

# Aberrant Vertebral Artery Causing High Cervical Myelopathy: Case Report

## Case Report

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### Abstract

The vertebral arteries are commonly affected by anatomical variations. Here we report an anomalous and aberrant intradural course of left vertebral artery leading to compression of upper part of spinal cord at cervico-medullary junction and involving the spinal nucleus of trigeminal nerve. This leads to the involvement of motor tracts and trigeminal nerve.

**Keywords:** Trigeminal hypesthesia; Cervical myelopathy; Vertebral artery anomaly; Anatomical variation

### Introduction

The vertebral artery arises on both the sides from the first part of the subclavian artery at the root of the neck and proceeds superior and posteriorly in the interval between the vertical part of the longus colli and anterior scalene muscles to the level of the 6<sup>th</sup> cervical vertebra. The artery passes upwards through the transverse foramen of the 6<sup>th</sup> cervical vertebra and all succeeding transverse foramina. After leaving the transverse foramen of the atlas, the vertebral artery turns posteromedial and passes in a groove along the posterior arch of atlas. Then the vertebral artery turns anteriorly to enter the vertebral canal, penetrates the dura mater, enters through the foramen magnum, and runs superiorly along the anterior surface of the medulla oblongata to the inferior aspect of the pons. Here it joins the vertebral artery from the opposite side in the midline to form the basilar artery.

With opposite artery it supplies deep neck muscles, spinal cord and posterior part of the brain supplying the brainstem, cerebellum,

thalamus, occipital lobe and temporal lobe of the cerebral cortex [1,2].

The vertebral arteries are widely known to be variable in their course. This can lead to difficulty in the surgical management of many conditions of the cervical spine disorders. Occasionally abnormalities of the vertebral arteries themselves indicate and become symptomatic. Vertebral artery abnormalities have been reported to cause many of symptoms such as neck and arm pain [3,4].

Anomalous origin of vertebral artery is not very usual finding with the prevalence ranging from 3-8% [5,6]. Though vertebral artery anomaly is unusual, a report from a series of 300 vertebral artery anomalies and most of the cases are asymptomatic but few cases have been reported with cervical pain, occipital pain and myelopathy [7].

Here we report a rare case of high-level cervical cord compressive myelopathy and ipsilateral facial hypaesthesia due to anomalous left vertebral artery.

**Case Report**

A 40 years old male non-hypertensive, non-diabetic presented with progressive weakness in all four limbs and progressive complaints of headache, dizziness, left facial progressive weakness since 15 days. No history of vertigo, fever, recent travel or loose motions.

On examination patient was alert, conscious but presented with quadriparesis. The cranial nerves were intact but decreased sensation to touch and temperature in left C1, C2 and C3 segments distribution.

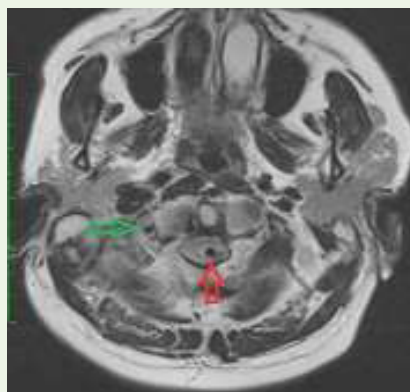
The deep tendon reflexes were exerted with mild spasticity. Speech and memory was intact. The patient was advised for MRI brain; MRI angiography with cranio-vertebral junction.

MRI Brain showed the intradural course of V3 segment of left vertebral artery, which was indenting over the cervico medullary junction. The left vertebral artery was passing posteromedially and intradurally between the axis and atlas and above the C1 vertebra's foramen transversarium and impinging on the upper segments of spinal cord. The image also showed a hyper intense signal in the cervicomedullary junction, which was suggestive of oedema (Figure 1).

The course of right vertebral artery was normal (Figure 2).



**Figure 1:** Axial T2 weighted image shows anomalous intra-dural course of V3 segment of left vertebral artery indenting over the cervico-medullary junction. Also, note hyper intense signal in the cervico-medullary junction suggestive of oedema.



**Figure 2:** Axial T2 weighted image at cervico-medullary junction. Red arrow indicated anomalous course of left vertebral artery. Note the normal course of right vertebral artery (green arrow).

The MRI angiography image demonstrated the anomalous course of left vertebral artery with cervico-medullary compression (Figure 3).

After MRI brain and MRI angiography, the patient was referred to Neurophysician for further management.

