Abstracts from the Thirty-Ninth Annual Meeting of the Southern Association for Vascular Surgery

Volumetric Analysis of the Initial Index Computed Tomography (CT) Scan Can Predict the Natural History of Acute Uncomplicated Type B Dissections

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Introduction: Our objective was to characterize the predictive impact of computed tomography scan volumetric analysis on the natural history of acute uncomplicated type B aortic dissections (AD).

Methods: We conducted a retrospective review of patients with acute AD from 2009 to 2014 using TeraRecon iNtuition (TeraRecon, San Mateo, Calif). Volumes were obtained using the true lumen (TLV), false lumen (FLV), and total aortic volume (TAV) from the left subclavian artery to celiac artery. Growth rate was calculated as the change in maximal diameter between the first and last available CT scan over the time interval. Differences in proportions were determined by analysis of variance, χ^2 test, or the Fisher exact test, as appropriate.

Results: During the study period, 164 patients had CT scan evidence of uncomplicated acute type B AD. Eleven patients were excluded for lack of adequate imaging. Thirty-six patients who underwent urgent repair (<14 days) were also excluded. To assess the natural history of the disease, we evaluated 117 patients: 85 who did not require intervention and 32 who underwent delayed TEVAR (n = 29) or open repair (n = 3; >14 days). Mean age was 66 ± 12, years 57% were male, and 34% were black. Risk factors included 95% hypertension, 29% coronary artery disease, 31% smokers, and 27% diabetic. The mean time between the initial and last imaging in follow-up or before repair was 13 months. Mean time to operation was 23 months. Mean TLV/FLV ratio on the initial CT scan was significantly higher in patients who did not eventually require an operation (1.55 vs 0.82; $P = .02$). The mean growth rate was higher in those eventually requiring operation (2.47 vs 0.42 mm/mo; $P = .003$). Patients were divided into three subgroups based on initial imaging TLV/FLV ratios (<0.8, 0.8-1.6, and >1.6). There was a significant difference in the growth rates between these groups (4.6 vs 2.4 vs 0.8 mm/mo; $P < .025$). Area under the receiver-operating curve (AUROC) analysis revealed, a TLV/FLV ratio <0.8 was highly predictive for eventually requiring an intervention (area = 0.8; sensitivity = 69%; specificity = 84%: positive predictive value [PPV] = 71%; negative predictive value [NPV] = 81%), with an odds ratio of 12.2 (confidence interval, 5-26; $P < .001$). Conversely, a TLV/FLV ratio of >1.6 was highly predictive for freedom from late intervention (sensitivity = 91%; specificity = 42%; PPV = 61%; NPV = 86%; Fig 1). After Kaplan-Meier analysis, 1-year and 2-year survival free of aortic interventions was 36% and 26% with a TLV/FLV ratio <0.8, 81% and 72% with a ratio of 0.8 to 1.6, and 88% and 80% with a ratio of >1.6 ($P = .001$; Fig 2).

Conclusions: CT scan volumetric analysis in patients with uncomplicated acute type B AD is a useful tool to predict the need for intervention. This may help select which patient with uncomplicated acute type B AD should undergo TEVAR preemptively.

