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VALIDATION OF O B FAMILONI ECG ABNORMALITIES IN ISCHAMIC STROKE CASES

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Abstract:

Introduction: stroke or cerebrovascular Accident according to WHO is focal or global neurological deficit of vascular origin lasting more than twenty-four hours or resulting in death before twenty-four hours.

Stroke is a health condition with global impact, causing significant morbidity and mortality worldwide. Many economies of the world commit to combating this problem. Worldwide and especially in subsaharan Africa, the victims are mainly in the productive age ranges, leading to huge economic loss. Stroke is currently the second leading cause of death worldwide after Ischaemic heart disease. Most strokes are preceded by modifiable risk factors. Controlling these risk factors would reduce the occurrence, morbidity and mortality of stroke.

Objectives: To see if difference exist between the ECG of ischemic stroke patients in University of Benin teaching hospital and Familoni study in ischaemic stroke patients in Ogun state university teaching hospital, Nigeria.

Method: This was a cross sectional analytical study carried out in UBTH, Benin between January 2010 and 2013. The electrocardiographic abnormalities of 60 admitted ischaemic stroke patients in this study was compared with the electrocardiographic abnormalities of 64 ischaemic stroke patients in the Familoni study. The data was analyzed using SPSS 21 software. A p – value of < 0.05 was considered significant

Results: The most common ECG abnormality among both group of stroke patients was ischaemic changes (53.3% vs 54.7%) and arrhythmias (33.3% vs 34.4%) respectively without statistically significant difference, $p > 0.05$. However, the QT interval prolongation was significantly less common in this study (4.7% vs 43.5%, $p<0.05$).

Conclusion: This study largely found similar values with Familoni study, more so that both centers are in southern Nigeria. The variation in the QT interval seen in both studies should be further elucidated.

Introduction

Stroke according to World Health Organization (WHO) is an acute neurological deficit of cerebrovascular origin that persists beyond twenty-four hours or is interrupted by death within twenty-four hours. It has been projected that stroke could soon be the most common cause of death worldwide as it is currently the second leading cause of death in the world, ranking after heart disease.[1-9]

Globally there is an increasing trend in the burden of non-communicable diseases especially cardiovascular and cerebrovascular diseases particularly in developing countries. Across Africa and in Nigeria the prevalence of stroke is also increasing. This transition imposes more constraints in dealing with the double burden of communicable and non-communicable diseases in a poor economy characterized by inadequate health systems.

This has been attributed to more people now living up to and beyond middle age because of improvement in sanitation and reduction in prevalence rate of infectious diseases coupled with increasing use of tobacco, westernized lifestyle and urbanization with reduced physical activity, increased caloric consumption and psychosocial stress also been implicated.

These acts synergistically to cause increased cardiovascular and cerebrovascular risk via weight gain, hypertension, dyslipidaemia, dysglycaemia and hyperuricaemia. By year two thousand and twenty it is predicted that non-communicable diseases will cause seven out of every ten deaths in developing countries compared with less than half that is obtained today.[2-9]

About eight hundred thousand people in the United States, have stroke each year, one hundred and thirty thousand of them die each year. One American dies from stroke every four minutes on average. Stroke cost the United States, an estimated $36.5 billion each year. Worldwide, stroke is the second leading cause of death after ischaemic heart disease, and is followed by lower respiratory tract infections, chronic obstructive lung disease, diarrhea and HIV/AIDS, as the leading six killers worldwide as at 2013.[10,11]

The incidence of stroke increases exponentially from thirty years of age, and the etiology varies with age. Advanced age is one of the most significant stroke risk factors. Ninety five percent of stroke occurs in people aged forty-five and above, two-thirds of stroke occurs in those over the age of sixty-five. [3,12]

Disability affects seventy five percent of stroke survivors enough to decrease their employability and stroke can affect patients physically, mentally, emotionally, or its combination. The result of stroke varies widely depending on size and location of lesion. Thirty to fifty percent of stroke survivors suffer post stroke depression, which is characterized by lethargy, irritability, sleep disturbance, lowered self-esteem and withdrawal while up to ten percent of all stroke patients develop seizures most commonly in the weeks subsequent to the stroke event and the severity of the stroke increases the likelihood of a seizure.[8, 13-15]

