Thalamic stroke in a patient with aberrant right vertebral artery arising from an atherosclerotic carotid bulb

Sally H. J. Choi, MD, Gary K. Yang, MD, PhD, and Jerry Chen, MD, MSc, Vancouver, British Columbia, Canada

ABSTRACT

Aberrant vertebral artery (VA) origins are uncommon, and those arising from the carotid bulb are exceedingly rare. We report a 79-year-old man with a right thalamic stroke and subsequent amaurosis fugax that was found to have severe right carotid bulb and internal carotid artery stenoses, as well as an aberrant VA arising from the bulb. He underwent carotid endarterectomy including eversion endarterectomy of the VA and had no recurrence of amaurosis fugax or posterior circulation symptoms at the 1-year follow-up. We also present a comprehensive review of the literature, focusing on symptomatic cases and those arising from the carotid bulb. (J Vasc Surg Cases and Innovative Techniques 2021;7:203-5.)

Keywords: Vertebral artery; Anomalous; Stroke; Carotid stenosis; Carotid trifurcation

Aberrant vertebral artery (VA) origins are uncommon. Usually, VA originates as the first branch of the subclavian artery and enters the transverse foramen at the sixth cervical vertebrae. The vast majority of aberrant VAs present asymptotically and left-sided ones are more common than right.1 Here we report a case of symptomatic right VA with aberrant origin from the right carotid bifurcation. Institutional review board approval was waived and informed consent was obtained from the patient.

CASE

A 79-year-old man with coronary artery disease, diabetes mellitus, and an extensive history of smoking presented with a 1-week history of persistent vertigo, dysarthria, dysphagia, and left-sided weakness. Magnetic resonance imaging revealed a right lateral thalamic stroke in the territory fed by the posterior cerebral artery. Because he presented in a subacute fashion, tissue plasminogen activator was not administered and the patient was treated medically by neurology. The preexisting dual antiplatelet therapy regimen for his percutaneous coronary intervention 3 weeks prior was continued along with an atorvastatin dose increase from 40 to 80 mg/d. He improved neurologically and only had minor residual deficits on discharge.

Two months later, he presented with a one-day history of right-sided amaurosis fugax. A computed tomography angiogram revealed severe right internal carotid artery and right carotid bulb stenosis as well as an aberrant right VA arising posteriorly from the right common carotid artery bifurcation (Fig). The aortic arch had conventional branching and the left VA was dominant with normal anatomy. The patient was deemed to have asymptomatic right carotid stenosis that had caused amaurosis fugax and was likely also responsible for the recent thalamic stroke as well. These same computed tomography angiogram findings were noted 2 months ago by radiology as well, but vascular surgery was not consulted at that time.

The patient underwent right carotid endarterectomy. A longitudinal arteriotomy was made over the common and internal carotid artery to facilitate classic endarterectomy. There was a significant plaque burden noted at the right carotid bulb and the patient required eversion endarterectomy of the VA and external carotid artery. The arteriotomy was closed with a bovine patch. There were no intraoperative electroencephalogram changes and shunting was not deemed necessary. Intraoperative findings of the aberrant right vertebral origin are shown in the Fig. He had an uncomplicated postoperative course and was discharged with a normal neurologic exam. At the 6-week follow-up, the patient remained free from carotid events and there was no recurrent carotid stenosis on ultrasound examination. He was kept on dual antiplatelet therapy for cardiac purposes and asked to stay on atorvastatin as well. At the 1-year follow-up, there were no new symptoms or recurrent stenosis and he was asked to continue with aspirin and atorvastatin. Ultrasound examinations at the 1- and 2-year follow-up visits showed a patent right VA with antegrade flow and no elevated velocities in the right internal carotid artery.

DISCUSSION

An abnormal origin of the VA is uncommon, and the incidence and prevalence are neither well-reported nor...
studied. Unilateral aberrant VAs are much more common than dual aberrant VAs and comprise 95.9% of cases. Among the unilateral cases, vast majority (85.6%) are left sided. One review noted that the vast majority (89.8%) of aberrant left VAs arise directly from the arch, whereas the majority (52.5%) of aberrant right VAs arise from the right common carotid artery. Another review reports similar percentage (84.7%) of aberrant left VAs to arise from the arch, but found the majority (64.8%) of aberrant right VAs to also arise directly from the arch.

Among the anomalies, certain variations are much more common than others. An aberrant left VA arising from the arch between the left common carotid artery and left subclavian artery is perhaps the most common variant. In contrast, the case we present of a right aberrant right VA arising directly from the carotid bifurcation is an exceedingly rare variant. The first reported case of carotid trifurcation with a vertebral branch was in 2014 and was left sided. The second case was reported in 2016 and was a right-sided variant in a patient with Klippel-Feil syndrome. To date, review articles on aberrant VAs were not able to identify any additional cases.

We report a case of symptomatic right VA with an aberrant origin from the right carotid bulb. Not only is this case an uncommon anatomic variant, but also its symptomatic presentation is very unusual. Most cases of aberrant VAs are asymptomatic and are usually detected incidentally. Patients with symptoms that can likely be explained by the aberrant origin of the VA are infrequently reported, and a comprehensive review by Yuan in 2016 only identified nine such cases. The postulated anatomic causes of symptoms were varied and included dissection, aneurysm, and critical stenosis of the VA.

In the case of our patient, it is likely that his initial right lateral thalamic stroke was due to atheroembolization from an aberrant VA originating from a critically stenosed carotid bulb. Although the nine cases in the review article caused symptoms through intrinsic disorders of the aberrant VA, our case is unique in that the aberrant VA had no inherent disease and he was symptomatic from adjacent carotid disease. Out of the two previously mentioned cases of carotid artery trifurcation with VA, one patient was asymptomatic while another also similarly suffered a thalamic stroke. However, this patient had no atherosclerotic disease of the carotid bifurcation and the association is less clear, although the authors postulate that the infarct could be from cerebral hemodynamic alterations given the patient’s lack of risk factors for stroke. The carotid endarterectomy led to a successful resolution of amaurosis fugax and the patient also had no recurrent posterior circulation symptoms at the 1-year follow-up, which could lend further support to the theory that local carotid bulb disease may have been responsible for the previous thalamic stroke.

Although the clinical significance of symptomatic aberrant VAs is evident, the significance of asymptomatic...
aberrant VAs cannot be overlooked. It is crucial to be aware of these anomalies for surgical planning of head and neck procedures or angiography.3,4 Aberrant VAs can increase the risk of certain pathologies. For instance, left VA of aortic origin was found to have a higher likelihood of VA dissection compared to VA from its usual subclavian origin.6 This may be due to the longer course it needs to travel in the neck.2 It is also postulated that alterations in hemodynamics from an aberrant vertebral origin can increase turbulence and predispose to aneurysms or cerebrovascular events,5,7 although there is no conclusive evidence to support this theory.8

CONCLUSIONS
We report a case of symptomatic right VA with aberrant origin from the right carotid bulb. This is an exceedingly rare anatomic variant and a symptomatic presentation of an aberrant VA is extremely uncommon as well. When faced with an unusual patient presentation, it is important to consider symptomatic aberrant VA on the differential as a rare cause of cerebrovascular symptoms.

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Submitted Oct 12, 2020; accepted Jan 17, 2021.