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Friday, Sept. 28, 2012
Paper Session I: Aortic Intervention

Improve trial: challenging anatomy of ruptured abdominal aortic aneurysms. ***T.L. Forbes, T.V. Novick, G. DeRose, J.R. Harris on behalf of the IMPROVE Trial Investigators.*** **From the Division of Vascular Surgery, London Health Sciences Centre and University of Western Ontario, London, Ont.**

Background: The multicentre IMPROVE (Immediate Management of the Patient with Rupture: Open Versus Endovascular Repair) trial randomizes patients with ruptured abdominal aortic aneurysms (rAAA) to open repair or CT scan and endovascular repair if possible. This report describes the aneurysm anatomy of patients with CT-confirmed rAAA. **Methods:** Patients with clinical diagnosis of rAAA were randomized to open repair or to CT scan and endovascular repair if possible. The CT scans were uploaded and analyzed centrally. **Results:** By the end of 2011, over half of the necessary 600 patients have been recruited. This report describes the first 54 patients with CT-confirmed rAAA. The parameters measured are shown in the Table.

Table. Clinical characteristics of 54 patients with CT-confirmed ruptured abdominal aortic aneurysms

Characteristic	Median (IQR)	
Maximum AAA diameter, mm	81.0	(70.3–93.8)
Neck diameter at renals, mm	24.0	(20.2–27.0)
Neck diameter 1cm below renals, mm	26.0	(21.0–35.0)
Neck length, mm	16.0	(6.5–29.8)
Iliac diameter, mm	15.0	(13–20)
Neck atheroma, %	45	(0–75)
Angle between neck and AAA, °	48.0	(27.5–64.0)

AAA = abdominal aortic aneurysm; IQR = interquartile range.

These were large aneurysms, with 21 (38.9%) having neck lengths ≤ 10 mm, and 12 (22.2%) with neck lengths ≤ 5 mm. Excluding the 12 patients with short (≤ 5 mm) neck lengths, 14 of the remaining 42 (33.3%) had conical necks (≥ 2 mm dilatation) and 7 (16.7%) had reverse conical neck (≥ 2 mm narrowing) configurations. Less than half (22 patients or 40.7%) of the CT scans exhibited anatomy that would satisfy the instructions for use of commonly used bifurcated endografts. **Conclusion:** These rAAA patients have large aneurysms with frequent suboptimal anatomy for endovascular repair. The selection of open or endovascular repair is dictated by this anatomy, as is the specific endovascular technique. Endovascular repair with suboptimal anatomy could sacrifice improved short-term results for poorer longer term outcomes and more frequent reinterventions.

Elective AAA repair: Do octagenarians do worse than other patients? ***M.-A. Lortie, S. Elkouri, N. Beaudoin, J.-F. Blair, B. Montreuil.*** **From the Division of Vascular Surgery, University of Montreal, Montréal, Que.**

Methods: We performed a retrospective review of consecutive patients with asymptomatic abdominal aortic aneurysm (AAA) who underwent elective repair, both endovascular aneurysm repair (EVAR; n = 94) and open (n = 144) in 1 vascular surgery department during a 5-year period. We divided patients in 2 groups: 70–79 years old and 80 years old and older. The primary outcome was to compare postoperative morbidity and mortality during the same hospitalization. The secondary outcome was to analyze factors that influence in-hospital mortality. **Results:** Between January 2005 and January 2011, 238 patients underwent surgery; 181 were between 70 and 79 years old and 57 were 80 years old or older. Differences in their demographic characteristics and comorbidities were not statistically significant, except for active smoking (42.5% v. 24.5%, respectively; p = 0.0224) and AAA diameter greater than 6 cm (33.2% v. 63.2%, respectively; p = 0.0001). There were more open surgeries in the 70- to 79-year-old group (66% v. 42%; p = 0.02). No statistically significant differences were observed in postoperative complications, except that atrial fibrillation was less frequent in the 70–79 group (7% v. 18%; p = 0.27). There were 3.3% hospital deaths in the 70–79 group (6 of 181) versus 8.8% in the 80+ group (5 of 57; p = 0.1727). Logistic regression demonstrated that chronic renal insufficiency (OR 6.1), concomitant iliac aneurysm repair (OR 7.2), congestive heart failure (OR 10.6) and AAA diameter greater than 6 cm (OR 8.2) were associated with increased mortality risk. **Conclusion:** Comparison of outcomes between septuagenarians and octogenarians after AAA repair did not demonstrate statistically significant differences in complications and in-hospital mortality, though there was a trend toward increased mortality in the octogenarian group.

Patterns of visceral and renal vessel involvement in aortic dissection. ***P. Ravichandran, D.M. Harrington, M.B. Lovell, J.R. Harris, G. DeRose, T.L. Forbes.*** **From the Division of Vascular Surgery, London Health Sciences Centre and University of Western Ontario, London, Ont.**

Background: To describe patterns of visceral vessel involvement and associated outcomes in aortic dissections. **Methods:** We reviewed CT scans of 39 patients with aortic dissections (30 type B,

9 type A). The celiac artery (CA), superior mesenteric artery (SMA) and renal arteries (RA) were recorded as perfused by the true or false lumen. Subsequent scans, over a median follow-up of 2 years (range 0–10) were reviewed for thrombosis, stenosis or aortic dilatation. **Results:** Of the 156 vessels analyzed, 50 (32%) were supplied by the false lumen. We identified 9 patterns of branch vessel involvement. The most common patterns observed were isolated false lumen supply of a RA (right 33.3%, left 17.9%) with the visceral and contralateral RA perfused by the true lumen. In 6 patients (15%), all vessels were supplied by the true lumen. In all, 12.8% of patients demonstrated false lumen supply of all vessels except for the right RA, and 10.3% of patients had false lumen supply of the CA and left RA. The remaining 4 patterns were each identified in a single patient. On follow-up imaging, 5 patients with false lumen RA supply developed RA thrombosis. Of the 9 patients with false lumen supply to the CA, 1 developed celiac dilatation and 1 developed celiac stenosis. Three patients developed stenosis or dilatation in branch vessels supplied by the true lumen, and 24 of the 39 patients demonstrated aortic dilatation on follow-up imaging. **Conclusion:** In the majority of cases of aortic dissections, at least 1 of the visceral or renal vessels is supplied by the false lumen. The most common pattern of abdominal branch vessel involvement is single RA perfusion by the false lumen with true lumen supply to the remaining vessels. Most commonly, the RAs arise from different lumens, whereas the SMA and CA are most often perfused by the same lumen.

Comparison of knowledge and attitudes of primary care physicians toward abdominal aortic aneurysm screening in Canada and Ireland. ***D.L. Wooster,* E.M. Wooster,† D. Moneley,‡ L. Ryan,‡ A. Dueck.§*** **From the *Division of Vascular Surgery, Department of Surgery, University of Toronto and University Health Network, the †Department of Theory and Policy Studies, OISE/University of Toronto, the ‡Department of Vascular Surgery and Royal College of Surgeons in Ireland, and the §Division of Vascular Surgery, Department of Surgery, University of Toronto and Sunnybrook Health Sciences Centre, Toronto, Ont.**

Background: The purpose of this study was to evaluate the knowledge and attitudes of primary care physicians with regards to abdominal aortic aneurysm (AAA) screening in major urban centres in Canada and Ireland. Both countries have AAA screening guidelines that have been promoted by their national vascular society but have no local or national strategy for implementation of the guidelines. **Methods:** Standardized structured paper surveys were distributed to 1600 primary care practitioners in a defined geographic area in both Canada and Ireland. Participation was voluntary, and results were stripped of any identifiers before analysis. Analysis was conducted using SPSS and descriptive statistics. The process was approved by research ethics boards. **Results:** Overall, 42.6% of invited participants responded. Fewer than 40% of physicians worked in an academic setting and 46%–56% have been in practice for more than 20 years. There was a vascular surgeon available at either their hospital or at the closest hospital to their practice for 70%–78%. Overall, 56% see more than 12 men over the age of 65 per week in their practice; 30% screen for AAA by physical exam, although they agree that this is a poor modality; only 40% were aware of AAA screening guidelines, and of these only 10% routinely screen by ultrasound and 5% actively screened target patients according to the guidelines. The majority agrees with the importance of screening for hypertension and a variety of cancers; they did not recognize specific patient or resource barriers to AAA screening. Focused discussions with a subset of respondents revealed that PCPs preferred active advocacy by consultant vascular specialists to promote AAA screening. **Conclusion:** Promotion of guidelines by a national vascular society does not correlate with an increased knowledge of guidelines or consistent practice for screening of AAAs among primary care physicians. Primary care physicians support of the principle of screening in general, and no specific barriers to screening were identified. Further studies are necessary to determine more vigorous strategies for widespread implementation of the AAA screening guidelines.

Vascular graft infections: a single-centre review. ***Y. Abdulrehman,* G. Harding.†*** **From the Divisions of General Surgery and †Vascular Surgery, University of Manitoba, Winnipeg, Man.**

Background: Vascular graft infections (VGIs) are rare but devastating complications of vascular surgery. The optimal surgical management remains controversial. Our aim was to review the local operative management of VGIs and specifically highlight the results of using the superficial femoral vein (SFV) as a replacement conduit in the setting of aortic graft infection (AGI). **Methods:** A retrospective review of patients with a diagnosis of VGI who underwent operative intervention at our institution was conducted from April 2004 to June 2010. Charts were identified using ICD-10 codes. We included infections of aortic, cross-femoral and axillary-femoral bypass grafts. Data collected from the charts included mortality, length of hospital stay, ICU admission, perioperative complications, amputation, in-hospital mortality, follow-up patency and need for revision. The major end points were graft patency, limb loss and in-hospital death. **Results:** A total of 34 patients who underwent operative intervention for VGIs were reviewed; 10 cross-femoral, 16 aortic and 8 axillary-femoral graft infections. All cross-femoral graft infections were replaced with vein graft (basilic or SFV); 88% (7 grafts) were patent on follow-up. There was 1 in-hospital death and no amputations in this group. Of the patients with AGIs, 9 were managed with excision and in-line reconstruction using SFV and 7 with excision and extra-anatomic bypass using prosthetic graft. Of those seen in follow-up, all of those with SFV reconstruction were patent compared with only 2 of 3 of those with extra-anatomic bypass. Similarly, excision and SFV reconstruction was associated with a lower in-hospital mortality rate; 11% (1 patient) versus 50% (4 patients) in those who had undergone excision and extra-anatomic bypass. There was no difference in the amputation rate. **Conclusion:** Review of literature reveals that the approach to VGIs is evolving. Our results with femoral vein reconstruction are encouraging, with acceptable mortality, morbidity and good long-term patency when compared with alternatives approaches.

