Hemodynamic determinants of functional class in patients with severe aortic stenosis and preserved systolic function

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Conflict of interest:

We declare the absence of any potential conflict

Background

Treatment options (timing for valve replacement) in severe AS is largely based on the presence of symptoms and functional class

A number of known factor (BNP level, myocardial strain, LVM …) are associated with functional class. Others such as AVA are a poor predictor of symptoms especially in patients with severe AS

Objectives

Our study explored hemodynamic determinants of functional class and advanced functional class impairment based on echocardiographic analysis and cardiac catheterization

Methods

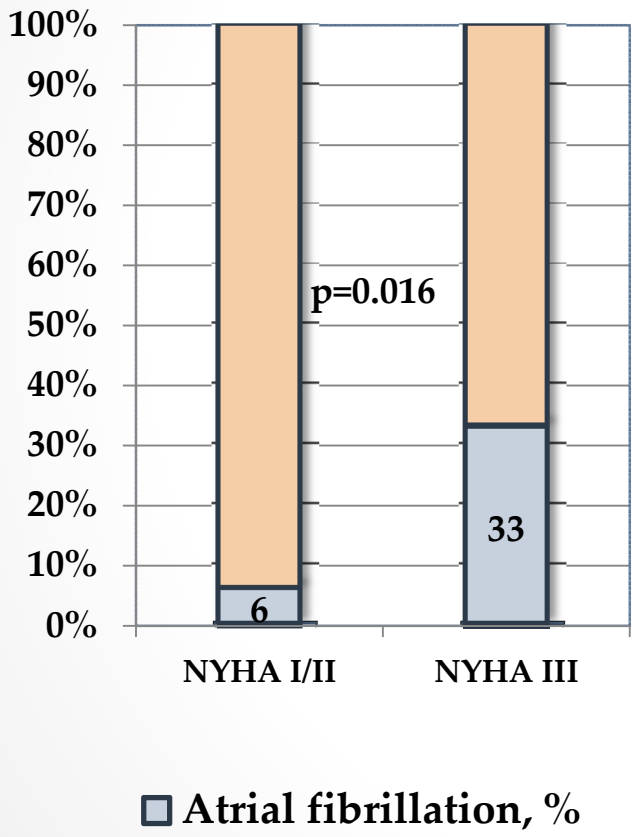
44 patients with severe AS (AVA<1.0 cm^2) and preserved LV systolic function (EF≥50%) without other significant valvular disease were were included.
The mean age was 80.4±8.4 years. Male/female – 55/45%

Clinical data. Age, gender, co-morbidity, functional class according to NYHA classification. 2 subgroups were differed:
1) mildly symptomatic patients with NYHA I/II, n=17 and
2) patients with more advanced heart failure - NYHA III, n=27

Cardiac catheterization. Left ventricular end diastolic pressure and mean diastolic pressure were assessed in patients underwent coronary catheterization before AVR, TAVI or for coronary investigation.

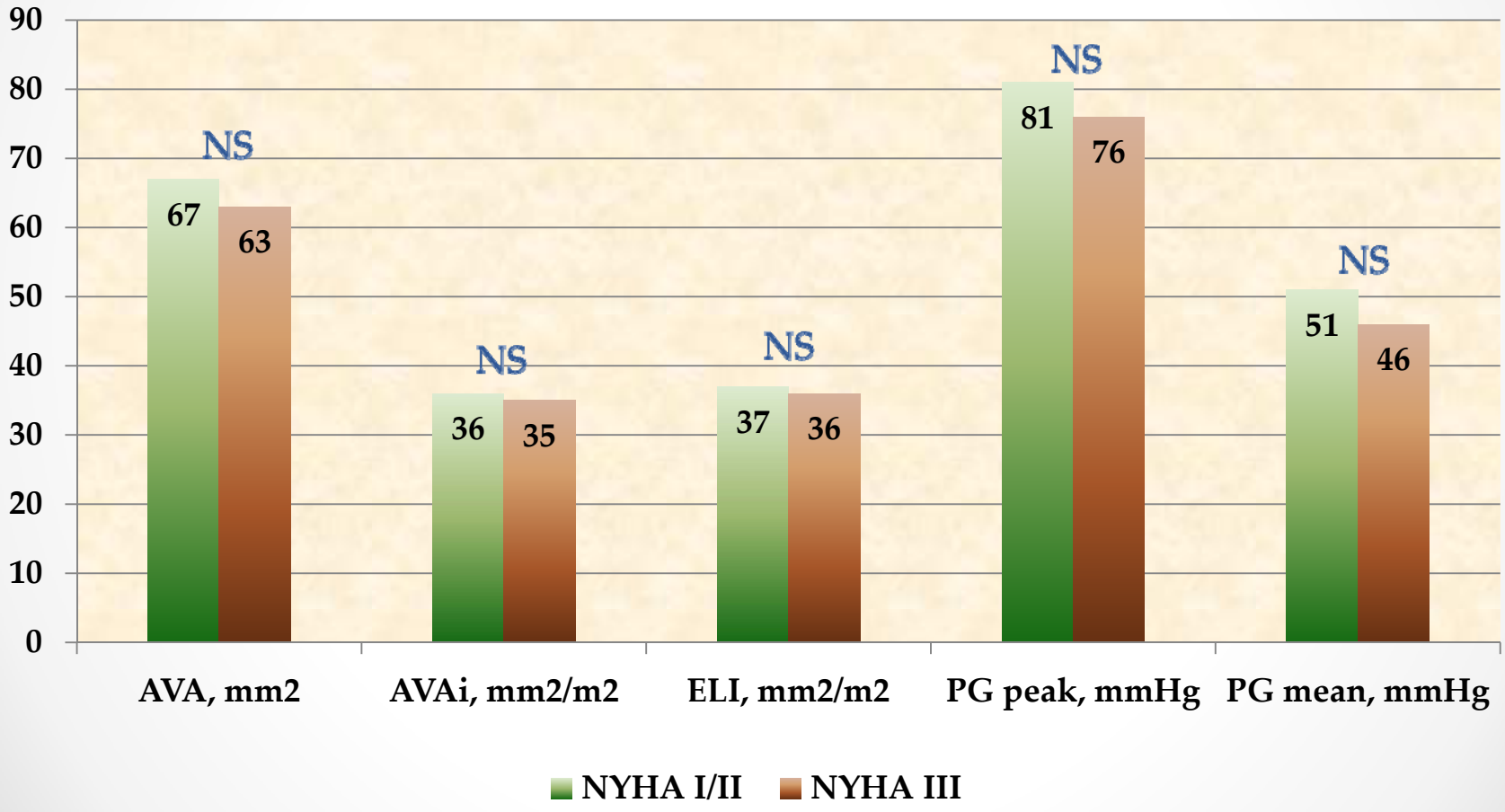
Echocardiography. LV dimensions, LA area, E, A, e', a', s', LVM, LVMi, pulmonary pressure, SV, SVi by VTI and Simpson, EF visually estimated and by Simpson, CO, CI, V_{peak}, V_{mean}, PG_{peak}, PG_{mean}, AVA, AVAi, ELI, valvular resistance, systemic vascular resistance, valvulo-arterial impedance. Global longitudinal strain by 2D strain analysis.

