ISSN: 2966-4837

Brazilian Journal of Respiratory, Cardiovascular and Critical Care Physiotherapy
Jornal Brasileiro de Fisioterapia Respiratória, Cardiovascular e em Terapia Intensiva

Clinical-functional assessment of patients with aortic stenosis undergoing transcatheter aortic valve implantation

Avaliação clínico-funcional de pacientes com estenose aórtica submetidos ao implante transcateter de valva aórtica

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Abstract

Background: transcatheter aortic valve implantation (TAVI) is known to enhance valve structure and function in old adults with aortic stenosis. **Aim:** to evaluate the clinical and functional characteristics of 40 patients (mean age 79 ± 5 years) undergoing transfemoral TAVI during their hospital stay. **Methods:** this cross-sectional study. Data on mean aortic valve area, Society of Thoracic Surgeons (STS) morbidity and mortality score, echocardiographic measurements, peak cough flow (PCF), handgrip strength (HGS), 5-meter walk test (5MWT), and 6-minute walk test (6MWT) were collected at three time points: pre-TAVI, post-TAVI, and at hospital discharge. **Results:** results showed reductions in peripheral oxygen saturation (p = 0.004), peak aortic gradient (p = 0.001), and mean aortic gradient post-TAVI (p = 0.001), along with increased left ventricular ejection fraction (p = 0.001) and prolonged 5MWT completion time on the first postoperative day (p =0.003). Moderate negative correlations were observed between the European System for Cardiac Operative Risk Evaluation II score (EuroSCORE II) score and PCF (r = -0.329; p = 0.041), STS with PCF (r = -0.473; p = 0.002), and STS with 6MWT at discharge (r = -0.324; p = 0.044), as well as STS with HGS pre-TAVI (r = -0.363; p = 0.041). **Conclusion:** changes in clinical and functional variables, the increase in 5MWT time suggests a deterioration in frailty in the population. Implementing pre- and postoperative rehabilitation programs may help mitigate functional losses in this clinically vulnerable population.

Keywords: Aortic Valve Stenosis; Transcatheter Aortic Valve Replacement; Functional Status.

Resumo

Introdução: o implante transcateter de válvula aórtica (TAVI) é conhecido por melhorar a estrutura e função da válvula em idosos com estenose aórtica. **Objetivo:** avaliar as características clínicas e funcionais de 40 pacientes (idade média de 79 ± 5 anos) submetidos a TAVI transfemoral durante a internação hospitalar. **Métodos:** estudo observacional. Dados sobre área valvar aórtica média, escore de morbidade e mortalidade da *Society of Thoracic Surgeons* (STS), medidas ecocardiográficas, pico de fluxo de tosse (PFT), força de preensão manual (FPM), teste de caminhada de 5 metros (TC5M) e teste de caminhada de 6 minutos (TC6M) foram coletados em três momentos: pré-TAVI, pós-TAVI e na alta hospitalar. **Resultados:** os resultados mostraram reduções na saturação periférica de oxigênio (p = 0,004), pico do gradiente aórtico (p = 0,001) e gradiente aórtico médio pós-TAVI (p = 0,001), juntamente com aumento da fração de ejeção do ventrículo esquerdo (p = 0,001) e prolongamento do tempo de conclusão do TC5M no primeiro dia de pós-operatório (p =0,003). Foram observadas correlações negativas moderadas entre o escore *European System for Cardiac Operative Risk Evaluation II score* (EuroSCORE II) e PFT (r = -0,329; p = 0,041), STS com PFT (r = -0,473; p = 0,002) e STS com TC6 na alta hospitalar (r = -0,324; p = 0,044), bem como do STS com FPM pré-TAVI (r = -0,363; p = 0,041). **Conclusão:** alterações nas variáveis clínicas e funcionais, o aumento do tempo do TC5M sugere piora da fragilidade na população. A implementação de programas de reabilitação pré e pós-operatória pode ajudar a mitigar as perdas funcionais nesta população clinicamente vulnerável.

Palavras-chave: Estenose de Válvula Aórtica; Substituição da Válvula Aórtica Transcateter; Estado Funcional.

