CLINICAL RESEAPCH

Effects of Warm Acupuncture Combined with Chinese herbal Decoction on Facial Nerve Function and Surface Electromyography in Patients with Peripheral Facial Paralysis

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Abstract

Objective To explore the efficacy of warm acupuncture combined with Chinese herbal decoction on patients with peripheral facial paralysis, and its effects on facial nerve function and surface electromyography. **Methods** A total of 120 patients with peripheral facial paralysis treated in our hospital from Mar. 2018 to Mar. 2020 were selected, these patients were divided into the control group and observation group according to the random number table method, with 60 cases in each group. The control group were treated with Western medicine and Chinese herbal decoction, and on the basis of the control group, the observation group were treated with warm acupuncture, the facial nerve function, facial disability index physical function (FDIP) scores, FDI social function (FDIS) scores, the levels of endothelin (ET), nitric oxide (NO), tumor necrosis factor-α (TNF-α), R1 latency of blink reflex (R1 latency) and compound muscle action potential (CMAP) amplitude in the two groups were compared before and after treatment. **Results** After treatment, the total effective rate in the control group was significantly lower than that in the observation group ($P<0.05$). After treatment, the facial nerve function, FDIS, ET, TNF-α and R1 latency in both groups were significantly lower than those before treatment ($P<0.05$), and these indicators in the control group were significantly higher than those in the observation group ($P<0.05$). After treatment, the FDIP, NO, CMAP amplitude in both groups were significantly higher than those before treatment ($P<0.05$), and these indicators in the control group were significantly lower than those in the observation group ($P<0.05$). **Conclusion** Warm acupuncture combined with Chinese herbal decoction has notable curative effect for patients with peripheral facial paralysis, and it can significantly improve facial nerve function and the quality of life of patients.

Introduction

Peripheral facial paralysis, with the abbreviation of facial paralysis, also known as peripheral facial neuritis, is a common and frequently occurring disease in clinic. The clinical manifestations of patients with peripheral facial paralysis are facial motor dysfunctions, such as deviation of the mouth and eyes, widened ocular fissure, inability to close eyes, disappearance of the frontal striae, salivation, and choking, which seriously affect the normal life and work of patients [1]. The pathogenesis of peripheral facial paralysis is unknown and may be caused by factors such as viral infection, microvascular ischemia and autoimmune inflammatory diseases [2-4]. At present, the clinical treatment of peripheral facial paralysis is still controversial, and Western medicine mainly uses vitamin B drugs, corticosteroids, and antiviral drugs for peripheral facial paralysis treatment, but Western medicine has many side effects and fails to achieve clinically expected efficacy [5]. Traditional Chinese medicine (TCM) therapies have a long history and have achieved good results in the clinical treatment of many diseases. Studies have found [6-7] that warm acupuncture has a good efficacy in the clinical treatment of hemiplegia patients after stroke, which can effectively improve the motor function of

patients and improve the clinical efficacy. Therefore, this study investigated the efficacy of warm acupuncture combined with Chinese herbal decoction for the treatment of peripheral facial paralysis, further observed its effect on the facial nerve function and surface electromyography related indicators in patients with peripheral facial paralysis, and aimed to explore the effective treatment of peripheral facial paralysis, the results of the present study are reported as follows.

Materials and methods

General data

Clinical data

A total of 120 patients with peripheral facial paralysis who were diagnosed and treated in our hospital from March 2018 to March 2020 were selected and randomly divided into the control and observation groups (60 patients each) according to the random number table method. The general data, such as gender, age, disease duration, and affected side, were compared between the two groups, which were not statistically significant (P>0.05) and comparable, see Table 1. This study was approved by the ethics committee of our hospital and all patients voluntarily participated and signed an informed consent.

