

Predictors of Left Atrial Stroke and Thrombi in Patients with Rheumatic Mitral Stenosis a Clinical and Echocardiographic Study

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Abstract: Rheumatic mitral stenosis is common clinical problem in India. Patients with mitral stenosis are associated with an increased risk of thromboembolism and are a major cause of morbidity and mortality. Spontaneous echo contrast formation in LA and left atrial appendage (LAA) is not an uncommon finding in these patients. The clinical implications of such LA/LAA spontaneous echo contrast reflect its association with LA/LAA thrombus formation and subsequent systemic embolic phenomenon. There are various factors which determine the individual risk for development of the left atrial clot/ spontaneous echo contrast and thromboembolism in patients with rheumatic mitral valve, which include AF, left atrial size, duration of symptoms, severity of mitral stenosis, and left atrial appendages function. Most of which are interrelated and their relative importance has been investigated in nonvalvular AF or in heterogeneous population of rheumatic heart disease. Hence this study was conducted on homogeneous population of 100 consecutive patients with mitral stenosis attending the department of cardiology and were studied by transthoracic and transoesophageal echo-Doppler techniques. The study concluded that not only severity of mitral stenosis but various clinical and echocardiographic variables influence the prevalence of left atrial spontaneous echo contrast and embolism independently, patients with mitral stenosis who develop embolic phenomenon have invariably, left atrial spontaneous echo contrast and/or left atrial clot. Detection of left atrial spontaneous echo contrast and/or left atrial clot by TEE will, per se, identify candidates, at high risk for thromboembolism, and thus for the treatment with oral anticoagulants or antiplatelets.

Keywords: LA-left atria, LAA- left atrial appendage, AF- atrial fibrillation, LASEC- left atrial spontaneous echo contrast, TEE- transthoracic echocardiography.

INTRODUCTION

Rheumatic mitral stenosis is common clinical problem in India. Patients with mitral stenosis are associated with an increased risk of thromboembolism and are a major cause of morbidity and mortality [1]. Spontaneous echo contrast formation in LA and left atrial appendage (LAA) is not an uncommon finding in these patients. The interest in left atrial spontaneous echo contrast and thrombi in mitral stenosis started in 1985. In 1986, the role of transesophageal echocardiography for the detection of atrial appendage/left atrial thrombi was validated [2]. Spontaneous echo contrast is a low amplitude echogenic haze with slow repetitive movement in the cavity that typically disappears when flow increases [3]. These abnormal smoke-like shadows were initially described in situations of marked circulatory stasis. The pathogenesis of spontaneous echo contrast is complex and multifactorial. Red blood cell aggregation is

prerequisite of spontaneous echo contrast because the diameter of the aggregate increases and is closer to the wavelength of the transducer, thus allowing ultrasound reflection to occur. Hematocrit level has direct relationship with aggregation of red blood cells. Black *et al.* [4], showed a significant relationship between increased hematocrit level and presence of spontaneous echo contrast in patients with nonvalvular atrial fibrillation.

The occurrence of spontaneous of spontaneous echo contrast and thrombi has been linked to supraventricular arrhythmias, most commonly atrial fibrillation. It has been considered a potential marker of thromboembolic risk in these patients based on high prevalence of spontaneous echo contrast in patients who had either thrombus or a prior history of thromboembolism. Left atrial spontaneous echo contrast, LA thrombi, and embolic events are closely

related phenomena with several associated factors in these patients. The number of these factors has increased since introduction of transesophageal echocardiography. These factors which determine the individual risk for development of the left atrial clot/spontaneous echo contrast and thromboembolism in patients with rheumatic mitral valve diseases= include atrial fibrillation, left atrial size, duration of symptoms, severity of mitral stenosis and left atrial appendage functions. Most of these conditions are interrelated, and their relative importance has been mainly investigated in nonvalvular atrial fibrillation or heterogeneous population of rheumatic heart disease. The present study analyzes the factors independently associated with the development of left atrial spontaneous echo contrast and left atrial thrombi in a group of homogeneous population of consecutive patients with mitral stenosis.

MATERIALS AND METHODS

This study was conducted in the department of cardiology at Gandhi Medical College and LBS Hospital Bhopal. 100 consecutive patients with moderate to severe mitral stenosis attending the department of cardiology were studied by transthoracic and transesophageal echo-Doppler techniques. Patients below 12 years, previous mitral commissurotomy, previous percutaneous mitral valvuloplasty, significant mitral regurgitation (>grade1), associated rheumatic fever, renal failure (Sr. creatinine >2.5mg/dl), severe hepatic disease, history of dysphagia or esophageal pathology, atrial fibrillation with slow heart rate (<50/min), pulmonary edema with shock, and patient on anticoagulation therapy were excluded from the study. Study populations following parameters were recorded age, sex, duration of symptoms, history of previous thrombotic events, NYHA class, heart rate, detailed physical, cardiovascular examination, ecg, and chest x-

ray. Initially transthoracic echocardiography was performed in all patients. All measurements were carried out as per recommendations of the American Society of Echocardiography. Then transesophageal echocardiography was done within 24 hours. Data are presented as mean ±SD. Statistical significance of differences between means was assessed by the students unpaired t test. The significance of differences between the proportions was assessed using the chi-square test. A p value of <0.05 was considered significant.

RESULTS AND DISCUSSION

Present study was undertaken to correlate the information provided by transthoracic and transesophageal echo-Doppler studies with left atrial spontaneous echo contrast, left atrial thrombi, and embolic phenomenon in patients with moderate to severe mitral stenosis with or without atrial fibrillation. Our study comprised of a homogeneous high risk group of 100 patients which was in contrast to previous studies where in a heterogeneous populations were studied. In our study no significance effect of gender was observed on the prevalence of left atrial spontaneous echo contrast and left atrial clot. These results are consistent with the various other studies [5,6].

