JACC: CARDIOVASCULAR INTERVENTIONS VOL. 11, NO. 21, 2018

PUBLISHED BY ELSEVIER

Impact of On-Site Cardiac Surgery on Clinical Outcomes After Transfemoral Transcatheter Aortic Valve Replacement

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ABSTRACT

OBJECTIVES This study sought to investigate the outcome of high-risk and inoperable patients with severe symptomatic aortic stenosis undergoing transfemoral transcatheter aortic valve replacement (TAVR) in hospitals with (iOSCS) versus without institutional on-site cardiac surgery (no-iOSCS).

BACKGROUND Current guidelines recommend the use of TAVR only in institutions with a department for cardiac surgery on site.

METHODS In this analysis of the prospective multicenter Austrian TAVI registry, 1,822 consecutive high-risk patients with severe symptomatic aortic stenosis undergoing transfemoral TAVR were evaluated. A total of 290 (15.9%) underwent TAVR at no-iOSCS centers (no-iOSCS group), whereas the remaining 1,532 patients (84.1%) were treated in iOSCS centers (iOSCS group).

RESULTS Patients of the no-iOSCS group had a higher perioperative risk defined by the logistic EuroSCORE (20.9% vs. 14.2%; $p < 0.001$) compared with patients treated in hospitals with iOSCS. Procedural survival was 96.9% in no-iOSCS centers and 98.6% in iOSCS centers ($p = 0.034$), whereas 30-day survival was 93.1% versus 96.0% ($p = 0.039$) and 1-year survival was 80.9% versus 86.1% ($p = 0.017$), respectively. After propensity score matching for confounders procedural survival was 96.9% versus 98.6% ($p = 0.162$), 93.1% versus 93.8% ($p = 0.719$) at 30 days, and 80.9% versus 83.4% ($p = 0.402$) at 1 year.

CONCLUSIONS Patients undergoing transfemoral TAVR in hospitals without iOSCS had a significantly higher baseline risk profile. After propensity score matching short- and long-term mortality was similar between centers with and without iOSCS. (J Am Coll Cardiol Intv 2018;11:2160–7) © 2018 by the American College of Cardiology Foundation.

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Manuscript received May 10, 2018; revised manuscript received July 5, 2018, accepted July 10, 2018.

ISSN 1936-8798/$36.00 https://doi.org/10.1016/j.jcin.2018.07.015

In recent years, transcatheter aortic valve replacement (TAVR) has become the standard therapy for elderly high-risk and inoperable patients with severe symptomatic aortic stenosis (1). Current guidelines recommend a close cooperation of various disciplines within the so-called heart team (2–4). According to the recently updated European Society of Cardiology guidelines, TAVR should only be performed in institutions with both cardiology and cardiac surgery departments on site (class IC recommendation) (2). This recommendation is based on the necessity of a close cooperation between the heart team members for optimal patient selection and treatment allocation as well as the benefit of an institutional on-site cardiac surgery (iOSCS) in case of major complications during TAVR that require bailout cardiac surgery (5). With regard to the latter, such complications as annulus rupture, ventricular perforation, or prosthesis embolization occur rarely with a downward trend in recent years (6). However, if immediate conversion to surgery becomes necessary, outcomes are still unfavorable even in an optimal setting comprising a hybrid operation theater and both disciplines on site (7,8).

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Between January 2011 and November 2016, a total of 3 experienced interventional cardiology departments in Austria performed transfemoral (TF) TAVR in the absence of iOSCS, but in close cooperation with cardiac surgeons from associated institutions collaborating in the heart team as suggested by the position paper of the German Society of Cardiology (9). Data on the procedures at these centers were documented within the prospective multicenter Austrian TAVI registry. We sought to compare short- and long-term outcome in patients treated in centers with iOSCS versus without (no-iOSCS).

METHODS

PATIENT SELECTION. All patients were evaluated by local heart teams formed by cardiologists, cardiac surgeons, anesthesiologists, radiologists, vascular and cardiothoracic surgeons, and neurologists. In the 3 hospitals without iOSCS interdisciplinary heart team conferences with visiting cardiac surgeons were performed on a regular basis to allow a detailed discussion of each potential TAVR candidate and guarantee accurate patient selection. Only patients deemed at high surgical risk based on the logistic EuroSCORE or presenting with conditions prohibitive for surgery were accepted for TF TAVR at hospitals without iOSCS. At these centers, all TAVR procedures were performed in especially equipped catheter laboratories suitable for potential emergency thoracotomy. Exclusively patients with adequate femoral vascular access were approved for TAVR in centers without iOSCS. In addition to cardiovascular anesthesiologists, cardiothoracic and vascular surgeons were present during each procedure to allow for bailout surgery if indicated. Finally, all TAVR procedures were performed according to current standard of care and all clinical decisions were at the treating physician's discretion.

