LONG QTC IN ECG OF PATIENTS PRESENTING WITH ACUTE HEMORRHAGIC AND ISCHEMIC STROKE

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ABSTRACT

Objective: To determine the frequency of occurrence of long QTc in patients presenting with acute hemorrhagic and ischemic stroke.

Study Design: Descriptive cross sectional study.

Place and Duration of Study: Department of Medicine, Combined Military Hospital, Malir from, Jan 2017 till Jul 2017.

Material and Methods: Administration permission from concerned authorities and ethical committee was taken. All cases of stroke, regardless of sex, ethnicity, religion and socioeconomic status fulfilling the inclusion and exclusion criteria taken from the emergency department, had informed consent from the patients except for cases in shock, confusion or coma where it was taken from the next of kin. Pertinent history and laboratory tests taken to fulfill the inclusion and exclusion criteria, including CT scan head or MRI brain whichever available. ECG was recorded by a nursing staff, interpreted by me and QTc measured by Bazett's formula. The values were entered in the predesigned performa.

Results: Total 184 patients were included according to the inclusion criteria of the study. Mean age (years) in the study was 61.63 ± 5.20. There were 143 (77.7) male and 41 (22.3) female patients. Frequency of occurrence of long QTc in patients presenting with acute hemorrhagic and ischemic stroke was 135 (73.4) and 49 (26.6) respectively.

Conclusion: The study concludes that frequency of patients with QTc prolongation in patients with stroke is higher in our setup. This Prolonged QTc is a useful predictor of impending clinical deterioration and may provide an opportunity for early intervention to reduce severe loss.

Keywords: Acute cerebral events, Stroke, QTc, Ischemic heart disease.

INTRODUCTION

Stroke is the third leading cause of morbidity and mortality worldwide[1]. According to the World Health Organization (WHO) estimates, developing countries account for 85% of deaths from stroke[2] and for the year 2020, stroke will stay the second leading cause of death along with ischemic heart disease (IHD) both in developing and developed countries[3]. During the last three decades there is decline in the incidence of the disease in the western population, whereas the burden of the disease in South Asian countries (India, Pakistan, Bangladesh, and Sri Lanka) is expected to rise[4]. In Pakistan exact epidemiological data is lacking, but in our daily practice we stroke is the commonest reason for admission in neurology and medical wards[5]. Rapid intervention after onset of a stroke can limit neurological damage and improve patient recovery of functioning[6].

Cardiovascular abnormalities, i.e. arrhythmias and ECG abnormalities, myocardial injury and cardiac dysfunction, as well as pulmonary edema are common manifestations in patients with NT-IH[7-9]. The data regarding these symptoms is mainly based on studies in patients with SAH, more specifically, in patients with aneurysmatic SAH. Different cardiovascular complications may occur independently or simultaneously in varying degrees of severity[10-15]. They may develop immediately or be delayed. It is unclear which patients will develop severe cardiovascular complications. There is evidence

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that these complications are more likely to occur with an increasing degree of neurological deficit[16-18].

Acute cerebral events play an important role in generating autonomic imbalance especially cardiac rhythm disturbances[19]. This forms the basis of significant lethal abnormalities of heart rate and rhythm like QTc prolongation, ventricular fibrillation, asystole, and ultimately death[9]. Patients with a prolonged QTc interval are more likely to die within 90 days compared with patients without a prolonged interval. QTD was demonstrated as an independent predictor of functional outcome and mortality following acute neurological events[20]. In another study, the change in QTD (calculated as the absolute difference between QTD measured on admission and on the last available ECG) was significantly higher in patients who died than in survivors, and was associated with changes in neurological function in patients treated with thrombolytic therapy for acute ischemic stroke[20,21].

Central nervous system-mediated cardiac injury is a field of mounting interest pertaining to brain-heart interactions. In a cross-sectional study design, we explored QT deviation patterns and their relation to the affected cerebral region in a series of patients with first acute ischemic stroke (the first stroke the patients had ever experienced). This research has been conducted to study the relation of QTc prolongation in patients suffering from hemorrhagic and ischemic stroke. This study can be used to compare the mortality rates of stroke patients having prolonged QTc and normal QTc. Also prolonged QTc can be included in the stroke prognosis scoring system, to predict the mortality and morbidity rates.

PATIENTS AND METHODS

It was a descriptive cross sectional study done in the department of medicine, Combined Military Hospital, Peshawar from 06 January 2017 to 07 July 2017.

Non probability consecutive sampling technique was used in the study. Using WHO calculator the sample size was 184. Administration permission from concerned authorities and ethical committee were taken. All cases of stroke, regardless of sex, ethnicity, religion and socioeconomic status fulfilling the inclusion and exclusion criteria were taken from the emergency department of the hospital and informed consent were taken from the patients except for cases in shock, confusion or coma where it was taken from the next of kin of the patient. Pertinent history including past medical and drug history, and laboratory tests were taken to fulfill the inclusion and exclusion criteria. This included the CT scan head or MRI brain whichever available, Blood complete picture, random Blood glucose, Serum Na, K, Ca and Mg. An ECG was recorded by a nursing staff and interpreted by me and QTc was measured by Bazett's formula. The value was entered in the predesigned performa attached as annexure. The proforma also included the patient's particulars and CT scan or MRI Brain findings. Exclusion Criteria included; (a) patients with subarachnoid

Table-I: Frequency of QTc Prolongation among age stratification.

