Comparison of 64-Slice Vs 128-Slice CT in Stroke Imaging: A Comprehensive Review

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ABSTRACT

Rapid and accurate neuroimaging is essential for acute stroke management, guiding decisions for thrombolysis and mechanical thrombectomy. Multidetector computed tomography (MDCT) systems—particularly 64-slice and 128-slice scanners—are widely used for non-contrast CT (NCCT), CT angiography (CTA), and CT perfusion (CTP). This review compares the performance of 64-slice and 128-slice CT scanners in stroke imaging, focusing on spatial/temporal resolution, acquisition speed, radiation dose, diagnostic accuracy, workflow efficiency, and suitability for resource-limited settings. Evidence suggests that 128-slice CT provides superior temporal resolution, reduced motion artifacts, enhanced CTA and CTP quality, and faster workflow. However, 64-slice scanners remain highly effective for NCCT and routine CTA, offering cost-efficiency and adequate diagnostic accuracy for most emergency stroke pathways.

INTRODUCTION

Stroke is a major global health burden, and timely imaging plays a critical role in determining treatment pathways such as IV thrombolysis (time window ≤4.5 hours) and mechanical thrombectomy (window ≤24 hours). CT remains the first-line imaging modality because of its speed, availability, and high sensitivity for hemorrhage. MDCT advancements—from 16-slice to 64-slice and now 128-slice—have improved coverage, z-axis resolution, and perfusion imaging.

This review analyzes the comparative advantages and limitations of 64-slice and 128-slice MDCT systems in the context of emergency stroke imaging.

Technical Differences Between 64-Slice and 128-Slice CT

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Detector Configuration

Parameter	**64-Slice CT**	**128-Slice CT**
Detector row configuration	64 × 0.625 mm	128 × 0.6 / 0.625 mm
z-axis coverage	~40 mm	~80 mm
Detector technology	Adaptive array	Enhanced adaptive array
Typical rotation time	330–400 ms	280–330 ms

Implication:

Greater z-axis coverage in 128-slice CT improves whole-brain imaging and reduces motion artifacts.

Spatial and Temporal Resolution

128-slice CT achieves:

- Higher temporal resolution (due to dual-source options and faster gantry rotation)
- Better isotropic voxels
- More accurate vessel visualization in CTA

64-slice CT provides:

- Adequate resolution for NCCT and CTA
- Slightly more susceptibility to motion artifact in unstable patients

Clinical Comparison in Stroke Imaging

Non-Contrast CT (NCCT)

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NCCT is used to detect:

Intracerebral hemorrhage

Early ischemic changes (loss of gray–white differentiation)

Hyperdense artery sign

ASPECTS scoring

Performance:

Both scanners offer similar diagnostic capability for hemorrhage.

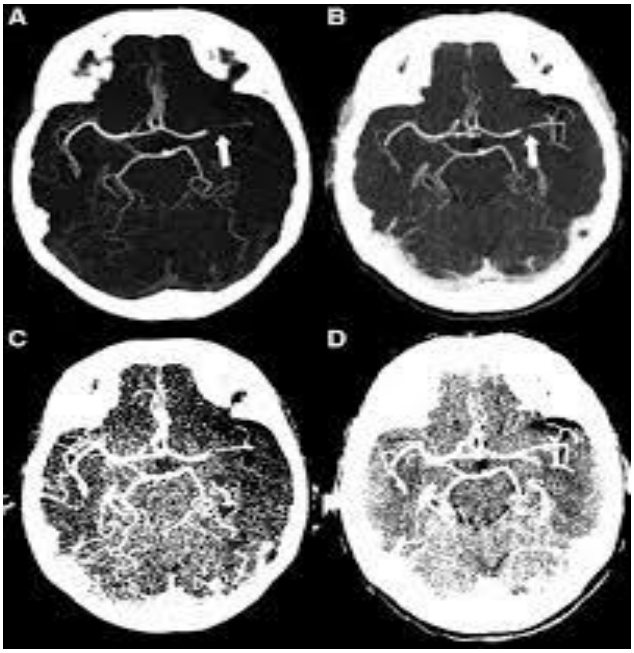
128-slice shows **slightly improved gray–white differentiation**, but not clinically transformative.

