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Aorta: Research

Descending Thoracic and Thoracoabdominal Aortic Aneurysm Repairs: The Society of Thoracic Surgeons Adult Cardiac Surgery Database Analysis

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ABSTRACT

BACKGROUND Contemporary national outcomes of open and endovascular aortic repair for descending thoracic aortic aneurysms (DTAAs) and thoracoabdominal aortic aneurysms (TAAAs) are unclear. This study evaluated this issue by using The Society of Thoracic Surgeons (STS) Adult Cardiac Surgery Database (ACSD).

METHODS From July 1, 2017 to June 30, 2022, study investigators identified 3522 adults who underwent planned DTAA repair (open, 328; endovascular, 1895) or TAAA repair (open, 870; endovascular, 429), after excluding ascending aorta or aortic arch aneurysms (zone 0, 1, or 2), interventions with a proximal extent in zone 0 or zone 1, juxtarenal or infrarenal aortic interventions, hybrid procedures, aortic trauma, and aortic infection.

RESULTS Most DTAA interventions (85.2%) were endovascular repairs, whereas most TAAA interventions were open repairs (66.9%). For DTAA interventions, the operative mortality, permanent stroke rate, and rate of spinal cord injury were 4.2%, 3.8%, and 2.4% for endovascular repairs and 9.2%, 8.5%, and 4.6% for open repairs, respectively (all $P < .05$). For TAAA interventions, the operative mortality, permanent stroke rate, and rate of spinal cord injury were 6.5%, 2.1%, and 3.0% for endovascular repairs and 11.7%, 6.0%, and 12.2% for open repairs, respectively (all $P < .05$). Increasing annual open TAAA repair volume was associated with lower odds of experiencing the composite of operative mortality, permanent stroke, or spinal cord injury.

CONCLUSIONS On the basis of STS ACSD data, endovascular repair was the predominant approach for treating DTAA, whereas most patients undergoing TAAA interventions had an open surgical repair. Outcome differences between open and endovascular approaches may be related to patient selection. Increasing center experience with open TAAA repair is associated with improved outcomes.

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The morbidity and mortality associated with open surgery to repair descending thoracic aortic aneurysms (DTAAs) and

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thoracoabdominal aortic aneurysms (TAAAs) are significant.[1,2] Endovascular techniques are associated with lower morbidity and mortality in suitable patients, and this approach has revolutionized the treatment paradigm.[3-5] For DTAAs, current consensus guidelines favor the use of endovascular repair for anatomically eligible patients without connective tissue disorders, whereas open surgical repair is considered reasonable in patients with limited comorbidities and prolonged life expectancy.[6] In contrast, open surgical repair is generally preferred in patients with TAAAs.[6] Because of advances in stent graft technology, surgical techniques, and adjuncts to mitigate spinal cord ischemia, contemporary national practice trends and outcomes are unclear. Therefore, using The Society of Thoracic Surgeons (STS) Adult Cardiac Surgery Database (ACSD), we performed an analysis of patients who underwent open surgical or endovascular repair for DTAAs and TAAAs to define contemporary practice patterns and outcomes.

PATIENTS AND METHODS

DATA SOURCE. Adult patients (aged ≥18 years) who underwent open interventions for DTAAs and TAAAs or any endovascular aortic interventions for aortic aneurysms between July 1, 2017 and June 30, 2022 (n = 7130) were identified from the STS ACSD, a repository for more than 7 million records encompassing data from 1030 participant groups. Exclusion criteria were aneurysms involving the ascending aorta or aortic arch (zone 0, 1, or 2), aortic interventions with a proximal extent in zone 0 or zone 1, aortic interventions limited to the juxtarenal or infrarenal aorta (proximal extent of aortic intervention in zone 8 or lower), hybrid or planned staged hybrid procedures, trauma involving any part of the aorta, aortic infection, unplanned aortic procedures, and missing extent of aortic interventions. Patients who underwent open DTAA or TAAA repair with sternotomy listed as the operative approach were also excluded because of the likelihood of concomitant proximal repair and erroneous coding (Figure 1). Because detailed imaging and anatomic data were unavailable, the proximal and distal extents of aortic interventions were used as surrogates to distinguish between DTAA and TAAA (Supplemental Methods) and to identify the types of TAAA on the basis of the modified Crawford classification (Supplemental Table 1). Data access for this study was approved by the STS Participant User File research program (PUF-ACSD-2020-004). The Institutional Review Board at Cedars-Sinai Medical Center (Los Angeles, CA) approved the study protocol with a waiver of informed consent (STUDY00001188, approved on February 19, 2021). All patient characteristics and study end points were defined according to standard STS ACSD definitions.

