Acupuncture for rehabilitation after surgery for cerebellopontine angle meningioma

A case report

Dexiong Han, MDa, Yejing Shen, MMb, Hantong Hu, MDa, Ying Zhang, MDa, Xingling Li, MMa, Lianqiang Fang, MMb, Hong Gao, MMa.

Abstract

Rationale: In some cases, surgery of cerebellopontine angle meningioma (CPAM) might result in multiple cranial nerve injury, which could bring serious impact on the patients, especially when it affects the function of facial muscles and eyeballs. This report describes a successful application of acupuncture for rehabilitation in a patient after surgery for CPAM.

Patient concerns: A 27-year-old patient presented with limitation of left eye abduction, accompanied with frontal and facial sensory disturbance on the left side after resection of the pontocerebellar angle tumor. The patient also suffered from significant anxiety and depression as concomitant symptoms.

Diagnoses: Based on medical history, clinical symptoms, and magnetic resonance imaging results, the patient was diagnosed with the fourth, fifth, sixth, and seventh cranial nerve injury after surgery for CPAM.

Interventions: Acupuncture treatment was applied for this patient. One acupuncture session was given every 2 days in 35 days, and the needles were retained for 30 minutes per session.

Outcomes: After acupuncture treatment, the limitation of left eye abduction had totally recovered. The superfi- cial sensory disturbance in the frontal and facial region was significantly relieved. Besides, the scores of Hamilton Anxiety and Depression Scale showed a significant reduction. However, the superficial sensory of the alar and nasolabial groove on the left side still decreased mildly when compared with the right side.

Conclusion: Acupuncture might be an option for rehabilitation after surgery for CPAM.

Abbreviations: CPAM = cerebellopontine angle meningioma, HAMA = Hamilton Anxiety Rating Scale, HAMD = Hamilton Depression Rating Scale, MRI = magnetic resonance imaging, PFT = posterior fossa tumors, TCM = traditional Chinese medicine.

Keywords: acupuncture, cerebellopontine angle meningioma, multiple cranial nerve injury

1. Introduction

Cerebellopontine angle meningioma (CPAM) is the most common posterior fossa tumor (PFT)[1] and accounts for a high percentage in PFT.[2] Till date, surgical treatment has been acknowledged as the best therapy, which includes various approaches in terms of different locations and different sizes of tumors. Among them, the retrosigmoid approach[3] is one of the most commonly used surgical methods, but it may also pose a risk of injury to multiple cranial nerve and bring serious impact on patients. As a physical therapy that could be adopted as a treatment option for promoting rehabilitation of neural function, acupuncture has been proved effective by increasing clinical studies[4,5] in recent years, although the underlying mechanism remains unclear and further investigation is needed. This case report describes a successful application of acupuncture for rehabilitation in a patient after surgery for CPAM.

2. Case description

In early August in 2016, a 27-year-old male was admitted to our outpatient acupuncture department, who presented as limitation of left eye abduction accompanied with frontal and facial sensory disturbance on the left side for more than 2 months. According to his medical history, the patient received a magnetic resonance imaging (MRI) examination in a hospital in late May because he experienced chronic headache previously. The MRI report revealed neoplasia in clival area, which mainly indicated meningioma (Fig. 1A and B). Four days later, a brain computed tomography angiogram scan further confirmed neoplasia in the left cerebellopontine angle territory and shifting basilar artery under compression. Some parts of the left posterior cerebral
artery and its branches were embedded in tumors. The next day, the patient underwent the surgery of pontocerebellar angle tumor resection via the retrosigmoid approach, and no significant hematoma was found according to his postoperative cerebral computed tomography. Postoperative pathological findings also verified meningioma of left cerebellopontine angle (World Health Organization grade 1).

However, after the surgery he began to suffer from limitation of left eye abduction, accompanied with shallower left nasolabial groove and numbness in the forehead and face. The re-examination of cerebral MRI showed postoperative pathologic change of left CPAM, abnormal enhancement of the left trigeminal nerve, and expansion of the prepontine cistern with signal-intensity abnormalities. Additionally, there was inflammation in the left mastoid (Fig. 1C and D). The patient’s symptoms and complaints were not improved after taking mecobalamin. Thus, he sought for acupuncture treatments.

