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ORIGINAL ARTICLE

# Correlation of Left Atrial Size with Mitral Valve Area & Atrial Fibrillation in The Patients of Mitral Stenosis An Echocardiographic Based Study

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## ABSTRACT

**Background:** Valve stenosis is a common heart disorder and an important cause of cardiovascular morbidity and mortality. Rheumatic heart disease (RHD) is the most common cause of mitral stenosis (M.S). It is most common in females as compared to males. Enlarged left atrium is the feature of mitral stenosis. In view of the associated lower survival valve diseases thus represent an important public health problem.

**Objective:** To see how many patients of mitral stenosis have atrial fibrillation (A.F) and what is the relationship between left atrial size and mitral valve area.

**Methodology:** This study was performed in the cardiology department of Gulab Devi Chest Hospital. We took the data of 50 patients. SPSS version 16.0 was used to evaluate the data. Descriptive statistics, bar charts and Pearson correlation test was used.

**Results:** The mean age and BMI of the patients were 35±12.37 and 20.76 ± 3.87 respectively. Data showed females predominance. Out of 50 patients 46% had atrial fibrillation. Mean LA size was reported as 50.6±11.93mm with minimum and maximum range as 32mm and 100mm .The mean mitral valve area (MVA) was 0.84±0.17cm<sup>2</sup> with minimum and maximum range as 0.6 and 1.5cm<sup>2</sup>. Echocardiographic investigations revealed that out of 50 patients 47 patients had pliable mitral valve, 2 patients had non pliable mitral valve, 25 had pulmonary hypertension and 6 patients had calcified valve. Pearson Correlation test shows a weak correlation (0.014) between left atrial size and mitral valve area with a p-value 0.926 which is insignificant.

**Conclusion:** Frequency of M.S is more common in females as compared to males. Out of 50 patients 23 patients had atrial fibrillation (AFIB). RHD is the common risk factor in the patients of mitral stenosis and there is no correlation between LA Size and MVA.

**Keywords:** Valvular heart disease, Atrial fibrillation (A.F), Rheumatic heart disease (RHD).

## INTRODUCTION

Valvular heart disease represents important cause of cardiovascular morbidity and mortality.(1) Mitral stenosis is the valvular heart disease characterized by the narrowing of the orifice of mitral valve of the heart. The normal mitral valve orifice is 4 to 5 cm, which essentially creates a common chamber between left atrium and left ventricle in diastole.(2) The mitral valve was the valve most commonly affected by rheumatic fever/rheumatic heart disease.(3)

Rheumatic heart disease are generally believed to be diseases of temperate climates and rarities in tropical countries.(4) Chronic rheumatic heart disease is the commonest cause of mitral stenosis. Approximately 25% of all the patients

with rheumatic heart disease have pure MS and an additional 40% have combined mitral stenosis (MS) and mitral regurgitation (MR).(5)

Recent reports from the developing countries have documented Rheumatic fever (RF) incidence rates as high as 206/100,000 and RHD prevalence as high as 18.6/1000.(6)

Atrial fibrillation in rheumatic heart disease (RHD), particularly with mitral stenosis, is accepted as a factor that predispose to systemic embolization.(7) The incidence of atrial fibrillation as a complication of mitral stenosis has been estimated at 40%.(8) Atrial fibrillation usually develops in the presence of pre-existing ECG of left atrial enlargement. Enlarged left atrium is the feature of mitral stenosis, whether the valve is

stenotic, incompetence or both.(9) Although rheumatic heart disease represents the main cause of giant left atrium, other etiologies have also been reported.(10) Echocardiography has become the key tool for the diagnosis and evaluation of valve disease, and is the primary non invasive imaging method for valve stenosis assessment.(11) Echocardiography is a reliable method of documenting the presence of mitral stenosis.(12) The rationale of this study was to see how many patients of mitral stenosis have atrial fibrillation and what is the relationship of left atrial size with atrial fibrillation and mitral valve area, as these have been studied globally but no sufficient local data are available.

## MATERIALS AND METHODS

**Design and Setting:** Our study was a cross sectional survey of 50 patients with Mitral stenosis presented in CCU of Gulab Devi chest hospital. Study was completed in six months.

**Sampling technique:** We used non probability (purposive) sampling.

**Sample selection criteria:** All patients with ages between 12 to 80 years, including both males and females, with mitral stenosis confirmed through clinical investigations and other diagnostic procedures notably echocardiography were included in the study. Foreigner patients and those having any other valvular disease and Atrial fibrillation due to causes other than mitral stenosis were excluded.

**Data collection methods:** After taking verbal consent patients were interviewed. Left atrial size and mitral valve area and related reading were noted down on a short structured questionnaire in addition to collecting basic demographic details. Patients were asked about the presence of chronic hypertension and diabetes mellitus. Information was also obtained regarding smoking history and history of heart disease in first degree relatives. All data was entered in a performa. There was no follow up.