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How to cite: Sousa WM, Gardenghi G, Fernandes FH, Prudente ML, Oliveira JCM, Souza Filho LFM, et al. Clinical-functional assessment of patients with aortic stenosis undergoing transcatheter aortic valve implantation. Brazilian Journal of Respiratory, Cardiovascular and Critical Care Physiotherapy. 2025;16:e00032025. https://doi.org/10.47066/2966-4837.2024.0013en

Submitted on: January 14, 2025
Accepted on: May 05, 2025

Study carried out at: Hospital ENCORE, Aparecida de Goiânia, GO, Brazil.
Ethical approval: CAAE 96696518.0.0000.5083 from Universidade Federal de Goiás, no. 2.921.551

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INTRODUCTION

The rise in life expectancy has resulted in an increased prevalence of valvular heart diseases in old adults. Aortic stenosis (AS) is the most prevalent primary valvular disease, caused by a dynamic process of inflammation, lipid accumulation, and calcification. Risk factors for AS include advanced age, dyslipidemia, smoking, systemic arterial hypertension, and diabetes mellitus[1]. Treatment can be administered through surgical or catheter-based interventions[1-3].

AS manifests as a slowly progressive condition characterized by a latency period and subsequent development of symptoms such as angina, heart failure, and syncope. These symptoms exacerbate the prognosis and impair physical capabilities, ultimately resulting in a survival period of approximately two to three years[1,4,5]. The combination of these factors, associated with high frailty incidence in old adults, diminishes functional capacity, increases mortality risk, and may contraindicate conventional valve replacement surgery[6].

Transcatheter aortic valve implantation (TAVI), introduced in Europe in 2002[7], revolutionized the treatment and prognosis, becoming the recommended therapy according to current guidelines for inoperable and high-risk surgical patients. This is due to its less invasive nature and consistent results in disease progression[3]. On the other hand, clinical and functional aspects related to TAVI are poorly explored despite studies demonstrating changes in functional capacity post-procedure[8]. Although surgical risk scores are employed for stratification in these patients, they do not encompass functional criteria.

Understanding discharge conditions allows for better intra and post-hospital care planning, improves discharge decision-making, and facilitates post-discharge rehabilitation based on physical exercise. Adequate knowledge of functional factors supports biopsychosocial impacts on individual abilities to perform tasks and the interaction of old adults with family and society.

This study hypothesizes that functional decline or worsening of frailty occurs on the first day of the postoperative period, along with potential relationships between clinical and functional variables. Therefore, this study aimed to assess the preoperative, perioperative, and postoperative clinical and functional characteristics of patients hospitalized with AS undergoing TAVI.

METHODS

Study design

A cross-sectional study was undertaken with a sample comprising patients with AS undergoing transfemoral TAVI.

Setting

The study was conducted between November 2, 2018, and March 31, 2023, at a cardiology service in a private hospital in a city in the Midwest region of Brazil. It received approval from the Research Ethics Committee (#96696518.0.0000.5083), and all participants provided written informed consent, adhering to resolution 466/2012.

Participants

The study included old adults of both sexes who underwent TAVI and remained in the Intensive Care Unit (ICU). Patients without documented records of any evaluation related to the surgical procedure and those with cognitive difficulties and progressive neuromuscular, rheumatologic, or orthopedic diseases limiting the performance of physical tests were excluded.

Data collection from medical records occurred at the following time points: (1) pre-TAVI, (2) surgical record, and (3) post-TAVI. Functional data were collected (1) the day before TAVI (pre-TAVI), (2) on the first postoperative day (post-TAVI), and (3) on the day of hospital discharge (Figure 1).

The sample size was calculated for each cardiorespiratory and functional variable, with mean and standard deviation measurements acquired at the pre-TAVI, post-TAVI, and hospital discharge time points. GPower® 3.1 software was utilized, revealing a minimum estimated sample size of 29 patients (95% CI 22 to 37) at a significance level of 5%, a confidence interval of 95%, and a sample power of 80%.

