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THE ROLE OF ADVANCED ECHOCARDIOGRAPHY IN RISK STRATIFICATION OF PATIENTS WITH SEVERE AORTIC STENOSIS TREATED BY TRANSCATHETER AORTIC VALVE IMPLANTATION

PhD THESIS SUMMARY

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Summary

Introduction

As the most common degenerative valvular disease in adults, aortic stenosis (AS) has a significant impact on public health because of the amount of resources required for appropriate diagnosis and treatment, particularly in the context of an aging population. Since long-term survival after invasive treatment for AS is comparable to that of the general population adjusted for age and comorbidities, accessibility to treatment is of major importance. Transcatheter aortic valve implantation (TAVI) has become the preferred method for treating symptomatic severe AS [1, 2]. With technological advancements and demonstration of excellent clinical outcomes, patient selection criteria have expanded from high or prohibitive surgical risk to low-risk patients [3, 4].

Recent advances in echocardiographic techniques, such as 3D echocardiography, speckle-tracking, and myocardial strain analysis, have enhanced the detection of subtle changes in cardiac structure and function, with potential roles in risk stratification and treatment optimization, both before and after the intervention. However, significant discrepancies exist on the resources required for diagnosis versus treatment, as well as treatment versus follow-up, with significant socioeconomic, medical, and ethical implications. Internationally, multiple guidelines and studies emphasize the importance of risk assessment and stratification for optimizing outcomes; however, specific parameters or standardized methodologies are not provided [1, 2, 5-7]. In this context, it is necessary to optimize patient selection and improve TAVI outcomes using advanced echocardiographic techniques for pre-procedural risk stratification, evaluation of procedural outcomes, and adjustment of post-procedural management, with the ultimate goal of improving the quality of life and long-term prognosis while managing resources efficiently.

In clinical practice, prognostic evaluation following the diagnosis of aortic stenosis is an essential part of treatment decision-making and therapeutic strategy selection, with the goal of improving clinical outcomes. This process involves comprehensive assessment of AS severity, extravalvular cardiac damage, and associated comorbidities. According to current guidelines for the treatment of valvular pathology, symptomatic severe AS has an indication for invasive treatment [1, 2]. However, the associated cardiac damage of long standing AS may negatively affect patient prognosis, even with treatment [8].

The evolution of risk scores in AS has undergone significant transformation, from a simple assessment of valvular severity to the inclusion of extracardiac impairment. This evolution reflects

a deeper understanding of the systemic implications of AS and the need for more precise and personalized management. EuroSCORE (European System for Cardiac Operative Risk Evaluation) and STS (Society of Thoracic Surgeons Predicted Risk of Mortality) were among the first scores developed to evaluate operative risk and prognosis in patients undergoing aortic valve surgery but tend to overestimate risk in the context of TAVI [9, 10]. With the expansion of transcatheter procedures, specific scores such as TVT (Transcatheter Valve Therapy) and FRANCE-2 have been developed, which integrate anatomical and extracardiac factors, allowing for a more accurate assessment of the risks associated with TAVI [11].

Studies have shown that extravalvular damage can worsen postoperative outcomes and increase the risk of mortality and complications, leading to the inclusion of these factors in risk scores for a more accurate evaluation [11-16]. Genereux classifies cardiac impairment associated with aortic stenosis into five stages, with this classification having demonstrated prognostic value, as the risk of mortality increases with the degree of cardiac impairment [17]. This classification allows for a comprehensive understanding of the extent of extravalvular impairment in AS, providing a framework for evaluating the disease severity and planning appropriate treatment. A recent meta-analysis evaluated this classification across a broad spectrum of AS severity and symptomatology [18]. This study suggests that early staging of cardiac lesions might be useful for determining the optimal timing of intervention and evaluating the need for additional treatment to improve long-term prognosis [18].

The aim of this thesis was to identify new prognostic factors in the treatment of AS and to assess the function and impact of transcatheter-implanted aortic valve prostheses on cardiac function and prognosis in the context of advanced echocardiography.

