

## Valve Repair for Chronic Mitral Regurgitation

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Valve repair is the best surgical treatment for mitral regurgitation. In the present article we describe the results of mitral valve repair in patients with chronic mitral regurgitation treated at our center during the last eight years. The degree of correction of valve insufficiency, functional benefit, in-hospital morbidity and mortality, postoperative outcome of ventricular function, and middle-term overall and reoperation-free survival are analyzed.

**Key words:** *Mitral valve. Mitral regurgitation. Surgery. Valvuloplasty.*

### Reparación valvular en la insuficiencia mitral crónica

La reparación valvular es el tratamiento quirúrgico ideal de la insuficiencia mitral. En este trabajo presentamos los resultados de la reparación valvular en pacientes con insuficiencia mitral crónica operados en nuestro centro durante los últimos 8 años. Analizamos el grado de corrección de la insuficiencia, el beneficio funcional, la morbilidad hospitalaria, la evolución posquirúrgica de la función ventricular y la supervivencia global y libre de reoperación a medio plazo.

**Palabras clave:** *Válvula mitral. Insuficiencia mitral. Cirugía. Valvuloplastia.*

## INTRODUCTION

Whenever technically possible, valve repair (VR) is the surgical treatment of choice for mitral regurgitation (MR). Among the advantages of this technique over valve replacement is the reduced use of prosthetic material, which lowers the incidence of endocarditis and thromboembolic complications, as well as the need for chronic anticoagulation.<sup>1-4</sup> In addition, the subvalvular apparatus is spared, hence postoperative left ventricular function is more highly preserved.<sup>4-6</sup> This has resulted in benefits in long-term survival among patients with mitral valve prolapse who undergo VR versus artificial valve placement, without leading to a higher incidence of reoperation.<sup>7</sup> Valve repair is also superior to valve replacement in nondegenerative valve disease involving greater surgical risk, such as ischemic MR<sup>8,9</sup> and MR secondary to terminal dilated cardiomyopathy.<sup>10-12</sup> In 1957, Lillehei et al<sup>13</sup> per-

formed the first open mitral annuloplasty under extracorporeal circulation. Since then, a number of surgical techniques to repair the mitral valve have been described and most nonrheumatic cases of MR are now amenable to repair. The purpose of this study was to analyze the mid-term results among patients with chronic MR who have undergone VR at our center over the last 8 years.

## PATIENTS AND METHODS

Between January 1997 and July 2004 we performed 74 mitral plasties as elective surgery in patients with chronic MR. Mean patient age was 60±14 years (range, 16-83 years); 59% (n=44) were men. Before surgery, 68% of the patients were New York Heart Association (NYHA) functional class III-IV and 27% were in atrial fibrillation. The mean preoperative left ventricular ejection fraction (LVEF) was 56%, although 16% of the patients (n=12) had severe ventricular dysfunction (LVEF=39%). The etiology of MR was degenerative in 37 (50%) cases, ischemic in 12 (16%), hypertrophic obstructive cardiomyopathy in 11 (15%), dilated cardiomyopathy in 6 (8%), endocarditis sequelae in 4 (5%), and rheumatic in 4 (5%). The pathophysiological mechanism causing MR was most

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**TABLE 1. Comparison of Clinical and Echocardiographic Data Before and After Repair\***

	Preoperative	Postoperative	P
Degree of MR, n (%)			
0	0 (0)	13 (18)	<.001
1	0 (0)	46 (62)	
2	5 (7)	12 (16)	
3-4	69 (93)	3 (4)	
Mean±SD	3.63±0.59	1.17±0.9	<.001
NYHA Class, n (%)			
I-II	24 (32)	71 (96)	<.001
III-IV	50 (68)	0 (0)	
Mean±SD	2.64±0.82	1.15±0.36	<.001
Atrial fibrillation, n (%)	20 (27)	15 (20)	NS
Left atrium, mm	47.6	45.7	NS
LVEF, %	56	54	NS
EDD, mm	58	53	.015
ESD, mm	38	37	NS

\*EDD indicates left ventricular end-diastolic diameter; ESD, left ventricular end-systolic diameter; LVEF, left ventricular ejection fraction; MR, mitral regurgitation; SD, standard deviation.

