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Very early re-do microvascular decompression for patients with trigeminal neuralgia

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Abstract

Although microvascular decompression (MVD) is the widely recognized surgical option for patient with trigeminal neuralgia (TN), and most patients could receive satisfactory outcome, some patients still complained of severe pain, with culprit vessel omission and incomplete decompression as the commonly mentioned reasons. Here we reported three cases of very early re-do MVD for patients with TN. We found that both artery and vein simultaneous compressed the trigeminal nerve, and tight adhesion was found between the vein and nerve. The artery was totally decompressed, but the vein could not be decompressed without affecting the blood flow due to the severe adhesion, the patients still complained of severe pain after the first surgery. Very early re-do MVD was performed and we totally separated the veins from the nerve. The symptoms of patients disappeared immediately without any complication. No recurrence was found during follow up. We conclude that culprit vein should be retained if possible, rather than sacrificed, and very early reoperation may be a feasible choice for patient with persistent symptom after MVD.

Keywords: culprit vein; trigeminal neuralgia; re-do microvascular decompression; very early

INTRODUCTION

Trigeminal neuralgia (TN), one of the most common neuropathic pains, manifests as paroxysmal, lightning-like, stabbing pain confined to the distributions of trigeminal nerve, which mainly affects the second and third branches of the nerve.[1] TN could be divided into primary and secondary based on the mechanism, neurovascular conflict (NVC) is the most accepted mechanism of it, and superior cerebellar artery is the most common culprit artery.[1] In rare case, other artery could also be the culprit vessel of TN, such as persistent trigeminal artery.[2] Tumors, aneurysms, arteriovenous malformations, and other lesions in the cerebellopontine angle are common causes of secondary TN.[3] As the only method that could decompress the culprit vessels and completely preserve the structural and functional integrity of the nerve, microvascular decompression (MVD) is the preferred treatment for patient with TN who is refractory to oral medications.[1] Culprit vein is relatively less reported than artery and it's management remains controversial.[4,5] Although most patients could receive good outcome from MVD, there are still about 5% of patients who has persistent symptoms after surgery.[6,7] Previous studies reported that culprit vessel omission, incomplete decompression and veins compression might be the main causes.[6,7] We reported three cases of reoperation for invalid MVD due to culprit vein. All the patients had good outcome without facial numbness after early re-do MVD.

METHODS

Patients

From January 2016 to January 2021, 3 patients with TN underwent very early re-do MVD. All the patients manifested as severe continuous burning pain for 5 to 30 minutes and took oral medications to control the pain but the efficacy waned over time. Preoperative magnetic resonance imaging

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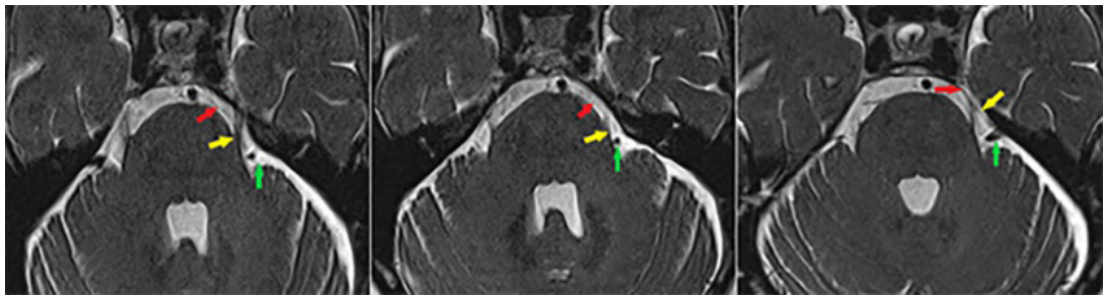

Figure 1: Preoperative magnetic resonance imaging showed superior cerebellum artery and petrosal vein compressed the nerve.

showed close relationships. between artery, vein and trigeminal nerve (Figure 1).

