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<th>Publisher</th>
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Re: [SPAM] Enquiry on status of submitted manuscript

Friday, June 27, 2008 12:37 AM

Dear Dr. Ikenna Onwuekwe,

Your article is under the last proof-reading of our co-editor. It will going to be published in the following issues of 2008.

Editor

Prof. Nezih Oktar MD

--------Original Message--------

From: Ikenna Onwuekwe
Date: 26.06.2008 13:46:48
To: editor@jns.dergisi.org
Cc: canan.akkoc@pleksus.com.tr, info@jns.dergisi.org
Subject: [SPAM] Enquiry on status of submitted manuscript

Dear Sir,

Please accept my deep regards.

I write seeking to know the status of the manuscript i submitted as a 3rd revised document ' stroke minicis - a CT base study of Nigerian African stroke patients' with reference number JNS 1775.REV-3?

I hope it was to your satisfaction?

Thank you for your anticipated response.

Yours truly,

Dr. Ikenna Onwuekwe

EGE UNIVERSITESI

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http://us.mail.yahoo.com/mc/showMessage?rid=1&sort=date&order=dow... 01/07/2008
Title: Stroke mimics - A study of CT images in Nigerian African stroke patients.

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Grant support: None
Summary

Background: Stroke is a major cause of morbidity and mortality worldwide. In African countries stroke accounts for 4-9% of deaths and between 6.5-41% of neurological admissions in hospital based studies.\(^1\) Sophisticated neuroimaging modalities for the investigation of suspected stroke have been available especially in developed societies thus enhancing the accurate diagnosis of stroke in many cases. However in sub-Saharan Africa these facilities are found in very few centres. In Nigeria, the country with the largest black population, computerized tomography became available in few centres only in the recent years and is largely unaffordable for most patients with stroke.

Aim: This retrospective study sought to examine the computerized tomography findings in Nigerian patients with a prior clinical diagnosis of stroke and to establish a comparison between the radiological and clinical diagnosis of stroke as made by the physicians with a view to identifying stroke mimics.

Methodology: A retrospective review was done of the medical and computerized tomography records of all patients with a clinical diagnosis of stroke who were referred to the Memfys Hospital for Neurosurgery Enugu for brain scan over a four and half year period (January 2003- June 2007). The data obtained was analysed using Statistical Package for the Social Sciences version 11.

Results: A total of 2207 patients had brain scan over the period with 142 (6.4%) being referred with a prior diagnosis of stroke. There were more males 102(71.8%) than females 40(28.2%). The mean age of the patients was 54.4 years. Computerized tomography scan confirmed the clinical diagnosis of stroke in 93 patients (65.5%) while 33 patients (23.2%) had stroke mimics. A negative scan was found in 16 patients (11.3%). The clinical accuracy for stroke diagnosis was thus 65.5% while diagnostic errors were made in 34.5% of the patients especially those at extremes of age.
Conclusion: Despite the use by physicians of clinical scoring systems in the diagnosis of stroke in Africa, it is evident that a significant rate of misdiagnosis exists with potential implications for the provision of adequate care of patients. There is a need to improve the accessibility and affordability of CT scan in the continent.

Key words: stroke, mimics, Nigerians.
Introduction

Stroke is defined as focal or global neurological deficit of cerebrovascular origin, lasting more than 24 hours or leading to death. Stroke can be classified as either ischaemic and haemorrhagic. In the developing countries especially, stroke is diagnosed readily without recourse to sophisticated investigations like CT or magnetic resonance imaging (MRI). Consequently many presumed stroke patients are managed blindly until they die or recover. The extent of this problem has been studied in few African countries with little attention paid to it in Nigeria, the most populous country on the continent.

Stroke workup has greatly advanced in recent times with magnetic resonance imaging based modalities gaining a lot of acceptance. However because of availability, cost and professional competence computer tomography is still the investigation modality of choice. In Nigeria CT is still not available in most institutions and in almost all cases it is not done in the emergency room. In several institutions this is changing. At Memos Hospital for Neurosurgery Enugu (MHNE), which at the time of this review was the only centre offering CT scan in the whole of South East and South South Nigeria, these patients are seen days after initial assessment by the referral physician. The estimated population of the region is 40 million.

The stroke burden in Nigeria is considerable. In South West Nigeria Omoetokun et al found a community prevalence of 58-405/100,000 and a crude annual mortality rate of about 700/100,000 per year for stroke while Akinlabi and co-workers reported a stroke incidence rate in Ibadan of about 26 per 100,000.4 Njoku et al reported that stroke constituted 0.36% of total hospital admissions in Sokoto, North East Nigeria.5 For South East Nigeria data is limited.
Materials and methods

During the period covered by this study, Memfys Hospital for Neurosurgery Enugu (MHNE) served as the only facility offering CT services for the entire South East and South South zones of Nigeria with a combined population of more than 45 million. It is a privately owned facility.