Technical factors are strongest predictors of postoperative renal dysfunction following open juxtarenal aneurysm repair. ***L. Dubois, C. Durant, D. Harrington, T.L. Forbes, G. DeRose, J.R. Harris.*** **From the Division of Vascular Surgery, the University of Western Ontario, London, Ont.**

Background: Juxtarenal abdominal aortic aneurysms (AAA) are predominantly repaired using an open technique, requiring suprarenal clamping. We present a series of patients with juxtarenal AAA and analyze factors predictive of postoperative renal dysfunction. **Methods:** Between March 2000 and September 2011, all patients in our prospectively maintained database undergoing juxtarenal AAA repair were evaluated for demographics, operative details and in-hospital outcomes. Postoperative renal dysfunction was classified using the RIFLE criteria (glomerular filtration rate decrease > 25%). The relationship between perioperative factors and postoperative renal dysfunction was explored using both univariate and multivariate analysis (logistic regression). **Results:** Of 169 patients, 76 (45%) required clamping above 1 renal artery, whereas 93 patients (55%) required clamping above both renal arteries. Mean renal ischemia time was 29.2 minutes (range 12–65 min). Twenty-seven patients (16%) underwent adjunctive renal procedures, whereas 19 patients (11.3%) required left renal vein division, and 130 patients (76.9%) received mannitol. Postoperative renal dysfunction occurred in 63 patients (37.3%), with the majority (69%) resolving during hospital stay and 4.1% requiring postoperative dialysis. Patients developing postoperative renal dysfunction had significantly longer mean renal ischemia times (34.7 v. 25.9 min, $p < 0.001$), a higher rate of bilateral suprarenal artery clamping (68.3% v. 47.2%, $p = 0.008$), higher rates of adjunctive renal procedures (26.7% v. 8.8%, $p = 0.002$) and higher rates of left renal vein division (20.6% v. 5.7%, $p = 0.003$). Logistic regression identified left renal vein division, ischemia time and clamp position as the strongest predictors of renal dysfunction, whereas the use of mannitol seemed to be protective. Overall in-hospital mortality was 4.1% as compared with 10% among those with postoperative renal dysfunction. **Conclusion:** Postoperative renal dysfunction occurred in 37.3% of patients following juxtarenal AAA repair. Technical factors including renal ischemia time, clamp position and left renal vein division are the strongest predictors of renal dysfunction, whereas the use of mannitol is protective.

Friday, Sept. 28, 2012
Paper Session II: Aortic Aneurysm EVAR

Type II endoleaks post-EVAR: incidence, rate of aneurysm sac enlargement and success of endoleak treatment. ***J. Dunn, D.I. Obrand,, S. Ladowski, K.S. MacKenzie, M.M. Corriveau, C.Z. Abraham, O.K. Steinmetz.*** **From McGill University, Montréal, Que.**

Background: Our purpose was to evaluate the natural history of type II endoleaks in patients undergoing abdominal aortic aneurysm endovascular repair (EVAR). The relationship between type II endoleak, aneurysm sac enlargement and treatment of type II endoleaks was examined. **Methods:** We retrospectively reviewed the medical records and imaging results of all patients having EVAR for abdominal aortic aneurysm (AAA) at 2 university teaching hospitals between 1999 and 2010. Presence of type II endoleak on follow-up imaging, CT scan or ultrasound was used to identify cases. Branched, fenestrated and ruptured AAAs were excluded from the data set. Sac enlargement was defined as greater than 5 mm increase in maximal sac diameter. Treatment included open repair or endovascular with coils and/or glue. **Results:** A total of 598 cases were examined. The mean follow-up of the total group was 35.3 ± 70.4 months (range 0–149.9 mo). We identified 79 type II endoleaks (incidence 13.2%). In follow-up of these cases, a decrease in aneurysm sac was seen in 23 (29.1%), whereas 33 remained stable (41.8%) and 23 (29.1%) showed sac enlargement. Of the 23 type II endoleaks associated with increase in AAA diameter, 15 underwent treatment (65.2%) and 8 had no treatment (34.8%). Spontaneous resolution occurred in 5 endoleaks (21.7%). In most cases, treatment was by angiography and coiling. The treatment success rate was 80%, with only 3 cases of residual endoleak postcoiling. Two patients underwent open repair of their type II endoleaks (9.1%). One patient with a stable type II endoleak died of aneurysm rupture 51 months after undergoing EVAR. **Conclusion:** Most type II endoleaks associated with an enlarging AAA sac can successfully be treated by endovascular techniques. Lifelong surveillance is warranted in all patients with type II endoleak post-EVAR, even those with stable AAA sac diameter.

Ultrasound for follow up of endovascular aortic aneurysm repair: Is CT necessary? ***D. Obrand, C. Abraham.*** **From the Jewish General Hospital, Montréal, Que.**

Background: Various protocols exist for patients undergoing endovascular abdominal aortic aneurysm repair (EVAR). Follow-up is necessary owing to the incidence of delayed rupture despite repair. Most protocols use CT scans for this follow-up, as it is highly sensitive in detecting endoleaks. However, recent studies have shown the harmful effects of repeated radiation exposure. Other studies have shown that ultrasound is not as effective at identifying endoleaks as are CT scans. Since 2008, we have instituted an ultrasound-only follow-up, with CT scans reserved for those patients found to have enlarging aneurysms, irrespective of the presence or absence of endoleak. **Methods:** We conducted a retrospective review of a prospective database of patients undergoing elective EVARs from 1998 to 2010. Evaluation of endoleaks, sac enlargement, secondary treatments and method of diagnostic imaging were reviewed. Mortality rates, secondary interventions and freedom from delayed rupture are reported. **Results:** In all, 239 patients undergoing EVAR were eligible: 30-day mortality was 2.1%, mean follow-up was 32.2 months (range 1–149 mo), and 15 patients were lost to follow-up for a 93.5% follow-up rate. Type 2 endoleaks were identified in 27 patients (11.3%); 7 resolved spontaneously. Sac enlargement occurred in 10 of the 20 remaining sacs. Two aneurysm ruptures occurred, both in patients with enlarging aneurysms noted on follow-up imaging. **Conclusion:** Sac enlargement is a useful tool in determining the need for further interventions after EVAR. Ultrasound follow-up of patients undergoing EVAR is effective in the determination of sac enlargement, irrespective of the presence or absence of endoleaks allowing for further interventions to reduce the incidence of postrepair ruptures and thus reducing the patients exposures to harmful effects of radiation.

Trends in the utilization of endovascular therapy for elective and ruptured thoracic abdominal aortic aneurysm procedures across Canada. ***P. Jetty,* D. Husereau.†*** **From the *Division of Vascular and Endovascular Surgery, The Ottawa Hospital and University of Ottawa, and the †Department of Clinical Epidemiology and Community Medicine, University of Ottawa, Ottawa, Ont.**

Background: Randomized trials have shown improved operative mortality with endovascular aneurysm repair (EVAR) and similar long-term mortality rates. There have not been any trials assessing the outcome of thoracic endovascular aneurysm repair (TEVAR); however, enthusiasm for TEVAR continues to increase. The current knowledge of utilization rates of TEVAR in Canada is limited. **Methods:** Patients who underwent nonruptured (TAA) and ruptured TAA (RTAA) repair, by either open surgical repair (OSR) or TEVAR, in Canada were identified from hospital discharge abstract data. Trends in rates for OSR and TEVAR were calculated by province and by year, and standardized per 100 000 persons over 65 years of age (per capita). **Results:** Between April 2004 and March 2009, 613 TAA procedures were performed in Canada, either by OSR (n = 327) or TEVAR (n = 286). The proportion of all elective AAA procedures by TEVAR increased from 25.5% in 2005 to 61.7% in 2009, the highest current proportion of EVAR utilization in Ontario (76.1%) and the lowest in Manitoba (< 5%). After standardization, the national rate of total procedures for TAA increased 25%; however, this did not translate into a proportional decline in the rate of RTAAs as a result during the study period. However, regions such as Manitoba that underutilized TEVAR demonstrated trends toward higher per capita rupture TAA rates compared with national average rates. Provincial variations in TEVAR use did not correlate with differences in comorbidities. **Conclusion:** Use of TEVAR in Canada for AAAs has increased in the past 5 years, with an increase in overall TAA procedure volumes. Compared with EVAR, there has been an earlier acceptance and a more rapid diffusion of TEVAR technology. Although the national rate of ruptured TAAs did not proportionally correlate with the significant rise in TEVAR utilization, provinces such as Manitoba, which underutilized TEVAR, demonstrated trends toward higher per capita rupture TAA rates compared with national average rates, indicating a region which may also have the largest potential for future increased use of TEVAR.

Patency of the contralateral internal iliac artery in aortouniiliac endografting. ***S. Hossain, O.K. Steinmetz, M.M. Corriveau, K.S. MacKenzie.*** **From McGill University, Montréal, Que.**

Background: Our purpose was to determine the outcome of the contralateral internal iliac artery (IIA) in patients undergoing endovascular abdominal aortic aneurysm repair (EVAR) with an aortouniiliac endograft and femorofemoral bypass. **Methods:** This retrospective study evaluated 131 consecutive patients with abdominal aortic aneurysm treated with aortouniiliac EVAR and femorofemoral bypass at a single institution between October 2001 and November 2010. Following review of the medical records, 31 patients were excluded from the study owing to lack of intravenous contrast use on follow-up CT imaging (14), intentional preoperative/intraoperative coiling and/or coverage of the contralateral IIA (11), death within 24 hours of the surgery (2), absence of femorofemoral bypass (2), existing bypass of the femoral arteries (1) and immediate conversion of endovascular to open surgery (1). This left 100 patients for inclusion in the study. Preoperative demographics and postoperative contrast-enhanced CT scans with multiplanar reconstruction were reviewed for all patients. Contralateral IIA patency was determined intraoperatively following occluder deployment. The last available postoperative CT imaging for all patients was then identified and evaluated for contralateral IIA patency. Patency on imaging was defined as contrast enhancement of the IIA in continuity with the external iliac artery and absence of > 50% stenosis at the origin of the IIA. If occlusion was identified on the last available follow-up CT scan, previous CT scans during the follow-up period were reviewed to determine duration of patency. Clinical outcome focused on postoperative pelvic ischemia and reported symptoms of buttock claudication. **Results:** Median age at time of operation was 77.6 ± 6.7 years; 78% of these patients were male. Median clinical follow-up was 24.3 months postsurgery, and median follow-up of imaging with intravenous contrast was 21.7 months. Overall, 67 patients (67%) had a patent contralateral IIA on last imaging follow-up, whereas 33 patients (33%) had either occluded (25 patients, 76%) or stenotic (7 patients, 24%) internal iliac arteries. Preoperative demographics including diabetes, chronic renal insufficiency, dyslipidemia, coronary artery disease, hypertension, chronic obstructive pulmonary disease, age and sex were not significantly different between the 2 groups. Of the patients with IIA occlusion, 80% (20 of 25) were found to have occluded on the first postoperative imaging (median 8.0 d). Buttock claudication was reported in 18% (6 of 33) with occluded IIA compared with only 3% (2 of 67) with patent contralateral IIA on final imaging follow-up (18% v. 3%, p = 0.014). There were no observed cases of buttock necrosis, spinal ischemia or colonic ischemia. **Conclusion:** Our findings suggest that aortouniiliac EVAR with femorofemoral bypass is associated with a significant incidence of contralateral IIA malperfusion on postoperative CT imaging. Occlusion appears to occur early in the postoperative period in the majority of patients, and patient-reported buttock claudication is observed significantly more frequently in patients with occluded IIA compared with those with patent IIA. More serious pelvicischemic complications were not seen in this series. Further study is required to determine if modification of procedural conduct can prevent contralateral IIA occlusion and prevent the development of buttock claudication.

