# Cerebral Hyperperfusion Syndrome Following Carotid Endarterectomy: A Case Report

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## Abstract

Cerebral hyperperfusion syndrome (CHS) is a rare but potentially life-threatening complication of carotid revascularization. A 73-year-old woman presented with convulsions three days after left carotid endarterectomy for a reported 97% stenosis. She described blurred vision, vertigo and facial paralysis. Contrast-enhanced CT demonstrated left hemispheric hypervascularization, and MRI showed left frontoparietal and thalamic vasogenic edema. Her condition deteriorated to coma, prompting intensive care admission. Corticosteroid administration was reported during her admission. She recovered, was discharged two days later and had no residual deficits at one-month follow-up. This temporal course does not establish an independent treatment effect of corticosteroids. The case illustrates the need to consider CHS in patients with neurological deterioration after carotid endarterectomy. Evidence on risks and timing after carotid artery stenting should be distinguished from evidence after endarterectomy.

Keywords: Cerebral hyperperfusion; Carotid endarterectomy; Complication

## Introduction

Cerebral hyperperfusion syndrome (CHS) is a rare but potentially life-threatening complication of carotid revascularization. Clinical manifestations include headache, neurological deficits, seizures and impaired consciousness. Impaired cerebral autoregulation is considered an important mechanism, although the pathophysiology is not fully understood [1]. Evidence after carotid endarterectomy (CEA) and carotid artery stenting (CAS) should be distinguished when discussing risks and timing.

## Case Report

A 73-year-old woman presented to the emergency department with convulsions three days after left CEA for a reported 97% left carotid stenosis (Figure 1). She described blurred vision followed by vertigo and left facial paralysis. Immediate contrast-enhanced cerebral CT showed increased vascularization in the left cerebral hemisphere compared with the right (Figure 2).

Her condition deteriorated rapidly during the 30 minutes after CT. She entered a coma with clonic forehead movements, trismus, laboured breathing and hypersalivation. Emergency MRI demonstrated subcortical vasogenic edema in the left frontoparietal and thalamic regions, interpreted as consistent with CHS after CEA (Figures 3 and 4).

The patient was transferred to the intensive care unit. Electroencephalography showed no abnormalities. Corticosteroid administration was reported during admission. She recovered and was discharged home two days later. At a neurology consultation one month later, she had no residual deficits.

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## Carotid and Cerebral CT Angiography



Figure 1. Contrast-enhanced CT angiography of the neck showing severe left carotid stenosis (arrow), reported as 97% before endarterectomy.

