

Abstract 1**The Case for a *In Situ* Lesser Saphenous Vein Bypass**

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Background: *In situ* lesser saphenous vein graft has been advocated in cases where the greater saphenous vein is not available and the arteries requiring bypass are confined to the lower leg. This is often the case of patients with diabetes and end-stage renal disease, whose disease pattern typically affects the tibioperoneal vessels, sparing the femoropopliteal segment. The use of an *in situ* technique offers the potential advantages of decreasing surgical trauma to the vein and its vasa-vasorum, size-matching of vein and artery at the anastomoses and improving patency rates. We reviewed the use of *in situ* lesser saphenous vein graft with special attention to its technical requirements.

Cases: A 76- and a 73-year-old man presented with critical limb ischemia. Both had a history of diabetes, end-stage renal disease and previous use of the greater saphenous veins for coronary or peripheral bypasses. Both had tibioperoneal disease and single run-off through the common plantar artery and distal peroneal artery, respectively. Venous mapping showed diminutive veins, with exception of the ipsilateral lesser saphenous veins, which appeared appropriate for graft purposes. The patients were placed in prone position for a posterior approach. Using a longitudinal incision, the lesser saphenous veins was exposed. Proximal anastomosis was based on the popliteal artery, which was exposed through the same incision. Separate incisions were made to expose the run-off vessels, and a fibulectomy was required to expose the distal peroneal artery. We successfully performed an *in situ* lesser saphenous vein bypass using the common plantar and the distal peroneal artery as target vessels. Both bypasses were patent at 18 and 24 -months follow up, respectively.

Conclusion: The presence of an appropriate lesser saphenous vein, with a diameter of 3 to 4 mm and adequate length to reach the target artery, is usually appropriate for an *in situ* lesser saphenous vein bypass. Criteria include patent femoral arteries, adequate popliteal arteries to base the graft and, preferentially, target vessels approachable in prone position through a medial or lateral approach. Anastomosis to peroneal, tibial, dorsalis pedis or plantar arteries have all been described using this technique. In our experience, this approach can be used safely for bypasses from the popliteal to distal arteries.

Abstract 2**Endovascular Repair of a Traumatic Infraarenal Aortic Transection: A Case Report and Review**

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Blunt abdominal aortic trauma occurs in up to 0.04% of all non-penetrating injuries and carries a mortality rate ranging from 24-74%. Seat belt injury is associated with 50% of reported blunt aortic trauma.

This is the case of a twenty-one year old male restrained passenger who was involved in a high speed motor vehicle accident. In the emergency room, he had obvious evidence of lap-belt injury with abdominal wall contusion and ventral herniation. His peripheral pulses were normal and there was no pulsatile abdominal mass. Abdominal Computer tomographic (CT) images revealed a large amount of free intraperitoneal fluid with signs of mesenteric avulsion and fracture/dislocation of T11-T12. CT angiography revealed an aortic transection and surrounding pseudoaneurysm 2cm above the aortic bifurcation. There was no extravasation of contrast.

Initial operative management included right hemicolectomy and resection of small bowel from mid jejunum to distal ileum. Notable findings included a massive rectus sheath ventral hernia, an extensive mesenteric tear with distal small bowel and right colonic ischemia, and a pancreatic contusion. Twenty four hrs later the patient underwent endovascular repair of the aortic transection. Via a right femoral cut-down, a 14mm x 5.5cm stent-graft (AneurRx, Medtronic, Inc., Sunnyvale, CA) was placed across the distal abdominal aorta. Follow up arteriogram revealed complete obliteration of the pseudoaneurysm without evidence of leak. There were no complications related to the aortic stent-graft in the post-operative period. The patient was discharged in good condition.

As this case represents, endovascular repair of traumatic aortic injury is feasible and may represent an improved treatment in certain settings. A review of the literature will be presented.

Abstract 3**Should Ruptured Abdominal Aortic Aneurysms Be Repaired In The Octogenarian?**

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Purpose: Repair of ruptured abdominal aortic aneurysms continues to be a challenge to vascular surgeons, but successful outcomes are now more common with the refinement of technical, anesthetic, and physiologic monitoring improvements. Advanced age has been used as a predictor of mortality and morbidity. This had led many to question whether octogenarians should be offered repair of ruptured abdominal aortic aneurysms because of their age.

Methods: We conducted a retrospective review of all patients who underwent emergent repair of their ruptured abdominal aortic aneurysm over the last 15 years. Risk factors were similar in both groups. A left retroperitoneal approach was used preferentially.

Results: Operative mortality was 39% (14/36) for those 80 years and greater, and 26% (48/184) of those under 80 years. Major complications were seen in 56% of octogenarians and 41% of patients younger. Long-term survival was 47% at both 3 and 5 years for the octogenarians, and 52% and 45% for 3 and 5 years for those under 80.

Conclusion: Although previous studies have demonstrated that advanced age is a risk factor for morbidity and mortality during ruptured abdominal aneurysm repair, our series demonstrates that this may not be necessarily true. We conclude that octogenarians should not be denied repair of their ruptured aneurysms based on age alone.

