Endoscopic-assisted microvascular decompression for trigeminal neuralgia secondary to vertebrobasilar dolichoectasia: Case reports and literature review

Duong Dai Ha[1,2], Pham Hoang Anh[1,2], Le Duc Tam[2,3], Chu Thanh Hung[2], Pham Tuan Dung[1], Dong Van He[1]

1. Viet Duc University Hospital, 2. Hanoi Medical University, 3. Hanoi Medical University Hospital

Keywords:
Trigeminal neuralgia, vertebrobasilar dolichoectasia, microvascular decompression, endoscope-assisted.

Corresponding author:
Duong Dai Ha,
Viet Duc University Hospital
40 Trang Thi Street, Hoan Kiem District, Ha Noi City
Mobile: 0902 233 578
Email: duongdaiha@gmail.com

Received: 20 July 2021
Accepted: 17 August 2021
Published: 30 September 2021

Abstract

Introduction: Trigeminal neuralgia (TN) secondary to vertebrobasilar dolichoectasia (VBD) was a rare condition with limited cases reported in the medical literature. This paper reported two successful cases of endoscopic-assisted microvascular decompression (MVD) for TN secondary to VBD.

Case presentation no. 1: A 53-year-old male with a history of myocardial infarction and heart failure was diagnosed of left trigeminal neuralgia V2 and V3 for three years. The pain did not respond to medical therapy with Tegretol at the dose of 800mg per day. Brain magnetic resonance imaging (MRI) revealed a neurovascular conflict between VBD and the left trigeminal nerve. The endoscopic-assisted MVD was indicated and we used keyhole retrosigmoid craniotomy. The shredded neurosurgical sponges were interposed between VBD and trigeminal nerve. The 0^o and 30^o rigid rod-lens endoscope was used to explore and confirm the complete decompression. Postoperatively, TN was disappeared entirely. At one-year postoperative, no facial pain and paraesthesia were found.

Case presentation no. 2: A 71-year-old male with healthy history was diagnosed of right trigeminal neuralgia V2 for four years. The pain did not respond to medical therapy with Tegretol at the dose of 800mg per day. Brain MRI demonstrated a neurovascular conflict between VBD and the right trigeminal nerve. He was received endoscopic-assisted MVD via keyhole retrosigmoid craniotomy. After the operation, his facial pain disappeared permanently and he has paraesthesia at right upper lip. He was discharged after a week. At 6 months postoperative, no facial pain were found.

Conclusion: Endoscope-assisted MVD allowed better visualization of REZ and neurovascular conflicts behind neural structures and least cerebellar retraction in management of trigeminal neuralgia secondary to VBD.

Introduction

According to International Headache Society, trigeminal neuralgia (TN), also known as tic douloureux, is characterized by recurrent unilateral brief shock-like pain, abrupt onset and termination, limited to the distribution of one or more trigeminal divisions and triggered by innocuous stimuli[1,2,3,4]. Trigeminal neuralgia is a common health problem affecting significantly to patients` quality of life. The annual incidence of trigeminal neuralgia is 4-27 case per 100,000 population. The average age of onset is 40-60s with a female predilection. The previous studies reported the neurovascular conflict, a leading cause of primary trigeminal neuralgia, accounted for 76.3-100%. In which, arterial and venous vessels made up 90.7% and 9.3%, respectively. While superior cerebellar artery (SCA) and anterior inferior cerebellar artery (AICA) were often the offending vessels, trigeminal neuralgia secondary to vertebrobasilar dolichoectasia (VBD) was a rare condition with a general incidence of under 1%[5]

Vertebrobasilar dolichoectasia (VBD) is featured by ectasia, elongation, and tortuosity of the vertebrobasilar artery. Some case reports showed treatment options for trigeminal neuralgia secondary to vertebrobasilar dolichoectasia, such as medications, microvascular decompression (MVD), Cyberknife stereotactic radiosurgery, and nerve blocks but not endoscopic-assisted MVD[6-10]. This paper aims to report two successful cases of endoscopic-assisted microvascular decompression for trigeminal neuralgia secondary to vertebrobasilar dolichoectasia and literature review.

