#1 - INCIDENCE OF MICROEMBOLIZATION IN THE NON-TARGET CAROTID TERRITORY DURING PERCUTANEOUS CAROTID REVASCULARIZATION.

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Aim: Silent infarcts and clinically significant strokes in the non-target carotid territory have been reported after percutaneous carotid interventions. We prospectively assessed the incidence of microembolization (MES) in the non-target carotid artery by trans-cranial Doppler (TCD) in a series of patients undergoing percutaneous carotid revascularization with distal embolic protection (CAS) or flow reversal (FRS).

Methods: TCD insonation of the non-target middle cerebral artery was conducted during 25 procedures (18 CAS and 7 FRS). TCD detects intra-procedural microemboli as high intensity transient signals (HITs). HITs in the non-target carotid were divided into 3 phases: pre-protection (PRE: till filter deployed or flow reversal established), protection (PROT: until filter removed or antegrade flow re-established) and post-protection (POST: after filter removed or antegrade flow re-established).

Results: Mean HITs in the non-target carotid during percutaneous revascularization were 85.1 (SD 68.7, range 3-282). Mean PRE, PROT and POST HITs in the non-target carotid were 43.3 (SD 38, range 3-123), 36.1 (SD 43.8, range 2-180), and 10.1 (SD 8.3, range 0-26) respectively. Right-sided carotid interventions had a mean of 26.8% HITs in the non-target (Left) carotid territory, while left-sided interventions had a mean of 17.1% HITs in the non-target (Right) carotid, and this difference was significant by the Wilcoxon Two-Sample test (two-sided p= 0.0485).

Conclusions: Recent interest in delayed occurrence of vascular dementia after percutaneous carotid revascularization warrants increased study of the incidence of microembolization. Micro-embolization in the non-target carotid territory underscores the unique risks of a percutaneous approach to carotid revascularization compared to carotid endarterectomy.

#2 - CLOSE-CELL STENTS PRESENT WITH HIGHER VELOCITIES ON DUPLEX ULTRASOUND COMPARED TO OPEN-CELL STENTS AFTER CAROTID INTERVENTION; SHORT AND MID TERM RESULTS

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Objective:The purpose of this study was to evaluate the effect of carotid cell design on duplex ultrasound(DU) velocity readings in the immediate post operative period and over time
Methods:A prospective database encompassing all patients treated with carotid artery stents between 2003 and 2008 was established and analyzed for stent type (Close-cell Vs Open-cell), indications and co-morbidities. Patients were followed clinically and with DU immediate post operative and every 6 months thereafter. PSV,EDV and ICA/CCA ratios of PSV were recorded. Chi Square and T-test were used to analyze data.
Results:214 interventions with 157(73.3%) Open-cell and 57(26.7%) Close-cell types of carotid stents were performed in 205 patients. Two groups were similar regarding demographics, co-morbidities, lesions characteristics, stent length and diameter. Only difference was significantly higher mean age and History of MI in close-cell group Vs open-cell group. (P=0.027 and 0.004 respectively). Immediate post operative PSV and ICA/CCA ratio were significantly higher in Close-cell group vs open-cell group (P=0.003 and 0.001 respectively). This difference persisted during 20.2+16.4 months follow up period (P=0.017and0.002). (Table 1) Diabetics and calcified lesions had higher PSV and ICA/CCA ratio immediate post operative (P>0.05) and over time (P<0.05 for calcified lesions). Number of readings showing Restenosis(>300cm/s) over time are significantly higher in close cell 5(8.7%) vs open cell 1(0.06%).EDV was not statistically different in two groups (P>0.05)
Conclusion:Our study suggests duplex criteria to screen for post stent restenosis may require modification according to stent type. However, long term effect of stent design on restenosis is still to be established.

	Open-cell	Close-Cell	P value
Post Operative PSV	93.1+ 38.7	115.9+ 66.1	**0.003**
Post Operative EDV	26.3+10.7	27.3+17.2	0.279
Post Op ICA/CCA Ratio	1.45+ 0.52	2.08+ 1.66	**0.001**
Latest PSV	110.0±51.9	147.2± 108.8	**0.017**
Latest EDV	30.4±15.7	28.89±20.9	0.360
Latest ICA/CCA ratio	1.76± 0.81	2.61± 2.31	**0.002**

Table.1

#3 - OUTCOMES RELATED TO ANTIPLATELET OR ANTICOAGULATION USE IN PATIENTS UNDERGOING CAROTID ENDARTERECTOMY

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OBJECTIVE: The number of patients undergoing vascular procedures who are prescribed warfarin or clopidogrel continues to rise. Our purpose is to examine outcomes in patients undergoing carotid endarterectomy (CEA) while on anti-platelet or anticoagulation therapy.

METHODS: Retrospective review of 260 consecutive patients undergoing CEA. Patient demographics, operative details, perioperative use of aspirin, clopidogrel, or warfarin, and early/late outcome data were collected. Endpoints included postoperative morbidity/mortality and bleeding complications.

RESULTS: There were 152 men and 108 women (mean age=69.3 years) with mean follow-up=406 days. 45.9% of patients were symptomatic. Eversion endarterectomy was utilized in 126 (48.5%), Dacron-patch in 112 (43.1%) and bovine pericardial-patch in 14 (5.4%). 171 patients were taking aspirin, 50 aspirin + clopidogrel, 10 warfarin (mean INR=1.62, range 1.2–2.1); 29 were not on any antiplatelet therapy. All patients on warfarin underwent eversion endarterectomy. There were 19 (7.3%) complications (12 major, 7 minor). 30-day stroke and stroke/death rate was 0.7% and 1.1% respectively. Patients taking clopidogrel developed more neck hematomas (16% vs 1.8%, p=0.0004) compared with aspirin alone. For patients taking clopidogrel, Dacron-patch repair resulted in more hematomas than eversion endarterectomy (14% vs 2%, p=0.01). There was no difference in the incidence of neck hematoma based on endarterectomy technique in patients on aspirin alone. No patient on warfarin had a perioperative complication or developed a neck hematoma.

CONCLUSIONS: Clopidogrel use during CEA increases the risk of neck hematoma, particularly when using a Dacron-patch. Patients taking warfarin can undergo CEA using the eversion-technique, without increased risk of bleeding complications.

Complications	ASA 171 (65.8%)	Clopidogrel 50 (19.2%)	Warfarin 10 (3.8%)
Major			
Myocardial Infarction	1 (0.6%)	1 (2%)	0 (0%)
Hematoma with Exploration	2 (1.1%)	6 (12%)	0 (0%)
Stroke	2 (1.1%)	0 (0%)	0 (0%)
Minor			
Nerve Injury	2 (1.1%)	1 (2%)	0 (0%)
Surgical Wound	0 (0%)	1 (2%)	0 (0%)
Hematoma without Exploration	1 (0.6%)	2 (4%)	0 (0%)

Major and minor complications related to aspirin, clopidogrel or warfarin use in patients undergoing carotid endarterectomy.

#4 - SINGLE CENTER EXPERIENCE WITH MODIFIED EVERSION CAROTID ENDARTERECTOMY

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BACKGROUND:
Transarterial endarterectomy is commonly performed for orificial atherosclerotic renovascular disease. Adopting this technique to carotid endarterectomy (Modified Eversion Carotid Endarterectomy - MECE) utilizes a traditional longitudinal arteriotomy confined to the bulb. This obviates the need for patch closure, simplifies the procedure, and permits easy conversion to traditional patch closure (PCEA) for technical defects. We compared the safety and efficacy of this technique to PCEA.

METHODS:
Three vascular surgeons perfored 223 CEA from July 2004 to December 2008 at a tertiary teaching hospital. Outcomes measured included peri-operative stroke, overall morbidity, mortality and late restenosis. Incidence of moderate (50-79%) and severe (≥80%) restenosis was examined at < 6 weeks, 1 year and ≥ 2 years after operation. Data was analyzed with student t test ($p<0.05$ = significant).

RESULTS:

CEA was performed for symptomatic disease in 40.4% (90/223) of patients. One author performed MECE in 68.7% (90/131) of his patients during this period; the remaining patients (58%, n = 129) underwent traditional PCEA. Intra-operative ultrasound was performed for all patients and 5.6% (5/90) of patients were converted from MECE to PCEA for residual flaps. Intraoperative carotid cross clamping time was shorter in MECE group (28.0 vs. 51.6 minute, p=0.001). The mortality rate was 1.8% (4/223), and peri-operative stroke rate was 1.35% (3/223), all occurring in patients with PCEA. Overall morbidity was 5.3%. evenly divided between MECE and PCEA group. Late restenosis rate on duplex scan was 8.5% (0.89% severe stenosis), early occlusion occured in one patient with PCEA, and the re-intervention rate was 0.89% (2/223). Incidence of restenosis was equivalent between the two groups (MECE 8.4% vs. PCEA 8.5%, p=0.52).

CONCLUSIONS:
Modified Eversion Carotid Endarterectomy is a safe alternative to conventional endarterectomy with a comparable restenosis rate to PCEA, can offer the potential advantage of shorter clamping time and obviates the need of patch closure.

#5 - A RANDOMISED PLACEBO CONTROLLED TRIAL OF THE EFFECT OF PRE-OPERATIVE STATIN USE ON MATRIX METALLOPROTEINASES (MMP) & TISSUE INHIBITORS OF MATRIX METALLOPROTEINASES (TIMP) IN AREAS OF LOW AND PEAK WALL STRESS (PWS) IN PATIENTS UNDERGOING ELECTIVE OPEN REPAIR OF ABDOMINAL AORTIC ANEURYSM (AAA).

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Objective:
To study effects of statins on MMPs and TIMPs in areas of Low and Peak wall stress.

Method:
Elective open AAA repair patients were randomised to receive either Atorvastatin 80 mg or placebo for 4 weeks pre-operatively. Finite element analysis was used to determine stress distribution. Full thickness aortic samples were obtained from low and peak wall stress (PWS) areas, snap-frozen and stored at -80C for subsequent MMP2, 8 & 9 and TIMP1 & 2 analyses. Statistical analysis was performed using SPSS 16.0.

Results:
Forty patients were recruited (20/group). Both groups were well matched (p>0.05) for median age (Placebo 72(59-83) years; Statin 77(52-86) years), gender (Placebo 17male; Statin 18male), co-morbidities and duration of hospital stay (Placebo 8(5-25)days; Statin 7(5-47)days).

MMPs & TIMPs:
There were no differences in levels of MMP's & TIMP's between the statin and placebo group and also no differences were observed at the levels of MMP's & TIMP's at the low and peak wall stress areas.

Conclusion:
In conclusion this study showed that short term use of statins is not associated in reducing levels of MMP-2, 8 & 9 and TIMP-1 & 2 in areas of low and peak wall stress in AAA patients. This relationship needs further exploration through case control models.

#6 - DESIGN AND IMPLEMENTATION OF AN INTEGRATED 0+5 VASCULAR RESIDENCY PROGRAM

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Objectives: New vascular training paradigms introduced in 2007 require reconsideration and redesign of curricula and clinical coverage issues. After two application cycles we reviewed the success and limitations of our original design, curriculum, funding issues, medical student recruitment schemes, and NRMP results.

Methods: Local and national trends regarding RRC guidelines, applicant pool demographics, GME and alternative funding sources for integrated programs were reviewed. Demographics from the ERAS system and background questionnaires were collected from all integrated residency applicants and compared to data

obtained from general surgery residents applying for our traditional independent (5+2) fellowship.

Results: In the 2009 Match, we attracted 65 medical student applicants for the integrated 0+5 program and 53 general surgery residents for the independent 5+2 program. Details regarding the two applicant groups are summarized in the table below. Review of national data showed the number of integrated vascular residency positions increased from four to nine to 19 in 2007, 2008, and 2009, respectively. Medical student applicants registered for the NRMP match that ranked an integrated 0+5 program increased from 9 to 31 to 66 in the same period (P<.01).

