ravichandran

11:00am-11:30am

CSVS Invited Guest Lecture I - Arbutus Ballroom

Uncommon Vascular Diseases Are More Frequent Than You Thought!

Peter Lawrence, MD, Chief of Vascular Surgery, UCLA

Objectives – upon completion of this session, attendees will be able to:

- 1) Be aware of the frequency of uncommon vascular disease*
- 2) Identify three vascular diseases that are uncommon*
- 3) Describe the methodology for conducting multi-institutional studies on uncommon diseases*

11:30am-1:00pm	CSVS Annual General Meeting (members only) – <i>Songhees Suite</i>
11:30am-1:00pm	Lunch & Exhibits – <i>Harbour Room</i>
11:30am-1:00pm	Invited Guest Speaker & Residents Meet and Greet – <i>Harbour Room/Patio</i>
1:00pm-2:15pm	Paper Session III: Endovascular Aortic Interventions II: Predicting and Preventing Complications - <i>Arbutus Ballroom</i>
	Moderators: Dr. Joel Gagnon, Dr. Leonard Tse
	<i>Objectives: Upon completion of this session, attendees will be able to:</i>
	<i>1) Identify new models that help to predict endovascular stentgraft behavior</i>
	<i>2) Describe common pitfalls and complications of endovascular technologies</i>
	1:00-1:15 A novel in-vitro model predicts aortic stent-graft hemodynamic alterations after endovascular repair
	Presenter: R. Moore
	1:15-1:30 Morphologic suitability for endovascular treatment in ruptured abdominal aortic aneurysm in a single academic center
	Presenter: A. Poirier
	1:30-1:45 The heterogeneous clinical course of type 2 endoleaks: a single institution experience
	Presenter: C. de Mestral
	1:45-2:00 Comparison of quantitative analysis and qualitative assessment of iliac artery tortuosity
	Presenter: M. Doyle
	2:00-2:15 Endograft shortening during endovascular repair of abdominal aortic aneurysms in severe aortoiliac tortuosity
	Presenter: K. Lee
2:15pm-2:45pm	Debate – Implementing Innovation - <i>Arbutus Ballroom</i>
	Moderator : Dr. Min Lee
	<i>Objectives: Upon completion of this session, attendees will be able to:</i>
	<i>1) Compare the outcomes achieved by open and endovascular approaches to aortic pathology</i>
	<i>2) Discuss the future challenges and frontiers in treatment of aortic pathology</i>
	“We have over-implemented EVAR, and it is time we revisited open aneurysm Repair” For : Dr. Jacques Tittley Against : Dr. Cherrie Abraham
2:45pm-3:00pm	Refreshment Break & Exhibits – <i>Harbour Room</i>
3:00pm-4:00pm	VSEP Jeopardy - <i>Arbutus Ballroom</i>
	Moderator: Dr. Guiseppe Papia
	<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>

4:00pm-5:00pm

Rapid 3 minute Poster Presentations: A brief introduction - Arbutus Ballroom

Moderator: Dr. April Boyd

Objectives: Upon completion of this session, attendees will be able to

1) Describe issues related to and affecting Vascular Surgery

2) Understand advances in various topics in Vascular Surgery

Isolation and molecular characterization of proliferating plaque macrophages

Presenter: C. Zavitz

Treatment of Complex Aortic Pathologies in the Endovascular Era: The Ottawa Experience

Presenter: G. Hajjar

Impact of Floor-to-Door Time on Mortality After Blunt Traumatic Thoracic Aortic Injury

Presenter: V. Gupta

Toronto Experience with the Hemodialysis Reliable Outflow (HeRO) Grafts; A single centre experience

Presenter: E. Greco

Fenestration of aortic stent-grafts: laser puncture followed by balloon angioplasty (non-compliant balloon vs cutting balloon)

Presenter: R. Guidoin

Anatomic factors are more predictive than anticoagulants for type II endoleaks following EVAR

Presenter: K. Lee

Predictors of Hospital Readmissions after Lower-Extremity Amputations in Canada

Presenter: A. Kayssi

Anti-platelet Therapy Prescription Patterns after Lower Limb Angioplasty in Canada – Results from a National Survey

Presenter: A. Kayssi

After-Hours Rupture Aortic Aneurysm Repair Outcomes. An Institutional Experience

Presenter: M. Guirgis

Exploring the training experiences of a direct entry vascular surgery resident cohort using focus groups

Presenter: F. Naji

Predictors of Failure and Mortality With Endovascular Repair of Presumed Infected Saccular Thoracic Aortic Aneurysms

Presenter: J. Cooper

Rehabilitation Outcomes after Lower-Extremity Amputations in Canada Presenter: A. Kayssi

Internal iliac artery coverage during endovascular repair of abdominal aortic aneurysms is a safe option: a preliminary study

Presenter: V. Kansal

	<p>A cadaveric study to facilitate the surgical and the percutaneous approaches of the femoral artery Presenter: C. Tremblay</p> <p>Public Knowledge about PAD: The Gap is Larger than we Thought Presenter: M. Al Hamzah</p> <p>Impact of Diabetes on Carotid Artery Revascularization: A Systematic Review and Meta-analysis Presenter: M. Hussain</p> <p>Trends in Aortic Repair in Ontario 2002-2014 Presenter: G. Roche-Nagle</p> <p>The influence of abdominal aortic aneurysm geometry on pulsatile flow dynamics Presenter: A. Boyd</p>
5:00pm-6:00pm	CSVS Wine & Cheese Amongst the Posters –Arbutus Ballroom Foyer
6:30pm	President’s Dinner (closed – CSVS Executive Members only)

Saturday, September 26, 2015

7:00am	CSVS Registration Desk Opens – Arbutus Ballroom Foyer
7:00am-8:00am	CSVS Education Committee meeting – Executive Room
7:00am-8:00am	CSVS Research Committee meeting – Cowichan Room
7:00am-7:45am	Continental Breakfast & Exhibits – Harbour Room
	<p>Paper Session IV: Venous Disease - Arbutus Ballroom Moderator: Dr. Jerry Chen Objectives: Upon completion of this session, the attendees will be able to:</p> <ol style="list-style-type: none"> 1) Identify the determinants of severe venous disease 2) Describe novel approaches to the treatment of venous insufficiency. 3) Discuss areas for quality improvement in the treatment of venous thromboembolic disease
7:45am-8:45am	<p>0745-0800 Risk factors associated with venous ulcers in a Canadian population Presenter: G. Yang</p> <p>0800-0815 Combined coil embolization and foam sclerotherapy for the management of varicose veins: description of a novel technique Presenter: A. Kayssi</p> <p>0815-0830 Initial experience with endovenous cyanoacrylate adhesive to treat saphenous incompetence Presenter: F. Elias</p> <p>0830-0845 Temporary Inferior Vena Cava Filters: Indications, retrieval rates and follow-up management at a single academic institution Presenter: M. Tao</p>

8:45am-10:00am

Paper Session V: Peripheral Arterial Disease - Arbutus Ballroom

Moderator: Dr. Shung Lee

Objectives: Upon completion of this session, the attendees will be able to:

- 1) Describe the outcomes associated with new wound treatments in the setting of peripheral arterial disease
- 2) Identify areas for quality improvement in the treatment of peripheral arterial disease.
- 3) Discuss advances in imaging for peripheral arterial disease

0845-0900 Mid-term report of randomized control trial of negative pressure wound therapy for high risk wounds in lower extremity revascularization

Presenter: K. Lee

0900-0915 Preventing surgical site infections in bypass patients in the era of hospital based quality improvement initiatives

Presenter: A. Dueck

0915-0930 Sex differences in the long-term outcomes of peripheral arterial disease

Presenter: M. Hussain

0930-0945 Magnetic Resonance Imaging characterization of peripheral arterial chronic total occlusions with microCT and histological validation

Presenter: T. Roy

0945-1000 CSVS Manpower Survey

Presenters: T. Lindsay, P. Petrsek

10:00am-10:30am

Refreshment Break & Exhibits – Harbour Room

10:30am-11:15am

Research - Arbutus Ballroom

1030-1045 Present and Perish? Translation of grants to publication

Presenter: S. Crawford

Presentation of 2015 Award Winners

Cook Research Award (presented by Dr. Graham Roche-Nagle)

Gore Research Award (presented by Dr. Graham Roche-Nagle)

John L. Provan Education Award (presented by Dr. Guiseppe Papia)

2014 Cook, Gore and Provan Awards – project updates

11:15am-11:45am

CSVs Invited Guest Lecture II - Arbutus Ballroom

Learning Open Vascular Surgery- Does Practice Make Perfect?

Peter Lawrence, MD, Chief of Vascular Surgery, UCLA

Objectives: Upon completion of this session, attendees will be able to:

- 1) Know the principles of learning psychomotor skills
- 2) Understand the impact of endovascular treatment on open surgical volume
- 3) Be familiar with research related to the impact of simulation training in learning open surgery

11:45am-12:15am

Presidential Address – “Four Seconds” Dr. Thomas Forbes

Introduction by Dr. Greg Browne

12:15pm-1:30pm

Lunch – Harbour Room

1:30pm-3:00pm

Paper Session VI – Aortic Interventions: Type B Aortic Dissection and other topics - Arbutus Ballroom

Moderator: Dr. Andrew Hill

Objectives: Upon completion of this session, the attendees will be able to:

- 1) *Understand the changing management of Type B Aortic Dissections*
- 2) *Discuss the findings of new models of aortic aneurysmal rupture*
- 3) *Discuss whether vascular outcomes are influenced by day of the week or the type of care unit*

1:30-1:45 Poor long-term outcomes for Type B Aortic Dissections raises the need for re-evaluating current management strategies: A population based analysis

Presenter: H. Khambati

1:45-2:00 Predicting the natural history of acute uncomplicated type B dissections by volumetric analysis of the initial index computed tomography (CT) scan

Presenter: J. Panneton

2:00-2:15 Intermediate care unit admission after elective open aneurysm repair

Presenter: D. Dion

2:15-2:30 Low wall shear stress predominates at sites of abdominal aortic aneurysm rupture

Presenter: A. Boyd

2:30-2:45 Inflammatory responses in a BAPN/AT2 induced murine model of aortic aneurysm

Presenter: J. Byrne

2:45-3:00 Effect of day of the week on mortality and cardiovascular outcomes following elective AAA repair and lower limb revascularization: a population based study

Presenter: L. Dubois

3:00pm-3:30pm

Refreshment Break & Exhibits – Harbour Room

3:30pm-4:45pm

Paper Session VII: General Topics in Vascular Surgery - Arbutus Ballroom

Moderator: Dr. Keith Baxter

Objectives: Upon completion of this session, the attendees will be able to:

- 1) *Identify areas for quality improvement in vascular surgery*
- 2) *Identify areas for healthcare savings in vascular surgery*
- 3) *Understand manpower issues facing vascular surgery*

3:30-3:45 Unplanned early readmissions in vascular surgery

Presenter: G. Roche-Nagle

3:45-4:00 Routine Pathological examination of vascular surgery specimens is unnecessary and costly

Presenter: J. Patapas

4:00-4:15 Fluoroscopy time during EVAR: can we do better?

Presenter: J.J. Brassard

4:15-4:30 Risk-modifying medication prescription and compliance in Vascular surgery patients

Presenter: A. Kayssi

4:30-4:45 Vascular Surgery Manpower in Canada: Will I have a job?

Presenter: S. Lotfi

4:45pm

Meeting Adjournment

4:45pm-6:00pm

Exhibits Dismantling

6:00pm-9:00pm

CSVS Annual Dinner **Advance registration and dinner ticket required.*

THE UNION CLUB - 805 Gordon St, Victoria, BC

Cocktail Reception 6:30pm/Dinner 7:00pm

2015 Sigvaris President's Award and Josephus C. Luke Award announcements will be made at the dinner.

9:00pm-12:00am

Wine & Dessert Reception

Robert Bateman Centre – 470 Belleville St., Victoria, BC

Attendees will be transported from Union Club to Robert Bateman Centre by horse drawn trolleys.

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 Education 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 25-26, 2015
Victoria, BC Canada**

Friday, September 25th, 2015

PAPER SESSION I: ENDOVASCULAR AORTIC INTERVENTIONS I: INNOVATIONS

In Situ Laser Fenestration During TEVAR: Innovation in Practice

Jean M Panneton MD, S Sadie Ahanchi MD, Jason Moore MD, Division of Vascular Surgery, Eastern Virginia Medical School, Norfolk, VA

Background: Retrograde in situ laser fenestration of arch branches during emergent thoracic endovascular aortic repair (TEVAR) is an innovative method to revascularize aortic branches for a variety of acute thoracic aortic pathology.

Methods: We reviewed all consecutive patients who underwent TEVAR with left subclavian artery (LSA) or left carotid artery (LCA) revascularization by in situ laser graft fenestration from September 2009 through October 2013.

Results: Emergent TEVAR with laser fenestration was successfully performed in 35 patients for all types of thoracic aortic pathology including 7 ruptures. An average of two endografts (range, 1-4) were deployed in zones 0, 1 and 2. 34 LSA and 1 LCA were revascularized with a balloon expandable covered stent. Mean operative time was 162 minutes. Average hospital length of stay was 12 days. No major fenestration-related complications occurred. Stroke rate was 2.9% (1/35), a stroke occurred in a patient with a previous stroke presenting with hypotension from a ruptured intramural hematoma. One patient developed postoperative paraplegia from a ruptured acute type B dissection. In-hospital operative mortality rate was 5.7%. Mean imaging follow-up by computed tomography angiography (CTA) was 20 months (range 1-53 months) and demonstrated a 100% primary patency for all stented branches. Two patients had asymptomatic LSA stent stenosis. Mean clinical follow-up was 23 months (range 1-66 months). Fenestration related reintervention rate was 8.6% and all 3 were type Ic endoleaks (1 early requiring coiling and 2 late requiring restenting of the LSA). There was no instance of type III endoleak between the stented branch and the endograft. Aortic reintervention rate was 5.7% and both patients had type Ia endoleaks unrelated to the fenestration.

Conclusions: In situ retrograde laser fenestration can safely and effectively revascularize arch branches during TEVAR. Imaging surveillance by CTA has documented the durability of this innovative technique of intraoperative endograft modification.

Budget Impact of Percutaneous Endovascular Abdominal Aorta Aneurysm Repair (PEVAR) Compared to Standard Endovascular Repair in Canadian Hospitals

Graham Roche-Nagle^a, Maureen Hazel^c, Dheeraj K. Rajan^b. Division of Vascular Surgery^a, & Division of Vascular and Interventional Radiology,^b Toronto General Hospital, University of Toronto, Toronto, ON. Johnson & Johnson Medical Companies,^c Markham, ON.

