Holter monitoring for assessment of possible paroxysmal atrial fibrillation as a cause in otherwise normal sinus rhythm patients with acute ischemic stroke: a hospital based study

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Abstract

Background: Stroke/ cerebrovascular accidents are common and among the major causes of mortality and morbidity. Thromboembolism are also among the causes of ischemic strokes. Diagnosis of atrial fibrillation makes the difference in the management of ischemic strokes for long term as anticoagulation are given in these cases for prevention of further embolic events.

Methods: A prospective observational study was done from july 2019 to june 2021 for patients admitted for ischemic strokes who were otherwise found to have normal sinus rhythm. A 24 hour holter monitor was connected and analyzed for possible paroxysmal atrial fibrillation. Baseline investigations including trans-thoracic echocardiography was done. Data were analyzed and results were sought.

Results: Out of 212 patients admitted for stroke, only 116 were eligible for the study. Male female ratio was 2:1. Ninety-four percent of patients had at least one or more risk factors: Smokers (74%) followed by Hypertensives (70%), Dyslipidemics (54%) and Diabetics (20%). Twenty-two percent of patients were found to have paroxysmal atrial fibrillation. There was no gender difference between the occurrences of paroxysmal atrial fibrillation. Among the risk factors, smoking and hypertension were significantly associated with the occurrence of paroxysmal atrial fibrillation (P: 0.001 and 0.002 respectively) while other risk factors like diabetes and dyslipidemia had no significant association. There was significant association of paroxysmal atrial fibrillation with mortality (P: 0.0013).

Conclusion: Patients who are in otherwise normal sinus rhythm in electrocardiography with ischemic cerebrovascular accidents may have paroxysmal atrial fibrillation as cause of event. Smoking and hypertensive patients are significantly associated with occurrence of paroxysmal atrial fibrillation and stroke and these patients are more likely to die than the patients having normal heart rhythm. Management of these patients definitely defer in terms of possible use of anticoagulants.

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Introduction:

Ischemic and hemorrhagic events are the two different extremes of cerebrovascular (CV) events which are among the major causes of mortality and morbidity in humans. Of 35 million deaths attributable to chronic non-communicable diseases that occurred worldwide in 2005, stroke was responsible for 5.7 million (16.6%) deaths, and 87% of these deaths occurred in low-income and middle-income countries. 1 Ischemic events are more frequent than hemorrhagic. Transient ischemic attack (TIA), Reversible ischemic neurological disease (RIND) and irreversible stroke are the different types in ischemic CV

events. Athero-thrombotic (AT) and thrombo-embolic (TE) phenomenon are the causes of ischemic CV events of which the former one leads the cause. TE may be either cardio-embolic (CE) or embolism from large vessels like aorta or carotids. The CE event has greater incidence than later with atrial fibrillation (AF) being the most common arrhythmia causing the large number of ischemic CV events especially in valvular heart disease patients and elderly.2

AF, either in permanent form or paroxysmal (PAF) form carries similar risk in development of atrial thrombus and thus causing CE phenomenon.2 The permanent form of AF is easily diagnosed and treatment with either anti-platelets or anticoagulation (any one given according to CHADS2VASc risk) is started accordingly but the latter one is underdiagnosed and if present, the patient is at greater risk of developing CE events as they are not kept on prophylaxis.3

Hence this study aimed to do a 24 hour holter ECG monitoring to look at possibility of cardiac arrhythmias like PAF in patients hospitalized in Manipal Teaching Hospital with acute ischemic CV events who are otherwise in normal sinus rhythm (NSR).

Methods:

A prospective, cross-sectional, descriptive observational study was done. The study participants were all the patients aged more than 18 years with an acute ischemic CV event who otherwise were in NSR admitted in manipal teaching hospital. All consecutive patients were taken from the date of ethical approval till june 2021. An electrocardiogram (ECG) was obtained to prove NSR at the time of admission. Following that with informed consent, patient was connected to holter ECG monitor and the report was analyzed after 24 hours. Investigations like echocardiography and other routine investigations were also done to assess for other risk factors of ischemic CV events like thrombus in the left atrial appendage . A preformed proforma was filled for the data entry. The data was entered in excel sheet and analyzed using SPSS software.

