Original Research Paper

Volume - 16 | Issue - 05 | May - 2026 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Clinical Radiology

COMPUTED TOMOGRAPHY ANGIOGRAPHY IN YOUNG ISCHEMIC STROKE PATIENTS: A BRIEF REVIEW

Dr. Firdaus Ahmed	Senior Consultant, Department of Interventional Radiology, GNRC Hospitals, Dispur, Assam
Dr. Kangkana Mahanta	Consultant, Department of Radiology and Imaging Sciences, GNRC Hospitals, Dispur, Assam
Dr. Sneha Gang	Senior Research Associate, Department of Research and Analytics, GNRC Hospitals, Dispur, Assam
Dr. Ananya Barman*	Senior Research Associate, Department of Research and Analytics, GNRC Hospitals, Dispur, Assam *Corresponding Author

ABSTRACT Ischemic stroke in young adults accounts for up to 15% of all strokes and presents unique etiologic challenges. To review the role, diagnostic yield, and clinical implications of computed tomography angiography (CTA) in young ischemic stroke patients. Narrative review of current literature focusing on vascular imaging findings and clinical impact of CTA in young adults. CTA provides rapid, high-resolution evaluation of intracranial and extracranial vasculature, enabling identification of large vessel occlusion (LVO), cervical artery dissection, carotid web, vasculitis, and other non-atherosclerotic arteriopathies. Studies demonstrate significant diagnostic yield in anterior circulation strokes, particularly for detecting dissection and non-stenotic vascular lesions. CTA plays a pivotal role in acute management and etiologic workup of young ischemic stroke patients. Its integration into standardized stroke imaging protocols improves diagnostic accuracy and therapeutic decision-making.

KEYWORDS : Computed Tomography Angiography, Young Stroke, Cervical Artery Dissection, Large Vessel Occlusion, Carotid Web

INTRODUCTION

Ischemic stroke in young adults differs significantly from stroke in older populations in terms of etiology, risk factors, and prognosis. While large artery atherosclerosis and small vessel disease predominates in older patients, younger individuals more commonly exhibit non-atherosclerotic causes such as cervical artery dissection, cardioembolism, inflammatory vasculopathies, and congenital vascular anomalies [1,2]. Rapid and accurate identification of vascular pathology is critical for determining eligibility for reperfusion therapy and guiding secondary prevention strategies. Computed tomography angiography (CTA) has emerged as a cornerstone imaging modality in acute stroke evaluation due to its rapid acquisition, accessibility, and high spatial resolution. CTA involves intravenous administration of iodinated contrast followed by rapid, thin-slice helical CT acquisition during the arterial phase. Modern multi-detector CT (MDCT) scanners allow high spatial resolution, fast acquisition (seconds), 3D reconstructions (MIP, VR) and coverage from aortic arch to vertex.

Role of CTA in Acute Stroke Workflow

CTA is typically performed in suspected acute ischemic stroke allowing detection of large vessel occlusion (LVO), localization of thrombus and identification of underlying vascular pathology. Systematic reviews demonstrate high diagnostic performance of single-phase CTA in detecting LVO, supporting its routine use in acute stroke triage [3]. Early identification of LVO is particularly important in young patients who may benefit substantially from mechanical thrombectomy due to better baseline functional reserve.

Etiologic Spectrum in Young Adults and CTA Findings

Cervical Artery Dissection

Cervical artery dissection is one of the most frequent causes of ischemic stroke in young adults. CTA findings include tapered stenosis, intimal flap, double lumen, and pseudoaneurysm formation. Community-based cohort studies report carotid dissection as the most common abnormal CTA finding in young anterior circulation stroke patients [4]. CTA demonstrates high sensitivity for extracranial dissections and is often the first-line imaging modality in emergency settings.

Non-stenotic and Structural Lesions

CTA can identify carotid webs and non-stenotic plaques that may serve as embolic sources. Such lesions may be under recognized on routine imaging but have important therapeutic implications [4]. Additionally, CTA evaluates congenital vascular variants, aneurysms, and arteriovenous malformations that may contribute to stroke.