Clinical data: age and atrial fibrillation are associated with advanced symptoms

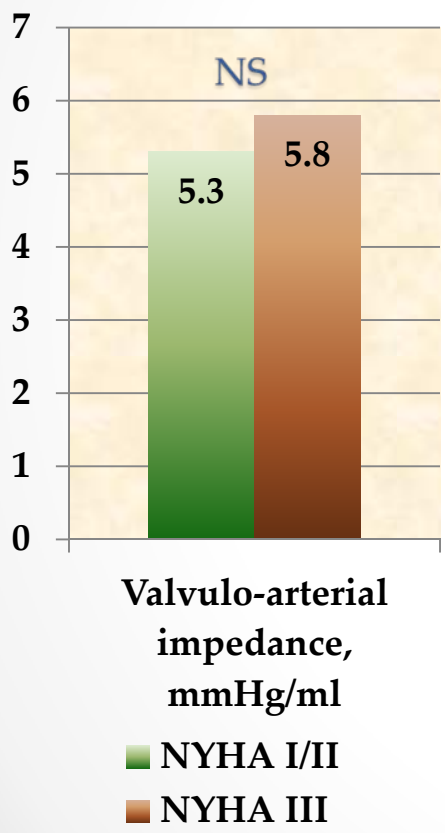


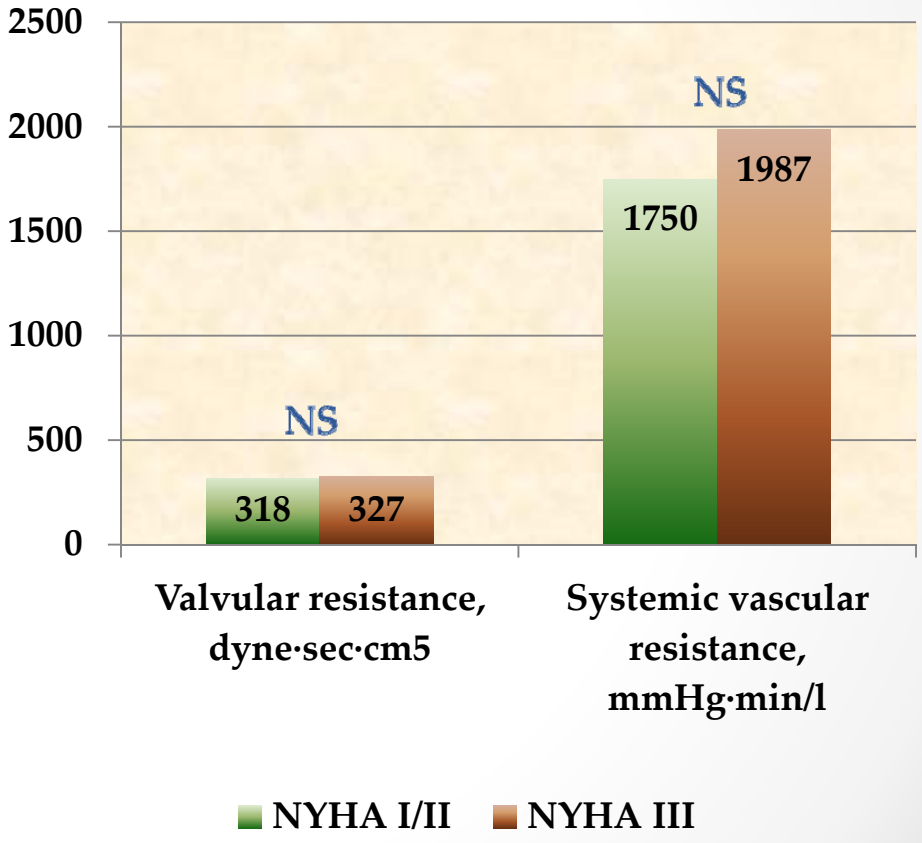
	Age
NYHA I/II	77.6±9.0
NYHA III	82.7±7.1
p	0.024

