



**Canadian Society for Vascular Surgery  
La Société canadienne de chirurgie vasculaire**



**32<sup>ND</sup> ANNUAL MEETING ON VASCULAR SURGERY**

SEPTEMBER 24-25 2010  
FAIRMONT WATERFRONT HOTEL  
VANCOUVER, BC

**FINAL PROGRAM**

## CSVS EXECUTIVE COMMITTEE

President - Dr. Don McCarville  
President Elect -Dr. Jerry Chen  
Past President -Dr. Oren Steinmetz  
Past Past President - Dr. Daryl Kucey  
Secretary - Dr. Gerrit Winkelaar  
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Program Committee Chair 2009 - Dr. Andrew Dueck  
Local Arrangements Chair 2009 - Dr. Keith Baxter

### Previous Executive Committees for the CSVS Annual Meetings

1979	President Allan Downs Secretary Wayne Johnston Treasurer John Provan Program Chairman Walter Waddell	1987	President Fernand Laurendeau Secretary Michael Ameli Treasurer Charles Lye Program Chairman Jean Lassonde
1980	President Allan Downs Secretary Wayne Johnston Treasurer John Provan Program Chairman James Symes	1988	President Wayne Johnston Secretary Michael Ameli Treasurer Charles Lye Program Chairman Neil V. McPhail
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Treasurer Jacques Tittley  
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- 2010 President Donald McCarville  
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Treasurer Jacques Tittley  
Program Chair Andrew Dueck

*Our sincere thanks for their efforts.*

## CANADIAN SOCIETY FOR VASCULAR SURGERY INVITED GUEST LECTURERS

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

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

### PREVIOUS MEETINGS

1979 Montreal  
1980 Ottawa  
1981 Toronto  
1982 Quebec  
1983 Calgary  
1984 Montreal  
1985 Vancouver  
1986 Toronto  
1987 Winnipeg  
1988 Ottawa  
1989 Edmonton  
1990 Toronto  
1991 Quebec  
1992 Ottawa  
1993 Vancouver  
1994 Toronto

1995 Montreal  
1996 Halifax  
1997 Vancouver  
1998 Toronto  
1999 Quebec City  
2000 Banff  
2001 Ottawa  
2002 Halifax  
2003 Victoria  
2004 Quebec City  
2005 Toronto  
2006 Calgary  
2007 Montreal  
2008 Saskatoon  
2009 Ottawa

### PRESENT MEETING

2010 Vancouver

### FUTURE MEETINGS

2011 St. John's  
2012 Quebec City



## **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 eight 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 speciality that encompasses not only the surgical management of atherosclerosis but also provides conservative therapy and nonoperative endovascular therapies in this very challenging group of patients. The Canadian Society for Vascular Surgery continues to be the Canadian forum where these specialists can present their work, consult with their colleagues, and remain abreast of the current and most up-to-date management of these patients.



### **CSVS VISION**

*To Lead Vascular Care in Canada*

### **CSVS MISSION**

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

### **Educational Objectives of the CSVS 31st Annual Meeting taking place September 25<sup>th</sup> and 26<sup>th</sup>, 2009**

- 1 The participant will be able to discuss the latest advances in open and endovascular surgery from major Canadian Centers and how these advances can be incorporated into one's daily practice.
- 2 The participant will be able to describe the topics and the relevance of current basic science research by vascular surgeons in Canada.
- 3 The participant will be able to explain the concepts of new and emerging endovascular techniques in the treatment of infrainguinal peripheral vascular disease.
- 4 The participant will be able to list and describe current issues in the training of vascular surgeons.
- 5 The participant will be able to list his/her own knowledge gap by participating in the VSEP Jeopardy contest.

The program will provide scientific or clinical presentations by the general membership stressing the opportunity for the participant to discuss and contribute opinions and evaluations. Presenters are encouraged to submit a manuscript to the Recorder to be considered for publication in a peer reviewed journal.

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 Surgeons. The maximal CME credit is 11.75 hours.

**Canadian Society for Vascular Surgery**  
**32<sup>nd</sup> Annual Meeting - Final Program**  
**September 24 - 25, 2010, Fairmont Waterfront Hotel, Vancouver, BC**

**Thursday, September 23, jeudi le 23 septembre 2010**

13h30-14h00	CSVS Executive Committee Luncheon (closed) – <i>Nootka Room</i>
14h00-17h00	CSVS Executive Committee Meeting (closed) – <i>Nootka Room</i>
18h00-21h00	RCPSC Vascular Surgery Specialty Committee Meeting (closed) – <i>Princess Louisa Room</i>
18h00-20h00	CSVS Registration desk opens/ouverture du bureau d'inscription de la SCCV – <i>Waterfront Foyer</i>

**Friday, September 24 | vendredi le 24 septembre 2010**

07h00	CSVS Registration Desk opens / Ouverture du bureau d'inscription de la SCCV – <i>Waterfront Foyer</i>
07h00 – 08h00	Continental Breakfast / Petit Déjeuner – <i>Waterfront Foyer</i>
08h00 – 08h15	Welcome and Opening Remarks – <i>Waterfront Ballroom A/B</i> <b>President</b> - Dr. Don McCarville; <b>Program Chair</b> - Dr. Andrew Dueck; <b>Secretary</b> - Dr. Gerrit Winkelaar
	<b>Paper Session I: Occlusive Disease and Education Topics</b> <i>Waterfront Ballroom A/B</i> Moderators: Dr. G. Papia, Dr. A. Dueck
	<b>Objective: Upon completion of this session attendees will be able to:</b> (1) describe current outcomes of endovascular and open therapy for peripheral vascular disease (2) understand the modern requirements of vascular surgery training.
	<b>0815-0830 Effect of Arachidonic Acid on the Monocyte-Endothelial Cell Binding.</b> <i>S. Marlene Grenon, Jason P. Hatton, Millie Hugues-Fulford. Department of Surgery and Department of Medicine, University of California, San Francisco; Hugues-Fulford Laboratory and Department of Surgery, Veterans Affairs Medical Center, San Francisco, California.</i>
	<b>0830-0845 Risk Factors and Outcomes of Infrainguinal Revascularization in the Regina Qu'Appelle Health Region for the Past Seven Years.</b> <i>Jonathan Misskey, David Kopriva, Donald McCarville. Division of Vascular Surgery, Department of Surgery, Regina Qu'Appelle Health Region; College of Medicine, University of Saskatchewan.</i>
08h15 - 10h00	<b>0845-0900 Endovascular Management of Claudicants for Femoropopliteal Occlusive Disease.</b> <i>K. Kvinlaug, C. Abraham, O. Steinmetz, K. Mackenzie, M. Corriveau, D. Obrand. Division of Vascular Surgery, McGill University, Montreal.</i>
	<b>0900-0915 Subintimal Angioplasty for Iliac Artery Occlusions: A Safe and Effective Endovascular Option.</b> <i>Brian L Chen, Jean M Panneton. Division of Vascular Surgery, Eastern Virginia Medical School, Norfolk, Virginia, USA.</i>
	<b>0915-0930 Early Experience with Remote Superficial Femoral Artery Endarterectomy.</b> <i>Brent A. Chang, Keith A. Baxter, David C. Taylor, Joel Gagnon. Division of Vascular Surgery, University of British Columbia, Vancouver.</i>
	<b>0930-0945 Developing a New Residency Curriculum: An Initial Needs Assessment and Environmental Scan.</b> <i>Elisa Greco, Elizabeth M. Wooster, Heather L. Cox, Andrew D. Dueck, Douglas L Wooster. University of Toronto, Division of Vascular Surgery, University Health Network - Toronto General Hospital and St. Joseph's Hospital; University of Toronto, Department of Surgery; University of Toronto, Ontario Institute for Studies in Education; University of Toronto, Division of Vascular Surgery, Sunnybrook Health Sciences Centre; University of Toronto, Division of Vascular Surgery.</i>
	<b>0945-1000 Initiation and Implementation of the Wait Time Strategy for Vascular Surgery in Ontario.</b> <i>Thomas Lindsay, Junell D'Souza, Erik Youngson, Claudia Zanchetta, University Health Network, University of Toronto; Cancer Care Ontario.</i>

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- 10h00-10h30** Refreshment Break & Exhibits | Pause santé et exposants – Waterfront Ballroom C  
**The Great Debate I** – Waterfront Ballroom A/B  
“Be it resolved that BIRT Carotid Artery Stenting is Equivalent (and therefore better) than Carotid Endarterectomy.”
- 10h30-11h15** **Objective:** Upon completion of this session attendees will be able to: (1) list the frequency and nature of complications associated with carotid artery stenting and carotid endarterectomy; and (2) list the indications for each procedure in the prevention of stroke.  
**For** – Dr. Thomas Forbes **Against** – Dr. Shaun MacDonald
- 11h15-11h45** **Presidential Address:** Dr. Don McCarville – Waterfront Ballroom A/B
- 12h00-13h45** Lunch and CSVS Annual General Meeting (CSVs members only) / Malaspina Room  
Assemblée générale annuelle et déjeuner (réservé aux membres de la SCCV)
- 12h00-13h00** **Residents/trainees Meet & Greet with Invited Guest Lecturer** - Sechelt Room  
CSVs Invited Guest Lecture - Waterfront Ballroom A/B  
**Upper Extremity Ischemia** - *Dr. Greg Moneta, Professor of Surgery & Chief, Division of Vascular Surgery, Oregon Health & Science University, Portland, Oregon*
- Objectives:**
- 14h00-14h45** **1. Have an organized approach to the evaluation of upper extremity ischemic syndromes**  
**2. Understand treatment options for upper extremity ischemic syndromes**  
**3. Appreciate the differing presentations of upper extremity ischemic syndromes**
- Paper Session II: Cerebrovascular, Venous and Policy Topics**  
Waterfront Ballroom A/B  
*Moderators: Dr. G. Moneta, Dr. A Dueck*
- Objective:** Upon completion of this session attendees will be able to describe current health care system realities regarding treatment of venous disease, cerebrovascular disease and endovascular aneurysm repair.
- 14h45-15h45** **1445-1500 Expectations of Patients and Referring Physicians in the Management of Varicose Veins.** *Douglas Wooster and Andrew Dueck. University of Toronto.*  
**1515-1530 Public Health Initiatives and Stroke Awareness: Effective Education or Ignored Advertisement?** *Michael Clemente, Elizabeth Wooster, Douglas L. Wooster, Andrew D. Dueck, Graham Roche-Nagle. OISE/University of Toronto, University of Waterloo, Department of Surgery, University of Toronto.*
- 1530-1545 Priority-setting Decisions for Endovascular Aortic Repair—OHTAC Guidelines in Practice.** *J. Buchner, M.A. Moloney, T.F. Lindsay, B.B. Rubin, G. Roche-Nagle. Department of Vascular Surgery, Toronto General Hospital.*
- 15h45 - 16h00** Refreshment Break & Exhibits | Pause santé et exposants – Waterfront Ballroom C  
VSEP Jeopardy – Moderator: Dr. Ravi Sidhu – Waterfront Ballroom A/B
- 16h00 - 17h00** **Objective:** Upon completion of this session participants will be able to elucidate their strengths and weaknesses in knowledge of a variety of vascular topics.
- 17h00** Adjourn
- 17h00 – 18h00** **CSVs Poster Session** – Waterfront Foyer  
Wine & Cheese amongst the Posters
- 17h00** **President’s Dinner** (CSVs Executive Committee Members only)

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**Saturday, September 25 | samedi le 25 septembre 2010**

- 07h00** CSVS Registration Desk Opens | Ouverture du bureau d'inscription de la SCCV – Waterfront Foyer
- 07h00 – 08h00** Continental Breakfast /Petit Déjeuner – *Waterfront Foyer*
- 08h00-08h10** **Presentations of 2010 Award Winners** – Cook Research Award and Gore Research Award (presented by Dr. Don McCarville) John L. Provan Education Award ( presented by Dr. Ravi Sidhu), Sigvaris President's Award (presented by Dr. Andrew Dueck) - Waterfront Ballroom A/B
- 08h10-08h30** 2009 Cook and Gore Award recipient updates
- Paper Session III: Aortic Pathology I – Engineering and Imaging Topics**  
Waterfront Ballroom A/B Moderator: Dr. T. Forbes, Dr. A. Dueck
- Objective: Upon completion of this session attendees will be able to list four examples of modern engineering technology applied to vascular surgery therapy and education.**
- 0830-0845 Hemodynamic Evaluation of Crossed-Limb EVAR Using Computational Fluid Dynamics.** T.L.T. Shek, L.W. Tse, A. Nabovati, C.H. Amon. Institute of Biomaterials & Biomedical Engineering, University of Toronto; Toronto General Hospital, University Health Network, Toronto; Department of Mechanical & Industrial Engineering, University of Toronto.
- 08h30 – 09h30** **0845-0900 In Situ Retrograde Laser Fenestration during TEVAR: A New Approach to Aortic Branch Revascularization.** Christopher L. Stout and Jean M. Panneton. Division of Vascular Surgery, Eastern Virginia Medical School, Norfolk, Virginia, USA.
- 0900-0915 Construction and Validation of a 'Bench Top' Endovascular Simulation Model: the Cannulation Suite.** Rajvinder Sidhu and Jonathan Weir-McCall. Department of Surgery, Imperial College, London, UK; Department of Clinical Radiology, Guy's and St Thomas' NHS Trust, UK.
- 0915-0930 Evaluation of an Electromagnetic 3D Navigation System to Facilitate Complex Endovascular Tasks: A Feasibility Study.** *Rajvinder Sidhu and Jonathan Weir-McCall. Department of Surgery, Imperial College, London, UK; Department of Clinical Radiology, Guy's and St Thomas' NHS Trust, UK.*
- 09h30 – 10h00** Refreshment Break & Exhibits | Pause santé et exposants – Waterfront Ballroom C
- CCSVI Forum - Waterfront Ballroom A/B**  
**Objective: Upon completion of this session, participants will have an understanding of the current evidence and issues surrounding Chronic Cerebrospinal Venous Insufficiency as it relates to Multiple Sclerosis**
- 10h00-11h30**
- 10h00-10h30** Vascular Surgeons' View - Dr. Keith Baxter, UBC, Dept of Vascular Surgery  
**10h30-11h00** Radiologists' View – Dr. Lyndsay Machan, UBC, Dept of Radiology  
**11h00-11h30** Neurologists' View – Dr. Anthony Traboulsee, UBC, Division of Neurology
- 11h30 – 13h00** Lunch amongst the Exhibitors – Waterfront Foyer
- Paper Session IV: Aortic Pathology II – Epidemiology Topics –**  
*Waterfront Ballroom A/B*  
*Moderators: Dr. P. Jetty, Dr. G. Moneta*  
**Objective: Upon completion of this session attendees will be able to describe current Canadian trends in AAA repair and follow up.**
- 13h00 – 14h00**
- 1300-1315 Is the 5.5-5.9 cm AAA in Men Really a Large Dangerous Aneurysm?**  
*Peter M. Brown and David T. Zelt, Department of Surgery, Queen's University (Kingston) and Kingston General Hospital.*

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**1315-1330 Endurant Graft for Endovascular Treatment of AAA: Early Results from a Prospective, Multi-centered Canadian Registry.** K. Kvinlaug, D.K. Lawlor, G. DeRose, R. Willoughby, J. Fenton, K. Mackenzie, T.L. Forbes, M. Corriveau, O.K. Steinmetz. McGill University Health Centre, Montreal; London Health Sciences Centre, University of Western Ontario, London; Sudbury Regional Hospital, Sudbury.