STUDY END POINTS. The primary end points included a composite of operative mortality, permanent stroke, or spinal cord injury, as well as its individual components. Secondary end points included renal failure, prolonged ventilation >24 hours, postoperative transfusions, and gastrointestinal events or liver dysfunction or failure. Detailed definitions of end points are shown in the Supplemental Methods.

STATISTICAL METHODS. Baseline characteristics were reported as either mean with SD or median with interquartile range (IQR) for continuous variables and proportions for categoric variables. Between-group comparisons were performed using the Student *t* test or the Wilcoxon rank sum test for continuous variables and the Pearson χ^2 test for categoric variables. Procedural trends were analyzed using the Cochran-Armitage trend test. For missing data, single imputation was used for variables with <5% missingness, similar to methods described and validated in previous STS risk prediction models. Included variables with missing data are reported in Supplemental Table 2.

A risk-adjusted comparison between endovascular repair and open surgical repair was performed by logistic regression using a generalized estimating equation model with a logit link function and binomial distribution adjusting for clustering at the center level. Separate models were constructed for patients with DTAA and TAAA, and a composite end point of operative mortality, permanent stroke, or spinal cord injury was used as the outcome of interest. Variables included for adjustment were selected a priori on the basis of data availability and clinical significance. These variables were age, race, body mass index, sex, diabetes, hyperlipidemia, hypertension, peripheral vascular disease, cerebrovascular disease, long-term dialysis dependence, congestive heart failure, atrial fibrillation, urgency of the procedure, aneurysm rupture, cardiogenic shock, unresponsive neurologic status, previous aortic interventions, genetic aortopathy, previous

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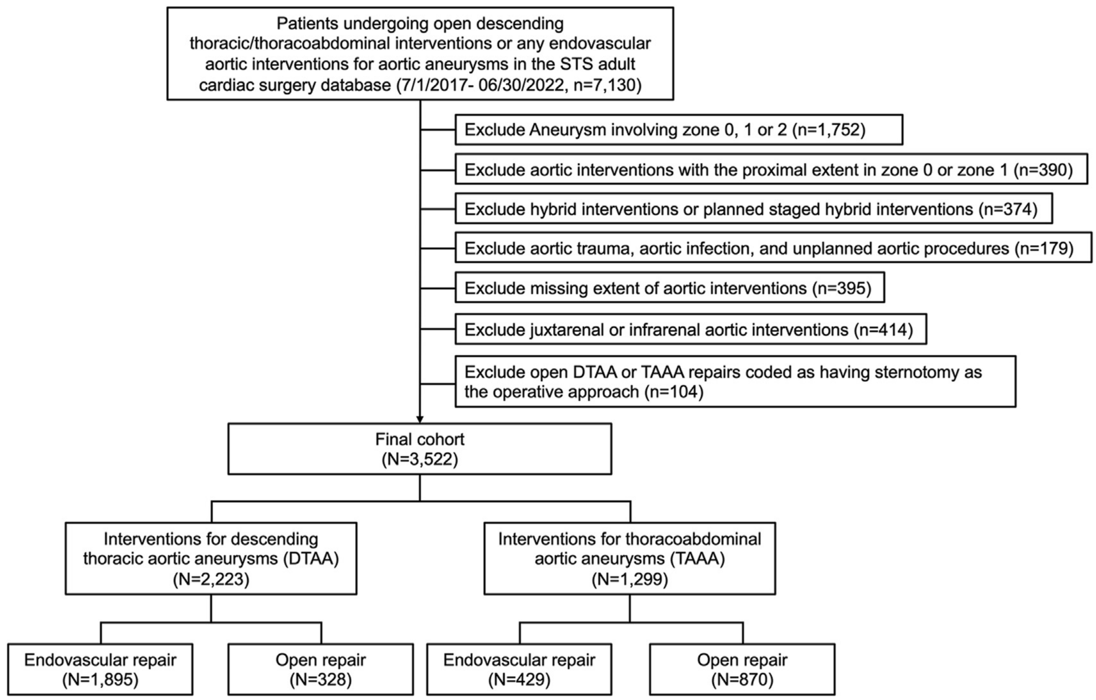

