Midterm outcomes of thoracic endovascular aortic repair versus optimal medical therapy for uncomplicated acute type B dissection

Kevin G. Hu, BS,[a] Wei-Guo Ma, MD,[a] Stevan Pupovac, MD,[a] Irbaz Hameed, MD,[a] Soraya Fereydooni, MD,[a] Eric S. Li, MD,[a] Haleigh Larson, MD,[a] Mohammad Zafar, MBBS,[a] Britt Tonnessen, MD,[b] Jonathan Cardella, MD,[b] Eduard Aboian, MD,[b] Raul Guzman, MD,[b] Cassius Ochoa Chaar, MD,[b] David Strosberg, MD,[b] Matthew Williams, MD,[a] Naiem Nassiri, MD,[b] Roland Assi, MD,[a] and Prashanth Vallabhajosyula, MD, MS[a]

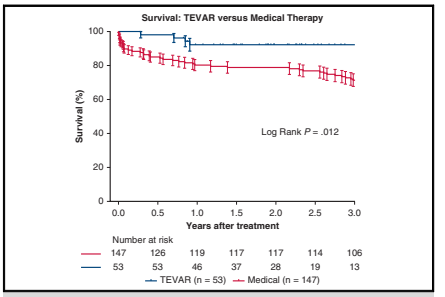
ABSTRACT

Objective: We sought to compare the early and midterm outcomes of thoracic endovascular aortic repair (TEVAR) versus optimal medical therapy (OMT) for uncomplicated acute type B aortic dissection.

Methods: Data were analyzed for 200 consecutive patients with uncomplicated acute type B aortic dissection from February 1992 to July 2022, including 147 with initial OMT and 53 undergoing TEVAR at index hospitalization. Baseline, intraoperative, and postoperative data, survival, and (re)intervention were compared between the two strategies.

Results: In-hospital/30-day mortality was 7.5% (15/200) for the entire series, which was significantly lower in the TEVAR group compared with the OMT group (0 vs 10.2% [15/147]; $P = .013$). Thirty-day rates were 5.7% (3/53) for reintervention after TEVAR and 15.6% (23/147) for intervention after OMT ($P = .064$). Death within 30 days of (re)intervention was 0 (n = 0) in the TEVAR group and 18.4% (n = 14) in the OMT group ($P = .063$). There were no significant differences in the incidences of stroke, paraplegia, acute kidney injury, sepsis, or malperfusion syndrome after initial treatment. Kaplan–Meier survival in the TEVAR group was 92.3% (95% CI, 80.7-97.0) at 1 year and 3 years, significantly higher than in the OMT group (80.3% [95% CI, 72.8-85.8] and 71.4% [95% CI, 63.4-78.0]; $P = .012$). In patients aged 65 years or more, TEVAR also achieved a significantly higher survival, which was 93.7% (95% CI, 77.5-98.3 vs 69.7% [95% CI, 58.0-78.7]) at 1 year and 93.7% (95% CI, 77.3-98.3] vs 60.5% [95% CI, 48.7-70.5]) at 3 years ($P < .001$).

Conclusions: In this single-institution experience, upfront TEVAR performed at index hospitalization for uncomplicated acute type B aortic dissection was associated with improved survival at early and midterm follow-up. (JTCVS Open 2025;24:67-76)



TEVAR improved survival for uATBAD up to 3 years compared with medical treatment. *TBAD*, Type B aortic dissection.

CENTRAL MESSAGE

Management of uATBAD using TEVAR by a multidisciplinary aortic team may render improved survival compared with OMT in the early and midterm.

PERSPECTIVE

The optimal treatment strategy for uATBAD remains undefined. This single-center experience showed that TEVAR for patients with uATBAD was associated with improved survival at 30 days, 1 year, and 3 years compared with OMT, even in those aged more than 65 years. These results argue favorably for consideration of using TEVAR as first-line treatment for uATBAD.

From the Divisions of [a]Cardiac Surgery and [b]Vascular Surgery, Department of Surgery, Yale School of Medicine, New Haven, Conn.

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K.G.H. and W-G.M. contributed equally to this article.

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Address for reprints: Prashanth Vallabhajosyula, MD, Director, Yale Aortic Institute, Director, Yale Pulmonary Thromboendarterectomy Program Division of Cardiac Surgery, Yale School of Medicine, 330 Cedar St BB204, New Haven, CT 06520 (E-mail: prashanth.vallabhajosyula@yale.edu).

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Abbreviations and Acronyms

AKI = acute kidney injury
ATBAD = acute type B aortic dissection
EVAR = endovascular abdominal aortic repair
IQR = interquartile range
OMT = optimal medical therapy
TEVAR = thoracic endovascular aortic repair
STS/SVS = Society for Thoracic Surgery and Society for Vascular Surgery
uATBAD = uncomplicated acute type B aortic dissection

Traditionally, acute type B aortic dissection (ATBAD) has been managed with optimal medical therapy (OMT), comprising aggressive anti-impulse medical therapy for blood pressure control and appropriate pain control.[1] Although thoracic endovascular aortic repair (TEVAR) has emerged as the standard of care for patients presenting with complicated ATBAD, its role in the management of uncomplicated ATBAD (uATBAD) remains undefined.[2] Two prospective randomized trials have compared TEVAR and OMT to OMT alone. The ADSORB trial demonstrated improved aortic remodeling but failed to show any significant difference in 1-year survival.[3] The INSTEAD trial only found a significant decrease in aorta-specific mortality in the TEVAR cohort at 5-year follow-up.[4] Despite the positive effects of aortic remodeling in favor of TEVAR,[3] data supporting survival benefit of TEVAR for uATBAD are mixed.[5-9] A study of 145 pairs of propensity score–matched patients with uATBAD showed a significant survival benefit with TEVAR,[7] and another retrospective series of 338 patients found higher rates of rupture and mortality with medical therapy.[8] A recent survey from Australia and Europe showed the ratio of physicians choosing TEVAR rather than OMT for uATBAD as approximately 50:50,[10] and current societal guidelines recommend medical therapy as the initial management strategy for uATBAD.[11-13] Although the 2020 Society for Thoracic Surgery and Society for Vascular Surgery (STS/SVS) guidelines recommended consideration of TEVAR for uATBAD in patients with well-defined high-risk features based on anatomic and clinical parameters,[14] collectively, these results highlight the need to better understand the potential role of TEVAR in the management of uATBAD.

