

ECHOCARDIOGRAPHIC PREDICTORS OF LEFT ATRIAL THROMBUS FORMATION IN PATIENTS WITH RHEUMATIC MITRAL STENOSIS

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Contribution

SNH conceived the idea, planned the study and drafted the manuscript. AB ZA helped in acquisition of data and did statistical analysis. SNH drafted the manuscript and critically reviewed manuscript. All authors contributed significantly to the submitted manuscript.

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ABSTRACT

Objective: To assess the factors responsible for left atrial appendage clot formation in patients with severe mitral stenosis employing transesophageal echocardiography.

Methodology: An observational cross sectional study was conducted on patients with severe mitral stenosis who underwent transesophageal echocardiography before percutaneous transmitral commissurotomy (PTMC) at Gulab Davi hospital and Punjab institute of Cardiology, Lahore from 1st August to 31st December 2015. Patients were divided into two groups on the basis of presence or absence of thrombus. Group -1 Patients with thrombus while Group-2 patients included those without thrombus in left atria. Data were entered in the SPSS-20 and echocardiographic factors responsible for clot formation were analyzed.

Results: Out of 82 patients, 73 of patients were women. Mean age was 35.87 ± 11.8 years. Group 1 included 24 patients (women to men ratio 91:9). Group 2 included 58 patients (women to men ratio 88:12). Patients of both groups did not differ significantly regarding age, sex, systolic pulmonary artery pressure and mitral valve mean pressure gradient (MVMPG) but group 2 patients had less frequent atrial fibrillation ($p \leq 0.05$), smaller left atrial size ($p \leq 0.05$), bigger mitral valve area and no low flow velocities ($p \leq 0.05$) which indicated left atrial appendage dysfunction. Atrial fibrillation was observed in 35 (42.7%) patients and was significantly associated with thrombus formation i.e. 20 (83.3%) patients.

Conclusion: It is concluded that frequency of left atrial thrombus formation is increased in patients of rheumatic mitral stenosis with low left atrial appendage flow velocities, atrial fibrillation and smaller mitral valve area.

Key Words: Mitral Stenosis, Left Atrial Thrombus, Transesophageal, Echocardiography

INTRODUCTION

Rheumatic mitral stenosis is still present in developing world.¹ Left atrial appendage clot is a common complication of mitral stenosis. The management of patient differs significantly if there is presence of clot.² Various factors had been studied as a risk factor for clot formation.³

Mitral stenosis is a huge burden in third world countries.⁴ A study showed that the incidence of rheumatic fever is 206/100,000 and prevalence of rheumatic heart disease is 18.6/1000.⁵ The prevalence of rheumatic heart disease (RHD) in Pakistan is also high like other third world countries and was found to be 22/1000 in inner Lahore.⁵ The most effected valve in rheumatic heart disease is mitral valve.⁶ It is solely affected in 25% and is affected in combination with other valves in 40% of patients.⁴ The symptoms develop 10 to 20 years after the disease.⁷

Mitral stenosis can lead to enlargement of the LA leading to increased risk of thrombus formation.⁸ The frequency of left atrial thrombi is 20-33% in different studies.⁷ Left atrial thrombus is more frequently associated with embolic events.⁹

Left Atrial Appendage (LAA) is the common site of thrombus formation.¹⁰ Increasing age and severity of MS also increase the risk of thrombus formation.^{4,10} Depressed LAA function has also shown to be one of the predictors of left atrial appendage clot.¹¹ Left atrial thrombus can be defined as echo dense mass of any size with independent motion relative to chamber wall found in left atrial cavity or left atrial appendage.¹²

To assess the factors responsible for left atrial appendage clot formation in patients with severe mitral stenosis employing transesophageal echocardiography.

METHODOLOGY

This observational cross sectional study consisted of patients of mitral stenosis who were referred for Transesophageal echocardiography (TEE) before percutaneous transmitral commissurotomy (PTMC) at Gulab Davi hospital and Punjab institute of Cardiology, Lahore from 1st August to 31st December 2015. A written informed consent was obtained, a designed study proforma or questionnaire was filled and information regarding personal details, history, clinical examination. Mitral stenosis was diagnosed on the basis of echocardiography and atrial fibrillation was documented on baseline electrocardiogram. Patients were divided into two groups on the basis of presence of thrombus. Group-1 included patients with thrombus in left atria while Group-2 included patients without thrombus in left atria.

A complete transthoracic echocardiographic examination was done in all patients with a 2-5 MHz transducer. Mitral

valve area was measured by continuous wave Doppler using pressure half time method.^{13,3} Systolic pulmonary artery pressure was measured using maximal tricuspid regurgitation velocity and applying Bernoulli equation to convert this value into pressure values. Estimated right atrial pressure was added in this value. To maximize the transthoracic visualization of left atrial thrombus all standard view were done along with angulations of transducer.

Transesophageal echocardiography (TEE) was performed in all cases after transthoracic echocardiography (TTE) using a 9 T MHz transducer multiplane probe. All patients were given local pharyngeal anesthesia (1% lidocaine spray) and intravenous diazepam. During the study heart rate, blood pressure, single lead ECG and pulse oximetry were monitored. TEE probe was introduced with the patient lying supine in left lateral position. The left atria was scanned in short axis and bicaval view. With a counter clockwise rotation of the probe at the level of aortic valve, left atrial appendage was visualized and thrombus was diagnosed by the presence of well-defined echogenic intracavity mass having an echo texture different from that of underlying endocardium.

