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Case Report

Endoscopic assisted microvascular decompression for vertebral artery - Associated hemifacial spasm – A case report

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ABSTRACT

Introduction: and importance: Vertebral-artery associated hemifacial spasm is rare. Microvascular decompression (MVD) of hemifacial spasm (HFS) associated with the vertebral artery (VA) shows high rates of incomplete cure and complications compared to non-VA-related HFS.

Case presentation: A 39-year-old male who presented with a 2-year history of progressive left-sided typical HFS. Endoscopic assisted MVD for VA-associated HFS via a retro-sigmoid keyhole was performed. Neurovascular conflicts by both the VA and the AICA around the root exit zone of the facial nerve in sandwich type were successfully decompressed.

Clinical discussion: Vertebral-artery associated hemifacial spasm is challenging. With the assistance of endoscopy, multiple neurovascular conflicts were clearly demonstrated without significant cerebellar retraction. The VA and AICA were safely interposed with preservation of perforators under excellent view.

Conclusion: Endoscopic assisted MVD offers reliable decompression with minimum invasiveness in case of VA-associated HFS with multiple compressions.

1. Introduction

Hemifacial spasm (HFS) is characterized by asymmetrical, spontaneous, and recurring contractions of muscles innervated by the ipsilateral facial nerve [1–3]. The most common cause of HFS is compression of the facial nerve by cerebral vessels [1,3,4]. Vessel compression is assumed to generate nerve demyelization with subsequent alteration in signal transmission, that regulates a muscle spasm in the area innervated by the facial nerve.

The medical treatment for HFS is Botulin Neurotoxin injection, which provides effective but transient relief of symptoms [5]. Anticonvulsant drug prescription has much limits due to its side effect and low efficacy [6]. Since Gardner and Janneta established and popularized microvascular decompression (MVD) in patients with hemifacial spasm (HFS), the developments in microsurgical and neuromonitoring techniques have ameliorated neurosurgeons to enhance the cure rate of MVD to over 90% [7]. Furthermore, the rate of complications that could lead to permanent neurological sequelae has been reduced ever since [7]. Provided that botulinum toxin provides only short-term improvement of HFS symptoms and no durable medical therapy has been found, successful MVD is of extreme importance for the resolution of HFS.

Visualization of the neurovascular compression (NVC) site at the root exit zone (REZ) of the facial nerve is crucial during MVD for a successful outcome [8,9]. Minimal cerebellar retraction to avoid neurovascular injury might not always allow complete exposure of the NVC site, which is a major cause of unsuccessful MVD [10–12]. The vertebral artery (VA) as an offending vessel for HFS exacerbates this potential difficulty [7,13,14]. In this study, we analyzed the endoscope-assisted microvascular decompression (MVD) in managing hemifacial spasm caused by both the VA and the AICA in a sandwich type compression of the facial nerve.

2. Clinical presentation

A 39-year-old male who presented with a 2-year history of progressive left-sided typical HFS. He described the spasms as intermittent, painless and involuntary, progressing from the eye to the mouth. The patient's hearing was normal, and he exhibited no other cranial nerve

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Abbreviations and acronyms

AICA	anterior inferior cerebellar artery
CISS	constructive interference in steady state
HFS	Hemifacial spasm
MRI	Magnetic resonance imaging
MVD	Microvascular Decompresison
NVC	neurovascular compression
PICA	posterior inferior cerebellar artery
REZ	root exit zone
TOF 3D	Time of flight 3-Dimensional
VA	vertebral artery

palsy or neurological deficits. No relevant drug history, family history and psychosocial history was found.

Magnetic resonance imaging shows the left vertebral artery causing compression over root entry zone of left facial nerve. TOF 3-Dimensional Magnetic resonance images show left vertebral artery which deviated laterally before joining the right vertebral artery to form the basilar artery (Fig. 1).