At our institution, until November 2019, all patients presenting with uATBAD were medically managed with tight blood pressure control, and surgical repair was considered in those who sustained delayed complications such as malperfusion syndrome, rapid aortic enlargement, and contained aortic rupture. In November 2019, cardiac surgeons specializing in aortic surgery, vascular surgeons, anesthesiologists, and intensive care physicians formed a dedicated team for joint management of all patients with ATBAD. Accordingly, a change in the management algorithm was instituted with upfront TEVAR, instead of OMT, being the first-line treatment for uATBAD with high-risk features. We report our institutional outcomes comparing these 2 management strategies for uATBAD.

MATERIAL AND METHODS

The Yale University Human Investigation Committee approved this retrospective study and waived the need for patient consent (Institutional Review Board protocol ID: 2000020356, date of approval: 3/2/2017, latest update 1/17/2023).

Patients

All patients presenting with uATBAD (n = 217) from February 1992 to June 2022 admitted to our institution were evaluated retrospectively. Of these, 17 patients were excluded due to incomplete data or findings of complicated ATBAD (Figure 1). ATBAD was defined as any acute aortic dissection process that (1) spares the ascending aorta and arch; (2) has an entry tear at or distal to the left subclavian artery; (3) involves at least the entire descending thoracic aorta; and (4) had patient presentation and admission for uATBAD within 48 hours of symptom onset.

Until November 2019, OMT was the first-line treatment for patients with uATBAD with and without high-risk features, and only 15 such patients underwent TEVAR for complications during follow-up, whereas patients without high-risk features were treated with OMT even after November 2019. Starting from November 2019, a multidisciplinary team of cardio-aortic and vascular surgeons jointly managed uATBAD with TEVAR as first-line treatment for complicated ATBAD and uATBAD with high-risk radiologic or clinical features. This included patients with persistent pain despite OMT at 48 hours, high-risk radiologic features according to the STS/SVS guidelines,[14] and persistent hypertension with systolic blood pressure greater than 140 mm Hg despite OMT for a duration of more than 48 hours. Patients with poor conversion from intravenous to oral antihypertensive medications also underwent TEVAR. Patients with complicated ATBAD (malperfusion syndrome, aortic rupture) and incomplete clinical data were excluded from this study.

The study cohort consisted of 200 patients, with 147 receiving OMT and 53 undergoing TEVAR at index hospitalization (Figure 1). Before November 2019, 138 patients underwent OMT, including 85 patients with and 53 patients without high-risk features. After November 2019, of 62 patients with uATBAD, 39 had high-risk features or met the above criteria and underwent TEVAR and 23 did not have high-risk features, of whom 9 had OMT and 14 failed OMT and underwent TEVAR.

The whole series was followed up for a median duration of 5.3 years (interquartile range [IQR], 2.3-11.3 years; mean 7.3 $\pm$ 6.3 years). The median follow-up was 8.7 years (IQR, 5.0-13.8 years; mean 9.4 $\pm$ 6.3 years) in the OMT group and 2.1 years (IQR, 1.3-2.8 years; mean 2.1 $\pm$ 0.9 years) in the TEVAR group. Therefore, we only compared outcomes up to 3 years, given the shorter follow-up in the TEVAR group.

Management

All patients with ATBAD were given anti-impulse therapy targeting a systolic blood pressure of 100 to 120 mm Hg and heart rate of less than 80 bpm. Anti-impulse therapy comprised treatment with nicardipine, along with esmolol (or labetalol) and nitroprusside infusion. Patients were considered to have failed anti-impulse therapy if target systolic blood pressure less than 130 mm Hg was not achieved within 48 hours and would be considered for TEVAR via a shared decision-making approach.

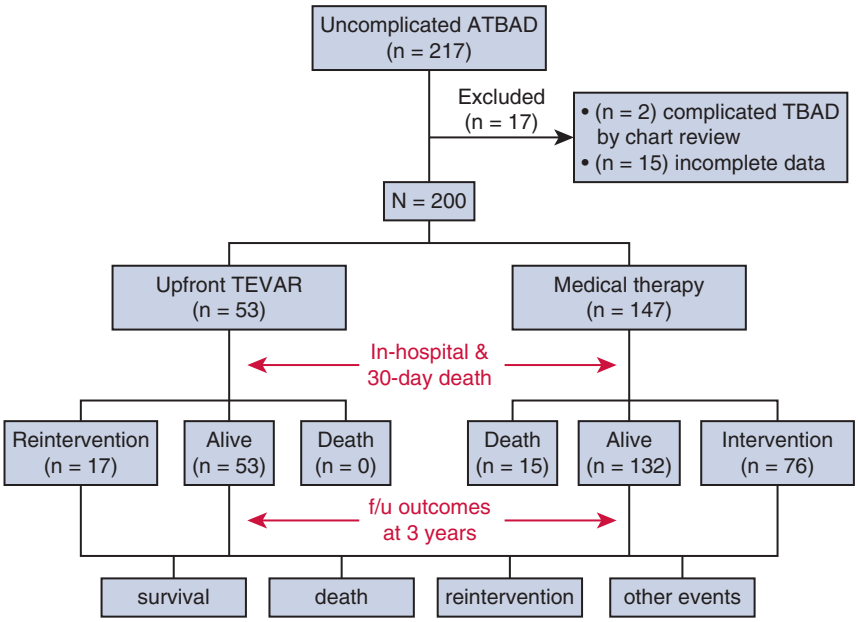

FIGURE 1. Inclusion of patients with uATBAD is shown in this flow chart. *uATBAD*, Uncomplicated acute type B aortic dissection; *TEVAR*, thoracic endovascular aortic repair; *f/u*, follow-up.