Abstract 4**B-Mode ultrasound measurement of carotid bifurcation stenoses: Is it reliable?**

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Introduction: In the majority of cases, duplex ultrasonography (DU) is the sole imaging study necessary prior to carotid interventions. Duplex-derived internal carotid artery (ICA) peak systolic velocity (PSV), ICA end-diastolic velocity (EDV) and ICA/common carotid artery (CCA) PSV ratio are the most commonly utilized parameters for predicting critical carotid stenoses. However, the role of direct B-mode measurement of maximal ICA narrowing is ill defined. We therefore investigated the reliability of B-mode ultrasound measurement of 50, 60 and 70% NASCET carotid bifurcation arteriographic stenoses.

Study Design: We reviewed the records of 138 patients (76 female, 62 male) who underwent imaging of 239 carotid arteries with both arteriography and DU from January 1995-January 2000. All DU were performed by registered vascular technologists (n=5). Maximum arteriographic stenosis was determined according to the NASCET study design. Using arteriography as the 'gold standard', B-mode measurement of the maximal narrowing at the carotid bifurcation as well as the ICA PSV and ICA/CCA PSV ratio were subjected to receiver operator characteristics (ROC) curves for three clinically relevant stenoses thresholds: 50%, 60% and 70%.

Results: B-mode ultrasound measurement of carotid stenosis alone was statistically similar to ICA PSV, ICA EDV and ICA/CCA PSV ratio in detecting arteriographic stenosis of >70% ($p>0.3$). When combined with the velocity criteria, B-mode ultrasound improved the PPV by 15% from 61% to 76%.

Criteria	Arteriographic >70% stenosis			
	Sens	Spec	PPV	NPV
B-mode Mode image >78%	87.1	86.8	60.7	96.6
PSV raPSV Ratio >4.2	88.9	88.9	65.4	97.2
ICA PSV >267cm/s	85.7	88.1	62.9	96.3
ICA EI ICA EDV >99cm/s	86.4	80.0	50.3	96.2

Similar results with B-mode image were seen for arteriographic stenosis >50% and >60% ($p>0.25$).

Correlation between B-mode measurement of carotid stenosis and arteriography was statistically significant ($r=0.7614$; $p<0.001$) and was similar among the 5 technologists ($p=0.2$).

Conclusion: B-mode measurement of carotid bifurcation narrowing is as reliable as duplex-derived velocity criteria in evaluating clinically relevant threshold ICA carotid stenoses. The routine use of B-mode ultrasound in conjunction with the velocity parameters enhances the PPV of carotid DU. Our experience suggests that with current refinements in B-mode resolution, stenosis measurements are accurate among experienced technologists. B-mode ultrasound measurement of clinically relevant threshold carotid stenoses is a useful tool for verifying duplex-derived velocity stenosis parameters and is potentially helpful, in the absence of an arteriographic gold standard, for the prospective validation of carotid stenosis velocity thresholds.

Abstract 5**Long term study of outcomes in 2777 claudicants**

Objective: Delineate the natural history of claudication and determine the risk factors for mortality, revascularization, and amputation. **Methods:** We prospectively collected data on 2777 male veteran claudicants over a 15-year period including demographics, clinical risk factors, and non-invasive vascular studies. Key outcomes (death, revascularization, amputation) were determined by extracting data from national VA databases. Data were analyzed using life-table and Cox hazards model. **Results:** Mean follow up period was 47 months. We examined several baseline risk factors in a multivariate Cox model. The table shows event rates and

predictive factors for each of the outcomes. As shown, patients exhibited high mortality rate, but relatively low rates of the other

Outcome	10-year event rate	Predictive Factors (negative predictors in <i>italics</i>)
Mortality	41%	Age, Lower ABI, Diabetes, Stroke
Revascularization	17%	<i>Aorto-iliac disease, Diabetes, Lower ABI, Smoking, Age, Angina</i>
Amputation-Major	7%	Diabetes, Lower ABI, <i>Systolic Blood Pressure Smoking, Angina</i>
Amputation Minor	7%	Diabetes, <i>Angina</i>

outcomes. Surprisingly, history of angina, myocardial infarction, and level of arterial disease (aortoiliac, infrainguinal, or diffuse) were *not* significant predictors of mortality. Diabetes and lower ankle-brachial index (ABI) were strong predictors for major amputation, while diabetes was the most important risk factor for minor amputation. Multiple variables were found to predict revascularization, including lower ABI and proximal arterial disease. **Conclusion:** In this large natural history study of claudicants, we found a high mortality rate. Four independent risk factors were found to have a large impact on survival. However, the level of arterial disease was not as important a predictor for mortality as the overall reduction of the perfusion, as measured by ABI. Our data also suggest that patients with suprainguinal disease were more likely to be considered for revascularization. The 2 variables that were negative predictors for revascularization in this model may represent markers indicating a poorer general condition in patients considered for operative therapy. Consistent with other studies, the risk of major amputation at 10-year follow up was low, with diabetes being a principal risk factor. Contrary to published data, the level of disease was not a predictor for amputation in this cohort.

Abstract 6**Endovascular Exclusion of Saccular Abdominal Aortic Aneurysms Using “Stacked” *AneuRx* Aortic Cuffs**

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Background: Aorto-aortic “tube” endografts have demonstrated a high failure rate with fusiform abdominal aortic aneurysms (AAA) previously because of early and late Type I endoleaks at the distal attachment site. Saccular AAA, however, may have anatomy more conducive to tube endovascular repair.