Stroke can be classified into ischaemic stroke and haemorrhagic stroke.[2]

Ischaemic stroke occurs as a result of an obstruction within a blood vessel supplying blood to the brain. It accounts for about eighty seven percent of all stroke cases. The underlying condition for this type of obstruction is the development of fatty deposits lining the vessel wall. This condition is called atherosclerosis. These fatty deposits can cause obstruction mainly as shown below;

Types of Ischaemic Stroke

(a)Cerebral thrombosis. Refers to a thrombus that develops at the clogged part of the vessel. (b)Cerebral embolism. Refers generally to a blood clot in the cerebrovascular system from another location in the circulatory system, usually the heart and large arteries of upper chest and neck, these tend to be associated with atrial fibrillation and other heart diseases. (c)Systemic Hypo-perfusion. This is a general decrease in blood supply for example in shock. (d)Venous thrombosis. This leads to stroke due to locally increased venous pressures which exceeds the pressure generated by the arteries. These infarcts are more likely to undergo haemorrhagic transformation (leaking of blood into the damaged area) than other types of ischaemic stroke. (e) Cryptogenic stroke. This is stroke of unknown origin. Constitutes thirty to forty percent of all ischaemic stroke.[9, 16-19]

Less frequently used though stroke can also be classified based on the Oxford classification into 4 types;

(a) Total Anterior Circulation Infarct (TACI). (b) Partial Anterior Circulation Infarct (PACI). (c) Lacunar infarct (LAC). (d) Posterior Circulation Infarct (POCI). These four entities predict the extent of the stroke, the area of the brain affected, the underlying cause and the prognosis.[20, 21]

Fure B in Norway studied two hundred and seventy-nine acute ischemic stroke patients and found ECG change of prolonged QT of 36%, ST depression of 24.5%, atrial fibrillation of 19.9% and T wave inversion of 17.8%[22]

Familoni O B in Shagamu, Nigeria studied sixty-four acute ischaemic stroke patients and found prolonged QT cmax in 43.8%, ST depression in 29.7%, T wave inversion in 21.8% and U wave in 9.3%[23].

Arboix A. in Barcelona, Spain carried out a prospective clinical study on one thousand patients with cerebral infarction (CI) (nine hundred and fifty-six lacunars and forty-four non lacunar infarctions) and in a control group (CG) (n= 1000) without organic cerebrovascular diseases to evaluate the ECG abnormalities. Seventy two percent of CI and thirty eight percent of CG had ECG abnormalities. These abnormalities were significantly more common at the beginning of the disease (72%) then three weeks after the development of focal neurological symptoms (72% vs 54%). The major ECG findings were abnormal ventricular repolarization (changes in the ST segment and the T-wave); prolonged QTc interval, and U-waves. Atrial fibrillations were significantly more common in no lacunar infarctions than lacunar infarctions (18% vs. 2%) and in the CG (5%)[24].

Liao J in Ontario, Canada, evaluated Holter monitoring of ECG in five hundred and eighty-eight participants, new atrial fibrillation/flutter was detected in 4.6% of consecutive patients with ischaemic stroke. Duration of monitoring ranged from twenty-four–seventy-two hours. These same authors mentioned two studies (140 participants) which evaluated event loop recorders after Holter monitoring. New atrial fibrillation/flutter was detected in 5.7% to 7.7% of consecutive patients. Liao concluded that screening consecutive patients with ishaemic stroke with routine Holter monitoring will identify new atrial fibrillation/flutter in approximately one in twenty patients[25]

Dogan in Turkey studied two hundred and twenty-two stroke patients and compared ECG abnormalities in both ischaemic and Heamorrhagic strokes. Sixty five percent of ischaemic stroke patients had ischaemic-like ECG changes and also fifty seven percent of Haemorrhagic stroke patient. Atrial fibrillation was more frequent in ischaemic than Haemorrhagic stroke (34% vs. 13%, P = 0.01) other ECG changes were not different in both groups [26]

Methods

Data from 60 ischaemic stroke cases in University of Benin teaching hospital, Benin city, Nigeria was compared with 64 ischaemic stroke cases in Ogun state University teaching hospital, Shagamu, Nigeria.

