

## TRANSESOPHAGEAL ECHOCARDIOGRAPHIC ASSESSMENT OF LEFT ATRIAL THROMBUS IN PATIENTS OF RHEUMATIC SEVERE MITRAL STENOSIS WITH NEGATIVE RESULT ON TRANSTHORACIC ECHOCARDIOGRAPHY

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### Contribution

TMK conceived the idea and designed the study. Data collection and manuscript writing was done by TMK, AA, MIF, KAH, and MMIB. All the authors contributed equally to the submitted manuscript.

All authors declare no conflict of interest.

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### ABSTRACT

**Objective:** The objective of the study was to assess the frequency of clot in left atrium by transesophageal echocardiographic diagnostic procedure (TEE) in patients with rheumatic severe mitral stenosis (MS) in those patients in whom transthoracic echocardiographic diagnostic procedure (TTE) did not observe any clot in left thrombus.

**Methodology:** The descriptive cross-sectional study was carried out on 369 patients with rheumatic severe MS. Patients having mitral valve area of 1.5 cm<sup>2</sup> or less planned for PMV were included in study. Non-cooperative patients were excluded. It was decided to do TEE on a similar day before the intervention to assess LA thrombus.

**Results:** The mean age of the included patients was 45.65 ±11.54 years. There were 122 (33.1%) male patients and 247 (66.9%) female patients. In this study, clot in LA was diagnosed in 29.5% patients having negative TTE. LA clot was found in 33 male patients (30.3%) and 76 female patients (69.7%).

**Conclusion:** There is a high risk of missing LA thrombus on transthoracic echocardiography, therefore we recommend performing TEE in patients with normal TTE study before the procedure.

**Keywords:** rheumatic severe mitral stenosis, percutaneous mitral valvuloplasty, transesophageal echocardiography, transthoracic echocardiography

## INTRODUCTION

Narrowing of the orifice of mitral valve (MV) causing obstruction in the flow of blood from left atrium to left ventricle causes mitral stenosis (MS).<sup>1</sup> The predominant cause of mitral stenosis is rheumatic fever.<sup>1</sup> The severity of MS is dependent on the degree of valve opening in diastole or mitral valve orifice area.<sup>1</sup> The severe MS is labeled when the opening of MV is decreased to 1.5cm<sup>2</sup> or less.<sup>1</sup> Percutaneous mitral valvuloplasty (PMV) has been considered as an effective treatment of patients with MS.<sup>2</sup>

The result of PMV is based on the severity of anatomical lesions assessed by transthoracic echocardiography (TTE).<sup>2</sup> But at the same time studies show that nearly every fifth MS has a clot in the left atrium (LA).<sup>3</sup> Thrombus formation in the LA is generally considered to be secondary the atrial fibrillation, atrial size or properties of wall surface that occur either alone or in combination with abnormalities of MV.<sup>4</sup> Wallach et al reported LA thrombi in 36% of patients on autopsy of 296 patients with moderate or severe rheumatic MS.<sup>5</sup> TTE has its own limitations for the diagnosis of LA thrombi<sup>2</sup> which could have deleterious effect on the outcome of the procedure frequently causing thromboembolic events.<sup>6</sup> Transesophageal echocardiography (TEE) is now considered as an efficient method for diagnosing clot in LA recently.<sup>7</sup> Aschenberg et al reported thrombi in 6 out of 21 patients using TEE and their findings were confirmed via surgery for mitral valve replacement in all cases reporting 100% sensitivity and specificity.<sup>8</sup>

This study was designed to assess thrombus in left atrium by TEE in patients suffering from rheumatic severe MS in whom the TTE was unable to diagnose the thrombus in LA before doing PMV to save lots of patients from thromboembolic events.

## METHODOLOGY

The descriptive, Cross sectional study was carried out in patients of Cardiology unit of Chaudhary Pervaiz Elahi Institute of Cardiology, Multan from 1<sup>st</sup> June 2018 to 31<sup>st</sup> May 2019. Sample size of 369 cases was calculated via Open Epi software with 95% of confidence level, and 40% expected

percentage of clot in LA detected via TEE in those patients who have negative TTE results for LA clot.