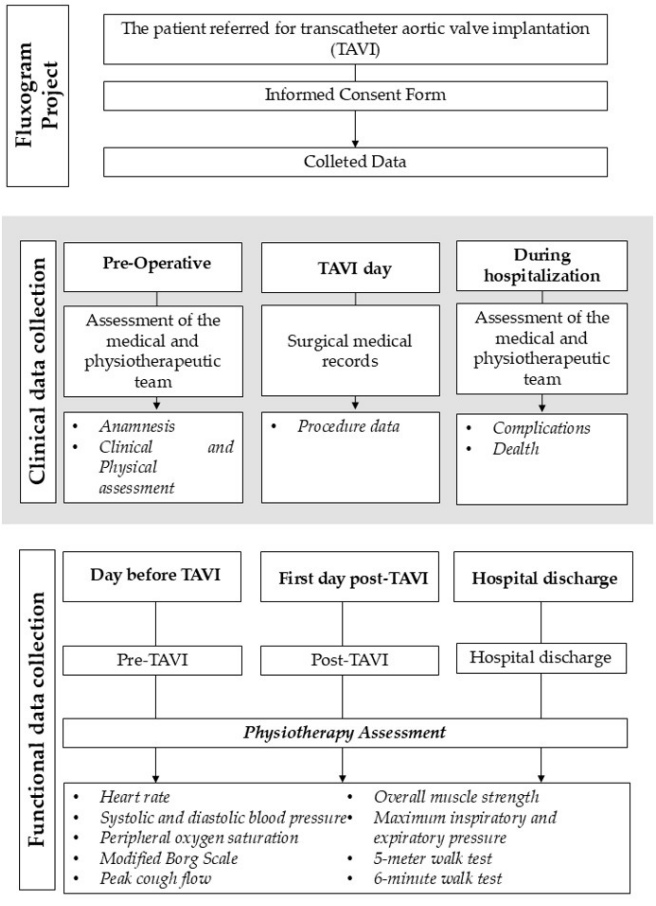

Figure 1. Flowchart of the data collection stages.

Assessment instruments

Clinical evaluation

The following informati+on was extracted from the patient's medical records: (1) age, sex, body mass, height, body mass index[9]; (2) abdominal and hip circumference, with cardiovascular risk classified according to Lean et al.[10]; (3) heart rate, systolic blood pressure, and diastolic blood pressure, collected from an electrocardiographic system; (4) peripheral oxygen saturation (SpO2), measured by pulse oximeter; (5) transthoracic echocardiogram for acquiring the mean aortic gradient (MAG), aortic valve area, and left ventricular ejection fraction (LVEF); (6) New York Heart Association functional classification (NYHA), European System for Cardiac Operative Risk Evaluation II score (EuroSCORE II), and Society of Thoracic Surgeons morbimortality score (STS).

Perioperative assessment

Information related to the surgical procedure was recorded. Additionally, the number of successful procedures, length of hospital stays (days), complications such as the need for permanent pacemaker implantation, emergency surgery, paravalvular leakage (PVL), life-threatening bleeding, acute myocardial infarction, prosthetic endocarditis, cerebrovascular events, cardiopulmonary arrest, and the number of existing deaths were documented.

Functional assessment

The Modified Borg Scale assessed respiratory effort sensation and limb fatigue[11]. Peak Cough Flow (PCF) measurement was conducted using the Peak Flow Meter® equipment and classified according to Freitas et al.[12].

For the assessment of overall muscle strength, using handgrip strength[13], a hydraulic hand dynamometer SH - Saehan® was employed following recommendations and considering the reference equation described by Novaes et al.[14].

Maximum respiratory pressures were measured using the portable digital manovacuometer model MVD-300®, following the recommendations of the American Thoracic Society (ATS)[15]. According to Neder et al.[16], the found values were compared with the predicted values.

The five-meter walk test (5MWT) was conducted at a comfortable walking pace to assess frailty[17]. The six-minute walk test (6MWT) was used to evaluate functional capacity following ATS guidelines[18]. The analysis considered the distance covered and the predicted distance established by the equation described by Soares and Pereira[19].

Statistical analysis

The data were analyzed using the Statistical Package for Social Science 26.0, and normality was tested using the Shapiro-Wilk test. Patients' surgical and hospital baseline characteristics were assessed through absolute and relative frequency for categorical variables and mean ± standard deviation or median, minimum, and maximum for continuous variables. Comparison between moments assessment was performed using Analysis of Variance (Friedman ANOVA test) and Bonferroni post hoc tests. The Pearson correlation test was applied, and simple linear regression was used. The chosen level of significance was established at 5%.

RESULTS

Forty adults were assessed for completing stage pre-TAVI. However, there were losses in stages post-TAVI and hospital discharge for functional variables (Figure 2). For clinical variables, loss was observed in the surgery and post-surgery stages (Figure 2).

The patients' baseline characteristics are shown in Table 1. Most patients were male, with a mean age of 79 ± 5 years and a mean BMI of overweight. The EuroSCORE II and STS indicated moderate operative risk, and the NYHA classification II and III were predominant.

The prevalence of comorbidities is presented in Table 2. Systemic arterial hypertension was the most prevalent disease (n=35, 90%).