Conclusions: Significant differences exist between integrated and independent applicants for vascular training. Applicants for an integrated 0+5 vascular residency are more likely to be female, slightly older, in the top quartile of their medical school class, have higher number of publications, have more interest in cardiovascular research, and score better on the USMLE Step 2. Curricular development should recognize unique requirements for each applicant group. Addition of integrated residents may require novel extra-GME funding strategies. Surging student interest in vascular training is driving significant reconsideration of what constitutes "essential" elements of vascular training.

TABLE

2009 Residency and Fellowship Applicants	0+5 program (n=65)	5+2 program (n=53)	p-value
% female	30.8%	13.2%	.07
Age when applying for residency	29.1	26.7	<.001
Additional degrees (PhD, MPH, MS, MBA, JD)	20.0%	20.8%	1.0
% Top quartile of class on Dean's letter	59.3%	28.6%	.04
# of publications through medical school	3.9	1.0	<.001
% of publications in cardiovascular fields	45.5%	9.8%	<.001
% of publications in basic science	37.9%	49.6%	.15
USMLE Step 1 Score	228.6	225.9	.30
USMLE Step 2 Score	238.3	221.2	<.001

#7 - LONG-TERM RESULTS OF ENDOSCOPIC VERSUS OPEN SAPHENOUS VEIN HARVEST FOR LOWER EXTREMITY BYPASS.

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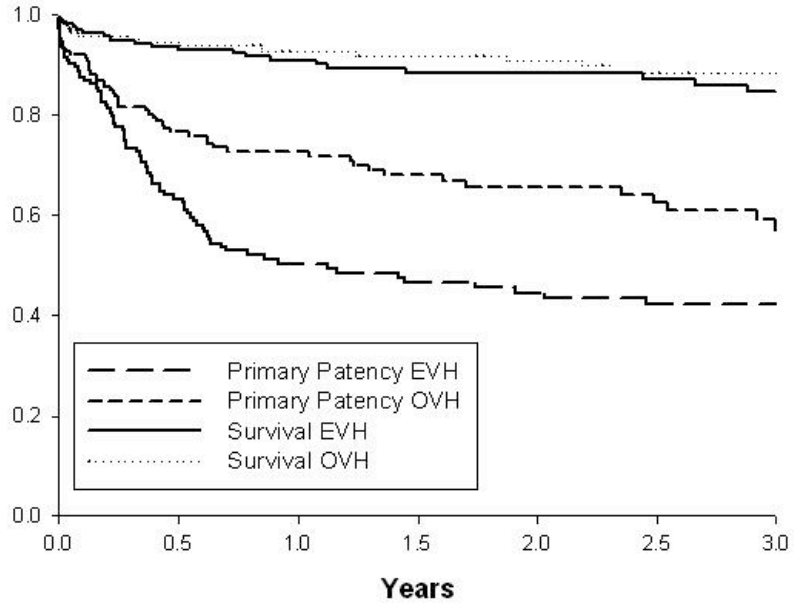
Objective: Endoscopic saphenous vein harvest (EVH) lowers wound infection rates and cost compared to conventional harvest. There are few long-term patency and outcome data, however. The objective of this study was to determine long-term outcomes following EVH compared to those following conventional harvest.

Methods: We reviewed all lower extremity bypass using saphenous vein at one institution over a 10-year period, comparing those harvested endoscopically versus using conventional open techniques. Patency, limb salvage, and survival were determined using life-table methods with Cox proportionate hazard testing.

Results: A total of 363 patients (mean 67 range 24-100 years, 69% male) underwent lower extremity bypass and their charts were available for review. 170 patients underwent EVH (90% using a non-insufflation technique) and 193 conventional (by means of continuous or skip incisions). Mean follow up was 36.4 (0.13 to 240 months). Indications for bypass were tissue loss, claudication, rest pain, and other. Primary patency was worse in the EVH group as compared to conventional at 6 (63.3±4.0% vs 77.3±3.3%) 12 (50.4±4.2% vs 73.7±3.6%) and 36 (42.2±4.5% vs 59.1±4.9%) months ($p<0.001$). However, there were no significant differences in limb salvage or survival up to 3 years. Contrary to previous experience, there were no differences in LOS or wound complication rate.

Conclusion: Despite comparable limb salvage and survival rates, the primary patency rate of EVH is inferior to conventionally harvested vein (confirming recent data for vein used for coronary bypass). In light of the lack of difference in LOS and wound complications, the lower patency rates suggest that EVH be reevaluated and perhaps abandoned in favor of conventional harvest.



Primary Patency and Survival for Endoscopic Vein Harvest (EVH) and Open Vein Harvest (OVH)

#8 - THROMBOLYSIS FOR ACUTELY OCCLUDED LOWER EXTREMITY ARTERIAL BYPASS GRAFTS: FUNCTIONAL OUTCOMES

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Objective: Evaluate the functional outcomes of thrombolytic therapy for acutely occluded lower extremity bypass grafts.
Methods: This is a single-center retrospective study of consecutive patients undergoing catheter-directed thrombolysis for acutely occluded lower extremity arterial reconstructions. The primary outcome measured was the ability to ambulate independently at 6 months. Secondary outcomes included 30-day morbidity, the

ability to live independently in the community, amputation-free survival, graft patency, and number of secondary procedures and hospitalizations. These outcome variables were assessed relative to the following graft and patient variables: type of graft (autogenous vs synthetic), underlying atherosclerotic disease, duration of symptoms, diabetic status, and use of tobacco. Chi-squared analysis and Fisher's exact test were utilized to assess differences between groups.
Results: 46 consecutive patients with occluded lower extremity arterial reconstructions underwent primary thrombolysis between 4/04 and 07/08. 27 patients had a synthetic graft, while 19 patients had an autogenous graft. 65% of patients underwent an adjunctive procedure endovascular procedure to maintain graft patency. Mean duration of symptoms was 8.9 days. At baseline, 43 patients (93%) were able to ambulate independently, while 83% lived independently in the community. At 3 months and 6 months, only 2/3 of patients were able to ambulate independently. 32% of patients were able to attain an optimal outcome of 6 month amputation-free survival, independent ambulation and independent domiciliary status without any further hospitalizations or procedures.
Conclusions: A significant portion of patients will fail to ambulate at 6 months after endovascular therapy for an acutely occluded infra-inguinal bypass graft. Moreover, in spite of the minimally invasive nature of thrombolysis, most patients will require multiple hospital re-admissions and procedures to maintain graft patency and limb salvage.

#9 - THE SUCCESS OF ENDOVASCULAR THERAPY FOR ALL TASC GRADED FEMOROPOPLITEAL LESIONS: LARGEST TRIAL TO DATE

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Objective: Advancements in technology and practice have led to increased endovascular management of all TransAtlantic Society Consensus (TASC) graded lesions. This study aims to evaluate the success of endovascular therapy in the management of TASC graded femoropopliteal lesions.

Methods: Patients undergoing endovascular treatment for femoropopliteal lesions between 2002 and 2008 were divided by TASC scores and evaluated for primary, assisted primary, and secondary patency rates at 12, 24, and 36 months, limb loss, and postoperative complications.

Results: 557 femoropopliteal lesions (TASC A-5.7%, B-27.5% C-34.3%, D-32.5%) in 474 patients (mean age 72.2±10.6, 54.4% male) were treated with endovascular interventions. Mean follow-up was 52.3±16.6 months. Higher TASC scores were associated with higher coronary artery disease rates: A-43.8%, B-50.3%, C-53.4%, D-63.5% (p=0.029). All other patient characteristics and comorbidities were equivalent between all groups. TASC score was a significant predictor of primary and assisted primary patency with lower patency rates for TASC D, but was not a significant predictor of secondary patency rates (Table 1). TASC scores did not significantly contribute to time to loss of secondary patency (Figure 1), limb loss, or postoperative complications (p = NS).

Conclusion: We believe all femoropopliteal lesions can be safely and effectively managed with endovascular therapy. While TASC D lesions do have lower primary and assisted primary patency rates, high secondary patency rates comparable to other TASC scores can be achieved with effective prevention of limb loss. This data provides evidence to support endovascular therapy as first line management for all femoropopliteal lesions regardless of TASC score.

#10 - SFA SILVERHAWK ATHERECTOMY VERSUS ANGIOPLASTY AND STENTING: EARLY RE-INTERVENTION AND FAILURE RATES BASED ON TASC CRITERIA

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Objective: To compare early re-intervention rates following atherectomy (Silverhawk) or primary angioplasty and stent placement for the treatment of superficial femoral artery occlusive disease.

Methods: A prospective endovascular database was retrospectively reviewed to determine rates of re-intervention following either SFA Atherectomy or PTA/stent placement. Outcomes are evaluated based on

TASC criteria for each group.

Results: 70 plaque excisions (61.7% men) and 51 PTA/stent placed (56.9% men) were performed from August 2004 until December 2008. Indications for each were for tissue loss based on SVS ischemia (25 for atherectomy 17 for stenting), rest pain (22; 13) and claudication (23; 20). The mean increase in ABI was 0.22□ 0.21 and 0.41□ 0.15 for atherectomy and SFA /stent respectively (p=0.002). Adjuvant procedures were required in 24.3% following atherectomy and 34.5% after PTA/stent. TASC criteria for atherectomy included 32 TASC C and 19 TASC D lesions, while for the SFA/stent there were 21 TASC C and 13 TASC D lesions identified. Restenosis or occlusion requiring re-interventions developed in 18.6% (TASC C/D rate 73%) of the atherectomy and 38% (TASC C/D rate 54%) of the SFA stent patients (p=0.024).

Conclusion: Both atherectomy and PTA/stent placement can be used for the treatment of SFA occlusive disease. The rate of adjuvant interventions and re-interventions is higher in PTA/stent patients. However, TASC C/D lesions have a higher failure rate following Atherectomy. Endovascular technique selection based on TASC criteria should be considered in the treatment of SFA occlusive disease.

#11 - THE EFFECT OF PERCUTANEOUS INTERVENTION ON WOUND HEALING IN PATIENTS WITH MIXED ARTERIAL –VENOUS DISEASE

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Introduction: Patients with combined arterial and venous insufficiency that have open venous ulcers are notoriously hard to treat. Ankle-brachial index (ABI) 0.5 to 0.8 has been shown to be an independent predictor of poor healing. Since adequate compression therapy is contraindicated in patients with an ABI less than 0.7, we undertook and aggressive policy of percutaneous revascularization.
Methods: Twenty seven patients with clinical and duplex scan evidence of chronic venous insufficiency, active leg ulcers and impaired arterial perfusion (ABI < 0.7)(IAP)were treated on a protocol that required percutaneous revascularization prior to ambulatory compression therapy. The patients were followed on a 2-week interval prior to and after revascularization. Wound planimetry and time to complete closure was recorded.
Results: The patients' results were compared against the patients' own previous wound healing trajectory. In addition their healing rate was compared against previously published rates of IAP venous wound closure; 25% closure at 10 weeks, 50% closed at 19 weeks. At enrollment in the protocol the average ABI and wound size (cm2) was 0.56, 12 cm2. The wounds had been open an average of 17 weeks. After intervention the average ABI, average time to closure, and closure rate at 10 weeks and absolute closure rate were; 0.97, 10 weeks, 75 % and 100 %.
Conclusion: Even though previous studies have shown that mixed arterial venous ulcers will close without arterial intervention, we advocate an aggressive approach to percutaneous revascularizationin in this population, as attaining a near normal ABI allows for much more timely wound closure

