Title

The Impact Of Timing Of Thoracic Endovascular Aortic Repair On The Postoperative Outcomes Of Patients With Uncomplicated Type B Aortic Dissection

Journal

Journal of Vascular Surgery, 79(6)

ISSN

0741-5214

Authors

Veranyan, Narek

Hamouda, Mohammed

Elsayed, Nadin

et al.

Publication Date

2024-06-01

DOI

10.1016/j.jvs.2024.03.433

Peer reviewed

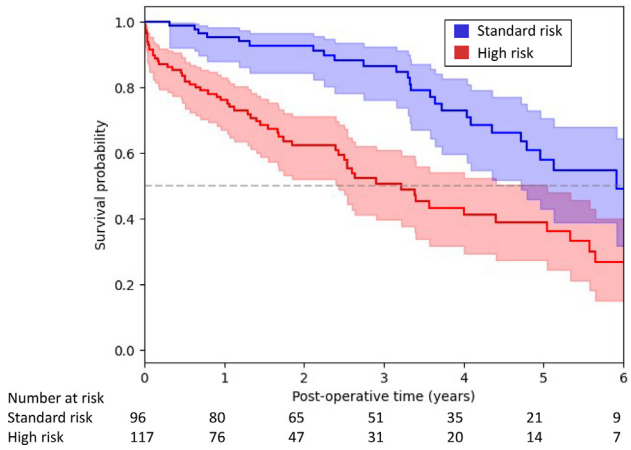

Fig. Kaplan-Meier survival curve by risk group.

Table. Baseline characteristics of patients by risk classification

Patient characteristic	All patients (N = 213)	Standard risk (n = 96)	High risk (n = 117)	*P* value
High-risk classifier				
CFS ≥4	57 (26.8%)	0	57 (48.7%)	
CFS (mean)	3.01 ± 1.01	2.48 ± 0.61	3.44 ± 1.02	< .01
METs ≤2	33 (15.5%)	0	33 (28.2%)	
METs (mean)	3.61 ± 1.04	4.10 ± 0.92	3.20 ± 0.95	< .01
Prior stroke/SCI	16 (7.5%)	0	16 (13.7%)	
COPD	17 (8.0%)	0	17 (14.5%)	
CKD	49 (23.0%)	0	49 (41.9%)	
CHF	11 (5.2%)	0	11 (9.4%)	
Active cancer	7 (3.3%)	0	7 (6.0%)	
Heavy atheroma burden	4 (1.9%)	0	4 (3.4%)	
PAD	26 (12.2%)	0	26 (22.2%)	
Cirrhosis	2 (0.9%)	0	2 (1.7%)	
Substance use disorder	17 (8.0%)	0	17 (14.5%)	
Age, years	73.3 ± 7.4	73.1 ± 8.4	73.4 ± 6.5	.77
Male gender	154 (72.3%)	70 (72.9%)	84 (71.8%)	.98
White race	195 (91.6%)	88 (91.7%)	107 (91.5%)	.91
BMI, kg/m^2	27.4 ± 4.9	28.0 ± 4.7	27.1 ± 5.0	.19
Diabetes	31 (14.6%)	17 (17.7%)	14 (12.0%)	.34
Hypertension	192 (90.1%)	84 (87.5%)	108 (92.3%)	.35
Hyperlipidemia	165 (77.5%)	72 (75.0%)	93 (79.5%)	.66
History of smoking	182 (85.4%)	78 (81.2%)	104 (88.9%)	.26
Previous aortic surgery	114 (53.5%)	51 (52.1%)	63 (53.9%)	.99
CAD	94 (44.1%)	37 (38.5%)	57 (48.7%)	.18
Previous MI	44 (20.7%)	25 (26.0%)	19 (16.2%)	.11
Coagulopathy	10 (4.7%)	6 (9.4%)	4 (3.4%)	.52
Symptomatic or urgent presentation	30 (14.1%)	11 (11.5%)	19 (16.2%)	.41
Average maximum aneurysm size, cm	69.0 ± 12.4	68.0 ± 11.3	69.9 ± 13.3	.27

BMI, body mass index; *CAD*, coronary artery disease; *CFS*, Clinical Frailty Score; *CHF*, chronic heart failure; *CKD*, chronic kidney disease; *COPD*, chronic obstructive pulmonary disease; *METs*, Metabolic Equivalence; *MI*, myocardial infarction; *PAD*, peripheral arterial disease; *SCI*, spinal cord injury.

highlighting the importance of frailty assessment. High-risk status and frailty assessment may be important in guiding clinical decision-making.

