

## MITRAL VALVE REPAIR FOR ISCHEMIC MITRAL REGURGITATION: EXPERIENCE AT A TERTIARY CARE HOSPITAL

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### **Contribution**

All the authors contributed significantly to the research that resulted in the submitted manuscript.

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### **ABSTRACT**

**Objective:** To know the outcomes of mitral valve repair for ischemic mitral regurgitation and its medium term survival.

**Methodology:** This retrospective study was carried out at a tertiary care hospital. All those patients who underwent mitral valve repair for ischemic mitral regurgitation between January 2007 and January 2009 were included in the study. Patients were followed at regular 3 monthly intervals and time related survival curves developed using Statistical Package for Social Sciences. Mortality was considered as the primary outcome during the follow up period.

**Results:** A total of 19 patients (n=19) with a mean age  $53.84 \pm 6.85$  years underwent repair for mitral valve for ischemic regurgitation. These included 13(68.4%) male patients while 6(31.6%) were females. All the patients had moderate to severe mitral regurgitation on echocardiography preoperatively. All the patients underwent concomitant Coronary Artery Bypass Grafting. The in hospital stay was  $19.79 \pm 4.35$  days with no in hospital mortality. Patients were followed up for 36 months. During followed up, 2 (10%) patients died, one at 25th month and the other at the 35th month both due to heart related causes. A Cox-regression model showed age [OR=1.185, (95%CI, 0.994 to 1.412, p=0.058)], low EF [OR=1.02, (95% CI,0.897 to 1.157, p=0.773)] and longer cross clamp time [OR=1.05, (95% CI, 0.763 to 121.723, p=0.351)] to be predictors of mortality.

**Conclusion:** Repair for mitral regurgitation post myocardial infarction can be undertaken with acceptable mortality and provides good medium term results. The repair should be done whenever the adjacent tissue is not diseased and friable.

**Key Words:** Mitral Valve Repair, Ischemic Mitral Valve Regurgitation, Myocardial Infarction

## INTRODUCTION

Myocardial infarction leads to mechanical complications like mitral regurgitation (MR), ventricular free wall rupture or aneurysm formation, ventricular septal rupture and tamponade following rupture. They carry a grim prognosis.<sup>1</sup>

Mitral valve regurgitation is a serious mechanical complication of acute Myocardial Infarction (AMI). It is a strong predictor of worse prognosis after AMI.<sup>2</sup> The incidence of mitral valve regurgitation in AMI has been reported to be 13%.<sup>3</sup> Ischemic regurgitation of the mitral valve after MI is either acute or chronic; both have different characteristics regarding pathophysiology, management and mortality.

Various pathophysiologic causes Ischemic mitral regurgitation (IMR) include ventricular dilation, papillary muscle displacement with ischemic ventricular remodelling and consequent leaflet tethering, and partial rupture of papillary muscle.<sup>4</sup> The operative strategy should consider addressing all the pathophysiologic basis of IMR rather than treating a single issue. A repair or replacement can be contemplated. Owing to the fact that replacement impairs the subvalvular apparatus and consequent left ventricular dysfunction, strategies were devised to counter this including repair of the valve. Repair not only maintains the integrity of the subvalvular apparatus but also abolishes the need for anticoagulation and related complications.<sup>5</sup>

Repair of the mitral valve in the settings of myocardial infarction can be very problematic. In acute conditions, the myocardium may be friable and necrotic, thus providing a weak platform for the sutures. But whenever deemed possible, a repair procedure can be undertaken.

We describe our experience with the classic Carpentier-Edward technique, annuloplasty and papillary muscle relocation for the repair of mitral valve in suitable patients.

## METHODOLOGY

This retrospective study was performed at Punjab Institute of Cardiology, Lahore checking the hospital record of patients from January 2007 to January 2009.

The hospital record of all those patients who had undergone mitral valve repair for ischemic mitral valve regurgitation was studied. A total of 19 such patients were identified. Patients were then followed up for 36 months since the time of their surgery.