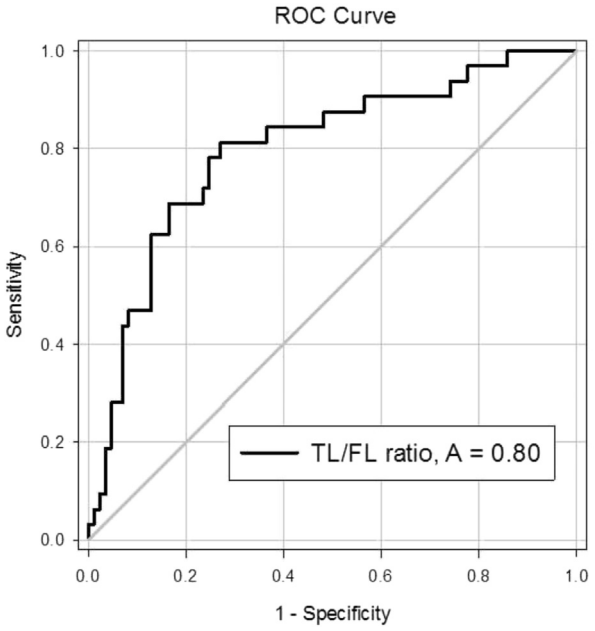

Fig 1. Area under the receiver-operating curve (AUROC = .80) for true lumen (*TL*) volume (TLV)/false lumen (*FL*) volume (FLV) ratio and intervention.

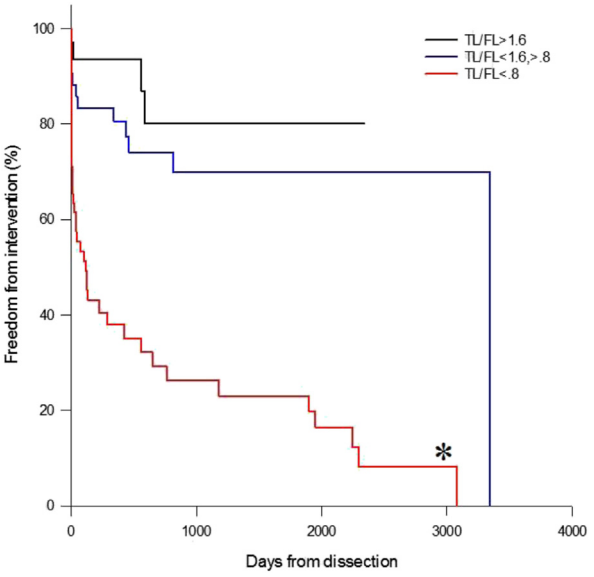

Fig 2. Kaplan-Meier curves of freedom from intervention (%) between study participants with true lumen (*TL*)/false lumen (*FL*) ratios less than 0.8 (*red*), greater than 0.8 but less than 1.6 (*blue*), and greater than 1.6 (*black*). *Statistically different from other groups at $P < .001$.

Author Disclosures: K. S. Lavingia: None; **S. Larion:** None; **S. Ahanchi:** None; **C. Ammar:** None; **M. Bhasin:** None; **A. Mirza:** None; **N. Reddy:** None; **D. Dexter:** None; **J. M. Panneton:** None.

EndoAnchor Treatment of Type Ia Endoleaks After Endovascular Infrarenal Aortic Aneurysm Repair

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Introduction: Type Ia endoleaks continue to occur immediately after endograft deployment or remote from the initial procedure in patients undergoing endovascular aneurysm repair (EVAR). EndoAnchors have been

used to treat the endoleak in such patients, and the current series reports the outcome of therapy in the Aneurysm Treatment Using the Heli-FX EndoAnchor System Global Registry (ANCHOR).

Methods: During a 29-month period ending in July 2014, 201 patients were enrolled in ANCHOR and treated with EndoAnchors for immediate type Ia endoleaks after endograft deployment (primary arm; n = 109 [54.2%]) or type Ia endoleaks remote from EVAR (revision arm; n = 92 [45.8%]). Patients were followed up for clinical outcomes over a mean of 15 ± 6 months after EndoAnchor implantation. Computed tomography (CT) images were reviewed by an independent core laboratory in 145 patients (72.1%) preoperatively and in 109 (54.2%) postoperatively (108 with contrast). Continuous variables were assessed with the Student *t*-test and dichotomous variables with the Fisher exact test. Bonferroni corrections were used for multiple comparisons.

