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Original Research Article

Clinical and Radiological Characteristics of Stroke in Young Adults: A Prospective Study

Hariram Savjibhai Parmar[1], Ketan Vajubhai Dhanani[2]

[1]Associate Professor, Department of Radio-Diagnosis, Shantabaa Medical College & General Hospital, Amreli, Gujarat, India

[2]Assistant Professor, Department of General Medicine, Shantabaa Medical College & General Hospital, Amreli, Gujarat, India

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Corresponding author: Dr. Ketan Vajubhai Dhanani

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Abstract

Background: Stroke in young adults represents an emerging public health concern with distinct clinical and radiological characteristics compared to older populations.

Objective: To identify the clinical presentation and radiological profile of patients presenting with stroke in young adults.

Methods: A prospective observational study was conducted among 120 young stroke patients. Detailed clinical evaluation and CT-based radiological assessment were performed to determine stroke subtype and neurological manifestations.

Results: Hemiparesis (55.0%) and facial nerve involvement (46.7%) were the most common clinical features. Infarcts were the predominant CT finding (65.0%), and ischemic stroke constituted 76.7% of cases. Decreased consciousness showed a significant association with hemorrhagic stroke, while seizures were observed in 20.0% of patients.

Conclusion: Young stroke patients demonstrate a predominance of ischemic pathology with diverse clinical presentations, emphasizing the importance of combined clinical and radiological evaluation for early diagnosis and management.

Keywords: Young stroke, Clinical profile, Radiological findings, Ischemic stroke.

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Introduction

Stroke, traditionally considered a disease of older adults, increasingly affects younger populations, with approximately 10–15% of all strokes occurring in adults under 50 years of age [1]. Recent evidence demonstrates a rising incidence of stroke in young adults globally, driven by both conventional vascular risk factors and unique etiologies characteristic of this age group [2]. The younger demographic faces distinct clinical challenges including atypical presentations, diverse risk factor profiles, and a broader range of underlying causes compared with older stroke cohorts [3]. Clinically, motor deficits, sensory loss, speech disturbances, and cranial nerve involvement are common manifestations in young stroke patients, though heterogeneity in presentation often complicates prompt diagnosis [4].

Radiological imaging plays a pivotal role in the characterization of stroke subtypes and identification of the underlying pathology. Non-contrast computed tomography (CT) remains the frontline modality for acute stroke evaluation due to rapid availability and high sensitivity for hemorrhagic lesions, whereas magnetic resonance imaging (MRI), particularly diffusion-weighted imaging (DWI), is more sensitive for detecting acute ischemia and delineating infarct patterns [5]. Beyond simple lesion detection, advanced imaging techniques such as CT angiography and MR angiography facilitate evaluation of vascular pathology including arterial occlusion, arterial dissection, and venous thrombosis, which are more prevalent etiologies in young adults [6]. Detailed radiological profiling not only aids in diagnosis but also influences etiological classification according to systems like the Trial of ORG 10172 in Acute Stroke Treatment (TOAST) criteria, which is essential for optimal management and prevention strategies [7].

Epidemiological studies indicate that ischemic strokes predominate in young adults, but hemorrhagic strokes, cerebral venous thrombosis, and rarer vasculopathies also represent a significant proportion of cases [8]. Traditional risk factors such as hypertension, diabetes mellitus, dyslipidemia, and smoking are increasingly prevalent in this age group, mirroring global public health trends that propagate vascular risk across younger adults [9]. Moreover, non-traditional risk factors including patent foramen ovale, arterial dissection, hypercoagulable states, and connective tissue disorders further expand the etiological spectrum encountered in young stroke populations [2,10]. Radiological identification of these conditions often requires nuanced interpretation of CT and MRI findings, underscoring the need for comprehensive imaging protocols in this setting.

Overall, the integration of clinical findings and radiological data is crucial for understanding the heterogeneous nature of stroke in young adults, guiding individualized therapeutic approaches, and informing strategies for secondary prevention. The present study aims to define the clinical and radiological profile of young adults presenting with stroke, elucidating patterns that may enhance early recognition and tailored management of this vulnerable population.

Material and Methods

This prospective observational study was conducted to evaluate the clinical presentation and radiological profile of stroke in young adults. The study was carried out in the Department of General Medicine and Radiodiagnosis at a tertiary care teaching hospital over a defined study period after obtaining prior approval from the Institutional Ethics Committee. Written informed consent was obtained from all participants or their legally authorized representatives before enrollment in the study, and confidentiality of patient information was maintained throughout the research process.