**Discussion**

Knowing the anatomical abnormalities, no matter how rare but still necessary for perfect diagnosis and treatment of patients. The vertebral artery is linked with several anatomical variations for e.g. - in approximately 4-6% of subjects the left vertebral artery arises from the aortic arch [1,8]. Further, in 60-70% of the subject the vertebral artery is of different size, with left more frequently larger than the right [2,3]. Seldom is a single vertebral artery present, or one fails to reach the opposite vessel to form the basilar artery [8]. Even though abnormalities of the vertebral artery may not be common, reports of deficits due to the extra cranial neural compression are seen. Most of the patients come with symptoms of irritation or injury to the nerve root or cranial nerve deficits [4]. MRI, CT angiography or cerebral angiography are the choice of investigations to diagnose such patients [7]. In our case, also we investigated the patient by MRI.

In our case there was cord compression at cervico-medullary junction with involvement of spinal nucleus of trigeminal nerve; as the patient complained of progressive weakness of all four limbs indicating the lesion of pyramidal tracts as well as there was left hypesthesia of the face and forehead with loss of touch and temperature.

Imaging of the cervical spine showed the abnormal course of left vertebral artery dorsal to spinal cord. Continuous pulsations of the artery for a longer duration might be the cause of compressive myopathy in our case, there might be sporadic and irregular stimulation of the spinal cord by the abnormal course of left vertebral artery involving the spinal nucleus of trigeminal nerve which lies in the higher segments of spinal cord and this correlates with the loss of exteroceptive sensations on the ipsilateral side of face and forehead.

Structural anomalies of the vertebrobasilar system can create a variety of neurological symptoms. In such cases of direct compression,



**Figure 3:** MRI angiography image shows abnormal medial course of left vertebral artery (red arrow) causing compression over the cervico-medullary junction. The left vertebral artery aberrantly entering the spinal canal below the level of atlas. Compare the normal course of right vertebral artery.

neural structures by the vertebra-basilar system and pulsatile character of arterial blood flow can produce cranial nerve or ponto-medullary dysfunction, cervical myopathy or cervical radiculopathy [9].

Classically Jannetta related vascular compression of the trigeminal nerve to trigeminal neuralgia and conveyed that microvascular decompression of the affected nerve could induce symptomatic relief [10]. In these cases, trigeminal nerve dysfunction is secondary to compression of the caudal part of spinal nucleus of trigeminal nerve. In present study also, there was the compression of upper part of spinal cord segments involving the spino-medullary junction.

Cervical myelopathy may be precipitated by vertebral artery tortuosity; such abnormalities may be more frequently symptomatic which though generous is not ideal, as the spinal canal at the foramen magnum cannot provide a space to an intruding vascular structure without cervical cord compression [11]. In present study also, tortuosity of abnormal course of left vertebral artery may be the prime reason for the myelopathy and cord compression leading to involvement of spinal nucleus of trigeminal nerve and motor fibres, which lead to weakness in limbs and face.

The bilateral VA normally develop from the distal part of the 7<sup>th</sup> dorsal intersegmental arteries. Anatomical variations of VA arise from persistence or obliteration of these arch arteries and intersegmental arteries. Anomalous origin of VA occurs when there is aberrant anastomosis during the embryonic development of the arch. The site of anastomosis will define the eventual unusual origin. However, the difference in the entry level of VA is related to the dominance of a ventral or dorsal intersegmental anastomosis

Intradural course of C1-C2 VA means the VA courses posteromedially after the exiting the C2 transverse foramen and pierce the spinal canal between C1 and C2 not traversing through C1 transverse foramen, this was present in our case also. The embryological explanation is the first intersegmental artery remains without persistence of the first VA.

Congenital osseous anomalies such as hypoplastic odontoid, Os odontoideum and bifid C1 posterior arch have been reported to increase the incidence of intradural course C1-C2 VA [11-14].

However, in our case no osseous anomalies and variation in the origin of left vertebral artery was present but there was anomalous course of left vertebral artery at C1-C2; which represents the first intersegmental artery.

## Conclusion

Anomalies of vertebral artery can cause disturbances in vertebra-basilar blood supply and related to anatomic position of anomalous vertebral artery, cervical and spino-medullary junction may produce

vascular complications. Thus, abnormal course of vertebral artery should be a part of differential diagnosis of upper cervical lesions presenting the symptoms of myelopathy in limbs and on face.

Microvascular decompression around the vertebral artery could be sufficient and safe method to indirectly decompress the spinal cord.

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