In this thesis, the prognostic potential of a novel factor was investigated, a factor that assesses the coupling of the right ventricle to the pulmonary artery, which integrates the right ventricular systolic performance with the pulmonary circulation overload through a noninvasive parameter in the treatment of AS. Additionally, the function and impact of the implanted transcatheter aortic valve prosthesis on cardiac function and prognosis were investigated within the context of advanced echocardiography.

Working hypothesis and general objectives

The general objectives of this thesis are as follows:

1. To assess the prevalence of impairment of ventriculo-arterial coupling of the right ventricle to the pulmonary circulation, identify the influencing factors, and evaluate its prognostic value in patients with aortic stenosis undergoing TAVI.

2. To evaluate the prevalence of prosthesis-patient mismatch and its impact on cardiac function and long-term clinical outcomes in patients with AS undergoing TAVI.

The working hypotheses that formed the basis of the studies can be summarized as follows:

1. Ventriculo-arterial coupling (VAC) of the right ventricle to the pulmonary circulation, estimated non-invasively by the ratio of right ventricular free wall longitudinal strain (RVLS) to systolic pulmonary artery pressure (sPAP), is a pre-procedural parameter that enables risk assessment and independently predicts long-term clinical outcomes in patients with AS undergoing TAVI.

2. Prosthesis-patient mismatch, defined according to echocardiographic criteria, affects cardiac function and long-term clinical outcomes in AS patients undergoing TAVI.

General research methodology

Study population

This study was conducted at "Prof. Dr. C.C. Iliescu" Emergency Institute for Cardiovascular Diseases in Bucharest, Cardiology and Cardiovascular Surgery Department. Patients were evaluated for inclusion in the study between September 2018 and May 2020. A total of 228 consecutive patients with symptomatic severe aortic stenosis (AS) with an indication for TAVI were assessed. Of the potentially eligible patients, 160 met the inclusion criteria and adhered to the follow-up protocol, forming the final study population.

The methodology involved analyzing a cohort of patients with severe AS, prospectively enrolled according to the eligibility criteria outlined below. The patients underwent clinical, and imaging assessments based on a predefined protocol. The inclusion criteria were as follows: symptomatic severe aortic stenosis (Vmax > 4.0 m/s, mean gradient > 40 mmHg, AVA < 1.0 cm^2, AVAi < 0.6 cm^2/m^2), intermediate or high risk according to the STS-PROM score (≥ 4%) or age > 75 years, and technical feasibility for transfemoral TAVI. Exclusion criteria included poor echocardiographic windows, relative or absolute contraindications for transfemoral TAVI as per guidelines, and lack of advanced echocardiographic evaluation pre- and post-TAVI.

Patient evaluation

All patients included in the study underwent a comprehensive evaluation, medical history and physical examination, ECG, echocardiography, coronary angiography, and thoraco-abdominal-pelvic CT with cardiac gating. Advanced echocardiography was performed one day before TAVI and one-month post-TAVI in the Euroecolab echocardiography laboratory within the Cardiology Department at "Prof. Dr. C.C. Iliescu" Institute using the Vivid E95 ultrasound machine (General Electric Healthcare, Horten, Norway). The acquisition protocol followed current recommendations [19] and included advanced imaging techniques, such as Tissue Doppler Imaging (TDI) and speckle tracking for cardiac function analysis, using dedicated software for offline analysis (EchoPAC PC, GE Medical Systems).

In addition to assessment of AS severity and classical parameters for evaluating cardiac function and associated valvular impairment, advanced echocardiographic parameters were evaluated. LV global longitudinal strain was analyzed using a 17-segment model for myocardial

strain imaging [20]. Left atrial strain analysis evaluated global longitudinal strain and strain rate for each phasic function of the left atrium (LAε, maximum longitudinal strain value for reservoir function; SSr, systolic strain rate for reservoir function; ESr, early diastolic strain rate for conduit function; ASr, late diastolic strain rate for pump function). Right ventricular myocardial function was analyzed using global longitudinal strain of the right ventricle, free wall longitudinal strain, and interventricular septal longitudinal strain.

