

Morphological and functional cardiac changes in TAVI follow-up: evaluation through transthoracic echocardiography

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Background

Aortic Stenosis is a valvular disease with increasing prevalence. The most common etiology of aortic stenosis is degenerative calcification of the leaflets due to lipid accumulation, fibrosis and inflammation, usually present in older individuals, and has bad prognosis when becomes symptomatic. The replacement of the aortic valve is the first surgical therapeutic option for severe aortic stenosis however, 30 to 40% of patients cannot accomplish by contraindications. Transcatheter aortic valve implantation (TAVI) is a treatment option for patients who cannot undergo surgical valve replacement. ^{1,2,3,4}

Objective

To describe and compare morphological and functional cardiac changes, through transthoracic echocardiography, in the follow-up after TAVI.

Methods

Type of Study - Descriptive and retrospective study.

Study population - 10 patients, between 63 and 85 years old, submitted to TAVI were evaluated by transthoracic echocardiography.

Variables - Sex, age, body mass index, type 2 diabetes mellitus, dyslipidemia, hypertension, smoking, family history of coronary disease, hormonal risk factors and EuroSCORE.

Echocardiographic variables: perivalvular regurgitation, maximum velocity and gradient, left ventricular end-diastolic and end-systolic volume, ejection fraction, left ventricular mass index and left atrium diameter.

Inclusion Criteria - Patients refused for conventional surgery, Aortic valve: model Edward Sapiens and evaluation made by transthoracic echocardiogram between 24h to 72h and from 1 to 14 months after the procedure (from January 2014 to April 2016).

Exclusion criteria - Bad acoustic window, incomplete protocol and presence of known cardiopulmonary disease: acute myocardial infarction, hypertrophic cardiomyopathy and dilated cardiomyopathy.

Statistical analysis - Descriptive statistics, Shapiro-Wilk test, Wilcoxon's test and McNemar test. The results were considered statistically significant when p value < 0.05 .

Protocol - According to the recommendations of the American Society of Echocardiography (2010).⁵ Two transthoracic echocardiograms were evaluated: the first was performed 24h to 72h after TAVI procedure and the 2nd from 1 to 14 months after the procedure. All measurements were made off line by a single operator to minimize variability. *Phillips CX50*[®] ultrasound systems was used.

Conclusions

Transcatheter valve aortic implantation is a relatively new procedure for aortic stenosis treatment, with morphological and functional changes in the heart.³

It was registered a significant increase in maximum velocity and gradient from the first to the second echocardiogram.

Left ventricular mass index decreased in average 15.71 g/m², and from a clinical perspective can have an impact in the patient's prognostic.