#12 - EMERGING NATIONAL TRENDS IN THE MANAGEMENT AND OUTCOMES OF LOWER EXTREMITY PERIPHERAL ARTERIAL DISEASE

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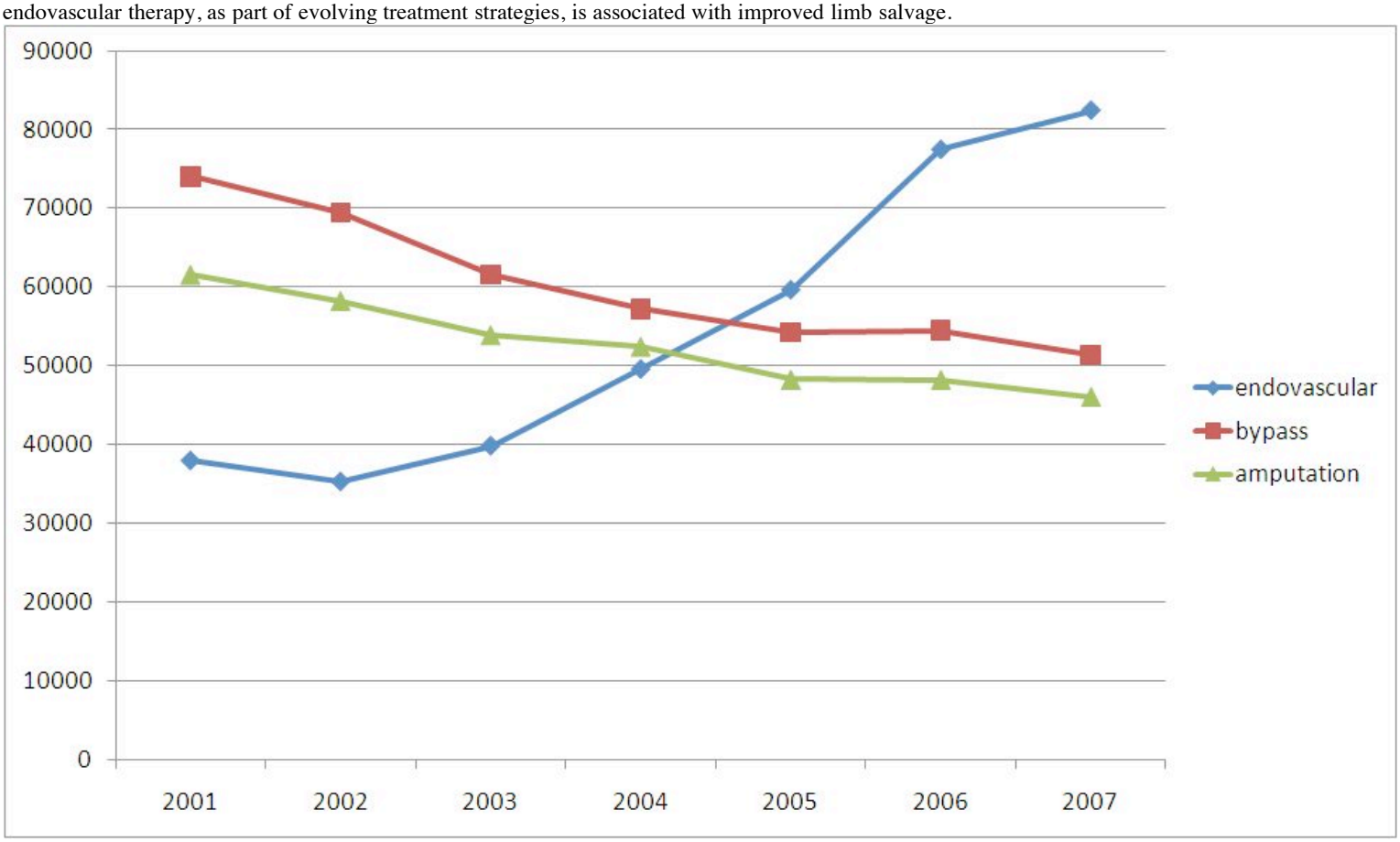
OBJECTIVE – We sought to analyze emerging national trends in the treatment of lower extremity peripheral arterial disease (PAD) and associated outcomes.
METHODS – The Nationwide Inpatient Sample was queried from years 2001-2007. Patients with a diagnosis of extremity atherosclerosis were selected by ICD-9 code 440.20-440.24, resulting in an average of 307,000 annual hospitalizations. Within this group, we determined the annual number of lower extremity bypasses, endovascular interventions, and major/minor amputations (below/above knee amputation vs. toe/foot amputation). Chi-square analysis was performed on discharge-weighted data to compare two time periods (2001-2003 and 2004-2007) to determine changes in management and differences in outcome.
RESULTS – Comparing the two time periods, the average annual number of endovascular interventions increased by 78% (37692 vs. 67248, p<0.001), and open lower extremity bypasses decreased by 20% (68326 vs. 54348, p<0.001). The total number of interventions annually increased by 15% (106018 vs. 121596, p<0.001). The number of total amputations (59693 vs. 50254, p<0.001), major amputations (39543

vs. 31043, p<0.001), and minor amputations (20150 vs. 19211, p<0.001) performed annually all significantly decreased.
CONCLUSIONS – Between the time periods examined, the treatment of lower extremity PAD has evolved with increased use of less invasive endovascular techniques and fewer open lower extremity bypasses. There are now also a greater number of patients receiving intervention overall. These trends are associated with fewer total (major and minor) lower extremity amputations. These results suggest that increased use of endovascular therapy, as part of evolving treatment strategies, is associated with improved limb salvage.



Total Interventions Per Year

#13 - ENDOVENOUS LASER ABLATION OF THE SAPHENOUS VEIN IN OVER 1000 LIMBS WITH ONE TO TWO YEAR FOLLOW UP

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OBJECTIVE
The objective of this study is to review the clinical and duplex results of endovenous laser ablation (EVLA) of incompetent great (GSV) and small (SSV) saphenous veins with at least one-year follow-up.

METHODS
This is a retrospective, multi-center study that reviewed 1,010 limbs in 951 patients undergoing EVLA with a 980nm diode laser. Patients undergoing EVLA of an incompetent GSV or SSV with at least one year follow-up were included. Periprocedural complications and duplex ultrasound data were analyzed at one or more years postoperatively.

RESULTS
861 GSVs (85%) and 149 SSVs (15%) were included in this study. Approximately half of the patients had a BMI>25. 55% of the patients underwent phlebectomy at the same time as EVLA. At one year, the saphenous trunks were occluded in 912 limbs (90.2%). The number of complications was very low (3.2%) and involved a 3rd degree burn in one patient (0.1%), deep vein thrombosis (DVT) in five patients (0.5%),

and sensory nerve damage in 27 cases (2.7%). However, only 3/27 patients with nerve damage still had sensory deficits at one year. 329/1010 limbs (32%) had two year follow up and 4 limbs that were previously occluded demonstrated reflux.

CONCLUSION
Based on a duplex scan at least one-year post-treatment, this multi-center registry confirms the safety and efficacy of EVLA in the treatment of great and small saphenous vein reflux. Additionally, the moderate number of duplex failures could not only be a guide for further improvements in this technique, but may also serve as a resource for more well-defined indications for endovenous laser treatment.

#14 - INCIDENCE AND CHARATERISTICS OF VENOUS THROMBOEMBOLIC DISEASE DURING PREGNANCY: A CONTEMPORARY SERIES

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OBJECTIVES: To evaluate the incidence and characteristics of venous thromboembolic events (VTE) associated with pregnancy in a contemporary patient series.

METHODS: We performed a retrospective review of 33,311 deliveries between June, 2003 and June, 2008. Patients with objective documentation of a VTE during pregnancy or the three month postnatal period were identified from hospital discharge ICD-9 codes. Diagnosis of deep venous thrombosis (DVT) was largely made by Duplex ultrasound and pulmonary embolism (PE) by computerized tomographic angiography (CTA).

RESULTS: Of 33,311 deliveries during the study period, 74 patients (0.22%) had a VTE. There were 40 incidents of DVT (0.12%) and 37 incidents of PE (0.11%). DVT involved the iliac veins (6), the femoral or popliteal veins (16), the infrapopliteal veins (17) and the axillary vein (1). Most (57.5%) DVT involved the left lower extremity. Thirty-eight (51.6%) of the VTEs occurred in the postnatal period, 33 (87%) within one week of delivery. Sixty-eight percent of the postnatal VTEs were in patients undergoing cesarean section. Among patients with VTE during pregnancy, there were 28% in the first trimester, 25% in the second, and 47% in the third. Events were distributed among maternal age groups as follows: 26% age13-24, 50% age 25-34 and 24% age 35-54.
Of the 35 patients tested for a hypercoagulable disorder, 12 were found to have a positive test result. Five (6.8%) of these 74 patients had a prior history of VTE, with 2 having a hypercoagulable disorder. In addition, 45 of the 74 patients were on oral contraceptive therapy or received hormonal stimulation therapy prior to preganancy.

Patients with a VTE during pregnancy were treated with low molecular weight or unfractionated heparin. Most postnatal patients were treated with subcutaneous low molecular weight heparin and coumadin. Six IVC filters were placed in patients with bleeding complications from anticoagulation. There were no deaths.

CONCLUSIONS: Comparing our results to historic controls (DVT:0.04-0.14% and PE:0.003-0.04%), the incidence of DVT in pregnancy has not changed significantly. We note, however, that the incidence of pulmonary embolus in our series is higher than previously reported. CTA has been utilized for the diagnosis of PE for only the past decade. The increase in the rate of PE in the current series may be due to the higher sensitivity of CTA when compared with previous diagnostic modalities. Most thromboembolic events in pregnancy can be explained by a history of a hypercoagulable disorder or previous use of oral contraceptive therapy.

#15 - SURGICAL BYPASS OF HEMODIALYSIS-RELATED CENTRAL VENOUS OCCLUSION.

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Background: Venous hypertension due to stenosis of the central veins, or its major tributaries in patients undergoing hemodialysis is a complex problem.

Aim: This retrospective study evaluates our experience with Central venous bypasses. Surgical technique, access and function rates were examined. Demographics, comorbilities, complications, reintervention and factors influencing in mortality and their outcomes were determined.

Method: From January 2006 to August 2009, 9 patients (4 males (44.4%)) with a mean age of 44 yo all adults with ESRD, underwent surgical bypass of central veins secondary to hemodialysis related central venous occlusion. All patients included had undergone multiple access surgeries.

Results: The most common comorbilities associated were arterial hypertension (77%), type 2 Diabetes mellitus (33%) and peripheral arterial disease (22%). Upper extremity venous hypertension was the indication in 5 cases (55%), superior vena cava (SVC) syndrome in 2 of them (22%), and lower extremity edema in the remaining 2 (22%). Polytetrafluoroethylene (PTFE) grafts were used for all the surgical bypasses. The most frequent procedure was subclavian to SVC bypass grafting (44%), followed by brachial artery to right atrium bypass (22%), one subclavian to right atrium bypass (11%), one case of right femoral to right common iliac (11%) and finally one case of right external iliac to suprarenal inferior vena cava (11%). The 30-day mortality was 11%. A patient developed hemomediastinum in the immediate postop period and was taken to the operating room for chest exploration and hematoma evacuation. 5 cases of thrombosis occurred (55%), infection occurred on 5 patients (55%). All patients required a second intervention. During a mean follow-up of 36 months, only 5 (55 %) accesses remained functional. Average function time was 7.6 months.

Conclusion: Central venous bypass grafting in dialysis access remains an attractive final option. It should be indicated only in patients whom all the vascular access were exhausted, and percutaneous techniques fails. But, due to the magnitude of the surgical procedure, it still has high morbidity and poor functional outcomes. Enthusiasm for its use should be temporal.

