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Impact of proximal seal zone length and intramural hematoma on clinical outcomes and aortic remodeling after thoracic endovascular aortic repair for aortic dissections

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Objective: Thoracic endovascular aortic repair (TEVAR) has become standard treatment of complicated type B aortic dissections (TBADs). Whereas adequate proximal seal is a fundamental requisite for TEVAR, what constitutes "adequate" in dissections and its impact on outcomes remain unclear. The goal of this study was to describe the proximal seal zone achieved with associated clinical outcomes and aortic remodeling.

Methods: A retrospective review was performed of TEVARs for TBAD at a single institution from 2006 to 2016. Three-dimensional centerline analysis of preoperative computed tomography was used to identify the primary entry tear, dissection extent, distances between arch branches, and intramural hematoma (IMH) involvement of the proximal seal zone. Patients were categorized into group A, those with proximal extent of seal zone in IMH/dissection-free aorta, and group B, those with landing zone entirely within IMH. Clinical outcomes including retrograde type A dissection (RTAD), death, and aortic reinterventions were recorded. Postoperative computed tomography scans were analyzed for remodeling of the true and false lumen volumes of the thoracic aorta.

Results: Seventy-one patients who underwent TEVAR for TBAD were reviewed. Indications for TEVAR included malperfusion, aneurysm, persistent pain, rupture, uncontrolled hypertension, and other. Mean follow-up was 14 months. In 26 (37%) patients, the proximal extent of the seal zone was without IMH, whereas 45 (63%) patients had proximal seal zone entirely in IMH. Proximal seal zone of 2-cm IMH-free aorta was achieved in only six (8.5%) patients. Review of arch anatomy revealed that to create a 2-cm landing zone of IMH-free aorta, 31 (43.7%) patients would have required coverage of all three arch branch vessels. Postoperatively, two patients developed image-proven RTADs requiring open repair, and one patient had sudden death. All three of these patients had TEVAR with the proximal seal zone entirely in IMH. No RTADs occurred in patients whose proximal seal zone involved healthy aortic segment. At 24 months, overall survival was 93% and freedom from aorta-related mortality was 97.4%. Complete thoracic false lumen thrombosis was seen in 46% of patients. Aortic remodeling, such as true lumen expansion, false lumen regression, and false lumen thrombosis, was similar in both groups of patients.

Conclusions: Whereas achieving 2 cm of IMH-free proximal seal zone during TEVAR for TBAD would often require extensive arch branch coverage, failure to achieve any IMH-free proximal seal zone may be associated with higher incidence of RTAD. The length and quality of the proximal seal zone did not affect the subsequent aortic remodeling after TEVAR.

Gender-related outcomes after open repair of descending thoracic and thoracoabdominal aortic aneurysms

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Objective: Female sex has been associated with greater morbidity and mortality for a variety of major cardiovascular procedures. We sought to determine the influence of female sex on early and late outcomes after open descending thoracic aortic aneurysm (DTA) and thoracoabdominal aortic aneurysm (TAAA) repair.

Methods: We searched our aortic surgery database to identify patients having open DTA or TAAA repair. Logistic regression and Cox regression analyses were used to assess the effect of sex on perioperative and long-term outcomes.

Results: From 1997 until 2017, there were 783 patients who underwent DTA or TAAA repair. There were 462 male patients and 321 female patients. Female patients were significantly older (67.6 $\pm$ 13.9 years vs 62.6 $\pm$ 14.7 years; $P < .001$), had more chronic pulmonary disease (47.0% vs 35.7%; $P = .001$) and forced expiratory volume in 1 second $<$50% (28.3% vs 18.2%; $P < .001$), and were more likely to have degenerative aneurysms (61.7% vs 41.6%; $P < .001$). Operative mortality was not different between women and men (5.6% vs 6.2%; $P = .536$). However, women were more likely to require a tracheostomy after surgery (10.6% vs 5.0%; $P = .003$) despite a reduced incidence of left recurrent nerve palsy (3.4% vs 7.8%; $P = .012$). Logistic regression found female sex to be an independent risk factor for a composite of major adverse events (odds ratio, 2.68; confidence interval, 1.41-5.11) and need for tracheostomy (odds ratio, 3.73; confidence interval, 1.53-9.10). Women also had significantly lower 5-year survival.

Conclusions: Women undergoing open DTA or TAAA repair are not at greater risk for operative mortality than their

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male counterparts are. Reduced preoperative pulmonary function may contribute to an increased risk for respiratory failure in the perioperative period.

Coexisting hypogastric aneurysms worsen the outcomes of endovascular treatment by the iliac branch devices within the pELVIS Registry

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Objective: Hypogastric aneurysms (HAs) frequently coexist with aortoiliac aneurysms (AIAs). However, the presence of an HA is a contraindication to endovascular aneurysm treatment by iliac branch devices (IBDs) because of the risk of distal sealing-related endoleaks. No robust evidence exists in the published literature, and therefore we sought to evaluate the performance of IBDs in the presence of HAs within a multicenter registry of nine vascular centers.