**13h00 – 14h00**  
(continued)

**1330-1345 Comparison of Different Imaging Modalities in Surveillance of EVAR in the Early Postoperative Period.** I. Vucemilo, J. Clothier, D. Szalay, T. Rapanos, V. Iyer, D. Toffolo, F. Gestaldo, G. Yip, J. Tittley. Division of Vascular Surgery and Division of Radiology, McMaster University.

**1345-1400 Late Conversion of Endovascular to Open Repair of Abdominal Aortic Aneurysms.** Benjamin A. Isserlin, Jeremy R. Harris, D. Kirk Lawlor, Guy DeRose, Thomas L. Forbes. Division of Vascular Surgery, London Health Sciences Centre & The University of Western Ontario, London.

**14h00 – 14h30**

Refreshment Break & Exhibits | Pause santé et exposants – Waterfront Ballroom C

**Paper Session V: Aortic Pathology III – Complex, Thoracic and Epidemiology Topics**  
Moderator: Dr. J. Paseneau, Dr. A. Dueck

**Objective: Upon completion of this session attendees will be able to: describe current trends in advanced treatment of aortic pathology.**

**1430-1445 Understanding the Target Population for Abdominal Aortic Aneurysm (AAA) Screening in Ontario: An Analysis of Census Data.** H. Cox, D. Wooster, A. Dueck, E. Greco, E. Wooster. University of Toronto.

**1445-1500 Computerized Tomographic (CT) Assessment of Change in Common Femoral Artery (CFA) Cross-surface Area with a Purse String Closure Following EVAR: Feasibility Study.** J. Clouthier, I. Vucemilo, D. Szalay, T. Rapanos, V. Iyer, F. Gestaldo, G. Yip G, J. Tittley Division of Vascular Surgery and Division of Radiology, McMaster University.

**1500-1515 Iliac Branched Devices for the Treatment of Common Iliac Aneurysms: Are They Worth the Effort?** J. Evans, I. Vucemilo, J. Tittley, T. Rapanos, V. Iyer, D. Szalay. Department of Vascular Surgery, McMaster University.

**14h30 – 16h15**

**1515-1530 Peri Renal Aortic Aneurysm Repair using Custom Fenestrated Aortic Grafts: Early Results and Costs.** Thomas Lindsay, Heather Cox, George Oreopoulos, Barry Rubin, KT Tan. Toronto General Hospital, University Health Network, and University of Toronto.

**1530-1545 Natural History of Minimal Aortic Injury Following Blunt Thoracic Aortic Trauma.** Biniam Kidane, Jeremy R. Harris, D. Kirk Lawlor, Guy DeRose, Thomas L. Forbes. Division of Vascular Surgery, London Health Sciences Centre & The University of Western Ontario, London.

**1545-1600 “EVAR vs Open Repair.com”- What the Internet is Telling Our Patients about the Management of Abdominal Aortic Aneurysms.** P. Jetty, B. Chan, E. Gee RN, F. Momoli, S. Nagpal, T. Brandys, G. Hajjar, A. Hill. The Division of Vascular and Endovascular Surgery, The Ottawa Hospital and the University of Ottawa.

**1600-1615 Identifying AAA Patients with the Highest Risk Following Endovascular Repair.** Ali Cadili, Marilou Hervas-Malo, Sunita Ghosh, Harold Chyczij. University of Alberta, Edmonton.

**16h15 – 16h30**

Adjourn

**16h30 – 18h00**

Exhibits Dismantling – Waterfront Ballroom C

**18h30**

**CSVS 2010 Annual Dinner – Vancouver Art Gallery (750 Hornby Street)**



## PROGRAM WITH ABSTRACTS

Friday, September 24<sup>th</sup>, 2010

Paper Session I: Occlusive Disease and Education Topics

Moderators: Dr. G. Papia, Dr. A. Dueck

### Effect of Arachidonic Acid on the Monocyte-Endothelial Cell Binding

S. Marlene Grenon<sup>1,2,3</sup>, Jason P. Hatton<sup>2</sup>, Millie Hugues-Fulford<sup>2,4</sup>

<sup>1</sup>Department of Surgery, University of California, San Francisco, San Francisco, California, <sup>2</sup>Hugues-Fulford Laboratory, Veterans Affairs Medical Center, San Francisco, San Francisco, California, <sup>3</sup>Department of Surgery, Veterans Affairs Medical Center San Francisco, <sup>4</sup>Department of Medicine, University of California, San Francisco, San Francisco, California

**Introduction:** One of the earliest events in the atherosclerosis is the retention of low density lipoprotein (LDL) in the arterial wall followed by adhesion and infiltration of monocytes through the endothelia. Omega-6 fatty acids have been reported to enhance tumor necrosis factor alpha (TNF- $\alpha$ ) induced adhesion molecule expression in endothelial cells, and elevated prostaglandin synthesis is observed in atherosclerotic plaques. However, the role of fatty acids in endothelial cell binding of monocytes has not been fully explored. We examined the effect of arachidonic acid (AA), an  $\omega$ -6 fatty acid, on the ability of EA.hy.926 endothelial cells to bind U937 monocytes.

**Methods:** Confluent EA.hy.926 cells were treated with either AA, Interleukin-1  $\beta$  (IL-1 $\beta$ ), or vehicle-alone for 5 hr. Cells were washed, incubated with U937 cells for 30 minutes and the number of monocytes adhered after gentle washing was measured using fluorescent assay.

**Results:** At concentration of 1 $\mu$ g/ml, AA significantly increased EA.hy.926 binding of U937 compared to control and the level of binding induced by AA was comparable to that obtained with 10ng/ml IL-1 $\beta$ . Neither eicosapentaenoic acid (an  $\omega$ -3 fatty acid), nor oleic acid (an  $\omega$ -9 fatty acid) enhanced EA.hy.926 binding of monocytes above control levels. Pretreatment of EA.hy.926 with COX-2 inhibitor indomethacin blocked the increase in U937 cell elicited by AA treatment.

**Conclusion:** We conclude that AA can enhance the ability of EA.hy.926 to bind monocytes through a mechanism that is dependent on COX-2 activity and hence prostaglandin synthesis. Taken together these data indicate that the AA (which is primarily carried by LDL) can promote monocyte adhesion to endothelial cells, suggesting that the dietary fatty acid intake could have important consequences for early events in atherosclerosis.

### Risk Factors and Outcomes of Infrainguinal Revascularization in the Regina Qu'Appelle Health Region for the Past Seven Years

Jonathan Misskey<sup>2</sup>, David Kopriva MDCM FRCS<sup>1</sup>, Donald McCarville, MD FRCS<sup>1</sup>

<sup>1</sup> Division of Vascular Surgery, Department of Surgery, Regina Qu'Appelle Health Region

<sup>2</sup> College of Medicine, University of Saskatchewan

**Introduction:** Determination of preoperative and intraoperative risk factors is a mainstay of quality assurance in vascular surgical procedures<sup>1</sup>. The vascular surgery division in the RQHR regularly monitors outcomes for carotid surgery and abdominal aortic aneurysms; however there has been no review of outcomes for lower extremity bypass surgery. Through analysis of hospital records of patients admitted for revascularization, identification of pertinent risk factors will allow for the implementation of targeted improvements in perioperative patient care.

**Methods:** All cases of infrainguinal revascularization in the RQHR from April 1, 2002 to March 31, 2009 were included. Data were collected through a retrospective medical chart review. A total of 116 patient variables (demographics, comorbidities, surgical factors) and seven outcomes (postoperative infection, graft failure, limb loss, renal failure, stroke, myocardial infarction and death) were recorded. Multivariable analysis with multiple logistic regression was used to determine independent associations between adverse outcomes and pre- and intraoperative risk factors.

**Results:** A total of 507 bypasses were performed. 54 bypasses (10.6%) developed infections; 58 bypasses (11.4%) required reoperation for graft hemorrhage, stenosis or thrombosis; 44 (7.5%) had subsequent limb loss; 5 (1.0%) had postoperative renal failure requiring dialysis; 22 (4.3%) had a postoperative myocardial infarction; 9 (1.8%) had a postoperative stroke; and 15 (3.0%) died in hospital. Multivariable analysis showed morbid obesity (BMI > 40) to be independently associated with higher rates of infections (odds ratio [OR], 6.26; 95% confidence interval [CI], 1.61 - 13.26; P < 0.01), limb loss (OR, 8.848; 95% CI, 1.75 - 44.67; P < 0.01), and renal failure (OR, 44.23; 95% CI, 17.69 - 5905.90; P < 0.01). A history of heart failure was associated with higher rates of limb loss (OR, 11.19; 95% CI, 3.18 - 39.42; P < 0.01), and death (OR, 4.835; 95% CI, 1.19 - 19.58; P = 0.02). Orthopedic mobility impairment was associated with higher rates of graft failure (OR, 1.80; 95% CI, 1.00 - 3.22, P < 0.05), and limb loss (OR, 3.64, 95% CI, 1.79 - 37.70, P < 0.01). The self-expandable LeMaitre valvulotome with limited saphenous vein exposure was associated with higher graft failure rates (OR, 2.95; 95% CI 1.31 - 6.64 P < 0.01).

**Conclusions:** Morbid obesity, history of heart failure, and orthopedic mobility impairment were independently associated with multiple adverse outcomes. Use of the self-expandable LeMaitre valvulotome with limited exposure of the saphenous vein was associated with higher rates of graft failure. Further investigation with respect to patient follow-up is required to determine the long-term graft patency and limb salvage rates.

#### **References:**

1. Flu HC, Ploeg AJ, Marang-van de Mheen PJ, Veen EV, Lange CPE, Breslau PJ, Roukema JE, Hamming JF, Lardenoye JHP. Patient and procedure related risk factors for adverse events after infrainguinal bypass. *J Vasc Surg* 2010;51:622-7.

#### **Endovascular Management of Claudicants for Femoropopliteal Occlusive Disease**

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**Background:** Intermittent claudication can be disabling for patients but has a low rate of amputation. Patency rates from endovascular treatment of peripheral arterial disease have improved over the last decade and approach bypass results. As the elderly population increases, so too will demand for these less invasive techniques. We reviewed our experience with patients diagnosed with severe intermittent claudication treated by Vascular Surgeons at a University teaching hospital with peripheral endovascular techniques.

**Methods:** A retrospective chart review was performed of claudicant patients who had peripheral endovascular treatment for femoropopliteal occlusive disease from January 2006 until December 2007. Outcomes examined included changes in symptoms, ABI's, and freedom from amputation.

**Results:** Within the two years, 27 patients with severe intermittent claudication were managed with 32 peripheral angioplasties with and without stenting. 74% (17/23 patients) had improvements in their ABI.

Primary patency rates were 86%, 78%, and 65% respectively at 1 month, 6 months, and 1 year. Assisted primary patency rates were 100%, 100%, and 83% at each of the same respective intervals. Four patients underwent repeat endovascular management of which all were improved. Failure of a treatment did not result in any amputations.

**Conclusion:** Our early results suggest that claudicants can be managed aggressively with peripheral endovascular techniques to improve quality of life without high adverse outcomes.

### **Subintimal Angioplasty for Iliac Artery Occlusions: A Safe and Effective Endovascular Option**

Brian L Chen, MD, Jean M Panneton, MD, *Division of Vascular Surgery, Eastern Virginia Medical School, Norfolk, VA, USA*

**Background:** Traditionally, aortobifemoral bypass has been the intervention of choice for iliac artery chronic total occlusion (CTO). However, it is associated with significant morbidity and mortality, making this procedure prohibitive in high risk patients. To reduce procedural risk, subintimal angioplasty (SIA) for femoropopliteal CTO has been utilized by many, but few have extended this endovascular technique to treating iliac artery CTO. We present our experience with 101 successful SIA for iliac artery CTO.

**Methods:** A retrospective review of consecutive patients with iliac artery CTO treated with subintimal angioplasty from June 2000 to January 2009 was completed. Demographic, risk factors and procedural data were collected. Primary and secondary patency, survival, freedom from claudication, and limb salvage were determined by Kaplan-Meier survival analysis. Univariate and multivariate analyses were completed to identify factors adversely affecting primary patency.

