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Research Article

Clinical and echocardiographic study of atrial fibrillation

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ABSTRACT

Background: Atrial fibrillation is associated most commonly with mitral valve disease. Atrial fibrillation is reported to occur in 29% of patients who have isolated mitral stenosis and in 16% who have isolated mitral regurgitation. The incidence increases to 52% in mitral stenosis combined with regurgitant lesions of rheumatic etiology.
Objective is to study the incidence, clinical features, etiology and complications of atrial fibrillation.
Methods: A hospital based cross sectional study was conducted among 60 cases of atrial fibrillation at Mamata General Hospital, Khammam from July 2008 to March 2009. All cases were examined in detail as per the questionnaire with special reference to cardiovascular system. In each case, history of present and past illness was carefully inquired into so as to obtain a complete historical background of the case. Investigations, electrocardiogram and echocardiography were carried out. Data was entered in Microsoft Excel sheet and analyzed using proportions.
Results: There was female predominance. The age ranged from 19 years to 85 years. Atrial fibrillation patients with rheumatic etiology commonly presented below 50 years. The chief complaints were found to be dyspnoea, palpitations, pedal edema, chest pain, hemoptysis and weakness of the limbs. The duration of symptoms ranged from 15 days to 20 years. Rheumatic heart disease was found to be the most common cause in 73.33% of cases. Mitral stenosis was the most common lesion among patients with rheumatic heart disease. The ventricular rate ranged between 60-180/min. Congestive cardiac failure was the commonest complication.
Conclusions: Chronic atrial fibrillation due to rheumatic etiology was more common in younger group. Females were more commonly affected than males. Rheumatic heart disease was the commonest cause followed by ischemic heart disease and hypertension. The common complications were congestive cardiac failure, angina and embolic stroke. Most of the cases of chronic atrial fibrillation were associated with large left atrial size.

Key words: Atrial fibrillation, Mitral valve disease, Complications

INTRODUCTION

Atrial fibrillation is associated most commonly with mitral valve disease. Atrial fibrillation is reported to occur in 29% of patients who have isolated mitral stenosis and in 16% who have isolated mitral regurgitation. The incidence increases to 52% in mitral stenosis combined with regurgitant lesions of rheumatic etiology.[1]

Cardiovascular conditions like heart failure, myocardial infarction, valvular disease impose a substantial risk of atrial fibrillation. Adjusting for other relevant conditions, heart failure was associated with a 4.5 and 5.9 fold risk and valvular heart disease a 1.8 and 3.4 fold risk for

Atrial fibrillation in men and women respectively. Myocardial infarction significantly increased the risk factor adjusted likelihood of atrial fibrillation by 40% in men only.[2]

Of the major cardiovascular risk factors investigated by the Framingham study, hypertension and diabetes were significant independent predictors of atrial fibrillation adjusting for age and other predisposing conditions. For men and women respectively, diabetes conferred a 1.4 and 1.6 fold risk and hypertension a 1.5 and 1.4 fold risk after adjusting for other associated conditions.[2]

The multiple wavelet hypothesis as the mechanism of re-entrant atrial fibrillation was advanced by Moe 3 and colleagues who proposed that fractionation of wave fronts propagating through atria results in self-perpetuating daughter wavelets.

Henry et al[4] suggested that left atrial size is an important factor in the development of Atrial fibrillation. Atrial fibrillation was rare when left atrial dimension was below 44 mm but common when exceeded 40 mm.

Based on Framingham study data, echocardiography predictors of atrial fibrillation include left atrial enlargement, left ventricular fractional shortening, and left ventricular wall thickness.[2]

Gage and colleagues[5] developed a scoring system for stroke risk prediction in atrial fibrillation called CHADS.[2] Each of the letters in the acronym represents a risk factor: congestive heart failure, hypertension, age, diabetes and stroke. Previous stroke or transient ischemic attack is the strongest predictor of stroke and therefore carries two points whereas the other risk factors carry one point each.

