



University of Toronto
Division of Vascular Surgery

VASCULAR SURGERY RESEARCH DAY

Friday June 21st, 2019

University Club of Toronto
380 University Avenue
Toronto, Ontario



University of Toronto
Division of Vascular Surgery

Chair's Welcome



It is with great pleasure that I welcome you to the Annual University of Toronto Vascular Surgery Research Day. It's been another productive year and as we come to the end of the academic year we gather to celebrate the successes and research productivity of our faculty, students, residents, fellows and research trainees. This year's Research Day has several returning features, including Researcher's Forum sessions, a Rapid Fire session and many very interesting abstract presentations.

The highlight of the day will be the 8th *Annual K. Wayne Johnston Visiting Lecture in Vascular Surgery*. We are privileged to have Professor A. Ross Naylor from The Leicester Vascular Institute, Glenfield Hospital, Leicester, UK as our guest. I'm sure his talks will be fascinating, informative and will inspire us to greater academic heights.

I'd like to extend specific thanks to the U of T Vascular Surgery Executive who made this day possible through their commitment to our academic mission. These surgeons include: Drs. Mohammed Al-Omran (Division Head, St. Michael's), Andrew Dueck (Division Head, Sunnybrook), Christiane Werneck (Division Head, Trillium), Kerry Graybiel (Division Head, Humber River), Gus Azoubel (Division Head, Scarborough), George Oreopoulos (Residency Program Director), Mark Wheatcroft (Fellowship Program Director), Elisa Greco (Director of Undergraduate Medical Education) and Graham Roche-Nagle (Quality & Best Practices).

Special thanks to Michelle Paiva, our Division's Administrative Assistant, without who this day would not have been possible.

Also, we appreciate the generosity and commitment of W.L. Gore & Associates who are the premier sponsor of this event through an unrestricted education grant.

Welcome and I hope you enjoy the University of Toronto Vascular Surgery Research Day.

Sincerely,

Thomas L. Forbes, MD, FRCSC, FACS
R. Fraser Elliott Chair & Head, Division of Vascular Surgery, UHN
Sprott Department of Surgery, Peter Munk Cardiac Centre
Professor & Chair, Division of Vascular Surgery, University of Toronto



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K. Wayne Johnston Visiting Lecturer in Vascular Surgery

In recognition of Dr. Johnston's unprecedented contributions to our specialty of Vascular Surgery and the University of Toronto an annual lecture began in his name. Dr. Johnston was a founding member and President of the Canadian Society for Vascular Surgery and later became President of the Society for Vascular Surgery. He is a pre-eminent academic surgeon who served as Editor-in-Chief of the Journal of Vascular Surgery and Co-Editor of two editions of Rutherford's Textbook of Vascular Surgery. No other Canadian, and few internationally, have contributed more to academic vascular surgery than Dr. Johnston. In 2009 he was honored with the Lifetime Achievement Award by the Society for Vascular Surgery. In 2018 Dr. Johnston was honored as a Member of the Order of Canada for his outstanding achievement, dedication to the community and service to the nation.

This lectureship was made possible through the generous donations of faculty, students and alumni.



Previous K. Wayne Johnston Lecturers

2012	Joseph L. Mills	University of Arizona
2013	Lewis B. Schwartz	University of Chicago
2014	Philip P. Goodney	Dartmouth
2015	Ronald L. Dalman	Stanford University
2016	Melina R. Kibbe	Northwestern University
2017	Marc Schermerhorn	BIDMC, Harvard University
2018	Julie Freischlag	Wake Forest Baptist Medical Center



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2019 K. Wayne Johnston Visiting Lecturer in Vascular Surgery

Professor A. Ross Naylor MD, FRCS(Ed), FRCS(Eng)
The Leicester Vascular Institute
Glenfield Hospital
Leicester, UK



Ross Naylor graduated MBChB from Aberdeen University (Scotland) in 1981 and was awarded his MD in 1990. His vascular surgery training was undertaken at Aberdeen, Edinburgh and Leicester. He was appointed consultant vascular surgeon to Aberdeen Royal Infirmary in 1993, before returning to Leicester Royal Infirmary as consultant vascular surgeon in 1995. He was appointed Reader in Vascular Surgery in 2002 and Professor of Vascular Surgery in 2003.

His main research interests relate to the management of carotid artery disease, with a specific interest in developing strategies for preventing peri-operative stroke during carotid surgery and for developing novel antiplatelet and antithrombotic strategies aimed at reducing peri-operative cardiovascular risk. He has (co)-authored 507 publications (H-Index = 60) and 74 book chapters, as well as co-editing three textbooks of vascular surgery, mainly in the field of cerebral vascular disease.

Professor Naylor has served on the Executive and Council of the Vascular Society of Great Britain and Ireland (2006-2012), the Executive and Council of the European Society of Vascular Surgery (2010-2016) and the Council of the World Federation of Vascular Societies (2018-current). He served as President of the Vascular Society of Great Britain and Ireland from 2011-2012. He has also served on the Editorial Boards of the British Journal of Surgery (2000-2005), the Journal of Vascular Surgery (2003-2008, 2016-current) and the European Journal of Vascular and Endovascular Surgery (2006-2016). He was Senior Editor (2010-2013), then Editor in Chief of the European Journal of Vascular and Endovascular Surgery from 2013-2016. He is an author/contributor to 13 vascular-based guidelines and was (co)-chairman of the 2018 ESVS guidelines on the management of carotid and vertebral artery disease. In 2017, Professor Naylor was awarded honorary membership of the ESVS.



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Objectives:

1. To obtain new knowledge regarding advances in basic science and clinical research in the field of vascular surgery.
2. For vascular surgery trainees, to have an opportunity to present their research work and to obtain feedback and questions from their peers.
3. To obtain new knowledge regarding the pathophysiology of abdominal aortic aneurysms.
4. To understand the value of continuing quality assurance in surgical practice.
5. To have an opportunity to learn and collaborate with colleagues within and without the University of Toronto.

Accreditation:

The 2019 University of Toronto Division of Vascular Surgery Annual Research Day is a self-approved group learning activity (Section 1) as defined by the Maintenance of Certification Program of the Royal College of Physicians and Surgeons of Canada

Certificates of Attendance and Evaluation Forms will be sent to attendees following the meeting.





University of Toronto Division of Vascular Surgery

Sponsorship:

We'd like to thank W.L. Gore and Associates who have agreed to a multi-year commitment as sole sponsor to support the U of T Vascular Surgery Research Day through an education grant. Special thanks to David Grieco, Senior Development Officer in the Office of Advancement at the U of T Faculty of Medicine for stewarding this donation.

Marty Sylvain, former Global Sales Leader for Gore says, "W.L. Gore & Associates has provided creative therapeutic solutions to complex medical problems for more than forty years. During that time, more than 35 million innovative Gore Medical Devices have been implanted, saving and improving the quality of lives worldwide. W.L. Gore & Associates is committed to advancing vascular surgical and endovascular therapy and as a result is pleased to be able to provide educational grant support to the University of Toronto, Division of Vascular Surgery. It is our hope that through this educational grant we will be able to support the University of Toronto in some of our shared values including commitment to ongoing learning, dedication to sharing knowledge with peers and patients, creating consensus within the medical community and the analysis of clinical outcomes".





University of Toronto
Division of Vascular Surgery

RESEARCH DAY AGENDA

June 21st, 2019
University Club of Toronto
380 University Avenue
2nd Floor Main Dining Room

0730 – 0800: Continental Breakfast

0800 – 0815: Welcoming Remarks

Thomas L. Forbes

Professor & Chair, Division of Vascular Surgery, University of Toronto

0815 – 0945: Morning Session (10 minute presentations, 5 minutes questions)

Moderator: George Oreopoulos (Residency Program Director)

0815 – 0830: **Early and late population-based thoracoabdominal aortic aneurysm outcomes following endovascular and open repair**

Rodolfo V. Rocha, Maral Ouzounian, Mohammed Al-Omran, Peter C. Austin, Thomas L. Forbes, Douglas S. Lee, Thomas F. Lindsay

0830 – 0845: **Status of plasma n-terminal brain natriuretic peptide in patients with peripheral arterial disease and critical limb ischemia**

Bader Alsuwailam, Abdelrahman Zamzam, Mohammad Qadura

0845 – 0900: **Optimizing preoperative cardiac risk stratification for aortic surgery**

Caleb CJ Zavitz, Naomi Eisenberg, Graham Roche-Nagle

0900 – 0915: **A systematic review and meta-analysis of the long-term outcomes of endovascular versus open repair of abdominal aortic aneurysm**

Ben Li, Shawn Khan, Konrad Salata, Mohamad A. Hussain, Charles de Mestral, Elisa Greco, Badr A. Aljabri, Thomas L. Forbes, Subodh Verma, MD, Mohammed Al-Omran



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- 0915 – 0930: **Lyve-1 negative bone marrow-derived macrophages participate in aortic aneurysm/dissection**
Angela Li, Rickvinder Besla, Emily Chen, Shaun Pacheco, Takuo Emoto, Marwan Althagafi, Myron Cybulksy, Clinton Robbins, John Byrne
- 0930 – 0945: **Performance assessment of a novel steering catheter for crossing peripheral arterial occlusions**
Trisha L. Roy, Mohammad A. Tavallaei, James J. Zhou, Andrew D. Dueck, Graham Wright
- 0945 - 1030: **8th Annual K. Wayne Johnston Lecturer**

Those who forget the past are condemned to repeat it
Professor A. Ross Naylor
Leicester Vascular Institute, Glenfield Hospital, Leicester, UK
- 1030 - 1100: **Refreshment Break**
- 1100 - 1115: **Researcher's Forum**

Carotid atherosclerotic disease and stroke prevention: identifying the vulnerable plaque in the lab and at the bedside. A new era with new targets?