frequently posterior leaflet prolapse (n=29, 39%), followed by central MR due to ring dilation or restrictive motion of the valve leaflets (n=22, 30%), systolic anterior motion (n=11, 15%), mixed prolapse of both leaflets (n=6, 8%), and exclusively anterior leaflet prolapse (n=6, 8%). The type of mitral VR most frequently performed was quadrangular resection of the posterior leaflet in association with ring annuloplasty (n=26, 35%). In 18 (24%) patients, the double-orifice (Alfieri) technique was used; in 10 (56%) of these cases, together with ring annuloplasty. In 18 (24%) patients, anterior leaflet plasty was performed: longitudinal folding plasty (in 11 patients with refractory hypertrophic obstructive cardiomyopathy, MR and systolic anterior motion), implantation of artificial expanded polytetrafluoroethylene chordae (n=3), triangular resection (n=2), excess tissue resection and repair with pericardium patch (n=1), and chordal shortening (n=1). In 50 (68%) patients, a partially flexible ring was implanted (Carpentier-Edwards Physio<sup>®</sup>, Edwards Lifesciences LLC, Irvine, CA, United States), as a single technique in 15 (30%) of them and additional to other techniques in the remaining 35 (70%). Four (5%) patients underwent Wooler annulo-

plasty as an alternative to ring annuloplasty. In 37 (50%) patients, the VR was associated with another surgical procedure: coronary revascularization (n=11), extended septal myectomy (n=11), aortic valve replacement (n=7), tricuspid plasty (n=4), aortic valve plasty (n=1), closure of congenital septal defects (n=2), and aortic valve replacement plus myocardial revascularization (n=1).

All patients underwent intraoperative transesophageal echocardiography (pre-VR and post-VR) and a control transthoracic echocardiography at the time of the final clinical follow-up visit. The pre-VR and post-VR quantitative variables were compared by Student's *t* test for paired data and the survival analysis was done by the Kaplan-Meier method.

## RESULTS

Mean patient follow-up was 38±22 months. A comparison of the preoperative and postoperative clinical and echocardiographic data is shown in Table 1. Both the MR grade and degree of dyspnea decreased significantly after VR, with LVEF with postoperative preservation of LVEF and a decrease in the left ventricular end-diastolic diameter. One (1.3%) patient who had undergone quadrangular resection of the posterior leaflet associated with ring annuloplasty required reentry into extracorporeal circulation due to residual Grade 3 MR in the intraoperative echocardiogram, which was resolved with the double-orifice technique. There was no operative mortality. One patient (1.3%) was reoperated for hemorrhaging and one required intraaortic balloon counterpulsation during the postoperative period. Two patients (2.7%) died while hospitalized (Table 2). Three patients (4%) required reoperation for recurrence of significant MR (Table 3); one of these patients died after valve replacement, the only case of mortality in our series during follow-up (1.3%). Overall survival and reoperation-free survival were 95.9±2.3% and 94.7±3.1% at 3 years, respectively (Figure). At the time of the final clinical follow-up visit, 75% of the patients were not receiving anticoagulants. No hemorrhaging, thromboembolic, or infectious complications were reported during follow-up, although there were 2 cases of ventricular tachycardia that required defibrillator implantation: 1 patient with MR secondary to dilated cardiomyopathy

**TABLE 2. Deaths Following Mitral Valve Repair (n=3, 4%)\***

Patient	MR Cause	MR Mechanism	Plasty	Post-VR MR (IOTEE)	Phase at Death	Cause
Male, 71 years	F (DM, LVEF=28%)	Central	Wooler+AVR	1	Hospital	Cardiogenic shock
Male, 41 years	D	Prolapse of both leaflets	Ring+QR	1	Late	MR, MVR, HF
Male, 59 years	HOCM	SAM	AML+myectomy	2	Hospital	Arrhythmia

\*AML+ indicates anterior mitral leaflet plication; AVR, aortic valve replacement; D, degenerative; DCM, dilated cardiomyopathy; F, functional; IOTEE, intraoperative transesophageal echocardiography; HF, heart failure; HOCM: hypertrophic obstructive cardiomyopathy; LVEF, left ventricular ejection fraction; MR, mitral regurgitation; MVR, mitral valve replacement; QR, quadrangular resection; SAM, systolic anterior motion; VR, valve repair.

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