All the medical and CT records of patients with a clinical diagnosis of stroke who were referred to the MHNE for CT over a four and half year period from January 2003 to June 2007 were obtained and reviewed. Relevant data was obtained and statistical analysis was done using SPSS version 11.
Results

A total of 142 patients diagnosed with stroke were referred to the MHNE for brain CT. This constituted 6.4% of the total number of 2,207 patients who used the facility in the study period. There were 102 males (71.8%) and 4% females (28.2%) with a M:F ratio of 2.55:1. The mean age of the stroke patients was 54.4 years with a range of 7 months to 88 years (SD 16.9). The M:F ratios in confirmed stroke patients were 2.15:1 for ischaemic stroke, 2:1 for intracerebral haemorrhage and 2.3:1 for subarachnoid haemorrhage.

The clinical diagnosis of stroke was confirmed by CT in 93 patients (65.5%). In 33 patients (23.2%), there were other intracranial pathologies present which masqueraded as stroke while a normal “negative” scan was obtained in 16 cases (11.3%). There were 51 cases of ischaemic stroke (55%), 27 cases of intracerebral haemorrhage (29%) and 15 cases of subarachnoid haemorrhage (16%). The conditions that clinically mimicked a stroke included subdural haematoma, intracranial neoplasm, hydrocephalus, intracranial cyst and abscess. Table 1 shows the distribution of the CT results. The clinical accuracy for stroke diagnosis was thus 65.5% while diagnostic errors were made in 34.5% of the patients especially those at extremes of age.

The tendency to make a clinical misdiagnosis of stroke was most common for patients in the 2nd, 3rd and 8th decade of life. The sensitivity of the clinical stroke assessment was 0.66 while the specificity was 0.33.

Below the age of 40 years the commonest finding in all the patients scanned was stroke. Of the 17 patients with this “stroke in the young”, 10 (58.8%) had ischaemic stroke, 5 (29.4%) had intracerebral haemorrhage and 2 (11.8%) suffered subarachnoid haemorrhage.
Discussion

Stroke is a major cause of morbidity and mortality among middle aged Africans. The outcome of stroke is dependent on early diagnosis and treatment. CT of the brain is the standard for categorizing the various stroke subtypes and thus enables the formation of an ideal stroke registry. Only 6.4% of patients referred to the MNHE were for stroke cases and this reflects the still unacceptably low utilization of this modality by clinicians.

In CT confirmed stroke cases the male to female ratio was 2.55:1. This is comparable to studies done elsewhere in Nigeria and supports the fact that stroke is commoner in males. At the University of Maiduguri Teaching Hospital (North East Nigeria) the male to female ratio was 2.5:1. In another study by Ogun et al, the male to female ratio was 2.4:1 and at the University of Nigeria Teaching Hospital Enugu the male to female ratio is 1.27:1. The mean age was 54.4 years. It is well known that the peak age of stroke depends on so many variables including race and ethnicity. The study in South East Nigeria by Onuaveke et al showed a similar peak age of 53.5 years. At Maiduguri, North East Nigeria, it was also similar at 54 years while in the South West several studies by Ogun et al and Kolapo et al in different stroke cohorts showed mean age to be between 54 - 60 years. It may well be that the peak age of stroke is lower in Africans.

Connor and co-workers in South Africa reported an even lower mean age of 48 years in their series. Poor health seeking habits, a high prevalence of risk factors other than atherosclerosis as well as a high stroke burden in the young may be contributory factors.

The commonest CT finding in subjects below 40 years of age was stroke, 17 cases in all. This age group made up 18.3% of all referrals and about 18.2% of all confirmed stroke cases. A similar finding was reported by Nwoeu et al who found 10-20% of all strokes in the tropics occurring in the young (age < 40 years). In as much as it has been suggested that the high stroke prevalence in Africans might be due to the
stroke burden in the young infections, haemoglobinopathies, drug use and malnutrition may also be contributory. Shriver et al reported 12% of strokes to occur in persons below forty years.12

The distribution of the stroke subtypes by CT in this study compares well with several other studies. Ischaemic stroke was commoner as was reported in the South West of Nigeria by Owolabi et al 13 (56% ischaemic and 44% haemorrhagic) and Ogun et al 7 (48% ischaemic and 40.7% haemorrhagic). These results however contrast with the data commonly reported from Southern African countries where cerebral haemorrhages are more frequent.14-17 This finding once more stresses the peculiar regional and racial variations in disease presentation. More studies involving larger numbers of patients would need to be carried out to further examine this relationship in African stroke patients.

