To Study the Risk Factors for Atrial Fibrillation and the Relation Between Cardiac Symptoms with Left Atrial Area on Echocardiography

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ABSTRACT

BACKGROUND
Atrial fibrillation (AF) is the most common arrhythmia. It is associated with significant morbidity and mortality. Size of the left atrium (LA) is an important factor for atrial fibrillation which can land subjects into various complications. We wanted to study the echocardiography findings (size of LA) among AF cases with various underlying aetiology.

METHODS
A cross-sectional observational study was conducted for a duration of 2 years to measure left atrial size by echocardiography in patients of atrial fibrillation in various diseases. A proforma was designed to collect the desired information from the patients**.** The preformed structured proforma consisted of recording of investigations and was used as data collection tool. All efforts were made to determine the aetiology of atrial fibrillation.

RESULTS
A total of 50 cases of AF were studied. Major risk factors found were RHD (44%) Hypertension (28%) and IHD (24%). LA volume on echo was determined and it was found that the majority of symptoms (palpitation, breathlessness, chest pain) was associated with dilated LA.

CONCLUSIONS
Atrial fibrillation (AF) is associated with significant morbidity and mortality and to find out the underlying aetiology will help in reducing the same. The size of left atrium is found to have association with various cardiac symptoms and also an important role in atrial fibrillation particularly in patients of rheumatic heart disease which predisposes the patients to stroke and other cardio-embolic events. Hence, timely management will help in reducing the morbidity and mortality significantly.

KEYWORDS
Atrial Fibrillation, Left Atrium, Rheumatic Heart Disease

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BACKGROUND

Atrial fibrillation (AF) is the most common arrhythmia.[1] It is associated with significant morbidity and mortality.[2,3] According to current guidelines AF is defined as: standard ECG shows irregular RR intervals, i.e. RR intervals do not follow a repetitive pattern. There are no distinct P waves on the ECG. Some apparently regular atrial electrical activity may be seen in some ECG leads, most often lead V1. The atrial cycle length (when visible) i.e., the interval between two atrial activations, is usually variable and >200 ms, corresponding to a heart rate of >300 atrial activations per minute.[4] Thromboembolic stroke from the left atrial appendage (LAA) is the most feared complication.[5] Patients with ischemic stroke have a significantly worse prognosis than other stroke patients, with increased mortality. The patients who survive have loss of independence and requirement for a high level of care.[6]

Another major comorbidity associated with AF is congestive heart failure (CHF). AF and CHF thus have been identified as the 2 major epidemics of cardiovascular disease in the 21st century.[7] Atrial fibrillation can be caused by, or a cause of CHF, and their coexistence leads to a vicious cycle of decreased exercise capacity, worsening heart failure and increased morbidity and mortality.[8] The human LA has a variety of functions. It is an electrically active chamber that functions as a reservoir, conduit and a booster pump at various phases of the cardiac cycle.[9] In addition, and there is evidence of an endocrine role in regulating blood volumes through Atrial Natriuretic Peptide (ANP). Until recently, the LA has largely been neglected while research has focused on the left ventricle (LV). However, the importance of the LA has now been appreciated in numerous cardiac conditions and research involving LA anatomical, functional and electrophysiological abnormalities is gathering momentum. Hemodynamically, the LA functions as a reservoir (during systole), conduit (during diastole) and a booster pump (during late diastole).[10] Left ventricular filling is modulated by LA function. In early ventricular diastole, the mitral valve opens due to an atrioventricular pressure gradient. The initial atrial to ventricular flow is through passive.

Emptying which is attributed to the energy stored within the elastic LA wall during LV systole.[11] The next phase involves active relaxation and the "sucking" effect of the LV. This phase is termed diastasis or the plateau phase, during which the LA acts as a conduit with little change in the LA volume. In the normal heart, most of the LV filling occurs in diastasis.[12] In late diastole, the LA contracts and serves as a booster pump. Rapid LV filling occurs early in diastole, but in patients with a poorly compliant LV, there is an increased reliance on LA contraction for augmentation of LV filling.[13] LA contraction contributes from 10%-30% of the cardiac output, with the "booster" role of the LA becoming more prominent in patients with LV abnormalities and with increasing age.[12] In normal subjects, the relative contributions of the reservoir and conduit phases to LV filling are about 40% and 35% respectively. The contribution of LA contraction to LV stroke volume increases from 12% at age 20 years to 46% at 80 years, in normal subjects.[14] LA reservoir and booster functions are accentuated during exercise, while the conduit function remains unchanged. This leads to increased LV filling through maintenance of the atrioventricular pressure gradient in diastole and enhanced LA contraction secondary to increased preload.[15] The Frank-Starling mechanism is operative in the LA with enhanced contractility in the presence of increasing stretch levels.[12,16] However, increased LA stretch is associated with electrical remodelling and increased risk of arrhythmias.[17]