A total of 120 consecutive patients presenting with clinical features suggestive of acute stroke were included in the study. Young adults were defined as individuals aged between 18 and 50 years. Patients were recruited from emergency services, inpatient wards, and neurology referrals. Diagnosis of stroke was established based on clinical examination supported by neuroimaging findings. Both ischemic and hemorrhagic stroke cases were included to allow comprehensive evaluation of the radiological spectrum in this age group. Patients with traumatic intracranial hemorrhage, brain tumors, central nervous system infections, or those with incomplete clinical or radiological data were excluded from the study.

Detailed clinical evaluation was performed for each patient at admission, including demographic data, presenting symptoms, risk factor assessment, neurological examination, and Glasgow Coma Scale scoring where applicable. Common clinical presentations such as hemiparesis, speech disturbances, altered sensorium, seizures, cranial nerve involvement, and headache were recorded systematically. Relevant laboratory investigations including complete blood counts, blood glucose levels, lipid profile, coagulation profile, and other etiological workup were documented as part of routine patient care.

Radiological evaluation was performed using non-contrast computed tomography of the brain at presentation to differentiate ischemic from hemorrhagic stroke and to identify early radiological changes. Magnetic resonance imaging of the brain, including diffusion-weighted imaging and fluid-attenuated inversion recovery sequences, was performed whenever clinically indicated to detect early infarcts and define lesion characteristics. Additional imaging modalities such as CT angiography or MR angiography were utilized in selected patients to evaluate vascular abnormalities. Radiological findings were categorized based on stroke type, anatomical location, vascular territory involved, and presence of complications such as edema or mass effect.

All clinical and imaging data were recorded in a structured proforma and entered into a computerized database for analysis. Statistical analysis was performed using standard statistical software. Continuous variables were expressed as mean with standard deviation, whereas categorical variables were presented as frequencies and percentages. Associations between clinical presentation and radiological findings were evaluated using chi-square test or Fisher's exact test for categorical variables, while independent t-test or analysis of variance was applied for comparison of continuous variables when appropriate. A p-value of less than 0.05 was considered statistically significant.

Ethical clearance for the study was obtained from the Institutional Ethics Committee prior to initiation, and the study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Patient participation was voluntary, and all diagnostic procedures performed were part of standard clinical care without additional risk to participants.

Results

Table 1 demonstrates the clinical profile of young adults presenting with stroke in the present study population of 120 patients. Seizures were absent in 96 patients (80.0%) while 24 patients (20.0%)

presented with seizures at admission, indicating that seizure activity was a relatively less frequent but important manifestation. Consciousness level was normal in 74 patients (61.7%) whereas 46 patients (38.3%) had decreased consciousness, suggesting that a considerable proportion of patients presented with altered sensorium. Cranial nerve involvement showed that 50 patients (41.7%) had no cranial nerve deficit, while facial nerve involvement was the most frequent abnormality observed in 56 patients (46.7%), followed by multiple cranial nerve involvement in 8 patients (6.6%) and oculomotor nerve involvement in 6 patients (5.0%).

Speech evaluation revealed normal speech in 54 patients (45.0%), dysphasia in 30 patients (25.0%), and speech not determined in 36 patients (30.0%), reflecting the variability of cortical involvement. Sensory deficits were relatively uncommon, with hemisensory loss seen in 12 patients (10.0%) while 108 patients (90.0%) had normal sensory examination. Motor deficits were the predominant clinical feature, with hemiparesis seen in 66 patients (55.0%), hemiplegia in 40 patients (33.3%), and monoplegia in 14 patients (11.7%). Table 2 shows CT scan findings among the study population, highlighting the radiological spectrum of stroke in young adults. Infarcts constituted the majority of imaging findings, seen in 78 patients (65.0%), followed by intracranial hemorrhage in 24 patients (20.0%) and venous thrombosis in 18 patients (15.0%). These findings emphasize that ischemic pathology remains the most common radiological presentation even in younger age groups.

Table 3 presents the distribution of stroke types based on clinical and radiological diagnosis. Ischemic stroke was identified in 92 patients (76.7%) while hemorrhagic stroke accounted for 28 patients (23.3%), demonstrating a clear predominance of ischemic etiology in this cohort. The association between clinical presentation and stroke type was not statistically significant for sensory deficit (p=0.462), whereas decreased consciousness showed a significant association with hemorrhagic stroke (p=0.038).