	QTc Prolongation		*p*-value
Age Group	**Yes**	**No**	0.130
30-40 years	3(2.9%)	-	
41-70 years	102(97.1%)	79(100%)	

Table-II: Effect modifier like gender stratification with QTc Prolongation.

	QTc Prolongation		*p*-value
Gender	**Yes**	**No**	0.053
Male	87(82.9%)	56(70.9%)	
Female	18(17.1%)	23(29.1%)	

hemorrhage, (b) previous history of ischemic heart disease and/ or taking any anti arrhythmic drugs, (c) space occupying lesions of the brain, stroke of infective or infiltrative etiology, (d) electrolyte imbalance that may impart ECG changes not related to stroke, (e) known cases of diabetes mellitus, (f) patients on drugs affecting QT interval like fluoroquinolones, anti malarials, anti epileptic drugs.

Data was entered and analyzed by SPSS 17 statistical software. Means and standard deviations were calculated for numerical variables like age in years. Frequency and percentages were calculated for categorical variables like gender, stroke classification and QTc prolongation. Long QTc were stratified among age, gender and acute hemorrhagic and ischemic stroke to see effect modification. Post stratification was applied through chi square test to determine the value of *p*. A *p*-value≤0.05 would be considered significant. Funding was done by Combined Military Hospital Malir, Medical department.

RESULTS

There were 143 (77.7) male and 41 (22.3) female patients who were included in the study. There were 135 (73.4) acute ischemic patients whereas 49 (26.6) hemorrhagic patients. There were 105 (57.1) patients who had prolonged QTc. Effect modifier like age stratification was compared with QTc prolongation. There were 03 (2.9) patients who had prolonged QTc interval and aged between 30 – 40 years whereas there were 102 (97.1) patients who had prolonged QTc interval and aged between 41 – 70 years.

Effect modifier like gender stratification was compared with QTc prolongation. There were 87 (82.9) male patients who had prolonged QTc interval whereas 18 (17.1) female patient.

Table-III: Ischemic stratification and Hemorrhagic stratification and with QTc Prolongation.

	QTc Prolongation		*p*-value
Ischemic Stratification	**Yes**	**No**	
Yes	67(63.8%)	68(86.1%)	0.130
No	38(36.2%)	11(13.9%)	
Hemorrhagic stratification			
Yes	38(36.2%)	11(13.9%)	0.001
No	67(63.8%)	68(86.1)	

Table-IV: Effect modifier like Hemorrhagic startification with with QTc Prolongation.

	QTc Prolongation		*p*-value
Hemorrhagic	**Yes**	**No**	
Yes	38 (36.2%)	11 (13.9%)	0.001
No	67 (63.8%)	68 (86.1%)	

Effect modifier like ischemic stratification was compared with QTc prolongation. There were 67 (63.8) ischemic patients who had prolonged QTc interval. Chi-square test was used to compare ischemic stratification with QTc prolongation which was statistically significant (*p*-value 0.001).

Effect modifier like hemorrhagic stratification was compared with QTc prolongation. There were 38 (36.2) hemorrhagic patients who had prolonged QTc interval. Chi-square test was used to compare hemorrhagic stratification with QTc prolongation which was statistically significant (*p*-value 0.001).

Chi-square test was used; to compare ischemic stratification with QTc prolongation which was statistically significant (*p*-value 0.001) and to compare hemorrhagic stratification with QTc prolongation which was statistically significant (*p*-value 0.001).

DISCUSSION

There appears to be increased incidence of QTc prolongationin patients with acute ischemic

stroke at the time of ED presentation, independent of previously existing congenital heart disease, acute electrolyte abnormalities, or current medication regimen; however, QTc was not a predictor of cardiac mortality as the cause of death after an ischemic stroke[1]. There were 143 (77.7%) male and 41 (22.3) female patients and a similar study conducted by Stead *et al*[10] have showed that 56.5% patients were male and 43.5% were female.

In our study, mean age (years) was 61.63 ± 5.20 whereas a study conducted by Stead *et al*[10]. The mean age in years was 73.6 years.

In our study, there were 105 (57.1) patients who have prolonged QTc, whereas in an early study of 150 patients with acute stroke, Golstein[13] detected QT prolongation in 45% patients.

In our study, there were 135 (73.4) acute ischemic patients and 49 (26.6) hemorrhagic patients whereas a study conducted in 201311, 82% patients with ischemic stroke and 18% hemorrhagic patients.

A study conducted by Stead *et al*[10] found that men were more likely to have a prolonged QTc interval than women (42.6% v 26.7%, P 5.002), whereas in our study, there were 87 (82.9) male patients who have prolonged QTc interval.

In our study, there were 38 (36.2) hemorrhagic patients who have prolonged QTc interval. Similarly, a retrospective study conducted in Belgium by Sakr *et al*, in subarachnoid hemorrhage (SAH) patients, 34% of the patients had a prolonged QTc[16].

Although association between increased QT dispersion and ventricular rhythm has been evaluated extensively, but use of this electrocardiographic marker with the incidences of acute haemorrhagic stroke is relatively less studied[12]. Studies show repolarization abnormalities, manifesting as prolonged QTc in 44.2–68.29% of the patients having haemorrhagic stroke[17].

CONCLUSION

Frequency of patients with QTc prolongation in patients with stroke is significant in our setup which is a useful predictor of impending clinical deterioration and may provide an opportunity for early intervention to reduce severe loss. The study provides the basis for further research regarding the burden of this important cardiac rhythm disturbance which may help in modifying the stroke prognosis scoring system by incorporating the prolongation of QTc in the protocol.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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