Author Disclosures: M. Bunker: Nothing to Disclose; **A. M. Gillan:** Nothing to Disclose; **M. P. Sweet:** Artivion Inc, Medtronic PLC, W. L. Gore & Associates, Inc; **S. L. Zettervall:** Cook Medical, W.L Gore.

PC228

Outcomes Of Bridging Stentgraft Through The Suprarenal Fixation Stent Of Previous EVAR In Complex Endovascular Aortic Treatment

Rodolfo Pini,[1] Gianluca Faggioli,[■] Gemmi Sufali,[2] Betti Shyti,[■] Andrea Vacirca,[3] Enrico Gallitto,[4] Mauro Gargiulo[■]. [1]University of Bologna, Bologna, Italy; [2]University of Bologna, Treviglio, Italy; [3]University of Bologna, Bologna, Italy; [4]IRCCS Sant'Orsola, Vascular Surgery - University of Bologna, Bologna, Italy

Objectives: The endovascular treatment of type 1a endoleak (T1aEL) with fenestration or branch (f/bEVAR) is widespread accepted; however, the behavior of the bridging stent graft deployed through the suprarenal fixation stent (BSG-SF) of the previous EVAR graft has been scarcely investigated in the literature. The aim of the present study is to evaluate the visceral vessel loss (VVL) and the instability (VVI) of BSG-SF of f/bEVAR for the treatment of T1aEL of previous EVAR.

Methods: A single-center analysis of all complex f/bEVAR procedures accomplished from 2012 to 2023 was performed. Patients treated for T1aEL with the necessity of BSG-SF were selected and analyzed. In case of fenestrations, the bridging stenting was performed with a balloon expandable stentgraft (Advanta V12 or Begraft). For branches directed to renal arteries (RAs), a combination of balloon and self-exandable stentgraft (Advanta or VBX in association with Viabhan) was used, and in case of branches for superior mesenteric artery (SMA), only a balloon expandable stentgraft was chosen. VVL and VVI were evaluated in the perioperative period and during the follow-up, and possible risk factors were investigated.

Results: In the study period, over a total of 392 f/bEVAR, 24 (6.1%) were performed for the treatment of T1aEL with BSG-SF in previous EVAR. Over a total of 1317 bridging stents, 36 (2.7%) were used in BSG-SF, 34 for Ras, and two for SMA. The perioperative VVL was 0 of 36 in BSG-SF and 42 of 1281 (3.2%) in the other target VV ($P = .27$). At a mean follow-up of 39 ± 20 months, the VVI rate was 5.5% (2 RAs with branches) in the BSG-SF and 1.4% (15 RAs, 2 celiac trunks, 1 SMA; 11 branches and 7 fenestrations) in the general population ($P = .09$). By multivariate Cox regression analysis, VVI was not influenced by BSG-SF, but the use of branches and renal arteries as target visceral vessel had higher risk for VVI during the follow-up: hazard ratio (HR), 3.1, 95% confidence interval (CI), 1.4-4.3 and HR, 2.1; 95% CI, 1.1.3.4, respectively.

Conclusions: The BSG-SF of f/bEVAR for the treatment of T1aEL after EVAR is associated with satisfactory perioperative results and similar VVI during the follow-up compared with standard f/bEVAR; however, branches with renal arteries as target VV are associated with higher late VVI.

Author Disclosures: G. Faggioli: Cook Medical; **E. Gallitto:** Cook Medical; **M. Gargiulo:** Cook Medical; **R. Pini:** Nothing to Disclose; **B. Shyti:** Nothing to Disclose; **G. Sufali:** Nothing to Disclose; **A. Vacirca:** Nothing to Disclose.

