COMPLICATIONS ASSOCIATED WITH THE USE OF PERCUTANEOUS ARTERIAL CLOSURE DEVICES IN ENDOVASCULAR INTERVENTIONS. T. Joseph, P. Coney, A. Atwal, P. Slaney, R. Downing. Worcestershire Royal Hospital, Worcester, UK.

Objectives: To assess the experience of Vascular Society members of complications arising from the use of percutaneous arterial closure devices. Methods: Questionnaire survey of 450 members of the Vascular Society. Results: One hundred and sixty-six (37%) questionnaires were returned. One hundred and fourteen (69%) respondents had experience of closure devices; Angio-Seal and Perclose were the most commonly used of the 7 types of devices reported. Eighty-one (71%) of these respondents described a total of 218 limb-threatening complications, which had ended in arterial interventions in 202 cases, 3 lower limb amputations and 5 deaths.

Conclusion: Complications of percutaneous closure devices are not uncommonly seen and carry a significant morbidity and mortality. Interdisciplinary audit of the use of percutaneous arterial closure devices is advised as result of the life and limb threatening complications revealed in this survey.

FENESTRATED AND BRANCHED ENDOVASCULAR REPAIR OF THORACOABDOMINAL AORTIC ANEURYSMS. T.L. Forbes, * S.W. Kribs, * C.Z. Abraham. † From the *London Health Sciences Centre, University of Western Ontario, London, Ont. and the †Sir Mortimer B. Davis Jewish General Hospital and McGill University, Montréal, Que.

Objective: To describe our initial experience with endovascular repair of thoracoabdominal aortic aneurysms (TAAAs) with fenestrated and branched stent grafts. Methods: Two elderly males presented with 70 mm and 74 mm diameter TAAAs, each having had open infrarenal abdominal aortic aneurysm repair previously. One patient had a concomitant left renal artery bypass. Both patients were deemed high-risk for open repair because of medical comorbidities. Custom fenestrated and branched endografts were designed with the Cook (Australia) Endovascular Planning Group. One patient’s endograft included 3 fenestrations (celiac axis, superior mesenteric artery, right renal artery) while the other employed a branch (celiac axis) and fenestration (superior mesenteric artery). Both cases were performed in the operating room under general anesthesia with cerebrospinal fluid drainage and portable C-arm fluoroscopy. Results: Both cases were technically successful. The branch and fenestrations were fixed to their respective arterial orifice with Fluency or Atrium covered stents. Completion angiography demonstrated no endoleaks and perfusion of all 5 target visceral arteries. One patient required planned retroperitoneal conduit placement because of inadequate access vessel caliber, while the other required unilateral popliteal artery thrombectomy at the end of the procedure. This patient suffered from early unilateral lower extremity paraesthesia that completely resolved. Recovery was otherwise uneventful for both patients. CT scans at 3 and 4 months respectively demonstrated no endoleaks and perfusion in all 5 target visceral arteries. Conclusion: In our initial experience, branched and fenestrated endovascular repair of TAAAs has proven to be an attractive option for elderly and medically compromised patients, with encouraging short-term results.


Objective: A reappraisal of a single institution experience with a highly standardized technique of aortic repair and its consequences on survival and spinal cord protection. Methods: One hundred and twenty-six patients with a mean age of 27 years had Dacron graft interposition within a mean delay of 12 hours to repair a traumatic descending aortic tear. Most (92%) had associated injuries (60% orthopaedic, 40% abdominal and 30% cerebral) for a mean injury severity score (ISS) of 44 (median 41). The aortic tear was at high risk in 19 cases: 3 developed an hypovolemic shock at arrival with a preoperative chest drainage of 5 L, 12 L and 16 L, respectively. Ten had a severe coarctation syndrome (mean gradient of 63 mm Hg) resulting in pre-
operative paraplegia (4), anuria (5), intestinal gangrene (1). In 6 cases an associated subclavian artery tear challenged the surgical technique. Distal circulatory support was established as a priority. In the first 40 cases, a passive 9-mm Gott shunt inserted between the ascending and the descending aorta was used. In the last 86 cases, organ protection was assured through an atri–aortic left heart bypass driven with a BioMedicus pump delivering a median flow of 4000 mL/minute.

Results: The overall survival rate is 95.2% (120/126). Six deaths were due to associated injuries. No mortality occurred in the last 56 cases. Excluding 4 paraplegia observed before the aortic repair, 1 new paraplegia occurred (0.8%) due to a non-functional Gott shunt. No paraplegia occurred in 86 patients protected with the left heart bypass. Conclusion: Open repair of traumatic rupture of the thoracic aorta performed by an experienced team is extremely safe even in adverse physiologic conditions if optimal circulatory support is used. These results should question the overenthusiastic use of stents as a primary choice to treat this lesion.

ENDOTHELIALIZATION OF POLYESTER VASCULAR PROSTHESES IN CANINE: THE SIGNIFICANT ROLE OF TRANSMURAL COMMUNICATION AT A SUBCELLULAR LEVEL. Z. Zhang, Y. Douville, N. Gilbert, S. Briana, H. Zhao. From the *Department of Surgery, Faculty of Medicine, Laval University; the Research Center of Saint-François d’Assise Hospital, Québec, Que. and the †Thoratec Corporation, Pleasanton, Calif., USA.

The importance of microporous and water permeable wall for the healing of polyester (Dacron) vascular prostheses has been known for a long time. However, the significance of its permeability to soluble substances at a subcellular level has not been demonstrated. Polyester arterial prostheses were prepared in such a way that each of them contained 3 segments, of which at least 1 segment was impervious and another segment was permeable to water but impermeable to cells. Twenty graft segments were implanted in 7 dogs as a thoracoabdominal bypass for 2 months. The prostheses were then harvested, longitudinally opened and photographed before fixation. The explants were fixed in formalin and treated for histological staining with hematoxylin-eosin, Weigert, and Masson’s trichrome for the identification of cells, elastin fibres, and collagenous tissues, respectively. Immunohistological staining was performed to identify endothelial cells, smooth muscle cells and fibroblasts. Scanning electron microscopy was carried out to investigate the morphology of the lumen of the grafts. The low porosity graft capped by 2 thrombogenic segments was also jeopardized in the absence of wall permeability. In conclusion, transmural communication at a subcellular level may have played a critical role in the fallout-based endothelialization of arterial prostheses in canine. This highlights the potential function of perigraft cytokines and growth factors in endothelial healing.


Purpose: To describe the early Canadian experience with a novel Health Canada approved Anaconda™ endovascular stent graft for the treatment of infrarenal aortic aneurysms.

