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Article

Outcomes in Patients With Severe Coronary Artery Disease and Aortic Stenosis Undergoing Surgical Aortic Valve Replacement and Coronary Artery Bypass Grafting vs. Transcatheter Aortic Valve Replacement

John Kucera[1,2], Gustavo Rodriguez[2,3], Sarah Halbert[4], Suzanne Arnott[3], Sean M. Lee[5], Christian D. Nagy[6,7], Gregory Trachiotis[2,3,*], Jared Antevil[2,3]

[1]Department of Surgery, Walter Reed National Military Medical Center, Bethesda, MD 20889, USA
[2]Division of Cardiothoracic Surgery and Heart Center, Washington DC Veterans Affairs Medical Center, Washington, D.C. 20422, USA
[3]Department of Surgery, George Washington University Hospital, Washington, D.C. 20037, USA
[4]Department of Surgery, MedStar Georgetown University Hospital, Washington, D.C. 20007, USA
[5]Office of Clinical Research, School of Medicine & Health Sciences, George Washington University, Washington, D.C. 20037, USA
[6]Division of Cardiology, Medical Faculty Associates, The George Washington University, Washington, D.C. 20037, USA
[7]Division of Cardiology and Heart Center, Washington DC VA Medical Center, Washington, D.C. 20422, USA
*Correspondence: gregory.trachiotis@va.gov (Gregory Trachiotis)

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Abstract

Background: Coronary artery disease (CAD) is highly prevalent in veterans with severe aortic stenosis (AS). However, the optimal management of CAD in this patient population remains a topic of contention. Historical management was predicated on surgical aortic valve replacement (SAVR) with concomitant coronary artery bypass grafting (CABG). Transcatheter aortic valve replacement (TAVR) has demonstrated efficacy in managing aortic stenosis in this population, albeit without addressing the underlying CAD when performed in isolation. This has resulted in a debate regarding the management of CAD in the context of severe AS, which requires intervention. This manuscript aimed to provide evidence to assist physicians in choosing the optimal management of patients presenting with severe AS and CAD. **Methods**: This is a retrospective cohort study using the Veterans Affairs Surgical Quality Improvement Project (VASQIP) database. Perioperative data were extracted for patients with severe AS and high-grade ($\geq$70%) left anterior descending (LAD) artery stenosis who underwent either SAVR + CABG or isolated TAVR between 2012 and 2020. Cohorts were propensity matched. The odds of myocardial infarction (MI) and stroke within 30 days of surgery were compared using logistic regression. The survival probability at 1 month, 6 months, 2 years, and 5 years was compared using a time-varying Cox regression. **Results**: A total of 587 patients were included (332 SAVR + CABG and 255 isolated TAVR). Propensity score matched (PSM) analysis alongside the nearest-neighbor method yielded a paired sample of 510 patients. MI was not observed within 30 days postoperatively for either group. The TAVR cohort had 92% lower odds of postoperative stroke (odds ratio (OR) = 0.08; 95% confidence interval (CI) [0.00, 0.50]; p = 0.027). No significant differences were observed in survival within the first 30 days. Between one and six months post-operation, the TAVR cohort had higher survival than the SAVR + CABG cohort (hazard ratio (HR) = 0.38; 95% CI [0.15, 0.95]; p = 0.038). However, between 2 and 5 years, the TAVR cohort exhibited a lower survival (HR = 1.69; 95% CI [1.05, 2.70]; p = 0.030). Overall, the TAVR cohort had a lower 5-year survival rate. **Conclusions**: Although SAVR + CABG may increase the risk of postoperative stroke, this combination is associated with improved long-term mortality in patients with severe AS and severe CAD. Furthermore, the need for additional revascularization is reduced in patients undergoing SAVR + CABG, including those with single-vessel CAD. In contrast, TAVR reduces 30-day stroke risk but does not demonstrate the same mortality benefit long-term when compared to SAVR + CABG.

Keywords

aortic valve stenosis; coronary artery disease; surgical aortic valve replacement; coronary artery bypass graft; transcatheter aortic valve replacement

Introduction

The introduction of transcatheter aortic valve replacement (TAVR) as an alternative to surgical aortic valve replacement (SAVR) in the early 2000s allowed for the treatment of severe aortic stenosis (AS) in patients with prohibitive surgical risks [1]. Subsequent technical advancements and improvements in valve designs have resulted in the expansion of TAVR use to patients with a multitude of risk profiles, including younger patients with longer life expectancies [2]. However, these advancements have also promoted a debate regarding optimal management of patients with known coronary artery disease (CAD) who require aortic valve replacement. The complexity in determining appropriate treatment strategies for these patients arises in part from the fact that both disease processes are intrinsically linked [3]. The results of studies examining the clinical impact of CAD in patients with AS treated with TAVR are variable [4,5].