The patient was indicated endoscopic assisted microsurgery to decompress neurovascular conflict. The procedure was performed by dr A.H.P and his team. The patient was in a park bench position. A standard keyhole retro-sigmoid craniotomy was utilized. Cerebrospinal fluid was drained for brain relaxation. The lower cranial nerves were identified, and the arachnoid was dissected for visualization of cranial nerves seven and eight. Under microscope, neurovascular compression of the facial nerve was suspected but not identified.

The 0- degree and 30-degree rod-lens endoscope was introduced, and the facial nerve was compressed at the Root Exit Zone in a sandwich type by the vertebral artery and the AICA loop (Fig. 2). Under the microscope, we put a Teflon pad between the VA and the Root Exit Zone of the facial nerve, then we strengthened the interposition by Teflon sponges. Next step, we put another Teflon pad to separate the AICA loop and the Root Exit Zone of the facial nerve (Fig. 3). Again, 0° and 30° rigid rod-lens endoscope was used to confirm the complete decompression. The dura mater was closed in a water-tight fashion. The 2-cm in diameter bone flap was placed, and the skin was closed.

Postoperatively, hemifacial spams disappeared entirely on the first day postoperative. No neurological deficit and bleeding complications were reported. The patient was discharged after 5 days. At one month and three month postoperative follow-up, neither hemifacial spams nor neurological deficit was found. He was happy to return to his normal life.

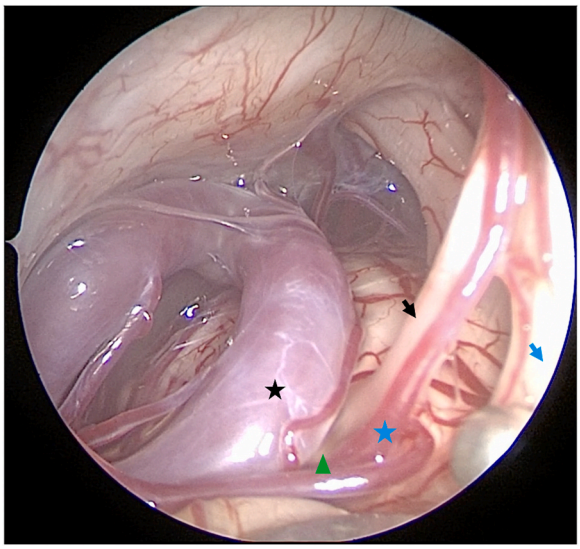

Fig. 2. Endoscopy image of the CP Angle. The REZ (green triangle) of the 7th cranial nerve (black arrow) was compressed by the vertebral artery (black star) and the AICA loop (blue star). The 8th cranial nerve (blue arrow) was demonstrated. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

The work has been reported in line with the SCARE 2020 criteria [15].

3. Discussion

In facial nerve anatomy, there is a short area of non-fascicular nerve rostrally and posteriorly and a long area of intra-pontine facial nerve on the caudal side [16]. Typical hemifacial spasm is caused by vessels on the antero-caudal side of the nerve, while atypical HFS is caused by vessels on the posterior rostral side [17,18]. Typical spasm starts in the orbicularis and gradually progresses caudally, while atypical spasm starts in the buccal muscles and progresses rostrally [16]. Our patient presented with a history of 2-year lefi-sided hemifacial spasm. On neurologic examination, he had a typical presentation of hemifacial spasm, with intermittent, painless and involuntary spasm progressing from the eye to the mouth. On magnetic resonance imaging, the neurovascular compression was suspected in the root exit zone of the facial nerve, by the laterally deviated left vertebral artery (Fig. 1).

