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Original Research Article

Role of CT in Evaluation of Cerebrovascular Accidents

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Abstract

Background: A cerebrovascular accident occurs when there is an abrupt loss of blood flow to a part of the brain, which causes a commensurate loss of neurologic function. The study's objective was to assess computed tomography's contribution to cerebrovascular accidents.

Method: 70 adult patients who had undergone cerebrovascular accidents were studied. Their previous histories of hypertension, diabetes mellitus, and cardiac disease were noted, and a CT scan was performed.

Results: Out of 70, 44 (62.90%) had infarction, 18 (25.70%) had subarachnoid hemorrhage, 1 (1.6%) had tumors, 2 (3.33%) had cerebral-cavernous thrombosis, and 1 (1.6%) were normal.

Conclusion: The CT scan study proved to be the gold standard technique for the diagnosis of acute stroke and hemorrhages in different parts of the brain.

Keywords: GE Revolution EVO 128-slice CT, Infarction, Hemorrhage, Stroke, Tumour.

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Introduction

After cancer and heart disease, cerebrovascular accidents (CVAs) rank among the top causes of death in developed countries. In India, they are also among the top causes of death. It makes up around 1% of general hospital admissions.[1] An acute loss of focal and occasionally global brain function that lasts longer than 24 hours or results in death with no evident cause other than vascular origin is known as a cerebrovascular accident or stoke.[2]

Cerebrovascular accidents are a major cause of mortality and mobility, and in most cases, there are no distinguishing characteristics that make it clinically difficult to distinguish between ischemic and hemorrhagic strokes.[3] Early and accurate diagnosis may reduce morbidity and mortality. One of the most precise techniques for locating and detecting a brain infarct is computed tomography.[4] CT effectively distinguishes between hemorrhagic and ischemic infarctions.[5,6] CT facilitates the comparison of abnormality patterns identified by pathologic results with clinical profiles.[7] Vascular rupture causes hemorrhagic stroke, which is typically linked to hypertension.[8] In contrast, the primary cause of ischemic stroke is intracranial thrombotic or embolic blockage.[9] The study's objective was to assess computed tomography's function in cerebrovascular disease and distinguish between various stroke types.

Material and Methods

This study done on 70 patients with a clinical diagnosis of an acute stroke who were taken admission in Darbhanga Medical College and Hospital, Laheriasarai, Bihar were included. The current investigation was carried out from August 2023 to June 2025".

Samples of cases which is referred patients with a clinical history suspected of stroke-like symptoms are collected for study. "The GE REVOLUTION EVO 128-SLICE CT SCANNER was used to perform a computed tomography scan of the patients' heads".

Contiguous axial sections up to 5 mm thick are acquired as part of the imaging protocol without the use of intravenous contrast agents. Brain window settings were used to evaluate the images. According to the proforma, clinical information and the case's computed tomography results were documented.

A comparison between computed tomography imaging and other diagnostic imaging tools, such as M.R.I will not be attempted.

Patients having neurological deficiencies from clear non-vascular causes, such as hypoglycemia, diabetic ketoacidosis, or trauma, were not included in this analysis. CT scan findings in cerebrovascular accident strokes were classified with percentages. Similarly, intracranial hemorrhages at different parts of the brain were also studied and classified with percentages.

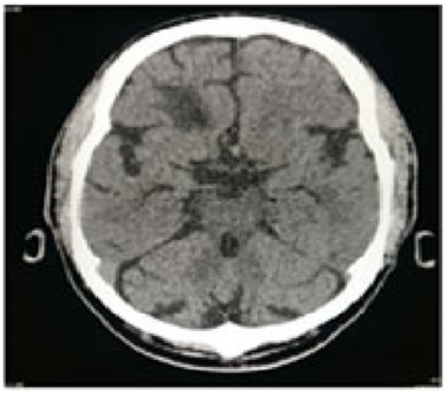

Figure 1: Acute infarct RT aca

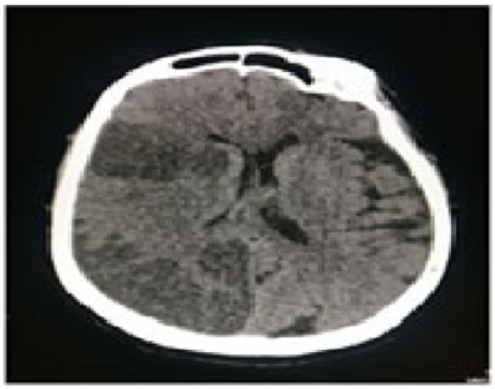

Figure 2: acute infarct – RT mca territory

Figure 3: Acute infarct – RT pca territory

Figure 4: Intracerebral hemorrhage

Results

Study of CT findings in cerebrovascular accidents 44 (62.90%) infarction, 18 (25.70%) hemorrhage, 4 (5.70%) subarachnoid hemorrhage (SAH), 1 (1.6%) tumors, 2 (3.33%) cerebralvenous thrombosis (CVT), and 1 (1.67%) normal.