Background: Despite technologic advances in modular endovascular stent graft design, challenges during deployment are predictably related to access tortuosity and stenosis, marginal landing zone quality and length, errors in preoperative length measurements due to difficulties in predicting graft behaviour in vivo, and errors related to the often dynamic nature of the deployment process, which can result in malpositioning of the stent graft. In addition, the duration of the endovascular procedure can be significantly affected by difficulties with contralateral limb access, particularly if advanced techniques (e.g., “up and over wire”) are required. We describe the use of a newly approved device that has unique features related to graft design and deployment that address many of these device-related issues, leading to potential improvements in EVAR. Study design: Prospective cohort study of patients treated in a tertiary vascular centre by surgeons experienced in endovascular repair. Standard clinical endovascular inclusion/exclusion criteria were used and anatomically, aneurysms with severe angulation of iliac access vessels and/or the aortic neck were included. Methods: Between January and March 2007, 16 male patients (mean age 73.6 [standard deviation [SD] 5.05] yr; ASA status II, n = 4; ASA III, n = 11; ASA IV, n = 1) with infrarenal abdominal aortic aneurysm (AAA) (mean diameter 5.68 [SD 0.66] cm, mean neck length 33.19 [SD 11.62] mm, mean neck angulation 33.25° [SD 43.86°], mean maximal iliac angulation 72.63° [SD 40.87°]) had elective (n = 11) or urgent (n = 5) EVAR with the Anaconda™ device using the protocols established for deployment. Procedures were completed in the operating room under either local or general anesthesia with a mobile C-arm unit and fluoroscopic table. Patients were assessed for endoleak or graft complications with 64-slice spiral CT imaging within a week of surgery, and then at 3 months, with further planned follow-up at 6-month intervals. Results: Mean values were derived for operative time (141.38 [SD 46] min), fluoroscopy time (16.76 [SD 9.35] min), intraoperative dye load (132.31 [SD 68.72] mL) and blood loss (396.15 [SD 279.48] mL). Primary adjunctive procedures were required in 5 patients (31%) and included internal iliac embolization in 3 patients, limb extension and external iliac angioplasty in 1 patient and internal/external iliac “kissing balloon” angioplasty in 1 patient. Median length of stay (LOS) was 6.68 days (range 1–23 d), with 1 patient requiring an ICU stay of 2 days due to cardiopulmonary complications. No perioperative or late deaths were observed. Secondary interventions were required in 3 patients (18%). Two patients with marginally acceptable

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Iliac access vessels (7 mm diameter) developed limb ischemia postoperatively, and one of these patients had acute iliac occlusion preoperatively, and suffered ipsilateral graft limb thrombosis requiring cross femoral bypass. This patient also had a type 1A endoleak requiring laparotomy and aortic cerclage. The second patient with limb ischemia had an iliac dissection requiring Palmaz stent placement. The only patient with a type 2 endoleak had immediate postoperative coil embolization due to the development of atrial fibrillation and the need for full-dose anticoagulation. Common femoral artery dissection related to the “square-faced” profile of back of the delivery nose cone was observed in 1 patient and required suture repair. Another patient had rupture of the delivery handle during attempted deployment, and was successfully converted using a different endograft and represented the only “intention to treat” failure. **Conclusions:** The improvements in contralateral access, the proximal hook fixation, and the specific deployment features of the Anaconda™ endovascular device allowed for successful initial EVAR exclusion of infrarenal aortic aneurysms with high-risk anatomy in 94% of patients. The short nose cone, and the sheath, which has a tendency to kink and is not well tapered over the cone nose, poses challenges with calcified vessels and tortuous anatomy. Care must be observed during deployment to ensure that the device main body is rotated and canted with the fixation hooks perpendicular to the long axis of the neck in order to achieve stable endoskeletal modifications to the nose cone and of the delivery sheath will enhance the performance of this endovascular system. Ongoing follow-up and larger series are required to assess mid-term and long-term EVAR performance.


**Background:** The aim of this study was to review our experience with the introduction of carotid artery angioplasty and stenting (CAS) as a treatment for carotid stenosis in high-risk patients and compare clinical outcomes to carotid endarterectomy (CEA) patients treated over the same time period at our centre. **Methods:** CAS was introduced to a vascular surgery group over a 3-year period with all cases performed under the supervision of a single experienced endovascular surgeon. One hundred and sixty-one patients underwent 172 carotid revascularization procedures (45 CAS and 127 CEA). In the CAS group, 93% were high-risk according to the reporting standards of the American Society of Interventional and Therapeutic Neuroradiology and Society of Interventional Radiology. Demographic, operative and follow-up data were retrospectively collected on all patients. Death, stroke and restenosis rates were compared at 30 days and later follow-up. Degree of stenosis on follow-up exams was determined by Duplex ultrasound. **Results:** There were no differences in baseline risk factors or indications for intervention between groups, except that more CAS patients were considered high cardiac risk (13% vs. 2%, p < 0.05). High-risk carotid lesions were present in 67% of CAS patients. Cardiac event, stroke and death rates are shown in the table.

<table>
<thead>
<tr>
<th>Event</th>
<th>No. carotid endarterectomy (and %)</th>
<th>No. carotid stent (and %)</th>
<th>p value*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>30 days (n = 172)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiac events</td>
<td>1/127 (0.8)</td>
<td>2/45 (4.4)</td>
<td>0.17</td>
</tr>
<tr>
<td>Stroke</td>
<td>1/127 (0.8)</td>
<td>2/45 (4.4)</td>
<td>0.17</td>
</tr>
<tr>
<td>Death</td>
<td>1/127 (0.8)</td>
<td>0/45 (0)</td>
<td>0.56</td>
</tr>
<tr>
<td><strong>30 days and later F/U</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td>2/127 (1.6)</td>
<td>4/45 (8.9)</td>
<td>0.04</td>
</tr>
<tr>
<td>Death</td>
<td>2/127 (1.6)</td>
<td>2/45 (4.4)</td>
<td>0.28</td>
</tr>
</tbody>
</table>

F/U = follow-up, *Fisher’s exact test.*

Mean follow-up (F/U) for all patients was 13 months (range 0–42 mo). Restenosis rate (> 50%) was higher in CAS than CEA (35% vs. 15%; p = 0.02). Three patients had reintervention in the CAS group and 1 patient in the CEA group had redo CEA. **Conclusion:** Restenosis > 50% and stroke was observed more frequently in our initial experience with high-risk patients undergoing CAS compared with low-risk patients undergoing CEA during the same time period. Further study to evaluate the effect of the learning curve for early results as well as follow-up for intermediate and long-term durability of CAS is required.