**Statistical techniques:** Both descriptive and inferential statistical analyses were done in Statistical Package for Social Sciences (SPSS) version 16.0. We had access to the original raw data and these data were combined to perform the analyses. Categorical data were presented as percentages and in form of graphs while descriptive and frequency distribution was used for quantitative analyses. Pearson Correlation test was used to asses correlation.

## RESULTS

The results thus we obtained showed that out of 50 patients there were more number of males (34%) than females (66%). Data showed that the mean age of patients were  $35 \pm 12.37$  and mean BMI of the patients was  $20.76 \pm 3.87$ . Out of 50 patients 46% had atrial fibrillation.

Among 50 patients RHD was present in 28(56%) patients, 16% were reported as smokers, 20% had hypertension (HTN), 16% were diabetics and 18% had ischemic heart disease (IHD) with positive family history of heart disease in only 16% of the patients.

Mean LA size was reported as  $50.6 \pm 11.93$ mm with minimum and maximum range as 32 and 100mm The mean of Mitral Valve Area was  $0.84 \pm 0.17$ cm<sup>2</sup> with minimum and maximum range as 0.6 and 1.5cm<sup>2</sup>.

Table-1. shows descriptive of important findings related to M.S revealed in our study. It shows that out of 50 patients 37(74%) had abnormal X-ray findings. ASO Titer was positive in 7(14%) patients. Blood report was abnormal in 24(48%) patients and in viral mark only 10 patients had Hepatitis C. Abnormal ECG findings were revealed in 34 patients. ECHO studies revealed that out of 50 patients 47 patients had pliable mitral valve, 2 patients had non pliable mitral valve, 25 had pulmonary hypertension and 6 patients had calcified valve.

Table-1. Description of Important Findings Related to Mitral stenosis

VARIABLES	FREQUENCY (N = 50)	PERCENTAGE
Abnormal X-ray Findings*	13	26 %
Abnormal blood report**	24	48 %
ASO titer positive	7	14 %
Atrial Fibrillation	23	46 %
Presence of RHD	28	56 %
Viral Mark (Hepatitis B,C)	10	20.41 %
Abnormal ECG***	34	68%
<u>ECHO Findings</u>		
Pliable valve	47	94 %
Non pliable valve	2	4 %
Calcific valve	6	12 %
Pulmonary Hypertension	25	50 %

\* Enlarged left atrium, prominent pulmonary veins, Kerley's B lines.

\*\* Raised ESR, increase or decrease in the leukocytes count.

\*\*\* P-mitral (bifid P wave) and/or RVH

**Table 2:** Pearson Correlation test shows a weak correlation (0.014) between left atrial (LA) size and Mitral Valve Area (MVA) with a p-value 0.926 which is insignificant.

**Table-2. Pearson Correlation Results**

	Mitral valve Area	P-value
Left Atrial size	0.014	0.926

## DISCUSSIONS

The causes of mitral stenosis in western countries include coronary heart disease, hypertension, and rheumatic and non rheumatic valve heart disease.(13) Although all of the cardiac valves may be involved by the rheumatic process, the mitral valve is involved most prominently and in virtually all cases.(14) As the mitral orifice narrows in MS, it curtails free flow of blood from left atrium to left ventricle, and a pressure gradient develops between the two chambers. This pressure gradient is added on to left ventricular diastolic pressure, which results in increasing left atrial pressure that eventually leads to left atrial enlargement and pulmonary congestion.(2) In order to confirm that enlargement causes fibrillation, the assumption that large atria are more susceptible to this arrhythmia would have to be made; on the other hand, any effort to prove that the abnormal rhythm causes enlargement must be based on the presumption that the intrinsically abnormal state of the fibrillating atria leads to distension. Calcification and a consequent decrease in leaflet mobility are subsequent features in rheumatic MS and may be the primary mechanism in MS of degenerative origin.(15) Calcific deposits lead to cardiac conduction disturbances in these patients, or to embolism due to dislodgement of calcified material in the blood stream. Female sex and diabetes mellitus are thought to be significantly associated with and mitral annulus calcification, Associated risk factors were, for mitral annulus calcification : age, female sex, hypertension, diabetes mellitus, hypercholesterolaemia, and an enlarged left atrium and also with atrial fibrillation.(16)

The detection of mitral stenosis has been a classic application of echocardiography. ECHO is the most accurate approach to diagnose and evaluation of M.S. ECHO is recommended in all patients with M.S at initial presentation for re-evaluation of changing symptoms or signs

(depending on disease severity for monitoring disease progression). Incidence of rheumatic MS parallels that of acute rheumatic fever. In 2005 a descriptive study was designed in the department of Medicine, King Edward Medical College / Mayo Hospital and Punjab Institute of Cardiology, Lahore. A total of 129 conservative cases of mitral stenosis were included. 42 (37.5%) of them were males and 70 (62.5%) were females. These results were consistent with our study in perspective of female predominance which was reported as 66% in our study.