**Results:** 120 patients underwent an attempted SIA of an iliac CTO, with a success rate of 82%. Technical failure was due to the inability to re-enter the lumen in all cases. Indications for intervention were severe disabling claudication, 64 (63%), and critical limb ischemia (CLI), 37 (37%). 90 patients underwent percutaneous SIA, while 11 patients underwent a combined SIA with surgical outflow procedure. Lesions were classified as TASC B, 39 (39%), TASC C, 27 (27%), and TASC D, 35 (35%). In 82 (81%) lesions, stents were deployed with an average of 1.2 (range:0-3) stents utilized. A re-entry device was used in 14(14%) lesions. Procedural complication rate was 8.9%, with a 30-day mortality rate of 0.8%. Primary patency rates at 1, 2 and 3-years were 86%, 76% and 68% respectively. Secondary patency rates at 1, 2, and 3-years were 94%, 92%, and 80% respectively. Survival rate was 56% at 6 years, reflecting the poor health of this cohort. Limb salvage rate for CLI patients at 1 and 6 years was 97% and 95%. Freedom from claudication at 1, 3, and 6 years was 89%, 78%, and 73%. Univariate analysis identified hyperlipidemia, coronary artery disease, and prior surgical bypass in treated limb as factors for loss of primary patency; however, on multivariate analysis no factors remained statistically significant.

**Conclusion:** This study demonstrates that subintimal angioplasty of iliac CTO is feasible and can be performed safely and effectively, even in high risk patients. Excellent patency and limb salvage rates can be achieved. In our experience, the safety and durability of SIA makes it an attractive first-line therapy for iliac artery occlusive disease.

### **Early Experience with Remote Superficial Femoral Artery Endarterectomy**

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**Background:** Remote endarterectomy using a single femoral incision is a potential alternative for lower limb revascularization for long arterial occlusions of the superficial femoral artery (SFA). It has been described as a safe and effective technique for SFA disease, and has the appeal of preserving the option for future bypass procedures. This technique has gained popularity in Europe over the past couple decades; however, it has not been commonly adopted in North America. Here we describe our early experience with this technique.

**Methods:** We retrospectively reviewed all patients at a single centre who had remote superficial femoral artery endarterectomy (RSFAE) performed on long segment SFA disease using a reusable desobliterotome.

**Results:** Since 2008, we performed 9 RSFAE on 8 patients; 1 patient had the procedure done bilaterally. Indications for the procedure were severe claudication in 7 and limb salvage in 2. The mean age was 70 years old (59-85) and 3 patients were female. Technical success was achieved in all patients and two perforations at the reentry site were treated with a covert stent graft. The mean OR time was 159 minutes (123-215) and the median length of hospital stay was 2 days (1-15). Follow-up duplex ultrasounds were performed at 6 month intervals for follow-up. The primary-assisted patency was 100% at 179 days and one patient underwent a proximal angioplasty and stenting at 11 months. Two patients with ischemic ulcers healed during the follow-up period and all other patients improved clinically.

**Conclusions:** This study suggests that RSFAE is a safe and effective intervention for long segment SFA occlusion. This data warrants more robust, long-term exploration of this technique, as it represents a potentially viable alternative to bypass grafting procedures.

#### **Developing a New Residency Curriculum: An Initial Needs Assessment and Environmental Scan**

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**Background:** As of 2012, vascular trainees will have the option of direct entry from medical school into a 5-year vascular surgery residency program ("0+5"). This new program provides an opportunity for the implementation of a new curriculum including longitudinal learning of the content expertise of vascular surgery and strategies for Continuing Education and Professional Development (CEPD). There is no literature regarding the expected scope of practice of a graduating vascular resident and the varied practice patterns of vascular specialists. It may be that with continued advances in the specialty a disconnect between training and practice will magnify. Therefore, prior to curriculum development, the scope of practice needs to be defined and standards unified. In order to develop a comprehensive vascular residency curriculum we propose to identify the scope of practice, zone of expertise, and preferred practice profile of vascular surgeons, any deficits between training and practice, and what CEPD strategies surgeons use to address these deficits.

**Methods:** We are in the process of conducting three iterative surveys addressing scope of practice. The first round targeted practicing members of the Canadian Society for Vascular Surgery. The concepts of "Scope of Practice" (SoP), "Zone of Expertise" (ZoE), and "Preferred Practice Profile" (PPP) were explored. The open-ended SoP questions were analyzed qualitatively. The answers were coded for common ideas. These common ideas created the medical expert knowledge that will help inform the development of the curriculum content.

**Results:** Of the 111 surveys distributed, 20% completed the survey. 92% have been in practice for more than 6 years and 46% work in an urban academic hospital. Abdominal aortic aneurysms appear on 100% of respondents in all three categories (SoP, ZoE, and PPP). Infrainguinal bypass was listed in the SoP of 95% of respondents, however it only appeared in 68% of PPP. Divergent responses were found, few physicians listing carotid body tumors, vascular trauma and mesenteric bypass in their PPP. Alternatively some listed procedures managed by other specialties within their PPP (i.e.: pacemakers, amputations). Endovascular procedures appeared in 84% of respondents SoPs, 65% of their ZoE, and 63% of their PPP. EVLT and sclerotherapy appeared in 21% for all three categories. Compared to the contents of standard vascular surgery textbooks, practice patterns reflected only a limited subset of expertise.

**Conclusion:** These results highlighted the major disease processes to which residents need comprehensive exposure. As the SoP defined by our respondents was limited compared to standard textbook content, it was difficult to identify the true scope of practice of a practicing vascular surgeon. For curriculum development, additional study is required to determine curriculum and examination weighting, effective CEPD strategies and appropriate timing for the introduction into the residency curriculum.

### **Initiation and Implementation of the Wait Time Strategy for Vascular Surgery in Ontario**

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**Introduction:** Ontario first implemented its' Wait Time Strategy (WTS) to measure and reduce wait times for five key procedures in 2005, and expanded in April 2009 to include measurement of wait times for all surgical procedures, including Vascular Surgery. The purpose of this presentation is to describe the principles of the strategy, processes used for setting targets, and provide a preliminary overview of case volumes and trends observed in Vascular Surgery over the first year.

**Methods:** Prior to implementation of the WTS for Vascular Surgery, an Expert Panel of Vascular Surgeons developed a case classification tool and evidence based wait time targets. All Ontario hospitals are required to report wait times for elective vascular surgical procedures according to the classification and priority ranking. Once the case is done, data is submitted, analyzed and reported.

**Results:** Between April 1, 2009 and March 31, 2010, a total of 8169 cases have been entered for Vascular Surgery (only priority 2-4 cases included). The overall 90<sup>th</sup> percentile wait time for Vascular Surgery was 101 days, which is well within the Priority 4 provincial access target of 182 days. The case distribution, volume and 90<sup>th</sup> percentile wait time is shown in days, in table 1. Cases are also analyzed according to individual priority access targets, to ensure timely access is achieved based on urgency of need. The priority ranking of cases and its distribution is shown in table 2. Table 3 shows the case volume and priority ranking for carotid endarterectomy which have the same targets in two specialties.

Table 1

Service Detail 1 and Key Procedures (*)	Completed Case Volume	% Total Case Volume	90th Percentile Wait Time	% Cases Completed within Access Target
Arterial Bypass Surgery	1,673	20.5%	82	69
*Femoral Popliteal/Tibial Bypass	1,027	12.6%	81	69
Aneurysm Repair	1,666	20.4%	86	72
*Abdominal Aortic Aneurysm Surgery	1,276	15.6%	89	70
Arterial Surgery (Non-Bypass)	1,574	19.3%	82	70
*Carotid Endarterectomy	766	9.4%	65	70
Creation Arteriovenous Fistula Surgery	1,485	18.2%	86	87
Thoracoabdominal Surgery	128	1.6%	110	86
Venous Surgery	1,643	20.1%	172	85
<b>Vascular Surgery</b>	<b>8,169</b>		<b>101</b>	<b>76</b>

Notes: Only Priority 2, 3 and 4 cases included. Only Key Procedures are shown at the Service Detail 2 level, and therefore volumes do not sum to totals shown. All volume percentages are compared to total volume, and therefore do not sum to 100%.

Source: WTIS; Data period: April 1, 2009 - March 31, 2010; Queried on April 7, 2010

Table 2

Priority	Completed Case Volume	% Case Volume	90th Percentile Wait Time	% Cases Completed within Access Target
Priority 2	1,991	24.4%	53	51
Priority 3	3,124	38.2%	88	76
Priority 4	3,054	37.4%	146	93

Source: WTIS; Data period: April 1, 2009 - March 31, 2010; Queried on April 7, 2010

Table 3

Service Area	Priority	Completed Case Volume	90th Percentile Wait Time	% Cases Completed within Access Target
Neurosurgery	Priority 2	103	153	62
	Priority 3	92	38	92
	Priority 4	21	354	76
Vascular Surgery	Priority 2	353	41	49
	Priority 3	304	69	83
	Priority 4	109	97	97

Source: WTIS; Data period: April 1, 2009 - March 31, 2010; Queried on April 7, 2010

**Conclusions:** Vascular Surgery completed 90% of cases within 101 days, which is well below the provincial priority 4 access target of 182 days (as of March 2010). Only 76% of vascular surgery cases were completed within their specific access targets, with the poorest performance seen for priority 2 cases. Strategies for improvement will need to include approaches aimed at both individual surgeons and hospitals/LHINs in order to address system wide problems.

### The Great Debate

*“Be it resolved that BIRT Carotid Artery Stenting is Equivalent (and therefore better) than Carotid Endarterectomy”*

**For:** Dr. T. Forbes    **Against:** Dr. S. MacDonald

### Presidential Address

Dr. Don McCarville

**Residents/Trainees Meet & Greet with Invited Guest Speaker – Dr. Greg Moneta**

### CSVS Annual General Meeting

#### CSVS Invited Guest Lecture

Dr. Greg Moneta, Professor of Surgery & Chief,  
Division of Vascular Surgery, Oregon Health & Science University, Portland, Oregon  
**“Upper Extremity Ischemia”**

**Friday, September 24<sup>th</sup>, 2010**

**Paper Session II: Cerebrovascular, Venous and Policy Topics**

**Moderators:** Dr. G. Moneta, Dr. A. Dueck

### **Expectations of Patients and Referring Physicians in the Management of Varicose Veins**

Douglas Wooster MD, Andrew Dueck MD, *University of Toronto*

**Background:** Patients with varicose veins present for consultation with a variety of expectations regarding management. Such attitudes are determined by personal experience and advice from the referring primary care provider. The aim of this study was to analyze these expectations in comparison to vascular specialists' advice for treatment.

**Methods:** Consecutive patients who presented for management of varicose veins were studied. Specific demographic data was collected and collated to the indication for referral, advice offered and patient's choice of management. Results of physical examination and duplex scanning were noted. Correlations with the management chosen and the patient's demographics were explored.

**Results:** The 100 patients studied showed the following characteristics: age 20 – 86, female 72%, overweight 65%, duration of disease 1 – 30 years, previous treatment 45%, venous complications 16%, standing job 48%. The reason for referral ('management' 45%, injections 28%, operation 27%) differed from the patients' expectations (unsure 30%, injections 45%, operation 25%). The specialists' advice (support stocking 92%, weight reduction 60%, injections 22%, operation 20%, endovenous Rx 5%) differed from the patients' choice (support stocking 61%, weight reduction 4%, injections 20%, operation 12%, endovenous Rx 3%). Requests for injections and/or endovenous procedures correlated with smaller veins, younger patients, female gender and a lower incidence of being overweight. Requests for operation correlated with a standing job but not duration of symptoms or previous complications.

**Conclusions:** There are distinct differences between patients' and their physicians' expectations compared to specialists' advice in venous management. Patients' expectations do change when given advice but they still reject the use of support stockings and the need for weight reduction. Their interest in operative management relates more to job activities than their venous pathology.

### **Are Patients with Transient Ischemic Attacks Getting Carotid Endarterectomy Surgery in Time?**

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**Objective:** The Ontario government is implementing a Wait Time Strategy (WTS) to increase access and reduce wait times for certain surgical health services, including Carotid Endarterectomy (CEA). According to WTS guidelines, 90% of patients with transient ischemic attacks (TIA) with severe carotid disease should undergo CEA within 2 weeks. This is supported by international recommendations from vascular and neurological societies, as the risk of stroke is highest during the first 2 weeks following a TIA. The objective of the study was to identify whether these goals are being met and the factors affecting wait times.

**Methods:** This cohort study identified all patients who underwent CEA, by five vascular surgeons, at the Ottawa Hospital from January 2008 to January 2010. Using electronic hospital records and office charts, the following time points were recorded: date of the initial TIA, dates of the referral to and visit with a vascular surgeon, date of the decision to proceed with CEA, and the surgery date. Independent variables included symptoms (retinal TIA, hemispheric TIA, or stroke), degree of stenosis, distance from our tertiary care centre, referral source (GP, ER, or specialist/neurologist), imaging modalities and pre-operative cardiology and neurology work-up. Wait times are presented in median values with interquartile ranges (IQR) as well as the 90<sup>th</sup> percentile value according to the provincial WTS definition.