#16 - VENA CAVA THROMBECTOMY AND PRIMARY REPAIR AFTER RADICAL NEPHRECTOMY FOR RENAL CELL CARCINOMA: SINGLE CENTER EXPERIENCE

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Objective: Inferior vena cava (IVC) reconstruction for locally advanced renal cell carcinoma (RCC) includes resection with and without interposition grafting, patch graft, or primary repair. The proposed benefits of lateral venorrhaphy and primary repair are avoidance of foreign material, a more expeditious repair, and preservation of lower extremity venous outflow.

Methods: Single center retrospective review of 20 patients with RCC and IVC tumor thrombus treated with radical nephrectomy, lateral venorrhaphy, thrombectomy, and primary vena cava repair between July 2002 and January 2009. Demographic data, diagnostic information, radiographic cross-sectional imaging, and procedural outcomes were examined.

Results: Among the 12 men and 8 women, the mean age was 57.1 years (31 - 83); mean tumor size was 9.8 cm (3 to 17 cm) and 90% (n = 18) of RCC was identified pathologically as clear cell adenocarcinoma; Neves classification was level 1 for 55 % (n = 11), level 2 for 25% (n = 5), level 3 for 10% (n = 2), and level 4 for 10% (n = 2) of patients. All patients underwent en bloc radical nephrectomy with tumor thrombus removal and primary IVC repair. Mean total operative time was 547.9 □ 138.5 minutes, while mean IVC cross clamp time was 10.8 minutes (6 – 29 minutes). There were no intra-operative deaths or pulmonary embolism (PE) and all IVC margins were pathologically negative.

Peri- operative complications include one PE , one exacerbation of chronic lymphedema, and two cases of new onset erectile dysfunction. Mean follow-up is 18.5 □ 12.1 months (1 to 52 months). There are no radiographic or clinically significant changes in mean IVC diameter during follow-up. No late deaths have occurred, however there has been a tumor recurrence rate of 15% over follow-up.

Conclusions: For advanced RCC with tumor thrombus extension into the IVC, lateral venorrhaphy and primary IVC repair avoids complicated caval reconstructions and results in high patency rates with a low tumor recurrence rate.

#17 - FULL METAL JACKET OF THE SUPERFICIAL FEMORAL ARTERY: A RETROSPECTIVE REVIEW.

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Objective: The technique of full metal jacket (FMJ) of the superficial femoral artery (SFA) has been associated with poorer short and long term results. However, routine stenting of the SFA has been shown in a prospective randomized trial to be associated with superior results. We examined our experience with FMJ of the SFA to stratify the risk factors and safety of this technique.
Methods: Retrospective data was gathered for peripheral angioplasties and stenting for the time period between January 2005 and December 2008. The cases of FMJ stenting of the SFA were identified by angiographic findings and the operative dictations providing the stent data. The selective FMJ stenting of SFA was performed for the residual stenosis after balloon angioplasty of SFA due to either dissection or significant recoil. The cases with concomitant iliac artery angioplasty and/or stenting were excluded from the dataset for analysis. The variables for the evaluation are mortality rate, limb salvage rate, risk factors and primary patency rates.
Results: 63 cases of SFA FMJ were identified from database of 1353 patients who had peripheral endovascular intervention between the time period between January 2005 and December 2008. Average age of the patients being 70 (standard deviation: 10.1) and the median primary patency rate was 9 months (95% CI: 5.06 – 12.94). The overall mortality rate was 12.7% (standard deviation: 0.4)with death occurring at average 15.4 months from initial intervention. The overall limb salvage rate was 95.2 % (standard deviation: 0.21). 2 out of 3 cases requiring amputation had preexistent gangrene. 65 % (41/63) patients were claudicants, whereas 23% (15/63) patients had intervention for some form of tissue loss (ischemic ulcer, gangrene). Average creatinine level was 1.67 (standard deviation: 2.03) and 49% (31/63) of the patients were diabetics. The average 6 months patency rate was 55%. Multivariate logistic regression analysis showed that diabetes (OR: 0.33; p= 0.044, 95% CI: 0.11 – 0.97) and creatinine ≥ 1.6 (OR: 0.16; p=0.038, 95% CI: 0.03 – 0.9) were the independent risk factors for less than 6 months patency rates.
Conclusion: Our experience suggests promising results for the technique of FMJ of the SFA and that further examination of the technique is warranted.

#18 - ENDOVASCULAR THERAPY FOR INFRAINGUINAL LESIONS IN OCTOGENARIANS: NOT AS SAFE AS YOU MAY THINK

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Background: Despite recent literature highlighting the advantages of endovascular interventions in the management of primary infrainguinal lesions for octogenarians, long term overall outcomes remain less well described. The aim of this study is to review our institutional experience with endovascular therapy in octogenarians.
Methods: All patients undergoing endovascular treatment for femoropopliteal lesions from 2002 to 2008 were retrospectively reviewed. Patients ≥80and <80 years old were compared for demographics, co-morbidities, patency, limb salvage, sustained clinical success (resolution of symptoms and preservation of limb), and secondary complications of access site (i.e.: hematoma, thrombosis) and systemic complications (i.e.: myocardial infarction, death). Statistical analysis was conducted with logistic regression, Cox hazard analysis, and Kaplan-Meier survival curves.
Results: A total of 576 lower extremities in 557 patients underwent endovascular interventions of which 529 patients were <80 and 162 were patients ≥ 80. Mean follow-up time was 8.2 months. Intervention indications (patients <80 vs. ≥ 80) included claudication 52.6% vs. 32.1%, rest pain 12.8% vs. 20.4%, and tissue loss 32.7% vs. 45.1%. Peripheral interventions included angioplasty (33.9% vs. 38.7%), primary stenting (54.4% vs. 54.3%), and atherectomy (11.7% vs. 7.0%). Both patient cohorts had equivalent TASC score lesion grades. Patients ≥80 were more likely to be male and had higher rates of CAD or COPD compared to patients <80. Overall, limb loss rates, primary patency rates, time to limb loss, time to loss of primary patency, mean increase in ABI, overall morbidity, and mortality between the two patient cohorts were equivalent (p = ns), There was a trend towards greater risk of post-operative access site thrombosis in

the octogenarian cohort as compared to the patients <80 (p = 0.08) Patients ≥ 80 were also found to be more likely to have a 30-day peri-procedural complication (i.e. acute restenosis) requiring an operative re-intervention as compared to their younger cohorts (14.2% vs 8.7%, p = 0.03). All re-interventions were secondary to acute thrombosis and were treated endovascularly with repeat angioplasty and/or stent placement. Not unexpectedly, octogenarians were also found to have an average length of stay that was 1.8 days greater than patients < 80 (p = 0.007).
Conclusions: Overall endovascular procedures in octogenarians result in equivalent outcomes and primary patency rates when compared to patients younger than 80. However, patients ≥ 80 are 1.7 times as likely to develop 30-day peri procedural complications requiring a return visit to the operating room for treatment of their acutely thrombosed lesion. The ≥ 80 cohort also trended towards having a greater likelihood of post-operative complications of access site thrombosis. Thus, one should be cautious when aggressively treating octogenarians with endovascular therapy for infrainguinal lesions.

#19 - ENDOVASCULAR REPAIR OF A RUPTURED 11 CM THORACOABDOMINAL AORTIC ANEURYSM IN A HIGH-RISK PATIENT USING A SURGEON-MODIFIED FENESTRATED-BRANCHED ENDOGRAFT

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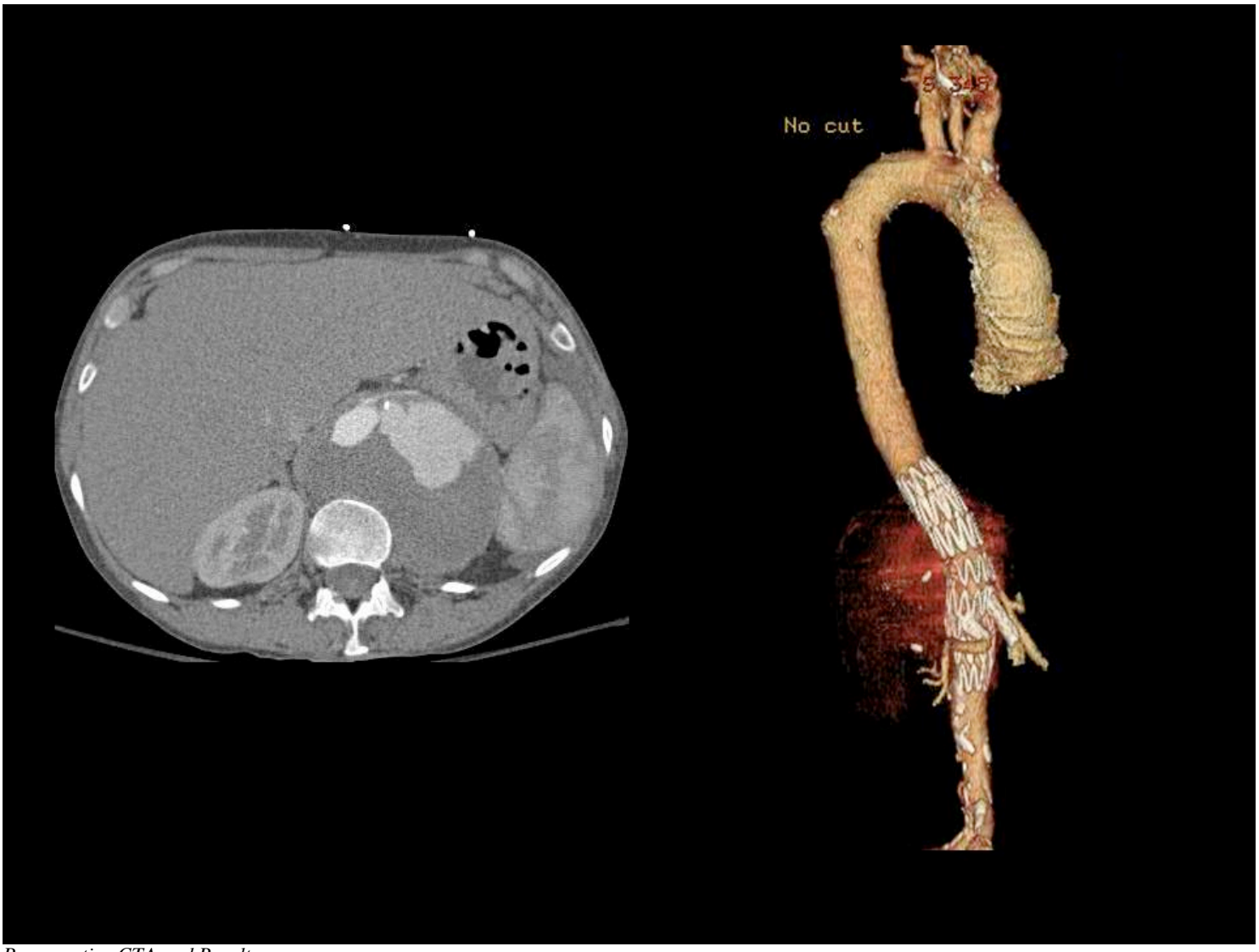
Objective: To describe the feasibility and early results of a novel approach for emergent endovascular treatment of a ruptured thoracoabdominal aortic aneurysm (TAA) in a high-risk patient.
Methods: A 55 year-old woman presented with back and chest pain. Computed tomography angiogram (CTA) demonstrated a ruptured 11.3 cm type IV TAA. The patient's history included a prior open TAAA repair, severe pulmonary dysfunction, renal insufficiency with a solitary right kidney, recent intracranial hemorrhage, necrotizing pancreatitis, and an active entero-cutaneous fistula. She was felt to be at prohibitive risk for open surgery and was taken emergently to the endovascular suite. A Cook Zenith endograft was modified to create fenestrations for the celiac, superior mesenteric, and right renal arteries. The modified device was re-sheathed and introduced into the patient. The fenestrations on the modified device were aligned with the visceral vessels and the device was deployed. Through these fenestrations, branch stents were placed into the celiac, superior mesenteric, and right renal arteries using iCAST stent-grafts. Completion angiogram demonstrated aneurysm exclusion, with preservation of blood flow to the visceral vessels and no endoleak.
Results: The patient recovered without complication and was discharged on the third post-operative day. At 9-months, the patient is alive without complication. All branch-stents are patent. There is no evidence of endoleak, endograft migration, or loss of device integrity.
Conclusion: Surgeon-modified fenestrated-branched endografts provide a feasible alternative for the treatment of ruptured or symptomatic aneurysms in patients at prohibitive risk for emergent, life-saving open surgery.