In patients undergoing TEVAR, central line and right radial arterial line was placed. Intraoperatively, intravascular ultrasound was performed to cross-confirm true lumen access and endografting sizing by ultrasound was compared to computed tomography imaging results. In cases of discordance, we chose the intravascular ultrasound data for TEVAR sizing. We primarily used Relay Pro endograft (Terumo Aortic, Florida) at our center. The decision for endograft sizing was performed jointly with the goal of 0 oversizing (at most 5%) at the proximal landing zone and maximum 5% oversizing at the distal landing zone. As experience accrued, we increasingly used tapered devices to prevent oversizing at the distal landing zone, where the true lumen is typically smaller in zones 4/5 compared to zones 2/3. We preferred to perform carotid-left subclavian bypass, especially when the left vertebral artery was dominant or codominant. All patients had neuromonitoring with continuous electroencephalogram and somatosensory or motor evoked potentials. Cerebrospinal fluid drainage catheter was not preemptively placed. After endograft deployment, mean arterial pressure was maintained at >90 mmHg.

Definitions

Reintervention in the TEVAR group was defined as any open or endovascular repair on the aorta or iliac arteries after the index TEVAR operation. Intervention in the OMT group was defined as any open or endovascular repair on the aorta or iliac arteries after OMT was deemed inadequate for treating uATBAD due to development of aortic complications. Acute kidney injury (AKI) was defined as an increase of serum creatinine of more than 1.5-fold from baseline at any point after initial treatment.

Statistical Analysis

Statistical analyses were performed using R (version 4.1.2). Data are expressed as mean ± SD or median (IQR), or as number (%). Comparisons were made using Student *t* test or Mann–Whitney *U* test was used for comparison of continuous variables, and Pearson's chi-square test or Fisher exact test for categorical variables. Normality of continuous variables was assessed with the Shapiro–Wilk test. Survival and reintervention were assessed with the Kaplan–Meier method and compared by log-rank test. Competing risks of death and reintervention were estimated based on decomposition of time-related events into component phases, as described by Blackstone and colleagues.[15] All statistical tests were 2-sided and a *P* value of <.05 was considered statistically significant.

RESULTS

Baseline Characteristics and Operative Data

Mean age was 63.8 ± 14.4 years, and 123 were men (61.5%). Hypertension was seen in 145 patients (72.5%), dyslipidemia in 73 patients (36.5%), smoking in 92 patients (46.0%), diabetes in 25 patients (12.5%), Marfan syndrome in 10 patients (5.0%), and prior cardiac surgery in 40 patients (20.0%). The 2 groups were otherwise similar in baseline characteristics except a higher percentage of male patients in the TEVAR group (73.5% versus 57.1%, $P = .035$) (Table 1). Mean time from onset to TEVAR was 5.8 ± 4.3 days.

In the TEVAR group, left subclavian artery coverage was performed in 27 patients (50.9%), and open arch debranching was performed in 5 patients. The distal extent of TEVAR with covered stent was to zone 5 in 41 and to zone 4 in the remaining patients. Proximal landing zone was zone 0 in 5 patients, zone 2 in 38 patients, and partial zone 2/3 in 10 patients. A single endograft was used in 29 patients (54.7%), and 23 patients (43.4%) had 2 or more grafts implanted. The procedural success rate was 100%.

Early Mortality and Morbidity

For the entire cohort, 30-day mortality was 7.5% (15/200), which occurred exclusively in the OMT group (10.2% vs 0.0%, $P = .013$). Of these 15 deaths, the cause was descending aortic pathology in 12 patients (80.0%), cardiac arrest in 2 patients (13.3%), and stroke in 1 patient

TABLE 1. Baseline characteristics

Variable	OMT (N = 147)	TEVAR (N = 53)	*P* value
Age, y	63.5 ± 14.8	64.8 ± 13.2	.538
Male, n (%)	84 (57.1)	39 (73.5)	.035
Body mass index, kg/m^2	29.9 ± 8.6	30.2 ± 9.6	.862
Hypertension, n (%)	99 (67.3)	46 (86.8)	.219
Dyslipidemia, n (%)	47 (32.0)	26 (49.1)	.137
Current or prior smoking, n (%)	60 (40.8)	32 (60.4)	.105
Coronary artery disease, n (%)	23 (15.6)	11 (20.8)	.678
Chronic kidney disease, n (%)	19 (12.9)	9 (17.0)	.821
Diabetes mellitus, n (%)	16 (10.9)	9 (17.0)	.479
Prior myocardial infarction, n (%)	12 (8.2)	1 (1.9)	.112
Prior cerebrovascular event, n (%)	11 (7.5)	7 (13.2)	.413
Marfan syndrome, n (%)	7 (4.8)	3 (5.7)	.308

Values are expressed as n (%) or mean ± SD. *OMT*, Optimal medical therapy; *TEVAR*, thoracic endovascular aortic repair.