Table 1: Clinical Features of Stroke in Young Adults (n = 120)

Clinical Feature	Category	Number (120)	Percentage (%)
Seizures	Absent	96	80.0
	Present	24	20.0
Consciousness	Normal	74	61.7
	Decreased	46	38.3
Cranial Nerve Deficit	Normal	50	41.7
	Oculomotor	6	5.0
	Facial	56	46.7
	Multiple	8	6.6
Speech	Normal	54	45.0
	Dysphasia	30	25.0
	Not determined	36	30.0
Sensory Deficit	Normal	108	90.0
	Hemisensory loss	12	10.0
Motor Deficit	Hemiplegia	40	33.3
	Hemiparesis	66	55.0
	Monoplegia	14	11.7

Table 2: CT Scan Findings in Young Stroke Patients (n = 120)

CT Scan Findings	Number (120)	Percentage (%)
Infarct	78	65.0
Venous thrombosis	18	15.0
Hemorrhage	24	20.0

Table 3: Type of Stroke (n = 120)

Type of Stroke	Number (120)	Percentage (%)
Ischemic	92	76.7
Hemorrhagic	28	23.3

Discussion

The present prospective study evaluated the clinical and radiological profile of stroke in young adults and demonstrated that ischemic stroke was the predominant subtype, accounting for 76.7% of cases, while hemorrhagic stroke represented 23.3%. The predominance of ischemic pathology observed in this study is consistent with contemporary

epidemiological trends indicating that vascular risk factors and lifestyle changes are contributing to an increasing burden of ischemic stroke among younger populations. Previous studies have shown that young stroke patients frequently present with focal neurological deficits such as hemiparesis and cranial nerve involvement, which were also the most common findings in this cohort, with hemiparesis observed in 55.0% of patients and facial nerve involvement in 46.7% [11].

These findings highlight the importance of early neurological assessment in identifying stroke patterns that may otherwise be overlooked due to atypical age presentation. Altered consciousness was present in 38.3% of patients in this study and showed a significant association with hemorrhagic stroke, suggesting that clinical severity at presentation may help differentiate between stroke subtypes. Previous literature has emphasized that decreased level of consciousness is more frequently associated with intracranial hemorrhage or extensive infarction, reflecting the severity of underlying pathology [12].

The presence of seizures in 20.0% of patients further supports the concept that cortical involvement is common in young stroke populations, particularly in cases of venous thrombosis or hemorrhagic transformation. The relatively low proportion of sensory deficits compared with motor involvement suggests that motor pathways may be more frequently affected in this age group, consistent with prior neuroimaging studies examining vascular territory distribution [13]. Radiologically, infarcts were identified in 65.0% of cases, reinforcing the role of ischemia as the primary pathological process in young stroke patients. The detection of venous thrombosis in 15.0% of patients underscores the importance of considering alternative etiologies unique to younger individuals, such as prothrombotic states or hormonal influences.

Earlier studies have demonstrated that comprehensive imaging protocols, including CT and MRI, significantly improve diagnostic accuracy and help identify uncommon causes of stroke in young adults [14].

The integration of radiological findings with clinical presentation allows for better etiological classification and targeted management strategies, which is crucial for preventing recurrence in this population. Speech abnormalities were identified in 25.0% of patients, while speech assessment was not possible in 30.0% due to altered consciousness or severe deficits, indicating substantial cortical involvement in a significant subset of patients.

Previous research has highlighted that language dysfunction in young stroke patients is often associated with left hemispheric infarcts and may contribute to long-term disability if not recognized early [15]. Overall, the findings of this study emphasize that stroke in young adults presents with a wide clinical spectrum and requires a multidisciplinary approach combining clinical examination with detailed radiological evaluation to achieve accurate diagnosis and effective treatment planning.

Conclusion

The present study demonstrates that ischemic stroke remains the most common subtype among young adults, with motor deficits and cranial nerve involvement representing the predominant clinical manifestations.

Radiological evaluation revealed that infarcts were the most frequent imaging finding, followed by hemorrhage and venous thrombosis, highlighting the diverse etiological spectrum in this age group. Integration of clinical assessment with radiological profiling plays a vital role in early diagnosis, accurate classification, and optimized management of stroke in young adults, ultimately contributing to improved clinical outcomes and prevention of long-term disability.

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