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Selected Abstracts from the July Issue of the Journal of Vascular Surgery☆

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Long-term durability of open repair of juxtarenal abdominal aortic aneurysms

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Objective: As branched/fenestrated endografts expand endovascular options for juxtarenal abdominal aortic aneurysms (JAAAs), long-term durability will be compared to that of open JAAA repair, which has not been documented in large contemporary series. The goal of this study was to assess the late clinical and anatomic outcomes after open JAAA repair.
Methods: From July 2001 to December 2007, 199 patients underwent open elective JAAA repair, as defined by a need for suprarenal clamping. End points included perioperative and late survival, long-term follow-up of renal function, and freedom from graft-related complications. Factors predictive of survival were determined by multivariate analysis. RESULTS: The mean patient age was 74 years, 71% were men, and 20% had baseline renal insufficiency (Cr >1.5). Thirty-seven renal artery bypasses, for anatomic necessity or ostial stenosis, were performed in 36 patients. Overall 30-day mortality was 2.5%. Four patients (2.0%) required early dialysis; one patient recovered by discharge. Two additional patients progressed to dialysis over long-term follow-up. There was one graft infection involving one limb of a bifurcated graft. Surveillance imaging was obtained in 101 patients (72% of survivors) at a mean follow-up of 41 ± 28 months. Renal artery occlusion occurred in four patients (3% of imaged renal arteries; one native/three grafts). Two patients (2.0%) had aneurysmal degeneration of the aorta either proximal or distal to the repaired segment, but there were no anastomotic pseudoaneurysms. Remote aneurysms were found in 29 patients (29% of imaged patients), 14 of whom had descending thoracic aneurysm or TAAA. Four patients underwent subsequent thoracic endovascular aneurysm repair (TEVAR). Actuarial survival was 74 ± 3.3% at 5 years. Negative predictors of survival included increasing age at the time of operation (relative risk [RR], 1.05; $P = .01$), steroid use (RR, 2.20; $P = .001$), and elevated preoperative creatinine (RR, 1.73; $P = .02$).
Conclusions: Open JAAA repair yields excellent long-term anatomic durability and preserves renal function. Perioperative renal insufficiency occurs in 8.5% of patients, but few of them progress to dialysis. Graft-related complications are rare (2% at 40 months); however, axial imaging revealed descending thoracic aneurysms in 14% of imaged patients, making continued surveillance for remote aneurysms prudent. These data provide a benchmark against which fenestrated/branched endovascular aneurysm repair (EVAR) outcomes can be compared.

Thirty-day outcome and quality of life after endovascular abdominal aortic aneurysm repair in octogenarians based on the Endurant Stent Graft Natural Selection Global Postmarket Registry (ENGAGE)

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Objectives: To determine 30-day outcome and quality of life after elective endovascular abdominal aortic aneurysm repair in octogenarians.
Methods: From March 2009 to May 2011, 1200 patients with abdominal aortic aneurysms were treated with endovascular aneurysm repair (EVAR) using the Endurant stent graft were included in the Endurant Stent Graft Natural Selection Global Postmarket Registry (ENGAGE) registry. Among these, 926 (77%) were aged <80 years, and 274 (23%) were aged ≥80 years. Quality of life was assessed using composite EuroQoL 5-Dimensions Questionnaire index scores. RESULTS: Gender was unequally distributed, with more female patients among the octogenarians ($P = .043$). Octogenarians had a significantly higher American Society of Anesthesiologists classification ($P < .001$) and differed significantly in baseline risk factors. The younger cohort was more likely to smoke ($P < .001$) and be alcoholics ($P = .005$). Octogenarians had larger aortic aneurysm ($P = .010$) and left iliac artery diameters ($P = .017$) and greater infrarenal neck angulation ($P = .01$). The technical success rate was >99% for both cohorts. Octogenarians were more often operated on under general anesthesia ($P = .028$), had a longer procedure duration ($P = .001$), and an increased length of hospitalization; both total ($P < .001$) and postprocedure ($P < .001$). All-cause mortality and major adverse event rates were similar in the two groups ($P = .835$ and $P = .186$, respectively). There was no difference in the number of secondary endovascular procedures or aneurysm rupture at 30 days. At discharge, both groups had reduced health status dimensions, except anxiety/depression, when compared with baseline. At 30 days, the octogenarian group had a lower composite EuroQoL 5-Dimensions Questionnaire index compared with the younger group indicating a slower recovery (0.83 ± 0.20 vs 0.87 ± 0.16; $P = .003$).
Conclusions: Octogenarians can be safely treated using the Endurant stent graft with a high technical rate of success, low perioperative mortality, and no reduction in quality of life. Octogenarians did, however, appear to recover more slowly than younger patients with respect to certain quality of life components. Long-term data are needed to confirm these results.