Case presentation

Case presentation no. 1

A 53-year-old male with a history of myocardial infarction and heart failure complained of left refractory hemifacial pain for three years prior to admission. His episodes of left hemifacial pain were intermittent, electrical-like, severe, sharp, and piercing. The pain radiated along with the sensory distribution of the maxillary and mandibular branches of the trigeminal nerve. It was triggered by talking, washing his face, eating, and brushing his teeth. The visual analog scale (VAS) was seven out of ten. His facial pain was refractory to carbamazepine (Tegretol ®) 200mg with four tablets twice daily. The patient had a heart failure and myocardial infarction history, which was treated with three coronary stent placements in 2016 and 2017. He has been using clopidogrel (Plavix ®) 75mg a tablet per day for four years ever since. On examination, the patient was alert and oriented. The motor and sensory functions of the trigeminal nerve and corneal reflex were intact. Oculomotor, trochlear, and abducens cranial nerves were normal. No neurological deficit was found.

Brain magnetic resonance imaging (MRI) with gadolinium contrast revealed a neurovascular conflict between vertebrobasilar dolichoectasia and left trigeminal nerve on three-dimensional constructive interference in steady state (3D CISS) (figure 1) and contrast-enhanced SPACE sequence (figure 2). The conflict was grade III (marked indentation in the root) [9].

Clopidogrel was temporarily discontinued for seven days preoperative, and enoxaparin (Lovenox ®) was replaced. The endoscopic-assisted microvascular decompression was indicated. The patient was in a park bench position, and keyhole retrosigmoid craniotomy was used. After opening the dura, we slowly drained cerebrospinal fluid (CSF) and relaxed the cerebellum. After that, the entire trigeminal root was explored from the root entry zone (REZ) at the brainstem to the porus of Meckel`s cave with endoscopic assistance. The root was freed from all arachnoid adhesions. The offending vessel was a vertebrobasilar dolichoectasia, which compressed and made a significant indentation in the left trigeminal nerve. Figure 5 and 6 showed the trigeminal nerve and vertebrobasilar dolichoectasia before and after microvascular decompression. The shredded neurosurgical sponges were interposed between vertebrobasilar dolichoectasia and trigeminal