Preoperative CTA and Result

#20 - PERSISTENT ILIOCAVAL FISTULA FROM TYPE II ENDOLEAK – A CASE REPORT WITH 9-YEAR FOLLOW-UP

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INTRODUCTION

Most type II endoleaks following endovascular aneurysm repair (EVAR) resolve early. Intervention is usually reserved for persistent leaks with increasing aneurysm sac size. We present an unusual late complication of type II endoleak following EVAR of an aneurysm with an iliocaval fistula and a novel approach to hypogastric access necessitated by the patient's anatomy.

CASE PRESENTATION

A 66-year-old male underwent emergent EVAR for a ruptured 7.8 centimeter right common iliac artery aneurysm. Intra-operatively, an iliocaval fistula was noted. Concerns of potential dislodgement of intramural thrombus from the aneurysm sac prompted subsequent placement of an IVC filter. The patient recovered uneventfully and remained minimally symptomatic for nine years. Regular surveillance CT scan revealed persistent type II endoleak, but essentially no change in sac size, presumably due to decompression via the

iliocaval fistula. However, he recently developed congestive heart failure despite a normal ejection fraction.

Attempts at coil embolization of the right hypogastric artery through various arterial collaterals were unsuccessful. Therefore, the right internal jugular vein was accessed, the IVC filter traversed, and the right hypogastric artery cannulated by way of the iliocaval fistula. Coil embolization was then performed, resulting in an immediate marked reduction of flow through the fistula (Figure).

DISCUSSION

Although high output heart failure is well described in arteriovenous fistulae, we believe this is the first reported case from a type II endoleak. The persistence of the iliocaval fistula allowed for a novel route of access for coil embolization of the hypogastric artery.

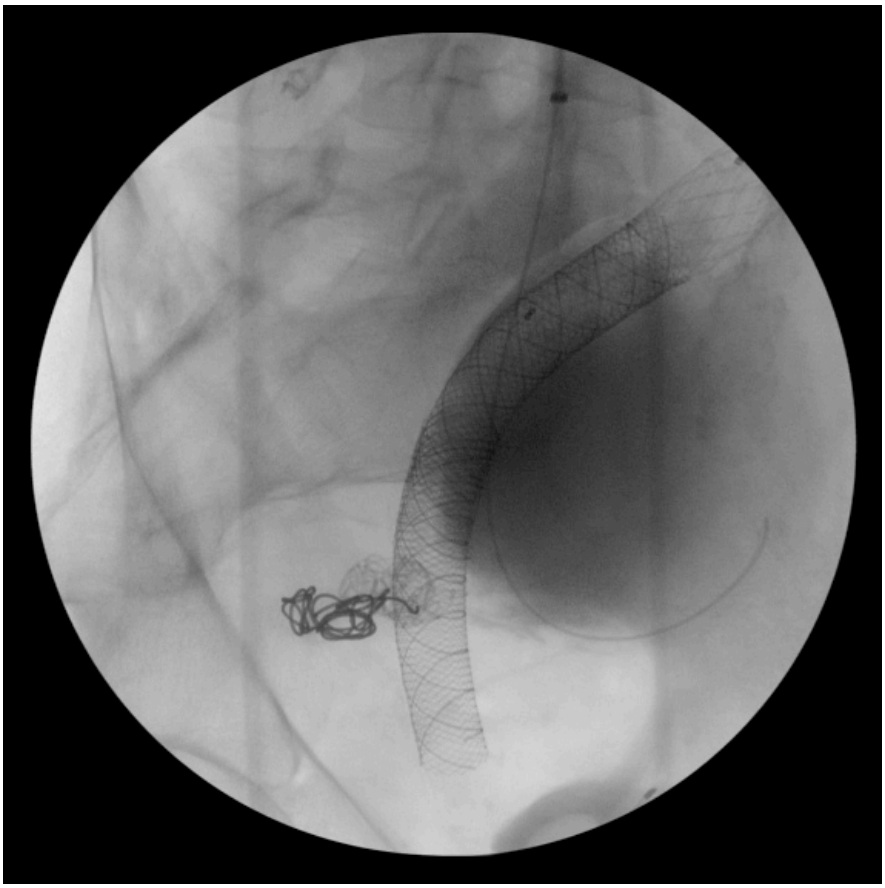

Figure: Hypogastric artery embolization via iliocaval fistula

#21 - TECHNIQUE OF RETROGRADE SUPERIOR MESENTERIC ARTERY STENTING FOR ACUTE ON CHRONIC MESENTERIC ISCHEMIA

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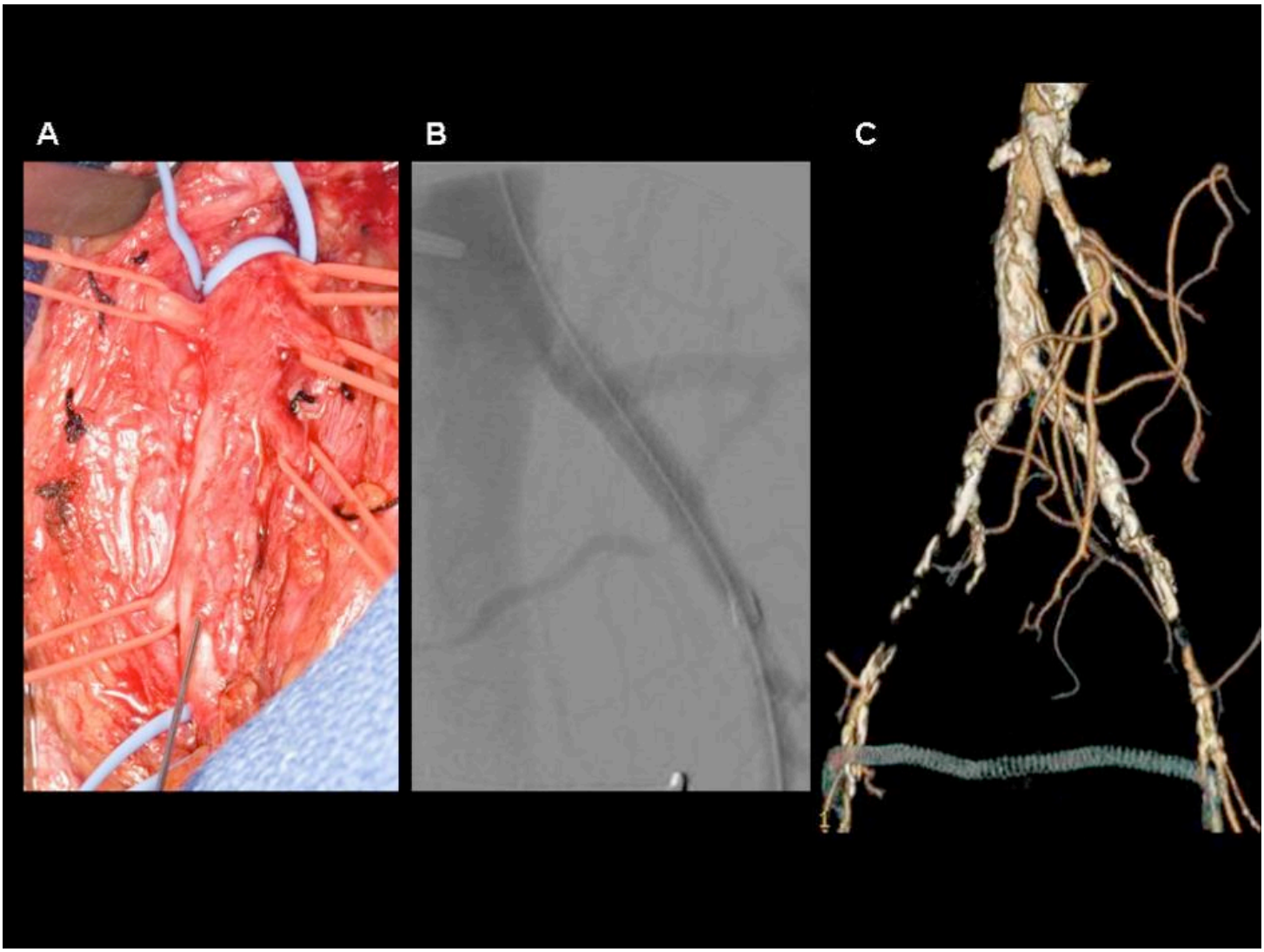
Objectives
Revascularization for acute on chronic mesenteric ischemia can be challenging in the present of peritoneal contamination and severe aorto-iliac disease that limits inflow for a mesenteric bypass. We describe the technique of retrograde superior mesenteric artery (SMA) stenting in a patient with this presentation.
Methods
A 70 year-old female presented with acute on chronic abdominal pain, weight loss, pneumoperitoneum, multiple comorbidities and left gangrenous toes. Abdominal exploration revealed bowel gangrene and perforation with peritoneal contamination, which required resection. The SMA was densely calcified and occluded and there was severe calcification of the supra-celiac and infra-renal aorta with calcification and occlusion of the iliac arteries. The SMA was exposed in the base of the mesenteric and side branches were

controlled with vessel loops. Retrograde access was established with a micro-puncture set and 7Fr sheath. The occlusion was crossed, pre-dilated and stented using balloon-expandable stent. The SMA was opened longitudinally, allowed to flush and was closed using a saphenous vein patch angioplasty. Revascularization of the occluded iliac arteries was performed 12 days later using bilateral femoral endarterectomy and stenting of the occluded iliac arteries due to progressive gangrenous changes.
Results
The patient was dismissed home and remained ambulatory and asymptomatic with patent SMA and iliac stents at 3 month follow up.
Conclusion
Retrograde SMA stenting is an expeditious option to revascularize patients with acute on chronic mesenteric ischemia who have peritoneal contamination and no other good source of inflow to the mesenteric arteries.



A. Wire access of exposed SMA , B. completion angiography after SMA stent placed, C. CTA post stent with occluded iliacs

#22 - ILIAC VEIN INJURY TREATED WITH A COMBINED OPEN SURGICAL AND ENDOVASCULAR TECHNIQUE

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Pelvic venous injuries are associated with a high morbidity and mortality. Endovascular techniques are now being used with increased frequency to manage these injuries. We report a case of iatorgenic venous injury that required a combined open and endovascular approach.

Pt. is a fifty year old female scheduled for an L5-S1 fusion via both anterior and posterior approaches. During the exposure, significant venous bleeding was encountered. Several clips were placed and hemostasis was achieved. During the posterior portion of the procedure, the evoked potentials in the left leg ceased. The procedure was completed and in recover, the patient was found to have a cold, mottled, and pulseless left leg. The patient was taken for open left femoral embolectomy with immediate restoration of normal arterial flow. The femoral vein was noted to be tense and distended. A venogram revealed occlusion of the proximal left external iliac vein with extravasation of contrast. Unsuccessful attempts were made to cross the occlusion with a wire from both the left as well as the right femoral vein. The patient became hemodynamically unstable and the abdominal incision was opened and the wound explored. Heavy venous bleeding was present and was difficult to control. The external iliac vein was found to be divided with two clips across the distal stump. These were removed and a wire was passed into the lumen of the proximal stump of the external iliac vein. A 20mm by 9.5 cm Excluder stent graft was then placed across the area of injury. There was on-going extravasation from the proximal edge of the stent and this was successful controlled by placement of a second 20mm by 9.5 cm stent. The wound was then packed and left open and the patient was taken to intensive care. The wound was subsequently closed and the patient made an excellent recovery. At the six month post-operative visit, the stents were patent and the patient had minimal leg swelling. She has been maintained on coumedin to maintain an INR between two and three.