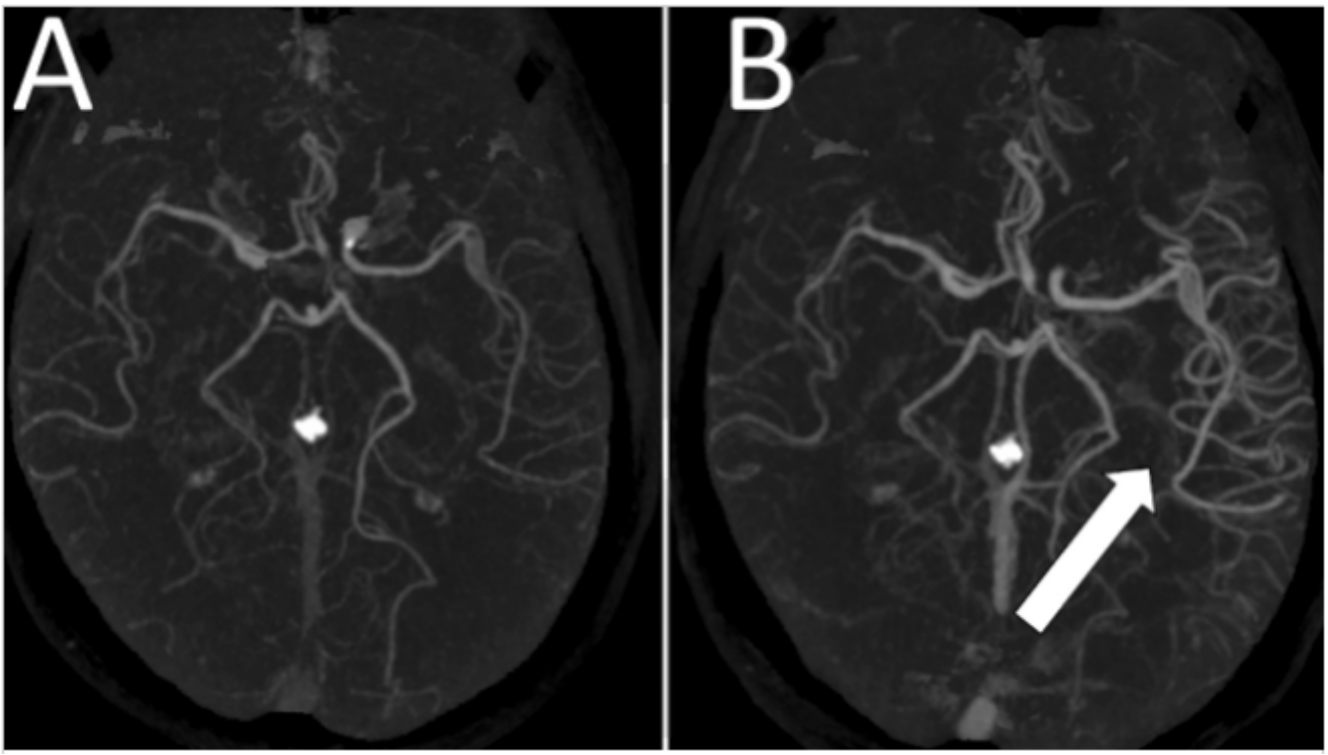



Figure 2. Cerebral CT angiography before CEA (A) and during emergency admission three days after CEA (B). Increased left hemispheric vascularization is visible on the admission examination (arrow).