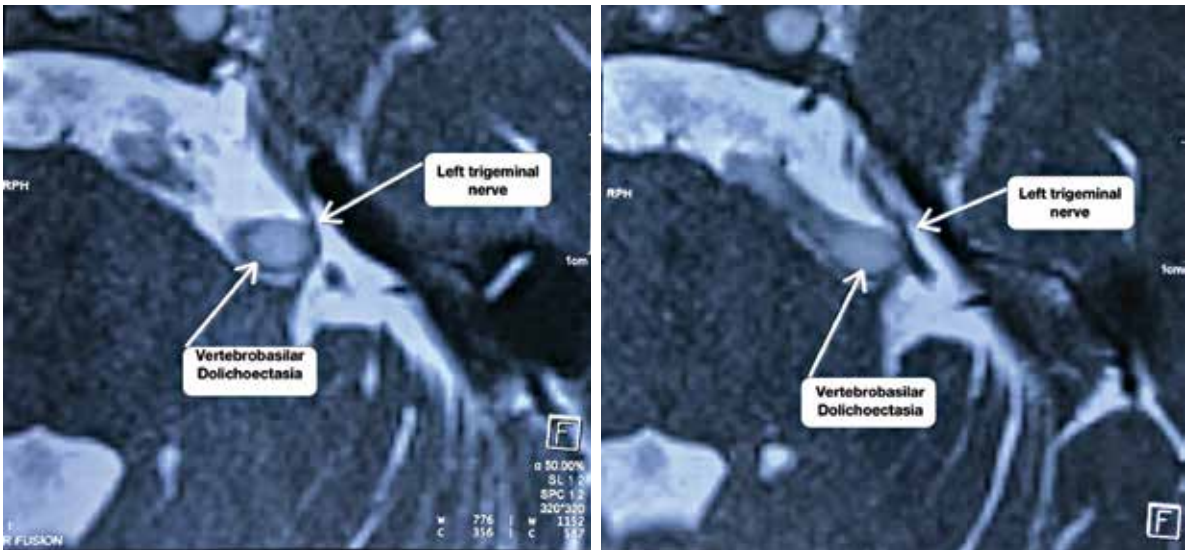

Figure 1. Brain magnetic resonance imaging with gadolinium contrast revealed a neurovascular conflict between vertebrobasilar dolichoectasia and left trigeminal nerve on three-dimensional constructive interference in steady state (3D CISS)

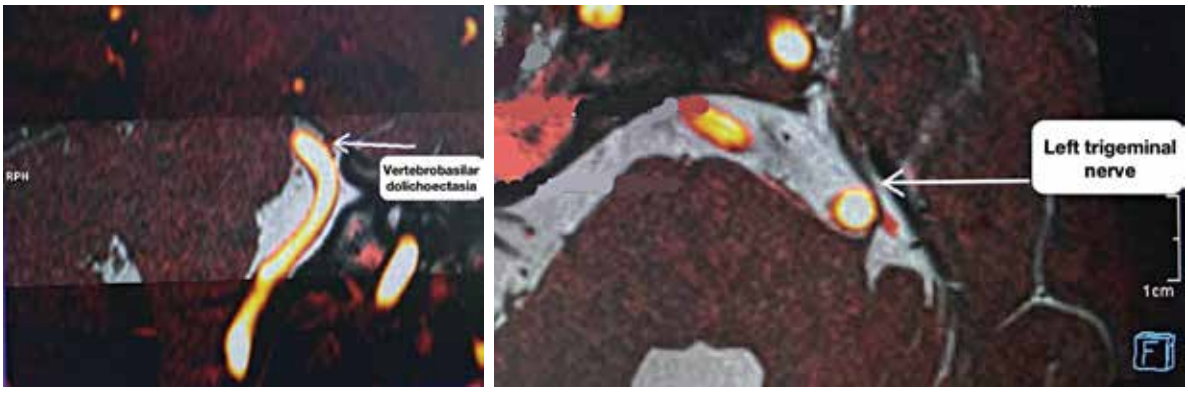

Figure 2. Brain magnetic resonance imaging with gadolinium contrast revealed a neurovascular conflict between vertebrobasilar dolichoectasia and left trigeminal nerve on contrast-enhanced SPACE sequence.

nerve. Again, 0° and 30° rigid rod-lens endoscope was used to explore and confirm the complete decompression.

Postoperatively, trigeminal neuralgia was disappeared entirely on the first day postoperative. No neurological deficit and bleeding complications were reported. The patient was discharged after a week. At a one-year postoperative follow-up, no facial pain and sensory abnormalities were found. The patient did not need to use carbamazepine anymore. He was happy to return his normal life.

Case presentation no. 2

A 71-year-old male with a healthy history was presented to our hospital with complaints of right facial pain along sensory distribution of maxillary nerve for four years prior to admission. His episodes of right hemifacial pain were intermittent, electrical-like, severe, sharp, and piercing. The pain radiated along with the sensory distribution of the maxillary branch of the trigeminal nerve. It was triggered by eating and brushing his teeth. Brain MRI demonstrated a neurovascular conflict

between VBD and the right trigeminal nerve. His facial pain was refractory to carbamazepine (Tegretol ®) 800mg per day. On examination, the patient was alert and oriented. The motor and sensory functions of the trigeminal nerve and corneal reflex were intact. Oculomotor, trochlear, and abducens cranial nerves were normal. No neurological deficit was found.