The prevalence of AS is estimated to be 2–8% in patients over 65 years old, with an increasing incidence in the United States mostly due to an aging population [6–8]. Notably, these patients exhibit similar pathophysiological processes and risk factors; up to 70% of patients with AS have concomitant CAD [4,9–11]; thus, CAD has been identified as a poor prognostic factor for patients undergoing SAVR. Therefore, the standard of care for managing AS in patients with concomitant CAD has historically been through SAVR and coronary artery bypass grafting (CABG) [11,12]. Furthermore, addressing known CAD concurrently with SAVR via CABG is currently a Class I recommendation [13]. CABG at the time of SAVR is known to improve long-term survival without increasing perioperative mortality rates; however, there are limited data to compare TAVR in isolation to SAVR + CABG in patients with known CAD, especially those who are symptomatic [14].

Severe AS can also present with clinically similar symptoms to CAD, including but not limited to angina, dyspnea, and exercise intolerance, confounding a clear diagnosis of the dominant pathology. Meanwhile, the advent of TAVR has ushered in a significant shift in treatment paradigms for patients with severe AS; one that has continued to evolve over the last two decades. Prior studies have demonstrated that SAVR + CABG, compared to SAVR in isolation, results in a mortality reduction of more than one-third (hazard ratio (HR) 0.62, 95% CI [0.49–0.79]; $p < 0.001$) in patients with CAD [14]. This same study noted a survival benefit in patients with moderate (50–70%) LAD disease (HR 0.62; $p = 0.02$) and severe CAD disease (HR 0.62; $p = 0.02$). Unfortunately, the same mortality benefit has not been demonstrated in patients undergoing percutaneous coronary intervention (PCI) in association with TAVR [15]. TAVR can also make subsequent PCI more complex to treat, by limiting access to the coronary ostia [16,17].

TAVR is a viable option in patients with prohibitive surgical risk, albeit with the disadvantage of not addressing known CAD [18,19]. However, the implementation of TAVR continues to expand, with clinicians now considering this technique an alternative to SAVR in younger and healthier patients who would otherwise be fit for cardiac surgery. The life-long expectancy of patients with CAD results in an increased risk of re-intervention or progression of CAD, which underlies the 2021 ACC/AHA recommendations for CABG at the time of SAVR in this population [3]. Thus, a discussion of the optimal management of AS and CAD via SAVR, CABG, or TAVR alone is warranted. Therefore, this manuscript aimed to compare outcomes in patients with known CAD with severe AS who are undergoing SAVR + CABG or TAVR in isolation.

Methods

Database Query

The Veterans Affairs Surgical Quality Improvement (VASQIP) database was queried for patients who had undergone either SAVR and concomitant CABG (SAVR + CABG) or isolated TAVR between January 2012 and December 2020. The inclusion criteria comprised patients who had a diagnosis of severe AS and high-grade left anterior descending artery (LAD) stenosis (≥70%). Patients with a concurrent diagnosis of endocarditis or aortic dissection were excluded from the cohort; otherwise, all patients who underwent SAVR + CABG or TAVR alone with evidence of LAD stenosis exceeding 70% were included. Demographic and perioperative data for these patients were extracted from VASQIP and analyzed. Some of the included categorical variables, originally coded in VASQIP as ordinal grading scales, were recoded into nominal "yes/no" variables. This was performed owing to the limited information available on the VASQIP-defined criteria used for each variable code value, and changes were noted in these definitions at different time points within the included period of interest. Both males and females were included, but gender was not utilized in PSM. VASQIP data were queried using IBM SPSS Statistics software (V31, New York, NY, USA).

Statistical Analysis

Stroke

We fitted a logistic model to data representing the occurrence of stroke within 30 days post-operation. The primary independent variable in the logistic model was procedure type, categorized as SAVR + CABG and TAVR cohorts. Before fitting the logistic model, we propensity score matched (PSM) the two cohorts using the nearest-neighbor method to adjust for potential bias arising from patient characteristics. The following patient characteristics were including in the matching: age, diagnosis of diabetes, congestive heart failure (CHF), American Society of Anesthesiologists (ASA) classification, history of cerebrovascular disease (CVD), history of peripheral vascular disease (PVD), chronic obstructive pulmonary disease (COPD), diuretic use, presence of cardiomegaly, smoking status, functional status, preoperative diagnosis of atrial fibrillation (AFib), body mass index (BMI), preoperative use of an intra-aortic balloon pump (IABP), and history of prior heart surgery.