Kathryn L. Howe
Division of Vascular Surgery, Peter Munk Cardiac Centre, University Health Network
Assistant Professor, Department of Surgery, University of Toronto
- 1115 - 1200: **Surgeon-Scientist Training Program Forum**
(10 minute presentations, 5 minutes questions)
Moderator: Dr. Mohammed Al-Omran (Division Head, St. Michael's Hospital)
- 1115 - 1130: **Comprehensive capture in endovascular surgery: development of the endovascular operating room black box**
Lauren Gordon, Bart Doyen, Mark Wheatcroft, Charles de Mestral, Teodor P. Grantcharov, I van Herzeele



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- 1130 - 1145: **Short-term outcomes of combined neuraxial and general anaesthesia versus general anaesthesia alone for elective open abdominal aortic aneurysm repair: a population-based cohort study**
Konrad Salata, Faraj Abdallah, Mohamad A. Hussain, Charles de Mestral, Elisa Greco, Badr A. Aljabri, Muhammad Mamdani, C. David Mazer, Thomas L. Forbes, Subodh Verma, Mohammed Al-Omran
- 1145 - 1200: **The development and validation of a simulated competency assessment in diabetic wound management**
Omar Selim, Andrew Dueck, Catharine M Walsh, Ryan Brydges, Allan Okrainec
- 1200 - 1245: **Lunch**
- 1245 - 1330: **8th Annual K. Wayne Johnston Lecturer**

Weapons of myth and distraction in the war against Error
Professor A. Ross Naylor
Leicester Vascular Institute, Glenfield Hospital, Leicester, UK
- 1330 - 1500: **Afternoon Session** (10 minute presentations, 5 minutes questions)
Moderator: Dr. Andrew Dueck (Division Head, Sunnybrook Health Sciences Centre)
- 1330 - 1345: **Comparison of incidental and symptomatic penetrating aortic ulcers and associated outcomes through a retrospective analysis**
Jason Koppert, Naomi Eisenberg, Maral Ouzounian, Jacob Udell, Kong Teng Tan, John Byrne
- 1345 - 1400: **Local and regional management variation after acute type B aortic dissection accompanies regional disparities in post dissection mortality in Ontario**
Miranda Witheford, Limei Zhou, Joan Porter, Douglas S. Lee, Ahmed Kayssi, Daryl Kucey
- 1400 - 1415: **Assessing aspirin and ticagrelor sensitivity in peripheral arterial disease patients using PFA-200 and light transmission aggregometry**
Hamzah Khan, Reid Gallant, Shubha Jain, Abdelrahman Zamzam, Sherri Afxentiou, Heyu Ni, Mohammed Al-Omran, Margaret Rand, Mohammad Qadura



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- 1415 – 1430: **Long term outcomes of endovascular arteriovenous graft salvage**
Monica Abdelmasih, Naomi Eisenberg, Graham Roche-Nagle
- 1430 – 1445: **Development of a planning method for fenestrated endovascular aneurysm repair**
Sean A. Crawford, Helen Genis, Matthew G. Doyle, Thomas F. Lindsay, Cristina H. Amon, Thomas L. Forbes
- 1445 – 1500: **Factors influencing participation of surgeon educators in undergraduate medical education**
Sneha Raju, Christine Moon, George Christakis
- 1500 - 1530: Refreshment Break
- 1530 - 1545: Researcher's Forum
- Data linkage to advance vascular care**

Charles de Mestral
Division of Vascular Surgery, St. Michael's Hospital
Assistant Professor, Department of Surgery, University of Toronto
- 1545 - 1633: **Rapid Fire Presentations** (5 minute presentations, 3 minutes questions)
Moderator: Dr. Thomas Forbes (Division Head, University Health Network)
- 1545 – 1553: **#DiabeticFoot**
Brandon Van Asseldonk, Mohammed Firdouse, Ahmed Kayssi
- 1553 – 1601: **COMPASS for vascular surgeons: A practical approach**
Mohamad A Hussain, Mark Wheatcroft, Patrice Nault, Thomas F. Lindsay, Deepak L. Bhatt, Sonia S. Anand, Subodh Verma, Mohammed Al-Omran
- 1601 – 1609: **Renal hemodynamic changes post-fenestrated endovascular aneurysm repair**
WC Patrick Lin, Matthew G. Doyle, Cristina H. Amon, Thomas L. Forbes



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1609 – 1617: Development of an infrared imaging catheter for guidance of complex endovascular interventions

Patrick Z. McVeigh, Brian C. Wilson, Graham Roche-Nagle, Mark Wheatcroft

1617 – 1625: Pan-Canadian survey of the indications for home care nursing following major vascular surgery

Jean Jacob-Brassard, Mohammed Al-Omran, Konrad Salata, Mohamad Hussain, Ahmed Kayssi, Graham Roche-Nagle, Charles de Mestral

1625 – 1633: Analysis of abdominal aortic aneurysm videos on YouTube

Mohammed Firdouse, Brandon Van Asseldonk, Mark Wheatcroft

1635: Awards Presentation

Best Presentation by a Junior Resident (PGY1 & 2)

Best Presentation by a Senior Resident or Fellow

Alumni Award for Best Presentation by a SSTP Resident

Adjournment

Previous Research Day Award Winners

	Best Presentation by a Junior Resident (PGY1 & 2)	Best Presentation by a Senior Resident or Fellow	Alumni Award for Best Presentation by a SSTP Resident
2015	Patrick McVeigh	Ahmed Kayssi	Mohamad Hussain
2016	Caleb Zavitz	Ahmed Kayssi	Trisha Roy
2017	Caleb Zavitz	Charles de Mestral	Konrad Salata
2018	Sneha Raju	Omer Abdulrahim	Sean Crawford

Previous Teaching Award Winners

	Most Outstanding Teacher – Resident or Fellow (as voted on by residents and fellows)	Most Outstanding Teacher – Faculty (as voted on by residents and fellows)
2016	Ahmed Kayssi	Andrew Dueck
2017	Charles de Mestral	Mark Wheatcroft
2018	Miranda Witheford	Thomas Lindsay



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0815 – 0945: Morning Session

Early and Late Population-Based Thoracoabdominal Aortic Aneurysm Outcomes Following Endovascular and Open Repair

Rodolfo V. Rocha, Maral Ouzounian, Mohammed Al-Omran, Peter C. Austin, Thomas L. Forbes, Douglas S. Lee, Thomas F. Lindsay

Divisions of Vascular Surgery, Cardiovascular Surgery & Cardiology, Peter Munk Cardiac Centre, University Health Network & Division of Vascular Surgery, St. Michael's Hospital

Objective: To evaluate in-hospital and long-term outcome of endovascular and open thoracoabdominal aortic aneurysm (TAAA) repair in Ontario.

Methods: Population-based study in Ontario, from 2006 – 2017, using a validated algorithm to accurately identify patients receiving endovascular or open TAAA. Primary endpoint was mortality. Secondary endpoints were a composite of mortality, permanent spinal cord injury, permanent dialysis, and stroke (TALE); the individual endpoints of the composite; disposition at discharge; hospital length of stay; myocardial infarction; and secondary procedures following discharge.

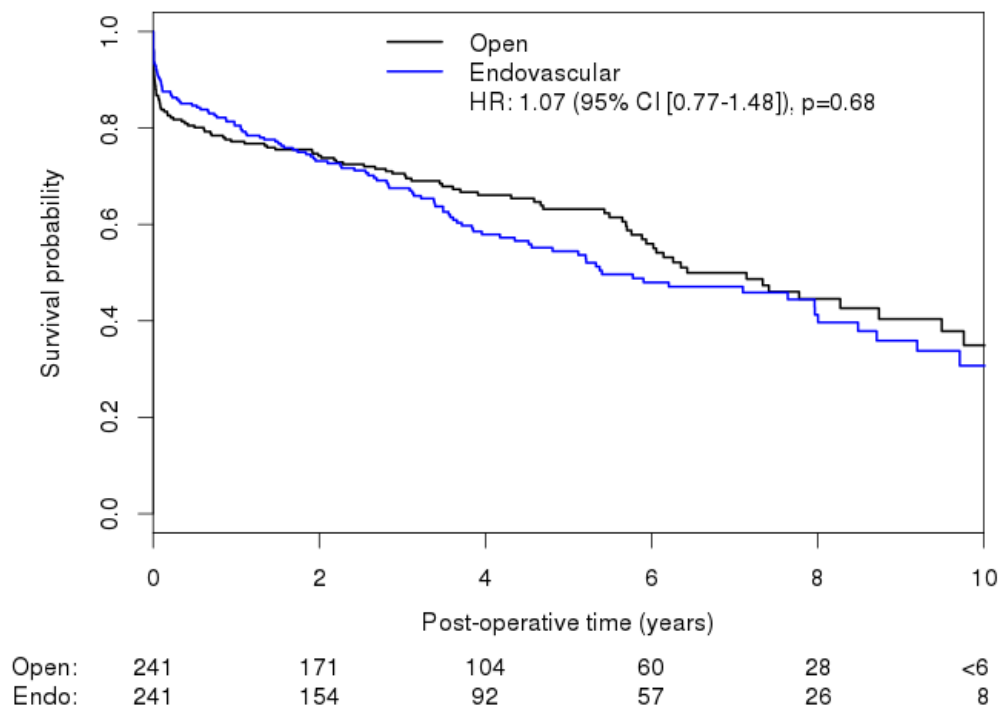
Results: 664 adults underwent surgical repair of a TAAA by Endovascular (n=303 (45.5%)) vs. Open (n=361 (54.5%)) approach. Propensity score matching resulted in 241 patient pairs with mean age of 70.1 ± 9.6 vs 69.4 ± 10.0 years for endovascular vs open repair, respectively (standardized mean difference: 0.07). Endovascular repair frequency increased during the study period and in the last 5 years comprised over 50% of repairs. In the matched sample, open repair was associated with a higher incidence of in-hospital death (17.4% vs 10.8%, $p=0.04$), TALE (26.1% vs 17.4%, $p=0.02$), discharge to rehabilitation facilities (18.7% vs 10.0%, $p=0.02$), and longer median length of stay (12 [7-21] vs 6 [3-13] days, $p<0.01$). Long-term mortality was not significantly different (HR:1.07 95%CI:0.77-1.48) (**Figure 1**), nor were the other secondary endpoints, with the exception of secondary procedures in the thoracoabdominal aorta or its branches, which was higher in the endovascular group (HR:2.64 95%CI:1.54-4.55). Among those undergoing endovascular vs open repair, 10-year survival was 30.7% vs. 34.9%, respectively ($p=0.62$).

