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Case report

Cervical radiculopathy caused by vertebral artery loop formation: a case report ☆

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ABSTRACT

Vertebral artery loop formation is a rare cause of cervical radiculopathy. We report a case of a 70-year-old man who was referred because of a chronic cervicobrachialgia. Initial plain cervical x-ray showed widening of the left C3-C4 intervertebral foramen. Additional magnetic resonance angiography revealed the presence of a vertebral artery loop, which had migrated into the left C3-C4 neural foramen and caused compression of the left C4 nerve root. Surgery was considered, but the patient's symptoms resolved with conservative treatment. The aim of this case report is to raise the knowledge of both clinicians and radiologists about vertebral artery loop formation as a rare but potentially life-threatening cause of cervical radiculopathy. If overlooked, cerebrovascular stroke during transforaminal cervical steroid injections or catastrophic vertebral artery damage during surgery may occur.

Introduction

Cervical radiculopathy is usually caused by cervical discopathies or cervical spondylosis, but in cases of unresolved radiating pain, clinicians must keep in mind some rare entities, such as cysts, tumors, congenital and vascular malformations, including vertebral artery loop formation (VALF) [1-5]. The vertebral arteries arise from the subclavian artery and provide the blood supply to the cerebellum, medulla oblongata, spinal cord and neck muscles. The V1-V3 segments are located extracranial, whereas V4 is situated intra-cranial (Fig. 1) [6]. The V2 segment, located between the transverse foramen of C6 to C2, is a narrow area for the artery to transverse which may result in symptomatic anomalous V2 segments and adjacent bony erosions leading either to compression of the cervical nerve roots, causing pain or radicular symptoms, or compression of the artery, evoking vertebrobasilar insufficiency [1,3,4,6]. We present a case of VALF compressing the left C4 nerve root, causing cervical radiculopathy.

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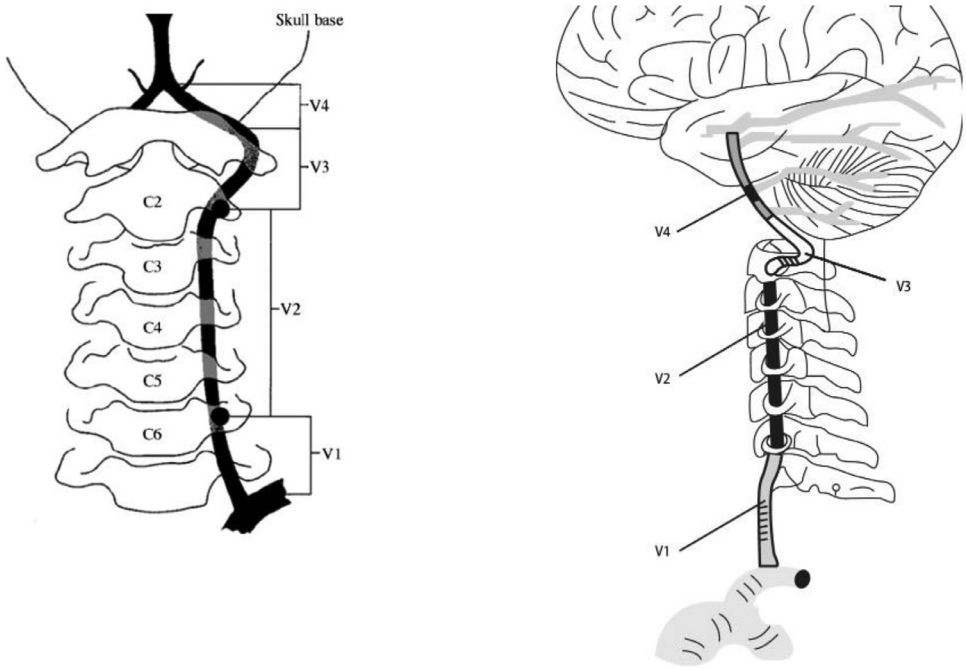

Fig. 1 – The vertebral arteries arise from the subclavian artery and provide the blood supply to the cerebellum, medulla oblongata, spinal cord and neck muscles. The V1-V3 segments are located extra-cranial, whereas V4 is situated intra-cranial. The V2 segment, located between the transverse foramen of C6 to C2, is a narrow area for the artery to transverse which may result in a VALF.