3. Examination

Physical examination was performed before acupuncture. The patient’s both pupils were in equal size with a diameter of about 3 mm. He had sensitive pupillary light reflex, symmetric wrinkles on both sides, and satisfying closeness of eyelid. Some positive physical findings were observed. His left eye had movement disorder including abduction, oblique abduction. In addition, Hirschberg test showed an inward deviation at an angle of 45°. The tongue was in the middle and the left nasolabial groove became a little shallower. Superficial sensibility in the periauricular region, forehead, and left face diminished significantly. Superficial sensibility in the left alar and left nasolabial groove disappeared. Limb muscular strength, muscular tension, and tendon reflex were all normal. Both the Hoffmann sign and Babinski sign were negative. The Hamilton Anxiety Scale (HAMA) indicated significant anxiety (18 scores) and the Hamilton Depression Scale (HAMD) suggested moderate depression (17 scores). In addition, according to traditional Chinese medicine (TCM), tongue diagnosis showed a light red tongue with thin white coating and pulse diagnosis demonstrated a taut pulse.

4. Intervention

Based on medical history, clinical symptoms and MRI results, the patient was diagnosed with the fourth, fifth, sixth, and seventh cranial nerve injury after surgery for CPAM. Acupuncture treatment was planned for this patient. Before the intervention, the acupuncture procedures were explained to the patient and informed consent was obtained. On the basis of TCM syndrome differentiation and the definite diagnosis, the following acupoints were selected: left Fengchi (GB20), left Taiyang (EX-HN5), Suliao (DU25), left Yingxiang (LI20), left Dicang (ST4), bilateral Hegu (LI4), bilateral Zusanli (ST36), and left Zhiyin (BL67). Intervention procedures were displayed in details in Table 1. One acupuncture session was given every 2 days for 35 days and the needles were retained for 30 minutes per session.

5. Outcome

Primary outcome was ocular movement, which was assessed based on Hirschberg test. Secondary outcome was the mental status measured by HAMA and HAMD. All outcomes were evaluated before intervention, every 4 sessions throughout the study and at the end of the treatment course.

After 4 treatment sessions, the abduction amplitude of the left eye increased obviously, but still could not return to the primary position. Hirschberg test showed an inward deviation at an angle of 30°. Meanwhile, the numbness in the left periauricular region

Figure 1. (A and B) MRI revealed neoplasia in clival area, which mainly indicated meningioma. (C and D) After operation, MRI showed pathologic change of left cerebellopontine angle meningioma postoperation and abnormal enhancement of the left trigeminal nerve, and the prepontine cistern enlarged with signal-intensity abnormalities. (E) Abdution of the left eye had partly regained. (F) Abdution of eye on the affected side had totally recovered. MRI = magnetic resonance imaging.
was relieved. The scores of HAMA and HAMD also showed a reduction (12 points and 14 points, respectively). At the end of 7 treatment sessions, the patient could look at a target front horizontally. After 12 treatments, limitation of left eye abduction had partly improved (Fig. 1E), and superficial sensory disturbance in the periauricular region, forehead, and left face had reduced to 4 points. However, the superficial sensory disturbance in the frontal and facial region still decreased mildly when compared with the right side. Lastly, at the 3-month follow-up by telephone, the patient reported that his symptoms had not recurred.

6. Discussion

The incidence rate of meningioma accounts for about 6% to 15% of cerebellopontine angle tumors,[6,7] ranking only second to acoustic neuroma. Its histological morphology is complicated and it is generally classified into 7 categories, which includes epithelia type, fibroblast type, transitional cell type, psammoma body type, hemangioblastoma, papillary type, and variant type.[8] Though most tumor cells are well-differentiated and grow benignly, meningioma is located in the irregular gap between cerebellum, pons, and petrous part of temporal bone, and the gap forms an inverted 3 triangle. To be specific, meningioma is close to the fifth, sixth, seventh, eighth, ninth, tenth, eleventh pairs of cranial nerves and the brainstem as well as some vital blood vessels, which consists of superior cerebellar artery, anterior inferior cerebellar artery, posterior inferior cerebellar artery, super petrosal vein, inferior petrosal vein and their branches. Therefore, choosing an appropriate operative method is of great significance to protect the important tissue, reduce sequelae, and improve life quality for patients.

The most commonly used surgical method is the retrosigmoid approach, which features a simple operation approach and a clear operative field, making it easy to control the size of an incision. In addition, this approach also makes it easily operable for patients.

The divergent channel connect with eye.