Methods: Clinical and radiographic information of 804 patients with AIAs treated by IBDs was retrospectively reviewed and analyzed using prearranged, defined, and documented protocols. The treatment period was between January 2005 and April 2017.

Results: HA was present in 315 (32.6%) of the overall 910 deployed IBDs. Mean radiologic follow-up was 32 months. The incidence of incomplete aneurysm exclusion and type I endoleak was 3% in the HA group vs 0.7% in the non-HA group (P = .019). The 5-year freedom from IBD-related type I endoleak was 93% vs 98% in the HA group vs the non-HA group, respectively (P = .006). Subgroup analysis of the HA group revealed that use of a single distal bridging stent graft vs multiple bridging devices led to higher rate of type I endoleak (9.6% vs 2.8%; P = .031), branch occlusions (8.3% vs 0.9%; P = .009), and buttock claudication (7.6% vs 1.9%; P = .038).

Conclusions: This series of AIAs with HAs is the largest reported. It shows that HAs coexisting with AIAs, when treated with IBDs, have significantly worse outcomes. Lengthening the distal landing zone with more than one bridging stent graft into the distal healthy hypogastric artery or one of its main branches improves outcomes.

Addition of proximal intervention to carotid endarterectomy increases risk of stroke and death

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Objective: Adding ipsilateral, proximal endovascular (IPE) intervention to carotid endarterectomy (CEA) for the treatment of tandem bifurcation and supra-aortic trunk disease is controversial. Some suggest that this combined strategy (CEA + IPE) confers no risk over isolated CEA (ICEA). Others disagree, reserving CEA + IPE for symptomatic patients. Using the Vascular Quality Initiative (VQI), this study assessed the effect of adding IPE to CEA on stroke and death risk. We further weighed CEA + IPE outcomes in the context of symptomatic status and Society for Vascular Surgery guidelines.

Methods: All CEAs in the VQI database from 2003 to 2017 were reviewed. Urgent and redo CEAs were excluded. CEA + IPE procedures were identified. To isolate the effect of IPE, patients undergoing other concurrent procedures were removed, providing an ICEA cohort. Primary end points were perioperative (30-day) stroke and death. Univariate and logistic regression analyses were performed.

Results: After exclusion and identification of CEA + IPE, 66,519 procedures were available for analysis. Of these, 66,115 represented ICEA and 404 represented CEA + IPE. Most patients (60%) were male, 93% were white, and 41% were symptomatic. Average age was 70 $\pm$ 9 years. Those undergoing CEA + IPE were more likely to be female (50% vs 40%; $P < .001$) and smokers (87% vs 76%; $P < .001$), and they were more likely to have coronary artery disease (32% vs 27%; P = .04), congestive heart failure (14% vs 10%; P = .01), and chronic obstructive pulmonary disease (30% vs 22%; $P < .001$). ICEA patients were more likely to have severe ipsilateral stenosis (86% vs 80%; P = .002) and to undergo intraoperative shunting (53% vs 49%; P = .05). There was no difference in 30-day mortality between cohorts (1% vs 1%; P = .23). However, CEA + IPE had higher rates of perioperative stroke (3.0% vs 1.4%; P = .01) and combined 30-day stroke and death (3.5% vs 1.8%; P = .02). When patients were stratified by symptomatic status, there were no differences in primary end points between cohorts in asymptomatic patients. In symptomatic patients, CEA + IPE carried significantly higher stroke (4.9% vs 1.9%; P = .002) and stroke and death risk (6.0% vs 2.4%; P = .002). After risk adjustment, predictors of stroke and death were diabetes (odds ratio [OR], 1.2; P = .001), symptomatic status (OR, 1.7; $P < .001$), and CEA + IPE (OR, 1.9; P = .02).

Conclusions: The addition of IPE to CEA confers increased stroke and death risk over ICEA. Risk is largely in symptomatic patients. Although CEA + IPE increases risk compared with ICEA, overall risk remains low. Based on this VQI analysis, CEA + IPE outcomes for asymptomatic patients fall within Society for Vascular Surgery guidelines for ICEA. Those for symptomatic patients do not, and consideration should be given to other surgical bypass, cerebral protection, and staged strategies.

Burnout, depression, perceived stress, and self-efficacy in vascular surgery trainees

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Objective: Burnout is a work-related syndrome involving emotional exhaustion, depersonalization, and a sense of reduced personal accomplishment that has become prevalent in all levels of medical training. We sought to

understand factors associated with burnout identified in vascular surgery trainees.

Methods: An anonymous electronic survey consisting of demographic and programmatic information as well as validated scales for burnout, depression, perceived stress, self-efficacy, and social support was given to all vascular surgery trainees in the United States. Univariate and multivariate analyses were used to compare responses. Residents were grouped into quartiles based on burnout level, and predictors of burnout were determined.