The high incidence of Atrial fibrillation and its significant contribution to both cardiovascular and cerebrovascular morbidity and mortality aroused interested for us conduct this study. The study is aimed at assessing the incidence, clinical features, etiology and complications of atrial fibrillation.

METHODS

Study design: Hospital based cross sectional study.

Study sample: 60 cases of atrial fibrillation.

Study place: Mamata General Hospital, Khammam.

Study period: From July 2008 to March 2009.

Ethical consideration: Institutional Ethics committee permission was obtained before the start of the study. Individual informed patient consent was taken from all study subjects.

Inclusion and exclusion criteria

This study included only chronic atrial fibrillation (persistent and permanent). Chronic Atrial fibrillation was defined as longer than 7 days for this study. New onset/acute atrial fibrillation were excluded from the study.

60 cases were examined in detail as per the pre-designed, pre-tested questionnaire with special reference to cardiovascular system. Other systems were also examined in detail, whenever it was found necessary. In each case, history of present and past illness was carefully inquired into so as to obtain a complete historical background of the case.

Investigations like urine examination, complete blood picture, erythrocyte sedimentation rate, blood urea, serum creatinine, blood sugar, serum electrolytes, chest X ray examination and electrocardiogram and echocardiography have been carried out. Blood for culture and sensitivity, CT scan of brain and thyroid function tests were done whenever necessary.

The electrocardiogram was studied for rate and f wave system. The echocardiography was studied to assess the valvular lesions, MVA in mitral stenosis cases and enlargement of chambers particularly the left atrium size.

Atrial fibrillation was diagnosed using 12 lead electrocardiograms. On the surface of ECG, P wave were absent and are replaced by rapid fibrillatory waves f that vary in size, shape and timing leading to irregular ventricular response.

Data was entered in Microsoft Excel sheet and analyzed using proportions.

RESULTS

Table 1: Age and sex wise distribution of study subjects.

Age group (years)	Male	Female	Total	Percentage
11-20	2	1	3	5
21-30	3	4	7	11.67
31-40	1	10	11	18.33
41-50	9	9	18	30
51-60	8	4	12	20
61-70	2	2	4	6.67
71-80	2	2	4	6.67
>80	0	1	1	1.67
Total	27	33	60	100

There were 33 females and 27 males which show that there was female predominance. The age ranged from 19 years to 85 years. Atrial fibrillation patients with

rheumatic etiology commonly presented below 50 years but hypertension and ischemic heart disease presented after 50 years.

Table 2: Clinical presentation in patients with chronic atrial fibrillation.

Complaint	Number	Percentage
Dyspnoea	50	83.33
Palpitations	31	51.67
Pedal edema	16	26.67
Chest pain	18	30
Hemoptysis	01	1.67
Paralysis	08	13.33

The chief complaints were found to be dyspnoea, palpitations, pedal edema, chest pain, hemoptysis and weakness of the limbs. The duration of symptoms ranged from 15 days to 20 years. Shorter duration was noticed in cases of ischemic heart disease and longer duration in rheumatic heart disease.

Table 3: Distribution of study subjects as per etiology of atrial fibrillation.

Etiology	Number	Percentage
Rheumatic heart disease	44	73.33
Ischemic heart disease	07	11.67
Hypertension	03	5
Dilated cardio-myopathy	03	5
Coronary heart disease	02	3.33
Chronic obstructive pulmonary disease	01	1.67

Table 4: Different valvular affection in rheumatic heart disease with atrial fibrillation.

Valvular heart disease affected type	Number	Percentage
MS	15	34.09
MR	04	9.09
MS+MR	14	31.81
MS MR+AR	03	6.81
MS+MR+AS	01	2.27
MS+MR+AS+AR	03	6.81

MS = mitral stenosis, MR = mitral regurgitation, AR = atrial regurgitation, AS = atrial stenosis.