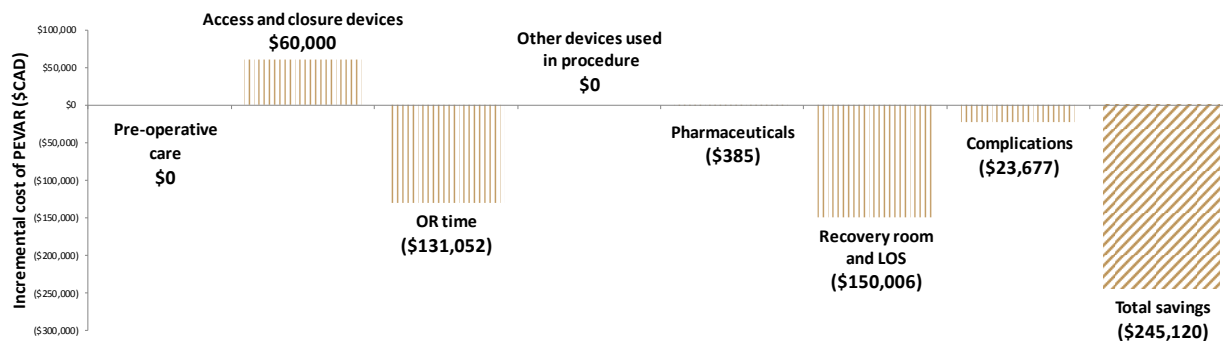
Objectives: Percutaneous endovascular abdominal aortic repair approach is a minimally invasive technique that has demonstrated clinical benefit over traditional surgical cut down associated with standard endovascular AAA repair (EVAR) yet has not realized wide-spread adoption. The objective of our study was to evaluate the budget impact to a hospital of changing the technique for AAA repair from the EVAR approach to the PEVAR approach.

Methods: We examined the budget impact of replacing the EVAR approach with the PEVAR approach in a Canadian hospital that performs 100 endovascular AAA repairs annually. The model incorporates the costs associated with surgery, length of stay and postoperative complications occurring within 30 days. The cost data used in the model was obtained from peer reviewed literature, the Ontario Case Costing Initiative and

case costing from a large Canadian hospital. Patient outcomes data were obtained from pooling published prospective studies after completing a comprehensive literature review. A multivariate sensitivity analysis was completed.

Results: The use of PEVAR in AAA repair is associated with increased access device costs when compared to the EVAR approach (\$1,000 vs \$400). However, AAA repair completed with the PEVAR approach demonstrates reduced operating time (101 vs 133 minutes), a reduction in length of stay (2.2 vs 3.5 days) and time in the recovery room (174 vs 193 minutes) and a reduction in post-operative complications (6% vs 30%) which offset the increased device costs. The model establishes that switching to the PEVAR approach in a Canadian hospital performing 100 AAA repairs annually would result in a potential cost avoidance of \$245,120 (Figure 1).

Figure 1 – Hospital budget impact of conversion from EVAR to PEVAR



Conclusions: A change in AAA repair technique from EVAR to PEVAR can be a cost-effective solution for Canadian hospitals.

Short Term Outcomes of Introducing Percutaneous Endovascular Aneurysm Repair in Comparison to Open Endovascular Aneurysm Repair at an Academic Institution

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Background: Percutaneous endovascular aneurysm repairs were introduced at the Hamilton General Hospital in April 2011.

Objective: To demonstrate the short term 30-day outcomes for elective percutaneous endovascular aneurysm repairs (PEVAR) in comparison to elective open endovascular aneurysm repairs (OEVAR) at a single institution.

Methods: A retrospective chart review on elective abdominal aneurysm repairs performed from April 2011 to December 2012 at Hamilton General Hospital was performed. Thirty day outcomes were recorded.

Results: Four out of five vascular surgeons adopted using PEVARs over the time period. 26 PEVARs and 107 OEVARs for elective abdominal aneurysm cases were performed. 2 PEVARs were converted to OEVARs. There was 1 mortality (3.8%) in the PEVAR group and 1 mortality in the OEVAR group (0.9%). Postoperative complications were slightly higher in the OEVAR group than the PEVAR group but not statistically significant with more wound infections (4.7% vs 0%), myocardial infarction (0.9% vs 0%), venous thromboembolic events (4.7% vs 0%), and respiratory events (4.7% vs 0%). Mean length of stay was similar at 1 day (range of 1-24 days in the OEVAR group; range of 1-9 days with the PEVAR group). 9% of the OEVAR group and 7.6% of the PEVAR group was readmitted in the first 30 days. In the OEVAR group 5 cases (4.7%) had to return to the OR in the first thirty days versus 1 patient (3.8%) in the PEVAR group.

Conclusion: We have demonstrated the safety and efficacy of introducing PEVARs at an academic hospital

that is comparative to OEVARs.

Direct High Resolution Angioscopic Imaging During Endovascular Surgery

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Objectives: The 2D fluoroscopy used for real time imaging during an endovascular procedure is often sub-optimal in terms of 3D structural or pathological resolution and confers a significant radiation dose to both the patient and the operator. Here we demonstrate the feasibility of using an endovascular ultraminiature, high resolution scanning fiber endoscope (SFE) to directly image and guide the placement of aortic stent graft components as an adjunct to conventional fluoroscopy.

Methods: A 3.7Fr SFE was used alongside standard endovascular components in a porcine aorta model system. By making use of pulsed balloon occlusion to provide a blood-free field of view, the SFE was used to image the intact aortic endothelium and identify branch locations, to visualize and guide the deployment of an infrarenal covered stent graft, to identify iatrogenic dissections, and to assess renal stent placement as shown in Figure 1.

Results: High resolution, video-rate imaging was shown to be possible during all of the common procedures tested here, and provided information that was complimentary to standard fluoroscopic imaging. SFE angioscopy was able to accurately guide the placement of graft components and identify subtle dissections which were not apparent on fluoroscopy.

Conclusion: Endovascular imaging with a SFE provides important information on factors which cannot be assessed fluoroscopically and represents a novel platform on which future vascular interventional techniques may be based as it allows for periprocedural inspection of the integrity of the vascular system and the deployed devices. Additionally it may be of diagnostic use for inspecting the vascular wall and in postprocedural device evaluation, while reducing the overall radiation dose to both patient and operator.

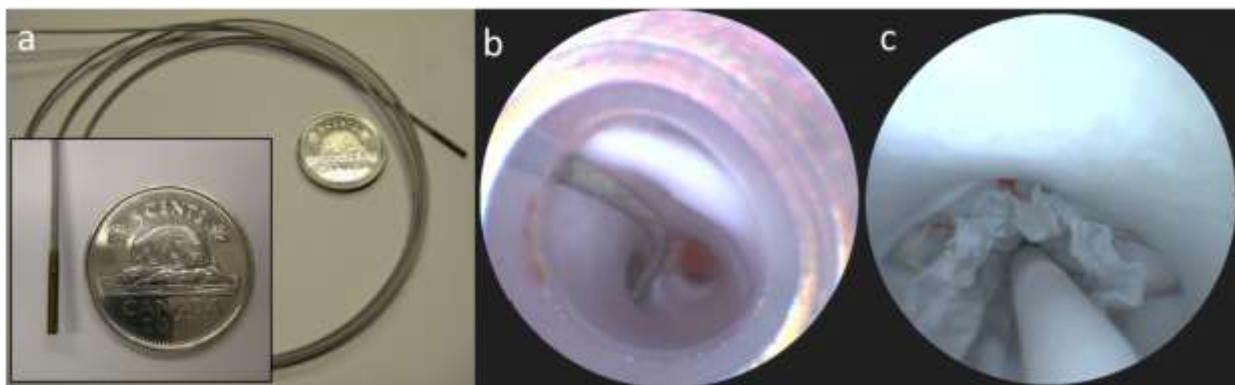


Figure 1. 3.7Fr high-resolution angioscope design (a) used in the study, along with in-vivo porcine model system images of (b) 0.014" microwire branch selection and (c) aortic covered stent graft deployment under direct visualization without the need for continuous fluoroscopy.

The In-Hospital Cost of Treating Thoracoabdominal and Juxtarenal AAAs with EVAR in a High Risk Patient Population

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Objectives: The aim of this study was to evaluate the 30 day results and in hospital costs of elective fenestrated (fEVAR) and branched (bEVAR) endovascular aneurysm repair of juxtarenal and thoracoabdominal aortic aneurysm at a single academic institution.

Methods All elective fenestrated (fEVAR) or branched (bEVAR) cases treated between July 2007 and March 2014 were included. Procedural details, 30-day outcomes and in-hospital cost (excluding professional fees) of the index procedure were analyzed. The relatively small sample size and skewness of cost data were addressed by using the non-parametric bootstrap to compare means between groups and calculate confidence intervals.

Results: There were 84 consecutive fEVAR (n=61) and bEVAR (n=23) procedures. In-hospital and 30-day mortality was 3.3% (fEVAR) and 4.3% (bEVAR). This was related to bowel ischemia in 2 patients (fEVAR) and respiratory failure in 1 (bEVAR). Mean hospital stay was 7.2±0.8 (fEVAR) and 12.6±2.2 days (bEVAR). Endografts incorporated 292 visceral vessels inferior to the proximal seal zone. The fEVAR group included 54 scallops and 155 fenestrations, while bEVAR cases had 67 branches and 16 fenestrations. Technical success was 97% and 95% respectively (151/155 and 79/83). Both fEVAR and bEVAR cohorts were further divided into two sub-groups. Sub-group “A” included patients who did not experience any intraoperative or postoperative event (fEVAR, n=29; bEVAR, n=7), while sub-group “B” included patients who did (fEVAR, n=32; bEVAR, n=16). The difference in device-related costs between the two sub-groups was not significant (fEVAR; mean difference and 95% CI, \$3,233 (-\$560 to \$7,188), p=0.09 and bEVAR; \$2,485 (-\$6,605 to \$11,592), p=0.61). However, there were significant differences in hospital length of stay (fEVAR; mean difference and 95% CI, 6.2 (3.9 to 8.8), p<0.0001, bEVAR; 9.5 (5.1 to 17.0), p=0.0024) and non-device-related costs (fEVAR; mean difference and 95% CI, \$14,459 (\$9,131 to \$23,238), p<0.0001, bEVAR; \$16,327 (\$5,815 to \$27,947), p=0.0024) Table 1. In uncomplicated fEVAR and bEVAR, hospital length of stay and non-device-related costs were reduced by approximately 60% and 40% respectively.

Conclusions: Advanced endovascular therapy for complex aortic aneurysms is effective with respectable mortality. Intraoperative adverse events and postoperative systemic complications increase in-hospital costs and length of stay. Our clinical results compare favorably with those of open Juxtarenal and thoracoabdominal aortic aneurysm repairs.

	No *Intraoperative or **Postoperative Events	Intraoperative or Postoperative Events	Mean Difference (95% CI)	p-value
Fenestrated EVAR				
Total Visit Cost[§]	46,893	64,585	17,692 (10,517 to 27,244)	<0.0001
Total Device-related Cost[§]	29,357	32,590	3,233 (-560 to 7,188)	0.0992
Non Device-Related Cost[§]	17,536	31,995	14,459 (9,131 to 23,238)	<0.0001

Hospital Length of Stay (days)	3.9	10.2	6.2 (3.9 to 8.8)	<0.0001
Branched EVAR				
Total Visit Cost [§]	77,242	96,054	18,813 (3,969 to 34,278)	0.0158
Total Device-related Cost[§]	48,280	50,765	2,485 (-6,605 to 11,592)	0.6100
Non Device-Related Cost[§]	28,962	45,290	16,327 (5,815 to 27,947)	0.0024
Hospital Length of Stay (days)	6.0	15.5	9.5 (5.1 to 17.0)	0.0024

Table 1. Selected cost details#

*Examples of intraoperative events; iliac and visceral vessel cannulation failure/rupture/dissection, including minor dissection treated intraoperatively with a simple technique. **Examples of postoperative events; myocardial infarction, stroke, paraplegia, and renal dialysis; delirium, implantation fever, urinary tract infection and urine retention. # Data represented as mean. 95% confidence interval (CI) in parentheses.

Development and Implementation of EVAR Follow Up Guidelines: A Quality Improvement Project through the IDEAS Ontario Program

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Objective: Life-long imaging follow-up is essential to the safe and appropriate management of patients who undergo EVAR. Adherence to surveillance guidelines is known to be poor, and EVAR does not protect against death with future aneurysm rupture. Our objective was to improve post-EVAR follow up imaging to > 90%.

Methods: We examined compliance to EVAR follow-up in a cohort of patients with grafts implanted between August 2010 and December 2012. Using quality improvement tools learned through the IDEAS Ontario (Improving and Driving Excellence Across Sectors) advanced curriculum, we developed a process map to identify barriers and areas of potential improvement. We implemented a number of initiatives to address what we had identified and used a PDSA (Plan-Do-Study-Act) cycle to evaluate the impact of our initiatives.

Results: Following audit of EVARS (N = 176) performed, we identified that 39% of our patients had inadequate follow up. We identified a number of factors for improvement, including consensus of follow up protocol among the surgeons, tracking system for the patients, and improving patient education. We achieved consensus with the surgeons, variable buy-in (0-98%) of the tracking system, and found that 50% of our patients did not know they required long-term follow up. Human factor analysis figured prominently in the barriers to achieving unified success. We were able to achieve 100% imaging follow up during the course of the program.

Conclusion: We performed a systematic analysis of widely documented problem and developed change ideas that we implemented within our division. By the end of the course, we had achieved our goal. Quality improvement is an ongoing cycle requiring constant re-engagement and buy-in, and is becoming the standard of care and will significantly impact future program funding.

Friday, September 25th, 2015

PAPER SESSION II: STROKE AND EXTRACRANIAL CEREBROVASCULAR DISEASE

Public Health Initiatives and Stroke Awareness

Maged Metias¹, Naomi Eisenberg¹, Michael D Clemente², Elizabeth M Wooster³, Andrew D Dueck¹, Douglas L Wooster¹, Graham Roche-Nagle¹; ¹Division of Vascular Surgery, Department of Surgery, University of Toronto, ²University of Waterloo, ³OISE/University of Toronto

Objectives: Our group demonstrated poor stroke literacy 5 years ago*. We wanted to re-assess baseline knowledge of stroke risks factors, signs or symptoms, anatomical location and behaviors to determine the impact of public awareness campaigns.

Methods: Four hundred patients and accompanying family members and friends were recruited from the cardiology and vascular clinics. Patients were considered as stroke literate if they (1) identified at least three stroke risk factors; (2) listed three stroke symptoms; and (3) recognized the brain as the organ in which stroke occurs.