Methods: At our institution, 129 abdominal aortic aneurysms have been treated endovascularly. After conclusion of FDA approved Phase II and III clinical trials, 5 patients underwent endoluminal exclusion of a saccular AAA. The average maximum diameter of the aneurysms was 3.7 cm (range, 3.0 to 4.7 cm). Patients ranged in age from 55 to 69 years old. *AneuRx* aortic cuff prostheses (3.75 cm length) were utilized in all patients via a right femoral approach. The aortic cuffs were placed sequentially with approximately 1.5 cm of overlap (“stacked”) until complete exclusion of the aneurysm was achieved. Either 2 or 3 cuffs were employed per patient. Patient follow-up ranged from 4 to 32 weeks with abdominal CT scans at 4 and 24 weeks.

Results: All procedures were performed under spinal or local anesthesia with an average procedural time of 87 ± 51 minutes. Successful exclusion of saccular infrarenal aortic aneurysms was achieved in all 5 patients using “stacked” aortic cuffs. The average estimated blood loss was 540 cc (range, 200 to 900 cc). The overall average hospital length of stay was 1.6 days. No major morbidity or mortality occurred in this group. There were no early or late endoleaks demonstrated and no aneurysm expansion has occurred. All prostheses remain in good position with no evidence of device migration at last follow-up.

Conclusion: Saccular AAA provides idea anatomy for endovascular repair with a “tube” endograft. Due to a higher rate of reported Type I endoleaks with unibody aorto-aortic endografts, aortic cuffs may be more effective in a “stacked” configuration to treat this type of aneurysm.

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Abstract 7**Inflammatory Abdominal Aortic Aneurysm Treated by Endovascular Stent Grafting**

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Inflammatory abdominal aortic aneurysms (IAAA) present both a diagnostic and therapeutic dilemma. This problem can be difficult to define preoperatively by either ultrasound or arteriography. However, the diagnosis can often be made by computed tomography. Standard open surgical management may be complicated due to surrounding dense peri-aneurysmal inflammation. This inflammatory response increases risk of injury to the duodenum, left renal vein and ureters. Transperitoneal aortic exposure for repair of IAAA is hazardous and retroperitoneal exposure while minimizing risk of bowel or renal vein injury still exposes the patient to the risk of ureter injury. Alternatively, endovascular repair of an IAAA with a stent graft can definitively effect aneurysm exclusion and potentially avoid injury to vital structures in an inflamed operative field. However, the role of endovascular stent grafts in the management of IAAA's remains speculative and undefined. Furthermore, long-term durability of stent grafts and their ability to effect regression of peri-aneurysmal retroperitoneal inflammation are unknown.

We present a patient with an infrarenal IAAA who was referred for definitive repair after abandonment of an attempt at open transperitoneal aneurysm repair. Arterial anatomy was suitable for a stent graft. The patient's IAAA was successfully treated with an Ancure™ (Guidant/EVT) bifurcated endograft. Immediate post-deployment arteriography demonstrated no endoleak and the patient was discharged to home two days after aneurysm repair. CT scan and duplex ultrasound two weeks after stent grafting continue to show no endoleak and demonstrate minimal-to-mild decrease in the surrounding peri-aneurysmal inflammatory response. Six-month follow-up CT and ultrasound data will be available in December 2000.

Abstract 8**Getting Paid for What We Do: Vascular procedures under CPT 2000.**

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Introduction: Medicare reimbursement guidelines changes for vascular surgical procedures over the years has made obtaining adequate compensation for work done difficult. Understanding the new codes, the use of pre-existing codes, as well as modifiers that apply under CPT 2000 can increase reimbursement for the same clinical work.

Methods: A review of billing practices for three high volume procedures was done. Careful analysis of operative records in 1998 through 2000 documented all the work done for Insertion of Greenfield Filter, Femoral-Popliteal Bypass (Vein), and Exposure Assistance for Spine L5-S1 fusions. The major difference was recognizing what additional procedures whose performance been taken for granted in 1998 could also be listed for reimbursement with appropriate codes and modifiers in 2000. Many routine aspects of vascular cases, even if done by nursing under surgeon orders, were captured in the 2000-year cases. Complete documentation in the chart and the operative reports was an essential component of the charge capture efforts

Results:

Procedure	'Old' CPT codes	'Old' Charges	Added Procedure Charges	2000 CPT Codes	CPT 2000 Charges	Percent Increase
Greenfield filter,	37620	1689.06	IVC cavagram, Radiology based codes	37620,76940-26, 36010-51, 75825-26	\$2221.00	+31.5%
Femoral- Popliteal bypass (Vein)	35556	\$3605.00	IV antibiotics, Foley catheter, angiogram, Interpretation	35556, 36140-51, 75710-26, 90784-51, 53670-51	\$4065.00	+ 12.7%
L5-S1 exposure as Unlisted vascular case	34899	\$400.00	L5-S1 Exposure as two surgeon case	22558-62	\$2099.00*	+ 420%

* Vascular surgery charge after agreed fee percentage with primary spine surgeon.

The charges as noted have been reimbursed, albeit at the insurance carriers respective rates. This utilization of charge capturing does not include any –22 modifiers, which stand to allow more charges for complex cases.

Conclusions: The knowledge of CPT 2000 billing codes is essential to capturing deserved reimbursement from Medicare. Compulsive documentation of work already routinely done on a vascular surgery service can increase recoverable charges under current CPT 2000 guidelines.