ASPECTS scoring reliability is comparable.

Conclusion

→ **64-slice CT is sufficient for NCCT in acute stroke**, and 128-slice gives marginal enhancement.

CT Angiography (CTA)



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CTA is crucial for detecting:

- Large vessel occlusion (LVO)
- Stenosis of ICA, MCA
- Collateral circulation

64-slice CTA:

- Good visualization of major intracranial arteries

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- Susceptible to venous contamination due to slower acquisition

128-slice CTA:

- Faster table speed minimizes venous overlap
- Higher resolution improves detection of distal M2/M3 occlusions
- Better depiction of collaterals

Conclusion:

→ 128-slice CTA is superior for LVO detection and pre-thrombectomy evaluation.

CT Perfusion (CTP)

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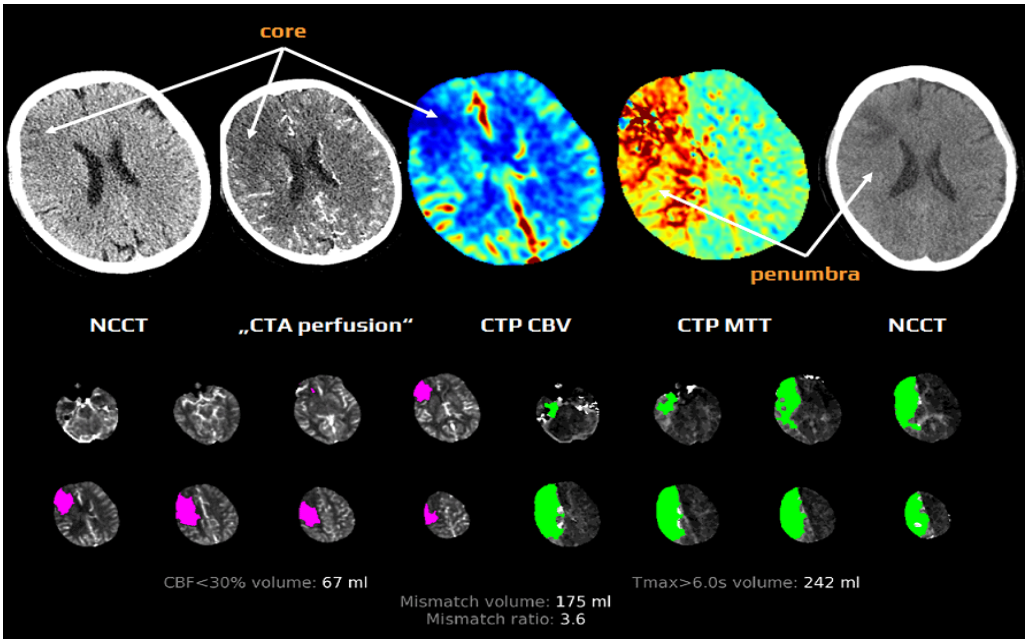

