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Computed Tomography Findings in Acute Stroke Patients: A Hospital-Based Cross-Sectional Study

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Abstract **Original Research Article**

Introduction: Stroke, or "cerebrovascular accident," is a medical disorder in which the brain's cells die due to insufficient blood flow. Successful stroke treatment varies according to the type of stroke, whether an infarct or a bleed, and it can be lethal without brain damage. ***Objective:*** The study aim was to compare clinical stroke diagnosis with computed tomography (CT) scan findings to determine stroke type (hemorrhagic or Ischemic). ***Method:*** This was a cross-sectional type of observational study conducted at the Department of Radiology & Imaging in Sylhet MAG Osmani Medical College Hospital, Sylhet, Bangladesh from 01 March 2023 to 01 June 2024. A total of 240 patients from the inclusion criteria were taken for the study purpose. Data of clinical diagnosis were compared individually with CT findings. ***Result:*** Out of 240 patients, 168 were males and 72 were females and they were in the age range of 20-80 years. Clinically 104 patients were suspected to have cerebral infarction, 76 intracerebral bleeds and 60 indeterminate. CT scan of the brain showed 116 cerebral infarcts, 84 intracerebral hemorrhages, 12 space-occupying lesions and 28 hemorrhagic infarcts. ***Conclusion:*** The study found that CT should be the first thing to do when a person has a stroke because it's easy, quick, and accurate at figuring out what happened.

Keywords: Stroke, Clinical, Computed, Tomography, Diagnosis.

INTRODUCTION

When blood flow to a portion of the brain is interrupted, a stroke occurs. The brain cells are unable to obtain the necessary oxygen and nutrients from the blood, and they begin to die within a few minutes. This can result in long-term brain damage, incapacity, or death [1]. Mainly in two types of stroke ischemic stroke is the most frequent kind of stroke, accounting for 87% of incidents. A blood clot blocks the flow of blood and oxygen to an area of the brain. The other type of stroke is hemorrhagic stroke which happens as a result of a blood vessel rupture. They are frequently caused by aneurysms or arteriovenous malformations (AVMs) [2]. In light of the therapeutic implications, it is critical to distinguish between hemorrhagic and ischemic strokes [3]. In practice, however, the clinical distinction has proven challenging, as minor hematomas can produce symptoms and signs that are comparable to those generated by infarcts [4]. Brain CT scans have become the most widely utilized primary radiologic examination for stroke since their introduction into clinical practice [5]. A head CT scan uses X-rays and computer technology to create detailed images of the inside of the head. It can quickly display the location and size of brain abnormalities such as blood clots or tumors. It also reveals infections or regions of the brain where tissue is dying or has died due to insufficient blood flow. A CT scan can distinguish between ischemic and hemorrhagic strokes. This imaging technique is essential for detecting blood in the skull from a hemorrhage, thereby guiding appropriate treatment [6]. An ischemic stroke occurs when there is a lack of blood flow; a hemorrhagic stroke occurs when there is bleeding, and a thrombotic stroke occurs when fatty deposits accumulate in blood vessels and cause them to become blocked [7]. Unilateral impairment of movement or sensation, trouble with comprehension or speech, a feeling of spinning, loss of vision on one side of the body, and headaches are possible signs of this condition. The choice of whether to administer thrombolytics or other treatments hinges on the precision of the diagnosis. On the other hand, a

misdiagnosis could result in patients either missing out on essential treatment or receiving potentially dangerous therapies without their knowledge [8]. The present study compared the clinical diagnosis with computed tomography to determine the specific type of acute stroke.

Objective

The main objective of this study was to compare clinical stroke diagnosis with computed tomography (CT) scan findings to determine stroke type (hemorrhagic or Ischemic).

MATERIALS AND METHODS

From March 1, 2023, to June 1, 2024, a total of 240 patients referred to the Radiology departments at Sylhet MAG Osmani Medical College Hospital, Sylhet, Bangladesh were included in this cross-sectional and observational study. CT scans of the brain were performed on all individuals with a clinical diagnosis of the acute stroke where indicated, clinical diagnosis, age, sex, the onset of symptoms, and time of hospitalization are included. Patients who presented with a fast onset of coma, rapid deterioration of neurological status, severe headache, severe vomiting, neck stiffness, and hypertension were diagnosed with hemorrhagic stroke. Patients presenting with a sudden start of lateralizing size, particularly those with atrial fibrillation, rheumatic heart disease, recent myocardial infarction, and carotid bruit, were deemed to have a cerebral infarction. Blood sugar, lipid profile, ECG, and echocardiography were all performed in addition to the standard investigation. Every patient underwent a cerebral CT scan. Finally, the CT scan findings and clinical diagnosis were compared separately in order to ascertain the specific clinical diagnosis.

RESULTS

Table-1 has shown that, 240 patients with 70% being male (168 patients) and 30% female (72 patients). The age distribution of the patients was as follows: 2.5% were in the 21-30 age groups, 4.16% were between 31-40 years old, 10% were in the 41-50 age range, 30.83% were aged 51-60 years, 44.16% were between 61-70 years, and 8.33% were in the 71-80 age group.