Functional class and AS severity

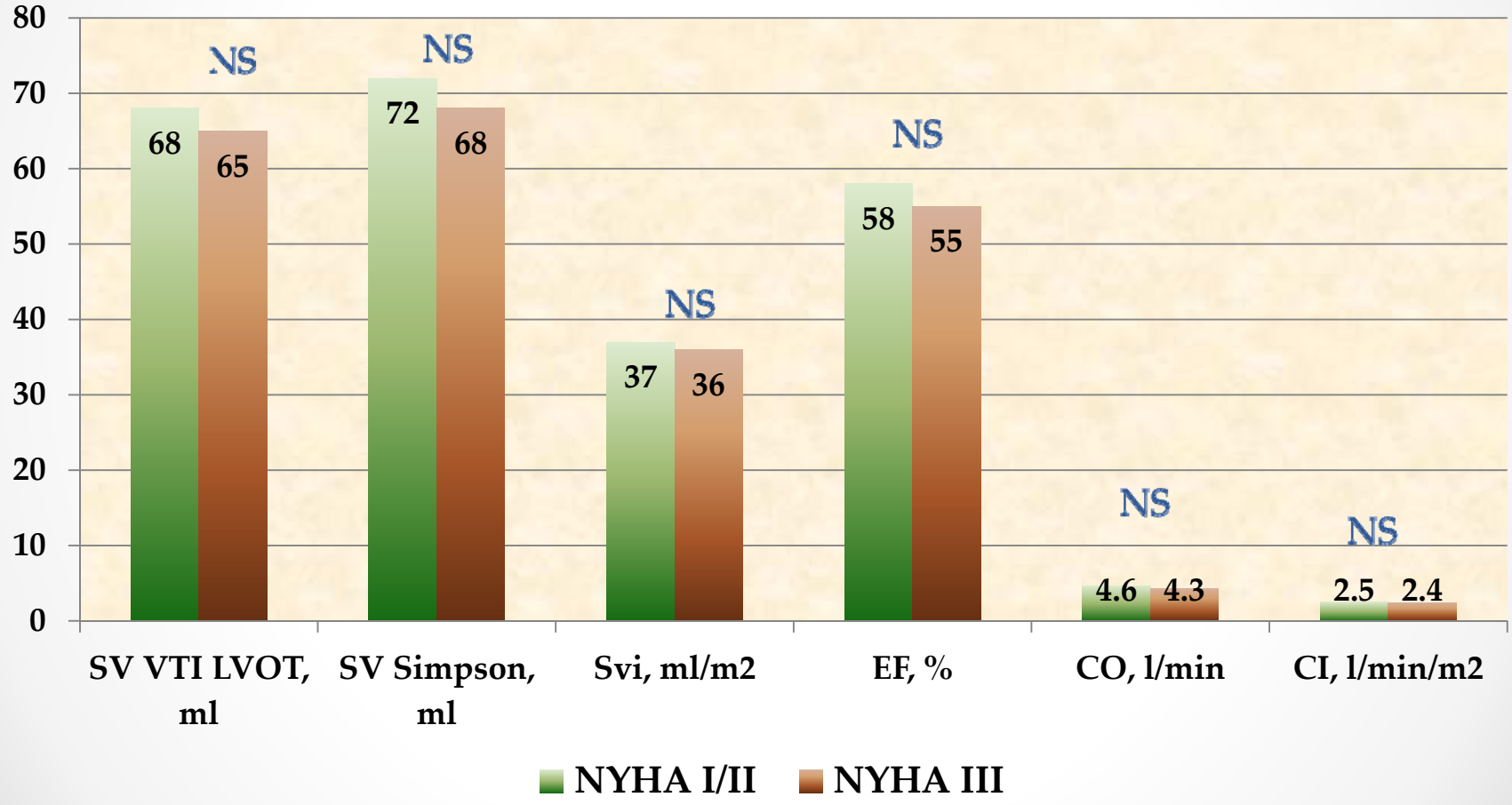


Functional class and afterload

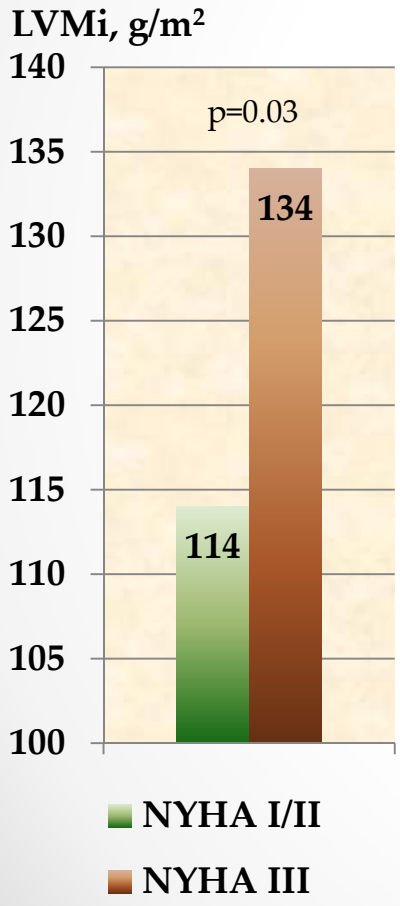


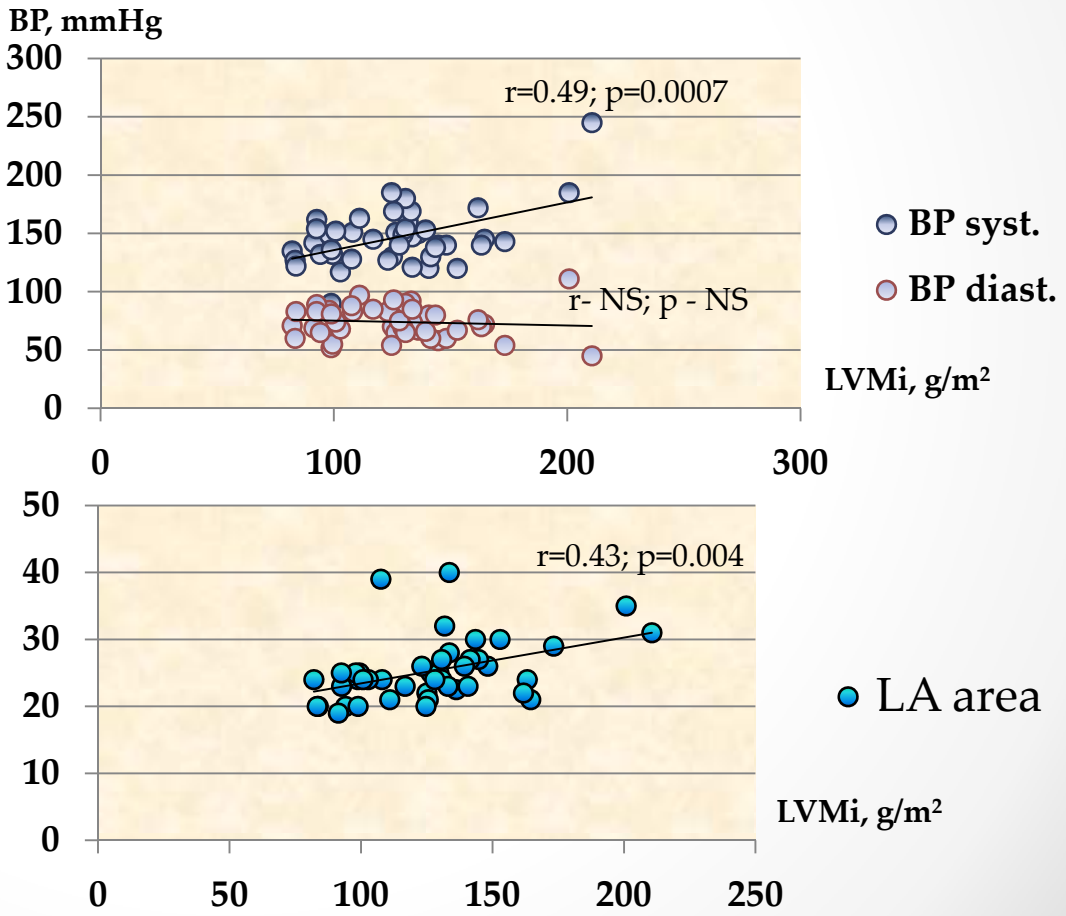


Functional class and cardiac performance

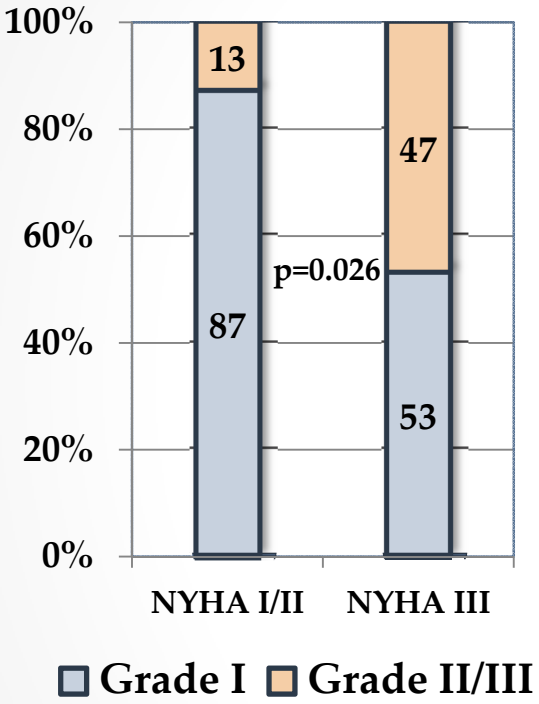