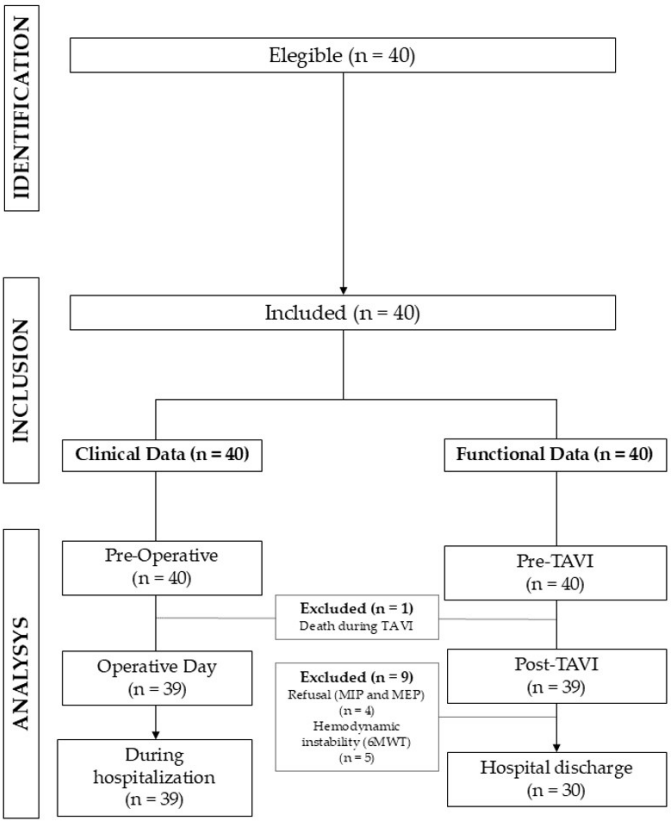

Figure 2. Study losses flowchart. TAVI: transcatheter aortic valve implantation. MIP: maximum inspiratory pressure; MEP: maximum expiratory pressure; 6MWT: 6-minute walk test

Table 1. Characteristics of patients.

Variables	n = 40	n (%)
Age (years)	79 ± 5	-
Weight (kg)	71.31 ± 12.97	-
Height (m)	1.64 ± 0.09	-
Body mass index (kg/m²)	26.57 ± 4.75	-
Waist Circumference (cm)	95.59 ± 12.97	-
Hip Circumference (cm)	99.49 ± 12.20	-
Waist/Hip Ratio	0.96 ± 0.11	-
Left ventricular ejection fraction (%)	60.30 ± 11.47	-
EuroSCORE II* (%)	4.94 ± 3.49	-
STS** (%)	6.05 ± 3.63	-
Aortic valve area (cm²)	0.83 ± 0.19	-
Permanent pacemaker	-	1 (2.6)
Age range		
< 80 years	-	20 (50)
≥ 80 years	-	20 (50)
Sex		
Female	-	19 (47.5)
Male	-	21 (52.5)
NYHA		
I	-	4 (10)
II	-	16 (40)
III	-	18 (45)
IV	-	2 (5)
Leaflet		
Bicuspid	-	3 (7.5)
Tricuspid	-	37 (92.5)

Values are described as mean ± standard deviation or n (%). n = absolute frequency; % = relative frequency. EuroSCORE II: European Cardiac Operational Risk Assessment System – risk*: low (0-2%), moderate (3-5%), high (≥6%); STS: Society of Thoracic Surgeons morbidity and mortality score – risk**: low (<4%), moderate (4-8%), high (>8%); NYHA: New York Heart Association functional classification.

After analyzing the surgical data (Table 3), we found that sedation was the most common anesthetic method. After the implant, all patients underwent percutaneous vascular repair. Regarding complications, 15% had a permanent pacemaker implantation, and only 13 patients exhibited mild paravalvular leakage. Only one experienced major bleeding due to right ventricle perforation caused by the temporary pacemaker electrode, leading to open chest surgery through sternotomy followed by death.

The average length of stay was 2 ± 1 days in the ICU and 1 ± 1 days in the ward, for a total of 3 ± 2 days.

Table 2. Prevalence of comorbidity.

	n	(%)
Systemic Arterial Hypertension	35	90%
Dyslipidemia	21	54%
Diabetes Mellitus	15	38%
Angioplasty and Coronary Artery Disease	14	36%
Chronic Obstructive Pulmonary Disease	10	26%
Acute Myocardial Infarction and Chronic Renal Failure	9	23%
Pulmonary Hypertension	7	18%
Carotid and Cerebrovascular Disease	6	15%
Porcelain Aorta	5	13%
Angina, Stroke and Transient Ischemic Attack	3	8%
Syncope	1	3%

n = absolute frequency; % = relative frequency.

Table 3. Surgical and hospital characteristics.

Variables	n=40	n (%)
Contrast	92.06 ± 40.04	-
Type of anestesia		
General anesthesia	-	6 (15)
Sedation	-	34 (85)
Type of Prosthesis		
CoreValve®	-	6 (15)
Edwards SAPIEN XT®	-	3 (7)
Edwards SAPIEN 3®	-	31 (77)
Size of the implanted valve (mm)		
20	-	1 (2)
23	-	15 (37)
26	-	11 (27)
29	-	12 (30)
34	-	1 (2)
Vascular access/repair		
Percutaneous (Prostar®/ProGlide®)	-	40 (100)
Complications		
Second prosthesis implantation	-	0
Conversion to sternotomy	-	1 (2)
Permanent pacemaker	-	6 (15)
Emergency surgery	-	1 (2)

Data expressed as mean ± standard deviation or n (%). n = absolute frequency; % = relative frequency.

