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Editors: Anton N. Sidawy and Bruce A. Perler

Comparison of fenestrated endografts and the snorkel/chimney technique

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Objective: Recent approval by the Food and Drug Administration of custom fenestrated endografts has increased endovascular options for patients with short-neck or juxtarenal abdominal aortic aneurysms (AAAs). We sought to compare the early learning curve at a single institution of fenestrated repair vs the snorkel technique.

Methods: From 2009 to 2013, we performed 57 consecutive snorkel procedures for juxtarenal AAAs in an Institutional Review Board-approved prospective cohort, and since the summer of 2012, we gained access to the Food and Drug Administration-approved custom fenestrated device. Patient demographics, imaging, and operative techniques were compared between the first 15 cases for each of the snorkel (sn-EVAR) and fenestrated (f-EVAR) endovascular aneurysm repair (EVAR) techniques.

Results: Patient demographics and AAA morphology on preoperative imaging were similar between the groups. Operative time tended to be similar in the 3- to 4-hour range, with more fluoroscopy time and less contrast material used in f-EVAR than in sn-EVAR ($P < .05$) because of differing strategies of renal premarking. Larger delivery systems for f-EVAR required a higher rate of iliac conduits (40% vs 0%). Perioperative complications, short-term renal patency rates, and evidence of acute kidney injury were similar.

Conclusions: The early experience of f-EVAR was similar to that of sn-EVAR in terms of patient demographics, case selection, and procedural characteristics. A significant portion of the learning curve for both procedures, particularly for f-EVAR, lies in the preoperative planning of fenestrations and the cannulation of branch vessels. Similar short-term postoperative outcomes between these two particular techniques indicate that both will have utility in the treatment of high-risk patients with complex anatomy.

Results of the ANCHOR prospective, multicenter registry of EndoAnchors for type Ia endoleaks and endograft migration in patients with challenging anatomy

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Objective: Proximal attachment site complications continue to occur after endovascular repair of abdominal aortic aneurysms (EVAR), specifically type Ia endoleak and endograft migration. EndoAnchors (Aptus Endosystems, Sunnyvale, Calif) were designed to enhance endograft proximal fixation and sealing, and the current study was undertaken to evaluate the potential benefit of this treatment.

Methods: During the 23-month period ending in December 2013, 319 subjects were enrolled at 43 sites in the United States and Europe. EndoAnchors were implanted in 242 patients (75.9%) at the time of an initial EVAR procedure (primary arm) and in 77 patients with an existing endograft and proximal aortic neck complications (revision arm). Technical success was defined as deployment of the desired number of EndoAnchors, adequate penetration of the vessel wall, and absence of EndoAnchor fracture. Procedural success was defined as technical success without a type Ia endoleak at completion angiography. Values are expressed as mean ± standard deviation and interquartile range.

Results: The 238 male (74.6%) and 81 female (25.4%) subjects had a mean age of 74.1 ± 8.2 years. Aneurysms averaged 58 ± 13 (51-63) mm in diameter at the time of EndoAnchor implantation (core laboratory measurements). The proximal aortic neck averaged 16 ± 13 (7-23) mm in length (42.7% <10 mm and 42.7% conical) and 27 ± 4 mm (25-30 mm) in diameter; infrarenal neck angulation was 24 ± 15 (13-34) degrees. The number of EndoAnchors deployed was 5.8 ± 2.1 (4-7). Technical success was achieved in 303 patients (95.0%) and procedural success in 279 patients (87.5%), 217 of 240 (89.7%) and 62 of 77 (80.5%) in the primary and revision arms, respectively. There were 29 residual type Ia endoleaks (9.1%) at the end of the procedure. During mean follow-up of 9.3 ± 4.7 months, 301 patients (94.4%) were free from secondary procedures. Among the 18 secondary procedures, eight were performed for residual type Ia endoleaks and the others were unrelated to EndoAnchors. There were no open surgical conversions, there were no aneurysm-related deaths, and no aneurysm ruptured during follow-up.

Conclusions: Use of EndoAnchors to treat existing and acute type Ia endoleaks and endograft migration was successful in most cases. Prophylactic use of EndoAnchors in patients with hostile aortic neck anatomy appears promising, but definitive conclusions must await longer term follow-up data.

Outcomes after abdominal aortic aneurysm repair requiring a suprarenal cross-clamp

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Objective: The objective of this study was to analyze the early and late outcomes of patients who require a

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suprarenal aortic cross-clamp during elective open repair of an abdominal aortic aneurysm (AAA).

Methods: Patients from 1998 to 2012 who required a suprarenal aortic cross-clamp during elective open AAA repair were reviewed. Data abstracted included demographics and comorbidities; preoperative, perioperative, and late renal function; late interventions related to AAA repair; and late mortality. A decrease in renal function was defined as a >30% decline in estimated glomerular filtration rate (eGFR) compared with the preoperative value. Primary outcomes included renal function, intervention-free survival, and overall survival.