Table 1 Comparison of general data between the two groups

Group	Cases	Gender (cases)		Age (years)	Disease duration (d)	Affected side (cases)	
		Male	Female			Left	Right
Observation group	60	35	25	38.46±8.23	5.23±1.45	33	27
Control group	60	32	28	39.37±7.56	5.52±1.62	31	29
χ^2/t		0.304		-0.631	-1.033	0.134	
P		0.581		0.529	0.304	0.714	

Inclusion and exclusion criteria

Inclusion criteria

Patients fulfilled the diagnostic criteria of peripheral facial paralysis in *The therapeutics of acupuncture and moxibustion* [8]: (1) the patient awoke with facial muscle stiffness, numbness, and paralysis on one side; (2) the frontal striae disappeared, the ocular fissure

was widened, the eyes were lacrimated, the nasolabial folds became shallow, the mouth angle drooped and slanted to the healthy side, and the sick side could not frown, close eyes, show teeth, bulge cheeks, etc.; (3) some patients initially presented with intra- or post auricular pain, and may also present with dysgeusia, hyperacusis, etc.; (4) as the course of the disease got

longer, contracture of muscles may occur because of paralysis, and mouth angle may be pulled back to the affected side, and even hemifacial spasm may occur, resulting in the phenomenon of Daocuo; All patients were unilateral affected; All patients with first onset.

Exclusion criteria

Patients with TCM allergy constitution; those did not accept warm acupuncture therapy; those had other facial paralysis disorders such as central facial paralysis; those presented with a psychiatric history or severe physical impairment; those with facial paralysis caused by trauma, tumor, or meningitis; women in pregnancy and lactation.

Treatment

After admission, patients in both groups were treated with anti-infective and antiviral and other basic treatment. The patients received oral prednisone tablets (Zhejiang Xianju Pharmaceutical Co., Ltd., H33021207, specification: 5 mg/tablet × 100 tablets) and mecobalamin tablets (Zhejiang Hangzhou Kangenbei Pharmaceutical Co., Ltd., H20060921, 5 mg/tablet × 20 tablets), 1 tablet/time each, 3 times/d, continuously treated for 3 weeks.

Control group

The control group was given the Chinese herbal decoction treatment, and the main components of the formula were unprocessed rehmannia root 20 g, dyers woad leaf 20 g, Radix Notopterygii 15 g, Radix Bupleuri 15 g, Hypericum perforatum 15 g, Saposhnikovia divaricata 12 g, Radix Angelicae Sinensis 12 g, Rhizoma Atractylodis 12 g, Schizonepeta tenuifolia 12 g, Rhizoma Chuanxiong 12 g, Radix Paeoniae Alba 12 g, Radix Glycyrrhizae 5 g, then added 500 mL water and decocted to 150 mL, one dose a day, and continuously treated for 3 weeks.

Observation group

The observation group was given warm acupuncture treatment on the basis of the control group. Then the affected side acupoints were selected, mainly Yangbai, Jiache, Hegu, Zusanli, Xiaguan and Quanliao

acupoints, and Zanzhu, Shuigou and Sibai were used as the matching acupoints for patients with frown weakness, philtrum deviation and facial stiffness. First, the moxa stick (Jiangsu Kangmei Pharmaceutical Co., Ltd., 20-30 cm in length, 1.7-1.8 cm in diameter, 10 sticks/box) was cut into 1cm segments, and after acupoint disinfection, 0.30 mm × 40 mm Huatuo brand sterile acupuncture needle (Suzhou Medical Supplies Factory Co., Ltd., No. 20162270970) cooperated with Hegu acupoint on the healthy side for oblique or flat needling, uniform reinforcing-reducing method was conducted. After getting Qi, the moxa stick was set on the needle handle and ignited, one burning section is one zhuang, one zhuang at each acupoint, with the degree of local flush achieved by moxibustion at each acupoint, once a day for 3 weeks.

