Vascular decompression of a vertebral artery loop producing cervical radiculopathy

Case report

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Vertebral artery tortuosity and loop formation are rare causes of cervical radiculopathy. The authors present the case of a 70-year-old man with 9 years of progressive right-sided cervical and scapular pain but no history of trauma. Computerized tomography myelography and magnetic resonance imaging revealed an ovoid mass in the right C3-4 intervertebral foramen. The patient underwent a right C-3 and C-4 hemilaminectomy and a complete C3-4 facetectomy. A pulsatile vascular structure was found compressing the right C-4 nerve root. The bone overlying the vascular structure was removed, producing decompression of the nerve root. Immediate postoperative angiography showed that this lesion was a focal vertebral artery loop. The patient’s symptoms resolved after surgery, supporting the use of vascular decompression of a cervical nerve root compressed by a vertebral artery loop for the relief of radicular symptoms.

Key Words • vertebral artery • tortuosity • loop • vascular compression • radiculopathy

Congenital or acquired tortuosity of the vertebral artery occurs equally in males and females. Unilateral lesions most often are found at C4-5, followed by C3-4 and C5-6, and affect left- and right-sided vessels equally. Bilateral vertebral artery loops compose a small percentage of this group. The anomaly is usually detected incidentally on cervical x-ray films obtained after trauma or as part of the evaluation for occipitocervical pain in individuals 40 to 60 years old. Vertebral artery tortuosity and loop formation rarely produce cervical radiculopathy. Other infrequent causes of cervical radiculopathy include vascular malformations, tumors, cysts, meningoceles, hypertrophic interstitial polyneuritis, and congenital absence of the pedicle. We present the third case report of the successful treatment of cervical radiculopathy caused by vascular compression of a nerve root by a vertebral artery loop.

Case Report

History. This 70-year-old man presented with a 9-year history of progressive neck stiffness and right-sided cervical pain radiating to the right scapula. There was no family history or skin stigmata of neurofibromatosis. Conservative therapy, including multiple epidural injections, various antiinflammatory medications, trigger-point injections, and physical therapy, failed to relieve his symptoms. The patient was referred to our institution after evaluation by several neurosurgeons.

Examination. On physical examination, the patient’s neck was stiff, allowing only 15 to 20° of flexion, extension, and lateral bending. His muscle strength was intact. The right shoulder girdle muscles had atrophied slightly but no fasciculations were present. Tenderness to palpation was elicited along the medial scapula. His sensory examination was normal and his reflexes were symmetrical.

Radiographic evaluation, including computerized tomography (CT) myelography and magnetic resonance (MR) imaging, demonstrated a 1-cm ovoid soft-tissue mass in the widened right C3-4 intervertebral foramen (Fig. 1A and B). Degenerative changes were consistent with the patient’s age.

Operation. The patient underwent a right C3-4 hemilaminectomy and complete facetectomy. The C-4 nerve root was compressed from above by a pulsatile mass (Fig. 1C) believed to be a vertebral artery loop. With the aid of high-power microscopy, bone around the vascular structure was removed and the C-4 nerve root was separated from the ectatic vertebral artery. Because two of the three
FIG. 1. A and B: A CT myelogram (A) and an MR image (B) obtained at the level of C3-4 demonstrating widening of the right intervertebral foramen (arrows) by a 1-cm ovoid mass. There is no compression of the spinal cord. Degenerative changes are consistent with the patient's age. C: Intraoperative view of the vertebral artery loop (solid arrow) after it was decompressed from the adjacent C-4 nerve root (open arrow). The structures were exposed via a C3-4 hemilaminectomy and complete C3-4 facetectomy. D and E: Right (D) lateral and (E) anteroposterior vertebral angiograms demonstrating a focal loop (arrows) projecting into the region of the C3-4 neural foramen.
Vertebral artery decompression

structural columns were preserved, it was not believed that the bone decompression created clinically significant instability of the C3–4 motion segment. A fusion procedure with autograft and an interspinous cable was considered, both preoperatively and intraoperatively, but was not believed to be warranted. Immediate postoperative angiography (Fig. 1D and E) confirmed the presence of a right vertebral artery loop at the level of C3–4.