Results: Our sample was comprised of 58.1% patients, 34.6% accompanying family and 4.8% friends of the patient. The average age was 57 years old with a male-to-female ratio of 50:50. The population demographics were similar to our previous study of 198* participants. A higher proportion of respondents were able to identify at least three risk factors of stroke compared with our original study (55.8% vs 30.8%). The most common *risk factor* for stroke identified in both studies was smoking (45.5% vs. 58.1%*) followed by hypertension (45.2% vs. 34.3%*). A total of 55.9% of respondents was able to correctly identify at least three *signs or symptoms* of stroke compared with 43.9% in our original study. Trouble speaking or understanding speech were the most commonly reported symptoms in both studies (62.7% vs. 66.7%*). Mirroring our prior study, recent respondents identified their main source of stroke information as television (67.1% vs. 64.1%*) followed by their doctor (39.3% vs. 36.4%*). When asked about the first response to an individual experiencing a stroke, 90.0% of respondents identified that they would call emergency rescue services or ambulance.

Conclusions: Health literacy is fundamental to patient engagement. Our recent study demonstrates a slight improvement despite the large investment in public awareness campaigns. Development and evaluation of effective interventions should be a priority.

Plaque Echodensity and Textural Features are Associated with Carotid Plaque Instability

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Objective: To assess whether carotid plaque morphological features – echodensity (brightness) and texture (heterogeneity) - obtained from digital image analysis of ultrasound images predicts histological plaque instability.

Methods: Patients scheduled to undergo carotid endarterectomy (CEA) were recruited and underwent carotid ultrasound. Digital image analysis was performed to extract 50 echodensity and textural features from ultrasound images using a commercially available Plaque Texture Analysis software (LifeQMedical Ltd). Carotid plaque surgical specimens were obtained and underwent histological analysis. Principal component analysis (PCA) was performed to reduce the 50 imaging variables to simplify statistical analyses. Logistic regression models were used to determine if PCA variables and individual imaging variables predicted histological features of plaque instability.

Results: We performed PCA on image analysis data from 160 patients, which reduced 50 imaging variables

to 5 PCA variables. We found that PCA1 and PCA2 significantly predicted overall plaque instability on histology (both $P=0.02$), while PCA3 trended towards significance ($P=0.07$). This suggests that combinations of the 50 imaging variables can predict plaque instability. We then sought to determine which specific types of individual imaging variables predict plaque instability. We found that features of plaque echolucency (darker plaques) and homogeneity were associated with a more unstable plaque phenotype on histology (increased overall instability, American Heart Association plaque classification, lipid core size, plaque inflammation, and decreased fibrous tissue). These results were independent of age, sex, and stenosis, and remained significant after adjustment.

Conclusion: Our findings suggest that digital image analysis of carotid plaques can predict histological plaque instability as assessed by multiple histological features. Importantly, unstable plaques on histology appear more echolucent and homogenous on ultrasound. These results are independent of stenosis suggesting that image analysis may have a role in refining selection of patients who undergo CEA.

Implementation and Adherence to Stroke Guidelines for Treatment of Extracranial Carotid Occlusive Disease Through a Multidisciplinary Team: Review of 1895 Carotid Endarterectomies in a Single Health Authority from 2006-2014

^{1,2,3}James Dooner, ^{1,2,3}Peter M. Kuechler, ^{1,2,3}Shung Lee, ^{1,2,3}Matthew Robinson, ^{2,4}Andrew Penn, ¹Royal Jubilee Hospital, ²Vancouver Island Health Authority, ³University of British Columbia, ⁴Victoria General Hospital.

Objective: To review the outcomes and impact of implementation and adherence to stroke guidelines in the management of symptomatic and asymptomatic carotid stenosis in a single health authority.

Methods: Retrospective review of 1895 successive carotid endarterectomies performed in a single health authority from 2006 to 2014. Rates of Stroke, Death, Coronary Intervention and Dysrhythmia, and Return to OR examined. In addition, the effects of implementing emergent carotid endarterectomy on patient length of stay and bed utilization examined.

Results: 1895 carotid endarterectomies were performed during the review period. In total, 19 strokes occurred (1.0%), with 12 deaths (0.6%) for a combined death/stroke rate of 1.6%. Coronary interventions were performed in 97 patients (5.1%), with dysrhythmias found in 1.1% of patients ($n=21$). Pre-operative length of stay decreased over the study period, and remains less than four days for emergent cases. Two acute stroke beds have been successfully closed during the study period.

Conclusions: A multidisciplinary approach to the management of symptomatic and asymptomatic carotid stenosis, incorporating emergent carotid endarterectomy, is associated with a low stroke and death rate in a high volume centre, and has allowed for improvements in patient flow and bed utilization.

Hospital Process Redesign Leading to Wait-Time Improvements in Delivery of Stroke-Prevention Surgery to Patients with Symptomatic Carotid Artery Stenosis

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Objective: To assess whether carotid endarterectomy (CEA) wait times have improved following a collaborative hospital process redesign at The Ottawa Hospital (TOH) aimed at expediting referral, evaluation, and treatment of patients with symptomatic internal carotid artery stenosis.

Methods: All patients who underwent CEA for symptomatic carotid stenosis at TOH from two separate time periods (Jan 2008 to Jan 2010; Jan 2014 to Jan 2015) were identified. Demographic data, clinical variables, and wait time intervals relating to dates of symptom-onset, referral to Vascular Surgery, and completion of CEA were documented and compared between periods. From 2011-2013, a hospital process redesign was initiated by the divisions of Vascular Surgery and Neurology, which emphasized prompt direct verbal communication between referring parties, collaborative patient evaluation, and a single-queue approach to both consultation and urgent on-call intervention by Vascular Surgery.

Results: A total of 185 patients were included in this study (92 from the previous 2008-2010 evaluation; 93

from 2014-2015). All patients presented with either TIAs or strokes. Referrals to Vascular Surgery were received from Neurologists (51%), General Practitioners (35%), and Emergency Physicians (14%), with a similar referral source distribution between the two periods. The median time from symptom-onset to CEA was reduced from 79 (IQR 34-161) to 18 (IQR 10-48) days. Time to Vascular Surgery referral decreased from 35 (IQR 7-68) to 8 (IQR 3-29) days from symptom-onset. Surgical wait times were halved to 7 (IQR 2-9) days, with nearly a third of patients undergoing CEA by a surgeon who differed from their initial consulting surgeon. A greater proportion of patients were assessed for surgery as outpatients in 2014-2015 vs. 2008-2010 (60% vs. 45%, $p=0.03$), with comparable total pre-operative days spent in hospital ($p=0.52$).

Conclusion: As a result of our previous audit and subsequent multidisciplinary hospital process redesign, patients with symptomatic carotid stenosis are being evaluated and referred for CEA in a more expedited fashion with comparable hospital resource utilization. Surgical wait times have been reduced through a single-queue approach to consultation and surgical booking that prioritizes timely patient care.

Friday, September 25th, 2015

PAPER SESSION III: ENDOVASCULAR AORTIC INTERVENTIONS II: PREDICTING AND PREVENTING COMPLICATIONS

A Novel In-Vitro Model Predicts Aortic Stent-Graft Hemodynamic Alterations After Endovascular Repair

Robert D. Shepherd,¹ Elena S. Di Martino,¹ Steven K. Boyd,¹ Randy D. Moore,² Kristina D. Rinker,^{1, 1} Schulich School of Engineering, University of Calgary, Calgary, Canada; ² Division of Vascular Surgery, Department of Surgery, University of Calgary, Calgary, Canada.

Objective: Secondary interventions after aortic endograft device failure represent the primary source of delayed morbidity and mortality after aortic endovascular repair. This study was undertaken to develop precise in-vitro models for aortic stent-graft implantation that detail flow characteristics that may predict device failure.

Methods: Stent-grafts were deployed in HeartPrint[®] tissue phantoms obtained from Materialise, and exposed to anti-coagulated circulating pig blood at 37C for 24 hours to seal the fabric. Phantom necks and limbs were closed with rubber stoppers and silicone sealant, and charged with phosphate buffered saline (PBS) containing 15% Optiray 320. Grafts were pumped to a pressure of 80-100 mm Hg using a syringe driven liquid column of PBS/contrast, clamped, and scanned in a Scanco XtremeCT at 91 μ m nominal isotropic resolution. Scan slices were reconstructed using Simpleware to yield solid models, which were meshed and utilized for Computational Fluid Dynamics (CFD) modeling.

Results: Time averaged wall shear stress revealed low shear stress areas corresponding to stent rings (Fig. 1); the oscillatory shear index varied throughout the stent, with values compatible with disturbed flow at the body/limb overlap zone and along the rings. Simulations of injected particles also showed increased distal platelet activation stress and non-uniform distribution of fluid streamlines in similar locations (Fig. 2), with a distinct difference between graft limbs.

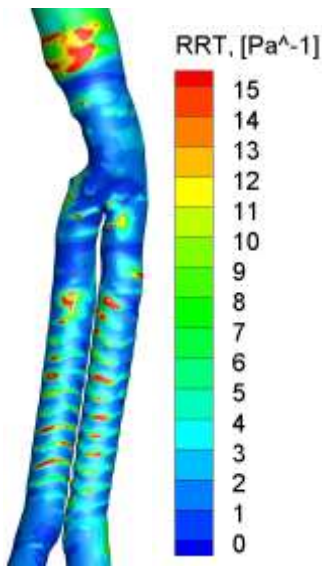


Figure 1: Prolonged Transit (low shear stress) in region of distal limb stents.

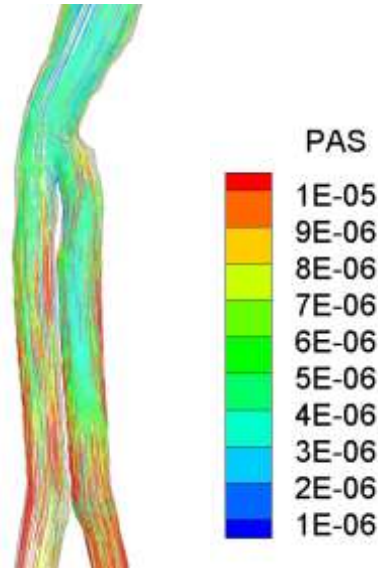


Figure 2: Increased platelet activation state in distal limbs during systole. Note limb-limb variability

Conclusions: Variations in flow characteristics likely impact the performance of aortic stent-grafts, and directly affect the potential for platelet aggregation. Observed limb-to-limb differences suggest that future devices may benefit from studies incorporating fluid modeling under physiologically relevant conditions to harmonize fluid paths and reduce flow recirculation.

Morphologic Suitability for Endovascular Treatment in Ruptured Abdominal Aortic Aneurysm in a Single Academic Center

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Purpose: To evaluate the morphologic suitability (MS) of patients with ruptured abdominal aortic aneurysm (rAAA) for endovascular repair (rEVAR).

Method: Retrospective review of computed tomography angiography (CTA) using a 3D workstation in patients operated for rAAA operated in the past 11 years in a single academic center. Assessment for rEVAR MS was done following “indications for use” (IFU) of a commercially available stent-graft (proximal neck ≥ 15 mm, neck angulation $< 60^\circ$ relative to the long axis of the aneurysm and $< 45^\circ$ relative to the axis of the suprarenal aorta, iliac artery distal fixation site > 10 mm in length). Further evaluation of MS was done with more permissive proximal aortic neck length criteria and including internal iliac embolization. 95% confidence intervals (CI) were calculated on MS proportion.

Results: 214 patients were operated for rAAA in our center from 2003 to 2014. 101 patients had computed tomography imaging prior to intervention, 64 of which had contrast enhanced CTA. 88% of patients were males, mean age was 68 (47- 90), with a mean AAA diameter of 75 mm (50-126 mm). MS for rEVAR following strict IFU was 31% (20/64, 95% CI 20% to 42%). Allowing more permissive treatment based only on aortic neck lengths of more than 14mm, 10-14mm, 5-9mm and less than 5mm with renal chimney increased the MS to 42%, 53%, 58% and 63% (40/64, 95% CI 51% to 75%), respectively. However, 9% (6/64) would have required unilateral (4) or bilateral (2) embolization of the internal iliac artery for an adequate distal seal zone.

Conclusion: Only a third of patients with rAAA on CTA who were operated in our center had morphologic suitability for rEVAR when following strict IFU of a commercially available stent graft. Shorter necks length, outside of IFU, and using iliac adjunctive techniques would have increased the MS to a maximum of 63%.

The Heterogeneous Clinical Course of Type 2 Endoleaks: A Single Institution Experience

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Objective: A common natural history for all type II endoleaks remains difficult to define based on existing often contradictory reports. We examined the clinical course of endoleaks managed at a single institution.

Methods: This is a retrospective cohort study using the Endovascular Aneurysm Repair (EVAR) database of Sunnybrook Health Science Centre, years 2004-2013. The cohort included patients with an infrarenal abdominal aortic aneurysm managed by EVAR and who had a type II endoleak. Patients with less than 1 year of radiologic follow-up post-EVAR were excluded. Outcomes of interest were presence of a type II endoleak on follow-up imaging, trends in aneurysm sac size and need for further intervention.

Results: A total of 61 patients were diagnosed with a type II endoleak over the study period. Follow-up ranged from 1 to 6.5 years. Four alternate clinical courses were appreciated, with defining characteristics presented below (table 1). Only 1 patient required intervention for a sac increase of 11mm in the first year post-EVAR and was managed with IMA embolization followed later by graft explantation and open repair.

Table 1: Summary of patients' clinical course

Type	Initial Type II endoleak *	Clinical course	N (%)	Resolution or detection of endoleak	Trend in aneurysm sac size	Intervention
A	Yes	Resolved	20 (33%)	18 of 20 patients (90%) showed permanent resolution by 1 st follow-up ultrasound at 1 month. Remaining 2 showed spontaneous resolution by 1.2 and 4.7 years respectively.	Decreased	0
B	Yes	Did not resolve	3 (5%)	Not applicable	Stable/Increased	1
C	Yes	Intermittently detected on follow-up imaging	9 (15%)	All resolved by 1 st follow-up ultrasound. Later detected again on an average of 65% of follow-up imaging visits	Stable	0
D	No	Detected on follow-up imaging	29 (48%)	Type II endoleak later detected within a median of 9 months (interquartile range 1-14 months)	Stable prior to detection	0

* Present on completion angiogram at time of EVAR

Conclusions: Patients with a type II endoleak follow a heterogenous clinical course. First detection and spontaneous resolution can occur beyond 1 year following EVAR.

Comparison of Quantitative Analysis and Qualitative Assessment of Iliac Artery Tortuosity

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Objectives: The objectives of this study were to quantitatively analyze and qualitatively assess iliac artery tortuosity and to compare the results using these two approaches.

Methods: Left and right iliac artery geometries, from the aortic bifurcation to the femoral artery, were separately segmented from preoperative CT scans of 50 fenestrated stent graft patients; vessel centrelines were obtained following segmentation. Tortuosity τ was calculated for each artery as the ratio of the centreline length to the distance between the endpoints. Following SVS guidelines, the calculated values were divided into four categories: absent (0, $\tau < 1.25$), mild (1, $1.25 \leq \tau < 1.5$), moderate (2, $1.5 \leq \tau < 1.6$), and severe (3, $\tau \geq 1.6$). Three vascular surgeons qualitatively assessed iliac artery tortuosity from the original unsegmented CT scans using the same four categories in accordance with typical clinical practice. Results from the three vascular surgeons were averaged to the nearest integer to determine the category for each iliac artery.