The influence of neck thrombus on clinical outcome and aneurysm morphology after endovascular aneurysm repair

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Objective: This study investigated the influence of significant aneurysm neck thrombus in clinical and morphologic outcomes after endovascular aneurysm repair (EVAR).

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Methods: The patient population was derived from a prospective EVAR database from two university institutions in The Netherlands from 2004 to 2008. Patients with significant thrombus in the neck (>2 mm in thickness in at least >25% of circumference) were identified as the thrombus group and were compared with the remaining patients without neck thrombus (no-thrombus group), treated within the same period. The primary end point was clinical success. Secondary end points included technical success and rates of decline in renal function. Detailed morphologic analysis of the aortic neck was serially performed for the thrombus group patients to assess changes in thrombus volume.
Results: The study included 389 patients: 43 (39 men; mean age of 72.3 years) met the criteria for the thrombus group; of these, 31 (72%) had significant thrombus in >50% of the aortic neck circumference, and 8 (19%) had circumferential thrombus >2-mm thick. Median follow-up was 3.34 years (interquartile range, 2.67-4.72). The estimated 5-year clinical success rate was 74% for the thrombus group and 62% for the no-thrombus group ($P = .23$). Endograft migration was more frequent in the thrombus group ($P = .02$). Multivariable Cox regression analysis showed a significant association between migration and use of a device without active fixation (hazard ratio, 4.9; 95% confidence interval, 1.31-18.23, $P = .018$) but not with the presence of neck thrombus ($P = .063$). No differences were found in the rates of decline in estimated glomerular filtration rate (eGFR) at 30 days and during follow-up between the thrombus and no-thrombus groups. The thrombus volume in the first 10 mm of aortic neck was progressively reduced over time until it was not measurable in most patients, resulting in complete circular attachment of the endograft to the vessel wall.
Conclusions: Our findings suggest that the presence of aneurysm neck thrombus has no significant influence on short-term and midterm EVAR results.

Prediction of asymptomatic abdominal aortic aneurysm expansion by means of rate of variation of C-reactive protein plasma levels

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Objective: C-reactive protein (CRP) is an independent risk factor for arteriosclerosis, but its role in abdominal aortic aneurysm (AAA) expansion remains not completely verified. There are no data about the prognostic significance of rates of variation of the CRP levels in asymptomatic AAAs. This study investigated the association between plasma CRP levels and AAA diameter and assessed the relationship between the gradient of CRP levels and rates of expansion in asymptomatic AAAs.
Methods: Plasma levels of high-sensitive CRP (hs-CRP) were measured using a high-sensitivity technique and AAA size was determined by computed tomography in 435 patients with asymptomatic AAAs followed up in our outpatient department.
Results: The median hs-CRP level was 4.23 mg/L. The aorta diameter increased in the four groups of patients determined according to hs-CRP quartiles (35 û ô 2, 40 û ô 3, 49 û ô 4, and 58 û ô 5 mm; $P = .01$). The median rate of CRP level variation per year was 1.4 mg/L. Patients with an elevation >1.4 mg/L had an expansion rate of 4.8 mm vs 3.9 mm in those <1.4 mg/L ($P < .01$). The multivariate age-adjusted logistic model confirmed initial diameter and variation of CRP level were the only factors associated with expansion, with odds ratios (95% confidence intervals) of 6.3 (3.1-7.5) and 3.4 (2.1-5.6).
Conclusions: These results confirm a statistical association between AAA diameter and hs-CRP plasma levels. This cohort study corroborates this potential causal association and contributes information about the value of the hs-CRP plasma level gradient as a marker of disease progression and rate of expansion.