PC230

The Impact Of Timing Of Thoracic Endovascular Aortic Repair On The Postoperative Outcomes Of Patients With Uncomplicated Type B Aortic Dissection

Narek Veranyan,[■] Mohammed Hamouda,[1] Nadin Elsayed,[2] Omar Alnouri,[■] Philip Goodney,[3] Mahmoud Malas[4]. [1]Center for Learning and Excellence in Vascular and Endovascular Surgery (CLEVER), Department of Surgery, Division of Vascular and Endovascular Surgery, UC San Diego, San Diego, CA; [2]Center for Learning and Excellence in Vascular and Endovascular Research, University of California San Diego, San Diego, CA; [3]Dartmouth Hitchcock Medical Center, Lebanon, NH; [4]Division of Vascular and Endovascular Surgery, University of California San Diego, San Diego, CA

Objectives: Thoracic endovascular aortic repair (TEVAR) is used to induce a favorable aortic remodeling in select patients with uncomplicated type B aortic dissection (uTBAD), although the impact of timing of TEVAR on the postoperative outcomes is not completely understood. The purpose of this study is to investigate the impact of TEVAR timing on the 30-day postoperative clinical outcomes of patients with uTBAD using a multi-institutional database.

Methods: The Vascular Quality Initiative (VQI) database was studied for all patients who underwent TEVAR for uTBAD excluding cases of aortic rupture or malperfusion. The study cohort was divided into TEVAR timing groups: <14 days (acute), 14-30 days (subacute), and >30 days (chronic) since the onset of dissection. Demographic, clinical, and perioperative characteristics and postoperative complications including overall mortality, disease/treatment-related mortality, and major adverse cardiovascular events (death, myocardial infarction, stroke) were compared between groups. Univariable and multivariable regression analysis was conducted, and model performance was evaluated with discrimination analysis using the receiver operating characteristic curve and area under the curve (AUC).

Results: Of 29,115 patients, 1854 met the inclusion criteria, of which 1304 (70.3%) underwent TEVAR in the acute, 188 (10.1%) in the subacute, and 362 (19.5%) in the chronic setting. Table 1 demonstrates the association of TEVAR timing with baseline characteristics. For all indications of TEVAR, except for aneurysmal degeneration, the odds of overall mortality (OR, 0.10; $P = .016$), disease/treatment-related mortality (OR, 0.12; $P = .048$), and MACE (OR, 0.08; $P = .007$) significantly decrease for patients undergoing TEVAR in the chronic vs acute setting. Odds of overall mortality (OR, 0.16; $P = .050$) and MACE (OR, 0.13; $P = .027$) were also significantly lower in the chronic compared to the subacute setting (Table 2). Postoperative mortality of uTBAD patients undergoing TEVAR for aneurysmal degeneration does not change with TEVAR timing (OR, 0.43; 95% CI, 0.09-1.97; $P = .278$). The AUC of the ROC curve for mortality is 82.21% (Fig 1).

Conclusions: The risks of postoperative mortality and MACE of patients undergoing TEVAR for uTBAD decrease when TEVAR is performed beyond 30 days from the onset of symptoms, except for patients with aneurysmal degeneration. Therefore, delaying TEVAR may reduce periprocedural risks, except for patients with early

Table I. Baseline characteristics per TEVAR timing

	TEVAR timing			
	<14 days	14-30 days	>30 days	
	n = 1304	n = 188	n = 362	*P*-value
Demographic variables				
Age, years	62.1 ± 13.7	60.5 ± 13.2	60.2 ± 12.1	.027
Male gender	806 (61.8%)	126 (67.0%)	212 (58.6%)	.152
BMI, kg/m^2	29.6 ± 7.1	29.5 ± 7.1	29.8 ± 6.7	.914
Ethnicity (Hispanic or Latino)	94 (7.2%)	9 (4.8%)	27 (7.5%)	.446
Race				
White	691 (52.9%)	109 (57.9%)	201 (55.5%)	.627
Black	457 (35.1%)	57 (30.3%)	116 (32.0%)	
Other	156 (11.9%)	22 (11.7%)	45 (12.4%)	
Medical history				
Smoking	799 (61.3%)	109 (57.9%)	240 (66.3%)	.110
COPD	213 (16.3%)	30 (15.9%)	62 (17.1%)	.920
DM	164 (12.6%)	25 (13.3%)	64 (17.7%)	.043
HTN	1158 (88.8%)	173 (92.0%)	350 (96.7%)	< .001
HD	50 (3.8%)	6 (3.2%)	14 (3.9%)	.906
Preoperative hemoglobin, g/dl	11.5 ± 1.9	10.9 ± 1.9	11.6 ± 1.9	< .001
Preoperative creatinine, mg/dl	1.2 ± 0.8	1.2 ± 0.7	1.1 ± 0.6	.069
CAD				
None	1148 (88.0%)	168 (89.4%)	323 (89.2%)	.040
History of MI	119 (9.1%)	10 (5.3%)	28 (7.7%)	
Stable angina	23 (1.8%)	3 (1.6%)	8 (2.2%)	
Unstable angina	14 (1.1%)	7 (3.7%)	3 (0.8%)	
CHF				
None	1187 (91.0%)	169 (89.9%)	321 (88.7%)	.142
Asymptomatic	78 (5.9%)	12 (6.4%)	20 (5.5%)	
Mild	20 (1.5%)	4 (2.1%)	15 (4.1%)	
Moderate or severe	19 (1.5%)	3 (1.6%)	6 (1.7%)	
CVD				
None	1189 (91.2%)	173 (92.0%)	334 (92.3%)	.860
Stroke without deficit	71 (5.4%)	10 (5.3%)	15 (4.1%)	
Stroke with deficit	44 (3.4%)	5 (2.7%)	13 (3.6%)	
Cardiac stress test				
Not done	1209 (92.7%)	170 (90.4%)	295 (81.5%)	< .001

