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Computerized Tomography findings in stroke patients in El-Obeid, Sudan.

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Abstract

Background*: Stroke is one of the leading causes of morbidity and mortality worldwide. Computed Tomography (CT) is an essential imaging technique in the diagnosis and classification of suspected stroke patients , most importantly ruling out intra-cerebral hemorrhage (ICH), subarachnoid hemorrhage (SAH) and subdural hematoma (SDH). CT is only recently introduced in El-Obeid hospital in Western Sudan. The objective of this study is to investigate the CT findings in patients referred for CT scanning with a clinical diagnosis of stroke.*

Methods*: The imaging findings of 712 suspected stroke patients, referred to our department in the period November 2016 to August 2017, were retrospectively reviewed. The age of patient, known existing morbidity (hypertension and/or diabetes mellitus), incidentally discovered high blood pressure and CT findings were recorded. CT was performed with a 16-slice scanner (GE Brightspeed). Data was analyzed using an open source statistical software package (PSPP, GNU.org).*

Results*: A total of 712 patients were included in this study, age range 1-102, mean 64.9 years, 306 (43%) of them were females. The majority of patients were males above 60 years age. Male:female ratio was 1.3:1. The majority of patients (503, 70.6%) had ischemic infarctions as the major CT finding, about one third (32.6%) of them with small vessels, para-ventricular ischemic changes, while those with ICH were 117 patients (16.4%). Ninety nine patients (13.9%) had other minor CT findings in addition to the major infarction. The commonest location of hemorrhage was in the basal ganglia and thalamus. Only 9.3% of patients were known hypertensive and/or diabetic.*

Conclusion*: CT is an essential tool in the diagnosis and management of stroke in ElObeid. Stroke is commoner in males over 60 years of age. Most strokes are ischemic, and the commonest location is small vessels ischemia in the periventricular region. Most patients have no known risk factors (hypertension and diabetes mellitus).*

Keywords*: stroke imaging, computed tomography, cerebral hemorrhage.*

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I. Introduction:

Stroke is one of the leading causes of morbidity and mortality worldwide. Computed Tomography (CT) is an essential imaging technique in the diagnosis and classification of suspected stroke patients [1-9], most importantly ruling out intra-cerebral hemorrhage (ICH), subarachnoid hemorrhage (SAH) and subdural hematoma (SDH) as opposed to ischemic infarction [3, 10], and excluding stroke mimics [11]. Without CT, up to 43% of strokes could be misdiagnosed clinically[12]. Although many studies have shown that magnetic resonance imaging (MR), particularly diffusion weighted imaging (DWI) is more sensitive for detecting early signs in acute stroke [13- 19] , CT is still a vital tool in the early diagnosis of stroke [20] and is the primary modality for the initial evaluation of patients with suspected stroke [21] and may show similar sensitivity to DWI [22]. Some studies advocated CT as the "one-stop shop for stroke evaluation" [23]. Early CT reduces cost of management of stroke and increases quality adjusted life-years [24]. Where available, a combination of CT and MR including DWI and perfusion studies, is the best for improving outcome and selecting patients for thrombolysis [25]. In low-income countries and in small towns and rural areas, where MR is not available, CT is the only imaging modality available for managing patients with stroke symptoms [26].

CT is only recently introduced in El-Obeid hospital and the whole of Kordofan region in Western Sudan. Elsewhere, CT of stroke patients has been extensively studied [3]. No published study to date investigated the CT findings in patients clinically diagnosed with stroke in El-Obeid, North Kordofan State in Western Sudan. The objective of this study is to investigate the CT findings in patients referred for CT scanning with a clinical diagnosis of stroke.

II. Methods:

The imaging findings of 712 suspected stroke patients, referred to our department in the period November 2016 to August 2017, were retrospectively reviewed. The age of patient, known existing morbidity (hypertension and/or diabetes mellitus), incidentally discovered high blood pressure and CT findings were recorded. CT was performed with a 16-slice scanner (GE Brightspeed). Data was analyzed using an open source statistical software package (PSPP, GNU.org).

III. Results:

A total of 712 patients were included in this study, age range 1-102, mean 64.9 years, 306 (43%) of them were females. Most patients were males above 60 years age. Male:female ratio was 1.3:1. The majority of patients (503, 70.6%) had ischemic infarctions as the major CT finding, about one third (32.6%) of them with small vessels, para-ventricular ischemic changes, while those with ICH were 117 patients (16.4%). The findings in all patients are shown in table 1. Ninety nine patients (13.9%) had other minor CT findings in addition to the major infarction, as detailed in table 2. Location of ischemic and hemorrhagic findings is shown in table 3 and 4, respectively. Co-morbidities associated with stroke findings are shown in table 5.