AUSTRIAN TAVI REGISTRY. Detailed information on the registry has been published previously (10). Baseline and outcome data were self-reported and prospectively entered into the Austrian TAVI Registry by the respective centers using a web-based case report form. Follow-up visits at 1, 3, 6, and 12 months and yearly thereafter were recommended. The study protocol was approved by the institutional human research committee (Medical University Graz) as the main ethics committee and complies with the ethical guidelines of the 1975 Declaration of Helsinki. A list of members of the Austrian TAVI Group is shown in the Online Appendix.

DATA EXTRACTION. Data of 1,842 patients from 10 centers receiving a TF TAVR between January 2011 and November 2016 were exported from the Austrian TAVI Registry on January 15, 2018. Altogether 20 patients were excluded from further analysis because of invalid data entry or missing outcome data. The remaining 1,822 patients (98.9%) were included into the final analysis (**Figure 1**).

ENDPOINTS AND FOLLOW-UP. The primary endpoints were procedural and 30-day survival. Procedural survival was defined as absence of mortality from any cause 0 to 72 h after the procedure. Secondary endpoints were 1-year survival, procedural complication-free survival, or 1-year complication-free survival. We defined complications as follows: cardiac tamponade or life-threatening bleeding (cardiac tamponade or bleeding requiring immediate intervention), major bleeding (bleeding requiring transfusion of a substantial amount of blood or surgical intervention), stroke (according to current guidelines), kidney failure (requirement of renal-replacement therapy), pneumonia (clinical diagnosis of pneumonia with respiratory insufficiency); severe aortic regurgitation (aortic regurgitation grade III

ABBREVIATIONS AND ACRONYMS

CAD = coronary artery disease

iOSCS = hospitals with institutional on-site cardiac surgery (department for cardiac surgery with inpatient beds)

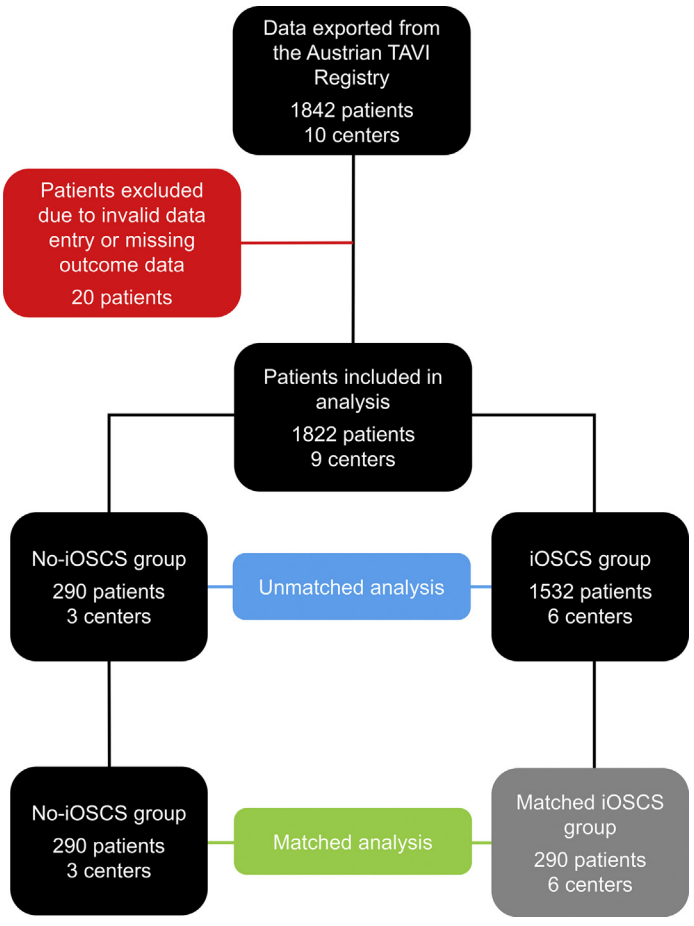
no-iOSCS = hospitals without on-site cardiac surgery (no department for cardiac surgery with inpatient beds, but close cooperation with associated cardiac surgery departments)

