Rotational vertebral artery insufficiency resulting from cervical spondylosis: case report and review of the literature

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Received 13 June 2005; accepted 11 August 2005

Abstract

Background: Four cases of vertebrobasilar insufficiency secondary to osteophyte formation at C5-C6 have been reported in the literature. In this article, we report the fifth such case and discuss the utility of dynamic computed tomographic angiography (CTA) in the management of this disorder.

Case Description: A 55-year-old right-handed man presented for evaluation after syncopal episodes associated with right-head turning. Workup revealed cervical spondylosis with stenosis. The C5-C6 level was significantly affected. Dynamic angiography revealed obstruction of vertebral artery flow with right-head turning secondary to an osteophyte at the foramen transversarium at C5-C6. This patient underwent a C5-C6 anterior cervical discectomy and fusion. He also underwent unroofing of the vertebral artery and drilling of the osteophyte at the foramen transversarium. Postoperative CTAs reveal reconstitution of flow in the vertebral artery with head turning.

Conclusion: The utility of dynamic 3-dimensional CTA in the management of this disorder avoids the risk of invasive studies.

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Keywords: Vertebral artery; Foramen transversarium; Vertebrobasilar insufficiency

1. Introduction

The consequences of VBI can be devastating. As early as 1933, DeKleyn [6] reported that vertebral artery circulation decreased when the head was turned to the opposite side. Based on cadaveric studies, the vertebral artery is most susceptible to occlusion with rotation at C1-C2 and C5-C6 [3]. To date, there have only been 4 patients with occlusion limited to C5-C6 reported in the literature [1,11,16,17]. We report a patient with symptomatic vertebral artery occlusion at C5-C6 associated with head turning. Furthermore, we discuss the applicability of dynamic CTA in this disorder and review the literature.

2. Illustrative case

A 55-year-old right-handed man, with a long-standing history of insulin-dependent diabetes mellitus and hypertension, presented to the neurosurgery clinic with a 20-year history of dizziness and near-syncope associated with turning his head to the right. Recently, these events had not only become more frequent, but they were occurring with less head rotation.

Neurological examination revealed no focal deficits other than a diabetic peripheral neuropathy. The patient could move his neck with adequate flexion and extension, but lateral rotation past 30° to the right caused a syncopal episode.

This patient had undergone extensive medical workup previously. This included numerous CT scans, magnetic resonance imaging, electroencephalography, conventional cerebral angiography, an echocardiogram, Holter monitoring, and cardiac catheterization. These studies did not reveal a clear etiology of his symptoms.

Cerebral angiography demonstrated codominant vertebral arteries. Dynamic angiography revealed complete occlusion...
of the right vertebral artery at the C5-C6 level with head turning of approximately 30° (Fig. 1). CTA revealed significant narrowing of the foramen transversarium at C5 and C6 secondary to osteophytic overgrowth. To better understand the pathophysiology of this patient’s symptoms, a dynamic CTA was performed. The patient turned his head to the right until he was just short of becoming syncopal. Significant narrowing of the foramen transversarium and early occlusion of the vertebral artery were seen (Fig. 2). The patient was placed in a cervical collar until he returned to undergo his operative procedure.

2.1. Operative intervention

The patient underwent fiberoptic intubation. Intraoperative monitoring of somatosensory-evoked potentials, brain stem–evoked potentials, and motor potentials was used. These remained at baseline throughout the course of the operation. A C5-C6 anterior discectomy and foraminal decompression and unroofing of the foramen transversarium were performed by KRB. A large osteophyte displacing the vertebral artery in the foramen transversarium was drilled away. The perivascular fibrous tissue was noted to be hypertrophic, and great care was taken to incise it until the vertebral artery was noted to be freely mobile. A Mizuho Doppler was used to confirm flow through the vessel with the patient’s head both in the neutral position and when turned to the right. There were no intraoperative or postoperative complications. The patient was discharged home on postoperative day 2. At his follow-up clinic appointment 6 weeks later, the patient reported complete resolution of his preoperative symptoms. A second dynamic CTA revealed reconstitution of flow in the vertebral artery at the C5-C6 level with head turning of greater than 60° (Fig. 3).

3. Discussion

VBI is characterized by dizziness, diplopia, dysarthria, visual disturbances, and sensorimotor findings. VBI may be suspected in patients with transient episodes of dizziness in the absence of orthostatic hypotension or active cardiovascular disease. VBI is usually caused by atherosclerosis, emboli, or arterial dissection. Such intrinsic causes are far more common than extrinsic causes such as tendinous bands, tumors, or osteophytic overgrowth.

VBI secondary to cervical spondylotic osteophytes was described by Sheehan and Meyer [15]. Cadaver studies have shown that extreme neck turning can compromise vertebral artery flow, especially at the C5 and C6 levels [14,18].
Spondylotic osteophytes projecting from the vertebral joints adjacent to the foramen transversarium have been documented to be the cause of significant stenosis [11]. Extrinsic compression of the vertebral artery along its course has been reported as a result of fibrous thickening of the tendons from the longus colli and anterior scalenus muscles, with osteophytic spur being the most common cause of compression at the C2 level [15,17].

Persistent and transient vertebral artery compression symptoms secondary to herniated cervical disks have also been reported [14,18]. Osteophytes at the unco-apophyseal joints compress the vertebral artery with head rotation, whereas those that occur at the facet joints seem to cause compression with neck extension [4]. The term “bow hunter’s stroke” has been reserved to describe the syndrome of VBI seen with transient occlusion or mechanical compression of the vertebral artery at the atlantoaxial level [12,13].

In this patient, dynamic angiography revealed occlusion of the vertebral artery at the C5-C6 level. A 3-dimensional CTA demonstrated the extent of osteophyte formation and its relationship to the vertebral artery. An interesting consideration in this patient is that although his vertebral arteries were codominant, he would experience syncopal episodes. In patients with preserved cerebral autoregulation, one would not expect this. This patient, however, had a long-standing history of insulin-dependent diabetes mellitus and hypertension. These have been known to impair cerebral autoregulation [2,10]. The effect of altered cerebral autoregulation on cerebral blood flow has been reviewed extensively [7]. We speculate that the transient change in cerebral arterial perfusion pressure caused by occlusion of one vertebral artery in the setting of impaired cerebral autoregulation contributed to this patient’s syncopal episodes with head turning. The use of dynamic CTA has not been routinely reported; however, it can significantly reduce the risks associated with repeat angiography. More importantly, however, this same imaging modality could be used to confirm the absence of vertebral artery occlusion with head turning postoperatively.

The first report of an anterior approach to decompress the vertebral artery secondary to cervical spondylosis was documented by Bakay and Leslie [1]. Citow and Macdonald [5] reported a posterior approach to decompress the vertebral artery affected by osteophytes arising from the facet joint. In certain circumstances, bypass procedures for occluded portions of the vertebral artery may be necessary [8,9]. These reports emphasize the need to tailor the surgical approach to the patient’s pathology. In our case, the use of dynamic CT angiography and 3-dimensional reconstruction provided valuable information and avoided the risks of invasive studies.

Acknowledgments

The authors thank Dr Brandi French, Nita K. Bulsara, RPh, and Laura Kays for their assistance in the preparation of this manuscript.

References