Appropriate statistical data analysis technique by using SPSS version 20 was applied. Qualitative variables were described by numbers and percentages while quantitative were described as mean and SD (standard deviations). Chi square test was applied for categorical variables and independent sample t test was applied for quantitative variables. 5% level of significance was used.

RESULTS

This study included 82 patients with ages ranging from 21 to 65 years mean age was 35.87±11.8 years. Of them 73 patients were women. Patients were classified into two groups based on the presence of thrombus. Atrial fibrillation was observed in 35(42.7%) patients (Table 1). Atrial fibrillation was more significantly associated with thrombus formation i.e. 20 (83.3%) patients having AF as compared to 4 (16.7%) having sinus rhythm. Group 1 consisted of 24 patients (2 men and 22 women) with left atrial thrombus. Group 2 consisted of 52 patients (7 men and 51 women) without left atrial thrombus (Table 2). Patients with left atrial thrombus did not differ significantly from the patients without left atrial thrombus regarding age, sex, systolic

Table 1: Patients with Atrial Fibrillation in Both Groups (n-82)

Variable		Total (n%)	Group 1 (n%)	Group 2 (n%)	P value
Atrial fibrillation	Present	35(42.7%)	20(83.3%)	15(25.9%)	0.000
	Absent	47(57.3%)	4(16.7%)	43(74.1%)	0.000

Group-1:Patients with thrombus, Group -2:Patients without thrombus

Table 2: Echocardiographic Findings of Two Groups

Variables	Group 1 (with LA thrombus) n=24 (mean± S.D)	Group 2 (without LA thrombus) n=58 (mean± S.D)	P value
LA size(mm)	58.9±15.9	50.2±9.6	.003
MVA(cm ²)	0.93±0.18	1.14±0.35	.007
LAA flow velocity (cm/s)	13.0±2.40	30.2±11.0	.000
MVMPG (mmHg)	13.0±4.04	12.0±4.47	.085
PASP (mmHg)	69.71±9.7	58.61±5.6	.008

pulmonary artery pressure (SPAP) and mitral valve mean peak gradient (MVMPG) but Group 2 patients had less frequent atrial fibrillation ($p \leq 0.05$), smaller left atrial size ($p \leq 0.05$), relatively bigger mitral valve area and no low flow velocities ($P \leq 0.00$) indicating left atrial appendage dysfunction.

DISCUSSION

Left atrial thrombus formation is a complication frequently encountered in patients with severe mitral stenosis with a higher chance of systemic embolization leading to higher morbidity and mortality.¹⁴ The increasing severity of mitral stenosis is significantly correlated with increased incidence of thrombus in the Left atrium and Left atrial appendage.¹⁵ Fifty percent of Left atrial thrombi in patients with rheumatic valvular disease, and nearly 90% of Left atrial thrombi in patients with non-valvular atrial fibrillation are limited to the Left atrial appendage.⁹ TEE is superior to TTE in the evaluation of LA thrombi.⁹

Our study supported that the severity of mitral stenosis was significantly related with thrombus formation. Ozkan et al, found similar results.¹⁵ Similarly the frequency of Left atrial thrombus increases with atrial fibrillation and low flow velocities. Fazlinezhad et al, found that patients with left atrial thrombus had more LA appendage dysfunction, more frequent atrial fibrillation and smaller mitral valve area.¹⁶ Our study also supported that atrial fibrillation was significantly associated with thrombus formation ($p \leq 0.05$). Ali et al, found similar results in patients of rheumatic mitral stenosis.³

Additionally in our results low Left atrial appendage flow velocities were found to be associated with smaller mitral valve area and larger Left atrial size. Guler et al, found that Left atrial size was significantly higher in patients with low emptying velocities.¹⁷ In this context, these results are supporting our study as patients with mitral stenosis and low LAA flow velocities had smaller mitral valve area as compared with those with high LAA blood velocity.¹⁸ We observed more frequent occurrence of left atrial thrombus in patients with atrial fibrillation (83.3%) as compared to sinus rhythm. Goswami et al, (2000) found similar results in patients of severe mitral stenosis as they had higher incidence of thrombus formation.⁷ In our study atrial fibrillation and left atrial enlargement were significantly associated with thrombus formation. Boonyasirinant et al, found similar results.¹⁹ Golbasi et al, found that left atrial appendage dysfunction leading to thrombus formation can occur in patients of rheumatic mitral stenosis with sinus rhythm. So chances of left atrial thrombus may also be present with sinus rhythm.¹² Conradie et al, found similar results that atrial fibrillation and left atrial enlargement are significant risk factors for thrombus formation in mitral stenosis.²⁰

LIMITATIONS

Smaller number of patients were included in my study and it can lead to variations in results. Also patients from other medical centers should be studied. We encountered patients with sinus rhythm and atrial fibrillation together but in future studies both groups should be separately studied.

CONCLUSION

This study concludes that frequency of left atrial thrombus is increased in patients of rheumatic mitral stenosis. It is mostly found in patients with low left atrial appendage flow velocities, atrial fibrillation and smaller mitral valve area.

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