Case Report

Fusion for subaxial bow hunter’s syndrome results in remote osseous remodeling of the hyperostotic growth responsible for vertebral artery compression

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INTRODUCTION

Bow hunter’s syndrome (BHS), or positional vertebrobasilar insufficiency, is a rare, yet well-established etiology of posterior circulation ischemia and stroke.[3,10] The majority of cases describe a subaxial cervical (V3) location with a variety of causes including cervical spondylosis and segmental instability.[6,8,11] Treatment is surgical with direct vertebral artery (VA) decompression, segmental fusion, or a combination of decompression and fusion.[5,6] Diffuse idiopathic skeletal hyperostosis (DISH), a pathological condition of the spine, may cause discomfort, dysphagia, and predispose patients to fracture.[2,7,12]
To the best of our knowledge, this is the first report of BHS in association with DISH. In addition, the authors present angiographic data that have not been previously reported, where the offending osseous growth remodels after fusion without direct decompression.

CASE REPORT

History and examination

This 77-year-old man with a medical history including coronary artery disease and dysrhythmia presented to the neurosurgery clinic after months of evaluations for repeated episodes of presyncope and at least four syncopal events, where the patient was found unconscious or had awoken on the ground after presumably losing consciousness. The patient reported these symptoms and events were preceded by turning his head to the right. In some instances, the patient reported double vision in conjunction with the presyncope symptoms. On physical examination, the patient was neurologically intact. He was able to reproduce the symptoms with head rotation of approximately 45° to the right. As a matter of safety, these assessments were performed in short intervals as to not elicit a full syncopal event. Diplopia was not detected.

A CT angiogram (CTa) of the head and neck demonstrated osseous changes consistent with cervical DISH as well as a "fang"-like osseous elongation of the right C5 lateral mass, which protruded into the vertebral foramen and compressed the VA [Figure 1]. A catheter-based cranial and cervical digital subtraction angiogram (DSA) demonstrated approximately 74% stenosis of the right VA at C5 in the neutral position, which progressed to full occlusion with right head rotation [Figure 2]. In addition, the patient was found to have a left VA which ended in an ipsilateral posterior inferior cerebellar artery without joining the right VA.

Operation

A C4–5 anterior cervical discectomy and fusion (ACDF) was performed under general endotracheal anesthesia. The traditional Smith-Robinson approach to the cervical spine was employed and special care was taken not to injure the esophagus, which had been displaced to the right of the cervical spine by large hyperostotic osteophytes. In addition to the C4–5 discectomy, partial osteophyte removal was required at C5 to allow for the plating system to lay flat. A structural allograft and low-profile titanium plating system was used to complete the surgery.

Figure 1: Preoperative CTa sagittal (a and c) reconstructions demonstrate the changes associated with diffuse idiopathic skeletal hyperostosis and the "fang"-like elongation of the C5 lateral mass (black circle) with mass effect on the vertebral artery. Axial (b and d) reconstructions demonstrate ventral osteophytes (white arrow) which displace the esophagus (white arrowheads) and display the osseous growth (black arrow). A 3D reconstruction (e) further details the precise anatomical location of the stenosis at C4–5.
Postoperative course

The patient tolerated surgery well and was discharged on postoperative day 1. He had an uneventful recovery and reported complete resolution of his symptoms with head rotation. Approximately 9 months after surgery, the patient underwent a repeat CTa and DSA as part of an evaluation for cardiac dysrhythmia. The CTa demonstrated blunting of the osseous growth at C5, and the DSA showed no evidence of VA compression in the neutral or dynamic positions [Figure 3].

DISCUSSION

Since Sorenson initially described the patient who presented with VA dissection after head rotation during archery practice, several additional causative etiologies of BHS have been described.[6,9,10] Originally described by Forestier and Rotes-Querol, DISH had been associated with pain, myelopathy, dysphagia, and fractures after disproportionally mild trauma. This is the first report in which a patient with DISH developed BHS.

In addition to a condition such a cervical spondylosis or rheumatoid arthritis, patients often have a vascular variant that predisposes them to have symptoms with positional occlusion of a single VA.[9] As Schuette and Barrow described this “two-hit” phenomenon in many cases of BHS, our patient displayed several contributing factors including a hypoplastic left VA, a mobile cervical segment adjacent to three levels fused by DISH, and an osseous growth that compressed the right VA.

Both surgical options of an ACDF or a posterior cervical lateral mass resection of C5 and lateral mass fixation and fusion were presented to our patient. With his lack of symptoms in the neutral position, advanced age, and premorbid cardiac risk factors, we felt that an ACDF would be as efficacious as a direct decompression of the VA, pose less perioperative risk, and produce an easier postoperative recovery.
In addition to the novel contributing etiology, this case is unique in that it angiographically demonstrates osseous remodeling. While we were expecting the ACDF to prevent dynamic occlusion of the VA, we did not anticipate such a dramatic osseous change that returned the lumen of the VA to its natural caliber. We suspect that arterial pulsations were responsible for remodeling the adjacent osseous growth. Arterial pulsations have been postulated to “direct” the formation of DISH osteophytes,
[2,4] and remote osseous remodeling has been demonstrated in other conditions after cervical fusion such as posterior fusion for cervical myelopathy.
[1] This, however, represents the first case of osseous remodeling revealed by angiography.

CONCLUSION

This case reaffirms the distinctive nature of BHS, which motion is required for symptomatology, and treatment strategies should be tailored to the patient and specific etiology. That is, a compressive structure of the VA may be safely treated with segmental fusion, rather than direct decompression, if the patient is asymptomatic in the neutral position.

Declarations of patient consent

Patient’s consent not required as patients identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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