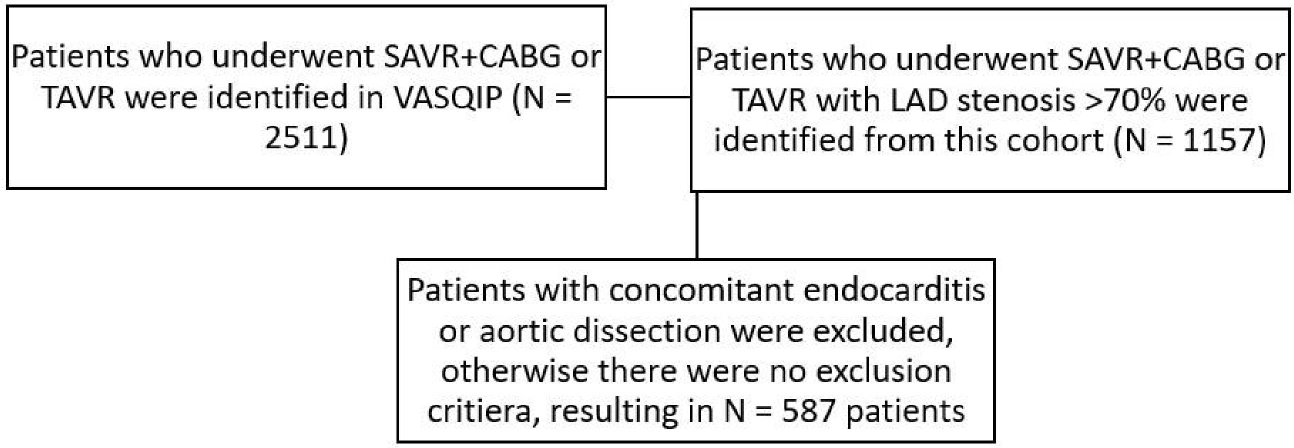

Fig. 1. Cohort inclusion criteria. SAVR, Surgical aortic valve replacement; CABG, Coronary Artery Bypass Gtaft; LAD, Left Anterior Descending artery; TAVR, Transcatheter aortic valve replacement.

Table 1. Actual stroke and myocardial infarction outcomes for SAVR + CABG and TAVR cohorts.

	SAVR + CABG (N = 255)	TAVR (N = 255)
Stroke		
No	245 (96.1%)	254 (99.6%)
Yes	10 (3.9%)	1 (0.4%)
Myocardial Infarction		
No	255 (100%)	255 (100%)
Yes	0 (0%)	0 (0%)

We then performed univariate tests for each patient characteristic to identify variables that were significantly different between cohorts after PSM; we included any such patient characteristic as a covariate in the model. We reported model parameter estimates on the odds ratio scale and calculated the significance of two-tailed hypothesis tests for each independent variable, using a 5% alpha level.

Myocardial Infarction

We planned to fit a logistic model to data representing myocardial infarction (MI), but none of the patients in the PSM cohorts experienced MI post-operatively within 30 days (Table 1).

Survival

To compare survival between the two PSM cohorts, we fitted a time-varying Cox proportional hazards (Cox PH) model to data representing five-year survival, following the approach of Zhang *et al*. (2018) [20]. We opted for a time-varying Cox PH model because, when we initially fitted a Cox PH model, we found that the hazard ratio changed dramatically over time, as evidenced visually and via Schoenfeld residual tests (see Results). That is, SAVR + CABG patients have higher survival than TAVR at some time points during the study interval, but lower survival at other time points; this pattern violates the assumption of proportional hazards and thereby invalidates results of a Cox PH model. We fitted our time-varying Cox PH model using a step function so that hazard ratios are moderated by time (see Zhang *et al*. (2018) [20] for a comprehensive treatise on said step function). We split survival data into the following intervals: 1 month, 6 months, 2 years, and 5 years. We right-censored patients who were lost to follow-up. We included covariates in the time-varying Cox PH model as described above for the logistic model. We reported model parameter estimates on the hazard ratio scale and calculated the significance of two-tailed hypothesis tests for each independent variable, using a 5% alpha level. To visualize results, we plotted Kaplan–Meier survival curves for five-year survival using the intervals defined above.

