



Research Article

CLINICAL ELECTROCARDIOGRAPHY AND ECHOCARDIOGRAPHY STUDY OF ATRIAL FIBRILLATION

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ABSTRACT

Introduction Atrial fibrillation is the most common sustained arrhythmia. It is marked by disorganized, rapid and irregular atrial contraction. Objectives of The Study 1) To study various clinical presentation of atrial fibrillation of patients admitted in SAIMS Hospital, Indore) To assess the frequency of underlying heart disease in patients with atrial fibrillation Materials And Methods This study is a clinical, prospective, observational study conducted at SAIMS Hospital-Indore, from December 2017 to June 2019. Detailed history was taken from patient and meticulous examination was done according to prepared proforma. Result The age of the patients varied from 30 to 85 years the maximum number of cases were seen between 60-79 years which was 15 cases. In the present study the male to female ratio was almost equal with 24(48%) male and 26(52%) female cases. Dyspnoea is the commonest symptom followed by palpitations. All the 50 cases had irregularly irregular pulse with a varying rate from 74 to 128 per minute. The pulse deficit varied from 10-26 per minute. XI Rheumatic valvular heart disease is the most common aetiology of atrial fibrillation observed in the present study. Mitral stenosis is the commonest valvular lesion observed in patients with rheumatic heart disease in the present study. Congestive cardiac failure is the most common complication observed followed by embolic phenomenon. In the present study left ventricular enlargement was seen in 18 cases on chest x ray. Left atrial enlargement was seen in 33 cases, 24 of cases were of chronic valvular rheumatic heart disease on 2D Echocardiography. Conclusion Atrial fibrillation was most commonly seen in Rheumatic heart disease followed by ischemic heart disease. Dyspnoea is the most common presenting complaint and congestive cardiac failure is the commonest complication.

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INTRODUCTION

Atrial fibrillation describes an irregular and often rapid heart rhythm. For many people, atrial fibrillation may cause symptoms but does no harm. Symptoms of atrial fibrillation vary from person to person. A number of people have no symptoms. The most common symptom in people with intermittent atrial fibrillation is palpitations, a sensation of rapid or irregular heartbeat. This may make some people very anxious. Many people also describe an irregular fluttering sensation in their chests. AF is typically a disease of the elderly affecting >10% of those older than 75 years. Other risk factors include Diabetes Mellitus, Cardiovascular Diseases like CHF, valvular Heart diseases, hypertension, previous MI. Although clinical hyperthyroidism is associated with new-onset AF, the prevalence is low in a population of patients with AF. In developing countries, rheumatic valvular heart disease, IHD, hypertension and congenital heart disease are the most commonly related conditions.

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The incidence of rheumatic heart disease is decreasing in developed countries while in India it still accounts for 30-45% of all cardiac cases in hospital practice. Rheumatic heart disease is still the most common antecedent disease related to the occurrence of atrial fibrillation in India. Mitral regurgitation is followed by mitral stenosis in the aetiology of atrial fibrillation. Atrial enlargement increases refractoriness to medical and electrical conversion of atrial fibrillation and helps in formation of thrombus.

Aim

1. To study various clinical presentation of atrial fibrillation of patients admitted in SAIMS Hospital Indore
2. To assess the frequency of underlying heart disease in patients with atrial fibrillation.

This study is intended to find out the varied presenting symptoms of AF and also the possible underlying predisposing factors both cardiac and non-cardiac with the help of the below mentioned investigations .2D Echocardiography is specifically utilized in studying Valvular heart diseases

associated with AF, Left atrial size, presence of clots in the left atrium. Because if treated properly, atrial fibrillation rarely causes serious or life-threatening problems.

Background

The history of atrial fibrillation dates back to 2598 B.C., when the earliest description of atrial fibrillation was made in "THE YELLOW EMPEROR'S CLASSIC OF INTERNAL MEDICINE (Huan Ti Nei Ching Su Wen), by a legendary emperor physician from china. William Harvey (1628-1700) observed ineffective "palpitations" (undulations) of the atria just before death in animals. He established the origin of heart beat in right atrium and that the beating heart created the pulse. He observed that sometimes the heart beat was too weak to reach the radial artery. Harvey must thus be credited with the first direct observation of fibrillating atrium.