Surgical technique and follow up

All the 3 patients underwent standard MVD. The surgeon found that the artery and vein compressed the nerve during the first surgery, with the artery being separated reasonably. As the rich-flow vein showed bad adhesion with the nerve, and the culprit artery was completely separated, the culprit vein was just slightly separated. The symptom of the patients showed no relief after the MVD, we discussed with the patients about re-operation with totally separated or coagulated the vein, and the operation risks (hemorrhage, edema, infarction) and obtained the patients' consents. Re-do MVD was performed within 2-5 days after the first operation using the original approach. We tried our best to completely separate the vein without other manipulation (Figure 2). Follow up was done through clinic or telephone interviews for at least 2 years. Comprehensive evaluation of outcome and complication were performed.

Outcome

Early repeat MVD was carried out within 2-5 days after the first operation, and we successfully separated the vein during re-do MVD (Figure 3), the patients experienced immediately total pain free without complication. Of note, no recurrence and numbness were recorded during a median time of 5 years (Table 1).

DISCUSSION

As a common neuropathic pain, TN results in much discomforts to the patient and great financial burdens to the society.[8] The overall annual incidence of TN is 5.7 per 100,000 women and 2.5 per 100,000 men, and it mostly affects the

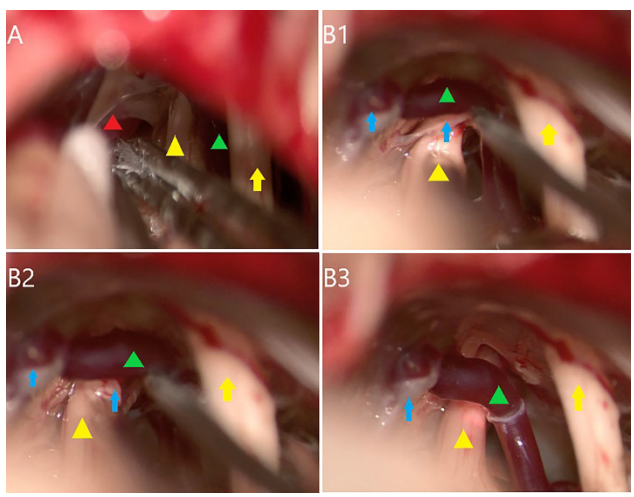

Figure 2. A (first MVD) showed the superior cerebellar artery (red triangle) and petrosal vein compressed the root entry zone of trigeminal nerve (yellow triangle). Of note, severe adhesions was seen around petrosal vein (green triangle). B1-B2 (repeat MVD) showed serve adhesion (blue arrow) between nerve and petrosal vein, B3 (repeat MVD) showed the petrosal vein was totally separated from the TN.

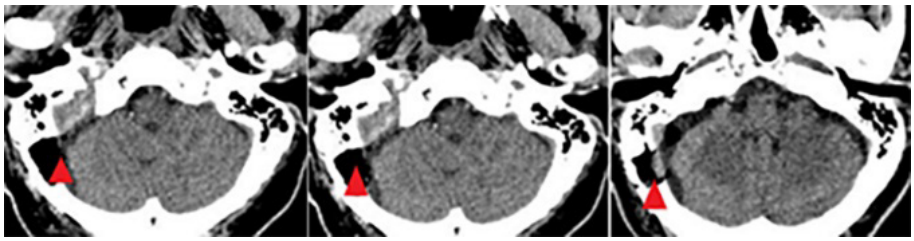

Figure 3: Postoperative CT showed mild edema with no infarction or hemorrhage.

patients aged between 50 to 60 years.[9] According to the mechanisms, TN could be divided into primary and secondary TN, and primary TN could be further divided into idiopathic and classical TN.[1] NVC is now the most accepted mechanism of primary TN, and secondary TN is mainly originates from the intrusions from local space occupying lesions.[1] MVD and lesions resections are now the first-line choices surgical option for primary and secondary TN, respectively.[1] However, many patients experienced failed operations and still complained of severe pain after surgery.[7]