Results: Of the 514 invitations sent, 177 (34%) respondents completed the survey. Trainees in the highest quartile of burnout were more likely to have moderate to severe depression (40% vs 4%; $P < .01$), higher perceived stress score (odds ratio [OR], 1.3; $P < .01$), lower social support (OR, 0.89; $P < .01$), and lower self-efficacy (OR, 0.76; $P < .01$), and they were less likely to reconsider vascular surgery as a career if given the chance to do it over ($\chi^2 = 20$; $P < .01$). Trainees without a self-identified mentor were significantly more likely to report burnout ($\chi^2 = 15$; $P < .01$). In addition, trainees who reported more frequent 80-hour work infractions each month (3.6 vs 2.3; $P < .01$) and those without access to programmatic social events ($\chi^2 = 11$; $P < .01$) had higher levels of burnout. In contrast, trainees with the lowest quartile of burnout scores reported lower depression (OR, 0.43; $P < .01$), lower stress (OR, 0.63; $P < .01$), more social support (OR, 0.1.2; $P < .01$), higher self-efficacy (OR, 1.2; $P < .01$), and fewer work week violations each month (2.3 vs 2.9; $P = .04$). Lower burnout scores were associated with program mentorship ($\chi^2 = 7.3$; $P < .01$), program-sponsored social events ($\chi^2 = 8.7$; $P < .01$), and being more likely to choose vascular surgery again if given the chance ($\chi^2 = 6.3$; $P < .01$). Highest burnout scores did not correlate with sex ($\chi^2 < .01$; $P = 1$), age (32 years vs 32 years; $P = .65$), marital status ($\chi^2 < .01$; $P = 1$), proximity to family (OR, 1.2; $P = .26$), alcohol consumption ($\chi^2 = 0.23$; $P = .63$), postgraduate year (OR, 1.1; $P = .47$), number of prior program graduates (OR, 0.95; $P = .73$), use of physician extenders in the program (OR, 0.93; $P = .74$), or total debt (OR, 1.0; $P = .63$). Similarly, there were no significant associations with these variables among trainees with the lowest quartile of burnout scores. On multivariate analysis, higher depression (OR, 1.6; $P < .01$) and higher perceived stress (OR, 1.2; $P < .01$) were associated with higher burnout scores, and lower burnout scores were associated with lower perceived stress (OR, 0.67; $P < .01$).

Conclusions: Burnout in vascular surgery trainees is associated with higher levels of depression and perceived stress and lower levels of social support and self-efficacy. The addition of programmatic social events, limiting 80-hour work week violations, and addition of formal mentoring programs may decrease levels of burnout.

A systematic review and meta-analysis of the comparison of performance among step-tip, split-tip, and symmetrical-tip hemodialysis catheters

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Objective: Patients with end-stage renal disease need vascular access to ensure sufficient blood flow during hemodialysis (HD). Patients who are poor candidates for arteriovenous access creation require long-term catheter placement. Problems such as dialysate recirculation, thrombosis, catheter-related infections, and malfunction can occur with HD catheters. Different tip designs (step, split, and symmetrical) have been developed to ameliorate the catheter-related problems. The aim of the study was to compare the efficacy and safety of split-tip, step-tip, and symmetrical-tip HD catheters.

Methods: The PubMed, Embase, Cochrane Library, and Scopus databases and the ClinicalTrials.gov registry were searched for studies published before November 2017. Studies comparing the clinical and rheologic outcomes of step-, split-, or symmetrical-tip catheters in patients undergoing HD were included in this meta-analysis. We conducted meta-analyses using random-effects models. The primary outcomes were catheter survival time and incidence of functioning catheters. The secondary outcomes were delivered blood flow rate, blood recirculation rate, and incidence of catheter-related complications.

Results: Seven randomized controlled trials and one retrospective study with a total of 988 patients were included. No significant differences were observed in the delivered blood flow rate (weighted mean difference, −5.37 mL/min; 95% confidence interval [CI], −23.75 to 13.02), incidence of catheter-related infections (risk ratio [RR], 1.18; 95% CI, 0.63-2.22), or incidence of catheter-related thrombosis (RR, 1.29; 95% CI, 0.64-2.59) between step-tip catheters and advanced (both split-tip and symmetrical-tip) catheters. Moreover, a meta-analysis of the incidence of functioning catheters at 1 month, 6 months, and 12 months revealed that the outcome of step-tip catheter use was better than that of split-tip catheter use, but with a significant difference only at 6 months (RR, 1.22; 95% CI, 1.02-1.46).

Conclusions: None of the catheter types exhibited unique features that can enhance their suitability for application. Hence, catheters can be selected by also considering different factors, including costs, ease of procedures, expertise of the clinician, and education and preference of the patient.