FIGURE 1 Study cohort identification. (DTAA, descending thoracic aortic aneurysm; STS, The Society of Thoracic Surgeons; TAAA, thoracoabdominal aortic aneurysm.)

coronary artery bypass grafting or heart valve surgery, and preoperative spinal drain placement. For the model including patients with TAAA, the modified Crawford classification was also added.

We also constructed 4 separate logistic regression models to determine factors associated with a composite end point of operative mortality, permanent stroke, or spinal cord injury in patients undergoing open DTAA repair, endovascular DTAA repair, open TAAA repair, and endovascular TAAA repair. Clustering at the center level was similarly addressed, and the variables included in the final model were chosen on the basis of stepwise selection. All tests were 2-tailed with an α level of 0.05. All statistical analyses were performed using SAS software version 9.4 (SAS Institute).

RESULTS

INTERVENTIONS FOR DTAA: PATIENT AND PROCEDURAL CHARACTERISTICS. After exclusions, a total of 2223 patients underwent interventions for DTAA during the study period: 1895 (85.2%) patients had endovascular repairs, and 328 (14.8%) patients had open surgical repairs. Procedural trends are shown in Figure 2A, with an increasing proportion of endovascular interventions over time ($P = .02$). Compared with patients who had endovascular repairs, patients who underwent open surgical repairs were younger (56 years [IQR, 46-66 years] vs 72 years [IQR, 64-78 years]; $P < .001$), with fewer comorbidities such as diabetes, chronic lung disease, and malignant disease (Table 1). Patients who underwent open surgical repair were more likely to have had previous aortic interventions (62.2% vs 39.2%), a family history of aortopathy (14.0% vs 8.7%), and genetic aortopathy (18.6% vs 5.7%; all $P < .01$). Other baseline patient and procedural characteristics are outlined in Table 1.

Among the 1895 patients undergoing endovascular repair, 1791 (94.5%) had femoral access, 1500 (79.2%) had percutaneous access, and 523 (27.6%) had an intravascular ultrasound examination during the procedure. Data on left subclavian artery management were available in 1771 patients: 1371 (77.4%) had native flow, 309 (17.5%) had an extraanatomic bypass, 43 (2.4%) had a branched or parallel graft, 26 (1.5%) had stent graft fenestration, and 18 (1.0%) did not have any flow restored. Among the 328 patients who underwent open surgical repair, cardiopulmonary bypass was used in 290 (88.4%), with a median bypass time of