Table 1: CT scan findings in 70 clinically suspected stroke cases

CT Diagnosis	No. of cases	Calculation for 70 cases
Infarction	44 cases	62.90%
Haemorrhage	18 cases	25 .70%
Subarachnoid Hemorrhage (SAH)	4 cases	5.70%
Tumor	1 case	1.6%
Cerebralvenous Thrombosis (CVT)	2 cases	3.33%
Normal	1 case	1.6%

The age range of the patients in our study encompasses individuals aged 20 to 89 years of life. The oldest patient age included was eighty-seven years, while the youngest one was twenty-one.

Table 2: Age stratification in infarcts cases (n=44)

Age Group	No. of cases	Percentage
20 to 29 Years	2 cases	4.5%
30 to 39 Years	2 cases	4.5%
40 to 49 Years	5 cases	11.36%
50 to 59 Years	6 cases	13.6%
60 to 69 Years	16 cases	36.36%
70 to 79 Years	12 cases	27.27%
80 to 89 Years	1 case	2.27%

Table 3: Age-wise distribution in cases of intracerebral haemorrhage (n=18)

Age Group	No. of cases	Percentage
20 to 29Years	1 case	5.55%
30 to 39Years	1 case	5.55%
40 to 49Years	1 case	5.55%
50 to 59Years	0 case	0
60 to 69Years	8 cases	44.44%
70 to 79Years	5 cases	27.77%
80-89Years	2 cases	11.11%

Both hemorrhage and infarction were found to be most prevalent in the 60–69 age range.

Table 4: Sex wise distribution (n=70)

Gender	No. of cases	Percentage
Male	47	67.14%
Female	23	32.86%
Total	70	100%

The study included 47 male participants i.e., 67.14% and 23 female participants i.e., 32.86%. The study showed Infarction in male participants i.e. 65.7% and Infarction in females i.e.: 34.21%. Ratio amongst Male and female found to be (1.05:0.5).

In intracerebral haemorrhage male accounted for 66.66% hemorrhage and females accounted for: 33.33% hemorrhage. Male: Female ratio 2:1.

A prior history of hypertension was considered a significant risk factor." Although most of the patients acknowledged that no evaluation done for increased in blood pressure prior to the commencement of stroke, 30% of cases I. e. 21 patients had a pre-existing elevated blood pressure history". Amongst Twelve patient I. e. Among those with hypertension, 55.56 percent had cerebral hemorrhage. I have seven patients. e.g 33.34% of people with hypertension had an infarct.

A history of diabetes mellitus was documented in almost 30% of the patients included in this study. Before their stroke, many patients had not been examined for signs of diabetes. Twenty-one of the seventy patients had pre-existing diabetes. 66.67% of patients with pre-existing diabetes showed cerebral infarction i.e. 14 cases. 33.34% of the patients with pre-existing diabetes showed intra cerebral haemorrhage i.e., 7 cases.

Twenty percent of the patients in our study had heart disease, according to their medical histories. e. in fourteen instances. Five of the twelve cases showed changes in ECG after a stroke attack, two of them had silent cardiac angina, and seven had cardiac disease that had previously been identified.

Among 70 cases of CT scan evaluation [assessment, analysis] of CVA, 44 patients of infarcts were detected that accounts for 63.33% cases. 13 patients had infarct in region of right MCA territory accounting for 29.5% cases. Patients had infarct in region of left MCA territory accounting for 22.7% cases. 05 patients had infarct in region of right PCA territory accounting for 11.3% cases. 02 patients had infarct in region of left PCA territory accounting for 5.26% cases. 01 patient had infarct inside of right ACA territory accounting for 2.63% cases. 01patient had infarct in region of left ACA territory accounting for 2.63% cases. 03 patients had infarct in region of right. MCA and PCA territory accounting for 7.89% cases. 02 patients had infarct in region of left. MCA and PCA territory accounting for 5.26% cases. 04 patients had infarct in site of both MCA territory accounting for 10.52% cases. 01 patient had infarct in region of vertebrobasilar artery territory accounting for 2.63% cases. 02 patients had lacunar infarcts accounting for 5.26% cases In this research the region of right MCA is the most commonly affected site. 18 of the 70 cases of clinically presumed CVA in study were found to be cerebral hemorrhage, accounting for 25.71 percent of the total. Intracerebral hemorrhage in 18 cases. Six patients, or 33.33 percent, discovered intracerebral hemorrhage in the left MCA territory. Four cases, or 22.22% of the total, discovered cerebral hemorrhage in the right MCA territory. 6.66 percent of the patients had cerebral hemorrhage in the right PCA territory. 6.66 percent of the cases had a intracerebral hemorrhage in the region of left PCA territory.

