

RELATION BETWEEN LEFT ATRIAL SIZE AND ATRIAL FIBRILLATION IN DIFFERENT DISEASESRajith K. S¹, Divya H. R²**HOW TO CITE THIS ARTICLE:**

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ABSTRACT: BACKGROUND: Atrial fibrillation is the most common cardiac dysrhythmia and left atrial size is an important factor in the development of atrial fibrillation. In the presence of atrial fibrillation an increase in left atrial size is associated with increased risk of stroke as well as increased morbidity and mortality. In this context, this study entitled "relation between left atrial size and atrial fibrillation in different diseases" was undertaken to study the left atrial size in different diseases causing atrial fibrillation and its relation to the atrial fibrillation. **METHODS:** A cross-sectional study was done from March 2004 to February 2006 in all medical units of Basaveshwar teaching and general hospital and Government general hospital Gulbarga. 70 cases of atrial fibrillation were studied in the present study. **RESULTS:** In the present study Atrial Fibrillation was common in >40 years age group (70%), left atrial enlargement was also more common in this age group (69.38%). Left atrial enlargement was seen in 70% of patients with Atrial Fibrillation. Rheumatic heart disease was the most common cause of Atrial Fibrillation (54.28%) and left atrial enlargement was seen in 92% of these patients with mean left atrial size of 58.92 mm. Next most common cause was coronary artery disease (20%) and left atrial enlargement was seen in 57.14% patients with a mean left atrial size of 39.5 mm. Left atrial size was normal in patients with thyrotoxicosis, congenital heart disease, lone Atrial Fibrillation and primary pulmonary hypertension. Left atrial enlargement was significantly associated with worsening of functional status ($p<0.01$), pulmonary arterial hypertension ($p<0.005$) and congestive cardiac failure ($p<0.02$). 17.14% of patients with Atrial Fibrillation had embolic complications like stroke, of them left atrial enlargement was seen in 83.33% patients. 4.27% of patients with Atrial Fibrillation died during the hospital course, of them left atrial enlargement was seen in 66.66% patients.

KEYWORDS: Atrial size, Atrial fibrillation, Arrhythmia, Rheumatic heart disease, Cardiomyopathy, Coronary artery disease.

INTRODUCTION: Atrial fibrillation has been called the grandfather of cardiac arrhythmias by Selzaer.¹ Atrial fibrillation is the most common sustained cardiac arrhythmia encountered in clinical practice, associated with substantial morbidity and mortality.² Atrial fibrillation commonly occurs with rheumatic heart disease, coronary artery disease, cardiomyopathy, mitral valve prolapse, hypertension.

In the setting of acute myocardial infarction or following cardiac surgery, atrial fibrillation is common but usually of limited problem. A number of potentially reversible non-cardiac conditions are also associated with transient atrial fibrillation which include hyperthyroidism, acute alcohol intoxication, non-cardiac surgery or diagnostic procedures, changes in autonomic tone and pulmonary conditions leading to hypoxemia. Continuing problems with atrial fibrillation are most commonly associated with rheumatic heart disease, hypertension and coronary artery disease.³

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Since rheumatic heart disease is the commonest cause of atrial fibrillation, some investigators have suggested that atrial fibrillation is related to rheumatic involvement of the left atrial wall, others however have noted patients with atrial fibrillation have a large left atrium and interpret this as evidence that atrial dilatation is in some way related to atrial fibrillation.

Still others have suggested that age is an important factor influencing the development of atrial fibrillation. Echocardiography has proven to be a valuable non-invasive tool for quantitatively assessing left atrial size.⁴ The present study is an attempt to assess the relation between left atrial size and atrial fibrillation in different diseases.

OBJECTIVE: To study left atrial size in different diseases causing atrial fibrillation.

METHODOLOGY: STUDY SETTING: A cross-sectional study was carried out in Basaveshwar Teaching & General Hospital and Government General Hospital attached to Mahadevappa Rampure Medical College, Gulbarga, from march 2004 to February 2006. In the present study 70 cases of atrial fibrillation were studied.

METHOD OF COLLECTION OF DATA: An informed consent was taken from all the 70 patients in the study group who were then subjected to the following:

- a) Detailed history taking
- b) Thorough general physical examination
- c) Systemic examination
- d) Lab investigations like thyroid function tests, serum electrolytes, blood sugar, chest X-ray, 12 lead ECG and echocardiography.

The proforma was designed based on the objective of the study and it was pretested and used after modification.

ELECTROCARDIOGRAM: A standard 12 lead ECG was recorded in all patients and was analyzed for evidence of atrial fibrillation. Atrial fibrillation was said to be present if ECG shows irregular or undulating baseline, absent P-wave, presence of fibrillatory 'F' waves and varying R-R interval.