Results: Average left and right iliac artery tortuosities were calculated to be 1.27 ± 0.14 and 1.29 ± 0.13 , respectively. The majority of these cases were classified in categories 0 or 1, as shown in the plot in Fig. 1. For the average qualitative cases, the majority were in categories 1 or 2. Direct comparisons between methods found agreement in 12 of 100 cases. One reason for this discrepancy is that none of the qualitative cases were in category 0, as iliac arteries are rarely straight and it is difficult to qualitatively discern between categories 0 and 1.

Conclusions: Comparisons between calculated and qualitatively assessed iliac artery tortuosities highlighted a discrepancy between SVS guidelines and clinical practice, which should be taken into account during clinical discussions on endovascular access or calculations of iliac artery geometric properties.

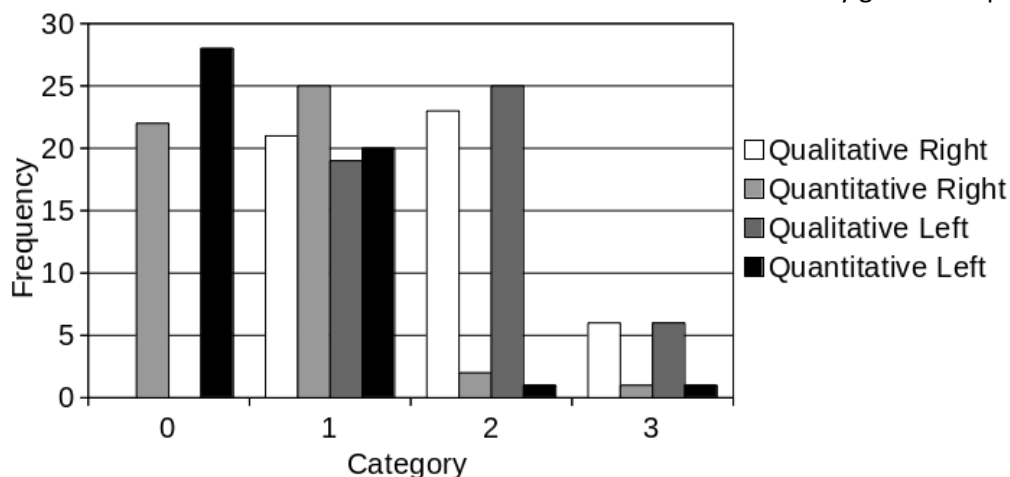


Figure 1. Plot of iliac artery tortuosity categories

Endograft Shortening during Endovascular Repair of Abdominal Aortic Aneurysms in Severe Aortoiliac Tortuosity

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Objective: Severely tortuous aortoiliac anatomy can influence the deployment of the endograft during endovascular repair of abdominal aortic aneurysms (EVAR) and have a negative impact on distal fixation. The purpose of this study is to determine how severe aortoiliac tortuosity can change an aortic endograft's length and how it affects distal fixation.

Methods: A retrospective review of a prospectively collected vascular surgery database at a university affiliated medical center was used to identify the study patients. The goal was to identify patients who underwent EVAR with the main body device deployed to a severely tortuous iliac artery. Severe aortoiliac tortuosity was defined as aortoiliac or iliac angulation less than 90 degrees. Patients were excluded if more than one device was deployed distal to the main body device, which made accurate lengths measurements difficult.

Results: 469 patients underwent EVAR between 2008 and 2014. Of the 171 patients with severe aortoiliac tortuosity, only 18 patients were found to have the main body placed on the side of severe tortuosity

without an extension limb. Mean lengths of the main body for EVAR was 169mm and this length significantly shortened to 147mm once placed in the severely tortuous AAA ($p < 0.001$). Treatment length of the main body side measured from lowest renal artery to iliac bifurcation also significantly shortened from 179mm to 170mm ($p = 0.001$). The most angulated portion of the artery on the main body side became significantly less post EVAR, changing from 86 degrees to 114 degrees ($p < 0.001$). Analysis of the non-tortuous side showed a non-significant change in treatment length ($p = 0.859$) and angulation ($p = 0.195$).

Conclusion: Severe aortoiliac tortuosity can cause significant shortening of endografts which can negatively impact distal fixation during EVAR. Consideration for a longer main body or an extension limb should be given in tortuous aneurysms.

Friday, September 25th, 2015

POSTER PRESENTATIONS

Isolation and Molecular Characterization of Proliferating Plaque Macrophages

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Proliferation of macrophages within atherosclerotic plaques is the dominant force behind lesional cell accumulation, yet little is known about the factors that drive this.

Objective: We aimed to develop and validate a process for isolating single, viable proliferating macrophages from atherosclerotic lesions, and perform a molecular characterization of these cells.

Methods: Atherosclerotic aortas were collected from ApoE^{-/-} mice fed a diet high in fat and cholesterol. Single cell suspensions were isolated by mechanical and enzymatic disruption, and cells were stained with fluorochrome-conjugated antibodies and DNA binding dyes. Cells were sorted by FACS, and proliferating and non-proliferating macrophages were isolated. RNA was collected from both fractions, and the expression of 62,976 total RNA transcripts was interrogated by competitive microarray.

Results: We identified an optimized strategy for isolation, identification, and sorting of live, proliferating macrophages from atherosclerotic plaques, suitable for gene expression analysis. Of the 62,976 genes we investigated, 858 were significantly different in expression between the proliferating and non-proliferating macrophages. Genes with the greatest fold change in expression included Ldlrad3, Gm626, Btn1a1, EphA5, and Fam54a, all of which were at least 7.5-fold different in expression between proliferating and non-proliferating macrophages. Principal component analysis was performed, and identified unique gene signatures which can discriminate proliferating from non-proliferating cells.

Conclusions: The process described here allows the first-ever viable isolation of proliferating macrophages from atherosclerotic plaques. We identified unique gene signatures of proliferating and nonproliferating macrophages. Further analyses will now be completed, and candidate genes will be examined as potential therapeutic targets. To interfere with atherosclerosis.

Treatment of Complex Aortic Pathologies in the Endovascular Era: The Ottawa Experience.

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Objective: To describe and communicate our experience with a series of complex aortic pathology treated with an unconventional method of combined, so called hybrid, open/endovascular means.

Method: In this series we present 8 patients with complex and unusual aortic pathologies, that underwent treatment by means of combined endovascular, and open surgical techniques

One patient had a delayed **type I endoleak** post REVAR treated with an open repair and proximal fixation of the endograft. Three patients had a **mycotic aneurysms** involving the visceral segment of the abdominal aorta, treated with a hybrid open/endo procedure consisting of: various visceral debranching, followed by an endograft of the mycotic segment. Four patients had a **complicated type B dissections** not amenable to endo branch grafting alone. They were treated with a combined endo/open approach, consisting of TEVAR plus type IV open repair of the abdominal aortic segment, through a retroperitoneal approach.

Results: One intraoperative death secondary to coagulopathy in a patient with a complicated type B dissection. All other patients recovered well and discharged from hospital. Two patients to rehab and the other six discharged home. Length of stay varied from 1 week to 3 months. Complications : included massive transfusions and intraop arrhythmias(1 pt type b dissect) pulmonary edema. (1pt with mycotic aneurysm). Failure to thrive and Cdiff (1pt mycotic aneurysm). Delayed type III endoleak in a patient treated for dissection. 1 pt with mycotic aneurysm had transient renal failure requiring short term dialysis. There were no septic graft complications in patient treated endovascularly for mycotic aneurysms.

Conclusion: Endovascular graft fabric is amenable to open suturing. There was no septic graft complications even when used in a setting of aortic infections, provided prolonged use of antibiotics coverage. In this era of endovascular interventions, new options continue to emerge as adjunct treatments, that can be added to open surgical repair. This might lessen the morbidity and provide viable options for treatment, of complex aortic pathologies, that would otherwise prove to be prohibitively too risky to undertake with conventional open surgical approach, in cases not entirely amenable to endovascular grafting. It is crucial to communicate new findings and experiences in order to expand our treatment options.

IMPACT OF FLOOR-TO-DOOR TIME ON MORTALITY AFTER BLUNT TRAUMATIC THORACIC AORTIC INJURY

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Objective: Blunt traumatic thoracic aortic injury (BTAI) can be a lethal injury with an estimated 70-85% mortality prior to hospital arrival. This study's objective is to investigate whether a relationship exists between time from injury to presentation (floor-to-door time) & mortality.

Methods: Using the Ontario Trauma Registry, we identified patients hospitalized with BTAI between 1999 & 2009. Variables including age, sex, Injury Severity Score (ISS), Charlson comorbidity index, systolic blood pressure (SBP) on admission, use of operative intervention (open/endovascular) & time from injury to presentation were analysed using multivariate logistic regression to determine independent predictors of mortality.

Results: We identified 264 cases of BTAI that survived until hospital admission. Of these, 220 patients had documentation of the time from injury to hospital presentation. Approximately 68.2% (n=150) presented within 60 minutes of injury. On adjusted multivariate analysis, the following were independent predictors of lower mortality: younger age (OR=1.02, 95% CI: 1.00-1.04, P=0.03), lower ISS (OR=1.04, 95% CI: 1.01-1.07, P=0.01), higher admission SBP (OR= 0.98, 95% CI: 0.97-0.99, P<0.001) & use of operative intervention (OR= 0.34, 95% CI: 0.13-0.92, P=0.03). A pre-hospital time or floor-to-door time of ≤60 minutes independently predicted lower mortality (OR=0.41, 95% CI: 0.18-0.96, P=0.04).

Conclusions: In BTAI patients who survive long enough to reach hospital, our findings suggest that arriving within 60 minutes of injury independently predicts reduced mortality, supporting the concept of the golden hour in trauma. This effect persists after controlling for important confounders like ISS & presenting vital signs. To our knowledge, the protective effect of reduced floor-to-door time has not previously been reported.

Toronto Experience with the Hemodialysis Reliable Outflow (HeRO) Grafts; A single centre experience

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Ontario and the University of Toronto

Objective: A review of St. Michael's Hospital's experience with the HeRO graft in patients requiring hemodialysis.

Methods: A retrospective review of HeRO grafts at St. Michael's Hospital was performed. Patient demographics, inclusion criteria, pre-operative comorbidity status, procedural success, patency, re-intervention rates, complications, and mortality were analyzed.

Results: Fourteen HeRO grafts have been inserted since February 2011 with strict adherence to the manufacturer's indications for use (IFU). Mean age was 54 years old. Patients had exhausted upper extremity AV fistula and graft options. Seven patients had bilateral central venous stenosis or occlusion. One patient had superior vena cava stenosis without clinical obstruction. No patient had clinical or radiological superior vena cava (SVC) obstruction. All 14 HeRO grafts were successfully implanted at the index operation. Six patients required further intervention; four grafts required thrombolysis, one had external compression causing stenosis, and one graft had to be explanted post-operative day 1 for steal syndrome. In the patients requiring thrombolysis, 2 were critically ill when the graft thrombosed, 1 was due to hypotension, and 1 was due to sub-therapeutic anti-coagulation. However, in each instance the thrombolysis procedure was relatively straightforward. To date, 6 patients continue to dialyse via their HeRO grafts, 6 patients are deceased and one patient had a renal transplant.

Conclusions: Patient selection is imperative for successful HeRO graft insertion and use; specifically, patients without SVC obstruction, without congestive heart failure, with adequate sized brachial artery (>4mm), and without significant distal arterial disease in the arm. In addition, we modified the HeRO arterial limb by replacing the standard ePTFE with an early puncture graft. Anti-platelet therapy and avoidance of hypotension are important factors preventing thrombosis in HeRO grafts in our population. Overall, we have found the HeRO graft to be a useful adjunct in patients with challenging vascular access. Patient selection and adequate aftercare are paramount.

Fenestration of aortic stent-grafts: laser puncture followed by balloon angioplasty (non-compliant balloon vs cutting balloon)

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The realization of an in-situ fenestration in stent-grafts allows patients with most life threatening pathologies to be amenable to percutaneous treatments. The long-term durability raises questions much based upon the extent of damages caused by the procedure. Four types of aortic stent-grafts, i.e. Cook Zenith TX2 (stainless steel stents and multifilament woven fabrics), Medtronic Talent (Nitinol stents and monofilament woven fabrics), Medtronic Endurant (Nitinol stents and multifilament woven fabrics) and Vascutek Anaconda (Nitinol stents and multifilament woven fabrics) were subjected to Excimer laser fenestrations with a 2.3 mm diameter probe at low and high energy in vitro in a physiological saline solution followed by balloon angioplasty. In a first series of tests 6 mm diameter non-compliant balloons were used and they were replaced by 6 mm diameter cutting balloons in a second series of tests. The fenestrations were observed non-destructively (gross observations and light microscopy) and destructively (SEM). The creation of the fenestrations was shown to be feasible in each of the four devices. Each device demonstrated varying degrees of fraying and/or tearing. The monofilament twill weave (Medtronic Talent) tore in two directions (warp and weft) while the multifilament weave fenestrations showed more fraying. The cutting balloons aggravated the tearing of fabrics. The fenestrations were free of melting of the yarns and blackening of the filaments. However, the observed structural damages to the fabrics must be carefully considered. The in situ fenestration must imperatively be restricted to urgent and emergent cases with dilatation balloons.

Anatomic factors are more predictive than anticoagulants for type II endoleaks following EVAR

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Objective: Although some anatomic factors and use of anticoagulants have been linked to type II endoleaks following EVAR, few studies have examined both in detail as predictors of postoperative type II endoleaks. We used a detailed anatomic protocol to assess whether anatomic or anticoagulants were more predictive of ongoing type II endoleaks following EVAR.

Methods: A retrospective review of a prospectively collected vascular surgery database at a university affiliated medical center was used to identify the study patients. We examined multiple anatomic factors and use of anticoagulants as predictors of postoperative type II endoleaks.

Results: Between May 2009 and December 2012, 181 patients were identified that had complete follow-up imaging for at least two years. Of these, 31 patients had postoperative type II endoleaks (17%). Mean number of patent aortic sac branches (5.1 vs 4.4, $p = 0.03$) were higher in patients with type II endoleaks, while average aortic sac thrombus thickness (13.6 vs 18.4 mm, $p = 0.016$), average % of sac circumference covered with thrombus (58.7 vs 79.1%, $p = 0.011$), and % of aortic sac area composed of thrombus (33.9 vs 47.4%, $p = 0.003$) were all lower in patients with endoleaks. Use of Plavix, or anticoagulants was not associated with presence of endoleaks.