Abstract 9

“Endotrash”: Stents Gone Awry in the Peripheral Circulation

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Introduction: As catheter based treatment for vascular occlusive disease increases, complications associated with intra-vascular stents may also be expected to increase. We present six unusual vascular complications secondary to mal-deployed or undeployed stents.

Methods: A computerized registry was reviewed to evaluate clinical and referral information for patients identified with vascular complications associated with mal-deployed stents. Additional patient information was obtained from clinical records. Arteriograms, intraoperative videos, and intraoperative photos were also reviewed.

Results: Six patients were identified and treated for management of mal-deployed intravascular stents. Two cases involved supra aortic branches (carotid and subclavian) and required complex revascularization. Three other patients had stents maldeployed in the infra-diaphragmatic aorta or visceral branches. Two of these patients required major aortic reconstruction while one patient was managed non-operatively leading to renal artery thrombosis and dialysis. One patient suffered embolization of a coronary stent and required local excision. Three of these six cases required urgent revascularization.

Conclusions: Mal-deployed stents may increase the risk of distal vascular complications and require more detailed consideration for arterial reconstruction. Foreign bodies can migrate distally and potentiate occlusive problems of distal vessels. Caution must be used not only at the time of deployment but also in careful follow-up.

Abstract 10**Endovascular Repair Of Thoracic Aortic Aneurysms; A Paradigm Shift In Standard Of Care**

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The standard open surgical treatment of thoracic aortic aneurysms is associated with significant morbidity and mortality. Endovascular repair is less invasive and potentially less morbid for patients with multiple risk factors.

We report our results in 7 consecutive high-risk patients (6 ASA Class IV, 1 ASA Class III) treated with endovascular grafts from January 1998 through June 2000. There were 4 male and 3 female patients with an average age of 75 years. Mean aneurysm size was 6.5 cm. All aneurysms were repaired with Gianturco Z-stent PTFE prostheses. There were no perioperative deaths. Mean length of stay was seven days. Technical success was achieved in all 7 patients. Two patients had neurologic complications following repair (1 patient with transient lower extremity numbness related to spinal arthritis and 1 patient with bowel and bladder incontinence). Both patients were independent with ambulation. Mean follow-up was 13 months. There was no evidence of endoleak or stent migration during the follow-up period. A comparative review of the literature is made.

Repair of thoracic aortic aneurysm by endovascular means is safer and less morbid than conventional open repair. This represents a paradigm shift in the preferred surgical treatment of these complex patients.

Abstract 11**Simultaneous Bilateral Upper Extremity Venous Thrombosis In A Factor V Leiden Heterozygote: A Case Report And Review**

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Primary upper extremity DVT is usually suspected in young, healthy individuals with a history of repetitive upper extremity movement. Secondary upper extremity DVT is associated with predisposing factors such as: hypercoagulable state, malignancy, immobility, trauma, and the use of central venous access catheters. To general knowledge, this is the first known report in the English literature of simultaneous bilateral upper extremity effort thrombosis in a Factor V Leiden heterozygote.

A 21-year-old previously healthy male presented with bilateral shoulder swelling, discomfort, lower face edema, and prominence of the superficial veins of both shoulders. The patient was employed on a landscaping crew pushing a heavy wheelbarrow for the 6 weeks leading-up to his presentation. Duplex venous imaging revealed acute thrombus in the subclavian, axillary, cephalic, and portion of the brachial veins, bilaterally. CXR revealed no anatomic abnormality. Computerized tomography of the chest was normal. Bilateral upper extremity venography confirmed the venous duplex findings. The patient was treated with catheter-directed fibrinolysis, bilaterally. Post-treatment venography revealed successful thrombolysis with persistent stenosis of both proximal subclavian veins, suggestive of thoracic outlet compression. The patient was treated with anticoagulation (intravenous heparin and Coumadin) and discharged home with improvement of his discomfort and edema. Heterozygosity of the Factor V Leiden mutation was subsequently found on completion of the hypercoagulable evaluation initiated at presentation.

Venography one month after discharge revealed recurrent thrombosis of a portion of the right subclavian/axillary vein with well-developed collateral veins. The left subclavian vein was patent, moderately narrowed and irregular, but with numerous collateral vessels present. Because of persistent external compression, the right side was treated surgically. A scalenotomy, thrombectomy and venous patch angioplasty of the right subclavian/innominate vein was performed through a supra-clavicular approach. No left-sided intervention was undertaken because of the lack of ipsilateral symptoms and apparent adequate collaterals. The patient was discharged fully anticoagulated. He was asymptomatic with a patent reconstruction at one month post-operatively. Management of individuals with both underlying hypercoagulability syndromes and anatomic abnormalities of the thoracic outlet remains poorly defined.

Abstract 12**Angiographic Access Site Complications in the Era of Arterial Closure Devices**

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Coronary and peripheral angiography is associated with a low but significant risk of access site complications. While percutaneous devices have been shown to permit more rapid puncture site closure, previous reports have suggested the incidence and severity of complications associated with these devices is higher than with manual compression. This study compares access site complications with and without closure devices in the current era.

We conducted a retrospective review of patients with access site complications after coronary or peripheral angiography between 1998 and 2000. Forty-five complications requiring vascular surgical consultation were identified in the 4800 procedures performed during this time period. Fourteen complications occurred in 1536 procedures (0.9%) using suture-mediated or collagen devices and 31 occurred in 3264 procedures without devices (0.9%).