All patients underwent preprocedural CT according to the TAVI protocol and current guidelines [21]. This involved cardiac CT with retrospective ECG gating and contrast administration to assess the aortic root, followed by thoraco-abdominal-pelvic CT with contrast to evaluate the aorta and iliofemoral axes to assess the feasibility of transfemoral access. CT examinations were performed using a 64-slice scanner (Sensation 64, Siemens Medical Systems, Forchheim, Germany), and the acquired images were analyzed using dedicated software for offline analysis (3mensio Structural Heart, Aortic Valve, Pie Medical Imaging, Netherlands).

Patient follow-Up

Patients were subsequently evaluated at 3 months and 1-year post-TAVI through medical history, clinical examination, resting ECG, and standard transthoracic echocardiography. Follow-up focused on identifying the following events: occurrence of congestive heart failure, improvement in cardiac function, reverse cardiac remodeling, improvement in filling pressures, evolution of pre-existing functional mitral regurgitation, evolution of pre-existing functional tricuspid regurgitation, identification and quantification of paravalvular regurgitation, structural or nonstructural valve deterioration, and all-cause mortality.

Long-term follow-up data (>1 year) were obtained through telephone or online questionnaires, including information on symptom evolution, rehospitalization for complications associated with the procedure or post-TAVI treatment, rehospitalization for heart failure, arrhythmias, and coronary ischemic events, for which data availability was 88.1%. All-cause mortality was obtained by querying the Romanian National Population Registry at three years post-TAVI, with 100% data availability. The primary outcome was defined as a composite endpoint of major adverse cardiac events (MACE), including rehospitalization for cardiac causes (obtained through institutional database searches and/or telephone or online questionnaires) and all-cause mortality at 3 years post-TAVI.

Statistical analysis

The description and comparison of discrete variables are expressed as number and frequency using the Chi-square or Fisher t-test, while continuous variables are expressed as mean ± standard deviation and compared using the Student t-test for normal distribution or non-parametric tests (Mann-Whitney) for non-normal distribution. Normal or abnormal data distribution was assessed using the Kolmogorov-Smirnov test. The Bonferroni method was used to adjust the p-values for multiple comparisons.

Associations between the studied parameters were identified using Pearson and Spearman correlation coefficients. The relationship between the studied factors and the dependent variable was analyzed using ANOVA for clinical characteristics, Odds Ratios for event frequency, and regression analysis to establish the connection between clinical variables and events.

Comparisons between study groups regarding event frequency, as well as the relationship between dependent variables and events over time and clinical variables, were analyzed using survival analysis (Kaplan-Meier analysis and Cox proportional hazards). Time-dependent receiver operating characteristic (ROC) curves were used to determine the individual and combined predictive values of certain parameters for mortality [22]. Cutoff values for each tested variable were established through analysis based on the highest sum of sensitivity and specificity [23, 24]. Regression analysis was used to create risk scores, and their evaluation was performed using C-statistics and ROC (Receiver Operating Curve) analysis. The statistical significance was set at $p<0.05$. Data were analyzed using statistical analysis programs such as IBM SPSS Statistics 21 and SAS/STAT Software.

Summary of results

1. Study of the Relationship Between Right Ventriculo-Arterial Coupling and Prognostic Impact in Patients with Severe Aortic Stenosis Treated with TAVI

Baseline characteristics

Patients with impaired ventriculo-arterial coupling were younger, more frequently had atrial fibrillation, a history of myocardial infarction, angina pectoris, and a higher NYHA functional class compared to patients without impaired coupling. There were no significant differences in the presence of comorbidities between the groups. While there were no significant differences between the groups in terms of peak transvalvular aortic flow velocity and mean transvalvular gradient, the group with impaired coupling had a higher incidence of bicuspid aortic valves and lower indexed aortic valve area ($p = 0.031$ and $p = 0.008$, respectively). Additionally, patients in the impaired coupling group had more advanced cardiac lesions, as indicated by the higher frequency of left and right ventricular systolic dysfunction, larger left atrium size, more frequent left atrial dysfunction, right atrial and ventricular dilation ($p < 0.001$).