Conclusion: Endovascular repair was associated with improved early mortality that diminished after one year and had a higher rate of secondary procedures. Long-term survival following TAAA repair was poor and independent of repair technique.



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Figure 1: Kaplan-Meier curves for survival following endovascular versus open thoracoabdominal aortic aneurysm repair following propensity score matching





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Status of Plasma N-Terminal Brain Natriuretic Peptide in Patients with Peripheral Arterial Disease and Critical Limb Ischemia

Bader Alsuwailam, Abdelrahman Zamzam, Mohammad Qadura
Division of Vascular Surgery, St. Michael's Hospital

Objective: N-terminal pro brain natriuretic peptide (NT-proBNP) is recognized as powerful predictor of cardiovascular outcomes in patients with coronary artery syndrome. Several studies demonstrated significant prevalence of coronary artery disease (CAD) in patients with critical limb ischemia (CLI). The aim of this study is to explore the association between serum levels of NT- proBNP and the severity of peripheral artery disease (PAD) in the absence of acute coronary syndrome (ACS).

Methods: A total of 457 participants were recruited and matched on the basis of their age, sex and cardiovascular risk factors. Patients were stratified on the basis of their clinical history, claudication distance, and ankle-brachial index into non-PAD, mild, moderate and severe PAD. Enzyme-linked immunosorbent assay was used to measure NT- proBNP.

Results: Severe PAD was associated with higher levels of NT-pro BNP in the absence of ACS (Mean 456.1, *P*-Value 0.043). A Kendall's tau-b correlation was run to determine the relationship between PAD severity and NT-proBNP plasma concentrations amongst 457 participants. There was a poor positive correlation between PAD severity and NT- proBNP plasma concentrations, which was statistically significant ($\tau_b = 0.123$, $p = 0.020$).

Conclusion: NT-pro BNP used to stratify CAD are elevated in patients with PAD and CLI in the absence of ACS. Our work demonstrated a direct correlation between NT-proBNP levels and severe PAD. This correlation may have future implications in further intensifying risk reduction therapy in this patient group and further cardiovascular risk stratification prior to vascular intervention.



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Optimizing Preoperative Cardiac Risk Stratification for Aortic Surgery

Caleb CJ Zavitz, Naomi Eisenberg, Graham Roche-Nagle
Division of Vascular Surgery, Peter Munk Cardiac Centre, University Health Network

Objectives: Despite aggressive risk factor modification and meticulous operative technique, perioperative cardiovascular complications dominate the morbidity and mortality of aortic surgery. Individual surgeons' preferences as well as various societal guidelines vary widely with respect to the ideal preoperative cardiac risk stratification scheme to minimize this. This study was designed to describe current preoperative cardiac risk stratification practice at a tertiary vascular centre, evaluate these schemes in real world practice, and propose an optimized approach.

Methods: We conducted a retrospective analysis of prospectively collected data from our Vascular Quality Initiative (VQI) database from 2010-2017. Open surgical abdominal aortic aneurysm repairs (OSRs) were queried, and adverse cardiac events (myocardial infarction, myocardial injury after noncardiac surgery (MINS), new arrhythmia, new CHF, or cardiovascular death) along with preoperative cardiac testing results were studied. A selective retrospective chart review was then conducted to investigate details not captured in the VQI database.

Results: 178 OSRs were identified, including 129 elective cases. The majority (62%) of elective patients had preoperative cardiac stress testing. 79% of these stress tests were negative, yet 33% of these patients (vs 48% of those with positive stress tests) experienced an adverse cardiac event. Upon further review, many patients who sustained unanticipated cardiac events had irreversible defects on their stress testing or untreated coronary disease on coronary angiography.

Conclusions: Preoperative cardiac risk stratification with stress testing was only modestly protective against adverse cardiac events undergoing open AAA repair. Alternative strategies including biomarker use or coronary angiography warrant further real-world investigation.



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A Systematic Review and Meta-Analysis of the Long-Term Outcomes of Endovascular versus Open Repair of Abdominal Aortic Aneurysm

Ben Li, Shawn Khan, Konrad Salata, Mohamad A. Hussain, Charles de Mestral, Elisa Greco, Badr A.

Aljabri, Thomas L. Forbes, Subodh Verma, MD, Mohammed Al-Omran

Divisions of Vascular Surgery, St. Michael's Hospital & Peter Munk Cardiac Centre, University Health Network

Objective: To synthesize the literature comparing the long-term (5-9 years) and very long-term (≥ 10 years) all-cause mortality, reintervention, and secondary rupture rates between endovascular aneurysm repair (EVAR) and open surgical repair (OSR) of abdominal aortic aneurysm (AAA).

Methods: MEDLINE, Embase, and CENTRAL were searched up to May 2018 for studies comparing EVAR to OSR with a minimum follow-up of 5 years. Study selection, data abstraction, and quality assessment were conducted by two reviewers, with a third author resolving discrepancies. Study quality was assessed using Cochrane and Newcastle-Ottawa scales. Pooled ORs with 95% CIs were calculated using random-effects models. Heterogeneity was quantified using the I^2 statistic and publication bias was assessed using funnel plots.

Results: Our search yielded 3,431 articles. 3 RCTs and 68 observational studies comparing 151,092 EVAR to 148,692 OSR patients were included. Inter-rater agreement was excellent for screening ($\kappa=0.78$) and full-text review ($\kappa=0.89$). Risk of bias was low to moderate. EVAR was associated with higher long-term all-cause mortality (OR 1.19, 95% CI 1.06-1.33, $p=.003$, $I^2=91\%$), reintervention (OR 2.12, 95% CI 1.67-2.69, $p<.00001$, $I^2=96\%$), and secondary rupture rates (OR 4.84, 95% CI 2.63-8.89, $p<.00001$, $I^2=92\%$). In the very long-term, there was no mortality difference between groups, but EVAR was associated with more reinterventions (OR 2.47, 95% CI 1.71-3.57, $p<.00001$, $I^2=84\%$) and secondary ruptures (OR 8.10, 95% CI 1.01-64.99, $p=.05$). Sub-analysis of recent studies (last year of patient recruitment ≥ 2010) demonstrated no long-term mortality differences between groups.

Conclusions: EVAR is associated with higher long-term mortality, reintervention, and secondary rupture rates compared to OSR. In the very long-term, EVAR is also associated with more reinterventions and secondary ruptures. Notably, EVAR mortality has improved over time. Vigilant surveillance following EVAR is recommended.



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Lyve-1 Negative Bone Marrow-Derived Macrophages Participate in Aortic Aneurysm/Dissection

Angela Li, Rickvinder Besla, Emily Chen, Shaun Pacheco, Takuo Emoto, Marwan Althagafi, Myron Cybulksy, Clinton Robbins, John Byrne

Division of Vascular Surgery, Peter Munk Cardiac Centre, University Health Network

Objective: Lyve-1⁺ resident aortic macrophages independently self-renew, and are functionally distinct from bone marrow derived macrophages that are recruited during inflammation. We hypothesized that Lyve-1⁺ and Lyve-1⁻ macrophages differentially contribute to aortic aneurysm/dissection.

Methods: The contribution of Lyve-1 expression to aortic and cardiac macrophage populations was characterized using conditional depletion with *Lyve-1^{cre/+}Csf1^{fl/fl}* mice. Abdominal aortic aneurysms (AAA) were induced in mice by administering β -Aminopropionitrile monofumarate in drinking water and osmotic infusion of angiotensin II. In order to assess the importance of macrophages, we depleted monocytes and macrophages by infusion of anti- Colony Stimulating Factor 1 Receptor (CSF1R) neutralizing antibody. *Lyve-1^{cre/+}Csf1^{fl/fl}* mice and parabiosis was used to determine the contribution of monocyte-derived and resident macrophage populations, respectively. Aortas were analyzed using histology and flow cytometry.

Results: *Lyve-1^{cre/+}Csf1^{fl/fl}* mice had selective depletion of aortic and cardiac tissue resident macrophages ($P < 0.01$). AAA is associated with increased CD11b⁺ F4/80⁺ macrophages ($P < 0.0001$), and disease severity correlated with relative depletion of Lyve-1⁺ macrophages ($P < 0.05$). Parabionts with aneurysm had increased chimerism in aortic macrophages compared to naïve, suggesting contribution of circulating cells. Whilst anti-CSF1R neutralization protected against AAA, conditional depletion of Lyve-1 macrophages in *Lyve-1^{cre/+}Csf1^{fl/fl}* did not.

Conclusions: These data suggest that Lyve-1⁻ bone marrow-derived aortic macrophages drive abdominal aortic aneurysm/dissection.



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Performance Assessment of a Novel Steering Catheter for Crossing Peripheral Arterial Occlusions

Trisha L. Roy, Mohammad A. Tavallaei, James J. Zhou, Andrew D. Dueck, Graham Wright
Division of Vascular Surgery & Sunnybrook Research Institute, Sunnybrook Health Sciences Centre

Objective: Peripheral arterial percutaneous vascular interventions have high immediate technical failure rates (~20%). The most common mode of failure is the inability to cross lesions. The purpose of this study is to demonstrate the feasibility using a novel steering catheter (CathPilot) for crossing peripheral arterial chronic total occlusions (CTOs).

Methods: A prototype CathPilot device was manufactured (Figure 1). 3D-printed lesions were placed within an arterial phantom to simulate a CTO. 4 operators were blinded to the lesions and attempted to cross the lesion with a conventional guidewire and KMP catheter and with a guidewire/CathPilot. The crossing time was measured. Aluminum foil was mounted on the surface of another lesion, and users were asked to puncture as much of the lesion surface as possible within 5 minutes using a guidewire and conventional KMP, Oscor steering catheter, and the CathPilot catheter. The mean puncture force delivered was also measured and compared.