**Results:** Of the 117 patients who underwent CEA, 92 (78.6%) were symptomatic. The median time from first TIA to CEA surgery was 2.5 months (74 days (IQR 31-153)). A significant proportion of this delay in receiving surgery occurred prior to the referral (34 days, IQR 6-69) and consultation with a vascular surgeon (42 days, IQR 15-107). The median wait time for surgery once the decision was made to proceed with CEA was 14 days (IQR 8-25) and the WTS wait time (90<sup>th</sup> percentile) was 40 days or 5.7 weeks. These wait times did not differ between patients with greater than or less than 70% stenosis. The multivariate analysis revealed that patients referred to neurology for their TIA experienced the greatest delay in receiving CEA (68.5 days longer compared to direct ER referrals,  $p=0.04$ , and 48.8 days longer than direct vascular referrals,  $p=0.05$ ). Delay in referral to vascular was also related to patients with retinal TIA symptoms (58.2 days longer,  $p=0.05$ ) and distance from the tertiary care centre (4.4 days for each 10 km away,  $p=0.009$ ). Patients who presented to the ER (self referrals or GP referrals) and subsequently admitted following their TIA had the shortest delay in seeing a vascular surgeon and subsequently getting a CEA compared to patients seen in the clinic and booked electively for surgery (61.4 days faster,  $p=0.01$ ). There was no difference between surgeons for wait times to be seen in the clinic; however there were differences amongst surgeons once the decision was made to proceed with CEA. The study design did not permit the capture of patients who had a major stroke either before seeing a vascular surgeon or while waiting for surgery, as these patients did not eventually undergo a CEA.

**Conclusion:** Our wait times for CEA currently do not fall within the recommended 2-week guideline. It is possible that a proportion of the patients with TIAs are succumbing to stroke before ever seeing a vascular surgeon, as a significant proportion of the delay occurs prior to the vascular consultation. Important factors include proximity to our tertiary care centre, retinal TIA symptoms, and patients referred to neurologists as

outpatients. Other factors may include patient delay in seeking care, and poor access to expedited duplex scans. Patients should be referred to the ER immediately following a TIA, and a multidisciplinary approach (by the ER, neurology and vascular) should take place on one single admission to expedite imaging, consultations and booking of surgery with in the 2-week window. A single queue model for booking surgeries as well as clinic referrals may also improve surgical wait times for CEA.

### **Public Health Initiatives and Stroke Awareness: Effective Education or Ignored Advertisement?**

Michael Clemente<sup>2</sup>, Elizabeth Wooster, Master of Education<sup>1</sup>, Douglas L. Wooster, MD<sup>3</sup>, Andrew D. Dueck, M.Sc, MD<sup>3</sup>, Graham Roche-Nagle, MD MBA<sup>3</sup>

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<sup>3</sup>Department of Surgery, University of Toronto, Toronto, ON

**Background:** Stroke is the third leading cause of mortality and a major cause of permanent disability in Canada, accounting for nearly 15,000 deaths and over 50,000 hospitalizations per year. Early recognition and treatment is crucial to improving survival and recovery following a stroke. Despite a variety of public awareness campaigns in a jurisdiction with organized stroke care, only 27% of people who have a stroke receive emergency care and treatment within two hours of onset of symptoms. Furthermore, increased patient awareness of stroke has been shown to significantly decrease pre-hospital delay time. This study assessed the current stroke awareness of patients and family members at two vascular clinics (one community, one academic hospital).

**Methods:** Surveys were conducted of patients and their family members at two vascular clinics in a defined urban area. All data was analyzed using SPSS 18.0 (SPSS Inc., Chicago, IL, USA).

**Results:** 152 (54 from community setting, 98 from academic hospital) out of 155 people approached completed the survey (98%). Respondents at either setting were similar in age, yet those in the hospital had more formal education and a higher prevalence of diabetes, kidney failure and previous stroke or TIA. Those in the community setting were more likely to have ever smoked.

Of the total sample population, 82% were able to correctly identify at least one risk factor (RF) and 92% could cite at least one warning sign (WS). The most commonly recognized RF were smoking (65%), hypertension (32%) and overweight (26%). The most common WS were trouble speaking (70%), weakness, numbness or paralysis (53%) and vision problems (47%); arm/limb pain and chest pain (5% and 6% respectively) were the most common incorrect responses. The major sources of stroke information were television (65%), medical professionals (39%), family and friends (13%) and newspapers/magazines (13%). The majority of respondents (90%) indicated that they would call emergency services when faced with someone who appeared to be having a stroke.

Younger age ( $\leq 65$ ) was correlated with correctly identifying at least one RF (92% vs. 67%,  $P < .001$ ) yet showed no significant difference in knowledge of WS. In addition, respondents with at least one year of college or university work had increased knowledge of RF (91% vs. 67%,  $P < .001$ ). Finally, stroke awareness was higher in

respondents in an academic hospital setting, as compared to those in a community setting: at least one RF (87% vs. 74%,  $P=.051$ ), at least one WS (96% vs. 85%,  $P=.019$ ).

**Conclusion:** Knowledge of stroke symptoms and warning signs were relatively high, indicating that current public awareness campaigns are effectively educating the at-risk population. Continuing to fund television ad campaigns and encouraging younger relatives to educate their older relatives could further improve the population's stroke awareness.

### **Priority-setting Decisions for Endovascular Aortic Repair – OHTAC Guidelines in Practice**

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**Introduction:** The proliferation of health technologies and public demand for them has become a major driver contributing to rising healthcare costs. The Ontario Health Technology Advisory Committee (OHTAC) is the single portal for providing evidence-based advice to the health care system regarding the uptake, diffusion and distribution for new health technologies in Ontario. In 2005 OHTAC made recommendations to confine the use of endovascular repair of abdominal aortic aneurysms (EVAR) to 'high risk' patients based on defined cardiac, pulmonary, renal co-morbidities and technical challenges for open surgery. The aim of our study was to determine if our institution was compliant with those recommendations.

**Methods:** We retrospectively analyzed 280 consecutive standard EVARs performed at our institution and applied the OHTAC guidelines for use.

**Results:** 95% of the EVARs analyzed at our institution were compliant to the OHTAC recommendations. 47% of the patients undergoing EVAR had significant cardiac risk, 27% had considerable pulmonary disease, 14% had a hostile abdomen or were technically challenging for open surgery and 3% had renal dysfunction. 9% were done in the emergency setting. 5% of cases did not satisfy the OHTAC guidelines. The average age of these 5% was 81.

**Conclusions:** Because demand for health care exceeds the supply of resources allocated to finance it, priority setting is a problem for every health care system in the world. Since innovation is the primary driver of escalating health care costs, these issues are particularly acute for new technologies. Currently our institution adheres to the OHTAC guidelines for EVAR in the vast majority of cases. Consideration should be given to adding age to the current criteria.

### **Outcomes of Surgical Treatment for Carotid Body Tumor: A Single Center Experience**

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*Division of Vascular Surgery and Peripheral Vascular Disease Research Chair, College of Medicine, King Saud University, Riyadh, Saudi Arabia*

**Background:** Carotid body tumors (CBT) are a rare condition but are the most common form of head and neck paraganglioma. The aim of this study was to evaluate the outcome for surgical excision of CBT.

**Method:** We conducted a retrospective cohort study between 1999 and 2009 using the medical records database from King Khalid University Hospital, Riyadh, Saudi Arabia.

**Results:** During the study period, 22 patients with CBT were identified. Of these, 4 patients had bilateral CBT. Mean age was 42 years and 52% of the patients were female. CBT was more common on the left side of the neck (88%). Neck lump & pain were the main presenting symptoms. Preoperative information derived from duplex scanning, magnetic resonance angiography, computed tomography, and in some patients the standard four-vessel Arteriography. All patients underwent surgical excision with no mortality. Six Patients (22%) had hoarseness of voice postoperatively, 1 (4.5%) was due to permanent vagus nerve palsy in a patient who had excision for recurrent CBT and the other to transient vagus nerve palsy. One patient (4.5%) had partial ptosis due to sympathetic nerve palsy and one patient (4.5%) had minor stroke postoperatively.

**Conclusion:** Careful surgical planning & prediction of perioperative complications using advanced radiological imaging coupled with performance of CBT in high volume center result in good outcomes.

### **Endovenous Laser Therapy for Lower Limbs Varicose Veins: A Single Center Experience**

Badr Aljabri, MD, Kaissor Iqbal, MD, Tawfiq Abu-ALNasr MD, Musaad Al-Salman, MD, Talal Al-Tuwaijri, MD, Mohammed Al-Omran, MD, MSc

*Division of Vascular Surgery and Peripheral Vascular Disease Research Chair, College of Medicine, King Saud University, Riyadh, Saudi Arabia*

**Background:** Endovenous laser therapy (EVLT) is a new, minimally invasive percutaneous endovenous technique for ablation of the incompetent veins. The aim of this study was to evaluate the early and intermediate outcomes of EVLT in the treatment of lower limbs varicose veins (LLVV).

**Methods:** Between March 1, 2006, and February 28, 2010, we conducted a prospective clinical trial to treat patients with LLVV using a 980-nm multidiode laser (inter-medic) with intermittent fiber pullback and tumescent local anesthesia. Patients were followed up prospectively with duplex ultrasonography at week 1 and at 1, 6 and 12 months postoperatively.

**Results:** Endovenous LLVV ablation was performed on 413 limbs in 317 patients. The mean age was 35 years and 65% were females. According to the CEAP classification, majority were C2 (80%). The average voltage use was 14.6 W (range from 10 to 15 W). The pulse time was 5 seconds with 1 second pause. LLVV occlusion rates were 99.7 % at 1 week, 98.6 % at 1 month, 97.2 % at 6 months, and 96.3 % at 12 months after EVLT. Subanalysis of the patients who received a voltage of 15W showed an occlusion rate of 100% at 1 week, 99.9 % at 1 month, 99.3% at 6 months, and 98.8% at 12 months.

Concomitant avulsion phlebectomy was performed in 240 limbs. Significant bruising was seen in 32 limbs (7.8 %) and superficial thrombophlebitis was seen in 5 limbs (1.2%) however, edema, excessive pain, hematoma, or cellulitis were not seen. Thrombus protruded into the lumen of the common femoral vein (CFV) was seen in 5 limbs (1.2%) after EVLT. These patients were treated with anticoagulation. Duplex follow-up scans of these patients performed at 12 weeks, showed that the thrombus previously identified at duplex scan was no longer protruding into the CFV.

**Conclusion:** Short term and intermediate results of EVLT are excellent. Greater doses of energy delivered are associated with better results. Long-term follow-up and comparison with standard stripping techniques are required to confirm the durability of EVLT.

### **Trends in Diagnosing and Treating Vascular Thoracic Outlet Syndrome: A Single Center Experience**

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*Division of Vascular Surgery and Peripheral Vascular Disease Research Chair, College of Medicine, King Saud University, Riyadh, Saudi Arabia*

**Background:** Thoracic outlet syndrome (TOS) consists of a group of distinct disorders that caused by a compression of the brachial plexus and/ or subclavian artery and vein. The vascular symptoms account for only 5% of the cases. The surgical intervention is performed to relieve the compression and alleviate the symptoms. The aim of this study was to highlight the different modalities of diagnosing & treating vascular TOS and to evaluate the outcomes.

**Method:** We conducted a retrospective cohort study between 1999 and 2009 using the medical records database from King Khalid University Hospital, Riyadh, Saudi Arabia.

**Results:** During the study period, 42 cases with vascular TOS were identified in 28 patients. Arterial TOS represented 95% of all cases. Mean age was 26 years and female represented 81% of this cohort. The majority of patients presented with chronic upper limb ischemia and only 11% patient presented with gangrene and rest pain (critical upper limb ischemia). The diagnosis was confirmed by duplex scanning in all of the patients. Preoperative information derived from duplex scanning and in some patients' upper limbs Arteriography and/or magnetic resonance angiography and/or computed tomography. The surgical approach for all patients was through a supraclavicular approach. All the patients had scalenectomy, 49% had cervical rib excision, 23% had 1<sup>st</sup> rib excision and in 28% excision of both cervical and 1<sup>st</sup> rib were performed. Vascular reconstructive procedures were done in 4 patients (resection and replacement of subclavian artery aneurysms in 3 cases and axillary-brachial bypass in one case). There was no mortality; however, 4 patients had postoperative complications in form of wound hematoma in one patient and transient neurological deficit (numbness and weakness) in 3 patients.

**Conclusion:** Careful surgical planning & prediction of perioperative complications using advanced radiological imaging coupled with performance of Vascular TOS in high volume center result in good outcomes.

## **A Novel Treatment of Two Cases of Secondary Aorto-duodenal Fistulas, in the Presence of a Type IV Thoracoabdominal Aortic Aneurysm**

G. E. Hajjar, M.D, S. Nagpal, M.D, T. Brandys, M.D, A. Hill, M.D, P. Jetty M.D.

*Division of Vascular and Endovascular Surgery, University of Ottawa*

Aorto duodenal fistulization following aortic graft placement, remains an uncommon but potentially lethal complication. The most commonly accepted treatment is prior distal extremities extra-anatomical revascularization followed by graft excision and aortic and duodenal closure.

Two patients presented to our institution with actively bleeding secondary aorto duodenal fistulae, following remote placement of infrarenal aortic grafts. Their condition was complicated by the presence of a type four thoracoabdominal aortic aneurysms. The quality of the aneurysmal aortic tissue proximal to the graft, and the involvement of the renal and visceral vessels made it impossible to simply excise the graft and ligate the infrarenal aorta, without a risk of massive hemorrhage and renal or visceral ischemia. Placement a new graft in-situ was considered hazardous in the setting of a large duodenal erosion, and acutely ill patient.

In this report, we describe a novel approach to treating such condition with prior extra-anatomical lower extremity revascularization, followed by a retroperitoneal approach to excise the aortic graft and patch repair the aneurysmal thoracoabdominal aortic segment with bovine pericardial patch. The duodenal repair was easily achieved through this approach.

In both cases the repair was successful, without renal or mesenteric ischemic complications. At one year follow up both patients remain well, with no evidence of sepsis, ischemia or patch degeneration.

Although pericardial patches have been frequently used in the setting of arterial infections and sepsis, to our knowledge no such procedures have been described in treating complicated thoracoabdominal aortic problems.