Friday, Sept. 28, 2012
Paper Session III: General Vascular Topics

Prevalence and significance of extravascular incidental findings on computed tomographic angiography and magnetic resonance angiography. ***R.Y. Yang,*† J.D. Jaskolka,† K.T. Tan,† G. Roche-Nagle.**** **From the *Division of Vascular Surgery, Department of Surgery, and the †Division of Vascular and Interventional Radiology, Department of Medical Imaging, University Health Network, University of Toronto, Ont.**

Background: Computed tomographic angiography (CTA) and magnetic resonance angiography (MRA) are routinely used to evaluate patients with vascular disease. They have the ability to detect unexpected nonvascular pathology. The purpose of this study was to determine the prevalence and significance of extravascular incidental findings in patients undergoing CTA or MRA. **Methods:** We performed a retrospective review of 737 patients who underwent CTA and 184 patients who underwent MRA during a 5-year period. Incidental findings were classified as low, moderate or high significance findings. For patients with high significance extravascular findings, hospital records were reviewed to determine if appropriate follow-up was

conducted. **Results:** Among the CTA patients, 539 (73.1%) had incidental findings. Low, moderate and high significance findings were discovered in 514 (69.7%), 95 (12.9%) and 41 (5.6%) patients, respectively. Twenty (48.8%) patients with high significance findings received appropriate follow-up investigations. Among the MRA patients, 95 (51.6%) had extravascular findings. Low, moderate and high significance findings were present in 80 (43.5%), 27 (14.7%) and 3 (1.6%) patients, respectively. Two (66.7%) patients with high significance findings received proper follow-up. **Conclusion:** Incidental extravascular findings on CTA and MRA are very common in patients with vascular disease. Although most of these findings are benign, a small percentage could be serious and not all received adequate follow-up in our study population. Referring physicians should arrange appropriate investigations for patients with potentially serious findings.

Alterations in gravitational mechanical loading: effects on endothelial cells. ***S.M. Grenon,*†‡ J. Aguado-Zuniga,*† M.S. Conte,†‡ M. Hughes-Fulford.†§*** **From the *Department of Surgery, University of California, San Francisco, the †Hughes-Fulford Laboratory, Veterans Affairs Medical Center, San Francisco, the ‡Department of Surgery, Veterans Affair Medical Center San Francisco, and the §Department of Medicine, University of California, San Francisco, San Francisco, Calif.**

Background: Mechanical forces including gravity affect mechanotransduction and subsequent cell function. The goal of this study was to investigate the impact of mechanical unloading (MU) and loading (ML) of endothelial cells with microgravity and hypergravity, respectively, with the hypothesis that MU alters baseline expression of inflammatory and adhesion molecule gene expression and these changes are reversed by ML. **Methods:** Human umbilical vascular endothelial cells (HUVECs) grown to confluency were studied. A desktop random positioning machine and a gravitational cell-loading apparatus provided MU and ML conditions, respectively. The experimental conditions included: control exposed to 1-gravity environment for 24 hours (CL); MU for 24 hours; MU for 24 hours with three 30-minute periods of ML of 12-gravity (MU/ML). Gene expression was studied with quantitative reverse transcription polymerase chain reaction and surface cell adhesion molecule with flow cytometry. **Results:** Mechanical unloading led to a significant decrease in gene expression of the adhesion molecules ICAM-1, VCAM-1, E-selectin, IL-6, TNF-α and VEGF; NOS-3, caveolin-1 and -2 were significantly increased with MU. There was also a significant decrease in cell surface proteins ICAM-1, VCAM-1 and E-selectin with MU seen on flow cytometry. The changes observed in gene expression with MU were reversed by gravitational mechanical loading (MU/ML; Figure). **Conclusion:** Gravitational MU decreases inflammatory and adhesion molecule gene expression, and these changes are reversed by short periods of ML. This points toward the importance of gravitational loading in mechanotransduction and warrants further investigations with regards to clinical significance.

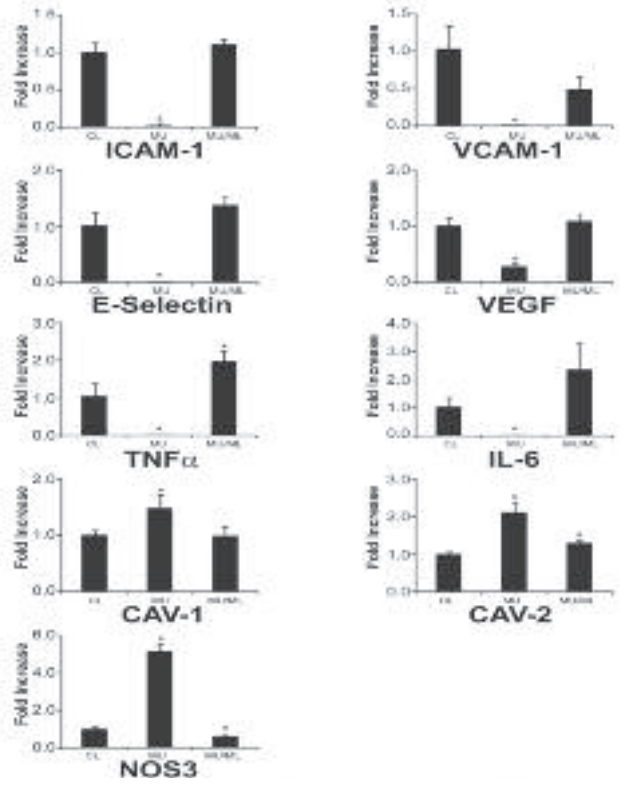

Fig. qRTPCR analysis of gene expression with 1-gravity (CL), gravitational mechanical unloading (MU) and gravitational mechanical unloading with 3 30-minute periods of mechanical hyperloading (MU/ML).

Radiation dose passport for vascular patients. ***K. Phillips,* N. Eisenberg,* T. Kongteng,† G. Roche-Nagle.*** **From the Departments of *Vascular Surgery and †Radiology, Toronto General Hospital, Toronto, Ont.**

Background: Radiation safety has received widespread media attention and is now in the forefront of patient's minds as they go about their medical decision-making. Recently, the Radiation Passport was developed to allow tracking of ongoing medical radiation exposure and to estimate the associated cancer risk (Baerlocher et al. *J Am Coll Radiol* 2010;7:277–80). Our objective was to characterize the radiation exposure over time and the associated cancer risk in patients undergoing endovascular aneurysm repair (EVAR), using the application Radiation Passport. **Methods:** We carried out a retrospective chart review of 54 consecutive patients who underwent EVAR at our institution in 2011. A Radiation Passport was created for each patient, including all medical radiation exposure they received from the time of their preoperative imaging until 3 months and 6 months post-EVAR. The cumulative radiation dose acquired and the estimated associated cancer risk were calculated. **Results:** We found that 83.3% (n = 45) of the patients were male, with a mean age of 77 (SD 8.4, range 52–90) years at the time of surgery. Patients were evaluated by CT scan preoperatively (98.1%, n = 53) and by MRA (1.9%, n = 1); 5.6% (n = 3) required reintervention within 3 months of EVAR and 7.4% (n = 4) within 6 months. The mean cumulative radiation dose was 58.7 mSv (SD 19.4, range 15.7–109.9) at 3 months and 59.8 mSv (SD 20.2, range 15.7–110.7) at 6 months post-EVAR. The baseline risk of cancer caused by background radiation for this group was 1 in 46 (2.2 ± 0.5%). This risk increased to 1 in 43 (2.3 ± 0.5%) 3 months and 1 in 42 (2.4 ±

0.5%) 6 months post-EVAR. **Conclusion:** Radiation Passport or similar tools may start to be used by patients and families in their medical decision-making. The vascular surgery community should know that these tools exist and be aware of the type of information patients are gathering from them. Based on the advanced age of this subset of patients and the relatively minor increase in cancer risk perioperatively, abdominal aortic aneurysm patients should not be discouraged from undergoing EVAR based on concerns over radiation safety.

Where to DRIL: finding the best inflow for the DRIL procedure. ***D. Kopriva, D. McCarville, S. Jacob.*** **From Regina, Sask.**

Background: The DRIL (Distal Revascularization–Interval Ligation) procedure is an effective method for treating ischemic steal syndrome caused by hemodialysis access. Uncertainty exists regarding the optimal placement of the proximal anastomosis for the DRIL bypass. **Methods:** In the preceding 5 years, 10 patients in the hemodialysis program of the Regina Qu'Appelle Health Region were evaluated as candidates for the DRIL procedure to treat ischemic steal caused by a brachiocephalic or brachiobasilic arteriovenous fistula. These patients underwent preoperative catheter angiography and arterial systolic, diastolic and mean pressures were obtained at 5 cm intervals from a point within the brachial artery 5 cm distal to the arterial anastomosis of the vascular access, to the subclavian artery. **Results:** Mean systolic blood pressures (mm Hg) with 95% confidence intervals are shown in the Figure. **Conclusion:** A zone of low pressure exists

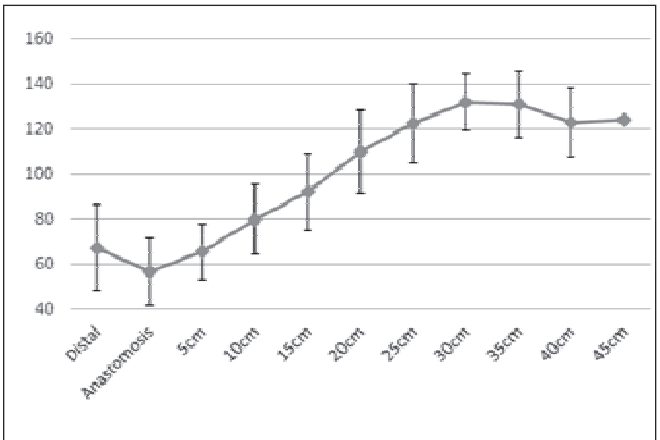

Fig. Systolic blood pressure (mean and 95% CI mmHg) measured a 5 cm intervals from the anastomosis of 10 patients identified as candidates for the DRIL procedure.

in the brachial artery near the arteriovenous anastomosis, and central pressures are not reliably achieved until 20 cm proximal to the arteriovenous fistula. Optimal DRIL bypasses should originate at least 20 cm proximal to the arteriovenous fistula.