Patient had cerebral haemorrhage in right MCA and PCA territories regions accounting for 6.66%. Patients had cerebral haemorrhage in left MCA and PCA territories regions accounting for 13.33%. 01 patient had intracerebral haemorrhage in both MCA territories regions accounting for 6.66%. 01 patient had haemorrhage in vertebro basilar artery territory region accountingor 6.66 %" In research left MCA territory was commonly affected region.

Table 5: Incidence recorded in ICH in different parts of brain in18 patients of Intracerebral Hemorrhage

	No. of cases	Percentage
Putamen/external capsule	9	50%
Thalamus	4	22.2 %
Cerebellum	2	13.34%
Pons	1	6.67 %
Miscellaneous	2	13.32 %

In this study Putamen/External capsule includes 9 cases (50%), Thalamic involvement includes in 4 cases (22.22%), Cerebellar involvement includes in 2 cases (13.33 %), Pontine hemorrhage includes 1 case (6.6 %) and Intraventricular extension was seen in 6 cases accounting for 40% patients hat had bad prognosis.

In our case study of 70 patients of CVA, 4 of them showed hemorrhage in sub arachnoid region that accounts for 5.8 %. Out of 70 cases in our study, two had CVT, and the calculated percentage was 3.33%. The patient did not have diabetes or hypertension. One case, or 1.6 percent, of 70 clinically suspected CVA cases on the basis of clinical symptoms who gone through CT scanning proved to be normal scans. This instance was viewed negatively. As there are technical issues in the detection of cerebral infarction, bleeding is ruled out always.

Our study found that stroke mimics—tumors—occurred in one out of every 60 suspected CVA cases, or 1.6 percent of the total. Clinicians thought these cases were strokes because the clinical presentations and clinical manifestations of tumors shows similarity to those of strokes. However, computed tomography scanning revealed that the cases were actually tumorous pathology. These patients exhibited stroke-like loss of motor abilities and/or sensory abilities on one side of the body.

Discussion

Out of 70 cerebrovascular accidents, 18 (25.70%) had hemorrhage, 4 (5.70%) had subarachnoid hemorrhage (SAH), 1 (1.6%) had tumors, 2 (3.33%) had cerebral venous thrombosis, and 1 (1.6%) was normal. Nine (50.0%) putamen/external capsule, four (22.2%) thalamus, two (13.34%) cerebellum, one (6.67%) pons, and two (13.32%) miscellaneous were the sites of cerebral bleeding. These results are largely consistent with earlier research [10,11,12].

It is an established fact that CT scanning as a tool in the early diagnosis of cerebrovascular accidents provides therapy via intra-arterial or intravenous pathways. The frequent misdiagnosis of stroke accident is quite common in cerebrovascular accidents. Other studies have reported the usefulness of CT scans to differentiate between hemorrhage and infarct and other causes of stroke, thus aiding in clinical management [13]. Due to wide spread availability, lower noninvasiveness, and cost-effectiveness, CT is already widely used in clinical practice to detect blind cerebrovascular injury (BCVI). It is reported neurological symptoms in patients with BCVI might be delayed due to the low sensitivity of CT scans, which could leave them untreated; hence, the pivot question seems to be how harmful under treatment is in undiagnosed BCVI patients.The human factor is even more important in visualizing subtle changes in imaging. There is no evidence on how accurate radiologists or other specialties are in diagnosing mild or minor BCVI in CT scans [14].

Previously CT was considered as insensitive in the evaluation of acute ischemic stroke patients; however, more recently, detection of early CT findings has proved to be prognostic for patients [15]. The use of CT coupled with early acute phase therapy has been shown to improve outcomes in the acute stroke patients. Cerebral CT is a mainstay emergency diagnostic tool in acute stroke patients and conveys important information within a few hours after the ictus [16]. It is reported that CT scan findings in 18 and 45 years of age patients had 80% infarction in the carotid artery and 20% in the vertebrobasilar artery. It is confirmed that multiple perfusion CT is useful and has comparable utility to diffusion and perfusion MRI for predicting final infarct volume, infarct growth, and clinical severity in acute ischemic stroke. In the CT scan of a stroke in the middle cerebral artery, the CT signs are larger than the similar DWI hyper signal. Hence, early CT signs might have patented dual fate [17].

Conclusion

As an accurate diagnosis is very essential for rational management of stroke and it should be recommended to be conducted ideally, CT scan is the gold standard method to diagnose acute stroke. Our study's findings and contributing variables show good correlation with research conducted globally.

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