

MITRAL REGURGITATION IN PATIENTS WITH MITRAL VALVE PROLAPSE

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ABSTRACT

Objective: To determine the frequency, severity and gender distribution of mitral regurgitation (MR) in patients with mitral valve prolapse (MVP) and effect of severity of MR on the left heart chambers enlargement.

Material and Methods: Echocardiography reports of patients from June 2003 to July 2006 were retrospectively searched for presence of MVP from the computerized database of Cardiology department, Lady Reading Hospital Peshawar. Demographic details and findings of comprehensive echocardiographic examination, including M-mode echocardiography, 2-dimensional echocardiography, and conventional and color Doppler ultrasonography conducted by experienced echocardiographers were recorded.

Results: Out of 25,303 echocardiographic examinations performed in the period, 1073 (4.24%) patients had MVP with mean age of 26 ± 14 years. Males were 585(54.52%) and females were 488(45.48%). MR was found in 444/1073 (41.37%) patients of which 211 (47.53%) were males and 233 (52.47%) were females. Overall MVP was more common in males however MVP with MR was more common in females. In patients of MVP having MR, mild, moderate and severe MR was noted in 312(70.3%), 54 (12.2%) and 78 (17.5%) patients respectively. In patients with MVP having severe MR, the mean LV end diastolic diameter was 6.94 ± 0.93 cm, mean LV end systolic diameter was 4.13 ± 0.75 cm and mean left atrial diameter was 5.56 ± 1.12 cm.

Conclusion: With no significant changes in gender distribution of MVP, a high proportion of patients with MVP have associated MR. Severity of MR in patients with MVP had significant effect on enlargement of left heart chambers.

Key words: Mitral Valve Prolapse, Mitral Regurgitation, Echocardiography.

INTRODUCTION

Mitral valve prolapse (MVP) has been described as a common disorder, with prevalence estimates generally ranging from 5 to 15 percent and up to 35 percent in some studies in the past.¹⁻³ These early studies have emphasized the frequent occurrence of echocardiographic abnormalities in patients with MVP, including thickened and elongated leaflets with important mitral regurgitation and left heart chambers enlargement. These abnormalities, in turn, have been associated with serious complications such as bacterial endocarditis, congestive heart failure, mitral valve surgery, arrhythmias and sudden death.^{4,5} Recent studies using the new diagnostic criteria have

reported prevalence of MVP as 0.6 and 2.4 percent.^{6,7} Mitral valve prolapse has been associated with a wide variety of symptoms that mostly bring these patients to hospital for check up.⁸ On the other hand patients having MVP with associated severe mitral regurgitation may be asymptomatic and it is their echocardiographic parameter that determines their future follow-up and management strategies.⁹ Although, generally considered as to be a benign condition, mitral regurgitation is one of the important predictor of morbidity and mortality in patients with mitral valve prolapse. Patients with mitral valve prolapse and higher degrees of regurgitation have been considered to be at higher risk than those with

SEVERITY OF MITRAL REGURGITATION (MR) IN PATIENTS WITH MITRAL VALVE PROLAPSE (MVP)

Severity of MR	Male (n=211)	Female (n=233)	Total (n=444)
Mild	155 (73.4%)	157 (67.4%)	312 (70.3%)
Moderate	24 (11.4%)	30 (12.9%)	54 (12.2%)
Severe	32 (15.2%)	46 (19.7%)	78 (17.5%)

Table 1

lower degrees of regurgitation, suggesting that the severity of mitral regurgitation may provide important information on the outcome.¹⁰ Very recently a novel genetic marker of an adverse disease course in MVP, the matrix metalloproteinase-3 promoter haplotype, has been identified.¹¹ This haplotype is considered as predictor of severity of mitral regurgitation and left ventricular remodeling in patients with MVP. Mitral valve repair for mitral regurgitation due to MVP is associated with excellent long-term survival and remain superior to mitral valve replacement.¹² Present study was therefore designed to determine the frequency, severity and gender distribution of mitral regurgitation in patients with mitral valve prolapse and to study the effects of severity of mitral regurgitation on the left heart chambers enlargement.

MATERIAL AND METHODS

Echocardiography reports of all patients from June 2003 to July 2006 were retrospectively searched for presence of MVP from the computerized database of Cardiology department of Lady Reading Hospital Peshawar. The gender distribution of MVP, associated presence and severity of mitral regurgitation and diameters of cardiac chambers were looked for. All patient had a comprehensive echocardiographic examination, including M-mode echocardiography, 2-

dimensional echocardiography, and conventional and color Doppler ultrasonography conducted by experienced echocardiographers. Echocardiography was performed in accordance with American Society of Echocardiography guidelines using GE RT 6800 and Siemens Acuson CV 70 ultrasonograph using 5 MHz transducer. Diagnosis of MVP (annular overshoot of leaflet > 2mm in the long-axis view) of flail segment, and of thickened leaflets was based in accordance with echocardiographic criteria of Devereux et al.¹³ Left ventricular diameters and left atrial diameter measurements were guided by 2D echocardiography. The degree of mitral regurgitation (MR) was assessed semi quantitatively using color Doppler technique and stratified into 3 categories: mild, moderate and severe. Planimetry was used to measure the mitral regurgitant jet on color-flow imaging and the ratio of the mitral regurgitant jet to the left atrial area was calculated.^{14,15}

Statistical analysis: SPSS version 13 was used for statistical analysis of the results. Age, gender and sizes of left sided heart chambers were compared between patients of MVP having mild, moderate, severe and no mitral regurgitation. Chi-square test and student *t* was used for comparing categorical and numerical variables respectively. All P values are two-tailed. P values of less than 0.05 are considered statistically significant.