An attempt has been made to establish the etiology by history, clinical examination, ECG, Chest X ray, echocardiography. The incidence was analyzed. Rheumatic heart disease was found to be the most common cause in 73.33% of cases followed by Ischemic heart disease in 11.67% of cases and hypertension in 5% of cases.

The above table shows that mitral stenosis was the most common lesion among patients with Rheumatic heart disease. Purely MS cases were 15 (34.09%), pure MR cases were 04 (9.09%). Other common valvular lesions were MS + MR in 14 (31.81%).

Table 5: Distribution of subjects as per the left atrial size.

Left atrial size	Number	Percentage
< 4 cm	06	10
4-5 cm	37	61.67
> 5 cm	17	28.33
Total	60	100

In the present study, the left atrium size ranged from 3 cm to 6.8 cm. Most of the cases had the size of 4-5 cm (61.67%).

Table 6: Distribution of subjects as per the ventricular rate.

Ventricular rate/min	Number	Percentage
< 100	24	40
100-150	33	55
> 150	03	05
Total	60	100

The ventricular rate ranged between 60-180/min. Most of the cases had the rate between 100-150/min. 5% of the cases had rate > 150/min.

Table 7: Distribution of subjects as per the complications.

Complications	Number	Percentage
Congestive cardiac failure	24	40
Angina	08	13.33
Embolic stroke	08	13.33
Hemoptysis	01	1.6
Infective endocarditis	01	1.6

Congestive cardiac failure was the commonest complication in 40% of cases. Stroke was also high amounting to 13.33% of cases. Infective endocarditis was seen in one case.

DISCUSSION

There were 33 females and 27 males which show that there was female predominance. The age ranged from 19 years to 85 years. Atrial fibrillation patients with rheumatic etiology commonly presented below 50 years but hypertension and ischemic heart disease presented after 50 years. The chief complaints were found to be dyspnoea, palpitations, pedal edema, chest pain, hemoptysis and weakness of the limbs. The duration of symptoms ranged from 15 days to 20 years. Shorter

duration was noticed in cases of ischemic heart disease and longer duration in rheumatic heart disease. An attempt has been made to establish the etiology by history, clinical examination, ECG, Chest X ray, echocardiography. The incidence was analyzed. Rheumatic heart disease was found to be the most common cause in 73.33% of cases followed by Ischemic heart disease in 11.67% of cases and hypertension in 5% of cases. Mitral stenosis was the most common lesion among patients with Rheumatic heart disease. Purely MS cases were 15 (34.09%), pure MR cases were 04 (9.09%). Other common valvular lesions were MS + MR in 14 (31.81%). In the present study, the left atrium size ranged from 3 cm to 6.8 cm. Most of the cases had the size of 4-5 cm (61.67%). The ventricular rate ranged between 60-180/min. Most of the cases had the rate between 100-150/min. 5% of the cases had rate > 150/min. Congestive cardiac failure was the commonest complication in 40% of cases. Stroke was also high amounting to 13.33% of cases. Infective endocarditis was seen in one case.

Tae-Seok Kim et al found that Pulmonary vein flow monitoring using echocardiography has the potential to an increasing role in the evaluation of cardiac function and AF ablation procedures.[6] Trans esophageal echocardiography also provides accurate information about the presence of a thrombus in the atria and thrombo-embolic risk. The novel technique of intra cardiac echocardiography has emerged as a popular and useful tool in the everyday practice of interventional electrophysiology. Other imaging modalities, such as computed tomography and magnetic resonance imaging have complementary roles in risk stratification and assessment of patients with AF.

Corrado G et al reported that trans esophageal and intra cardiac echocardiography have been employed in patients with atrial fibrillation to monitor percutaneous procedures such as pulmonary veins radiofrequency ablation or left atrial appendage obliteration.[7] In this review the available echocardiographic imaging modalities and their specific role in the evaluation and management in atrial fibrillation are described.

