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The Multivalvular Score for Predicting the Outcome of Mitral Regurgitation in Aortic Stenosis Patients Treated With TAVI: Prospective Validation

El *Multivalvular Score* para predecir la evolución de la insuficiencia mitral en pacientes con estenosis aórtica tratados con TAVI: validación prospectiva

To the Editor,

Up to 45% of patients with severe aortic stenosis (AS) have concomitant moderate or severe mitral regurgitation (MR).[1] The high rate of multivalvular disease is due to the elevated filling pressures of the left ventricle resulting from the increased afterload due to severe AS and the parallel deterioration of both valves due to the aging process. Clinical practice guidelines recommend surgical repair or replacement of both valves in this scenario, although this recommendation remains controversial due to the limited evidence and the higher mortality associated with this strategy.[2] Indeed, many patients undergo single surgical or percutaneous aortic valve replacement. The growing use of transcatheter aortic valve implantation (TAVI) in these patients suggests an improvement in the degree of MR in more than 50% of cases, with a parallel decrease in the cardiac mortality rate during follow-up.[3] Therefore, it is crucial to identify patients who could potentially improve in the concomitant degree of MR following TAVI. Previous studies have identified some predictors of MR persistence in this scenario, including calcification of the mitral apparatus, organic valvular disease, mitral annular dilatation, atrial fibrillation, left bundle branch block, and pulmonary hypertension.[2] Recently Cortés *et al.* have determined the impact of these and other factors in 177 patients with moderate or severe MR who underwent TAVI and whose echocardiographic and computed tomography images were centrally analyzed.[3] Following characterization of the main predictors of MR persistence, software named the *Multivalvular Score* was developed. This software is easy to use and helpful to the Heart Team when making clinical decisions about candidates for valve interventions (Figure 1A). This tool is available as open-access software for computers through a link,[4] as a free app for smartphones, or as an analog numeric scale, as shown in Figure 1C. The calibration value was 3.960 (*P* = .776) and discrimination was 0.781 (95%CI, 0.671-0.892).

By using this software, we aimed to perform a prospective validation of the score. A total of 144 patients with moderate or severe MR from 4 institutions who underwent TAVI between April, 2009 and June, 2016 were evaluated with the Multivalvular Score and clinical results 1 year after the procedure were compared with the predicted outcomes. The main clinical and imaging characteristics were similar to those of the original study[3] and are summarized in Table 1.

MR improved by at least 1 degree according to European guidelines at the 6-month follow-up in 73 patients (50.7%) and the improvement persisted in 69 (47.9%) at 1 year. The sensitivity and specificity of the Multivalvular Score in this population were 0.821 and 0.652, respectively, as shown in Figure 1B (area under the curve = 0.772 [95%CI, 0.663-0.881], *P* < .001). The 6-month mortality rate in these patients was 31.9% compared with 35% in the initial sample (*P* = NS).

The Multivalvular Score is the first tool fully available for clinical use that has demonstrated a certain capacity to predict the outcome of moderate or severe MR following TAVI. This scenario is often faced by the Heart Team and, until now, only surgical scores have been available. These scores can be used to determine the risk of dual valve replacement but are not useful to select which patients might benefit from more conservative approaches with single aortic valve replacement. Although there are certain limitations regarding the accuracy of the Multivalvular Score, its prospective validation opens a gate to more extensive use that will help to improve the accuracy of this tool, as well as to extend its applicability to alternative scenarios where more than 1 valve is severely affected.[5,6]