Case Report

A 70-year-old man presented with chronic cervicobrachialgia, radiating to his left trapezius region and upper arm since many years. He had a history of acromioplasty and carpal tunnel release at his left side, but the pain in his neck and upper arm persisted. Clinical examination of the neck showed painful and restricted movements in all directions, mainly to the left. Spurling maneuver on the left side provoked his symptoms, while shoulder abduction reduced his symptoms. There were no signs of sensory loss, diminished reflex function, motor weakness or upper motor neuron lesion.

Initial plain cervical x-ray (Fig. 2) showed widening of the left C3-C4 intervertebral foramen, accompanied with erosion of the adjacent bony structures. Computed tomography (CT) documented an added tissue structure in the left C3-C4 foramen along with bony scalloping, suggestive for a cervical neural sheath tumor (Fig. 3). Additional magnetic resonance angiography (MRA) revealed the presence of a vertebral artery loop formation (VALF), which had migrated into the left C3-C4 neural foramen and caused compression of the left C4 nerve root (Fig. 4). Dynamic cerebral angiography confirmed this diagnosis, but visualised excellent artery patency during head movements, presumably because the intervertebral joint is completely fixed by osteoarthrosis (Fig. 5). Surgery was considered, but the patient's symptoms resolved with Pregabalin 75mg twice a day and a multidisciplinary rehabilitation programme.

Discussion

Few cases of VALF causing cervical radiculopathy or other neurological symptoms have been described in literature. The reported incidences vary from 0.6% to 7.5% [1-5]. In most cases, the V2 segment contains the symptomatic VA loop (90.5%), compared with only 7.6% in the V1 and 1.9% in the V3 segment [5]. Within the V2 segment, C4-C5 is the most affected level, followed by levels C3-C4 and C5-C6 [1,5]. Furthermore, unilateral lesions are more frequently seen on the left side (46%) than on the right side (35%), whereas multilevel (13%) and bilateral lesions (5%) are observed less often [1,3 5].

The clinical presentation of a symptomatic VA loop depends on the anatomical location of the compressing anomaly. Whereas upper segment VA loops may result in dysphagia, spasmodic torticollis, occipital neuralgia or Horner syndrome, VA loops in the lower cervical spine can evoke the classic symptoms of cervical radiculopathy [1,2,7].

Fig. 2 – Left posterior oblique cervical radiograph shows widening of the left C3-C4 intervertebral foramen accompanied with erosion of the adjacent bony structures.

The development of a VA loop may be congenital or acquired. Although multiple potential mechanisms have been described, the exact pathogenesis remains unclear [1-5]. While some suggest an association with cervical trauma or spondylotic changes, potentially causing a relative elongation of the VA, others propose hemodynamic stress such as atherosclerosis and hypertension as possible causes [1,3-5]. Additionally, the vessel's pulsation could lead to repetitive micro-injuries, resulting in gradual demyelination along with progressive pain as a result of increased irritability [4,5]. Infrequently, a VA loop results in direct nerve compression into the nerve root foramen [4]. In our case, the patient had cervical spondylosis and disc space narrowing, but no history of cervical trauma or hypertension.