Data and Code Availability

We utilized the R statistical computing environment (R Core Team, 2021, Auckland, New Zealand) for PSM, model fitting, and visualization of results. The required R code and a comprehensive list of software, packages, and dependency versions needed to reproduce this analysis are available in our project repository: <**repository link redacted until publication**> [21]. The VASQIP database is available upon request through the Veterans Affairs National Surgery Office: https://www.data.va.gov/dataset/Veterans-Affairs-Surgical-Quality-Improvement-Prog/nf89-pcxq/about_data.

Results

The initial cohort yielded a total of 587 patients, of which 332 patients were in the SAVR + CABG group and 255 patients were in the isolated TAVR group (Fig. 1, Ta-

Table 2. Patient characteristics for SAVR + CABG and TAVR cohorts after propensity score matching.

	SAVR + CABG (N = 255)	TAVR (N = 255)	*p*-value
Age			
Mean (SD)	72.4 (7.8)	73.8 (7.7)	0.040
Median [Min, Max]	72.0 [54.0, 90.0]	73.0 [52.0, 95.0]	
ASA classification			
3	15 (5.9%)	11 (4.3%)	0.546
4	240 (94.1%)	244 (95.7%)	
History of diabetes			
No	152 (59.6%)	143 (56.1%)	0.473
Yes	103 (40.4%)	112 (43.9%)	
Use of diuretics			
No	161 (63.1%)	162 (63.5%)	1.000
Yes	94 (36.9%)	93 (36.5%)	
History of CVD			
No	182 (71.4%)	174 (68.2%)	0.500
Yes	73 (28.6%)	81 (31.8%)	
History of PVD			
No	211 (82.7%)	204 (80.0%)	0.495
Yes	44 (17.3%)	51 (20.0%)	
History of COPD			
No	182 (71.4%)	177 (69.4%)	0.698
Yes	73 (28.6%)	78 (30.6%)	
Cardiomegaly			
No	197 (77.3%)	188 (73.7%)	0.410
Yes	58 (22.7%)	67 (26.3%)	
History of smoking			
No	53 (20.8%)	58 (22.7%)	0.668
Yes	202 (79.2%)	197 (77.3%)	
Functional status			
Independent	235 (92.2%)	238 (93.3%)	0.733
Dependent	20 (7.8%)	17 (6.7%)	
History of AFib			
No	221 (86.7%)	213 (83.5%)	0.384
Yes	34 (13.3%)	42 (16.5%)	
Perioperative use of IABP			
No	251 (98.4%)	251 (98.4%)	1.000
Yes	4 (1.6%)	4 (1.6%)	
Prior heart surgery			
No	242 (94.9%)	172 (67.5%)	<0.001*
Yes	13 (5.1%)	83 (32.5%)	
BMI			
Mean (SD)	29.6 (5.6)	30.3 (6.2)	0.181
Median [Min, Max]	28.7 [17.1, 48.1]	29.7 [18.1, 62.3]	
History of CHF			
No	245 (96.1%)	244 (95.7%)	1.000
Yes	10 (3.9%)	11 (4.3%)	

* indicate significant differences between cohorts, as determined by *t*-tests for numeric variables and chi-squared tests of independence for categorical variables. SAVR, surgical aortic valve replacement; CABG, coronary artery bypass grafting; TAVR, transcatheter aortic valve replacement; SD, standard deviation; ASA, American Society of Anesthesiologists; CVD, cerebrovascular disease; PVD, peripheral vascular disease; COPD, chronic obstructive pulmonary disease; AFib, atrial fibrillation; IABP, intra-aortic balloon pump; BMI, body mass index; CHF, congestive heart failure.

Table 3. Actual stroke and myocardial infarction outcomes for SAVR + CABG and TAVR cohorts.

	SAVR + CABG (N = 255)	TAVR (N = 255)
Stroke		
No	245 (96.1%)	254 (99.6%)
Yes	10 (3.9%)	1 (0.4%)
Myocardial Infarction		
No	255 (100%)	255 (100%)
Yes	0 (0%)	0 (0%)

Table 4. Summary for logistic regression fitted to model the odds of stroke following each procedure, with adjusted odds ratios and 95% confidence intervals.

