ORIGINAL ARTICLE

Pattern and location of intracerebral hemorrhage in Enugu, South-East Nigeria: A review of 139 cases

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Abstract

Introduction: The incidence rates and location of nontraumatic intracerebral hemorrhage (ICH) have been shown to vary between population and races. Knowledge of ICH patterns may give some insight into the etiology of ICH and help reduce its burden particularly among Africans where health infrastructure is poorly developed. We present a retrospective review of ICH using a modern neuroimaging technique.

Objectives: To determine the pattern and location of ICH among patients presenting in a tertiary hospital in Enugu.

Methods: All the medical and computer tomography records of patients with a clinical diagnosis of hemorrhagic stroke with the location of hemorrhage clearly specified and complete patients' data were reviewed. The study duration was 11 years (January 2003 to December 2013). Relevant data were obtained, and statistical analysis was done using SPSS version 19 (IBM Corporation, New York, USA).

Results: A total of 139 (17.4%) out of 799 scans done over the period under review were analyzed. The frequency of lobar and deep cerebral hemorrhages (LH and DCHs) was 46.8% and 53.2%, respectively. The most common types of hemorrhage in men and women were deep cerebral (52.2% and 55.3%, respectively). Five percent (7/139) of all hemorrhages occurred in the cerebellum. Age distribution of the location of ICH shows that LHs peaked at 16–39 years while DCHs peaked at 40–49 years. There was not statistically significant difference between mean ages of occurrence of LH and hemorrhages of other locations.

Conclusion: Frequency of LH and DCH varied with age as LH peaked before the age of 40 while deep cerebral at 40–49 years. The age distribution of different types of ICH may suggest a higher role of other factors apart from hypertension. Further studies are required to establish the risk factors of LH and DCHs in our environment.

Key words: Deep cerebral hemorrhage, intracerebral hemorrhage, lobar hemorrhage, Nigeria

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Introduction

Stroke is the second leading cause of death worldwide and one of the leading causes of disability.[1] Intracerebral hemorrhage (ICH) is the second most common subtype of stroke with a worldwide incidence of 24.6–29.2/100,000 person-years and approximately 40,000–67,000 cases per year in the United States.[1,2] It accounts for up to 29–45% of all strokes in hospital- based studies in Nigeria.[3,4]

ICH may be lobar hemorrhage (LH) or deep cerebral hemorrhage (DCH) (including brain stem and cerebellar).

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The incidence rates and location of nontraumatic ICH have been shown to vary between population and races.[5-10] While hypertension is a common cause of all subtypes of ICH, cerebral amyloid angiopathy, arterio venous malformation, infections, hemoglobinopathies, and bleeding disorders are much more likely to cause LH.[11,12] Knowledge of ICH patterns may give some insight into the etiology of ICH and help reduce its burden particularly among Africans where health infrastructure is poorly developed.

Few studies have reviewed the pattern and location of ICH in blacks.[2] There is no study in Nigeria and Sub Saharan Africa on the pattern or location of ICH in native Africans.

We present a retrospective review of ICH using a modern neuroimaging technique.

Objectives

To determine the pattern and location of ICH among patients presenting in a tertiary hospital in Enugu.

Methods

This study was conducted at the radiology unit of Memfys Hospital for Neurosurgery Enugu. The hospital is a private tertiary institution that has a wide catchment area that includes the South East, South-South, and the North central zones of Nigeria. All socioeconomic groups seek treatment from the center.

All the medical and computer tomography (CT) records of patients with a clinical diagnosis of hemorrhagic stroke with their location clearly specified and complete patients' data were reviewed. Only cases of "hemorrhagic strokes" with intracerebral bleed were included. All cases of "pure" subarachnoid and intraventricular hemorrhages, brain tumors, subdural hematomas, and post-traumatic cases were excluded. In cases of repeat scan, each scan is recorded separately if the scan showed a different result. Medical history was not available in the reports and was not analyzed.

The study duration was 11 years (January 2003 to December 2013). Relevant data were obtained, and statistical analysis was done using SPSS version 19 (IBM Corporation, New York, USA).

Results

During the period under review, a total of 139 (17.4%) out of 799 scans done for strokes over the period under review were analyzed. Ninety-two were males (65.1%) and 47 (34.9%) were females. Male female ratio was 2:1. The mean age of the patients was 58.8 ± 14.5 (range: 16–92) years. There was no statistical difference between the mean age of men and women (56.1 ± 15.9 vs. 55.2 ± 14.7. $P = 0.75$). About 15% had additional intraventricular hemorrhage and 4% subarachnoid hemorrhage [Figure 1].

