Cardiac Arrhythmias in Ischemic Stroke Patients Admitted in a Tertiary Medical College of Central Nepal

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ABSTRACT

Background: Cardiac arrhythmias are known etiological agent for ischemic stroke and are also common after acute ischemic stroke. The objective of this research is to study various cardiac arrhythmias and find incidence of atrial fibrillation in acute ischemic stroke.

Methods: This hospital based cross sectional study conducted at COMS - Teaching Hospital included 100 patients with diagnosis of acute ischemic stroke from October 2015 to October 2016. Arrhythmias was classified as atrial ectopic beats, atrial fibrillation, premature ventricular complex, sinus bradycardia, sinus tachycardia, sinus arrhythmias, sick sinus syndrome, atrial tachycardia and ventricular tachycardia on basis of ECG monitoring for 24 hours.

Results: Among total 56% (n=56) had abnormal rhythm. Total incidence of atrial fibrillation was 20%. Other arrhythmias observed were sinus tachycardia in 9% (n=9), premature ventricular complex in 8% (n=8), ventricular tachycardia in 5% (n=5), sinus bradycardia in 4% (n=4), sinus arrhythmias in 4% (n=4), atrial ectopic beats in 3% (n=3), sick sinus syndrome in 2% (n=2) and atrial tachycardia in 1%(n=1). Right cerebral hemisphere was more involved than left in both normal and abnormal rhythm (p =0.714). Mortality observed was 4.5% (n=2) in normal rhythm and 8.9% (n=5) in arryhthmias (p=0.461).

Conclusion: Cardiac arrhythmias are frequent in acute ischemic stroke. Atrial fibrillation is most commonly observed arrhythmia in acute ischemic stroke and mortality is higher in patient with rhythm abnormalities than with normal rhythm.

Keywords: atrial fibrillation; cardiac arrhythmias; ischemic stroke.

INTRODUCTION

Stroke is second leading cause of death worldwide after cardiovascular disease accounting for 5.7 million deaths a year.[1] Cardiac arrhythmias which plays a major role in cardio-embolic strokes accounts for 15 – 20% of ischemic stroke.[2] Atrial fibrillation (AF) is major risk factor which confers fivefold increased risk for stroke.[3] High frequency of atrial ectopic beats and atrial tachycardia is also associated with increased incidence of stroke.[4] Cardiac complications are also common after acute stroke.[5, 6] Abnormal ECG and cardiac arrhythmias are identified in 50-70% of patients with acute stroke.[7,8] The frequency and severity of ECG changes is highest within 48 hours of stroke.[9] Patients with stroke having ECG changes are seen to have increased mortality than those having normal ECG.[10] Identification of high-risk patient is important to arrange appropriate cardiac monitoring and effective management of arrhythmias to prevent cardiac morbidity and mortality.[5] In this study, we aimed to study burden of various cardiac arrhythmias and find incidence of AF in acute ischemic stroke in current setting.

METHODS

A prospective cross-sectional study was conducted in Department of Neuromedicine of College of Medical Sciences and Teaching hospital from October 2015 to October 2016. All patients aged ≥ 18 years admitted with acute onset cerebrovascular events confirmed to be ischemic in nature on clinical examination and

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imaging of brain were enrolled in this study. Patients having stroke due to tumors, trauma infection, bleeding disorders, vasculitis, cortical venous thrombosis and patients with documented arrhythmias before onset of stroke were excluded. Patient were recruited as per medical ethics and informed written consent was taken from each patient or their relative. The ethical clearance was taken from the Ethical Review Board/ Ethical Clearance Committee of COMS-TH. A detailed socio-demographic data and relevant information were documented on structured perfoma with special focus on temporal profile of stroke patients. All participants underwent thorough detailed medical history, clinical evaluation, blood sampling, electrocardiography (ECG) and CT scan of Brain at admission, ECG monitoring for 24 hours in ICU. Complete hemoglobin, random blood sugar, fasting blood sugar, post-prandial blood sugar, glycosylated hemoglobin, renal function tests, lipid profile, thyroid function test, troponin I and CK-MB of all the patients were done in the institute laboratory by standard methods. Blood samples for relevant baseline investigations were collected at the time of admission and before initiating medication. ECG monitoring was done for 24 hours in Neuromedicine ICU with portable CUSTOMED MEDILOG 1 tape recorders. All recording were printed out on standard ECG paper and analyzed for rhythm abnormalities and

