Left Atrial size in Rheumatic Mitral Stenosis: An evaluation on the basis of age and heart rhythm

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Introduction

In Rheumatic Mitral Stenosis (MS) the left atrial size (LAD) increases with the increment of pressure gradient between the left atrium and left ventricle and the chance of left atrial mural thrombi increases with the increment of left atrial size[1,2]. Two-dimensional echocardiography is a well established technique to assess the left atrial size[3], LAD is measured by M-mode echocardiography in the standard parasternal long axis view[4] and enlarged LAD in rheumatic mitral stenosis is seen in echocardiography[1,2].

Atrial fibrillation (AF) is commonly occurred complication in MS patients. Patients with AF tend to be older than those patients in normal sinus rhythm and established AF is usually accepted as a manifestation of advanced mitral stenosis that significantly influences the survival rates[5,6]. Left atrialsize and AF are independent predictors of LA clot formation and systemic embolism in MS patients[7,8]. However the evaluation of enlarged LAD on the basis of age and heart rhythm among MS patients is unknown. This study mainly focuses on the evaluation of LAD on the basis of age and heart rhythm and aims to unveil the relation of LAD and age and LAD and heart rhythm in rheumatic mitral stenosis.

Methods

Study Subjects: One hundred seventy three patients with rheumatic mitral stenosis were recruited for the study. Age of the study subjects ranged from 10 to 79 years and mean ± SD was 43.8±12.9 years. Study subjects included 112 females (6S%) and 61 males (3S%). One hundred eight patients, 64 females and 44 males, were in atrial fibrillation and 6S patients, 48 females and 17 males were in normal sinus rhythm (NSR). Study subjects were further stratified on the basis of different age groups. The characteristics of study patients are given in table 1.

Total Study Population	173
Female	112 (65%)
Male	61 (35%)
Age (year) + SD	43.8±12.9
AF	108
SR	65
Age Group	
<40 year (AF/SR)	58 (20/38)
40-50 year (AF/SR)	63 (40/23)
>5O year (AF/SR)	52 (48/4)

Table 1 Characteristics of Patients

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SD: Standard Deviation, AF: Atrial fibrillation, SR: Sinus Rhythm

Echocardiography and LAD measurement:

The procedures of echocardiographic examinations were well performed in all study subjects. LAD was measured by Mmode echocardiography in the standard parasternal long axis view[4]. In all MS patients, MVA was directly measured in two-dimensional echocardiography[9].

Statistical Analysis: Patients were divided into three age groups according to the age. Patients in age <40 years were assumed young patients and 40-5O years age group was defined middle age group. Older than 50 years were considered older patients. Mean ± SD of LAD was separately calculated in 173 study patients according to their age stratification; young, middle age and older age groups. Unpaired student's t-test was calculated to test the statistical significance of LAD among each age group. Correlation coefficient between LAD and age and LAD and MVA were calculated by linear regression arialysis. Finally unpaired student's t-test was calculated to determine the statistical significance of LAD, MVA and age difference between NSR and AF group. In the whole statistical analysis, statistical significance was considered when $P<0.05$.

Results

Comparison of LAD in three age groups (young, middle age and older): LAD was found significantly larger in older patients when compared with middle age and young patients, respectively 59±9.22 mm and 54.46±8.74 mm, P<0.05 and 59±9.22 mm and 53.8±10.22 mm, P<0.001. The difference of LAD between middle age and young patients did not reach statistical significance (54.46±8.74 mm and 53.8+10.22 mm, P>0.5), see Fig. 1.

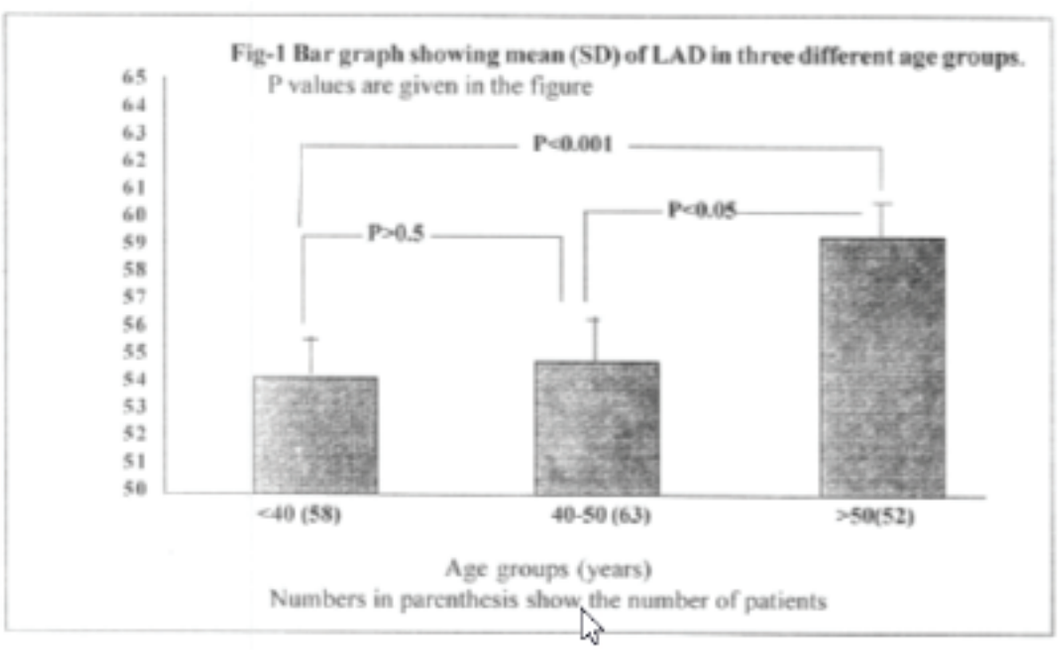

Fig-1 Bar graph showing mean (SD) of LAD in three different age groups.
P values are given in the figure