PPM = permanent pacemaker

TAVR = transcatheter aortic valve replacement

TF = transfemoral

FIGURE 1 Flowchart Diagram of Patients Included in This Analysis



Out of 1,842 patients of the Austrian TAVI registry, 1,822 patients of 9 centers could be included in the analysis. iOSCS = hospitals with institutional on-site cardiac surgery; no-iOSCS = hospitals without institutional on-site cardiac surgery; TAVR = transcatheter aortic valve replacement.

according to current guidelines), myocardial infarction (according to current guidelines), multiorgan failure (failure of at least 2 organ systems), and pacemaker implantation (requirement for pacemaker implantation before discharge). To further enhance quality of reported results, mortality data were verified and facilitated by data from the Austrian government's population registry (POPREG, Statistics Austria), which documents all births and deaths in Austria (11).

STATISTICAL ANALYSIS. Data were expressed as mean ± SD, median (interquartile range), or count (proportion) as appropriate. Unless stated otherwise, data were available for all patients. To compare continuous variables, Student's *t*-test in case of normally distributed variables or Mann-Whitney *U* test in case of skewed variables were used; to compare categorically Fisher exact test was used. Survival between groups was compared with the log-rank test.

We observed missing values in 8.7% of patients (n = 159) in 18 of 20 baseline variables. In total, 882 (2.4%) out of 35,558 values were missing. We therefore imputed 5 datasets using "MULTIPLE IMPUTATION" function in the IBM SPSS statistics package (IBM, Armonk, New York) with a maximum of 10 iterations. We used the "fully conditional specification" method to overcome bias if the data were not missing completely at random. We included all baseline parameters of **Tables 1 and 2** (except for valve manufacturer and the use of transesophageal echocardiography), 30-day mortality, and the center ID as predictors for missing values (12). Variables were imputed using predictive mean matching or logistic regression.

After multiple imputation, propensity score matching was performed using the "Across" technique (13) because of its advantages in reducing bias if the rate of missing data is low (14). In short, propensity scores were generated using logistic regression in each of the 5 imputed datasets using "glm" function in R version 3.2.2 (The R Project for Statistical Computing, Vienna, Austria). All imputed baseline variables (except for center ID, valve manufacturer, and the use of transesophageal echocardiography) were used as predictors. Afterwards, the propensity scores were averaged for each individual. Matching was performed in a 1:1 fashion using the resulting propensity score using "Match" function in R with fixed weights of 1 for all individuals. A list of missing variables and imputed values can be found in Online Table 1. In the main document, observed data are presented only. Outcome data were available for all patients, except for prolonged hospital stay, which was available for 1,563 patients (85.8%). All survival rates described in the text are Kaplan-Maier estimates. Graphs were created using SPSS.

RESULTS

BASELINE AND PROCEDURAL CHARACTERISTICS OF PATIENT COHORTS. Of a total of 1,822 patients included in the final analysis, 290 (15.9%) were treated in 3 hospitals without institutional departments for cardiac surgery (no-iOSCS group) and 1,532 (84.1%) patients were treated in 6 hospitals with cardiac surgery on-site (iOSCS group). There were substantial differences in baseline parameters

between the 2 groups (Table 1): patients of the no-iOSCS versus patients of the iOSCS group were significantly older with higher prevalence of coronary artery disease (CAD) (63.8% vs. 51.8%; p < 0.001), prior percutaneous coronary intervention (45.3% vs. 29.9%; p < 0.001), and moderately reduced left ventricular ejection fraction (38.7% vs. 26.2%; p < 0.001). Moreover, median mortality risk calculated by the logistic EuroSCORE was significantly higher in patients treated at no-iOSCS centers (20.9% vs. 14.2%; p < 0.001) compared with patients treated at iOSCS centers. Conversely, prevalence of chronic obstructive pulmonary disease grade Global Initiative for Chronic Obstructive Lung Disease IV was significantly lower in patients of the no-iOSCS versus the iOSCS group (4.7% vs. 10.9%; p = 0.001).

The rates of planned general anesthesia, planned vascular surgical access, and the use of transesophageal echocardiography were significantly higher in the no-iOSCS versus the iOSCS group. Moreover, there existed significant differences between the groups with regard to prosthesis selection (Table 2).