The distribution location of ICH is shown in Table 1. The frequency of LH and DCH were 46.8% and 53.2%, respectively. Five percent (7/139) of all hemorrhages occurred in the cerebellum. Age distribution of the location of ICH showed that LH peaked at 16–39 years while DCH peaked at 40-49 years [Figure 2]. Cerebellar hemorrhage, however, peaked at 70 years and above.

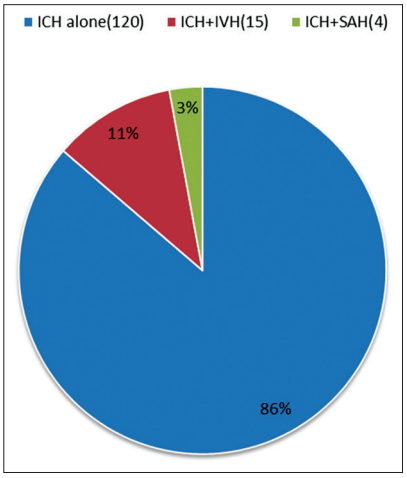

Figure 1: Pattern of intracerebral hemorrhage

Table 1: Distribution of ICH by gender and age groups

Gender	Lobar	Deep cerebral*	Total	Brain stem	Cerebellar
Males	44 (47.8)	48 (52.2)	92 (66.2)	2 (2.2)	6 (6.5)
Females	21 (44.7)	26 (55.3)	47 (33.8)	3 (6.4)	1 (2.1)
Age group					
<40	11 (16.9)	9 (12.2)	20 (14.4)	-	1 (14.3)
40-49	8 (12.3)	13 (17.5)	21 (15.1)	-	1 (14.3)
50-59	21 (32.3)	24 (32.4)	45 (32.4)	5 (100)	2 (28.6)
60-69	11 (16.9)	12 (16.2)	23 (16.5)	-	-
≥70	14 (21.5)	16 (21.6)	30 (21.6)	-	3 (42.7)
Total	65 (46.8)	74 (53.2)	139 (100)	5 (100)	7 (100)

*Deep includes internal capsule, thalamic, putamen, brain stem and cerebellar hemorrhages. ICH=Intracerebral hemorrhage

Table 2: Distribution of mean ages of occurrence of ICH

Type of ICH	Mean age (SD)	*P*
Lobar	55.3 (16.0)	-
Deep cerebral	56.2 (15.1)	0.988
Brain stem	53.3 (1.6)	0.992
Cerebellar	59.9 (21.0)	0.880

SD=Standard deviation; ICH=Intracerebral hemorrhage

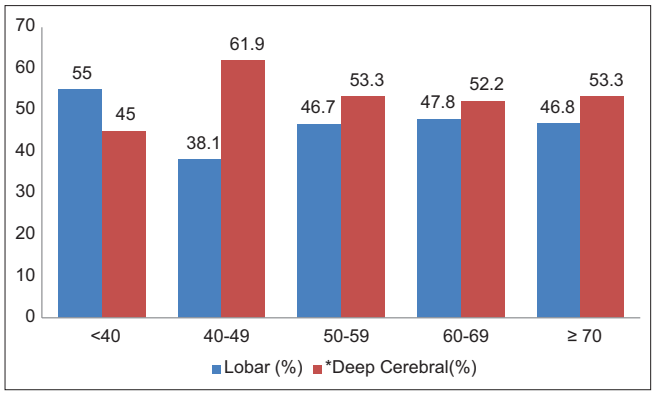

Figure 2: Age distribution of deep cerebral and lobar hemorrhages. *Deep includes internal capsule, thalamic, putamen, brain stem and cerebellar hemorrhages

Table 3: Comparison of different studies

	Total	Lobar (%)	Deep cerebral (%)	Brain stem (%)	Cerebellum (%)
Enugu, Nigeria	139	65 (46.8)	62 (44.6)	5 (3.6)	3 (2.2)
Greater Cincinnati[2]	1038	359 (35)	512 (49)	65 (6)	102 (10)
Izumo city, Japan[6]	350	53 (15)	242 (69	30 (9)	25 (7)
Southern Swede[5]	341	176 (52)	121 (36)	15 (4)	29 (9)
Jyvaskyla region, Finland[8]	158	53 (34)	77 (49)	11 (7)	17 (11)
Dijon, France[9]	87	16 (18)	58 (67)	5 (6)	8 (9)
Perth, Australia[7]	60	19 (40)	31 (52)	4 (7)	6 (10)
L'Aquila[10]	464	205 (44.2)	210 (45.3)	16 (3.4)	28 (6)

The mean age of occurrence of hemorrhages of different locations is shown in Table 2. There was no statistically significant difference between mean ages of occurrence of LH and hemorrhages of other locations.

Discussion

The key findings of this study are: (1) Occurrence of higher rates of DCH (53.2%). (2) Frequency of LH and DCH varied with age. (3) LH peaked before the age of 40 while DCH at 40–49 years; however, the mean ages of occurrence of all types of hemorrhages were similar.

