Predictors of persistent severe diastolic dysfunction after aortic valve replacement in aortic stenosis compared with aortic regurgitation

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Previous studies have demonstrated that a severe impaired diastolic function in patients undergoing aortic valve replacement is associated with a more difficult postoperative evolution.

Although many studies regarding the diastolic dysfunction have been published, there is a paucity of information on diastolic dysfunction evolution in the early and medium term postoperative cardiac surgical patient.

The influence and reversibility of the impaired diastolic function on early and medium term postoperatively, comparing patients with aortic stenosis to patients with aortic regurgitation was not studied yet.
1. To evaluate the effect of aortic valve replacement on left ventricular *diastolic function* and left ventricular *remodeling*, comparing patients with aortic stenosis to patients with aortic regurgitation.

2. To define the parameters which can be taken into consideration as *independent predictors* for *immediate and medium term evolution* in these patients and their adjusted value for calculation of a preoperative risk score.

3. To assess the *independent predictors* for the *persistence of the restrictive* left ventricular diastolic filling pattern after isolated aortic valve replacement.
5 years Prospective Study: 397 patients with restrictive LV diastolic filling pattern undergoing aortic valve replacement in Emergency Institute for cardiovascular diseases “C.C. Iliescu”

Evaluation – clinically
– echographically

Gender Distribution

Exclusion criteria
• associated mitral, tricuspid or coronary significant lesions
• chronic atrial fibrillation

Mean age: 65±16 years
Mean LVEF=52±15%

MATERIAL AND METHOD
Depending on the type of the aortic lesion and on the LV systolic performance, 4 subgroups were identified:

- **Group A**: 226 pts
  - AORTIC STENOSIS
  - **Subgroup A1**: 137 pts, LVEF > 50%
  - **Subgroup A2**: 89 pts, LVEF < 50%

- **Group B**: 171 pts
  - AORTIC REGURGITATION
  - **Subgroup B1**: 102 pts, LVEF > 50%
  - **Subgroup B2**: 69 pts, LVEF < 50%
MATERIAL AND METHOD

Statistical analysis:

Null hypothesis tested:

1. «The reversibility of restrictive flow pattern after aortic valve replacement depends on the type of the aortic lesion?»

2. «Early and medium term prognosis and LV remodelling after aortic valve replacement in preoperatively restrictive LVDFP patients is “better” in those with aortic stenosis compared to those with aortic regurgitation?»

3. «Severe aortic regurgitation, restrictive LV diastolic filling pattern and severe pulmonary hypertension are independent predictors for unfavourable postoperative evolution in patients undergoing aortic valve replacement?»

SYSTAT and SPSS programs were used for:

- analysis of simple linear and multivariate regression
- relative risks and correlation coefficient calculations.
1. The evolution of the LV diastolic function was different in aortic stenosis group compared with aortic regurgitation group. Early after aortic valve replacement, diastolic filling improved in patients with aortic stenosis, whereas patients with aortic regurgitation showed a deterioration in diastolic filling. At 1 year postoperatively the percent of the patients with persistent restrictive LVDFP was 23.01% in AS group and 60.23% in AR group (p=0.001).

2. The persistence of the restrictive LV diastolic filling pattern has increased the risk of death at 1 year postoperatively by 9.2 fold, regardless of the presence of other known parameters that increased mortality rate in aortic valve replacement. The persistence of the restrictive LV diastolic filling pattern was found as an independent predictor for increasing the early postoperative risk of death in these patients (p=0.002).
3. At 5 years postoperatively, cardiovascular event-free survival, including hospital visits caused by heart failure symptoms and sudden cardiac death, was significantly higher in the patients with preoperative aortic stenosis (87,17%) compared with aortic regurgitation group (64,91%).

![Graph showing cardiovascular event-free survival in months]
5. The parameters which can be used for prediction of immediate and medium term evolution in patients with restrictive LV diastolic filling pattern undergoing aortic valve replacement were: age, preoperative NYHA class, LV ejection fraction, presence of postoperative atrial fibrillation, coronary artery disease and smoking.

6. E/E' representing diastolic filling pressure is the most important preoperative predictor of risk of early postoperative hospital course and postoperative morbidity.

**RESULTS**

- Smoking: 6.4
- Coronary artery disease: 7.6
- Mechanical Prosthesis: 1.7
- BioProsthesis: 1.5
- Mean PAP > 50mmHg: 3.4
- Associated 2 degree MR: 2.1
- LVEF 35-50%: 6.2
- LVEF < 35%: 8.7
- NYHA class III/IV: 9.1
- Atrial fibrillation: 6.9
- Age > 75 years: 7.2

Relative Risk Scale: 0 to 9
5 years postoperative risk for cardiovascular events in patients with aortic valve replacement depending on the aortic valve lesion

**RESULTS**

- Age
  - < 75 years
    - > 50%: 6,5
    - > 75 years: 7,1
  - > 75 years
    - > 50%: 7,3
    - < 35%: 8,8

- Coronary artery disease
  - NO: 1,2
  - YES: 3,5

- LVEF
  - > 75 years
    - > 50%: 1,4
    - 35-50%: 2,8
    - < 35%: 3,2
  - < 75 years
    - > 50%: 2,1
    - 35-50%: 3,1
    - < 35%: 8,1
7. Simple linear and multivariate regression analysis has identified as independent predictors for persistence of a restrictive LVDFP after aortic valve replacement:

- preoperative aortic regurgitation (RR=19.2),
- E/E’ ratio >12 (RR=21.1),
- the LA dimension index >30mm/m² (RR=8.2, p=0.0017),
- LV end-systolic diameter (LVESD) >55mm (RR=8.6),
- severe pulmonary hypertension (PHT) (RR=9.7)
- 2 degree MR (RR=12.6).

There were not correlated with the increased rate for persistence of a restrictive LVDFP after aortic valve replacement in these patients:

- parameters of LV systolic performance
- age
- coronary artery disease
RESULTS

Risk of persistence of a restrictive LVDFP at 2 years postoperatively after aortic valve replacement

Coronary artery disease
LVEF<35%
Age>75 years
2 degree MR
LVESdiameter>55mm
Mean PAP>50mmHg
E/E’ratio>12
Aortic Regurgitation
LA dimension index >30mm/m²
Restrictive flow pattern is reversible mostly after aortic valve replacement for aortic stenosis than for aortic regurgitation, both in the early and medium postoperative term.

The parameters predicting fatal outcome and hospitalisation for heart failure on medium term were age, preoperative NYHA class, LVEF, atrial fibrillation, coronary artery disease and smoking.

E/E' representing diastolic filling pressure is the most important preoperative predictor of risk of early postoperative hospital course and postoperative morbidity.
The echographic **predictors for persistence** of a restrictive LV diastolic filling pattern in patients with aortic valve replacement were:

- preoperative aortic regurgitation
- E/E’ >12
- LV end systolic diameter >55mm
- the LA dimension index >30mm/m²
- severe pulmonary hypertension
- associated 2 degree mitral regurgitation
Thank you for your attention....