(Continued on next page)

Table I. Continued.

	TEVAR timing			
	<14 days	14-30 days	>30 days	
	n = 1304	n = 188	n = 362	*P*-value
Normal	84 (6.4%)	16 (8.5%)	64 (17.7%)	
Abnormal	11 (0.8%)	2 (1.1%)	3 (0.8%)	
Preoperative functional status				
Full	987 (75.7%)	135 (71.8%)	245 (67.7%)	.115
Light work	181 (13.9%)	29 (15.4%)	68 (18.8%)	
Self-care	112 (8.6%)	20 (10.6%)	39 (10.8%)	
Assisted care or bedbound	24 (1.8%)	4 (2.1%)	10 (2.8%)	
EF				
<30%	10 (0.8%)	4 (2.1%)	5 (1.4%)	< .001
30-50%	88 (6.8%)	13 (6.9%)	32 (8.8%)	
>50%	750 (57.5%)	138 (73.4%)	254 (70.2%)	
No EF record	456 (34.9%)	33 (17.6%)	71 (19.6%)	
Surgical history				
History of aortic aneurysm repair	57 (4.4%)	7 (3.7%)	20 (5.5%)	.552
History of aortic surgery	52 (3.9%)	4 (2.1%)	19 (5.3%)	.208
History of bypass surgery	32 (2.5%)	4 (2.1%)	27 (7.5%)	< .001
History of CABG	28 (2.2%)	5 (2.7%)	10 (2.8%)	.748
History of CEA or CAS	7 (0.5%)	0	1 (0.3%)	.508
History of PCI	70 (5.4%)	8 (4.3%)	21 (5.8%)	.744
History of PVI	21 (1.6%)	2 (1.1%)	10 (2.8%)	.251
Medication history				
ACE inhibitors	486 (37.3%)	81 (43.1%)	192 (53.0%)	< .001
Anticoagulants	128 (9.8%)	14 (7.5%)	35 (9.7%)	.584
Aspirin	461 (35.4%)	81 (43.1%)	178 (49.2%)	< .001
Beta blockers	951 (72.9%)	156 (82.9%)	309 (85.4%)	< .001
P2Y12 inhibitors	49 (3.8%)	6 (3.2%)	11 (3.0%)	.775
Statins	493 (37.8%)	77 (40.9%)	203 (56.1%)	< .001
Operative characteristics				
Anesthesia (general)	1276 (97.9%)	183 (97.3%)	355 (98.1%)	.856
ASA class				
≤ 2	13 (1.0%)	6 (3.2%)	5 (1.4%)	< .001
3	341 (26.2%)	59 (31.4%)	159 (43.9%)	
4	877 (67.3%)	122 (64.9%)	195 (53.9%)	
5	73 (5.6%)	1 (0.5%)	3 (0.8%)	
IVUS	982 (75.3%)	152 (80.9%)	262 (72.4%)	.092
Maximal aortic diameter, mm	42.5 ± 12.4	43.9 ± 10.4	47.4 ± 12.5	< .001
Urgency				
Elective	475 (36.4%)	111 (59.0%)	283 (78.2%)	< .001
Urgent	586 (44.9%)	71 (37.8%)	67 (18.5%)	
Emergent	243 (18.6%)	6 (3.2%)	12 (3.3%)	
Indication of TEVAR				
Aneurysmal degeneration	108 (8.3%)	25 (13.3%)	103 (28.5%)	< .001
Progression of Dissection	94 (7.2%)	24 (12.8%)	72 (19.9%)	< .001
Persistent Hypertension	319 (24.5%)	43 (22.9%)	48 (13.3%)	< .001
Persistent pain	1226 (94.0%)	172 (91.5%)	296 (81.8%)	< .001