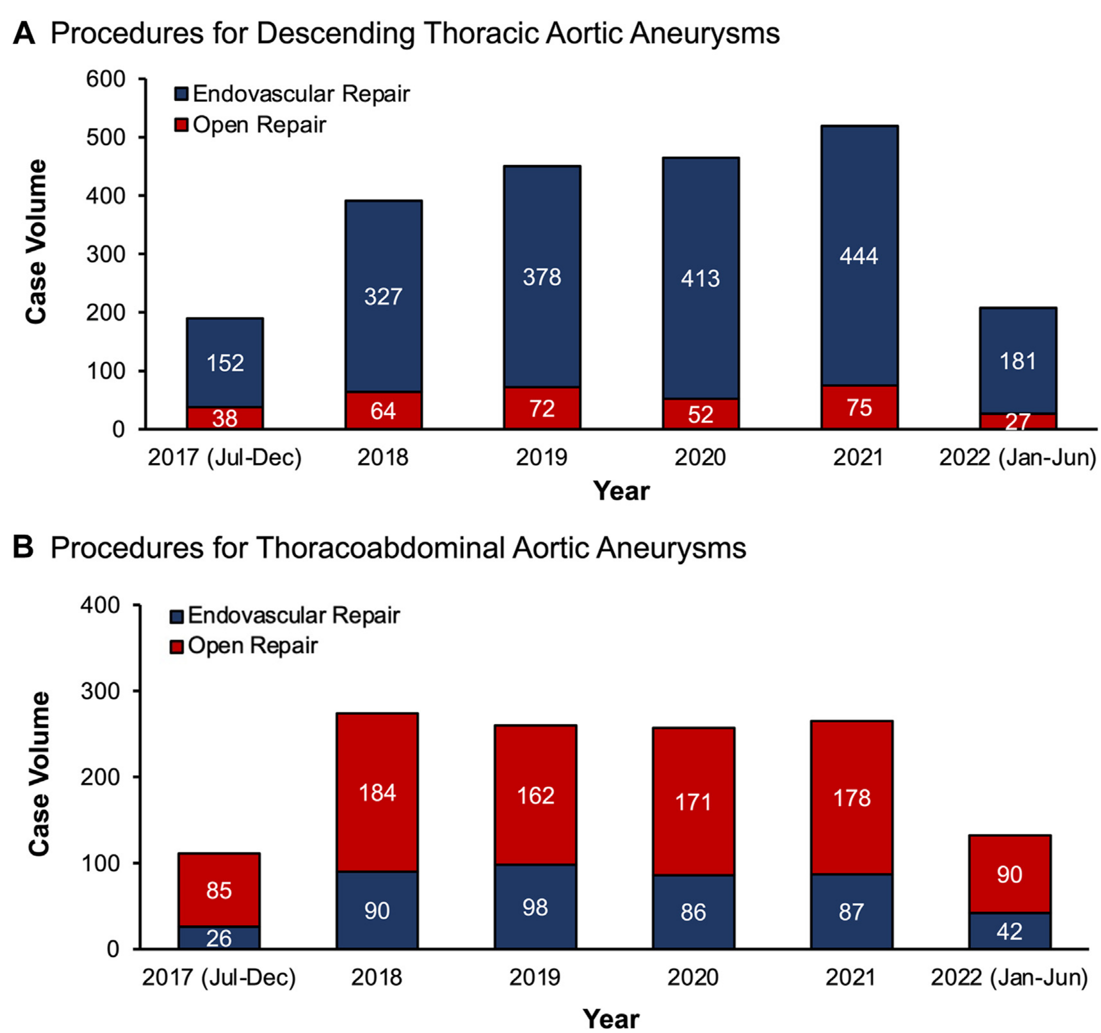

FIGURE 2 Procedural trends for (A) descending thoracic aortic aneurysm repair and (B) thoracoabdominal aortic aneurysm repair. (Jan, January; Jul, July; Jun, June; Dec, December.)

135 minutes (IQR, 74-201 minutes). Circulatory arrest was used in 138 (42.1%), and the median total circulatory arrest time was 28 minutes (IQR, 19-42 minutes). Intercostal arteries were reimplanted in 75 (22.9%) patients.

INTERVENTIONS FOR DTAA: OUTCOMES. The operative mortality, permanent stroke rate, and rate of spinal cord injury were 4.2%, 3.8%, and 2.4% for endovascular repair and 9.2%, 8.5%, and 4.6% for open surgical repair, respectively (all $P < .05$) (Table 2). Other outcomes are listed in Table 2. Factors associated with the composite primary outcome for open and endovascular DTAA repairs, respectively, are outlined in Table 3. Preoperative spinal drain placement (univariate odds ratio [OR], 0.88; 95% CI, 0.63-1.23; $P = .45$) and left subclavian artery revascularization (univariate OR, 1.23; 95% CI, 0.85-1.79; $P = .28$) were not associated with an increased risk of having the composite primary outcome. In the multivariable analysis, open surgical repair was associated with an increased risk of experiencing the primary composite end point (adjusted OR, 3.43; 95% CI, 2.15-5.46; $P < .001$). Short-term outcomes in a subgroup of patients without rupture, emergency or emergency salvage status, preoperative cardiogenic shock, or preoperative unresponsive neurologic status are outlined in Supplemental Table 3.