TABLE 1 Baseline Characteristics of No-iOSCS Patients, Complete iOSCS Group, and Matched iOSCS Patients

		iOSCS			
	No-iOSCS (n = 290)	Before Matching (n = 1,532)	p Value	After Matching (n = 290)	p Value
Female	63.4	59.1	0.171	63.4	0.931
Age, yrs	84 (80–87)	83 (79–86)	0.006	84 (81–87)	0.241
Height, cm	164 (159–170)	165 (159–170)	0.433	164 (158–170)	0.595
Weight, kg	70 (61–81)	70 (62–80)	0.484	70 (60–80)	0.527
BMI, kg/m^2	26 (23–29)	26 (23–29)	0.498	26 (23–28)	0.836
BSA, m^2	1.78 ± 0.20	1.79 ± 0.20	0.366	1.77 ± 0.21	0.538
COPD IV	4.7	10.9	0.001	8.6	0.088
Liver cirrhosis	1.2	1.3	1.000	1.1	1.000
Prior CAD	63.8	51.8	<0.001	55.2	0.044
Prior stroke	6.3	9.0	0.182	10.4	0.114
Prior PCI	45.3	29.9	<0.001	37.7	0.081
Prior pericardiotomy	8.3	11.9	0.109	7.6	0.874
LVEF					
30–50	38.7	26.2	<0.001	33.6	0.244
<30	10.7	8.8	0.344	12.5	0.592
Logistic EuroSCORE	20.9 (12.8–30.3)	14.2 (9.0–22.2)	<0.001	19.6 (13.1–28.6)	0.808
Porcelain aorta	4.3	7.5	0.083	6.7	0.256
Implanted pacemaker	13.0	8.4	0.024	12.7	1.000
First patients	27.6	10.1	<0.001	24.1	0.393
Echocardiography					
V_{max}, m/s	4.4 (4.0–4.8)	4.4 (4.0–4.8)	0.530	4.4 (4.0–5.0)	0.156
Mean gradient, mm Hg	48 (40–57)	47 (39–59)	0.748	50 (40–62)	0.233

Values are %, median (interquartile range), or mean ± SD.

BMI = body mass index; BSA = body surface area; CAD = coronary artery disease; COPD IV = chronic obstructive lung disease grade IV; first patients = patient number 1–30 per center; iOSCS = hospitals with institutional on-site cardiac surgery; LVEF = left ventricular ejection fraction; no-iOSCS = hospitals without institutional on-site cardiac surgery; PCI = percutaneous coronary intervention; V_{max} = maximum velocity.

CLINICAL OUTCOMES. Median follow-up for survival was 865 (interquartile range: 516 to 1,306) days. Procedural survival was 96.9% in the no-iOSCS group and 98.6% in the iOSCS group, respectively (p = 0.034) (Table 3). Similarly, there was a significant difference in 30-day survival rates between groups (no-iOSCS 93.1% vs. iOSCS 96.0%; p = 0.039). One- and 3-year survival were also significantly lower in the no-iOSCS group (80.9% vs. 86.1% [p = 0.017] at 1 year; 62.1% vs. 68.5% [p = 0.048] at 3 years).

Implantation rates without malposition, valve-in-valve, or rescue were similar between both groups. However, procedural complication-free survival was significantly lower in no-iOSCS patients compared with iOSCS patients (75.9% vs. 86.7%; p < 0.001): main differences were significantly higher rates of major bleeding (9.3% vs. 4.6%; p = 0.003) and pneumonia (3.8% vs. 1.0%; p = 0.001). Permanent pacemaker (PPM) implantation was performed more frequently in no-iOSCS centers versus iOSCS centers (32.2% vs. 15.7%; p < 0.001). Furthermore, the rates of prolonged hospital stay (>14 days) were significantly higher in patients treated in no-iOSCS centers compared with iOSCS centers (30.1% vs. 13.4%; p < 0.001).