COMPARISON OF AGE, GENDER AND LEFT HEART CHAMBERS BETWEEN PATIENTS OF MVP HAVING MODERATE AND SEVERE MITRAL REGURGITATION

Clinical variables	MVP with Severe MR	MVP with Moderate MR	P Value
Mean age (years)	26.85	32.79	0.10
Sex. Male	15.17%	11.37%	0.09
Female	19.74%	12.87%	
Mean LA diameter(cm)	5.56 ± 1.12	3.93 ± 0.75	0.0001
Mean LV diastolic diameter (cm)	6.09 ± 0.93	5.26 ± 0.83	0.001
Mean LV systolic diameter (cm)	4.13 ± 0.75	3.58 ± 0.71	0.001

Table 2

COMPARISON OF AGE, GENDER AND LEFT HEART CHAMBERS BETWEEN PATIENTS OF MVP HAVING MODERATE AND MILD MITRAL REGURGITATION

Clinical variables	MVP with Moderate MR	MVP with Mild MR	P Value
Mean age (years)	32.79	26.34	0.10
Sex. Male	11.37%	73.45%	0.005
Female	12.87%	67.35%	
Mean LA diameter (cm)	3.93 ± 0.75	2.89 ± 0.50	0.001
Mean LV diastolic diameter (cm)	5.26 ± 0.83	4.38 ± 0.54	0.001
Mean LV systolic diameter (cm)	3.58 ± 0.71	2.89 ± 0.41	0.001

Table 3

MITRAL VALVE PROLAPSE TOTAL AND THOSE WITH MITRAL REGURGITATION

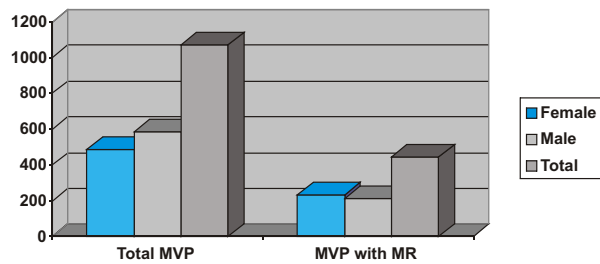


Fig-1

RESULTS

Total echocardiographic examinations performed in the last three years from June 2003 to July 2006 were 25303. Out of these 1073 (4.24%) were found to have MVP. Mean age of patients with MVP was 26± 14 years. Male were 585 (54.52%) and female were 488(45.48%). Mitral regurgitation (MR) was found in 444 (41.37%) patients of which 211 (47.53%) were male and 233 (52.47%) were female (Fig 1). Overall, MVP was more common in male patients than females while *MVP with mitral regurgitation* was more common in females than males.

Out of 444 patients of MVP with MR, 312 (70.3%) patients had mild MR, 54 (12.2%) had moderate MR and 78 (17.5%) had severe MR (table 1). Out of 211 male patients of MVP having mitral regurgitation, mild, moderate and severe MR was present in 155 (73.4%), 24 (11.4%), 32 (15.2%) respectively (Fig 2). While out of 233 female patients of MVP with MR, mild moderate and severe MR was present in 157 (67.4%), 30 (12.9%) and 46 (19.7%) patients respectively.

In patients with MVP having severe MR, the mean LV end diastolic diameter was 6.94±0.93 cm and mean LV end systolic diameter was 4.13±0.75 cm. Mean left atrial diameter of patients with MVP and severe MR was 5.56±1.12 cm. In patients with MVP and moderate MR, the mean

LV end diastolic diameter was 5.26±0.83 cm and mean LV end systolic diameter was 3.58± 0.71 centimeters. The mean LA diameter of patients with moderate MR was 3.93± 0.75 cm. When all the above parameters of left heart chambers were compared between patients of MVP with severe and moderate mitral regurgitation, the difference was highly significant statistically (P< 0.001, Table 2). Furthermore when these parameters of left heart chambers were compared between patients of MVP with moderate and mild mitral regurgitation, the difference was again highly statistically significant (P< 0.001), even though the values of both groups were within the normal reference range (Table 3). Patients having MVP without MR and those with mild MR had no significant difference between their LV end systolic and LV end diastolic diameters and LA diameters. Mean age of patients with MVP having moderate MR was 32.79± 24.24 years and mean age of patients with severe MR was 26.85±17.9 years. Age and gender were not significantly different between groups of patients with MVP having no, mild, moderate or severe mitral regurgitation.