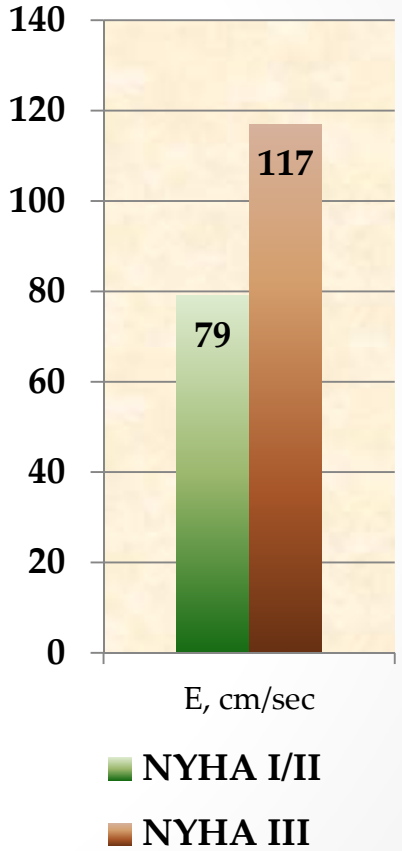
Increased LV mass associated with worse functional class, LA enlargement and higher systolic BP





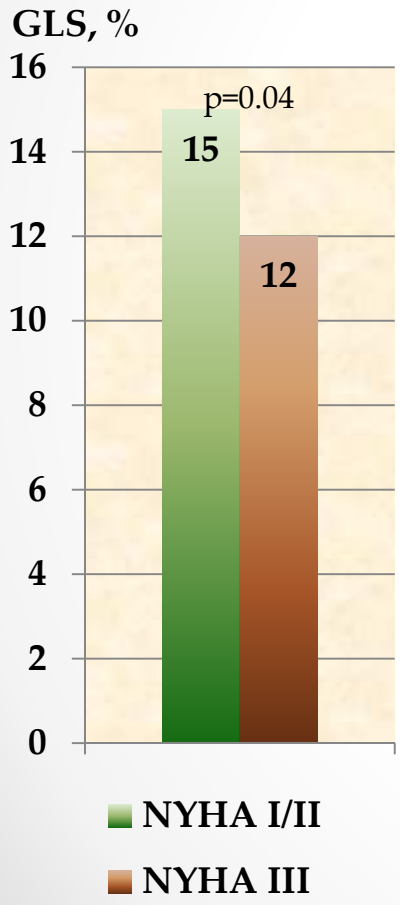
Advanced diast. dysf. associated with worse FC, increased LVM, LA enlargement and higher pulm. pressure

