

Carotid artery disease and its contribution to cerebrovascular disorders

Sarah Mitchell*

Department of Neurology, University of Sydney, Sydney, Australia

DESCRIPTION

Carotid artery disease is a significant cardiovascular condition that plays a major role in the development of cerebrovascular disorders, particularly ischemic stroke. The carotid arteries are large blood vessels located on each side of the neck that supply oxygen-rich blood to the brain. When these arteries become narrowed or blocked, the brain may not receive an adequate blood supply, increasing the risk of serious neurological complications. Carotid artery disease is most commonly caused by atherosclerosis, a gradual buildup of fatty deposits, cholesterol and calcium along the arterial walls. Over time, this narrowing interferes with normal blood flow and creates conditions that can lead to life-threatening cerebrovascular events.

The progression of carotid artery disease is often slow and may remain asymptomatic for many years. However, as plaque accumulates, the artery becomes increasingly narrowed, reducing blood flow to the brain. In some cases, pieces of plaque or blood clots can break loose and travel to smaller arteries in the brain, causing an obstruction. This interruption in blood flow deprives brain tissue of oxygen and nutrients, leading to ischemic stroke or transient ischemic attacks, often referred to as mini-strokes. These events can result in long-term neurological deficits, including weakness, speech difficulties, memory loss and impaired coordination, highlighting the strong connection between carotid artery disease and cerebrovascular disorders.

Several risk factors contribute to the development of carotid artery disease and its associated neurological complications. These include high blood pressure, high cholesterol levels, smoking, diabetes, obesity and a sedentary lifestyle. Aging and genetic predisposition also increase vulnerability. These risk factors accelerate atherosclerosis, making arterial narrowing more severe and increasing the likelihood of plaque rupture or clot formation. Effective management of these factors is major in reducing the burden of cerebrovascular disease linked to carotid artery pathology.

Diagnosis of carotid artery disease plays a vital role in preventing cerebrovascular disorders. Noninvasive imaging techniques such as carotid ultrasound are commonly used to assess blood flow

and detect arterial narrowing. More advanced imaging methods, including computed tomography angiography and magnetic resonance angiography, provide detailed visualization of plaque characteristics and the degree of stenosis. Early detection allows clinicians to identify high-risk patients and implement timely interventions before a stroke or other neurological complication occurs.

Treatment strategies for carotid artery disease aim to reduce the risk of cerebrovascular events by improving blood flow and stabilizing plaque. Medical management is often the first line of treatment and includes antiplatelet medications, cholesterol-lowering drugs and blood pressure control. Lifestyle modifications such as smoking cessation, healthy diet, regular physical activity and weight management are equally important. For patients with significant arterial narrowing or symptoms of reduced cerebral blood flow, procedural interventions may be necessary. Carotid endarterectomy, a surgical procedure to remove plaque from the artery and carotid artery stenting, a minimally invasive technique to keep the artery open, have proven effective in reducing stroke risk when appropriately selected.

The impact of carotid artery disease on cerebrovascular health extends beyond acute stroke events. Chronic reductions in cerebral blood flow can contribute to cognitive decline, vascular dementia and other long-term neurological conditions. Repeated minor ischemic episodes may gradually impair brain function, affecting memory, attention and executive abilities. This highlights the importance of early diagnosis and comprehensive management not only to prevent stroke but also to preserve overall brain health and quality of life.

Advances in medical research and technology have improved outcomes for patients with carotid artery disease. Improved imaging techniques allow for better risk stratification, while refined surgical and endovascular procedures have enhanced safety and effectiveness. Multidisciplinary care involving cardiologists, neurologists, vascular surgeons and primary care providers ensures a holistic approach to managing both vascular and neurological risks.

Correspondence to: Sarah Mitchell, Department of Neurology, University of Sydney, Sydney, Australia, E-mail: sarah.mitchell@sydney.edu.au

Received: 03-Feb-2025, Manuscript No. AOA-25-39748; **Editor assigned:** 05-Feb-2025, PreQC No. AOA-25-39748 (PQ); **Reviewed:** 19-Feb-2025, QC No. AOA-25-397348; **Revised:** 26-Feb-2025, Manuscript No. AOA-25-39748 (R); **Published:** 05-Mar-2025. DOI: 10.35841/2329-9495.25.13.549

Citation: Mitchell S, (2025). Carotid artery disease and its contribution to cerebrovascular disorders. Angiol Open Access. 13.549.

Copyright: © 2025 Mitchell S. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

CONCLUSION

In conclusion, carotid artery disease is a major contributor to cerebrovascular disorders and remains a leading cause of ischemic stroke and related neurological complications. Its close association with atherosclerosis and common cardiovascular risk factors highlights the importance of prevention, early detection and timely intervention. Through effective medical therapy, lifestyle modification and when necessary, surgical or minimally invasive procedures, the risk of stroke and long-term brain damage can be significantly reduced. Addressing carotid artery disease is therefore essential in safeguarding cerebrovascular health and improving outcomes for individuals at risk of serious neurological disorders.

REFERENCES

1. Lefkowitz D, O'Leary DH, Goldstein S, Carlson MC, Fried LP, Longstreth Jr WT. et al. Cognitive impairment and decline are associated with carotid artery disease in patients without clinically evident cerebrovascular disease. *Ann Intern Med.* 2004;140(4): 237-247.
2. Wolpert SM, Caplan LR. Current role of cerebral angiography in the diagnosis of cerebrovascular diseases. *AJR.*1992;9(1):191-197.
3. Møller J, Nielsen GM, Tvedegaard KC, Andersen NT, Jørgensen PE. A meta-analysis of cerebrovascular disease and hyperhomocysteinaemia. *Scand J Clin Lab Invest.* 2000;60(6): 491-500.
4. Powers WJ, Press GA, Grubb Jr RL, Gado M, Raichle ME. The effect of hemodynamically significant carotid artery disease on the hemodynamic status of the cerebral circulation. *Ann Intern Med.* 1987;106(1):27-35.
5. Bakker FC, Klijn CJ, Jennekens-Schinkel A, Kappelle LJ. Cognitive disorders in patients with occlusive disease of the carotid artery: a systematic review of the literature. *J Neurol.* 2000;247(9):669-676.
6. Lindgren A, Roijer A, Norrving B, Wallin L, Eskilsson J, Johansson BB. et al. Carotid artery and heart disease in subtypes of cerebral infarction. *Stroke.* 1994;25(12):2356-2362.
7. Cassot F, Vergeur V, Bossuet P, Hillen B, Zagzoule M, Marc-Vergnes JP. et al. Effects of anterior communicating artery diameter on cerebral hemodynamics in internal carotid artery disease: a model study. *Circulation.* 1995 Nov 15;92(10):3122-3131.
8. Salasidis GC, Latter DA, Steinmetz OK, Blair JF, Graham AM. Carotid artery duplex scanning in preoperative assessment for coronary artery revascularization: the association between peripheral vascular disease, carotid artery stenosis, and stroke. *J Vasc Surg.* 1995;21(1):154-162.
9. Vernieri F, Pasqualetti P, Matteis M, Passarelli F, Troisi E, Caltagirone C. et al. Impaired cerebral vasoreactivity and risk of stroke in patients with asymptomatic carotid artery stenosis. *Jama.* 2000;283(16):2122-2127
10. Powers WJ. Cerebral hemodynamics in ischemic cerebrovascular disease. *Annals of Neurology.* 1991;29(3):231-240.