Midventricular obstruction and left ventricular remodeling after transcatheter aortic valve implantation

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Introduction: Long existing pressure overload results in left ventricular (LV) hypertrophy in severe aortic stenosis (AS). Post-TAVI left ventricular remodeling after relief of the high-pressure overload could lead to manifestation of postprocedural midventricular obstruction caused mostly by marked LV wall hypertrophy with the interposition of the hypertrophic papillary muscle in small LV chamber.

Our aim was to evaluate the incidence and predictors of midventricular obstruction during 1-year follow-up in patients with AS who underwent transcatheter aortic valve implantation.

Methods: 30 consecutive patients (mean age: 82.3 ± 5.6 years) with symptomatic severe AS who underwent TAVI in 2018-2019 in Almazov centre and survived >12 months were enrolled in our observational, prospective, single-center study. Evolut R and Sapien-XT valves were used. All patients underwent transthoracic echocardiography before TAVI and at 3, 6, and 12 months after the procedure. There were no patients with baseline midventricular obstruction or concomitant hypertrophic obstructive cardiomyopathy.

Results: Procedure was successful in all cases. During 1 year of follow-up after TAVI, 3 patients (10%) demonstrated postprocedural midventricular obstruction with peak gradient – 36,3 ± 24,3 mm Hg.

There was no difference in prosthetic diameter between obstructive and non-obstructive patients (27.0 ± 3,4 vs. 27.7 ± 5,1 mm, $p = 0.85$ - nonparametric Mann-Whitney U test for all comparisons).

At baseline echocardiography, patients with midventricular obstruction had a significantly thicker interventricular septum (14.7 ± 2.5 vs. 11.5 ± 1.6mm, $p < 0.05$), higher LV mass index (170.3 ± 63.6 vs. 121.0 ± 39.5 g/m2, $p < 0.05$) and relative wall thickness (0.59 ± 0.03 vs. 0.49 ± 0.05 mm, $p < 0.02$) compared with non-obstructive patients.

Reductions in LV mass index were more significant in non-obstructive patients (49.8 ± 27.3 vs. 15.3 ± 15.0 g/m2, $p < 0.04$); however, obstructive patients demonstrated higher reductions in end-systolic diameter (8.7 ± 7.1 vs. 0.3 ± 3.9 mm, $p < 0.05$) and volume (21.7 ± 20.0 vs. 1.2 ± 8.4 mm, $p < 0.01$) than non-obstructive patients throughout the 1-year follow-up.

Midventricular obstruction peak gradient correlates strongly with preoperative relative wall thickness ($rs=.73$; $p < 0.001$), moderate negatively with end-systolic LV diameter ($rs=-.45$; $p < 0.05$).

In the multiple regression analyses, preoperative relative wall thickness ($p < 0.001$), reductions in interventricular septum ($p < 0.05$) and posterior wall ($p < 0.05$) thickness were identified as risk factors of postprocedural midventricular obstruction.

Conclusions: 10% of patients during 1 year of follow-up after TAVI demonstrate midventricular obstruction of various severity with poor reverse LV remodeling. Patients with a small hypertrophic left ventricle and high preoperative relative wall thickness, are at greater risk of development of the postprocedural midventricular obstruction.

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