Post-TAVI echocardiographic changes

All echocardiographic parameters describing AS severity improved significantly after the procedure. Compared with baseline, there was a significant improvement in LVEF post-TAVI ($p = 0.008$), as well as a reduction in indexed LV mass ($p < 0.001$). In addition to the reduction in mitral regurgitation after TAVI ($p = 0.003$), there was a decrease in the left atrial volume ($p = 0.007$) and improvement in its function ($p < 0.001$). A significant improvement in ventriculo-arterial coupling was also observed after TAVI ($p = 0.007$), primarily driven by a decrease in sPAP ($p < 0.001$) and to a lesser extent by the global contractility of the right ventricle. The observed trend of improved global right ventricular contractility post-TAVI was largely due to improved LV systolic function and interventricular interdependence.

Significant improvements of echocardiographic parameters describing AS severity were observed after TAVI, regardless of the group. LV remodeling and functional improvement were significant after the procedure, regardless of the initial state of ventriculo-arterial coupling. The left atrial function and volume improved significantly after TAVI in both groups. The right atrial diameter decreased significantly after TAVI only in the impaired coupling group ($P = 0.046$). In this group, right ventricular function improved after TAVI according to strain parameters: RV

GLS (p = 0.001), RV-FWS (p = 0.003), septal strain (p = 0.003), and RV S' (p = 0.026), but not by TAPSE (p = 0.187) or FAC (p = 0.060).

Predictors of impaired ventriculo-arterial coupling

Predictive factors for impaired ventriculo-arterial coupling were identified using univariate and multivariate analyses. Pre-TAVI left atrial function quantified by LA longitudinal strain, and right atrial diameter were independent predictors of RV/PA coupling impairment. Conversely, age, left atrial function expressed by LA longitudinal strain, and right ventricular diameter were independent predictors of persistent ventriculo-arterial coupling impairment post-TAVI.

Clinical outcomes

Follow-up data were available for all patients, with an average follow-up duration of 2.5 years (903 ± 216 days; range, 134–1,095 days). During follow-up, MACE occurred in 38 patients (24.4%), including 19 rehospitalizations (11.9%) and 25 deaths (15.6%). At 3 years of follow-up, the survival rate was 82.1%. Kaplan-Meier analysis revealed that impaired ventriculo-arterial coupling was associated with unfavorable outcomes: long-term survival without rehospitalization or death was lower (54.8% vs. 85.6% in patients without impaired coupling, p = 0.001), and overall survival was lower (66.3% vs. 94.9% in patients without impaired coupling, p < 0.001). The rehospitalization rates were similar between the two groups.

Pre-TAVI impairment of ventriculo-arterial coupling, quantified by the non-invasive surrogate parameter RV-FWS/sPAP, proved to be an independent predictor of both mortality (HR = 5.97, CI = 1.44–24.8, p = 0.014) and MACE (HR = 4.14, CI = 1.37–12.5, p = 0.012).

To evaluate the impact of changes in ventriculo-arterial coupling, patients were reclassified based on the post-TAVI RV free wall strain/sPAP ratio. Kaplan-Meier analysis revealed that impaired ventriculo-arterial coupling was also associated with unfavorable outcomes, even though it did not reach statistical significance. Long-term MACE-free survival was 59.0% compared to 76.3% in patients without impaired coupling (p = 0.063), and overall survival was 71.5% in patients with impaired coupling compared to 85.5% in those without impaired coupling (p < 0.001).

Reclassification of patients based on the evolution of the RV-FWS/sPAP ratio led to 4 subgroups: patients normal ventriculo-arterial coupling (44.3%), patients with persistent ventriculo-arterial uncoupling (34.4%), patients with recovered ventriculo-arterial coupling (16.0%), and patients with new-onset of ventriculo-arterial uncoupling (5.3%).

