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## MR Imaging of Dolichoectasia of Vertebrobasilar system causing Medullary compression

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#### ABSTRACT **INTRODUCTION:**

Brainstem compression from dolichoectatic vertebrobasilar system has been recently found to be the cause of non-specific neurologic symptoms in middle age and elderly patients. Most of the presenting complaints were related to cerebellar and vestibular complaints like vertigo, dizziness, and imbalance. In this study, we aim to look for imaging evidence related to medullary compression due to dolichoectatic arteries in the region of the medulla.

#### **METHODS:**

We retrospectively reviewed 8 cases referred from neurology and other specialty departments who were referred for neuroimaging with non-specific transient symptoms which were primarily vestibular or cerebellar. We evaluated the clinical presentation and imaging sequences for presence of neurovascular conflict / compression.

#### **RESULTS:**

In our sample of 8 cases, there were several imaging findings that suggested neurovascular conflict / compression. 4 patients had evidence of dolichoectasia of vertebrobasilar arteries causing a significant impression on the medulla. The most common region involved in all our positive cases were around the antero-lateral aspect of the right medulla. 4 cases had no evidence of neurovascular conflict and no major neurovascular conflict could be identified.

#### **CONCLUSION:**

Although the symptoms may be transient and imaging may not correlate with the clinical picture in most cases, neurovascular compression involving the medulla, as a possible cause of the patients symptoms may be suggested in cases with typical imaging findings. However, with review of literature as a source, most of the cases need to be treated with a conservative approach in the initial stages as treatment with minimally invasive neurovascular decompression may not yielded expected results in all cases.

**Keywords**: Medullary compression, neurovascular conflict, dolichoectatic vertebra basilar artery

## **INTRODUCTION**

Dolichoectasia of the vertebrobasilar system is described as generalized enlargement of vertebral and basilar arteries. They may be unilateral or also bilateral, although bilaterality is usually uncommon. These arteries may also appear tortuous in their course (1-3). Due to enlargement, they may cause a resultant vascular impression on structures they come in contact with namely the brainstem and cerebellum which may lead to a wide range of clinical features which range from being asymptomatic to several non -specific symptoms (3, 8, 9, 10).

### **METHODS**

We retrospectively included patients that presented to our departments for various neurological symptoms from Jan 2020 to August 2020. All our patients were imaged in our institution. MRI was done using Siemens 1.5 T MAGNETOM ESSENZA MRI scanner. The course of the vertebral and arteries with respect to the medulla and cervical spinal cord structures was evaluated using specific sequences which included MRA (Magnetic Resonance Angiography) and 3D Fast Turbo Spin sequences

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such as SPACE (Sampling Perfection with Application-optomized contrasts using different flip angle Evolution) using additional MPR reconstruction for optimal evaluation of the course of dolichoectatic arteries.

Dolichoectasia of the vertebra-basilar system was enlargement calculated based on of the vertebrobasilar arteries at mid pons level more than 4.5mm <sup>(2, 7).</sup> Using the above cut off intervals, patients with imaging evidence of vertebral arterv dolichoectasia were assessed. Compression of brainstem and spinal cord was evaluated. All patients with imaging features of both vertebrobasilar dolichoectasia with medullary compression were included in the study. Patients who had other structural or abnormal imaging findings which would have led to the symptoms were excluded from the study.

#### Results

Our study included a total of 8 patients (5 men and 3 women). The average age was 58.3 years (age range 49 - 76 years). Clinical features of compression of the medulla were observed in all 8 patients which included dizziness, vertigo, and postural imbalance. Dysarthria was in one patient. The presence of neurovascular compression on the medulla was seen

in 4 patients whereas the rest of the patients did not have any typical imaging appearances of a neurovascular conflict. The most common site of compression was found to be the antero-lateral aspect of medulla on the right side. In all 4 cases, a dominant right sided vertebral artery was found, along with a reduced caliber of the left vertebral artery.

#### DISCUSSION

In our study, clinical features of neuro vascular compression on the medulla ranged from completely asymptomatic cases to non-specific symptoms like postural imbalance, dizziness and vertigo. In 4 patients, the diameter of the dolichoectatic vertebral artery was more than 4.5mm, and the most common region involved was the anterolateral medulla with the right vertebro-basilar system being the most commonly involved side. 4 of the patients with clinical features had imaging findings suggestive of medullary compression while the rest had no significant neurovascular conflict, hence it is difficult to ascertain if the imaging findings were responsible for the clinical manifestations as, in our study, 4 patients with typical symptoms no had imaging evidence of neural compression.



**Fig 1** – **Anterolateral compression of the right medulla by a dolichoectatic right vertebral artery in a 56 year old male patient -** Axial SPACE (A) and Axial TOF MRA (B) shows smooth indentation of the right vertebral artery with minimal displacement of the medulla to the contralateral side. SPACE Coronal (C) and TOF MRA Coronal (D) shows the tortuous course of the right vertebral artery causing minimal displacement of the edulla.

In recent literature, dolichoectasia of the vertebrobasilar artery has been associated with compression of the pons, cranial nerve palsies, and even ischemic events <sup>(2, 4, 9)</sup> and symptoms typically correlate with the involved neural structure. It is suggested that considering these findings, patients should have both imaging features of vascular compression involving the medulla with associated clinical findings. In medical literature, there has been less discussion of vascular

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compression, although there are a few reports of medullary compression by vertebral artery <sup>(10, 14–17).</sup> A similar study done by Savitz et al. described nine patients with imaging features of medullary compression dolichoectatic vertebral artery and a recent study done by Qi Li et al. <sup>(23)</sup> which includes ten patients with medullary compression by a

vertebral artery <sup>(10).</sup> In both these studies, the most common clinical signs and symptoms included dizziness, vertigo, imbalance, ataxia, and limb weakness. The study done by Qi Li et al. <sup>(23)</sup> had other important findings such as hemiparesis, which was present in five patients.



**Fig 2** – **Anterolateral right medullary compression by a dolichoectatic right vertebral artery in a 61 year old female patient -** Axial SPACE (A) and Axial TOF MRA (B) shows indentation of the right vertebral artery. SPACE Oblique Sagittal (C) and (D) and TOF MRA Oblique Sagittal (E) shows the tortuous course of the right vertebral artery causing compression of the medulla.

Treatment of neurovascular ideally may vary from conservative medical management to microvascular decompression (MVD). However, there is no ideal treatment as in some cases, there was no response to treatment following microvascular decompression with persisting symptoms. A possible explanation may be that there has been irreversible damage due to sustained compression of the involved neural structure. The effectiveness of MVD surgery has been shown to be higher in patients with medullary compression who had symptoms of dysphagia, hoarseness, and respiratory compromise <sup>(10, 22).</sup>

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#### CONCLUSION

Although there have been classical imaging findings in patients with medullary compression due to dolichoectatic vertebral artery, the nonresponsiveness to surgical treatment in patients suggest that there might be variable causes and not just a single entity to the symptoms. In all fairness, future studies with multiple trials in symptomatic patients are required for an effective conclusion and to advise a preferable treatment option.

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