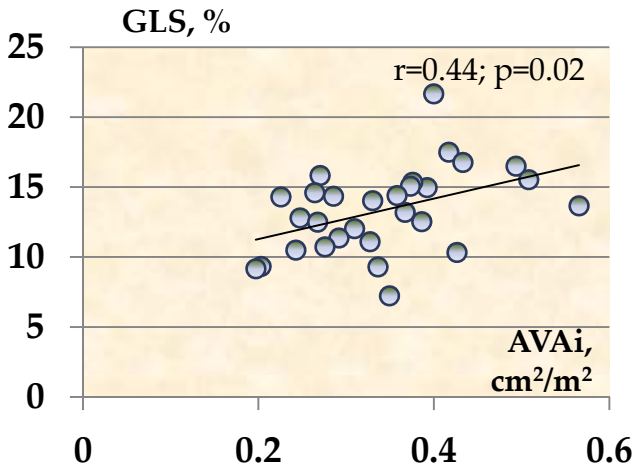


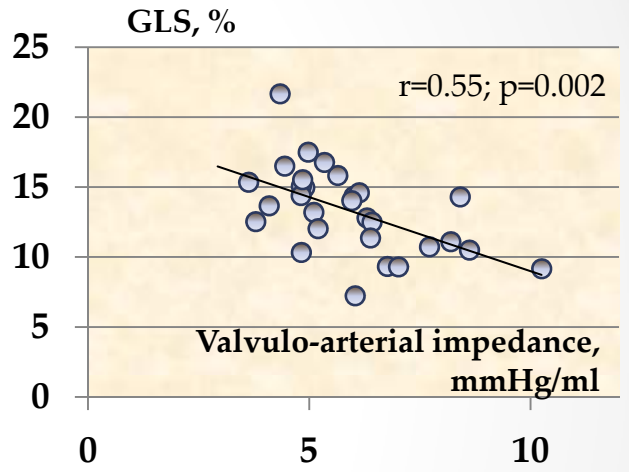


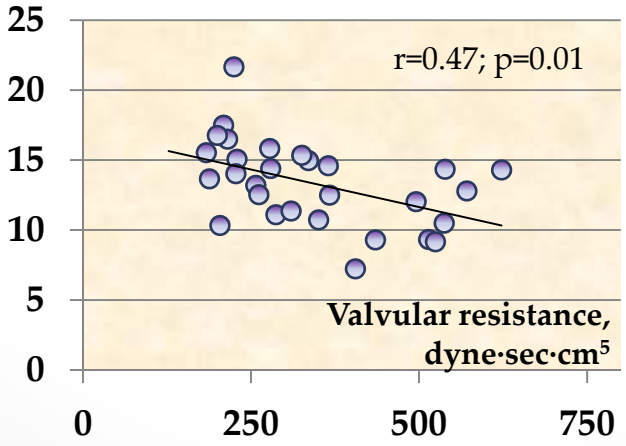
Diastolic dysfunction	LA area, cm^2	PASP, mmHg	LVMi, g/m^2
Grade I	22.8±2.0	38.1±10.1	114.9±24.8
Grade II/III	26.8±4.1	52.2±7.5	143.6±36.7
p	0.008	0.0004	0.03

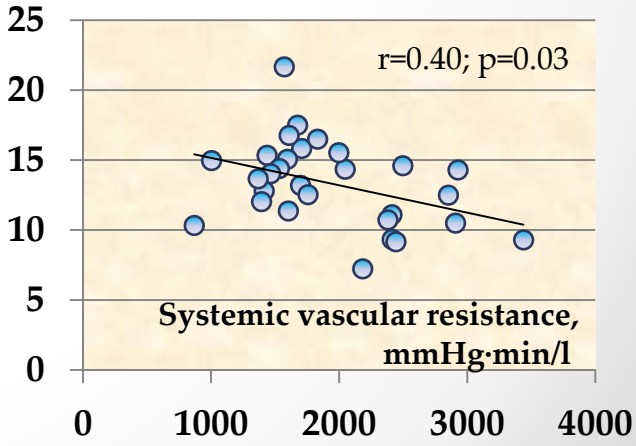
Decreased GLS associated with worse functional class and elevated afterload