**Purpose:** To demonstrate the technique, safety and efficacy involved in a novel approach to managing the internal–external iliac bifurcation during EVAR with concurrent bilateral common iliac artery aneurysms. **Study design:** Case series of 3 male patients (mean age 67 yr) with abdominal aortic aneurysm (AAA) and concomitant bilateral common iliac artery aneurysm treated with this approach using a bifurcated endovascular aortic graft. **Background:** Management of the internal iliac arteries during endovascular repair for aortic aneurysms with bilateral common iliac arteries is controversial, with some authors reporting good results with bilateral internal iliac embolization and coverage (*J Vasc Surg* 2004;40:698-702). Most series have demonstrated the need to preserve flow through at least one internal iliac artery during endovascular repair in order to minimize the negative outcomes associated with pelvic ischemia. Multiple reperfusion techniques have been described (*J Vasc Surg* 2006;44:1162-9), but all are associated with difficulties related to the angulation, calcification, or depth in the pelvis of the iliac branches, and are limited by the useable length of the hypogastric trunk and external iliac for reconstructions and/or stent deployment. **Methods:** A limited flank incision to expose the iliac bifurcation was completed, followed by placement of an end–side or end–end ilio–femoral bypass from the proximal iliac aneurysm. This rifampicin-soaked
prosthesis was then tunneled extraperitoneally to the ipsilateral groin incision for endovascular stent access, and distal graft limb deployment. The iliac aneurysm was then opened distally to within 1 cm of the bifurcation, and a 14 Fr sheath obturator or Coon’s tip dilator was passed from the common femoral arteriotomy retrograde and manually directed into the orifice of the internal iliac artery. Endarterectomy of the bifurcation was performed as required for calcification or stenosis. The distal common iliac aneurysm was then oversewn on the mandrill to maintain the lumen and create the internal–external bypass. After completion of EVAR the ileofemoral graft was anastomosed to the femoral artery and the internal–external bypass was then perfused through retrograde flow. The contralateral internal iliac was embolized and covered with endograft limb to achieve endoseal.

Results: Mean follow-up at time of reporting was 150 days. No patients demonstrated ischemic colitis, sacral plexopathy, graft occlusion, nor any perioperative or delayed mortality. There was no ipsilateral proximal claudication reported. Two patients demonstrated predischARGE type II endoleaks, which are being observed, and 1 patient developed a retroperitoneal hematoma requiring transfusion. Conclusion: Common iliac aneurysmorrhaphy is a novel, safe and effective approach in managing patients with AAA and concomitant bilateral common iliac artery aneurysms, and allows for preservation of internal iliac perfusion. This technique is more attractive than other bypass techniques (e.g., internal–external bypass) because of the easier superficial pelvic dissection required, the ability to accommodate even very short hypogastric trunks, the ability to utilize endarterectomy at the iliac bifurcation to enhance patency, the use of the autogenous circulation for the reconstruction, and the unlimited prosthetic distal landing zone created for limb deployment. The need for larger series and long-term outcome is justified.

TIME OF C5A RECEPTOR ANTAGONIST ADMINISTRATION INFLUENCES LOCAL AND REMOTE ORGAN INJURY IN A MOUSE MODEL OF RUPTURED ABDOMINAL AORTIC ANEURYSM. W.S. Johnson, S. Nicholson, B.B. Rubin, T.F. Lindsay. Division of Vascular Surgery, Toronto General Hospital, Department of Surgery, University of Toronto, Toronto, Ont.

Objective: Complement is an essential mediator of organ injury that contributes to the 40% to 75% mortality of ruptured abdominal aortic aneurysm (rAAA). We sought to determine if a C5a receptor antagonist (C5aRa) reduces organ injury in a mouse model of rAAA and the time of maximal effect.

Methods: C57BL/6 mice were assigned to 1 of 4 experimental groups: (1) sham, (2) shock, (3) clamp, and (4) shock + clamp (SC). The SC group (simulating rAAA repair) was further assigned to 3 treatment groups: (1) sham, (2) SC+C5aRa administered before shock, (2) SC+C5aRa administered at the end of shock, and (3) SC+C5aRa administered at the end of aortic clamping. All animals in the SC groups experienced 1 hour of hemorrhagic shock followed by 30 minutes of suprarenal aortic clamping and 2 hours of resuscitated reperfusion. Animals in treatment groups received an intravenous bolus of C5aRa (2 mg/kg) at the different time points. Lung and gut injury was assessed by the permeability to 125I-labelled albumin. Neutrophil sequestration was assessed by levels of tissue myeloperoxidase and proinflammatory cytokines by the tissue levels of TNF-α. Conclusions: These data characterize the mouse model of rAAA and establish it as an investigational tool for further molecular intervention. Complement inhibition via C5aRa successfully attenuates both local and remote organ injury. C5aRa is most effective when given after the period of hemorrhagic shock, the timing of which holds significant clinical promise.


We present 3 cases of delayed vascular injury following blunt abdominal trauma all of which have undergone medico-legal investigation.

The first case involves a 55-year-old man who presented to the emergency department after suffering a cardiac arrest. Of note in his past medical history, he had been involved in a motor vehicle accident 15 months previously and suffered a mild blunt abdominal injury and soft tissue injuries to his chest. A post mortem revealed a 12-cm abdominal aortic aneurysm (AAA) with free rupture into the peritoneal cavity.

The second case involves a 17-year-old boy who again was involved in a motor vehicle accident and sustained a severe blunt abdominal injury resulting in a compression fracture of L3 and L4 requiring spinal fusion and a localized dissection of his infrarenal aorta which extended from the level of his inferior mesenteric artery (IMA) to the aortic bifurcation. He has undergone subsequent CT/ultrasound assessment of his aorta which indicated his aorta may have increased in size by 3–4 mm.

The third case involves a 30-year-old man who was involved in a fight and sustained multiple blows to the epigastric and umbilical area of his abdomen. Subsequent to this he had been suffering from intermittent bouts of upper abdominal pain.
Seven months later during an acute presentation he underwent a laparotomy and resection of infarcted small bowel which lay in the distribution of the superior mesenteric artery.

We feel that these cases have important potential medico-legal implications for vascular surgeons with regard to the follow-up and treatment of patients who undergo blunt abdominal trauma.

**Fishing for Bass: Surveying Primary Physicians in the Barriers to Aortic Screening Study.** E.M. Wooster, D.L. Wooster, A. Dueck. University Health Network — Toronto General Hospital, University of Toronto, Toronto, Ont.

Primary care physicians were surveyed to determine attitudes and identify barriers to screening for abdominal aortic aneurysms (AAAs).

Six hundred standardized, structured surveys were distributed to all primary care practitioners in a defined geographic area. Participation was voluntary, and results were anonymous.

Seventy-four percent of respondents were general practitioners; 92.5% worked in a community setting.

Fifty-five percent saw >11 male patients per week who were over age 65. Responses indicated support for identifying asymptomatic AAAs; only 4.7% thought their patients were too sick to undergo repair, 0% felt their patients would be unwilling to undergo repair, and 0% felt the risk of rupture was too small to justify repair. Access to vascular surgical services was available to 76.7% in the hospital closest to them, and to 100% in the city in which they practice.

Sixty percent of respondents were aware of the recommendations. Twenty-nine percent of physicians routinely screened eligible patients for AAAs. Respondents routinely screened patients for breast cancer (79.1%), prostate cancer (80.5%), colon cancer (80.9%), and hypertension (83.7%); 42.9% routinely screened patients for peripheral artery disease.

Although primary practitioners are routinely exposed to the importance of AAAs appear to be limiting factors. Despite recent publicity, almost 40% of primary care physicians remain unaware of screening guidelines for AAAs. Of those who were aware of guidelines, only one-third follow them. Screening for AAAs lags significantly behind other major screening programs.