Brain MRI with gadolinium contrast revealed a neurovascular conflict between vertebrobasilar dolichoectasia and right trigeminal nerve (figure 3). He was received endoscopic-assisted MVD similar to case no. 1 (figure 4). After the operation, his facial pain disappeared permanently and he was discharged after a week. We continued Tegretol ® for one month postoperative and then discontinued permanently. At 6 months postoperative, he denied of facial pain but he has paraesthesia at right upper lip.

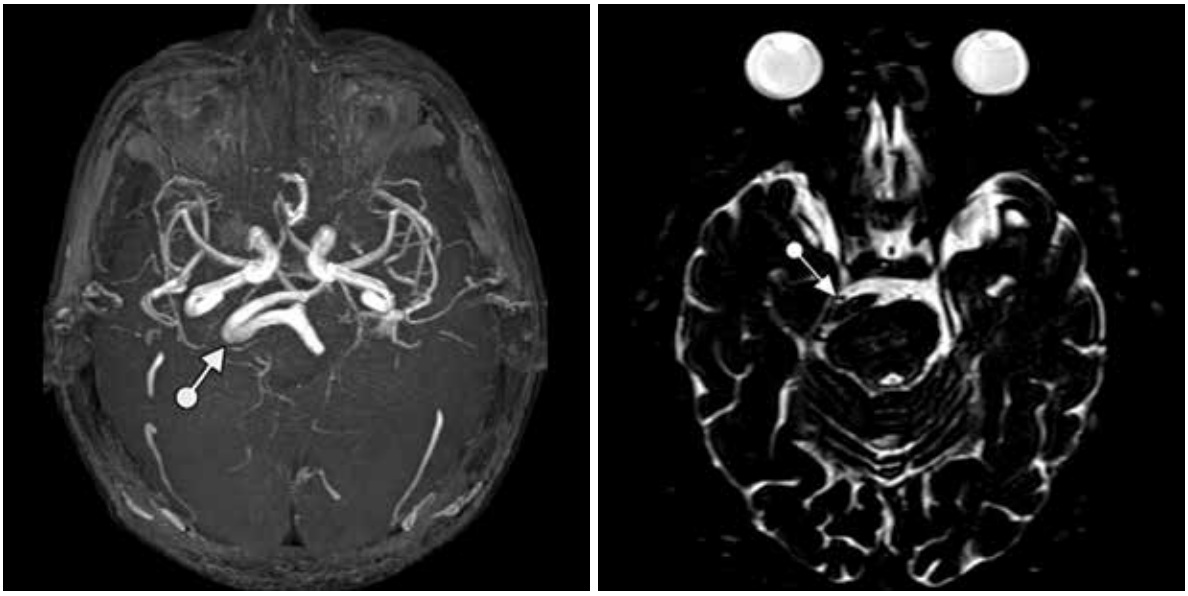

Figure 3. Vertebrobasilar dolichoectasia (arrow) on brain MRI

Dicussion

Trigeminal neuralgia secondary to vertebrobasilar dolichoectasia (VBD) was a rare condition, and microvascular decompression (MVD) was still the most common and most effective treatment options. In 2009, Noma et al. reported three cases with first-line therapy of carbamazepine[8]. After carbamazepine was failed to control trigeminal neuralgia, two of them received radiofrequency thermocoagulation (RFTC), and one of them was operated on with microvascular decompression. Of two RFTC cases, one case had paraesthesia, and one patient had contralateral hemifacial spasm posttreatment. In contrast, the MVD case disappeared neuralgia for a long term and experienced temporarily ipsilateral hearing impairment. Besides, Campos et al. also illustrated a satisfactory surgical decompression outcome of trigeminal neuralgia due to vertebrobasilar dolichoectasia[10]. Besides, gamma knife surgery was the second-most common choices. However, a previous study demonstrated that trigeminal neuralgia with VBD had lower pain control rates of gamma knife surgery than those without VBD. Last but not least, Cyberknife radiosurgery was a new and promising alternative for TN secondary to VBD[9]