CHEST X-RAY: Chest X-ray PA view was taken and was looked for evidence of left atrial enlargement, cardiomegaly and pulmonary congestion.

ECHOCARDIOGRAPHY: Echocardiography was performed in all the cases. Left atrial size was measured by 2D echo guided M-mode echocardiography measurement was obtained as per the recommendations of American Society of Echocardiography. Left atrial enlargement is considered to be present if left atrial dimension measured is more than 40 mm. As there is no specific grading for the left atrial enlargement, echocardiographic grading of the left atrial size has been done as follows.

LA size \leq 40mm – Normal.

LA size 41 – 50 mm - Mild enlargement.

LA size 51 – 60 mm - Moderate enlargement.

LA size $>$ 60 mm - Severe enlargement.

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Echocardiography was also used to make out underlying structural heart disease causing atrial fibrillation.

RESULTS: The study was carried out on 70 patients with atrial fibrillation.

Age group (years)	Males		Females		Total	
	No.	Percent	No.	Percent	No.	Percent
≤ 20	2	6.67	1	2.50	3	4.28
21 - 30	5	16.67	3	7.50	8	11.28
31 - 40	3	10.0	7	17.5	10	14.42
41 - 50	5	16.67	7	17.5	12	17.14
51 - 60	7	23.33	7	17.5	14	20.0
> 60	8	26.66	15	37.5	23	32.85
Total	30	100.00	40	100.00	70	100.00

Table 1: Age and sex wise distribution of cases

In the present study, age of the patients ranged from 15 years to 85 years with a mean age of 50.81 years. There were 30 males and 40 females with a male-female ration being 1:1.3.

Diseases	No. of cases	Percent
Congenital heart diseases	2	2.85
Rheumatic heart disease	38	54.28
Coronary artery disease	14	20.00
Hypertension	7	10.00
Cardiomyopathy	4	5.71
Thyrotoxicosis	2	2.85
Lone atrial fibrillation	2	2.85
Primary pulmonary Hypertension	1	1.42
Total	70	100.00

Table 2: Etiological Analysis of atrial Fibrillation

In this study, most common cause of atrial fibrillation was rheumatic heart disease, 38 (54.28%). Next most common was Coronary artery disease 14 (20%), followed by hypertension in 7 cases (10%), cardiomyopathy in 4 (5.71%), congenital heart disease in 2 (2.85%), thyrotoxicosis in 2(2.85%), lone atrial fibrillation in 2 (2.8%) and primary pulmonary hypertension in 1 case (1.42%).

ECG findings	No. of cases n=70	Percent
P-wave absent	70	100.00
Varying R-R interval	70	100.00
Coarse Fibrillatory waves	43	61.42

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Fine Fibrillatory waves	27	38.57
Right Ventricular Hypertrophy	16	22.85
Left Ventricular Hypertrophy	11	15.71
Right axis deviation	17	24.28
Left axis deviation	9	12.85
Myocardial Infarction Changes	9	12.85
Ischemic changes	5	7.14

Table 3: Analysis of ECG in Patients with Atrial Fibrillation

In this study, ECG changes of acute myocardial infarction were seen in 9 patients (12.85%) and ischemic changes were seen in 5 patients (7.14%). Coarse fibrillatory waves were seen in 43 patients (61.42%) and fine fibrillatory waves in 27 (38.57%) patients.

Chest X-ray findings	No. of cases N=70	Percent
Cardiomegaly	46	65.71
Left atria enlarged	35	50.00
Normal	24	34.28

Table 4: Analysis of chest X-ray Findings in Patients with Atrial Fibrillation

In the present study of 70 patients, cardiomegaly was seen in 46 (65.71%) patients, left atrial enlargement was seen in 35 cases (50%).

LA Size	No. of cases	Percent
40 and below (normal)	21	30.00
41-50 mm (mildly enlarged)	22	31.43
51-60 (moderately enlarged)	15	21.43
61 and above (severely enlarged)	12	17.14
Total	70	100.00

Table 5: Echocardiographic Left atrial Size

Normal LA size is 19 mm to 40 mm. In this study 21 patients (30%) had normal LA size and 49 patients (70%) had enlarged LA. In this study LA size varied from 20 mm to 76 mm with a mean LA size of 49.19 mm.

