Hemodynamic Determinants of Functional Class in Patients with Severe Aortic Stenosis and Preserved Systolic Function

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Objective:

The clinical symptoms of heart failure are known indications for intervention in patients with severe aortic stenosis (AS). Aortic valve area (AVA) is a poor predictor of symptoms. Our study explored hemodynamic determinants of functional class (FC) based on echocardiographic analysis and cardiac catheterization.

Methods and results:

Forty-four patients with severe AS (AVA<1.0 cm^2) and preserved LV systolic function (ejection fraction, EF$\geq$50%) were included. Patients with additional significant valvular disease were excluded. The mean age was 80.4±8.4 years. No correlation was found between NYHA FC and valvular resistance, valvulo-arterial impedance, systemic vascular resistance, indexed aortic valve area (AVAi) and energy loss index.

There was no correlation between FC and parameters reflecting cardiac performance such as stroke volume, cardiac output and EF (r=-0.20, p=0.19; r=-0.06, p=0.71; r=-0.10; p=0.53 respectively). Impaired contractility (lower global longitudinal strain, analyzed by 2-dimentional speckle tracking) and decreased transvalvular flow were related to advanced symptoms of heart failure (r=-0.39, p=0.038; r=-0.35, p=0.019 respectively).

Elevated left ventricular mean diastolic pressure, assessed during coronary catheterization performed before valvular intervention (AVR/TAVI) or for coronary investigation, positively correlated with NYHA class (r=0.31; p=0.042). Also, advanced age, atrial fibrillation, degree of diastolic dysfunction (DD), and indexed left ventricular mass (LVMi) positively correlated with NYHA class (r=0.39, p<0.01; r=0.31, p=0.04; r=0.36, p=0.035; r=0.32, p=0.036 respectively). Increased LVMi was provoked by elevated systolic blood pressure but not by valvular and valvulo-arterial resistance. DD was associated with elevated pulmonary pressure (r=0.57; p<0.001) and left atrial size (r=0.43; p=0.01). By multivariant analysis only transvalvular flow correlated negatively with NYHA class (p=0.005).

Conclusions:

Transvalvular flow appears to be a more important determinant of functional class than severity of AS per se, parameters of valvular/valvulo-arterial resistance, left ventricular pre- and afterload indices in patients with severe AS and preserved systolic function.