Results: Aneurysms averaged 60 ± 16 mm in maximum diameter, with infrarenal neck length of 16 ± 12 mm, infrarenal neck diameter of 28 ± 6 mm, and infrarenal angulation of 37° ± 17°. Aortic necks were <10 mm in length in 42.7% and <5 mm in 17.5% of patients. An average of 6 ± 2 and 7 ± 3 EndoAnchors was implanted in the primary and revision cases, respectively ($P = .003$), with successful deployment and absence of type Ia endoleak on completion angiography in 190 of 201 patients (94.5%). Over mean follow-up of 15 ± 6 months, all-cause mortality was two of 200 (1.0%), with aneurysm-related reinterventions in 21 patients (10.4%). There were 12 patients (6.0%) with endograft-related reinterventions and 11 patients (5.5%) with EndoAnchor-related reinterventions, all for type Ia endoleaks. There were no ruptures or open surgical conversions. Core laboratory analysis identified endoleaks in 14 of 108 patients (13.0%) with postoperative contrast CT studies; four of 60 in primary cases (6.7%), and 10 of 48 in revisions (20.8%; $P = .043$). The endoleak was evident on the first postoperative CT scan in all but one of these cases. Short neck predicted EndoAnchor failure; 18 ± 13 mm vs 8 ± 5 mm in those with and without postoperative type Ia endoleaks, respectively ($P < .001$). Neck length of 5 mm was evident in 39.1% of patients with 12-month CT scans; sac enlargement (>5 mm) developed in 3.7% of patients.

Conclusions: EndoAnchors are successful in remediating type Ia endoleaks in 87.0% of cases. Success was more frequent in patients treated for endoleaks that were detected and treated at the time of the initial EVAR compared with those identified and treated in follow-up. EndoAnchors should be considered as a potentially effective treatment option when type Ia endoleak is encountered during or after EVAR.

Author Disclosures: W. D. Jordan: Consultant, Aptus; Grant support, Aptus; **K. Ouriel:** Consultant, Aptus; Other, Aptus. **M. Mehta:** None; **F. R. Arko:** None; **J. P. Henretta:** None; **B. J. Pearce:** None; **J. P. de Vries:** None.

Active Smoking Is Associated With Increased Odds of Limb Loss Among Claudicants Undergoing Infrainguinal Bypass

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Introduction: Smoking cessation is one of the primary methods of treating claudication. However, many patients receive revascularization for claudication while still smoking. We examined regional data from the Vascular Quality Initiative (VQI) database to evaluate the impact of smoking on outcomes of revascularization in claudicants in the VQI.

Methods: With consent of the members of the Carolinas Vascular Quality Group (CVQG) of the VQI, all cases entered in the infrainguinal (INF) bypass, suprainguinal bypass, and peripheral vascular intervention modules were reviewed from 2010 to 2012. Univariate analysis was used to identify demographic and comorbid differences between active and nonactive smokers. Multivariable regression modeling was used to assess primary outcomes of major adverse limb event (MALE), amputation-free survival (AFS), limb loss (LL), and death.

Results: We identified 730 active smokers and 636 nonactive smokers undergoing revascularization for claudication. Mean follow-up was 247 (214) days. Active smokers were younger and had more chronic obstructive pulmonary disease, but less diabetes, congestive heart failure, hypertension, and statin use. Multivariable regression modeling showed no differences in overall outcomes of MALE, AFS, and death between active and nonactive smokers when all procedure modules were combined; active smokers were more likely, however, to suffer limb loss (3% vs 11%; odds ratio [OR], 2.3; 95% confidence interval [CI], 1.0-5.4; $P = .05$). When we examined the modules separately, there were no differences in outcomes between active and nonactive smokers in peripheral vascular intervention (n = 1252 limbs) or suprainguinal bypass (n = 122). Compared with nonactive smokers, active smokers with claudication who received INF bypass had a much higher odds of MALE (21% vs 11%; OR, 2.8; 95% CI, 1.1-7.4; $P = .03$) and limb loss (10% vs 1%; OR, 21.0; 95% CI, 1.5-292; $P = .02$), but had no difference in death or AFS (Table).

Conclusions: Claudicants who undergo INF bypass while actively smoking have increased odds of MALE and limb loss compared with nonactive smokers in the CVQG. ORs for limb loss and MALE are significantly higher than that of previously reported patients with claudication treated with medical management. Before performing INF bypass on claudicants, aggressive smoking cessation methods should be implemented.