The types of procedures and catheter sizes (mean 7 Fr) used were not different in the two groups. Other than complications involving a retained device, there was no difference between device and manual compression with respect to incidence or types of complication, requirement for operation, type of operation or outcome. Access site complications identified included pseudoaneurysm (n=22; 49%), bleeding or hematoma (n=8; 18%), arteriovenous fistula (n=5; 11%), arterial thrombosis (n=4; 9%), infection (n=4; 9%) and retained device (n=2; 4%). Twenty-three patients (64% vs 45%; p=NS) required operative intervention including pseudoaneurysm repair, hematoma drainage and thrombectomy. Twelve patients (27%) underwent successful ultrasound guided pseudoaneurysm compression and 10 patients (22%) required no intervention.

These data demonstrate that closure devices facilitate arterial puncture site repair without an increase in access site complications. These devices can be safely utilized when rapid hemostasis is desired after coronary or peripheral angiography.

Abstract 13**Lower Extremity Bypass Graft Revision In Diabetics.**

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Background: Failing lower extremity vein grafts in diabetic patients may be identified by surveillance duplex scanning (DXS). The value of routine pre-revision angiography (PRE-ANGIO) in modifying operative management, and risk factors for recurrence, are uncertain. In a diabetic population, we evaluated: (1) value of PRE-ANGIO, (2) factors predictive of benefit from PRE-ANGIO, (3) incidence of recurrent stenosis, and (4) factors that predict recurrence. Forty-two infrainguinal vein bypasses undergoing primary revision were retrospectively studied. Initial graft stenosis was detected at a mean of 11.5 ± 3.6 months after the original bypass. ***Value of PRE-ANGIO:*** PRE-ANGIO was obtained in 38 cases, revealing additional findings in 29 (76%), and altering the operative plan in 27 (71%). The most frequent additional PRE-ANGIO finding was the identification of a lesion in the inflow or outflow tracts (18 of 27 cases). ***Factors:*** Cases where PRE-ANGIO altered the management plan had a mean systolic velocity ratio across the stenosis (**Vr**) of 7.3 ± 6.1 , versus a **Vr** of 4.8 ± 1.3 for cases where PRE-ANGIO did not alter the management plan ($p < 0.04$). DXS, however, identified 4 lesions not seen on PRE-ANGIO; 3 of 4 were confirmed as webs at surgery. ***Recurrent stenoses:*** Twenty out of 42 grafts (48%) developed recurrent stenoses at a mean of 4.9 ± 3.8 months from initial revision. Recurrent stenosis was not a predictor of ultimate graft failure unless left untreated. Five of 10 untreated grafts ultimately failed. A total of nine of the 42 grafts eventually failed (21%), leading to 3 amputations (7%). ***Factors:*** Restenosis occurred in 69% of female limbs as compared to 38% of male limbs ($p = 0.06$). **Conclusion:** Failing infrainguinal bypass grafts identified by DXS in diabetics should undergo PRE-ANGIO. This frequently alters the management plan, especially in the presence of a high **Vr** across stenoses. High rates of limb salvage (93%) and assisted primary graft patency (79%) despite a high recurrent stenoses rate (48%) justify routine DXS, PRE-ANGIO, and aggressive graft revision.

Abstract 14**Problematic Outcomes Following Contemporary Management Of Venous Thoracic Outlet Syndrome**

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We reviewed our experience with multimodal management of venous TOS to assess the role of aggressive efforts at venous recanalization and the relationship to functional outcome. Since 1995, 7 patients (6 male and 1 female) ages 16-53 presented with symptomatic axillosubclavian venous thrombosis. All but one had a recent history of strenuous arm activity or were athletes. Four patients presented on anticoagulation with recurrent thrombosis after previous thrombolysis and/or PTA one to six months prior. Patients underwent preoperative venography and catheter directed thrombolysis (7) and PTA (4). Residual stenoses of 2-5cm in length were present in 6 patients and chronic occlusion in one. All operations were performed via either a supracavicular or paracavicular approach and consisted of anterior scalenectomy (7), first rib resection (7), medial claviculectomy (2), cervical rib resection (1), circumferential venolysis (7), venous catheter thrombectomy (3), vein patching (2), endovenectomy (3), and internal jugular venous transposition (2). One perioperative occlusion of the subclavian vein occurred and was successfully treated with tPA and PTA but required operative drainage of a wound hematoma. Postoperative duplex-ultrasound follow-up was available for all patients and revealed recurrent thrombosis (1 to 6 months) of the treated subclavian vein in four patients despite therapeutic anticoagulation. Only one of these patients had worsening symptoms with the remaining 3 patients improved. Both patients requiring IJ transposition were asymptomatic with patent reconstructions. Vein TOS is associated with aggressive multimodal interventions and venous reconstruction has an acceptable functional outcome despite poor venous patency rates. IJ transposition may be more durable in cases of extensive residual axillosubclavian venous disease.

Abstract 15**Angioplasty Is Effective In Treating Blue Toe Syndrome**

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Introduction: Blue toe syndrome is a manifestation of distal embolization associated with significant pain and risk of tissue loss. The recommended treatment options for this problem include patch angioplasty of the lesion or bypass with exclusion of the presumed source of emboli. Although focal arterial lesions can be effectively treated with angioplasty, it is unclear whether performing angioplasty in a lesion suspected of causing distal embolization might acutely worsen the condition and what long-term effects this would have in preventing future embolization. The purpose of this study was to evaluate the results of six patients with unilateral blue toe syndrome treated with percutaneous angioplasty.