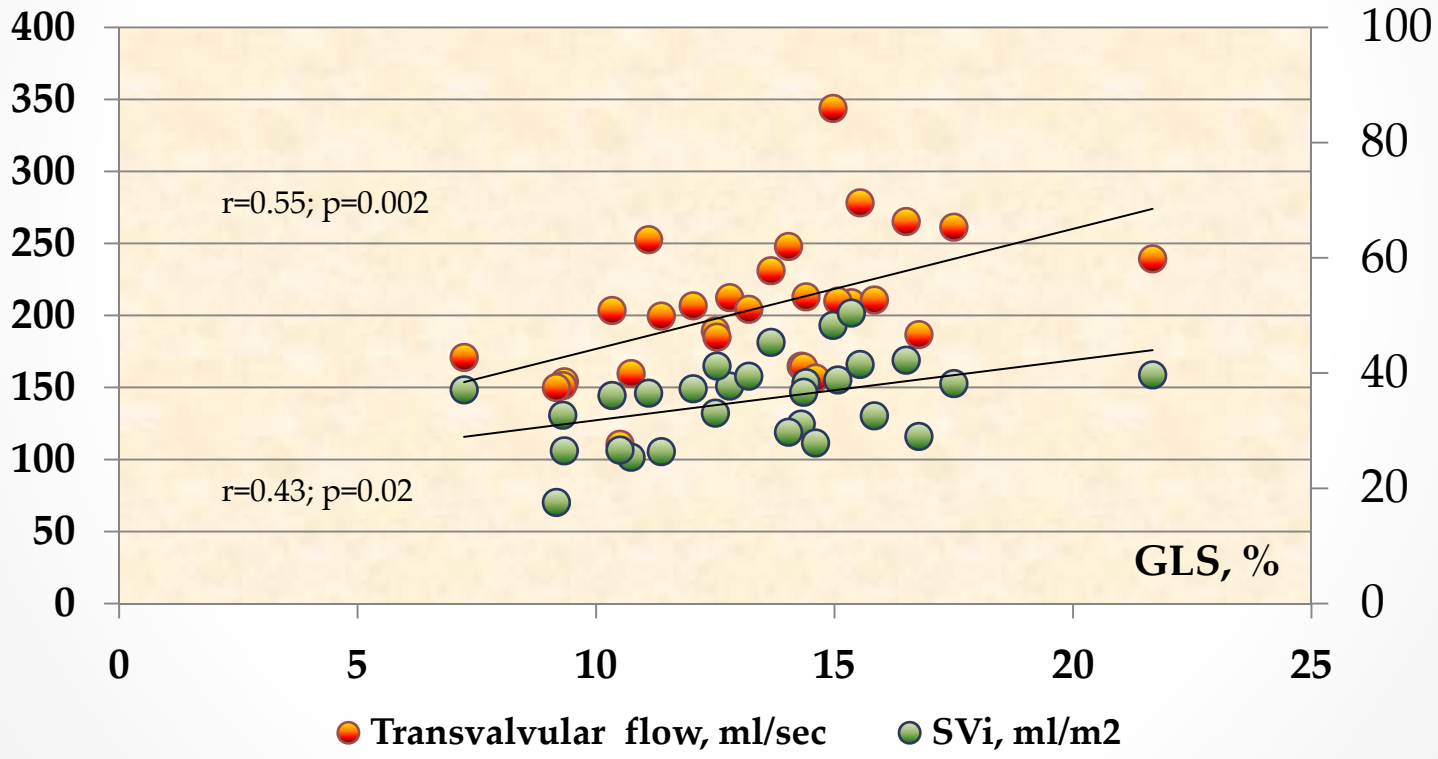




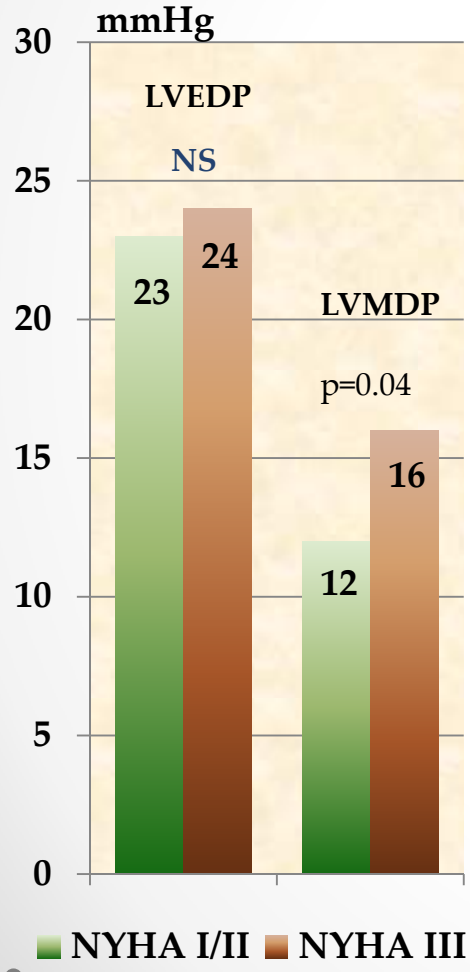


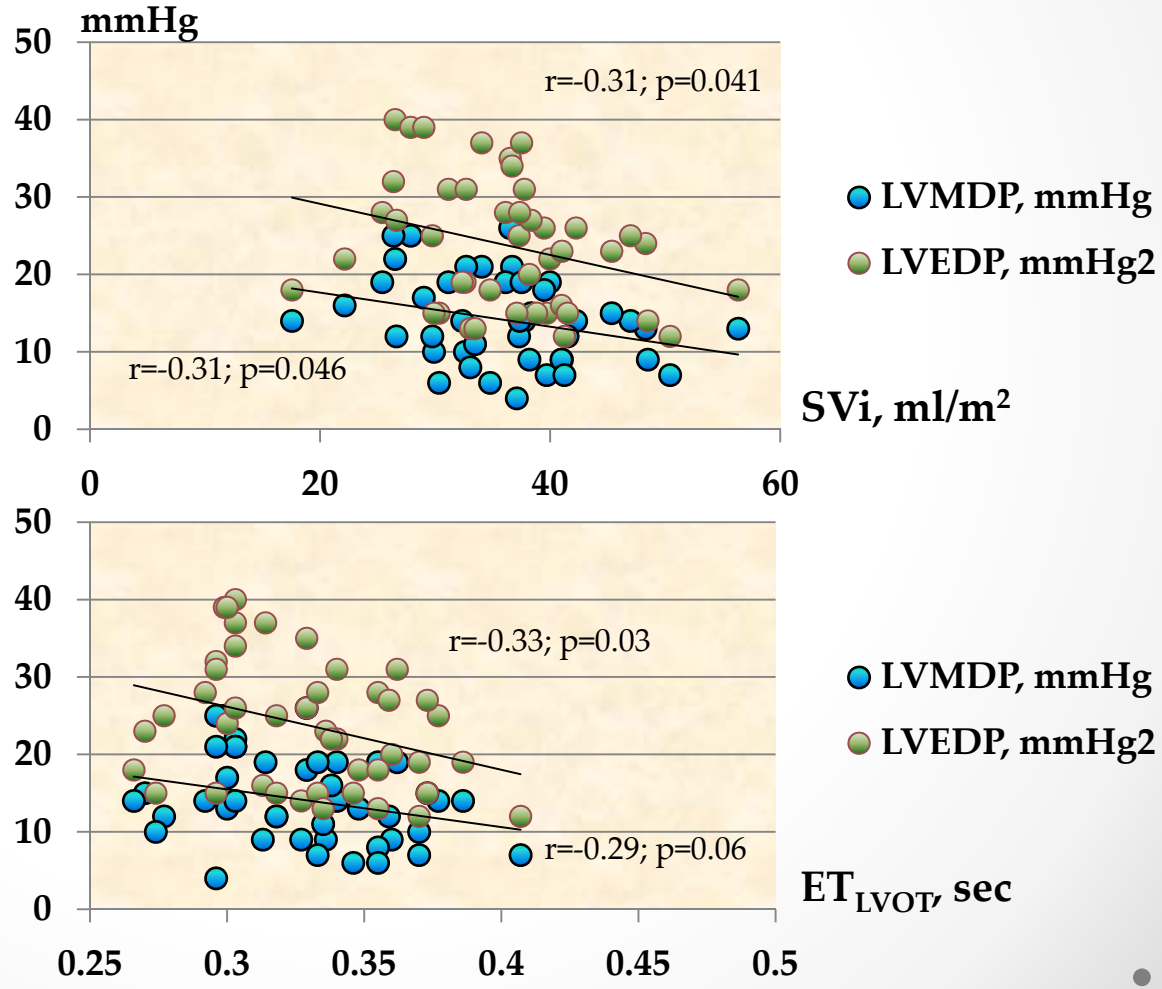


GLS correlates with cardiac performance



Elevated LV diastolic pressure associated with worse functional class, lower SV and shorter ejection time