Conclusion: Anatomic factors related to thrombus load in the aortic sac and number of patent aortic sac branches are predictive of type II endoleaks following EVAR. Patients with minimal aortic thrombus and 5 or more patent aortic sac branches are at highest risk of post-operative type II endoleaks and may benefit from embolization at the time of EVAR.

Predictors of Hospital Readmissions after Lower-Extremity Amputations in Canada.

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Objective: To describe the factors associated with early (≤ 30 days) and late (30-365 days) hospital readmissions after lower-extremity amputations in Canada.

Methods: A retrospective cohort study was carried out of all Canadian adults who underwent elective lower-extremity amputations in the years 2006-2008 for non-traumatic indications. Patients were identified from the Canadian Institute for Health Information's Discharge Abstract Database that includes all hospital admissions across Canada, with the exception of the Province of Quebec.

Results: During the study period, 3823 patients underwent lower limb amputations (major amputations=95%) and 2116 were readmitted at least once (55.4%). Of those, 1112 readmissions (29.1%) were early, within 30 days (mean= 5.0 ± 8.3 days post-discharge) and 1004 (26.3%) were late, between 30 and 365 days (mean= 151.4 ± 95.9 days post-discharge). Stump complications accounted for 8.5% and 6.5% of early and late readmissions, respectively. Stump revision surgery was performed in 301 readmitted patients (7.9%). Predictors of early readmission included amputation by a vascular surgeon (odds ratio (OR) 1.6, 95% confidence ratio (CI), 1.3-1.9), female gender (OR 1.2, CI 1.1-1.5), and a short (<7 day) admission (OR 1.7, CI 1.4-2.1). Predictors of late readmission included a longer (≥ 7 days) admission (OR 1.5, CI 1.2-1.8), discharge to a long-term care facility (OR 3.3, CI 2.7-3.9), and home discharge with community supports (OR 2.3, CI 1.8-2.9).

Conclusion: Half of patients undergoing lower-extremity amputations are readmitted to hospital within one year. Markers of patient dependence (long hospitalization, discharge to long term care facility) predict late readmission. Lengthening the perioperative hospitalization period may decrease the chances of early readmission in this vulnerable patient population.

Anti-platelet Therapy Prescription Patterns after Lower Limb Angioplasty in Canada – Results from a National Survey

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Objectives: To assess the current views and practices of Canadian endovascular specialists with regards to dual anti-platelet therapy after lower-limb angioplasty.

Methods: A national online survey of Canadian Vascular Surgeons (VSs) and Interventional Radiologists (IRs) was administered to characterise the type and duration of anti-platelet therapy prescribed post-lower-limb angioplasty.

Results: Thirty-nine VSs and 31 IRs completed the survey (overall response rate: 21%). Respondents came from every region in Canada and practiced in an academic (59%), community (25%), or a mixed academic-community setting (16%). The average number of years in practice was greater for VSs than IRs (15.5 vs. 10.4 years, $p=0.016$). Most respondents (69% VSs and 90% IRs) performed lower-limb angioplasties (Annual median: 38 superficial femoral/popliteal artery and 20 infra-popliteal artery angioplasties). All respondents prescribed anti-platelet therapy. Respondents either prescribed aspirin (ASA) alone (19%), clopidogrel alone (26%), or both ASA and clopidogrel (48%). Most respondents placed patients on ASA indefinitely (96% VSs, 77% IRs), and clopidogrel for 3 months (59% VSs, 52% IRs). The duration of clopidogrel therapy otherwise varied between 1-12 months. The most common patient side-effects encountered by respondents were medication intolerance (21% VSs, 10% IRs), peptic ulcers (8% VSs, 10% IRs), and GI bleeding (13% VSs, 3% IRs). Most respondents (92% VSs, 100% IRs) believed it would be ethical to study mono- versus dual anti-platelet therapy post-peripheral angioplasty in the context of a randomized-controlled trial.

Conclusions: Considerable variation exists in the approach to anti-platelet therapy after lower-limb angioplasties among Canadian endovascular specialists. Prospective studies are needed to clarify the type and duration of anti-platelet therapies that would benefit this patient population and harmonize medical therapy amongst endovascular specialists.

After-Hours Rupture Aortic Aneurysm Repair Outcomes. An Institutional Experience

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Background: Ruptured aortic aneurysms have a mortality rate as high as 90%. Treatment of ruptured thoracic (TAA) or abdominal (AAA) aortic aneurysm involves either open surgical repair or endovascular aneurysm repair (EVAR). Several studies have demonstrated a higher mortality for patients admitted to the hospital on the weekends than on the weekdays for certain acute conditions including ruptured aortic aneurysms.

Purpose: The purpose of this study is to examine our institutional outcomes for after-hours ruptured aortic aneurysm repair for both open and endovascular interventions in a high volume, technically experienced center. Furthermore, we examined the effect of distance from hospital on short-term operative mortality of ruptured aortic aneurysm repairs.

Methods: A single center, retrospective review of all aortic ruptures that underwent repair at HGH from April 2011 to March 2014. Our primary outcome was short-term mortality. This was analyzed for those presenting with ruptured TAA or AAA during either regular daytime hours (ie. Weekdays - 8am to 6pm) and after-hours (ie. Weekdays 6pm - 8am and all weekends). Additionally, distance from hospital based on postal code was analyzed as a factor for short-term mortality.

Results: There was a total of 74 patients presenting with ruptured aortic aneurysms during that period. (10 Ruptured thoracic aortic aneurysms all repaired endovascularly, 64 Ruptured abdominal aortic aneurysms, 42 repaired open and 22 repaired endovascularly). There was no statistically significant difference in short-term mortality between those patients presenting after hours and those presenting during regular daytime hours. Distance from hospital was not a statistically significant factor in short-term mortality of ruptured

aortic aneurysm repair.

Conclusion: In our small series, no statistically significant difference in short-term mortality of ruptured aortic aneurysm repair was identified based on time of presentation or distance from hospital.

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-1-4 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 explore the experiences of PGY-1-4 vascular residents currently in the 0+5 pathway, gaining insights regarding the current status of vascular surgery programs as well as inform future program design and development.

Methods: We will explore the experiences of current PGY 1-4 residents by way of interactive online focus group comprised of 3-5 residents each. Participants include all residents in Canadian vascular surgery programs. Online focus group discussions were 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: A total of 6 focus groups were completed, with a total number of 10 subjects. This involved four first year residents, one second year resident and three senior residents. Overarching 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.

Conclusion: A wealth of insights was obtained regarding resident satisfaction, program performance, and residents' overall opinions of the direct entry training option. Themes generated can serve to inform a framework for future program development, as well as optimizing methods of introducing a 0+5 program into existing traditional 5+2 academic training centers.

PREDICTORS OF FAILURE AND MORTALITY WITH ENDOVASCULAR REPAIR OF PRESUMED INFECTED SACCULAR THORACIC AORTIC ANEURYSMS

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Objectives: Saccular aneurysms of the thoracic aorta are often treated with endografts despite concerns of an infective etiology. We aim to identify predictors of morbidity, mortality and endovascular graft failure in this patient population. We also examined anatomic predictors of infection based on imaging alone.

Methods: A retrospective review of our prospectively maintained database (May 2006 to February 2015) identified seventeen patients that underwent endovascular repair for presumed infected, saccular, thoracic aortic aneurysms. Patients were classified as likely infective versus suspicious for infection based on either positive blood cultures or elevated white blood cell count at time of diagnosis.

Results: There were 9 men and 6 women with a median age of 69 years. Six patients had positive blood cultures, 2 presented with aortoenteric fistula, and 3 with aorto-pulmonary fistula. Twenty-three stent grafts were placed under fluoroscopic guidance with coverage of the subclavian artery in 3 patients. There were 4 perioperative mortalities and 2 patients required re-intervention. Median follow-up was 19 months (range 1-75 months). For those surviving the perioperative period all cause mortality was 8%, and 2 patients required re-intervention for continued dilation of the aortic aneurysm. Aneurysm diameter, neck length, or

lobularity, did not predict failure or mortality, however, patients with positive blood culture or leukocyte count greater than 15,000 were at higher risk of perioperative mortality (44% vs 0%, $p < 0.032$). Thickness of aneurysm wall, irregular contour, diameter of neck of aneurysm, or presence of peri-aortic changes did not predict outcome or infection status.

Conclusions: Treatment of saccular thoracic aneurysms with thoracic endograft can be done with reasonable results in patients without high risk features of infection. There were no anatomic predictors of failure, mortality, or infective status but patients with positive blood cultures or leukocyte count above 15,000 are at higher risk of perioperative mortality. Clinical parameters are more predictive of outcome than anatomic ones.

Rehabilitation Outcomes after Lower-Extremity Amputations in Canada

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Objective: To describe trends in rehabilitation after lower-extremity amputations in Canada and the factors affecting rehabilitation length of stay.

Methods: A retrospective cohort analysis was carried out of Canadian adults undergoing elective lower-extremity amputations in the years 2006-2009 for non-traumatic indications and discharged to a rehabilitation facility. Patients were identified from the Canadian Institute for Health Information's Discharge Abstract Database that includes hospital admissions across Canada except Quebec.

Results: The analysis included 5342 patients who underwent lower limb amputations, 1904 of whom were transferred to a rehabilitation facility (35.6%). The most common reasons for rehabilitation were below-knee (74.2%) and above-knee (16.6%) amputations. The average duration of rehabilitation varied by whether the amputation was performed by a vascular (mean= 40.2 \pm 26.4 days), orthopedic (mean= 42.7 \pm 31.2 days), or general surgeon (mean= 39.3 \pm 25.5 days). Most patients (71.9%) were subsequently discharged home and a minority (9.4%) were readmitted to hospital. Predictors of longer rehabilitation included amputation by an orthopedic surgeon (Beta=5.0, $P < 0.01$), older age (Beta=0.2, $P < 0.01$), and a history of ischemic heart disease (Beta=3.8, $P = 0.03$) or congestive heart failure (Beta=5, $P = 0.04$). Conversely, patients who spent fewer than 7 days in hospital were significantly more likely to have a shorter rehabilitation stay (Beta=-4, $P = 0.03$).

Conclusion: Rehabilitation length of stay after major lower-extremity amputation varies by the type of surgeon performing the amputation. A shorter perioperative hospitalization period predicts a shorter rehabilitation stay. Differences between provider specialties are likely due to unstudied systems issues, rather than technical considerations.

Internal iliac artery coverage during endovascular repair of abdominal aortic aneurysms is a safe option: a preliminary study

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Background: Endovascular aneurysm repair (EVAR) occasionally requires extension of the iliac graft limb into the external iliac artery (EIA) due to lack of suitable landing zones in the common iliac artery (CIA), resulting in coverage of the internal iliac artery (IIA) origin. In these cases, the IIA is sacrificed by embolization to prevent retrograde perfusion, subsequent type II endoleak, and post-repair aneurysm dilation and rupture. This traditional approach is debated. IIA coverage without embolization is a technically simpler alternative promising better clinical outcome; however, the safety of this method is not well studied.

Objective: To assess the incidence of Type II endoleak following simple coverage of IIA during endovascular aneurysm repair.

Methods: 362 EVARs performed by a single surgeon at The Ottawa Hospital from October 2004 to August

2014 were reviewed. At the discretion of the surgeon, 21 patients underwent repair with IIA coverage, without embolization. Type II endoleak was assessed retrospectively by reviewing operative reports and follow-up computed tomography (CT) imaging.

Results: IIA coverage without embolization was technically successful in 100% of cases. No patient reviewed suffered type II endoleak from a covered IIA in postoperative CT scans done at 1 month, 6 months, 1 year and annually thereafter. Follow-up ranged from 6 months to 8 years. No patients were lost to follow-up. Furthermore, no severe pelvic ischemic complications were observed peri-operatively or in subsequent follow-up.

Conclusion: In selected cases, IIA coverage without embolization is a technically successful and safe alternative to embolization in EVARs where the graft must be extended into the EIA.

A cadaveric study to facilitate the surgical and the percutaneous approaches of the femoral artery

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Objective: Our goal is to facilitate both the surgical and the percutaneous approaches of the femoral artery through a better anatomical understanding of the inguinal region.

Methods: This is a cadaveric study, conducted on specially embalmed cadavers that keep the flexibility of the tissues. (1) Radiopaque latex was injected through the external iliac artery. A/P radiography and plane by plane dissections were carried along in order to study the cutaneous arteries at risk of injury during the surgical approaches. (2) Ultrasonography (US) guided injections of markers and dissections were used to validate the identification of the inguinal ligament and its relation to the femoral artery. Ultrasound-guided percutaneous approach was simulated both in normal and in obese cadavers.

Results: (1) Although there is considerable variation in the pattern of the cutaneous vascularization, the blood supply to the proximal and middle portion of the skin around classical vertical incision is at risk of injury during the surgery. Indeed, a very frequent common trunk of the superficial epigastric and circumflex iliac arteries arises laterally from the femoral artery and either the trunk (18%), or the superficial epigastric (82%), cross over the femoral artery in its proximal first 2 cm. (2) The average length of the proximal femoral artery is about 3.56 cm. An X-rays investigation confirmed the passage of the proximal femoral artery anteriorly to the first third of the femoral head. We were able to validate the US identification of the inguinal ligament in relation to the proximal femoral artery.

Conclusion: Lowering the infrainguinal vertical incision by 2 cm, when compatible with the surgery, will considerably reduce the potential devascularization of the borders of the wound yielding a better postoperative outcome. Moreover, we developed a simple method for ultrasound-guided arterial puncture, suitable for obese patients, to facilitate the percutaneous approach of the femoral artery.

Public Knowledge about PAD: The Gap is Larger than we Thought

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Objective: Unlike coronary heart disease, peripheral arterial disease (PAD) has not been a major focus in population-based cardiovascular health programs and campaigns. The aim of our study was to examine the knowledge of PAD among the general public.

Methods: We conducted a cross-sectional, interview-based survey of 240 adults at multiple public locations

in Toronto, Canada, from September, 2014–October 2014. A pre-designed and validated questionnaire was used to examine participant knowledge of PAD within the following domains: signs and symptoms, risk factors, preventive measures, treatment options, and possible complications. Descriptive analysis and correlation tests were carried out.

Results: Of the 240 participants surveyed, 65% were women, 44% were ≥ 60 years old, and 69% had completed post-secondary education (Table 1). Although 21% of the participants had heard about PAD, only 6% knew someone else with the disease. Participants were able to identify at least one PAD knowledge domain variable in the following frequencies (Table 2): signs and symptoms (14%), risk factors (14%), preventative measures (17%), treatment options (14%), and possible complications (15%). Knowing a patient with PAD was associated with better knowledge of all domains.

Conclusion: Our results demonstrate poor overall knowledge of PAD among the general population in Toronto. The public is not aware of the risks of PAD, nor are they aware of measures they can take to prevent PAD. Population-based interventions are urgently needed to increase awareness of PAD among the public.