Methods: During a five year period, a total of six patients were identified with unilateral blue toe syndrome. Ankle/brachial indices were obtained, followed by arteriography. The study group included three men and three women with an age range of 35 to 83 years. Their atherosclerotic risk factors included smoking (6/6), hypertension (4/6), diabetes mellitus (2/6) and hypercholesterolemia (1/6). One patient had a history of illicit drug use. The patients were followed clinically by repeat clinical examinations and vascular laboratory studies.

Results: Arteriography typically demonstrated a focal preocclusive lesion with thrombus at the distal end of the lesion. Angioplasty was technically successful in all cases. The ABI's increased following angioplasty (pre 0.82 +/- .08; post 1.02 +/- .09). The symptoms resolved in all six patients over the ensuing month, and there were no recurrences with a mean follow up of 15 months (range 4 to 23 months). There was one death at four months associated with a pre-existing colon carcinoma.

Conclusions: Unilateral arterial to arterial emboli were found in association with focal preocclusive lesions. Despite the presence of thrombus in some of these lesions, these patients were not acutely worse following angioplasty. There was good initial angiographic success in all cases. There was also hemodynamic improvement as shown by an improvement in the ankle/brachial indices. Although long-term follow up is not available, these intermediate results suggest that angioplasty should be considered a reasonable alternative to standard operative approaches for patients with blue toe syndrome associated with arterial to arterial embolization.

Abstract 16**Iliofemoral Bypass: A Dual Center Experience**

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While endovascular management of focal iliac disease is standard of care, the management of diffuse disease or occlusions remains controversial. A retrospective review of 76 patients who underwent unilateral iliofemoral (IF) bypass was undertaken. The cohort consisted of 43 males (58%) and 33 females (42%) with a mean age of 68 yrs. Atherosclerotic risk factors were present in all including diabetes mellitus (31%), smoking (76%), hypertension (61%), previous myocardial infarction or coronary artery bypass (24%), and previous vascular surgery (31%) among others. Indications for surgery were limb salvage in 30% of the population, the remainder having disabling claudication. Twenty-five percent of patients underwent a concomitant or subsequent outflow procedure on the operative side. Perioperative mortality secondary to pulmonary embolism occurred in 2 patients (2.7%) with a major complication rate of 7.6% (wound infection, thrombosis, PE, MI).

Average followup was 26 months consisting of periodic office visits and/or duplex monitoring. The results show a secondary patency rate of 83.7% by 3-year life table analysis. Limb salvage was successful in 85.2% of patients.

Conclusion: Iliofemoral bypass is an acceptable procedure for unilateral iliac occlusive disease with low morbidity and good long-term patency and should be considered the “gold-standard” for comparison of endovascular interventions in the iliac vessels.

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Abstract 17**Technical aspects of mesenteric revascularization in a contaminated abdomen**

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The management of mesenteric ischemia in the contaminated abdomen requires the use of non-prosthetic materials to achieve mesenteric revascularization. We present a case of an ischemic small bowel perforation in a 62 year-old woman whose pre-operative angiogram demonstrated occlusion of the celiac, superior mesenteric, and inferior mesenteric arteries. Vein mapping of the right greater saphenous vein demonstrated a dual saphenous system whose individual diameters were over 4 millimeters. Exploratory laparotomy revealed a diffusely ischemic small bowel and liver, as well as abdominal sepsis from the perforated small bowel. Revascularization was accomplished using saphenous vein in a non-reversed orientation as a bifurcated conduit from the supraceliac aorta to the hepatic and superior mesenteric arteries. Following revascularization, the liver and small bowel immediately regained a normal perfused appearance and the perforated segment of small bowel was resected and re-anastomosed. The patient's post-operative course was unremarkable and she was discharged 10 days post-operatively tolerating a general diet.

We will present a review of the pertinent literature and discuss technical aspects and options of mesenteric revascularization in the presence of a contaminated abdomen.

Abstract 18**Congenital absence of the External Carotid Artery:Atherosclerosis Without a Bifurcation**

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Congenital absence of the external carotid artery (ECA) is a recognized, but rare, anomaly of the carotid artery system. We report a 66 year old man who presented with an asymptomatic carotid bruit. Duplex ultrasound scan demonstrated a 60%-79% stenosis of the right common carotid artery, but the carotid bifurcation and the ECA were not visualized. Subsequent conventional angiography documented an 80% stenosis at the expected level of the carotid bulb; the ECA was not seen. Surgical exploration revealed a diseased single carotid artery with absence of a bifurcation. No ECA was present; the arterial branches that usually emanate from the ECA arose directly from the single carotid artery trunk. Carotid endarterectomy was performed with a patch angioplasty closure. Pre-operative imaging studies as well as intra-operative photographs highlight the discussion of this rare variant. The four cases already reported in the literature are reviewed and the embryological origin of this anomaly is considered. Concluding remarks address the pathophysiology of atherosclerosis in a carotid artery system without a bulb, bifurcation, or flow divider.

