



ROLE OF CT SCAN IN EVALUATION OF CEREBROVASCULAR ACCIDENTS IN COMORBID PATIENTS

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ABSTRACT

Background: Stroke is the third leading cause of death throughout the world. An acute stroke is defined as a focal or global deficit of brain function lasting for more than 24 hours which had occurred within 2 weeks of the patient's presentation. Computed tomography (CT) has greatly facilitated the diagnosis and management of stroke. Due to so many reasons, CVA is nowadays very common and also major emergency conditions presenting to emergency department. The purpose of the present study is to document the presence or absence of haemorrhage or infarcts and to determine its size & location of clinically suspected stroke. **Materials & Methods:** 70 cases of clinically suspected CVA, which was submitted for CT evaluation from August 2020 to January 2021 following commencement of Ethical Approval were included in this study. **Results:** Out of the 70 patients clinically suspected of CVA submitted for CT scan study of the brain. 41.42% had infarction, 24.28% patients had hemorrhage. 24.13% infarct and 41.17% hemorrhage was found in the age group of 40-49. Male preponderance was found over female. 07 patients had CAD, 14 had hypertension and 19 had diabetes. 13.79% cases of infarction had involvement of Left MCA territory while 23.52% cases of hemorrhage had involvement of Haemorrhagic infarction. 35.29% of hemorrhage were in Putamen / External capsule. Intraventricular extension was noted in 09 cases accounting for 52.94%. All the cases of CVT belonged to the age group of 20-30 years. **Conclusion:** CT scanning is a "Gold Standard" technique for the diagnosis of acute stroke and management of stroke depends upon "accurate diagnosis" and should be ideally done in all cases.

KEYWORDS : Stoke, Computed Tomography, CVA, infarct, hemorrhage.

INTRODUCTION

Cerebrovascular accident (CVA) or stroke is defined as an acute loss of focal and at times global (applied to patients in deep coma and those with subarachnoid haemorrhage) cerebral function, the symptoms lasting more than 24 hours or leading to death with no apparent cause other than that of vascular origin (WHO).¹

CVA is one of the leading causes of mortality after heart disease and cancer in the developed countries and one of the leading causes of death in India. Stroke is a generic term that describes a clinical event characterized by sudden onset of neurological deficit. Arterial ischemia /infarction are by far the most common cause of stroke, accounting for 80% of all cases. The remaining 20% are mostly hemorrhagic, divided between primary spontaneous intracranial hemorrhage (sICH), Non traumatic subarachnoid hemorrhage (SAH), and venous occlusions.²

The exact prevalence rate of this disease in the Indian population is not known, although it accounts for about 1% of admissions to general hospital. The incidence rate and the death rate from stroke increases dramatically with age. About 15 to 30% of patients die with each episode of cerebral infarction and 16 to 80% with cerebral haemorrhage. Those who survive are usually left with permanent disability. Thus, stroke becomes a great medical and social problem. Accurate and early diagnosis may improve the morbidity and mortality rates in the future as newer and more effective therapies are currently being instituted.³

There are several reasons for performing Brain CT of patients with cerebrovascular accidents.³

1. To establish the diagnosis & to identify types of stroke amenable by surgery.
3. To exclude intracranial haemorrhage & to diagnose spontaneous subarachnoid haemorrhage.
5. To detect bone changes.

The advent of CT in early 1970s greatly facilitated the

diagnosis and management of stroke and added significantly to our understanding of pathophysiological brain alterations in case of humans. With CT it is now possible for the first time to noninvasively and reliably diagnose and distinguish between stroke due to cerebral infarction and stroke due to hemorrhage. Despite many improvements in MR technology, CT is still the method of choice for more of the patients being evaluated for cerebrovascular accidents because of its fast acquisition.