Impact of Diabetes on Carotid Artery Revascularization: A Systematic Review and Meta-analysis

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Objectives: Diabetes has been suggested as a marker of higher operative risk during carotid revascularization. The aim of this study was to summarize the current evidence comparing the effectiveness of carotid revascularization in diabetic versus non-diabetic patients.

Methods: We conducted a systematic search of MEDLINE, EMBASE, and The Cochrane Library databases (1946 to January 2015) for all studies comparing the clinical outcomes of diabetic versus non-diabetic patients who underwent carotid endarterectomy (CEA) or carotid artery stenting (CAS). Two authors independently reviewed the studies for inclusion, quality, and extracted the data. We calculated treatment effects as odds ratios (OR) and 95% confidence intervals (CI). We quantified heterogeneity using the I^2 statistic. All pooled analyses were based on random-effects models. The pre-defined review protocol was registered at PROSPERO international prospective register of systematic reviews (CRD42015015873).

Results: Of the 1241 abstracts screened, we included 14 observational studies involving 16,264 patients. There was excellent agreement in study selection between the two reviewers (κ statistic 0.83, 95% CI 0.72–0.94). CEA was used in 10 studies, CAS in three studies, and one study utilized both CEA and CAS. Carotid revascularization in diabetic patients was associated with a higher risk of the following outcomes: perioperative stroke (OR 1.38, 95% CI 1.02–1.88, $P=0.04$; $I^2=13\%$), perioperative death (OR 1.94, 95% CI 1.36–2.75, $P<0.001$; $I^2=0\%$), and long-term risk of death (OR 1.57, 95% CI 1.22–2.03, $P<0.001$; $I^2=0\%$). Study quality was limited by selection bias, minimal control for confounders, and single-center retrospective design.

Conclusions: Diabetic patients are at an increased risk of perioperative stroke, death, and long-term mortality compared to non-diabetic patients who undergo carotid revascularization. This knowledge may help risk stratify patients with carotid stenosis prior to treatment. Future studies should focus on evaluating which mode of revascularization (CEA or CAS) is more effective in diabetic patients with carotid stenosis.

Trends in Aortic Repair in Ontario 2002–2014

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Objective: With the rapid increase in endovascular methods for aneurysm repair concerns arise regarding the ability to train future surgeons in open aortic exposure and repair. Recognizing these concerns and the current literature suggesting trainee experience has decreased, we sought to review the trends in open versus endovascular aortic repair in Ontario, responsible for training a significant number of vascular surgery graduates annually.

Methods: We conducted a population-based cohort study using health administrative data from Ontario covering the period from April 1, 2002 to September 30, 2014. The inpatient discharge abstracts (DAD) were searched for records containing a preadmission ICD-10-CA diagnosis code of I71.4 (abdominal aortic aneurysm, without mention of rupture) or I71.3 (abdominal aortic aneurysm, ruptured) or a CCI procedure code for open or EVAR surgery.

Results: Over the 12-year period studied 14,777 index hospitalizations were selected for analysis. Over the period studied, total abdominal aortic repairs fluctuated with a nadir of 1116 in 2010 and peak 1423 in 2011 remaining stable since. In 2003/04, EVAR procedures were 7.3% of the total, but by 2011/12, more than half the aortic abdominal aneurysm repairs were EVAR procedures. Since then open repair have consistently become less common to a current rate of 43.4%. EVAR procedures were more likely to occur in a teaching hospital, and more likely to be elective procedures. Ruptured repairs accounted for 7% (1068) of the total with EVAR accounting for 12.4% (132)

Conclusion: Total aneurysm case volume has remained stable over recent years, with increased growth of endovascular repair there remains a decreasing volume of open aortic experience. The increase prevalence of endovascular AAA repair may negatively impact resident training in open AAA repair. If this trend continues expectation that residents gain the proficiency necessary to safely perform open AAA repair without additional training may be unrealistic.

The influence of abdominal aortic aneurysm geometry on pulsatile flow dynamics

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Direct numerical simulation was performed on realistic geometries of two patient-specific abdominal aortic aneurysms (AAA) using physiologically realistic pulsatile flow conditions. The AAA diameters were 5 and 7 cm. Blood flow hemodynamics in both cases were shown to consist of large-scale periodic structures with flow transitioning from laminar-to-turbulent and back to laminar during a pulse. Transition did not occur until after the maximum flow rate was reached and turbulence persisted in the AAA after the bulk flow decelerated back to laminar conditions. In both cases, a jet of blood formed at the AAA neck and impinged against the arterial wall at the site of maximal aortic diameter. During the pulse, turbulent structures sheared across the AAA wall causing locally high wall shear stress (WSS). There were significant differences in pulsatile flow dynamics based on aortic size. The smaller AAA had higher velocity flow, WSS, and turbulent kinetic energy. This was also associated with spiraling blood flow into the iliac arteries. In contrast, flow in the larger AAA channeled down on the anterior wall of the aneurysm sac forming a large recirculation zone on its posterior aspect. This large recirculation zone was associated with regions of low WSS and velocity flow. Modeling pulsatile flow in realistic aortic geometries will improve our understanding of the hemodynamic changes that occur with AAA growth. This work may eventually elucidate the mechanisms involved in AAA expansion and lead to better prediction of rupture risk.

Saturday, September 26th, 2015

PAPER SESSION IV: VENOUS DISEASE

Risk Factors Associated with Venous Ulcers in a Canadian Population

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Objective: The aim of this study was to assess the clinical and demographic characteristics of patients with

venous leg ulcers (VLU) who were treated at a tertiary centre wound clinic.

Methods: A retrospective review was carried out for patients presenting with VLU in 2014 at our institution. Patient demographics, comorbidities, ulcer characteristics, investigations and treatments were examined and descriptive statistics and regression analyses were generated.

Results: A total of 263 patients with VLU were identified (mean age of 65 ± 1 years, 52% female). Comorbidities included hypertension (50%), hyperlipidemia (29%), smoking (27%), diabetes (25%), and leg trauma (20%). Investigations included peripheral arterial (47%) and venous (18%) duplex studies and wound biopsies (18%). Mixed arterial and venous ulcers were diagnosed in a subset of patients (20%) and were associated with diabetes (Odds Ratio (OR) 2.34; 95% Confidence Interval (CI) 1.90-2.88), hypertension (OR 2.85; 95% CI 2.31-3.53) and older age (74 ± 2 compared to 63 ± 1 in VLU only; $p < 0.001$). Vascular surgery referral was made in 16% of patients. Patients referred to vascular surgeons were older (70 ± 2 compared to 64 ± 1 ; $p < 0.05$), had lower ABI (0.86 ± 0.04 compared to 1.07 ± 0.02 ; $p < 0.001$) and were more likely to have mixed ulcers (OR 8.18; 95% CI 6.24-10.71). While patients were most commonly treated with compression therapy (92%), some also underwent angioplasty (6%) and venous ablation or stripping therapy (5%). Ulcer resolution occurred in 33% of patients at a median of 11.9 months of follow-up.

Conclusion: Patients with multiple comorbidities and the elderly are most susceptible to VLU. Proper management of VLU requires a multidisciplinary effort that includes wound care and vascular surgical support. Future efforts to increase the use of proper vascular tests and vascular surgery involvement are critical to improve the outcome in the management of VLU.

Combined Coil Embolization and Foam Sclerotherapy for the Management of Varicose Veins: Description of a Novel Technique

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Objective: To describe a novel technique for endovenous treatment of varicose veins using combined coil embolization and foam sclerotherapy of the great saphenous vein (GSV).

Methods: A retrospective case-series analysis was carried out on patients presenting to a Canadian hospital with advanced venous disease. All patients underwent fluoroscopically-guided coil embolization of the GSV and foam sclerotherapy of the GSV and below knee varices. The entire procedure was performed through a retrograde, below-knee 4 French sheath with standard angiographic equipment and 3% sodium tetradecyl sulfate foam. Patient demographics (age, cardiovascular risk factors) and post-procedural outcomes were reviewed and descriptive statistics were generated.

Results: Twenty-two patients (57% female, average age 63.6 ± 15.6 years) underwent the procedure on 23 legs between 2010-2015. Active or healed venous ulcers were present in 43.5% of patients, and 47.8% used compression stockings. Most patients (78.3%) presented for follow-up 57.2 ± 21.9 days post-operatively. The median duration of subsequent follow-up was 274 days. Doppler studies demonstrated complete GSV occlusion in all patients. There were no recurrences during the follow up period. While 3 patients (17.7%) noted skin discoloration overlying the treated varicose veins, none complained of pain on follow-up or developed leg numbness, deep vein thrombosis, or pulmonary emboli.

Conclusion: Coil embolization and foam sclerotherapy is a novel and effective treatment for varicose veins that utilizes existing and readily-available angiographic equipment. Future studies are needed to prospectively assess its efficacy in a multi-center setting.

Initial Experience with Endovenous Cyanoacrylate Adhesive to Treat Saphenous Incompetence

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Objective: To assess the safety and efficacy of cyanoacrylate glue embolization (CGE) for the treatment of

refluxing varicose veins.

Methods: A prospective registry was created starting January 2014 for all patients with refluxing varicose veins undergoing CGE at a single center. Neither tumescent anesthesia nor post interventional compression stockings were incorporated into the treatment. All patients underwent clinical examination and duplex ultrasound evaluation at 2 and 6 months post procedure.

Results: CGE was performed in 67 patients or 103 extremities with 108 vein segments. Target vein segments included 82.4% (89/108) great saphenous veins, 12.0% (13/108) short saphenous veins, and 5.6% (6/108) accessory saphenous veins. The treated segment lengths had a range from 12cm to 63cm. Technical success, defined as complete closure of the refluxing vein immediately after the procedure diagnosed by duplex ultrasound, occurred in 100% (108/108) of vein segments. The procedure was well tolerated with only 10.4% (7/67) of patients experiencing venospasm. Ultrasound results were available for 80.6% (54/67) and 46.3% (31/67) of patients at 2 and 6 months respectively. Only 1 of 108 target vein segments demonstrated recanalization. The target vein segment occlusion rate at 6 months was 96.8% (30/31). There were no cases of cellulitis or post procedural paresthesia reported. No serious adverse events including DVT occurred.

Conclusion: Cyanoacrylate glue embolization of refluxing varicose veins is safe and effective without the use of compression stockings or tumescent anesthesia at 6 months.

Temporary Inferior Vena Cava Filters: Indications, Retrieval Rates and Follow-Up Management at a Single Academic Institution

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Objective: To perform a retrospective review of indications for inferior vena cava filter placement retrieval rates and follow-up management at a single academic institution.

Method: We conducted a retrospective review of IVC filter procedures at our hospital between 2001 and 2013. We collected patient demographics, risk factors for venous thromboembolism, use of anticoagulation, co-morbidities, date of and indications for filter insertion and removal, complications and follow-up management.

Results: 1,123 IVC filter procedures were analyzed; 69% (n = 810) insertions and 31 % (n = 313) retrievals. The average age for insertion was 61.4 years and 53.3% were male. Analysis demonstrated that 98% were successfully inserted, 408 (51.5%) had absolute indications, 214 (27.0%) relative indications, 138 (17.4%) prophylactic and 32 (4.0%) for other indications. Of the filters inserted 657 (81.1%) were retrievable filters, retrieval attempts were made on 298 filters (45.4%). Successful retrieval on first attempt was made in 88.3% (n = 265). Of the remaining 33 filters, a second attempt at retrieval was made on 13 filters, 12 of which were successful. The mean time to first removal attempt in those with a retrievable filter was 76.4 days. Documentation of follow-up appointment post-insertion was absent in 409 cases (50.6%).

Conclusion: Current FDA guidelines advocate for filter retrieval as early as clinically appropriate, our analysis demonstrates that our filter retrieval rate and follow-up management is suboptimal. Given the established complications relating to long indwelling times and recent FDA warnings, an effective follow-up protocol needs to be implemented to optimize filter retrieval rates and to ensure exemplary quality of care.

Saturday, September 26th, 2015

PAPER SESSION V: PERIPHERAL ARTERIAL DISEASE

Midterm Report of Randomized Control Trial of Negative Pressure Wound Therapy for High Risk Wounds in Lower Extremity Revascularization

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Objective: Surgical site infection (SSI) following lower extremity revascularization has considerable morbidity and mortality associated with it. The purpose of this study is to determine effect of negative pressure wound therapy (NPWT) on primarily closed groin incisions to reduce surgical site infections in high risk vascular surgery patients undergoing lower limb revascularization.

Methods: This is a single center, prospective randomized controlled trial performed at an academic tertiary medical center. Vascular surgery patients were classified as high risk if they had body mass index greater than 30, previous femoral artery exposure or in Rutherford classification V or VI. All surgical wounds were closed primarily in the operating room and then randomized to NPWT or standard gauze dressing. The primary outcome was overall 30 day SSI and secondary outcomes include length of stay, readmissions, emergency room visits, reoperations, amputations and mortality.

Results: During the first eight months of the study, 59 patients have been enrolled. Average age of patients was 68 with majority being male (80%). Patients were classified as a high risk in 43% due to high BMI, 36% for redo surgery and 21% for presence of tissue loss. Revascularization included distal bypass in 32%, femoral to femoral artery bypass in 45%, femoral artery endarterectomy in 13% and other procedures in 10%. There were no in hospital surgical site infections. Overall 30 day SSI was 13.5% and in this midterm analysis there was a trend for lower SSI in NPWT (7%) compared to standard dressing (20%, p=0.12).

Conclusion: Mid-term analysis of this RCT identifies a trend for lower surgical site infection in high risk vascular surgery patients undergoing lower extremity revascularization treated with negative pressure wound therapy. The final results of this trial will allow us to better understand role of NPWT.

Preventing Surgical Site Infections in Bypass Patients in the Era of Hospital Based Quality Improvement Initiatives

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Objective: The purpose of the study is to investigate risk factors associated with Surgical Site Infections (SSIs) in vascular patients post-bypass surgery in the context of a hospital based quality improvement initiative.

Methods: A retrospective study was conducted using a combination of National Surgical Quality Improvement Program (NSQIP) data and chart review. Bypass surgery patients from October 2013 to December 2014 were included. Demographic data along with Pre-OP, Intra-OP, and Post-OP clinical data were collected from 68 cases within the timeline. 43/60 (72%) variables were available through NSQIP, and the remainder supplemented with chart review. 29/68 (42.6%) cases presented with surgical site infections. All demographics in 29 patients with SSI were compared to the other 39 patients without SSI. In addition, environmental factors (OR traffic) and compliance with proper use of Antibiotics, Antibiotic redosing, Post-OP Glucose Control, Normothermia, Post-OP mobility, and Wound Care were measured.

Results: The result of the review revealed no demographic relationship between the SSI group in comparison to the non-SSI group. However, a combination of Surgical Care Improvement Project (SCIP) measures and environmental factors were discovered to be potential contributors of surgical site infections in our patient population. Variables most highly correlated with SSI were average Blood Glucose (BG) of > 11mmol on Post-OP Day 1-3, Post-OP mobilization, Normothermia, and high OR traffic during the operation. All variables highly correlated with infection were added by chart review, and not available in NSQIP.