TABLE 2. Early mortality, morbidity and reintervention

Variable	OMT (N = 147)	TEVAR (N = 53)	*P* value
30-d mortality, n (%)	15 (10.2)	0 (0)	.013
Morbidity at 6 mo, n (%)			
Stroke	8 (5.4)	0 (0)	.113
Paraplegia	3 (2.0)	0 (0)	.567
Acute kidney injury	16 (10.1)	2 (3.8)	.164
Sepsis	3 (2.0)	3 (5.7)	.191
Malperfusion syndrome	12 (8.2)	1 (1.9)	.191
Reintervention, n (%)			.053
At 30 d	23 (15.6)	3 (5.7)	
1-6 mo	13 (8.8)	11 (20.7)	
6-12 mo	10 (6.8)	3 (5.7)	
Reintervention with TEVAR	11 (14.5)	10 (58.8)	<.001
30-d mortality after reintervention	14 (18.4)	0 (0)	.063

Values are expressed as n (%). *OMT*, Optimal medical therapy; *TEVAR*, thoracic endovascular aortic repair.

(6.7%). Complications after initial OMT or TEVAR included AKI in 18 patients (9%), sepsis or bacteremia in 6 patients (3.0%), and malperfusion in 13 patients (6.5%). Stroke and paraplegia occurred in 8 patients (4.0%) and 3 patients (1.5%), respectively, exclusively in the OMT group (Table 2). The mechanism of stroke was ischemic in 7 patients and hemorrhagic in 1 patient. One patient (1.9%) in the TEVAR group required postoperative lumbar drain placement for bilateral hip weakness. Mean length of stay was 11.7 ± 9.6 days. The OMT group did not differ significantly from the TEVAR group in the incidence of stroke (5.4% vs 0, $P = .11$), paraplegia (2.0% vs 0, $P = .57$), AKI (10.1% vs 3.8%, $P = .16$), sepsis/bacteremia (2.0% vs 5.7%, $P = .19$), or malperfusion syndrome (8.2% vs 1.9%, $P = .19$) within 6 months of initial treatment.

(Re)intervention in Optimal Medical Therapy and Thoracic Endovascular Aortic Repair Groups

Of the whole series, (re)intervention was performed in 93 patients: 17 (32.1%) in the TEVAR group and 76 (51.7%) in the OMT group. Reintervention with distal or proximal extension was more frequent in the TEVAR group (16/17, 94.1%) than in the OMT group (11/76, 14.5%; $P < .001$). In the OMT group, median time to intervention with TEVAR or open surgery in the 76 patients was 205 days (IQR, 20-678) (Table 2). The intervention was performed within 30 days of initial OMT in 23 patients (30.4%), within 6 months in 36 patients (47.4%), and within 1 year in 46 patients (60.5%). Of the procedures for intervention, there were 39 descending thoracic aortic replacements (51.3%), 15 total arch replacements with elephant trunk (19.7%), 15 TEVARs (19.7%), 4 EVARs (5.2%), and 3 abdominal aortic replacements (3.9%).

In contrast, 17 patients in the TEVAR group underwent reintervention at a median of 50 days from the initial TEVAR (IQR, 38-116.5 days), with 3 performed within 30 days and all within 1 year (range, 2-284 days). The procedures included distal extension TEVAR in 11 patients at a median of 47 days (IQR, 38-194 days), endovascular abdominal aortic repair (EVAR) in 3 patients, coil embolization of the left subclavian for a proximal endoleak in 1 patient at 81 days, left iliac stenting due to new dissection in 1 patient at 7 days, and ascending aortic and hemiarch repair for progressive ascending aortic aneurysm in 1 patient at 47 days. The indications for repeat TEVAR were residual dissection in 3 patients, stent graft-induced new entry in 3 patients, completion of a staged procedure in 2 patients, and endoleak, new dissection, and iatrogenic injury in 1 patient each. The indications for EVAR were new aneurysm formation, residual dissection, and completion of staged repair in 1 patient each.

At 30 days after initial treatment, the rates were 15.6% for intervention in the OMT group (23/147) and 5.7% for reintervention in the TEVAR group (3/53) ($P = .07$). Freedom from (re)intervention was 75.5% (95% CI, 67.7-81.7) versus 71.7% (CI, 57.5-81.8) at 6 months, 68.7% (95% CI, 59.8-75.5) versus 67.9% (95% CI, 53.6-78.7) at 1 year, and 57.8% (95% CI, 49.3-65.3) versus 67.9% (95% CI, 53.6-78.7) at 3 years in the OMT versus TEVAR groups, respectively ($P = .420$) (Figure 2). Thirty-day mortality after (re)intervention was 18.4% in the OMT group (14/76) versus 5.9% (1/17) in the TEVAR group ($P = .18$). Survival after (re)intervention did not differ significantly between the 2 groups ($P = .086$), despite TEVAR patients showing a higher survival of 94.1% (95% CI, 65.0-99.1) through 3 years after (re)intervention, compared with 82.9% at 6 months, 78.9% at 1 year and 72.3% at 3 years in the OMT group (Figure 3).