INTERVENTIONS FOR TAAA: PATIENT AND PROCEDURAL CHARACTERISTICS. A total of 1299 patients underwent interventions for TAAA during the study period after exclusions: 429 (33.0%) patients had endovascular repairs, and 870 (67.0%) patients

TABLE 1 Baseline Characteristics of Patients Undergoing Descending Thoracic Aortic Aneurysm Repair and Thoracoabdominal Aortic Aneurysm Repair

	Descending Thoracic Aortic Aneurysm			Thoracoabdominal Aortic Aneurysm		
Variable	Endovascular Repair (n = 1895)	Open Repair (n = 328)	*P* Value	Endovascular Repair (n = 429)	Open Repair (n = 870)	*P* Value
Age, y	72 (64–78)	56 (46–66)	<.001	73 (66–79)	64 (53–71)	<.001
Male sex	54.1 (1026)	66.2 (217)	<.001	55.9 (240)	58.9 (512)	.32
Body mass index, kg/m^2	26.8 (23.5–30.6)	28.4 (24.6–32.6)	<.001	25.9 (22.5–29.6)	26.3 (23.0–29.9)	.30
White race	70.2 (1330)	60.1 (197)	<.001	72.5 (311)	69.3 (603)	.19
Diabetes	21.9 (414)	11.9 (39)	<.001	18.4 (79)	12.8 (111)	.007
Hypertension	91.4 (1732)	87.8 (288)	.04	91.4 (392)	90.7 (789)	.69
Hyperlipidemia	40.3 (763)	35.4 (116)	.09	45.2 (194)	39.1 (340)	.03
Peripheral vascular disease	47.0 (890)	45.1 (148)	.54	67.1 (288)	69.2 (890)	.45
Cerebrovascular disease	24.7 (468)	18.9 (62)	.02	22.6 (97)	21.4 (186)	.61
Chronic lung disease	36.7 (696)	26.8 (88)	<.001	42.7 (183)	41.6 (362)	.72
Supplemental oxygen use	4.8 (90)	1.8 (6)	.02	7.7 (33)	1.5 (13)	<.001
Congestive heart failure	16.9 (320)	14.6 (48)	.31	18.2 (78)	14.7 (128)	.10
Atrial fibrillation	21.3 (404)	18.3 (60)	.21	23.1 (99)	17.8 (155)	.02
Malignant disease	7.7 (146)	2.1 (7)	<.001	8.9 (38)	4.9 (43)	.006
Previous aortic intervention	39.2 (742)	62.2 (204)	<.001	47.3 (203)	59.0 (513)	<.001
Previous CABG	9.3 (177)	6.7 (22)	.12	12.8 (55)	9.1 (79)	.04
Previous PCI	15.4 (291)	4.9 (16)	<.001	14.7 (63)	12.1 (105)	.19
Family history of aortic disease	8.7 (164)	14.0 (46)	.002	9.8 (42)	15.1 (131)	.009
Genetic aortopathy	5.7 (107)	18.6 (61)	<.001	6.1 (26)	17.4 (151)	<.001
Procedure status			.12			.59
Elective	66.4 (1225)	71.3 (234)		69.2 (297)	72.2 (628)	
Urgent	26.1 (494)	24.4 (80)		24.2 (104)	22.2 (193)	
Emergency	7.5 (143)	4.3 (14)		6.3 (27)	5.5 (48)	
Emergency salvage	0.2 (4)	0.0 (0)		0.2 (1)	0.1 (1)	
Aortic rupture	10.2 (193)	4.9 (16)	.002	8.6 (37)	8.4 (73)	.89
Preoperative spinal drain	35.6 (674)	67.1 (220)	<.001	43.6 (187)	78.2 (680)	<.001
Intraoperative blood transfusions	12.7 (241)	83.8 (275)	<.001	19.6 (84)	94.8 (825)	<.001
Intraoperative cerebral oximetry use	14.8 (280)	59.5 (195)	<.001	11.7 (50)	50.6 (440	<.001
Crawford extent			N/A			<.001
I	N/A	N/A		25.4 (109)	18.9 (164)	
II	N/A	N/A		7.5 (32)	38.2 (332)	
III	N/A	N/A		7.0 (30)	28.1 (244)	
IV	N/A	N/A		43.1 (185)	9.2 (80)	
V	N/A	N/A		17.0 (73)	5.8 (50)	