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## Brain MRI

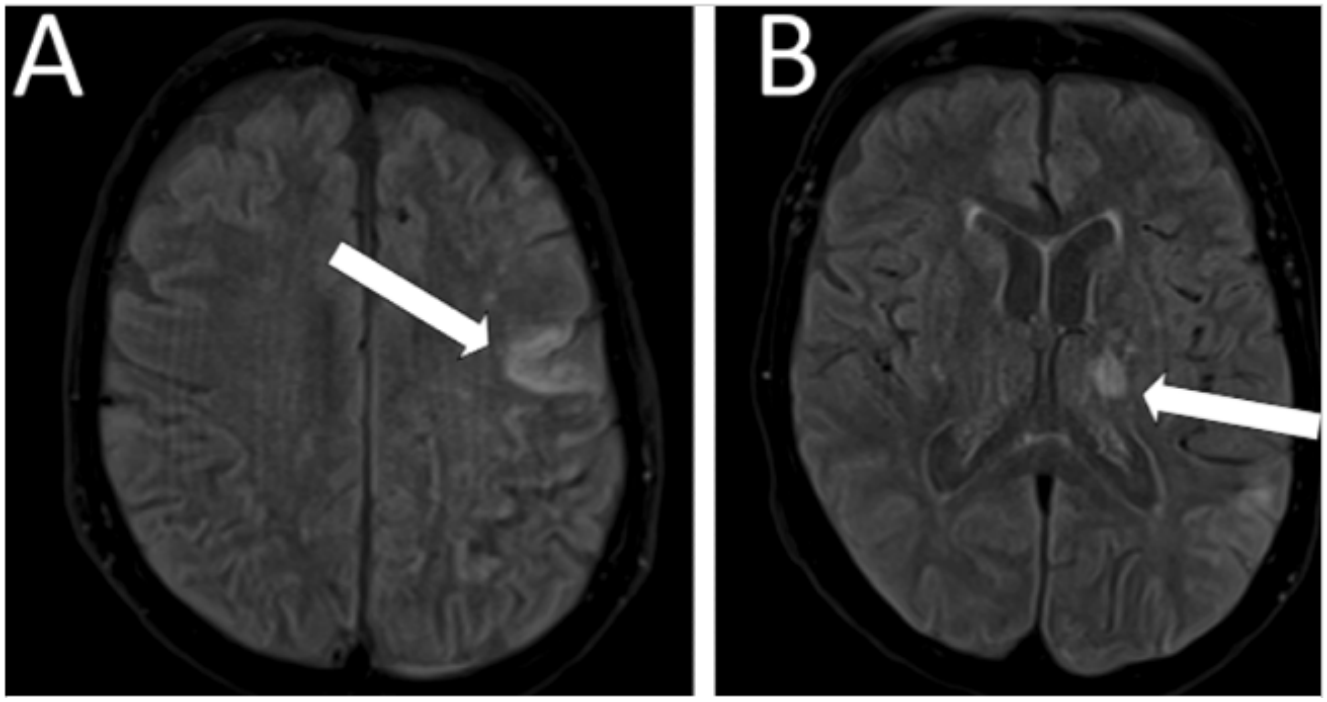



Figure 3. Axial FLAIR images from the 1.5 T brain MRI showing increased signal in the left frontal region (A, arrow) and left thalamic region (B, arrow), interpreted in the clinical account as vasogenic edema.

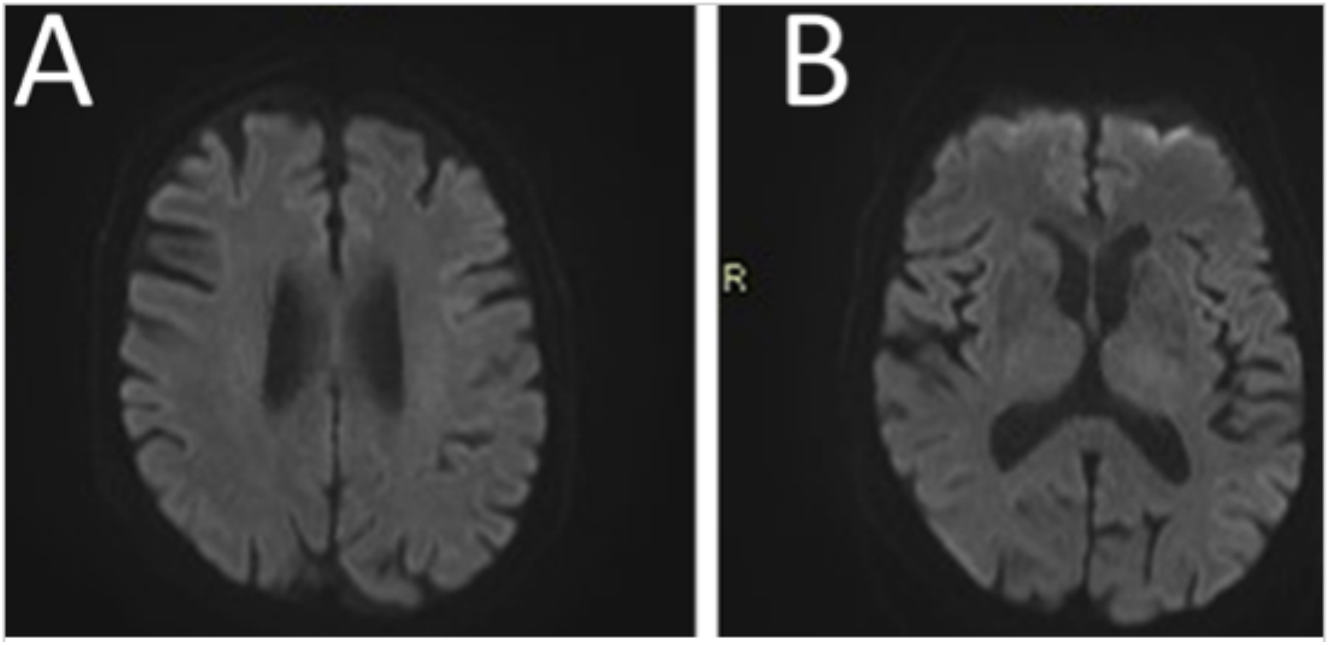



Figure 4. Diffusion-weighted images from the 1.5 T brain MRI at corresponding frontal (A) and thalamic (B) levels. No corresponding diffusion restriction was reported in the affected regions.