Figure 4. Park bench position, incision and intraoperative findings. Vertebrobasilar dolichoectasia (white arrow) and right trigeminal nerve (green arrow)

Microvascular decompression of vertebrobasilar dolichoectasia was more challenging than those other arteries due to its colossal vessel diameter and the weakness of the arterial wall, especially in patients with hypertension and atherosclerosis. Furthermore, coagulation therapy made the risk of intraoperative bleeding complication and vessel damage more dangerous in our case than in the others. Yang et al. recommended choosing the latero-inferior cerebellar approach and dissect the caudal cranial nerve at first. Then he moved VBD proximally to avoid rebounding of the large artery[7]. In our study, we have to move the trigeminal nerve laterally and then put the neurosurgical sponges between the offending artery and the nerve.

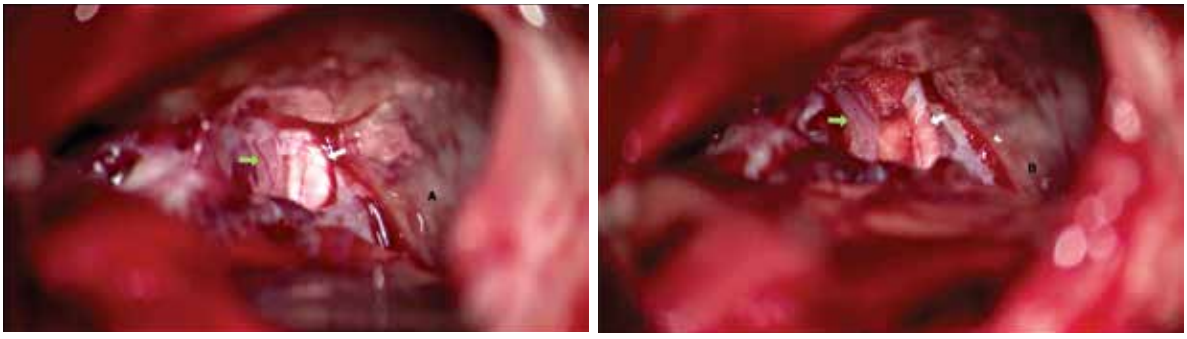

Figure 5. The trigeminal nerve (white arrow) and vertebrobasilar dolichoectasia (green arrow) before and after decompression on microscope

In trigeminal neuralgia secondary to vertebrobasilar dolichoectasia, an inspection of root entry zone (REZ) and complete microvascular decompression with a solely operating microscope were more challenging due to huge diameter of VBD and multiple offending arteries behind the VBD. However, the wide viewing field and high-quality resolution of endoscopes allowed better visualization of REZ and neurovascular conflicts behind neural structures and least cerebellar

retraction. This is more essential in case of less potential space created by a huge offending artery, vertebrobasilar dolichoectasia. The efficacy and safety of endoscopic-assisted microvascular decompression had been shown in the management of hemifacial spasm [11].

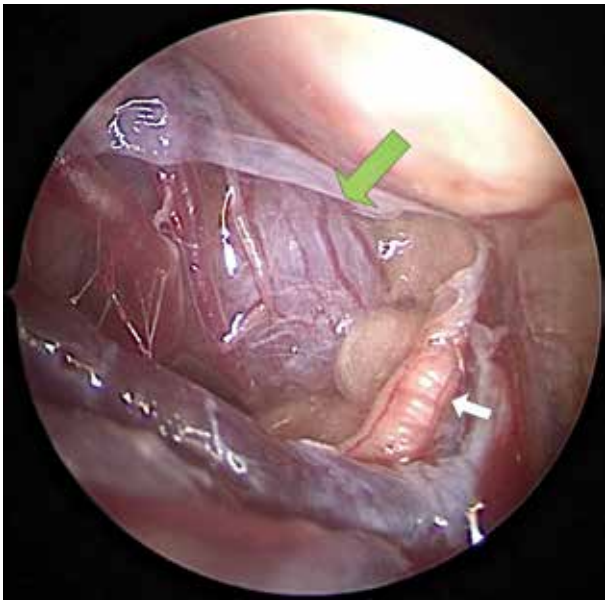

Figure 6. The trigeminal nerve (white arrow) and vertebrobasilar dolichoectasia (green arrow) after decompression on endoscope.