Because of the substantial differences in baseline parameters for the 2 study groups, a propensity score analysis was performed. Thereby, 290 individuals from the iOSCS group were matched to patients from the no-iOSCS group. No significant differences in baseline parameters between no-iOSCS and matched iOSCS patients were present except for CAD (63.8% vs. 55.2%; p = 0.044), planned general anesthesia (73.1% vs. 51.9%; p < 0.001), planned vascular surgical access (73.8% vs. 31.1%; p < 0.001), and valve type, respectively (Table 2; p < 0.001). After inclusion of imputed values into the analysis, there were no significant differences regarding the prevalence of comorbidities between both groups (Online Table 1) allowing a balanced matching of individuals to patients from the no-iOSCS group. The matched cohorts did not show any significant differences in short- or long-term survival rates as shown in Figure 2 and Table 3. Regarding specific outcome parameters, patients treated in no-iOSCS hospitals had a lower rate of procedural complication-free survival (75.9% vs.

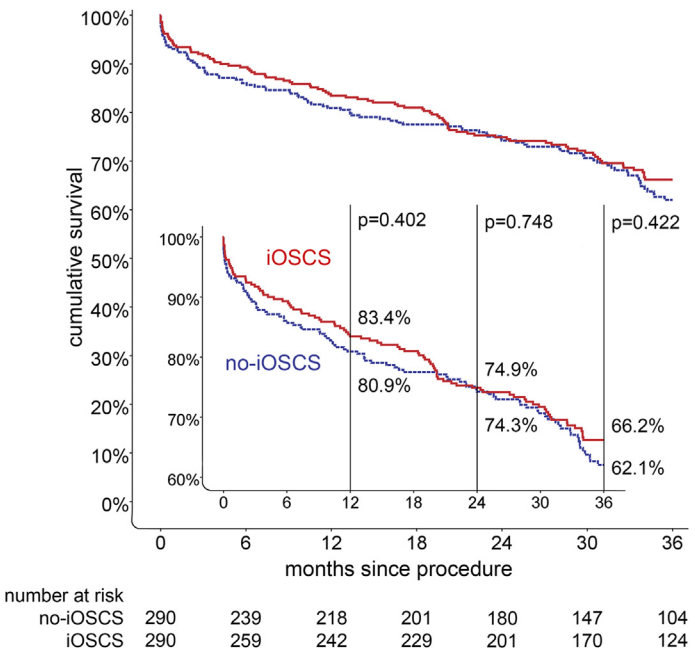
TABLE 2 Procedural Characteristics of No-iOSCS Patients, Complete iOSCS Group, and Matched iOSCS Patients

		iOSCS			
	No-iOSCS (n = 290)	Before Matching (n = 1,532)	p Value	After Matching (n = 290)	p Value
Valve manufacturer			<0.001		<0.001
Medtronic	95.9	63.3		45.5	
Edwards Lifesciences	0	31.0		51.7	
Boston Scientific	3.8	3.0		1.4	
Direct Flow Medical	0.3	0.2		0	
St. Jude Medical	0	2.6		1.4	
Planned general anesthesia	73.1	20.8	<0.001	51.9	<0.001
Planned surgical access	73.8	5.9	<0.001	31.1	<0.001
Use of TEE	71.0	13.5	<0.001	30.0	<0.001

Values are %.
TEE = transesophageal echocardiography; other abbreviations as in Table 1.

84.1%; p = 0.008) and a higher incidence of PPM implantation after TAVR (32.2% vs. 19.0%; p < 0.001). Finally, prolonged hospital stays occurred more frequently in no-iOSCS hospitals (26.0% vs. 14.5%; p < 0.001). Regarding major bleeding and pneumonia there was a trend toward higher rates in no-iOSCS centers that did not reach statistical significance in this analysis.

FIGURE 2 Three-Year Survival for the Propensity Score Matched Patient Population



There was no significant difference of survival between no-iOSCS and matched iOSCS patients. Abbreviations as in Figure 1.

DISCUSSION

In this study, 1,822 high-risk and inoperable patients with severe symptomatic aortic stenosis undergoing TF TAVR in Austria between January 2011 and November 2016 were analyzed. Short- and long-term outcome after TAVR were compared among 6 centers with iOSCS and 3 centers without iOSCS. Importantly, all institutions were equipped with heart team experts, capable of performing high-quality procedures and bailout surgery. Patients treated in hospitals without iOSCS were older, had a higher prevalence of CAD or previous percutaneous coronary intervention, and consequently showed a higher procedural risk defined by the logistic EuroSCORE. A propensity score matched analysis revealed comparable short- and long-term survival rates in both treatment groups.

