Short Communication

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Evaluation of Echocardiography Results after Severe Mitral Valve Regurgitation Repair Surgery

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ABSTRACT

BACKGROUND AND OBJECTIVE: Severe mitral valve regurgitation, which occurs primarily or secondary to various cardiovascular diseases, has undergone surgery and valve replacement and artificial valve insertion from several years ago. Within the last few years, severe mitral valve regurgitation has undergone repair surgery. This study was conducted to determine the results of mitral valve repair surgery.

METHODS: This cross-sectional study was conducted among 210 patients who had undergone surgery with the diagnosis of severe mitral valve regurgitation. Transesophageal Echocardiography (TEE) was performed for all patients before surgery, and echocardiography was performed one week after surgery and six months later and the results were evaluated in terms of regurgitation in three mild, moderate and severe cases.

FINDINGS: The mean age of patients with secondary mitral regurgitation was 43 – 85 years. In patients with secondary mitral regurgitation, 143 (83%) patients did not have mitral regurgitation, 27 (15%) patients had mild mitral regurgitation and 3 patients had moderate to severe mitral regurgitation, whereas in patients with primary mitral regurgitation, 30 (81%) patients did not have mitral regurgitation, 5 (14%) patients had mild mitral regurgitation and 2 (5%) patients had moderate to severe mitral regurgitation.

CONCLUSION: The results of the study showed that mitral valve repair with primary or secondary etiology had good results and can replace artificial valve in the future.

KEY WORDS: *Coronary stenosis, Mitral valve repair, Mitral valve regurgitation, Coronary artery bypass grafting, Echocardiography.*

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Introduction

Mitral valve regurgitation occurs when blood flows from the left ventricle into the left atrium (1) because mitral valve is not well closed at the time of systole. Anatomically, the mitral valve consists of four parts: Mitral Leaflets, Mitral Annulus, Mitral Chordae tendinea and Mitral Papillary Muscle. If any of these valve components are disturbed, the person will suffer from mitral valve regurgitation. Disorders of each of the valve components may occur, for example, due to mitral valve prolapse, rheumatic fever, infective endocarditis, and degenerative diseases.

However, sometimes the mitral valve is healthy in terms of the structure, but due to severe ischemia or severe mitral valve prolapse, secondary to heart failure due to ischemic heart disease (2-4), or other cases such as renal failure (5), the person suffers from mitral valve regurgitation, which is called secondary or functional. Surgical operation should be performed in severe symptomatic mitral valve regurgitation. If the result of repair and replacement is similar, replacement is preferable.

The valve replacement results while keeping the elements of chordae are similar to repair, and with the bioprosthetic valves, there is no risk of bleeding and long-term anticoagulant use (6). In the elderly, valve replacement is preferable. That's because there is no risk of bleeding and long-term anticoagulant use in bioprosthetic valves. The survival of the valve leaves no place for discussion, and this is more important in cases of emergency surgery, in which short-term ischemia is intended and repair is difficult and unreliable (6,7).

No technique is recommended for repairing papillary muscle rupture in cases of acute myocardial infarction (8). On the other hand, the spectrum of the results of repairing the valve with rheumatic disease or the valve that is impaired by radiation is much weaker than the regurgitation caused by degenerative disease, and therefore, rheumatic disease almost eliminates the need for complicated repair. In addition, the survival of repair is not constant in degenerative valves (9). Researchers who investigated mitral valve repair and replacement in a multivariate analysis reported a preference in late survival, mortality during surgery, and postoperative EF in recovery cases, but survival and analyses were not reported for people over 80 years of age (10, 11).

Most surgeons tend to replace the valve, especially among the elderly, in whom bioprosthesis cannot be used. Multivariate and multiphase hazard function analyses showed that after two years, the results of repair become evident, and therefore, every effort should be made to repair, even in cases where both valves need to be repaired (12). Thourani VH et al. conducted a retrospective study among 1250 patients with 625 repairs compared to 625 replacements. Repair was associated with shorter hospitalization period and lower hospital mortality, but 10-year survival was not better in patients over 60 years of age or those requiring coronary artery bypass surgery, and this study was fundamentally different from other studies, and therefore, the results are better in all types of repair except ischemic types and especially in people over 60 years of age, whereas the results of replacement are better in people over 60 years of age and ischemic cases (13, 14).