Diseases	LA Size						Mean LA size in mm
	Normal		Enlarged		Total		
	No.	Percent	No.	Percent	No.	Percent	
Congenital heart diseases	2	100.00	--	--	2	100.00	33.00
Rheumatic heart disease	3	7.89	35	92.00	38	100.00	54.18
Coronary artery disease	6	42.85	8	57.14	14	100.00	39.00
Hypertension	4	57.14	3	42.8	7	100.00	40.14

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Cardiomyopathy	1	25.00	3	75.00	4	100.00	42.75
Thyrotoxicosis	2	100.00	--	--	2	100.00	30.00
Lone atrial fibrillation	2	100.00	--	--	2	100.00	25.00
Primary Pulmonary Hypertension	1	100.00	--	--	1	100.00	37.00
Total	21	30.00	49	70.00	70.00	100.00	46.81

Table 6: LA size in different Diseases

In this study of 70 patients, 38 patients had rheumatic heart disease, among them 35 (92%) had enlarged left atrium and 3 (7.89%) had normal LA. 14 patients had coronary artery disease, and among them 8 (56.14%) had enlarged LA and 6(42.85%) had normal LA. Out of 7 patients of hypertension, 3(42.8%) had enlarged LA and 4 (57.14%) had normal LA. Out of 4 patients of cardiomyopathy, 3 (75%) had enlarged and 1 (25%) had normal left atrium. 2 patients each with congenital heart disease, thyrotoxicosis, lone atrial fibrillation and 1 patient with primary pulmonary hypertension had normal normal left atrium.

Age group (years)	LA Size					
	Normal		Enlarged		Total	
	No.	Percent	No.	Percent	No.	Percent
≤20	2	66.66	1	33.33	3	100.00
21-30	2	25.00	6	75.00	8	100.00
31-40	2	20.00	8	80.00	10	100.00
41-50	4	33.3	8	66.66	12	100.00
51-60	7	50.00	7	50.00	14	100.00
>60	4	17.39	19	82.60	23	100.00
Total	21	30.00	49	70.00	70	100.00

Table 7: Distribution of left atrial size according to Age

P > 0.05 Insignificant

In this study, 23 patients were of > 60 years of age. Among them 19 (82.6%) had enlarged left atrium and 4 (17.39%) had normal left atrium. Least number of patients were in < 20 years age group totally 3 patients, among them 2 (66.66%) had normal left atrium and 1 (33.33%) had enlarged left atrium.

DISCUSSION: AGE AND SEX: In the present study, the age of the patients ranged from 15 years to 85 years with a mean age of 50.81 years. Atrial fibrillation was common in >40 years of age group. Henry WL et al⁴ in their study showed that incidence of atrial fibrillation is higher (89%) in patients more than 40 years age.

Left atrial dilatation was also more common in patients more than 40 years age group (34 of 49)69.38%. In this study maximum number of patient were in >60 years of age group. In them 82.6% had enlarged LA. Dittrich Howard C et al⁵ concluded that patient's age is an independent of LA diameter with a mean age of 69+11 years with a mean LA diameter of 47+8mm.

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The present study is comparable to the study done by Henry WL et al. Thus it can be concluded that increasing age of patients with dilated left atrium predisposes them for atrial fibrillation.

ETIOLOGY: In the present study rheumatic heart disease was the most common cause of atrial fibrillation accounting for 38(54.28%) cases. Next in this order are coronary artery disease 14 (20%), hypertension 7 (10%), cardiomyopathy 4 (5.7%). Thyrotoxicosis, lone atrial fibrillation and congenital heart disease each accounting for 2 (2.85%) patients and primary pulmonary hypertension 1 (1.42%) patient.

In a study Samule Levy et al⁶ found hypertension (39.4%) as the most common cause of atrial fibrillation, next in this order were coronary artery diseases 16.6%, cardiomyopathy 15.3%, rheumatic heart disease 25% in women and 8% in men.

In this study rheumatic heart disease is the most common cause since in India rheumatic heart disease is still the most common cause accounting for 22 to 50% of all cardiac cases.

LEFT ATRIAL SIZE: In the present study left atrial size varied from 20 mm to 76 mm with a mean left atrial size of 46.81 mm. in this study 49 (70%) patients had left atrial size of >40 mm. Henry WL et al⁴ in their study showed that atrial fibrillation was rare when left atrial dimension was below 40 mm (3%), but common when this dimension exceeded 40mm (54%). Kulkarni AG et al⁷ in their study of RHD patients showed that 97.14% patients with atrial fibrillation had LA size of >40 mm with an average LA size of 55.58 mm. Levy et al⁶ in their study of atrial fibrillation showed mean LA size of 43.8+8.6mm.

The presence of atrial fibrillation is closely related to the degree of left atrial dilatation. The incidence of atrial fibrillation is more common when left atrial size exceeds 40 mm. In the present study of 70 cases, 38 cases were of rheumatic heart disease, among them 35(92.1%) had left atrium enlargement with a mean LA size of 55.92 mm. In a study by kulkarni AG et al⁷ 97.14% patients with atrial fibrillation had LA size of >40 mm with a mean LA size of 55.58 mm. The findings of the present study are comparable to the study done by Kulkarni AG et al.