Term	Odds ratio	95% confidence interval	*p*-value
Intercept	0.00	0.00, 0.22	-
Age	1.06	0.98, 1.15	0.177
Prior heart surgery	1.29	0.06, 8.53	0.825
TAVR	0.08	0.00, 0.50	0.027

The reference groups for procedure and prior heart surgery were SAVR + CABG and "no", respectively.

ble 2). After PSM, a total of 255 pairs of patients were included in the study. Univariate tests following PSM showed that age and history of prior heart surgery were significantly different between cohorts (Table 1). The mean age was significantly higher in the TAVR group (73.8) than in the SAVR + CABG group (72.4) ($p = 0.037$). Additionally, the proportion of patients with a history of prior heart surgery was significantly higher in the TAVR group (32.5%) than in the SAVR + CABG group (5.1%) ($p < 0.001$). Given the significant difference in these variables across both treatment groups, age and history of prior heart surgery were included as covariates in the logistic model and time-varying Cox PH model.

Stroke and MI

Table 3 presents the rates of postoperative stroke and MI. No post-operative MIs were reported for either intervention group. A total of 10 patients (3.9%) had a postoperative stroke in the SAVR + CABG group, and one patient (0.4%) had a postoperative stroke in the TAVR group. After controlling for age and prior heart surgery, the logistic model revealed that TAVR patients were 92% less likely to experience postoperative stroke (OR: 0.08; 95% CI [0.00, 0.50]; $p = 0.027$) compared to SAVR + CABG patients (Table 4; Fig. 2).

Survival

SAVR + CABG group demonstrated 99% survival at 30 days, 93% at 6 months, and 85% survival 2 years after surgery. The TAVR group showed 98% survival at 30 days, 96% survival at 6 months, and 86% survival at 2 years. We initially fitted a Cox PH model to data representing five-year survival. However, after performing Schoenfeld residual tests to verify the assumption of proportional hazards, we found that the hazard ratio for both cohorts changed over time ($\chi^2 = 5.83$; df = 1; $p = 0.016$) and age ($\chi^2 = 3.13$; df = 1; $p = 0.077$), violating the assumption of proportional hazards (global $\chi^2 = 9.58$; df = 3; $p = 0.022$). These findings are shown in Table 5.

The subsequent time-varying Cox PH model described in the methods, with the effects of cohort and age stratified by time interval, showed that TAVR patients had significantly higher survival than SAVR + CABG patients between 1 month and 6 months post-operation (HR = 0.38; 95% CI [0.15, 0.95]; $p = 0.038$). However, from 2 to 5 years, TAVR patients exhibited a significantly lower survival than SAVR + CABG patients (HR = 1.69; 95% CI [1.05, 2.70]; $p = 0.030$). Survival rates between the two cohorts did not differ significantly at 1-month post-operation or between 6 months and 2 years (Fig. 3; Table 5).

The effect of age on survival also changed over time, whereby, within 1 month post-operation, age did not influence survival. However, age significantly affected survival between 1 and 6 months post-operation: Each year increase in age was associated with an 11% increase in the risk of death (HR = 1.11; 95% CI [1.05, 1.17]; $p = 0.001$). Age continued to have a significant effect on survival in subsequent time intervals, but with decreasing hazard ratios (Table 6); this indicates that the impact of age is strongest at 1–6 months post-operation and attenuates from 6 months to 5 years post-operation.

Discussion

This study demonstrates that TAVR is associated with a lower postoperative stroke and 30-day mortality rate compared to SAVR + CABG in patients with severe AS and CAD. However, this benefit is not sustained in the long term. Beyond 2 years, SAVR + CABG has a clear advantage in all-cause mortality. Our results, which suggest reduced long-term survival in patients undergoing TAVR alone, are concordant with previously published data. In patients with CAD undergoing TAVR, prior studies indicate that up to 10% of patients may experience an acute coronary event at two years [22]. Progression of CAD in combination with altered coronary flow dynamics following TAVR placement may underlie these acute coronary events [22,23]. Studies have further indicated that CABG at the time of SAVR reduces late-term mortality relative to SAVR in isolation [24]. Since the introduction of TAVR, aortic valve procedures have increased to four times the prior levels; studies based on the TVT registry have raised questions about the optimal management of concomitant CAD to achieve a mortality benefit comparable to SAVR