Conclusion

Trigeminal neuralgia secondary to vertebrobasilar dolichoectasia was an uncommon condition and could be treated effectively by microvascular decompression. Endoscope-assisted microvascular decompression with the wide viewing field and high-quality resolution allowed better visualization of REZ and neurovascular conflicts behind neural structures and least cerebellar retraction.

References

1. Trigeminal Neuralgia: Võ Văn Nho, Võ Tấn Sơn. Neurosurgery - 2016
2. Trigeminal Neuralgia: Dương Đại Hà, Phạm Hoàng Anh. Neurosurgery - 2021
3. Olesen J. Headache Classification Committee of the International Headache Society (IHS) The International Classification of Headache Disorders, 3rd edition. *Cephalalgia*. 2018. doi:10.1177/0333102417738202
4. De Toledo IP, Conti Réus J, Fernandes M, et al. Prevalence of trigeminal neuralgia: A systematic review. *J Am Dent Assoc.* 2016. doi:10.1016/j.adaj.2016.02.014
5. Love S, Coakham HB. Trigeminal neuralgia: Pathology and pathogenesis. *Brain.* 2001. doi:10.1093/brain/124.12.2347
6. Noma N, Kobayashi A, Kamo H, Imamura Y. Trigeminal neuralgia due to vertebrobasilar dolichoectasia: Three case reports. *Oral Surgery, Oral Med Oral Pathol Oral Radiol Endodontology.* 2009. doi:10.1016/j.tripleo.2009.04.039
7. Yang XS, Li ST, Zhong J, et al. Microvascular decompression on patients with trigeminal neuralgia caused by ectatic vertebrobasilar artery complex: Technique notes. *Acta Neurochir (Wien).* 2012. doi:10.1007/s00701-012-1320-6
8. Wang Y, Cheng W, Lian Y. Vertebrobasilar dolichoectasia and basilar artery dissection presenting with trigeminal neuralgia: A case report. *Front Neurol.* 2019. doi:10.3389/fneur.2019.00491
9. Lakshman V, Aal M, Karumanchi P, Jaleel A, Iyer A. Trigeminal neuralgia secondary to vertebrobasilar dolichoectasia treated with cyberknife stereotactic radiosurgery. *Asian J Neurosurg.* 2019. doi:10.4103/ajns.ajns_53_18
10. Campos WK, Guasti AA, da Silva BF, Guasti JA. Trigeminal Neuralgia due to Vertebrobasilar Dolichoectasia. *Case Rep Neurol Med.* 2012. doi:10.1155/2012/367304
11. Leal PRL, Hermier M, Souza MA, Cristino-Filho G, Froment JC, Sindou M. Visualization of vascular compression of the trigeminal nerve with high-resolution 3t MRI: A prospective study comparing preoperative imaging analysis to surgical findings in 40 consecutive patients who underwent microvascular decompression for trigeminal. *Neurosurgery.* 2011. doi:10.1227/NEU.0b013e318212bafa
12. Park KJ, Kondziolka D, Berkowitz O, et al. Repeat gamma knife radiosurgery for trigeminal neuralgia. *Neurosurgery.* 2012. doi:10.1227/neu.0b013e318230218e
13. El Refaee E, Langner S, Marx S, Rosenstengel C, Baldauf J, Schroeder HWS. Endoscope-Assisted Microvascular Decompression for the Management of Hemifacial Spasm Caused by Vertebrobasilar Dolichoectasia. *World Neurosurg.* 2019. doi:10.1016/j.wneu.2018.09.166