Table 3. Continued...

Variables	n=40	n (%)
Paravalvular Leak		
Absent	-	26 (65)
Discreet	-	13 (32)
Moderate	-	1 (2)
Important	-	0
Life-threatening bleeding	-	1 (2)
Major bleeding	-	1 (2)
Death		
Cardiovascular	-	1 (2)
Stroke/Transient ischemic attack	-	0
Procedure success	-	39 (97)
Days in the Intensive Care Unit		
1	-	22 (56)
2	-	10 (26)
3 to 7	-	7 (18)
Days in the ward		
0	-	6 (15)
1	-	19 (49)
2	-	11 (28)
> 2	-	3 (8)

Data expressed as mean ± standard deviation or n (%). n = absolute frequency; % = relative frequency.

The follow-up of cardiorespiratory and functional variables at time points pre-TAVI, post-TAVI, and hospital discharge is presented in Table 4. Between time points pre-TAVI and post-TAVI, there was an increase in LVEF (p = 0.001). The peak aortic gradient improved at post-TAVI compared to hospital discharge (p = 0.001), the same was observed to MAG (p = 0.001). SpO2 decreased at post-TAVI compared to pre-TAVI (p = 0.004), and the time spent on the 5MWT increased (p = 0.003).

As detailed in Figure 2, the mean imputation method was employed for thirteen missing values, which were distributed among maximal inspiratory pressure, maximal expiratory pressure, and 6MWT.

EuroSCORE II and PCF (R^2 = 10.8) at post-TAVI had a moderate negative relationship. STS correlated negatively and moderately with handgrip strength (HGS) (R^2 = 13.2) at pre-TAVI, with PCF (R^2 = 22.3), and the distance covered in the 6-minute Walk Test (6MWTD) (R^2 = 10.5) at hospital discharge (Figure 3).

DISCUSSION

In this study, a similar distribution between sexes was observed, with a predominance of overweight patients and moderate operative risk. The population exhibited a moderate risk of mortality and multiple comorbidities, remaining hospitalized post-TAVI for an average of two days in the ICU and one day in the ward. Complications ranged from the need for permanent pacemaker implantation and mild PVL to death. Functional assessment demonstrated reduced levels of SpO2 and frail gait post-TAVI. Moderate relationships were observed pre-TAVI, where higher STS

Table 4. Cardiorespiratory and functional characteristics pre-TAVI, post-TAVI, and at hospital discharge (n = 39).

Variables	Expected	pre-TAVI		post-TAVI		Hospital Discharge		*p**
		Mean ± SD	95%CI	Mean ± SD	95%CI	Mean ± SD	95%CI	
LVEF	≥ 55%	60.30 ± 11.47	56.58 - 64.02	63.31 ± 12.33	59.31 - 67.31	-	-	0.001
PAG	0	69.30 ± 12.01	65.41 - 73.19	16.48 ± 6.64	14.33 - 18.63	-	-	0.001
MAG	0	42.00 ± 5.96	40.07 - 43.93	10.71 ± 4.06	9.39 - 12.02	-	-	0.001
HR	50 to 100 bpm	68.69 ± 14.40	64.03 - 73.36	71.92 ± 12.67	67.30 - 75.67	73.15 ± 13.75	68.37 - 77.48	0.062
SpO_2	≥ 94%	95.87 ± 2.24	95.15 - 96.60	94.56 ± 2.29	93.87 - 95.42	94.84 ± 2.06	94.10 - 95.42	0.004**
SBP	≤ 120 mmHg	123.36 ± 20.38	116.75 - 129.97	123.64 ± 20.09	117.07 - 130.81	129.76 ± 16.61	124.48 - 135.51	0.354
DBP	≤ 80 mmHg	67.56 ± 13.71	63.12 - 72.01	64.74 ± 11.17	60.62 - 68.08	68.06 ± 10.98	64.26 - 71.55	0.398

Values are expressed as mean ± standard deviation—95%CI: 95% confidence interval. LVEF: left ventricular ejection fraction; PAG: peak aortic gradient; MAG: mean aortic gradient; HR: heart rate; SpO_2: peripheral oxygen saturation; SBP: systolic arterial pressure; DBP: diastolic arterial pressure; BORG: Borg Scale; HGS: handgrip strength; PCF: peak cough flow; MIP: maximum inspiratory pressure; MEP: maximum expiratory pressure; 5MWT: 5-meter walk test; 6MWTD: distance covered in the 6-minute Walk Test; M: male; F: female; bpm: beats per minute; m: meters. *Friedman ANOVA test; **Bonferroni post-hoc test: pre-TAVI x post-TAVI, p=0.002; pre-TAVI x hospital discharge, p=0.018. ***Bonferroni post-hoc test: pre-TAVI x post-TAVI, p = 0.001

Table 4. Continued...