Moos et al. compared the maintenance of the chordae through repair and replacement of mitral valve in a four-year review and achieved better results with repair, but the risk of reoperation was higher (15). In a study, it was shown that of 162 patients who underwent operation due to nonrheumatic mitral valve regurgitation, the total 20-year survival was equivalent to the general population, three patients had to undergo primary reoperation, and seven patients had to undergo late reoperation.

All 65 survived patients were in function of class I and II (16). Due to the complications of bleeding and thromboembolism caused by artificial valves, the tendency to repair mitral is constantly increasing. In addition, endocarditis and pancreatic dysfunction are other complications of artificial valve, which cause secondary malfunctioning and according to the investigations of The World Society of Cardiovascular & Thoracic Surgeons, the tendency to repair is constantly increasing since 1990 (17).

In spite of this increase in repair, it is used less as a golden standard in cases of need. Mohty et al. from Mayo Clinic compared 279 cases of repair with 238 cases of replacement from 1980 to 1995. The total rate of repair during the years 1999 to 2000 was 74% for isolated mitral regurgitation, which is much higher than the global rate of 42.4%, and of these people, 55% only underwent mitral valve annuloplasty. This indicates that the mitral repair is still not considered an ideal approach all over the world (18). Therefore, this study was performed to evaluate the echocardiography after surgical repair of severe mitral valve regurgitation in Ayatollah Rouhani Hospital in Babol.

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Methods

After obtaining permission from the Ethics Committee of Babol University of Medical Sciences (MUBABOL.REC.1394.306), this cross-sectional study was performed in Ayatollah Rouhani Hospital among patients who were candidates for mitral valve repair surgery and all patients who underwent transthoracic echocardiography(TTE) and transesophageal echocardiography(TEE) and were diagnosed with primary and secondary severe mitral valve regurgitation and were supposed to undergo cardiac surgery. Patients who did not have appropriate echocardiography criteria and did not undergo echocardiography with satisfaction were excluded.

A total of 237 patients with severe mitral valve regurgitation were included in the study, of which 27 were excluded from the study for several reasons, including death or non-cooperation, and ultimately, 210 patients with severe mitral valve regurgitation who were candidates for surgery were studies. Transthoracic echocardiography (TTE) and transesophageal echocardiography (TEE) were performed for all patients who had the necessary criteria. All patients were operated by a surgeon and echoed by Vivid S60 Cardiovascular Ultrasound. The repair was done for all these patients by placing a ring in the valve annulus. After surgery, transesophageal echocardiography was performed immediately to do a more complete repair before bringing out the pump in case the operation was not successful. The repair was considered successful if there was no residual MR or there was only mild MR. One week after surgery and 6 months later, echocardiography was performed again and echocardiography results were evaluated. Diagnosis of valve regurgitation was done with echocardiography and all patients were echoed by one person. The results were analyzed using SPSS 23 software.

Results

A total of 173 patients with severe mitral valve regurgitation were evaluated for functional coronary artery disease. Thirty–seven patients had primary severe mitral valve regurgitation, and all patients developed severe mitral valve regurgitation due to severe mitral valve prolapse and because of flail and micromatosis. These patients had severe bilateral valve prolapse and most of them had P2 Flail and only 3 were A2 Flail. In these patients, in addition to placing ring in the mitral valve annulus, the repair of the cusps of mitral valve has also been done. Of the 210 patients who underwent mitral valve repair surgery, 127 (60.5%) were male and 83 (39.5%) were female. The age of patients with primary mitral valve regurgitation was 31–57 years old and patients with secondary mitral valve regurgitation was 43–85 years (Table 1). Of the total 173 patients with secondary MR, 113 (65%) were men and 60 (35%) were female. Of the 210 patients who underwent mitral valve repair diagnosed with severe mitral valve regurgitation, 173 (82%) had no MR after surgery, 32 (15%) had mild MR and 5 (3%) had moderate MR or higher. Of the 173 patients with mitral valve regurgitation who were secondary to coronary artery stenosis and had Functional MR and underwent surgical repair, 143 patients (83%) had no MR, 27 patients (15%) had mild MR and 3 patients (2%) had moderate MR or higher. Of 37 patients with primary mitral valve regurgitation who developed severe regurgitation due to severe mitral valve prolapse or micromatosis, ring placement was also performed along with valve repair, among which 30 patients (81%) had no MR, 5 patients (14%) had mild MR and 2 patients (5%) had moderate MR or higher (Table 2, 3).