Superficial vein thrombosis in a community setting: the need for a management algorithm. ***D. Wooster.*** **From the University of Toronto, Toronto, Ont.**

Background: Superficial vein thrombosis (SVT) has been considered a minor localized venous inflammation (phlebitis); however, studies have suggested that SVT is a deep vein thrombosis (DVT) equivalent, and guidelines recommend anticoagulant therapy or close surveillance. The aim of this study was to document the natural history of SVT and its management using a defined algorithm. **Methods:** Consecutive patients who presented with symptoms suggestive of SVT were identified by venous duplex ultrasound (VDU) to have SVT. All patients were admitted to a management algorithm. If no DVT was identified, the patients underwent a repeat VDU at 1 week and 1 and 3 months. If a patient was at high risk, showed SVT near junctions or DVT was identified, full anticoagulation was administered. All data were analyzed to identify the natural history of the SVT and factors predictive of DVT. **Results:** In 14 months, 72 patients were found to have SVT by VDU; 8 had DVT at initial presentation. Risk factors included age, obesity, varicose veins, previous DVT or SVT, known malignancy and hypercoagulable state. Superficial vein thrombosis was localized (29), locally extensive (19), multilevel (16) and bilateral (8). Of the 64 patients with SVT only, progression occurred in 30 (at 1 week in 15, 1 month in 10 and 3 months in 5), resolution in 20 patients and no change in 14 on repeat VDU; 15 patients were treated with anticoagulation (DVT 9, near junction 5, for travel 1). Need for anticoagulation correlated with initial findings of extensive SVT, obesity, previous SVT or DVT and hypercoagulable state. **Conclusion:** Superficial vein thrombosis is not a benign, minor condition; coexistent DVT is found in 11% and subsequent indication for anticoagulation in 22%. Management of patients with SVT in an algorithm of anticoagulation or careful surveillance is appropriate and is consistent with guideline recommendations.

Safety of carotid endarterectomy without shunt. ***R. Karam,* M. Lindsay,† P. Nault,‡ M.M. Corriveau,§ S. Elkouri.¶*** **From the *University of Montreal, Montréal, Que., the †University of Ottawa, and the the Divisions of Vascular Surgery at the ‡Hull Hospital, University of Ottawa, Ottawa, Ont., the §Royal Victoria Hospital, University of McGill, and the ¶Hôtel-Dieu du CHUM, University of Montreal, Montréal, Que.**

Background: Stroke is a rare complication of carotid endarterectomy (CEA). The usefulness of carotid shunting during CEA has not been proven. Our aim is to assess the safety of routine nonshunting, particularly in patients with contralateral carotid occlusion or recent stroke. **Methods:** We retrospectively reviewed medical records of consecutive patients undergoing CEA by 3 vascular surgeons in the province of Quebec, selected because they had a practice of routine nonshunting. The 95% confidence intervals (CIs) for 30-day stroke or death rates (SDR) were also calculated by the modified Wald method. **Results:** From May 2008 to June 2012, 229 patients were treated: 167 (73%) men and 62 (27%) women. The median age was 69 years (43–94). Sixty-one (26%) patients were asymptomatic, while 45 (20%) suffered from amaurosis fugax, 45 (20%) from transient ischemic attack and 78 (34%) from recent stroke. Thirty-four (15%) and 30 (13%) patients had contralateral carotid stenosis between 50%–69% and 70%–99%, respectively, while 16 (7%) had a contralateral carotid occlusion (CCO); 228 (99%) patients underwent surgery under general anesthesia. All patients had a 30-day follow-up. Globally, 2 (0.8%) patients died and 4 (1.8%) suffered from stroke, giving an SDR of 2.2% (5 of 229), with a 95% CI of 0.8%–5.2%. Out of the 78 patients who had a recent

stroke, 2 (2.6%) had a postoperative stroke, giving an SDR of 2.6% (2 of 78), with a 95% CI of 0.2%–9.4%. Regarding the 16 patients who had a CCO, 2 (12.5%) had a postoperative stroke, giving an SDR of 12.5% (2 of 16) with a 95% CI of 2.2%–37.3%. **Conclusion:** Our results suggest that nonshunting during CEA is a safe procedure for our patients. More patients are needed to confirm the safety of this practice in patients with contralateral occlusion or for those with recent preoperative stroke.

Saturday, Sept. 29, 2012
Paper Session IV: Peripheral Vascular Disease I

Vascular quality of care assessment: how admission to a vascular surgery service affects evidence-based risk factor modification in patients with lower extremity peripheral arterial disease. ***N. Steenhof,*†† F. Le Piane,* K. Leblanc,*†‡ N. Eisenberg,§ Y. Kwan,* C. Malmberg,* A. Papadopoulos,¶** G. Roche-Nagle.§††*** **From the *Department of Pharmacy, University Health Network, the †Faculty of Pharmacy, University of Toronto, the ‡Centre for Innovation in Complex Care, University Health Network, the §Division of Vascular Surgery, University Health Network, the ¶Faculty of Nursing, University of Toronto, the **Peter Munk Cardiac Centre, University Health Network, and the ††Faculty of Medicine, University of Toronto, Toronto, Ont.**

Background: Peripheral arterial disease (PAD) guidelines recommend aggressive risk factor modification to improve cardiovascular outcomes in this patient population. Recommended pharmacologic therapy includes antiplatelets, angiotensin converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARB) and HMG-CoA-reductase inhibitors. The objective of this study was to determine whether admission to a vascular surgery service improved rates of prescribing of these guideline-recommended therapies on discharge. **Methods:** A retrospective chart review of patients admitted to the vascular surgery service at University Health Network from January 2010 through July 2010 was conducted. Inclusion in the study required a primary or secondary diagnosis of lower extremity PAD. Criteria were established by a multidisciplinary clinical team to determine eligibility for a risk reduction therapy. Patient demographics, comorbidities and medications before admission were collected. Patients were assessed at discharge and deemed eligible to receive one of the recommended therapies according to the established criteria. **Results:** In total, 132 patients met inclusion criteria. The mean age of the patients was 71 years, 64% were male and 50% were emergency admissions. Prior to hospital admission, 64% of patients were on antiplatelet therapy, 73% were taking either an ACE inhibitor or an ARB, and 73% were taking an HMG-CoA-reductase inhibitor. At the time of discharge, 92% of eligible patients were prescribed at least 1 antiplatelet agent, 82% of eligible patients were prescribed ACE inhibitors or ARBs, and 83% of eligible patients were prescribed HMG-CoA reductase inhibitors. **Conclusion:** The results of this study reveal that there is suboptimal prescription of risk reduction therapies in the community, and this improves on admission to a vascular surgery service. Although the proportion of patients receiving evidence-based treatments at discharge is high, there is still room for improvement in this high-risk group of patients. Strategies for increasing these rates are being explored.

Factors related to walking performance in claudicants. ***P.M. Brown,* D.T. Zelt,* J.E. Tranmer.†*** **From the *Division of Vascular Surgery, Department of Surgery, Kingston General Hospital, and the †School of Nursing, Faculty of Health Sciences, Queen's University, Kingston, Ont.**

Background: To examine the associations in claudicants between ankle–brachial index (ABI), diabetic status, current smoking, waist circumference (WC), self-reported exercise and walking performance, as measured by the Gardner graded progressive treadmill test. **Methods:** Claudicants with an ABI ≤ 0.9, with claudication as the limiting factor in walking performance were invited to participate. Consenting participants completed a standardized graded treadmill test and an intake interview, which included a self-report history of current exercise activities. A 5-level categorical scale was created based on increasing levels of exercise (0 = sedentary to 4 = greater than 4.5 hours of walking per week or at least 2 hours on a treadmill). **Results:** We tested 157 patients (46 female, 111 male), with a mean absolute claudication distance (ACD) time of 429.7 seconds. There was no significant difference between sexes with respect to factors studied. Smokers were younger, had significantly lower ABI, WC and performance, and a higher proportion of sedentary activity. Patients with diabetes were more likely to have a larger WC and poorer performance but no difference in ABI, age or self-reported exercise. ACD was significantly different between the 5 categories of self-reported exercise ($F = 27.2$, $p < 0.001$); participants in the highest category (level 4) performed better than all other categories. Sedentary participants performed similar to those in levels 1–2 but different from those in levels 3–4. In a multivariate linear regression analysis, male sex ($\beta = 0.14$, 95% CI 14.5–219.3), smoking status ($\beta = -0.22$, 95% CI –187.7 to –60.7), diabetic status ($\beta = -0.20$, 95% CI –301.7 to –70.8) and self-reported exercise ($\beta = 0.56$, 95% CI 116.8–185.2), but not age, WC or ABI were associated with walking performance ($F = 20.2$, $p < 0.001$). **Conclusion:** Factors related to claudication performance that can be modified include smoking and exercise participation, with exercise being the most important factor. Our results suggest that a significant duration of regular walking exercise (i.e., ≥ 3.5 hours per week and/or treadmill) is needed to effect walking performance.

Prediction of limb salvage after arterial reconstruction for mangled extremities. ***M.A. Elsharawy.*** **From the Department of Surgery, University of Dammam, Al-Khobar, Kingdom of Saudi Arabia**

Background: Over the past 2 decades, few guidelines have been available for the decision-making process of primary amputation for mangled extremity. These guidelines were based on application of severity grading systems. However, these systems derived from retrospective data and a small number of patients. The aim of this study is to assess these scores for prediction of limb salvage after arterial reconstruction for mangled extremity. **Methods:** Between August 2003 and August 2011, a prospective study on all patients with arterial injuries in mangled extremity was undertaken. All patients were scored using the Mangled Extremity Severity Score (MESS) and the Mangled Extremity Severity Index (MESI). **Results:** During the study period, arterial reconstruction was performed in 124 patients with mangled extremity. Primary patency, secondary patency and limb salvage were 81%,

85.5% and 93.5%, respectively. The only factor affecting limb salvage was the site of trauma (upper limb 100% v. lower limb 89%, $p = 0.08$). There was no significant effect related to the mechanism of trauma (blunt 90% v. stab 100, $p = 0.125$), MESS (< 7, 100% v. > 7, 91%, $p = 0.22$) and MESI (< 20, 100% v. > 20, 90.5%, $p = 0.154$). **Conclusion:** Upper limb injuries were the least likely to lead to amputation. We recommend that all injuries, whatever their score, should be surgically explored before treatment decisions are made.

TCOM Study: transcutaneous oximetry as a prediction tool for chronic wound and amputation healing outcomes. ***K.A. Arsenault,*[*] *A. Al-Otaibi,*[†] *P.J. Devereaux,*[‡§¶] *J. McDonald,*[†] *K. Thorlund,*[§] *J.G. Tittley,*[†] *R.P. Whitlock.*[†¶]**
From the *Michael G. DeGroote School of Medicine, the †Department of Surgery, the ‡Department of Medicine, the §Department of Clinical Epidemiology and Biostatistics, and the ¶Population Health Research Institute, McMaster University, Hamilton, Ont.

