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Technical Notes & Surgical Techniques

Straightening the trigeminal nerve axis by complete dissection of arachnoidal adhesion and its neuroendoscopic confirmation for trigeminal neuralgia without neurovascular compression

Mami Ishikawa, MD, PhD [a,b,*], Natsumi Soma, MD [b], Atsuhiro Kojima, MD, PhD [c], Heiji Naritaka, MD, PhD [a]

[a] Department of Neurosurgery, Edogawa Hospital, Tokyo, Japan
[b] Department of Neurosurgery, Saitama Medical Center, Jichi Medical University, Saitama, Japan
[c] Department of Neurosurgery, Saitama City Hospital, Saitama, Japan

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ABSTRACT

Background: Microvascular decompression has been used as an effective surgical treatment for typical trigeminal neuralgia with neurovascular compression. Since microvascular decompression cannot be performed in patients with typical trigeminal neuralgia without neurovascular compression, it has recently been suggested that nerve combing or neurolysis (longitudinally splitting the trigeminal nerve from the root entry zone to the pons by microneedle) be used as a primary surgical treatment. However, postoperative numbness and dysesthesia were present in the patients.

Case description: We present a case of a 57-year-old woman with typical trigeminal neuralgia without neurovascular compression, which was evaluated by magnetic resonance imaging. A neurosurgical operation was performed in a supine-lateral position for the retromastoid approach under monitoring by electrophysiological evoked potentials. Since neurovascular compression could not be found, we performed straightening of the trigeminal nerve axis by complete dissection of the arachnoidal adhesion around the trigeminal nerve. Results were confirmed by a neuroendoscope. The patient demonstrated complete resolution of the trigeminal neuralgia without facial numbness and dysesthesia during the three years after the operation.

Conclusions: Straightening the trigeminal nerve axis by complete dissection of the arachnoidal adhesion around the trigeminal nerve was effective for typical trigeminal neuralgia without neurovascular compression.

1. Introduction

Microvascular decompression is recognized as an effective surgical treatment for typical trigeminal neuralgia. However, typical trigeminal neuralgia without neurovascular compression has been reported to occur in 3–17% of patients [1–10]. Partial sensory root resection, which for a long time has been performed as a so-called rhizotomy, has been recommended in patients with typical trigeminal neuralgia without vascular compression [11,12]. More recently, nerve combing or neurolysis has been used as a surgical option for typical symptomatic trigeminal neuralgia without neurovascular compression [2,3,5,6,9,10]. Typical trigeminal neuralgia presents as episodic facial pain on one side with a trigger, with a pain-free interval between the attacks. Carbamazepine is one of the medications that have been shown to be effective for this pain. Nerve combing or neurolysis involves using a microneedle to longitudinally split the trigeminal nerve from the root entry zone to the pons. However, postoperative numbness and dysesthesia were present in patients after nerve combing or neurolysis. On the other hand, Kondo et al. have emphasized the use of straightening of the nerve axis to treat patients without neurovascular compression. As our current case did not have neurovascular compression, we straightened the trigeminal nerve axis by complete dissection of the arachnoidal adhesion around the trigeminal nerve while using electrophysiological monitoring of the trigeminal and cochlear nerves. Results were then confirmed by a neuroendoscope. The patient has subsequently demonstrated no trigeminal neuralgia, no after effects, no facial numbness and no dysesthesia during the three years after the operation.

2. Case description

We present the case of a 57-year-old woman with trigeminal neuralgia without neurovascular compression, which was evaluated by magnetic resonance imaging (MRI) (Fig. 1, original thin axial images of the

* Corresponding author at: Department of Neurosurgery, Edogawa Hospital, 2-24-18 Higashikoiwa, Edogawa-ku, Tokyo 133-0052, Japan.
E-mail address: m.ishikawa@edogawa.or.jp (M. Ishikawa).

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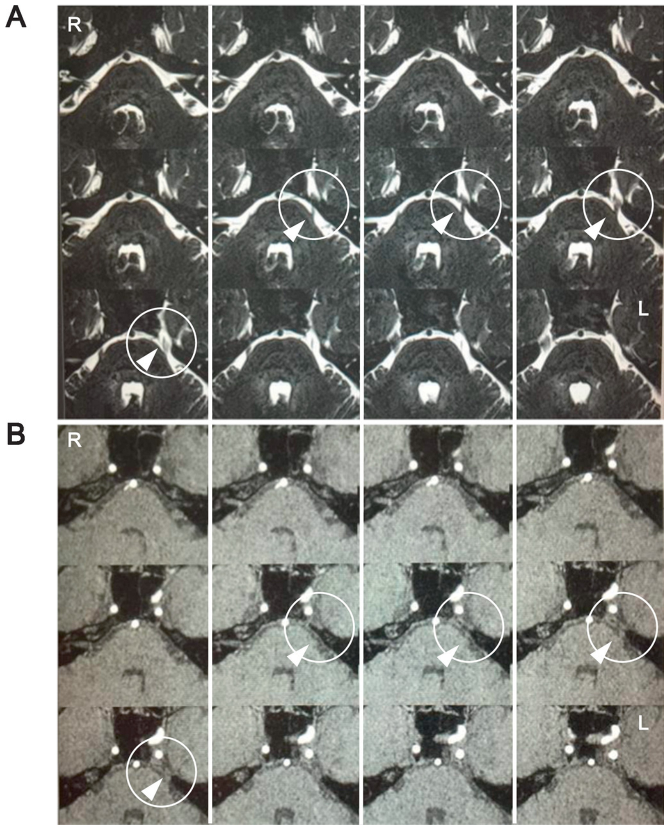

Fig. 1. MRI of left trigeminal nerve. Arrowheads and circles indicate the trigeminal nerve. A: thin axial images of the CISS Drive. B: original thin axial images of the 3D TOF-MRA. MRI: magnetic resonance imaging, TOF: time-of-flight. MRA: magnetic resonance angiography.