Jae-Hyung Park et al observed that patients with more severe TR were older and had more frequently persistent AF (each $p<0.001$).[8] TR severity was related to right atrial area and tricuspid annular systolic diameter (all $p<0.001$). The patients with moderate or severe TR had larger left atrial (LA) volume and increased systolic pulmonary artery pressure (SPAP) than the patients with mild TR ($p = 0.04$ for LA volume; $p<0.001$ for SPAP). RV remodeling represented by enlarged RV area and increased tenting height was more prominent in severe TR than mild or moderate TR (all $p <0.001$). Multivariate analysis showed type of AF, LA volume, tricuspid annular diameter and tenting height remained as significant determinants of severe TR. In addition, tenting height was independently associated with the presence of severe TR ($p = 0.04$).

Zhou X et al found that both the mitral and tricuspid annular areas in patients with lone AF were significantly larger compared with the controls (mitral: 9.5 +/- 1.2 vs 6.6 +/- 0.9 cm^2, lone AF vs control, $p < 0.01$) (tricuspid: 12.0 +/- 2.0 vs. 7.5 +/- 0.9 cm^2, $p < 0.01$).[9] The % increase in the annular area relative to the mean normal value was significantly greater in the tricuspid valve (44 +/- 18 vs. 60 +/- 28%, $p < 0.01$). Moderate or severe MR was not observed and the incidence of moderate or severe valve regurgitation (% jet area >20%) was significantly higher in the tricuspid valve (0/31 vs. 11/31, MR vs. TR, $p < 0.01$) in patients with lone AF. The % TR jet area showed significant correlation with tricuspid annular area ($r^2 = 0.65$, $p <0.001$). Lone AF is associated with annular dilatation of both mitral and tricuspid valves, but the annular dilatation and valvular regurgitation are significantly greater in the tricuspid valve.

Oren M et al reported that Of the 47 patients, 19 (40%) had paroxysmal AF and 28 (60%) had permanent AF.[10] Mild MR was present in nine of 19 patients (47%) with paroxysmal AF and in 15 of 28 (53%) with permanent AF ($p = 0.68$). Mild TR was identified in nine (47%) patients with paroxysmal AF, and in 16 (58%) of those with permanent AF ($p = 0.08$). None of the patients with paroxysmal AF had either moderate or severe AVVR.

Topilsky Y et al concluded that Id-FTR is frequent, linked to aging and atrial fibrillation, can be severe, and is of unique mechanism.[11] In Id-FTR, excess annular and RV-basal enlargement exhausts valvular/annular coverage reserve, and RV conical deformation does not cause notable valvular tenting. Conversely, PHTN-FTR is determined by valvular tethering with tenting linked to RV elongation and elliptical/spherical deformation. These specific FTR-mechanisms may be important in considering surgical correction in FTR.

Troughton RW et al concluded that echocardiography provides vital information about cardiac function, complications, and prognosis in patients with AF.[12] Modalities like TOE and ICE can help to guide ablation therapy and decisions related to cardio version. The integrated use of echocardiography will be an important component in the optimal management of the looming AF epidemic.

Illien S et al concluded that the strongest predictors of a thrombogenic milieu as assessed by TOE are a reduced LVEF of < 45% and age > 65 years.[13] Interestingly, there was a subgroup of patients presenting a thrombogenic milieu in the absence of any clinical risk factors.

Lobo TJ et al concluded that AF ablation in patients with ventricular systolic dysfunction is a safe and highly effective procedure.[14] Arrhythmia control has a great impact on ventricular function recovery and functional class improvement.

CONCLUSION

Chronic atrial fibrillation due to rheumatic etiology was more common in younger group. Females were more commonly affected than males. Rheumatic heart disease was the commonest cause followed by ischemic heart disease and hypertension. The common complications were congestive cardiac failure, angina and embolic stroke. Most of the cases of chronic atrial fibrillation were associated with large left atrial size.

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