Postoperative Course. The patient's symptoms resolved after surgery. Magnetic resonance imaging and MR angiography performed 1 year later demonstrated no change in the size of the vertebral artery loop or cervical instability at the operative level. The patient remained asymptomatic at a 2-year follow-up examination, and the muscle mass of his right girdle was normal.

Discussion

Various vascular, congenital, neoplastic, cystic, and metabolic conditions produce progressive cervical radiculopathy. A common radiographic finding associated with these lesions is enlargement of the affected neural foramen. The tumor that most commonly produces cervical radiculopathy in association with a widened intervertebral foramen is neurofibroma. Other neoplastic entities include meningioma, multiple myeloma, and metastases. Congenital absence of the vertebral pedicle is usually discovered incidentally after trauma but has been reported in association with neck pain, cervical radiculopathy, and headache. Coexistent radiological findings include enlargement of the intervertebral foramen, a malformed lateral mass, and deficiency of the transverse process. Coexistent radiological findings include enlargement of the intervertebral foramen, a malformed lateral mass, and deficiency of the transverse process.

Tortuosity of the vertebral artery without radicular symptoms is usually detected incidentally in patients evaluated for neck pain after trauma. The rare symptomatic vertebral artery loop can erode the vertebral foramen and directly compress the exiting nerve root. Other vertebral artery anomalies, such as arteriovenous malformations and aneurysms, should be considered in the differential diagnosis of cervical lesions associated with myelopathy, radiculopathy, and/or widening of the intervertebral foramen.

Anderson and Shealy reported on a 54-year-old woman with left-sided cervical pain attributed to a C3–4 vertebral artery loop. The patient underwent a C3–4 foraminotomy with sectioning of the compressed rootlet, and her preoperative symptoms gradually resolved. Zimmerman and Farrell reported two patients with vertebral artery loops that produced cervical radiculopathy symptoms. In the first case, a 50-year-old woman had experienced 2 months of progressive occipital and cervical pain. A C4–5 laminectomy was performed, and a pulsatile mass that resembled a tumor was encountered. When the mass was punctured with a needle, however, it spurted arterial blood. Her symptoms partially resolved. In the second case, a 70-year-old woman had a 3-year history of light-headedness. She denied headache, neck pain, or paresthesias. Plain radiographs of the cervical spine revealed erosion of the neural foramina at C3–4, and angiography demonstrated a tortuous vertebral artery. Anticoagulation therapy was initiated to prevent cerebral ischemia.

The efficacy of vascular decompression to treat dysfunction of the fifth, seventh, eighth, ninth, 10th, and 11th cranial nerves is well established. Vascular decompression of the optic nerve has also improved visual deficits. Our patient's cervical radicular symptoms likely improved for the same reason: removal of a pulsating and compressive mass.

Tokuda, et al., demonstrated the association of vertebral artery ectasia with Klippel-Feil anomaly. Sharma, et al., reported the case of a 75-year-old woman with a 2-year history of occipital neuralgia. She had a Klippel–Feil syndrome at C2–3 with an associated ectatic vertebral artery. Vascular decompression was performed to separate the vertebral artery from the left C2 nerve root, and a Surgicel plug was placed between the structures. The occipital neuralgia was relieved, and the patient was asymptomatic at an 18-month follow-up examination.

Duthel and coworkers reported on a 37-year-old man with cervico-brachial neuralgia of less than 1 year's duration. Imaging studies, including CT myelography, revealed an enlarged intervertebral foramen at C5–6. A vertebral artery loop was diagnosed by using angiography. The ectatic vessel was separated from the C-6 loop by using vascular dissection, and a plug of Teflon was placed between the two structures. The patient was asymptomatic at a 3-month follow-up examination.

Conclusions

Vertebral artery tortuosity with loop formation and erosion of the intervertebral foramen can produce symptomatic compression of the adjacent nerve root. The literature is sparse on this topic. In symptomatic cases, however, the onset has been in adulthood and the symptoms have been progressive. Almost all of these patients have been treated conservatively and their symptoms persisted. The present case supports the findings of two prior reports that cervical radiculopathy produced by a compressive vertebral artery loop can be associated with an excellent outcome when treated with vascular decompression. Moreover, this case represents the longest pretreatment symptomatic interval (9 years) and the longest asymptomatic follow-up period (2 years).

References


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