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Q1 Case report

Symptomatic medulla compression by vertebral artery. Case report and review of the literature

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ABSTRACT

Objective: Vertebral artery medulla compression syndrome (VAMCS) is a very rare condition manifesting as different neurological focal deficits. The case of a 36-year-old male with symptomatic brainstem compression by vertebral artery (VA) treated by means of microvascular decompression (MVD) and a review of the literature is presented.

Case report: On admission, a 36-year-old patient presented with hypoalgesia, hypothermesthesia and hemiparesis on the left side. Magnetic resonance imaging (MRI) of the head disclosed the right VA loop compressing the ventrolateral medulla and excluded other entities such as brain tumor, stroke and multiple sclerosis. Since displacement and significant compression of the right pyramidal tract was confirmed by diffusion tensor imaging (DTI), neurovascular compression syndrome was diagnosed. The patient underwent MVD of the medulla using a Gore-Tex implant as a separating material via the right far-lateral approach. The left hemiparesis and hemisensory loss remitted rapidly after the procedure. The post-procedural neurological improvement was maintained at one year follow-up. Based on a review of the literature, a total of 33 cases of surgically treated VAMCS has been reported so far.

Conclusion: VAMCS should be considered as the cause of neurological deficits when other pathological entities are ruled out. In symptomatic conflict of the VA with the medulla, microvascular decompression using a Gore-Tex implant can be an effective method of treatment. Nevertheless, a statistical analysis on all reported cases showed favorable results using the VA repositioning technique when compared with MVD (success rate 91% vs. 58%, $p < 0.05$).

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1. Introduction

The clinical significance of neurovascular compression has been explained by Jannetta, who linked it with trigeminal neuralgia. According to his theory, both the compression of nerve V and pulsatile blood flow in arteries affected by atherosclerosis and age-related elongation cause irritation and hyperactivity of this nerve [1]. Currently, neurovascular conflict is a commonly known clinical condition associated with disorders such as trigeminal neuralgia, hemifacial spasm and glossopharyngeal neuralgia [2]. Vertebral artery medulla compression syndrome (VAMCS) is a condition of significantly lower prevalence and more severe clinical course. The complex clinical presentation of VAMCS, as well as the frequent asymptomatic modeling of the brainstem by the vertebral artery (VA) [3], requires meticulous diagnostics. It is necessary to prove that the symptoms result from the compression of the brainstem by the VA, and clinical conditions such as brain tumor, stroke and multiple sclerosis should be ruled out.

In this paper, we report on the case of a young patient with symptomatic VAMCS. We also present a review of the literature concerning VAMCS with special attention paid to clinical symptoms, diagnostics and therapeutic methods. Cases of brainstem compression by VA aneurysm and compression of the upper cervical spinal cord were excluded from the analysis.

2. Case presentation

2.1. History and examination

A 36-year-old male with a history over the last six months of limping on his left leg and touch sensation impairment in the left half of the body presented with left hemiparesis. Over three months prior to admission, he experienced two episodes of syncope. During this period, the patient complained of paroxysmal ''lightning'' pain provoked by physical effort and neck flexion in the right occipital region extending to the opposite side of the body with concomitant nausea and periodic vomiting. Similar headaches appeared two years previously and spontaneously remitted after several months. On admission, neurological examination disclosed sensory loss to pain, temperature and non-discriminative touch on the left side of the body. Mild left hemiparesis with increased muscle tone and ankle clonus were observed.

2.2. Imaging studies

An MRI of the head revealed compression of the ventrolateral aspect of the medulla oblongata by an elongated and tortuous right VA (Fig. 1A–C). There were no pathological contrast enhancement or diffusion restriction regions in the brain. CT angiography and DSA (Fig. 1E) disclosed the loop of V4 segment of the right VA projecting posteriorly. Diffusion tensor imaging (DTI) demonstrated the compression and medial displacement of the right pyramidal tract at the level of the upper medulla oblongata (Fig. 1D). A post-processing tool (the syngo.MR Tractography, Siemens, Erlangen, Germany) was used for DTI analysis. ROI-based analysis was performed on the medulla oblongata to reconstruct the pyramidal tracts. Based on MRI, CT angiography and DSA, other conditions such as tumor, aneurysm and multiple sclerosis were excluded.

2.3. Surgical procedure

The patient was qualified for microvascular decompression (MVD). The motor and somatosensory evoked potentials were monitored intraoperatively. Right lateral suboccipital craniotomy with asymmetric removal of the posterior arch of C1 was performed using an inverted U-shaped musculocutaneous flap. Approximately, the posterior quarter of the occipital condyle was drilled out. The dura was opened with a lazy C incision posteriorly to the VA, followed by cisterna magna opening. The V4 segment of the right VA was exposed and, after stepwise microsurgical dissection along its course, the arterial loop compressing the medulla was reached. Then, the VA loop was dissected and shifted away from the brainstem, followed by placement of the separating material between the medulla and the VA. A short portion of Gore-Tex vascular prosthesis (Gore-Tex® Stretch Vascular Graft, 6 mm, W.L. Gore & Associates, Inc., Flagstaff, AZ) was used for this purpose (Fig. 1F). After visual verification of proper brainstem decompression, the implant position was fixed with fibrin glue (Tissucol®, 4 ml, Baxter Innovations, GmbH, Vienna, AT). VA repositioning with suturing to the dura was also considered before the procedure, but intraoperatively it was determined to be too risky. The motor and somatosensory evoked potential values were stable during the surgery. The dura was closed with watertight sutures, the bone flap was restored and the procedure was completed in the standard fashion.

2.4. Postoperative course and follow-up

No intra- or postoperative complications occurred. The neurological status of the patient improved rapidly in the postoperative period; all motor and sensory deficits resolved completely. Postoperative CT revealed proper fixation of the Gore-Tex implant at the ventrolateral aspect of the decompressed brainstem. The patient was discharged home on postoperative day 7. There was no recurrence of focal deficits within one year of follow-up.

3. Discussion and review of the literature

In 1967, Jannetta et al. reported five clinical cases presenting with trigeminal neuralgia related to a conflict of the superior cerebellar artery branch with the fifth cranial nerve, all of which were treated with MVD [1]. Since then, MVD has been commonly used in the surgical treatment of neurovascular conflicts, including hemifacial spasm and glossopharyngeal neuralgia [2]. Kim et al. reported the first case of a symptomatic conflict of the vertebral artery and the medulla in a patient who presented with hemiparesis and hypoglossal nerve paresis [4]. To the best of our knowledge, a total of 33 cases of surgically treated VAMCS has been reported so far (see Table 1).

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