

Atrial fibrillation Etiology and complications - A descriptive study

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Abstract: Atrial fibrillation (AF) is the most common sustained cardiac arrhythmias in clinical practice. AF is found in 0.4% adults below 60 years. Incidence of AF appears to double with each decade beginning with the seventh. In the 9th decade the incidence is thought to be as high as 8-10%¹. It is principally an acquired disease but rarely familial forms too have been described. This was an observational study conducted in the medicine unit of a tertiary care hospital over a period of 24 months. 75 patients with Atrial Fibrillation (AF) lasting more than one week were studied to determine the pattern of underlying heart disease, the risk of embolism, relation with site of embolism and left atrial size. Rheumatic heart disease was the commonest cause of AF. Mitral valve was the most commonly involved valve. AF occurred more frequently in older age groups. Most common symptom at presentation was dyspnea on exertion. Risk of AF and embolism were more common in females. Commonest site of embolism was left middle cerebral artery. Left atrial size was significantly large in AF patients. Detection of left atrial thrombus was more in patients with AF with embolism.

Keywords: Atrial fibrillation, cardiac arrhythmias, Rheumatic heart disease, Thromboembolism.

I. Introduction

Atrial fibrillation is the most common sustained cardiac arrhythmias in clinical practice. AF is found in 0.4% adults below 60 years. Incidence of AF appears to double with each decade beginning with the seventh. In the 9th decade the incidence is thought to be as high as 8-10%¹. It is principally an acquired disease but rarely familial forms too have been described associated with abnormalities in the chromosome 10, which may segregate in an autosomal dominant pattern. AF is characterized by totally disorganized atrial depolarization without effective atrial contraction. Clinically the following features are seen: irregularly irregular pulse, apex-pulse deficit more than 10 per minute, absent 'a' waves in JVP, first heart sound of varying intensities. Electrocardiographically, small irregular baseline undulations of variable amplitude and morphology called fibrillatory 'f' waves at the rate of 350-600 per minute may be seen. The ventricular rate is also grossly irregular, determined by the refractory period and conductivity of AV node. Sometimes a rise in ventricular rate may convert AF to Atrial flutter.

Common causes AF are rheumatic heart disease, ischemic heart disease, hypertensive cardiovascular disease, atrial septal defect, chronic lung disease, pericarditis and cardiomyopathies. Several non-cardiac disorders like thyrotoxicosis, acute alcoholism, post- surgery, emotional stress, increased vagal tone as in postprandial state and sympathetic over activity during exercise may also precipitate AF. Lone AF refers to subset of patients who lack clinical, electrocardiographic or echocardiographic evidence of cardiovascular diseases.² Morbidity associated with AF is related to high ventricular rate leading to

- Hypotension or angina pectoris, pulmonary congestion in susceptible individual.
- Systemic embolization, which occurs most commonly in patients with valvular heart disease.
- Loss of contribution of atrial contraction to cardiac output may cause fatigue.
- Pause following cessation of AF can cause syncope.
- Anxiety secondary to palpitation.³

AF is associated with two fold rise in cardiac mortality.¹ In patients with hypertrophied noncompliant ventricles, the combination of loss of atrial contraction and shortened filling period due to rapid rate produce hemodynamic instability resulting in hypotension, syncope and heart failure.

There is high risk of thromboembolic complications especially to the brain in adults below 60 years. Thromboembolic complications cover a wide spectrum and their manifestation may be symptomatic or asymptomatic. At one end of the spectrum are stroke and transient ischemic attacks. In Framingham study⁴ patients with AF but without rheumatic heart disease had more than 5 fold increase in stroke incidence, whereas patients with AF and rheumatic heart disease had 17 fold increase in the incidence of stroke. Paroxysmal or transient AF causes reduced annual risk of stroke than chronic AF. In 50-70% such embolic strokes resulted in death or severe neurological deficits. Certain suggested predictors for embolic stroke by Hinton et al are – duration of AF, intracardiac thrombus. Predictors of stroke in nonvalvular AF as per SPAF study⁵ include recent

congestive heart failure, history of hypertension and previous history of thromboembolism. Left ventricular dysfunction determined by transthoracic echo is an independent predictor.