According to this classification, Kaplan-Meier analysis showed that patients without impaired ventriculo-arterial coupling and those with persistent coupling impairment maintained similar trends for MACE and mortality. In the subgroup of patients with recovered ventriculo-arterial coupling, rehospitalization events and mortality were similar to those in the persistent ventriculo-arterial uncoupling. In the subgroup with new-onset of ventriculo-arterial uncoupling, there was only one rehospitalization event and no mortality. Although the initial ventriculo-arterial uncoupling improved early after the procedure, it continued to pose a higher long-term mortality risk.

2. Study of the prevalence of prosthesis-patient mismatch and its effects on cardiac function and clinical outcomes after TAVI

Baseline characteristics

According to the indexed effective orifice area (iEOA) measured by echocardiography in 160 patients during the 30-day post-TAVI evaluation, 96 patients did not develop PPM_M (60%), 47 patients (29.4%) had moderate PPM_M, and 17 patients (10.6%) had severe PPM_M, resulting in 64 patients with PPM_M (40%). After adjusting for BMI, only 50 patients (31.3 %) had PPM_M of whom 34 (21.3%) had moderate PPM_M and 16 (10.1%) had severe PPM_M. According to the iEOA estimated by the specific indexed area of the implanted valve, a lower incidence of PPM_V was observed, with 43 (26.9%) patients having moderate PPM_V and only 1 (0.6%) with severe PPM_V. Except for the higher incidence of women (57.8% vs. 39.6%, p=0.024) and higher BMI (28.5±5.0 vs. 26.9±4.5, p=0.033) in the PPM_M group, no significant differences were found in age (76.3±7.8 vs. 76.6±7.1 years, p=0.8), body surface area (p=0.1), or obesity prevalence (p=0.2). There were also no significant differences between groups in terms of cardiovascular risk factors (p>0.2).

Based on preoperative echocardiographic assessment, patients in the PPM_M group had lower AVA values (0.67±0.3 vs. 0.77±0.3 in the non- PPM_M group, p=0.039) and lower AVAi (0.37±0.2 vs. 0.44±0.2 in the non-PPM group, p=0.015), but no significant differences in mean transvalvular gradient or LVOT diameter between groups. Left atrial function impairment (reservoir function via LA GLS and SSr and pump function via ASr) was more frequent in the PPM_M group, despite similar left atrial dimensions (both volume and indexed area) in both groups.

According to preoperative CT angiography, patients in the PPM_M group had smaller aortic roots, suggested by smaller aortic annulus area (452.4±95 vs. 487.8±84 in the non- PPM_M group,

p=0.018), smaller LVOT-derived diameter (23.8±2.8 vs. 24.6±2.5 in the non- PPM_M group, p=0.048), and smaller Valsalva sinuses (p=0.038). The left coronary artery ostium height, another parameter associated with a smaller aortic root, was significantly lower in the PPM_M group. There were no significant differences in the CT-derived calcium score or distribution of calcifications at the valve and aortic root. There were no differences between groups in terms of procedural characteristics, except for a higher incidence of 20/23 mm valve use in the PPM_M group (51.6% vs. 28.1% in the non- PPM_M group, p=0.010).

Post-TAVI echocardiographic changes

All echocardiographic parameters describing AS severity, left atrial reservoir and contractile function, and LV systolic and diastolic function significantly improved after the procedure, as previously reported [25]. Additionally, a comparative analysis of pre-and post-TAVI echocardiographic parameters showed significant improvements in the same parameters in both the PPM_M and non- PPM_M groups.

At 1-month post-TAVI, there were no significant differences between patients with or without PPM in terms of indexed LV mass, LV volume, LVEF, and LV GLS (p=NS). The post-TAVI prevalence of paravalvular aortic regurgitation or mitral regurgitation did not differ between the two groups (p=0.96, p=0.12, respectively). Although left atrial size and indexed volume were similar between groups, global left atrial systolic strain (LAε: 13.7±6.1 vs. 16.9±7.4% in the non-PPM_M group, p=0.005) and atrial pump function (ASr: -1.0±0.6 vs. -1.3±0.6 in the non- PPM_M group, p=0.013) were impaired in the PPM_M group.