CT is a good diagnostic instrument even in early phase of acute ischemic stroke. In combination with new helical CT technique (CT angiography) all- important decisions regarding early therapeutics can be answered. Clinical approach to stroke has undergone many changes in the past few years. CT scan has become an essential and integral part of the assessment and has given a more objective basis to management and use of the IV contrast material. After non-contrast CT and the availability of follow-up studies in many instance significantly aids in the determination of the correct vascular etiology of the stroke.

There is paucity of literature on CT studies of patients with CVA. Hence the present study was conducted with an aim to detect the presence or absence of infarct or hemorrhage, determining the size, location of arterial territories involved in infarct with respect to onset of clinical symptoms and to detect other causes simulating stroke.

MATERIAL & METHODS

The present study was carried out in the Department of Radiology, Government Medical college, Azamgarh for a period of 6 months starting from August 2020 to January 2021 following commencement of Ethical Approval. A total of 70 patients with the clinical diagnosis of acute stroke referred to the radiology department for CT scan of the brain.

Inclusion Criteria

1. All postoperative patients of either gender in the age group of 20 and above were included.

- All those Patients who were willing to give signed written informed consent form were included.
- All patients with clinical diagnosis of acute stroke admitted in the Government Medical college, Azamgarh were eligible for the study.

Exclusion Criteria

- Patients who were not willing to sign the inform consent were excluded.
- All postoperative of either gender in the age group of less than 20 were excluded.
- Pregnant women and Lactating mother.
- Patients with neurological defects due to obvious cause other than vascular, such as hypoglycaemia, diabetic keto acidosis were excluded in this study.

Study Procedure

All patients referred for CT evaluation were scanned by using GE Hi speed dual slice spiral CT scanner and Toshiba helical CT scanner machine with the following specifications: 80 milliamperage, 120 kilovoltage, tilting angle ± 22°, matrix size of 512×512. Scans were taken parallel to the floor of the anterior fossa, the lowest section through the external auditory meatus and continuing to the top of the head. The gantry is angled towards the feet. Slice thickness of 4mm were used for scanning posterior fossa, 7mm for remainder of the head and wherever necessary still thinner sections were taken.

Routine IV contrast was carried out by using 40 ml of 76% iodinated contrast agent (calculated as 300 mg iodine per kg body weight) in all the cases of stroke except in intracerebral hemorrhage of non-traumatic origin. Follow up was done for a period of two months by subsequent repeat scans of the patient. These scans will be correlated with surgical finding where ever necessary or by favorable clinical outcome. Size of the lesion, peri-lesional edema, attenuation values will be compared with prior to and after treatment.

The study was considered as a case of cerebrovascular accident if the patients has an acute stroke which is defined as a focal or global deficiency of brain function lasting for more than 24 hours and occurred within 2 weeks of patients presentation in hospital.

Statistical Analysis

Descriptive statistical analysis has been carried out in the present study. Results on categorical measurements are presented in number (%). Chi-square test has been used to find the significance of study parameters on categorical scale between two or more groups. P value <0.05 were considered statistically significant.

RESULTS

- Out of 70 patients clinically suspected of CVA submitted for CT scan study of brain 29 patients had infarction, 17 patients had hemorrhage, 08 patient had subarachnoid hemorrhage (SAH), 07 patient had tumor, 03 patients had cerebral venous thrombosis (CVT), 06 patient had normal scan as presented in table no 1.

Table 1: Distribution of patients with clinically suspected CVA on CT study

CT Findings	No. of cases (n=70)	Percentage
Infarcts	29	41.42
Haemorrhage	17	24.28
SAH	08	11.42
Tumor	07	10
CVT	03	4.28
Normal	06	8.57
x ² = 5.66 d.f = 2 p = 0.561		

- In present study the age of the patient varied from second decade to ninth decade. The youngest patient was 24 years old and oldest was 91 years. The age distribution in case of infarcts and hemorrhage are illustrated in Table 2.

