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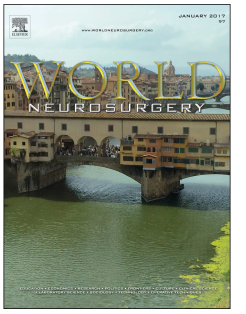

Aberrant Abducent Nerve during Microvascular Decompression for Trigeminal Neuralgia

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Key words :

Trigeminal neuralgia
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Aberrant vascular loop

Short Title:

Aberrant Abducent Nerve During MVD

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Abstract

Background

Microvascular decompression (MVD) is a commonly performed procedure to treat trigeminal neuralgia and hemifacial spasm. Knowledge of the variable anatomy of the cerebellopontine angle is crucial to avoid injury to cranial nerves.

Objective

Here, we highlight a case of aberrant anatomy of the abducent nerve encountered during MVD, emphasising the importance of visualising the surrounding cranial nerves.

Methods

Case report of a 76-year-old lady with right V1 and V2 trigeminal neuralgia, refractory to medical treatment, undergoing elective MVD.

Results

Intraoperatively, a distorted course of the cisternal component of the abducent nerve was noticed, caused by an ectatic anterior inferior cerebellar artery (AICA). Careful mobilisation of the offending vessel to decompress the trigeminal nerve was carried out; however, abducent nerve decompression was not attempted since its function was not compromised. Facial pain resolved post operatively without new diplopia.

Conclusion

Careful review of imaging prior to surgery is recommended in order to pre-empt such unusual anatomical variations.

Running title
Unusual Anatomy During Microvascular Decompression

Keywords
Microvascular decompression, Trigeminal neuralgia
Abducent nerve , Facial pain, Aberrant vascular loop

Background and Importance

Microvascular decompression (MVD) of cranial nerves is a commonly performed neurosurgical procedures for diverse conditions that include trigeminal neuralgia and hemifacial spasm.[1,2,3,4] A good clinical outcome requires transposition of the offending vessel away from the relevant cranial nerve without damage to nearby structures.

Here, we report a case of a severely distorted abducent nerve, stretched around an arterial loop, noted incidentally during MVD for trigeminal neuralgia. The patient's permission was sought and consent for reporting the case was granted. Ethics committee approval was not required. This case highlights the importance of recognising normal anatomy as well as identifying anatomical variation in order to avoid inadvertent injury to other structures during mobilisation of the aberrant vascular loop.

Clinical Presentation

A 76-year-old lady presented with right V1, V2 trigeminal neuralgia refractory to medical treatment. On examination, there was no cranial nerve abnormality. Magnetic resonance imaging (MRI) with high-resolution constructive interference in the steady state (CISS) sequence (Figure 1) demonstrated neurovascular conflict between the right trigeminal nerve and anterior inferior cerebellar artery (AICA) (Figure 1a). After appropriate counselling regarding the different surgical options, the patient opted to undergo MVD.

At surgery the trigeminal nerve was seen to be compressed between a vein and an aberrant arterial loop (Figure 2). Arachnoid dissection was carried out to allow safe mobilisation of the compressing artery. During this stage of the procedure, it was noted that the proximal portion of the AICA was stretching the cisternal portion of the abducent nerve. The normally straight cisternal course of the VIth nerve, from pontomedullary sulcus inferiorly to Dorello's canal superiorly, was distorted into a loop around the tortuous vessel, with the nerve having to course inferiorly again to gain access to the canal (Figure 2). Extra care was taken whilst mobilising the offending vessel in order to avoid damaging the abducent nerve. Since the patient did not have any symptoms related to abducent nerve compression, abducent nerve decompression was not attempted. The AICA was mobilised inferiorly to decompress the trigeminal nerve and to prevent further traction on the abducent nerve. Teflon and fibrin glue were used to immobilise the transposed AICA against the pons and prevent recompression of the trigeminal nerve.

Post-operatively, the patient experienced immediate relief from trigeminal neuralgia symptoms without the emergence of diplopia or abnormalities in external ocular movements. Retrospective review of pre-operative imaging confirmed deformation of the abducent nerve's course (Figure 1b).

Discussion

During microvascular decompression of the trigeminal nerve, the passage of the cisternal component of several other cranial nerves can be observed in the cerebellopontine angle, including the IV nerve coursing along the edge of the tentorium, the facial and vestibulocochlear nerve complex lying superficial and inferior to the trigeminal nerve and the VI nerve lying deep to all the other nerves as it courses along the clivus to reach Dorello's canal. Identification of these cranial nerves is important to avoid traction or injury.

In this case, although the abducent nerve was significantly distorted by a tortuous AICA, this was asymptomatic. It is well recognised that aberrant vascular loops can be in contact with cranial nerves without causing clinical signs or symptoms.[5,6,7] However, there are a few reported cases of abducent nerve palsy with vessel positive imaging,[8] the majority of which are caused by a dolichoectatic vertebral or basilar artery causing diplopia due to lateral rectus dysfunction. Only two of these cases are reported to have undergone successful microvascular decompression (MVD) as treatment.[9,10] Also being a motor nerve and of thinner calibre, may render it more resilient to distortion.