Abstract 19

Routine Early Post-Operative Duplex Scanning Is Unnecessary Following Uncomplicated Carotid Endarterectomy

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Purpose: Although early post-operative duplex scanning has become routine after carotid endarterectomy (CEA), it is unclear whether the results of these scans alter clinical management. The purpose of this study was to critically examine the usefulness of early post-operative duplex scans in evaluating the ipsilateral carotid artery (for technical perfection) as well as the contralateral carotid artery (for potential velocity changes after improvements in ipsilateral flow). **Methods:** Consecutive patients undergoing CEA between January 1995 and June 1999 in a tertiary hospital setting were studied. Patients underwent early postoperative duplex scanning according to the discretion of the operating surgeon and the availability of the patient. **Results:** 236 CEAs were performed in 212 patients with selective use of intraluminal shunting (18%), patch closure (51%), and intraoperative completion imaging studies (12%). Neurologic complications included 3 TIA's (1.3%), 3 non-disabling strokes (1.3%), and 3 disabling strokes (1.3%). There were no 30-day deaths. Sixty-five percent of patients undergoing uncomplicated CEA (147/227) underwent early duplex surveillance within six months of operation. Unsuspected sonographic abnormalities were discovered in 9 asymptomatic patients (6%), including 8 cases of mild ICA stenosis (>50% by velocity criteria) and one case of CCA stenosis (intimal flap). None of the patients with ICA stenosis developed symptoms or required operation at any time. The CCA intimal flap was electively repaired. Postoperative changes in velocity in the contralateral ICA were found in 6/48 (13%) patients known to have bilateral stenosis prior to CEA. There were 2 cases of *increased* velocity, upgrading from 50-79% to 80-99% stenosis, and both underwent uneventful contralateral CEA. There were 4 cases of *decreased* velocity, resulting in downgrading of stenoses from 50-79% to 0-49% (n=3) or from 80-99% to 50-79% (n=1). Only the latter patient underwent contralateral CEA, the remainder have been followed without intervention. Patients were followed for a median of 11 mos (range 0-45 mos). Early scanning appeared to offer no clinical benefit; survival and neurologic outcome were the same in the 147 patients scanned within the first six months, as in the 80 patients whose first postoperative scan occurred later (four-year neurologic event rate 0% in both groups; patient survival with early duplex 97±2.0%, without early duplex 96±3.0%; p=NS). **Conclusions:** Early ipsilateral duplex abnormalities following CEA are infrequent in asymptomatic patients and, even if found, rarely alter management. Patients with bilateral stenosis being considered for contralateral CEA should undergo repeat duplex scanning after the first operation, because of the significant rate (13%) of contralateral velocity changes induced by ipsilateral CEA.

Abstract 20**Does The Diameter Of The Cryopreserved Saphenous Vein Affect Patency In Lower Extremity Arterial Reconstructions?**

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Background: Cryopreserved saphenous vein allografts have provided an alternative conduit for arterial reconstructions when autogenous vein is not available. Historically, patency rates are poor, and are attributed to the immune response of the allograft's donor cells. We examined the influence of vein allograft diameter on graft patency.

Methods: The data from a prospective database of 266 saphenous vein allograft leg bypass operations was analyzed. The indications for surgery included severe claudication (20%), rest pain (27%), ulcer or gangrene (49%), and failed bypass graft (4%). Variables of vein diameter and location of the distal anastomosis (popliteal versus infrapopliteal) were independently tested using multivariate Cox Regression. Primary patency rates were calculated using Kaplan Meier analysis.

Results: The 12 month primary patency rate of allografts >5mm to the popliteal artery was 74%. This was substantially better than the 12 month primary patency of smaller diameter allografts in the popliteal location (3 mm allografts 33.7%, and 4 mm allografts 36%). The difference in primary patency between 3 mm allografts and >5 mm allografts was significant ($p=0.026$). However, the primary patency rates were similar between groups in the infrapopliteal location (3 mm allografts 32.6%, 4 mm allografts 36.8%, and >5 mm allografts 44.2%).

Conclusion: Larger diameter saphenous vein allografts have better patency rates in the popliteal location. Therefore, selection of a larger diameter allograft may be beneficial in bypass reconstructions to the popliteal artery. No correlation was seen between larger vein allograft diameter and improved patency in the infrapopliteal location. We saw no advantage in selecting larger allografts when bypassing to the tibial or peroneal arteries.

Abstract 21**Ultrasound Guided Thrombin Injection: Safe and Durable Treatment of Femoral Pseudoaneurysms**

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Objective: Ultrasound guided percutaneous thrombin injection has recently been described as a treatment for post-catheterization femoral pseudoaneurysm. Although ultrasound guided compression offers another nonoperative treatment option, thrombin injection has shown superior initial success rates. Reports of follow-up for thrombin injection longer than 30 days are currently lacking. We reviewed our initial experience with thrombin injection, then prospectively evaluated patients for occult late recurrences of their pseudoaneurysm and for distal circulatory complications.

Methods: Records and vascular laboratory data for all patients treated with ultrasound guided thrombin injection were reviewed for an 18-month period. Tibial vessel doppler waveforms and ankle brachial indices were routinely obtained before and after thrombin injection. Follow-up duplex examination were performed within 24 hours of initial treatment. In the prospective portion of the study, successfully treated patients underwent a repeat femoral duplex scan and lower extremity arterial examination for comparison with the pretreatment studies.

