

## Original Research Article

# Correlation of atrial fibrillation and left atrial size in rheumatic mitral valve disease

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## ABSTRACT

**Background:** Atrial fibrillation (AF) is the most common sustained cardiac arrhythmia which is associated with increased cardiovascular morbidity, mortality and preventable stroke. AF is common in rheumatic heart disease (RHD) particularly mitral stenosis (MS). Left atrial (LA) dilatation is the predisposing factor for the development of AF in rheumatic mitral valve disease. Aim was to study the correlation between AF and LA size in rheumatic mitral valve disease in the population of Southern Andhra Pradesh.

**Methods:** This is a prospective, observational study conducted in 42 patients diagnosed to have RMVD in Narayana Medical College and Hospital, Nellore, Andhra Pradesh between August 2018 and July 2020. Detailed patient history and complete clinical examination were performed. Standard 12 lead Electrocardiography (ECG) and 2-D echocardiography were done. Left atrial size was measured and compared with patients in AF and with sinus rhythm.

**Results:** The age of patients ranged from 20-76 years with the mean age of 40.33 years. Out of 42 patients 26 were in AF and 16 in sinus rhythm. Among 26 patients in AF, 22 (84.6%) had LA size  $\geq 4$  cm and 4 (15.38%) had  $< 4$  cm with mean LA size of 4.6 cm whereas among 16 patients in sinus rhythm, 10 (62.5%) had LA size  $< 4$  cm and 6 (37.5%) had  $\geq 4$  cm with a mean of 3.83 cm.

**Conclusions:** Left atrial size  $\geq 4$  cm is the predisposing factor for the development of AF in rheumatic mitral valve disease. Therefore, if patients in sinus rhythm who are at high risk of developing AF are identified, prophylactic anticoagulation and antiarrhythmic drugs might prevent AF induced complications like embolism and symptom exacerbation in rheumatic mitral valve disease.

**Keywords:** Atrial fibrillation, ECG, Echocardiography, Left atrial size, Rheumatic mitral valve disease

## INTRODUCTION

Atrial Fibrillation (AF) has evolved into the most common sustained tachyarrhythmia occurring mainly in mitral valve disease. It is associated with increased cardiovascular morbidity, mortality and preventable stroke. The prevalence of AF is 0.4% to 1% in the general population and as high as 5% and 8% in patients older than 70 years and 80 years respectively suggesting its increment with age. AF is associated with increased risk of stroke, heart failure exacerbation and all-cause mortality

especially in women. The mortality rate in patients with AF is twice that of patients with normal sinus rhythm (NSR).<sup>1</sup>

Left atrial enlargement is one of the elements that progresses in the natural history of rheumatic mitral valve disease particularly mitral stenosis. AF also occurs with many other cardiac disorders including coronary artery disease, cardiomyopathy, mitral valve prolapses and mitral valve annular calcification.<sup>2</sup> AF is a common consequence of left atrial dilatation. AF has been found in 40% cases

with mitral stenosis and 25% of cases with mitral regurgitation in a large series.<sup>3</sup>

MVD can lead to AF via multiple mechanisms such as left atrial (LA) volume and pressure overload, progressive atrial fibrosis, LA enlargement, and electroanatomic remodelling.<sup>4,5</sup> Advancement in LA enlargement and remodelling is a sign of long standing MVD. This promotes AF by affecting cell coupling, altering conduction velocity, and promoting re-entry.<sup>6</sup>

Echocardiography is a valuable non-invasive tool for quantitative measurement of left atrial size.<sup>7,8</sup> There were many western studies and few Indian studies to correlate AF and LA size. This study was done to correlate AF and LA size in the population of Southern Andhra Pradesh where Rheumatic mitral valve disease is still common.

## METHODS

This is a prospective, observational study conducted in 42 patients diagnosed to have RMVD in Narayana Medical College and Hospital, Nellore, Andhra Pradesh between August 2018 and July 2020. Informed consent from the patient and permission of the institutional ethical committee of the hospital was obtained. Detailed patient history and complete clinical examination were performed.

Patients with congenital heart diseases, non-rheumatic mitral valve disease, essential hypertension, post PTMC or valvuloplasty or valve replacement, coronary artery disease, patients on antiarrhythmic drugs and pregnant women were excluded from the present study.

Standard 12 lead ECG and 2-D echocardiography were done for each patient. AF was diagnosed if ECG showed absent P wave or fibrillatory f waves and irregular R-R interval.<sup>9</sup> LA size was measured in parasternal long axis view during echocardiography between the anterior margin of posterior aortic root and the anterior margin of posterior wall of LA. Left atrial dimension more than or equal to 4 cm is considered to be dilated LA. Mitral valve area was obtained by planimetry and pressure half time (PHT).

Left atrial dimension in patients of rheumatic mitral valve disease with AF was compared with left atrial dimension of patients in sinus rhythm. Statistical analysis was done using SPSS software trial version 26.0.