It is not known why neurovascular compression syndrome of the abducent nerve is so much rarer than for other cranial nerves in the cerebellopontine angle.[11] Its more medial location may render it less susceptible to tortuous vessels.

Conclusion

This report highlights that neurovascular conflict can be asymptomatic and that anatomical variations must be recognised to prevent unintended injury during microvascular decompression procedures. In this case, a tortuous AICA was causing asymptomatic displacement of the VI nerve and symptomatic conflict with the Vth nerve. This had to be taken into account when mobilising the vessel away from the symptomatic nerve to prevent further traction on the asymptomatic nerve. Successful decompression resulted in complete relief from trigeminal neuralgia pain without causing diplopia. Careful review of the pre-operative imaging is recommended in order to pre-empt similar unusual anatomical variations.

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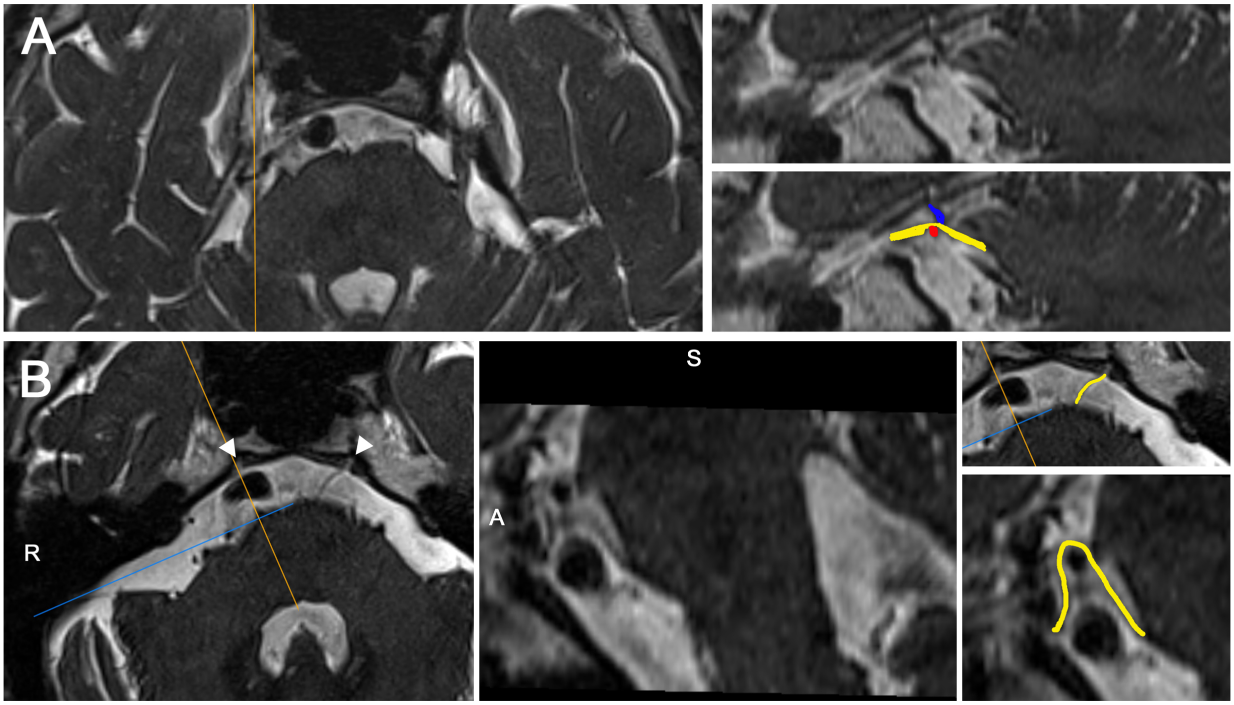
Figure Legends

Figure 1: High-resolution (0.5x0.5x0.5mm voxel), constructive interference in the steady state (CISS) sequence, magnetic resonance imaging (MRI).
A. Left panel: neurovascular conflict with distortion of the right trigeminal nerve by the anterior inferior cerebellar artery (AICA). **Right panels:** A 3D reconstruction of the MRI reveals that, as it courses from pons to Meckel's cave, the trigeminal nerve (yellow) is pushed superiorly by an ectatic anterior inferior cerebellar artery (AICA – red) and is compressed against the superior petrosal vein above (blue).
B. Left panel: Oblique axial image through the lower pons. Dorello's canal can be seen bilaterally (arrowheads). The left abducens nerve can be seen gaining access to Dorello's canal by a relatively direct route (in yellow on far-right top panel). **Middle panel:** 3D oblique sagittal reconstruction. The right abducens nerve is stretched around an ectatic AICA, making a "loop" before accessing Dorello's canal (in yellow on far-right bottom panel).