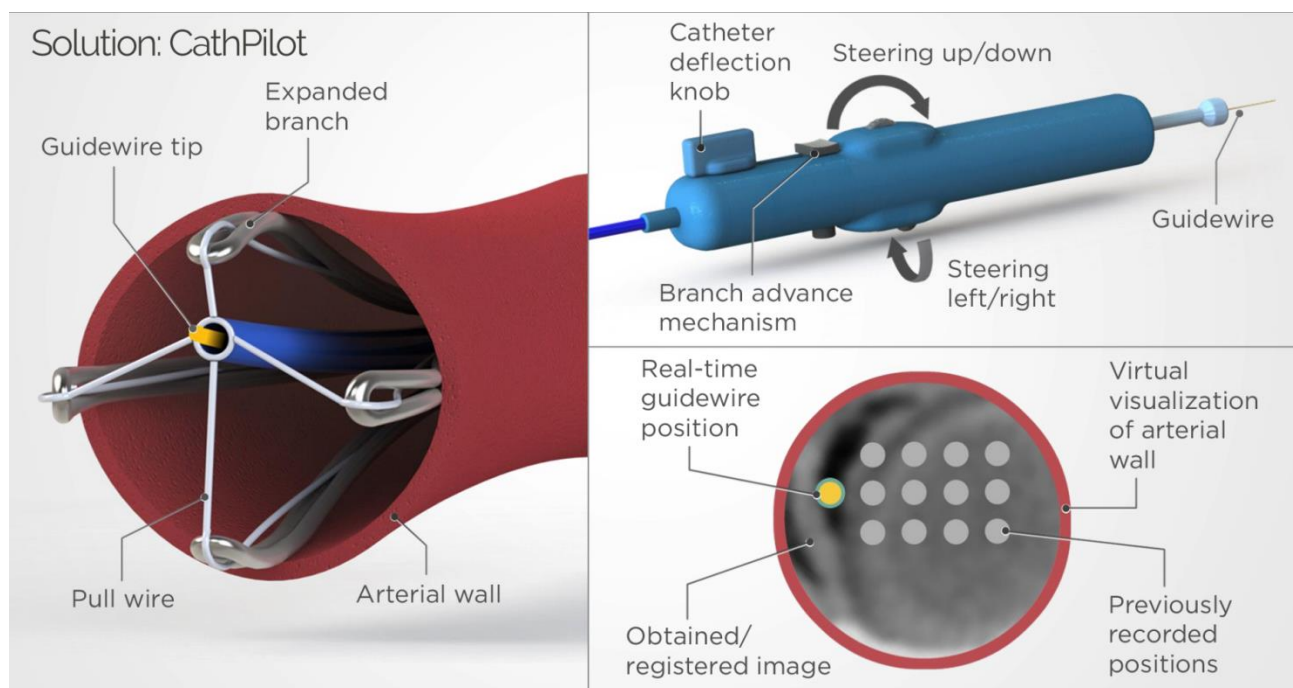
Results: Where users failed to cross lesions with a conventional approach (15-minute time limit), all users succeeded with the CathPilot in < 5 minutes. The CathPilot was effective at covering more of the surface of the lesion compared with KMP and Oscor catheters (Figure 2). The guidewire delivered on average 43.7 g of force with the CathPilot compared with 12.7 g with a KMP 16.9 g with the Oscor (Figure 2).

Conclusion: Crossing CTOs may be challenging due to the inability to effectively aim the guidewire tip and apply sufficient force to the lesion surface. The Cath-Pilot enables shorter crossing times with precise steering and can generate more puncture force compared with conventional catheters and currently commercially available steering catheters. Future work will determine if the CathPilot can be used to cross arterial lesions in-vivo.



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Figure 1: Cath-Pilot device specifications.





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1100 - 1115: **Researcher's Forum**

Kathryn L. Howe, MD, PhD, RPVI, FRCSC
Division of Vascular Surgery, Peter Munk Cardiac Centre, University Health
Network
Assistant Professor, Department of Surgery, University of Toronto

**Carotid Atherosclerotic Disease and Stroke Prevention: Identifying the Vulnerable
Plaque in the Lab and at the Bedside. A New Era with New Targets?**



Dr. Howe completed her PhD at McMaster University in the Molecular Immunology, Virology and Inflammation program. Her thesis focused on determining the mechanism behind the beneficial role of TGF-beta on enhancing intestinal epithelial barrier function and protection from EHEC O157:H7 infection. She went to medical school at the University of Toronto and completed a post-doctoral fellowship at Sick Kids, publishing in several fields during this time, including infection and immunity in HIV, ethics and sustainability in global surgery, and ischemia-reperfusion. She has been awarded competitive Canadian Institutes of Health Research Fellowships and National scholarships throughout her research career. As part of her Vascular Surgery residency (McMaster), Dr. Howe completed a 3-month clinical and research fellowship at Stanford University and established her own bench research program investigating the role of endothelial microRNA in vascular disease. Her clinical initiative is carotid revascularization and stroke prevention. While in the Leeper lab at Stanford, Dr. Howe became interested in the role of cellular communication within atherosclerotic plaques and efferocytosis ('clearance of the dead'), a process that is dysregulated in vulnerable lesions. Her research question *"Does endothelial activation lead to defective efferocytosis via altered microRNA secretion?"* will use *in vitro* and animal models, as well as human tissue from the McMaster University and Peter Munk Cardiac Centre BioBanks. Her ultimate goal is to find early regulators of atherosclerosis for development of innovative strategies for improved screening tools, risk assessment, and intervention in advance of devastating clinical events such as stroke and myocardial infarction.



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1115 - 1200: Surgeon-Scientist Training Program Forum

Comprehensive Capture in Endovascular Surgery: Development of the Endovascular Operating Room Black Box

Lauren Gordon, Bart Doyen, Mark Wheatcroft, Charles de Mestral, Teodor P. Grantcharov, I van Herzele

Divisions of Vascular Surgery & General Surgery, St. Michael's Hospital

Objective: Comprehensive capture in the operating room can improve our understanding of operative performance, processes and culture. In endovascular surgery, how these factors vary over a case are poorly understood. This objective of this study is to catalogue distractions, non-technical skills, technical skills and radiation safety behaviours in common endovascular procedures. This can inform patient and staff safety, efficiency, and education initiatives.

Methods: A modified OR Black Box system was installed in the hybrid angiosuite in Ghent, Belgium, equipped with a Philips Allura Xper FD20 system. Surgeons, nurses and anesthesiologists attended information sessions where informed consent was obtained. Endovascular cases are analysed for distractions, non-technical skills, technical skills and radiation safety behaviours using previously validated frameworks. Technical skills and radiation safety behaviours will be coded both through a global rating scale and with time-based analysis by two independent raters. Feasibility, reliability and validity will be assessed.

Results: 20 patients undergoing interventions for iliac and femoropopliteal atherosclerotic disease were recruited for the pilot study. Four cameras and three ceiling microphones were used to capture team behaviours and activity in the angiosuite. A connection with the C-arm system captures fluoroscopy images and radiation safety parameters. Data collection has completed, and data analysis is in progress. Technical rating scales are currently in development.

Conclusion: To our knowledge, this is the first integrated comprehensive capture system to be installed in a hybrid angiosuite. This research will identify common patterns of distractions, non-technical skills, technical skills and radiation safety behaviours and how they vary throughout endovascular cases. With the knowledge we gain from this study, we have the potential to improve resident education, staff safety and patient outcomes.



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Short-Term Outcomes of Combined Neuraxial and General Anaesthesia versus General Anaesthesia Alone for Elective open Abdominal Aortic Aneurysm Repair: A Population-Based Cohort Study

Konrad Salata, Faraj Abdallah, Mohamad A. Hussain, Charles de Mestral, Elisa Greco, Badr A. Aljabri, Muhammad Mamdani, C. David Mazer, Thomas L. Forbes, Subodh Verma, Mohammed Al-Omran
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Objective: Evidence for the use of neuraxial anaesthesia in the context of open abdominal aortic aneurysm repair (AAA) is sparse. The purpose of this study was to determine the 90-day outcomes of patients receiving combined general and neuraxial anesthesia (cGNA) versus general anaesthesia (GA) alone following elective open AAA repair.

Methods: A retrospective population-based cohort study was conducted using Ontario administrative data from 2003 to 2016. Open AAA patients with cGNA versus GA were identified using diagnostic, procedure and billing codes. Inverse probability of treatment weighted regression models were used to assess differences in 90-day mortality, major adverse cardiovascular events (MACE), acute kidney injury (AKI), dialysis, limb complications, respiratory failure, mechanical ventilation days, intensive care unit (ICU) and hospital lengths of stay, and discharge home.

Results: A total of 10,477 elective open AAA repairs were identified, with 9,003 (85%) cGNA and 1,444 (14%) GA patients. The cGNA group had significantly lower hazards for all-cause mortality (HR 0.47, 95% CI 0.37, 0.61, $p < 0.001$), MACE (HR 0.72, 95% CI 0.60, 0.86, $p < 0.001$) and stroke (HR 0.54, 95% CI 0.31, 0.96, $p = 0.04$). Furthermore, cGNA patients were at lower odds for AKI (OR 0.66, 95% CI 0.49, 0.89, $p = 0.006$), respiratory failure (OR 0.41, 95% CI 0.36, 0.47, $p < 0.001$), and limb complications (OR 0.30, 95% CI 0.25, 0.37, $p < 0.001$), with significantly higher odds to be discharged home (OR 1.32, 95% CI 1.15, 1.51, $p < 0.001$). Finally, cGNA was also associated with significant mechanical ventilation, and ICU and hospital stay benefits.

Conclusions: Open AAA repair with cGNA patients is associated with reduced risk of 90-day mortality, MACE, stroke, AKI, dialysis, respiratory failure, limb complications, shorter mechanical ventilation time, ICU and hospital lengths of stay, as well as higher likelihood for discharge home. NA should be considered as an adjunct to GA in open AAA repairs.



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The Development and Validation of a Simulated Competency Assessment in Diabetic Wound Management

Omar Selim, Andrew Dueck, Catharine M Walsh, Ryan Brydges, Allan Okrainec
Divisions of Vascular Surgery, Sunnybrook Health Sciences Centre & Division of General Surgery, University Health Network

Objective: Diabetic foot wounds comprise a third of diabetes-related healthcare expenditures, and are the primary cause of amputation in Canada. Few studies focus on how to teach or assess wound management. Given the importance of ‘assessment for learning’ in Competency by Design, we aimed to develop and validate a simulated competency assessment for use on junior trainees.