Table 2: Age distribution in case of infarcts and hemorrhage

Age (Years)	No. of cases with infarct (n=29)	No. of cases with hemorrhage (n=17)	p= 0.0411*
20-29	03 (1.34%)	03 (17.64%)	
30-39	01 (3.44%)	02 (11.76%)	
40-49	07 (24.13%)	07 (41.17%)	
50-59	04 (13.79%)	01 (5.88%)	
60-69	05 (17.24%)	00 (0.00%)	
70-79	04 (13.79%)	01 (5.88%)	
80-89	02 (6.89%)	03 (17.64%)	
90-99	03 (10.34%)	00 (0.00%)	

- Table 3 presents sex distribution among cases of infarcts and hemorrhage. Out of total 70 cases included in the study, 29 patients had infarction amongst 19 were males (65.51%) and 10 patients were female (34.48%) while 17 patients had hemorrhage amongst which 11 were male (64.70%) and 6 were female (35.29%).

Table 3: Sex distribution among cases of infarcts and hemorrhage

Sex	Infarction (%) (n=29)	Hemorrhage (n=17)
Male	19 (65.51)	11 (64.70)
Female	10 (34.48)	6 (35.29)
Male:Female	1.89:1.0	1.83:1.0

- Among the risk factors, past history of Coronary Artery Disease (CAD), Hypertension and Diabetes in CVA patients were given importance. Many patients were not tested previously for evidence of CAD, hypertension and diabetes before the onset of stroke. Out of 70 patients, 07 patients had history of pre-existing CAD, 14 had hypertension and 19 had diabetes. Prevalence of Infarction and hemorrhage among patients with these three risk factors were given in Table 4.

Table 4: Prevalence of infarction and hemorrhage in CAD, Hypertensive and Diabetic patients

Co-Morbid Condition	Infarction	Hemorrhage
CAD	05	02
Hypertension	06	08
Diabetes Mellitus	10	09

- Out of 70 cases of CT evaluation of CVA, 29 cases of infarction and 17 of intracerebral hemorrhage were diagnosed for involvement of vascular territory.

Table 5: Involvement of vascular territory among cases of infarction and hemorrhage

Vascular territory	Infarction (%) (n=29)	Hemorrhage (%) (n=17)
Right MCA territory	02 (6.89)	01 (5.88)
Left MCA territory	04 (13.79)	03 (17.64)
Right PCA territory	01 (3.44)	02 (11.76)
Left PCA territory	03 (10.34)	03 (17.64)
Right ACA territory	02 (6.89)	00 (0.00)
Left ACA territory	03(10.34)	00 (0.00)
Right MCA and ACA	01 (3.44)	00 (0.00)
Left MCA and ACA	02 (6.89)	01 (5.88)
Right MCA and PCA	03 (10.34)	02 (11.76)
Left MCA and PCA	01 (3.44)	00 (0.00)
MCA and vertebro basilar artery	02 (6.89)	00 (0.00)
MCA and PCA on both sides	01 (3.44)	00 (0.00)

Right MCA , PCA and ACA	01 (3.44)	00 (0.00)
Both sides of MCA	00 (0.00)	00 (0.00)
Vertebro basilar artery	02(6.89)	00 (0.00)
Isolated lacunar infarcts	01 (3.44)	01 (5.88)
Haemorrhagic infarction	00 (0.00)	04 (23.52)

- Table 6 shows the affected areas of brain in case of intracerebral hemorrhage in 17 patients.

Table 6: Incidence of intracerebral hemorrhage in different parts of brain

Areas of brain	No. of cases (n=17)	Percentages (%)
Putamen / External capsule	06	35.29
Thalamus	03	17.64
Lobar	02	11.76
Cerebellum	02	11.76
Pons	01	5.88
Haemorrhagic infarcts	01	5.88
Miscellaneous	02	11.76
Total	17	100

- In the present study intraventricular extension was noted in 09 cases accounting for 52.94% which had bad prognosis. The size of bleed in brain will reflect the severity of. In our study 08 patients had bleed in the size of 2-5 cms and the remaining patients showed damage of different sizes as given in Figure 1.

