Computerized Tomography Findings of Cerebrovascular Disease in Adults in Calabar, Nigeria

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ABSTRACT

Background: Computerized Tomography (CT) findings of Cerebrovascular Accidents (CVA) in patients in Calabar, Nigeria, have not been previously reported. The aim is to document the CT findings and the pattern and demographic features of the condition. **Materials and Methods:** We prospectively studied 87 consecutive patients, presenting over a 12-month period with diagnosis of stroke. The sociodemographic and clinical data as well as the CT findings were collected. Statistical analysis was done using the computer software STATA 10 corp., Texas, USA. **Results:** There were 49 males and 37 females with a median age of 56 years (45.75-67). The ischemic type of CVA predominated, (81.4%), with no significant gender difference (P = 0.99). The peak age of stroke was in those less than 50 years (33.7%). The individuals with hemorrhagic stroke were younger than those with ischemic stroke (median of 48 and 59 years, respectively). **Conclusion:** Stroke incidence in Calabar has evolved so much, as to affect a much younger age group and the female to male ratio is fast approaching equality. The hemorrhagic type tends to affect younger males. It is recommended that young people presenting with stroke in the Calabar area, particularly where a CT scan is not available, must be suspected to have a hemorrhagic stroke.

Key words: Alcohol; Calabar; cerebrovascular accidents; computerized tomography; sedentary lifestyle; stroke

Introduction

Cerebrovascular disease (CVD) is a focal neurological deficit of vascular origin lasting more than 24 hours and often preceded by a transient ischemic attack in 10–15% of the cases.[1] Cerebrovascular disease is synonymous with the word 'stroke,' and therefore, may be used interchangeably. Transient ischemic attack (TIA) is a neurological deficit of vascular origin, but with complete resolution within 24 hours. CVD is the most common cause of neurological morbidity and mortality in adults,[2] with ischemic stroke accounting for the majority of cases (80%) globally.[1] The onset of symptoms may be sudden, especially in the hemorrhagic type or gradual in the ischemic type.[1] However, the features are similar in both types, but the deficits vary according to the location and severity of the bleed or infarct. With advances in technology, imaging has become integral for the evaluation and management of acute stroke patients.[3-5] A non-enhanced computed tomography (CT) scan has been shown to be the first imaging tool for diagnosis of cerebral hemorrhage and infarcts, to rule out other brain lesions that may mimic CVD, such as, tumors, extradural hematomas, and abscesses.[3,6]

Computed tomography angiography, with and without perfusion studies, rapidly provides visualization of the blood flow and visualizes vascular occlusions, as well as assesses for salvageable brain tissue.[5] Magnetic Resonance Imaging (MRI) has emerged as an invaluable tool for the care of stroke patients, whereas, diffusion-weighted MRI imaging is more sensitive for the detection of hyperacute ischemia, an advantage CT lacks; gradient-echo MR sequences can be helpful in detecting hemorrhage.[7-9]

Unfortunately, MRI is expensive and out of the reach of most individuals in this region. It is also not available in our institution at this time. A CT scan has only become available in our environment about a year ago.

This study aims to document the CT scan findings in stroke patients in Calabar and its environs, from January to December 2012. No documented evidence in literature exists

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for this environment. The findings may assist physicians to better evaluate patients with CVD, thus enhancing prompt and appropriate management and improved prognosis.

Materials and Methods

This was a prospective, descriptive study, carried out on patients who presented with features of CVD (including hemiparesis, hemiplegia, reduced consciousness, loss of speech or vision, and anosmia) at the University of Calabar Teaching Hospital (UCTH), Calabar, between January and December 2012.

An informed consent was obtained from the patients before commencement of the study and details about their condition were recorded in a questionnaire.

Data obtained from each patient included age, gender, and duration of symptoms. Patients who had a history of head injury in the preceding six months were excluded from the study. The criteria for classification of strokes included, acute infarcts (those presenting within the first 24 hours), subacute infarcts (those presenting for a CT scan between one and seven days), and chronic infarcts (those presenting after one month). All scans were done using a fourth generation General Electric (GE) CT machine, one slice with the following specifications: Maximum kilovoltage 120, minimum kilovoltage 100, minimum milliamperage 100, maximum milliamperage 120, and slice thickness 3 mm from the base of the skull to the vertex.

All images were reformatted in all the cases, for a better analysis. The collected data was entered into the computer software STATA 10 Corp., Texas, USA. The data was summarized using frequencies, proportions, and means.

Results

Eighty-seven patients who presented with clinical stroke (37 females and 49 males) with a male: Female ratio of 1.32:1 (P = 0.99) were referred for a cranial CT scan over this period. Sixty-five (75.58%) of them had a CT that confirmed CVD. Others either had normal findings or were classified as stroke mimics [Table 1].

Out of these 65, ischemic stroke occurred in 47 (81.03%), while 11 (18.97%) had hemorrhagic stroke. All the hemorrhagic strokes occurred in males [Table 2].

