

# Predictors of Left Atrial Clot and Spontaneous Echogenic Contrast in Patients with Severe Rheumatic Mitral Stenosis: A Prospective Study By Transesophageal Echocardiography

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## ABSTRACT

**Objectives:** The objective of this study was to investigate various clinical and echocardiographic variables to predict the left atrial and left atrial appendage clot and spontaneous echo contrast in patients with severe rheumatic mitral stenosis.

**Materials and Methods:** Between 2011 till 2015, 206 patients of rheumatic mitral stenosis comprising of 90 males (mean age 37.2 years) and 116 females (mean age 35.4 year) underwent Transesophageal echocardiography at department of cardiology GMC Jammu.

**Results:** Left atrial clot and spontaneous echo contrast were present in 25.2% and 58% of cases respectively. There were no significant differences in the left ventricular ejection fraction (LVEF) between patients with and without clot. Patients with LA clot were older, had longer duration of symptoms respectively (more frequent atrial fibrillation, larger left atrial area and spontaneous echo contrast) as compared to patients without clot. Similarly, patients with spontaneous echo contrast were older, had more frequent atrial fibrillation left atrial clot, larger left atrial area and diameter and smaller mitral valve area as compared to patients without spontaneous echo contrast. The presence of Mitral Regurgitation has a protective effect against left atrial clot formation.

On multiple regression and discriminant function analysis, atrial fibrillation and left atrial area were independent predictors of

left atrial clot formation. In a subgroup of patients with sinus rhythm, larger left atrial area and presence of spontaneous echo contrast were significantly associated with the presence of clot in left atrium and left atrial appendage.

**Conclusion:** In patients with severe mitral stenosis, the presence of atrial fibrillation and larger left atrium (>40cm) and spontaneous echo contrast were associated with higher risk of clot formation in the left atrium and might be benefited by prophylactic anticoagulation.

**Key Words:** Left Atrial Clot, Transesophageal Echocardiography (TEE), Spontaneous Echo Contrast (SEC).

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## Article History:

Received: 29-12-2016, Revised: 27-01-2017, Accepted: 14-07-2017

Access this article online	
Website: <a href="http://www.ijmrp.com">www.ijmrp.com</a>	Quick Response code 
DOI: 10.21276/ijmrp.2017.3.4.029	

## INTRODUCTION

Rheumatic mitral valve stenosis is a common manifestation of rheumatic heart disease. The incidence of thromboembolic complications is higher in patients with rheumatic mitral stenosis and is a major cause of morbidity and mortality.<sup>1-3</sup> The left atrium and left atrial appendage are well recognized sites of clot formation. Patients with a clot in the left atrium and left atrial appendage had a higher incidence of systemic embolization.<sup>4-6</sup>

Various factors which include atrial fibrillation,<sup>4</sup> duration of symptoms,<sup>6</sup> left atrial size,<sup>7</sup> older age<sup>8</sup> and severity of mitral stenosis;<sup>9,10</sup> determine the individual risk for the development of left atrial clot and thromboembolisation in patients with rheumatic heart disease. However, the presence of moderate to severe mitral regurgitation has a negative predictive value for the development of clot in the left atrium.<sup>4,11</sup> Presence of spontaneous

echo contrast with mitral valve disease is associated with increased risk of clot formation and embolization.<sup>4,5,7,9,12,13</sup> It has been shown that transesophageal echocardiography is highly sensitive for left atrial clot.<sup>8,14</sup> This study was done to evaluate a large group of patients with severe rheumatic mitral stenosis not on anticoagulation therapy at the time of study to determine various variables which can predict the presence of clot in the left atrium or left atrial appendage seen by transesophageal echocardiography.

## MATERIALS AND METHODS

### Patients

206 patients with severe mitral stenosis being evaluated for percutaneous transventricular mitral commissurotomy/ ballon

mitral valvotomy were studied at Department of Cardiology Government Medical College Jammu (Table1). All clinical and echocardiography data were collected prospectively. Patients with more than mild mitral regurgitation, significant aortic valve disease on transthoracic echocardiograph, previous closed mitral valvotomy and on anticoagulation or Antiplatelet therapy were excluded from the study.

**Transthoracic Echocardiography**

The transthoracic studies were done by a standard technique using a Hewlett Packard Sonos 1500 machine with a 3.5 mhz transducer. M mode measurement was taken according to the recommendations of the American Society of Echocardiography.<sup>15</sup> The mitral valve area was measured by continuous wave Doppler using the pressure half time period. The mean transmitral diastolic pressure gradient was estimated from the maximal transmitral flow velocity using a modified Bernoulli equation. Left atrial diameter was taken in the parasternal long axis view in m mode at end systole. Left atrial end systolic area on 2d echocardiography was taken in two views parasternal long axis view and apical four chamber view and these two values were averaged. The

measurements were made in three beats in atrial fibrillation and the mean was taken for analysis. Mitral regurgitation was graded by colour Doppler echocardiography as recommended by helmcke et al.<sup>16</sup>

**Transesophageal Echocardiography**

Transesophageal echocardiography was performed after transthoracic echocardiography on the same day in all cases as described by us previously.<sup>8</sup> A 5mhz transducer with capacity for pulsed Doppler was used. All patients received local pharyngeal anaesthesia and intravenous diazepam, 2-5mg during echocardiography and a one lead electrocardiogram was recorded continuously.

The transesophageal probe was introduced with the patient lying supine in the left lateral position as the probe was advanced into the oesophagus, the left atrium was scanned in the short axis view.

A left atrial clot was diagnosed with a clearly defined echogenic intracavitary mass with echo texture different from endocardium and pectinate muscle.<sup>8</sup> SEC was diagnosed as smoke like echos with swirling motion distinct from white noise artefact.