Results: During the study period, 211 patients underwent open elective or urgent AAA repair; 69 required a suprarenal cross-clamp. The mean age was 71 years, and 80% were men. The mean preoperative creatinine concentration was 1.2 mg/dL, and the mean preoperative eGFR was 66 mL/min/1.73 m^2. Location of the aortic cross-clamp was suprarenal (37), supramesenteric (21), and supraceliac (11). Perioperatively, 21 patients (30%) experienced a significant decrease in eGFR; four patients required hemodialysis. Six patients had full recovery of renal function by discharge. Perioperative morbidity and mortality were 35% and 4%, respectively. At a mean follow-up of 3 years, seven patients had an eGFR significantly less than the preoperative value. Late interventions related to the AAA repair were required in eight patients. Indications included wound complication (3), anastomotic aneurysm (2), incisional hernia (1), anastomotic graft stenosis (1), and proximal aortic dilation (1). Overall 5-year intervention-free survival was 62% and overall survival 77%. Intervention-free survival was enhanced by antiplatelet use (P = .04), whereas overall survival was decreased by chronic obstructive pulmonary disease (P = .003) and perioperative pneumonia (P = .001).

Conclusions: More than a quarter of patients requiring a suprarenal cross-clamp during open AAA repair experience renal dysfunction. Late graft-related complications are few, with preoperative and perioperative pulmonary function negatively affecting overall patient survival.

Percutaneous thoracic endovascular aortic repair is not contraindicated in obese patients

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Objective: There are limited data describing the preclose technique with the Perclose ProGlide device (Abbott Vascular, Redwood City, Calif) in percutaneous thoracic endovascular aortic repair (P-TEVAR), particularly in obese patients, in whom use of this technique is thought to be relatively contraindicated. The purpose of this analysis was to describe our experience with P-TEVAR and to compare outcomes in patients with or without obesity.

Methods: All TEVAR procedures at a single institution from 2005 to 2011 were reviewed, and P-TEVAR patients were stratified by body mass index (obesity $>$ 30 kg/m^2). Preoperative computed tomography scans were analyzed for access vessel depth, calcification, and morphology. Technical success was defined as the ability to achieve hemostasis and to maintain limb perfusion without the need for common femoral artery exposure or obligate surgical repair of the vessel within a 30-day postoperative period. Generalized estimating equations and stepwise logistic regression were used to develop prediction models of preclose failure.

Results: The review identified 536 patients, in whom 355 (66%) P-TEVAR procedures were completed (366 arteries; n = 40 [11%] bilateral). Compared with nonobese patients (n = 264), obese patients (n = 91) were typically younger (59 $\pm$ 16 years vs 66 $\pm$ 16 years; P = .0004) and more likely to have renal insufficiency (28% vs 17%; P = .05) or diabetes mellitus (19% vs 9%; P = .02). The number of Perclose deployments was similar between groups (P = NS). Mean sheath size (25.4F vs 25.0F; P = .04), access vessel inner diameters (8.5 $\pm$ 1.9 mm vs 7. 9 $\pm$ 2.0 mm; P = .02), and vessel depth (5 0 $\pm$ 20 mm vs 30 $\pm$ 13 mm; $P < .0001$) were greater in obese patients. Adjunctive iliac stents were used in 7% of cases (10 [11%] in obese patients vs 16 [6%] in nonobese patients; P = .2). Overall technical success was 92% (92% for nonobese patients vs 93% for obese patients; P = .7). Three patients required subsequent operations for access complications, two obese patients (2%) and one nonobese patient (0.4%) (P = .3). Independent predictors of failure were adjunctive iliac stent (odds ratio [OR], 9.5; 95% confidence interval [CI], 3.3-27.8; $P < .0001$), more than two Perclose devices (OR, 7.0; 95% CI, 2.3-21; P = .0005), and smaller access vessel diameter to sheath size ratio (OR multiplies by 1.1 for each .01 decrease in ratio; 95% CI, 1.02-1.2; P = .007) (area under the receiver operating characteristic curve = .75).

Conclusions: Obesity is not a contraindication to P-TEVAR. P-TEVAR can be performed safely, despite the need for larger diameter sheaths. However, patients predicted to need adjunctive stenting or possessing smaller access vessel diameter to sheath size ratios are at highest risk of preclose failure with the Perclose ProGlide device, and selective use of this technique is recommended.

Predicted shortfall in open aneurysm experience for vascular surgery trainees

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Objective: Since the introduction of endovascular aneurysm repair (EVAR), the volume of open aneurysm repair (OAR) has steadily declined since 2000. The introduction of next-generation devices and branched and fenestrated endograft technology continues to increase the anatomic applicability of EVAR, further decreasing the need for OAR. This study models the decline in OAR and uses historical trends to forecast future decline in volume and its potential effect on vascular surgery training.

Methods: An S-curve modified logistic function was used to model the effect of introducing a new technology (EVAR) on the standard management of abdominal aortic aneurysm