The location of the primary neurovascular compression was the root

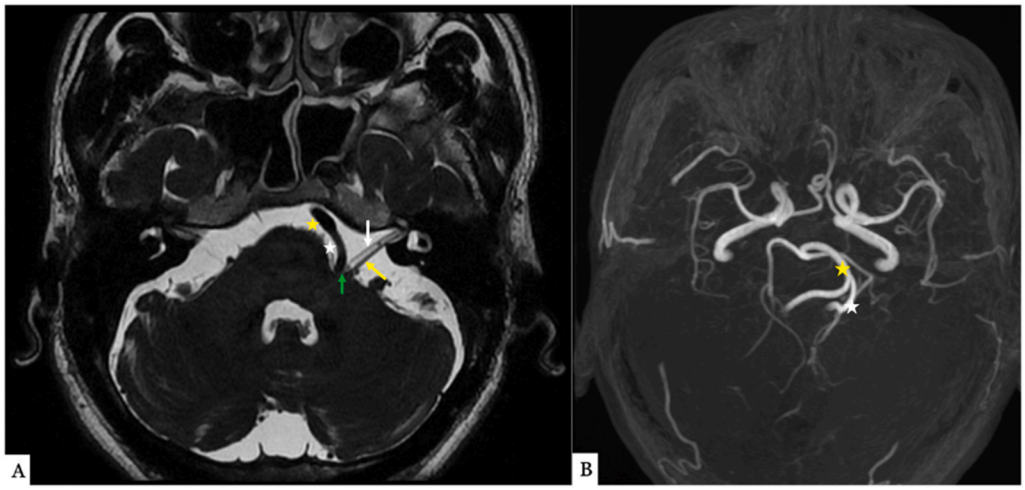

Fig. 1. A: CISS MRI image demonstrated the left cranial nerve (white arrow) was compressed at the root entry zone (green arrow) by the vertebral artery (white star). The basilar artery (yellow star) and the cranial nerve VIII (yellow arrow) were shown. B: TOF 3D images showed left vertebral artery (white star) which deviated laterally before joining the right vertebral artery to form the basilar artery (yellow star). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

