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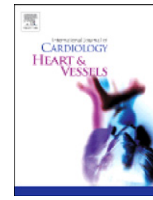

Repair or prosthesis insertion in ischemic mitral regurgitation: Two faces of the same medal

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ABSTRACT

Objective: The proper treatment of chronic ischemic mitral regurgitation (CIMR) is still under evaluation. The different role of mitral valve repair (MVr) or mitral valve prosthesis insertion (MVPI) is still not defined.
Methods: From May 2009 to December 2011 167 patients with ejection fraction (EF) ≤40% had MV surgery for CIMR, MVr in 135 (80.8%) and MVPI in 32 (19.2%). Indication to MVPI was a MV coaptation depth >10 mm. EF was lower (26 ± 7 vs 32 ± 6, p = 0.0000) in MVPI, whereas MR grade (3.6 ± 0.8 vs 2.7 ± 0.9, p = 0.0000), left ventricle dimensions (end diastolic, LVEDD, 62 ± 7 vs 57 ± 6 mm, p = 0.0001; end systolic, LVESD, 49 ± 8 vs 44 ± 8 mm, p = 0.0018), systolic pulmonary artery pressure (51 ± 22 vs 41 ± 16 mm Hg, p = 0.0037) and NYHA Class (3.6 ± 0.5 vs 2.8 ± 0.6, p = 0.0000) were higher.
Results: In-hospital mortality was similar (3.1 vs 3.7%) as well as 3-year survival (86 ± 6 vs 88 ± 4) and survival in NYHA Class I/II (80 ± 5 vs 83 ± 4). One hundred thirty nine patients had an echocardiographic evaluation after a minimum of 4 months (13 ± 8). EF rose significantly in both groups (from 26 ± 7% to 30 ± 4%, p = 0.0122, and from 32 ± 6% to 35 ± 8%, p = 0.0018). LVESD reduced significantly in both groups (from 49 ± 8 to 43 ± 9 mm, p = 0.0109, and from 44 ± 8 to 41 ± 7 mm, p = 0.0033). MR grade was significantly lower in patients who had MVPI (0.1 ± 0.2 vs 0.3 ± 0.3, p = 0.0011).
Conclusions: With appropriate indications, MVPI is a safe procedure which provides similar results to MVr with lower MR return, even if addressed to patients with worse preoperative parameters.

1. Introduction

Surgical treatment of chronic ischemic mitral regurgitation (CIMR) is nowadays more standardized, as its pathophysiology is better understood. Restrictive mitral valve (MV) annulopasty, proposed by Bolling et al. [1] is the procedure of choice. Other adjunctive procedures, as chordal cutting, papillary muscle repositioning, augmentation of leaflets, have been proposed, but their usefulness is still not well demonstrated. The possibility to insert a MV prosthesis in selected cases, proposed by our group [2], has recently been supported by other studies [3–6], which report mid and long term results similar to those of MV repair with lower grade of late MR. The failure rate of restrictive MV annuloplasty remains one of the weak points of the surgical treatment of CIMR and it is related to lower survival and worse clinical [7] and echocardiographic outcome.

We tried to rationalize MV surgery (repair or prosthesis insertion) for CIMR correction [2,8,9]. We herein report our more recent experience in patients with CIMR and ejection fraction (EF) ≤40% to evaluate if the strict application of that strategy could reproduce and confirm the results of our previous experiences from which it was generated.

2. Material and methods

From May 2009 till December 2011 167 patients with ejection fraction (EF) ≤40% underwent MV surgery for CIMR as first procedure. One hundred thirty five (80.8%) had MV repair (group MVr) and 32 underwent MV prosthesis insertion (group MVPI). Patients in cardiogenic shock were not included. The Institutional Review Board approved the research and waived patients' consent.

2.1. Definition

CIMR is defined as any MR that is due to excess of tethering of either or both leaflets as a result of misalignment of either or both papillary

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muscles. All the patients in this series had a previous myocardial infarction with regional wall abnormalities.

2.2. Preoperative echocardiographic evaluation

MR was graded following the European Society of Echocardiography recommendations [10]. MR was defined mainly according to vena contracta: mild (1+) if <3 mm, moderate (2+) if 3 to <5 mm, moderate to severe (3+) from 5 to <7 mm and severe (4+) if ≥7 mm. Recurrence of MR was defined as postoperative MR ≥ 2+. All echocardiographic measurements followed American Society of Echocardiography and European Society of Echocardiography guidelines [11]. Table 1 shows some relevant echocardiographic preoperative characteristics. Tissue Doppler Imaging S′ (TDI) was used to assess right ventricular (RV) function. A value of <10 cm/s was the cut point to identify RV dysfunction.

2.3. Surgical indications

All patients with CIMR ≥2+ were candidates for MV surgery. CIMR 1+ was never treated, but in 3 cases, where the systolic septolateral distance was severely dilated (>32 mm) and/or the coaptation length was minimal (≤2 mm). A coaptation depth (CD) of 10 mm or less was the limit for MV repair. If the CD was >10, the anatomy was not considered suitable for repair, and a prosthesis was inserted into the MV [2,8,9]. If the anterior leaflet (AL) was short (<25 mm) or excessively tethered, we respectively augmented or cut the second-order chords [9].

