



A Review of Carotid Artery Stenosis in Vascular Cognitive Impairment

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Abstract

Stroke is a known cause of cognitive impairment but the relationship between asymptomatic carotid artery stenosis and cognitive function is not clear. The main risk factors for vascular disease are also related to carotid stenosis and cognitive impairment. The association of high-grade stenosis of the internal carotid artery with cognitive impairment is related to silent embolization and hypoperfusion, but it may also be present without evidence of infarction on magnetic resonance imaging. Carotid stenosis treatment may lead to a decline in cognitive function due to complications related to the procedures (endarterectomy or stenting). On the other hand, reperfusion may improve cognitive impairment. The best treatment choice is unclear, considering possible deterioration of cognitive function related to carotid artery stenosis.

Keywords: Carotid artery; stenosis; vascular cognitive impairment

Introduction

This review is meant to encourage those involved in the treatment of cerebrovascular disease to look beyond traditional clinical endpoints of motor and speech stroke. Our study examines the relationship between the structural stability of carotid atherosclerotic plaque forming at the bifurcation of the common internal/external carotids and the symptomatology of such lesions. The theory behind this body of work is the hypothesis that carotid atherosclerosis stroke presents not only as a classical episodic clinical condition, but may also involve elements of a continuous process involving large and small vessel circulations, microcirculatory changes, cellular metabolic resistance to ischemia and micro embolic events. Recent studies suggest for every recognized clinical stroke, 5 silent strokes take place.

Search Methods for Review

We performed a robust search of the available medical literature searching for manuscripts with key terms related to carotid atherosclerosis, carotid stenosis, arterial stiffness, and carotid plaque along with any terms related to cognitive impairment, dysfunction, or dementia.

Carotid Atherosclerosis

Carotid artery atherosclerosis and its relationship to stroke have clinically been an area of considerable research focus due to the devastating effects of artery to artery emboli and the potential for diagnostic and therapeutic advances. Indeed, the accessibility beneath the skin of the neck of this source of stroke to noninvasive study has allowed the opportunity for far greater understanding of the pathophysiology of stroke disease processes.

Carotid Stiffness and Cognitive Impairment

Stiffening of the carotid artery or other elastic arteries is the gradual loss of elastin fibers and accumulation of stiffer collagen fibers in the media over time. This process, which can occur independent of the development of atherosclerosis, leads to loss of the ability of vasculature to appropriately accommodate to changes in blood pressure variation. This loss of responsive distensibility leads to higher pulsatile pressures and eventually increased flow load experienced by cerebral microvasculature and ultimately the brain parenchyma.

Structural stability of a carotid plaque is a result of its chemical composition, cellular material and new vessel formation. The main components of atherosclerotic plaque are connective tissue extracellular matrix, including collagen, proteoglycans, and fibronectin elastic fibers; crystalline cholesterol, cholesterol esters, and phospholipids; and cells such as monocytoid-derived macrophages, lymphocytes, smooth muscle cells and new endothelial lined vessels.

Some studies have shown cognitive decline after carotid endarterectomy with mechanisms related to cerebral hyperperfusion after carotid endarterectomy, while in asymptomatic cases MRI does not always disclose structural brain damage associated with postoperative cognitive impairment. The general anesthesia carotid procedures have also been linked to early cognitive decline that is temporary in nature.

Conclusion

The literature on cognitive outcome after carotid revascularization is complex and further studies investigating specific populations of patients with carotid stenosis will help elucidate whether carotid endarterectomy or carotid stenting is more appropriate for a given patient considering the cognitive function and risks after the procedure. There is no evidence to support the performance of prophylactic carotid endarterectomy or carotid stenting with the aim of preventing cognitive decline in otherwise asymptomatic patients.

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