Outcome measures

(1) Clinical efficacy: the clinical efficacy of patients were referring to the criteria of efficacy evaluation in the *Chinese guidelines for the diagnosis and treatment of idiopathic facial palsy* [9]; well-healed: the patient's facial motor function completely returned to normal; markedly effective: the patient had mild abnormalities of facial motor function, slight weakness of facial muscles, symmetric face at rest, and mild asymmetry of mouth angle; effective: patient has moderately abnormal facial motor function, facial muscle weakness, significant synkinesis, mild symmetry at rest of face, significant asymmetry of mouth angle; ineffective: patient has severely abnormal facial motor function, facial muscle weakness, facial asymmetry at rest, and severe asymmetry of mouth angle. Total effective rate = (well-healed cases + markedly

effective cases + effective cases) / total cases×100‰

(2) Facial nerve function: facial nerve function was evaluated in both groups with reference to the House-Brackmann [10] facial nerve function grading scale. Grade I: normal facial motor function; Grade II: moderate to good function of forehead, complete eye closure with minimal force, slight asymmetry of mouth angle, as mild dysfunction; Grade III: the forehead can do slight to moderate movement, the

eyes can be closed completely, the mouth has a slightly weak force, which is moderate dysfunction; Grade IV: significant asymmetry of facial motor function, facial weakness, no motor function of the forehead, eyes cannot be closed completely, the mouth can be moved with the greatest force, and it is severe dysfunction; Grade V: no motor function of the forehead, eyes cannot be closed completely, mouth can be slightly moved, it is severe dysfunction; Grade VI: absence of any motor function of the face as complete paralysis.

(3) Facial disability index: patient physical function was evaluated using the facial disability index (FDI) scale [11]. FDI scale included physical function (FDIP) and social function (FDIS). FDIP score: total of 5 questions with 6 options per question, 0 to 5 points for each option, total score = (sum of scores for 5 questions - 10) × 2.5, with a maximum score of 37.5 points, with higher scores indicating less physical dysfunction; FDIS score: total of 5 questions with 6 options per question, 1 to 6 points per option, total score = (sum of scores for 5 questions - 10) × 2, the maximum score was 40 points, with higher scores indicating greater social living ability.

(4) Serum factors: 2 ml of fasting venous blood was drawn from patients before and after treatment, the supernatant was collected after centrifugation at 3000 r/min, and the levels of endothelin (ET), nitric oxide (NO), and tumor necrosis factor-α (TNF-α) were measured by enzyme-linked immunosorbent assay (ELISA).

(5) Electromyography: after treatment, the R1 latency of blink reflex (R1 latency), compound muscle action potential (CMAP) amplitude in patients before and after treatment were recorded with surface electromyography detection instrument (Shanghai Bendi Medical Instrument Co., Ltd., 9033A07) at 25 ℃.

Statistical analysis

SPSS 20.0 was used for statistical analysis, the measurement data were expressed by the mean ± standard deviation ($\bar{x} \pm s$) and compared by t test, and the count data were compared using χ^2 test, the rank sum test was used for comparison of rank data, and the changes of facial nerve function and surface electromyography related indicators of patients before and after treatment were compared, $P<0.05$ was taken as statistically significant.

Results

Comparison of clinical efficacy between the two groups

After treatment, the total effective rate in the two groups was statistically significant, and the total effective rate in the control group was significantly lower than that in the observation group ($P<0.05$), as shown in Table 2.

Table 2 Comparison of clinical efficacy between the two groups [cases (%)]

Group	Cases	Well-healed	Markedly effective	Effective	Ineffective	Total effective rate
Observation group	60	31 (51.67)	14 (23.33)	12 (20.00)	3 (5.00)	57 (95.00)
Control group	60	22 (36.67)	11 (18.33)	16 (26.67)	11 (18.33)	49 (81.67)
χ^2						5.175
P						0.023

Comparison of facial nerve function grading between the two groups

Before treatment, there was no significant difference in facial nerve function between the two groups ($P>0.05$). After treatment, the facial nerve function grading in the two groups was significantly improved ($P<0.05$), and the facial nerve function grading in the control group was significantly worse than that in the

observation group (P < 0.05), as shown in Table 3.