As a result of the highly pulsatile arterial pressure of the VA, plain cervical x-ray may reveal erosions with sharp and sclerotic margins on adjacent bony structures, accompanied with enlargement of the affected intervertebral neural foramen [1]. When enlargement of the intervertebral foramen appears on cervical radiographs or CT, clinicians and radiologists should consider the rare diagnosis of VALF [2-5]. Nonetheless, the differential diagnosis may include other arteriovenous malformations, aneurysms, neoplastic or malformative processes [2-4]. A cervical neural sheath tumor is a frequent misdiagnosis based on CT alone, but may potentially lead to VA injury during surgery [3]. To specify the abnormalities seen on radiographs, additional imaging is necessary [1-5]. Within the widened intervertebral foramen, CT may visualize VALF as a contrast enhancing mass, while signal-void characteristics appear on MRI, which confirms the vascular abnormality [1,3,5]. Additionally, CTA, MRA or angiography should be performed to differentiate these vascular lesions and assess the morphology and tract of the vasculature [1,3-5].

As a consequence of the infrequency of VALF inducing symptomatic cervical radiculopathy, no strong evidence concerning the preferred treatment option (conservative or surgical) has been established in the literature and it is solely based on case reports [2,5]. Conservative treatment may include non-steroidal anti-inflammatory treatments, physiotherapy or injection therapy and has been recognized as successful in several cases [1,3-5], as our case. When conservative treatment has failed, several surgical procedures, including decompressive laminectomy, foraminotomy with sectioning of the compressed rootlet, vascular reconstruction or microvascular decompression, have been reported as effective strategies [1-5]. A literature review of 2020 concluded that the effectiveness of the different neurosurgical interventions are similar in both the short-term and the long-term and depends on patient- and intervention-specific characteristics [5]. This heterogeneity of therapeutic options described in the literature creates difficulties when adapting treatments to individual patients' characteristics [2,5].

Although the real incidence of a symptomatic VALF is extremely low, clinicians should keep this differential diagnosis in mind when investigating a patient with cervical radiculopathy. When misdiagnosed as a spondylotic or disc herniation induced common radiculopathy, serious implications during treatment can occur. It may potentially cause life-threatening cerebrovascular stroke during transforaminal cervical steroid injections or catastrophic vertebral artery damage during surgery [1,3,5].

The aim of this case report is to raise the knowledge of both clinicians and radiologists about VALF as a rare but potentially life-threatening cause of cervical radiculopathy.

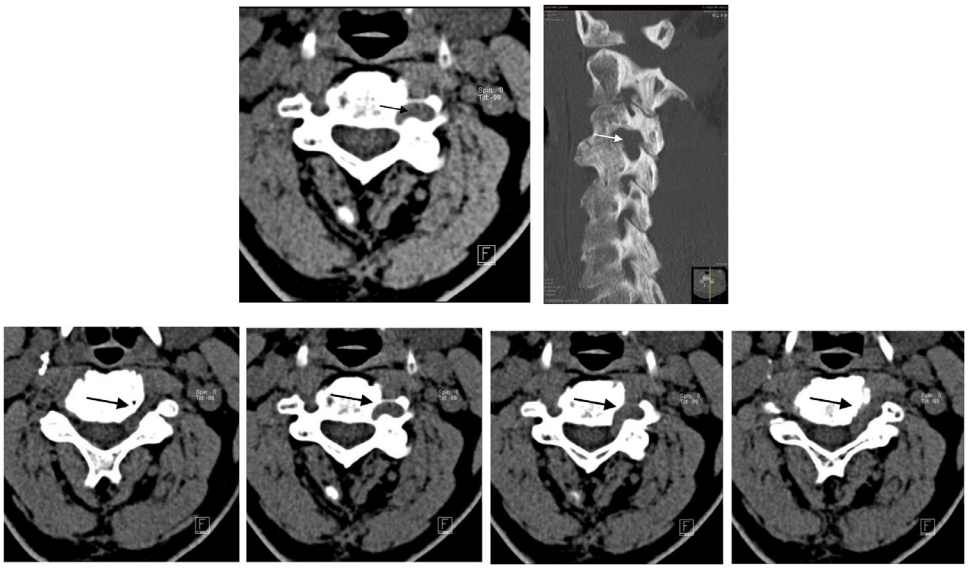

Fig. 3 – Axial computed tomography scan obtained at the level C3-C4 (A) and sagittal computed tomography scan (B) show an added tissue structure within the widened left C3-C4 foramen along with bony scalloping. (C) A consecutive sequence of the axial compute tomography slices shows the course of the artery in relation to the left C3-C4 foramen.