## **Endovascular Repair of Complicated Acute Aortic Dissections with Uncovered Stents**

Jeremy R. Harris, Benjamin A. Isserlin, D. Kirk Lawlor, Guy DeRose, Thomas L. Forbes

*Division of Vascular Surgery, London Health Sciences Centre & The University of Western Ontario, London, ON*

**Objectives:** Most acute Type B aortic dissections (AD) are treated successfully with hypertension management. However, some progress to visceral, renal and/or lower extremity ischemia and result in a high risk of mortality. We reviewed our initial experience with uncovered stents (Cook Medical, Bloomington, IN) in the treatment of acute complicated AD.

**Methods:** A retrospective database review to identify patients with acute AD who underwent endovascular management with uncovered dissection stents between 2007 & 2010.

**Results:** 4 patients with acute AD underwent endovascular repair with uncovered dissection stents. 50% were males and the median age was 54 (range: 49-78). Patients presented with an acute type B AD (2 patients), type A AD (1 patient) and an iatrogenic AD following mitral valve repair. Indication for surgery was renal/visceral and lower extremity ischemia in all cases, and endovascular intervention occurred within 1-3 days of presentation. All patients were treated with a proximal covered stent graft and uncovered dissection stents to line the complete thoracoabdominal aorta. The patient with the type A AD also underwent a Bentall

procedure. There was one instance of continued gut ischemia and subsequent mortality (iatrogenic AD). The 3 survivors (75%) had a median hospitalization of 9 days (range:8-38). There were no complications or reinterventions during the 3-16 months of radiologic and clinical follow-up.

**Conclusions:** Complicated acute aortic dissections result in significant morbidity and mortality risks, especially if they result in visceral, renal and/or lower extremity ischemia. Uncovered dissection stents can be used in such cases of malperfusion. In this initial experience this has resulted in improved survival and no requirement for reintervention during the first year of follow-up. Continued radiologic and clinical surveillance is required.

### **Fate of Amputees Following Below Knee Amputation: Early and Mid Term Results**

Julius Poon, M.D., MUSAAD al-GHAMDI, M.D., YORK N. HSIANG, M.D., *Division of Vascular Surgery, University of British Columbia, Vancouver General Hospital, Vancouver, B.C.*

**Purpose:** The purpose of this study was to determine the outcomes of patients undergoing below knee amputation (BKA) for gangrene or critical limb ischemia.

**Methods:** A retrospective review of all patients undergoing BKA by the Vascular Surgery service of a tertiary care University-affiliated teaching hospital from Jan 1, 2006 to Dec 31, 2007 was performed. Demographic and clinical data was collected and analyzed. Up to 2-year follow up was determined by contacting patients or contacting physicians working at rehabilitation hospitals.

**Results:** Over this two-year period, 60 patients underwent BKA (45 male, 15 female), with one patient having bilateral BKAs. The average age was 67 years (range 38-91). Preoperatively, 33/61 patients were not able to walk. The indication for surgery was entirely for sepsis or ischemia, (61/61, 100%). Furthermore, 36/61 (58%) of the patients had a failure of a previous revascularization or more distal amputation, and 5/61 (8%) required an amputation despite a patent bypass graft. Major co-morbidities were diabetes (49/61, 80%) and chronic renal failure (25/61, 41%). A post-op nerve sheath catheter for analgesia was used in 60/61 (98%) of patients. There were 4 perioperative deaths (6%). Seventeen (28%) wound complications occurred, of which 14 (23%) required revision. The average length of stay before transfer to a rehabilitation facility was 25.6 days. During a follow up period of two years, an additional 25 patients (42%) died. Twelve patients were lost to follow up. The average time to final prosthesis was 4.8 months. At one year post BKA, 33/35 (94%) patients who were alive, were walking with their prosthesis, and 2/61 (3%) could not walk because of either a poor fitting prosthesis or poor wound healing.

**Conclusion:** When BKA is required for sepsis or ischemia; the vast majority of patients can expect to survive the procedure. However, amputation revision is commonly needed. The two-year survival is poor. However, for patients who tolerate amputation and survive at least two years, ambulation with a walking prosthesis was seen in the vast majority.

### **Incidence, Follow-up, and Outcomes of Incidental Abdominal Aortic Aneurysms**

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**Background:** Incidental abdominal aortic aneurysms (AAAs) are identified during imaging for other reasons. Incidental AAAs are important findings since they require monitoring and surgical treatment when indicated to prevent rupture. The prevalence of incidental AAAs and their management has not been extensively studied.

**Methods:** We electronically screened a 25% simple random sample of abdominal computerized tomographic (CT), ultrasound (US) and magnetic resonance imaging (MRI) studies conducted between 1996 and 2008 at a single academic medical centre between. Screen positive reports were manually reviewed to determine if they showed an incidental AAA. We reviewed the medical record of all in-patients to determine if the incidental AAA was documented, a treatment plan for it was identified, and whether it was communicated to the patient's family physician via the discharge summary. Using evidence-based recommended schedules, we determined the adequacy of each person's AAA monitoring.

**Results:** In 79 121 abdominal imagings, we identified 812 incidental AAAs (1.0% of all studies or 364 incidental AAAs annually [95% CI 349-379]). Patients were elderly (mean age 74 years) and AAAs had a mean diameter of 4.0 cm. For inpatients (n=222), the AAA was noted in only 51 patients (29%) and communicated to the family physician in only 45 patients (26%). Of 329 patients who were observed beyond their 1<sup>st</sup> recommended follow-up scan, only 51 patients (16%) were monitored appropriately throughout their entire follow up (median proportion of follow-up time with recommended monitoring: 56% IQR 32%-82%). 98 patients (13%) underwent elective AAA repair, the probability of which was significantly increased when AAA monitoring frequency was compliant with that recommended in practice guidelines. 6 patients (0.8%) were admitted with aortic rupture, the probability of which was independent of AAA monitoring.

**Conclusion:** Incidental AAAs are common and appear to be poorly monitored. Our data suggest that improved monitoring of incidental AAA was independently associated with elective AAA repair. Population-based analyses are required to determine the influence that monitoring has on incidental AAA rupture and patient mortality.

### **Contrast Ultrasound in the Surveillance of Endovascular Abdominal Aortic Aneurysm Repair**

Nagpal SK , Jetty P, Brandys T, Hajjar G, Hill AB, *Division of Vascular Surgery, University of Ottawa*

**Hypothesis:** Contrast (microbubble) ultrasound (CUS) is better than color duplex (CD) and at least equal to CT scan in the detection of endoleaks (EL) after endovascular aneurysm repair.

**Methods:** This is a prospective, interventional cohort trial. Health Canada approval was obtained for off label use of the contrast ultrasound agent Definity ®. All patients who have undergone endovascular abdominal aortic aneurysm repair were eligible for this study. This part of the 2 stage trial (lead-in phase and recruitment phase) included 10 patients. This lead-in phase will allow investigators to optimize dosing, rate of infusion, scanning techniques, and evaluate safety of contrast ultrasound injection. Patients with and without endoleak by CT scan were selected to maximize the learning curve for scanning. Ultrasounds were done within 6 weeks of the CT scan. The scanning technician was blinded to the CT scan results. Scanning by color duplex was done prior to contrast injection. Contrast preparation required mixing the agent in a "shaker" for 45 seconds. It was then either injected by direct I.V bolus, or diluted with saline and transfused over 20 minutes. Both injection techniques were evaluated for ease of administration and visualization of blood flow. Evaluation of aortic size, presence of endoleak, location of endoleak, and significant graft stenosis were compared between the modalities.

**Results:** There were no complications associated with ultrasound contrast injection or scanning. Bolus injection allowed better visualization than infusion techniques with adequate scanning times. No graft stenosis was visualized on CT scan, colour duplex, or contrast ultrasound. Comparing modalities for endoleak detection were as follows:

		<u>CT scan EL</u>				<u>CD EL</u>				<u>CD EL</u>	
		Yes	No			Yes	No			Yes	No
<u>CUS</u>	Yes	4	1	<u>CUS</u>	Yes	3	2	<u>CT</u>	Yes	2	2
<u>EL</u>	No	0	5	<u>EL</u>	No	0	5	<u>EL</u>	No	1	5

Statistical tests on the lead-in phase were not done due to the involvement of only 10 patients. No endoleaks were missed by CUS that were detected by the other modalities. Aneurysm sac size measurements were comparable between U/S and CT scan.

**Conclusion:** Contrast ultrasound appears to be safe, and the learning curve steep. Bolus injection technique is easier to administer, allows greater visualization and scan time is adequate compared to infusion technique. Early data indicate CUS seems comparable to CT scan for assessment of endoleaks (presence and location). Recruitment for this trial is ongoing.

**Identifying Scope of Practice, Zone of Expertise, and Preferred Practice of Vascular Surgeons: The Role for Continuing Medical Education, Professional Development and Self-Assessment**

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**Background:** Studies have shown there is a gap between training programs and consultant practice. Furthermore, there are ongoing changes in practice throughout the physician’s career. Focused self-assessment and reflection based on practice profile yield a greater impact and improved outcomes from Continuing Education and Professional Development (CEPD) activities as compared to developing CEPD activities with no relevance to a physician’s clinical practice. The Royal College of Physicians and Surgeons of Canada has outlined seven maintenance of certification (MOC) educational principles that CPED activities should embody. The first four principles are to make the activity personal, to identify a need or gap, to be relevant to scope of practice, and include reflection as a tool for learning. This study is designed address these four principles by conducting an environmental scan of practicing vascular surgeons using a self-reflection tool to identify any gaps in knowledge or practice and subsequently develop CEPD activities designed to address these gaps.

**Methods:** A self-reflection and assessment tool was developed and distributed to practicing vascular surgeons across Canada. This survey was designed to assess surgeon’s Scope of Practice (SoP), Zone of Expertise (ZoE), and Preferred Practice Profile (PPP). SoP refers to what you do routinely and on call, ZoE refers to what you have specialty training or particular interest in, and PPP refers to what you “like to do” or are recognized by peers for. These were addressed as open-ended type questions. The data was coded for common practices and ideas. The findings were compared to the outlined scope of practice included in standard vascular surgical textbooks.

**Results:** Twenty percent of vascular surgeons responded. 92% of the respondents have been in practice for more than 6 years. 46% of the respondents work in an urban academic hospital. The SoP and ZoE for open procedures were identical for 55% of vascular surgeons. The PPP was identical to the SoP and ZoE for open procedures in 26% of vascular surgeons. Similarly, for endo-vascular procedures, the SoP and ZoE were identical in 53% of vascular surgeons. In 6% of the vascular surgeons the PPP and SoP were identical; in 12% of surgeons the PPP and ZoE was identical; and in 29% of vascular surgeons the PPP, ZoE, and SoP were identical. The scope of practice reported was a narrow subset of textbook SoP.

**Conclusion:** The aim of the study was to identify gaps in knowledge and practice through self-assessment in order to develop CEPD activities. However, almost half of surgeons did not identify any gaps between scope of practice and preferred practice. Compared to the scope of practice outlined in a vascular surgery textbook, a narrow scope of practice was reported by the surgeons. Inherently, the PPP should be a subset of ZoE which again is a subset of SoP; however, our respondents showed homogeneity and lack of discrimination between these three categories. This creates difficulty in identifying any perceived knowledge or practice gap for which to design a CEPD activity. A CEPD activity in how to self-assess and reflect on practice may improve surgeon's abilities to identify gaps in knowledge and practice. A follow up survey specifically asking their perceived knowledge gap may be of added benefit. Combined with a mini practice-audit we could then identify the unperceived gaps as well. This would provide a stronger base to develop CEPD activities to address these gaps while adhering to the MOC educational principles.

#### **Venous Duplex Ultrasound in Patients with Leg Swelling: Unexpected and Unusual Findings**

Mary Angelson BScN, Douglas Wooster MD, Andrew Dueck MD, *Toronto West Vascular Lab, University of Toronto*

**Background:** Patients with lower limb swelling often present for venous duplex ultrasound to assess their legs for the presence of deep venous thrombosis (DVT). Detailed ultrasound protocols can reliably identify DVT; other pathology is occasionally encountered and can be characterized by ultrasound.

**Methods:** Venous duplex ultrasound studies with unexpected or unusual findings were identified and the findings classified. Alternative imaging studies were correlated where possible. Details of the ultrasound findings and identified pathology were noted.

**Results:** Fifty patients with specific positive ultrasound findings other than reflux or DVT to account for leg swelling were identified. The pathology identified was as follows: Popliteal cyst (22), soft tissue tumor (11), pelvic tumor (4), arteriovenous malformation (4), arteriovenous fistula (3), popliteal venous aneurysm (3), lymphedema (2) and venous lake (1). The specific findings in each setting will be described.

**Conclusion:** Detailed ultrasound protocols can reliably identify a variety of significant vascular and non-vascular pathology other than DVT and venous reflux to account for leg swelling. Such findings should be characterized and reported in the physician's interpretation.

#### **A Clinical Vascular Attachment for Interventional Radiology Fellows - A New Paradigm in Training**

Moloney MA, Lindsay TF, Rubin BB, Tan KT<sup>1</sup>, Roche-Nagle G, *Department of Vascular Surgery, Department of Radiology<sup>1</sup>, Toronto General Hospital, Toronto*

**Introduction:** The rapid evolution of endovascular techniques for the treatment of vascular diseases requires that vascular surgeons develop proficiency in these techniques, and that interventional radiologists develop proficiency in the clinical evaluation and management of patients who are best treated with endovascular techniques. In response to this need both vascular surgery and interventional radiology initiated a 2 week clinical vascular attachment to train radiology fellows in clinical aspects of vascular diseases. Here we evaluate the attitudes and feedback relating to this endeavor.

**Methods:** The attitudes of vascular surgery and interventional radiology faculty and fellows toward the clinical vascular attachment were surveyed using a formal questionnaire using a Likert scale.