In recent years, various novel treatment strategies have evolved, which may potentially reduce the burden of morbidity in patients with AF. In order to assess the efficacy of these novel therapies, more sensitive imaging modalities can be helpful, particularly in assessing LA structure and function, and in monitoring these parameters in patients with AF, before and after various treatment strategies, and how they relate to cardiomyopathy and stroke risk, as well as overall morbidity and mortality. AF is easy to diagnose but difficult to treat. An alarmist and epidemic proportion of the disease across the globe and particularly our country warrants immediate and appropriate responses. The beginning of cure has begun with Radio Frequency Ablation (RFA) for patients of paroxysmal AF without structural heart disease; however, there still awaits a long dream of cure for all. Prevention of AF lies to a greater extent is spreading information and utilization of other media to the predisposed individuals; however, there lacks a national preventive programme and a comprehensive administrative approach in the country regarding the same.

There also exists a paucity of data on the epidemiology of AF in India. An analysis of the data from the Indian Heart Rhythm Society Atrial Fibrillation Study reveals that rheumatic heart disease is the most common cause of atrial fibrillation in India accounts for nearly 50% of cases. Atrial fibrillation account for 15% of all strokes and is the leading cause of embolic stroke. Atrial Fibrillation (AF) is the most common chronic arrhythmia, worldwide. It is estimated that it affects more than 2.3 million Americans, or 1% of the population and the prevalence is expected to increase by more than 2.5 fold by 2050. The lifetime risk of developing AF is 25% for men over 40 years of age.[18] The size and volume of left atrium is an important development of atrial fibrillation particularly in patients of rheumatic heart disease and also helps in cardioversion.[19,20] A number of diseases have been found to be associated with left atrial dysfunction. It is therefore essential to document echocardiographically left atrial size serially and offer surgical therapy in patients of rheumatic heart disease, when the left atrium size attains more than 4.0 cm.

Therefore, keeping in view of the urgent need and the lacunae in literature the present study was undertaken to study the left atrial size in patients of atrial fibrillation in various diseases.

METHODS

A single point cross-sectional study was conducted to study the left atrial size by echocardiography in patients of atrial fibrillation in various diseases. The study was conducted in tertiary care hospital.

Inclusion Criteria

- Patients of atrial fibrillation aged above 12 years irrespective of cause and willing to participate were included in the study.
- Patients who were intellectually and physically capable of responding and participating were included.

Exclusion Criteria

- Patients of atrial fibrillation less than or equal to 12 years were excluded from the present study.
- Participants who lacked the ability to cooperate with the study protocol were also excluded from the present study.

Sample Size

The study is an enumeration of the entire subjects of 50 patients included in the study fulfilling the inclusion criteria. Based on the existing literature the parameters were considered to obtain the sample size and the minimum sample size derived was 50 patients.

Ethical Considerations

Consent taken from each participant and study approved by institutional ethical committee.

RESULTS

Risk Factor	Present (%)	Absent (%)
Rheumatic heart disease	22 (44)	28 (56)
Hypertension	14 (28)	36 (72)
Ischaemic heart disease	12 (24)	38 (76)
Hyperthyroidism	04 (08)	46 (92)

Table 1

Palpitation	Normal (%)	Dilated (%)
Present	07 (14%)	31 (62%)
Absent	02 (04%)	10 (20%)

Table 2

Breathlessness	Normal (%)	Dilated (%)
Present	07 (14%)	32 (64%)
Absent	02 (04%)	09 (18%)

Table 3

Chest Pain	Normal (%)	Dilated (%)
Present	03 (06%)	16 (32%)
Absent	06 (12%)	25 (50%)

Table 4

DISCUSSION

Atrial Fibrillation is a manifestation of various illnesses the commonest being rheumatic valvular heart disease of the mitral valve. However it is also seen in COPD with Pulmonary Hypertension, Systemic Hypertension, Ischemic heart disease, Endocrine diseases like hyperthyroidism. Irrespective of cause, signs- symptoms and complications arising out of Atrial Fibrillation are similar and life-threatening and morbid. Hence this study was undertaken in an attempt to find reproducible parameters of association which may predict and warn of impending complications. In this study, Left atrial area of 50 patients of atrial fibrillation due to various causes was studied. A correlation of these parameters with symptoms of patients examined.