Methods: We organized our assessment development and validation process using Kane’s validity framework. The Nominal Group Technique was used to build consensus amongst 9 Canadian experts in diabetic wound management on the assessment tool and 2 testing scenarios. Commercially available wound simulators were modified to fit these scenarios. Validity evidence was built by assessing 74 clinician participants’ (61 physicians, 13 non-physicians) performance on the scenarios: 44 novices (< 50 cases), 17 intermediates (50 - 500) and 13 experts (> 500). Two assessors independently rated participants using the assessment tool. Overall reliability was evaluated using Generalizability Theory. Internal consistency was measured using Cronbach’s Alpha. Test-retest reliability and inter-rater reliability were calculated using Intra-class Correlation Coefficients [ICC]. Scoring differences between experience groups were evaluated using ANOVA.

Results: Using the performance data collected, we were able to show that our assessment exhibits high internal consistency (Alpha=0.953). Test-retest reliability was also excellent – ICC=0.943 for single measures and ICC=0.971 for average measures. Pooled inter-rater reliability was fair for single measures with ICC=0.705 and good for average measures ICC=0.827. The tool differentiated between novices and the other two groups well ($p<0.01$) but not between intermediates and experts ($p=0.339$). Our Generalizability coefficient was 0.871 and our Phi coefficient was 0.866 indicating very good reliability overall.

Conclusion: The accumulated validity evidence suggests competency assessment can be used to assess junior physicians’ competence in diabetic wound management during simulated cases.



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1330 - 1500: Afternoon Session

Comparison of Incidental and Symptomatic Penetrating Aortic Ulcers and Associated Outcomes through a Retrospective Analysis

Jason Koppert, Naomi Eisenberg, Maral Ouzounian, Jacob Udell, Kong Teng Tan, John Byrne
Division of Vascular Surgery, Peter Munk Cardiac Centre, University Health Network

Objective: To compare the clinical courses of incidental and symptomatic PAUs. Understanding differences between the populations may contribute to better management of incidentally found PAUs.

Methods: UHN patient records were queried for 'PAU' diagnoses and synonymous terms using Montage radiology software. CT or MRI scans of PAUs were analyzed and measured for individual patients and charts were also reviewed.

Results: A total of 389 patients with 545 PAUs were identified in the UHN population. Average age was 74 ± 9.5 years. There were 341 patients in our review with follow up data. Of these patients, 131 (38.4%) presented with symptoms of acute aortic syndrome and 210 (61.5%) patients were incidental findings and asymptomatic. Surgery as a treatment, occurred in 32 (24.4%) of the symptomatic and 22 (10.4%) of incidental patients. Median survival was similar in incidental and symptomatic patient groups at 97 and 101 months respectively ($p=0.16$). A total of 9 patients died due to aortic complications: 5 patients (2.3%) in the symptomatic group and 4 patients (3.1%) in the incidental group. In our population, 132 patients (34%) also had current or prior malignancy.

Conclusions: The population of patients presenting with a PAU represents a highly comorbid population with many patients succumbing to illnesses other than their PAUs. A large portion, 28% (109), were deceased from pathologies other than PAU. In our population, incidentally diagnosed patients had a median survival similar to those presenting with PAU as an Acute Aortic Syndrome. Our population also had an unexpectedly high rate of current or prior malignancy.



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Local and Regional Management Variation after Acute Type B Aortic Dissection Accompanies Regional Disparities in Post Dissection Mortality in Ontario

Miranda Witheford, Limei Zhou, Joan Porter, Douglas S. Lee, Ahmed Kayssi, Daryl Kucey
Division of Vascular Surgery, Sunnybrook Health Sciences

Objective: To assess current regional treatment paradigms for acute Type B Aortic Dissection (TBAD) in Ontario and gauge the impact of changes to surgical strategies on patient mortality after TBAD.

Methods: A population-based retrospective cohort study utilizing Ontario administrative databases was performed on patients presenting with acute TBAD between 2005 and 2016. Regional variation was assessed across Local Health Integration Networks (LHIN), the health authorities responsible for regionalization of healthcare in Ontario. Patient demographics, specific hospital and LHIN practices regarding medical, surgical intervention, and patient outcomes were compared. Management strategies were assessed against in-hospital and follow-up mortality up to 11 years post diagnosis.

Results: The cohort of acute TBAD patients totalled 2068. While long-term medical therapy typified TBAD management in Ontario (90%), the incidence of surgery during index admission for TBAD was more prevalent in urban areas (5.1% vs 2.5%; $p < 0.01$). Surgery after medical failure was more common among rural Ontarians (7.2% vs 4.1%; $p < 0.01$). Treatment strategies varied significantly depending on hospital type, with surgery during index admission offered more commonly in teaching hospitals ($p < 0.01$). Significant differences in the number of index TBAD presentations between LHINs were observed, however, the percentage of patients treated surgically at any time of follow-up was equivalent. In-hospital mortality varied from 11.4% to 32.5%, demonstrating significant variation by LHIN ($p < 0.05$). Patient 30-day mortality ranged from 17.1% to 42.5% with significant inter-LHIN variability, and differences in mortality over the entire follow-up period ($p < 0.05$).

Conclusions: Variation in the management strategy of acute TBAD on the basis of patient location and treating hospital was observed across Ontario, with mortality post-diagnosis varying significantly based on LHIN. These results suggest that mortality after acute TBAD is multifactorial. Access to optimal initial care and diagnosis, in-hospital management, and ongoing access to specialised follow-up care are paramount to achieving favourable long-term outcomes.



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Assessing Aspirin and Ticagrelor Sensitivity in Peripheral Arterial Disease Patients using PFA-200 and Light Transmission Aggregometry

Hamzah Khan, Reid Gallant, Shubha Jain, Abdelrahman Zamzam, Sherri Afxentiou, Heyu Ni, Mohammed Al-Omran, Margaret Rand, Mohammad Qadura
Division of Vascular Surgery, St. Michael's Hospital

Objective: Aspirin (ASA) is a commonly prescribed antiplatelet medication, however 25-60% of PAD patients have a lower than normal ability to inhibit platelet aggregation after standard dosing, giving physicians the false assumption that their patients are receiving best medical management. Platelet Function Analyzer (PFA-200) is a platelet test in which blood is aspirated through an active biological membrane and clotting time is determined. Light Transmittance Aggregometry (LTA) is the gold standard for platelet activity, where light transmittance is compared between platelet rich and platelet poor plasma. We evaluated PFA-200 for its ability to detect a patient's response to antiplatelet therapy, using LTA as gold standard. We hope to create a methodology that can personalize patient's antiplatelet therapy, providing patients with the best medical management.

Methods: In this case control study, 36 patients, PAD (ABI <0.9) and non-PAD controls (ABI = 0.9-1.2) were recruited to this study. Patients were stratified into the following groups: PAD on ASA (n=20), PAD not on ASA (n=5), non-PAD on ASA (n=4), and non-PAD not on ASA (n=7). For each patient sample, ASA response was analyzed by PFA-200 and validated with LTA. A clotting time of >162s for PFA and light transmittance of > 20% indicated a patient "non-responsive to antiplatelet therapy".

Results: Using PFA-200 and after validation via LTA, we found that 67% of PAD patients taking ASA, and 30% of non-PAD taking ASA had activated platelets despite antiplatelet therapy; however, 94% of patients were responsive to Ticagrelor. As expected, 100% of patients within the PAD not on ASA and non-PAD not on ASA groups had normal activated platelet responses.

Conclusions: Our data suggests that PFA-200 can be used to detect ASA insensitivity. Assessing platelet activation via PFA-200 and LTA methodology can be used to personalize antiplatelet therapy for peripheral arterial disease patients in order to provide the best medical management to PAD patients. We are currently investigating the reasons for why patients may not be responding to their aspirin such as compliance, dosage, absorption, and epigenetics in our lab.



University of Toronto Division of Vascular Surgery

Long Term Outcomes of Endovascular Arteriovenous Graft Salvage

Monica Abdelmasih, Naomi Eisenberg, Graham Roche-Nagle

Division of Vascular Surgery, Peter Munk Cardiac Centre, University Health Network

Objectives: Annually, a significant number of arteriovenous grafts fail acutely, often leading to disruption of dialysis schedules, hospitalization, intervention or need for alternative access creation, and increase in healthcare costs. Most commonly, failure is due to thrombosis secondary to a stenotic lesion or physiological causes such as hypotension or dehydration, requiring pharmaceutical or mechanical declotting. While immediate technical success rates of these endovascular salvage procedures are high, less is known about their long-term lifespan. The goal of this study is to examine the modalities, targets, and long-term outcomes, including patency, following endovascular declotting of arteriovenous grafts.

Methods: This is a retrospective cohort study involving all patients with end-stage renal disease who underwent declotting (thrombolysis and/or thrombectomy) of an arteriovenous graft at Toronto General Hospital between April 2005 and June 2015, with follow up until June 2017. The main outcomes of interest are primary, primary assisted and secondary patency as well as access survival at the end of follow up.

Results: 85 patients (51.8% male, 48.2% female) with 91 arteriovenous grafts (58% loop, 36% straight, 47% upper arm, and 48% forearm) underwent 172 declotting salvage attempts within the study period. Patient comorbidities included hypertension (66%), diabetes (39%), and peripheral vascular disease (3.5%). An anatomic cause of dysfunction (stenosis) was found on angiography in 74% of salvage attempts. The most commonly treated sites were the venous anastomosis (43%) and outflow vein (30%). Angioplasty was performed in 80% of cases. 6% (N = 10/172) of declotting salvage attempts were unsuccessful at the time of the procedure. Access survival until the end of follow up in June 2017 was 20% (N = 18/91).

Conclusions: 94% of endovascular declotting attempts were technically successful, although 41% of patients (N = 35/85) required multiple salvage attempts during the study period. Overall, 20% of arteriovenous grafts survived until the end of follow up.