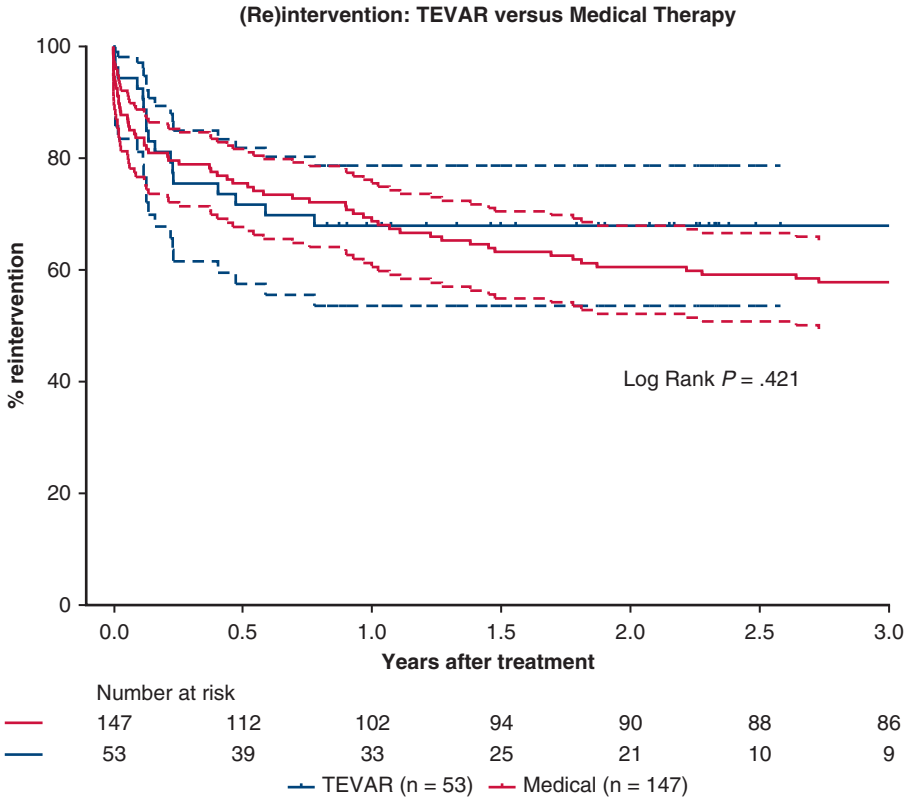

FIGURE 2. Kaplan–Meier freedom from (re)intervention for OMT and TEVAR management strategies demonstrated no significant differences. *OMT*, Optimal medical therapy; *TEVAR*, thoracic endovascular aortic repair. 95% CI.

Late Death

A total of 102 deaths occurred during follow-up, including 98 patients in the OMT group at a median of 5.0 years (IQR, 0.7-8.6 years) and 4 patients in the TEVAR group at a median of 0.8 years (IQR, 0.4-0.9) after discharge. Of the 29 deaths within 1 year in the OMT cohort, the cause was descending aortic pathology in 19 patients (65.5%), malignancy in 3 patients (10.3%), stroke and cardiac arrest in 2 patients (6.9%) each, and multisystem organ failure and pulmonary failure in 1 patient (3.4%) each. Of the 4 deaths in the TEVAR group within the first year, 1 patient died of cardiac arrest, but the cause of death was unknown for the other 3 patients. On Kaplan–Meier analysis, survival in the TEVAR group was 98.1% at 6 months (95% CI, 87.3-99.7) and 92.3% (95% CI, 80.7-97.0) at 1 year and 3 years, which was significantly higher compared with the OMT group (85.0% [95% CI, 78.1-89.8]; 80.3% [95% CI, 72.8-85.8]; 71.4% [95% CI, 63.4-78.0], respectively) (Figure 4; $P = .01$).

In patients aged 65 years or more[16] (32 with TEVAR, 76 with OMT), 30-day mortality was significantly higher in the OMT group (18.4% [14/76] vs 0 [0/32], $P = .009$). In this age subgroup, patients undergoing TEVAR at index hospitalization also showed significantly higher survival at 6 months (96.9% [95% CI, 79.7-99.5] vs 76.3% [95% CI, 65.1-84.3]), 1 year (93.7% [95% CI, 77.5-98.3] vs 69.7% [95% CI, 58.0-78.7]), and 3 years (93.7% [95% CI, 77.3-98.3] vs 60.5% [95% CI, 48.7-70.5]) compared with the OMT group ($P < .001$) (Figure 5).

Competing Outcomes Analysis for Death Versus (Re)intervention

In competing outcomes analysis, the rates of mortality and (re)intervention in the TEVAR group were 6% and 32%, respectively, and 62% were alive without (re)intervention at 3 years (Figure 6, *A*). In contrast, at 3 years in the OMT cohort, 22% were deceased, 42% had undergone an intervention, and only 36% of patients were alive without intervention (Figure 6, *B*).

DISCUSSION

The present study adds to the current literature on the optimal management strategy for uATBAD, especially in patients with high-risk features. The results of this retrospective analysis suggest that TEVAR at index hospitalization for uATBAD with high risk features may be associated with improved survival in the short and midterm, without increasing the risk of TEVAR-related complications such as death, stroke, and paraplegia. In this series, the rates of early death, stroke, and paraplegia were 0% in the TEVAR cohort, suggesting that a