II. Aim

To determine the pattern of underlying heart disease , the risk of embolism , relation with site of embolism and left atrial size in patients with atrial fibrillation.

III. Materials And Methods

This was an observational study conducted in the medicine unit of a tertiary care hospital over a period of 24 months. A total of 75 patients with Atrial Fibrillation (AF) lasting more than one week were studied. . Patients with paroxysmal AF and AF associated with acute systemic illness were excluded. Written informed consent was obtained from all the study subjects. A detailed history and clinical examination ,twelve lead electrocardiogram, chest radiography, transthoracic echocardiogram, doppler study of peripheral artery in patients with features of peripheral arterial disease, and thyroid function test in patients with clinical suspicion of thyrotoxicosis were performed. Atrial fibrillation (AF) was defined as a supraventricular arrhythmia characterized electrocardiographically by low-amplitude baseline oscillations (fibrillatory or f waves) and an irregularly irregular ventricular rhythm. SPSS (Statistical Package for the Social Sciences) were used for data analysis. Chi-square test was applied to find the significance of difference between two proportions and a P value of less than 0.05 was accepted as indicating statistical significance.

IV. Results

75 patients with Atrial Fibrillation (AF) lasting more than one week were studied. Mean age of the participants was 48.33 years (SD 14.22) ranging between 13 years -73 years. The age distribution of the participants has been depicted in Table 1.

Table 1 Age distribution of the patients

| Age in completed years | Number of participants | Percentage |
|------------------------|------------------------|------------|
| <20 | 2 | 2.7 |
| 21-30 | 7 | 9.3 |
| 31-40 | 16 | 21.3 |
| 41-50 | 20 | 27 |
| 51-60 | 17 | 22 |
| 61-70 | 9 | 12 |
| ≥71 | 4 | 5.7 |
| Total | 75 | 100 |

More than half were females (57.33%). Addiction habits among the participants are shown in fig.1.

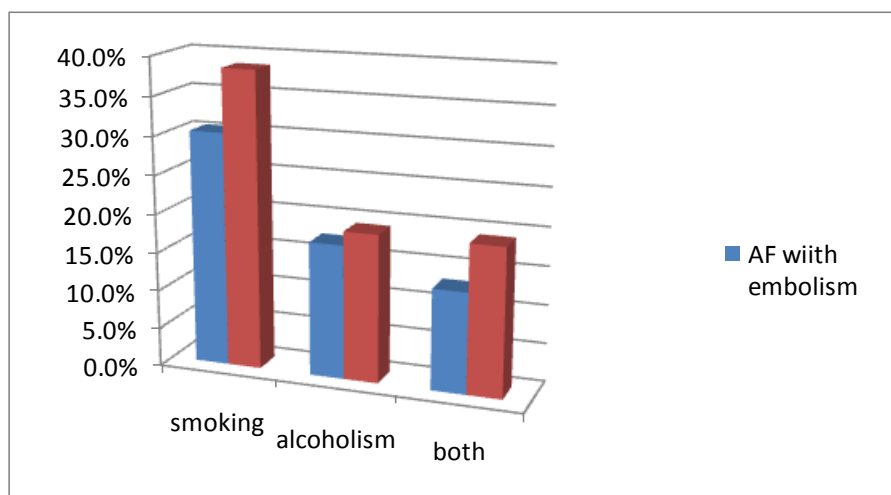


Figure 1 Addiction habits among the participants.

The most common symptom at presentation to hospital was Class III or IV dyspnea (New York Heart Association) present in about half of the participants (37 out of 75 cases of AF). Fig 2 depicts the symptoms at presentation.