The surgical techniques used for repair were 1) chordae reconstruction with annuloplasty 2) Re-implantation of PM in LV wall with annuloplasty 3) Reimplantation of the Papillary muscle in the corresponding Papillary muscle

(PM) with a sandwiched pledget-reinforced PTFE suture and annuloplasty ring (Carpentier-Edwards Classic). The repair procedure was undertaken after assessing the surrounding tissue for strength. A PTFE suture was used in all cases for the repair. Cardiopulmonary bypass was used in all the cases.

Statistical Package version 19 was used to analyse the data. Survival curve was estimated by using Kaplan and Meier curve. Cox proportional hazards model was used to investigate the effect of exposure to mortality in the mitral valve repair. A two tailed p-value  $\leq 0.05$  was used to indicate statistical significance.

## RESULTS

The results showed that 13(68.4%) were male while 6(31.6%) were female patients included in the study. The mean age was  $53.84 \pm 6.85$  years with the range 40-63 years (Table 1). All the patients (100%) underwent concomitant CABG. The mean EF was  $44.47 \pm 7.62$ . The mortality was 2 (10.5%). In 10 (52.6%) patients the posterior left ventricular artery (PLV) was stenosed. Chordae rupture was noted in 5(26.3%) patients while partial rupture of papillary muscle was noted in 14(73.7%) patients. Most of the patients, 13(68.4%), underwent elective surgery while 6(31.6%) patients underwent emergency procedure. Chordae reconstruction with annuloplasty was performed in 5 (26.3%) patients. in 8 (42.1%) patients, Re-implantation of PM in LV wall with annuloplasty was done. Reimplantation of the PM in the corresponding PM with a sandwiched pledget-reinforced PTFE suture and annuloplasty ring (Carpentier-Edwards Classic) was performed in 6 (31.6%) patients. The mean Cross Clamp time was  $106.5 \pm 12.86$  minutes. The mean In-hospital stay was  $19.79 \pm 4.35$  days.

(Figure 1) A Kaplan-Meier curve indicated that nineteen patients were followed for 36 months. Two (10%) patients died. One at 25th month and the other patient at 35th month.

The estimated hazard/ risk of death in the mitral valve repair after MI patient increases by 1.185 times with increase in age by one year, 1.02 times with poor ejection fraction, 1.23 times with emergency surgery, 1.05 times with cross clamp time and they had extended hospital stay (OR=1.04) after adjustment for the effects of the other variables in the model. Higher cord indicates positive relationship between the hazard but negative relationship with the survival (Table 2).

## DISCUSSION

Myocardial infarction can lead to mechanical complications. Of note are the ventricular free wall rupture, ventricular septal rupture and papillary muscle rupture of dysfunction with resultant mitral valve regurgitation. Mitral regurgitation

**Table1: Demographical and Clinical Characteristics of the Patients (n=19)**

Variables		Percentages (%)
Gender	Male	13(68.4%)
	Female	6(31.6%)
Age		53.84±6.85
Artery which caused pathology	PLV	10(52.6%)
	PDA	3(15.8%)
	Left Cx	6(31.6%)
The type of pathology	Chordae rupture	5(26.3%)
	partial PMR	14(73.7%)
The type of surgery	Elective	13(68.4%)
	Emergency	6(31.6%)
Type of mitral repair	chordae reconstruction with annuloplasty	5(26.3%)
	Only annuloplasty	8(42.1%)
	Reimplantation of the PM in the corresponding PM with a sandwiched pledget-reinforced PTFE suture and annuloplasty	6(31.6%)
Mortality		2(10.5%)
Cross Clamp time (min)		106.5±12.86
In hospital stay (days)		19.79±4.35
Survival time (months)		23.59±7.52
EF (%)		44.47±7.62

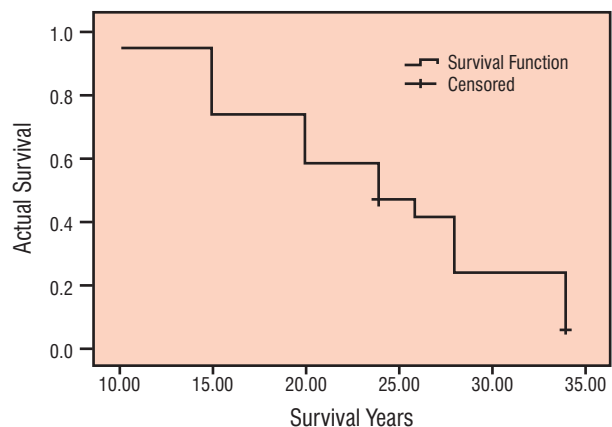
in the ischemic setting has been described in 11-19% patients after MI. with the advent of new techniques for repair, the results of the operation are improving.<sup>6,7</sup>The presence of mitral regurgitation before or after AMI leads to poor prognosis. Thus a correction in the form of replacement or repair is always warranted. The indication for intervention has been a subject of debate but generally +1 MR is left alone, +4 is certainly addressed and +2, +3 is the decided on individual basis with no uniform consensus. Patients in our study fell in the moderate to severe category.