Table 1

| Acupoint Location | Channel distribution | Relationship with eyes | Procedure |
|-------------------|----------------------|------------------------|-----------|
| Fengchi (GB20)    | Gallbladder channel of Foot-Shaoyang | Originates from the outer canthus and one branch starts from the outer canthus | Perpendicular insertion for 1.2 cun |
| Taiyang (EX-HN5)  | Extra point           | Near the outer canthus  | Perpendicular insertion for 1.0 cun |
| Suliao (GV25)     | Governor vessel       | A branch to the lower central part of the eye. Also used for superficial paresthesia here | Upward oblique insertion for 0.3 cun |
| Yingxiang (LI20)  | Large intestine channel of Hand-Yangming | Mainly used for the treatment of local functional rehabilitation and superficial paresthesia of left nasolabial groove | Upward oblique insertion for 0.5 cun |
| Dicang (ST4)      | Stomach channel of Foot-Yangming | The divergent channel connect with eye | Backward horizontal insertion for 0.5 cun |
| Zusanli (ST36)    | Stomach channel of Foot-Yangming | Its muscle regions manage the underpart of eye | Perpendicular insertion for 1.2 cun |
| Hegu (LI4)        | Large intestine channel of Hand-Yangming | Illness of the face and mouth can be cleared by needling Hegu | Perpendicular insertion for 1.0 cun |
| Zhijin (BL67)     | Bladder channel of Foot-Taiyang | Originates from the inner canthus of the eye. Its muscle regions manage the upper part of eye. And the root of bladder channel of Foot-Taiyang is BL67, the tip is eye | Perpendicular insertion for 0.1 cun |
Acupuncture belongs to complementary and alternative medicine and could effectively promote rehabilitation of neural function.\[9\] Previous studies have confirmed that acupuncture plays a positive role in the treatment of various ocular diseases, including xeroma,\[10,11\] abducent paralysis,\[12\] glaucoma,\[13\] anisometropic amblyopia,\[14\] and keratoconjunctivitis sicca.\[15\] The mechanisms may be explained by decreasing intraocular pressure,\[16\] improving the central visual field,\[17\] increasing ophthalmic blood flow,\[18\] and promoting retinal nerve growth factor and brain-derived neurotrophic factor.\[19\] Meanwhile, some studies also have proved that acupuncture can effectively protect the nerve, accelerate microcirculation and metabolism, and promote the recovery of neural function.\[20,21\]

In this case, Fengchi (GB20), Taiyang (EX-HN5), Sualio (GV25), Yingxiang (LI20), and Dicang (ST4) are local acupoints, which could stimulate the local region and promote rehabilitation of the cranial nerve injury. And acupoints of Hegu (LI4), Zusanli (ST36), and Zhiyin (BL67) are also selected as distant points according to the distribution of relevant meridians. The locations and meridian distributions of these points, as well as their relationships with the patient’s clinical symptoms, are displayed in Table 1. When treating ocular diseases with acupuncture, local points, such as Jingming (BL11), Chengqi (ST11), Cuanzhu (ST2), Sibai (ST2), Taiyang (EX-HN5), Sizhukong (SJ23), Tongziliao (GB1), and Fengchi (GB20), are generally selected. Supplementary distant acupoints vary according to different fundamental theories. For examples, when considering special therapeutic effect, acupoints like Yanglao (SI6), Guangming (GB37), Taichong (LR3), Sanyinjiao (SP6), Ganshu (BL18) are commonly used, and their locations and meridian distributions are presented in Table 2. Acupoints can also be selected based on different TCM syndromes, their common type of syndromes, and the selected points are shown in Table 3.

Although the definitive mechanisms are not fully understood and further investigation is needed, acupuncture might be an option for rehabilitation after surgery for CPAM.

### Table 2

| Acupoint      | Location                                                                 | Channel distribution                        |
|---------------|---------------------------------------------------------------------------|---------------------------------------------|
| Yanglao (SI6) | On the dorsal ulnar aspect of the forearm, in the depression on the radial side if the proximal end of the caputulum the ulna | Small intestine channel of Hand-Taiyang     |
| Guangming (GB37) | 5 cun superior of the tip of the external malleolus, slightly anterior to the anterior border of the fibula | Gallbladder channel of Foot-Shaoyang        |
| Taichong (LR3) | In the depression distal to the junction of the 1st and 2nd metatarsal bones | Liver channel of Foot-Jueyin                |
| Sanyinjiao (SP6) | 3 cun above the meridian malleolus, on the posterior border of the meridian aspect of the tibia | Spleen channel of Foot-Taiyin              |
| Ganshu (BL18) | Level with the lower border of the spinous process of the 9th thoracic vertebra, 1.5 cun lateral to the posterior midline | Bladder channel of Foot-Taiyang             |

### Table 3

| Type of syndrome                  | Symptoms                                                                 | Common acupoints                                                                 |
|-----------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Liver and kidney deficiency type  | Sore eyes, soreness and weakness of waist and knees, red tongue with less coating, deep and thin pulse | Ganshu (BL18), Shenshu (BL23), Taixi (KI3), Zhaohai (KI6)                        |
| Damp-heat in liver and gallbladder type | Gum in the eyes, excessive tearing, sticky slimy sensation in the mouth, red tongue with yellow and greasy coating, slippery and rapid pulse | Yinlingquan (SP9), Yanglingquan (GB34), Zusanli (ST36), Zulinqi (GB41)             |
| Liver qi stagnation type          | Dilated eyes, becoming sentimental, pale tongue with thin coating, wry pulse | Taichong (LR3), Zhiou (SJ6), Guangming (GB37)                                    |
| Qi stagnation and blood stasis type | Enduring disease acute trauma, postoperative or enduring disease, accompanied with depression, purple tongue, dusky or with stasis macular, rough or wry pulse | Geshu (BL17), Taichong (LR3), Hegu (LI4), Sanyinjiao (SP6)                       |