Results: Forty-nine of 52 femoral pseudoaneurysms (94%) were successfully treated with ultrasound guided thrombin injection. Two immediate failures and one early recurrence were treated surgically. There was one thrombotic complication to the native circulation identified at the time of injection. Follow-up studies were obtained in 32 of 46 available patients with a mean circulation identified at the time of injection. Follow-up studies were obtained in 32 of 46 available patients with a mean length of follow-up of 9 months (range 3-17 months). No late recurrences of the pseudoaneurysms or arterial-venous fistulas were observed. No distal circulatory complications were detected by arterial wave form analysis. Three deaths occurred in the interim (cardiac related). Two patients were lost to follow-up. The remaining 12 patients reported no additional groin or limb complications but declined to be restudied.

Conclusions: Ultrasound guided thrombin injection is a safe and effective treatment for iatrogenic pseudoaneurysms. Thrombin injection should be the therapy of choice for catheter related femoral false aneurysms.

Abstract 22**Durability Of Percutaneous Balloon Angioplasty And Stent Implantation For The Treatment Of Abdominal Aortic Coarctation:**

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Background: Abdominal aortic coarctation (AAC) is an uncommon vascular lesion with serious sequelae primarily related to uncontrolled hypertension. Balloon-expandable stents have recently been utilized in the treatment of AAC as an adjunct to angioplasty or alternative to surgical intervention when mesenteric and renal arteries are not involved.

Case Presentation: A 17 year-old female presented with hypertension uncontrolled by beta-blockade. She underwent arteriography, which revealed a 4cm-long isolated supra-celiac aortic coarctation with a 3.2mm luminal diameter. The peak and mean pressure gradients across the coarctation were 64mmHg and 37mmHg, respectively. Balloon angioplasty of the coarctation to 9mm followed by implantation of a 4cm-long Palmaz™ P4014 stent was performed. After stent implantation there was no residual gradient across the lesion. At one-year follow-up the patient was normotensive without medication. Contrast enhanced computed tomography (CT) at that time showed no recurrent coarctation. However, at her two-year follow-up the patient presented with recurrent hypertension. Repeat CT scan showed significant contracture of the stent, and angiogram confirmed a stenosis at the level of the aortic stent. The peak and mean pressure gradients were 33mmHg and 27mmHg, respectively. A repeat endovascular stent procedure was performed.

Conclusion: Implantation of balloon-expandable stents is a safe and technically feasible treatment modality for abdominal aortic coarctation not involving the renal and mesenteric arteries. However, the long-term durability may limit the effectiveness of this approach when compared to traditional surgical interventions.

Abstract 23**Spontaneous Late Carotid-Cutaneous Fistula Following Radical Neck Dissection**

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Purpose: To present an unusual case of a spontaneous carotid-cutaneous fistula and its surgical management.

Case Description: The patient is a 50 year old man who presented with spontaneous, pulsatile bleeding from his left neck. He had previously undergone a left radical neck dissection four years ago for tonsillar squamous cell carcinoma with postoperative radiation therapy. He had no evidence of recurrent cancer on followup. The patient was urgently taken to the operating room for a neck exploration. Proximal control of the common carotid artery was obtained at the base of the neck and distal control of the internal and external carotid arteries was obtained above the angle of the mandible. The area of the bleeding and the worst scarring was initially avoided. A reversed saphenous vein bypass was placed as an interposition graft from the common to the internal carotid artery, with ligation of the external carotid artery. The entire carotid bifurcation with the adherent skin where the bleeding had originated was excised. Inspection of the bivalved specimen demonstrated a small opening from the carotid bulb to the skin that easily admitted a small probe. Soft tissue coverage of the wound was achieved using a pectoralis major myocutaneous flap. The patient awoke neurologically intact and was discharged without complications on postoperative day 7.

Conclusion: Surgical revascularization of the internal carotid artery covered by a well-vascularized soft tissue flap should be considered a viable alternative to ligation in the management of late carotid complications following radical neck dissection.

Abstract 24**Endoluminal Graft Repair of AAA by Vascular Surgeons at a Nonclinical Trial Center**

Purpose: To compare early results and complication rates of commercially available endoluminal grafts (ELG) for abdominal aortic aneurysm (AAA) performed by a team of vascular surgeons at a nontrial center with those of published results from trial centers.

Method: A retrospective chart review of all patients undergoing endoluminal graft repair of AAA at our medical center.

Results: From Oct 1, 1999 to Sept 1, 2000 a team of vascular surgeons electively repaired AAA's in 67 patients at a regional referral center. Of these 67 patients, 39 were performed with a commercially available ELG (29AneuRx, 10 Ancure). Primary technical success rate was 100% with 30-day mortality of 2.6%. Average hospital length of stay was 3.03 days with ICU stay of 1.24 days. Average operative estimated blood loss was 579 ml. (100-2500) with average transfusions of 0.61 units prbc (0-6). Ninety percent of ELG patients left the hospital without complications (1 bilateral wall stents, 2 fem-fem grafts for limb occlusion). Two of 13 patients (15%) with 6 month CT follow-up have evidence of endoleak. All 6 month follow-up patients have shown decreasing aneurysm size except one patient with an endoleak who has a stable aneurysm size.

Conclusions: A team of vascular surgeons at a nonclinical trial center can safely perform ELG for AAA with results similar to published series from trial centers.