ELSEVIER

Bow Hunter's Syndrome Causing Vertebrobasilar Insufficiency in a Young Man with Neck Muscle Hypertrophy

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Vertebrobasilar insufficiency is characterized by impaired blood flow within the posterior circulation, producing symptoms of vertigo, nausea, vomiting, visual disturbances, and syncope. Given these nonspecific symptoms, the diagnosis of vertebrobasilar ischemia may be difficult to distinguish from more benign conditions. A healthy 37-year-old man presented to our clinic with near syncope upon turning his head to the left. Dynamic angiography revealed occlusion of the left vertebral artery at C7 with 90° head rotation to the left, consistent with bow hunter's syndrome. No obvious bony abnormalities were identified on computed tomography or magnetic resonance imaging scans. Transient rotational vertebral artery syndrome, a rare cause of vertebrobasilar insufficiency, has most often been reported at the C1−2 level, and the majority of cases occur in patients >50 years of age because of degenerative osteophytes and contralateral atherosclerosis. We present the unusual case of a young man with symptoms of vertebrobasilar insufficiency and discuss the potential effects of weightlifting and neck muscle hypertrophy on vertebral artery flow dynamics.

Vertebrobasilar insufficiency (VBI), occurs when flow through the vertebral or basilar arteries is impaired, causing ischemia to the brainstem, cerebellum, thalamus and occipital lobes. Common symptoms and signs of VBI include vertigo, nausea, vomiting, syncope, dysarthria, visual field deficits, ataxia, and other sensorimotor deficits. The most common causes of VBI are atherosclerotic stenosis or thromboemboli.[1,2] but extrinsic compression by bony structures and soft tissues has also been described. Rotational vertebral artery syndrome (RVAS), also known as bow hunter's syndrome, is a rare variation of VBI in which physiologic head turning causes external compression of the vertebral artery (VA) by adjacent structures. In a young and healthy patient, bow hunter's syndrome is an uncommon but important diagnosis, because the effects of posterior circulation ischemia can lead to acute or progressive infarction. We will review the pathophysiology of RVAS and discuss options for diagnosis and treatment.

CASE REPORT

A 37-year-old active duty man presented with an 8-month history of near syncope when turning his head >90° to the left. He described the development of tunnel vision, scotomas, and roaring in the ears, usually when over-rotating to check his blind spot while driving. The symptoms resolved within seconds of resuming a midline head position. The patient denied any associated neurologic symptoms with turning his head to the right or <90° to the left, and did not experience lightheadedness

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Ann Vasc Surg 2014; 28: 1032.e1–1032.e10
http://dx.doi.org/10.1016/j.avsg.2013.06.038
Published by Elsevier Inc.
Manuscript received: March 6, 2013; manuscript accepted: June 11, 2013; published online: November 4, 2013.

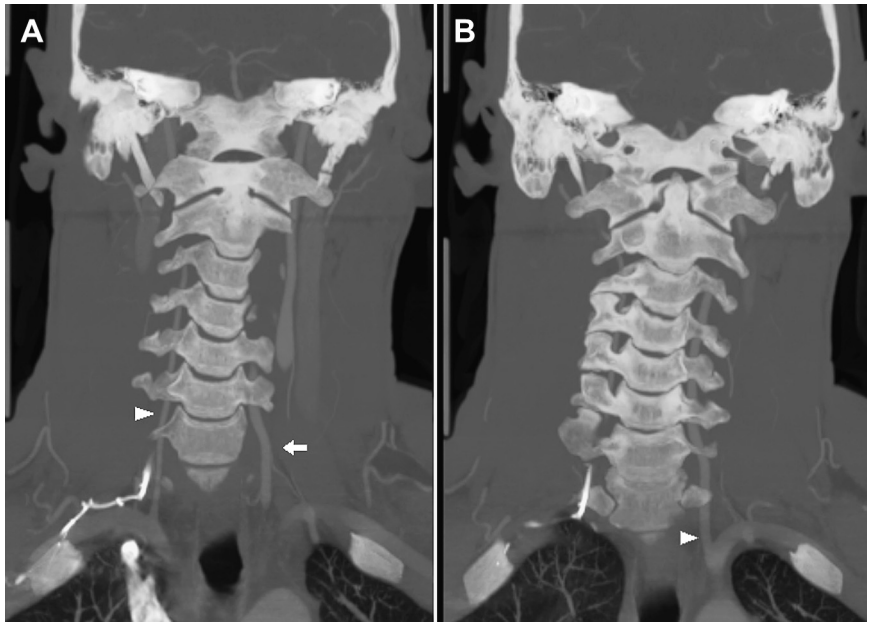

Fig. 1. Coronal computed tomography angiography scan with the patient's head in a neutral position. (**A**) Dominant left vertebral artery (white *arrow*) and hypoplastic right vertebral artery (*arrowhead*). (**B**) The left vertebral artery is patent along its course. The *arrowhead* indicates the origin of the left vertebral artery from the left subclavian artery.

or neck pain with arm abduction. He denied recent trauma, although he recalled an instance of being knocked out while playing sports in high school. He was a recreational body builder who participated in frequent weightlifting, and his physical examination was notable for hypertrophy of the neck, shoulder, and chest muscles. His symptoms were reproduced by rotating his head past 90° to the left, across the shoulder, and maintaining this extreme rotation for several seconds. No motor or sensory deficits were elicited.

The patient underwent duplex ultrasonography of the bilateral carotid artery and VAs, which revealed decreased flow velocity in the right VA with dynamic rotation as described above. A computed tomography angiography (CTA) scan revealed a dominant left VA and hypoplastic right VA without evidence of atherosclerosis or VA origin stenosis (Fig. 1). A CTA scan also revealed that the left VA was in an ovoid configuration, partially compressed between the longus colli and a slip of the anterior scalene, at the level of the C7 vertebral body (Fig. 2). A magnetic resonance imaging scan of the cervical spine did not reveal stenosis of the vertebral foramina, ligamentous bands, arthropathy, malalignment, disc herniation, osteophytes, or craniocervical junction malformations. The patient then underwent a formal dynamic angiogram with access into the right common femoral artery. The VA was carefully cannulated at the origin with a taper-tip straight catheter to alleviate the risk of dissection. In $\leq$45° of rotation, normal morphology and angiographic flow was seen through the left VA (Figs. 3,4). In 90° of head rotation to the left, the initial symptoms were reproduced, and the left VA revealed an abrupt cutoff at the level of the C7 vertebral body, confirming the diagnosis of bow hunter's syndrome (Fig. 5).

The patient was offered anterior surgical exploration to excise any muscular or ligamentous entrapment, with possible unroofing of the transverse foramen should dynamic intraoperative ultrasound continue to reveal flow occlusion; however, he declined treatment because his symptoms only occurred with extreme lateral head rotation. We advised him to stop body building with reference to the neck, shoulders, and chest, and also advised that he install extra mirrors in his car for visualization of the blind spot in order to prevent over-rotation while driving. The patient has since had improvement in his symptoms and remains on full active duty.

DISCUSSION

Bow hunter's syndrome, characterized by vertigo, near-syncope, and visual deficits associated with head rotation, was described as early as 1956 and was then referred to as cervical vertigo.[3] The name bow hunter's syndrome was first used by Sorenson in 1978[4] to describe a patient who had a brain stem stroke during archery practice and experienced this constellation of symptoms. In more recent times, reports of causative activities and predisposing conditions have expanded beyond archery to