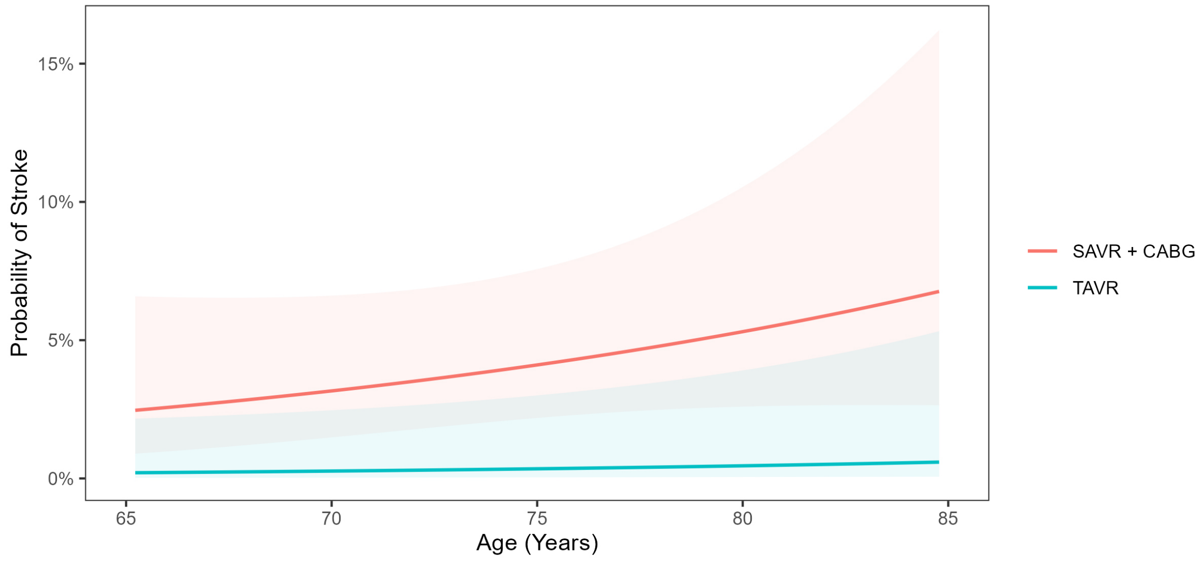

Fig. 2. Predicted probabilities (lines) and 95% confidence intervals (shaded regions) from logistic regression fitted to model the odds of stroke following SAVR + CABG and TAVR. Prior heart surgery was held constant at "no". SAVR, surgical aortic valve replacement; CABG, coronary artery bypass grafting; TAVR, transcatheter aortic valve replacement.