The mean age of the patients was 34.8±9.7 years and mean mitral valve area was 0.86±0.14cm. LASEC was present in 52% of patients. LA clot was found in 21% of present, atrial fibrillation was present in 69% and embolic phenomenon was observed in 19% of patients. In our study 49 patients (64.4%) with severe mitral stenosis had LASEC compared to 3 patients (12.5%) with moderate mitral stenosis (p<0.001). 19 (25%) having severe MS had LA clot while 2 (8.33%) patients having LA clot had moderate MS(p<0.01).

Table-1: Effect of severity of Mitral Stenosis on Prevalence of LASEC and LA clot.

Parameter	Moderate MS (N=24)	Severe MS (N=76)	P value
LASEC	3(12.5%)	49(64.4%)	<0.001
LA clot	2(8.33%)	19(25%)	<0.01

We observed that the duration of symptoms had significant positive correlation with the presence of left atrial spontaneous echo contrast (p<0.005) and left atrial clot (p<0.05). Similarly, patients with left atrial spontaneous echo contrast and LA clot had more frequent atrial fibrillation (60.8% vs .32.2%, p<0.05 and 23.1% vs. 16.1%, p<0.01), respectively.

Systemic embolization is the most dreaded complication of left atrial spontaneous echo contrast and LA clot. In our study systemic embolization was found in 19 patients. Out of these 19 patients 18(94.73%) had LASEC and 9(47.3%) had LA clot. This correlation of LASEC and LA clot with systemic embolization was statistically significant p<0.001 and p<0.01 respectively. Our observation is consistent with that of Acarturk *et al.* [7]

Table-2: Embolic events in patients with LASEC and LA clot

Parameter	With embolic event N=19	Without embolic event N=81	P value
LASEC	18(94.73%)	34(41.97%)	<0.001
LA Clot	9(47.3%)	12(14.8%)	<0.01

The incidence of LASEC in MS varies from 21 to 67 % [8]. In our study LASEC was found in 52% of patients. These patients with spontaneous echo contrast were (37.4 ± 12.2 vs. 32.2 ± 7.2 years, $p<0.05$), had longer duration of symptoms (42.2 ± 30.0 vs. 30.8 ± 21.2 months, $p<0.01$), larger left atrial area and diameter (38.7 ± 9.2 vs. 1.05 ± 0.14 cm², $p<0.01$ and 55.2 ± 7.4 vs. 44.0 ± 6.2 mm, $p<0.01$, respectively), had more frequent atrial fibrillation and clot (80.76% vs. 56.25%, $p<0.05$ and 40.38% vs. 0.0%, $p<0.001$, respectively) as compared to patients without spontaneous echo contrast. However, there was no significance difference with respect to ventricular ejection fraction and mean diastolic pressure gradient between these groups. Similar observation have been reported by other studies [5,9]. Likewise atrial clot was found in 21 patients and had direct correlation with age, duration of symptoms mitral valve area, left atrial area, and presence of LASEC (100% vs 39.24%, $p<0.001$.) as compared to patients without

clot(table 3). Similar observations have been reported [5, 10].

Recent or previous peripheral embolism occurred in 19 (19%) patients and had significant correlation with age (36.9 ± 11.6 vs. 31.8 ± 7.2 years, $p<0.05$), duration of symptoms (42.8 ± 33.5 vs. 30.7 ± 24.1 months, $p<0.05$), mitral valve area(0.66 ± 0.19 vs. 1.04 ± 0.11 cm², $p<0.01$), left atrial diameter (55.8 ± 6.3 vs. 45.7 ± 3.4 mm, $p<0.01$), left atrial area (37.8 ± 9.2 vs. 29.4 ± 6.2 cm², $p<0.01$), presence of left atrial spontaneous echo contrast and clot (94.73% vs 41.97%, $p<0.01$ and 47.36% vs. 14.81%, $p<0.01$, respectively). However peripheral embolization had no significant correlation with age, left ventricular ejection fraction and diastolic gradient. Our results support the observation of the other studies showing the independent association between LASEC/Clot and the history of embolic phenomenon [11, 9]

Table-3: Characteristic of patients with and without embolism

Variables	With embolism	Without embolism	P value
Age	36.9 ± 11.6	31.8 ± 7.2	<0.05
Duration of symptoms Months	42.8 ± 33.5	30.7 ± 24.1	<0.05
Men/women	6/13	34/47	NS
LA area cm ²	37.8 ± 9.2	29.4 ± 6.2	<0.01
MVA cm ²	0.66 ± 0.19	1.04 ± 0.11	<0.001
LVEF %	69.4 ± 7.4	70.1 ± 2.3	NS
LASEC	18(94.73%)	34(41.97%)	<0.01
Clot	9(47.36%)	12(14.81%)	

CONCLUSION

According to our study we conclude that left atrial spontaneous echo contrast predicts the formation of left atrial clot in mitral stenosis. Various clinical and echocardiography variables influence the prevalence of the atrial spontaneous echo contrast and embolism independently, in addition to severity of mitral stenosis. Patients with mitral stenosis who develop embolic phenomenon have invariably, left atrial spontaneous echo contrast and/or left atrial clot. Detection of left atrial spontaneous echo contrast and/or left atrial clot by TEE will, per se, identify candidates, at high risk for thromboembolism, and thus for the treatment with oral anticoagulants or antiplatelets.

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