**Results:** Eighty-six percent (19/22) of the questionnaires were completed and returned. Both staff interventional radiologists and vascular surgeons supported the concept of the clinical vascular attachment model (4.1) and strongly favored continuation of the program on completion (4.9). They also agreed that it improved relations between the two departments (4.2). All surveys indicated that 2 weeks was insufficient time and recommending doubling the length of the attachment. The most beneficial aspect of the rotation was attending clinics (4.6), gaining understanding of open surgery (4.5) and ward rounds (3.9).

**Conclusion:** Radiology fellows benefit from a vascular rotation that provides broad clinical training in the evaluation, treatment and outcome of patients undergoing endovascular procedures. Fostering cooperative programs like this between the specialties will enhance training and improve the care of vascular patients.

**Saturday, September 25<sup>th</sup>, 2010**

**Presentation of 2010 Awards**

**Cook Research Award & Gore Research Award** presented by Dr. D. McCarville

**John L. Provan Education Award** presented by Dr. R. Sidhu

**Sigvaris President's Award** presented by Dr. A. Dueck

**2009 Cook/Gore Awards – Recipients' Updates**

**Paper Session III: Aortic Pathology I – Engineering and Imaging Topics**

**Moderators:** Dr. T. Forbes, Dr. A. Dueck

### **Hemodynamic Evaluation of Crossed-Limb EVAR Using Computational Fluid Dynamics**

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**Background:** The off-label technique of crossing the limbs of bifurcated stent grafts for endovascular aneurysm repair (EVAR) is often employed in the face of splayed aortic bifurcations to facilitate cannulation and prevent device kinking. However, little attention has been directed to the implications of crossed-limb EVAR, especially in comparison to straight-limb EVAR. In current literature, prediction of clinical graft device failure using hemodynamics remains largely through studies of straight-limb in-plane geometries.

**Objective:** The present work analyzes the wall shear stress distribution and magnitude of forces contributing to graft device dislodgement in an out-of-plane crossed-limb graft configuration. The simulated results are contrasted to those obtained for a counterpart in-plane straight-limb configuration. The ability of the crossed-limb geometry to generate helical flow is also quantified.

**Methods:** A representative crossed-limb computational geometry is rendered with Materialise MIMICS computed tomography (CT) segmentation software. Outline points inherited from the crossed-limb geometry are subsequently used for construction of a counterpart straight-limb configuration in SolidWorks software. Physiological velocity and pressure boundary conditions are applied to the constructed geometries for steady-state and pulsatile scenarios. The hemodynamic flow field is then predicted using computational fluid dynamics (CFD) software, ANSYS CFX, after which critical variables and plots are extracted.

**Results:** Of particular interest are relative mechanistic failure contributions of lateral shear forces, wall shear stress distributions, and flow field patterns. These parameters are commonly linked to device migration, endoleak development, and thrombosis. Also of interest is the ability of crossed-limb geometry to exploit bifurcation anatomy to generate quantifiable helical flow. At many arterial sites, helical flow is naturally created and there are suggestions to its benefits in literature.

**Conclusions:** The out-of-plane curvature studied may point out similarities and deficiencies in current research assumptions (e.g., in-plane graft geometries). Furthermore, should the crossed-limb geometry demonstrate improved device fixation and fluid flow patterns, the crossed-limb technique may become a primary EVAR technique to reduce the risk of device migration and thrombogenesis.

## **In Situ Retrograde Laser Fenestration during TEVAR: A New Approach to Aortic Branch Revascularization**

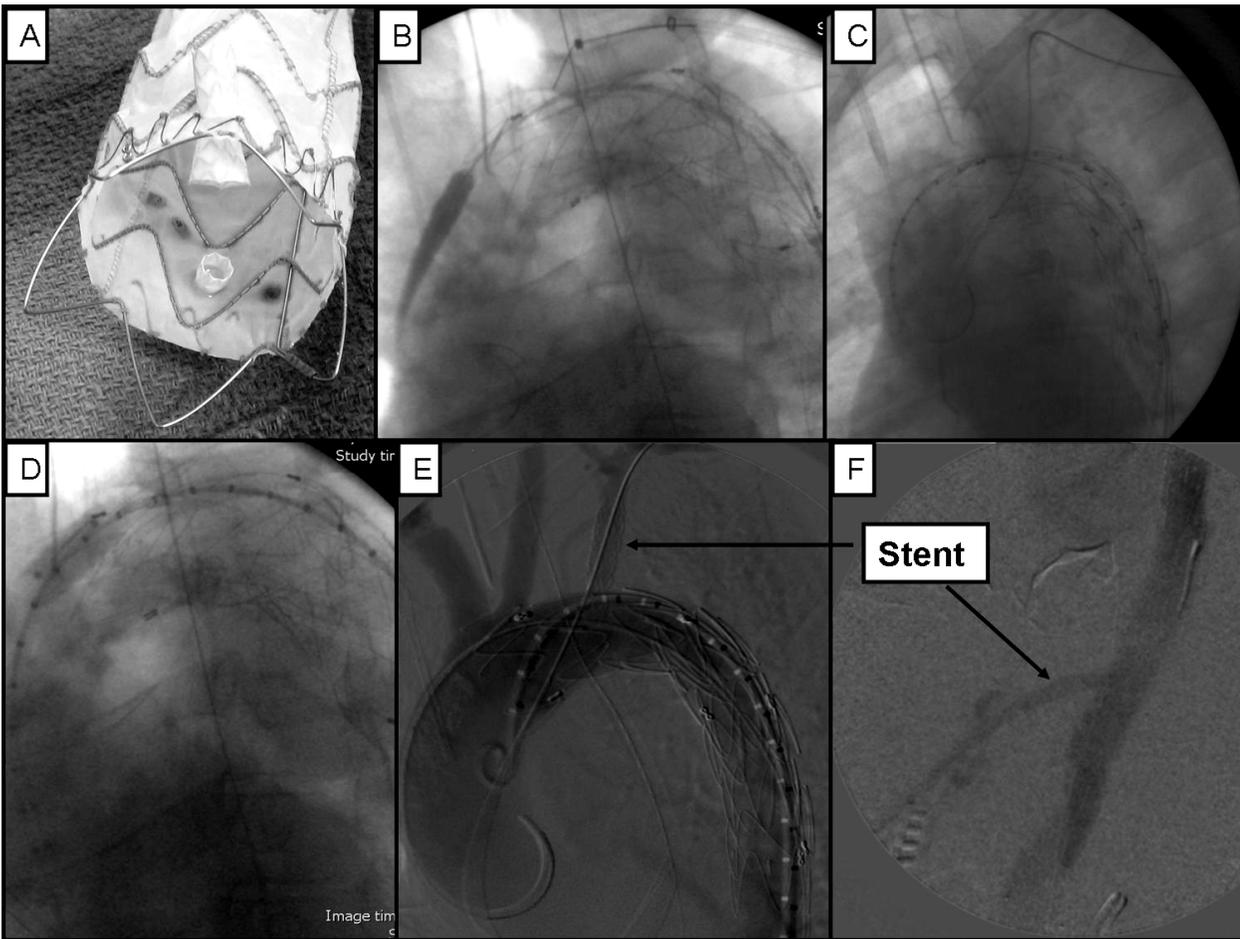
Christopher L. Stout MD, Jean M. Panneton MD, *Division of Vascular Surgery, Eastern Virginia Medical School, Norfolk, VA, USA*

**Background:** Thoracic endovascular aortic repair (TEVAR) remains restricted in its expansion because of the aortic branch vessels, and prefabricated branched endografts have multiple practical limitations. We present our experience with an adaptable and ready to use method to revascularize aortic side branches.

**Methods:** We successfully performed ex-vivo laser fenestration and stenting of thoracic endografts to test its feasibility (figure 1a). Then we proceeded in patients in whom a TEVAR would cover the origin of a side branch vessel and the Spectranetics Turbo Elite 2.0-2.5 millimeter (mm) laser catheter was placed retrograde to the vessel origin over a 0.014" wire (Figure 1b). Thoracic endografts were deployed. With laser-endograft contact, the laser applied 45 millijoules/mm<sup>2</sup> at 25 pulses/second to the endograft creating a fenestration allowing trans-endograft access (Fig. 1c). A predilatation was performed to 6mm. A 10mm Atrium ICAST stent was deployed ¼ into the endograft lumen and ¾ into the branch vessel. The endograft portion was flared using a 14mm balloon (Fig. 1d). Aortograms are performed to confirm patency (Fig. 1e-f).

**Results:** Six patients, mean age of 55.2 years, were treated. Two had symptomatic intramural hematomas, one had a symptomatic aneurysm while the other 3 had Stanford type B dissections with thoracoabdominal aneurysms. One required a hybrid infrarenal aortic replacement with renal debranching before TEVAR and SMA laser fenestration. The other five had laser fenestration of the left subclavian artery. Technical success was 83.3%. In one instance the subclavian covered stent was snorkeled along the proximal thoracic endograft. All stents were patent at last imaging follow-up with no evidence of fenestration-related endoleak.

**Conclusion:** Endovascular retrograde in-situ laser fenestration and stenting during TEVAR is an innovative treatment option for revascularizing branch vessels utilizing standard endovascular inventory and skills.



### Construction and Validation of a 'Bench Top' Endovascular Simulation Model: The Cannulation Suite

Rajvinder Sidhu<sup>1</sup>, Jonathan Weir-McCall<sup>2</sup>, <sup>1</sup>Imperial College London (UK), Department of Surgery, <sup>2</sup>Guy's and St Thomas' NHS Trust (UK), Department of Clinical Radiology

**Introduction:** This paper describes the construction of a novel 'bench top' endovascular simulation model and its subsequent validation.

**Methods:** A simulation model called the Cannulation Suite was built. It consisted of: an enclosure; an arterial sheath; multipurpose 4F catheter; guidewire; video-camera; lamp; simulated fluoroscopy; and a pulsatile silicone aortic arch model containing water, connected to a pump. 16 participants of varying experience in performing endovascular procedures on patients (non experts: 11 participants, 0-50 procedures performed; and experts: 5 participants, >50 procedures performed) were given a standardised training session in cannulating the brachiocephalic artery on the model. Participants then cannulated the brachiocephalic artery as part of the assessment. Participants' performance was recorded and assessed by two experienced, blinded assessors using a validated global rating scale to evaluate the first step of construct validity. Participants then completed a structured questionnaire (five point Likert scale) on the model to evaluate its face and content validity.

**Results:** The Cannulation Suite was developed at a cost of \$310. Face and content validity was shown by 16 participants who all felt that the simulator was realistic and useful for training surgeons to perform endovascular procedures. Experts performed significantly better than non experts in cannulating the brachiocephalic artery (performance score 39 and 33 out of 40 respectively,  $p=0.02$ ) demonstrating construct validity. The intra-class correlation coefficient for agreement between video-assessors was 0.98.

**Conclusions:** An inexpensive and portable endovascular simulation model was built and shown to be an effective training tool. Face, content and the first part of construct validity of the Cannulation Suite was established.

### **Evaluation of an Electromagnetic 3D Navigation System to Facilitate Complex Endovascular Tasks: A Feasibility Study**

Rajvinder Sidhu<sup>1</sup>, Jonathan Weir-McCall<sup>2</sup>, <sup>1</sup>*Imperial College London (UK), Department of Surgery*, <sup>2</sup>*Guy's and St Thomas' NHS Trust (UK), Department of Clinical Radiology*

**Introduction:** We describe a novel approach to cannulating artery's using the StealthStation® Guidance System (Medtronic, USA). This uses electromagnetic technology to track the guidewire, displaying a 3D image of the vessel and guidewire.

**Materials/Methods:** The study was performed on a validated 'bench top' simulation model called the Cannulation Suite. This set up was comprised of a silicone aortic arch model and simulated fluoroscopy. The accuracy of the StealthStation® was assessed. 16 participants of varying experience in performing endovascular procedures (novices: 6 participants, ≤5 procedures performed; intermediate: 5 participants, 6-50 procedures performed; experts: 5 participants, >50 procedures performed) underwent a standardised training session in cannulating the subclavian artery on the model with fluoroscopy and with the StealthStation®. Each participant was then assessed on cannulating the left subclavian artery using the conventional method (i.e. with fluoroscopy) and with the StealthStation®. Performance was recorded and evaluated using pre-defined outcome measures (total procedure time, fluoroscopy time, total vessel wall hits with wire and catheter) and a global rating scale, by two experienced, blinded assessors. The subjects then completed a structured questionnaire on the potential advantages of the StealthStation®. A five point Likert scale was used to rate their agreement or disagreement with seven statements relating to the potential advantages of the StealthStation® in clinical practice e.g. it can potentially decrease exposure of the patient to contrast and radiation.

**Results:** The StealthStation® was accurate to within 1.7mm. Every participant completed the cannulation task. The fluoroscopy time was significantly less with the navigation system than the conventional method for cannulating the left subclavian artery (median 0s and 14s respectively,  $p < 0.001$ ). There was no significant difference between total procedure time ( $p = 0.53$ ), total wire ( $p = 0.86$ ) and catheter hits ( $p = 0.13$ ) to the vessel wall between the conventional method and StealthStation®. There was no significant difference in left subclavian artery cannulation performance on the global rating scale between the conventional method and StealthStation® ( $p = 0.40$ ). The intra-class correlation coefficient for agreement between video-assessors for all scores was 0.98 or higher. 88% strongly agreed that the StealthStation® can potentially decrease exposure of the patient to contrast and radiation.

