

Original Article**Etiological factors responsible for Atrial Fibrillation**

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ABSTRACT

Background: Atrial Fibrillation (AF) is most common chronic rhythm disorder in cardiovascular diseases with various underlying etiologies. Electrocardiogram is the most important investigation in these patients with other investigations may helpful in differential diagnosis. Primary treatment targets in these patients are control of ventricular rate and prevention of embolic complications, while reversion to normal sinus rhythm is achievable in very few patients.

Aims of study: The aims of this study was to collect and compare data of atrial fibrillation patients to various other studies done in our country as well as from western countries .

Material and Methods: The present clinical study was conducted on patients of AF of various etiologies admitted in PDU Medical college & general hospital Rajkot between the period of Nov2002 to October 2004 till total 150 patients (fulfilling the inclusion criteria) were finalized for the study.

Results: Rheumatic Heart Disease (RHD) was most common etiology affecting young aged female particularly. Most of the patients achieved good ventricular rate with Digoxin, CCBs and β -blockers. Anticoagulants used in fewer patients.

Conclusion: In present study of AF, RHD was the commonest etiology in our setup with no change in that trend, comparing the studies from our country in last few decades. In future, non-communicable diseases like IHD would replace infectious diseases like RHD. The availability of coagulation tests at smaller centers and development of newer and safer molecules would increase the use of anticoagulants in these patients, which would decrease the mortality and morbidity further.

Key Words: Atrial fibrillation, RHD, Cerebral embolism

INTRODUCTION

Atrial fibrillation (AF) is one of the most common of chronic rhythm disorders of heart. The exact mechanism of AF in man is not yet been demonstrated, in most instances the history of arrhythmia and examination of patient suggests some form of primary atrial diseases or dysfunction.

Etiology

Although atrial fibrillation may complicate any cardiac diseases and it is sometimes seen in absence of any apparent diseases. The BIG FIVE etiology factors were:

- Rheumatic heart diseases
- Ischemic heart diseases (IHD) and Acute Myocardial Infarction
- Hypertensive heart diseases

- Thyrotoxicosis
- Cardiomyopathies

Other less commonly encountered factors: Congenital heart diseases (e.g. ASD), Atrial dilatation; secondary to myocarditis or pulmonary embolism, Acute pericarditis, pericardial constriction, COPD, Old age, Advancing age and increased left atrial size were closely related to development of atrial fibrillation [1]. Atrial fibrillation is seen infrequently during surgery and immediate postoperative period.

Classification of Atrial Fibrillation

Classification of Atrial fibrillation (AF) begins with distinguishing a first detectable episode, irrespective of whether it is symptomatic or self-limited. Published guidelines from an American College of Cardiology (ACC) / American Heart Association (AHA) / European Society of Cardiology (ESC) committee of

experts on the treatment of patients with atrial fibrillation recommend classification of AF into the following 3 patterns:

1. **Paroxysmal AF** – Episodes of AF that terminate spontaneously within 7 days (most episodes last less than 24 hours)
2. **Persistent AF** - Episodes of AF that last more than 7 days and may require either pharmacologic or electrical intervention to terminate
3. **Permanent AF** - AF that has persisted for more than 1 year, either because cardioversion has failed or because cardioversion has not been attempted

- **Lone atrial fibrillation**

AF in younger patients without structural heart diseases, who were at a lower risk for thromboembolism [2].

- **Neurogenic atrial fibrillation**

Coumel [3] described a vagal and adrenergic form of AF. According to Coumel adrenergic has the following features (1) occurs less frequently than the vagal AF (2) Onset is during daytime (3) Often preceded by precipitating factors [2,4] include the various stress mechanism including the following: Nausea, Vomiting, Acute gastroenteritis, Coughing, Heavy ingestion of alcohol, Severe pain, Hypoglycemia, Emotional upset, Digitalis administration

- **Mechanism**

- 1] Theory of circus movement
- 2] Theory of multiple atrial foci
- 3] Theory of multiple reentry circuits
- 4] Unifocal theory

- **Pathology and pathophysiology:**

The pathology of atrial fibrillation is that of the associated diseases state. The most frequent pathoanatomic changes in AF were atrial fibrosis and loss of atrial muscle mass. Histological examination of atrial tissue of patients with AF has shown patchy fibrosis juxtaposed with normal atrial fibers, which may account for nonhomogeneity of conduction. The sinoatrial (SA) and AV nodes may also be involved, accounting for the sick sinus syndrome and AV block. It is difficult to distinguish between changes due to AF and those due to associated heart

diseases, but fibrosis may precede the onset of AF. In patient with previous rheumatic activity, Aschoff's bodies were frequently present in left atrial appendages in the heart of patients with atrial fibrillation.