Only 58 (89.23%) patients had documented evidence of the time of onset of the stroke. Therefore, they were further analyzed. Thirty-five presented with acute infarcts, two were subacute and 11 were chronic infarcts. The total number of hemorrhagic CVDs was 11 and all were seen during the acute phase [Figures 1-3].

The age range of patients presenting with a clinical stroke was 26 to 93 years. Those with CT-confirmed stroke had a median of 56 years (interquartile range 45.75 - 67 years) [Table 3].

The peak age of occurrence was in those less than 50 years of age [Table 3]. As shown in Table 4, individuals with hemorrhagic stroke were younger than those with ischemic stroke (P = 0.008). Most of the cases affected the left hemisphere, while 6.6% were bilateral [Figure 4]. The most common site of affectation was the parietal lobe, either occurring alone, in 27 (47.4%), or in combination with other sites [Figure 5].

Table 1: Distribution of stroke by gender

Clinical diagnosis	Sex		Total	Key
	M	F		
Stroke	37	28	65	Frequency
	56.92	43.08	100.00	Row percentage
	75.51	75.68	75.58	Column percentage
Others	12	9	21	Frequency
	57.14	42.86	100.00	Row percentage
	24.49	24.32	24.42	Column percentage
Total	49	37	86	Frequency
	56.98	43.02	100.00	Row percentage
	100.00	100.00	100.00	Column percentage

χ^2=0.0003 P=0.99

Table 2: Stroke-type by gender

Stroke type	Sex		Total
	M	F	
Haemorrhagic	11	0	11
	100.00	0.00	100.00
	30.56	0.00	18.97
Ischaemic	25	22	47 100.00
	53.19	46.81	81.03
	69.44	100.00	
Total	36	22	58
	62.07	37.93	100.00
	100.00	100.00	100.00

χ^2=8.30; P=0.004

Table 3: Distribution of stroke by age

Age (years)	Frequency (%)
<50	29 (33.7)
50-59	21 (24.4)
60-69	18 (20.9)
≥70	18 (20.9)
Total	86 (100)

Table 4: Stroke-type by age

Stroke type	Median *N*	Interquartile median age (years)	Standard deviation interquartile range
Haemorrhagic	11	48	40-53
Ischaemic	47	59	48-70
Total	58	55.5	48-66

z=−2.65z P=0.008; SD – Standard deviation

Figure 1: Cerebral edema over the right frontoparietal lobe obscuring the insular region in a 71-year-old man. CT scan done after 15 hours

Figure 2: Acute hemorrhage in the left basal ganglia region in a 48-year-old man. CT scan done four days after

Figure 3: Chronic infarct right parietal lobe in a 44 year old. CT scan done five weeks after

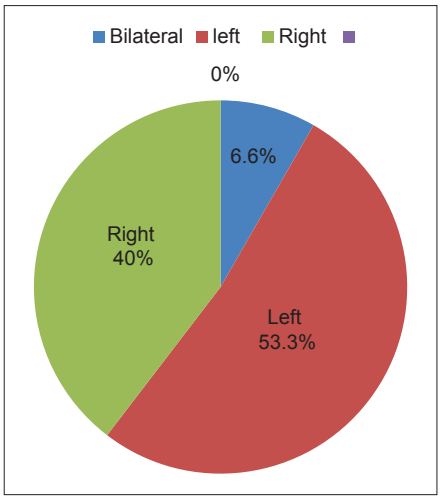

Figure 4: Distribution of stroke by cerebral hemisphere

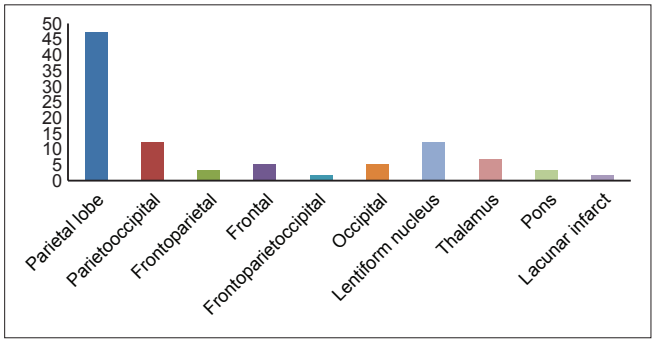

Figure 5: Anatomical location of stroke

Discussion

Cerebrovascular accident is one of the leading causes of disability and death in the elderly. It is documented to be the third most common cause of death in the developed countries.[1,3] A CT scan is the first line imaging modality used in the diagnosis and follow-up of patients with CVD where available. However, studies have shown that even with the most modern CT scan facilities, ischemic strokes will go undetected for the first few hours.[10-12] Subtle findings that may be seen in the first six hours include a hyperdense artery sign, obscuration of the lentiform nucleus, and loss of the gray-white interfaces. The last two occur as a result of vasogenic edema.[13] The last two develop after six hours of reaching its peak, between 24 and 48 hours after onset of ischemia, and are recognized on a CT scan as a low attenuation in the affected region. The hyperdense vessel sign occurs as a result of an acute thrombus within a big vessel, usually the middle cerebral artery (MCA).[14] In the index study, it was seen only in the MCA. Stroke patients presenting with normal CT findings within three hours of onset can be offered intravenous thrombolysis, with excellent prognosis recorded. None of our patients presented within the first six hours after the stroke occurred, likely because of financial constraints and non-orthodox beliefs and practices, such as witchcraft, or a belief that when a patient is struck by stroke he is literally said to be struck by a ghost or witch. Hospital care

becomes necessary only when the patient worsens or does not quickly respond to non-orthodox methods.