**Conclusions:** Cannulation of vessels is feasible with the StealthStation®.

#### **CCSVI Forum**

Vascular Surgeons' View - *Dr. Keith Baxter, UBC*

Radiologists' View - *Dr. Lyndsay Machan, UBC*

Neurologists' View - *Dr. Anthony Traboulsee, UBC*

**Is the 5.5-5.9 cm AAA in Men Really a Large Dangerous Aneurysm?**

Peter M. Brown, David T. Zelt

*Department of Surgery, Queen's University Kingston and Kingston General Hospital*

In our previous study (JVS 2003) we found a low risk of rupture in males with AAA 5.5 to 5.9 cm of only 0.8% per year. Lederle (2002), however, found a 9.4 % annual rupture rate for 5.5 to 5.9 cm AAA no different than that for 6.0-6.9 cm (10.2%). Recent data from European endograft conservative arms also suggests a low risk of rupture in men with 5.5-5.9 cm AAA. We will present an update in:

1. our unfit patients 5.5-5.9 cm undergoing surveillance
2. our fit male patients with 5.5-5.9 cm AAA undergoing repair
3. a review of diameters of all male AAA ruptures from our center in the past five years.

Eighteen patients have been followed for a mean of 21 months with one unexplained death. All of this time was spent within a size range of 5.5-5.9 cm. Although a small sample we did not see the 3-4 expected AAA ruptures.

Between November 2005 to October 2009 we performed elective procedures on males with the following AAA sizes:

		% total
<5.5 cm	16	13% (note nine at 5.4 cm)
5.5-5.9	50	41%
6.0-6.9	35	29%
7.0-7.9	12	10%
8.0-9.9	9	7%
10 cm or greater	1	1%

Aneurysms 5.9 cm or less in males were 54% of our elective repairs; whereas large AAA 8.0 cm or more were only 8% of electives. The 50 patients with 5.5-5.9 cm AAA waited a mean of 131 days each with no ruptures.

Between 2004-2009 we have admitted 59 males with ruptured AAA. Of these 45 had preop CT imaging (from referring centers or our own).

< 5.5 cm	1	2%
5.5-5.9	0	0%
6.0-6.9	6	13%
7.0-7.9	14	31%
8.0-9.9	18	40%
10 cm or greater	6	13%

54% of our elective procedures were on males with AAA under 6.0 cm in contrast to 2% of our imaged ruptures.

The stated risk of rupture of 9.4% found in the VA study may reflect a subgroup of patients (extremely ill) with a very high risk of rupture. Our evidence from a variety of sources suggests a much lower risk. This deserves further study from a number of Canadian vascular centers.

### **Endurant Graft for Endovascular Treatment of AAA: Early Results from a Prospective, Multi-centered Canadian Registry**

K. Kvinlaug<sup>1</sup>, D.K. Lawlor<sup>2</sup>, G. DeRose<sup>2</sup>, R. Willoughby<sup>3</sup>, J. Fenton<sup>3</sup>, K. Mackenzie<sup>1</sup>, T.L. Forbes<sup>2</sup>, M. Corriveau<sup>1</sup>, O.K. Steinmetz<sup>1</sup>

<sup>1</sup>McGill University Health Centre, Montreal, Quebec; <sup>2</sup>London Health Sciences Centre, University of Western Ontario, London, Ontario; <sup>3</sup>Sudbury Regional Hospital, Sudbury, Ontario

**Objective:** As endovascular treatment of abdominal aortic aneurysm (AAA) progresses, new stents are developed to overcome anatomy which would otherwise require open surgery. The Endurant graft, approved in Canada since 2008 and with FDA review underway, is appropriate for use in infrarenal aortic aneurysms with challenging anatomy: short proximal necks (10 – 14 mm), wide necks (>28 mm), angled necks (45°-75°), and small external iliac arteries (<8 mm).

**Methods:** Prospective evaluation of patients treated electively with the Endurant graft for infrarenal AAAs between September 2008 and January 2010 at three Canadian centres. Primary endpoints were technical success, complications (intraoperative and post-operative), endoleak, secondary intervention, stent migration, graft thrombosis, and mortality.

**Results:** 111 patients were registered in the database over a 16 month period (mean age 75 years, range 53 – 93). 58 patients (52%) had challenging anatomy: short proximal necks (17 cases, range 8 – 14 mm, mean 12), wide necks (4 cases, range 29-34 mm, mean 31), angled necks (8 cases, range 45°-90°, mean 63°), and small external iliac arteries (44 cases, range 4.5 – 7.5 mm, mean 6.6). The overall technical success rate was 100%. The perioperative complication rate was 19% (4% intraoperative, 16% post-operative). No conversion to open surgery was necessary. Mean follow-up was 131 days (range 2 – 344). 9 patients (8%) had type II endoleaks on follow-up CT (no Type I). There were 3 secondary interventions performed to treat access vessel complications (no treatment of endoleaks). There was no stent migration. One case developed graft thrombosis in the follow-up period. There was one perioperative mortality (aspiration pneumonia) and 4 late deaths (3 cardiac, 1 cancer cause) on follow-up.

**Conclusion:** The Endurant graft is a safe and versatile option for endovascular repair of abdominal aortic aneurysms and offers a viable alternative in cases of challenging anatomy. Longer term validation is required.

### **Comparison of Different Imaging Modalities in Surveillance of EVAR in the Early Postoperative Period**

Vucemilo I<sup>1</sup>, Clouthier J<sup>1</sup>, Szalay D<sup>1</sup>, Rapanos T<sup>1</sup>, Iyer V<sup>1</sup>, Toffolo<sup>1</sup>, D, Gestaldo F<sup>2</sup>, Yip G<sup>2</sup>, Tittley J<sup>1</sup>, <sup>1</sup>Division of Vascular Surgery, McMaster University, <sup>2</sup>Division of Radiology, McMaster University

**Objectives:** To compare sensitivity of US and CTA in detection of endoleaks, and AXR and CTA in detection of stent migration, as a part of EVAR surveillance.

**Methods:** This is retrospective study of McMaster EVAR database. We identified a cohort of 200 consecutive patients who underwent EVAR between 2008 until January 2010, .Outcomes of interest were: rate of endoleak

detected by US on postoperative day 1 (POD1) and CTA on postoperative day 14 (POD14), comparison of agreement between this studies, and rate of stent migration detected by AXR and CTA.

**Results:** Comparison of US (POD1) and CTA (POD 14) in detection of endoleak:

US (POD1) <sup>1</sup> rate of endoleaks	23	11.5 % (23/200)
CTA (POD 14) <sup>2</sup> rate of endoleaks	58	29 % (58/200)
Agreement between US and CTA	12	6 % (12/200)
Endoleak on US (POS1) only	11	5.5 % (11/200)
Endoleak on CTA (POD14) only	46	23 % (46/200)
Number of US reported as “poor visibility”	85	42.5 % (85/200)

Comparison of AXR and CTA in detecting graft migration:

AXR (POD14) rate of migration	3/200	1.5 % (3/200)
CTA (POD14)rate of migration <sup>1</sup>	0/200	0 %(0/200)
Agreement between AXR (POD1) and CTA (POD14)	0/200	0%
Rate of stent fracture on AXR and CTA	0/200	0%

**Conclusion:** Conventional US on postoperative day 1 identified only 1/3 of endoleaks detected by CTA on postoperative day 14 (12 % vs. 30.6%), with agreement in presence of endoleak in only 6% (12/200) patients. This could be due to patient’s body habitus, excessive amount of intrabdominal gas, or possibly spontaneous resolution of some of the endoleaks. US was considered inadequate due to poor visibility in 42.5% of studies. Stent migration has been reported on 3 out of 200 AXR that failed to be identified on same day study CTA (subsequent CTA’s of these 3 patients failed to identify stent migration as well). Based on this data, US on postoperative day 1 could be omitted as a part of EVAR surveillance. AXR, apart from its role in detection of stent fracture, is not adequate study for detection of stent migration, and could be omitted from long term surveillance of EVAR.

### Late Conversion of Endovascular to Open Repair of Abdominal Aortic Aneurysms

Benjamin A. Isserlin, Jeremy R. Harris, D. Kirk Lawlor, Guy DeRose, Thomas L. Forbes

*Division of Vascular Surgery, London Health Sciences Centre & The University of Western Ontario, London, ON*

**Objectives:** Failure of endovascular repair of an abdominal aortic aneurysm (EVAR) can result in significant risks of morbidity and mortality. We review our experience with late conversions to open repair.

**Methods:** A retrospective database review to identify all EVAR procedures between 1997 and 2010 and those subsequently converted to open repair. Late conversion to open repair was defined as those occurring at least 30 days following the initial EVAR procedure.

**Results:** 892 EVAR repairs were performed between 1997 and 2010. Six of these patients (0.007%) required late conversion to open repair with a mean age of 71 (range:58-83) and fifty percent were females. Half (3) of the initial EVAR cases were for ruptured aneurysms. Median time to secondary conversion was 15.6 months (range:1.7-61.3 months). Indications for secondary conversion (50% urgent, 50% elective) included persistent

type I endoleak (3 cases), combined type II and III endoleak (1 case), graft thrombosis (1 case) and aneurysm rupture (1 case). Supraceliac clamping was required in the majority of cases (67%) and mean transfusion requirement was 2.6 units. Total endograft explantation occurred in two cases (33%) while partial or total endograft preservation occurred in 4 cases (67%). Median length of stay following secondary conversion was 7 days (range:6-73 days). There were no instances of early or in-hospital mortality following open conversion.

**Conclusion:** Our EVAR experience includes a low rate of late secondary conversions to open repair with the majority a result of persistent aneurysm perfusion. Although it can be technically challenging, late conversion can be done safely. This experience supports the requirement for ongoing surveillance following EVAR.

Saturday, September 25<sup>th</sup>, 2010

Paper Session V: Aortic Pathology III – Complex, Thoracic and Epidemiology Topics

Moderators: Dr. J. Paseneau, Dr. A. Dueck

### **Understanding the Target Population for Abdominal Aortic Aneurysm (AAA) Screening in Ontario: An Analysis of Census Data**

H. Cox, D Wooster, A Dueck, E Greco, E Wooster, *University of Toronto*

The CSVS Gore Research Award Report 2009 – 2010

**Background:** AAA screening has been shown to improve health outcomes, save lives and be cost-effective. Formal advocacy for a AAA screening program in the literature in Canada has occurred since 1999. An organized national or provincial program has not yet been declared.

**Methods:** Using population and costing data from Statistics Canada and CIHI we identified the characteristics of the primary screening target population of men between 65 and 75 years of age. We analyzed the eligible number of men, the temporal variation due to an aging population, the regional variation and the impact of the rate of screening adoption on yield of disease. An AAA screening program was modeled over a 10 year period. We performed sensitivity analysis using estimates of yield from Canadian published literature to determine the burden of the disease.

**Results:** There are over 450,000 Ontario men in the target population eligible for screening. There are provincial and regional variations with both population size and unequal distribution. The number of eligible patients decreases over time. The annual eligibility over 10 years ranges from 460,000 to 105,873 patients. Should all patients be screened provincially, there would be over 23,000 annual referrals to vascular surgeons (for AAA >3 cm) and approximately 3000 annual aneurysm operations. A minimum of 510 lives would potentially be saved annually. Millions of dollars are projected to be saved with screening, despite the cost of screening.

Adoption rates however are not expected to be 100%. A sensitivity analysis, modeling various adoption rates, yield, surgical mortality rates and costs due to EVAR will be presented. With an adoption rate of 80%, rates of intervention 6836 persons would be missed annually.

**Conclusions:** Comprehensive population data, from Statistics Canada, CIHI and the literature provide patient and cost data to strengthen public policy decision making for AAA screening in Canada. Modeling of the base case and sensitivity analysis can inform society and the Canadian vascular surgeon and prepare him or her for the potential change in practice.

### **Computerized Tomographic (CT) Assessment of Change in Common Femoral Artery (CFA) Cross-surface Area with a Purse String Closure Following EVAR: Feasibility Study**

Clouthier J<sup>1</sup>, Vucemilo I<sup>1</sup>, Szalay D<sup>1</sup>, Rapanos T<sup>1</sup>, Iyer V<sup>1</sup>, Gestaldo F<sup>2</sup>, Yip G<sup>2</sup>, Tittley J<sup>1</sup>

<sup>1</sup>*Division of Vascular Surgery, McMaster University*, <sup>2</sup>*Division of Radiology, McMaster University*

**Objective:** To evaluate CT scan in determining the extent of femoral artery cross-surface area change with femoral artery purse string access/closure technique during EVAR, and it's correlation with clinical outcomes.

**Methods:** 59 patients were randomly selected from the McMaster University EVAR database. CT scan was performed at 6 months from EVAR. The narrowest diameter of CFA (purse string area) was compared to the

same preoperative level of CFA by using fixed bony landmarks. CT software was used to obtain the perimeter of the artery of interest and cross-section area was calculated.

Outcomes of interest were: percentage change in postoperative cross-section area of an access femoral artery, postoperative access site complications and possible graft occlusion.

**Results:** Cross-section area of left CFA decreased by mean of 18 % (range 6-70 %) in comparison to preoperative size. Cross-section area of right CFA decreased by mean of 21% (range 1-57 %) as well. Of patients with a cross-sectional area reduction, only 3 complained of postoperative claudication. Two had an occluded right endovascular limb, and 1 had bilateral iliac stent stenosis. They all underwent secondary angioplasty with clinical improvement. 1 patient had asymptomatic right CFA dissection, 2 patients had asymptomatic external iliac artery dissections and 2 patients had groin seromas.

**Conclusion:** Postoperative CT scanning can detect significant postoperative narrowing of CFA cross-sectional area when a purse string closure technique is used for access vessels during EVAR. The clinical significance of this finding is however uncertain. To objectively estimate the impact of this arterial narrowing, a prospective study has been designed where non-invasive studies, including ankle-brachial indices, will be done before and after EVAR, and then correlated with clinical outcomes and the cross-sectional area change of access arteries on CT scan. Subsequently, further comparison can be examined with a "Perclose" technique when performing EVAR percutaneously.