In 1903 Hennirich Ewald Bering described irregularly irregular pulse - which was known to physiologist as "delirium cordis" or arrhythmia perpetua. In 1920 Thomas Lewis showed that this dangerous type of irregularity was atrial fibrillation. He suggested the old "Circus movement theory

The By-Pass tract: The By-pass tract is a short tract which is mainly continuation of the posterior inter-nodal tract, but also receives fibers from the anterior and middle inter-nodal tracts. This tract is so named because it by-passes the main body of the AV node to enter it distally, It may also enter the bundle of His directly. Fibers from all three inter-nodal tracts blend or intermingle just proximal to the AV node where all three tracts divide into two divisions one entering the crest of AV node and the other contribution to the by-pass tract.

AV Node: AV node is a flattened oblong structure concave on one side and convex on other side. The AV node is situated on the right side of the central fibrous body - the body that anchors the mitral valve annulus.

Bundle of his: The distal end of AV node continues as the bundle of His. The external morphology does not reveal a sharp demarcation between the two, the AV node blending imperceptibly with the bundle of His. The internal structure of AV node, however differs markedly from that of bundle of His. The main body of the AV node has a labyrinthine structure of the interweaving strands of cells, where as the bundle of His is characterized by fibers which are organized in parallel channels or strands. The bundle of His penetrates the central fibrous body and proceeds anteriorly, descending towards the interventricular septum where it divides into right and left bundle branches. The AV node and bundle of his are sometimes collectively referred to as AV junction.

Right bundle branch: The right bundle branch is a relatively well defined and easily detectable structure situated rather more deeply beneath the epicardium, it passes down the right side of the interventricular septum and along the free edges of the moderator band to the base of the anterior papillary muscle. It gives off relatively few branches until it reaches the anterior papillary muscle where it begins to ramify, breaking up into a net work of small branches.

Left bundle branch: Left bundle branch passes down the left side of inter-ventricular septum and emerges below the posterior cusp of aortic valve. In contrast to the structures of right bundle branch, the left bundle branch breaks up almost

immediately into a number of small branches or rootlets which proceed onwards into two major sweeps or radiations.

The autonomic supply of the heart: Heart is supplied by both parasympathetic and sympathetic fibers. Parasympathetic supply: Parasympathetic innervations consists of branches from (R) and (L) vagi. Right vagus supplies the SA node and the left vagus supplies AV node. The parasympathetic system does not innervate the ventricles.

Sympathetic supply: Sympathetic system innervates both the atria and ventricles.

Surgery: Mc Comb JM⁹: The two most promising surgical options are the "corridor" and "maze" procedures. The corridor procedure effectively isolates both the left and the right atrium, leaving a strip of myocardium connecting the sinus node to the atrioventricular node. This procedure does not prevent atrial fibrillation but isolates the fibrillating atria. Although a 70% "cure" rate is reported, sequential atrioventricular contraction is not restored (with the consequent hemodynamic effects), and the risk of thromboembolism remains. The maze procedure is intended to prevent atrial fibrillation completely by channeling the atrial activation between a series of incisions. This procedure therefore restores coordinated atrial as well as ventricular electrical activity, permitting atrial transport with good hemodynamic results and low thromboembolic risk.

MATERIAL AND METHODS

Source of data: The study will be conducted on 50 cases of atrial fibrillation in SAIMS Hospital-Indore

Inclusion criteria: Patient above the age of 18 years will be taken for study. 2) Atrial fibrillation confirmed with 12-lead ECG.

Exclusion criteria: Patients less than 18 years. From the patients satisfying the inclusion criteria information pertaining to age, sex associated comorbid conditions and drug therapy were obtained.

All these patients then underwent detailed clinical examination and all essential laboratory tests including chest X-ray, ECG, and Echocardiography were done. Routine blood examinations were done. All patients suspected of hyperthyroidism were subjected for thyroid function tests.

RESULTS

Study design: A Prospective clinical study with 50 patients is undertaken to study the aetiology and complications of atrial fibrillation.

Table 1 Age distribution of patients studied.

Age	Number of cases
20-39	05
40-59	19
60-79	24
80-85	02

In this present study of atrial fibrillation the age of the patients varied from 30 to 85 years with a mean age of 57.76 ± 12.79 years. The youngest patient was 30 year old and oldest patient was 85 year old. The maximum number of cases were seen between 60-79 years which was 24 cases (48%). The mean age of patients with Rheumatic heart disease is 52.76 ± 12.72. The youngest patient was 30 and oldest was 74.