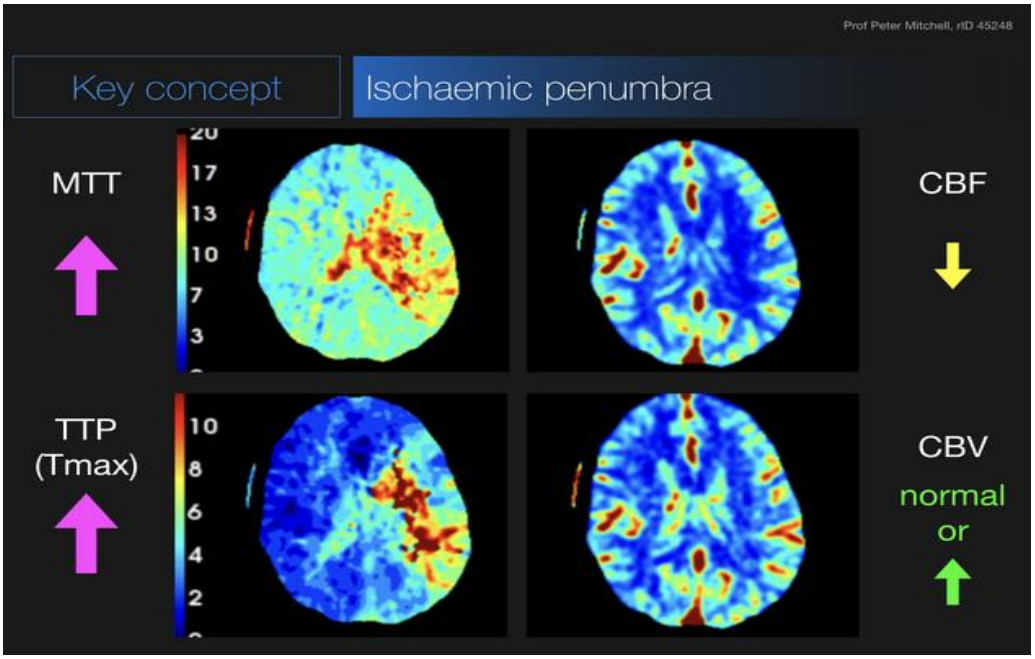

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Why CTP matters:

- Estimates infarct core
- Defines salvageable penumbra
- Determines eligibility for late-window thrombectomy (DAWN/DEFUSE-3 criteria)

Performance Comparison:

64-Slice CT

Limited coverage (~4–8 cm), may miss posterior circulation strokes

Lower temporal sampling → potential errors in time-to-peak (TTP) and cerebral blood flow (CBF) maps

More prone to noise in low-dose protocols

128-Slice CT

Whole-brain perfusion possible with 80–100 mm coverage

Higher temporal resolution yields:

- More accurate perfusion maps
- Better core/penumbra differentiation
- Reduced truncation artifacts

Conclusion:

→ **128-slice CT is significantly superior for CTP**, especially in comprehensive stroke centers.

4. Workflow Efficiency in Emergency Stroke Pathways

64-Slice CT Workflow

Slightly longer acquisition

Limited perfusion coverage requires multiple scans → delays

Quality depends heavily on patient motion

128-Slice CT Workflow

- Faster acquisition (entire brain in <1 second for CTA)
- Ideal for unstable patients (agitated, tachypneic)
- Reduces movement-related nondiagnostic scans
- Supports “One-Stop Stroke Imaging” (NCCT + CTA + CTP in <5 min)

Impact: Faster workflow improves “door-to-needle” and “door-to-puncture” times—critical for stroke outcomes.

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Radiation Dose Comparison

Parameter	64-Slice CT	128-Slice CT
NCCT	Comparable	Comparable
CTA	Slightly higher	Lower due to faster rotation
CTP	Higher cumulative dose	Lower due to optimized temporal sampling

128-slice scanners often reduce dose by 10–25% because of:

- Shorter acquisition times
- Iterative reconstruction
- Advanced detector efficiency

Cost, Maintenance & Suitability for Resource-Limited Settings

64-Slice CT

- Lower cost (₹3–5 crores)
- Widely available
- Ideal for district hospitals and emergency trauma units

Adequate for:

- NCCT
- Standard CTA
- Limited perfusion

128-Slice CT

- Higher cost (₹6–10+ crores)
- More demanding maintenance
- Best for medical colleges and tertiary stroke centers
- Essential if performing:
- Whole-brain CTP
- High-throughput stroke imaging

Summary of Advantages and Limitations

Advantages of 128-Slice CT

- Faster acquisition
- Better CTA (LVO + collaterals)

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- Whole-brain CTP
- Lower motion artifacts
- Lower radiation dose
- Better workflow in stroke alerts

Advantages of 64-Slice CT

- Cost-effective
- Adequate for NCCT and routine CTA
- Sufficient for basic stroke pathways
- Lower operational complexity

CONCLUSION

Both 64-slice and 128-slice CT scanners play important roles in acute stroke imaging. While 64-slice CT remains reliable for NCCT and standard CTA, the 128-slice CT provides substantial advantages in speed, perfusion imaging, motion reduction, and workflow optimization. For comprehensive stroke centers aiming to support thrombectomy programs, 128-slice CT is the superior choice. However, in resource-limited settings, 64-slice CT remains a cost-effective and clinically acceptable solution, especially when complemented with improved radiographer protocols.

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