stroke was based on World Health Organization.[12] Hypertension was defined as per the 2017 ACC/AHA task force guideline.[13] Diabetes was defined as per the 2017 ADA guidelines.[14] Dyslipidemia was defined as per the 2017 AACE guidelines.[15] Smokers were defined as anyone who has smoked 100 cigarettes in his or her lifetime and who currently smokes cigarettes as per the CDC- National health interview survey.[16] Collected data was entered in Microsoft excel 2007 and uploaded into SPSS 17 version. Categorical variables was expressed in numbers and percentages, whereas normally distributed data was expressed as mean ± standard deviation. Chi-square test and Student's t-test was used to calculate p-value as appropriate. A two-sided p-value of <0.05 was considered as statistically significant with 95% confidence interval.

RESULTS

Out of 100 acute ischemic stroke patients, 56% (n=56) had rhythm abnormalities whereas 44% (n=44) had normal rhythm. Atrial fibrillation was observed in 20% (n=20), sinus tachycardia in 9% (n=9), premature ventricular complex (PVCs) in 8% (n=8), ventricular tachycardia in 5% (n=5), sinus bradycardia in 4% (n=4), sinus arrhythmias in 4% (n=4), atrial ectopic beats in 3% (n=3), sick sinus syndrome in 2% (n=2) and atrial tachycardia in 1% (n=1) (Table 1).

Table 1. Total detected cardiac arrhythmias in ECG and 24 ECG monitoring.		
Arrhythmias	**ECG at Emergency (n)**	**24 hour ECG recordings**
Atrial Fibrillation	16(51.61)	16(28.57)
Paroxysmal Atrial Fibrillation	-	4(7.14)
Sinus Tachycardia	9(29.03)	9(16.07)
Premature Ventricular Complex	1(3.23)	8(14.29)
Ventricular Tachycardia	0	5(8.93)
Sinus Bradycardia	4(12.90)	4(7.14)
Sinus Arrhythmias	0	4(7.14)
Atrial ectopic beats	0	3(5.36)
Sick sinus Syndrome	1(3.23)	2(3.57)
Atrial tachycardia	0	1(1)

arrhythmias were classified as Atrial Fibrillation (AF), Premature Ventricular Complex (PVCs), Ventricular Tachycardia (VT), Sinus arrhythmia, Atrial Ectopic Beats (AEBs), Sinus Bradycardia, Sinus Tachycardia as per standard definition.[11] Case definition of

In patient with rhythm abnormalities, cardioembolic stroke was present in 41.1% (n=23) whereas large vessel disease in 33.9% (n=19), small vessel disease in 14.3% (n=8) and stroke due to determined and undetermined etiology in 5.4% (n=3) in each.

However, no significant difference regarding TOAST subtypes was seen between patients with normal and abnormal rhythm (p= 0.165) (Figure 1).
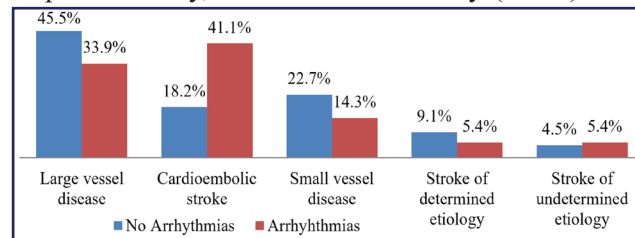
In present study, middle cerebral artery (MCA) was