**Refining the Indications for Carotid Endarterectomy in Asymptomatic Carotid Stenosis: A Systematic Review and Meta-Analysis.** T.M. Mastracci, G. Arena, C.M. Clare, C.S. Cinà. From the *Division of Vascular Surgery and Department of Clinical Epidemiology and Biostatistics, the †Department of Surgery, Division of General Surgery and the ‡Departments of Medicine and Clinical Epidemiology and Biostatistics, McMaster University, Hamilton, Ont.

**Objective:** We undertook a systematic review and meta-analysis to refine the indications for carotid endarterectomy (CEA) in asymptomatic carotid stenosis. **Methods:** Database searching, study eligibility, quality assessment, and data extraction were performed independently in duplicate. Electronic databases were searched using a modified Cochrane search strategy. Reference lists of retrieved and review articles, relevant textbook chapters, and authors’ personal files were also searched. The outcomes chosen were “all stroke (long-term) and perioperative death” and “major or disabling stroke (long-term) and perioperative death.” Secondary analyses and subgroups for analysis were determined a priori. Agreement was calculated with Cohen’s kappa. Random effects models were used to estimate relative risk (RR). **Results:** The search yielded 594 citations; 44 articles were retrieved, and 7 randomized controlled trials (5961 patients) met eligibility criteria. Agreement for judgment of relevance was excellent (κ = 0.92, 95% confidence interval [CI] 0.85–0.96). The degree of stenosis required for eligibility in the original studies was variable (>50% stenosis to >60% stenosis). One study was excluded post hoc from the meta-analysis because of methodologic differences. The pooled results for all outcomes are presented in Table 1. The number needed to treat presented in this table is calculated based on pooled absolute risk reduction across all studies. Event rates in the control groups for “all stroke (long-term) and perioperative death” vary from 5.5% to 12.9%. Applying the pooled RR reduction to these control event rates, the number needed to treat varies from 56 to 24, respectively. Outcomes stratified by age, degree of stenosis, and sex were available for 2 of the 6 randomized controlled trials did not reveal statistically significant differences. **Conclusion:** Carotid endarterectomy modestly reduces the risk of stroke or perioperative death in patients with asymptomatic carotid artery stenosis.

**Table 1: Outcomes for metaanalysis of randomized controlled trials comparing carotid endarterectomy with best medical management in asymptomatic carotid stenosis**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>All stroke or perioperative death</th>
<th>Major or disabling stroke or perioperative death</th>
<th>All cause mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of trials reported</td>
<td>4</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>No. of events for immediate surgery, n/N</td>
<td>170/2775</td>
<td>77/2527</td>
<td>441/2775</td>
</tr>
<tr>
<td>No. of events for deferred surgery, n/N</td>
<td>222/2788</td>
<td>112/2518</td>
<td>440/2785</td>
</tr>
<tr>
<td>Range of risk of outcome in deferred surgery group, %</td>
<td>5.5–12.9</td>
<td>3.7–4.8</td>
<td>0–33</td>
</tr>
<tr>
<td>Pooled, weighted RR</td>
<td>0.68</td>
<td>0.69</td>
<td>1.01</td>
</tr>
<tr>
<td>Pooled RR reduction, %</td>
<td>25</td>
<td>32</td>
<td>0</td>
</tr>
<tr>
<td>Pooled, weighted absolute risk reduction</td>
<td>0.03</td>
<td>0.01</td>
<td>0</td>
</tr>
<tr>
<td>p value</td>
<td>0.0001</td>
<td>0.01</td>
<td>0.85</td>
</tr>
</tbody>
</table>

RR = relative risk; NA = not applicable.
2.1 mmol/L; follow-up visits. Improvement in LDL cholesterol (2.7–
plete data set contains 37 patients who have had 2 or more
cular surgeon, medical internist, nurse and dietitian. The com-
this program and are followed every 3 to 6 months by the vas-
To date, 60 patients (36 males and 24 females) have entered
factors, thereby improving quality of life and reducing mor-
proach. The goal of this program is to care for medically high-
ing the Chronic Care Model in a multidisciplinary setting/ap-
T. Forbes
LHSC VASCULAR RISK MANAGEMENT PROGRAM: THE MUL-
Between June 2000 and March 2007, 165 patients under-
ent endovascular repair of either thoracic aortic, abdominal
or common iliac aneurysms at our institution. Patients
were followed with serial CT scans and duplo ultrasonogra-
phy. Ten of our patients (6.0%) exhibited aneurysm sac ex-
pansion between 10 and 67 months following endovascular
(mean 36.2 mo). Six were associated with endoleaks
(2 type I, 3 type II and 1 type IV). Six cases demonstrated
stent-graft migration. All 10 patients were successfully

treated. Six patients underwent redo endovascular stent-graft
procedures, 2 patients were treated with coil embolization of
lumbar arteries, 1 patient was treated by open ligation of
the inferior mesenteric artery, and 1 patient received a hybrid
open/redo endovascular stent-graft repair. No patients re-
quired stent-graft explantation. This review highlights the im-
portance of surveillance for endovascular patients, and illus-
trates endotension may be successfully treated with a variety
of techniques.

LHSC VASCULAR RISK MANAGEMENT PROGRAM: THE MUL-

TIDISCIPLINARY APPROACH. K. Lawlor, G. Dresser, M. Lovell,

T. Forbes. Division of Vascular Surgery, University of

Western Ontario, London, Ont.

The Vascular Risk Reduction Clinic was established at the
London Health Sciences Centre (LHSC) in October 2005 us-
ing the Chronic Care Model in a multidisciplinary setting/app-

roach. The goal of this program is to care for medically high-
risk vascular patients by optimally managing cardiovascular risk
factors, thereby improving quality of life and reducing mor-
bidity and mortality associated with vascular disease. Results:
To date, 60 patients (36 males and 24 females) have entered
this program and are followed every 3 to 6 months by the vas-
cular surgeon, medical internist, nurse and dietitian. The com-
plete data set contains 37 patients who have had 2 or more
follow-up visits. Improvement in LDL cholesterol (2.7–
2.1 mmol/L; \( p = 0.0159 \)), total/HDL cholesterol ratio (4.3
to 3.5; \( p = 0.011 \)), systolic/diastolic BP (141 to 135/79
to 76 mm Hg; \( p = 0.0045 \)) and hemoglobin Alc (7.4 to 6.4%;
\( p = 0.0002 \)). As well, the overall 10-year risk assessment im-
proved in all patients (mean ATP III aged adjusted relative
risk difference is 7.48, \( p = 0.02 \)). Despite access to a dietitian
and motivational interviewing, smoking and body mass index
were not reduced. Conclusions: This preliminary data con-
firms the early success of this management model in this pa-
tient population. Interventions based primarily on drug ther-
apy (cholesterol, blood pressure and blood glucose control)
were more likely to achieve targets than those dependant on
lifestyle modification (smoking and body mass index [BMI]).
This data emphasizes the need for enhanced effort in smoking
cessation and weight control. We look forward to longer term
follow-up to evaluate cardiovascular and cerebrovascular out-
comes in this extremely high-risk group of patients.