Background: Researchers have proposed transcutaneous oximetry (TcPO2) as a method to predict nonhealing of chronic wounds and the occurrence of healing complications for lower limb amputations. There is, however, uncertainty regarding the optimal threshold value for TcPO2 and its ability to independently predict these outcomes. **Methods:** We undertook 2 systematic reviews and meta-analyses, searching 5 major medical databases, relevant review articles and reference lists. We selected all studies that evaluated TcPO2 for its ability to healing complications of chronic wounds or lower limb amputations and conducted data abstraction independently and in duplicate. Results were pooled using the DerSimonian and Laird random-effects model. **Results:** In the first review, 4 studies, enrolling 901 patients with 910 lower extremity chronic wounds demonstrated that a periwound TcPO2 level below a cutoff of 20 mm Hg or 30 mm Hg was an independent predictor of chronic wound healing complications (OR 3.21, 95% CI 1.07–9.69). In the second review, 14 prospective cohort studies, enrolling 626 patients with 658 amputations, reported data that allowed for the calculation of an unadjusted relative risk of amputation revision associated with a TcPO2 level below cutoffs of 10 mm Hg (OR 1.80, 95% CI 1.19–2.72), 20 mmHg (OR 1.75, 95% CI 1.27–2.40), 30 mm Hg (OR 1.41, 95% CI 1.22–1.62) and 40 mm Hg (OR 1.24, 95% CI 1.13–1.35). It was not possible to evaluate TcPO2 as an independent predictor of amputation healing complications due to an insufficient number of studies reporting risk-adjusted results. **Conclusion:** The first review suggests that TcPO2 measurements have independent prognostic value in predicting chronic wound complications and can provide clinicians with a means to assess these wounds. The second review revealed significant associations of low TcPO2 levels with amputation healing complications, but highlighted the need for a large, sufficiently powered study to determine this tool's independent predictive ability and an appropriate threshold value. Based on these results, we recently began a multicentre observational study that aims to evaluate TcPO2 and transcutaneous carbon dioxide in this context.

The use of reentry devices improves the procedural safety and clinical outcomes of recanalization of iliac artery occlusions. ***J.M. Panneton, S.S. Ahanchi.* From the Division of Vascular Surgery, Eastern Virginia Medical School, Norfolk, Va.**

Background: Our aim was to analyze the effect of reentry device use on outcomes of iliac artery chronic total occlusion (CTO) recanalization. **Methods:** A retrospective review of patients with iliac artery CTO treated with subintimal angioplasty (SIA) from 2006 to 2011 was completed. We compared the outcomes of 2 groups: those procedures completed with versus those without reentry device. **Results:** Of the 121 iliac artery CTOs that underwent SIA, 32 cases used a reentry device and 89 did not. For the entire cohort, the mean age was 65, 45% were men, 76% had hypertension, 71% hyperlipidemia, 36% diabetes and 56% coronary artery disease. Indications for the procedure included claudication (60%) and critical limb ischemia (40%). The clinical profile and indications for intervention were not statistically different for the 2 groups. Combining TASC C and D lesions, the reentry device group had a trend toward a higher percentage of more advanced lesions compared with the nonreentry device group (82% v. 66%, $p = 0.07$). Yet despite the more advanced lesions, the technical success rate was higher in the reentry device group (100% v. 77%, $p = 0.002$). The combined major complication rate, retrograde aortic dissection and 30-day mortality rate of the reentry group was also reduced (0% v. 10%, $p = 0.04$). Lastly, the 1-, 2- and 3-year primary and secondary patency rates appear to be improved with the use of reentry devices (primary patency at 1, 2 and 3 years for the reentry device group v. the nonreentry device group was 100%, 100%, 100% v. 84%, 72%, 64%, $p = 0.02$; and secondary patency at 1, 2, and 3 years for the reentry device group v. the nonreentry device group was 100%, 100%, 100% v. 93%, 91%, 77%, $p = 0.125$). **Conclusion:** The routine use of reentry devices further improves the technical success, safety and primary patency of SIA recanalization of iliac artery CTO.

CT scans on renal function post EVAR peripheral arterial disease and vulnerability to cardiovascular events: data from the heart and soul study. ***S.M. Grenon,*[*†] *C.D. Owens,*[*†] *M.S. Conte,*[*] *E. Vittinghoff,*[‡] *M. Whooley,*[‡§¶] *B.E. Cohen.*[§¶]**
From the *Department of Surgery, University of California, San Francisco, the †Department of Surgery, Veterans Affairs Medical Center, San Francisco, the ‡Department of Epidemiology and Biostatistics, University of California, San Francisco, the §Department of Medicine, University of California, San Francisco, and the ¶Department of Medicine, Veterans Affairs Medical Center, San Francisco, Calif.

Background: Among patients with coronary artery disease (CAD), those with comorbid peripheral arterial disease (PAD) have a greater vulnerability to cardiovascular (CV) events than those with CAD alone. It is unclear why the presence of PAD predisposes patients with CAD to adverse CV outcomes. In a prospective cohort study of patients with CAD, we evaluated potential mechanisms that might explain the adverse CV outcomes associated with PAD. **Methods:** We evaluated 1020 patients with stable CAD recruited from 2000 to 2002 and followed for an average of 7.2 (SD 2.6) years. Incident PAD events were adjudicated based on physician diagnosis, radiological imaging and/or need for PAD surgery. We used Cox proportional hazards models to evaluate the association between PAD events

and subsequent risk of CV events or death. Models were adjusted for traditional cardiovascular risk factors and a history of PAD at baseline. **Results:** Among the 1020 patients, 67 patients developed incident PAD events during the follow-up period. Patients who developed PAD events had a higher risk of subsequent CV events and death compared with those who did not develop PAD (Figure). After adjustment for traditional cardiovascular risk factors and self-reported history of PAD, development of PAD events remained associated with an 84% increased risk of subsequent cardiovascular events (adjusted HR 1.84, 95% CI 1.15–2.96, p = 0.01) and an 89% increased risk of death (adjusted HR 1.89, 95% CI 1.30–2.74, p = 0.0009). Only a small portion of this association was explained by baseline differences in levels of IL-6, TNF-α and fibrinogen. **Conclusion:** In a contemporary cohort of patients with CAD, development of incident PAD was associated with adverse CV outcomes. The increased risk of CV events was not fully explained by shared risk factors or inflammation. Further research is necessary to understand how the presence of PAD increases risk of subsequent CV events.

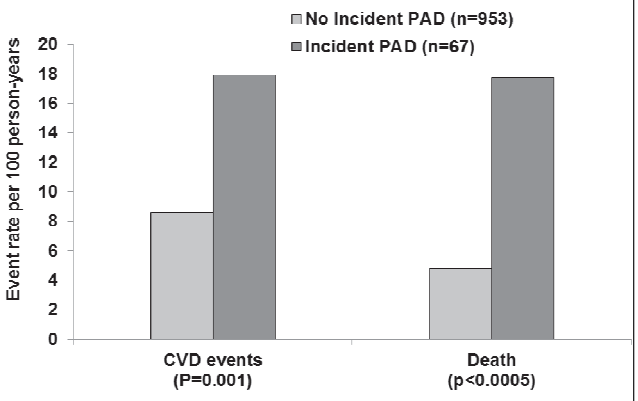

Fig. Event rates in patients with or without peripheral arterial disease.

Saturday, Sept. 29, 2012
Paper Session V: Peripheral Vascular Disease II

Risk factors for premenopausal peripheral arterial disease. *A. Ducas, A. Junaid, A. Boyd.* From the Health Sciences Centre and Grace Hospital, University of Manitoba, Winnipeg Man.

Background: Despite similar risk factors, women have lower prevalence of peripheral artherial disease (PAD) in the premenopausal period compared with age-matched men. The prevalence of PAD increases from 3%–4% up to 29% in women after menopause. By the 7th to 8th decades, the prevalence is comparable in men and women. Little is known about the factors that protect women from PAD before the onset of menopause. The purpose of the study was to retrospectively review the ankle–brachial index (ABI) and risk factor data in premenopausal (< 53 yr) women referred for ABI testing in the province of Manitoba between 1993 and 2010. **Methods:** In Manitoba, a province of 1.1 million, virtually all ABI tests are performed at 2 hospitals by trained technicians. Both sites also collect risk factor data. The ABI results were considered to be abnormal if less than 0.9. Risk factors included were smoking, coronary arterial disease, obesity, diabetes, hypertension, hypercholesteremia, cerebrovascular disease and chronic renal failure. **Results:** Between 1993 and 2010, 928 women under the age of 53 underwent ABI testing (4.2% of all women in the database). Of these, 260 had abnormal ABI (2.6%), 85% were between the ages of 41 and 52 and 27.9% had critically low ABI. The most prevalent risk for premenopausal PAD in this population was current or former smoking (85%). In most cases, multiple coexisting risk factors such as hypertension (57%), diabetes (55%) and hyperlipidemia (55%) were present; however, no risk factor other than smoking was present in 9.1% of women. In premenopausal nonsmokers, PAD did not develop unless 3 or more risk factors were present. **Conclusion:** The development of premenopausal PAD is unusual and does not develop without multiple combined risk factors. Current and former smoking was most associated with the development of premature PAD. Therefore, ABI testing in premenopausal women without multiple combined risk factors, including smoking, is unlikely to be of value.

Association between depression and peripheral arterial disease: insights from the heart and soul study. *S.M. Grenon,[*†] J. Hiramoto,[*] E. Vittinghoff,[‡] M. Whooley,[‡§¶] B.E. Cohen.[§¶]* From the *Department of Surgery, University of California, San Francisco, the †Department of Surgery, Veterans Affairs Medical Center, San Francisco, The ‡Department of Epidemiology and Biostatistics, University of California, San Francisco, the §Department of Medicine, University of California, San Francisco, and the ¶Department of Medicine, Veterans Affairs Medical Center, San Francisco, Calif.

Background: Risk factors for peripheral artery disease (PAD) are tightly linked to those for coronary artery disease (CAD). Depression is known to increase the risk of CAD, but few studies have evaluated the association between depression and PAD. We examined the association of depression with PAD and evaluated potential mediators of this association. **Methods:** We used data from the Heart and Soul Study, a prospective cohort of 1024 men and women with CAD recruited in 2000–2002 and followed for a mean of 7.2 (SD 2.6) years, with less than 1% annual loss to follow-up. Depressive symptoms were assessed with the validated 9-item Patient Health Questionnaire (PHQ). Prevalent PAD at baseline was determined by self-report. Prospective PAD events were adjudicated based on review of medical records (including physician diagnosis, radiological imaging and/or need for PAD surgery). We used logistic regression and Cox proportional hazards models to estimate the independent associations of depression with prevalent PAD and subsequent PAD events, adjusting for potential mediators of these associations. **Results:** At baseline, 199 patients (19%) had depressive symptoms (PHQ ≥ 10). Prevalent PAD was reported by 12% of patients with depression and 7% of those without depression (age-adjusted OR 1.80, 95% CI 1.06–3.06, p = 0.03). During follow-up, PAD events occurred in 9% of patients with depression and 6% of those without depression (age-adjusted HR 1.78, 95% CI 1.03–3.08, p = 0.04). Factors explaining more than 5% of the association between depression and incident PAD events included race/ethnicity, diabetes, congestive heart failure, HDL, triglyceride levels, serum

creatinine, inflammation, smoking and levels of physical activity. **Conclusion:** Depressive symptoms were associated with a greater risk of PAD. Since elevations in traditional, modifiable cardiovascular risk factors partially explain the association between depression and PAD, it is possible that more aggressive treatment of these risk factors could eliminate the association between depression and PAD.