University of Toronto Division of Vascular Surgery

Development of a Planning Method for Fenestrated Endovascular Aneurysm Repair

Sean A. Crawford, Helen Genis, Matthew G. Doyle, Thomas F. Lindsay, Cristina H. Amon & Thomas L. Forbes

Division of Vascular Surgery, Peter Munk Cardiac Centre, University Health Network & Institute of Biomaterials and Biomedical Engineering & Department of Mechanical and Industrial Engineering, University of Toronto

Objective: To create a stent graft planning tool that incorporates the aortoiliac deformation caused by the delivery system in order to reduce the occurrence of fenestration misalignment.

Methods: Clinical data for 38 advanced endovascular procedures was obtained from a prospectively maintained clinical database. Vascular deformation in response to the delivery system was modeled using the finite element solver LS-DYNA. A custom algorithm then determines the relative fenestration positions through a simulated stent graft expansion within the deformed geometry. The angle and vertical positions of the fenestrations in the simulated stent graft plans was then compared with the original clinical plans.

Results: The mean discrepancy between the simulated and actual delivery system positions was 2.8 ± 0.3 mm. Sixty-one percent of the simulated plans had at least one fenestration that was at least 15° or 4 mm different from the clinical plan. When compared to the original clinical plans, patients with discrepant plans had a median angle difference of 0° [0 - 45°], 7.5° [0- 30°], 7.5° [0- 30°], and 15° [0- 52°] for the celiac, superior mesenteric, left renal, and right renal arteries respectively. The median differences in the vertical positions of the fenestrations were 2.5 mm [0-7.2 mm], 2.4 mm [0.2-13.2 mm], and 3.2 mm [1.4-13 mm] for the celiac, left renal, and right renal arteries. Patients with discrepant stent graft plans had longer lengths of hospital stay, 8.5 vs 2.8 days ($P < 0.001$), and had a trend towards an increased incidence of severe complications, 22% (N=5) vs 0% (N=0; $P = 0.06$).

Conclusion: One of the factors contributing to complications in advanced endovascular aneurysm repair is fenestration misalignment. This study proposes an objective method for fenestrated stent graft planning that could help minimize fenestration misalignment by incorporating the intraoperative deformation of the arterial tree and the simulated position of the device within the aorta.



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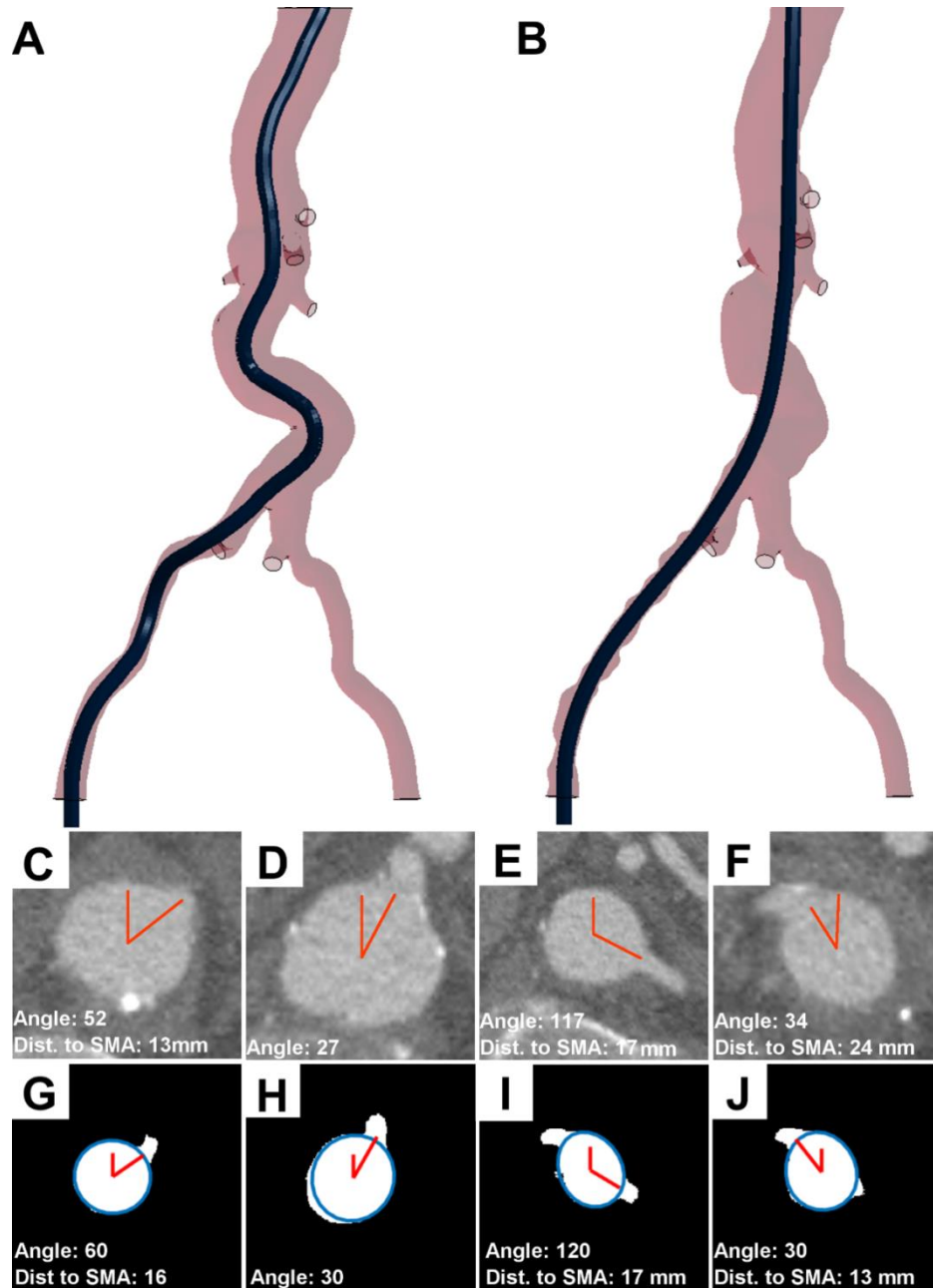


Figure 1. (A) Initial deformation of the delivery system to the aortic centerline. (B) Position of the delivery system and aortoiliac deformation post-simulation. (C-F) Fenestration position based on preoperative vessel centerline and (G-J) based on the deformed geometry and simulated deployment for the celiac, superior mesenteric, left renal and right renal arteries respectively.



University of Toronto Division of Vascular Surgery

Factors Influencing Participation of Surgeon Educators in Undergraduate Medical Education

Sneha Raju, Christine Moon, George Christakis

Division of Vascular Surgery, University of Toronto & Division of Cardiac Surgery, Sunnybrook Health Sciences Centre

Objectives: Surgeon educators are underrepresented in Undergraduate Medical Education (UME) due to a multitude of reasons. We hope to improve the current compensation model at the University of Toronto in order to adequately recognize, reward and increase surgeon educators. The purpose of this study was to investigate teaching roles available to surgeons, and to create a system for tracking and adequately recognize surgeon involvement in UME. Further, we evaluated obstacles preventing surgeon involvement in UME.

Methods: A comprehensive review of all possible roles surgeons may take in UME was assembled. 49 individuals were invited to participate. In the Delphi study, participants were asked to evaluate each teaching role on the amount of effort needed per hour of the activity via two surveys and an in-person meeting. Results were analyzed using descriptive statistics, and Cronbach's alpha values were used to determine if consensus was reached.

Results: Twenty-five participants, including physicians, residents and medical students, completed the study. A comprehensive list of possible roles for Surgeon educators was produced, with input from the Delphi committee. In the Delphi Study, consensus for effort scores was reached on almost all values, with most teaching activities falling between "moderate effort" and "most effort" to teach per hour (Table 1). Thematic analysis of surgeon interviews outlined important concepts with regard to teaching duties, need for a culture change, and recognition for teaching responsibilities.

Conclusion: Surgeon teaching is crucial in UME, however it is undervalued and not tracked, leading to underrepresentation of surgeon educators. We hoped to increase surgeon involvement by designing a way to better track and recognize surgeon involvement in UME. The "effort score" we developed to objectively and transparently qualify teaching was able to determine the relative effort needed for each teaching activity in UME at the University of Toronto. Combining the effort score and time committed to each teaching activity will produce a cumulative teaching score for each instructor.



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Position	Effort Score (weighted average from Delphi)
Committee Chair	4.80
Committee Member	3.41
Curriculum Development and Review Member	4.13
Faculty Development, Organizer	4.00
Faculty Development	3.85
Reference Letter-Writer	3.05
Surgery Preclerkship Director	4.47
Surgery Clerkship Director	4.53
Surgery Evaluation Director	4.36
Division Director	4.12
Site Director	3.88
Surgical Lead in Undergraduate Education (SLUE)	3.63
Site Coordinator, Site Specific, Preclerkship	4.00
Grader, Preclerkship	2.91
Instructor Recruiter, Preclerkship	3.42
OSCE Coordinator, Preclerkship	3.85
Administrative Preceptor / Clerk Director	3.83
Course Director	4.55
Seminar/PBL/CBL Preparation	3.23
Tutor/Seminar Leader/PBL Leader/CBL Leader	3.15
Lecture Preparation	3.35
Lecturer	3.07
Clinical Preceptor	3.02
I/OSCE examiner	3.06
Standardized patient trainer	3.13
Research mentor	3.53

Table 1. Effort Scores as determined by the Delphi Council, per hour of undergraduate teaching activity



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1530 - 1545: Researcher's Forum

Charles de Mestral, MD, PhD, FRCSC
Division of Vascular Surgery, St. Michael's Hospital
Assistant Professor, Department of Surgery, University of Toronto

Data Linkage to Advance Vascular Care



Dr. de Mestral is a vascular surgeon at St. Michael's Hospital and a Surgeon-Scientist in the Department of Surgery of the University of Toronto. He is a graduate of the McGill University Faculty of Medicine followed by General Surgery and Vascular Surgery training at the University of Toronto. During his general surgery residency, he obtained a PhD in health services research and economic evaluation. Dr. de Mestral is an Adjunct Scientist with the Institute for Clinical Evaluative Sciences, an Assistant Professor with the Institute for Health Policy, Management & Evaluation and, a Scientist in the Li Ka Shing Knowledge Institute of St. Michael's Hospital. He conducts research on clinical effectiveness as well as the provision, quality and cost of surgical care.