An analysis of patients with PPM_M based on predicted versus unpredicted PPM_M showed larger LV volumes, significant mitral regurgitation, and a larger aortic root in the unpredicted PPM group. After TAVI, unpredictable PPM_M was associated with subclinical LV dysfunction and larger LV volumes.

Predictors of PPM and impact on cardiac function

Two separate analyses were performed: one based on preoperative characteristics to determine factors associated with the occurrence of PPM_M and one based on postoperative characteristics to analyze the impact of PPM_M on cardiac function after TAVI.

In the multivariable regression model for preprocedural factors, increased BMI (increase per unit OR 1.01, p=0.012) and prosthesis number (OR 0.79, p=0.001) were independent predictors of the presence of PPM_M. There was no significant association between PPM_M and age,

body surface area, obesity, aortic valve calcium score, indexed LV mass, prosthesis oversizing, or postdilatation.

In the multivariable regression model for postprocedural factors, left atrial systolic function (LA GLS: OR 0.92, p = 0.022) was independently associated with the presence of PPM_M after the procedure. Similarly, pre- and post-TAVI characteristics were analyzed separately based on reclassification into predicted and unpredicted PPM_M subgroups. After TAVI, left atrial dysfunction (LA GLS: OR 0.93, p=0.014) was independently associated with unpredicted PPM_M, while subclinical LV dysfunction (LV GLS: OR 0.81, p=0.015) was independently associated with predicted PPM_M.

Clinical Outcomes

Three-year mortality was higher in the PPM_M group than in the non- PPM_M group (23.4% vs. 10.4 %, p=0.026), even after adjusting for BMI (25.5% vs. 11.0%, p=0.019). Reclassification of the PPM_M group into moderate and severe PPM_M showed a trend towards higher mortality in both moderate and severe PPM_M groups compared to the non- PPM_M group, but without a significant overall difference (23.4% and 23.5% vs. 10.4%, p=0.104).

PPM_V (estimated by the implanted valve size) underestimated the incidence of measured PPM_M (27.5% estimated PPM_V vs. 40.0% measured PPM_M, p=0.011) and did not predict mortality (HR=0.67, p=0.42; AUC=0.477, p=0.71).

Reclassification of the PPM group into predicted and unpredicted PPM_M groups, based on estimated PPM_V for the specific aortic prosthesis size, revealed a trend of progressively worse prognosis in the non- PPM_M group, the predicted PPM_M group, and the unpredicted PPM_M group (10.4%, 16.0%, and 28.2%, respectively; p=0.036). Kaplan-Meier survival analysis illustrated event-free survival over the follow-up period, with differences between groups becoming evident after one year of follow-up and reaching statistical significance at three years post-procedure.

None of the baseline characteristics was predictive of mortality in the univariate analysis and were therefore not included. Post-TAVI procedural and echocardiographic parameters were further analyzed, along with various definitions of PPM. While increased mean aortic transvalvular gradient, left atrial dysfunction (LA GLS), and LV diastolic dysfunction were associated with mortality in the univariate analysis, only the presence of PPM was independently associated with mortality.

Conclusions and personal contributions

1. Contributions regarding the relationship between right ventriculo-arterial coupling and prognostic impact in patients with severe aortic stenosis treated with TAVI

In the first study, the role of ventriculo-arterial coupling of the right ventricle to the pulmonary artery (RV/PA coupling), defined by non-invasive parameters using the ratio of right ventricular free wall longitudinal strain (RV-FWS) to systolic pulmonary artery pressure (sPAP), was evaluated for its prognostic value and predictors in a cohort of prospectively enrolled patients with AS undergoing TAVI. The selection of this parameter was based on the individual and combined predictive value of various noninvasive surrogate markers of RV/PA coupling in relation to mortality, with the RV-FWS/sPAP ratio showing the highest predictive capacity in this study. By using the RV-FWS/sPAP ratio, this study introduced an advanced and more precise method for assessing RV/PA coupling in patients with severe AS. This approach overcomes the limitations of TAPSE by providing a comprehensive evaluation of myocardial function and long-term prognosis, with RV-FWS capable of detecting subtle myocardial function changes that might be overlooked when using TAPSE.