Figure 2: Intraoperative microscope photographs during microvascular decompression of the right trigeminal nerve.
Left column: Three intraoperative microscope photographs at various stages of the procedure. **Right column:** Identical faded photos to assist with labelling of structures.
Top row: The superior aspect of the right cerebellopontine angle has been exposed revealing the tentorium, petrous and trigeminal nerve (a) that is clearly compressed between a vein superiorly and a tortuous anterior inferior cerebellar artery (AICA) (d) inferiorly. The seventh and eighth nerve complex (c) can be seen inferiorly, towards the right of the frame. The sixth nerve (b) can be seen through the arachnoid after looping around the tortuous AICA as it *descends* inferiorly towards Dorello's canal (arrow).
Middle row: The sixth nerve (b) is more clearly seen after arachnoid release and severe compression of the trigeminal nerve (a) by the AICA (d) is more readily appreciated.
Bottom row: The AICA and its branches (d) has been mobilised inferiorly and stuck to the pons below the trigeminal nerve with Teflon and fibrin glue (e). The loop of the abducent nerve around the AICA can be seen deep to the severely dented, but now well decompressed trigeminal nerve (a).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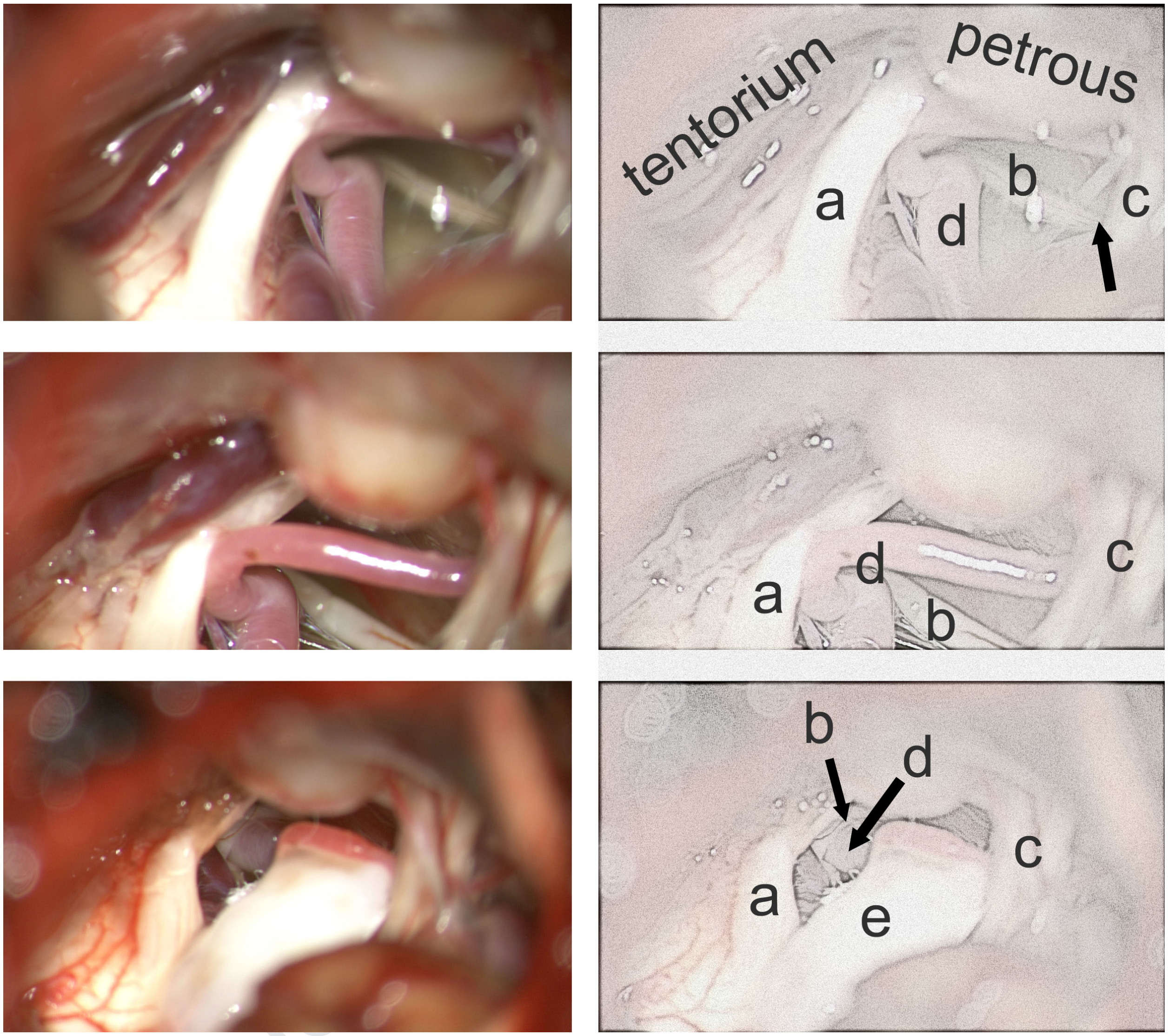
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petrous
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Abbreviations

AICA - Anterior inferior cerebellar artery

CISS - Constructive interference in the steady state

MVD – Microvascular Decompression

MRI - Magnetic resonance imaging

Vth nerve – Trigeminal nerve

V1 – Opthalmic division of the trigeminal nerve

V2 – Maxillary division of the trigeminal nerve

VIth nerve – Abducent nerve