This case report demonstrates successful management of a life-threatening iliac vein injury using a combined open surgical and endovascular approach.

#23 - CHRONIC SMA DISSECTION LEADING TO ANEURYSMAL DEGENERATION IN A PATIENT WITH FIBROMUSCULAR DYSPLASIA: A CASE REPORT

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Objective: Aneurysms of the superior mesenteric artery are an uncommon occurrence. We report a case of a young patient with documented fibromuscular dysplasia that developed aneurysmal degeneration of the superior mesenteric artery (SMA) secondary to previously unrecognized chronic SMA dissection.

Presentation: A 48-year-old woman with a history of fibromuscular dysplasia previously treated with multiple balloon dilatations of the carotid and renal arteries presented to the vascular surgeon's office with post-prandial abdominal pain and weight loss. A CT angiogram demonstrated circumferential thickening of the SMA concerning for vasculitis. This study prompted a follow-up arteriogram which demonstrated an SMA aneurysm.

Intervention: The patient underwent open exploration. It was discovered intraoperatively that the arterial wall thickening seen on CT angiogram was in fact mural thrombus associated with a chronic dissection of the SMA which had become aneurysmal. The aneurysm was repaired by fenestrating the intimal flap and performing an SMA bypass from healthy proximal SMA to healthy distal SMA using a reversed saphenous vein graft sewn end-to-end. Her postoperative course was uneventful, and her post-prandial abdominal pain was relieved.

Conclusion: Dissection and aneurysmal degeneration of arteries affected by fibromuscular dysplasia is an uncommon occurrence, especially in the superior mesenteric artery. We discuss the diagnosis, workup, treatment, and literature review of this unusual presentation.

#24 - ENDOVASCULAR REPAIR OF AN IATROGENIC THORACIC AORTIC INJURY DURING POSTERIOR APPROACH SPINAL SURGERY

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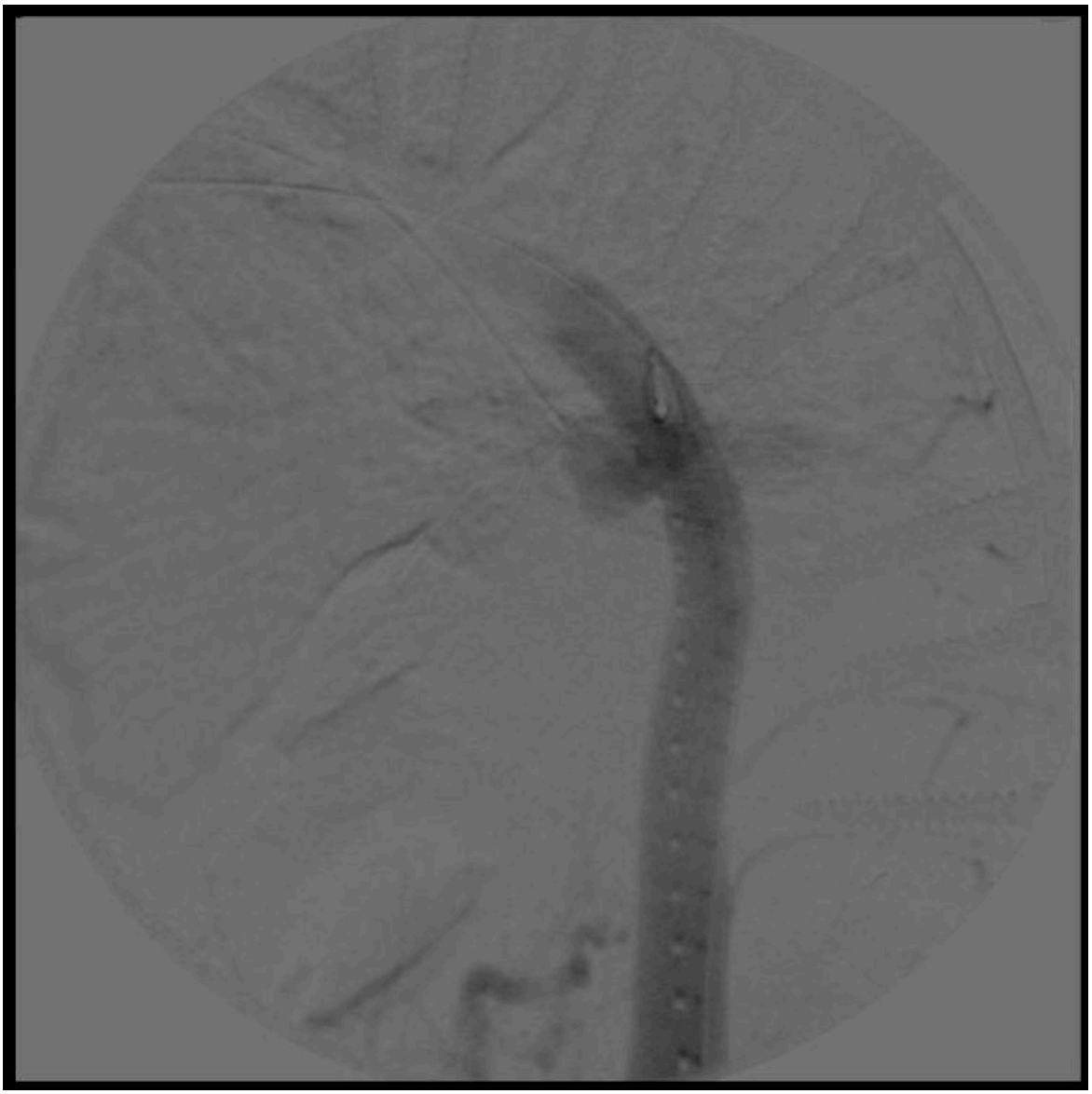
We present a 53 year old male with persistently symptomatic Scheuermann's kyphosis with a history of left anterior thoracoretroperitoneal and multiple prior posterior approach reconstructions. He underwent redo posterior exposure from the cervical to distal lumbar spine. Temporary stabilizing rods were placed and T8 vertebral body resection was underwent to permit radical kyphosis correction. During mobilization of T8, torrential bleeding was encountered and temporarily controlled with digital occlusion. Due to the patient's positioning, severe kyphosis, and prior thoracotomy, an endovascular approach was felt to be the best

option.

Maintaining digital occlusion, the spine exposure was sealed with iodine-impregnated adhesive dressing. The patient was then moved to a radiolucent table and rotated to the right lateral decubitus position. After sterile prep, the left femoral artery was exposed and angiography confirmed the presence of the aortic injury. A thoracic endograft was deployed, with cessation of bleeding and hemodynamic stabilization. Post-deployment angiography confirmed exclusion of the injury. He was returned to the prone position for completion of his spinal surgery. His postoperative course was noted for delayed-onset paraparesis that did not respond to lumbar CSF drainage.

This is the first report of endovascular repair of an iatrogenic intraoperative aortic injury incurred during posterior approach spinal surgery. As the aorta is inaccessible from the prone position, definitive repair requires at least partial patient repositioning while employing temporizing maneuvers to avoid exsanguination. Prior anterior spine exposure with sacrifice of multiple left-sided segmental arteries may increase the risk for neural ischemia with subsequent aortic injury and repair.



Angiogram demonstrating aortic injury.

#25 - HYBRID REPAIR OF ABDOMINAL AORTIC ANEURYSM IN PATIENT WITH STENOSIS OF BILATERAL ILIAC STENTS

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OBJECTIVES - The explosion in endovascular interventions for peripheral vascular disease has resulted in procedures by a multitude of specialties. Non-vascular surgeons performing these interventions can create scenarios which make future vascular interventions challenging. We present a case report illustrating this point.

METHODS - A 68 year old male with severe COPD, coronary artery disease with prior myocardial infarction and multiple abdominal operations presented with an abdominal aortic aneurysm. In our opinion, this patient was a prohibitive operative risk for open repair. Review of his imaging revealed a 6.7cm infrarenal aneurysm and bilateral iliac stents (8mm Right, 6mm Left) extending from the CIA to the common femoral arteries. After careful review a Zenith Renu (30 x 108mm) graft was placed through the right groin following serial dilation and balloon angioplasty. Left brachial access was used for arteriography. The left femoral artery was accessed and the CIA was coil-embolized to prevent backbleeding. A right to left femoral to femoral artery bypass was then performed. In doing so the right CFA stent required partial resection.

RESULTS - The patient tolerated the procedure well and was discharged home on postoperative day 3. Subsequent postoperative CT angiogram revealed patent grafts with no evidence of endoleak.

CONCLUSIONS - This case demonstrates an intervention performed by a non-vascular surgeon which made the only option for aneurysm repair nearly impossible. Similar problems will become increasingly common as more providers offer endovascular interventions, thus emphasizing the importance of the vascular surgeon's expertise in the care of these patients.

Postoperative CT angiogram demonstrating Cook Zenith Renu endograft and femoral artery to femoral artery bypass

#26 - ENDOVASCULAR REPAIR OF A RUPTURED DESCENDING THORACIC ANEURYSM WITH CONCOMITANT 7.0 CM ABDOMINAL AORTIC ANEURYSM.

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Objective: To describe the feasibility and early result of a simultaneous endovascular repair for a ruptured descending thoracic aortic aneurysm and 7.0 cm abdominal aortic aneurysm

Methods: A 77 year-old female presented with chest pain, hypotension and anemia. CTA revealed a ruptured 5.6 cm descending thoracic aortic aneurysm and an asymptomatic 7.0 cm abdominal aortic aneurysm. Co-morbidities included recent colectomy and colostomy creation (6 days out), COPD, coronary artery disease, cholecystectomy, hysterectomy. A spinal drain was placed and these aneurysms were repaired under local anesthesia. The ruptured thoracic aneurysm was treated with a Cook TX2 proximal device and a Medtronic Talent component distally. The infrarenal AAA was repaired with a standard Cook Zenith Endograft.

Results: The patient was discharged on post-operative day 5 without complication and neurologically intact. At 3 months, both endografts were patent and without endoleak or migration. Both aneurysm sacs had decreased in diameter.

Conclusion: In select situations, combined TEVAR and EVAR are feasible and necessary.

#27 - RENAL ARTERY BYPASS CAN RESCUE RENAL FUNCTION IN ANURIC PATIENTS WITH BILATERAL RENAL ARTERY OCCLUSION

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OBJECTIVES: The role of renal revascularization for patients with renovascular disease on hemodialysis remains ill-defined. We describe two cases of successful renal artery bypass in patients with underlying bilateral renal artery occlusion who developed acute renal failure and became dialysis-dependent.
METHODS: The first patient was a 54 year-old woman who developed acute renal failure after emergency aortobifemoral bypass surgery. This patient's serum creatinine rose from 1.6 to 5.4 mg/dl over 4 days. She became anuric and hemodialysis was initiated. The second patient was a 62 year-old woman admitted with symptoms of uremia and found to have a large retroperitoneal high-grade sarcoma. Similar to the first patient, this patient's serum creatinine rose from 4.1 on admission to 9.4 mg/dl within 4 days. She also became anuric and was initiated on hemodialysis. Both patients had underlying bilateral renal artery occlusion.
RESULTS: The size of the kidneys of the first patient was normal. In the second patient, the right kidney was smaller than the normal size left kidney. In both patients, we attempted percutaneous revascularization but were not able to cross neither renal artery occlusion. We then performed bilateral renal artery bypass using woven 6 mm Dacron grafts from the limbs of the bifurcated aorto-bifemoral bypass graft, in the first patient, 16 days after her initial surgery. For the second patient, we excised the retroperitoneal sarcoma and placed a woven 8 mm woven Dacron graft from the infra-renal abdominal aorta to the left renal artery. Both patients recovered their renal function post-revascularization and hemodialysis was stopped. Neither patient has needed dialysis at 14- and 2-months, respectively.
CONCLUSIONS: This case report shows that renal salvage is possible with urgent revascularization, even after a prolonged period of anuria in patients with bilateral renal artery occlusion. We postulate that a normal kidney size may be an important predictor for successful renal salvage.