## Discussion

The patient developed neurological deterioration three days after CEA, with left hemispheric hypervascularization on CT and vasogenic edema on MRI. The reported clinical and imaging findings were interpreted as CHS. The patient recovered after intensive care admission during which corticosteroids were administered. This observed sequence does not establish that corticosteroids caused the recovery or demonstrate their independent efficacy in CHS.


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## Evidence After CEA and CAS

Risk estimates depend on the procedure, population and definition used. In the Vascular Quality Initiative analysis of 51,001 carotid endarterectomies, CHS was recorded in 0.18% of procedures [2]. Huibers et al. studied carotid artery stenting, not endarterectomy: their pooled CHS estimate was 4.6%, and stroke occurred in 47% of CHS patients [3]. These CAS findings should not be interpreted as CEA-specific risk estimates. The CAS series by Abou-Chebl et al. associated hyperperfusion with severe treated internal carotid stenosis, contralateral severe stenosis or occlusion, and peri-procedural hypertension [4].

The reported timing of CHS differs after carotid artery stenting and endarterectomy. The review by Lin and Liu describes an earlier peak after CAS than after CEA [1]. The approximately 12-hour interval reported by Huibers et al. concerns CAS patients [3]. Delayed presentation remains possible, so elapsed time alone should not exclude CHS.

## Imaging Assessment

CHS is assessed using the clinical course and imaging evidence of altered cerebral hemodynamics. CT and MRI can identify edema, hyperemia or hemorrhagic complications. Transcranial Doppler and perfusion imaging can support hemodynamic assessment, but definitions and thresholds vary [1]. Arterial spin labeling has also been investigated for prediction of hyperperfusion after CEA [5]. Imaging evidence of hyperperfusion should be distinguished from the clinical syndrome.

## Conclusion

CHS should be considered in patients with neurological deterioration after carotid revascularization, including delayed presentation after discharge. The present case followed CEA; risk estimates and time intervals derived from CAS populations should be identified as such. Clinical recovery was observed, without establishing an independent corticosteroid treatment effect.

## Conflict of Interest

The authors declare that there were no conflicts of interest within the meaning of the recommendations of the International Committee of Medical Journal Editors when the article was written.

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## References

1. Lin YH, Liu HM. Update on cerebral hyperperfusion syndrome. J Neurointerv Surg. 2020;12(8):788–793. https://doi.org/10.1136/neurintsurg-2019-015621

2. Wang GJ, Beck AW, DeMartino RR, Goodney PP, Rockman CB, Fairman RM. Insight into the cerebral hyperperfusion syndrome following carotid endarterectomy from the national Vascular Quality Initiative. J Vasc Surg. 2017;65(2):381–389.e2. https://doi.org/10.1016/j.jvs.2016.07.122

3. Huibers AE, Westerink J, de Vries EE, et al. Editor's Choice - Cerebral Hyperperfusion Syndrome After Carotid Artery Stenting: A Systematic Review and Meta-analysis. Eur J Vasc Endovasc Surg. 2018;56(3):322–333. https://doi.org/10.1016/j.ejvs.2018.05.012

4. Abou-Chebl A, Yadav JS, Reginelli JP, Bajzer C, Bhatt D, Krieger DW. Intracranial hemorrhage and hyperperfusion syndrome following carotid artery stenting: risk factors, prevention, and treatment. J Am Coll Cardiol. 2004;43(9):1596–1601. https://doi.org/10.1016/j.jacc.2003.12.039

5. Fan X, Zuo Z, Lin T, et al. Arterial transit artifacts on arterial spin labeling MRI can predict cerebral hyperperfusion after carotid endarterectomy: an initial study. Eur Radiol. 2022;32(9):6145–6157. https://doi.org/10.1007/s00330-022-08755-x