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Role of Computed Tomography in Evaluation of Cerebro-Vascular Accidents

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Abstract

Objective: To evaluate cerebrovascular accidents using computed tomography. **Materials and Methods:** A descriptive study was carried out at the Department of Radio-diagnosis of Dr Vasantrao Pawar Medical College and research centre from August 2014 to November 2016, to evaluate cerebrovascular accidents using computed tomography. One hundred patients who fulfilled the inclusion criteria were thoroughly evaluated. **Results:** 64% patients had cerebral infarction while 24% patients had intracerebral haemorrhage. 6% patients had SAH while 2% patients each had CVT and tumour respectively. 2% patients showed normal findings. 24% patients had a history of Diabetes mellitus whereas 30% patients had history of pre-existing hypertension. 20% patients had heart disease. 26% patients had a history of smoking whereas 28% patients consumed alcohol regularly. Out of 100 cases of clinically suspected CVA subjected to CT study, 2 cases turned out to be normal accounting for 2% of the study group. These cases were taken as negative cases.

Keywords: Cerebrovascular Accidents, Haemorrhage, Infarct, Stroke, CT

1. Introduction

Cerebrovascular accident 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]. Cerebrovascular accidents are one of the leading causes of death after heart disease and cancer in the developed countries and one of the leading causes of death in India.

There are several reasons for performing Brain CT of patients with cerebrovascular accidents[2].

- To establish the diagnosis.
- To identify types of stroke amenable by surgery.
- To exclude intracranial haemorrhage.
- To diagnose spontaneous subarachnoid haemorrhage.
- To detect bone changes.

Thanks to the high spatial and density resolution capability of a CT, it is one of the most accurate methods available for identifying and localizing an infraction within the brain. Ischemic infarction, haemorrhagic infarction and intracerebral haematoma are usually differentiated. CT also permits identification of the acute and chronic sequence that may develop after a sequence of infarction.

2. Material and Methods

2.1 Type of Study

Cross-sectional study.

2.2 Study Period

From August 2014 to November 2016.

2.3 Study Setting

The study was conducted in CT section of Department Radio-diagnosis of Medical College and tertiary health care centre.

2.4 Study Participants

Data for the intended study was collected by sampling referred cases with history of stroke with even C.T serial numbers for a period of 24 months.

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2.5 Sample size

100 cases.

2.6 Eligibility Criteria

2.6.1 Inclusion Criteria

All patients with clinical diagnosis of acute stroke admitted in MVPS Dr. Vasantrao Pawar Medical College, Nashik are eligible for the study.

2.6.2 Exclusion Criteria

- Pregnancy.
- Patients diagnosed with psychiatric illnesses.
- Patients with neurological defects due to obvious cause other than vascular (such as hypoglycemia, diabetic ketoacidosis).

3. Results

3.1 Distribution of Patients according to CT Findings

64 (64%) patients had cerebral infarction while 24% patients had intracerebral haemorrhage. 6% patients had SAH while 2% patients each had CVT and tumour respectively. 2% patients showed normal findings.

Table 1. Distribution of patients according to CT Findings

CT Findings	N	%
Cerebral Infarction	64	64%
Intracerebral Haemorrhage	24	24%
Cerebral Venous Thrombosis (CVT)	2	2%
Subarachnoid hemorrhage (SAH)	6	6%
Tumour	2	2%
Normal	2	2%
Total	**100**	**100%**

3.2 Involvement of Vascular Territory

3.2.1 Cerebral Infarction

The present study had 64 cases of cerebral infarction. 18 (28.4%) patients had infarction in right middle cerebral artery (MCA) territory while 14 (21.9%) patients had infarction in left MCA territory. 9.4% patients had infarction in right Posterior Cerebral Artery (PCA) territory while 4 (6.2%) patients had infarction in left PCA. 2 (3.1%) patients each had infarction in right and left anterior cerebral artery (ACA) territory respectively. 4 (6.2%) patients each had infraction in right MCA and PCA, left MCA and PCA and right and left MCA territory respectively. 2 (3.1%) patients had infarction in vertebro basilar artery territory except PCA branch and 4 (6.2%) patients had lacunar infarction.