Conclusion: NSQIP was effective to identify cases with infections through basic demographic and clinical information. Chart review was required to add variables which allowed identification of cases at high risk of infection. Our study suggests improvement of postoperative blood glucose, reduction in OR traffic, and mobilization may lower postoperative SSI.

Sex Differences in the Long-term Outcomes of Peripheral Arterial Disease

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Objectives: Data on sex-related differences in outcomes of patients with peripheral arterial disease (PAD) are limited. We sought to investigate differences in long-term adverse CV and limb outcomes between male and female PAD patients.

Methods: A population-based cohort study with up to 7 years of follow-up was conducted using linked administrative databases in Ontario, Canada. Individuals aged 40 years or older who visited a vascular surgeon between April 1, 2004 and March 31, 2007, and carried a diagnosis of PAD comprised the study cohort. The primary outcome was a composite of death or hospitalization for stroke or myocardial infarction. Secondary outcomes included lower limb amputation or revascularization. Cox proportional hazards modeling was used to compute unadjusted hazard ratios (HR), and HRs adjusted for baseline covariates.

Results: A total of 6915 patients were studied. Women (n=2461) were older (72±12 versus 69±11 years). Women experienced the primary outcome at a higher rate in the unadjusted model (unadjusted HR, 1.06 [95% CI, 1.002 to 1.13]; P=0.044), although there was no difference in the risk of primary outcome after controlling for baseline covariates (adjusted HR, 0.99 [95% CI, 0.92 to 1.05]; P=0.64). Women were less likely to undergo minor amputation (adjusted HR, 0.73 [95% CI, 0.62 to 0.85]; P<0.001), and arterial bypass surgery (adjusted HR, 0.82 [95% CI, 0.71 to 0.94]; P=0.004). There were no differences in the rates of major amputation (adjusted HR, 0.95 [95% CI, 0.84 to 1.08]; P=0.43) or endovascular revascularization (adjusted HR, 1.04 [95% CI, 0.90 to 1.19]; P=0.60).

Conclusions: We found women with PAD tend to be older; however after controlling for baseline characteristics, we identified no significant differences in the long-term risk of adverse CV events between women and men. Women experience similar or lower rates of amputation and revascularization to those seen in men.

Magnetic Resonance Imaging Characterization of Peripheral Arterial Chronic Total Occlusions with MicroCT and Histologic Validation

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Objective: Guidelines recommend surgical bypass for peripheral chronic total occlusions (CTOs). Endovascular revascularization, however, offers improved morbidity and shorter length of hospitalization. Not all lesions are amenable to this technique but predicting crossability is difficult due to limitations in characterizing CTOs with current imaging techniques. This study demonstrates the ability of MRI to characterize peripheral CTO components with microCT and histologic validation.

Methods: MRI was performed on 15 excised human peripheral arterial CTO segments from 4 patients. Each sample was imaged at 7 Tesla at high resolution (75µm³ voxels) to produce T2- and T2*-maps using ultrashort echo (UTE) sequences with echo times: {20µs, 500µs, 1ms}. A T2* difference image was produced by subtracting the UTE images and a phase map was constructed. The T2, UTE 20µs and T2* difference images were used together to differentiate CTO components. MicroCT and histology were used to validate regions of interest (ROIs).

Results: 3 independent reviewers identified 47 ROIs. Example ROIs are presented in Figure 1: Human peripheral arterial chronic total occlusion components. There was excellent agreement between MRI and microCT for calcium (sensitivity 87%, specificity 99%). There was also good agreement between MRI and histology for adipose tissue (100%, 100%), soft tissue (97%, 97%), thrombus (78%, 100%), collagen (83%,

94%) and open lumen (95%, 98%).

Conclusion: These results demonstrate the potential of high-resolution T2 and T2* imaging using UTE, to characterize lesion components in human peripheral CTOs. Further work is required to better differentiate thrombus from collagen. This study provides the foundation for future studies in determining the lesion crossability and procedural success rates in peripheral in CTOs.

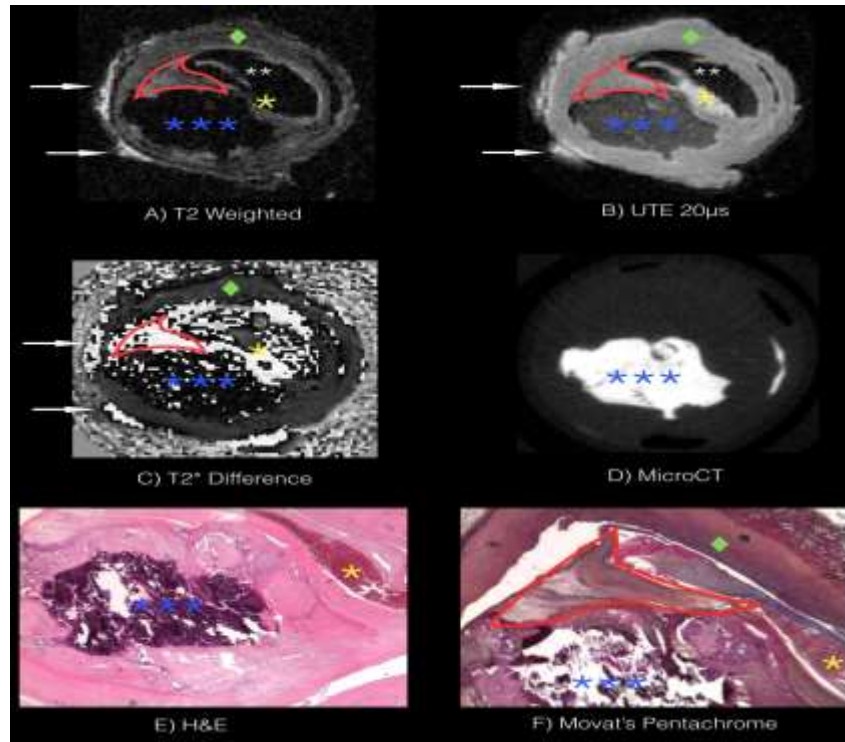


Figure 1: Human peripheral arterial chronic total occlusion components. The T2 weighted image (A) shows CTO components in relative grey scale. Adipose tissue appears hyper intense (arrows), soft tissue like smooth muscle appears grey (□) and corresponds to the dark red colour of muscle in the Movat's pentachrome histology section (F), Calcium, blood and open lumen show as signal voids on T2 weighted images. On UTE 20µs image (B) the lumen is black (**) in contrast to calcium which is dark grey (***) and thrombus appears hyper intense (*), which corresponds to the calcium on microCT (D) and the red thrombus in the H&E histology section (E). Collagen is typically not seen on T2 weighted images unless it is mixed with other substances like muscle or loose fibrous tissue as seen here. To detect collagen more specifically, a T2* difference image (C) and shows areas of fat and collagen as white. Fat can be differentiated from collagen with the T2 weighted image, where fat is hyper intense and collagen is not. The collagen on the T2* difference image (designated as a region of interest outlined in red) corresponds to the yellow stain on the Movat's Pentachrome section (F).

Saturday, September 26th, 2015

RESEARCH

Present and Perish? Translation of Grants to Publication

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Objective: The objective of this study was to assess the effectiveness of the Canadian Society for Vascular Surgery (CSVS) awards in promoting research and its subsequent publication in peer-reviewed journals.

Methods: CSVS award recipients from 2005-2013 were searched on the PubMed database for publications with abstracts relating to the award topic as published on the CSVS website. The Cook Research Award, the Gore Research Award, the John L. Provan Award, the Josephus C. Luke Award and the Sigvaris President's Award were evaluated. The Society for Vascular Surgery (SVS) Resident Research Awards (2005-2013), the

Clinical Research Seed Grants (2012-2013) and the Canadian Association of General Surgeons (CAGS) Canadian Surgery Research Fund Awards were evaluated for comparison.

Results: The CSVS Cook, Gore and Provan prospective awards resulted in publications in peer-reviewed, PubMed-indexed journals in 44% (n=9), 38% (n=8), and 13% (n=8) of the awards, respectively. The overall publication rate in this prospective award category was 32% (n=25). Only 55% of award recipients presented their research at the subsequent CSVS meeting as mandated. The Josephus C. Luke Award and the Sigvaris Award resulted in publications in 66% and 20% of awards, respectively. In comparison, the SVS Resident Research Awards, which require simultaneous submission of both an abstract and manuscript resulted in a 100% publication rate (n=9). The SVS Clinical Research Seed Grants had a publication rate of 66% (2012-2013; n=6). The CAGS Canadian Surgery Research Fund Awards resulted in a publication rate of 83% (n=24).

Conclusions: Despite mandated follow-up reports in subsequent years, CSVS awards have a marked lower publication rate than the CAGS or SVS awards. While further evaluation would be required to better understand the factors most important to the conversion of a CSVS abstract to publication, we need to improve the dissemination and publication of these society funded research projects.

Saturday, September 26th, 2015

PAPER SESSION VI: AORTIC INTERVENTIONS: TYPE B AORTIC DISSECTION AND OTHER TOPICS

Poor Long-Term Outcomes for Type B Aortic Dissections Raises the Need for Re-Evaluating Current Management Strategies: A Population Based Analysis

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Background and Objective: Medical management with blood pressure and heart rate control is the mainstay for Type B aortic dissections, with surgical intervention typically reserved for unstable and complicated dissection patients with end-organ malperfusion. However, long-term outcomes of these patients are unknown. This single-institution population-based study is the largest of its kind in Canada and compares long-term outcomes of medical and surgical treatment strategies.

Methods: Data was analyzed on all patients presenting with Type B aortic dissections at the Ottawa Hospital between 1991 and 2012. Eligible patients were found using ICD-9 and ICD-10 codes, and diagnosis was confirmed based on review of medical records (microfiche, paper charts, and vOACIS), imaging, intraoperative visualization, or autopsy. Standardized information was obtained for each patient, including demographic data, presenting symptoms, diagnosis, and details of treatment. Primary outcome was all-cause mortality, and secondary measures included morbidity, surgical intervention, and compliance with treatment and followup.

Results: 517 patients were identified as having aortic dissections, with 98 confirmed to be isolated Type B. Mean age was 66 years (range: 22 – 93), and 62% were male. 59% of Type B dissections were uncomplicated and treated medically, while 25% were treated surgically with open or endovascular repair. The remaining 16% were palliated. Survival for all Type B dissections at 30-days, 1-year, 5-years, and 10-years was 90.3%, 70.4%, 55.9%, and 31.3% respectively. Female gender was associated with higher short- and long-term mortality (p=0.023). Uncomplicated Type B Aortic dissection patients treated medically had poor short- and long-term survival by Kaplan Meier analyses when compared to the average Canadian age- and sex-adjusted population (p<0.001). When compared to the medical group, the higher-risk surgically-managed complicated dissections had greater short-term mortality; however, surgical intervention appeared to confer a long-term benefit, with survival curves crossing at 4-years; survival at 5-years for the medical and surgical groups were 64.4% and 72.4% respectively. Close proximity to a tertiary care centre was associated with higher in-hospital and 30-day mortality, but improved long-term outcomes.

Conclusion: Long-term outcomes for Type B aortic dissections (including uncomplicated dissections) are very poor, questioning the validity of the current gold standard of medical management. Contrastingly, surgical management potentially confers a late survival benefit. With ongoing improvements in endovascular technology and current literature on aortic remodelling post-stenting, this study prompts a re-evaluation of

current management strategies for Type B Aortic dissections.

Predicting the Natural History of Acute Uncomplicated Type B Dissections by Volumetric Analysis of the Initial Index Computed Tomography (CT) Scan

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Introduction: Our objective was to characterize the predictive impact of CT scan volumetric analysis on the natural history of acute uncomplicated type B aortic dissections (TBAD).

Methods: We conducted a retrospective review of patients with acute TBAD from 2009-2014. Using TeraRecon iNtuition software, volumes of the true lumen (TLV), false lumen (FLV), and total aortic volume (TAV) were measured. Growth rate was calculated. The primary study end-point was delayed aortic intervention and was correlated with the volumetric analysis.

Results: Over a 5 year period, 164 patients had CT scan evidence of uncomplicated acute TBAD. 11 patients were excluded for lack of adequate imaging as well as 36 patients who underwent urgent repair (<14days). We evaluated a total of 117 patients: 85 who did not require intervention and 32 who underwent delayed TEVAR (29) or open repair (3). Mean age was 66 years. Mean TLV/FLV ratio on initial CT scan was significantly higher in patients who did not eventually require an operation (1.55 vs 0.82, $p=0.02$). Mean growth rate was higher in those eventually requiring operation (2.47 vs 0.42 mm/month, $p=0.003$). Patients were divided into 3 subgroups based on their initial TLV/FLV ratios (< 0.8, between 0.8 - < 1.6, and >1.6). There was a significant difference in the growth rates between these three groups (4.6 vs. 2.4 vs. 0.8 mm/month, $p<.025$). Area under the receiver-operating curve analysis revealed, a TLV/FLV ratio < 0.8 was highly predictive for the primary end-point of aortic intervention (area = 0.8; Sensitivity = 69%; Specificity = 84%; PPV = 71%; NPV= 81%), with an odds ratio of 12.2 ($p<0.001$). Conversely, a TLV/FLV ratio of >1.6 was highly predictive for freedom from delayed operation. After Kaplan Meier analysis, 1 year/2 year survival free of aortic interventions was 60% and 42% with a TLV/FLV ratio < 0.8, and 92% and 82% with a ratio >1.6, $P=0.001$.

Conclusion: Initial CT scan volumetric analysis in patients presenting with uncomplicated acute TBAD is a useful tool to predict need for future intervention.

Intermediate Care Unit Admission After Elective Open Aneurysm Repair

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Purpose: To evaluate the safety and hospital impact of transition from a routine to a selective policy of postoperative transfer to intensive care unit (ICU) for elective open abdominal aortic aneurysm (AAA) repair.

Methods: This retrospective study included all open elective AAA repair from August 8 2010 to December 1 2014 performed in our center. The study was approved by the Institutional Review Board and informed consent was waived. Patients were identified through our prospective database and electronic charts were reviewed to extract patient characteristics, operative details and postoperative complications. Patients operated before March 13 2012 were routinely sent to ICU after operation (group A). Patients treated after this date were sent directly to an intermediate care unit with a ratio of 1 nurse for 3 patients (group B) unless otherwise determined preoperatively by the surgeon or after intraoperative complications. We evaluated the safety of our change in practice, looking at complications and mortality rate, length of stay as well as transfer from intermediate care unit to ICU.