Table-1 Sex and Age distribution in Patients of Acute Stroke (n=240)

Characteristics of Patients	
Gender of Patients	**Cases (N, %)**
Male	168 (70%)
Female	72 (30%)
Age Group (In Year)	**Cases (N, %)**
21-30	6 (2.5%)
31-40	10 (4.16%)
41-50	24 (10%)
51-60	74 (30.83%)
61-70	106 (44.16%)
71-80	20 (8.33%)
Total	**240 (100%)**

The below table has shown that, the diagnoses among the 240 patients were as follows: 31.66% (76 patients) were diagnosed with hemorrhage, 43.33% (104 patients) with infarction, and 25% (60 patients) had an indeterminate diagnosis.

Table-2 Clinical diagnosis of the type of acute stroke (n=240)

Diagnosis	**Cases (N, %)**
Haemorrhage	76 (31.66%)
Infarction	104 (43.33%)
Indeterminate	60 (25%)

Table-3 has indicated that the distribution of diagnoses among the 240 patients was as follows: 35% (84 patients) were diagnosed with hemorrhage, 48.33% (116 patients) with infarction, 11.66% (28 patients) with a space-occupying lesion, and 5% (12 patients) with hemorrhagic infarct.

Table-3 CT Scan findings in patients with acute stroke (n=240)

Diagnosis	**Cases (N, %)**
Hemorrhage	84 (35%)
Infarction	116 (48.33%)
Space Occupying Lesion	28 (11.66%)
Hemorrhage Infarct	12 (5%)

The below table has indicated that 76 cases were clinically diagnosed as hemorrhage, with CT scans confirming 42 of these, resulting in an agreement rate of 55.26%. For infarction, 104 cases were clinically diagnosed, with 60 confirmed by CT scan, yielding a 57.69% agreement rate between the clinical diagnosis and CT scan results.

Table-4 CT Scan findings in clinically diagnosed cases (n=180)

Specific Type of Acute Stroke	Clinical Diagnosis	CT Scan Confirmation	Agreement of Results
Haemorrhage	76	42	55.26%
Infarction	104	60	57.69%

DISCUSSION

Stroke is a severe and life-threatening medical condition caused by inadequate blood flow to the brain, leading to cell death. Since clinical examination alone is insufficient to distinguish between ischemic and hemorrhagic stroke, a CT scan or MRI is required. Brain imaging assists clinicians in making management decisions and determining whether to use antiplatelet or thrombolytic therapies for acute stroke.

The impact of stroke is considerable, not only due to its high mortality but also because of the morbidity associated with it. An incorrect clinical diagnosis can significantly affect the patient's outcome. There is no doubt that computed tomography scans greatly enhance the accuracy of stroke diagnosis. Relying solely on clinical diagnosis for acute stroke is unjustifiable, especially given the widespread availability of CT scans.

In this study, the clinical diagnosis of patients was only 75% accurate when compared to CT scan findings, which revealed a 25% misdiagnosis rate. This evidence of the limitations of clinical diagnosis aligns with the findings of Salawu *et al.,* (2009), who reported a 15% misdiagnosis rate when comparing clinical diagnoses with CT scans in Maiduguri [9]. In a similar study conducted in Ethiopia, Ase fa *et al.,* (2010) reported a misinterpretation rate of 30% in relation to clinical diagnosis [10]. In a study of 156 Nigerian patients, Ogun *et al.,* (2001) found 44% misinterpretation rate when comparing CT findings with clinical diagnosis [11].

To aid physicians in making clinical diagnoses, several scoring systems like the "Allen score" and the "Siriraj score" were developed to evaluate the likelihood of infarction or hemorrhage. While diagnoses made using these scores tend to be more accurate than those made solely by a physician's clinical judgment, they also introduced certain complexities. Over the past decade, the "Allen score" (also known as the Guy's Hospital score), a validated clinical tool, gained considerable support but has since declined in popularity. In a study involving 1059 patients in Glasgow, it was found that the Guy's Hospital score had a sensitivity of 70% for detecting hemorrhage and a specificity of 64%, while the Siriraj score showed a sensitivity of 68% and a specificity of 64%. This study concluded that neither score is effective in ruling out bleeding before starting anticoagulant therapy [12]. Badam *et al.,* examined the Siriraj stroke score and Guy's Hospital score in an Indian environment [13]. Both of the previously mentioned scoring systems were found to be inadequate for definitively identifying bleeding or infarction in this study. The findings highlighted the crucial importance of routine CT scans for acute stroke patients, as they are readily available around the clock in major hospitals and provide rapid imaging. Moreover, CT scans offer clear diagnostic advantages, as they quickly rule out hemorrhages and can detect even small tumors that may mimic a stroke.

CONCLUSION

While significant advances in stroke imaging have been made, including CT perfusion imaging, Xenon CT, CT angiography, MR diffusion imaging, MR perfusion imaging, and MR angiography, the study discovered that clinical diagnosis of acute stroke alone is frequently insufficient, resulting in a high risk of poor patient morbidity. As a result, it is critical that CT be used whenever possible in acute stroke therapy.

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