All the patients in our study underwent a concomitant coronary artery bypass procedure along with mitral valve repair. Revascularization is one of the treatment strategies for ischemic mitral regurgitation. Less postoperative MR and similar 5-year survival have been reported by Kim et al, when they compared patients with only revascularization and those with revascularization as well as mitral valve repair.<sup>8</sup>

The choice of annuloplasty technique has been a controversial subject over the years.<sup>9</sup> We used the techniques of undersized annuloplasty with the help of

measured Dacron strip used for posterior annuloplasty rather than the full circumference in all the patients. Timek et al, have described the importance of Septolateral dimension correction for patients with ischemic MR.<sup>10</sup> They showed that correcting this dimension can abolish MR. McGee et al, have shown that significant MR does appear in a subset of patients 6 months after the procedure but remains constant

**Figure 1: Kaplan-Meier Survival Curve**



**Table 2: Cox Proportional-Hazards Model was used to Analyse the Effect of Exposure to Mortality in the Mitral Valve Repair for Mitral Regurgitation after Myocardial Infarction**

Variables	B	Wald	P-value	Exp(B)	95.0% CI for Exp(B)	
					Lower	Upper
Age	.169	3.581	.058	1.185	.994	1.412
Gender(male)	-1.938	4.198	.040	.144	.023	.919
Pre-operative EF%	.019	.083	.773	1.02	.897	1.157
Chordae rupture pathology	.548	.099	.753	1.730	.057	52.680
Emergency Surgery	.208	.045	.832	1.231	.181	8.369
Cross Clamp Time(min)	.045	.871	.351	1.047	.763	121.723
In hospital stay(days)	.043	.041	.840	1.044	.951	1.151

thereafter.<sup>11</sup> They showed that the type of annuloplasty had no effect on survival. In-hospital mortality reported in their article is 6%. In their study they have observed that a simple ring annuloplasty wasn't sufficient to abolish MR. It should be coupled with additional repair procedures to address all the causes of the functional MR.

Our study did not observe any operative mortality. This could be likened to the fact that most of our patients presented after the acute phase and that's why the tissues were more amenable to repair. But the procedure does carry a high operative mortality. Crabtree et al, have reported an operative mortality of 10.1% and Siberman et al, described a 7% operative mortality.<sup>12,13</sup> Late mortality in our study was 10%. Both patients died because of worsening symptoms, progressive mitral regurgitation and pulmonary edema. Survival at 3 years was reported to be 68.3% by Crabtree et al.<sup>12</sup> Siberman et al, showed late mortality of 18%, 33 +/- 20 months after surgery.<sup>13</sup>

Age, poor ejection fraction, chordae rupture, elective surgery and cross clamp time were identified as predictors of mortality in our study. These findings are consistent with those described by Siberman et al.<sup>13</sup>

Mitral valve repair maintains the geometry of the left ventricle better than replacement owing to the fact that repair leaves the subvalvular apparatus intact. This leads to better outcomes as shown by Tischler et al.<sup>14</sup> Advantages carried by repair include abolishing the need for anticoagulation and low risk of infection compared to replacement.<sup>4</sup> Akins et al, have described freedom from all valve-related morbidity and mortality as 85% in patients in whom the valve was repaired vs 73% patients in patients with mitral replacement for ischemic mitral regurgitation.<sup>15</sup>

## CONCLUSION

It can be concluded that mitral valve can be repaired where possible with acceptable mortality and valve related complication thus saving patients from all the complications of prosthetic valves namely anticoagulation and stuck valves. The results need to be compared with mitral valve replacement in this part of the world as limited data is available.

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