Case Report

Cerebral Embolus Following Chiropractic Manipulation in a Patient with a Calcified Carotid Artery

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ABSTRACT

BACKGROUND AND PURPOSE

Dissection of the cervicocranial vessels is the principal cause of ischemic brain injury following cervical spinal manipulation. Cervical spinal manipulation leading to cerebral embolus in the absence of dissection is not described in the literature. Current case documents cerebral embolism originating from extensively calcified internal carotid artery immediately following cervical spinal manipulation in the absence of dissection.

METHODS

We describe a case and imaging findings of a 63-year-old male who underwent cervical spinal manipulation and developed sudden onset of left-arm numbness and weakness.

RESULTS

Computed tomography angiography demonstrated extensively calcified right internal carotid artery at the site of redone carotid endarterectomy as well as calcified embolus in the right inferior middle cerebral artery.

CONCLUSIONS

Calcified carotid artery may be at risk for embolization following cervical spinal manipulation. Our recommendation is that, patients with extensively calcified carotid arteries should refrain from aggressive neck maneuvers and cervical spine manipulation therapy to avoid liberation of cerebral embolus.

Keywords: Calcification, cervical manipulation, embolus, spine, stroke.

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Introduction

Cervical spine manipulation therapy (SMT) has been associated with cervical artery dissection and stroke.[1] The biologically plausible explanation that suggests a causal connection between SMT and dissection comes from the known stretching of the vertebral and carotid arteries that occurs during neck manipulation. One case control study reported neck manipulation as an independent risk factor for vertebral artery dissection in patients younger than 60 years.[2] We present a unique case of a middle-aged man who had previous carotid endarterectomy with extensive "porcelain-like" calcification of the patch-grafted segment who suffered a transient ischemic attack immediately following neck manipulation. Imaging findings demonstrate presence of a calcified embolus in the right middle cerebral artery likely originating from the calcified internal carotid artery with angiography revealing no residual stenosis or dissection. Although carotid sinus massage,[3] and carotid ultrasonography,[4] have been reported to dislodge emboli from cervical arteries, this case is unique in suggesting a link between an artery-to-artery embolism in highly calcified cervical vessels as an additional risk factor for SMT-induced embolism in the absence of dissection.

Case Report

A 63-year-old right-handed man with a past medical history of coronary artery disease, right carotid endarterectomy for asymptomatic carotid stenosis 18 years prior to presentation and repeat carotid endarterectomy with saphenous vein patch graft 2 years later for restenosis, presented to the hospital with left-arm weakness and numbness. The patient sought chiropractic services for neck pain that was troubling him for a few days prior to the event. The symptoms occurred about 30 minutes following neck manipulation. The neurological examination revealed clumsiness in the left hand along with impaired light touch. Symptoms resolved after 5 hours. Magnetic resonance imaging (MRI) of the brain showed an acute ischemic stroke in the right posterior frontal and parietal cortex. Transesophageal echocardiogram showed an ejection fraction of 60%, no evidence of a patent foramen ovale, no thrombus in the left atrium or ventricle, and no plaque in the aortic arch. Computed tomography (CT) angiogram of the head showed "porcelain" calcification of the right internal carotid artery and most importantly a calcified embolus in the inferior division of the right middle cerebral artery. CT Hounsfield units of the embolus ranged from 802 to 950, suggesting calcific composition.

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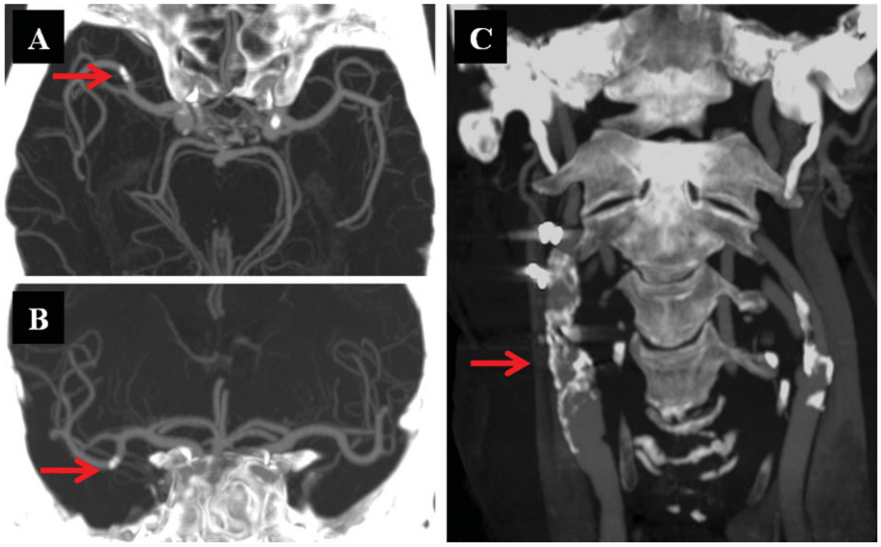


Fig 1. CT angiogram postprocessed maximum intensity projection images of the head and neck in axial (A) and coronal (B and C) views showing heavily calcified "porcelain-like" right internal carotid artery (arrow in C) and calcified embolus in the inferior division of the right middle cerebral artery (arrows in A and B).

Conventional cerebral angiogram was then performed, which confirmed findings of the CT angiogram including absence of ipsilateral internal carotid artery dissection.

Discussion

Chiropractic neck manipulation may involve high velocity, low-amplitude traction, and rotational movements of the neck. Rarely, these nonphysiological motions of the neck are thought to cause dissection of the cervical arteries leading to stroke. Acute stroke from an embolus originating from a carotid plaque following carotid sinus massage is infrequent but has been reported,[3] as has stroke following carotid duplex,[4] and transcranial Doppler involving compression of the carotid artery.[5] Even simple auscultation of the carotid may cause a retinal embolus.[6] Cervical osteophytes may increase the risk of embolization from the carotid artery.[7] To our knowledge this is the first case demonstrating a temporal association between SMT, stroke, and a CT angiogram showing calcific embolus in the intracranial vasculature without an associated dissection in a patient with heavily calcified cervical vessels.

Carotid endarterectomy with autologous saphenous vein patch graft is a standard approach to managing symptomatic and asymptomatic carotid atherostenosis. Two years after carotid endarterectomy was performed, our patient returned with restenosis from intimal hyperplasia. A repeat carotid endarterectomy with saphenous vein patch graft was performed. CT angiogram obtained during this admission revealed dense extensive calcification at the surgical site, which is best described as "slab-like" or "porcelain-like" calcification extending along the length of the patch which is distinctly different from the focal calcification seen at the carotid bifurcation on the contralateral side (Fig 1). This pattern of calcification is uncommon and may be a result of altered flow dynamics following a capacious patch graft.

In this case, the absence of other sources of emboli (e.g. cardiac, aortic arch, carotid siphon) strengthens our hypothesis that the calcified extracranial internal carotid artery was the source of embolus. The temporal relationship between the neck manipulation and the development of neurological symptoms suggests a causal association, especially, in the absence of other potential predisposing events like strenuous exercise, heavy lifting, and valsalva. We believe that the combination of a "porcelain" carotid calcification and neck manipulation contributed to the cerebral embolus. It is recommended that patients with extensive carotid calcification be advised against cervical SMT in order to avoid the liberation of calcific emboli.

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