Correlation between LAD, age and MVA: When study subjects were stratified on the basis of heart rhythm, no correlation between LAD and age was found in both NSR and AF groups. While in the whole study subjects without heart rhythm stratification, a good positive correlation (r=0.26, P<0.000) between LAD and age was found (Table-2). However a significant negative correlation

Between LAD and MVA (r= -0.28, P<0.05) was observed in NSR group, no correlation was found Between LAD and MVA in AF group and the whole study population, see the table 2.

Table 2 Linear regression and correlation analysis of LAD with age and MVA.

Correlation Analysis	Correlation Coefficient (r)	P
LAD and Age		
SR group	0.11	NS
AF group	0.02	NS
Whol	0.26	<0.001
LAD and MVA		
SR group	-0.28	<0.05
AF group	-0.14	NS
Whole	-0.14	NS

NS: Non Significant, LAD: Left atrial size, MVA: Mitral valve area, Other abbreviations as table 1.

Comparison of Age, MVA and LAD between NSR and AF group: Patients in AF were found older (49±13.3 years and 36.3+10.4 years, P<0.001) and had larger LAD (58.8±9.5 mm and 49.9±6.6 mm,

P<0.001) when compared with patients in NSR. MVA was not found different between AF and NSR groups (Table 3).

Table 3 Comparison of LAD, Age and MVA between NSR group and AF group

Patients	LAD(mm)	Age (Yr.)	MVA(CMP)
NSR group	49.9±6.6	36.3±10.4	1.11±0.4
AF group	58.8±9.5*	49.04£13.4*	1.13±0.4

** P<0.001 (abbreviations as previous tables)*

Discussion

Rheumatic heart disease is still a problematic heart disease and a subject of major health concern in developing countries[10]. In developing countries, rheumatic heart disease is the most common cardiovascular disease in children and young adults and remain a major public health problem[11]. In developed countries, however it is becoming mainly a geriatric disease[12], rheumatic fever and rheumatic heart disease is still a problem in developed

countries like USA[13] Mitral valve stenosis is the commonest valvular lesion in rheumatic heart disease[5,14]. So we are mainly concerned on the study of rheumatic mitral stenosis and have tried to reveal the results of the evaluation of LAD on the basis of age and heart rhythm in this study.

Left atrial size enlarges in MS[1,2] and previously it is reported that the left atrial size enlargement is an independent risk factor for the left atrial thrombi and it is an indication for anticoagulation therapy for MS patients, who are in NSR[15]. Recently in some studies, it is documented that left atrial size and AF are independent predictors of left atrial clot formation and systemic embolism in rheumatic heart disease[7,8] . Beside these clinical investigations, the evaluation of LA size on the basis of age and heart rhythm in MS patients is unavailable in those previous reports. One of the interesting findings of this study is that the size of left atrium is significantly enlarged in older age group when compared with middle age and young age group in MS patients, regardless of heart rhythm and gradual increment in the mean left atrial size among three age groups is observed in this study. Correlation analysis of the whole study population shows significant positive correlation between left atrial size and age, though the correlation was not established when separately calculated after patient stratification on the basis of heart rhythm, NSR and AF. Almost 43 years back, in one study, progressive cardiac enlargement was not observed with advancing age alone in either symptomatic or symptomatic rheumatic MS patients[16]. In that study cardiac chamber enlargement was determined by serial fluoroscopic examinations, while in this study LAD is measured by M-mode echocardiography in standard parasternal long axis view.

In this study, we observed no correlation between left atrial size and MVA. This finding is consisted with the finding of 1950s[5], although the left atrial size was determined by x-ray views in that study. However good negative correlation between left atrial size and MVA was observed in NSR group alone, mean mitral valve area was not found different when compared between NSR and AF groups. In previous studies of MS patients it was reported that the patients with AF tended to be older[4,17] and had larger left atrial size[17]. The result of this study consists with those previous findings.

Series of studies have approved the association between enlarged left atrial size, AF, age and left atrial clot formation and systemic embolism in rheumatic mitral stenosis[7,8,18].

Relationship between left atrial size enlargement and age and heart rhythm is not evaluated in those series of studies. The evaluation of relationship between left atrial size enlargement and age and heart rhythm in rheumatic mitral stenosis is ever first attempted in this study. Older patients have a tendency of having more enlarged LAD when compared with middle age and young age groups according to this study. Recently in one comparative study of MS patients larger LAD in older age group is documented[19], Without providing the heart rhythm profile. The data of the study is on the favor of our findings.

However unavailable data of Mitral Regurgitation (MR) and left atrial pressure limited the findings of this study, the findings that patients in AF are older and have larger LAD than patients in NSR and in the whole study population, regardless of heart rhythm, older patients have larger LAD in the comparison of middle age and young patients and a significant positive correlation between LAD and age reveal the tendency of LAD enlargement with advance age in rheumatic mitral stenosis. Correlation between LAD and MVA in rheumatic MS does not establish according to the finding of this study.

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