SHORT-TERM AND LONG-TERM SURVIVAL. The finding that patients treated in no-iOSCS hospitals were older with higher prevalence of CAD and higher logistic EuroSCORE has also been described by Eggebrecht et al. (15) who analyzed data from the AQUA-Registry between 2013 and 2014. The results of the present study demonstrate similar procedural survival rates for departments with and without iOSCS, especially within the propensity score matched subgroup. Even long-term survival seemed to be comparable in both treatment groups (iOSCS vs. no-iOSCS), which has not yet been evaluated.

PERIPROCEDURAL MANAGEMENT AND COMPLICATIONS. A comparison of unmatched baseline populations revealed a significantly higher rate of specific periprocedural complications in the no-iOSCS group. The higher incidence of post-procedural pneumonia might be associated with the higher percentage of planned general anesthesia and the subsequent need for intubation and ventilation as known from other patient populations (16). Access site-related complications are among the most frequent adverse events in the context of TAVR: major bleeding caused by vascular complications was significantly more frequent in the no-iOSCS group versus the iOSCS group but is in line with access site complication rates reported in other studies. Conversely, access site complication rates reported by iOSCS centers were very low compared with currently available data from registries and randomized clinical trials (15,17,18). After propensity score matching, similar event rates with regard to severe complications, such as cardiac tamponade, life-threatening bleeding, or stroke, were observed, which is in

keeping with the results of Eggebrecht et al. (15,19). However, prolonged hospital stay and PPM implantation were still significantly more frequent in hospitals without iOSCS. Furthermore, lower rates of the combined endpoint "procedural complication-free survival" were observed in these centers. Because complex procedures, such as TAVR, are associated with a learning curve and the caseload per center and operator corresponds to the outcome, the lower caseload at no-iOSCS hospitals might have contributed to the latter findings (20).

NEED FOR PPM IMPLANTATION. There was a significantly higher rate of TAVR-related PPM implantations correlating with the high percentage of Medtronic CoreValve use in no-iOSCS compared with iOSCS institutions. The self-expanding Medtronic (Minneapolis, Minnesota) CoreValve is known to perform comparably well to the balloon expandable Edwards (Irvine, California) Sapien valve with respect to all major outcome parameters, such as cardiovascular mortality, device success, or vascular complications, albeit with a higher need for PPM implantation (21,22). Accordingly, selection preferences regarding valve manufacturers and prostheses most probably contributed to the increased rate of PPM implantation in the no-iOSCS group.

DEFINITION OF HIGH-RISK AND INOPERABILITY. In contrast to many other studies, investigating intermediate- or even low-risk patients, the no-iOSCS cohort in this analysis represents a true high-risk and inoperable patient population with a mean logistic EuroSCORE of >20% (17,23). Because it is important to compare clinical outcome data and especially long-term survival between patient cohorts of similar risk characteristics, these results cannot be extrapolated to populations with lower risk profiles.

INSTITUTIONAL ON-SITE CARDIAC SURGERY. The need for surgical backup at institutions performing TAVR procedures mainly arises from potential occurrence of major access but also nonaccess site complications (e.g., aortic dissection, annulus rupture, prosthesis embolization, coronary occlusion, and myocardial perforation, respectively) (24). Because of technological improvements and the growing experience of the treating interventionists the need for bailout surgery is steadily decreasing. Recent trials report rates <1%. However, the outcome of these patients is still unfavorable, even in an optimal setting comprising a hybrid operation theater and both disciplines on site (8). According to data published by Hein et al. (25), close to 70% of bailout surgeries are performed in the same room as TAVR. Frequently, an immediate transfer to the operating theater is impossible because of organizational difficulties (e.g., in huge hospitals with greater distance between catheter laboratory and the cardiothoracic operating room it might be necessary to perform bailout surgery directly on the TAVR table). Therefore, careful patient selection and close on-site cooperation of interventional cardiologists, cardiac and vascular surgeons, and anesthesiologists might be even more important than the theoretical availability of iOSCS dislocated from the TAVR-performing catheter laboratory.