Among rheumatic heart disease cases, 18 were mitral stenosis, of them 16 (88.88%) had LA size more than 40 mm with mean LA size of 51.5 mm. 3 patients had mitral regurgitation with mean LA size of 63.66 mm all three with LA size >40 mm. 9 patients had both MS and all 9 (100%) had LA size >40 mm with a mean LA size of 57.44 mm. 9 patients had multivalvular lesion, among them 7(77.77%) had LA size of >40 mm with mean LA size of 51.11 mm.

In this study 14(20%) cases were of coronary artery disease, of them 8 (57.14%) had left atrial size >40 mm with a mean LA size of 39.5 mm. In a study by Levy et al⁶ coronary artery disease accounted for 16.6% of total atrial fibrillation cases with a mean left atrial size of 43.8+8.6 mm. In a study by Howard DC et al⁵ coronary artery disease accounted for 23% of cases of atrial fibrillation with a mean left atrial size of 47+8 mm. all these studies are comparable to the present study.

In this study 7(10%) cases were of hypertension of them 3 (42.8%) had LA size >40 mm with a mean LA size of 40.14 mm. in a study by Levy et al⁶ hypertensive heart disease accounted for 21.4% of cases of atrial fibrillation with a mean size of 43.8+8.6 mm. In a study by Howard CD et al, hypertension accounted for 55% of cases of cases of atrial fibrillation with a mean LA size of 47+8 mm. In a study by Papazoglou NM et al⁸ hypertension accounted for 22% atrial fibrillation cases.

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In this study 4 (5.71%) cases were of cardiomyopathy, of them 3 (75%) had LA size >4 mm with mean LA size of 42.75 mm. In a study by Papazoglou NM et al⁸ cardiomyopathy accounted for 11% of atrial fibrillation cases. In a study by Levy et al⁶ cardiomyopathy accounted for 5.06% of atrial fibrillation cases with a mean LA size of 43.8±8.6 mm. These studies are comparable to the present study.

In this study 2(2.85%) cases were of congenital heart disease, with a mean LA size of 33 mm both had normal LA size that is <40 mm. In a study by Papazoglou NM et al⁸ congenital heart disease accounted for 4% of atrial fibrillation cases. In a study by Jose MO et al⁹, the mean LA size in patients with ASD with atrial fibrillation was 57±10 mm.

In this study 2(2.85%) cases were of lone atrial fibrillation (idiopathic) with a mean LA size of 25 mm with mean age of 45.5 years. In a study by Kopecky SL et al¹⁰ of lone atrial fibrillation patients mean age was 44 years and was seen in 2.7% patients of atrial fibrillation. In a study by Brand FN et al¹¹, lone atrial fibrillation accounted for 4% of total atrial fibrillation cases.

In this study of 70 patients 9 (12.85%) patients were in NYHA class-I, of them 3 (33.33%) had enlarged LA. 15 (21.42%) patients were in NYHA-II, of them 8(53.33%) had enlarged LA. 23(32.85%); patients were in NYHA-III of them 17(73.91%) had enlarged LA. In this study increased LA size is significantly associated with worsening of functional states (p<0.01). In a study by Levy et al⁶ 29.2% patients were in class-I, 48.3% in class-II, 17.4% in class-III and 5.0% in class-IV.

In this study, 38 (54.28%) had pulmonary arterial hypertension, of them 32 (84.22%) patients had enlarged LA. In this study enlarged LA is significantly (p<0.005) associated with pulmonary arterial hypertension. In this study, 28 (40%) patients had congestive cardiac failure of them 24 (85.71%) had enlarged LA. Enlarged LA was significantly (p<0.020) associated with congestive cardiac failure. In a study by Levy et al⁶ 29.8% patients were in congestive cardiac failure. In a study by Howard CD et al⁵ CCF was significantly (p<0.001) associated with enlarged LA.

CONCLUSION: Atrial fibrillation was common in >40 years age group and associated left atrial dilatation is also more common in >40 years age group. Left atrium was enlarged in patients with Rheumatic heart disease, Coronary artery disease, Hypertension, Cardiomyopathy. Left atrium was not enlarged in patients with Congenital heart disease, Thyrotoxicosis, Lone AF and Primary pulmonary hypertension.

Left atrial enlargement in patients with AF is found to be associated with worsening of functional status, pulmonary arterial hypertension and congestive cardiac failure. Embolic complications like stroke were more in patients with atrial fibrillation and left atrial dilatation. This has got some therapeutic implications like prophylactic anticoagulation to prevent embolic complications in patients with atrial fibrillation

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