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Role of brain imaging using CT/MRI in diagnosis and management of stroke

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Abstract

Introduction: Prevalence of morbidity and mortality is keep rising in poorly managed stroke cases. Early detection and proper diagnosis have great potential in management of stroke. The development of brain imaging modalities (CT/MRI) have led to a milestone that provides a living autopsy of the brain.

Objective: The goal of this prospective study is to determine the clinical efficacy of CT/MRI and its benefits over traditional techniques of clinical diagnosis in stroke patients.

Methods: 50 patients in whom clinical signs of stroke i.e., slurring of speech, weakness on one side of the body, deviation of angle of mouth, and neurological deficits observed were recruited in the study. CT/MRI was used to diagnosed the stroke.

Results: The NCCT finding have revealed Diffused cerebral atrophy in 14 (28%) patients, Chronic Infarct in 11 (22%) patients, Subacute Infarct in 7 (14%) patients, Acute Infarct in 6 (12%) patients and Encephalomalacia in 2 (4%) patients whereas 10 (20%) patients underwent MRI brain.The MRI brain finding have revealed Diffused cerebral atrophy in 6 (6%) patients, Chronic Infarct in 1 (2%) patient, Subacute Infarct in 4 (8%) patients, Acute Infarct in 3 (6%) patients and Encephalomalacia in 2 (4%) patients whereas 37 (74%) patients underwent NCCT head.

Conclusion: In both NCCT head and MRI brain finding have revealed diffuse cerebral atrophy as the most common finding among recruited patients followed by the chronic infarct (22%), subacute infarct (14%), acute infarct (12%) and encephalomalacia (4%).

Keywords: CT, MRI, infract, brain, cerebrum

Introduction

Stroke has been defined as "rapidly developing clinical signs of focal or global disturbance of cerebral function, lasting for more than twenty-four hours or leading to death, with no apparent cause other than vascular origin" by the WHO [1]. A cerebrovascular accident is another name for an acute stroke. As a consequence of underlying cerebrovascular disorder, acute stroke is characterised as the abrupt onset of focal neurological findings in a vascular territory. The annual incidence rate (AIR) of a first-ever stroke was 123.15 per 100,000 people [2].The AIR in the Mumbai study was 148 per 100,000 people; when age was adjusted to the Segi's 1996 world population, the AIR was 154 per 100,000 [3]. In the Trivandrum

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study, age-standardized AIRs per 100,000 were 135 [4]. Ischemic stroke, intracerebral haemorrhage and subarachnoid haemorrhage all had age-standardized AIRs of 74.8, 10.1 and 4.2, respectively [5]. Ischemic stroke being the most frequent form, is caused by a blockage of blood flow to a certain region of the brain. 85% of acute strokes are caused by an ischemic stroke [6]. Cerebral infarction is responsible for 80-85% of strokes, but intra-cerebral bleed is responsible for just 9-15 percent. After heart disease and cancer, it is the world's third leading cause of mortality.

Because computed tomography is a non-invasive approach that takes a short amount of time to perform and poses little danger to the patient, it is the most valuable emergency diagnostic tool for stroke. In the event of an acute stroke, a CT scan can easily discriminate between haemorrhage and infarct, directing anticoagulant medication. It can also reveal the location and extent of the lesion, as well as give prognostic information. There are a number of other stroke-like illnesses that can be discovered[3].The development of CT scan and Brain imaging modalities have led to a milestone that provides a "Living Autopsy" of the brain'[7]. The goal of this prospective study is to determine the clinical efficacy of computed tomography and its benefits over traditional techniques of clinical diagnosis in stroke patients. As a result, its (CT/MRI) function in the patient's following therapy and prognosis may be identified. The present study also aims towards establishing the role of various risk factors in contributing to the onset of stroke.

Material and Methods

Patients recruitment: 50 patients in whom clinical signs of stroke i.e., slurring of speech, weakness on one side of the body, deviation of angle of mouth, and neurological deficits observed were recruited in the study. CT/MRI was used to diagnosed the stroke.

Radiological investigations: Non-Contrast Computed Tomography (NCCT) head will be performed on all the clinically suspicious patients of stroke. MRI Brain in selected patients. The NCCT head was performed on a Philips computed tomography machine-128 slices. MRI Brain was done in suspected cases of embolic stroke and to rule out stroke mimics. Patients requiring MRI were undergo MRI examination on Philips Intera Achieva 1.5 Tesla MRI using sense head coil.

Statistical analysis: Data obtained was analyzed according SSPS version 20 (statistical package for the social sciences). The sociodemographic data was presented in form of number and percentage. For quantitative variable, mean was used as measure of central tendency and standard deviation was used as measure of variability.