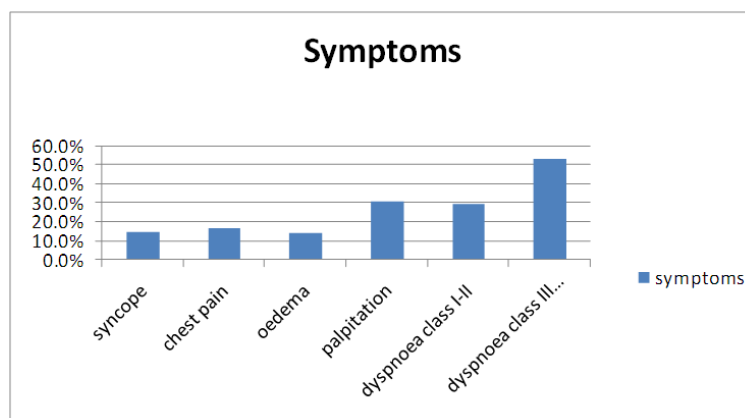


Figure 2 clinical features of the patients.

ECG revealed that 50 out of the 75 had a ventricular rate between 75-100/minute (Table 2). 18 had more than 100 beats/minute and 7 had less than 75 beats/minute.

Table 2 ventricular rate among the patients with AF

| Ventricular rate | AF with embolism Number (%) | AF without embolism Number (%) |
|------------------|--------------------------------|-----------------------------------|
| < 75/minute | 2 (8.7) | 5 (9.6) |
| 75 -100/ minute | 18 (78.3) | 32 (61.5) |
| >100/minute | 3 (13) | 15 (28.9) |
| Total | 23(100) | 52(100) |

Out of the 75 cases, 50 were due to rheumatic valvular heart lesions, especially mitral valve involvement. Coronary artery disease was the second common cause (table 3).

Table 3 Etiology of AF

| Underlying heart disease | AF with embolism N = 23 | AF without embolism N= 52 | Total Number(Percentage) N = 75 |
|---|----------------------------------|---------------------------------|---------------------------------------|
| RHEUMATIC HEART DISEASE | 17 | 33 | 50 (66.7) |
| • Mitral Stenosis Only | 6 | 4 | 10 |
| • Mitral Regurgitation Only | 2 | 6 | 8 |
| • Mitral Stenosis+ Mitral Regurgitation | 6 | 11 | 17 |
| • Multivalvular | 3 | 12 | 15 |
| CORONARY ARTERY DISEASE | 0 | 8 | 8 (10.6) |
| CONGENITAL HEART DISEASE | 2 | 3 | 5 (6.67) |
| • ASD | | | 4 |
| • Ebstein's anomaly | | | 1 |
| CARDIOMYOPATHY | 1 | 4 | 5 (6.67) |
| • Dilated cardiomyopathy | | | 3 |
| • Right ventricular endomyocardial fibrosis | | | 2 |
| HYPERTENSIVE HEART DISEASE | 0 | 1 | 1(1.33) |
| THYROTOXICOSIS | 0 | 1 | 1 (1.33) |
| LONE AF | 3 | 2 | 5 (6.67) |

23 out of the 75 patients with AF had past history of embolism. Out these 15 were female patients. 22 out of the 23 with embolism 22 (96%) involved the cerebral circulation (Table 4). One patient had femoro-popliteal occlusion. Left atrial thrombus was detected in three cases (13.04%) of AF with systemic embolism and two cases (3.84%) of AF without embolism. Mitral stenosis was the basic lesion in all these 5 cases. Dynamic intra cardiac echoes were seen in two cases of embolism and four cases of without embolism.

Table 4 Peripheral embolisation in patients with AF

| Artery involved in embolism | Number(N= 23) | Percentage |
|----------------------------------|----------------|------------|
| Right middle cerebral artery | 9 | 39 |
| Left middle cerebral artery | 11 | 48 |
| Vertebrobasilar artery | 2 | 8.6 |
| (Peripheral) Femoro-popliteal | 1 | 4.4 |

Among the 23 patients with embolism 1 had Diabetes Mellitus, 2 had hypertension and 1 had hypercholesterolemia. Diabetes Mellitus and hypercholesterolemia was found in patients having no structural heart lesion (Lone AF). Hypertension was found in those who had rheumatic heart disease.