The results of this study confirm that the removal of aortic valve obstruction via TAVI has beneficial effects on ventriculo-arterial coupling, which are observable shortly after the procedure. The study revealed that impaired RV/PA coupling is predominantly influenced by persistent pulmonary hypertension and is associated with more advanced cardiac lesions. Although cardiac function significantly improves after TAVI, cardiac impairment remains only partially reversible. Additionally, while the initial impairment of RV/PA coupling improves early after the procedure, it continues to be associated with a high long-term mortality risk [25]. This study demonstrated that the initial RV-FWS/sPAP ratio, as a non-invasive surrogate marker of RV/PA coupling, enhances risk assessment and independently predicts long-term clinical outcomes in patients with AS undergoing TAVI [25]. These findings require further confirmation in larger studies to validate the results.

2. Contributions regarding the prevalence of prosthesis-patient mismatch and its effects on cardiac function and clinical outcomes after TAVI

In the second study, the prevalence of prosthesis-patient mismatch (PPM) was evaluated using different definitions along with the short-term impact of PPM on cardiac function and its

influence on medium-term mortality in patients with AS undergoing transfemoral TAVI with a balloon-expandable valve. Given the ongoing controversies regarding the optimal definition of PPM in the context of TAVI, the present study employed multiple definitions to provide a comprehensive and accurate assessment of the impact of PPM on cardiac function and clinical outcomes.

The primary finding of this study was the association between measured PPM_M and left atrial dysfunction after TAVI, as well as increased mortality [26]. To the best of our knowledge, this is the first report on the effect of PPM_M on left atrial function associated with clinical outcomes. Although causality cannot be determined based on the current data, from a pathophysiological perspective, PPM affects LV remodeling and regression of myocardial mass after TAVI, which is associated with persistently impaired diastolic function and increased LV filling pressures. Previous studies have suggested that left atrial strain is significantly decreased in all stages of diastolic dysfunction, supporting left atrial dysfunction as a potential marker of diastolic dysfunction [13].

Consistent with the existing literature, the incidence of predicted PPM_V (according to the specific characteristics of the implanted valve) is lower than the incidence of measured PPM_M and does not correlate with mortality, suggesting that PPM cannot be prevented in the clinical context solely by determining the predicted iEOA of the implanted valve [26].

In conclusion, the parameters analyzed and presented in this thesis have shown significant prognostic roles in the risk assessment and prediction of clinical outcomes in patients with severe AS undergoing TAVI. However, additional studies are necessary to confirm their utility in current clinical practice. These studies should focus on integrating noninvasive parameters obtained through advanced echocardiography into standard risk stratification protocols. Validation in various clinical contexts and larger patient cohorts is essential to confirm their ability to guide therapeutic decisions and refine patient management.

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Theme: Aortic Stenosis and TAVI

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Abstracts

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Presentations

1. Complication Management Following Transcatheter Aortic Valve Implantation - Contained Annular Rupture and Ventricular Septal Defect. **Parasca, C.A.**; Calin, A.; Radu, R.; Deleanu, D.; Chioncel, O.; Popescu, B.A.; Bubenek-Turconi, S.; Iliescu, V.A. Congresul National de Cardiologie, Editia a 58-a 2018
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7. Illustrative case – symptomatic aortic stenosis. TAVI or SAVR: a heart team decision. **Parasca, C.A.**, the 2nd Edition „Valvular Heart Disease Forum" – June 16-17th, 2023, Online event.