Table 3 Comparison of facial nerve function grading between the two groups [cases (%)]

Group	Time	I	II	III	IV	V	VI
Observation group	Before treatment	0 (0.00)	21 (35.00)	15 (25.00)	13 (21.67)	7 (11.67)	4 (6.67)
	After treatment	29 (48.33)	20 (33.33)	5 (8.33)	4 (6.67)	2 (3.33)	0 (0.00)
Control group	Before treatment	0 (0.00)	23 (38.33)	14 (23.33)	12 (20.00)	5 (8.33)	6 (10.00)
	After treatment	18 (30.00)	18 (30.00)	12 (20.00)	8 (13.33)	4 (6.67)	0 (0.00)

Comparison of FDIP and FDIS scores between the two groups

Before treatment, there was no significant difference in FDIP and FDIS scores between the two groups (*P*>0.05). After treatment, the FDIP score in the two groups was significantly higher than that before treatment (*P*<0.05), the FDIS score in the two groups was significantly lower than that before treatment (*P*<0.05), and the FDIP score in the control group was significantly lower than that in the observation group (*P*<0.05), and the FDIS score in the control group was significantly higher than that in the observation group (*P*<0.05), as shown in Table 4.

Table 4 Comparison of FDIP and FDIS scores between the two groups (points)

Group	Cases	FDIP		FDIS	
		Before treatment	After treatment	Before treatment	After treatment
Observation group	60	14.74±3.56	21.42±2.87*	19.36±3.35	12.36±3.12*
Control group	60	15.23±4.20	19.34±3.82*	18.95±3.84	14.28±2.88*
t		-0.689	3.372	0.623	-3.503
P		0.492	0.001	0.534	0.001

Comparison of serum factor levels between the two groups

Before treatment, there was no significant difference in the levels of ET, NO and TNF-α between the two groups (*P*>0.05). After treatment, the ET and TNF-α levels in the two groups were significantly lower than those before treatment (*P*<0.05), the NO level in the two groups was significantly higher than that before treatment (*P*<0.05), and the levels of ET and TNF-α in the control group were significantly higher than those in the observation group (*P*<0.05), the level of NO in the control group was significantly lower than that in the observation group (*P*<0.05), as shown in Table 5.

Comparison of electromyography indicators between the two groups

Before treatment, there was no significant difference in R1 latency and CMAP amplitude between the two groups (*P*>0.05). After treatment, the R1 latency in the two groups was significantly lower than that before treatment (*P*<0.05), the CMAP amplitude in the two groups was significantly higher than that before treatment (*P*<0.05), and the R1 latency in the control group was significantly higher than that in the observation group (*P*<0.05), the CMAP amplitude in the control group was significantly lower than that in

the observation group ($P<0.05$), as shown in Table 6.

Table 5 Comparison of serum factor levels between the two groups

Group	Cases	ET (ng/L)		NO (µmol/L)		TNF-α (µg/L)	
		Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Observation group	60	82.36±9.45	58.34±9.26*	34.56±5.62	72.36±8.42*	26.74±6.10	13.62±3.13*
Control group	60	83.15±8.82	67.56±8.79*	35.23±6.20	57.34±7.37*	27.23±5.82	16.58±3.75*
t		-0.473	-5.594	-0.620	10.397	-0.450	-4.694
P		0.637	0.000	0.536	0.000	0.653	0.000

Note: compared with before treatment: *$P<0.05$.

Table 6 Comparison of electromyography indicators between the two groups (points)

Group	Cases	R1 latency (ms)		CMAP amplitude (mV)	
		Before treatment	After treatment	Before treatment	After treatment
Observation group	60	11.23±2.34	8.46±2.12*	0.92±0.24	1.62±0.40*
Control group	60	11.50±2.48	9.68±1.84*	0.95±0.28	1.25±0.38*
t		-0.613	-3.366	-0.630	5.195
P		0.541	0.001	0.530	0.000

Note: compared with before treatment: *$P<0.05$.