Table. Primary outcomes of claudicant patients undergoing infrainguinal bypass by smoking status

Outcomes	*Smokers (n = 119), %*	*Nonsmokers (n = 91), %*	χ^2 P	*Adjusted OR (95% CI)*	P
MALE	21	11	.04	2.8 (1.1-7.4)	.03
AFS	12	12	.91	1.2 (0.4-3.2)	.8
Death	3	11	.03	0.3 (0.08-1.23)	.09
Limb loss	10	1	.008	21.0 (1.5-292)	.02

AFS, Amputation-free survival; *CI,* confidence interval; *MALE,* major adverse limb event; *OR,* odds ratio.

Author Disclosures: R. Vallabhaneni: None; **C. A. Kalbaugh:** None; **M. A. Farber:** None; **B. H. Tonnessen:** None; **T. E. Brothers:** None; **W. A. Marston:** None; **J. W. Hallett:** None.

Multivariate Analysis of 319 Iliac Stents Reveals the Strong Impact of Demographic Factors and Lesion Severity on Stent Patency

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Introduction: The aim of our study was to perform a large-scale multivariate analysis to identify the demographic, anatomic, or procedural factors that impact primary iliac stent patency.

Methods: A retrospective record review of iliac stenting from 2011 to 2013 was conducted. Index iliac stenting patients were identified by Current Procedural Terminology codes 37220, 37221, 37222, and 37223. Differences in demographic, anatomic, and procedural characteristics were analyzed by univariate analysis between groups based on primary patency. Variables that were considered significant ($P < .05$) were brought forward in the Cox regression multivariate analysis.

Results: A total of 224 patients (53% male) underwent primary iliac artery stenting, and 319 limbs were analyzed. Average age was 66 years (range, 38-93 years) and 57% were Caucasian. Indication for procedure was 64% claudication, 23% rest pain, and 13% ulcer/gangrene. The cohort included all TransAtlantic Inter-Society Consensus (TASC) classifications: 50% TASC A, 25% TASC B, 12% TASC C, and 13% TASC D. The treated anatomic location was isolated external iliac artery (EIA) in 27%, isolated common iliac artery (CIA) in 55%, and combined CIA/EIA in 18%. Intervention distal to the iliac arteries was performed in 37% of the cohort. There were no procedural-related mortalities. Kaplan-Meier analysis at 1 and 3 years revealed a primary patency of 86% and 51%, primary assisted patency of 98% and 89%, and secondary patency of 99% and 90%. For those patients with critical limb ischemia preprocedurally, limb salvage was 88% at 1 year. By Kaplan-Meier analysis, primary patency at 1 year was 93% for Caucasian patients vs 79% for non-Caucasian ($P = .001$). One-year Kaplan-Meier primary patency was 76% in patients aged <60 years, 86% in patients aged 60-70 years, and 97% in patients aged >70 years, with a significant difference among all groups ($P < .001$). Primary patency was significantly different for those with and without EIA occlusion ($P < .001$), with 1-year primary patency by Kaplan-Meier analysis of 71% and 86%, respectively. Primary patency was also significantly different for those with and without aortic occlusion ($P = .008$), with 1-year patency of 84% and 87%, respectively. The reentry device differed significantly among groups ($P = .028$), with 1-year patency rates of 79% for reentry device use and 87% for those who did not have reentry device. We evaluated five factors on multivariate analysis, and three factors were identified to impact primary patency: Caucasian race (HR, 0.517; 95% confidence interval [CI], 0.313-0.852; $P = .01$) and older age at the time of procedure (HR, 0.945; 95% CI, 0.920-0.971; $P < .001$) positively affected patency. EIA occlusion (HR, 2.352; 95% CI, 1.294-4.275; $P = .005$) negatively affected primary patency. Aortic occlusion and reentry device were no longer significant in our multivariate model.