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CASE REPORT

Diagnosis and treatment of micro-entrapment syndrome of nerves innervating the face: A report of two cases

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KEYWORDS

micro-entrapment syndrome of nerves innervating face;
facial paralysis;
trigeminal neuritis;
pulsed radiofrequency;

ABSTRACT

The term “micro-entrapment syndrome of nerves innervating the face (MESNIF)” is a relatively new concept. It refers to the micro-entrapment of facial nerve (trigeminal nerve and facial nerve) terminals for various reasons, resulting in one-side facial discomfort, subjective sensory abnormalities, or stiffness, and in certain cases, localized micro muscle movement abnormalities and motor disharmony. It is frequently caused by facial paralysis or chronic trigeminal neuritis or injury, and is prevalent in clinical practice. Peripheral facial paralysis affects 60%–70% of people. Both men and women are susceptible to it. It is most common in young and middle-aged women. At the moment, there are two types of therapy options for this disease: nonsurgical treatments and surgical treatments. Among surgical treatments, pulsed radiofrequency has good curative results. This paper describes two typical situations that had good curative effects.

1 Introduction

Nerve entrapment syndrome occurs when a peripheral nerve passes through a bone fiber tube, and a few are inflammatory reactions caused by compression and chronic injury of the fiber edge, resulting in abnormal nerve function, pain, sensory disturbance, motor disturbance, and electrophysiological changes.

In recent years, we have discovered that some patients with facial paralysis or trigeminal neuritis have noticeable facial discomfort, although con-

ventional testing cannot accurately locate the neuropathy. Consequently, we believe that we may use the concept of classic nerve entrapment syndrome to hypothesize that it is a special type of nerve entrapment syndrome known as micro-entrapment syndrome of nerves innervating the face (MESNIF). Furthermore, we discovered that MESNIF is affected by pulse radiofrequency (PRF). Multiple treatment courses can improve the clinical impact, and postoperative cooperation with traditional Chinese medicine may have a greater benefit.

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This paper presents two cases of patients diagnosed with MESNIF who felt relaxed and relieved of facial stiffness after receiving PRF treatment, and reviews the literature published.

2 Typical cases

2.1 Case 1

The patient is a 37-year-old woman, and had been brought to the hospital for 3 years because of “left facial stagnation and eyelid insufficiency”. After suffering from fatigue and cold, the patient developed left facial stagnation and inadequate eyelid closure on September 10, 2018. She was diagnosed with “peripheral facial paralysis” at the local hospital on September 20, 2018. Glucocorticoids were injected into the mastoid area behind her ears as an empirical treatment but this did not work. She was given antiviral medications, neurotrophic pharmaceuticals, microcirculation-improving drugs, traditional Chinese medicine decoctions, and therapies such as acupuncture and red light irradiation for 3 years. However, the outcome was poor, and her symptoms got worse. As she came to our facility for treatment on October 27, 2021, she described feeling involvement in her left lips when she tried to raise her left brow.

The physical examination of her face revealed that her left face was rigid, her forehead lines were somewhat shallower, and she could not raise her brow, frown, display her teeth, or pucker her lips, yet she could close her left eyelid. She was graded II in the House–Brackmann (HB) Facial Nerve Grading System.

This patient underwent radiofrequency ablation. The therapy was: The patient was placed in the supine position, with her head tilted to the left during the therapy. The right mastoid tip 1 cm back was used as the puncture point for routine disinfection, with the radiofrequency

(RF; RF Lesion Generator, RFE2-A, Beijing Neo Science Co., Ltd.) puncture needle pointing in the direction of the external auditory canal, with a depth of 3 cm, after successful local anesthetic with 3 mL of 2% lidocaine. PRF nerve regulation treatment was given for 960 s after 0.9 V electrical stimulation and obvious facial muscle contraction (6 Hz, 99 V). The intraoperative procedure is shown in Fig. 1.

The patient’s facial paralysis and associated mobility improved after the operation, and her facial stiffness and discomfort disappeared. Her facial muscles were relaxed, and the treatment eased the feeling of involvement in her left lips when she tried to raise her left brow, after a 1-month follow-up.