### References

[1] Senior A, Douglas JA, Thompson S. Unilateral vocal cord palsy and dysphagia: an unusual presentation of cerebellopontine angle meningioma. J Surg Case Rep 2015;2015:1–3.
[2] Tan LA, Gerard CS, Ahuja SK, Mohdakhar R. Retrosigmoid approach for resection of cerebellopontine angle meningioma and decompression of the trigeminal nerve. Neurosurg Focus 2014;36(1 Suppl):1.
[3] Colasanti R, Tailor AR, Zhang J, et al. Functional petrosectomy via a suboccipital retrosigmoid approach: guidelines and topography. World Neurosurg 2016;87:143–54.
[4] Liu Z, Yan S, Wu J, et al. Acupuncture for chronic severe functional constipation: a randomized trial. Ann Intern Med 2016;165:761–9.
[5] Li M, Tien-A-Looi SC, Guo ZL, et al. Repetitive electroacupuncture attenuates cold-induced hypertension through enkephalin in the rostral ventral lateral medulla. Sci Rep 2016;6:35791.
[6] Nakamura M, Roser F, Dormiani M, et al. Facial and cochlear nerve function after surgery of cerebellopontine angle meningiomas. Neurosurgery 2005;57:77–80.
[7] Nakamura M, Roser F, Mirzai S, et al. Meningiomas of the internal auditory canal. Neurosurgery 2004;55:119–27.
[8] Elster AD, Challa VR, Gibert TH, et al. Meningiomas: MR and histopathologic features. Radiology 1989;170:857–62.
[9] Chen LF, Fang JQ, Ma RJ, et al. Additional effects of acupuncture on early comprehensive rehabilitation in patients with mild to moderate...
acute ischemic stroke: a multicenter randomized controlled trial. BMC Complement Altern Med 2016;16:1–9.

[10] Liu Q, Liu J, Ren G, et al. Proteomic analysis of tears following acupuncture treatment for menopausal dry eye disease by two-dimensional nano-liquid chromatography coupled with tandem mass spectrometry. Int J Nanomedicine 2017;12:1663–71.

[11] Yang L, Yang Z, Yu H, et al. Acupuncture therapy is more effective than artificial tears for dry eye syndrome: evidence based on a meta-analysis. Evid Based Complement Alternat Med 2015;2015:1–1.

[12] Do A, Wahner-Roedler DL, Bauer BA. Acupuncture treatment of diplopia associated with abducens palsy: a case report. Glob Adv Health Med 2014;3:32–4.

[13] Chan HH, Leung MC, So KF. Electroacupuncture provides a new approach to neuroprotection in rats with induced glaucoma. J Altern Complement Med 2005;11:315–22.

[14] Lam DS, Zhao J, Chen LJ, et al. Adjunctive effect of acupuncture to refractive correction on anisometropic amblyopia: one-year results of a randomized crossover trial. Ophthalmology 2011;118:1501–11.

[15] Grönlund MA, Stenevi U, Lundeberg T. Acupuncture treatment in patients with keratoconjunctivitis sicca: a pilot study. Acta Ophthalmol Scand 2004;82:283–90.

[16] Chu TC, Potter DE. Ocular hypotension induced by electroacupuncture. J Ocul Pharmacol Ther 2002;18:293–305.

[17] Sagara Y, Fuse N, Seimiya M, et al. Visual function with acupuncture tested by visual evoked potential. Tohoku J Exp Med 2006;209:235–41.

[18] Naruse S, Mori K, Kurihara M, et al. Chororetinal blood flow changes following acupuncture between thumb and forefinger. Nippon Ganka Gakkai Zasshi 2000;104:717–23.

[19] Pagani L, Manni L, Aloe L. Effects of electroacupuncture on retinal nerve growth factor and brain-derived neurotrophic factor expression in a rat model of retinitis pigmentosa. Brain Res 2006;1092:198–206.

[20] Hsiu H, Huang SM, Chen CT, et al. Acupuncture stimulation causes bilaterally different microcirculatory effects in stroke patients. Microvasc Res 2011;81:289–94.

[21] Wang WW, Xie CL, Lu L, et al. A systematic review and meta-analysis of Baihui (GV20)-based scalp acupuncture in experimental ischemic stroke. Sci Rep 2014;4:1–6.