#28 - HYPOGASTRIC ARTERY PRESERVATION DURING AORTOILIAC ANEURYSM REPAIR

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Introduction: Hypogastric artery embolization with iliac limb extension is often performed for patients with

concomitant aorta and common iliac artery aneurysms during standard endovascular aneurysm repair (EVAR). However, pelvic ischemia symptoms following hypogastric artery exclusion can be debilitating. We herein describe a case of hypogastric artery preservation using commercially available stentgrafts.

Case Report: A 67 year-old man underwent EVAR for a 5.1 cm infrarenal abdominal aorta aneurysm (AAA) and a 3.7 cm right common iliac artery aneurysm. Due to his active lifestyle and a large right hypogastric artery, we decided to preserve the hypogastric artery utilizing an innovative technique that has rarely been described in the literature. Following confirmation of our anatomy, a Gore Excluder main body endograft was delivered through the patient's left femoral artery. Then a "bell-bottom" iliac limb was placed in the contralateral gate to bridge to a second Gore Excluder main body endograft with its own contralateral gate directed into the right hypogastric artery. Finally, two covered stents of 11 mm and 13 mm in diameters were placed through the left brachial artery via a long destination sheath. The covered stents bridge the large right hypogastric artery and the contralateral gate of the second main body. Thus, a trifurcated configuration of stentgrafts was created to exclude the aortoiliac aneurysms while maintaining persistent flow to the right hypogastric artery. Completion angiogram confirmed good stentgraft position with absence of endoleaks. The patient did well and was discharged on the first post-operative day. Follow-up CT scan at one month confirmed both aneurysm exclusion and patent bilateral hypogastric arteries (Figure 1).

Conclusion: This case underscores the feasibility of preserving hypogastric arteries during EVAR using commercially available stentgraft devices. The technique described herein enables patients with concurrent aorta and iliac aneurysms to undergo EVAR without increasing the risk of pelvic ischemia. While the long-term durability of this trifurcated graft configuration remains to be determined, the short-term results are superb.

#29 - TRANSABDOMINAL DIRECT EMBOLIZATION OF LARGE TYPE-II ENDOLEAK USING ONYX

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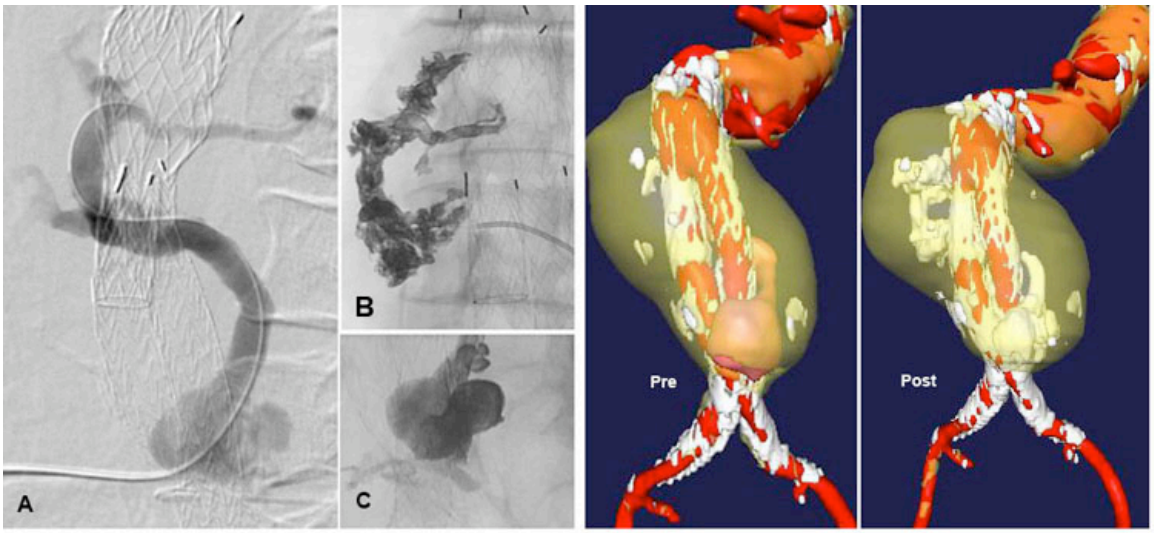
76 yo woman with a prior endovascular repair for an infrarenal AAA. She developed a type-II endoleak with continued enlargement of the aneurysm sac, despite multiple attempts at endovascular embolization, and laparoscopic clipping of the IMA. The endoleak was sustained through several pairs of hypertrophied lumbar arteries. We thus proceeded with direct embolization of the endoleak itself through an anterior transabdominal approach under dynaCT guidance. We placed a 4Fr sheath to maintain access into the endoleak, through which a coaxial system (4 Fr guide catheter and and inner microcatheter) to allow close monitoring of the embolization. Onyx was directed to treat the entire endoleak in a sequential manner (Figure). Followup CT revealed complete resolution of the endoleak with stabilization of the sac size. Onyx offers many advantages as an embolic agent for endoleaks.



A. Endoleakogram
B. Post Onyx embo of upper and mid moieties
C. Post NBCA embo of lower moiety

M2S 3D CT model pre and post embolization

Figure

#30 - INFRARENAL VENA CAVAL DISRUPTION SECONDARY TO BLUNT TRAUMA

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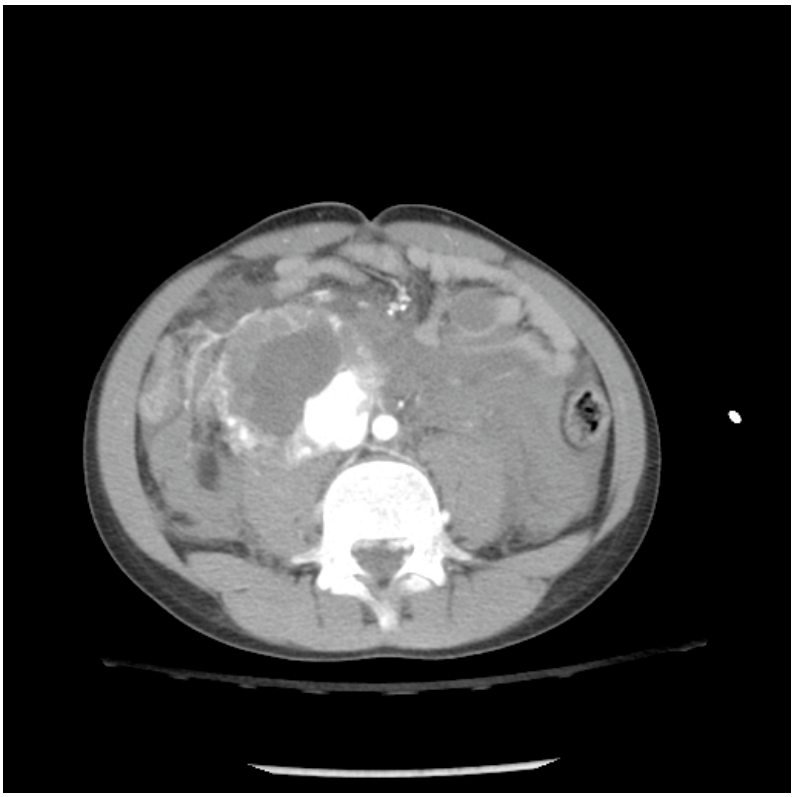
Introduction: Injuries to the inferior vena cava (IVC) are often lethal, and typically associated with penetrating trauma. Significant damage to the IVC from blunt mechanisms comprises a rare subset often associated with multi-organ and/or bowel injury.

Methods: We present a case report of infrarenal vena cava avulsion in a 9 year old male due to minimal blunt trauma. CT scan with IV contrast demonstrated a large retroperitoneal hematoma with IVC disruption and active extravasation. There was no evidence of arterial or other intraabdominal injury.

Results: The patient underwent operative exploration. Prior to laparotomy, expeditious bilateral percutaneous transfemoral balloon occlusion catheters were inflated in the common iliac veins under fluoroscopy. Laparotomy demonstrated total disruption of the vena cava from the iliac vein confluence to the renal veins. The anterior 2/3 of the IVC was avulsed leaving only the posterior portion in situ within the retroperitoneum. Hemodynamic instability, profound hemorrhage, and the extent of venous damage prompted IVC ligation, and a damage control operation was undertaken. The following day, the patient was returned to the operating room for a second look and abdominal closure. Pathologic evaluation revealed fresh thrombus mixed with high grade spindle cell sarcoma. No sequelae from IVC ligation was noted in short-term follow-up.

Conclusions: Blunt injury to the IVC is a rare entity, and isolated caval injuries located outside of the retrohepatic space should alert the surgeon to a potential underlying malignant etiology.



CT demonstrating IVC hematoma

#31 - LONG-TERM OUTCOMES OF PALMAZ STENT PLACEMENT FOR INTRAOPERATIVE TYPE IA ENDOLEAK DURING ENDOVASCULAR ANEURYSM REPAIR.

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Objective: Perioperative proximal endoleaks during endovascular aneurysm repair potentiate graft migration, aneurysm sac expansion, and stent-graft failure. Adjunctive placement of a Palmaz stent at the proximal landing zone can improve proximal seal and eliminate perigraft flow; however, the long-term sequelae associated with this maneuver are unknown. We sought to evaluate the impact of Palmaz stent placement for Type Ia endoleaks on delayed endoleak formation, graft migration, and aneurysm expansion.

Methods: A retrospective cohort review of a prospectively maintained database was performed. From 2000-2005, all consecutive patients undergoing infrarenal endovascular aneurysm repair were evaluated for a Type I endoleak treated with Palmaz stent placement. Fenestrated, juxtarenal, and investigational devices were excluded from analysis. Postoperative and follow-up axial imaging were analyzed for three primary endpoints: Type I endoleak formation, stent-graft migration, and aneurysm sac expansion. In addition, a paired analysis was performed comparing suprarenal aortic diameters, infrarenal aortic neck diameters, aortic neck lengths, and proximal seal zones.

Results: Thirty-six consecutive patients were identified with intraoperative Type I endoleaks treated with Palmaz stenting. Five patients with ruptured abdominal aortic aneurysms died before discharge; the remaining 31 patients compromised the cohort for analysis. During a median follow-up period of 53(interquartile range; 14-91) months, no type I endoleak developed after Palmaz stent placement. Despite patients experiencing aortic neck length (26%) and proximal seal zone (35%) loss, no stent-graft migrated in this population. Continued aortic degeneration accounted for proximal seal zone loss. At a distance 15mm below the lowest renal artery, the mean aortic diameter increased 3.2mm (95% CI, confidence interval; 0.4-6.0, $P<0.5$), and 63% of patients demonstrated an increase of greater than 10%. Mean aortic sac regression was 5.8mm (95% CI; 0.5-11.0, $P<0.05$). Overall, aortic sac regression occurred in 55% of patients, 20% increased up to 10%, and 25% increased more than 10% on last follow-up evaluation.

Conclusions: Proximal neck reinforcement with a Palmaz stent serves as an effective endovascular adjunct in order to treat intraoperative Type I endoleaks, and this maneuver has a very high technical success rate.

Most importantly, it has a profound clinical impact on delayed Type I endoleak formation and stent-graft migration.