Variables	Expected	pre-TAVI		post-TAVI		Hospital Discharge		*p**
		Mean ± SD	95%CI	Mean ± SD	95%CI	Mean ± SD	95%CI	
BORG								
Dyspnea	0	0.40 ± 0.81	0.13 - 0.66	0.63 ± 1.32	0.21 - 1.11	0.24 ± 0.41	0.11 - 0.39	0.511
Fatigue lower limb	0	0.87 ± 1.79	0.29 - 1.45	0.58 ± 1.21	0.20 - 1.02	0.56 ± 0.73	0.34 - 0.82	0.209
HGS (M)	> 29.26 kgf	46.27 ± 21.86	39.43 - 59.17	46.90 ± 23.83	38.31 - 60.13	44.12 ± 20.77	37.17 - 55.63	0.901
HGS (F)	> 28.55 kgf	46.28 ± 22.41	33.24 - 52.92	47.18 ± 24.40	33.77 - 55.15	44.21 ± 21.26	32.13 - 51.31	0.930
PCF	> 160 l/min	238.21 ± 87.48	209.85 - 266.56	234.44 ± 97.75	201.79 - 268.64	234.89 ± 90.70	202.05 - 260.63	0.237
MIP (M)	≥ -82.39 mmHg	-55.44 ± 33.53	42.36 - 76.54	-55.17 ± 31.74	40.41 - 72.69	-50.08 ± 20.65	39.92 - 59.68	0.647
MIP (F)	≥ -81.61 mmHg	-56.43 ± 34.10	38.39 - 64.03	-56.60 ± 32.00	37.63 - 63.98	-50.81 ± 20.97	37.7 - 57.8	0.052
MEP (M)	≥ 85.10 mmHg	71.49 ± 35.34	54.72 - 91.48	68.27 ± 35.52	46.03 - 83.69	70.00 ± 35.59	51.85 - 91.69	0.555
MEP (F)	≥ 83.79 mmHg	72.54 ± 35.34	56.55 - 83.03	70.23 ± 35.40	54.13 - 82.41	70.89 ± 35.61	52.01 - 76.91	0.083
5MWT	< 7 s	7.74 ± 3.88	6.48 - 9.00	9.89 ± 4.35	8.45 - 11.43	9.10 ± 3.13	8.16 - 10.21	0.003***
6MWTD	≥ 271.88 m	257.01 ± 102.61	223.75 - 290.27	237.97 ± 111.53	198.98 - 274.15	237.17 ± 106.86	199.78 - 270.46	0.057

Values are expressed as mean ± standard deviation—95%CI: 95% confidence interval. LVEF: left ventricular ejection fraction; PAG: peak aortic gradient; MAG: mean aortic gradient; HR: heart rate; SpO_2: peripheral oxygen saturation; SBP: systolic arterial pressure; DBP: diastolic arterial pressure; BORG: Borg Scale; HGS: handgrip strength; PCF: peak cough flow; MIP: maximum inspiratory pressure; MEP: maximum expiratory pressure; 5MWT: 5-meter walk test; 6MWTD: distance covered in the 6-minute Walk Test; M: male; F: female; bpm: beats per minute; m: meters. *Friedman ANOVA test; **Bonferroni post-hoc test: pre-TAVI x post-TAVI, p=0.002; pre-TAVI x hospital discharge, p=0.018. ***Bonferroni post-hoc test: pre-TAVI x post-TAVI, p = 0.001

scores were associated with lower HGS. Higher STS scores were related to shorter 6MWTD at hospital discharge.

Among the observed characteristics are the minimum age of 65 and the presence of half of the patients over 80, which aligns with the existing report in the literature[2]. Advanced age is a significant factor in the development of AS, attributed to increased degeneration of the aortic valve annulus, particularly associated with more severe states of valvular pathology[3,4].

In the studied population, multiple comorbidities are more common, accompanied by a moderate risk of mortality according to the STS criteria[6]. Some studies have noted the presence of a high STS risk in some instances[20,21], overweight, and high cardiovascular risk[2,20,22]. The associated comorbidities presented in this study also resembled those reported in the literature, with conditions such as systemic arterial hypertension occurring in 76 to 84% of cases[20] and diabetes mellitus between 24 to 40%[2,20,22].