- **ELECTROPHYSIOLOGY** [5]: Singer et al [5] found that tissue that demonstrated chronic fibrillatory arrhythmia in vivo were characterized by low level of resting transmembrane potential and depressed excitability and conduction.
- **CLINICAL FEATURES** [2] : The clinical feature of the AF depends largely on two factors: ventricular rate & previous cardiac status.
- **SYMPTOMS & SIGNS:** Dyspnoea, Palpitation, Fatigue on slight exertion, Syncopal attack, Chest pain, Cough, Light headness, Loss of consciousness, Swelling of feet, Cyanosis, Raised JVP, Irregularly irregular pulse, Oedema feet, Absence of "a" wave in jugular venous pulse, Apex pulse deficit, Signs of embolisation, Signs of embolisation, Rales at the lung bases, Pleural effusion, Ascitis, Thyroid enlargement, Signs of associated diseases (i.e. cardiac murmur)
- **INVESTIGATIONS :**

- **Electrocardiogram**[2,6-9]

Electrocardiogram is the investigation for AF. Electrocardiogram may give rough idea about the etiology and type of atrial fibrillation.

Electrical activity of the atrium can be detected electrographically as small irregular baseline undulation of variable amplitude and morphology called f wave, at a rate of 350 to 600 beats per minute. At times small, fine, rapid f wave may occur and were detected only by right leads or by intracavitary or common in patients with rheumatic heart diseases, while fine fibrillatory waves (0.5 mm) were generally found in patients with arteriosclerosis heart diseases.

The ventricular response is grossly irregular and in the untreated patients with normal AV conduction, it is usually between 100 and 160 beats / minute. Atrial fibrillation should be suspected when the electrocardiogram shows supraventricular complexes at an irregular rhythm and no obvious p waves.

- **Echocardiography :** Echocardiography is an important investigation tool for the diagnosis

of various heart diseases producing atrial fibrillation.

- Lab Studies

Laboratory studies indicated includes CBC count (looking for anemia, infection), Serum electrolytes and BUN/creatinine (looking for electrolyte disturbances or renal failure), Cardiac enzymes - CK and/or troponin level (to investigate myocardial infarction as a primary or secondary event), BNP (to evaluate for CHF), D-dimer (if the patient has risk factors to merit a pulmonary embolism workup), Thyroid function studies (looking for thyrotoxicosis, a rare, but not-to-be-missed, precipitant), Digoxin level (may be obtained when appropriate for subtherapeutic levels and/or toxicity; generally considered safe to give Digoxin to patient with AF on Digoxin for rate control without waiting for lab values if patient presents with AF with rapid ventricular response [RVR]), Toxicology testing or ethanol level

- CT and MRI.
- Holter Monitoring or Event Recording
- Electrophysiology Study

Management

Primary objective is Rate control. Rate-controlling agents act primarily by increasing AV nodal refractoriness, Beta-blockers and calcium channel blockers were first-line agents for rate control in AF, Digoxin is indicated in patients with heart failure and reduced LV function., Amiodarone has a class IIa recommendation from the ACC/AHA/ESC for use as a rate-controlling agent for patients who were intolerant of or unresponsiveness to other agents. Anticoagulation and Cardioversion (electrical or pharmacological) is indicated few patients.

MATERIAL AND METHODS

The present clinical study is conducted on patients of AF of various etiologies admitted in PDU Medical college & general hospital Rajkot between the period of Nov2002 to October 2004 till total 150 patients (fulfilling the inclusion criteria) were finalized for the study.

Criteria of inclusion into the study

1. The patient must have atrial fibrillation; chronic AF patients were preferred,
2. All the patient of AF irrespective of underlying etiologies were included into the study,
3. AF with complication of various types was also included into the study.

Criteria of exclusion: Only the Pediatric patients were excluded

All the patients were admitted to either medical ward or ICCU and their history and clinical examination were conducted in detail. All the patients were studied with a clinical Performa and investigated as per their clinical needs.

RESULTS

In present study 90% patients had Congestive cardiac failure. It is the most common complication seen, followed by cerebral embolism in 15 (10%) patients.

Table1: Distribution of patients

Variable	No. (%) (n=150)
Age (in yrs)	
15-20	6(4%)
21-30	25(16.67%)
31-40	39(26.00%)
41-50	32(21.33%)
51-60	25(16.67%)
>60	23(15.33%)
Sex	
Male	65(43.33%)
Female	85(56.67%)

Table 2: various etiologies of Atrial Fibrillation

Etiologies	No. (%)
Rheumatic heart diseases	126(84%)
Ischemic heart diseases	10(6.67%)
Hypertensive heart diseases	7(4.67%)
Cardiomyopathy	3(2.00%)
Thyrotoxicosis	2(1.33%)
Lone AF	2(1.33%)
Pulmonary diseases	0(0.00%)
Congenital heart diseases	0(0.00%)

Table 3: Age distribution of patients of AF in various studies [10-15]