A number of studies have taken into consideration with various etiological causes,

A study conducted by Tejinder Kumar reported,[21] Congestive cardiac failure in 67%. Most of patients had RHD 54%, CAD 9%, Hypertension (alone) 8% and Chronic Obstructive pulmonary Disease (8%), Cardiomyopathy 7%, Hyperthyroidism 3% and congenital heart disease 2% seen. 9% of the patients had the lone atrial fibrillation. In Our study Rheumatic heart disease was seen in 44%. Another study by Rannvijay et al.,[22] who also studied the aetiology of Atrial fibrillation reported Rheumatic heart disease as the commonest cause of atrial fibrillation seen in 66 (60%) of patients. Hypertensive heart disease in 13 patients (12.73%) and degenerative valvular heart disease in 12 patients (10.91%). Other causes in order of frequency were Ischaemic heart disease, Cor pulmonale, Thyrotoxicosis, Idiopathic dilated cardiomyopathy and constrictive pericarditis. Lone atrial fibrillation was seen in only one patient.

In our study hypertension was seen in 28%. Hypertension has been considered the most common risk factor for AF globally, prevalence is 41.6% in India and 80.7% in Eastern Europe.[23] Hypertension was greater risk for AF in which 50% in men and 40% in women, had 4th rank after HF, aging, and valvular heart disease, according to the Framingham study.[2] In a study conducted by Rannvijay et al.,[22] hypertensive heart disease was reported in 12.73% individuals. In our study Ischaemic heart disease was seen in 24%. Another study conducted by Dr. Kbr Shastry[24] reported that most common cause is Rheumatic Heart Disease (70%), second most common cause IHD (6%) then HOCM (6%), HTN (4%), Pericarditis (4%), Ebstein's Anomaly (4%), and Lone AF (2%). MS (88.57%) were the most common lesion in RHD. In our study thyroid dysfunction was absent in 92% patients and thyroid dysfunction in the form hyperthyroidism was seen in 8% patients. Previous studies in this regard showed mixed variations whereas some reported that both hypo and hyperthyroidism increase atrial fibrillation inducibility.[25-26] whereas other did not find any association.[27]

Symptom wise our study reported palpitation in 76% and breathlessness in 78% whereas chest pain was seen in only 38%. Tejinder Kumar[21] reported Dyspnoea is the commonest symptom 74%, palpitations 57%, fatigue 19%, syncope 17% and chest pain 11% and 14% patients were asymptomatic. A study conducted by Hanan et al.,[28] found that LA enlargement is more suitable to predict

thromboembolic markers in nonvalvular AF patients. The indexed and non-indexed LA AP diameter and indexed LA ellipsoid volume were the most accurate parameters for predicting thromboembolic markers. In our study the relationship between Echo LA and different symptoms revealed that majority of the symptoms (palpitation, breathlessness, and chest pain) were associated with dilated area (Table 2).

CONCLUSIONS

Atrial fibrillation (AF) is the most common arrhythmia. It is associated with significant morbidity and determining the underlying aetiology will help in reducing the same. Increase in size of left atrium is associated with various cardiac symptoms and plays an important role in atrial fibrillation particularly in patients of rheumatic heart disease which predisposes the patients to stroke and other cardio-embolic events. Hence, timely management will help in reducing the morbidity and mortality significantly.

REFERENCES

[1] Go AS, Hylek EM, Phillips KA, et al. Prevalence of diagnosed atrial fibrillation in adults: national implications for rhythm management and stroke prevention: the Anticoagulation and Risk Factors in Atrial Fibrillation (ATRIA) Study. JAMA 2001;285(18):2370-2375.

[2] Benjamin EJ, Levy D, Vaziri SM, et al. Independent risk factors for atrial fibrillation in a population-based cohort. The Framingham Heart Study. JAMA 1994;271(11):840-844.

[3] Miyasaka Y, Barnes ME, Gersh BJ, et al. Incidence and mortality risk of congestive heart failure in atrial fibrillation patients: a community-based study over two decades. Eur Heart J 2006;27(8):936-941.

[4] Camm AJ, Kirchhof P, Lip GY, et al. Guidelines for the management of atrial fibrillation: the Task Force for the Management of Atrial Fibrillation of the European Society of Cardiology (ESC). Europace 2010;12(10):1360-1420.

[5] Le DL, Khodjaev SD, Morelli RL. Percutaneous methods of left atrial appendage exclusion: an alternative to the internist. Journal of Community Hospital Internal Medicine Perspectives 2014;4:22719.

[6] Lamassa M, Di Carlo A, Pracucci G, et al. Characteristics, outcome, and care of stroke associated with atrial fibrillation in Europe: data from a multicenter multinational hospital-based registry (The European Community Stroke Project). Stroke 2001;32(2):392-398.

[7] Braunwald E. Shattuck lecture--cardiovascular medicine at the turn of the millennium: triumphs, concerns, and opportunities. N Engl J Med 1997;337(19):1360-1369.