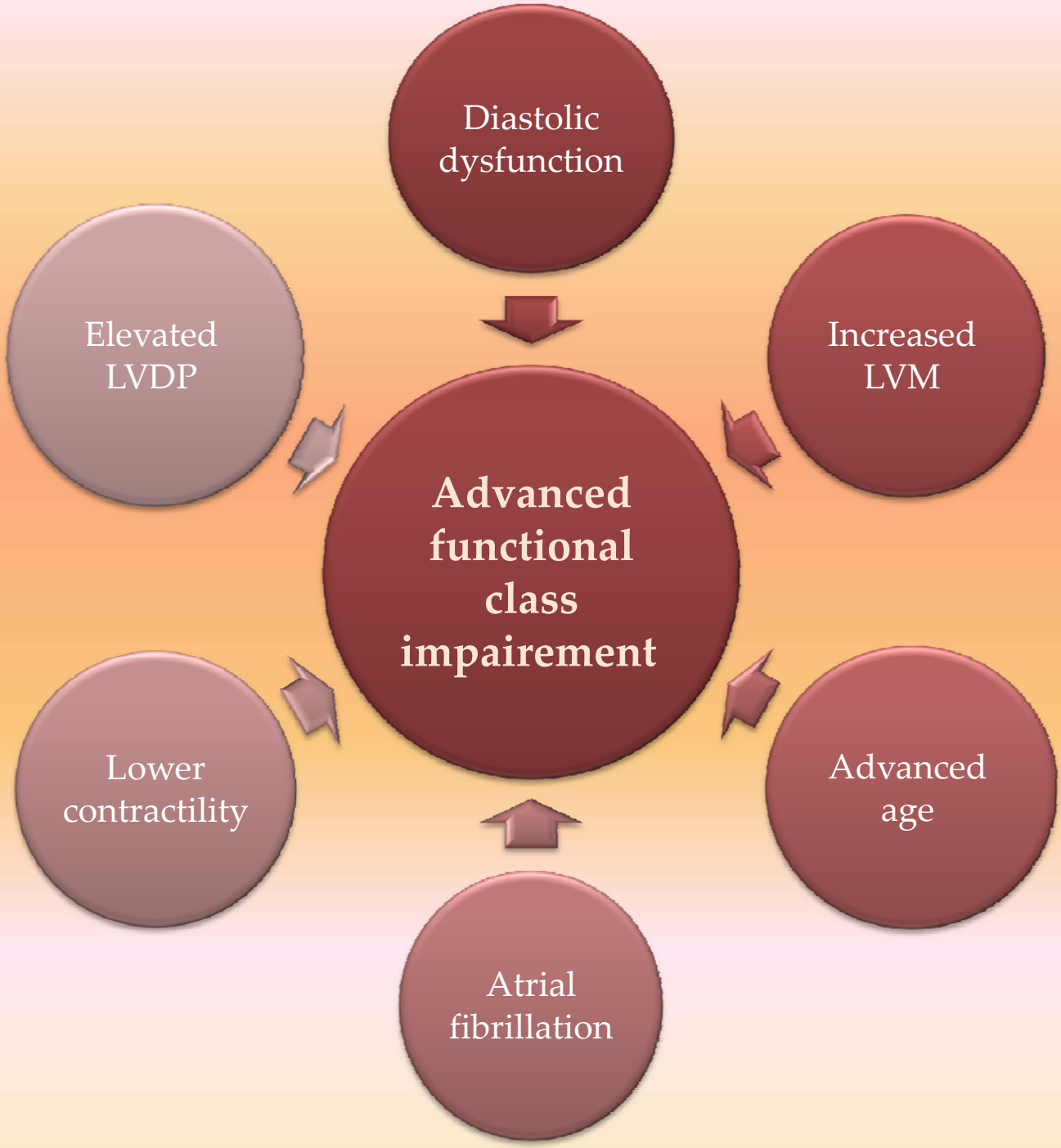




Conclusions

1. Atrial fibrillation and advanced age are associated with symptoms progression.

2. Hemodynamic determinants associated with advanced functional class impairment in patients with severe AS and preserved systolic function are:
   - higher LVM
   - advanced diastolic dysfunction
   - decreased GLS (contractility)
   - elevated LVMDP (secondary to the formers?)


Diastolic dysfunction
Elevated LVDP
Increased LVM
Advanced functional class impairement
Lower contractility
Advanced age
Atrial fibrillation