ERK ACTIVATION OCCURS AT THE HUMAN CAROTID BIFUR-
cation. C.S. Cinà, A.J. Ingrym, J.C. Krepsinsky. From
the Divisions of *Vascular Surgery and †Nephrology, McMaster
University, Hamilton, Ont.

Background: We have observed extracellular signaling-regu-
lated kinase 1/2 (Erk1/2)-mitogen–activated protein kinase
(MAPK) activation in vascular smooth muscle-like cells in re-

pons to cyclic mechanical strain, and such activation medi-
ates proliferation and matrix elaboration. Others have ob-

served acute Erk activation in human arteries after mechanical
(angioplasty) trauma, and Angiotensin II (AII) infusion acti-

vates Erk in rat aortae. Thus, we asked whether chronic Erk

activation might occur at a site of ongoing mechanical strain
(the carotid bifurcation), whether this was related to AII and
if such activation was associated with cellular proliferation at
this site. Methods: Human carotid arteries (\( n = 50 \) to date)
were collected at the time of endarterectomy en bloc from in-
tima to external elastic lamina. Two sections were taken from
grossly normal artery above (external) and below (common)
the bifurcation and through the lesional area at the bifurcation
itself. One was placed in liquid nitrogen for later protein ex-
traction and one into OCT compound for immunostaining.
Clinical data were collected anonymously into a database.
Twelve samples (6 from subjects taking ACE inhibitors and 6
without ACE inhibitor therapy) form the basis of this re-
port. Protein from each section was extracted and analyzed by
Western blotting for Erk activation and proliferating cell nu-
clear antigen (PCNA) expression. Localization of active
(phosphorylated) Erk was assessed by immunostaining.

Results: The strongest Erk activation was observed at the bi-

curcation, with lesser activation in the common carotid and lit-
tle activation in external carotid. Expression of PCNA mir-
rored Erk activation. Immunostaining revealed Erk activation
primarily in the medial layer; little activation was observed in
atheromatous lesion. Therapy with ACE inhibitors did not af-
fact the levels or location of Erk activation observed.

Conclusion: Chronic Erk activation is seen at the human
carotid bifurcation, and is associated with PCNA expression.
The role of Erk in the development of lesions at this site in re-
sponse to mechanical strain merits further study.

MINISTEROTOMY AND MINIMALLY INVASIVE HYBRID PROCED-
URES FOR THE MANAGEMENT OF TRANSVERSE ARCH
ANEURYSMS. L. Pawlowski,* J. Pettit,* L. Harrison,*
CA. Hinjosa,* L. Garrido-Olivares,* LB. Carvalho-Perron,*
J. Velianou,* C.S. Cinà.* From the Divisions of *Vascular
Surgery and †Cardiology, McMaster University, Hamilton,
Ont.

Background: Endovascular techniques are well established for
the treatment of thoracic aortic pathology. Innovative ap-
proaches are pursued in an attempt to extend their use to the
transverse aortic arch. Objectives: To present the results of
hybrid procedures, using open techniques as an adjunct, to in-
crease the applicability of endovascular repair of transverse aor-
tic arch aneurysms. Method: This is a retrospective review of
data collected prospectively, in a tertiary vascular centre with
an established endovascular program. We included aneurysms of
the transverse aortic arch in which endovascular procedures
were used with the adjunct of open surgery (hybrid procedure). Transverse aortic pathology was classified according to the proximal landing zone in: zone 0 (proximal to the brachiocephalic artery), zone 1 (including the left common carotid artery), and zone 2 (including the left subclavian artery). A ministernotomy was used to approach the ascending aorta, and cervical incisions were used for all other debranching procedures.

**Results:** From February 2005 to November 2006, 8 aneurysms involving the transverse aortic arch were identified in which debranching of the aortic arch was required before endovascular graft repair. The indications for surgery were: atherosclerotic aneurysms in 6 and a ruptured mycotic aneurysm in 2 patients. The open adjuncts included: 3 carotid-carotid-subclavian transpositions, 1 carotid-subclavian transposition, and 4 ascending aorta to brachiocephalic and left common carotid bypasses. All patients survived and 1 with a ruptured mycotic transverse arch aneurysm suffered an embolic stroke which left him with moderate functional impairment. At a median follow-up of 317 days (126–696 d) all patients were alive and the one who suffered a stroke is able to ambulate without a cane. **Conclusions:** Ministernotomy is an effective approach to aortic arch debranching, and hybrid procedures, either a staged or in the same sitting, appear to be safe and effective to treat pathology of the transverse arch.

**ANKLE BRACHIAL INDEX ON KILIMANJARO: UNIQUE DATA WITH UNEXPECTED RESULTS.** *P. Nault, J. Paradis. University of Ottawa, Gatineau, Que.*

**Background:** High altitudes trigger the carotid bodies to increase blood pressure and heart rate to counteract the low atmospheric \(O_2\) pressure (hypoxemia) during the first week above 4000 m. It is not known if there is a differential increase in blood pressure in arms versus legs in healthy subjects at 4000 m. High blood pressure is a cause of peripheral artery disease (PAD), which is 20 times more common in the legs than arms, suggesting potential differences in regulation between arms and legs. We wanted to see if high altitude causes blood pressure differences in arms versus legs in healthy subjects. **Objectives:** The objectives of this study were 2-fold: (1) to determine the effects of altitude (4000 m) on ankle brachial index (ABI); (2) to determine the relationship between high altitude ABIs with previously measured health variables.

**Methods:** Twenty climbers (17 males, 3 females) from the same Canadian region (sea level, T1) were recruited. Age, body mass index (BMI), waist circumference and \(V_o_{2}\)max were assessed by a registered kinesiologist before ascension. ABIs at T1 were performed in a vascular laboratory. All ABIs at 4000 m (T2) were performed by the same vascular surgeon (RVT) who was blinded to baseline data. ABI, \(O_2\) saturation and pulse rate were measured at the end of the day after 1 hour of rest. SPSS 14.0 was used for statistical analysis.

**Results:** ABIs measured at T2 (mean 1.19) were greater than those at T1 (mean 0.97) \((t = -6.23; 95\% \text{ confidence interval } [CI] -0.32 \text{ to } -0.17; p < 0.001). T2 ABIs were positively related to oxygen saturation measured at T2 \((n = 19; r = 0.45; p = 0.02). T2 ABIs were positively related to \(V_o_{2}\)max at T1 \((n = 19; r = 0.436; p = 0.03). ABIs at T2 were inversely related to T1 resting heart rate \((n = 19; r = -0.47; p = 0.04). Overall blood pressure was increased at T2. **Conclusions:** ABIs at T2 were greater than those at T1 and highest T2 ABIs were related to higher oxygen saturation. This finding shows that the blood pressure in the legs can be different than that in the arms under physiologic stresses in subjects who did not demonstrate differences at baseline.