After approval from the Ethical Review Board of the hospital and taking informed consent from the patients were included in the study. The consecutive patients included in the study were having severe rheumatic MS diagnosed via TTE having mitral valve area reduced to 1.5 cm<sup>2</sup> or less, planned to undergo PMV having negative TTE for LA thrombus and cooperative patients. All the included patients had LA size more than 40 mm measured on 2D TTE. All patients were having atrial fibrillation on the electrocardiogram. TTE was performed on Vivid E 95 machine with M5SC Cardiac probe. Parasternal long axis view, apical 4 chamber and apical 5 chamber views were used to assess the clot in LA. TEE was performed on Vivid E 95 machine with 6TC Cardiac probe. Mid-esophageal aortic valve short axis view (30-60 degrees) and then anteflexing transducer and rotating the multiplane angle from 0 to 180 degrees and mid-esophageal 2 chamber view (80-100 degrees) were used for assessment of clot in LA and LAA. All TTE and TEE were performed and reviewed by two post-fellowship 3-year experience senior cardiologists. All the patients included in the study had body mass index up to 25 kg/m<sup>2</sup> and none of the patients had any abnormality of chest wall which makes the visualization of clot in LA difficult on TTE. All patients were having good echo window for TTE and good echogenicity. Location and size of clot will be assessed on TEE. TEE was performed on similar day before PMV within a week of performing TTE. The information was collected on a preformed proforma for every patient. SPSS version 20 was used to analyze the data. Mean and standard deviation were used to present quantitative variables like age. Frequency and percentage were used to show the quantitative variable like gender and whether the LA thrombus was present or not.

## RESULTS

The mean age of the cases included was 45.65 ±11.54 years. There were 122 (33.1%) male patients and 247(66.9%) female patients. TEE diagnosed LA thrombus in 29.5% patients having negative TTE. 33 male patients (30.3%) and 76 female patients

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(69.7%) have thrombus in their LA. The patients were divided into four groups according to age. Age group, frequency of patients in each age group and frequency and percentage of LA thrombus in each age group is shown in Table No. 1. Out of 109, 86(78.9%) patients have clot in left atrial appendage while 23 (21.1%) have clot in Left atrial appendage extending into the left atrium. Smallest thrombus size measured was 7x6 mm and the largest thrombus size measured was 23x12mm.

**Table 1: Patients Distribution According to Age and Frequency of LA Thrombus in Each Age Group**

Age group	Number of patients	Patients having LA thrombus	Percentage
Less than 20 years	25	8	32%
20-40 years	204	79	38.7%
40-60 years	121	16	13.2%
More than 60 years	19	6	31.6%
<b>Total</b>	<b>369</b>	<b>109</b>	<b>29.5%</b>

### DISCUSSION

PMV is a valuable alternative to surgical commissurotomy for the management of MS.<sup>2</sup> However; left atrial thrombus is the contraindication to the procedure<sup>6</sup> which can lead to thromboembolic events while performing the procedure. In recent years, TEE is established as an excellent tool for detecting LA thrombi in patients with MS undergoing PMV.<sup>7</sup>

According to comparative study between TTE and TEE conducted by Lin et al TEE detected left atrial thrombi in with a specificity of 100%, sensitivity of 100% and accuracy of 100%, while TTE detected clot in LA with a specificity of 100%, sensitivity of 69.2% and accuracy of 87.1%.<sup>9</sup> Krishnamoorthy et al showed in their study that TEE has 97% sensitivity, 100% specificity, negative predictive value of 99.6% and positive predictive value of 100% to detect a thrombus.<sup>10</sup> In the study conducted by Kronzon et al reported that 26% patients who had LA clot diagnosed on TEE.<sup>11</sup> Rao et al showed that 28.33 % of patients had clot in LA when TEE was performed on patients having negative TTE for LA clot.<sup>12</sup> Our results are comparable to both of these studies. However, there are studies which

showed more significant results. In the study conducted by Fayyaz et al it was shown that 40% of the patients having negative TTE had clot in LA when TEE was performed.<sup>13</sup> But there are studies from which our findings were significant as shown by Acarturk et al who reported that 20.8% patients had a detectable LA clot on TEE which was not shown on TTE as reported by Belen in his article.<sup>14</sup> A study conducted by taking larger sample size by Srimannarayana et al reported that out of 490 patients 33.2% patients had LA clot on TEE.<sup>15</sup>

The comparison of our study with other national and international studies showed that TEE is a useful diagnostic procedure to find out clot in LA in those patients who had severe MS and PMV is planned and TTE failed to detect any thrombus. By performing this simple test, we can save the patient from embolic events like transient ischemia attacks or stroke and improve the outcome of PMV. Therefore, we recommend that every patient who is planned for PMV must have TEE for detection of undetected clot in LA on TTE.

### CONCLUSION

There is a high chance of missing clot in LA on TTE so performing a trans esophageal echocardiography before PMV not only rule out clot in LA but in this way we can save patients from possible thromboembolic events during the procedure.

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