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1545 – 1633: Rapid Fire Presentations

#DiabeticFoot

Brandon Van Asseldonk, Firdouse Mohammed, Ahmed Kayssi
Division of Vascular Surgery, Sunnybrook Health Sciences Centre

Objective: Social media has seen a rapid increase in its use by health care professionals for collaboration, advocacy and dissemination of information. Diabetes is a chronic disease with an increasing prevalence and a significant lifetime risk of foot infection. This study reviews the temporal use of a popular twitter hashtag pertaining to diabetic foot infections with the aim to increase practitioner and patient awareness.

Methods: A retrospective search for all Twitter tweets containing the hashtag #DiabeticFoot was conducted from July 2nd 2013 to March 2nd 2019 using Symplur Signals. Symplur (<https://www.symplur.com/>) is a paid, publicly available health care analysis tool that aggregates data from Twitter tweets.











Results: There were a total of 12 640 tweets, 6214 retweets, and 3945 users. There was a steady increase in the number of tweets that contained the hashtag #DiabeticFoot ($R^2 = 0.31$, $p < 0.0001$). The vast majority (72.3%) of users contributed only 1 tweet and declining numbers created 2 or more tweets. A notable expectation is the 3.6% of users who authored 10 or more tweets. Within the 280 character tweets, “ulcers”, “care”, “uncontrolled” and “causing” made up the top ranking words. Table 1 shows twitter influencers based on a Symplur algorithm rank, consisting of vascular surgeons, podiatrists and diabetes societies.

Conclusion: Awareness of diabetic foot infections on twitter continues to grow, with vascular surgeons, podiatrists, and diabetes societies playing an important role. The negative impact of diabetic foot infections is reflected in the tweet content. Vascular surgeons have an opportunity to lead on important health issues in the online community.



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Table 1: Top 10 #DiabeticFoot Twitter influencers according to SymplurRank

Rank	SymplurRank	Thumbnail	Username	Name	Description	Followers	Location
1	94.1		@dgarmstrong	David G. Armstrong	Dedicated to amputation prevention, wound healing, diabetic foot, biotechnology and the intersection between medical devices and consumer electronics.	8,236	Los Angeles, California
2	85.7		@jmills1955	Joseph L. Mills MD	Vascular & Endovascular Surgery; Diabetic foot; Angioplasty; Leg bypass; AAA; Carotid disease/stroke; Health Care; Science; Evolution ~ Tweets often my opinions	3,793	Houston, TX
3	83		@diabeticfoot1	Giacomo Clerici	dedicated to diabetic foot care, new technologies & limb salvage	4,458	
4	82.7		@apma	APMA	Your official source for foot health tips and information from today's podiatrist.	38,247	Bethesda, Maryland
5	82.1		@BCM_Surgery	BCM_Surgery	The official Twitter account for the Michael E. DeBakey Department of Surgery at Baylor College of Medicine. For more information call 713-798-8070.	1,720	Houston, Texas
6	81.6		@DiabeticFootCa	Diabetic Foot Canada	Diabetic Foot Canada is a division of Wounds Canada focused on benefiting patients with diabetic foot problems and amputation prevention	2,084	Canada
7	81.5		@VascularSVS	Vascular SVS	The Society for Vascular Surgery® (SVS) is a not-for-profit professional medical society, composed primarily of vascular surgeons.	2,745	Chicago, IL
8	80.7		@monteromiguel	Miguel Montero-Baker	Assoc Prof of Vascular and Endovascular Surgery - Baylor College of Medicine. Chairman of Endovascular Latinamerica (HENDOLAT)	708	Houston, TX
9	80.7		@diabetesuk	Diabetes UK	We are the UK's leading diabetes charity. Our vision is to build a world where diabetes can do no harm. Tweets answered between 9-5pm Mon-Fri	159,188	UK
10	80.6		@ahmedkayssi	Ahmed Kayssi	Vascular surgeon and wound care physician at the University of Toronto. Passionate about limb preservation and indigenous health. Comments/tweets are my own.	1,577	Toronto, Ontario



University of Toronto Division of Vascular Surgery

COMPASS for Vascular Surgeons: A Practical Approach

Mohamad A Hussain, Mark Wheatcroft, Patrice Nault, Thomas F. Lindsay, Deepak L. Bhatt, Sonia S. Anand, Subodh Verma, Mohammed Al-Omran

Divisions of Vascular Surgery, St. Michael's Hospital & Peter Munk Cardiac Centre, University Health Network

Objective: Antiplatelet therapy with aspirin or clopidogrel has traditionally been considered the standard treatment for risk reduction in peripheral artery disease (PAD); however, recent data from the COMPASS (Cardiovascular Outcomes for People Using Anticoagulation Strategies) trial have established low dose rivaroxaban plus aspirin as a new antithrombotic regimen for PAD. This objective of this study was to suggest a practical approach for the application of data from the COMPASS trial in patients with PAD.

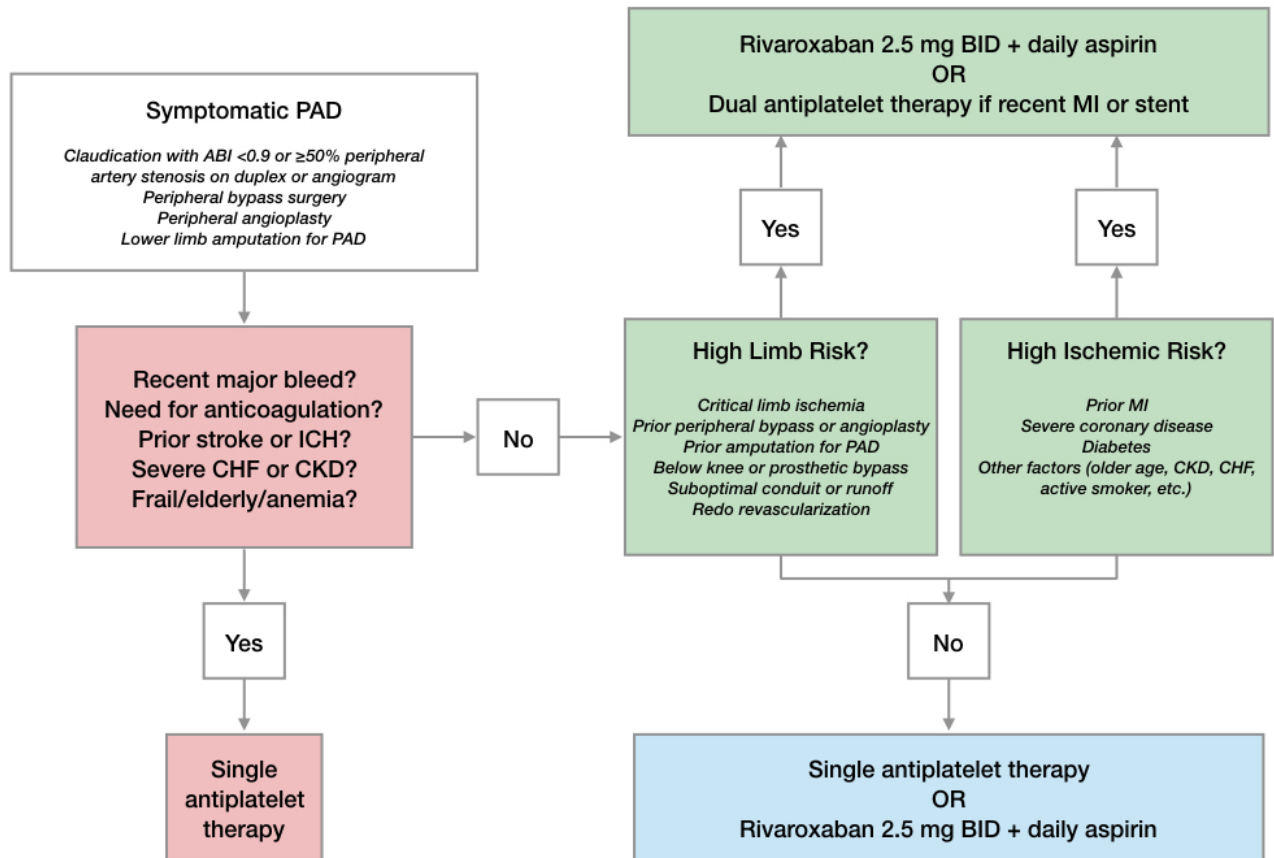
Methods and Results: In this case-based review, we summarize data from the COMPASS trial, and discuss important considerations when initiating this therapy in PAD patients. The COMPASS trial showed that low dose rivaroxaban 2.5 mg twice-daily plus daily aspirin was superior to aspirin alone in reducing major adverse cardiovascular and cerebrovascular events, and major adverse limb events (MALE) among patients with stable atherosclerotic vascular disease, including those with PAD. The risk for major bleeding, however, was higher with rivaroxaban plus aspirin. Critical limb ischemia at baseline (rest pain, ulcer, or gangrene), previous limb or foot amputation, or a history of peripheral revascularization surgery or stenting were independently associated with increased MALE events within the trial.

Conclusions: Intensification of antithrombotic therapy with low dose rivaroxaban plus aspirin should be considered in low-bleeding risk PAD patients who are at increased risk for ischemic and/or limb events. A practical approach for clinicians is presented to help incorporate COMPASS data into practice (**Figure**).



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Figure. Practical approach to application of COMPASS results for peripheral artery disease patients.





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Renal Hemodynamic Changes Post-Fenestrated Endovascular Aneurysm Repair

WC Patrick Lin, Matthew G, Doyle, Cristina H. Amon, Thomas L. Forbes

Division of Vascular Surgery, Peter Munk Cardiac Centre, University Health Network & Institute of Biomaterials and Biomedical Engineering & Department of Mechanical and Industrial Engineering, University of Toronto

Objective: Decreased renal function is not uncommon in AAA patients after receiving fenestrated endovascular aneurysm repair (FEVAR). It is unclear whether this is caused by reduction of blood flow in the renal arteries or via other physiological changes due to the presence of bridging stents. The objective of this study is to quantify renal artery hemodynamics before and after FEVAR.