2.2 Case 2

The patient is a 58-year-old woman, and was admitted to the hospital for “more than 5 years



Fig. 1 Minimally invasive PRF surgery under local anesthesia.

of left face sensory disorder". Five years ago, the patient felt swelling and tightness on the left side of her face with no direct cause, particularly on the side of the oral mucosa, as well as discomfort on the left gingiva. The local clinic provided only symptomatic treatment, which did not alleviate the problems. Later, as the condition progressed, the left-sided discomfort spread to the area underneath the left eyelid fissure, to the left of the midline of the face, and in front of the left ear. They noticed a tightness in the face, a deformity in the left dental arch, and discomfort in the left throat during eating, which was occasionally accompanied by slight pain.

Physical examination on admission showed that acupuncture pain and temperature sensation of the skin beneath the left eyelid fissure were reduced in comparison to the contralateral side. Magnetic resonance imaging of the trigeminal nerve and blood vessels revealed that: (1) the left trigeminal nerve was slightly skinny and may atrophy; and (2) vascular compression at the root of the left facial nerve.

PRF therapy was: The patient put her head angled to the right in a supine position. A 0.5 cm × 0.5 cm area in front of the left mastoid tip was taken as the puncture point for routine disinfection and sheet placing. The RF puncture needle was pointed upward and slightly backward with a depth of 3.5 cm after 5 mL of 2% lidocaine local anesthetic was successfully applied. The PRF nerve control treatment was administered for 960 s (42°C, 78 V) after 0.6 V electrical stimulation and apparent facial muscle contraction.

The patient's discomfort in the left corner of the mouth and in front of the ear was significantly reduced after the operation.

3 Discussion

The bone fiber canal and ventricular compression

syndromes include nerve entrapment syndrome. The lesions are seen mainly in certain anatomical locations, such as the bone fiber tube or inelastic muscle fiber edge, tendon arch, and other major compression areas of nerve channels, where the compressed nerves are difficult to avoid and buffer.

Its etiology can be divided into three categories: (1) intraductal compression: tendon sheath cyst, neurofibroma, and chronic traumatic inflammation of the nerve; (2) extratubular compression: bone wart, bone and key injury, and ligament injury; and (3) systemic diseases: rheumatoid arthritis, mucoedema, obesity, diabetes, hyperthyroidism, Reynaud's disease, and pregnancy can be associated with nerve entrapment syndrome. Nerve ischemia and mechanical damage are two harmful variables associated with nerve entrapment. Acute short-term compression can cause nerve ischemia, blockage of the pressor axon's axoplasmic flow, hypoxia, and edema. Severe and long-lasting compression can demyelinate nerve fibers, cause distal axon collapse, and cause Waller degeneration of the myelin sheath [1].

In ancient Chinese literature, ailments of the cheek include "oblique mouth and eye", "remote stroke mouth", "facial discomfort", and so on. "Lingshu · Jingjin" discusses that the paw's mouth is remote: "The tendon of Foot-Yangming ... The mouth of the paw is far and urgent, and the eyes are unusual. The tendon will be vertical if it is heated, and the eyes will not open." Zhang's Yitong discusses facial pain: "Even the lips, cheeks and hair border are painful ... If it is touched by the hand, the Foot-Yangming meridians are poisoned by the wind, which is introduced into the meridians, and the blood clots but does not work." The symptoms recorded in ancient writings are largely compatible with the clinical indications of trigeminal nerve injury or peripheral facial paralysis. Another record of eminent

doctors concerns tears: "When the wind comes upstream, tears come out of the eyes."

