

# Therapeutic observation on superficial needling with different frequencies for intractable facial paralysis

## 不同频率浮针治疗顽固性面瘫的疗效观察

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### Abstract

**Objective:** To observe the therapeutic effect of superficial needling with different frequencies for intractable facial paralysis.

**Methods:** A total of 120 patients with intractable peripheral facial paralysis were allocated into a superficial needling with high frequency group (150 times/min), a moderate frequency group (100 times/min) and a low frequency group (50 times/min) according to the random number table method. The Toronto facial grading system (TFGS) was used to evaluate facial nerve functions before treatment and after 2 weeks and 4 weeks of treatment respectively. The electromyography (EMG) test of the mandibular branch of facial nerve was used to compare the motor nerve conduction velocity (MCV), sensory nerve conduction velocity (SCV) and monophasic action potential (MAP) among different groups, and was done before treatment and after 4 weeks of treatment. The clinical efficacy was also compared.

**Results:** After 2 weeks and 4 weeks of treatment, the changes of TFGS scores in the three groups all showed statistical significance (all  $P < 0.05$ ), and the TFGS score in the low frequency group was substantially higher than that in the other two groups. After treatment, the changes of the MCV and SCV in the three groups all showed statistical significance (all  $P < 0.05$ ), and the results in the low frequency group were higher than those in the other two groups; the change of MAP in the three groups showed no statistical significance ( $P > 0.05$ ). The total effective rate was 65.0%, 80.0% and 95.0% in the high frequency group, moderate frequency group and low frequency group respectively, and the between-group differences showed statistical significance ( $P < 0.05$ ).

**Conclusion:** Compared with the superficial needling with high and moderate frequencies, superficial needling with low frequency can produce more significant clinical efficacy for intractable facial paralysis.

**Keywords:** Acupuncture Therapy; Superficial Needling; Facial Paralysis; Eye-mouth Deviation; Nerve Conduction; Action Potentials; Frequency

**【摘要】目的:** 观察不同频率浮针治疗顽固性周围性面瘫的临床疗效。**方法:** 将120例顽固性周围性面瘫患者按随机数字表法分成浮针高频组(150次/min)、浮针中频组(100次/min)和浮针低频组(50次/min)。采用多伦多面部神经功能分级法(TFGS)评价并比较各组治疗前、治疗2周和4周后的面神经功能。于治疗前和治疗4周后进行面神经下颌支肌电图检查,比较各组运动神经传导速度(MCV)、感觉神经传导速度(SCV)和动作电位(MAP)波幅。比较各组的临床疗效。**结果:** 治疗2周和4周后,三组TFGS评分均存在统计学差异(均 $P < 0.05$ ),且浮针低频组得分高于其他两组。治疗后,三组MCV和SCV存在统计学差异(均 $P < 0.05$ ),且浮针低频组优于其他两组;三组MAP波幅无统计学差异( $P > 0.05$ )。浮针高频组、浮针中频组和浮针低频组的临床有效率分别为65.0%、80.0%和95.0%,差异具有统计学意义( $P < 0.05$ )。**结论:** 低频率浮针治疗顽固性周围性面瘫的临床疗效优于中频和高频,可以达到更好的治疗效果。

**【关键词】** 针刺疗法; 浮刺; 面神经麻痹; 口眼歪斜; 神经传导; 动作电位; 频率

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Intractable peripheral facial paralysis or intractable facial paralysis refers to facial paralysis that lasted longer than 3 months. It belongs to Kou Bi (mouth deviation) or Mian Tan (facial paralysis) in traditional Chinese medicine (TCM)<sup>[1]</sup>. It is commonly seen in summer and winter and can affect any age group but

with a preference among 20-40 years old. Males are on a higher risk<sup>[2]</sup>. Facial paralysis has an incidence of 23/100 000 and ranks the sixth of all nervous system diseases<sup>[3]</sup>. Sequelae or complications may be caused by the loss of proper treatment time or improper treatment approach, which will greatly affect the patients' appearance and quality of life (QOL), and create huge economic and social burden<sup>[4]</sup>. Clinical study has showed Western medicine is effective for

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facial paralysis in acute stage, whereas with an unsatisfactory effect in the rehabilitation of facial muscles<sup>[5]</sup>. For promoting the treatment result and improving patients' QOL, based on clinical literatures, our years of clinical experience and the expertise of Fu Zhong-hua's superficial needling techniques, we conducted this study to observe the therapeutic efficacy of superficial needling with different frequencies for intractable facial paralysis. The report is now given as follows.

## 1 Clinical Materials

### 1.1 Diagnostic criteria

This was based on the diagnostic criteria of peripheral facial paralysis in the *Practical Otolaryngology*<sup>[6]</sup>, with the exception of peripheral facial paralysis caused by cerebrovascular diseases, tumor, otitis media, etc. The TCM diagnostic criteria were based on the textbook of *Acupuncture Therapy*<sup>[7]</sup>, including facial paralysis of wind-cold or wind-heat patterns. Wind-cold pattern was characterized by the coldness in the head and back, no sweating, tightness in the neck and shoulder. The tongue was pale with white coating, and the pulse was floating. Wind-heat pattern was manifested as pain around or behind the ear, fever in facial region, a red tongue with yellowish thin coating, dry or bitter mouth, and a floating-rapid or wiry pulse.