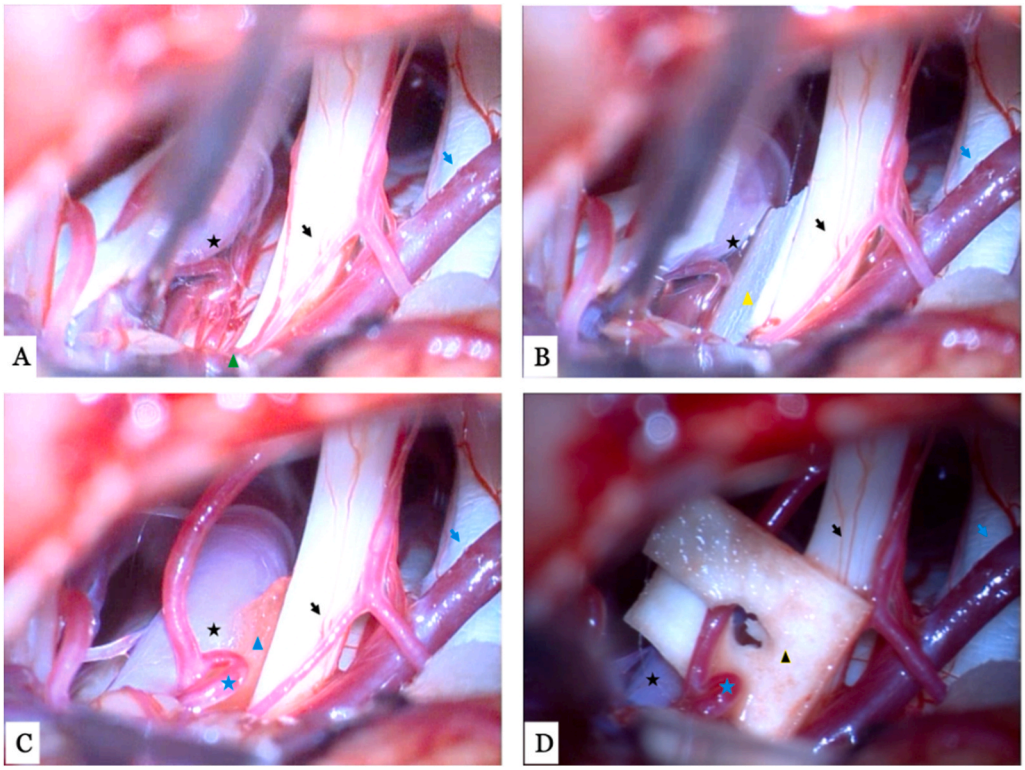

Fig. 3. Microsurgical view of the CPA
A: The REZ (green triangle) of the 7th cranial nerve (black arrow) was compressed by the vertebral artery (black star). The 8th cranial nerve (blue arrow) was shown.
B: We put a Teflon pad (yellow triangle) to separate between the vertebral artery and the 7th cranial nerve at its REZ.
C: We put some Teflon sponges to strengthen the interposition between the Vertebral artery and the 7th cranial nerve. The AICA loop (blue star) was also seen.
D: Another Teflon pad was used to separate between the AICA loop and the 7th cranial nerve (black triangle). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

exit zone, attached segment, root detachment point, and cisternal portion [19]. A single vascular culprit was identified in 62%, and additional potential culprit vessels were seen in 38%. The primary culprit vessels were the AICA and PICA, while elongated VA was one of the less encountered causes. In cases of vertebral artery – associated hemifacial spasm, microvascular decompression (MVD) is considered to be challenging, and symptom recurrence is occasionally encountered [10,14,18,20–24]. With its large diameter and inflated stiffness, the VA occupies the surgical field, is arduous to move, and hinders the compression site near the REZ of the facial nerve (Fig. 2).

There are 6 patterns of neurovascular compression: loop type, arachnoid type, perforator type, branch type, sandwich type and tandem type [25,26]'. In sandwich type, the nerve was sandwiched between two different vessels independently. Most of patients with sandwich type compression suffered from unsatisfactory results [27]. For achievement of complete decompression of sandwich type lesions, a cautious investigation of the ventromedial aspect of the REZ was critical, because the decompression of only one vessel on the dorsal aspect of the REZ could leave the patient susceptible to a recurrence [25]. In our patient, under the microscope, neurovascular compression of the facial nerve was suspected. Using the microscope and the 0-degree endoscope, view of the facial nerve's root exit zone was hindered by the cerebellum. Under the view of 30-degree endoscope, the Root Exit Zone of the facial nerve was clearly explored (Fig. 2), the neurovascular compression was clearly identified with our significant cerebellar retraction, and the two simultaneous culprit vessels were revealed. Subsequently, the two vessels were interposed using Teflon pads (Fig. 3). The endoscope was used to confirm the decompression.

4. Conclusion

- Vertebral artery-associated hemifacial spasm is rare and challenging.
- Endoscope assisted microvascular decompression was an effective treatment of vertebral artery-associated hemifacial spasm.
- Utilization of endoscope provides a broader view without brain retraction and the ability to identify multiple compressions in surgery of hemifacial spasm.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Ethical approval

The study was approved by the Research Ethics Committee of Hanoi Medical University. The procedures used in this study adhere to the tenets of the Declarations of Helsinki.

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The authors declared no funding for this research.

Author contribution

Anh Hoang Pham: Conceptualization, Methodology, Investigation, Writing - original draft, Writing - review & editing, Visualization. Ha Dai Duong: Conceptualization, Methodology, Investigation, Writing - review & editing, Supervision. Hung Thanh Chu: Conceptualization, Methodology, Investigation, Writing - original draft, Writing - review & editing, Visualization. Hai Trung Vu: Visualization, Writing - original draft, Writing - review & editing. Dung Tuan Pham: Visualization, Writing - original draft, Writing - review & editing. He Van Dong: Conceptualization, Resources, Supervision.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Registration of research studies

1. Name of the registry: N/A*
2. Unique identifying number or registration ID: N/A*
3. Hyperlink to your specific registration (must be publicly accessible and will be checked): N/A*

* Exempt: not a first-man-case report.

Guarantor

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Declaration of competing interest

The authors declared no conflict of interest.

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