Figure 1. Classification of acute ischemic stroke patients by TOAST criteria.

more involved than other territories in both normal and abnormal rhythm. Similarly, right cerebral hemisphere was more involved than left cerebral hemisphere in both normal and abnormal rhythm (p =0.714). (Figure 2)
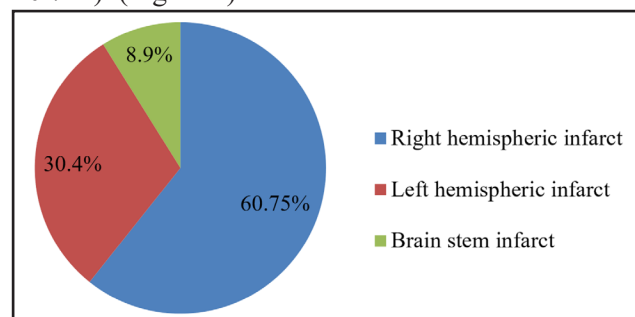

Figure 2. Location of infarct among patients with arrhythmia.

Mortality observed was 4.5% (n=2) in normal rhythm and 8.9% (n=5) in arryhthmias (p=0.461).

DISCUSSION
We found that out of 100 stroke patients, 56% had rhythm abnormalities and 44% had normal rhythm. The incidence of atrial fibrillation was 20% in acute ischemic stroke and mortality was slightly higher in patient with rhythm abnormalities. Prevalence of atrial fibrillation is increasing worldwide. It is found in more than 5 percent of patients older than 69 years.[17] Studies on non-valvular AF show a total 5% per year risk of developing stroke and cumulative 35% in the lifetime.[18] High frequency of atrial ectopic beats and atrial tachycardia are also associated with increased stroke risk.[4] Electrocardiogram abnormalities occur frequently but are under recognized after strokes.[7,8]

The patterns of abnormalities vary from abnormal T waves to QT prolongation, to fatal arrhythmias, such as ventricular fibrillation that cause sudden cardiac death.[19] Stroke induced ECG changes are generally evanescent, resolving over a period of days to months and are highest within 48 hours of stroke.[9] Multiple studies have reported arrhythmias varying from 20% to 60% during 24 hour ECG monitoring in acute ischemic stroke patients. Cardiac arrhythmia was present in 56% in present study which was higher than most of other studies.[20] This might be due to exclusion of critically ill patients requiring mechanical ventilator in their study. Incidence of Atrial fibrillation in stroke patient was reported 23.04% by a study from Italy and 18% by Oxfordshire community stroke project which was comparable to present study.[21,22] Studies from India reported low incidence of atrial fibrillation which might be due to the fact that many enrolled patients were below age 45 years in their study.[23,24] Four percent of atrial ectopic beats was reported in a studies from Canada during 24 hour ECG monitoring which was similar to our findings.[25] Studies from India and Pakistan reported 9% and 6.25% of premature ventricular complex.[23,26] Similarly, non-sustained VT was reported 11.54% and 8% respectively by studies from Spain and USA.[27,28] These were comparable to present study. Dewan and Rana studied 7 days mortality in 100 acute ischemic stroke patients and observed 13% of patients expired by seven day.[29] Study from Istanbul reported 14.8% mortality in patient with ECG changes which was comparable to present study.[10]

Limitations
Our study has several limitations. Firstly, our sample size was small and study was restricted to single center only. Secondly, patient was observed just for 24 hours, prolonged cardiac monitoring would have revealed more significant arrhythmias. Thirdly, patient was not followed up to look for reversal of ECG changes and cardiac arrhythmias.

CONCLUSIONS
Cardiac arrhythmias are frequent in acute ischemic stroke. Atrial fibrillation is most commonly observed

arrhythmia in acute ischemic stroke and mortality is higher in patient with rhythm abnormalities than with normal rhythm.

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