Comparison of adverse reactions between the two groups

There were no obvious adverse reactions in the two groups during the treatment, and the tolerance was good and the safety was high.

Discussion

In recent years, with the improvement of living standards as well as the acceleration of life pace, the incidence of peripheral facial paralysis has shown an increasing trend year by year. Western medicine holds that peripheral facial paralysis is caused by nonspecific inflammation of the facial nerve, and therefore, it is commonly treated with anti-inflammatory, anti-infective, and antiviral drugs. Western medicine treatment has certain therapeutic effect, but it may also be accompanied by side effects, making patients dependent on it. In TCM, peripheral facial paralysis falls under the category of "deviated mouth" and "eye and mouth deviation", it is believed that due to disharmony between nutrient Qi and defensive Qi, emptiness of meridians, invasion of Yang Ming and Shaoyang meridians by external pathogens, resulting in meridian block and facial muscle paralysis. Therefore, the treatment of peripheral facial paralysis should mainly focus on expelling wind and dredging meridians [12].

The results of this study showed that the total effective rate in the control group was significantly lower than that in the observation group after treatment. The facial nerve function grading, FDIP and FDIS scores in the two groups were improved after treatment, and the improvement degree of the observation group was significantly better than that of the control group, indicating that the clinical symptoms and life quality of patients with peripheral facial paralysis were improved after treatment, and the curative effect of warm acupuncture combined with

Chinese herbal decoction is more significant. In this study, the TCM decoction contained unprocessed rehmannia root, dyers woad leaf, Radix Notopterygii, Radix Bupleuri, Hypericum perforatum, Saposhnikovia divaricata, Radix Angelicae Sinensis, Rhizoma Atractylodis, Schizonepeta tenuifolia, Rhizoma Chuanxiong, Radix Paeoniae Alba and Radix Glycyrrhizae, among which unprocessed rehmannia root, dyers woad leaf, Hypericum perforatum, Radix Angelicae Sinensis and Radix Glycyrrhizae have the effect of clearing away heat and toxin, tonifying blood and promoting blood circulation; Radix Notopterygii, Radix Bupleuri, Saposhnikovia divaricata and Rhizoma Atractylodis have the effect of dispersing cold and expelling wind; Schizonepeta tenuifolia, Rhizoma Chuanxiong and Radix Paeoniae Alba have the effect of dredging collaterals and relieving pain. The combination of all kinds of herbs can play the effect of dispelling wind and detoxifying, dredging collaterals and activating blood circulation, and reconciling the Qi of Sanyang meridian [13]. In addition, in this study, Yangbai, Jiache, Hegu, Zusanli, Xiaguan and Quanliao acupoints on the patient affected side were selected as the main acupoints for warm acupuncture treatment, in which Yangbai belongs to the foot Shaoyang gallbladder meridian, and acupuncture at this acupoint has the effect of dispersing wind and clearing heat; Jiache belongs to the foot Yangming stomach meridian, acupuncture at this acupoint has the effect of activating blood and dissipating heat; Hegu belongs to the yuan-primary acupoint of hand Yangming meridian, and acupuncture at this acupoint has the effect of removing pathogenic factors and activating collaterals; Zusanli can reconcile Qi and blood and smooth the Qi patency of viscera and meridians, especially for spleen and stomach, which has the effect of invigorating middle jiao and strengthening vital Qi to eliminate pathogenic factors [14]; Xiaguan belongs to the crossing acupoint of foot Yangming and Shaoyang meridians, and acupuncture at this acupoint has the effect of unblocking Yangming meridian Qi and blood [15]; Quanliao belongs to the hand Taiyang small intestine meridian, and acupuncture at this

acupoint has the effect of dredging meridians and activating collaterals. At the same time, the Zanzhu acupoint belongs to the foot Taiyang bladder meridian, acupuncture at this acupoint has the effect of anti fatigue, sedation and pain relief; the Shuigou acupoint is the meridian acupoint of governor vessel, and acupuncture at this acupoint has the effect of dispelling wind and arousing spirit; the Sibai acupoint belongs to the foot Yangming stomach meridian, and acupuncture at this acupoint has the effect of relieving pain and improving eyesight. Warm acupuncture combined with Chinese herbal decoction in treating patients with peripheral facial paralysis has a synergistic effect, which can effectively relieve facial muscle spasm and motor dysfunction in patients, so that facial nerve function can be improved, thereby improving patients' social living ability.