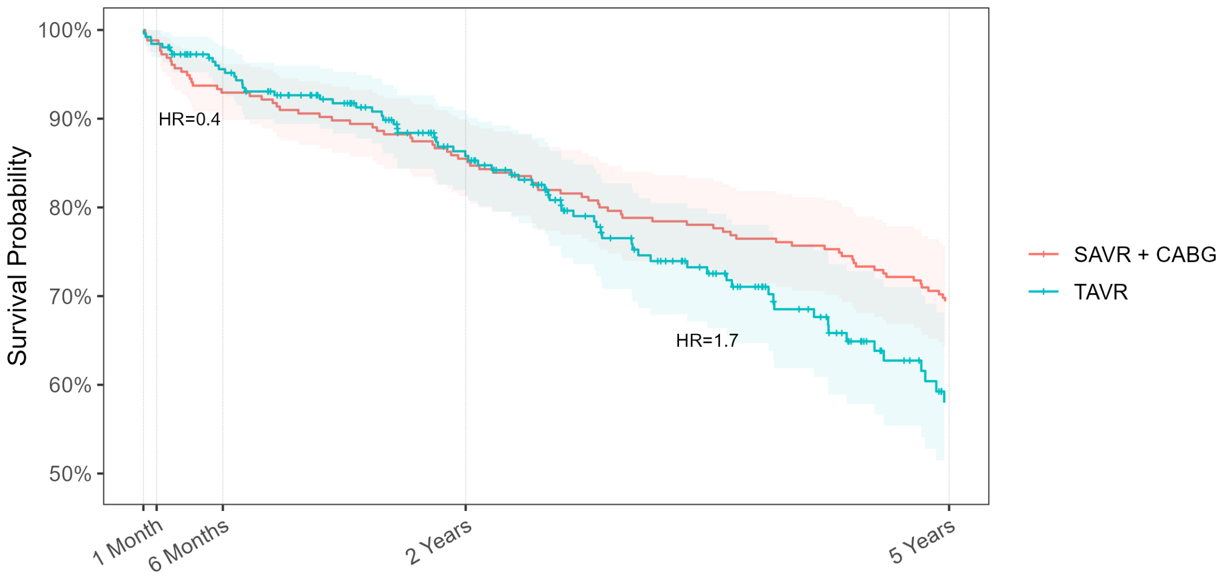

Fig. 3. Kaplan–Meier survival curves for five-year survival following SAVR + CABG and TAVR. Significant hazard ratios (HRs) from the time-varying Cox proportional hazards model are shown and positioned within their respective time intervals, with SAVR + CABG serving as the reference cohort. Tick marks on survival curves indicate right-censoring. Mortality HR is 0.4 between 1 and 6 months (95% CI [0.15, 0.95]; $p = 0.001$) for TAVR, and mortality HR is 1.7 between 2 and 5 years (95% CI [1.05, 2.70]; $p = 0.030$) for TAVR.

+ CABG [25]. Patients with severe AS often present with concomitant obstructive CAD [26]. Given that significant LAD stenosis is found in up to 70% of TAVR patients, our results further suggest that the optimal management of significant CAD is predicated upon intervention at the time of aortic valve replacement [4].

The increased mortality in patients undergoing TAVR compared to SAVR + CABG is likely attributable in part to unresolved CAD. This effect has been previously demonstrated in studies examining the cause of death following TAVR, with known CAD being associated with a significantly increased risk of death at 2-year mean follow-up

Table 5. Survival table.

Group	Interval	At risk (n)	Events (n)	Survival probability	95% confidence interval
SAVR + CABG	1 month	252	3	0.99	0.98, 1.00
	6 months	237	15	0.93	0.90, 0.96
	2 years	218	19	0.85	0.81, 0.90
	5 years	177	41	0.69	0.64, 0.75
TAVR	1 month	251	4	0.98	0.97, 1.00
	6 months	229	7	0.96	0.93, 0.98
	2 years	164	21	0.86	0.81, 0.91
	5 years	46	37	0.58	0.50, 0.67

N, number.

Table 6. Summary for time-varying Cox proportional hazards regression fitted to model time-to-death following SAVR + CABG and TAVR, with adjusted hazard ratios and 95% confidence intervals.

Term	Hazard ratio	95% confidence interval	*p*-value
Prior heart surgery	1.18	0.77, 1.82	0.455
Age			
0–1 month	1.03	0.93, 1.13	0.608
1 month–6 months	1.11	1.05, 1.17	0.001
6 months–2 years	1.06	1.02, 1.11	0.003
2 years–5 years	1.03	1.00, 1.06	0.027
TAVR			
0–1 month	1.23	0.27, 5.55	0.792
1 month–6 months	0.38	0.15, 0.95	0.038
6 months–2 years	1.14	0.60, 2.16	0.695
2 years–5 years	1.69	1.05, 2.70	0.030

Effects of cohort and age are stratified by time interval. The reference group for procedure and prior heart surgery was SAVR + CABG and "no", respectively.

(HR 1.56, 95% CI [1.08, 2.26]; $p = 0.02$) [27]. Although TAVR in isolation is an option in patients with CAD and AS, it does not address extant CAD. It has been previously demonstrated that veterans with known CAD undergoing TAVR do not have improved outcomes at 1 year with PCI, further promoting the consideration of SAVR + CABG in suitable patients [15]. Studies examining PCI to manage CAD in patients undergoing TAVR have shown similar results to our data. In a recently published analysis of 37,822 Medicare beneficiaries, SAVR + CABG was found to have improved 5-year survival, MI, stroke, and valve reintervention compared to TAVR + PCI [28]. Meanwhile, TAVR + PCI demonstrated improved mortality within 30 days in this study; however, this benefit was not sustained in the long term. This suggests that performing PCI in combination with TAVR is not associated with the same mortality benefit as performing SAVR with CABG. Our data did not examine TAVR + PCI, and further study on this topic is warranted. Given these results, patients presenting with CAD identified before aortic valve replacement should be considered for SAVR + CABG, depending on their surgical candidacy.