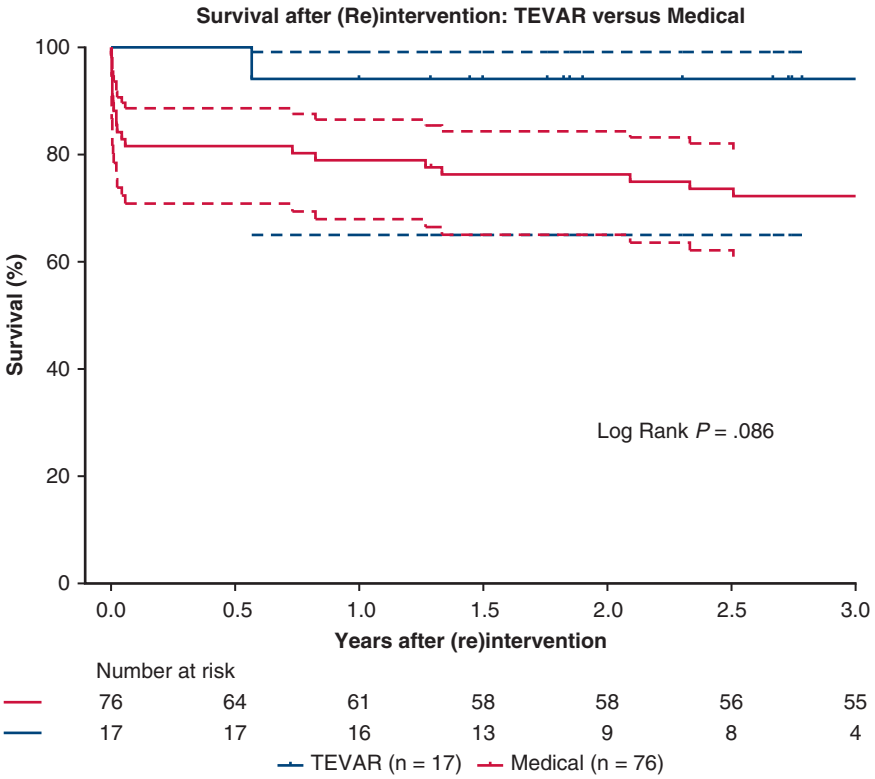

FIGURE 3. Kaplan–Meier survival after intervention for OMT versus reintervention for TEVAR groups is shown. *OMT*, Optimal medical therapy; *TEVAR*, thoracic endovascular aortic repair. 95% CI.

multidisciplinary team strategy for management of uATBAD allows for optimization of procedural, clinical, and radiologic outcomes with TEVAR in this acute, complex patient population who are prone to developing high-risk complications such as malperfusion syndrome, aortic rupture, retrograde dissection into the arch, and rapid aneurysmal growth. In light of the recent guidelines that suggested a Class IIB recommendation for intervention on uATBAD,[2,13] these findings are of particular interest because there remains no clear consensus regarding the optimal first-line treatment for uATBAD.[11,17] Our data support the idea that patients with uATBAD with high risk features may benefit from early TEVAR. In some studies, 5-year intervention-free survival with OMT was reported as low as 40%,[18-21] suggesting that a considerable number of patients with uATBAD receiving OMT end up receiving conversion to open repair at some point during follow-up. Therefore, with such high reintervention rates, the risks associated with OMT need to be carefully balanced against the procedural risk of TEVAR at the index hospitalization. If TEVAR can be performed with very low procedure-related morbidity and mortality in this patient population, then early TEVAR may offset the risk of OMT alone in such complex patients who are prone to rapid disease progression and fatal complications.

Furthermore, given the possibility of procedural selection bias in our study, the multidisciplinary team development with a shared decision-making model impacted management strategy. This investigation also suggests that TEVAR at index hospitalization may not change the overall reintervention rate compared with OMT, but it does change the type of (re)intervention required over follow-up. In our study, more patients in the OMT group required open repair, including total arch replacement with elephant trunk technique or thoracoabdominal aortic aneurysm repair. The TEVAR group, on the other hand, had reintervention solely with endovascular procedures. Therefore, it is possible that TEVAR at index hospitalization enables subsequent (re)intervention to be safer and less complex, and patients undergoing initial OMT may be managed with TEVAR should intervention be necessary. This important difference in the types of (re)intervention required may explain some of the favorable outcomes seen with TEVAR in patients aged 65 years or more, because open surgery in these patients may be associated with higher risk of mortality and morbidity.[22] A multidisciplinary team model not only facilitates shared decision-making and helps improve patient satisfaction and the quality of care but also significantly enhances patient adherence after discharge, enabling us to obtain a very high rate of imaging and clinical surveillance.

Other groups have shown that TEVAR can be performed with exceedingly low rates of morbidity, short-term mortality, and neurological sequelae compared with OMT.[3,5,7,21] The results of our single-institution experience are

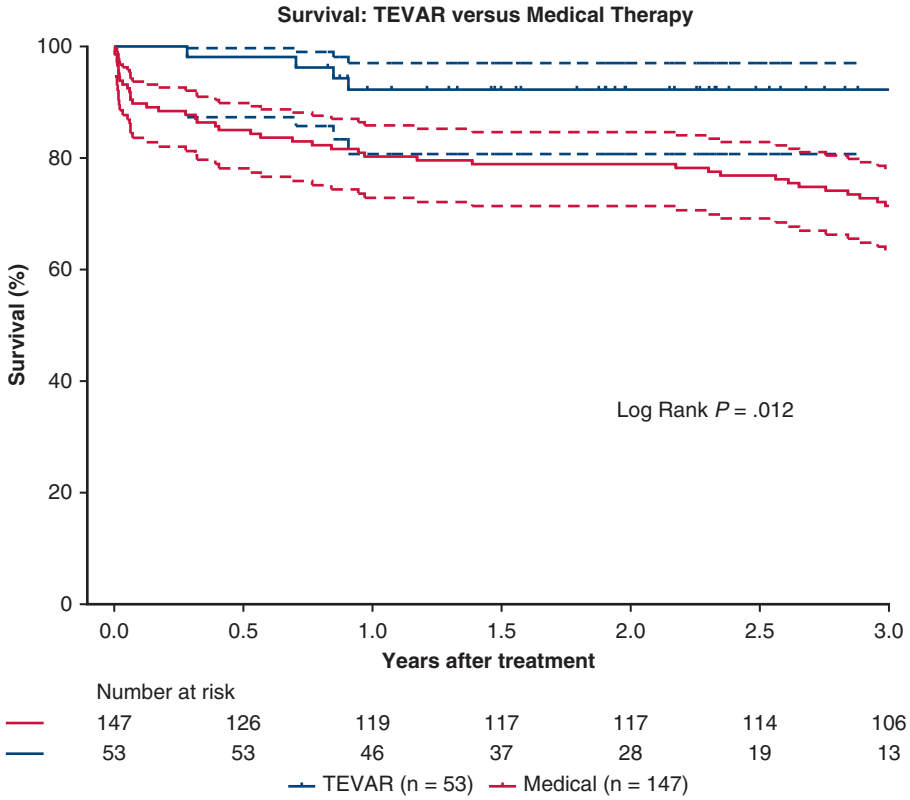

FIGURE 4. Kaplan–Meier survival was significantly higher up to 3 years in the TEVAR group compared with OMT group. *TEVAR*, Thoracic endovascular aortic repair; *OMT*, optimal medical therapy. 95% CI.