Age group (years)	Percentage in various studies					
	Kanel et al.	Prakas et al.	Jani et al.	Vatsaraj et al.	Japanese study	Present study
11-20	0.00%	70.8%	16.00%	12.60%		04.00%
21-30	16.37%	38.11%	20.00%	18.67%	56.00%	16.67%
31-40	37.68%	28.67%	20.00%	17.33%		26.00%
41-50	30.96%	11.19%	16.00%	27.33%	20.00%	21.33%
51-60		06.28%	18.00%	10.37%	08.00%	16.67%
>60	14.95%	04.88%	10.00%	13.33%	16.00%	15.33%
Sex	Lown et al.	Helpen et al.	Kannel et al.	Rana et al.	Jani et al.	Present study
Male	42.00%	57.14%	44.80%	50.00%	42.00%	43.33%
Female	58.00%	42.86%	55.20%	50.00%	58.00%	56.67%

Table 4: Showing comparison of etiological factors [11,14,15-17]

Etiology	Jani et al	Vatsaraj et al	Rana et al.	Hurst et al	Stephen et al	Present study
Rheumatic	70%	75.33%	66.66%	20%	21.52%	84%
Atherosclerotic	6%	6%	10.00%	34%	22.87%	6.67%
Hypertensive	-	-	10.00%	10.90%	-	4.67%
Congenital heart diseases	-	-	1.70%	1.70%	5.26%	-
Cardiomyopathy	-	2.67%	5.60%	5.60%	5.26%	2%
Thyrotoxicosis	4%	2%	3.00%	3.0%	-	1.33%
Pulmonary diseases	6%	4%	-	-	1.75%	-
Drug induced	2%	-	-	-	8.71%	-
Pericardial diseases	2%	-	-	-	1.75%	-
Unrecognized	-	2.67%	-	-	-	1.33%

However peripheral or pulmonary embolism is not encountered in present study.

Among various modalities of treatment used for AF; most commonly used drugs were CCB and Digoxin. Few patients were given beta blockers alone or in combination. Among all patients 85% were given aspirin while rests were given warfarin combined with aspirin. The underuse of anticoagulant is perhaps due to lack of facility of prothrombin time test at peripheral centers of our setup.

DISCUSSION

Table 4 show that highest incidence of AF is reported in age group of 31 to 40 years in present study and it rarely seen at extremes of age. However in Japanese study about 44.00% patients had age more than 40 years, this difference is perhaps due to occurrence of rheumatic heart diseases at early age in our setup. In majority of Indian studies there is female

preponderance while majority of foreign studies male sex is preponderance. This difference is there because, in western countries ischemic heart diseases among old aged males is the major etiological factor while in our country RHD-which is more common in young females –is most responsible etiology. On comparison between various symptoms on presentation in various studies. Breathlessness, Palpitation & cough were amongst the most common complaints. Other uncommon symptoms were abdominal pain, Nausea & Vomiting and Hemoptysis. Irregularly irregular pulse is seen in 100% patients in all the studies performed as it is one of the defining criteria for AF other prominent signs observed were oedema feet, raised JVP, ascites. Embolic symptoms had similar frequency in all studies with 10% pts in the present study.

Among most of the INDIAN studies the principle cause of AF is Rheumatic heart diseases. While in the western studies Ischemic heart diseases is the most

common cause. The 2nd most common cause is Ischemic heart diseases in Indian studies while it is the most common cause in the west. Hypertension is among the other common causes. Cardiomyopathy is among the less common cause found in 2.67% & 2% pts. In Vatsaraj and in present study. Thyrotoxicosis was encountered in various studies ranging from 1.33% to 4%. Present study did encountered in 1.33% patients.

Among RHD patients MS is the commonest cause of AF, among all studies including the present study. Vatsaraj et al, Hurst et al and present study reported MS in 40.71%, 23.90% & 49.35% respectively. Isolated MR is found in fewer patients than MS. It is found in 17.40%, 0.89%, 2.36% of patients in Hurst, Vatsaraj et al & present study respectively.

Cardiac failure is found in 64% of patients in present study. In other studies also it is found in more than 60% of patients. Incidence of embolisation is found in approximately 10% of patients in previous studies. In present study it is found in 10.66% patients.

On comparing the overall outcome seen in patients with AF after treatment, most of the Patients of AF have a good overall outcome if their ventricular rate is properly controlled-almost more than 90% of patients in various studies. Majority of the patient in various studies achieved good rate control with three basic pharmacological agents namely Digoxin, CCBs and β -blockers. However reversion to normal sinus rhythm was rare, No patient was reverted to sinus rhythm in present study.

CONCLUSION

Atrial Fibrillation is the most common chronic rhythm disorder detected in cardiovascular diseases patient. RHD is the most common etiological factor in our setup, that's why affecting younger people and females more often than there western counterpart. Ventricular rate control becomes the primary target in most patients which can be achieved in good number of patients with traditional pharmacological agents like Digoxin, β -blockers and CCBs. Cardioversion useful for hemodynamically compromised patients. Most debilitating complication is embolic stroke which emphasizes on more frequent use of anticoagulants and availability of coagulation tests at smaller centers.

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