This study revealed a relatively higher stroke incidence in Calabar, when compared with studies such as that by Komolafe *et al*.[12] in Ife, Southwest-Nigeria, where only 135 patients presented with stroke over a six-year period, and that conducted in Saudi Arabia,[15] which showed 71 patients over a four-year period. This is probably related to men engaging in early and intense consumption of alcohol and tobacco smoking as well as a sedentary lifestyle and oily diets in the Calabar area.

Although there were more males than females in the present study, the difference did not reach statistical significance (P = 0.999). This contrasts with other studies done within Nigeria. The study done in Enugu by Eze *et al*.[3] recorded a male to female ratio as high as 4.1:1 in ischemic and 3:1 for hemorrhagic strokes. Ikeh *et al*.[16] in another study conducted in the University of Nigeria Teaching Hospital, Enugu, showed a male to female ratio of 5.1:2 for cerebral infarction. This may be related to the fact that the culinary culture in Calabar area promotes obesity in females and to the fact that obesity in females is admired in this culture.[17] Furthermore, the Calabar society is matrilineal when compared with other parts of the country, thereby exposing women to near equal stress as men.[17] These stress factors have been reported to play an important role in the onset of hypertension, and therefore, stroke.[18]

Our study has revealed a great number of acute infarcts. Acute infarcts have been defined as those occurring within 24 hours,[19-22] whereas, subacute infarcts are those that occur in one to seven days, and chronic infarcts occur in one month and beyond.[22] The type of findings noted in the acute phase include: Hyperdense vessel sign, obscuration of lentiform nucleus, and varying types of cerebral edema, depending on the severity of the vessel affectation.[14] It has been noted that other studies done within the country have not classified stroke according to the time of presentation, making our study quite unique.

Subacute stroke was noted in only two cases, both presented with hemorrhagic transformation of the infarct.

Chronic infarcts, presented after one month, they all presented as extensive areas of infarcts, some had become encephalomalacic, a known complication.[21,22]

The hemorrhagic type of CVD occurred in the younger age group. This is in contrast to the findings of Eze *et al*.,[3] in Enugu, Southeast-Nigeria, who showed that hemorrhagic CVD was significantly more common in patients between 60 and 90 years of age, whereas, the ischemic type was seen in the 50-59 year age group. This could be explained by the fact that the young males in Calabar, besides leading a sedentary lifestyle, had an early exposure to smoking and alcohol. A study conducted in Nepal revealed the combination of smoking and alcohol drinking to be the highest risk factor for hemorrhagic stroke.[23]

Our study also showed that the highest incidence of CVD was in individuals aged below 50 years, the youngest being 26 years. This differs from the study from north eastern Nigeria by Watila *et al*.[24] which showed that the 56-65 year age group recorded the highest incidence. The North Eastern Nigerian trend was similar to the south eastern Nigerian trend, which showed the highest incidence, 113 (22.54%), in the 50-59 year age group.[3] The probable explanation again could be because of the culinary and sedentary lifestyle of the Calabar environment in Nigeria. It is also possible that the younger men are more likely to carry out a CT scan and aim for expert and prompt treatment because the stroke occurs in the prime time of their lives.

Only one young male (31 years) presented with a primary subarachnoid hemorrhage. The clinical evaluation suggested the cause of the subarachnoid hemorrhage to be a ruptured Berry's aneurysm. Four out of the 87 individuals presented with a subdural hematoma. About three had seizure disorders and although they clinically presented with a stroke, the CT studies turned out negative. The patients who had a negative CT scan illustrated the limitation of a clinical examination and the need for a CT scan to be present in every facility that managed these patients.

The study showed again that the left cerebral hemisphere was more affected than the right hemisphere. The explanation for this is unclear. The parietal lobe and lentiform nucleus, especially the internal capsule, were the anatomical sites most involved. The middle cerebral artery, which is the largest artery that supplies blood to the brain,[14] also supplies to these sites and this may explain why these regions are most commonly affected.

Conclusions

Our study has revealed a relatively higher incidence of stroke in the Calabar area, with the gender difference being insignificant. The younger age group recorded a higher incidence of stroke, more so in the hemorrhagic type. The likely contributory factors to all these findings include the culinary and sedentary lifestyle, as well as early introduction to alcohol and smoking, as also the society being more matrilineal compared to other environments in Nigeria. The left cerebral hemisphere, especially the parietal lobe, has been more commonly affected.

We recommend that young people presenting with stroke in the Calabar area, particularly where a CT scan is not available, must be suspected to have hemorrhagic stroke, till proven otherwise.

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