Large Vessel Occlusion

Although less common than in elderly patients, LVO occurs in young adults, often secondary to embolism or dissection. CTA provides rapid occlusion mapping and collateral assessment, guiding thrombectomy decisions.

Congenital and Structural Abnormalities

CTA can detect arteriovenous malformations (AVMs), aneurysms, vascular hypoplasia, and persistent embryonic arteries. These findings may guide further evaluation or intervention.

Diagnostic Yield

Routine head and neck CTA enhances etiologic classification in young ischemic stroke. In anterior circulation strokes, clinically relevant vascular abnormalities are identified in a significant proportion of cases, particularly dissections and carotid pathology [4]. Compared with ultrasound, CTA offers superior visualization of intracranial arteries and distal cervical segments. While digital subtraction angiography (DSA) remains the gold standard, CTA provides a non-invasive, high-yield alternative suitable for emergent settings.

Advantages and Limitations

CTA offers several advantages including rapid acquisition suitable for acute stroke workflows, high spatial resolution facilitating identification of large-vessel pathology, wide availability across emergency imaging settings. However, CTA has a few limitations such as radiation exposure and contrast use must be balanced, especially in younger patients, limited resolution for small-vessel disease or subtle vasculopathies which may warrant MRI or conventional angiography in selected cases. Therefore, dose optimization protocols and judicious use are recommended to minimize cumulative radiation exposure.

Table 1: Comparison with Other Imaging Modalities

Modality	Strengths	Limitations
Computed tomography angiography (CTA)	Rapid, widely available, high spatial resolution, LVO detection	Radiation, contrast nephrotoxicity
Magnetic resonance angiography (MRA)	No radiation, vessel wall imaging	Longer acquisition, less available emergently
Digital subtraction angiography (DSA)	Gold standard, dynamic flow evaluation	Invasive, procedural risks
Ultrasound	Bedside, no radiation	Limited intracranial visualization

Clinical Implications

CTA findings directly influence eligibility for mechanical thrombectomy, initiation of anticoagulation in arterial dissection, surgical planning in structural vascular lesions and risk stratification for secondary prevention. Given the long life expectancy and socioeconomic impact of stroke in young adults, accurate vascular diagnosis is essential for optimizing long-term outcomes.

CONCLUSION

CTA is an indispensable imaging modality in the evaluation of young ischemic stroke patients. It provides rapid, high-resolution vascular assessment that not only facilitates acute therapeutic decisions but also identifies diverse non-atherosclerotic etiologies prevalent in this population. Incorporation of CTA into standardized stroke imaging protocols improves diagnostic yield and supports precision-based management strategies.

REFERENCES

1. Maaijwee NA, Rutten-Jacobs LC, Schaapsmeerders P, et al. Ischaemic stroke in young adults: risk factors and long-term consequences. Nat Rev Neurol. 2014;10(6):315-325.
2. Ekker MS, Verhoeven JI, Vaartjes I, et al. Stroke incidence in young adults according to age, subtype, sex, and time trends. Neurology. 2019;92(21):e2444-e2454.
3. Fasen BACM, Heijboer RJJ, Hulsmans F-JH, Kwee RM. Diagnostic performance of single-phase CT angiography for detecting large vessel occlusion in ischemic stroke: a systematic review and meta-analysis. Eur J Radiol. 2021;134:109458.
4. Schenk WB, Brinjikji W, Larson AS, Nasr DM. Diagnostic yield of neck CT angiography in young adults with anterior circulation ischemic stroke: a community-based study. Neurohospitalist. 2021;11(2):119-124.
5. Powers WJ, Rabinstein AA, Ackerson T, et al. 2019 AHA/ASA guideline for the early management of patients with acute ischemic stroke. Stroke. 2019;50(12):e344-e418.