**Table 1: Patients Demographics**

<b>Total number of patients</b>	<b>206</b>
<b>Males</b>	90
<b>Female</b>	116
<b>Number of patients above 50 years</b>	77
<b>Number of patients below 50 years</b>	129
<b>Mean age of males –</b>	37.2 years
<b>Mean age of females –</b>	35.4 years
<b>Mean age of both sexes –</b>	36.3 years
<b>LA Clot</b>	52 patients (25.2%)
<b>No Clot</b>	152 patients (73.5%)
<b>All cases of severe mitral stenosis were taken with MVA &lt; 1.0 cm<sup>2</sup></b>	

**Table 2: Comparison of patients variable with Left Atrial Size with LA clot and SEC**

S no.	LA Size	No Of Patients	SEC	LA Clot
1.	4-0 – 5.0 cm	23 patients	5	2
2.	5-0 – 6.0 cm	97 patients	31	13
3.	≥ 6.0 cm	86 patients	71	37

**Table 3: Comparison of patients of LA clot with and without Spontaneous Echogenic contrast (SEC)**

No Of Patients	LA Clot	No LA Clot
<b>SEC --- 107</b>	49	58
<b>WITHOUT SEC --- 99</b>	3	96

**Table 4: Comparison of patients of Sinus rhythm and Atrial fibrillation with SEC and LA Clot**

No of Patients	SEC	LA Clot
<b>Atrial Fibrillation (AF) 96 pts</b>	56	27
<b>Sinus Rhythm= 110 pts</b>	40	13

**Table 5: Comparison of patients with Mitral Regurgitation with and without LA CLOT**

MR	LA Clot	No LA Clot
<b>Mild -- 41</b>	6	35
<b>Mod -- 5</b>	Nil	-Nil

**Table 6: Clinico Echocardiographic predictors of LA Clot**

Variables	Clinical predictors of LA clot	Echo cardiographic predictors
Duration of symptoms	Old age,	MVA
LVEF	Atrial Fibrillation	LA size
MVA	Longer duration of Symptoms	Presence OF AF
LA Area	Sex	Presence of SEC
Rhythm NSR ,AF		
Presence of SEC		

LVEF (Left ventricular ejection fraction), MVA (mitral valve area) AF (atrial fibrillation)

LA (left Atrial) Area\_SEC Spontaneous echogenic contrast

## RESULTS

Left atrial clot and Spontaneous echogenic Contrast were present in 25.2% and 58% of cases respectively.(Table 2) There were no significant differences in the left ventricular ejection fraction (LVEF) between patients with and without clot. Patients with clot were older had longer duration of symptoms respectively more frequent atrial fibrillation, larger left atrial area and spontaneous echo contrast as compared to patients without clot. Similarly, patients with spontaneous echo contrast were older, had more frequent atrial fibrillation left atrial clot, larger left atrial area and diameter and smaller mitral valve area as compared to patients without spontaneous echo contrast. There were no significant differences in left ventricular ejection fraction. On multiple regression and discriminant function analysis, atrial fibrillation and left atrial area were independent predictors of left atrial clot formation.(Table 3, 4) In a subgroup of patients with sinus rhythm, larger left atrial area and presence of spontaneous echo contrast were significantly associated with the presence of clot in left atrium and left atrial appendage because of depressed left atrial appendage function In our study presence of Mitral regurgitation diminishes the chances of formation of LA clot. (Table 5) Table 6 depicts the variable, Clinical predictors of LA clot and echocardiographic predictors of LA clot.

## DISCUSSION

The incidence of left atrial clot in our study was 25% in other studies the incidence of left atrial clot in patients with mitral stenosis varies from 5 to 28%.<sup>4,7,8,10,11,17-20</sup> Spontaneous echo contrast was also found to be an important predictor of systemic embolisation, independent of presence of clot in left atrium.<sup>9,21,22</sup> Goswani KC et al<sup>8</sup> In their study on 200 patients with severe mitral stenosis, found that besides atrial fibrillation, a subgroup of patients in normal sinus rhythm with depressed left atrial appendage function (left atrial appendage ejection fraction < or = 25%) had a higher risk of clot formation in left atrial appendage and these patients should be routinely anticoagulated for prevention of clot formation.

LA echo contrast or spontaneous echo contrast is smoke like echoes in cardiac chambers and it refers to the blood stasis. LA smoke is a common finding in patients with severe MS and the importance of such echocardiographic finding is its association with LA thrombus formation and with subsequent systemic arterial embolization. Li et al<sup>23</sup> reported that the incidence of LA smoke is higher in patients with atrial fibrillation rhythm in comparison with sinus rhythm even though they had similar mitral valve area. In our study, 107 patients had LA smoke and 56 of them had AF rhythm and LA smoke was significantly lower in patients with sinus rhythm.

## CONCLUSION

The frequency of left atrial clots increased with the presence of LAA dysfunction, atrial fibrillation rhythm and smaller mitral valve area. Presence of Mitral regurgitation had protective effects against LA clots.

Hence, in patients with severe mitral stenosis, the presence of atrial fibrillation and larger left atrium (>40cm) and spontaneous echo contrast were associated with higher risk of clot formation in the left atrium and might be benefited by prophylactic anticoagulation.

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**Source of Support:** Nil.

**Conflict of Interest:** None Declared.

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**Cite this article as:** Sushil Kumar Sharma, Arvind Kohli, Sanjeev Bhat, Vivek Sharma, Nasir Choudhary. Predictors of Left Atrial Clot and Spontaneous Echogenic Contrast in Patients with Severe Rheumatic Mitral Stenosis: A Prospective Study By Transesophageal Echocardiography. *Int J Med Res Prof.* 2017; 3(4):144-47. DOI:10.21276/ijmrp.2017.3.4.029