#32 - HYBRID REPAIR OF THORACOABDOMINAL AORTIC ANEURYSMS INVOLVING THE VISCERAL VESSELS: COMPARATIVE ANALYSIS BETWEEN NUMBER OF VESSELS RECONSTRUCTED, CONDUIT, AND GENDER

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Introduction: Thoracoabdominal aortic aneruysm repairs are technically challenging. The advent of endovascular aneurysm repair in combination with visceral/renal artery bypasses has allowed for hybrid endovascular repair(HR) of these aneurysms. The purpose of this study was to evaluate whether the number of visceral/renal artery reconstructions, conduit, or gender effected outcomes.

Methods: All patients were captured prospectively in a vascular registry and retrospectively reviewed between 2004 and 2009 that underwent visceral/renal bypass associated with an endovascular aortic aneurysm repair. Patients undergoing standard open TAAA repair and those with aortic arch branch vessel reconstructions associated with thoracic endovascular repair were excluded from analysis. Patients were separated into two groups based on the number of vessels bypassed. Group 1 (n=9) contained patients who required one or two bypasses and Group 2 (n=15) contained patients who required three or four bypasses.

Results: A total of 64 TAAA repairs were performed. Twenty-two patients with hybrid repair and aortic arch vessel reconstructions and 18 patients with open TAAA repair were excluded. A total of 24 (38%) patients with HR were evaluated. Overall mortality was 12.5% (3/24) and the incidence of spinal cord ischemia was 8.3% (2/24). Preoperative comorbidities and ASA scores were similar between groups. Patients in Group 1 were younger [69.7 +/-10.6 versus 76.0 +/-5.7 years old (p=0.074)], had significantly less blood loss [988.9 +/-919.8 ml versus 4583.3 +/- 5488.94 ml, (p=0.043)], required less blood transfusions [4.4+/-1.3 versus 8.6 +/-6.4 units PRBC (p=0.0641)] and had a shorter length of stay [11.4+/-5.6 versus 21.9+/-15.1 days, (p=0.090)]. There was no difference in mortality. The incidence of peri-operative morbidity, including bowel ischemia [11%(1/9) versus 27% (4/15), (p=0.208)], myocardial infarction [11%(1/9) versus 13% (2/15), (p=0.775)], wound infection [0% versus 27%(4/15), (p=0.128)], and pneumonia [11%(1/9) versus 40%(9/15), (p=0.19)] was less in group 1 but not significantly. Patients with three or four bypasses had a significantly greater requirement for a skilled nursing or rehabilitation facility after discharge (79% (11/14) versus 29% (2/7), p=0.04). There were no statistically significant differences in post-operative outcomes when comparing choice of conduit (autogenous or prosthetic) or gender. Cox-proportional hazards regression found that bowel ischemia was the only post-operative complication associated with decreased survival [p=0.037, CI (0.1328-4.3075)].

Conclusions: Hybrid aortic aneurysm repair carries significant risk of patient morbidity with an acceptable mortality for patients considered to be at high risk for standard thoracoabdominal repair. In patients requiring fewer visceral/renal reconstructions there is a trend towards fewer post-operative complications and a significantly shorter length of stay. Furthermore, there is a significantly lower need for skilled nursing requirements after discharge from the hospital. Bowel ischemia is associated with significantly worse outcome and attempts at avoiding this complication and aggressive management is indicated. Type of conduit used and gender do not seem to influence outcome.

#33 - EVALUATING OUTCOMES OF ENDOLEAK DISCREPANCIES BETWEEN CT SCAN AND ULTRASOUND IMAGING AFTER ENDOVASCULAR ABDOMINAL ANEURYSM REPAIR

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Introduction:

Endovascular repair for abdominal aortic aneurysm (EVAR) requires regular surveillance. Current practice, that includes CT scan, has been hindered by need for contrast administration and ionizing radiation exposure. Duplex ultrasound (US) has been used but may be limited in complete evaluation of the endograft and aneurysm. We compared these two imaging modalities for effective treatment after EVAR.

Methods:
We reviewed our prospectively maintained database to capture all EVAR procedures done between October 1999 and June 2009. Patients were routinely evaluated with CT and US imaging within 30 days after the procedure and intermittently at 6-12 month intervals after treatment. US imaging was evaluated with attention towards maximum aneurysm diameter, presence of an endoleak, and compared with findings on simultaneous contrast CT imaging.

Results:
We identified 1062 EVARs in 927 patients who underwent 3120 imaging encounters via the surveillance protocol. Of these 3120 encounters, 610 had both CT scan and US at the same visit. Contrast was not used in 49 CT scans, leaving 561 encounters for comparing contrast CT imaging with US findings. CT and US detection of endoleaks correlated in 442 encounters (78.8%). Discrepancies occurred in 119 encounters (21.2%) as follows: CT scan only endoleak in 17.8% (N=100; Type I=6, Type II=91; Type III=3) and US only endoleak in 3.4% (N=19; Type II=19) encounters. Ninety nine (17.6%) of these 119 encounters, where US failed to detect a CT-identified endoleak, did not require secondary interventions. Eventually 15 patients required intervention after 20 discrepancy encounters (3.6%): 11 patients continued with the surveillance protocol via CT or US imaging, while 4 were followed by CT imaging only. Considering these 11 patients, US eventually detected an endoleak on subsequent visits in 5 patients, US identified an increase in aneurysm diameter in 4 patients, and US never identified the type II endoleaks in 2 patients. When the endoleak raised concern or the aneurysm enlarged, we undertook 19 secondary interventions in these 15 patients: vessel embolization (N=8), iliac extenders (N=5), graft relining (N=3), graft explants (N=2) and proximal cuff (N=1). While 3 ruptures occurred in our entire treatment experience, no ruptures occurred in patients who maintained the prescribed surveillance protocol.

Conclusion:
Surveillance after EVAR is necessary as secondary interventions are sometimes required. While US has lower sensitivity in detecting endoleaks, comparison with CT findings can identify the appropriate patients for US surveillance only. Even considering the discrepancies between CT imaging and US, repeated US surveillance may identify an unstable aneurysm that requires further intervention. Although US has not been established as an exclusive surveillance tool, it can be used to effectively monitor patients after EVAR with reduced need for CT imaging.

#34 - ENDOVASCULAR REPAIR OF RUPTURED THORACIC AORTIC ANEURYSMS: PREDICTORS OF PROCEDURE RELATED STROKE

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OBJECTIVE:
Thoracic endovascular aneurysm repair (TEVAR) is a valuable tool in the treatment of ruptured descending thoracic aneurysm (rDTAA). A major complication of this procedure is stroke. We investigated the incidence and risk factors for stroke following TEVAR for rDTAA.
METHODS:
We retrospectively evaluated the outcomes of all patients that were treated with TEVAR for rDTAA at seven referral institutions between 2002 and 2007. Eighty-seven patients were identified, with a mean age of 69.8 ±12 years and 69.0% were male. Multivariate logistic regressions analysis was used to investigate risk factors for stroke, including demographics, co-morbidities, aneurysm and procedural details.
RESULTS:
The in-hospital mortality was 18.4% (n=16), and 8.0% (n=7) suffered from stroke. Four out of seven patients with stroke (57.1%) expired within 30 days compared with 15.2% (n=12) of the patients without stroke (p=0.006). Increasing age (OR 1.45, p=0.014) was a risk factor for developing stroke, while more recent endovascular procedures were associated with a lower risk of stroke (OR 0.49, p=0.032) in multivariate regression analysis. The aneurysm-related survival at 1 year after TEVAR was 42.9% for patients that suffered from stroke, and 77.2% for patients without stroke (p=0.006).
CONCLUSIONS:
Endovascular repair of rDTAA is associated with a considerable risk of stroke, and stroke is an important

cause of 30-day mortality in this patient group. Particularly older patients are at risk for developing stroke after endovascular repair of rDTAA. The risks of stroke decreased significantly over time in this evaluation.

#35 - PERCUTANEOUS ENDOVASCULAR ANEURYSM REPAIR: FEASIBILITY TRIAL OUTCOMES, AND THE DESIGN OF A PROSPECTIVE, RANDOMIZED TRIAL

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Objectives: Several single-center reports have been published regarding percutaneous endovascular abdominal aortic aneurysm repair (PEVAR). We report a multicenter PEVAR experience and present the design for the first prospective, randomized controlled trial of PEVAR.

Methods: A feasibility evaluation of PEVAR using the IntuiTrak endovascular system (Endologix Inc., Irvine, CA) was prospectively conducted. A grading system was used to evaluate iliac access, ease of main body deployment, inner core removal, and introducer sheath use. The 'preclose' technique for PEVAR was used with either the Prostar XL or Proglide closure devices (both, Abbott Vascular, Redwood City, CA). Clinical utility measures were recorded and compared to original PMA trials.

Results: A total of 124 EVAR procedures were performed during the feasibility evaluation. Of those, 25 cases (20.2%) were attempted percutaneously at nine separate institutions. The Proglide device was used in 7(28%) patients, while the ProStar XL was used in 18 (72%) of patients. Technical success was 100%, all cases were completed percutaneously, with no conversions to open repair. A significant reduction ($P<0.05$) in contrast volume [136±59 vs. 189±84mL] and estimated blood loss [127±221 vs. 341±413mL] was observed compared to the initial PMA trial. No intraoperative endoleak or serious adverse events were observed.

Conclusions: This early experience supports the technical feasibility of PEVAR. These data support the development of the first randomized, controlled trial to evaluate the safety, efficacy, and utility of this approach. The primary and secondary endpoints of an FDA-approved protocol will be presented.

#36 - CAUSES OF LATE MORTALITY AFTER ENDOVASCULAR AND OPEN SURGICAL REPAIR OF INFRARENAL ABDOMINAL AORTIC ANEURYSMS

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Abstract:

Introduction: Several reports suggest unexpectedly high rates of late abdominal aortic aneurysm (AAA) rupture after endovascular AAA repair (EVAR). However, a population-based study examining causes of late death after EVAR versus open surgical repair has not been performed.
Methods: We performed a retrospective cohort study of patients undergoing infrarenal AAA repair based on information from the Medicare inpatient hospital discharge records (MedPAR files), physician claim files (Part B files, 20% sample), and Medicare Denominator Files for the years 2001-2004. Using the Social Security Death Index, we identified all "late" deaths, or deaths occurring after 30 days and after hospital discharge. We then used the National Death Index to identify cause of death information, in particular those deaths likely to have been caused by late rupture. Lastly, we compared causes of late death and survival between EVAR and open repair using Wilcoxon log-rank and rank-sum tests.
Results: Overall, 13,971 patients underwent AAA repair (6,119 EVAR, 7,852 open repair) between 2001 and 2004. After a mean follow up of 1.6 years of follow-up in the endovascular cohort and 1.9 years in the open cohort, we found that mortality rates were similar across repair type (15.4% EVAR, 15.9% open repair, adjusted OR for death after open repair 0.98, 95% CI 0.90-1.07). Overall, 2,194 deaths occurred; 523 occurred prior to discharge or within 30 days, and 1,671 occurred after thirty days and after hospital discharge. Of these 1,671 late deaths, cause of death information was available from the National Death Index for 1,515 (91%). The 15 most common codes for causes of late death are dominated by cardiac disease (atherosclerotic heart disease, acute myocardial infarction) and pulmonary disease (lung cancer, respiratory failure). Causes of late death with specific mention of aneurysm were identified in 37 patients

(2.4% of all deaths), but this event was not more common in EVAR or open repair (15 patients (0.3%) in the EVAR group, 22 patients (0.3%), in the open repair group, p=0.71).
Conclusions: Late deaths from aneurysm rupture after EVAR or open repair appear to be relatively infrequent and similarly distributed across procedure type. Our results emphasize that EVAR is of comparable effectiveness to open AAA repair in preventing aneurysm-related death.