**Mortality from ruptured abdominal aortic aneurysms in southern Saskatchewan.** *N. Peti, D. Kopriwa, D.J. McCarville. Regina Health District, Regina, Sask.*

The Regina Qu’Appelle Health Region (RQHR) provides all specialist vascular care for southern Saskatchewan and portions of southwestern Manitoba. A chart review was undertaken on all cases of ruptured abdominal aortic aneurysms (rAAA) presenting to the RQHR between March 1, 1996 and February 28, 2006. One hundred and one cases of rAAA presented to the RQHR over this 10-year period. Thirty-seven percent of patients presented with blood pressure below 90 mm Hg systolic. Seven percent had no recordable blood pressure. The overall mortality was 25%. Seven patients were treated palliatively and 94 had open surgical repair of rAAA. The operative patients suffered 19% mortality. The mortality rate for rAAA seen in the RQHR is below the rate reported in the medical literature even though our patient demographics are comparable to other series. Mortality risk was not statistically different for patients presenting within the city of Regina and those presenting from a greater distance. We postulate that our favourable mortality risk implies that a large number of the most unstable cases of rAAA in southern Saskatchewan die in the community without the benefit of specialist evaluation in the RQHR. Further education of primary care physicians and patients might lead to the salvage of some of these patients.


**Purpose:** Endovascular treatment of thoracic aortic pathology (TEVAR) has emerged as a viable alternative to open surgical repair. Long-term follow-up of these patients with imaging studies is required to detect complications requiring secondary interventions. The aim of this study was to evaluate the need for open surgical intervention to treat early and late aortic complications post TEVAR. We evaluated the indications, preoperative work-up, intraoperative strategy, and outcomes of these procedures. **Methods and patients:** All patient information was obtained by a retrospective review of an established clinical database for all endovascular thoracic stent graft cases. From October 1999 to March 2007, 100 patients were treated with TEVAR with a median follow-up of 22 months (range 0–70 mo). We reviewed the cases of 7 patients (6 from our series, and 1 case who had TEVAR at another institution) who required open surgical intervention to treat early or late aortic complications post TEVAR. **Results:** Median time from TEVAR to intervention was 26 months (range 6 d to 57 mo).
Indications for surgical intervention were retrograde dissection of proximal ascending aorta (1), endoleak (4), graft infection (5), aortoesophageal fistula (2), aortobronchial fistula (2). Overall mortality was 29% (2 cases) and was associated with uncontrolled sepsis in both. Circulatory arrest with deep hypothermia was used with success for explantation of proximal (zone 1 and 2) endografts. Left atriofemoral partial bypass was used during endograft explantation of more distal lesions. All cases are summarized in the table below. Conclusions: Aortic complications after TEVAR, which require open surgical re-intervention are seen infrequently. However, these complications can occur years after the initial procedure. This experience underscores the importance of ongoing clinical and radiologic follow-up of all patients undergoing TEVAR. Operative mortality is high for these open surgical interventions, but long-term survival and control of local sepsis can be achieved in the majority of patients.

Is there an ideal endovascular device to treat isolated iliac or popliteal artery aneurysms? C.S. Cina, R. Moore, C.A. Hinojoa, L. Garrido-Olivares, L. Carvalho-Perron, J. Pettit, L. Pawlowski, L. Harrison. From the *Division of Vascular Surgery, McMaster University, Hamilton, Ont. and the †University of Calgary, Calgary, Alta.

Background: Isolated iliac (IIAA) and popliteal artery aneurysms (PAA) are the second most common after those of the abdominal aorta (AAA). No specific endograft exists to treat IIAA or PAA. In this setting, covered stents or limbs of endovascular grafts primarily designed to treat AAA have been used. The main issues with these grafts are: short lengths, the need for multiple stents with consequent decrease in lumen and differential longitudinal compliance; graft failure due to angulation and repeated movement at the joint level; and dislodgment of the stents at the landing and overlapping zones. Purpose: To report the feasibility of treating IAA and PAA with a new endovascular stent made of thin polyester externally supported by separate nitinol rings, which have ideal characteristics of diameters, length and flexibility.

Methods: Selection criteria for PAA included: diameter > 30 mm; presence of a 30-mm landing zone in the proximal and distal popliteal artery; absent or treatable stenotic inflow disease; and at least one vessel run-off extending to the foot. Selection criteria for IAA included: diameter > 30 mm; presence of a proximal landing zone of 10–15 mm and of a distal landing zone of at least 30 mm. All patients were selected and measurement defined on CT angiography. We achieve access to the ipsilateral femoral artery with an open technique. In PAA a flexible stabilizing knee device was used for 7 days after surgery. Follow-up included duplex ultrasound (DUS), plain x-rays and ankle brachial index at discharge; CT angiography at 2 weeks and every 6 months. All patients treated for PAA received preoperative ASA and Plavix which were continued after surgery indefinitely. Only patients with a minimum follow-up of 6 months are reported. Results: From July 2006 to April 2007, 4 IAA and 3 PAA were repaired, all males, age 71 (standard deviation [SD] 5) years. The diameter was 34 (SD 2) mm. All were atherosclerotic and treated electively. For patients with PAA, the tibial run-off was 1 vessel in 1, and 2 vessels in 2 patients. All repairs were technically successful and median hospital stay was 1.66 (rounded 1.7) days (range 1 to 2.79 – rounded 3). At a mean follow-up of 7 months there were no graft-related complications or graft occlusions and no reinterventions were required. Conclusions: Endovascular repair of IAA or PAA is feasible with this new endoprosthesis which provides technical advantages and possible long-term success compared with currently used endografts. Further studies are necessary to define the ideal indications, anatomic and prosthetic graft limitations, the role of anticoagulant and antiplatelet treatment, and further technical modifications of the device which can make it ideal for this use.

**AORTOILIAC DISEASE REQUIRING OPEN AND ENDOVASCULAR INTERVENTION IN PATIENTS AWAITING RENAL TRANSPLANT.** T.M. Mastracci, J. Pasternak, D. Szalay. Division of Vascular Surgery and Department of Clinical Epidemiology and Biostatistics, McMaster University, Hamilton, Ont.

Background: Many patients with chronic renal failure have associated peripheral vascular disease (PVD). Aortoiliac disease proximal to the recipient site may compromise the success of the transplantation. Vascular surveillance is an accepted component of post-transplant care. We have extended these principles to include a proactive approach to the identification and treatment of aortoiliac disease in the pretransplant population. Methods: Descriptive analysis of a prospective collected database of renal transplant patients at a tertiary care centre in Canada. We have identified a subgroup of patients who re-
quired treatment of aortoiliac disease proximal to the proposed site of transplant. Results: At our centre, 75 patients underwent renal transplant in the last 12 months. This population is 62.5% male, with an average age of 52 years (standard deviation [SD] 13.4 yr). Over the same period, 7 patients required intervention for vascular disease before transplantation. All patients with clinically significant lesions were male, and the average age was 59 years (SD 2.7 yr). The underlying cause of renal failure was polycystic kidney in 3, diabetes in 1 and hypertensive nephropathy in 3 patients. There were 5 operative interventions: 4 aortobi–iliac repairs, and 1 iliac endarterectomy with angioplasty. The remaining 2 interventions were percutaneous iliac angioplasty and stents. The indication for intervention was occlusive disease in 4 and aneurysmal disease in 3 patients. Conclusion: In our experience, 9.3% of patients awaiting renal transplant required intervention for aortoiliac disease before transplantation. This incidence of clinically relevant vascular lesions, especially in older, male recipients, suggests that it may be beneficial to proactively investigate for the presence of aortoiliac disease and intervene when appropriate.