In a local literature inverse correlation between left atrial size and mitral valve area (MVA) with p value 0.017(insignificant) were reported. Their findings reveals mitral valve area ranged from 0.5 to 3.10 cm<sup>2</sup> with a mean value of 1.0469 ± 0.4146 cm<sup>2</sup>. Only one patient had MVA of less than 0.5 cm<sup>2</sup>. The left atrial size ranged from 33 to 80 mm with the (mean 50.91 ± 8.66). Thus using the value of 45 mm as a definite indicator of left atrial enlargement, they reported 54 patients (48.2%) to have left atrial enlargement.(5) These results seem to be consistent with our study which shows Left atrial size ranged from 32 to 100mm (50.6±11.9). MVA ranged from 0.6 to 1.5cm<sup>2</sup> (0.8±0.17) and weak or no correlation between LA size and MVA with p value (0.926). Earlier studies dealing with possible factors in the development of atrial fibrillation in patients with mitral stenosis have not shown consistent results.(8) our study shows that out of 50 patients 46% (23) have atrial fibrillation. The mitral valve was the valve most commonly affected by RF/RHD (3) and in our study RHD is the common risk factor causing mitral stenosis.

## CONCLUSION

In our study frequency of mitral stenosis is most common in females as compared to males. Out of 50 patients 23 had atrial fibrillation and RHD is the common risk factor. Pearson Correlation shows weak or no correlation between left atrial size and mitral valve area.

Further studies will help to provide consistent knowledge of association between left atrial size and mitral valve area and may develop the concept of severity of M.S in this regard.

## REFERENCES

1. Patel BB. SIGNIFICANCE OF ECHOCARDIOGRAPHY IN VALVULAR HEART DISEASE.

2. Carabello BA. Modern management of mitral stenosis. *Circulation*. 2005;112(3):432-7.
3. Thakur JS, Negi PC, Ahluwalia SK, Vaidya NK. Epidemiological survey of rheumatic heart disease among school children in the Shimla Hills of northern India: prevalence and risk factors. *Journal of epidemiology and community health*. 1996;50(1):62-7.
4. Carapetis JR, Wolff DR, Currie BJ. Acute rheumatic fever and rheumatic heart disease in the top end of Australia's Northern Territory. *The Medical journal of Australia*. 1996;164(3):146.
5. Niaz Z, RAZZAQ A, Saleem K, AZIZ B, Nazar T, Maqsood U, et al. Atrial fibrillation in mitral stenosis and its correlation with left atrial size, mitral valve area and left atrial thrombus. *Biomedica*. 2005;21.
6. Schotten U, Neuberger HR, Allessie MA. The role of atrial dilatation in the domestication of atrial fibrillation. *Progress in biophysics and molecular biology*. 2003;82(1):151-62.
7. Wolf PA, Dawber TR, Thomas Jr HE, Kannel WB. Epidemiologic assessment of chronic atrial fibrillation and risk of stroke The Framingham Study. *Neurology*. 1978;28(10):973-.
8. PROBST P, GOLDSCHLAGER N, Selzer A. Left Atrial Size and Atrial Fibrillation in Mitral Stenosis Factors Influencing Their Relationship. *Circulation*. 1973;48(6):1282-7.
9. Le Roux B, Gotsman M. Giant left atrium. *Thorax*. 1970;25(2):190-8.
10. El Maghraby A, Hajar R. Giant left atrium: A review. *Heart Views: The Official Journal of the Gulf Heart Association*. 2012;13(2):46.
11. Rahimtoola SH, Durairaj A, Mehra A, Nuno I. Current evaluation and management of patients with mitral stenosis. *Circulation*. 2002;106(10):1183-8.
12. Nichol P, Gilbert B, Kisslo J. Two-dimensional echocardiographic assessment of mitral stenosis. *Circulation*. 1977;55(1):120-8.
13. Lip G, Beevers DG. ABC of atrial fibrillation. History, epidemiology, and importance of atrial fibrillation. *BMJ: British Medical Journal*. 1995;311(7016):1361.
14. Labovitz AJ, Nelson JG, Windhorst DM, Kennedy HL, Williams GA. Frequency of mitral valve dysfunction from mitral annular calcium as detected by Doppler echocardiography. *The American journal of cardiology*. 1985;55(1):133-7.
15. Braunwald E, Turi ZG. Pathophysiology of mitral valve disease. *Mitral Valve Disease* Oxford, UK: Butterworth-Heinemann. 1996;33.
16. Boon A, Cheriex E, Lodder J, Kessels F. Cardiac valve calcification: characteristics of patients with calcification of the mitral annulus or aortic valve. *Heart*. 1997;78(5):472-4.