The patient characteristics in this study support the fact that increasing age increases the risk of hemorrhagic stroke.[1-4] The peak age of occurrence of ICH was similar to previous reports and occurred a decade earlier in Africans than Caucasians. Furthermore, it also suggests, in Nigeria, that peak age of ICH is similar in both sexes unlike ischemic stroke.[3,4] Flaherty *et al.*[2] reported an excess of DCH notably in young and middle-aged persons similar to findings in the present study. Findings elsewhere show that blacks generally have a relatively high prevalence of hemorrhagic stroke.[2, 12-16]

Our report highlights the distribution of ICH in Nigerian Africans. No data had previously described the location of hemorrhages among Nigerians. Most data on ICH has been extrapolated from African Americans[2,15] and Caribbeans.[17]

Deep cerebral/brain stem and cerebellar hemorrhages are frequently caused by chronic hypertension and were seen in 53.2% of cases (52.2% in men and 55.3% in women). This finding is not surprising considering the predominant age group studied and the high prevalence of hypertension in Nigeria. Hypertension which is an established risk factor for DCH (including brain stem and cerebellar) is known to be more prevalent in males than females [18,19] and increases with age. The higher frequency of DCH in females may suggest the role of other etiological factors in Africans and possibly a different pattern of ICH. The roles of metabolic disorders such as diabetes and dyslipidemia in the genesis of ICH have been proven. These metabolic disorders are known to be more common in women and may explain to some extent the pattern found in this study. Most of the females studied were postmenopausal thus removing the protective effect of sex hormone. Furthermore, the prevalence of hypertension in men and women has been reported to be the same in some studies in Nigeria.[20]

The peak age of DCH (40–49 years) supports findings by Ruíz-Sandoval *et al.*[21] This may be explained not only by the increasing incidence and prevalence of hypertension but by factors such as smoking, drug use, heavy alcohol consumption, and sedentary lifestyle especially among hypertensive individuals. The age-specific frequency of DCH remained stable after 50 years.

Previous reports have demonstrated an excess of ICH in blacks in young and middle-aged persons,[2] particularly for DCH and brain stem locations.

The higher rate of LH among subjects <40 years may indicate causes such as HIV, central nervous system infections, and hemoglobinopathies such as sickle cell disease which are common in Sub Saharan Africa (SSA) among young individuals where LH is less likely to be related to angiopathy. The increasing use of alcohol, smoking, and recreational drugs are some other factors that may be contributory. LH increased after 49 years and remained stable. Rates of LH and DCH from 70 years and above (in whom amyloid angiopathy becomes a significant cause of hemorrhage) were 46.7% and 53.2%, respectively which may reflect higher rates of hypertension in this age group. Most elderly individuals with LH may also have had hypertension for many years.[22] Current estimates show that almost 50% of ICHs in the lobar region are related to amyloid angiopathy.[21,22]

In the GERFHS case–control study,[23] hypertension was not found to be an independent risk factor for LH; however, it was suggested that in different age groups especially in middle-aged individuals, among whom amyloid angiopathy

is rare, hypertension may also play an important but different role in LH in males and females.[2] This concept is supported by the peak age of occurrence of DCH and LH in this study. Furthermore, less well-defined risk factors (perhaps genetic and infections such as HIV) contribute differently to the rates and patterns of ICH in Africans.

Although this report is the first in South East Nigeria and possibly Africa, population-based studies have been reported elsewhere among Caucasians and Asians [Table 3]. These studies found the rates of LH different from the index study probably due to differences in various risk factors and methodology. Our report is similar to the one from L'Aquila[10] in Italy. The rates of DCH were similar with studies from the USA[2] and Finland.[8] Studies performed in Sweden[5] and France[9] showed similar rates of brainstem hemorrhages.

Our study has some limitations. The major limitation of this study is the noninclusion of clinical data in the analysis. Furthermore, data about the risk factors for hemorrhagic stroke were not documented, and the size of hemorrhages was not consistently stated.

This is a hospital based study, therefore, there is a possibility that very severe cases may be overrepresented and fatal cases totally excluded. Case ascertainment was done through radiological reports. During the period under review, there were times when the CT machine was out of service and cases during such periods were missed. A multi-center study may be preferable.

The risk factors for ICH and stroke were not documented. Such data will help establish the relative risk of different types of ICH among the population studied.

Conclusion

The frequency of LH and DCH varied with age with LH peaking before the age of 40 while DCH at 40–49 years. The age distribution of different types of ICH may suggest a higher role of other factors apart from hypertension. Further studies are required to establish the risk factors of LH and DCH in our environment.

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Conflicts of interest
There are no conflicts of interest.

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