In conclusion, this research adds evidence confirming the constant improvement of MR following TAVI in half of the patients and validates the Multivalvular Score as a simple tool that helps to predict which patients with concomitant AS and moderate or severe MR will improve after isolated TAVI. Conversely, it is also crucial to identify those patients who will require a surgical, percutaneous, or hybrid strategy to repair both valves.
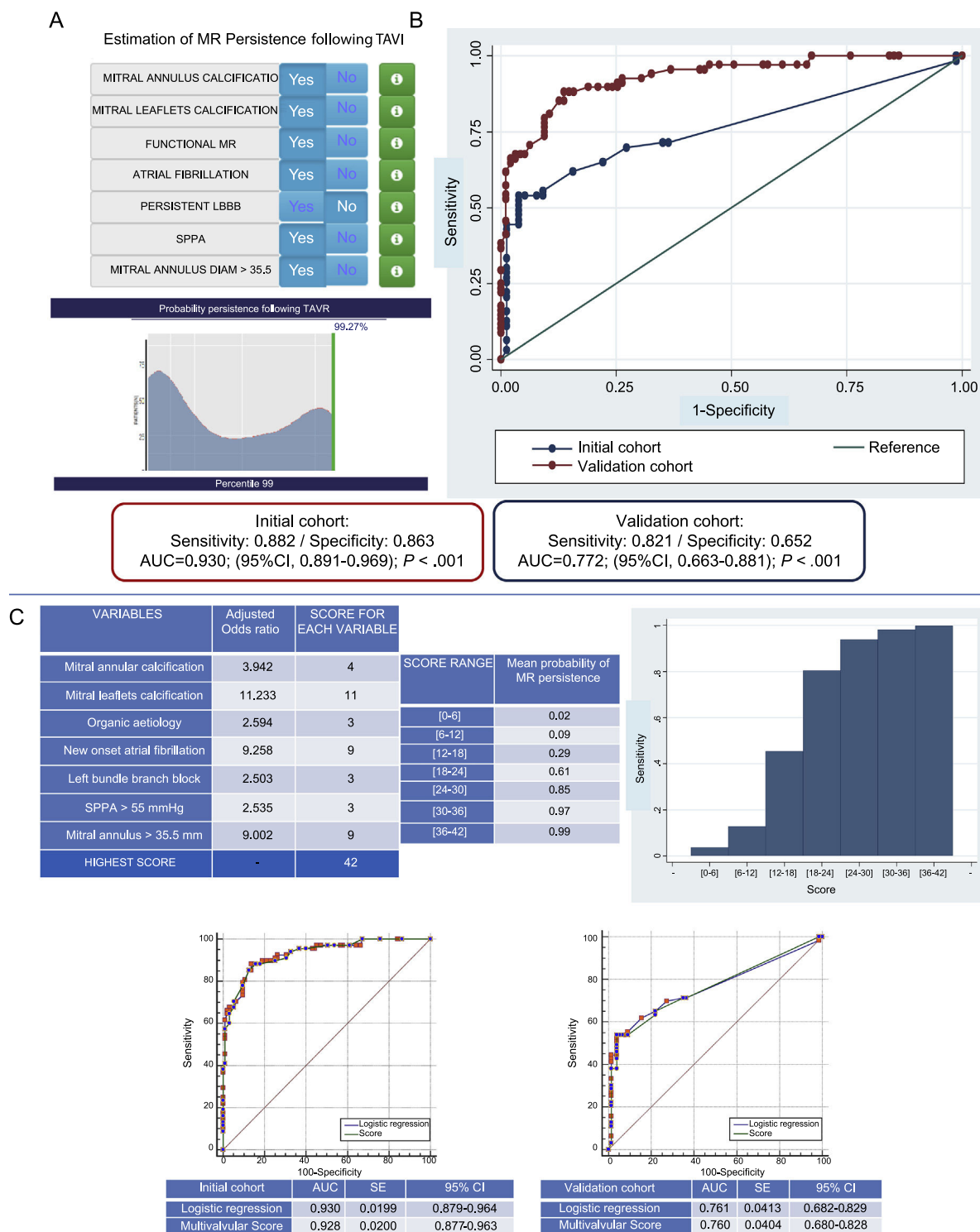
Figure 1. A: interface of the "Multivalvular Score". B: ROC curves showing sensitivity and specificity for the initial sample[4] and for the validation sample. C: score assigned to each variable and range of scores associated with different likelihoods of mitral regurgitation persistence; the ROC curves below demonstrate an exceptional correlation of the logistic regression and the score system. 95%CI, 95% confidence interval; AUC, area under curve; LBBB, left bundle branch block; MR, mitral regurgitation; ROC, receiver operating characteristic; SE, standard error; SPPA, systolic pressure of pulmonary artery; TAVI, transcatheter aortic valve implantation.

Table 1

Comparison of the Main Clinical and Echocardiographic Characteristics of the Initial and the Validation Samples

Characteristics	MR ≥ 3 Initial sample[4] N = 177	MR ≥ 3 Validation sample N = 144	P
Clinical characteristics			
Age, y	81.3 ± 6.3	80.9 ± 5.2	.713
Male	102 (57.6)	96 (66.7)	.098
STS Score, %	5.1 [3.9-7.8]	4.7 [3.3-7.1]	.342
Logistic EuroSCORE, %	12 [9-18]	11.2 [6.9-16.9]	.441
Hypertension	129 (73.3)	101 (70.1)	.588
Diabetes mellitus	61 (34.7)	52 (36.1)	.758
Chronic kidney disease	44 (25)	35 (24.3)	.910
Prior heart surgery	23 (13.1)	17 (11.8)	.748
Prior atrial fibrillation	58 (33.1)	41 (28.1)	.407
NYHA class III-IV	77 (44)	58 (40.3)	.110
Echocardiographic characteristics			
Aortic valve area, mm^2	0.63 [0.5-0.78]	0.7 [0.4-0.7]	.899
Peak gradient, mmHg	80.9 ± 23.1	83.2 ± 21.3	.789
Mean gradient, mmHg	51.4 ± 15.6	52.4 ± 12.3	.882
Left ventricular ejection fraction, %	60 [49.5-66]	62 [48-68]	.210
SPPA, mmHg	50 [35-60]	47 [33-56]	.103

Values are expressed as No. (%), mean ± standard deviation, or median [25th-75th interquartile range], depending on variable distribution.
MR, mitral regurgitation; NS, nonsignificant; NYHA, New York Heart Association; SPPA, systolic pressure of pulmonary artery; STS, Society of Thoracic Surgeons.

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Circulating MiRNA Dynamics in ST-Segment Elevation Myocardial Infarction-driven Cardiogenic Shock

Dinámica de microARN circulantes en pacientes con infarto agudo de miocardio con elevación del segmento ST con shock cardiogénico

To the Editor,

Cardiogenic shock (CS) occurs in approximately 5% of acute myocardial infarction cases and, despite improvements over the last few decades, it represents the leading cause of in-hospital mortality, remaining as high as 40%.[1]

MicroRNAs (miRNAs) bind target mRNA and act as posttranscriptional regulators of gene expression. MiRNAs can be detected in the circulation and have been proposed as promising biomarkers due to their robust stability to temperature changes and their resistance to degradation by endogenous RNase activity. More specifically, miR-21 is deregulated under cardiovascular disease conditions such as heart failure. MiR-122 has been reported to play a role in remodeling and fibrosis and in the early identification of ST-segment elevation myocardial infarction (STEMI) patients at higher risk of developing major adverse events after undergoing primary percutaneous coronary intervention (PCI), and has been found to be massively increased in a porcine model of CS.[2,3] MiR-320a and miR-423-5p are highly expressed in the fetal heart.[4] In addition, miR-320a is elevated in patients with chest pain of ischemic origin.[5] MiR-423-5p has been validated in patients with heart failure and its abundance is related to disease severity.[6]

Therefore, in the present study, we sought to assess the expression dynamics of these miRNAs during the first 24 hours