The proportion of haemorrhagic stroke was high in patients below the age of 40 - 41% compared to the overall proportion which was 29%. This supports the finding that haemorrhagic strokes are commoner in the young.

The diagnostic accuracy was 65.5% and this compares favourably with the frequency of 68% obtained by Ogun et al in South West Nigeria.7 Stroke mimics in this study included intracranial neoplasms, subdural haematoma and hydrocephalus. Other findings were cysts, brain atrophy and encephalomalacia. CT showed no abnormality in 11.3% of stroke patients. Errors of diagnosis were more common in the 2nd, 3rd and 4th decades of life. It is possible that lacunar strokes account for the 11.3% of patients that had no CT findings and those with atrophy, hydrocephalus and encephalomalacia. It must be noted that CT is not 100% sensitive and the overall sensitivity depends on the duration of stroke before scanning. In some large series lacunar strokes, undetectable by CT, account for 15% - 30% of cases.18
The clinician assessment for stroke in this study had a sensitivity and specificity of 0.66 and 0.33 respectively. Several studies have compared the clinician bedside assessment with validated scoring systems and CT findings. Coovatt et al in South Africa demonstrated that the Siriraj and Guy's Hospital Stroke Scores did not offer much advantage over the clinician assessment which had sensitivity and specificity values of 0.60 and 0.93 in cerebral haemorrhage while for ischaemic stroke it was 0.79 and 0.60 respectively. This conclusion was similarly demonstrated in Turkey by Ozeren et al. in Sweden bedside clinical diagnosis for stroke was accurate in 87% of cases. It is however conceded that these stroke scoring systems are useful, especially in resource poor settings, to determine the presence of cerebral haemorrhage.

In considering the significance of this study, several limitations must be recognized. Like all retrospective studies it is difficult to evaluate the accuracy of the referral clinical diagnosis. The CT diagnosis has an observer bias especially if the findings are not definite. There is also referral bias, CT scans in general are expensive for most Nigerians and as such affordability can influence referral. Similarly it is possible that unawareness of the existence of such a facility at the MNHE can influence the study outcome.

Conclusion

Stroke mimics are common differentials of strokes. Despite a level of accuracy of clinician assessment for stroke, this study shows a significant percentage of misdiagnosis in patients referred for CT scan, indicating that more emphasis needs to be laid on continuous medical education, training and retraining of medical practitioners. The high proportion of haemorrhagic strokes among Nigerians coupled with the significant nature of stroke in the young suggest a strengthening of public health measures to reduce the prevalence of known risk factors. Strokes in blacks carry high fatality rates and poor outcome even if the
patient survives. The need for functional stroke units and intensive care units cannot be overemphasized. It must be understood that there exists a continuum of care that ranges from stroke risk factor reduction and prevention to rehabilitation.

The sensitivity of clinical stroke scores varies with the population studied and may not be relied solely for diagnosis of stroke. Areas for further research include collection of comprehensive stroke incidence and mortality data to define differences in rates among different ethnic, socioeconomic, racial and geographic regions of Africa.

Acknowledgement

We are grateful to the members of staff of the Medical Records Department of the Memfys Hospital for Neurosurgery Enugu for their assistance in the course of this study.
References


Table 1 showing the distribution of findings by brain CT

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<th>Pathology found</th>
<th>Number of patients</th>
<th>%</th>
<th>Cumulative %</th>
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<tr>
<td>Ischaemic stroke</td>
<td>51</td>
<td>35.9</td>
<td>35.9</td>
</tr>
<tr>
<td>Intracerebral haemorrhage</td>
<td>27</td>
<td>19.0</td>
<td>54.9</td>
</tr>
<tr>
<td>Subarachnoid haemorrhage</td>
<td>15</td>
<td>10.6</td>
<td>65.5</td>
</tr>
<tr>
<td>Subdural haematomata</td>
<td>8</td>
<td>5.6</td>
<td>71.1</td>
</tr>
<tr>
<td>Intracranial neoplasms</td>
<td>6</td>
<td>4.2</td>
<td>75.4</td>
</tr>
<tr>
<td>Abscess</td>
<td>1</td>
<td>0.7</td>
<td>78.1</td>
</tr>
<tr>
<td>Hydrocephalus</td>
<td>10</td>
<td>7.0</td>
<td>83.1</td>
</tr>
<tr>
<td>Nothing &quot;negative&quot; found</td>
<td>16</td>
<td>11.3</td>
<td>94.4</td>
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<tr>
<td>Cyst</td>
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<tr>
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<td>Atrophy</td>
<td>4</td>
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