Early experience with simultaneous hybrid revascularization for co-existent iliofemoral and infrainguinal occlusive disease. ***P. Ravichandran, L. Dubois, T.L. Forbes, G. DeRose, J.R. Harris.*** **From the Division of Vascular Surgery, the University of Western Ontario, London, Ont.**

Background: Many patients presenting with critical limb ischemia require extensive revascularization for multilevel arterial occlusive disease. We describe our early experience in treating such patients with a simultaneous hybrid approach and present relevant short-term outcome data. **Methods:** Between August 2010 and March 2012, all patients undergoing simultaneous hybrid revascularization for coexistent iliofemoral and infrainguinal occlusive disease were retrospectively reviewed for demographic characteristics, operative details, perioperative complications and short-term outcomes. Patients were only included if their original operative procedure involved femoral endarterectomy, iliac balloon angioplasty with or without stenting, and infrainguinal revascularization (open or endovascular). **Results:** In all, 13 patients (14 limbs) met the stated inclusion criteria. Patients presented with ischemic rest pain (Rutherford class 4, $n = 1$), ulceration (Rutherford class 5, $n = 3$) or gangrene (Rutherford class 6, $n = 10$). Following hybrid iliofemoral reconstruction, open infrainguinal bypass was undertaken in 12 cases (11 autogenous, 1 synthetic), and endovascular therapy was used in 2 cases. Concurrent digital or forefoot amputations were performed in 7 cases. Over a mean follow-up of 3.1 months (range 1–10.4 mo), 2 patients required below-knee amputations due to progressive infection (despite clinically patent infrainguinal bypasses). Both patients were diabetic, with preoperative digital or forefoot ulceration/gangrene. One additional patient required a femoral-femoral artery bypass to treat an iliac occlusion (infrainguinal bypass remained patent), resulting in 100% primary assisted patency. Overall limb salvage was 86%, and there were no in-hospital deaths. **Conclusion:** Hybrid revascularization is highly effective in restoring arterial circulation in patients with severe critical limb ischemia secondary to multilevel arterial occlusive disease. In our early experience, limb loss occurred secondary to progressive infection rather than failure of revascularization.

Saturday, Sept. 29, 2012
Paper Session VI: Vascular Education and Research

A prospective, randomized, crossover observational study comparing medical students' ultrasound guided technique versus a novel real time needle guidance ultrasound technique for vascular access using a phantom gel model. ***D. Kopac,[*] J. Chen,[*] R. Tang,[†] H. Vaghadia,[†] A. Sawka.[†]*** **From the *Division of Vascular Surgery and the †Department of Anesthesia University of British Columbia, Vancouver, BC**

Background: To compare traditional ultrasound-guided vascular access with a novel technique using an ultrasound with a needle guidance positioning system (nGPS) for both in-plane and out-of-plane techniques and to assess student perception of each task using the validated NASA Task Load Index questionnaire. **Methods:** A prospective, randomized crossover study of medical students was conducted using a phantom gel model. Each student performed 3 ultrasound-guided punctures with each of the 4 modalities (in-plane no nGPS, in-plane with nGPS, out-of-plane no nGPS, out-of-plane with nGPS) for a total of 12 attempts. A poststudy, validated NASA-TLX task load index questionnaire was conducted to assess the students' perceptions of the 2 different techniques. **Results:** Thirty students completed the study with a total of 90 attempts with each modality. A higher success rate for vascular access using the nGPS for both the in-plane (94% v. 91%) and the out-of-plane (86% v. 70%) views was observed, but this did not reach statistical significance. The students perceived their ability to access vessels increased with the aid of the nGPS (6.83 v. 5.77, $p = 0.007$) with a higher performance satisfaction score (mean 14.5 v. 13.2, $p = 0.041$), The students perceived the mental demand (mean 11.0 v. 13.3, $p = 0.035$) and effort (mean 11.1 v. 13.1, $p = 0.044$) to be lower for the nGPS versus the traditional ultrasound-guided technique. If given a choice, students would overwhelmingly use the nGPS (26 of 30, 87%) as opposed to the traditional counterpart. **Conclusion:** The use of precision ultrasound nGPS did not significantly improve success rate of vascular puncture compared with the traditional ultrasound-guided technique. However, the assessment of mental task load strongly favours the use of the nGPS over the traditional 2-dimension technique.

National EVAR fluoroscopy times study. ***J. Clouthier,[*] T. Forbes,[†] S. Nagpal,[‡] K. Baxter,[§] J. Tittley.[*]*** **From the Divisions of Vascular Surgery, *McMaster University, Hamilton, †Western University, London, the ‡University of Ottawa, Ottawa, Ont., and the §University of British Columbia, Vancouver, BC**

Background: Radiation exposure is becoming an important topic for vascular surgeons as an increasing number of vascular diseases can be and are being treated by endovascular means. The most common of these is EVAR. Total fluoroscopy time has been shown to be a good estimate of total radiation exposure. Surprisingly, there are no studies or guidelines indicating what should be a target fluoroscopy time for EVAR procedures. We look to tabulate a large number of radiation fluoroscopy times from a variety of centres across Canada in order to ascertain what the national fluoroscopy trends are for "typical" infrarenal AAA. These data will enable us to determine what are appropriate and safe fluoroscopy times in order to limit radiation exposure for surgeons, nurses and patients. **Methods:** This is a national retrospective study involving large volume EVAR centres. We reviewed all EVAR procedures performed between 2008 and 2011. The inclusion criteria were infrarenal AAA of any diameter. Exclusion criteria were any involvement of renal arteries, TEVAR, fenestrated or branched grafts. We looked at fluoroscopy times as indicated by the radiology or operative report. We also examined complications ranging from endoleak, migration, dissection, stenosis and occlusion. A questionnaire about surgeon practice was also forwarded to all surgeons who participated in the study. **Results:**

Over 2000 EVARs were performed between 2008 and 2011 at the centres involved. Of these, just under 1000 EVARs met our inclusion/exclusion criteria The average fluoroscopy time was less than 8 minutes, and the complication rate of the procedure was equal to that indicated in the literature. Type 2 followed by type 1 endoleaks were the most common. The fluoroscopy time was slightly higher in EVARs performed percutaneously compared with cut-down. There was no correlation between shorter fluoroscopy time and complication rate. **Conclusion:** Fluoroscopy can be used as a rough estimator of overall radiation exposure. In an era when vascular surgeons will be performing increasing numbers of endoscopic procedures and training younger surgeons to do so, it is important to limit their exposure. This is the first study of its kind looking at national trends in fluoroscopy times, illustrating that "typical" EVARs can be performed safely well under 8 minutes and often under 5. This knowledge can help generate a worthwhile discussion regarding techniques and approaches to limit radiation exposure.

Preparation and biocompatibility assessment of woven silk fibroin and polyester (PET) small diameter vascular prostheses. ***G. Guan,* L. Wang,* X. Yang,* L. Peng,* H. Xingyou,* M.W. King,*† R. Guidoin.‡*** **From the *Key Laboratory of Textile Science and Technology of Ministry of Education, College of Textiles, Donghua University, the †College of Textiles, North Carolina State University, Raleigh, NC, and the ‡Department of Surgery, Laval University, Québec City, Que.**

Background: Thrombosis remains the main cause of clinical failure for small diameter vascular prostheses. To date, in situ endothelialization of grafts and regeneration of blood vessels seems to be the ideal therapy for repairing diseased and injured arteries. Therefore, the major clinical goal is to prepare a vascular graft with satisfactory mechanical performance, significant antithrombotic properties and the ability to promote endothelialization. Our objective was to fabricate silk fibroin/polyester (PET) small diameter vascular prostheses and characterize their architecture and mechanical properties, as well as their cyto- and hemocompatibility. **Methods:** Prostheses were woven on a 20 shaft narrow shuttle loom using silk fibroin (*bombyx mori*) and PET multifilament and monofilament yarns. The mechanical properties, thickness and water permeability were measured with universal textile tester, thickness tester and water permeability device. MTT assay was used to evaluate the viability and proliferation of endothelial cells on the graft materials. Rabbit vein blood was used for measuring the hemolysis and thrombus formation. Commercial prostheses and tissue culture plates were used as the control. **Results:** The brioin/PET woven grafts were ivory in colour, soft, flexible and elastic in both radial and longitudinal directions. The range of inner diameters and wall thicknesses were 3.8–6.0 mm and 0.104–0.285 mm, respectively, with water permeability of 21–470 mL/min/cm^2. The mechanical properties were significantly stronger than those of native blood vessels. The grafts supported endothelial cell proliferation, erythrocyte integrity and showed a significantly improved antithrombotic performance compared with the commercial control. **Conclusion:** The fibroin/PET small diameter prototype arterial prostheses showed good mechanical properties and superior cyto- and hemocompatibility. Implantation as carotid artery bypasses in pigs are in progress to validate the patency and the regeneration of a viable blood conduit. **Acknowledgements:** Funded by Fundamental Research Funds of Central Universities (2011), RFDP (No.20100075110001), NSFC (No. 51003014, No. 31100682) and International Cooperation (No. 10520706600).

Fatigability of stent-graft woven fabrics with zig-zag versus ringed stents. ***J. Lin,* L. Wang,* R. Guidoin,† G. Song,* M. Nutley,‡ Z. Zhang,† Y. Douville.†*** **From the *College of Textiles, Donghua University, Shanghai, P.R. China, the †Department of Surgery, Laval University, Québec City, Que., and the ‡Department of Surgery, University of Calgary, Calgary, Alta.**

Background: Aortic stent grafts have gained a broad clinical acceptability throughout the past decades. However, the frequency of graft-related adverse events mandates close follow-up. Our ongoing international retrieval program has identified damage of graft fabric caused by contacting apexes of zig-zag stent. Our objective was to identify the most optimal configuration of the metallic supports using an in vitro fatigue/buckling machine. **Methods:** The machine developed at the College of Textiles, Donghua University, permitted accelerated buckling of 200 cycles/minute under a pressure of 360 mm Hg. The tests were in duplicate and scheduled for 8, 24, 48 and 168 hours, or stopped when holes were observed. We manufactured stent grafts with a 10 mm diameter and a 100 mm length of woven polyester conduit. Three Nitinol zig-zag stents were sutured externally at a 35° angle. Each stent required 13 stitches of 5–0 polyester suture. Anaconda stent grafts were used as controls. **Results:** Three test devices ruptured after 16, 19 and 20 hours, respectively. After 48 hours of cycling, broken sutures were observed on the Anaconda control devices. Abrasion caused by the rings was visible. Most of the sutures broke following 168-hour cycling, with stitch holes enlarged. **Conclusion:** The degree of resistance to progressive, localized damage that occurs when the woven polyester fabric stent grafts are subjected to cyclic bending and folding is a good indicator to compare the fatigue life of various devices. Damage is cumulative and begins with dislocation due to movement and persistent slips. This is followed by microperforations and small holes that lead to major ruptures. These results suggest that suturing metal stents to fabric conduits represent an Achilles' heel of these devices. In order to develop a new generation of long-term durability, the issue of fatigue life of aortic stent grafts must be further addressed.