Results:

Total number of patients admitted with stroke were 212. Fifty seven 57 were excluded initially as they were hemorrhagic strokes (any form). 155 patients were having ischemic strokes, further 17 were excluded as they were either transferred/ discharged/went in LAMA before holter could be done. Another 16 patients were already having atrial fibrillation and or flutter, hence these were also excluded. Hence 122 patients were having ischemic stroke with normal sinus rhythm. Further six patients did not give consent. So, 116 patients who underwent 24 hour holter ECG monitoring were taken for the study.
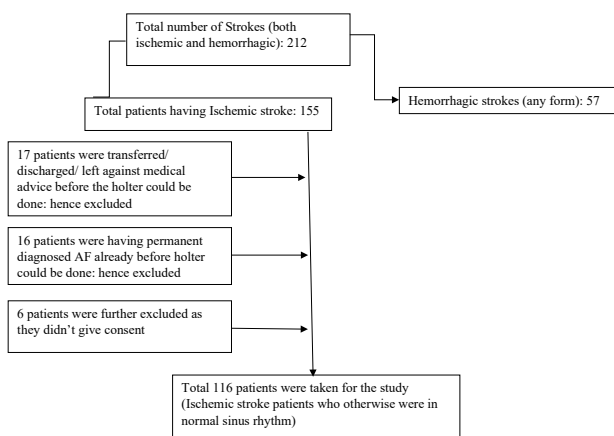
Out of total 116 patients taken for the study, the mean age of the patients was 67.52years ranging from 35 to 92years. Seventy eight (78) patients were male while thirty-eight (38) patients were females with male female ratio of 2.05. (Table 1)

Table 1: Gender distribution of patients having ischemic stroke:

Male (n)	78	M:F
Female (n)	38	2.05
Total (n)	116	

Risk factors were analysed for the causes of stroke where most of the patients were found to be smokers (74.1%) followed by hypertensives (70.68%), Dyslipidemics (54%), Diabetes (20%) and only 13% were having other risk factors like connective tissue disorders (SLE and RA in 2 each), drugs like steroids (3) and family history of strokes (3). (Table 2)

Table 2: Risk factors of patients:

Risk Factors	Number of Patients (%)
Smoking	86 (74.1)
Hypertension	82 (70.68)
Dyslipidemia	63 (54.31)
Diabetes mellitus	24 (20.68)
Others	10 (8.62)
Combined (2 or more)	110 (94.8)

All 116 patients underwent 24 hour holter monitoring for analysis of any cardiac arrhythmias. Sixty eight patients (58%) had some form of cardiac arrhythmia as shown in table 3. Significant cardiac arrhythmias like paroxysmal atrial fibrillation was seen in 26 (22%) of patients, three patients each were having Paroxysmal supraventricular tachycardia and short run ventricular tachycardia respectively. Two patients had significant pauses with features of sick sinus syndrome: tachy-brady variety. Although there were few patients with AV blocks, 1 patient had intermittent complete heart block.

Table 3: Holter monitoring showing cardiac arrhythmias:

Category of arrhythmia		Number of patients	Percentage (%)
Cardiac arrhythmia in any form		68	58.62
a	Atrial/ Supraventricular Ectopics	49	42.24
b	Paroxysmal Atrial Fibrillation	26	22.41
c	Paroxysmal Supraventricular tachycardia	3	2.58
d	Ventricular ectopics (isolated)	36	31.03
e	Ventricular ectopics: bigeminy, trigeminy, pairs etc	11	9.48
f	Ventricular tachycardia (short run)	3	2.58
g	Sick sinus syndrome with pause	2	1.72
h	Variable degree AV blocks (including CHB)	5 (1)	4.31 (0.8)

Further sub-analysis of patients who had paroxysmal atrial fibrillation was done that showed that there was no difference in gender for having paroxysmal atrial fibrillation (P: 0.24); Table 4.

Table 4: Gender difference in case of paroxysmal atrial fibrillation:

Parox-ysmal Atrial fibrilla-tion	Fe-male	Male	Odds ratio	Rel-ative risk	95% Confi-dence inter-val	P val-ue
Yes	11	15	1.71	1.51	0.69-4.20	0.24
No	27	63				

Further analysis on impact on risk factors on PAF and CVA was analyzed where association smoking and hypertension for the development of PAF were significant (P: 0.001 and 0.002 respectively). Patients with Dyslipidemia and Diabetes were also analysed but was found to be statistically insignificant (P: 0.169 and 0.29 respectively) (Table 5).

Table 5: Impact of risk factors on possibility of paroxysmal atrial fibrillation:

Risk Factors		Paroxysmal Atrial Fibril-lation		Odds ratio	95% Confi-dence interval	P value
		No	Yes			
Smoking	Yes	86	19	7.78	2.97-20.34	0.001
	No	30	07			
Hyper-tension	Yes	82	16	3.85	1.59-9.35	0.002
	No	34	10			
Dyslipid-emia	Yes	63	8	0.52	0.21-1.31	0.169
	No	53	18			
Diabetes Mellitus	Yes	24	3	2.00	0.55-7.22	0.290
	No	92	23			

Total 10 patients died during the hospital study. Mortality were also taken into consideration for analysis. Table 6 shows outcome in patients who were analyzed and found to have paroxysmal atrial fibrillation showed significant mortality (P: 0.0013).