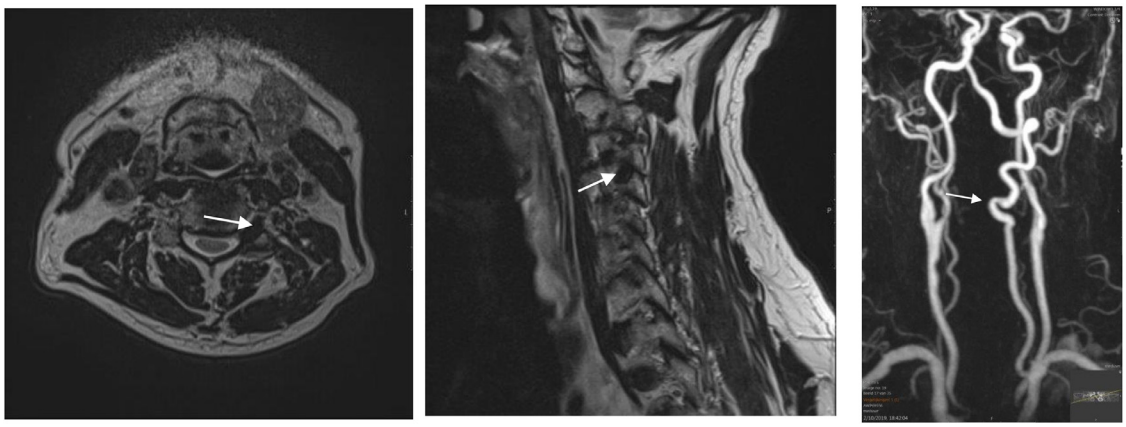

Fig. 4 – T2-weighted axial (A) and sagittal (B) magnetic resonance images show a signal-void vascular structure in the left C3-C4 intervertebral foramen. (C) Magnetic resonance angiography shows the vertebral artery loop formation (VALF).

Fig. 5 – Cerebral angiography shows the vertebral artery loop formation (VALF).

Patient consent

The authors obtained from the patient written informed consent for the publication of this case report and images.

REFERENCES

[1] Kim HS, Lee JH, Cheh G, Lee SH. Cervical radiculopathy caused by vertebral artery loop formation: a case report and review of the literature. J Korean Neurosurg Soc 2010;48(5):465–8.

[2] Chibbaro S, Mirone G, Yasuda M, Marsella M, Di Emidio P, George B. Vertebral artery loop–a cause of cervical radiculopathy. World Neurosurg 2012;78(3-4):375 e11-3.

[3] Doweidar A, Al-Sayed S, Al-Kandery S. Symptomatic vertebral artery loop: a case report and review of literature. J Radiol Case Rep 2014;8(5):35–41.

[4] Wood L, Czyz M, Forster S, Boszczyk BM. The diagnosis and management of a vertebral artery loop causing cervical radiculopathy. Eur Spine J 2017.

[5] Tonsbeek AM, Groen JL, Vleggeert-Lankamp C. Surgical interventions for cervical radiculopathy caused by a vertebral artery loop: a case report and review of the literature. World Neurosurg 2020;135:28–34.

[6] Ekşi M, Toktaş ZO, Yılmaz B, Demir MK, Özcan-Ekşi EE, Bayoumi AB, et al. Vertebral artery loops in surgical perspective. Eur Spine J 2016;25(12):4171–80.

[7] Urut DU. Cervical nerve root compression due to vertebral artery loop indentation: case report. Sisli Etfal Hastan Tip Bul 2018;52(4):307–9.