## RESULTS

A total of 42 patients with the diagnosis of rheumatic mitral valve disease were enrolled in the study. Age ranged from 20- 76 years and the mean age was 40.33 years. There were 17 males and 25 females with M:F ratio of 0.68:1 showing a female preponderance. The nature of lesion was isolated Mitral stenosis (MS) in 22 patients (52.3%), isolated mitral regurgitation (MR) in 4 patients (9.5%) and both MS+MR in 16 patients (38.09%) (Table 1).

**Table 1: Nature of rheumatic mitral valve disease.**

Rheumatic mitral valve disease (RMVD)	No. of cases	%
MS	22	52.3
MR	4	9.5
MS+MR	16	38.09
Total	42	100

The age of patients ranged from 20-76 years with the mean age of 40.33 years. Patients were divided into two groups for correlating age with rhythm, i.e.  $\leq 30$  years and  $>30$  years. Out of the 10 patients in the age group of  $\leq 30$  years, 8 patients (80%) were in sinus rhythm and 2 patients (20%) were in AF. Whereas out of the 32 patients in the age group of  $>30$  years, 24 patients (75%) were in AF and 8 patients (25%) were in sinus rhythm. P value was  $<0.001$  which is statistically significant (Table 2).

**Table 2: Correlation between age and rhythm.**

Age (in years)	Sinus rhythm N (%)	AF N (%)	Total N (%)	P value
$\leq 30$	8 (80)	2 (20)	10 (23.8)	$<0.001$
$>30$	8 (25)	24 (75)	32 (76.19)	

Out of the 42 patients, 26 patients (61.9%) had AF whereas 16 patients (38.09%) were in sinus rhythm. Among the 26 patients in AF, 22 (84.6%) had LA size  $\geq 4$  cm and 4 (15.38%) had  $<4$  cm with mean LA size of 4.6 cm whereas among 16 patients in sinus rhythm, 10 (62.5%) had LA size  $<4$  cm and 6 (37.5%) had  $\geq 4$  cm with a mean of 3.83 cm. The difference in the LA size observed in patients with AF and sinus rhythm was statistically significant ( $p<0.001$ ) (Table 3).

**Table 3: Correlation between LA size and rhythm.**

Size	No. of cases with sinus rhythm N (%)	No. of cases with AF N (%)	Total N (%)	P value
$<4.0$ cm	10 (62.5)	4 (15.38)	14 (33.33)	$<0.001$
$\geq 4.0$ cm	6 (37.5)	22 (84.6)	28 (66.66)	
Total	16 (38.09)	26 (61.9)	42 (100)	

## DISCUSSION

The development of AF indicates a turning point in the disease course in a patient with rheumatic mitral valve disease and is associated with acceleration of the rate at which symptoms progress. LA dilatation is the predisposing factor for the development of AF.

In the present study of 42 patients of rheumatic mitral valve disease, 76.19% were in the age group of >30 years and 23.8% were in the age group of <30 years. This shows that prevalence of AF is more among the patients with age more than 30 years. This is comparable to the findings reported by Mariyamballi et al, Henry et al and Shrestha et al, Duran et al reported that AF was highest among patients with age >40 years (89%) and >30 years (79%) respectively.<sup>8,10,11,18</sup> Thus it can be concluded from the data that increasing age can be an important predictor of the development of AF associated with RMVD.

In the present study, 84.6% of the patients with AF had LA size  $\geq 4.0$  cm whereas 15.38 % had LA size <4.0 cm with the mean LA size of 4.6 cm. In the study done by Kulkarni et al, 97.14% of patients with AF had LA size >4 cm with average of 5.56 cm.<sup>11</sup> Singh G et al found mean LA size of 5.02 cm in patients with rheumatic heart disease with AF.<sup>12</sup> Henry et al showed that 54% patients had AF, when LA size was >40 mm, Keran et al reported that LA size was larger ( $37.6 \pm 10.8$  mm) in patients with MS.<sup>14</sup> Gupta et al reported that 90.7% patients having AF had LA size more than 50 mm.<sup>15</sup> A study by Mrozowska et al showed that AF was rare when LA dimension was below 40 mm.<sup>16</sup> Another recent study showed that in RMVD patients with LA size of >40 mm, 97% had AF.<sup>17</sup>

All these results correlate with the present study which shows that AF is common with LA size of more than 4 cm.

Small sample size is a limitation of this study. The treatment modalities and stroke risk in mitral valve disease with atrial fibrillation have not been studied.

## CONCLUSION

Left atrial size  $\geq 4$  cm is the predisposing factor for the development of AF in rheumatic mitral valve disease. Therefore, if patients in sinus rhythm who are at high risk of developing AF are identified, prophylactic anticoagulation and antiarrhythmic drugs might prevent AF induced complications like embolism and symptom exacerbation in rheumatic mitral valve disease.

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