CISS Drive (TR/TE, 1500/282 ms; flip angle, 90°; slice thickness, 0.6 mm; field of view, 160 × 144 mm; matrix size, 320 × 288) and 3D TOF-MRA (TR/TE, 28/6.8 ms; flip angle, 18°; slice thickness, 1.0 mm; slice overlap of 18 mm; field of view, 200 × 200 mm; matrix size, 224 × 256).

The patient underwent a neurosurgical operation (straightening of the trigeminal nerve axis) under microscopic observation (OPMI Pentero 900; Zeiss, Oberkochen, Germany) with the results confirmed through endoscopy. We used a rigid neuroendoscope with a high-vision monitor (Storz, Tuttlingen, Germany) and ridged holding devices to fix the endoscope (Point Setter; Mitaka Kohki, Tokyo, Japan). General anesthesia was induced and maintained with remifentanil and propofol. Brainstem auditory-evoked potentials (BAEP), cochlear nerve evoked action potential (CNAP) and trigeminal nerve evoked action potentials (TNAP) were used to monitor the hearing and trigeminal nerve functions. The patient was placed in a supine-lateral position for the retrosigmoid approach. After incision of the dura mater, adhesions of the arachnoid to the cerebellum, petrosal vein, petrosal bone, trigeminal nerve and dura mater from the root entry zone of the trigeminal nerve to Meckel's Cave were found, dissected and cleared from each of the areas (Fig. 2, Video). We considered these adhesions of arachnoid as arachnoiditis. After positioning the CNAP and TNAP recording electrodes on the cochlear and trigeminal nerves, respectively, we dissected the arachnoiditis found on the nerves. Neurovascular compression was not found, although the arachnoiditis was extremely tight, thereby making the posterior fossa very narrow. In the final step, the neuroendoscope, which was fixed with a Point Setter, was introduced and used to confirm that the axis of the trigeminal nerve was straighten and that there was no adhesion present anywhere (Fig. 2, Video). Elongations of the latencies of the wave V of the BAEP, positive potential 1 (P1), negative potential 1 (N1) and positive potential 2 (P2) of the CNAP were within 0.2–0.3 ms during the operation (Fig. 3A). Clear recordings of the TNAPs were obtained following stimulations of the supraorbital nerve, infraorbital nerve and mental nerve and there were no changes observed in their latencies during the operation (Fig. 3B).

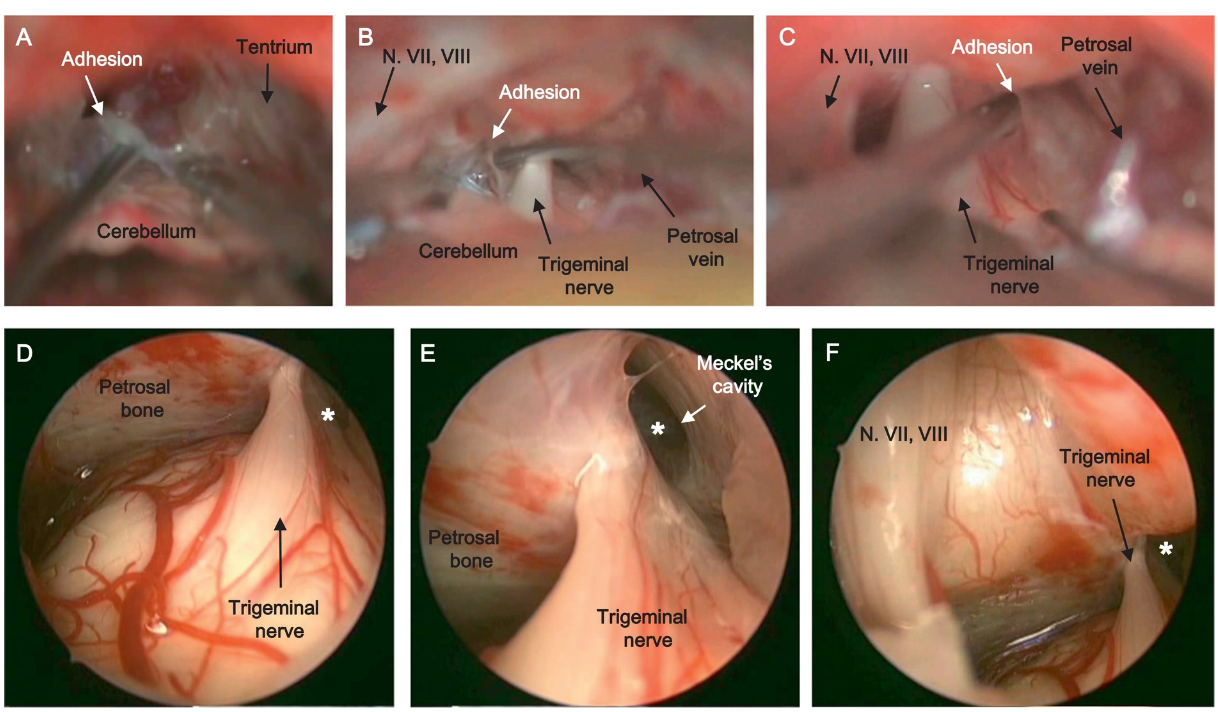

Fig. 2. Microscopic and endoscopic images of the arachnoiditis around the trigeminal nerve. Before (A, B, C, microscopic vies) and after (D, E, F, endoscopic view) dissection of the arachnoidal adhesion. *: Meckel's cavity.