Comparing the embolic potential of open and closed cell stents during carotid angioplasty and stenting

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Objective: We sought to determine the effects of open (O) and closed (C) cell stents on the size and number of embolic particles generated during carotid artery stenting (CAS) and assess the impact on outcome.
Methods: Embolic debris from carotid filters after CAS was analyzed using photomicroscopy and imaging software. Patient comorbidities, preoperative cerebrovascular symptoms, stent type, and outcomes (perioperative major adverse events [MAEs]) were examined.
Results: Carotid filters from 173 consecutive CAS procedures (O, 125 and C, 48) were reviewed. The mean age was 70.9 ±9.2 years; 58% were men. Mean stenosis was 88.2%±8.1%; 36.6% had neurological symptoms preprocedurally. There was no difference in preoperative symptoms between the two groups (O, 38.7% vs C, 31.3%; P = not significant [NS]). However, closed cell stent use was associated with higher degree of stenosis (O, 87.2% ± 8.0% vs C, 90.6% ± 7.8%; P =.01), an older age (O, 70.0 ± 8.6 years vs C, 73.4 ± 10.2 years; $P = .03$), and peripheral arterial disease (PAD; 21.1% vs 43.5%; $P = .01$). A larger mean particle size was observed in patients treated with open cell stents compared to closed cell stents (O, 416.5 ± 335.7 μm vs C, 301.1 ± 251.3 μm; $P = .03$). There was no significant difference in the total number of particles (O, 13.8 ± 21.5 vs C, 17.6 ± 19.9; P = NS), periprocedural stroke (P = NS), and MAEs between the two groups (P = NS).
Conclusions: Open cell stents are associated with a larger mean particle size compared to closed cell stents. No impact on procedural outcomes based on stent type was observed.

Failed superficial femoral artery intervention for advanced infrainguinal occlusive disease has a significant negative impact on limb salvage

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Objective: Endovascular treatment of superficial femoral artery (SFA) lesions is a well-established practice. The repercussions of failed SFA interventions are unclear. Our goal was to review the efficacy of SFA stenting and define negative effects of its failure.
Methods: A retrospective chart review was conducted from January 2007 to January 2010 that identified 42 limbs in 39 patients that underwent SFA stenting. Follow-up ankle-brachial index and a duplex ultrasound scan was performed at routine intervals.
Results: Mean patient age was 68 years (range, 43-88 years), there were 22 men (56%) and 17 women (44%). Intervention indication was claudication in 15 patients (36%), rest pain in seven patients (17%), and tissue loss in 19 patients (45%). There were 15 patients (36%) with TransAtlantic Inter-Society Consensus (TASC) A, nine patients (21%) with TASC B, five patients (12%) with TASC C, and 13 patients (31%) with TASC D lesions. The majority of lesions intervened on were the first attempt at revascularization. Three stents (7.7%) occluded within 30 days. One-year primary, primary-assisted, and secondary patency rates were 24%, 44%, and 51%, respectively. Limb salvage was 93% during follow-up. Seventeen interventions failed (40%) at 1 year. Of these, seven patients (41%) developed claudication, seven patients (41%) developed ischemic rest pain, and three patients (18%) were asymptomatic. During follow-up, three patients (7.7%) required bypass and three patients (7.7%) major amputation, one after failed bypass. All limbs requiring bypass or amputation had TASC C/D lesions. Thirty-day and 1-year mortality was 2.6% and 10.3%, respectively.
Conclusion: Interventions performed for TASC C/D lesions are more likely to fail and more likely to lead to bypass or amputation. Interventions performed for TASC C/D lesions that fail have a negative impact on limb salvage. This should be considered when performing stenting of advanced SFA lesions.