Sparking interest: why medical students choose vascular surgery as a career. ***T. Roy,* A.D. Dueck,* G.D. Oreopoulos,* T.F. Lindsay* and the Association of Canadian Integrated Vascular Surgery Residency Programs (ACIVSRP), including T. Brandys,† T.L. Forbes,‡ T. Rapanos,§ R. Sidhu,¶ J.R. Harris,‡ D.L. Wooster,* J.A. Cooper,‡ M. Guirgis,§ M.A. Hussain,* H.K. Khambati† and J.D. Misskey.¶*** **From the Divisions of Vascular Surgery, *University of Toronto, Toronto, †University of Ottawa, Ottawa, ‡Western University, London, §McMaster University, Hamilton, Ont., and the ¶University of British Columbia, Vancouver, BC**

Background: The first Canadian 0+5 integrated vascular surgery (VS) residency programs begin July 2012. Growing interest in

this training pathway emphasizes the need to understand the demographics and motivating factors of the first 0+5 vascular residents and the qualities that made them successful in securing residency positions. **Methods:** An anonymous, web-based survey devised by Lee and colleagues (2010) was administered to the incoming 0+5 VS residents from English-speaking Canadian programs, with a 100% response rate. The survey assessed the background, personal experience, prior exposure to VS and motivations for residency specialty selection. The Canadian Program Director Survey devised by Wagoner and Suriano (1999) was administered to program directors and selection committee members from English-speaking Canadian 0+5 integrated VS residency programs in an anonymous, web-based format, with a 71% response rate. The survey assessed importance of electives, reference letters, research, applicant information, personal attributes, interview performance and academics. **Results:** Of responding 0+5 VS residents, 100% had VS mentors, participated in research, are interested in academic surgery and spent a minimum of 1 month on VS rotations in medical school. The average age is 25, and 83% are male. Clinical rotations, mentors and endovascular technology were the top-ranked reasons for choosing VS as a specialty. More focused training, interest in catheter-based therapies and research opportunities were the top-ranked reasons for choosing the 0+5 training route. Program directors and selection committee members ranked electives at their centre with positive feedback, excellent reference letters from a recognized name in VS and multiple papers published in journals as having the strongest positive impact when assessing medical student applications. **Conclusion:** Strategies to increase medical student exposure to VS through mentorship programs, increased clinical exposure to endovascular technologies and research programs will optimize the ability to attract the best candidates to integrated 0+5 VS residency programs.

Friday, Sept. 28, 2012
Poster Session

Patient preferences for location of abdominal aortic aneurysm surgery with implications for regionalization. ***J.H. Landau, T.V. Novick, J.R. Harris, G. DeRose, T.L. Forbes.*** **From the Division of Vascular Surgery, London Health Sciences Centre and University of Western Ontario, London, Ont.**

Background: Elective repair of abdominal aortic aneurysms (AAA) has been centralized in higher-volume centres in Canada, with reductions in postoperative mortality. The resulting increased travel distances may be undesirable to patients despite the mortality benefit. This study's purpose is to explore the strength of AAA patients' preference for local care versus longer travel distances and lower mortality rates. **Methods:** Patients with AAAs between 4 cm and 5 cm in diameter and living at least a 1-hour drive from our university-affiliated hospital were surveyed using a modification of the standard gamble technique. They were asked to assume that their AAA had grown to 5.5 cm and operative repair was recommended with a perioperative mortality risk at our centre of 2%. The level of additional operative mortality risk these patients would accept to undergo surgery locally, rather than at our regional centre, was determined. **Results:** To date, 44 patients have been surveyed, 93% live within a 2-hour drive of our regional centre, and 95% within a 30-minute drive of their local hospital. The majority (77%) had been prior patients at our hospital. If perioperative mortality risk was equivalent at both their local and our regional hospital, 41% of patients would prefer care at the tertiary centre and 50% of patients would prefer surgery locally. If perioperative mortality was increased, to any extent, at their local hospital, compared with our tertiary care centre, only 9% of patients still preferred local surgery. **Conclusion:** The vast majority of AAA patients will accept longer travel distances as long as it results in a reduction in perioperative mortality. In the absence of a survival advantage, one half would prefer local care, although a large proportion would still prefer a longer travel distance and care at our centre. Such patient preferences should be considered when decisions regarding regionalization of services are made.

Analysis of 15 years of wait time 1 and 2 data in vascular surgery at Kingston General Hospital 1996–2011. ***D.T. Zelt, P.M. Brown.*** **From the Kingston General Hospital and Queen's University, Kingston, Ont.**

Background: The current health care environment is highly focused on quality of care within the dimension of timely access. Fifteen years of wait time 1 and 2 data were analyzed to evaluate practice methodologies and reasons that would mitigate meeting provincial targets. **Methods:** Since 1996, the Division of Vascular Surgery has prospectively collected wait time 1 and 2 data for all elective referrals for outpatient clinic visits and scheduled surgery. Wait time 1 was measured against practice guidelines and predetermined targets. Wait time 2 targets originally set in 1996 have been adjusted to meet current provincial and ministry targets. **Results:** High-risk disease groups (large AAA > 6 cm, transient ischemic attack, peripheral vascular disease with rest pain) were targeted to be seen within 7 days of referral to clinic. Wait time 1 for each at 15 years was within 4 days of target. Wait time 2 targets for high risk groups (large AAA and transient ischemic attack) were challenged to meet average wait times and 90th percentile wait times with an average wait time 2 at 180 days or longer and a 90th percentile wait time of more than 400 days. The more common reasons for delay included case substitution for a more urgent case for both groups, or unavailable intensive care for postoperative AAAs. Dramatic decreases in wait time 2 to provincial targets or better have occurred through aggressive office management. **Conclusion:** Wait time management is a dynamic process. Wait time 1 management requires ongoing attention to practice guidelines and targets within the office booking visits. Whereas wait time 2 in is part dependent upon hospital resources, there is an ongoing need for aggressive operating room booking management for case substitution to maintain utilization and hence wait time reduction.

Flared textile cuff to reinforce the proximal sealing zone of fenestrated stent grafts. ***F. Wang, L. Wang, A. Mohammed, C. Li, H. Jia, B. Hou, R. Guidoin.*** **From the Key Laboratory of Textile Science and Technology of Ministry of Education, College of Textiles, Donghua University, Shanghai, P.R. China**

Background: Fenestrated stent grafts permit to extend the indications of AAA endovascular surgery in patients with severe limi-

tations, including absence of docking zone and fragility. Currently, the fenestrated devices are customized, and the delays of fabrication (6–12 wk) cannot be tolerated to treat emergencies. Our objective was to deploy a flared textile cuff to reinforce the proximal sealing zone in off-the-shelf stent grafts. The cuffs were fabricated by compression molding. Polyester mutifilament yarns were sized and used as warp yarns to fabricate 4 prototypes of fabrics. We had 2 1/1 plain fabrics and 2 2/2 twill fabrics similar to those used in Anaconda and Cook devices, respectively. The fabrics were compressed in a mold to obtain a flared structure after 10 minutes preheating at 160°C in a hot air oven. Heat setting was completed at 160°C for 30 minutes. **Results:** The cuff comprises a flat collar as base, an arc as curved section and a top as a regular fabric tube. The fabric count, density and thickness decrease from the first to the third section, and the results vary with the different prototypes. The physical and mechanical properties of these flared fabric cuffs compare favourably with the commercially available woven fabrics. It was therefore feasible to produce flared textile cuffs with a scope of properties better adapted to easier delivery and better adapted to tolerate various sizes of fenestration. Therefore, it would become feasible to have a selection of off-the-shelf devices to satisfy the needs that previously required customized devices. **Conclusion:** The development of flared textile cuffs represents a considerable step forward. First, it can be readily available off-the-shelf. Second, it permits adequate seal of the branches to the body of the stent graft without any risk of blood leakage.

Inferior vena cava tumour encasement: a case series and review of the literature. ***J. Harlock, K. Graybiel, T. Rapanos, D. Szalay.*** **From McMaster University, Hamilton, Ont.**

Background: Inferior vena cava (IVC) tumours can be classified as either primary or secondary. The operative management of these tumours can be challenging. The objective of this study is to perform a case review of patients who underwent operative resection of renal (RCC) or germ cell tumours (GCT) with IVC encasement at a single institution. **Methods:** A chart review was completed of 14 cases done. Related outcomes of the procedures and review of the literature will be reported. **Results:** Operative resection was performed for GCT in 6 cases and for RCC in 8. There were no perioperative mortalities in this series. Major 30-day morbidity was relatively reduced, and included bowel resection, pneumonia and ileus. Four patients had IVC invasion with tumour thrombus. One of these had such extensive disease that she was closed and a palliative approach was taken. The other 3 all underwent primary closure of the caval defect. The literature review demonstrates caval ligation to be a safe and effective option in those patients with chronic IVC occlusion. For those with acute occlusion of their IVC, or those with significant preoperative symptoms due to their venous outflow obstruction, reconstructive options include using prosthetic or autologous conduits. **Conclusion:** Patients who are deemed candidates for operative resection of their tumours with secondary IVC tumour involvement can be done with minimal operative morbidity and mortality. The majority of IVC defects can be repaired primarily, though ligation and IVC reconstruction are options.

An ironman with incapacitating claudication: a case report. ***P. Nault,*† M. Kimpton.†*** **From the *Centre de santé et de services sociaux de Gatineau and the †University of Ottawa, Ottawa, Ont.**

A 62-year-old amateur triathlete, who had accumulated over 130 000 km of cycling, 20 000 km of running and many thousands kilometres of swimming in the past 20 years, progressively became incapable of running. He presented with a severe claudication of the right buttock and thigh when running, although he did not complain of pain while cycling or swimming. The physical exam revealed an athletic patient with a pulsatile mass in the right iliac fossa. The ankle–brachial index was normal at rest bilaterally. A computed tomography angiogram showed an aneurysm of the right common iliac artery measuring 6.3 cm and an elongation of the external iliac arteries, more significant on the right than the left. Doppler ultrasonography did not reveal any stenosis of the arterial tree of the inferior extremities. Marfan, Ehlers-Danlos and Loeys-Dietz syndromes were all excluded as possible causes for these anatomic anomalies. The patient underwent a resection of his right common iliac artery aneurysm. The right external iliac artery was dissected minutely and unravelled. It became possible to create an anastomosis between the aorta and the right external iliac artery. Doppler ultrasonography done in the recovery room showed a dissection of the right external iliac artery. A right aortofemoral bypass was immediately done using Dacron. The postoperative period was without complications. The patient was able to start running again. After having done a literature review on the subject, we believe that this case of a common iliac aneurysm associated with an elongation of the external iliac arteries, without an associated syndrome, is unique.