According to "Lingshu · Evil Qi Viscera Disease Form IV", "the meeting of all Yang lies in the face ... Yangming can be seen on the face, while Shaoyang can be found on the cheek". It asserts that people's heads and faces are the result of different Yang colliding. It is also believed that "12 meridians and 365 collaterals, their blood and gas are all on the face and go through the empty orifices ... Their Qi and bodily fluid are all smoked on the face ... As a result, the weather is extremely cold, and there is nothing that can be done about it". The 12 meridians are said to evaporate body fluid and fumigate it on the face to protect the face from cold evil. As a result, the lesions of the cheek are found in the three yang meridians, mainly Yangming and Shaoyang. Their etiology is based primarily on the deficiency of the original sign, and the pathogenesis is based mostly on the deficiency of Yang Qi, the exterior guard is weak, and they are invaded by external pathogens, resulting in cheek discomfort. If the disease persists for a long time, it can cause deficiency because of excesses, such as blood deficiency, dryness and wind, and disturbance of small muscles, which can cause local spasms and dyskinesia; or, as stated in chapter 43 of *Su Wen Bi Lun*, "if the disease goes deep for a long time, the behavior of honor and defense is astringent", the long-term disease can turn into blood stasis, "the evil Numbness, strange feeling, and other symptoms might occur if blood stasis inhibits the collaterals of the cheek".

Currently, there are two treatments for MESNIF: surgeries and nonsurgical treatments. Local bracing, injection of corticosteroids and nonsteroidal anti-inflammatory drugs to reduce the inflammatory response of compression lesions, or nutritional nerve repair medications to repair damaged nerve fibers and nerve cells

are examples of nonoperative treatments [2]. However, this is a slow-progressing condition that seldom heals on its own and is frequently accompanied by psychological diseases as it progresses. Acupuncture and moxibustion are frequently employed for the treatment of such diseases. In modern Chinese medicine studies, Jiang et al. [3] and others found that acupuncture on the face can increase local blood circulation, alleviate muscle spasms, achieve analgesic and anti-inflammatory effects, promote tissue regeneration, and improve therapeutic efficacy. Tian [4] proposed that acupuncture and moxibustion be used to treat the aftereffects of facial paralysis after reviewing the literature. The local method is based primarily on the Hand- and Foot-Yangming meridians, which are supplemented by the Taiyang and Shaoyang meridians, to reconcile the local Qi and blood, allowing the facial muscles and muscles to be nurtured and warm. The remote access along the meridians is based primarily on the Hand-Yangming meridians, supplemented by the Shaoyang meridians, which are combined far and near and serve to strengthen the right and dispel evil, activate blood, and dredge collaterals.

In terms of surgical treatments, we recently discovered that PRF affects MESNIF. PRF is a new, minimally invasive interventional medication that has become popular in the treatment of chronic neuropathy. It is extensively utilized in clinics because of its features of reduced trauma, fewer complications, and no nerve injury. It is effective in treating the condition and has good long-term effects.

Sluijter was the first to publish the clinical application of PRF in 1997 [5]. According to research, conventional radiofrequency (CRF) thermocoagulation exposes the target nerve or tissue to continuous electrical stimulation by increasing the temperature surrounding the

tip of the RF needle [6]. Unlike CRF, PRF uses short-term electrical stimulation, followed by a long quiescent period (480-ms interval after the RF current emitted by traditional PRF lasts for 20 ms each time), allowing the heat to diffuse to the surrounding tissues over time and keeping the target temperature below 42 °C. Therefore, PRF does not generate enough heat to cause structural damage and it has little effect on protein coagulation. It does not influence the patient's motor nerve function and structure [7]. We employed PRF to treat MESNIF and achieved positive results. After the procedure, the majority of patients reported feeling more relaxed and relieved of facial stiffness. Multiple courses of treatment can improve the clinical impact even further, and the benefit of postoperative collaboration with traditional Chinese medicine may even be better.

The concept of MESNIF is new. At the moment, the diagnosis of this condition is based primarily on the patient's subjective symptoms. Numerous clinical cases have a significant impact on patients' physiology and psychology. This condition is deserving of medical care. In future research, we will strive to establish more objective examination items to help diagnose and differential diagnosis. Further research on the pathophysiology and functional imaging of this disease is expected to improve the therapeutic effect.

Consent

Both subjects were informed and have signed written consent forms agreeing to publish their medical records.

Conflict of interests

All contributing authors report no conflict of

interests in this work.

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