2.4. Surgical technique

After a median sternotomy, the ascending aorta and both venae cavae were cannulated, the superior vena cava directly. The MV was approached transseptally through a right atriotomy. The mitral annulus was reshaped with the SMB40 (Sorin Biomedica SpA, Saluggia, Italy) in 115 patients and with a Physioring (Edwards Lifescience, Irvine, CA, USA), median #26, in 20 patients. Insertion of a prosthesis inside the MV was obtained by cutting only a triangle of the AL with the base at AL insertion and the apex at the midpoint of A2. The remainder of the AL was pushed toward the annulus with the prosthetic sutures [8].

Any short (<25 mm) AL was disconnected from its insertion, and a pericardial patch was used to extend its height. The second-order chords were always cut to provide better mobility of the leaflet. When the second-order chords tethered the AL excessively, an aortotomy was performed, and these chordae were cut to increase the mobility of the leaflet.

Different techniques were used to exclude ventricular scars. In the case of an inferior scar, an incision parallel to the descending posterior artery was performed, and the scar was longitudinally excluded with interrupted U sutures. If the scar was limited to the apex and to the apical septum, a Dor procedure (purse-string with or without patch) was used. If the scar involved the septum more than the anterior free wall, a septal reshaping was performed. The purpose of these procedures was always to rebuild a conical shape.

Tricuspid repair was performed using a 50 mm long band (n = 62) or a MC3 (n = 13).

2.5. Clinical follow-up

All patients were clinically followed up in our outpatient clinic 3, 6, and 12 months after surgery and thereafter at yearly intervals. The most recent information was obtained by telephone interview. Follow-up was 98% complete. As some patient was living outside the country, in case of impossibility to contact him, the information at the last follow-up were considered if it was within the last 6 months, otherwise the patient was considered lost to follow-up. Mean follow-up time was 19 ± 9 months.

2.6. Echocardiographic follow-up

Every patient had at least one echocardiographic evaluation at discharge and 139 patients had a control during the follow-up. Time from surgery to the last control was 15 ± 8 months.

2.7. End points

The primary end points of this study were clinical and echocardiographic results as a whole and in the two groups were at the basis of this research.

2.8. Statistical analysis

Results are expressed as mean ± SD. Categorical variables are reported as counts and percentages. Echocardiographic modifications

Table 1
Clinical and echocardiographic data.

	All (n = 167)	MVr (n = 135)	MVPI (n = 32)	p
Age (y:mean ± SD)	62 ± 10	63 ± 10	62 ± 10	0.6117
Female gender (n, %)	39 (23.4)	34 (25.2)	5 (15.6)	0.2504
NYHA Class (mean ± SD)	2.9 ± 0.6	2.8 ± 0.6	3.6 ± 0.5	0.0000
Class II (n, %)	43 (13.5)	43 (31.8)	–	
Class III (n, %)	97 (68.8)	86 (63.7)	11 (34.3)	0.000
Class IV (n, %)	30 (17.7)	9 (6.7)	21 (65.6)	
EuroSCORE (mean ± SD)	7.0 ± 4.9	6.1 ± 3.9	10.6 ± 6.6	0.0000
Diabetes mellitus (n, %)	119 (71.2)	100 (74.1)	19 (59.4)	0.0985
AF (n, %)	22 (13.2)	16 (11.8)	6 (18.8)	0.2996
Previous AMI				
Anterior (n, %)	55 (32.9)	40 (29.6)	15 (46.9)	
Lateral (n, %)	17 (10.2)	13 (9.6)	4 (12.5)	0.1120
Inferior (n, %)	95 (56.9)	82 (60.7)	13 (40.6)	
EF (%:mean ± SD)	31 ± 7	32 ± 6	26 ± 7	0.0000
LVEDD (mm:mean ± SD)	58 ± 7	57 ± 6	62 ± 7	0.0001
LVESD (mm:mean ± SD)	45 ± 8	44 ± 8	49 ± 8	0.0018
Coaptation depth (mm)	8.6 ± 3.1	7.8 ± 2.7		12.2 ± 3.3
MR grade (1–4:mean ± SD)	2.9 ± 1.0	2.7 ± 0.9	3.6 ± 0.8	0.0000
PAPs (mm Hg:mean ± SD)	43 ± 18	41 ± 16	51 ± 22	0.0037
TDI (cm/s)	11.6 ± 1.2	11.5 ± 1.1	11.9 ± 1.4	0.0819

Legend. MVr, mitral valve repair; MVPI, mitral valve prosthesis insertion; y, year; SD, standard deviation; NYHA, New York Heart Association; AF, atrial fibrillation; AMI, acute myocardial infarction; EF, ejection fraction; LVEDD, left ventricular end diastolic diameter: LVESD, left ventricular end systolic diameter; MR, mitral regurgitation; PAPs, pulmonary artery pressure systolic; TDI, Tissue Doppler Imaging.