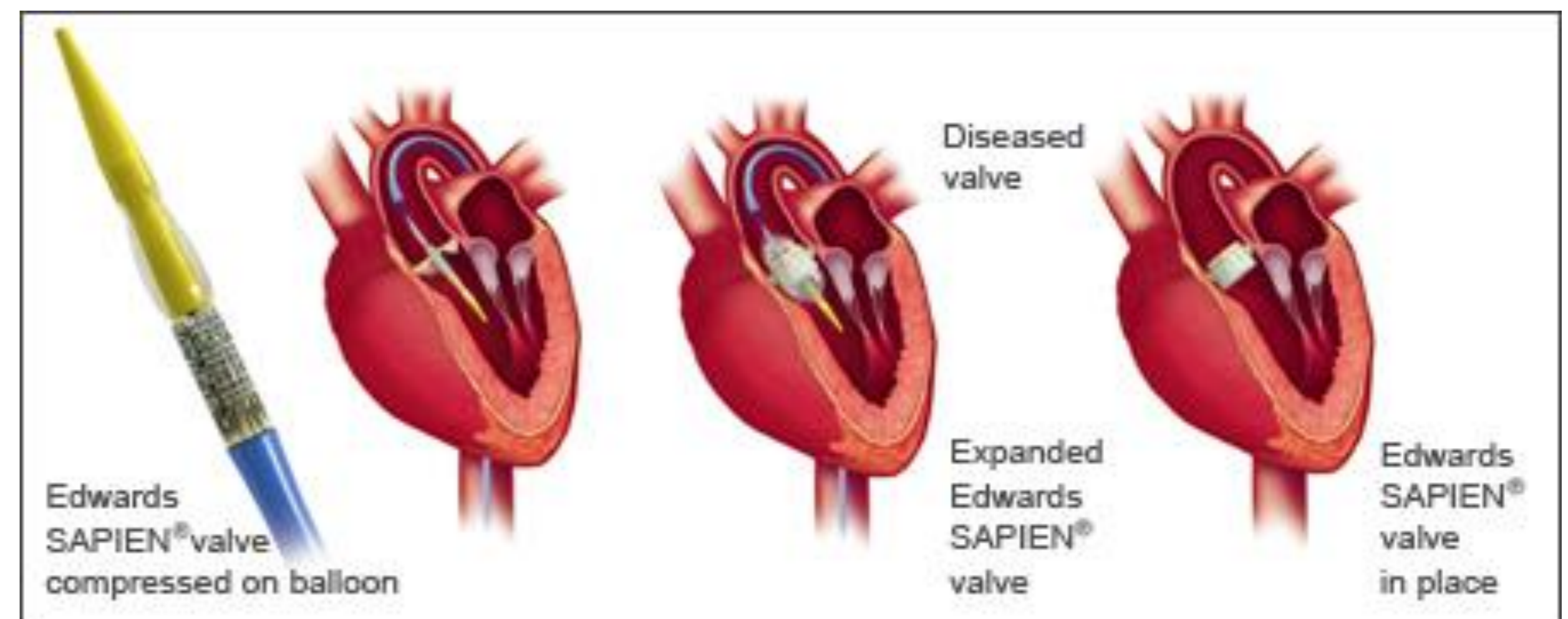


Fig.1 - Edwards SAPIEN[®] transcatheter aortic valve replacement - Edwards Lifesciences LLC⁶

Results

10 patients were studied with an average age of 76 years old, 60% male, an average body mass index of 25.42Kg/m².

Regarding the risk factors, 60% of the patients had dyslipidemia, 70% hypertension, 40% type 2 diabetes mellitus and 10% family history of coronary disease. No patient presented hormonal risk factors or smoking habits. On average, patients had a EuroSCORE of 2.96, and approximately 2 simultaneous risk factors.

It was registered a significant increase in maximum velocity and gradient ($p=0.004$ and $p=0.010$, respectively) from the first to the second echocardiogram. There weren't significant differences in left ventricle ejection fraction, end-diastolic and end-systolic volumes and in left atrium diameter. Left ventricle mass index decreased comparing to the first echocardiogram (from 157.92 to 142.28 g/m²), however, this difference wasn't statistically relevant. The prevalence of regurgitation (80%) was unchanged between evaluations.

	1 st Echo Evaluation Mean \pm SD or %	2 nd Echo Evaluation Mean \pm SD or %	Difference from 2 nd to 1 st evaluation Mean \pm SD	p value
Maximum velocity (m/s)	1.88 \pm 0.34	2.36 \pm 0.48	0.47 \pm 0.40	0.004
Maximum gradient (mmHg)	14.59 \pm 5.03	23.00 \pm 9.87	8.42 \pm 8.24	0.010
Ejection fraction (%)	59.59 \pm 5.85	59.45 \pm 9.94	-0.13 \pm 8.56	0.963
End-diastolic volume (ml)	98.72 \pm 21.85	101.25 \pm 43.19	3.18 \pm 45.48	0.284
End-systolic volume (ml)	40.46 \pm 12.91	42.36 \pm 24.50	1.90 \pm 25.91	0.575
Left ventricular mass index (gr/m ²)	157.99 \pm 38.77	142.28 \pm 28.01	-15.71 \pm 27.29	0.102
Left atrium diameter (mm)	63.69 \pm 13.17	64.21 \pm 11.01	0.52 \pm 7.34	0.827
Aortic perivalvular regurgitation	80%	80%	-	1.000
Regurgitation severity	Mild – 75% Moderate – 25%	Mild – 62.5% Moderate – 37.5%	-	-

Fig. 2 – Echocardiographic variables – results