Variables are expressed in % (n) or median (interquartile range). CABG, coronary artery bypass grafting; N/A, not applicable; PCI, percutaneous coronary intervention.

had open surgical repairs. Practice trends are shown in Figure 2B, with a stable proportion of patients undergoing endovascular repair ($P = .68$ for trend). Compared with patients who underwent endovascular repair, patients who underwent open surgical repair were younger (64 years [IQR, 53-71 years] vs 73 years [IQR, 66-79 years]; $P < .001$) and had fewer comorbidities (Table 1). Patients who underwent open surgical repair were more likely to have had previous aortic interventions (59.0% vs 47.3%), genetic aortopathy (17.4% vs 6.1%), and a family history of aortopathy (15.1% vs 9.8%; all $P < .05$). Other baseline patient and procedural characteristics are outlined in Table 1.

Among the 429 patients who underwent endovascular repair, 397 (92.5%) had femoral access, 347 (80.9%) had percutaneous access, and 98 (22.8%) had an intravascular ultrasound examination during the procedure. An endoleak at the end of the procedure was present in 33 (7.7%) patients. Among the 870 patients who underwent open TAAA repair, 262 (30.1%) procedures were performed at low-volume centers (<3 cases per year), 301 (34.6%) procedures were performed at medium-volume centers (3-7 cases per year), and 307 (35.3%) procedures were performed at high-volume centers (≥8 cases per year). These volume categories were defined by stratifying patients into terciles on the basis of the annual institutional

TABLE 2 Short-term Postprocedural Outcomes of Patients Undergoing Descending Thoracic Aortic Aneurysm Repair and Thoracoabdominal Aortic Aneurysm Repair

	Descending Thoracic Aortic Aneurysm			Thoracoabdominal Aortic Aneurysm		
Variable	Endovascular Repair (n = 1895)	Open Repair (n = 328)	*P* Value	Endovascular Repair (n = 429)	Open Repair (n = 870)	*P* Value
Composite end point	9.1 (173)	16.8 (55)	<.001	9.6 (41)	25.1 (218)	<.001
Operative mortality	4.2 (80)	9.2 (30)	<.001	6.5 (28)	11.7 (102)	.003
Stroke	3.8 (72)	8.5 (28)	<.001	2.1 (9)	6.0 (52)	.002
Spinal cord injury	2.4 (46)	4.6 (15)	.03	3.0 (13)	12.2 (106)	<.001
Renal failure	2.0 (38)	12.8 (42)	<.001	3.5 (15)	27.1 (236)	<.001
New dialysis	1.2 (23)	10.7 (35)	<.001	2.8 (12)	21.4 (186)	<.001
Postoperative transfusions	19.6 (371)	62.2 (204)	<.001	28.0 (120)	79.9 (695)	<.001
Prolonged ventilation>24 h	7.5 (143)	35.4 (116)	<.001	6.3 (27)	48.9 (425)	<.001
GI or liver events	2.4 (46)	10.7 (35)	<.001	4.9 (21)	18.4 (160)	<.001

Variables are expressed in % (n). GI, Gastrointestinal.

volume of open TAAA repair in a given calendar year. Cardiopulmonary bypass was used in 639 (73.5%) patients, with a median bypass time of 145 minutes (IQR, 87-219 minutes). Circulatory arrest was used in 166 (19.1%) patients, with a median total circulatory arrest time of 32 minutes (IQR, 20-57 minutes). Intercostal arteries were reimplanted in 333 (38.3%) patients (Supplemental Table 4). Among 362 patients with available data, 112 (30.9%) had left-sided heart bypass.

INTERVENTIONS FOR TAAA: OUTCOMES. The operative mortality, permanent stroke rate, and rate of spinal cord injury were 6.5%, 2.1%, and 3.0% for endovascular repair and 11.7%, 6.0%, and 12.2% for open surgical repair, respectively (all $P < .05$) (Table 2). Other outcomes are listed in Table 2. Operative mortality for open TAAA repair was 16.4% at low-volume centers, 11.0% at medium-volume centers, and 8.5% at high-volume centers ($P = .01$). Comparison of open vs endovascular TAAA repairs stratified by the modified Crawford extent is shown in Supplemental Table 5. Factors associated with the primary composite end point for open and endovascular TAAA repairs, respectively, are outlined in Table 3. In the multivariable analysis, open surgical repair was associated with an increased risk of experiencing the composite end point (adjusted OR, 3.92; 95% CI, 2.25-6.82; $P < .001$). Short-term outcomes in a subgroup of patients without rupture, emergency or emergency salvage status, preoperative cardiogenic shock, or preoperative unresponsive neurologic status are shown in Supplemental Table 6.

