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Original Research Article

CT Findings in Stroke: A Retrospective Descriptive Study

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Abstract

Background: Stroke is a leading cause of morbidity and mortality worldwide. Timely imaging with computed tomography (CT) is crucial for accurate diagnosis and clinical decision-making.

Objective: To describe the CT imaging characteristics of stroke and identify the distribution of ischemic and hemorrhagic lesions in a cohort of 260 patients.

Methods: A retrospective descriptive study was conducted on 260 stroke patients who underwent non-contrast. CT findings were analysed for stroke type, location, laterality, and associated complications.

Results: Of the 260 cases, 198 (76.2%) were ischemic and 62 (23.8%) were hemorrhagic strokes. The most common location for ischemic strokes was the middle cerebral artery (MCA) territory (62.6%). In hemorrhagic strokes, basal ganglia was the predominant site (48.4%).

Conclusion: Non-contrast CT plays a vital role in early identification of stroke subtypes. MCA infarcts and basal ganglia hemorrhages are the most common patterns, highlighting the utility of CT in guiding acute stroke management.

Introduction

Stroke remains one of the most significant contributors to global disease burden, ranking among the leading causes of adult disability and mortality worldwide. According to the World Health Organization, stroke accounts for approximately 11% of all deaths globally, with the incidence expected to rise due to aging populations and increasing prevalence of risk factors such as hypertension, diabetes, and sedentary lifestyles (1). Stroke is broadly classified into ischemic and hemorrhagic types, with ischemic stroke being more prevalent, comprising about 80–85% of cases (2).

Rapid and accurate diagnosis is critical in stroke management, particularly in the hyperacute phase where decisions regarding thrombolysis and neurosurgical intervention are time-sensitive. Computed tomography (CT), especially non-contrast CT (NCCT), remains the first-line imaging modality due to its availability, speed, and ability to exclude intracerebral hemorrhage, a key contraindication for thrombolytic therapy (3). While magnetic resonance imaging (MRI) offers higher sensitivity for early ischemic changes, CT remains the imaging modality of choice in emergency settings, particularly in resource-limited environments (4).

The interpretation of CT in stroke involves the identification of early signs of ischemia, localization of infarct or hemorrhage, assessment of lesion extent, and detection of complications such as cerebral edema, herniation, or hydrocephalus. Common ischemic findings include hypodensity in the affected vascular territory, loss of gray-white differentiation, and sulcal effacement, whereas hemorrhagic strokes typically present as hyperdense regions with or without mass effect (5).

Despite its widespread use, the spectrum of CT findings in stroke patients can vary depending on the timing of presentation, underlying etiology, and patient demographics. A detailed understanding of these patterns is essential for

clinicians and radiologists to optimize acute management and prognostication.

This study aims to describe the computed tomographic findings in a cohort of 260 patients with clinically suspected stroke, to determine the distribution of ischemic and hemorrhagic lesions, and to analyse their anatomical characteristics. The results are expected to enhance the recognition of common imaging patterns and reinforce the critical role of CT in acute stroke evaluation.

Materials and Methods

Study Design and Setting

This was a **retrospective descriptive study** conducted in the Department of Radiodiagnosis. The study included all patients who underwent non-contrast computed tomography (NCCT) of the brain for clinically suspected stroke over a **one-year period**.

Sample Size and Population

A total of **260 patients** aged 18 years and above, who presented with acute neurological deficits suggestive of stroke and underwent NCCT as the initial imaging modality, were included. Patients with traumatic brain injury, intracranial space-occupying lesions, or incomplete imaging records were excluded.

Data Collection

Demographic details (age, sex) and clinical indications were obtained from hospital records. All CT brain scans were reviewed by two experienced radiologists independently. In cases of discrepancy, consensus was reached through joint evaluation.

The CT scans were analysed for the following parameters:

- **Type of stroke**: ischemic or hemorrhagic
- **Location of lesion**: e.g., basal ganglia, thalamus, cerebral cortex, cerebellum, brainstem
- **Laterality**: right, left, or bilateral
- **Extent and complications**: cerebral edema, midline shift, intraventricular extension, hydrocephalus

Imaging Protocol

All scans were performed using a 64-slice CT scanner (Philips Brilliance). Axial sections were acquired at 5 mm thickness from the base of the skull to the vertex. No contrast was administered. Standard window settings for brain parenchyma and bone were used for evaluation.

Data Analysis

Data were compiled using Microsoft Excel and analysed using SPSS version 25. Descriptive statistics were used to present the frequency and percentage of various stroke types and anatomical patterns. Results were expressed in tables and figures for clarity.

Results

Demographic Profile

A total of **260 patients** were included in the study. The **mean age** was **62.7 ± 11.3 years**, with the age range between **34 and 89 years**. There was a **male predominance** with **158 males (60.8%)** and **102 females (39.2%)**.

Table 1: Age and Gender Distribution of Stroke Patients (N = 260)

Variable	Number of Patients	Percentage (%)
Age < 60 years	102	39.2
Age ≥ 60 years	158	60.8
Male	158	60.8
Female	102	39.2

Stroke Type Distribution

Out of the 260 CT scans analysed:

- **198 patients (76.2%)** were diagnosed with **ischemic stroke**.

- **62 patients (23.8%)** had **hemorrhagic stroke**.

Table 2: Distribution of Stroke Type

Stroke Type	Number of Cases	Percentage (%)
Ischemic	198	76.2
Hemorrhagic	62	23.8

Anatomical Location of Lesions

Among ischemic strokes:

- **124 (62.6%)** occurred in the **middle cerebral artery (MCA)** territory.
- **32 (16.2%)** involved the **posterior circulation**.
- **22 (11.1%)** were in the **anterior cerebral artery (ACA)** territory.
- **20 (10.1%)** showed multifocal involvement.