[8] Dries DL, Exner DV, Gersh BJ, et al. Atrial fibrillation is associated with an increased risk for mortality and heart failure progression in patients with asymptomatic and symptomatic left ventricular systolic dysfunction: a retrospective analysis of the SOLVD trials. J Am Coll Cardiol 1998;32(3):695-703.

[9] Habibi M, Samiei S, Venkatesh BA, et al. CMR-measured left atrial volume and function and incident atrial fibrillation: results from the multi-ethnic study of atherosclerosis (MESA). Circ Cardiovasc Imaging 2016;9(8).

[10] Toma Y, Matsuda Y, Moritani K, et al. Left atrial filling in normal human subjects: relation between left atrial contraction and left atrial early filling. Cardiovasc Res 1987;21(4):255-259.

[11] Grant C, Bunnell IL, Greene DG. The reservoir function of the left atrium during ventricular systole. An angiocardiographic study of atrial stroke volume and work. Am J Med 1964;37:36-43.

[12] Fukuta H, Little WC. The cardiac cycle and the physiological basis of left ventricular contraction, ejection, relaxation, and filling. Heart Fail Clin 2008;4(1):1-11.

[13] Hoit BD, Gabel M. Influence of left ventricular dysfunction on the role of atrial contraction: an echocardiographic-hemodynamic study in dogs. J Am Coll Cardiol 2000;36(5):1713-1719.

[14] Kuo LC, Quinones MA, Rokey R, et al. Quantification of atrial contribution to left ventricular filling by pulsed Doppler echocardiography and the effect of age in normal and diseased hearts. Am J Cardiol 1987;59(12):1174-1178.

[15] Toutouzas K, Trikas A, Pitsavos C, et al. Echocardiographic features of left atrium in elite male athletes. Am J Cardiol 1996;78(11):1314-1317.

[16] Asnes CF, Marquez JP, Elson EL, et al. Reconstitution of the frank-starling mechanism in engineered heart tissues. Biophys J 2006;91(5):1800-1810.

[17] Kalman JM, Sparks PB. Electrical remodeling of the atria as a consequence of atrial stretch. J Cardiovasc Electrophysiol 2001;12(1):51-55.

[18] Kataria V, Nair M. Epidemiology of atrial fibrillation in India. In: Manoria PC, ed. Monograph of atrial fibrillation. Indian College of Physicians 2006.

[19] Prakash R, Green MS, Kerr CR, et al. The association of left atrial size and occurrence of atrial fibrillation: a prospective cohort study from the Canadian registry of atrial fibrillation. Am Heart J 2004;148(4):649-654.

[20] Henry WL, Morganroth J, Pearlman S, et al. Relation between echocardiographically determined left atrial size and atrial fibrillation. Circulation 1976;53(2):273-279.

[21] Kumar T, Soodan SS. Clinical and echocardiographic profile of atrial fibrillation. JK Science 2011;13(2):73-76.

[22] Singh R, Kashyap R, Bhardwaj R, et al. The clinical and etiological profile of atrial fibrillation after echocardiography in a tertiary care centre from North India - a cross sectional observational study. Int J Res Med Sci 2017;5(3):847-850.

[23] Oldgren J, Healey JS, Ezekowitz M, et al. Variations in cause and management of atrial fibrillation in a prospective registry of 15,400 emergency department patients in 46 countries: the RE-LY atrial fibrillation registry. Circulation 2014;129(15):1568-1576.
[24] Sastry KBR, Suneel Kumar L, Anuradha P, et al. Clinical profile and echocardiographic findings in patients with atrial fibrillation. International Journal of Scientific and Research Publications 2016;6(2):44-47.
[25] Zhang Y, Dedkov EI, Teplitsky D, et al. Both hypothyroidism and hyperthyroidism increase atrial fibrillation inducibility in rats. Circ Arrhythm Electrophysiol 2013;6(5):952-959.
[26] Fuster V, Ryden LE, Cannom DS, et al. 2011 ACCF/AHA/HRS focused updates incorporated into the ACC/AHA/ESC 2006 guidelines for the management of patients with atrial fibrillation: a report of the American College of Cardiology Foundation/American Heart Association task force on practice guidelines. Circulation 2011;123(10):e269-367.
[27] Kim EJ, Lyass A, Wang N, et al., Relation of hypothyroidism and incident atrial fibrillation (from the Framingham heart study). Am Heart J 2014;167(1):123-126.
[28] Radwan HI. Relation between left atrial measurements and thromboembolic risk markers assessed by echocardiography in patients with nonvalvular atrial fibrillation: a cross-sectional study. Egypt Heart J 2017;69(1):1-11.