consistent with those findings: there were no deaths or neurological sequelae within 30 days for patients with uATBAD receiving upfront TEVAR. Furthermore, there is a growing body of evidence that suggests a survival benefit with TEVAR performed at the index hospitalization,[3-5,7,21,23] if not equivalent survival outcomes.[23] Future studies stratifying patient outcomes by radiologic and clinical features may help identify the factors associated with development of complications secondary to uATBAD that would benefit the most from TEVAR at index hospitalization. This is in line with the most recent STS/SVS guidelines that recommend consideration of early TEVAR for patients with uATBAD who have high-risk features.[14] Because an exact decision-making algorithm is not clearly delineated, the present study adds to the growing evidence that TEVAR may have a role in the management of uATBAD, especially in patients with high-risk features or those who initially present with stability but develop high-risk features. Given the dynamic changes in the management of ATBAD, the results of our study highlight the importance of a multidisciplinary team in managing this complex patient subset.

Few prospective randomized trials have attempted to fill this knowledge gap.[3,4,24] The ADSORB trial showed improved aortic remodeling with TEVAR at 1 year but did not find any significant difference in survival between TEVAR and OMT.[3] At 5-year follow-up, the INSTEAD trial revealed a significant decrease in aortic-specific mortality for patients treated with TEVAR when compared with those receiving OMT alone.[4] However, patients randomized in the INSTEAD trial were in the subacute or chronic phase of the dissection process, further obscuring the decision-making process. Nevertheless, ours is a retrospective series inherently limited by confounders precluding accurate evaluation of the benefits of TEVAR, whereas the randomization in these 2 trials largely addressed the confounding and resulted in no survival benefits. Therefore, we tread with caution, emphasizing the need for better understanding of TEVAR impact in improving the care of patients with uATBAD, especially in those with high-risk features.

Ongoing and future randomized controlled trials such as the Scandinavian multi-country trial by Rudolph and associates[25] are needed to further clarify the potential of TEVAR as initial therapy for uATBAD. Some database studies have also attempted to address the problem. Weissler and colleagues[22] did not find patients treated with TEVAR to have improved survival at 5 years in a large retrospective analysis of more than 7000 patients with uATBAD. However, their cohort was heterogenous, analyzing patients in the acute and subacute phases, and

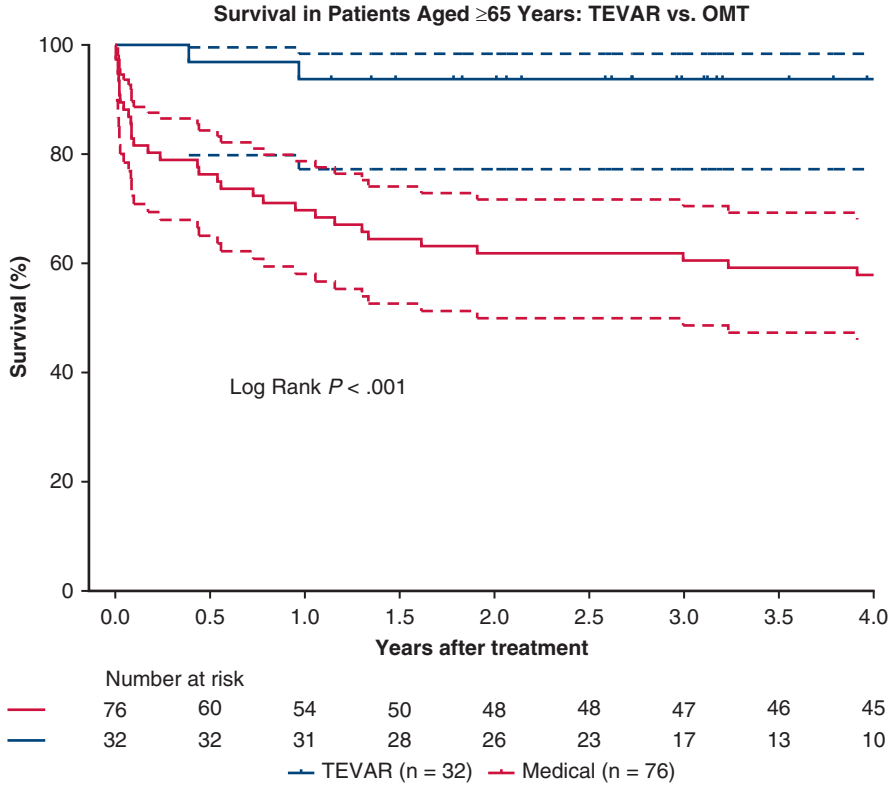

FIGURE 5. In a subgroup analysis of patients aged 65 years or more with uATBAD, Kaplan–Meier survival was significantly improved in patients with TEVAR compared with those with OMT. *uATBAD*, Uncomplicated acute type B aortic dissection; *TEVAR*, thoracic endovascular aortic repair; *OMT*, optimal medical therapy. 95% CI.

comprised only patients aged more than 65 years, given that they used data from the Centers for Medicare & Medicaid Services, which carry their own set of limitations.[22] Interestingly, the subgroup analysis of patients aged 65 years or more in this study found that TEVAR significantly improved early and late survival compared with OMT. Conversely, Muller and colleagues[26] in a study of more than 20,000 patients report noninferiority of TEVAR