Results

The mean age of the recruited patients was 65.40 ± 13.12 years. Among total 50 patients, males are present in greater number (60%) compared to their counterpart females (40%) with a male female sex ratio of 1.5. Among total 50 patients, majority of patients (50%) presented with the complaint of ataxia, limb weakness or difficulty in walking or generalized weakness or hemiparesis. this was followed by the complaint of irrelevant talk, irritability and mood swings (12%), altered sensorium (8%), loss of consciousness (8%), headache (6%), hemiparesis (6%), dizziness (4%), vision disturbance (2%), chest pain (2%) and seizures (2%) (Figure 1).

The NCCT finding have revealed Diffused cerebral atrophy in 14 (28%) patients, Chronic Infarct in 11 (22%) patients, Subacute Infarct in 7 (14%) patients, Acute Infarct in 6 (12%) patients and Encephalomalacia in 2 (4%) patients whereas 10 (20%) patients underwent MRI brain (Figure 2).

The MRI brain finding have revealed Diffused cerebral atrophy in 6 (6%) patients, Chronic Infarct in 1 (2%) patient, Subacute Infarct in 4 (8%) patients, Acute Infarct in 3 (6%) patients, and Encephalomalacia in 2 (4%) patients whereas 37 (74%) patients underwent NCCT head

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(Figure 3).

The area of infarct was ACAin 5 (10%) patients, MCA in 21 (42%) patients, PCA in 6 (12%) patients, VBA in 3 (6%) patients, MCA+PCA in 10 (20%) patients, PCA+VBA in 1 (2%) patient, MCA+PCA in 2 (4%) patient, ACA+MCA+PCA in 1 (2%) patient whereas 1 (2%) patient had intraparenchymal hemorrhage (Figure 4).