#### **Iliac Branched Devices for the Treatment of Common Iliac Aneurysms: Are They Worth the Effort?**

Evans, J, Vucemilo I, Tittley J, Rapanos T, Iyer V, Szalay D, *Department of Vascular Surgery, McMaster University*

**Background:** Preservation of pelvic blood supply is a significant challenge in endovascular repairs for patients with common iliac aneurysms. It is recommended to maintain direct inflow to at least one, and ideally both, internal iliac artery (s) to reduce both near and long-term morbidity. Iliac Branched Devices (IBD) allow an entirely endovascular approach to preservation of the ipsilateral internal iliac artery in patients with common iliac aneurysms.

**Objective:** To evaluate the short-term feasibility, efficacy and safety of Iliac Branched Devices (IBD) in the repair of common iliac aneurysms either in isolation or more commonly associated with aortic aneurysmal disease.

**Methods:** A retrospective review of the Endovascular Aneurysm Repair (EVAR) database from a single institution was performed to identify patients with common iliac aneurysms large enough to require an external iliac landing zone. Patients where an IBD was employed were identified and compared to those where the ipsilateral internal iliac artery was intentionally occluded or preserved with a hybrid endovascular / surgical approach. Outcomes of interest were: technical success, post-operative patency and endoleaks, and peri-operative morbidity and mortality.

**Results:** From January 2006 to March 2010 we found 88 patients (only 6 with isolated common iliac artery aneurysms) that required a landing zone in the external iliac artery. 67 patients had intentional occlusion of the ipsilateral internal iliac artery (as the contralateral internal artery was preserved). There were no technical failures and no peri-operative mortalities. There were 8 endoleaks, all type II, with only 2 requiring late embolization. 21 patients had an attempt at preservation of the ipsilateral internal iliac artery.

Of this group, 8 (all with bilateral common iliac aneurysms) had preservation of internal iliac artery with a hybrid approach employing endovascular exclusion or occlusion of the common iliac aneurysm and subsequent surgical revascularization of the internal iliac artery. There were no technical failures, endoleaks or mortalities in this small group.

The remaining 13 patients had IBD repairs. 12 of the 13 had bilateral common iliac aneurysms and the contralateral internal was intentionally occluded. In one patient the contralateral internal iliac was patent. One IBD occluded intra-operatively while the rest remain patent (follow-up ranging from 4 weeks to 48 months). There were 2 endoleaks (both type II) that resolved without need for intervention. The IBD group had 2 (of 13) in hospital mortalities. The deaths occurred a number of days (9 and 20) post-operatively but both were in part attributable to the sequelae of target or access vessel occlusion.

**Conclusion:** Our initial experience suggests that Iliac Branched Devices for the preservation of the internal iliac are technically feasible but may add increased complexity and risk over routine endovascular repair. We anticipate that increased experience with the device, in particular with patient (anatomic) selection, will improve our outcomes. Careful consideration must be given first to the need for, and next the potential risks and benefits of all available strategies to maintain pelvic blood supply.

#### **Peri Renal Aortic Aneurysm Repair using Custom Fenestrated Aortic Grafts: Early Results and Costs**

Thomas Lindsay MDCM, Heather Cox MD, George Oreopoulos MD, Barry Rubin MDCM, KT Tan MD, *Toronto General Hospital, University Health Network, and University of Toronto*

**Introduction:** Endovascular aneurysm repair (EVAR) is a transformative technology that is associated with reduced peri operative mortality and morbidity for AAA repair. Peri renal aneurysms are not suitable for conventional EVAR devices secondary to the lack of sufficient neck lengths for fixation. We report our initial experience with fenestrated grafts for peri renal aneurysms and the associated hospital costs incurred during these repairs.

**Methods:** Data was abstracted from patient charts, EVAR database and costs were provided by the UHN costing system. Costs were stratified into direct variable, direct fixed and indirect costs. Operative details and follow-up was obtained from dictated operative reports and follow-up from outpatient charts. Results are expressed as mean +/- SD.

**Results:** We performed 18 fenestrated EVARs between January 1 2008 and April 10 2010. One case was for the distal end of a type II thoracoabdominal aneurysm and was excluded from further analysis, leaving 17 peri-renal cases. There were 11 men and 6 women with a mean age of 74.7+/-7.2 years. Hypertension was present in 72%, previous MI in 28%, stroke in 6%, diabetes in 17% and one patient had had previous infrarenal aortic surgery. Mean OR and fluoroscopy time was 6.3+/-2.2 hours and 83.4+/-41.1 minutes, respectively and required a mean volume of 217+/-52 mls of contrast. There were a total of 29 stented renal fenestrations, 12 stented visceral fenestrations, 8 visceral scallops, 1 renal scallop and one combined renal/ celiac scallop. None of the scallops were stented. Two renal vessels could not be cannulated. Both of these patients underwent open renal artery exposure and retrograde re-canalization, only one of which was ultimately successful. The unsuccessful re-canalization patient had peri-operative renal dysfunction but did not require dialysis. The only creatine rise was associated with this case. Four patients had troponin elevations, and one required cardiac catheterization with 2 stents placed. The mean length of stay was 6.5 +/-6.8 days, and all patients are alive with a mean follow-up of 8.5+/-9.6 months. There were no type I endoleaks, 8 type II endoleaks, one from the IMA

that required treatment in follow-up. There were no postoperative type III or IV endoleaks. Graft costs were \$27,564 +/-3,070, while total hospital costs were \$46,186 for those in whom it was available.

**Conclusions:** Repair of peri-renal aortic aneurysms using fenestrated EVAR grafts is a viable approach for patients not otherwise be eligible for EVAR therapy. Our data demonstrate that these cases have longer procedure times, with increased use of fluoroscopy and contrast. We have a primary success rate of over 95% in the targeted stented vessels and secondary patency rate of 97%. These procedures are more expensive than conventional EVAR, however we are unable to benchmark these cost from national databases secondary to coding issues. To date fenestrated EVAR is associated with excellent early outcomes. These single center Canadian outcomes compares favourably with those published from the USA and Europe, and justify ongoing assessment of this technology compared to conventional open peri-renal aneurysm repair.

### **Natural History of Minimal Aortic Injury Following Blunt Thoracic Aortic Trauma**

Biniam Kidane, Jeremy R. Harris, D. Kirk Lawlor, Guy DeRose, Thomas L. Forbes

*Division of Vascular Surgery, London Health Sciences Centre & The University of Western Ontario, London, ON, Canada*

**Objectives:** Endovascular repair of blunt traumatic thoracic aortic injuries (BTAI) is commonly performed at most trauma centres with excellent results. However, little is known regarding which injuries do not require intervention. We review the natural history of untreated patients with minimal aortic injury at our centre.

**Methods:** Retrospective review of our trauma centre's database to identify all patients who suffered a BTAI over the last 11 years. The study cohort consists of initially untreated patients with minimal aortic injury (MAI) as defined on CT scan as having an intimal flap or pseudoaneurysm with minimal surrounding hematoma. Follow up CT scans were reviewed, as was clinical follow up.

**Results:** 69 patients were identified with BTAI over this 11 year period. 11 of these patients with initially untreated MAI were included in this study with intimal flaps (n=8, 73%), pseudoaneurysms with minimal hematoma (n=2, 18%) and circumferential intimal tear (n=1, 9%). 6 patients (55%) were male and the median age was 38. Length of clinical follow up ranged between 2-7 months post discharge while CT radiologic follow up ranged between 1 week and 2 years. During this follow up period 8 (73%) patients had complete resolution of their MAI. One patient (9%) with circumferential intimal tear showed extension of their injury 2 months post injury and underwent successful repair. 2 patients (18%) were lost to follow up.

**Conclusions:** There appears to be a subset of patients with BTAI who require no surgical intervention. This includes those with limited intimal flaps and pseudoaneurysms with minimal hematoma. Radiologic surveillance of these patients is mandatory to ensure MAI resolution and identify any progression that might prompt repair.

### **"EVAR vs. Open Repair.com"- What the Internet is Telling Our Patients About the Management of Abdominal Aortic Aneurysms**

P. Jetty MD, B. Chan MD, E. Gee RN, F. Momoli PHD, S. Nagpal MD, T. Brandys MD, G. Hajjar MD, A. Hill MD,

*The Division of Vascular and Endovascular Surgery, The Ottawa Hospital and the University of Ottawa*

**Objective:** Randomized trials and large population-based studies have demonstrated that endovascular aneurysm repair (EVAR) and open surgical repair of AAAs have similar long-term outcomes. Although the vascular surgeon may be the main source for information regarding individual suitability for EVAR or open repair, patients are taking a more active role in the decision making process, with the internet as the major

source of publicly available consumer health information. The quality of the information on the internet regarding the management of AAAs, and how it may influence the patient is evaluated.

**Methods:** This is a prospective, interventional, controlled study which enrolled patients with a small abdominal aortic aneurysm (<5.5 cm) seen in the outpatient clinic, by 5 vascular surgeons, at the Ottawa Hospital from March 2009 to October 2009. In the first part of the study, the patients' preference for EVAR vs. open repair before and after their visit with the surgeon was recorded on a 10 centimeter Visual Analog (VA) scale with "Prefer EVAR" at one end (+5), and "Prefer open repair" at the other (-5), and the center of the scale anchored at 0, indicating "no preference for either". The same VA scale was re-administered after patients were instructed to surf the internet for information that would help them decide which technique of repair was better. Differences in preference for technique of repair were analyzed using the paired Student T-test. In the second part of the study, the websites visited by each patient were individually evaluated by 2 reviewers, using the DISCERN tool, a validated instrument used to assess public medical information for reliability, quality of information, and bias. In addition, all of the videos available on *YouTube.com* concerning EVAR or open repair of AAAs were evaluated. All analyses were performed using SAS 9.2.

**Results:** Of the 106 patients recruited into the study, 71 patients (67%) returned the post-internet questionnaire. Most respondents were male (93.0%) with a mean age of 73.1 years, and a mean AAA diameter of 4.4 cm. 26.8% of patients had surfed the internet prior to their clinic visit. Patients did not have a significant preference for EVAR vs open repair before or after seeing the vascular surgeon. Overall, 67.6% of patients favoured EVAR after surfing the internet, with 57.7% of patients changing their initial baseline preference towards EVAR, 32.4% towards open repair, and 9.9% remaining unchanged. The overall mean VA scale change was +7.4 mm [1.1-13.7],  $p=0.02$ , in favour of EVAR. Patients who visited EVAR-biased websites were more likely to have a greater change in their baseline opinion towards favouring EVAR (+14.2 mm on the VA scale,  $p=0.003$ ). Patients visited a total of 127 unique websites, 112 of which were accessible for evaluation using the DISCERN tool. Most of these sites (59.8%) were considered below average or unacceptable (Discern score <50%). Most sites were biased towards a particular technique (68.8% favouring EVAR, 6.2% favouring open repair, and 25% neutral). A total of 73 unique videos on *YouTube.com* were also evaluated. These demonstrated a similar bias towards favouring EVAR (68.5%) and contained lower quality of information (94.5% below average or unacceptable).

**Conclusion:** Patients surfing the internet for information regarding EVAR vs. open repair of their AAAs will be influenced towards favouring EVAR. Most of the information is biased towards EVAR with many sites highlighting the minimal invasiveness of the procedure, and less emphasis on the need for surveillance imaging, or possibility of re-interventions. There is an increasing proportion of the elderly population visiting the internet for consumer health information; this could have a detrimental effect on patients with AAAs who are denied EVAR by their surgeon after being exposed to this information. The vascular surgery community should populate the internet with accurate, and un-biased information while encouraging patients to take an active role in the decision making process in the treatment of their aneurysms.

#### **Identifying AAA Patients with the Highest Risk Following Endovascular Repair**

Ali Cadili, MD, MSc, Marilou Hervas-Malo, MSc, Sunita Ghosh, MSc, Harold Chyczij, MD, MSc, FRCS(c),  
*University of Alberta, Edmonton, Alberta*

**Introduction:** It has been demonstrated that endovascular repair of arterial disease results in reduced perioperative morbidity and mortality compared to open surgical repair. The rates of complications and need for re-interventions, however, have been found to be higher than in open repair. The purpose of this study

was to identify the predictors of endograft complications and mortality in patients undergoing endovascular abdominal aortic aneurysm (AAA) repair; specifically, our aim was to identify a subset of AAA patients whose risk of peri-procedure mortality was so high that they should not be offered endovascular repair.

**Methods:** We undertook a prospective review of AAA patients receiving endovascular therapy at a single institution. Collected variables included age, gender, date of procedure, indication for procedure, size of aneurysm ( where applicable), type of endograft used, presence of rupture, ASA class, major medical comorbidities, type of anesthesia (general, epidural, or local), length of ICU stay, length of hospital stay. These factors were correlated to the study outcomes (overall mortality, graft complications, morbidity, re-intervention) using univariate and multivariate logistic regression

**Results:** A total of 199 patients underwent endovascular AAA repair during the study period. ICU stay, again, was significantly correlated to the primary outcomes (death and graft complications). In addition, length of hospital stay greater than 3 days, also emerged as a statistically significant predictor of graft complications in this subgroup ( $p=0.024$ ). Survival analysis for AAA patients revealed that age over 85 years and ICU stay were predictive of decreased survival. Statistical analysis for other subgroups of patients (inflammatory AAA or dissection) was not performed due to small numbers in these subgroups.

**Conclusions:** AAA patients greater than 85 years of age are at a greater risk of mortality following endovascular repair. In addition, patients who are expected to require post-procedure ICU admission are also at an increased risk for mortality following endovascular repair.

## 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 Secretariat 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 President will notify the recipient. The Treasurer will send the monetary reward of \$500.00. The Secretary will arrange for him/her to receive the appropriate plaque. 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 for 2010. 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.



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Graeme George Barber  
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