Aim: To compare the safety and outcome of antejugular and retrojugular approach to carotid endarterectomy. Methods: Consecutive patients who underwent carotid endarterectomy under a single surgeon had their preoperative, operative and postoperative data collected prospectively which included 6-week review by the surgeon and neurologist. Results: A total of 278 patients (189 men, 89 women) underwent carotid endarterectomy (156 antejugular, 122 retrojugular). Their median age was 71 years (range 40–89 yr). There was no significant difference between the 2 groups on comparing the demographics, risk factors and indications except for number of pre-CABG patients where the cohorts were small. There was 1 death in the antejugular group who had carotid endarterectomy for a symptomatic 99% stenosis, following occlusion of asymptomatic contralateral side (90% stenosis). Conclusion: Retrojugular approach to carotid artery is safe and it is quicker to perform with significantly less blood loss. It gives better exposure when higher dissection is necessary.

Ruptured aortic aneurysm in women. J. Lassonde, R. Ghalî. Maisonneuve-Rosemont Hospital, University of Montréal, Montréal, Que.

From 1995 to 2006, 29 female patients have been treated for a ruptured AAA.

In these patients, aneurysm diameters were established preop by scan or ultrasound in 23/29. Assuming that the diameters of implanted grafts were equivalent to a normal aortic diameter, ratios (AAA diameter/graft diameter) were calculated. In group A, (i.e., AAA ≤ 60 mm which comprised 10/23 patients [43%]), the mean aneurysm diameter was 57 mm, and the presumed normal aortic diameter, 14.6 mm, for a ratio of 3.9. In group B, the mean aneurysm diameter was 72 mm, and the normal aortic diameter 15 mm, for a ratio of 4.8. Rupture of AAA is a frequent complication in women with aneurysms between 50 and 60 mm (43%). Operative indication should be based on a ratio greater than 3.5. Thus, a normal aortic diameter of 12 mm with a distal aneurysm of 4.5 mm is equivalent to a 16-mm aorta with a 56-mm aneurysm. The limit of 55 mm as an indication for AAA is less applicable for small aortic diameter.


The “Transatlantic consensus conference on peripheral arterial disease” was published in 2000, in the Journal of Vascular Surgery, the European Journal of Vascular and Endovascular Surgery and in Angiology. The Canadian Society for Vascular Surgery was an active part in developing the 107 recommendations and 47 critical issues contained within this document. Criticisms of the document, however, were that it was large and inaccessible, in particular to general practitioners who could implement many of the recommendations. TASC II was set up to increase the accessibility of the document to all branches of health care professionals to update the document as well as to provide rigorous grading for the recommendations. With greater worldwide representation the TASC II Document Steering Committee has developed such a document. Representation was present from the disciplines of surgery, interventional radiology, vascular medicine, cardiology, diabetology, podiatry and included expertise in health economics and clinical epidemiology. The draft document received universal approval from all societies (in contrast to the former document) and was published simultaneously in North America and Europe. There is a new and updated classification system of arterial lesions with recommendations regarding endovascular versus surgical management. Recommendations have been expanded to include risk factor
modification in the generalized disease of atherosclerosis. Although the document does not address intraoperative and endovascular technical details in depth it does have recommendations regarding appropriate treatment.

This paper will highlight the changes included in the document, showcasing Canadian involvement in the process. Also, possible next steps to increase the profile of peripheral arterial disease in the Canadian population will be discussed.

**INITIAL EXPERIENCE WITH TRANSCRANIAL DOPPLER (TCD) AS THE SOLE DETERMINANT FOR SHUNTING DURING CAROTID ENDARTERECTOMY (CEA) UNDER GENERAL ANESTHESIA. S. Lee, J. Dooner, V. Hung. Vancouver Island Health Authority, Victoria, BC.**

**Purpose:** To describe our experience with Transcranial Doppler (TCD) in our initial 100 patients and to summarize the literature regarding accuracy for predicting the need for shunting during carotid endarterectomy (CEA) under general anesthesia (GA) (sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and ROC characteristics). **Background:** Although many surgeons perform CEA under locoregional anesthesia, a significant number of CEA are performed under GA. To prevent cerebral ischemia during carotid clamping, routine shunting is an acceptable technique in this circumstance. However, shunts will be unnecessary in up to 90% of patients. In addition to adding time and cost to the procedure, shunts have been implicated as a cause of carotid dissection and intraoperative air and particulate emboli. Thus, selective shunting is desirable when performing CEA under GA. The 3 modalities that are commonly used are distal internal carotid artery (ICA) stump pressures, EEG, and TCD. The literature suggests that none of these modalities offers 100% accuracy in determining the use of shunt during carotid occlusion. Fortunately, the risk of a false negative with either modality is extremely small and in fact may be acceptable when weighed against the potential morbidity of a policy of routine shunting. **Methods and Results:** We reviewed our first 100 patients using a policy of shunting if the middle cerebral artery (MCA) velocity dropped to < 50% of baseline upon clamping of the carotid bifurcation. Indications for surgery were symptomatic carotid disease in 65% and asymptomatic carotid disease in 35%. The MCA velocity profile pre and post anesthesia, during dissection, at cross-clamp, and with or without shunting are reported. The percentage of patients shunted is reported. The percentage of ipsilateral perioperative neurologic events was < 2% with none of the events occurring during the immediate postoperative period suggesting that intraoperative cerebral ischemia was not responsible for these cerebrovascular events. **Conclusion:** In our experience, we believe that TCD for determining selective shunting under general anesthesia is safe and accurate resulting in lower utilization of shunts. Given the low percentage of patients who require shunting when CEA is performed under locoregional anesthesia and the low incidence of stroke during CEA, a large number of procedures would need to be completed in order to validate TCD as a sole determinant for the need to shunt during CEA. In this regard, the literature is not conclusive. Further study of TCD in awake patients undergoing CEA is warranted.
transfusions only. **Conclusion:** Implementation of proactive strategies at a tertiary care centre can have a significant effect on the number of transfusions given to patients who undergo conventional open abdominal aortic aneurysm surgery.