MVD could be easily performed by experienced neurosurgeons, more than 90% of patients with TN could experience good outcome from MVD, but about 5% patients experience failed operation.[10,11] Some authors attribute poor outcome or failed operation to delayed relief and proposed closer follow up[12], but delayed relief is unusual in patient without immediate improvement after MVD, thus early reoperation should be considered. Offending vessel could be perforator that encircle the nerve, which is one of the common causes of difficult MVD and result in incomplete decompression.[13] Huang *et al*.[14] and Cho *et al*.[15] reported high rate of incomplete decompression in failed MVD and proposed that it was one of the main causes of the surgical failure providing support for the need of repeat MVD. Lee *et al*. classified the possible causes of MVD failure into three categories, offending vessel omission, insufficient decompression and untouched NVC site.[13] The omission artery is usually located at an uncommon site. Although the NVC may be clear, insufficient decompression also contributed to MVD failure. Teflon has also been reported as the cause of operation failure, which mainly included improper placement, inappropriate size and unsuitable shape.[16] For this, the size, shape and location of the Teflon should be taken into full consideration.

Although some investigators have proposed partial sensory rhizotomy as alternative treatment with satisfactory pain control, more than 80% of patients experienced facial numbness.[17,18] Also about 90% of patients suffered from facial numbness after MVD combined with internal neurolysis.[19-21] Complications could also impact the life quality of the patients. Zhang *et al*. compared the effect and complications of re-do MVD and percutaneous radiofrequency thermocoagulation for TN with failed MVD, the result showed that re-do MVD had better pain control and less complication.[22] Overall, early re-do MVD (vein management) may be indicated for the failed MVD patient with vein compression.

For patients with tight anatomical relationship with trigeminal nerve, culprit vein could adhere to arachnoid or compress the nerve and hamper MVD. Thin and low elastic vein has weak endurance to external force. In our study, the rich-flow culprit vein combined with severe adhesion made us doubly cautious during the first operation. Shorter vein cannot be easily stretched, while forced displacement or direct coagulation may damage venous refluxes and result in severe complications and even death.[23-25] The vein was only slightly separated in the first operation. When there is no pain relief, we totally separated it during re-do operation. Unlike artery, the large vein tends to adhere closely to the trigeminal nerve. Often, careful dissection is required to separate the vein, to minimize damage to the vein. It is worth noting that such close dissection near the outer membrane of the nerve may induce facial numbness. However, none of the patients experienced facial numbness in our study. If there is any venous injury, it could be usually controlled by a compression. Typically, compression provides effective hemostasis. In cases where compression hemostasis is ineffective, bipolar electrocoagulation can be used to gently cauterize the bleeding site, which makes no difference to the vein reflux. We held that vein should be preserved if possible, and any decision to cut the vein should be carefully evaluated.

In conclusion, on the basis that the culprit artery is managed properly, very early re-do MVD

Table 1: Basic, clinical characteristics and outcome of the patients

Patient	Gender	Age	Affected side	Duration of TN	Involved artery	Veins in repeat MVD	Follow-up	Complications	Post-operative pain	Post-operative numbness	Outcome
1	Male	82Ys	Right	1Y	SCA, AICA	Totally Separated	5Y	No	No	No	Pain free
2	Female	65Ys	Right	2Y	SCA, AICA	Totally Separated	1Y	No	No	No	Pain free
3	Female	57Ys	Left	10Y	SCA	Totally Separated	5Y	No	No	No	Pain free

TN: trigeminal neuralgia; SCA: superior cerebellar artery; AICA: anterior inferior cerebellar artery; Y: years; MVD: microvascular decompression

that further separated the culprit vein is a feasible choice for TN patient with persistent symptom after MVD. With careful management of the vein, patients could achieve a good immediate outcome, as well as a good long-term outcome.

DISCLOSURE

Ethics: The current study was approved by the ethics review committee of the first hospital of Sun Yat-Sen University, and the informed consents were waived.

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Conflicts of interest: None

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