Table 6: Outcome/mortality of patients with or without PAF:

Variables		Paroxysmal Atrial Fibrilla-tion		Odds ratio	95% Confi-dence interval	P value
		No	Yes			
Mortal-ity	Yes	3	7	10.68	2.52-45.12	0.0013
	No	87	19			

Discussion:

The study is among the few studies done in this country, although many studies are done in western countries. It's known that ischemic cerebrovascular accidents (CVA) are the most common form of strokes where athero-thrombotic (AT) and TE causes prevail. TE may be either CE or embolism from large vessels like aorta and carotids.

In this study the total number of patients studied were 116, the mean age of patients was 67.52yrs ranging from 35 to 92 years. The male to female ratio was 2.05. Although the incidence of ischemic strokes were more in male, there was no difference in the development of atrial fibrillation between the genders in our study.

Almost 58% of study patients had some form of cardiac arrhythmias seen in 24 hour holter study.. Significant cardiac arrhythmias like paroxysmal atrial fibrillation was seen in 26 (22%) of patients, three patients each were having Paroxysmal supraventricular tachycardia and short run ventricular tachycardia respectively. Two patients had significant pauses with features of sick sinus syndrome: tachy-brady variety. Although there were few patients with AV blocks, 1 patient had intermittent complete heart block. Although slightly lower than few other studies done by Bozluoclay et al and Goldtein et al 4, 5 showed vast majority of patients with stroke patients showing ECG changes in 62.1% and 92% of their study populations, it was comparable. Their studies showed the variation of ECG changes in stroke is seen over time and these changes may be only categorized and standardized by continuous ECG monitoring. Many other studies support the use of continuous ECG monitoring to detect the possible cardiac arrhythmias including paroxysmal atrial fibrillation (PAF). 6-13

Detecting subclinical AF in patients with ischemic CVA patients is crucial for managing the patients like preventing future embolic events. Almost 22% patients in our study showed PAF. A study by Sobonski et al14 suggested that duration of monitoring improves the detection of silent paroxysmal AF and thus facilitates the detection of patients who should receive oral anticoagulant treatment.

Risk factors like smoking, hypertension, dyslipidemia, diabetes mellitus (DM) were also evaluated. The most common risk factor in patient developing ischemic event was smoking followed by hypertension (74 and 70% simultaneously). 2 or more risk factors were present in >90% of cases. Study shows traditional risk factors are accountable for more than 80% of the global risk of all the strokes.15 These findings were comparable with the studies of Watila et al and Framingham study.16-19 Smoking and hypertension were strongly associated with paroxysmal atrial fibrillation and Ischemic events (P: 0.001 & 0.002 respectively). Dyslipidemia and DM alone were not having significant association with development of paroxysmal AF (table 5).

Ten patients died during hospital stay who were in the study. Seven patients were having PAF which was statistically significant in compared to mortality in patients without PAF (P: 0.0013). Studies 5-25 also shows similar results as increased mortality in patients with stroke and cardiac arrhythmias. High mortality in these individuals is likely because embolic strokes are larger causing more severe initial neurological impairment, possible recurrence and direct detrimental effect of AF on recovery from stroke.21-25

Conclusion: Any ischemic cerebrovascular event has either thrombotic or embolic as a cause. Patients who are in otherwise normal sinus rhythm in electrocardiography with ischemic cerebrovascular accidents may have paroxysmal atrial fibrillation

as cause of event. Smoking and hypertensive patients are significantly associated with occurrence of paroxysmal atrial fibrillation and stroke and these patients are more likely to die than the patients having normal heart rhythm.

Recommendation: As the treatment of ischemic defers in patients with atrial fibrillation (including paroxysmal) from patients without atrial fibrillation in which the former requires anticoagulation; this study highly recommends use of holter monitoring in all the ischemic stroke patients who are otherwise in normal sinus rhythm in admission. This definitely helps the patients getting proper anticoagulation therapy and prevent future events.

Limitation of this study: This study was conducted for a shorter duration of holter ECG monitoring (only 24 hours). The detection of PAF would have been more if the duration would have been longer (at least 72 hours).

Conflict of interest: The author bears no conflict of interest in preparing and publishing this manuscript.

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