Study area/design: This study was carried in the University of Benin Teaching Hospital (UBTH) which is one of the six first generation hospitals in Nigeria that offers secondary and tertiary care to patients in Edo and neighbouring states. This was a descriptive study that assessed the difference of electrocardiographic abnormalities between haemorrhagic and ischaemic cases.

Sampling method: A simple non-randomized sampling method was used in selecting patients recruited for this study. One hundred and twenty patients presenting for the first time with clinical features and imaging findings of stroke (CT brain scan was performed in all cases) and were admitted into the UBTH medical wards. They had a detailed history and physical examination finding entered into the data acquisition sheet. ECG was performed on the stroke patients within the first twenty-four hours of presentation.

Inclusion criteria:

a) Patients that have first ever occurrence of stroke.
b) Patients that are eighteen (18) years old and above.

Exclusion criteria:

a) Patients that have two or more occurrence of stroke (recurrent stroke)
b) Patients less than eighteen (18) years of age.
c) Patients that died within 7 days of presentation.
d) HIV positive patient.
e) Patients with malignancies.
f) Patients on immunosuppressive therapy.
g) Patients with electrolyte abnormalities.

Data analysis: Anthropometric measurement and data collected using the preformat were collated and analyzed using the International Business Machines Statistical Product and Service Solutions (IBM- SPSS) version 22. Data were presented using tables and charts. Frequencies and percentages were used to present categorical data while continuous data were expressed as mean (Standard Deviation). Frequencies were compared using the Pearson's Chi-square test while means were compared using the independent t-test. Where the data was skewed, continuous data were expressed as mean (inter-quartile range) and compared using the Mann Whitney U test. Significant chi-square comparisons were further tested using a binomial logistic regression where applicable. A p value less than 0.05 were considered significant for all statistical comparisons.

Results

ECG observation in Ischaemic CVA patients in UBTH and Familoni study

Group	\UBTH		FAMILONI	
	N	%	N	%
Total	60	100.0	64	100.0
Ischaemic changes	32	53.3	35	54.7
Arrhythmias	20	33.3	22	34.4
Prolong QT	4	6.7	28	43.5

Table compares ischaemic CVA patients in UBTH and O.B. Familoni study Sixty patients had ischaemic CVA in UBTH study and had abnormalities on their ECG. Familoni looked at sixty-four ischaemic CVA patients with ECG abnormalities. This was not statistically significantly different, $p > 0.05$. Ischaemic changes (comprising ST depression, T wave inversion and U waves) was present in thirty-two (53.3%) and thirty-five (54.7%) patients in UBTH and Familoni studies respectively and did achieve statistically significant difference. U waves were absent in UBTH study

Twenty (33.3%) and twenty-two (34.4%) patients in the UBTH and Familoni study had arrhythmias respectively. The difference was not significant, $p > 0.05$. Four (6.7%) and twenty-eight (43.8%) patients in the UBTH and Familoni study had prolong QT interval. This difference was significant, $P < 0.05$.

Discussion

This study largely found similar values with Familoni study, more so that both centers are in southern Nigeria. The variation in the QT interval seen in both studies could be explained by variables as follows;

(1) both studies had ECG recording within twenty-four hours of admission but the lacunar between stroke onset and patient presentation to the hospital varies. (2) Though overt heart disease patients were excluded in this study, no pre-stroke ECG records were done in both studies, therefore underlying sub-clinically heart disease could be at various stages. (3) In this prospective study, electrolyte and urea abnormality patients were excluded but Ca^+ and Mg^+ in both studies and K^+ in Familoni OB retrospective study was not documented as excluded.

These could have been responsible for the difference in QT interval but should be further elucidated by other studies.

Conclusion

This study largely validated Familoni work on electrocardiographic abnormalities in stroke patients

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