Table 2. Involvement of vascular territory in cerebral infarction

Vascular Territory	N	%
Right MCA	18	28.4%
Left MCA	14	21.9%
Right PCA	6	9.4%
Left PCA	4	6.2%
Right ACA	2	3.1%
Left ACA	2	3.1%
Right MCA and PCA	4	6.2%
Left MCA and PCA	4	6.2%
Right and Left MCA	4	6.2%
Vertebro basilar artery territory except PCA branch	2	3.1%
Lacunar	4	6.2%
Total	**64**	**100%**

3.2.2 Intracerebral Haemorrhage

The present study had 24 cases of intracerebral haemorrhage. 4 (16.7%) patients had infarction in right Middle Cerebral Artery (MCA) territory while 6 (25%) patients had infarction in left MCA territory. 2 (8.3%) patients each had infarction in right posterior cerebral artery (PCA), left PCA, left Anterior Cerebral Artery (ACA), right MCA and PCA, left MCA and PCA and right and left MCA territory respectively. 2 (8.3%) patients had haemorrhagic infarction.

Table 3. Involvement of vascular territory in intracerebral haemorrhage

Vascular Territory	N	%
Right MCA	4	16.7%
Left MCA	6	25%
Right PCA	2	8.3%
Left PCA	2	8.3%
Left ACA	2	8.3%
Right MCA and PCA	2	8.3%
Left MCA and PCA	2	8.3%
Right and Left MCA	2	8.3%
Haemorrhagic	2	8.3%
Total	**24**	**100%**

Incidence of Intracerebral Haemorrhage (ICH) in different parts of Brain

Putamen/external capsule involved 6 (50%) cases while thalamic and cerebellar involvement was seen in 2 (16.7%) cases each. Haemorrhagic infarction was also seen in 2 (16.7%) case.

Table 4. Incidence of Intracerebral Haemorrhage (ICH) in different parts of Brain

	N	%
Putamen/External capsule	6	50%
Thalamus	2	16.7%
Cerebellum	2	16.7%
Haemorrhagic infarcts	2	16.7%
Total	**12**	**100%**

4. Discussion

Stroke is the third leading cause of death and an important cause for Hospital admission and long-term disability in most industrialized population[3].

Cerebro- vascular accidents are caused by three major pathogenic mechanisms:

- Thrombosis (Arterial and Venous).
- Embolism.
- Haemorrhage.

Computed tomography is in clinical practice of utmost important for differentiating stroke from other diseases, which may mimic stroke, it also distinguishes one type of stroke from other. In a given case of suspected stroke, the CT adds value to:

- Establish the diagnosis of stroke.
- Identify type of stroke amenable to surgery.
- Exclude intracranial haemorrhage[4].
- Identifies mimics of stroke.

CT can be used to distinguish between haemorrhagic strokes and stroke due to infarction[1].

Early CT changes may be present within the first 3 hours after the onset of stroke and may or may not influence patient selection for thrombolytic therapy[5].

CT scan is a dramatically new non-invasive technique that provides direct visualization of the intracranial contents without discomfort or much risk to the patient (Radiation). CT helps to compare patterns of abnormalities with clinical profiles and pathologic anatomic findings at necropsy[6].

CT has proven to be of significant potential prognostic value in the evaluation of the acute stoke patient[3].

CT Findings in Infarction

CT changes in acute infarction evolve with time. Recent studies show that positive CT findings within the first 6 hours after onset vary from 56-92 %. Positive CT findings have also been described in the first 2 hours after cerebral infarction (68%), the incidence increases to 89% in the third hour and to 100% thereafter[6].

Recent advances in medical imaging allow detailed and sophisticated evaluation of the brain and intracranial and extra cranial vasculature. These tools continue to contribute to our understanding of the multifactorial processes that occur in the aging brain. Continued investigation, especially with newer functional and physiologic imaging techniques, will continue to aid in elucidating the pathophysiologic basis of age-related changes in the brain.

Rapid improvement in the hardware and software has resulted in CT scanners that can detect and characterize the stroke and its cause (atherosclerotic pathology of supra-aortic vessels) with an exquisite level of detail. CTP offers valuable information about the brain vascular physiology thus increasing the stroke diagnostic performance.

Computed tomography is the benchmark for the detection of hemorrhage and cerebral infarct due to the common availability, speed, low cost and accuracy. Since it is difficult to differentiate such small changes between acute, sub-acute and chronic infarct by naked eyes the current study is helpful to detect and classify the cerebral infarcts.

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