COMMENT

This study reported short-term outcomes of open and endovascular repair of DTAAs and TAAAs by using a contemporary cohort of patients from the STS ACSD. Detailed clinical and operative data in the newly established aortic section of the STS ACSD provided additional granularity regarding contemporary practice patterns compared with previous analyses of administrative data. Importantly, the present study captures only DTAA and TAAA interventions performed by cardiac surgeons in the STS ACSD. Interventions performed by vascular surgeons are not included. There are several noteworthy findings. First, endovascular repair was the predominant approach for treating DTAAs, whereas most patients undergoing TAAA interventions had open surgical repair. Second, open surgical repair was associated with increased operative mortality and permanent stroke compared with endovascular repair in patients with both DTAAs and TAAAs, although significant selection bias exists, and detailed anatomic eligibility data were unavailable. Third, a clear volume-outcome relationship exists for open repair of TAAAs, and superior outcomes are observed when surgery is performed at higher-volume centers.

To date, there are no randomized controlled trials comparing open vs endovascular repair for DTAAs or TAAAs. In the context of DTAAs, pivotal device trials have demonstrated lower perioperative morbidity and aneurysm-related mortality compared with open surgical repair in short-term and midterm follow-up,[4,5,7] whereas observational studies are generally limited by significant selection bias, often comparing patients with different anatomic eligibility and risk profiles.[3,8] In our study, open repair of DTAAs was associated with higher operative mortality and stroke. However, circulatory arrest was used in 42.1% of those patients undergoing

TABLE 3 Factors Associated With the Composite End Point of Operative Mortality, Permanent Stroke, or Spinal Cord Injury

Variable	Odds Ratio	95% CI	*P* Value
Open DTAA repair			
Intraoperative blood product administration	4.25	1.23–14.63	.02
Aortic rupture	3.20	1.08–9.53	.04
Age (for every 1-y increase)	1.05	1.03–1.08	<.001
Endovascular DTAA repair			
Hyperlipidemia	1.49	1.07–2.08	.02
Dialysis dependence	2.57	1.26–5.24	.009
Aortic rupture	2.45	1.59–3.76	<.001
Preprocedural cardiogenic shock	6.93	2.42–19.90	<.001
Intraoperative blood product administration	3.24	2.22–4.73	<.001
Age (for every 1-y increase)	1.02	1.01–1.03	.04
Open TAAA repair			
Crawford extent			
I	Reference	Reference	Reference
II	1.91	1.21–3.03	.005
III	1.03	0.63–1.68	.92
IV	0.80	0.40–1.61	.53
V	0.63	0.26–1.49	.29
Aortic rupture	2.29	1.37–3.82	.002
Chronic lung disease	1.40	1.01–1.95	.04
Age (for every 1-y increase)	1.03	1.01–1.04	<.001
Annual center volume of open TAAA repair			
<3 cases	Reference	Reference	Reference
3–7 cases	0.59	0.41–0.87	.007
≥8 cases	0.54	0.36–0.82	.003
Endovascular TAAA repair			
Age (for every 1-y increase)	1.05	1.01–1.08	.01
Intraoperative blood product administration	5.62	2.79–11.30	<.001
Hyperlipidemia	0.43	0.21–0.89	.02
Congestive heart failure history	2.84	1.34–6.01	.006

DTAA, descending thoracic aortic aneurysm; TAAA, thoracoabdominal aortic aneurysm.

open repair, a finding suggesting a highly complex group of patients. For TAAAs, the comparison of endovascular and open repair is difficult because of the current investigational status of endovascular devices, the variety of approaches to both open and endovascular repairs, and different patient populations with varying extents of disease.[9] Therefore, our intent was not to perform a direct head-to-head comparison of the 2 treatment strategies but rather to describe the general short-term outcomes by using a contemporary, national cohort, especially given that not all patients are simultaneously eligible for both treatment strategies.