Methods: Patient-specific geometries will be segmented from CT scans using VMTK and used to conduct computational fluid dynamics simulations in SimVascular. Literature-averaged cardiac flow rates with Womersley profiles will be imposed along with Windkessel outlet boundaries to provide physiologically realistic conditions. Windkessel parameters are established based on literature methods via estimation of flow rates and pressures at terminal branches by 0-D cascading of the arterial tree. Renal flow rates and pressures from simulation results will be used to correlate to glomerular filtration rate (GFR) and/or creatinine levels. In addition, physiological changes to the arterial tree will also be examined.

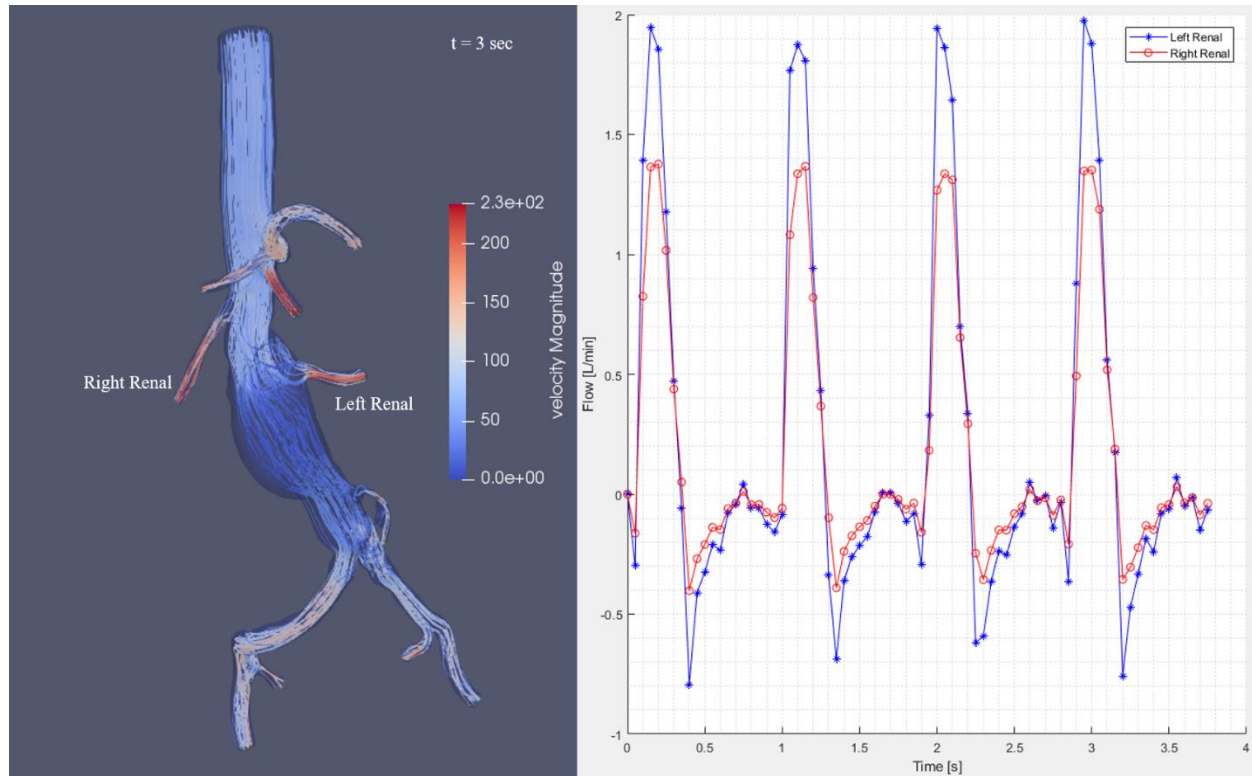
Results: Test cases are underway to establish a working simulation protocol. Velocity streamlines and renal flowrates for a preliminary pre-op patient test case using constant pressure outlets are shown in Fig. 1. Differing heights of the right and left renal arteries resulted in differing renal flow rates across the cardiac cycle. Velocity streamlines are shown at $t=3$ s near peak aortic flow.

Conclusions: Computational flow simulations may be able to shed light on causes of reduced GFR/creatinine levels in certain AAA patients. Whether the cause is predominantly hemodynamic in nature or physiologically related as a result of the stent graft remains to be seen. Segmentation, simulations, and data collection are currently ongoing.



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Figure 1: Velocities in right and left renal arteries prior to FEVAR





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Development of an Infrared Imaging Catheter for Guidance of Complex Endovascular Interventions

Patrick Z. McVeigh, Brian C. Wilson, Graham Roche-Nagle, Mark Wheatcroft

Divisions of Vascular Surgery, St. Michael's Hospital & Peter Munk Cardiac Centre, University Health Network & Department of Medical Biophysics, University of Toronto

Objective: To develop a platform for, and demonstrate the feasibility of, infrared scanning fiber angioscopy for the guidance of complex endovascular procedures in-vivo.

Methods: A theoretical optical framework for infrared imaging in blood was developed based on Mie scattering and used to design a prototype scanning fiber endoscope to provide monochrome imaging in the short-wave infrared (swIR). A prototype swIR scanning fiber endoscope was constructed and the optical performance characterized in blood-analogue optical phantoms. Proof-of-concept data was obtained using a fenestration identification task in a blood-analogue phantom.

Results: Optical imaging through blood with sufficient resolution for common endovascular tasks is feasible within several wavelength bands, with the window from (1550-1650nm) in the swIR providing the best balance of working distance and detection efficiency. Scanning fiber imaging is feasible over a distance of more than 10mm in air using this wavelength band and is primarily limited by detector noise at readout rates above 10MHz. This can be significantly improved by using avalanche-mode detection photodiodes with the trade-off of smaller active areas which necessitate better collection collimation. Imaging through water or blood phantom material is possible at a standoff distance of (0- 4mm), and is primarily limited by detector efficiency. This can be overcome by increased excitation power without significant local heating effects. The present working distance is still sufficient for fenestration identification with current advanced EVAR graft designs.

Conclusions: Scanning fiber angioscopy in the swIR wavelength region is feasible and allows the operator to "see through blood" over relevant working distances. A next generation detector design will facilitate even longer working distances and will enable *in-vivo* endovascular optical imaging without the need for proximal flow occlusion.



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Division of Vascular Surgery

Pan-Canadian Survey of the Indications for Home Care Nursing Following Major Vascular Surgery

Jean Jacob-Brassard, Mohammed Al-Omran, Konrad Salata, Mohamad Hussain, Ahmed Kayssi, Graham Roche-Nagle, Charles de Mestral

Divisions of Vascular Surgery, St. Michael's Hospital & Peter Munk Cardiac Centre, University Health Network & Sunnybrook Health Sciences Centre

Objective: Recent population-based data suggest that home care nursing is variably prescribed after vascular surgery and may reduce emergency department visits and hospital readmissions. We therefore sought to characterize the indications for home care nursing following major vascular surgery across Canada.

Methods: An online survey was distributed to the 141 members of the Canadian Society for Vascular Surgery with questions relating to home care nursing after carotid endarterectomy (CEA), endovascular aortic aneurysm repair (EVAR), open abdominal aortic aneurysm (AAA) repair and open or hybrid revascularization for peripheral arterial disease.

Results: There were 39 survey respondents (28%) from across the country (28% Ontario, 23% Prairie provinces, 18% British Columbia, 15% Québec, 15% Atlantic Canada). 64% of respondents (N=25 of 39) worked in a teaching hospital. Home care nursing was routinely prescribed by 5%, 8%, 31% and 38% of respondents following CEA, EVAR, Open AAA repair and revascularization respectively. Nearly all respondents reported no restrictions or standardized indications for home care nursing. Procedure-related criteria most often deemed to warrant a nursing care prescription were similar across surgery types: surgical site infection, wound complication (e.g. open wound, lymphatic leak), negative-pressure wound therapy, urinary catheter care. Across all procedure types, lack of social support, physical frailty and cognitive impairment were most frequently identified as patient-specific considerations for prescribing home care nursing. There were no evident region-specific response patterns.

Conclusions: Most polled Canadian vascular surgeons agree on the indications for home care nursing after vascular surgery however no standardized criteria influence their practice.



University of Toronto Division of Vascular Surgery

Analysis of Abdominal Aortic Aneurysm Videos on YouTube

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Objective: Use of YouTube™ has increased globally. The objectives of this study are to: 1) Perform a scoping review of YouTube™ on the topic of abdominal aortic aneurysms (AAA); and 2) Provide a summary of the AAA YouTube™ videos that are being accessed by vascular patients and surgical trainees.

Methods: A retrospective YouTube™ search was conducted on Chrome™ internet browser using the following terms: “Abdominal Aortic Aneurysm”, “Endovascular Aneurysm Repair”, “AAA Surgery”, and “AAA Repair”. All videos uploaded prior to December 18 2018 were analysed. Videos that were duplicate, not in English or not related to the topic (eg. thoracoabdominal and thoracic aneurysms, ascending arch aneurysms, Aortic dissections, miscellaneous) were excluded. Only videos pertinent to infrarenal abdominal aortic aneurysms were included in the final analysis.

Results: A total of 2367 videos were found in the initial search. 112 channels, 56 playlists, 100 user profiles and 923 videos were not related to the topic. Consequently, they were excluded. After removing 477 duplicates, a total of 699 videos were included in the final analysis. Majority of the videos were related to patient education (n=245, 35%), followed by lectures (n=174, 24.9%), surgical procedures (n=110, 15.7%), product demonstrations (n=103, 14.7%), and other (n=67, 9.6%). These videos were uploaded from 36 unique countries - majority being from the United States (n=331, 47.3%), followed by the United Kingdom (n=30, 4.3%), India (n=25, 3.5%), and others (n= 94, 13.4%). Country of upload was not available for 219 videos (31.3%). These videos were uploaded by commercial accounts (n=190, 27.2%), hospitals (n=173, 24.7%), physicians (n=101, 14.4%), scientific organizations (n=64, 9.1%) and others (n=171, 24.7%).

Conclusion: YouTube™ has a vast quantity of educational content on the topic of AAA for both patients and surgical trainees. However, YouTube™ users should be cautious about inaccurate or misleading videos.