According to the NYHA classification in the preoperative period, most patients showed symptoms during less intense activities. This observation underscores how patients were adversely affected by the overall course of the disease, suggesting a potential negative impact on their quality of life[23].

Regarding complications, the need for a permanent pacemaker implantation and PVL has been observed in other studies. A retrospective study involving 59 patients with severe AS undergoing TAVI revealed that 8.47% of patients required a permanent pacemaker[24]. On the other hand, a randomized clinical trial demonstrated mild PVL in 3.3% and moderate PVL in 6.7% of cases[22]. Given the high rate of atrioventricular block following TAVI, which can occur days after the procedure, the effects of a permanent pacemaker implantation may be more protective than detrimental[25]. PVL is common after TAVI, and while moderate to severe PVL may reasonably predict reduced survival, the association of mild PVL with a worse outcome remains controversial. However, this does not eliminate the need for clinical follow-up[26].

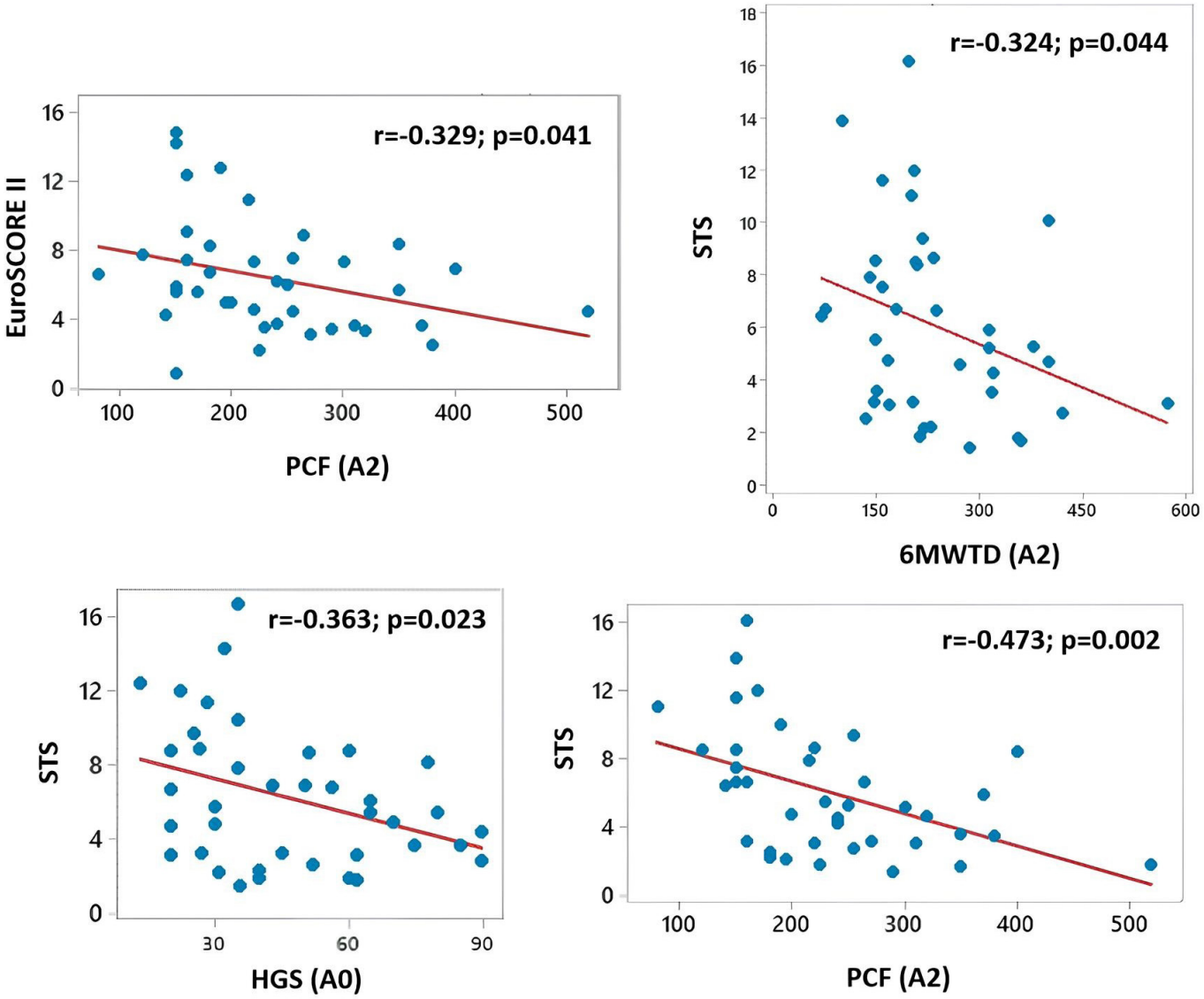

Figure 3. Relationship between clinical and functional parameters in old adults undergoing TAVI, n=39. PCF: peak cough flow; 6MWTD: distance covered in the 6-minute Walk Test; HGS: handgrip strength; A0: pre-TAVI; A2: hospital discharge; EuroSCORE II: score from the European Cardiac Operative Risk Assessment System II; STS: Society of Thoracic Surgeons mortality and morbidity and mortality score.