Table 1: Major CT findings

Major CT finding	Number	Percentage %
Ischemic infarction	503	70.6
Intra-cerebral hemorrhage	117	16.4
Subdural hematoma	41	5.7
Hemorrhagic infarction	14	2
Subarachnoid hemorrhage (SAH)	4	0.6
No CT abnormality detected	33	4.6
Total	**712**	**100**

Table 2: Minor co-existing findings in patients with major infarction:

Minor finding in addition to infarction	Number	%
Minor hemorrhage	29	5.8
Other smaller infarction(s)	55	10.9
Subdural hematoma	6	1.2
Subarachnoid hemorrhage	9	1.8
Total	**99**	**19.7**

Table 3: Location of lesions in infarction:

Location	Number	%
Multiple small vessels periventricular	164	32.6
Cerebral territorial	238	47.3
Basal ganglia lacunar	66	13.1
Periventricular only	18	3.6
Cerebellar	10	2
Pontine	4	0.8
Deep lacunar	3	0.6
Total large vessels	41	8.1
Total	**503**	**100**

Table 4: Location of ICH:

Location	Number	%
Thalamus and Basal Ganglia	48	41.1
Parietal	24	20.5
Temporo-parietal	11	9.4
Intra-ventricular	9	7.7
Frontal	5	4.3
Cerebellar	5	4.3
Pontine	4	3.4
Temporal	4	3.4
Occipital	2	1.7
Others	5	4.3
Total	**117**	**100**

Table 5: Co-morbidities in stroke patients:

Co-morbidity	Number	Percent %
Known hypertension	51	7.2
Known diabetes mellitus	13	1.8
Known hypertension AND diabetes mellitus	2	0.3

Incidentally discovered high blood pressure	7	1
Sickle-cell anemia	2	0.3
Others *	9	1.3
Total	**84**	**11.8**

* Others: include acute kidney injury, bleeding tendency, congestive heart failure, chronic kidney failure, dilated cardiomyopathy, progressive reversible encephalopathy, eclampsia, myeloproliferative disease and Parkinson disease.

IV. Discussion:

In this study of stroke patients, infarction represents more than two thirds of stroke types, while hemorrhage is the cause in less than one third. This is similar to findings in other places [27-29], with small variations. The majority of infarctions are of the slowly progressive small vessels ischemia, particularly in the periventricular areas, followed by deep lacunar infarctions in the temporal, parietal and basal ganglia, together representing 77.2% of infarcts. This differs from findings in other studies [30,31] where large vessel infarcts are more common, but is in agreement with findings in some studies in the region[32,33] . ICH was located most commonly in the basal ganglia, followed by the parietal lobe. This is in keeping with findings in other studies [34,35, 36].

Most stroke patients in this study do not have known risk factors, particularly hypertension and diabetes mellitus. Only 9.3% of the total number of stroke patients in our study had known hypertension, diabetes or both. However, a study done in El-Obeid found that 28% of stroke patients were hypertensive [37]. This may be due to the fact that our study population is coming from the emergency department, and were referred for CT before obtaining full clinical information, while the mentioned study was drawn from hospital inpatients who were fully examined and investigated during a longer period of follow up. Mild to moderate primary hypertension is largely asymptomatic for many years, and may present for the first time with stroke [29]. The lipid profile, body mass index (BMI) and smoking history were not available for this cohort of patients. These and other risk factors need to be studied as they are well documented, modifiable risk factors for stroke [29, 31].

Early identification and detection of modifiable risk-factors, raising awareness and appropriate management of known morbidity are important measures in reducing the risk of stroke. Most of North Kordofan population live in small towns and rural areas where health awareness is lacking and primary health care services are scarce. Many patients at high risk may be unidentified until the first ictus. Raising awareness and screening the population at risk is needed in our region, as well as further studies to map the risk factors and variations in the incidence of stroke.

V. Conclusion:

CT proved an essential tool in the diagnosis and management of stroke in ElObeid. Stroke is commoner in males over 60 years of age. Most strokes are ischemic, and the commonest location is small vessels ischemia in the periventricular region. Most patients have no known risk factors (hypertension and diabetes mellitus). Better screening for risk factors and raising of awareness are needed for better mapping of stroke incidence and types in our population.

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