ACE, Angiotensin converting enzyme; *ASA*, American Society of Anesthesiologists; *BMI*, body mass index; *CABG*, coronary artery bypass grafting; *CAD*, coronary artery disease; *CAS*, carotid artery stenting; *CEA*, carotid endarterectomy; *CHF*, congestive heart failure; *COPD*, chronic obstructive pulmonary disease; *CVD*, cerebrovascular disease; *DM*, diabetes mellitus; *EF*, ejection fraction; *HTN*, hypertension; *IVUS*, intravascular ultrasound; *PCI*, percutaneous coronary intervention; *PVI*, peripheral vascular intervention.
Discrete variables presented as case numbers (%), continuous variables presented as mean ± standard deviation.

Table II. Multivariable prediction models for outcome variables with odds ratios per TEVAR timing

	TEVAR timing					
	14-30 days vs <14 days		>30 days vs <14 days		>30 days vs 14-30 days	
	OR [95% CI]	*P*-value	OR [95% CI]	*P*-value	OR [95% CI]	*P*-value
Overall mortality	0.62 [0.22-1.71]	.357	0.10 [0.01-0.65]	.016	0.16 [0.03-0.99]	.050
Disease \ treatment-related mortality	0.66 [0.21-2.10]	.487	0.12 [0.01-0.98]	.048	0.18 [0.02-1.37]	.097
MACE	0.61 [0.24-1.54]	.293	0.08 [0.01-0.51]	.007	0.13 [0.02-0.79]	.027
MI	0.37 [0.46-2.96]	.349	0.01 [0.01- 0.86]	.043	0.03 [0.01-0.64]	.024
Stroke	0.45 [0.14-1.40]	.168	0.21 [0.05-0.99]	.048	0.47 [0.09-2.49]	.378
Respiratory complications	0.41 [0.13-1.27]	.124	0.22 [0.03-1.53]	.126	0.53 [0.14-1.98]	.346
Overall complications	0.44 [0.22-0.86]	.016	0.27 [0.09-0.81]	.019	0.63 [0.29-1.32]	.216
Reinterventions	0.29 [0.08-1.11]	.070	0.12 [0.10-1.41]	.093	0.42 [0.09-1.98]	.249
Aortic reinterventions	0.67 [0.28-1.58]	.363	0.30 [0.10-0.91]	.032	0.46 [0.14-1.48]	.193

ASA, American Society of Anesthesiologists; *BMI*, body mass index; *CAD*, coronary artery disease; *CHF*, congestive heart failure; *COPD*, chronic obstructive pulmonary disease; *CVD*, cerebrovascular disease; *EF*, ejection fraction; *HD*, hemodialysis; *HTN*, hypertension; *MACE*, major adverse cardiovascular events; *MI*, myocardial infarction; *OR*, odds ratio.
Logistic regression models adjusted for patient age, gender, ethnicity, race, ASA class, BMI, CAD, CHF, cardiac stress test result, CVD, COPD, HD, preoperative hemoglobin, creatinine, Beta-blockers, Statins, EF, preoperative functional status, maximal aortic diameter, urgency, indication for TEVAR (aneurysmal degeneration, progression of dissection, uncontrolled HTN, uncontrolled pain, TEVAR timing (acute, subacute, chronic), Interaction terms (timing-aneurysmal degeneration, timing-progression of dissection, timing-uncontrolled HTN).