However, iOSCS may also facilitate cooperation and workflow within the heart team. Especially patients treated in large centers might profit from the higher caseload in such institutions. In hospitals without iOSCS a lot of effort from the participating departments is required to offer comparable conditions. Consequently, the findings of this analysis should not in principle open TAVR procedures to cardiology departments without cardiac surgery on site and also not open such procedures to non-high-risk patients. Regarding the lack of hybrid surgical theaters (run together by cardiac surgeons and interventional cardiologist) and the unfavorable

TABLE 3 Primary and Secondary Outcomes of No-iOSCS Patients, Complete iOSCS Group, and Matched iOSCS Patients

		iOSCS			
	No-iOSCS (n = 290)	Before Matching (n = 1,532)	p Value	After Matching (n = 290)	p Value
Primary outcomes					
Procedural survival	96.9	98.6	0.034	98.6	0.162
30-day survival	93.1	96.0	0.039	93.8	0.719
Secondary outcomes					
Cumulative 1-yr survival	80.9	86.1	0.017	83.4	0.402
Cumulative 2-yr survival	74.3	77.5	0.131	74.9	0.748
Cumulative 3-yr survival	62.1	68.5	0.048	66.2	0.422
Procedural complication-free survival	75.9	86.7	<0.001	84.1	0.008
Cardiac tamponade or life-threatening bleeding	2.4	1.8	0.485	3.2	0.788
Major bleeding	9.3	4.6	0.003	4.8	0.051
Stroke	1.0	2.2	0.256	1.7	0.725
Kidney failure	1.0	1.0	1.000	0.3	0.624
Pneumonia	3.8	1.0	0.001	1.0	0.054
Severe aortic regurgitation	2.4	1.0	0.078	1.0	1.000
Myocardial infarction	1.0	0.5	0.397	1.4	1.000
Multiorgan failure	1.4	0.3	0.041	1.2	1.000
Pacemaker implantation	32.2	15.7	<0.001	19.0	<0.001
Prolonged hospital stay	26.0	13.4	<0.001	14.5	<0.001

Values are %. Prolonged hospital stay: hospital stay >14 day.
Abbreviations as in Table 1.

prognosis of these patients associated with rapid deterioration and high mortality rates, such a strategy with high success rates and acceptable safety, even in the absence of iOSCS, might be adequate as long as all efforts are made to guarantee a close cooperation between the members of the heart team. Importantly, well-coordinated heart teams with regular interdisciplinary heart team rounds for each individual patient were guaranteed and seen as pre-requisite in all TAVR-performing sites in Austria.

STUDY STRENGTHS AND LIMITATIONS. To the best of our knowledge, our study represents the largest cohort of high-risk and inoperable patients with severe aortic stenosis undergoing a TAVR procedure providing long-term clinical follow-up in centers with and without iOSCS. However, this investigation has several limitations. In comparison with prospective randomized clinical trials, registries lack complete data monitoring and are subject to selection bias. Therefore, underreporting of complications might have occurred. The limited patient number and the rare occurrence of severe complications might have obscured differences in outcome that would be significant in a larger patient population. A strength of our study is the complete long-term follow-up of hard clinical endpoints by using additional data from the Austrian population registry. Because data acquisition started back in 2011, the logistic EuroSCORE was selected as the risk score of choice. Likewise, standardized outcome assessment according to the Valve Academic Research Consortium was not available because of its introduction after establishment of the Austrian TAVI Registry (26).

CONCLUSIONS

Patients undergoing TF TAVR in no-iOSCS centers had a significantly higher baseline risk profile compared with patients treated in centers with iOSCS. After propensity score matching, short- and long-term mortality seemed to be comparable between centers with versus without iOSCS, albeit a lower rate of specific complications in iOSCS institutions. Consequently, the close cooperation between cardiologists and cardiovascular surgeons within the heart team seems crucial to guarantee high-quality interventions and minimize the risk of adverse events in TAVR patients.

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PERSPECTIVES

WHAT IS KNOWN? Current guidelines recommend TAVR to be performed only at institutions with a department for cardiac surgery on site. However, all recommendations regarding personal or infrastructural requirements for TAVR sites are level C and based on expert consensus.

WHAT IS NEW? Patients undergoing TAVR in no-iOSCS institutions had a significantly higher baseline risk profile. After propensity score matching short- and long-term mortality seemed to be comparable between centers with and without iOSCS, albeit a lower rate of specific complications in iOSCS institutions.

WHAT IS NEXT? Further investigations might help to determine the optimal setting for TAVR procedures in high-risk and inoperable patients as long as specific infrastructural resources, such as hybrid operating rooms, are not available for a considerable part of this steadily increasing patient population.

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KEY WORDS aortic stenosis, on-site cardiac surgery, TAVR, transfemoral

APPENDIX For a supplemental table and a list of the Austrian TAVI Group, please see the online version of this paper.