**COST-EFFECTIVENESS ANALYSIS OF ELECTIVE ENDOVASCULAR REPAIR COMPARED WITH OPEN SURGICAL REPAIR OF ABDOMINAL AORTIC ANEURYSMS.**


**Objective:** Clinical outcomes, resource utilization and quality of life information on patients undergoing elective abdominal aortic aneurysm (AAA) repair was collected prospectively in order to compare patients treated with an endovascular approach (EVAR) to open standard repair (OSR) and determine cost effectiveness. **Methods:** After IRB approval, all patients requiring elective repair of an AAA were invited to participate in a non-randomized, prospective observational study. Informed consent was obtained from all subjects before study participation. At baseline, demographic and medical data as well as quality of life information was collected from participating subjects. Subsequent data collection regarding surgical outcomes and resource use were obtained for the perioperative and postoperative periods. Patient-specific costing information was also obtained from initial hospitalization to discharge. Subsequent resource utilization data at 30 days post surgery and every 3 months post surgery for 1 year were obtained. **Results:** Between August 11, 2003 and April 3, 2005 at London Health Sciences Centre, 140 EVAR and 195 OSR patients were enrolled in the study. Based on a scale of comorbidities, all patients treated with EVAR were stratified as high risk; of the patients undergoing OSR, 52 patients were considered high surgical risk (OSR high risk) and 143 low surgical risk (OSR low risk). The perioperative mortality rate was 0.7% for EVAR and 9.6% for OSR high-risk. The mean initial hospitalization costs were $28 139 for EVAR compared with $15 494 for OSR low risk and $31 181 for OSR high risk. The average 1-year medical cost of follow-up was significantly greater for EVAR patients ($5181) than OSR patients ($1965). Productivity losses were not significantly different. The total mean 1-year cost of EVAR patients was $34 146, which compared with $23 165 for all OSR patients. However, when EVAR patients are compared with OSR high risk ($34 170) the difference was negligible ($-24). The estimated number of life years gained as determined from the Kaplan–Meier survival curves for EVAR and OSR high-risk patients were 0.959 and 0.848, respectively. The Quality Adjusted Survival curves and the resulting quality adjusted life years (QALYs) for EVAR and OSR were calculated to be 0.713 and 0.688, respectively. **Conclusions:** For patients at high risk, EVAR is a safe and effective procedure with fewer complications and mortality occurring in EVAR patients compared with OSR patients with similar baseline risks. The total hospitalization costs associated with EVAR compared with OSR high-risk patients are less and differences in the mean annual 1 year health-related costs are negligible. EVAR had 0.111 more life years gained compared with OSR high-risk patients.

**DEVELOPMENT OF A COMPREHENSIVE VASCULAR SKILLS ASSESSMENT (CVSA) FOR SURGICAL TRAINEES.**


**Background:** The assessment of surgical residents is often limited to assessment of knowledge by examinations and of technical skills based on the subjective opinion of consultants (accumulated during unsystematic observation). Although vascular surgical skills are important to practicing general surgeons, vascular surgery has been removed from the RCPSC General Surgery Objectives. Hence, there may be an erosion of requisite vascular skills required of general surgical (GS) trainees. There is a growing need to establish the level of proficiency of current trainees so that deficiencies in skill or knowledge can be identified and addressed. **Purpose:** To develop a reliable and valid Comprehensive Vascular Skills Assessment (CVSA) addressing both knowledge and technical skills of GS residents. **Methods:** Twenty-four of 38 GS residents at the University of British Columbia participated in this REB-approved study. Participants completed a 2-part CVSA. Part 1 was a short answer question examination (1 h). Content validity was ensured during question development by inclusion a panel of vascular and general surgeons. Part 2 was a series of 4 vascular surgical skills stations in a skills laboratory (IVC trauma, embolectomy, femoral anastomosis, ultrasound-guided line insertion) (1 h). Technical performance was rated using previously validated Global Rating Scales (Objective Structured Assessment of Technical Skills).
Results: The mean overall CVSA score was 50% with the Part 1 and 2 scores being 46.9% and 52.8%. The CVSA demonstrated excellent construct validity with significant improvement in scores with increasing PGY level ($p = 0.01$, ANOVA). The CVSA demonstrated excellent overall reliability with Cronbach’s $\alpha$ 0.9 (0.81 for Part 1 and 0.72 for Part 2).

Conclusion: The CVSA is a comprehensive assessment of vascular skills that is both valid and reliable. Hence, it offers an objective, feasible, and rapid assessment of GS trainee vascular skills. The results from this study (overall 50% score) indicate significant deficiencies in current general surgical training. Educators and surgeons must decide if this situation is acceptable.

The role of MRA and CTA in the preoperative identification of the artery of Adamkiewicz in patients undergoing thoracoabdominal aortic aneurysm repair. C.A. Hinojosa,* L.B. Carvalho-Perron,* L. Garrido-Olivares,* A.A. Franchetto,† M.L. Ellins,‡ J. Grynspan,‡ D. Jichici,‡ C.S. Cinà.*§ From the *Division of Vascular Surgery, †Department of Radiology, ‡Department of Critical Care Medicine and §Department of Epidemiology and Biostatistics, McMaster University, Hamilton, Ont.

Background: Traditional open and endovascular repair of thoracic and thoracoabdominal aortic aneurysms are associated with a risk of lower limb neurologic deficits. Surgical and radiological reports underscore the importance of preserving the intercostal artery from which the artery of Adamkiewicz (AKA) supplying the spinal cord originates. Ideally, this artery should be identified before surgery. Purpose: To report the results of using magnetic resonance angiography (MRA) and computed tomography angiography (CTA) to localize the AKA, in patients with thoracoabdominal aortic aneurysm (TAAA) candidates for surgical treatment. Methods: This is a prospective cohort of elective patients operated upon for TAAA who underwent CTA and MRA preoperatively to identify the AKA. The studies were performed using a 16- or 64-slice multidetector CT, and a 1.5T MRI, respectively. Expert radiologists interpreted the results of the studies. Exclusion criteria for MRA were: presence of foreign bodies non MRA-compatible, claustrophobia or logistical reasons. CTA was not done for serum Cr level greater than 250 mmol/L. Outcomes of the imaging studies were defined as follows: localization of the AKA, defined as identification of the vessel moving up to the anterior midsagittal surface of the spinal cord from the radicular-medullary artery originating from the dorsal branch of the intercostal or lumbar artery; identification of the AKA, defined as identification of the artery, but not of the level of the intercostal or lumbar artery from which it originated; and non identification of the AKA, when the artery was not identified or localized. Interrater reliability (i.e., the extent to which the tests revealed the same findings) was assessed using generalizability theory. Results: From 2002 to 2006, 16 patients underwent studies to identify the AKA; age 57 (SD 13.5 yr) and 11 (69%) males. A CTA was done in 11 (69%), an MRA in 13 (81%) and both tests in 8 (50%) patients, respectively. CTA alone was able to localize the artery in 9 patients (82%) and in 2 (18%) the artery was not identified. MRA alone localized the artery in 9 patients (69%), identified it in 1 (8%), and was not diagnostic in 3 (23%). By CTA and MRA, the AKA was always identified from T10 to L1. In the CTA the frequency at which each artery was localized is 1 artery at T10, 3 at T11, 2 at T12 and 3 at L1, for the MRA the frequency is equally distributed in 3 arteries by each level from T11 to L1. When the group of patients undergoing CTA and MRA were analyzed, agreement between the 2 tests was moderate ($G = 0.55$). Conclusions: CTA and MRA are noninvasive procedures capable of localizing the AKA. In our study the CTA appears to be superior to MRA, but this may be different if a 3D time-of-flight MRA is used. The test levels assigned by each tool in identifying the AKA were in moderate agreement.