In our study, patients with severe AS and CAD had an increased rate of stroke when undergoing SAVR and concomitant CABG compared to TAVR. Specifically, patients undergoing TAVR showed a 92% lower risk of developing a stroke in the postoperative period compared to patients undergoing SAVR and CABG (OR: 0.08; 95% CI [0.00, 0.50]; $p = 0.027$). The incidence of early stroke may be related to requisite cardiopulmonary bypass for SAVR, which carries a risk of stroke between 1.7% and 2.5% according to the STS database [29]. A prior study has also noted an association between embolic events and cardiopulmonary bypass, as well as subsequent postoperative neurologic dysfunction, which is ameliorated in TAVR patients, as there is no need for cardiopulmonary bypass. This risk is further increased by the manipulation of the ascending aorta, which is necessary in the context of central cannulation and cross-clamping during SAVR [30]. Despite this increase in perioperative stroke, this study demonstrated that patients treated with SAVR + CABG overall have improved long-term survival rates. The TAVR outcomes in our cohort may even be slightly better than those of a demographically similar cohort of civilian patients who undergo TAVR, as previously published data demonstrate that, despite higher rates of comorbid conditions, veterans experienced equivalent TAVR outcomes to non-veterans [31].

The variables used to create the paired cohort are those that have been demonstrated to have significant effects on postoperative cardiac surgery outcomes [32–34]. Although not comprehensive, the included variables were those common to both the VASQIP risk calculator and the Society of Thoracic Surgeons Predicted Risk of Mortality (STS-PROM) calculator, which have been shown to impact postoperative outcomes significantly and may have improved the comparison of high-risk patients. The significantly different variables between treatment groups that persisted after PSM are consistent with treatment trends in SAVR + CABG vs. TAVR for the time included in the study. Prior to the inclusion of younger patients in the populations approved for use of TAVR in AS, TAVR was almost exclusively being used in older patients. The older age and higher incidence of prior cardiac surgery in the TAVR group are consistent with current treatment trends. Additionally, patients with a previous history of heart surgery are less likely to be considered for SAVR + CABG in most centers, which is also reflected in the significantly higher proportion of patients with prior heart surgery in the TAVR group. Thus, confounding effects were dampened in comparative analyses by controlling both variables in the logistic and Cox regression models.

The principal limitation in this dataset is the inability to identify patients who underwent TAVR alone and subsequently underwent PCI as a planned staged intervention in VSQIP. This underscores the accurate evaluation of CAD at the time of planned TAVR and is challenging to account for statistically. This limitation may impact the conclusions of this manuscript, particularly because PCI is a potential management strategy for high-grade LAD stenosis and CAD in the TAVR population. If this occurred without being noted in the dataset, it may have impacted the overall survival in the cohort. The lack of post-operative MI being reported in this cohort may suggest under-reporting in the database, although this is challenging to definitively prove. Our data are also unable to define whether strokes were identified incidentally or as a result of symptoms, as the significance of clinically silent strokes is uncertain [29]. The data are also limited by a lack of available STS risk calculator scores, although similar variables to those incorporated into this system were chosen.

Conclusion

This study showed that in propensity-matched patients with severe AS and concomitant CAD, TAVR was associated with decreased 30-day risk of stroke when compared to SAVR + CABG. However, survival rates were significantly higher for those undergoing SAVR + CABG when compared to those who had an isolated TAVR. These results suggest that SAVR and concomitant CABG could be the preferred intervention in surgically fit patients with severe AS and CAD.

Abbreviations

CAD, coronary artery disease; AS, aortic stenosis; SAVR, surgical aortic valve replacement; CABG, coronary artery bypass grafting; TAVR, transcatheter aortic valve replacement; VASQIP, Veterans Affairs Surgical Quality Improvement Project; LAD, left anterior descending artery; PSM, propensity score matching; CT, computed tomography; MI, myocardial infarction.

Availability of Data and Materials

The data sets generated or analyzed during the current study are available at https://github.com/seanmlee/SAVR-CABG_vs_TAVR_for_CAD-AS.

Author Contributions

JK, GR, SA, JA, GT, and CN contributed to manuscript editing, formatting. SL Completed all statistical analysis. SH provided assistance with data analysis and manuscript drafting. GT, JA, CN and SL provided expertise, editing, and origination of concept. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

Ethics Approval and Consent to Participate

The study was carried out in accordance with the guidelines of the Declaration of Helsinki and approved by the Ethics Committee DC VAMC Research & Development Committee (R & DC), Ethics Number 1584919, approved 19 October 2022. Informed consent is waived under IRB approval.

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Not applicable.

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Conflict of Interest

The authors declare no conflict of interest. Gregory Trachiotis is serving as one of the Editorial Board members of this journal. We declare that Gregory Trachiotis had no involvement in the peer review of this article and has no access to information regarding its peer review.

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