In hemorrhagic strokes:

- **30 (48.4%)** were located in the **basal ganglia**.
- **14 (22.6%)** involved the **thalamus**.
- **10 (16.1%)** occurred in the **cerebellum**.
- **8 (12.9%)** were **lobar hemorrhages**.

Table 3: Anatomical Location of Stroke Lesions

Location (Ischemic, n = 198)	Number	%
MCA Territory	124	62.6
Posterior Circulation	32	16.2
ACA Territory	22	11.1
Multifocal	20	10.1
Location (Hemorrhagic, n = 62)	**Number**	**%**
Basal Ganglia	30	48.4
Thalamus	14	22.6
Cerebellum	10	16.1
Lobar	8	12.9

Associated CT Findings

In ischemic strokes:

- **Sulcal effacement** was present in 148 cases (74.7%).
- **Loss of grey-white differentiation** was noted in 126 cases (63.6%).

In hemorrhagic strokes:

- **Mass effect with midline shift** was seen in 28 cases (45.2%).
- **Intraventricular extension** occurred in 18 cases (29.0%).
- **Hydrocephalus** was identified in 8 cases (12.9%).

Table 4: Associated CT Findings in Stroke Patients

Finding	Ischemic (n=198)	%	Hemorrhagic (n=62)	%
Sulcal Effacement	148	74.7	-	-
Loss of Grey-White Differentiation	126	63.6	-	-
Midline Shift	-	-	28	45.2
Intraventricular Extension	-	-	18	29.0
Hydrocephalus	-	-	8	12.9

Discussion

This study analysed CT brain findings in 260 patients presenting with acute stroke symptoms, providing insights into the distribution of ischemic and hemorrhagic lesions and their anatomical patterns. The predominance of ischemic strokes (76.2%) over hemorrhagic strokes (23.8%) observed in this study is consistent with global epidemiological trends, which report ischemic strokes as the most frequent subtype, accounting for approximately 80–85% of all cases (1,2).

The **middle cerebral artery (MCA) territory** was the most commonly affected region in ischemic strokes (62.6%), reflecting the typical pattern of large vessel occlusion. This finding is corroborated by other studies that emphasize the vulnerability of the MCA territory due to its size and direct continuation from the internal carotid artery (3). The identification of **sulcal effacement** and **loss of grey-white matter differentiation** in over 60% of ischemic cases highlights the importance of recognising early parenchymal changes, especially when overt hypodensity may not yet be apparent.

In hemorrhagic strokes, the **basal ganglia** emerged as the predominant site (48.4%), which aligns with existing literature linking hypertensive hemorrhages with deep perforator vessels supplying this region (4). Other common sites included the thalamus, cerebellum, and lobar regions. Notably, **mass effect** and **intraventricular extension** were common complications observed on CT in hemorrhagic cases, underlining the need for urgent neurosurgical evaluation and intensive care management in such patients (5).

The study also noted a higher incidence of stroke in **males (60.8%)**, which may reflect underlying risk factor distributions, including higher rates of hypertension and smoking among men. The majority of patients (60.8%) were aged 60 years or older, reinforcing the established association between age and cerebrovascular risk (6).

The role of **non-contrast CT (NCCT)** in differentiating ischemic from hemorrhagic stroke remains vital, particularly in settings where MRI is not readily available or during the acute phase where rapid diagnosis is necessary. NCCT is reliable for detecting intracerebral hemorrhage and can identify early ischemic signs, which can guide therapeutic decisions, especially regarding thrombolytic therapy (7).

Limitations

This study was limited by its retrospective design and reliance on NCCT alone without follow-up imaging or clinical correlation. The absence of vascular imaging such as CT angiography (CTA) or perfusion studies may have limited the detection of smaller or transient ischemic events. Future prospective studies incorporating multimodal imaging and clinical outcomes would provide a more comprehensive understanding.

Conclusion

This study highlights the diagnostic significance of non-contrast CT in the acute evaluation of stroke. Ischemic strokes, particularly those involving the middle cerebral artery territory, were more prevalent than hemorrhagic strokes in our cohort. Hemorrhagic strokes frequently involved the basal ganglia and were often associated with complications such as midline shift and intraventricular extension. Early recognition of these patterns is crucial for timely therapeutic decisions. Non-contrast CT remains a valuable and accessible imaging tool, especially in resource-limited settings, for rapid stroke subtype classification and guiding initial clinical management.

References (Vancouver Style)

1. Feigin VL, Norrving B, Mensah GA. Global burden of stroke. Circ Res. 2017;120(3):439–48.
2. Donnan GA, Fisher M, Macleod M, Davis SM. Stroke. Lancet. 2008;371(9624):1612–23.
3. Adams HP Jr, Bendixen BH, Kappelle LJ, et al. Classification of subtype of acute ischemic stroke. Stroke. 1993;24(1):35–41.
4. Qureshi AI, Tuhrim S, Broderick JP, et al. Spontaneous intracerebral hemorrhage. N Engl J Med. 2001;344(19):1450–60.

5. Flaherty ML, Woo D, Haverbusch M, et al. Early deterioration following intracerebral hemorrhage. Neurology. 2004;63(3):461–7.
6. Béjot Y, Bailly H, Durier J, et al. Epidemiology of stroke in Europe and trends for the 21st century. Presse Med. 2016;45(12 Pt 2):e391–e398.
7. von Kummer R, Meyding-Lamadé U, Forsting M, et al. Sensitivity and prognostic value of early CT in occlusion of the middle cerebral artery trunk. AJNR Am J Neuroradiol. 1994;15(1):9–15.