Figure 1. ROC curve of the logistic regression model for overall mortality with AUC

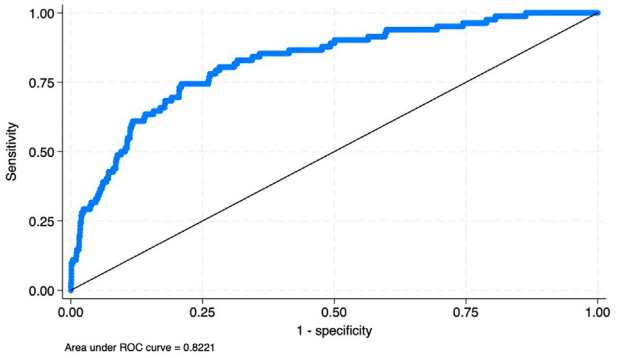

Fig. *AUC*, Area under the curve; *ROC*, receiver operating characteristic.

aneurysmal degeneration. Further studies are needed to validate these findings and help guide clinical decision-making for the timing of TEVAR for uTBAD.

Author Disclosures: O. Alnouri: Nothing to Disclose; **N. Elsayed:** Nothing to Disclose; **P. Goodney:** Nothing to Disclose; **M. Hamouda:** Nothing to Disclose; **M. Malas:** Nothing to Disclose; **N. Veranyan:** Nothing to Disclose.

PC232

The Effect Of Smoking Status On Short And Mid-Term Outcomes Of Asymptomatic Patients Undergoing Carotid Endarterectomy: Analysis Of National Multi-Institutional Data

Sabrina Straus,[1] Nishita R. Vootukuru,[2] Daniel Willie-Permor,[■] Nadin Elsayed,[3] Elsie Ross,[■] Mahmoud Malas[4]. [1]UCSD School of Medicine, La Jolla, CA; [2]UCSD, Chandler, AZ; [3]Center for Learning and Excellence in Vascular and Endovascular Research, University of California San Diego, San Diego, CA; [4]Division of Vascular and Endovascular Surgery, University of California San Diego, San Diego, CA

Objectives: The current medical landscape lacks comprehensive data regarding the impact of preoperative smoking status on both short and long-term outcomes for patients undergoing carotid endarterectomy (CEA). This study seeks to elucidate the influence of the duration of smoking cessation on postoperative and mid-term outcomes in this patient population.

Methods: Data was collected from the Vascular Quality Initiative (VQI) for all asymptomatic patients who had undergone CEA from 2016 to 2023. Outcomes were compared across three different smoking status groups (never smoker [NS], current smoker [CS], quit >30 days ago [Q30]). Our primary outcomes included in-hospital stroke, death, and MI. Secondary outcomes included 1- and 3-year stroke/death. We used inverse probability weighting (IPW) to balance the following preoperative factors: age, gender, race, ethnicity, BMI, diabetes, CAD, prior CHF, renal dysfunction, COPD, HTN, prior CABG/PCI, prior CEA/CAS, degree of stenosis, urgency, anesthesia type, and medications.

Results: The final analysis included 85,237 CEA cases with 22,343 (26.2%) NS, 41,731 (49.0%) Q30, and 21,163 (24.8%) CS. Notably, NS tended to be older and more likely to be a female. On the other hand, patients who Q30 were more likely to have comorbidities including obesity, CAD, prior CHF, and CKD, as well as prior procedures. Patients who are CS were more likely to have COPD and stenosis >80%. After IPW, we found no statistical difference for in-hospital stroke, death, or MI outcomes across the groups. However, the mid- term outcomes revealed Q30 and CS compared to NS had higher odds of 1-year stroke/death (OR, 1.3; 95% CI, 1.1-1.4; $P < .001$; OR, 1.3; 95% CI, 1.1-1.5; $P < .001$) and 3-year stroke/death (OR, 1.4; 95% CI, 1.3-1.6; $P < .001$; OR, 1.4; 95% CI, 1.3-1.6; $P < .001$), respectively (Table I).

Conclusions: In this large national study, we found that smoking status did not emerge as a substantial determinant of adverse short-term outcomes for asymptomatic patients undergoing CEA. However, smoking had a negative impact on the midterm stroke-free survival of these patients. Although this study suggests not delaying CEA for smokers, it emphasizes the importance of smoking cessation for improving mid-term survival. It is essential to acknowledge that the intricate relationship between smoking and surgical outcomes warrants further exploration and validation through additional prospective studies.