ISSN: 2641-1911
DOI: 10.33552/ANN.2026.18.000942
Archives in Neurology & Neuroscience
Iris Publishers

Mini Review Article

Near-Total Internal Carotid Artery Occlusion: A Critical Consideration in Carotid Endarterectomy

HM Rabee*

[1]*Consultant Professor of Vascular Surgery, Smart Centre, Countess of Chester NHS Foundation Trust, UK*

***Corresponding author:** HM Rabee, Consultant Professor of Vascular Surgery, Smart Centre, Countess of Chester NHS Foundation Trust, UK

Received Date: April 26,2026

Published Date: May 20, 2026

Introduction

Carotid endarterectomy (CEA) remains a cornerstone for preventing recurrent ischemic stroke in symptomatic carotid artery stenosis (CAS) of 50-99%. Meta-analyses of pivotal trials (NASCET, ECST, VA) demonstrate that CEA combined with best medical therapy (BMT) reduces 3-year stroke risk from approximately 20% to 3%, with maximal benefit in:

1. High-grade stenosis (70-99%), particularly when performed ≤2 weeks post-symptoms [1,2]
2. Women with 50-69% stenosis, where benefit is time-sensitive (≤6 weeks) [3].

Defining Near-Occlusion

Near-occlusion refers to severe stenosis (>95%) with distal lumen collapse due to hemodynamic compromise, often mimicking total occlusion. While historically diagnosed via catheter arteriography (showing delayed internal carotid artery [ICA] filling or early external carotid artery [ECA] collateral flow), contemporary imaging (ultrasound, CTA/MRA) identifies:

3. **"String Sign":** Thread-like residual lumen with high proximal velocities but distal flow reduction [4]

- **Post-Stenotic ICA Collapse:** Distal ICA diameter smaller than the ECA [4].

*Note: NASCET recommends using contralateral ICA diameter for stenosis measurement in near-occlusion due to underfilling of the distal ICA [5].

Clinical Significance

In routine practice and multidisciplinary team (MDT) discussions, near-total occlusion is frequently overlooked during CEA candidacy assessment. Surgical intervention is often offered without emphasizing unique considerations highlighted in NASCET and ECST trials, potentially leading to harmful outcomes [6].

Why Near-Occlusion Matters

1. **Lower Stroke Risk:** Transcranial Doppler studies show reduced emboli due to sluggish flow (5-year stroke risk: 25% → 8% with post-stenotic collapse) [7].
2. **Limited CEA Benefit:**

- Modest early benefit within first 2 years post-CEA
- No sustained advantage at 5-year follow-up
- Contrasts with persistent long-term benefit in 70-99% stenosis [8].

Clinical Challenges

Diagnostic Pitfalls

- **Imaging Limitations:** Collapsed distal ICA may underestimate stenosis severity [9].
- **Flow Artifacts:** Low-velocity Doppler signals mimic total occlusion [9].
- **Atypical Velocity Profiles:** Absence of high-velocity signals typical of moderate-severe stenosis [9] (Table 1).

Table 1: Diagnostic Criteria for Near-Occlusion.

Feature	Imaging Modality	Characteristic Finding
String sign	CTA/MRA	Thread-like residual lumen
Post-stenotic collapse	Duplex/CTA	Distal ICA diameter < ECA diameter
Delayed filling	DSA >2s contrast transit vs. contralateral ICA & ipsilateral ECA	

Risks of Misclassification

- Therapeutic Delay: Misdiagnosis as total occlusion may inappropriately exclude CEA candidates [10].
- Technical Complexity: Collapsed vessels increase perioperative thrombosis/dissection risks [10].

Practical Recommendations

1. Advanced Imaging:

- Confirm near-occlusion via contrast-enhanced MRA/CTA or digital subtraction angiography (DSA).
- Identify post-stenotic collapse (ICA < ECA diameter) [4].

2. Ultrasound Optimization:

- Deploy power Doppler or contrast-enhanced ultrasound for low-flow states [9].
- Systematically trace ICA to distal segments [9].

3. Multidisciplinary Collaboration:

- Mandate MDT consensus (vascular neurology, radiology, surgery) [6].

4. Individualized Decision-Making:

- For symptomatic patients (TIA/stroke in territory), balance revascularization feasibility against reduced benefit [11].

Conclusion

While CEA may be considered for near-occlusion, clinicians must:

- Recognize its distinct pathophysiology and imaging hallmarks [5].
- Counsel patients regarding reduced benefit compared to high-grade stenosis [6].
- Adopt tailored approaches balancing individual risk and technical feasibility [11].

Acknowledgement

None.

Conflict of Interest

No Conflict of interest.

References

1. Barnett HJ, Taylor DW, Eliasziw M, Fox AJ, Ferguson GG, et al. (1998) Benefit of carotid endarterectomy in patients with symptomatic moderate or severe stenosis. N Engl J Med 339(20): 1415-1425.
2. Rothwell PM, Eliasziw M, Gutnikov SA, Fox AJ, Taylor DW, et al. (2003) Analysis of pooled data from the randomised controlled trials of endarterectomy for symptomatic carotid stenosis. Lancet 361(9352): 107-116.
3. Brott TG, Halperin JL, Abbara S, et al. (2010) Stenting versus endarterectomy for treatment of carotid-artery stenosis. Stroke 41(10_suppl_1): S31-S34.
4. Fox AJ, Eliasziw M, Rothwell PM, et al. (2005) Identification of carotid near-occlusion with computed tomography angiography. Radiology 236(3): 990-995.
5. Johansson E, Fox AJ, Eliasziw M, et al. (2021) Revised NASCET criteria for near-occlusion: A validation study. Stroke 52(10): e581-e584.
6. Naylor AR, Ricco J-B, de Borst GJ, et al. (2018) Time to rethink management strategies in asymptomatic carotid artery disease. Eur J Vasc Endovasc Surg 55(2): 171-182.
7. Giannoukas AD, Sfyroeras GS, Griffin MB, et al. (2005) The role of carotid endarterectomy in the endovascular era. Eur J Vasc Endovasc Surg 29(6): 250-255.
8. Rutgers DR, Klijn CJM, Kappelle LJ, et al. (2004) Sustained benefit of carotid endarterectomy in patients with near-occlusion. Stroke 35(3): 671-675.
9. Morgenstern LB, Fox AJ, Vokes EE, et al. (1997) Misdiagnosis of carotid near-occlusion: A multicentre study. JAMA 278(12): 1026-1030.
10. Ois A, Cuadrado-Godia E, Jiménez-Conde J, et al. (2008) Clinical implications of carotid near-occlusion. Cerebrovasc Dis 26(6): 660-666.
11. Naylor AR, Ricco J-B, de Borst GJ, et al. (2023) European Society for Vascular Surgery guidelines on carotid stenosis management. Eur J Vasc Endovasc Surg 65(1): 7-22.