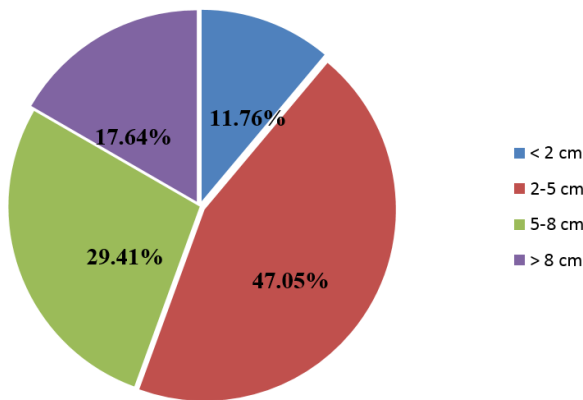


Figure 1: Different sizes of bleed

- In present study 08 case had subarachnoid hemorrhage. 03 cases had reported with CVT. All the cases were associated with cortical/subcortical hemorrhages adjacent to the occluded sinus. Out of 3 cases, 2 cases were male and 1 case were female. 1 female patients was in puerperium. All the cases of CVT belonged to the age group of 20-30 years (3rd decade). Table 6 demonstrates different areas of brain affected with CVT.

Table 6: Different areas of brain affected with CVT

Areas of brain affected with CVT	No of cases (n=3)
Superior sagittal sinus thrombosis	01
Sigmoid sinus thrombosis	01
Transverse sinus thrombosis	01

DISCUSSION

R.H. Rosenwasser et al. (2000) emphasized the need for CT Scanning as a tool in the early diagnosis of cerebrovascular accidents in providing therapy via intra-arterial or intravenous pathway.⁴

This study was directed to evaluate the role of CT scan in patients presenting with acute cerebrovascular accident in differentiating between haemorrhage, infarct and other

causes of stroke. Before the advent of CT scan and in places where CT scan was available, physicians were mainly dependent on the history, physical findings and the Allen s method of scoring system to differentiate between haemorrhage and infarct using this scoring system.

Previous studies have reported the usefulness of CT scan in patients suffering from stroke by ability to differentiate between haemorrhage and infarct and other causes of stroke and thus aiding in the clinical management. Oxfordshire Community Stroke project that assessed 325 consecutive patients of acute stroke highlighting the role of usefulness of CT scan.³

Previously, CT was considered insensitive in the evaluation of acute ischemic stroke patient; however, more recently detection of early CT findings has proved to be of prognostic value in the evaluation of these patients. Cerebral CT is a mainstay in emergency diagnostic work up of acute stroke patients and conveys important information within a few hours after the ictus.

In our study we studied 70 patients of stroke for a period of six months and of them 29(41.42%) patients had infarction, 17 (24.28%) patients had hemorrhage, 08 (11.42%) patient had subarachnoid hemorrhage (SAH), 07 (10%) patient had tumor, 03 (4.28%) patients had cerebral venous thrombosis (CVT), 06 (8.57%) patient had normal scan. These findings of the present study in relation to infarct and hemorrhage were contradictory to study reported by Kumar LT et al who reported 69% infarcts, 21% hemorrhage and 1% subarachnoid hemorrhage. Out of 60 cases of clinically suspected CVA subjected to CT study, 1 case turned out to be normal accounting for 1.6%. This case is taken as negative cases.

Similarly our study report revealed that age of the patient varied from second decade to ninth decade. The youngest patient was 24 years old and oldest was 91 years. Maximum infarct 07 (24.13%) and maximum hemorrhage 07 (41.17%) cases was found in the age group of 40-49 which was contradictory to the findings of Dr N. Radha MD et al who reported maximum number of cases in the age group of 60-69 years.