A prospective randomized study comparing fibrin sealant to manual compression for the treatment of anastomotic suture-hole bleeding in expanded polytetrafluoroethylene grafts

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Objective: The ideal hemostatic agent for treatment of suture-line bleeding at vascular anastomoses has not yet been established. This study evaluated

whether the use of a fibrin sealant containing 500 IU/mL thrombin and synthetic aprotinin (FS; marketed in the United States under the name TISSEEL) is beneficial for treatment of challenging suture-line bleeding at vascular anastomoses of expanded polytetrafluoroethylene (ePTFE) grafts, including those further complicated by concomitant antiplatelet therapies.

Methods: Over a 1-year period ending in 2010, ePTFE graft prostheses, including arterio-arterial bypasses and arteriovenous shunts were placed in 140 patients who experienced suture-line bleeding that required treatment after completion of anastomotic suturing. Across 24 US study sites, 70 patients were randomized and treated with FS and 70 with manual compression (control). The primary endpoint was the proportion of patients who achieved hemostasis at the study suture line at 4 minutes after start of application of FS or positioning of surgical gauze pads onto the study suture line.

Results: There was a statistically significant difference in the comparison of hemostasis rates at the study suture line at 4 minutes between FS (62.9%) and control (31.4%) patients ($P < .0001$), which was the primary endpoint. Similarly, hemostasis rates in the subgroup of patients on antiplatelet therapies were 64.7% (FS group) and 28.2% (control group). When analyzed by bleeding severity, the hemostatic advantage of FS over control at 4 minutes was similar (27.8% absolute improvement for moderate bleeding vs 32.8% for severe bleeding). Logistic regression analysis (accounting for gender, age, intervention type, bleeding severity, blood pressure, heparin coating of ePTFE graft, and antiplatelet therapies) found a statistically significant treatment effect in the odds ratio (OR) of meeting the primary endpoint between treatment groups (OR, 6.73; $P < .0001$), as well as statistically significant effects for intervention type (OR, 0.25; $P = .0055$) and bleeding severity (OR, 2.59; $P = .0209$). The safety profile of FS was excellent as indicated by the lack of any related serious adverse events.

Conclusions: The findings from this phase 3 study confirmed that FS is safe and its efficacy is superior to manual compression for hemostasis in patients with peripheral vascular ePTFE grafts. The data also suggest that FS promotes hemostasis independently of the patient's own coagulation system, as shown in a representative population of patients with vascular disease under single- or dual-antiplatelet therapies.

Long-term result of endovascular treatment for patients with nutcracker syndrome

Xiaobai Wang, Yan Zhang, Chengzhi Li, Hong Zhang

Objective: To retrospectively assess the therapeutic value of endovascular stenting for treatment of the nutcracker syndrome (NCS) in long-term follow-up and to explore the selection of the size of stents in Chinese patients with NCS.

Methods: From January 2004 to August 2010, 30 patients (two women and 28 men) between 13 and 32 years old (mean, 18.2) who were diagnosed with NCS were admitted for endovascular treatment. Each patient received one self-expanding metallic stent (14-mm diameter, 60 mm long) in the compressed portion of the left renal vein during the operation, and three patients with severe left-sided varicoceles received left gonadal vein embolization. The postoperative follow-up was 12 to 80 months (median, 36.0 months).

Results: The diameters at the ostium of left renal vein measured by the ultrasonic examination before treatment were 11.8 ± 1.8 mm. Technical success of operation was achieved in all patients. No perioperative complications occurred. Two cases of stent migration were found at 12 months: both stents prolapsed into the inferior vena cava, with uneventful follow-up (49 and 56 months, respectively). At 1-month follow-up, patients improved, including two patients who had persistent but less microscopic hematuria than before treatment. The clinical symptoms related to NCS almost disappeared at 3 months after the treatment. All stents were patent at the duplex scan examination, without restenosis, and no secondary recurrence of the symptoms occurred at the end of the follow-up.

Conclusions: Endovascular treatment is a safe, effective, and very minimally invasive technique that provides good long-term patency rates for patients with NCS, and under the premise morphologic measurements, 14-mm-diameter, 60-mm-long self-expanding stents should be first considered for Chinese patients with NCS.