Left atrial size was markedly increased in patients with AF (table 5). The mean (SD) left atrial size in AF with systemic embolism was 4.05 cm (1.2) and among those without systemic embolism was 4.24 cm (1.4). This difference was not statistically significant. Largest left atrium was seen in 42 year old female patient who had mitral restenosis and mitral regurgitation.

Table 5 Left atrial size in patients with AF

| Left atrial size | Number | Percentage |
|------------------|--------|------------|
| 2-2.9 cm | 11 | 14.67 |
| 3-3.9 cm | 25 | 33.3 |
| 4-4.9cm | 14 | 18.67 |
| 5-5.9 cm | 15 | 20 |
| 6- 6.9 cm | 5 | 3.75 |
| 7-7.9 cm | 1 | 1.33 |
| >8cm | 4 | 5.33 |
| Total | 75 | 100 |

V. Discussion

In the present study, we found that the commonest cause of AF was rheumatic heart disease (66.7%) followed by coronary artery disease (10.6%). In 1982 Selzer reported that the most potent risk factors for AF were cardiac failure and rheumatic heart disease.⁶ Population studies in India indicate prevalence of rheumatic heart disease was 2 per 1000 population.⁷ More than half of the patients with rheumatic heart disease had mitral stenosis.⁷ In the study by Selzer⁶, 36 % had mitral regurgitation, 34% had mitral stenosis, 21% had hypertensive disease and 19% had coronary heart disease. However in 1991, Wipf JE et al⁸ reported that atherosclerotic heart disease form 40% of AF cases. This is because coronary artery disease is common in the west. Most patients with atrial fibrillation were in the age group of 41-50 years (27%). According to Framingham heart study, as age advances, risk of developing AF also increases. 57% patients were females. This could be due to the fact that most common cause for AF is rheumatic heart disease especially mitral stenosis. According to Braunwald⁹, two-thirds of all patients with mitral stenosis are females. Smoking and alcoholism did not increase the risk of embolic episodes. Kannel too in 1982¹ observed that cigarette smoking was neither a consistent nor a striking predisposing factor for AF.

Embolism occurred in 30.66% cases, which is comparable to 25% incidence of stroke reported by Paterson¹⁰. In our study 34% of patients with rheumatic heart disease developed embolism when compared to 41% reported by Hinton et al in 1977⁴ according to Framingham study risk of stroke was 17.6 times higher among rheumatic AF compared to general population. In our study, 60% of the lone AF cases developed embolism. This may be due the fact these patients were above 65 years. Moreover two patients had other risk factors like diabetes and hypercholesterolemia. In this study the most frequent site of embolism was brain (96%) similar to result reported by Hinton et al⁴.

The left atrial size was markedly increased in these cases, similar to reports of Peterson (1987) and Henry et al (1976). In our study, left atrial size was more than 4 cm in 52% cases similar to Henry et al finding of 54%. According to Benjamin et al¹¹ for every 10 mm increase in LA size, the relative risk of stroke was 2.4 in men and 1.4 in women.⁶ But in our study, there was no significant difference in LA size between cases of AF with embolism or without embolism. This may be explained by the small number of patients.

Left atrial thrombus was detected in 13% cases of AF with embolism when compared to 8.64% among those without embolism. This finding is comparable to Hinton et al (1977) who reported on autopsy, there was an increased incidence of thrombus in left atrium in patients with AF who had embolism (51%) than in those who had no embolism (8%). The lower incidence of thrombus detection in our study may be because of poor visibility of thrombi in left atrial appendages in transthoracic echocardiogram. There was no relation between ventricular rate in AF with embolism or without embolism.

VI. Conclusion

Rheumatic heart disease was the commonest cause of Atrial Fibrillation. AF occurred more frequently in elderly population. Risk of AF and embolism were more common in females. Commonest site of embolism was left middle cerebral artery. Left atrial size was significantly large in AF patients. Detection of left atrial thrombus was more in AF with embolism.

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