Table 2 Gender Distribution

Gender	Cases
Male	24
Female	26

In the present study the male to female ratio was almost equal with 24(48%) male and 26(52%) female cases

Table 3 Presenting Symptoms

Dyspnoea	41
Palpitations	39
Pedal edema	33
Cough	21
Chest pain	18
Abdominal pain	9
Hemoptysis	5
Syncopal attack	2

In the present study of 50 cases of atrial fibrillation, 41 (82%) cases had history of dyspnoea followed by palpitations in 39(78%) cases, 33(66%) cases had history of swelling of limbs. Chest pain was present in 18(36%) cases. Abdominal pain was present in 9(18%) cases. Hemoptysis was seen in 5(10%) cases and 2(4%) cases presented with history of syncopal attacks.

Table 4 Complications

Ccf	40
Cor pulmonale	3
Cva	2
Superior mesent art ischemia	1
None	4

In the present study, 40(80%) cases developed congestive cardiac failure. 3 (6%) patients had Corpulmonale as complication. Superior mesenteric artery ischemia was seen in 1(2%) case and there were 2 (4%) cases of ischemic stroke. 3(6%) patients had no complications.

Table 5 Aetiology of AF

Rhd	25
Hypertension	6
Ihd + hypertension	6
Ihd	4
Copd	3
Cardiomyopathy	3
Asd	2
Thyrototoxicosis	1

In the present study rheumatic heart disease accounted for majority of cases of atrial fibrillation, i.e., 25(50%), ischaemic heart disease with hypertension was found in 6(12%) cases, only hypertension was found in 6 (12%) cases, ischaemic heart disease alone was detected in 4(8%) cases, Atrial septal defect in 2 (4%) cases, cardiomyopathy in 3(6%) cases, Chronic obstructive pulmonary disease in 3(6%) cases, and Thyrototoxicosis in 1(2%) case.

Table 6 Left Atrial size

Left atrial size	Cases
<3.7 cm	11
3.7-4 cm	08
4-5 cm	30
>5 cm	01

The mean left atrial size of 50 cases of atrial fibrillation is 4.122 ± 0.456 cm. The smallest measuring 3cm and the largest is 5.6cm. Most cases 30(60%) had left atrial size between 4-5cm. 11 (22%) cases had left atrial size <3.7cm. The mean left

atrial size of cases of rheumatic etiology is 4.344 ± 0.204 cm and that of other cases of atrial fibrillation is 3.9 ± 0.530 cm.

DISCUSSION

This present study entitled Clinical, ECG and Echocardiography study of Atrial Fibrillation was carried out in SAIMS Hospital Indore from December 2017 to June 2019. 50 cases of atrial fibrillation were studied in detail with regards to history, clinical data of these cases with reference to aetiological factors, complications, electrocardiographic and echocardiography findings. The history is taken in detail with particular reference to the symptomatology of cardiovascular system and thorough clinical examination was done.

Recent data suggest that hospital stay for atrial fibrillation are markedly greater than for any other arrhythmia. Data from clinical population are subject to influence a number of factors that tend to introduce bias. The single best sources of data are reports from the Framingham study.¹

Age: In this present study of atrial fibrillation the age of the patients varied from 30 to 85 years with a mean age of 57.76 ± 12.79 years. The youngest patient was 30 year old and oldest patient was 85 year old. The maximum number of cases were seen between 60-79 years which was 15 cases (30%).

The mean age of patients with rheumatic heart disease was 52.76 ± 12.72 years. The youngest was 30 years and oldest was 74 years. The mean age of AF patients observed in two Indian studies by Sharma *et al*² and Gurpal Singh *et al*³ were 40 ± 7 years and 57.33 years respectively. In the Framingham study,¹ 2325 men and 2826 women, 30 to 62 years old at entry were followed biennially over 22 years for the development of chronic atrial fibrillation in relation to antecedent cardiovascular disease and risk factors. The incidence rose sharply with age. Overall there was a 2.0 percent chance that the disorder would develop in two decades. The prevalence of atrial fibrillation is 0.5% for the group aged 50-59 years and rises to 8.8% in the group aged 80 to 89 years.⁴

Sex: In the present study the male to female ratio was almost equal with 24(48%) male and 26 (52%) female cases. In the Framingham study William B Kannel *et al*¹, 2325 men and 2826 women were followed biennially over 22 years for the development of atrial fibrillation. The incidence of atrial fibrillation did not differ significantly between sexes. Dante E Manyari *et al*⁵ in their study on patients with AF found the prevalence as 37 men VS 49 women out of 86 subjects who completed the study.

Gurupal Singh *et al*³ in their study of 64 patients in AF found the sex distribution to 29 males vs 35 females.