Results: 310 patients were included in the study: 266 men, 44 women, mean age 70 years, mean AAA diameter 65mm. Group A and B included 118 and 192 patients respectively. Postoperative mortality rate were similar in each group (1 %). ICU admission in group B was spared in 78% (149/192) of patients. Only 1% (2) of patients from the intermediate care unit were subsequently admitted to the ICU. There was no increase in mortality in group B (0.5%) compared to group A (0.8%) during hospital stay. Length of hospital

stay were similar between groups (group A: 8.6 days, group B: 8.0 days, P=NS).

Conclusions: Our results confirm the safety of a selective ICU pathway after open elective AAA repair with most patients sent directly to an intermediate care unit.

Low Wall Shear Stress Predominates at Sites of Abdominal Aortic Aneurysm Rupture

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Objective: Aortic diameter as the primary criterion in the decision to repair abdominal aortic aneurysms (AAAs) has drawbacks as some rupture below size thresholds, whereas others reach extreme size without rupture. Predictions of static aortic wall stress have also failed to reliably predict rupture potential. The objective of this study was to computationally assess blood flow characteristics at the site of infrarenal AAA rupture. On the basis of the finite element literature correlating rupture location with high static local wall stress, we hypothesized that a computational fluid dynamics approach would also demonstrate rupture at regions of high pressure and wall shear stress (WSS).

Methods: Three-dimensional AAA geometry was generated from computed tomography angiography images of seven ruptured AAAs. Aortic blood flow velocity, pressure, and WSS were computationally determined. Flow characteristics at the site of rupture were determined and compared across all cases.

Results: AAA size at the time of rupture was 8.3 +/- 0.9 cm. Only three of the seven AAAs ruptured at the site of maximal diameter. Blood flow velocity in the aneurysmal aorta showed dominant flow channels with zones of recirculation, low WSS predominated. Regardless of aneurysm size or configuration, rupture occurred in or near these flow recirculation zones in all cases. WSS was significantly lower and thrombus deposition was more abundant at the site of rupture.

Conclusions: This computational study was the first to assess blood flow characteristics at the site of infrarenal AAA rupture in realistic aortic geometries. In contradiction to our initial hypothesis, rupture occurred not at sites of high pressure and WSS but rather at regions of predicted flow recirculation, where low WSS and thrombus deposition predominated. These findings raise the possibility that this flow pattern may lead to thrombus deposition, which may elaborate adventitial degeneration and eventual AAA rupture.

Inflammatory Responses in a BAPN/AT2 Induced Murine Model of Aortic Aneurysm

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Purpose: Using an inducible murine model of aortic aneurysm, we sought to investigate the nature of the inflammatory response in the aorta, blood and bone marrow.

Methods: 10 adult C57/Bl6 mice received 2 weeks of oral beta-amino propiono-nitrile (BAPN) administration and 4 weeks of angiotensin-2 (AT2) delivered via osmotic pump. Mice were harvested at 4 weeks. The aortas were photomicrographed for analysis, and flow cytometry was used to examine the hematopoietic compartment in marrow, blood and aorta. Results were compared to 10 untreated controls.

Results: Three BAPN/AT2 treated mice died of aortic rupture between days 8 and 9. The remaining mice were harvested at one month. Aortic dilatation occurred at all regions except the infra-renal aorta in BAPN/AT2 treated mice. Focal aneurysmal dilatation was maximal in the suprarenal aorta at 1.86±0.1mm compared to controls 0.98±0.03mm (P<0.001). Aneurysmal dilatation (referenced to the unaffected infra-renal aorta) occurred in all BAPN/AT2 treated mice (P<0.0001). Aortic inflammation was characterized by an overall increase in CD45-2 positive cells (P<0.01) and a significant elevation in macrophages (P<0.001). Cell cycle analysis using Ki67 and DAPI demonstrated that aortic tissue macrophages were non-proliferating (97%). Circulating total cell counts and CD45-2 cells were increased in aneurysm with differential cell counts showing increased B-cells compared to control (P<0.001). Analysis of the bone marrow myeloid-lymphoid

compartment demonstrated that lymphocyte antigen C (Ly6C) low-intermediate positive monocytes were elevated in aneurysm ($P=0.03$).

Conclusions: The inflammatory response with BAPN/AT2 induced aneurysm is characterized by an increase in circulating hematopoietic cell lines (CD45-2 positive). Local aortic inflammation was predominated by macrophages, with low macrophage proliferation suggesting they are monocyte derived rather than from local proliferation.

Effect of Day of the Week on Mortality and Cardiovascular Outcomes Following Elective AAA Repair and Lower Limb Revascularization: A Population-Based Study.

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Objectives: Population-based studies have suggested procedures which occur later in the week (Thursday/Friday) have a higher mortality when compared to earlier in the week. No study has looked specifically at vascular procedures and adjusted for surgeon factors (years in practice, annual volume). We analyzed all elective AAA repairs and open lower limb revascularizations occurring in the province of Ontario over a 10 year time span looking for variation in 30-day mortality and cardiovascular outcomes (MI/stroke) according to what day of the week the procedure took place.

Methods: Using a population-based, prospectively-collected, administrative database, all elective AAA repairs and open lower limb revascularizations (LLR) occurring in the province of Ontario from 2003-2012 were identified. Multi-level logistic regression modeling was used adjusting for patient factors (age, sex, comorbidities, clustering among surgeon and institution, EVAR vs open for AAA, year of procedure, income) and surgeon factors (annual volume, years since medical school graduation), looking for a relationship between day of the week (Monday as reference category) and 30-day mortality as well as cardiovascular outcomes (MI/stroke).

Results: A total of 11 031 AAA repairs (EVAR + Open), and 12 406 lower limb revascularizations were included. For AAA repair, postoperative mortality was lowest on Wednesday (1.5%, OR 0.61, 95% CI 0.44-0.83; $P = 0.015$) when compared to the other days of the week; while no trend in postoperative mortality occurred for patients with LLR according to the day of the week (overall $P = 0.08$). Similarly, 30-day rates of composite cardiovascular endpoints (death, stroke, MI) did not differ significantly depending on the day of the week. A higher surgeon annual volume was associated with a lower postoperative mortality for AAA repair.

Conclusions: A 10-year analysis of this large population-based database reveals that the previously documented trend of increased postoperative mortality with operations taking place later in the week was not identified when surgeon factors were adjusted for. A surgeon's annual procedure volume and not years of experience influence postoperative mortality following AAA repair.

Saturday, September 26th, 2015

PAPER SESSION VII: GENERAL TOPICS IN VASCULAR SURGERY

Unplanned Early Readmissions in Vascular Surgery

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Objectives: Readmission is associated with high mortality, morbidity, and cost. In this study, we characterize the frequency and causes of early, unplanned readmissions after elective and emergency vascular surgery to identify modifiable targets for reducing readmission rates.

Methods: From 2007 to 2012, the medical records of all patients ($n = 3324$) admitted by the vascular surgery service at a single tertiary care institution were retrospectively reviewed. Readmissions to our hospital were

categorized as planned or unplanned and related or unrelated to the index procedure.

Results: The 28-day unplanned readmission rate to the same institution was 9.1% (n =302). During the same period there were 119 (3.6%) planned readmissions to any service within 28 days. Of the unplanned readmissions 200 (66%) were emergent admissions initially. The most common initial admission diagnosis in the unplanned readmissions was related to peripheral vascular disease (PAD) (53%) and aneurysmal disease (22%). The commonest readmission diagnosis was related to surgical site infections (25%), worsening PAD (20%) and non-vascular issues (20%).

Conclusions: To reduce readmission rates effectively, institutions must identify high-risk patients. Select comorbidities and postoperative complications contribute to unplanned readmissions after vascular surgery. The most frequent reason for readmission was surgical site infection. Interventions focused on wound care management and avoidance of infectious complications could help reduce readmission rates. By focusing on subgroups at risk for readmission, preventative resources can be efficiently targeted.

Routine Pathological Examination of Vascular Surgery Specimens is Unnecessary and Costly

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Objective The objective of this study is to evaluate the outcomes, usefulness, and cost-effectiveness of routine pathological examination of vascular surgery specimens.

Methods All vascular surgery specimens collected at The Ottawa Hospital from January 2010 to January 2015 were identified using PowerPath—a prospectively maintained pathology database. Operative and pathological diagnoses were compared. They were considered concordant if they agreed, and clinically useful if they potentially changed patient management. We arbitrarily identified a cohort of 500 patients for further analysis. We collected information on age, gender, surgeon, operative diagnosis, procedure, specimen type, specimen location, pathological analysis (number of blocks, slides, and special stains), urgency of procedure, clinical variables (vasculitis/connective tissue disorder, rupture/hemorrhage), and final pathological diagnosis. A cost analysis, including technical processing fees and professional reimbursement was used to estimate a total annual cost.

Results We identified 4645 specimens over the five-year study period. Of the 500 specimens included in our sample group, 321 (64.2%) were from males and the mean age was 67 years. The most common operative diagnoses included chronic lower extremity arterial disease (46.6%), abdominal aortic aneurysms (10.6%), and cerebrovascular disease (8.7%). The most common procedures were bypass/endarterectomy (30.8%), amputation (17%) and aneurysm repair (14.4%). The prevalence of concordant diagnoses was 100%, while the prevalence of clinically useful pathology was 6.6%. Clinically useful pathological findings were more likely to be from urgent cases (p<0.0001), rupture/hemorrhage (p=0.005), and known vasculitis or connective tissue disorder (p<0.0001). The number of slides examined per case was 1.4; this translated to a total cost per case of \$87.92. The estimated overall annual cost was \$81 668.

Conclusion This is the first ever study to evaluate the usefulness and cost-effectiveness of routine pathological examination of specimens collected in vascular surgery. Routine pathological examination of vascular surgery specimens had no discordant cases, a low prevalence of clinically-useful findings, and represented a significant annual cost.

Fluoroscopy Time During EVAR: Can We Do Better?

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Objective: To evaluate and compare the fluoroscopy time and the cumulative radiation dose during elective endovascular aneurysm repair (EVAR) for aneurysms of the abdominal aorta (AAA) in our institution to those

obtained at a national scale, in order to depict our actual practice and to improve it, if necessary.

Methods: This retrospective study includes all the EVAR for infra-renal AAA performed in the vascular surgery operation room at CHUM Hôtel-Dieu from January 2012 to February 2015. Exclusion criteria included thoracic EVAR, fenestrated and branched procedures. This study was approved by the Institutional Review Board and informed consent was waived. Patients were identified through our prospective database and electronic charts were reviewed to extract patient and intervention characteristics including gender, age and body mass index (BMI). We listed for each patient the total time of fluoroscopy, cumulative radiation dose and relevant information about the unfolding of the procedure: total surgery time, number of endografts, presence of leaks or stenoses during the operation, adjunctive procedures performed and presence of a resident or fellow during the procedure.

Results: 57 patients matched initial selection criteria : 48 males and 9 females. Average age at time of EVAR was 78 (56-89) years old. Average BMI of patients was 29 (21-47). Average fluoroscopy time was 24,0 (5,5-49) minutes and average total cumulative dose was 481 mGy (176-1567). Of the 57 procedures, 91% (n=52) included bi-iliac grafts and 9% (n=5) included uni-iliac grafts; 16% (n=9) presented iliac stenoses, 19% (n=11) endoleaks, 4% (n=2) required additional stent insertions, 5% (n=3) required iliac embolization, 16 % (n=9) required further dilations and 2% (n=1) required angioplasty. 81% (n=46) had either a resident or fellow attending. Procedures lasted for an average of 121 minutes (77-230 minutes).

Conclusion: Our fluoroscopy times largely exceed national mean fluoroscopy times of less than 8 minutes previously reported, indicating that there is significant place for improvement.

Risk-Modifying Medication Prescription and Compliance in Vascular Surgery Patients

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Objective: To describe the cardiovascular risk modification (RM) medication profile of vascular surgery patients at a Canadian vascular tertiary care center and assess the impact of a hospital admission on compliance with RF medications post-discharge.

Methods: A retrospective database review was carried out of all vascular surgery patients treated at our institution between August 2011 and February 2013. Baseline demographics and co-morbidities as well as pre- and post-hospitalization medication profiles were analyzed. Descriptive statistics and regression analysis were used to study the effect of a hospital admission on RF prescription patterns and compliance in our study patients.

Results: Five-hundred and eighty-five patients were identified in our database review (75% male, average age 70.8 ± 9.8 years). Most patients were on aspirin (ASA) (73%), a statin (77%), or a beta-blocker (52%) pre-operatively. Of the patients who were not on ASA, a statin, or a beta-blocker pre-operatively, only 50%, 43%, and 29% were started on those medications after undergoing surgery, respectively. Factors significantly associated with being started on ASA, a statin, or a beta-blocker included discharge to a rehabilitation or long-term facility rather than home, and being on multiple medications pre-admission. Length of stay was also significantly associated with being started on a beta-blocker in hospital. The type of surgery that the patients underwent was not associated with being started on a RM medication. Patients were more likely to be compliant with a RM medication in follow-up if they were already taking that medication before admission compared to if they were started on that medication after surgery (ASA: 86% vs. 75%, Statin 94% vs. 89%, Beta-blocker 86% vs. 64%).

Conclusions: Our findings suggest that admission to a hospital generally improves RM medication prescription patterns. Future initiatives are needed to improve hospital post-operative RM prescription patterns and increase compliance in this vulnerable patient population.

Vascular Surgery Manpower in Canada – Will I have a Job?

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Objective: The number of vascular surgery graduates across Canada is expected to increase significantly over the next 5-10 years based on the introduction of direct entry (0+5) residency programs in addition to the traditional (5+2) programs. The need for these newly qualified surgeons is unclear. This study evaluates the predicted vascular surgery manpower requirement across Canada to 2021.

Methods: The estimated and projected Canadian population for each year between 2013-2021 was determined by CANSIM. The number of vascular surgery procedures from 2008-2012 stratified by age, gender and province was obtained from the CIHI-DAD. Future need for vascular surgeons (VS) was calculated using two methods: (1) population analysis –the number of surgeons/100000 population and (2) workload analysis–the number of procedures/100000 population.

Results: The estimated Canadian population in 2013 was 35.15 million and there were 212 vascular surgeons performing 98339 procedures. The projected Canadian population by 2021 is expected to be 38.41 million, a 9.2% increase from 2013, however the expected growth rate in the 60+ age group is expected to be 30% vs. 3.4% in the <60 age group. Using population analysis modelling there will be a surplus of 5 VSs in Canada by 2021, however using workload analysis modelling (which accounts for the more rapid growth and larger proportion of procedures performed in the 60+ age group), there will be a deficit of 23 VSs by 2021.

Conclusions: Although population analysis projects a potential surplus of surgeons, workload analysis predicts a deficit of surgeons since it accounts for the rapid growth in the 60+ age group in which the majority of procedures are performed, thus more accurately modelling future VS need. This study suggests that there will be a need for newly graduating vascular surgeons in the next 5 years, which could impact resource allocation across training programs in Canada.

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