Although the literature suggests the occurrence of stroke, vascular complications, and infectious endocarditis[21], complications related to vascular and cerebrovascular events were absent in the present study. One hypothesis is that in previously published studies, the mean age was higher, which may explain the presence of these complications.

Additionally, severe life-threatening hemorrhagic events have been documented in other studies[21,22]. However, in this study, only one case resulting in fatality occurred within less than 24 hours. In a retrospective cohort of 407 patients, vascular complications and hemorrhages increased the risk of mortality within the 30-day to one-year period, regardless of the bleeding etiology[27].

Following the procedure, patients were transferred to the ICU, where they stayed for an average of two days and then to the ward for approximately one day. Despite presenting moderate surgical risk and low functional capacity, an early discharge (≤ 3 days) was observed[28,29]. This factor reduces hospital expenses related to TAVI, particularly for those undergoing transfemoral procedures, as it can be performed in a catheterization laboratory with local anesthesia and conscious sedation[28]. This factor impacts the decrease in cardiovascular, respiratory, and functional complications, promoting independent mobilization, self-care capacity, and improvement in emotional well-being[29].

The most common presentation of AS is characterized by an increase in aortic gradients proportional to the reduction in valvular area, with preserved LVEF[30]. Consistent with the literature, gradients, and LVEF improved in the population evaluated in this group after treatment. TAVI enables a reduction in aortic gradients and a substantial decrease in left ventricular after load and positively impacts clinical improvement[31]. Previous studies have reported pre- and

post-TAVI aortic gradient values similar to those observed in this study[32,33].

Moreover, post-TAVI surgery, a reduction in SpO2 was observed, along with an increase in the time taken to complete the 5MWT, indicating frailty. Given the advanced age and multiple comorbidities, on the first postoperative day, some patients may limit themselves to bed due to fear or insecurity, reducing functional demands[34]. This results in decreased peripheral stimulus, worsening outcomes compared to the preoperative state.

Reduced mobility is associated with unfavorable postoperative outcomes and predicts morbimortality in TAVI patients. A decrease of 0.1 m/s in gait speed is related to an increase of 11% in mortality[24]. The femoral puncture may also have influenced the distance values covered in the 6MWT and 5MWT, which were already below predicted levels.

The relationship between the STS score and HGS suggests that the functional status of old adults is crucial for minimizing surgical risk, as higher evaluated scores correlate with lower values of HGS. It is also noteworthy that PCF was low during hospital discharge, particularly in the presence of high STS and EuroSCORE II. HGS is directly associated with pulmonary complications, impacting hospitalization duration and readmissions[35]. Establishing a connection between the STS score and functional capacity is crucial. Inferring a poorer outcome in the 6MWT at the time of discharge, even during preoperative assessment, is significant. This inference can notably contribute to guiding individuals, including those unable to perform the 6MWT, toward preoperative rehabilitation[36].

The limitations of this study include (1) the inclusion of a single hospital institution, which may affect the external validity of the study, and (2) heterogeneity in the type of sedation applied before the surgical procedure, which may have interfered with the results of the evaluations carried out on the first day post-TAVI. Although none of the patients tested positive for the disease before or during hospitalization, the accumulated lifestyle changes may have impacted the functional capacity results.

The findings in this study underscore the importance of incorporating pre-TAVI exercise protocols, early mobilization, and multidisciplinary patient assistance post-TAVI. This is crucial as it can influence the functional capacity during discharge.

CONCLUSION

Although TAVI had limited impact on most clinical and functional variables, allowing for early ICU and hospital discharge, an increased time to complete the 5MWT on the first postoperative day suggests a transient decline in functional capacity, possibly indicating increased frailty. These findings highlight the potential vulnerability of this patient population in the immediate postoperative period. Therefore, the implementation of structured pre- and postoperative rehabilitation programs is recommended to mitigate functional decline and promote recovery in clinically fragile individuals undergoing TAVI.

FUNDING

This research was funded by Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brazil (CAPES) – Finance Code 001.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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