In our study out of 70 cases included in the study, the findings of the study revealed that there is a male preponderance over female in the incidence of infarction and hemorrhage. There were Male:Female ratio of 1.89:1.0 for infarction and 1.83:1.0 for hemorrhage recorded in the study. which was similar to study in South-West Nigeria who reported a male to female ratio of 1.3:1¹² along with a retrospective study of medical admissions at the University of Nigeria Teaching Hospital, Enugu reporting a male gender preponderance.¹³

In our study on analyzing the risk factors, past history of Coronary Artery Disease (CAD), Hypertension and Diabetes in CVA patients were given importance. Out of 70 patients, 07 patients had history of pre-existing CAD, 14 had hypertension and 19 had diabetes which was contradictory to the findings of Lokesh Kumar T et al⁵ who had more percentage of diabetic and hypertensive patients. Not much of study on patients with CAD has been reported in literature. Although, we did not review the lifestyle and habits of the patients, we think that men are more involved in high-risk habits such as smoking and alcoholism, and probably work harder under stressful conditions. These factors are closely associated with hypertension and other cardiac diseases which may elicit CVA.

On analyzing involvement of vascular territory among cases of infarction and hemorrhage it was noted that Maximum 04 (13.79) cases of infarction had involvement of Left MCA territory followed by 03 (10.34) cases of infarction had

involvement of Left PCA territory, Left ACA territory and Right MCA and PCA while 04 (23.52) cases of hemorrhage had involvement of Haemorrhagic infarction followed 03 (17.64) cases of hemorrhage had involvement of Haemorrhagic infarction Left MCA territory & Left PCA territory which was almost similar to the findings of Lokesh Kumar T et al.⁵ This finding was contradictory to the results reported by Razzaq AA et al who performed a CT study to investigate the role of CT in diagnosis and management of young stroke patients. He 80% of the patients had infarcts of carotid territory and 20%, the vertebro basilar distribution.⁹

In our study incidence of intracerebral hemorrhage in different parts of brain were studied and we found that 35.29% of hemorrhage were in Putamen / External capsule followed by 17.64% in Thalamus region, 11.76% in Lobar & Cerebellum region which was slightly higher than the findings of Dr N. Radha MD (RD) et al.⁶ Similarly our study results revealed that intraventricular extension was noted in 09 cases accounting for 52.94% which had bad prognosis. The size of bleed in brain will reflect the severity which was complementary to the findings of Lokesh Kumar T et al.⁵ Detection of early CT findings in acute ischemic stroke has proved to be of prognostic value in the evaluation of these patients. The use of CT coupled with early acute phase therapy of stroke such as thrombolytic therapy has been shown to improve outcome in acute stroke patients.¹⁰

In present study 08 case had subarachnoid hemorrhage. 03 cases had reported with CVT. All the cases were associated with cortical/subcortical hemorrhages adjacent to the occluded sinus. Out of 3 cases, 2 cases were male and 1 cases were female. 1 female patients was in puerperium. All the cases of CVT belonged to the age group of 20-30 years (3rd decade). These finding were almost similar to the result of Lokesh Kumar T et al.⁵

CONCLUSION

CT scanning comes out to be the "Gold standard" technique for diagnosis of acute stroke as the rational management of stroke depends on "Accurate diagnosis" and it should be ideally done in all cases. Since risk factors such as hypertension, diabetes, cardiac disease and previous episodes of stroke play major role in the evolution of cerebrovascular accidents, thorough analysis by CT scan, other investigations and treatment in these patients will decrease the incidence of fresh episodes of CVA. Since risk factors such as hypertension, diabetes and previous episodes of stroke play major role in the evolution of cerebrovascular accidents, it is suggested that Such patients should be investigated carefully. Sudden onset of neurological deficit or unexplained headache should further be investigated for the possibility of CVA and If treatment is given early some of the cases of CVA could be saved from life threatening problems.

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