Table 1. Frequency of mitral valve regurgitation

Valve regurgitation Variable	Operated patients N(%)	Secondary mitral N(%)	Primary mitral N(%)
Man	127(60.5)	113(89)	14(11)
Woman	83(39.5)	60(72)	23(28)

Table 2. Results of mitral valve repair with echocardiography

MR Variable	Without N(%)	Mild N(%)	Moderate N(%)
Total operated patients	137(82)	32(15)	5(3)
Patients with secondary regurgitation	143(83)	27(15)	3 (2)
Patients with primary regurgitation	30(81)	5(14)	2(5)

Table 3. Results of mitral valve repair with echocardiography based on gender

MR		Type of regurgitation	Woman N(%)	Man N(%)	Total N(%)
Before surgery	Severe	Primary	23(62)	14(38)	37(100)
		Secondary	60(35)	113(65)	173(100)
After surgery	Without MR	Primary	18(78)	12(86)	30(81)
		Secondary	48(80)	95(84)	143(83)
	Mild	Primary	3(13)	2(14)	5(14)
		Secondary	10(17)	17(15)	27(15)
	Moderate or higher	Primary	2(9)	0(0)	5(2)
		Secondary	2(3)	1(1)	3(2)

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Discussion

In the present study, 210 patients have referred with severe MR. 173 patients had severe MR secondary to ischemia and 37 patients had severe primary MR, all of whom had undergone valve repair surgery. The valve repair surgery was successful in 98% of patients with severe secondary MR and 95% of patients with severe primary MR repair. In the study of Ahmad et al., 93% of patients with primary mitral valve regurgitation caused by mitral valve prolapse did not have severe MR after valve repair surgery, and mitral valve repair was successful (1), which is similar to the results of the present study.

JH et al. showed that, despite the reduction in EF in the successful repair of the mitral valve, the stroke volume was maintained and this does not depend on the EF before the operation (19). Surgery for asymptomatic mitral valve regurgitation is not well-defined and there is no information to justify this. The recent attack of atrial fibrillation is considered as a relative indication, and especially if there is a chance of successful repair, history of atrial fibrillation for more than one year or the size of the left atrium above 50 mm are also signs of survival of AF after surgery (20). David TE et al. repaired 488 patients with mitral valve prolapse, repaired 289 patients with symptomatic primary regurgitation and 199 patients with asymptomatic primary regurgitation. 96% of asymptomatic patients and 76% of symptomatic patients did not have moderate MR or higher, and their repair has been successful. The results of this study were similar to the present study (21).

DEIA et al. showed that mitral valve repair in patients with severe ischemic MR along with coronary artery bypass grafting survived longer than the coronary artery bypass grafting along, and these results were similar to the present study and confirmed the success of this method (22). In the study of Takahashi et al. among patients with severe secondary MR, valve repair was performed using mitral valve annuloplasty method, and all patients had a moderate or higher incidence of MR after surgery and nearly 100% of patients had successful valve repair (23). In the study of Tavakoli et al., who repaired severe MR caused by acute myocardial infarction, 85% of this repair was successful and 15% of these patients died after repair, and the cause of their death was acute infarction and its large extent, and the repair of the mitral valve was not the cause of their death (8).

Flameng W et al. studied the relapse of mitral regurgitation rather than reoperation. Within eight years, the incidence of survival was 82.3±9.90% and lack of reoperation was 83.2±2.94% (6). They reported a linear rate for relapse of regurgitation in trivial upper bound of 3.8% per year and the severe type of 7.3% per year. Except for patients with high rate of relapses (shortness of chordae, without ring placement or sliding plasty), this rhythm was 9.6% and 5.2% per year in other patients, respectively. The absence of general thromboembolism and bleeding was 7.2 ± 4.90% within eight years.

They concluded that maintaining a successful repair is not a constant problem, and this should be considered when choosing the repair method. Good results were reported in mitral valve repair in patients with functional MR and severe primary MR who had appropriate repair criteria in echocardiography. In patients who undergo coronary artery bypass grafting, transesophageal echocardiography should be performed before surgery for severe functional MR, and if the conditions are appropriate, valve repair can also be performed simultaneously.

Considering that patients whose mitral valve has been replaced should always take anticoagulants, if they have the right conditions for repair, valve repair is recommended.

Conflict of Interest: No conflicts of interest.

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