Clinical symptoms: In the present study of 50 cases of atrial fibrillation, 41 (82%) cases had history of dyspnoea followed by palpitations in 39(78%) cases, 33(66%) cases had history of swelling of limbs. Chest pain was present in 18 (36%) cases. Chest pain could be due to ischemic heart disease or relative ischemia due to left ventricular hypertrophy or due to the increased ventricular rate or right ventricular hypertrophy. Abdominal pain was present in 9(18%) cases. Hemoptysis was seen in 5(10%) cases and 2(4%) cases presented with history of syncopal attacks. The symptoms observed by Gurupal Singh *et al*⁶ was similar.

Aetiology of atrial fibrillation: In the present study rheumatic heart disease accounted for majority of cases of atrial fibrillation, i.e., 25 (50%), ischaemic heart disease with hypertension was found in 6(12%) cases, only hypertension was found in 6 (12%) cases, ischaemic heart disease alone was detected in 4 (8%) of cases, Atrial septal defect in 2(4%) of cases, cardiomyopathy in 3(6%) cases, Chronic obstructive pulmonary disease in 3(6%) cases, and Thyrotoxicosis in 1(2%) case. Gurpal Singh, PremArora *et al*⁷ in their study at Government Medical College / GND Hospital, Amritsar of Sixty six (31 M, 35 F) consecutive patients having atrial fibrillation, the etiology was found to be due to rheumatic heart disease in 25 (8,17) : dilated cardiomyopathy (DCM) 15 (10,5) : hypertension 9 (2,7) : mitral valve prolapse 6 (4,2); thyrotoxicosis 6 (3,3); ischaemic heart disease (IHD) 2 (1,1); congenital (atrial septal defect) 1; digitalis toxicity 1, where as 1 had lone fibrillation.

Complications: In the present study, 40 (80%) cases developed congestive cardiac failure. In rheumatic valvular heart disease there will be hemodynamic abnormalities, atrial fibrillation decreases ventricular filling both through loss of the atrial booster pump and through reduction of filling time when the ventricular response is rapid.

Electrocardiography: In the present study electrocardiographic study was done with 12 lead electrocardiogram. The following observations were noted:

Rate and Rhythm: In the present study, the rate varied from 74 to 180 per minute and the maximum rate was between 90 to 110 per minute in 22(44%) cases. The rhythm was irregularly irregular in all the 50 cases (100%).

Echocardiography: In the present study left atrial enlargement was seen in 33(66%) cases, 24(48%) of cases were of chronic valvular rheumatic heart disease. The mean left atrial size in cases of atrial fibrillation was 4.122 ± 0.456 cm. The smallest size being 3cm and largest one measuring 5.6cm. The mean left atrial size in cases of rheumatic heart disease was 4.344 ± 0.204 cm. As rheumatic fever is the etiology of mitral valve abnormalities in many patients, with mitral valve disease some investigators have suggested that atrial fibrillation is related to rheumatic involvement of left atrial wall. Others suggest that left atrial enlargement due to mitral valve or aortic valve disease or cardiac failure cause dilatation of left atrium and atrial fibrillation is superadded on this. A study done by Palle Petersen *et al*⁸ aimed at correlating duration of atrial fibrillation with left atrial size. It showed that in cases with atrial fibrillation of short duration the mean left atrial size had increased significantly ($P=0.000007$) and also in cases with atrial fibrillation of long duration it showed significant increases in left atrial size ($P=0.00017$). The Framingham Study has examined the echocardiographic predictors of AF. The echocardiographic characteristics of persons who developed AF included larger left atrial, and left ventricular dimensions and ventricular wall thickness and more mitral annular calcification. Each 5mm increment in left atrial dimension increased AF risk 39%.

A 5% decrement in left ventricular fractional shortening increased the risk by 34%. A 4 mm increment in left ventricular wall thickness increased AF risk 28%. Mitral annular calcification doubled the risk.

Those with two or more of the foregoing echocardiographic abnormalities had a 4-fold greater risk than those free of them all.

CONCLUSION

Atrial fibrillation is seen to increase in prevalence with advancing age. An early incidence is seen in India due to a greater contribution of rheumatic etiology to the case load of atrial fibrillation. No significant difference was found with respect to gender, the ratio of male : female is 48:52. Dyspnoea is the commonest symptom followed by palpitations. Rheumatic valvular heart disease is the most common etiology of atrial fibrillation observed in the present study. Mixed valvular pathology was most commonly associated with AF. Mitral stenosis was the most common dominant lesion causing AF. Increasing left atrial size is a risk factor for atrial fibrillation.

This increased risk is not confined to rheumatic etiology but extends to other etiologies such as ischemic heart disease, hypertensive heart disease and COPD. Congestive cardiac failure is the most common complication observed followed by embolic phenomenon.

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