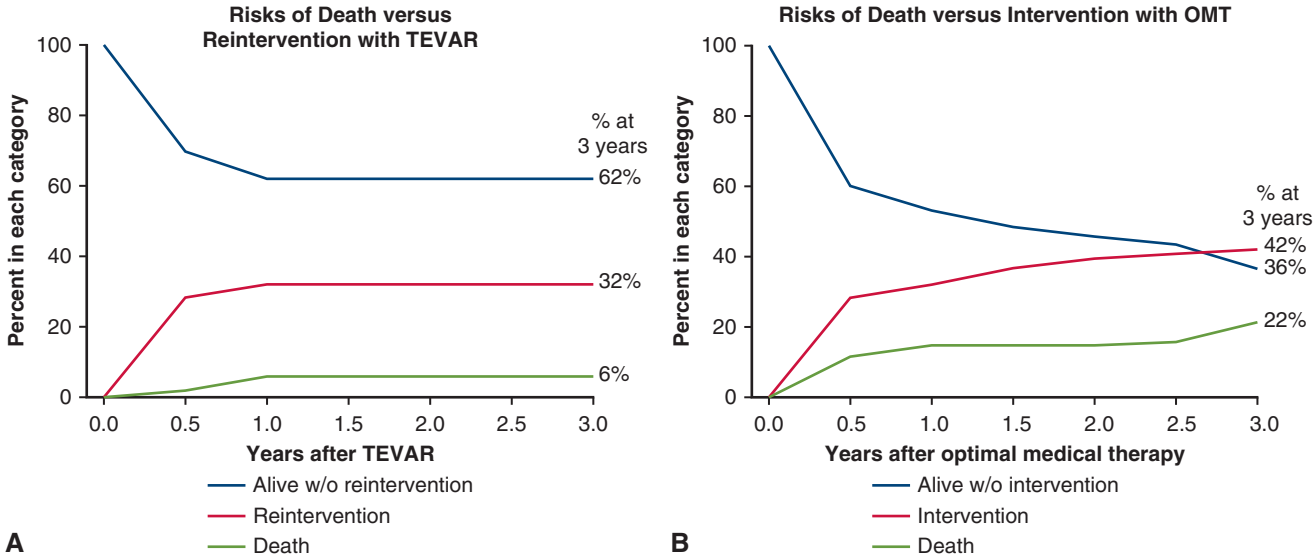

FIGURE 6. Competing outcomes analysis for risk of death versus reintervention is shown for the OMT and TEVAR cohorts. A, For the TEVAR group, at 3 years mortality was 6%, 32% had a reintervention, and 62% were alive without reintervention. B, For the OMT group, at 3 years after OMT, mortality was 22%, 42% had an intervention, and 36% were alive without intervention. *OMT*, Optimal medical therapy; *TEVAR*, thoracic endovascular aortic repair.

performed at a subacute time point for short- and long-term survival but worse survival when TEVAR is performed in the acute phase. However, in these studies, procedural complication rates of TEVAR were higher than what we have noted in our experience. Collectively, these studies suggest that a subpopulation of patients with uATBAD would benefit from TEVAR, and a multicenter randomized trial is warranted to understand its potentially beneficial role.

In this series, the rates of (re)intervention were not significantly different between the TEVAR and OMT groups up to 3 years. Although these (re)intervention rates are higher than those reported by other studies,[17,27,28] they may be the result of a more aggressive follow-up and surveillance with biannual imaging in our practice, thereby providing earlier detection of disease progression. The (re)intervention rates attest to the importance of meticulous, rigorous lifetime surveillance in this patient population, because the dissected aorta is prone to development of degenerative aneurysmal pathologies. In our experience, timely reintervention with TEVAR or other endovascular procedures to address chronic changes in the dissected aortic arch and thoracoabdominal aorta not only improves aortic remodeling but also may reduce the need for future reinterventions with complex open surgical operations.

Study Limitations

This study is limited by its retrospective design and observational nature. Although one of the largest studies showing a survival benefit using TEVAR as initial management for uATBAD, our sample size is still relatively small, such that our analysis is likely to be underpowered to detect more significant differences in outcomes. The small sample size makes it difficult to determine the relative effects of these respective changes over time, nor does it allow for propensity score matching, which may result in potential (known and unknown) confounding, such as comorbidities and treatment era. Our operating surgeons have extensive experience with type B aortic dissection, and thus our results may not be translatable to institutions with smaller case volumes. Moreover, different groups of surgeons managed patients with ATBAD before and after the establishment of multidisciplinary team in 2019. This may have introduced selection bias in the timing and the types of aortic intervention and reintervention performed in our patients.

Also importantly, patients in this study are drawn from a wide range of time periods. Standards of care have changed between the first OMT patient included in the cohort (1992) and the initiation of the TEVAR program (2019). Although it is likely that the TEVAR cohort was predisposed to better outcomes than the OMT cohort, it may be possible that patient care at the index hospitalization and medication and imaging follow-up after discharge were not optimal in the early period compared with the later period. In a single-center experience with medical management of ATBAD from 2001 to 2005, the University of Texas-Houston team reported 22 in-hospital deaths of 129 patients.[29] Their results are in line with the outcomes in our present analysis of ATBAD in the period before 2019. Likely, it speaks to the importance of TEVAR in the management of a subgroup of patients with uATBAD who are at risk for developing aortic complications. Furthermore, the introduction of the electronic medical record system in 2012 may have affected patient documentation accuracy. In addition, long-term follow-up data on blood pressure management or use of antihypertensives were not captured in this study, which does not allow for assessing how TEVAR changes this modality of blood pressure management.

CONCLUSIONS

This single-institution experience with the management of uATBAD with high risk features suggests that the introduction of a multidisciplinary team approach to performing TEVAR at the index hospitalization was associated with improved patient outcomes at the early and midterm follow-up. TEVAR may be performed safely in this patient population, potentially translating to improved survival and decreased open aortic reintervention rates. Lifelong close surveillance is required, because patients with uATBAD are prone to development of aneurysmal degeneration and other aortic complications in the chronic setting.

Conflict of Interest Statement

P.V. and N.N. are consultants for Medtronic and Terumo Aortic. All other authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

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