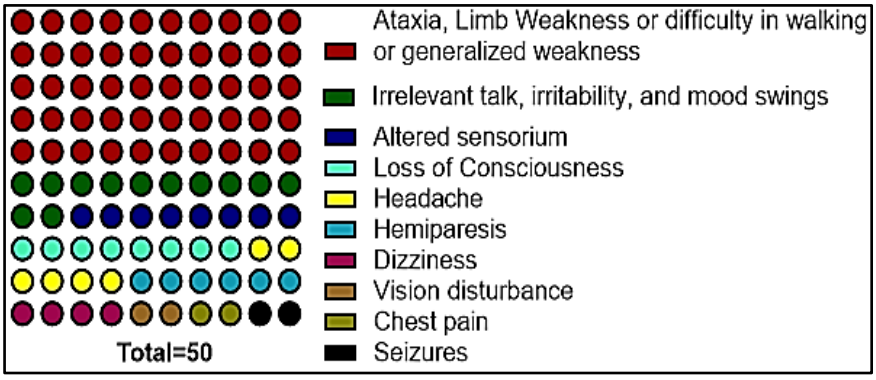

Fig 1: Presenting Complaints

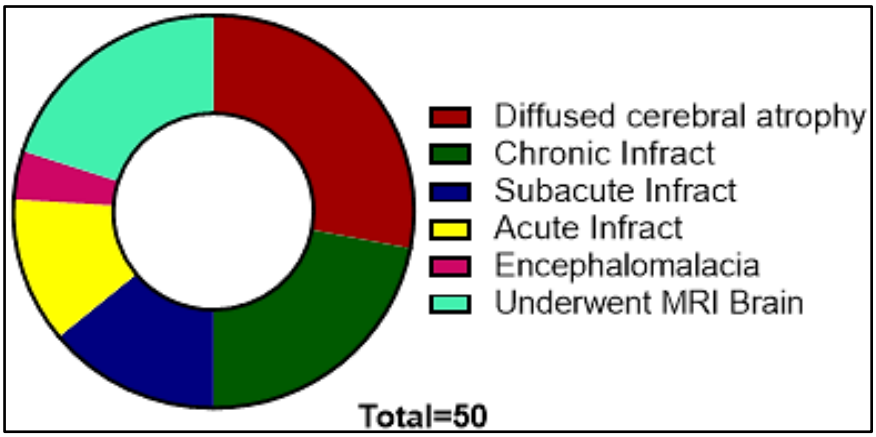

Fig 2: NCCT findings

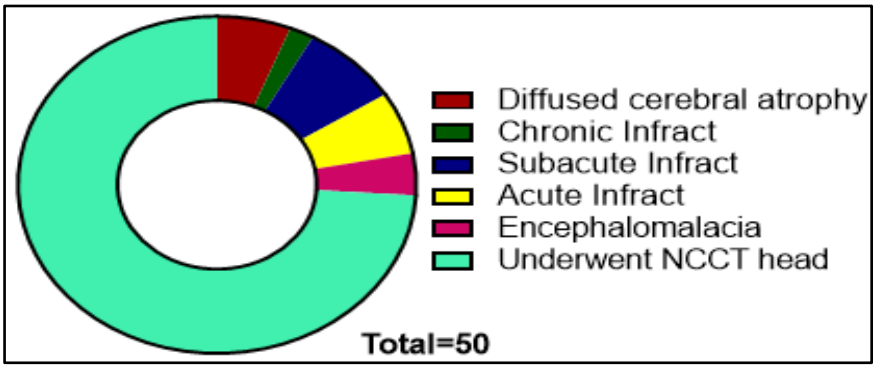

Fig 3: MRI brain findings

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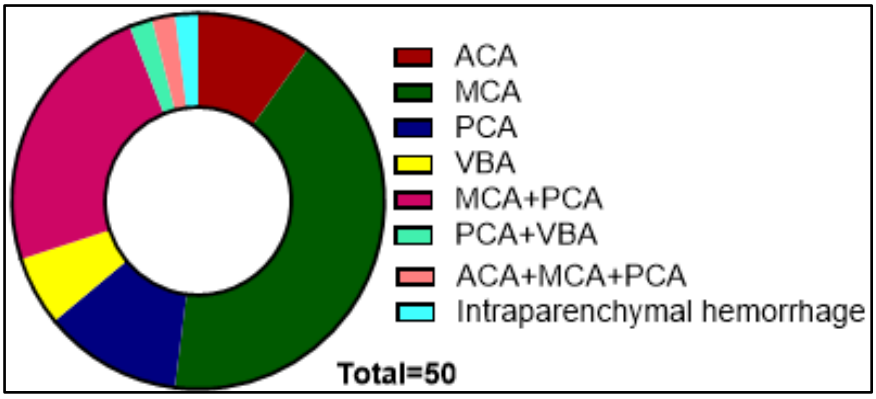

Fig 4: Area of infract

Discussion

The mean age of the recruited patients in the current study was 65.40 ± 13.12 years. In the study on Clinical and radiological profile of acute cerebrovascular accident conducted by Vandana *et al*., males had a mean age of 57.28 years and females had a mean age of 55.55 years while the overall mean age of patients was 56.31 years [8].Similar observations have been recorded in the study conducted by the Maskey*et al*. in which mean age of the patients was 63 years [9]. The prevalence of stroke is highest in the 51-60-year-old age group, accounting for 30.5 percent of all patients, which closely matches the findings of Ukoha*et al*.,[10]and Maskey*et al*.,[9].Similar findings were reported in investigations done by Aiyer*et al*.,[11],which revealed that 64 percent of the participants were older than 50 years. Atherosclerosis may be too responsible for the rise in the number of stroke patients over the age of 50.It might be related to changing lifestyles, sedentary behaviour, growing stress levels, and so on among the young age group [12].Nearly one-fifth of patients referred to hospitals in India with their first stroke are believed to be under the age of 40.

Among total 50 recruited patients in the present study, males are present in greater number (60%) compared to their counterpart females (40%) with a male female sex ratio of 1.5. In the study conducted by Vandana *et al*., the male to female ratio was 1.32:1 [8].Similar results have been found in study conducted by Aiyaret*et al*., in which male to female sex ratio was 1.9:1 [11].

The NCCT finding of presents study have revealed diffused cerebral atrophy in 28% patients, chronic infarct in 22% patients, subacute infarct in 14% patients, acute infarct in 12% patients, and encephalomalacia in 4% patients. The MRI brain finding in patients (13%) have revealed diffused cerebral atrophy in 6% patients, chronic infarct in 2% patient, subacute infarct in 8% patients, acute infarct in 6% patients, and encephalomalacia in 4% patients. In the study conducted by Kaur *et al*. [13]only 1.2% had venous stroke which was confirmed by magnetic resonance venography.

In the present study, area of infarct was ACA in 10% patients, MCA in 42% patients, PCA in 12% patients, VBA in 6% patients, MCA+PCA in 24% patients, PCA+VBA in 2% patient, ACA+MCA+PCA in 2% patient whereas 2% patient had intraparenchymal hemorrhage. Among the ischemic strokes, middle cerebral artery distribution strokes were more common (60.2%) than anterior cerebral circulation strokes (25.5%) in the study conducted by Kaur *et al*.[13].

Conclusion

The mean age of the recruited patients was 65.40 ± 13.12 years with males are present in greater number (60%) compared to their counterpart female (40%) with a sex ratio of 1.5. Majority of patients (50%) presented with the complaint of ataxia, limb weakness or difficulty in walking or generalized weakness. Clinical history hypertension, smoking, addiction of alcohol, diabetes and cerebrovascular accidents have been revealed by patients. Main ECG finding have revealed left ventricular hypertrophy and normal sinus rhythm. In

both NCCT head and MRI brain finding have revealed diffuse cerebral atrophy as the most common finding among recruited patients followed by the chronic infarct (22%), subacute infarct (14%), acute infarct (12%), and encephalomalacia (4%).

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