DISCUSSION

Mitral valve prolapse is generally understood to be the systolic displacement of an abnormally thickened, redundant mitral leaflet in to the left atrium during systole.¹³ New

SEVERITY OF MITRAL REGURGITATION WITH GENDER DISTRIBUTION

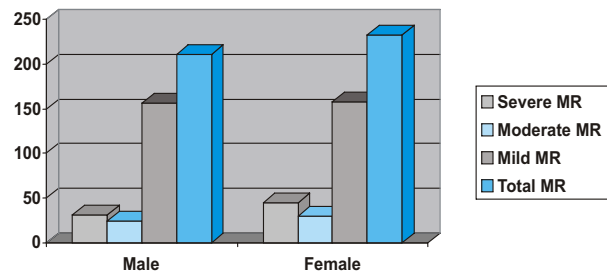


Fig-2

echocardiographic criteria have been established on the basis of an understanding of the 3-dimensional structure of the mitral valve.¹⁶ Recent studies that have used this criteria have shed new lights on the prevalence and complication of MVP in the general population. Although little is known about the natural history of MVP as diagnosed by these new criteria. Some studies have described MVP as a benign entity^{7,17} while others have described it a very heterogeneous disease with its natural history goes from extremely benign, with minimal mortality or morbidity, to severe, with excess mortality.¹⁰ An understanding of the prevalence of mitral valve prolapse and the identification of subgroups most susceptible to complication remain important because MVP is a common cause of valve repair/replacement for isolated mitral regurgitation and the thickened leaflets form a recognized substrate for bacterial endocarditis.^{18,19} Local data on the prevalence, complications and natural history of mitral valve prolapse in the general population is scarce. Local literature review showed no study on identification of high risk patients among those diagnosed as MVP. Our data showed a high proportion of patients with MVP having moderate to severe mitral regurgitation. Mitral regurgitation, ejection fraction less than 50%, left atrial diameter of more than 40 mm, atrial fibrillation and age more than 50 years have been described as risk factors predictors of excess mortality and cardiovascular morbidity in patients with MVP.^{17,20} Severity of mitral regurgitation is directly related to the enlargement of left sided cardiac chambers, recognized predictors of morbidity and mortality of patients with MVP. Enlargement of these left sided chambers causes heart failure, arrhythmias, thromboembolic phenomenon and pulmonary hypertension, the leading causes of end points in these patients. Ling et al in their study on patients with severe MR due to flail leaflet, reported a yearly mortality rate of 6.3 %. Independent determinants of mortality were old age, presence of symptoms, and a low ejection fraction. Yearly mortality reached 34 % in patients who were transiently in NYHA functional class III or IV but still 4.1 % for those in class I or II.²¹

Patients in the study population with severe MR had mean value of left atrium and left ventricle diameters well above the upper limit of normal ($P < 0.0001$). Mean values of left atrium and left ventricle diameters of our patients having moderate MR, although were within the normal reference range, they were statistically significantly more than the same diameters in patients of MVP having mild or no mitral regurgitation ($P < 0.001$). Asymptomatic patients with MVP and no significant MR can be evaluated

clinically every 3 to 5 years while those who have high risk characteristics, including those with moderate to severe MR, should be followed up once a year. A more recent and the first prospective study on the outcome of asymptomatic patients with MVP having severe regurgitation showed that the degree of mitral regurgitation strongly predicted the likelihood of survival in these patients.⁹ Patients with severe MR with symptoms or impaired LV systolic function require evaluation for mitral valve surgery.²²

Numerous studies indicate that patients with chronic severe MR have a high likelihood of developing symptoms or LV dysfunction over the course of 6 to 10 years.^{9,21,23} Recent advances in the technique of echocardiography have improved our understanding in preoperative evaluation of patient with MVP having MR for selecting the type of surgery required^{24,25} and quantification of the severity of mitral regurgitation in these patients.^{26,27} Further prospective community based studies are needed to know the natural history and identify high risk parameters to quantify the risk of complication in patients with mitral valve prolapse in our part of the world. The cause of younger age group being afflicted with MVP in our part of the world needs to be investigated further.

Study limitations

This is a retrospective analysis of the echocardiographic data of referred patients in a tertiary care hospital. It has the limitation inherent to all retrospective studies. These results are not applicable to the general population because of referral bias to a tertiary care hospital.

The reliability of routine echocardiographic interpretation and the agreement between MR grading and regurgitant volume with simultaneous MR quantification can be questioned.²⁸ However the routine echocardiography used in the present study is used clinically and is highly predictive of outcome.

CONCLUSION

The frequency of MVP in male and female is almost equal. Significant proportion of patients with MVP has mitral regurgitation. Severity of mitral regurgitation in patients with MVP had significant effect on enlargement of left heart chambers.

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