We observed that most patients who underwent DTAA treatment had endovascular repair (83.4%). This observation is consistent with current guideline recommendations suggesting that endovascular repair should be preferred for anatomically eligible patients without connective tissue disorders.[6] In contrast, only 35.6% of patients (n = 498) with TAAAs underwent endovascular repair during our study period. This finding contrasted with that of a previous study of the US National Inpatient Sample database suggesting that treatment of TAAAs has shifted predominantly to endovascular repair over the last 2 decades.[10] Analyses of German national data[11] and administrative data from Ontario, Canada[12] have similarly highlighted the shift in practice preferences from open repair to endovascular repair for TAAAs. The Society for Vascular Surgery's Vascular Quality Initiative database also confirmed a significant number of complex endovascular interventions for TAAAs, with 5826 cases reported between 2014 and 2022.[13] It is possible that because our study used only data from the STS ACSD, procedures performed by noncardiac surgeons (eg, vascular surgeons) were not included. Therefore, our data on procedural trends and technical approaches may not accurately reflect overall national practice and should be interpreted with caution.

Many previous studies have observed a volume-outcome relationship for complex vascular procedures such as TAAA repair.[14,15] We similarly found that a higher annual center volume of open TAAA repair was associated with lower odds of experiencing the composite of operative mortality, permanent stroke, or spinal cord injury. The operative mortality for open TAAA repair at high-volume centers was 8.3%, similar to the 7.5% reported by Coselli and colleagues[1] in a single-center series of more than 3000 open TAAA repairs. Our finding further supports the rationale of referring patients with TAAA who need open repair to high-volume, experienced aortic centers. However, we did not observe a similar volume-outcome relationship in other cohorts of patients undergoing endovascular DTAA repair, open DTAA repair, or endovascular TAAA repair. This finding may be related to the overall low case volume of open DTAA repairs and endovascular TAAA repairs during the study period and may therefore limit the statistical power to detect significant differences. Additionally, because the STS ACSD captures only procedures performed by cardiac surgeons, it is likely that not all DTAA and TAAA interventions performed nationally are included in this analysis, thus preventing a complete evaluation of the volume-outcome relationship.

STUDY LIMITATIONS. This analysis of contemporary practice trends and outcomes of patients undergoing DTAA and TAAA interventions has several limitations. First, procedures performed by noncardiac surgeons (eg, vascular surgeons) may not be captured in the STS ACSD, and this could limit the analysis of procedural trends, national practice patterns, and volume-outcome relationship. Second, because of the absence of detailed imaging and anatomic eligibility data, the designation of DTAA vs TAAA and the Crawford extent for TAAAs were determined on the basis of the extent of aortic interventions, which may be inaccurate. However, a similar method was used in a previous analysis of the Society for Vascular Surgery's Vascular Quality Initiative data.[16] Third, some data elements were incomplete and may be subject to inaccurate coding, particularly those elements related to aortic branch vessel management. We also lacked detailed variables regarding intraoperative adjuncts that may be used during TAAA repair, such as renal or visceral perfusion. Finally, only short-term outcomes were available in the STS ASCD, thus limiting the ability to evaluate longer-term survival, aneurysm-related complications, and reinterventions. Future linkage of the STS ACSD with other administrative data sets will be crucial to evaluate longer-term, real-world outcomes more thoroughly.

CONCLUSION. Among interventions for DTAAs and TAAAs that were captured by the STS ACSD, endovascular repair was the predominant approach for treating DTAAs, whereas most patients who underwent interventions for TAAAs had open surgical repair. Patients selected for open repair of DTAAs and TAAAs had significantly greater short-term morbidity and mortality, although significant selection bias may exist, and the lack of longer-term outcomes prevents us from drawing firm conclusions regarding whether one treatment modality is superior to the other. Identification of factors associated with increased risk of mortality and morbidity may allow improved risk stratification that can target anatomically eligible patients for endovascular repair. Additionally, the delegation of high-risk patients to aortic centers of excellence may be an appropriate strategy to improve outcomes.

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DISCLOSURES

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