Elective repair of abdominal aortic aneurysm with endovascular or open approach: up-to-date meta-analysis. ***M. Qadura,* F. Pervaiz,* A. Al-Azzoni,† J. Harlock,* D. Szalay,* T. Rapanos.**** **From the Divisions of *Vascular Surgery and †Cardiology, McMaster University, Hamilton, Ont.**

Background: The objective of this study is to provide an up-to-date meta-analysis on the short- and long-term mortality rates of elective repair of abdominal aortic aneurysms (AAA) via the open and endovascular approaches. **Methods:** We searched MEDLINE, EMBASE, the Cochrane Central Register of Controlled Trials and conference proceedings from major vascular meetings for randomized trials comparing open versus endovascular aneurysm repair (EVAR) elective repair of AAA. Relative risk (RR) and 95% confidence intervals (CIs) were calculated for short- and long-term mortality and reintervention rates. **Results:** The analysis encompassed 4 randomized controlled trials with a total of 2783 patients. The endovascular repair group resulted in reduced 30-day postoperative all-cause mortality when compared with open repair group (1.15% v. 3.2%, RR 2.81, 95% CI 1.60–4.94); however, there is no statistical difference in the long term all-cause mortality between both groups (25% v. 24%, RR 0.98, 95% CI 0.86–1.10). Interestingly, more patients underwent reintervention procedures in the endovascular repair compared with those who had open repair. (18.88% v. 9.28%, RR 0.49, 95% CI 0.40–0.60). Lastly, we found no statistical difference in long-term mortality rates due to cardiovascular disease, aneurysm-related and stroke after EVAR or open repair of AAA. **Conclusion:** Results of this meta-analysis demonstrate that the 30-day all-cause mortality rate is higher with open than with EVAR repair;

however, there is no statistical difference in the long-term all-cause mortality between both groups. The reintervention rate due to procedural complication was higher in the EVAR group. Therefore, patients' surgical risk, comorbidities and life expectancy should be considered in the treatment approach of elective repair of AAA.

Detailed analysis of a series of explanted talent AAA stent grafts: biocompatibility issues. ***B. Li,* D. Wei,† Z. Zhang,* Y. Douville,* M. Nutley,‡ R. Guidoin.*** **From the *Department of Surgery, Laval University, and Saint-François d'Assise Hospital Research Centre, Quebec City, Que., the †Institute of Cardiovascular Disease and Key Laboratory for Arteriosclerology of Hunan Province, University of South China, Henghyang City, Hunan Province, P.R. China, and the ‡Department of Surgery, University of Calgary, Calgary Alta.**

Background: The biocompatibility of explanted Talent stent grafts from autopsy and reoperations was investigated to highlight the capacity of the fabric to act as a scaffold to regenerate a blood conduit whose flow surface could be blood compatible and capsules encroached in the fabric. **Methods:** The explants (1 at autopsy and 5 at reoperations) were observed for gross morphology before and after dissection. The histology was investigated by scanning electron microscopy and light microscopy, after either paraffin or glycol methacrylate resin embedding and appropriate staining. This was followed by immunohistochemical analysis emphasizing the expression of fibrinolytic activators and their inhibitors. **Results:** The device harvested at autopsy was encapsulated both internally and externally, but the capsules were found detached and easily separated from the fabric wall. They were composed of compacted fibrin without any connection through the wall. The luminal surface was smooth and glistening; immunohistochemistry showed some endothelial cells and the presence of smooth muscle cell α-actin, but it remained slightly thrombogenic. The devices harvested at reoperation had different degrees of internal encapsulation with discrete patches of compact fibrin and irregularly scattered mural thrombi, leaving the underneath fabric structures visible. Externally, no capsule was attached to the prosthetic wall, and dispersed thrombi were presented. **Conclusion:** The healing of the autopsy device was more evident, but in the absence of tissue encroaching through the wall, both internal and external capsules did not penetrate through the fabric structure. The smooth and glistening luminal surface showed the presence of some endothelial cells. The adverse events that required reoperation may have impaired both the biocompatibility and the biostability. However, the presence of a thrombotic matrix and/or blood debris was sufficient to guarantee the imperviousness of the fabric wall in the absence of significant fabric holes.

A national survey of elastic compression stockings prescription rates following diagnosis of deep venous thrombosis and patient perspective. ***A. Kayssi, A. Petrosoniak, J. Levenstadt, N. Eisenberg, G. Roche-Nagle.*** **From the Department of Vascular Surgery, Toronto General Hospital, Toronto, Ont.**

Background: The post-thrombotic syndrome (PTS) is a chronic condition that develops in 20%–50% of patients after deep venous thrombosis (DVT). It is characterized by chronic pain, swelling and may result in ulceration. Elastic compression stockings (ECS) can reduce the incidence and severity of PTS. The aim was to investigate practices and perceptions nationally of physicians regarding adjunct therapies to anticoagulation in patients with lower extremity DVT. In addition, we wished to survey patient perspectives on ECS. **Methods:** A nationwide survey was conducted of Canadian primary care staff (n = 685) to investigate their attitudes toward prescription of ECS postdiagnosis of DVT. Also, a survey was randomly administered to patients diagnosed with a DVT attending a thrombosis clinic (n = 58). **Results:** The results demonstrated that the majority of staff physicians (58%) and residents (58%) were unsure whether ECSs were effective in preventing PTS. This resulted in only 12% of staff physicians and 26% of residents routinely prescribing ECS for below-knee DVTs. Only 10% of staff physicians and 12% of residents prescribed ECS for above-knee DVTs. More than 70% of respondents were unsure about the optimal timing of initiation and duration of ECS. A majority of staff and resident respondents correctly predicted 2 out of the top 3 reasons for patient noncompliance (soreness and the need for assistance, but not cosmesis). Half (50%) of DVT patients surveyed had ECS prescribed: 60% fulfilled the script, 69% wore them daily, and all these patients (100%) reported that ECS relieved the swelling and symptoms. **Conclusion:** Daily use of graduated ECS appears to reduce the risk of PTS and relieves patient symptoms. There is a lack of consensus among medics regarding ECS use after DVT. There is a need for widespread education for patients and doctors regarding the latest evidence of the benefit of ECS after DVT.

Quality of life outcomes after open versus endovascular abdominal aortic aneurysm repair: meta-analysis and systematic review. ***A. Kayssi,* L.L. Nguyen.†*** **From the *Department of Vascular Surgery, Toronto General Hospital, Toronto, Ont., and the †Department of Vascular and Endovascular Surgery, Brigham and Women's Hospital, Boston, Mass.**

Background: Endovascular repair of abdominal aortic aneurysms (EVAR) is a safe alternative to open aneurysm repair

Table. Standard difference in the mean SF-36 scores between endovascular and open abdominal aortic aneurysm repair 3, 6 and 12 months

	3 months		6 months		12 months	
Domain	SD	*p* value	SD	*p* value	SD	*p* value
Body pain	–0.024	0.856	–0.159	0.295	–0.274	0.102
General health	0.435	0.001	0.335	0.029	0.371	0.015
Mental health	–0.078	0.558	–0.202	0.182	–0.149	0.324
Physical functioning	–0.237	0.075	–0.332	0.029	–0.267	0.077
Emotional role functioning	0.04	0.766	–0.093	0.540	–0.196	0.193
Physical role functioning	–0.134	0.315	–0.098	0.520	–0.147	0.329
Social functioning	0.047	0.724	–0.061	0.688	–0.355	0.019
Vitality score	–0.192	0.151	–0.147	0.333	–0.197	0.193

SD = standard difference in the means of open and endovascular aneurysm repair scores for individual SF-36 domains, wherein a positive difference favours endovascular repair.

(OAR) in selected patients. The aim of this study was to compare the health-related quality of life (HR-QOL) outcomes of patients following EVAR and OAR. **Methods:** A literature search of PubMed, EMBASE and the Cochrane Library identified 5 randomized controlled trials comparing HR-QOL in EVAR and OAR. No consistent HR-QOL instrument was used among the studies. A meta-analysis was performed on the SF-36 and the EuroQol-5D (EQ-5D) HR-QOL results. **Results:** At 6 months, physical functioning was higher for OAR. At 12 months, social functioning was higher for OAR, but general health perception was higher for EVAR (Table). The SF-36 component summary scores were not statistically different. Open aneurysm repair was associated with a better EQ-5D score at 3 months (mean SD –0.102, $p = 0.034$). **Conclusion:** Open aneurysm repair was associated with better HR-QOL in some domains up to 12 months. There are insufficient data to demonstrate a HR-QOL advantage beyond 12 months. More studies are required to examine any long-term HR-QOL advantages for either intervention.

Abdominal aortic stent-grafts: from infancy to maturity.
***R. Guidoin,*[*] *Y. Douville,*[*] *L. Wang,*[†] *Z. Zhang,*[*] *M. Nutley,*[‡] *J. Lin.*[†] From the *Department of Surgery, Laval University, Québec City, Que., the †College of Textiles, Donghua University, Shanghai, P.R. China, and the ‡Department of Surgery, University of Calgary, Calgary Alta.**

Background: The utilization of aortic stent grafts is the most significant innovation in the treatment of aneurysmal disease. First implemented by Kononov and Volodos in the former Soviet Union in the early 1980s, it later became widely adopted in the late 1980s after Parodi's successful human implantation. Our objective was to review retrieved stent-grafts. **Methods:** We have analyzed more than 50 explanted stent-grafts since the late 1990s from various manufacturers and launched a systematic retrieval program in late 2010. **Results:** The early concepts highlighted by the Stentor were physician driven, and the adverse events were frequently related to poor designs and inadequate materials. Nitinol wires corroded rapidly, polypropylene sutures broke and the polyester weaves tore apart. During the first decade close attention was paid to the clinical results i.e., the biofunctionality. Progressively the material selection and the design issues were addressed, i.e., the biodurability, with Nitinol becoming much more resistant to corrosion. Due to the poor biocompatibility of current stent grafts, patients require yearly mandatory follow-up. The analyses of the explanted devices provided by surgeons in Canada and abroad have demonstrated a progressive decline in devices related adverse events, showing less material related failures after short-term implantation. However, the resistance of the graft fabric to abrasion requires further refinements. The supporting zig-zag stent designs remain a leading cause of fabric erosion. The number of adverse events related to an absence of biocompatibility and/or patients with more challenging anatomy are on the rise. This lack of biocompatibility impairs the durability of the blood conduit and precludes the long-term patency. Devices harvested at reoperation show a highly thrombogenic luminal surface whereas similar devices obtained at autopsy after fatalities unrelated to graft failure demonstrate a more blood-compatible flow surface. **Conclusion:** Only when biocompatibility can be achieved, will stent-grafting be considered as a mature technology.