The degree of facial nerve damage in patients with peripheral facial paralysis is an important indicator for judging the patient's facial motor function status, from which the patient's condition of mild or severity can be evaluated and, in this way, the appropriate treatment can be selected. Surface electromyography can objectively and timely respond to the severity of the disease and the neurological status of patients, and judge the prognosis of the disease [16]. CMAP amplitude and R1 latency are important electrophysiological indicators that reflect the nature and extent of the neuropathy in the body, and the more severe the facial nerve injury, the lower the CMAP amplitude and the longer the R1 latency [17]. In this study, after treatment, the R1 latency in the two groups was significantly lower and the CMAP amplitude was significantly higher than those before treatment, and the R1 latency in the observation group was significantly lower than that in the control group, and the CMAP amplitude in the observation group was significantly higher than that in the control group, which indicated that warm acupuncture combined with TCM decoction treatment could effectively alleviate facial nerve injury in patients. This may be due to the fact that warm acupuncture, through acupuncture to dredge the relevant meridians, causes the flow of Qi and blood to run smoothly, improves

the facial nerve function of patients, and promotes the normal expression of related neurotrophic factors, thereby promoting the recovery of injured facial nerve [18]. Therefore, warm acupuncture combined with Chinese herbal decoction may promote the repair of injured facial nerve, improve facial muscle motor function in patients with peripheral facial paralysis, and alleviate clinical symptoms.

Peripheral facial paralysis is a disease caused by non purulent inflammation of the facial nerve inside the stalk mastoid foramen, and the inflammatory reaction in the body as well as vascular endothelial cell damage play important roles in its occurrence and development. ET is a vasoconstrictor factor that is mainly synthesized in vascular endothelial cells and is strongly implicated in the development of facial nerve palsy through microcirculation, vasoconstriction, or hemodynamic alterations [19]; TNF-α is a proinflammatory cytokine involved in the pathological and physiological changes of edema after facial nerve palsy [20]; NO, a vasodilator factor synthesized by vascular endothelial cells, is able to maintain vascular homeostasis and can inhibit vasoconstriction induced by ET, meanwhile restore endothelial cell damage.

In this study, after treatment, the levels of ET and TNF-α in the two groups of patients were decreased and NO level was increased compared with before treatment, and ET and TNF-α levels in the observation group were significantly lower than those in the control group, and NO level in the observation group was significantly higher than that in the control group, indicating that warm acupuncture combined with TCM decoction can effectively attenuate the inflammatory response, reduce ET and TNF-α levels, and elevate NO level in patients with peripheral facial paralysis. Warm acupuncture may improve facial blood circulation and oxygen supply requirement by stimulating the facial nerve, and increase NO level, then allowing the vascular smooth muscle to be dilated and improving the function of vascular endothelial cells, thus restoring the balance of ET and NO and improving the symptoms of facial nerve palsy. In addition, warm acupuncture improved facial microcirculatory blood flow and lymphatic circulation, which was beneficial in attenuating facial nerve angioedema and inflammation, decreasing ET and TNF-α levels, improving the damaged facial nerve, restoring neurological function, and then effectively promoting patient recovery.

In conclusion, warm acupuncture combined with Chinese herbal decoction had a good effect in the treatment of patients with peripheral facial paralysis, which could effectively improve facial motor function of patients, improve quality of life, reduce the inflammatory response and have a good safety.

Declaration of conflict-of-interest

The authors declare no conflict-of –interest.

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