### 1.2 Inclusion criteria

Conforming to the above inclusion criteria; first onset; disease duration above 3 months; aged between 13 and 78 years; unilateral onset; informed consented.

### 1.3 Exclusion criteria

Facial paralysis secondary to other diseases; disease duration shorter than 3 months; with chronic cardiovascular diseases or diabetes or serious cerebrovascular diseases, or with mental disorders; a long course of disease with facial muscle spasm or linkage movement, namely perversion; during pregnancy or lactation; continued to receive treatment or switched to other treatments due to poor treatment result or recurrence of symptoms during follow-up visit period.

### 1.4 Statistical methods

All data were processed using SPSS version 22.0 software. Measurement data conforming to normal distribution were described as mean  $\pm$  standard deviation ( $\bar{x} \pm s$ ). One-way ANOVA was used for between-group comparisons, while Kruskal-Wallis rank-sum test was used for measurement data that didn't conform to normal distribution. Enumeration data were described as ratio or percentage, and Chi-square test was used for between-group comparisons.  $P < 0.05$  indicated statistical significance.

### 1.5 General data

A total of 120 patients with intractable facial paralysis

were included between October 2017 and February 2019 in our hospital, with 70 males and 50 females. The patients were randomized into a high frequency group, a moderate frequency group and a low frequency group, with 40 cases in each group. Between-group comparisons of age and gender among the three groups showed no statistical significance (all  $P > 0.05$ ), indicating the comparability (Table 1).

**Table 1. General data comparison**

Group	n	Gender (case)		Average age ( $\bar{x} \pm s$ , year)
		Male	Female	
High frequency	40	23	17	32.4 $\pm$ 2.1
Moderate frequency	40	23	17	33.9 $\pm$ 2.3
Low frequency	40	24	16	32.3 $\pm$ 2.2
Statistics value		0.019 <sup>1)</sup>		0.658 <sup>2)</sup>
P-value		0.991		0.520

Note: 1)  $\chi^2$ -value; 2) *t*-value

## 2 Treatment Methods

Acupoints: Taiyang (EX-HN 5), Cuanzhu (BL 2), Yangbai (GB 14), Quanliao (SI 18), Dicang (ST 4), Yingxiang (LI 20), Shangyingxiang (EX-HN 8), Jiache (ST 6), Qianzheng (Extra), Yifeng (TE 17), Shuigou (GV 26), and Kouheliao (LI 19) on the affected side; bilateral Hegu (LI 4), Zusanli (ST 36) and Sanyinjiao (SP 6).

Methods: After routine sterilization of local skin, sterile filiform needles of 0.30 mm in diameter and 40 mm in length (Suzhou Acupuncture Supplies Co., Ltd., China) were punctured with light and shallow manipulation and retained for 30 min.

### 2.1 High frequency group

After routine acupuncture procedure, a superficial needle of 0.60 mm in diameter and 52 mm in length (Nanjing Superficial Needling Medical Research Institute, China) were punctured at suitable sites, followed by sweeping manipulation downward around the affected area, with a frequency of 150 times/min for 2 min at each site. Such procedure included puncturing Taiyang (EX-HN 5) and sweeping towards the forehead for 2 min, puncturing Xiaguan (ST 7) and sweeping towards the nasal and cheekbone regions for 2 min, and puncturing Jiache (ST 6) and sweeping towards the mandibular region for 2 min. Then, withdrew the stainless steel needle and left the plastic tube underneath the skin, fixed it with a paste, and removed the tube after 6 h of retaining (Figure 1). The patients were advised to keep the treated areas away from water after the removal of tube. Patients were free to move about during tube retaining period.

### 2.2 Moderate frequency group

After routine acupuncture procedure, applied

superficial needling with a frequency of 100 times/min following the same acupoints, manipulation process and caution as those in the high frequency group.

### 2.3 Low frequency group

After routine acupuncture procedure, applied superficial needling with a frequency of 50 times/min

following the same acupoints, manipulation process and caution as those in the high frequency group.

Patients in all three groups received conventional acupuncture treatment once a day, and the superficial needling treatment once every three days. Four consecutive weeks were counted as 1 treatment course.



Figure 1. Sweeping manipulation

## 3 Therapeutic Efficacy Evaluation

### 3.1 Evaluation items

Used Toronto facial grading system (TFGS) to evaluation patients' facial nerve functions before and after 2 weeks and after 4 weeks of treatment. Used the electromyography test (EMG) of the mandibular branch of facial nerve to compare the motor nerve conduction velocity (MCV), sensory nerve conduction velocity (SCV) and monophasic action potential (MAP) before and after 4 weeks of treatment.

#### 3.1.1 Facial nerve functions

The resting symmetry, symmetry of voluntary movement, and synkinesis for each division of the face were evaluated by the TFGS<sup>[8]</sup>. The total score ranged from 0 to 100 points, and a higher score indicated better facial nerve functions.

#### 3.1.2 Nerve conduction velocity

EMG test was taken before and after 4 weeks of treatment to evaluate nerve functions of the mandibular branch of facial nerve. The MCV, SCV and MAP were recorded both before and after treatment.

### 3.2 Therapeutic efficacy

This was based on the *Clinical Treatment Efficacy Evaluation of the Peripheral Facial Nerve Paralysis* (revised edition)<sup>[9]</sup>.

**Cured:** Disappearance of all symptoms and signs, with full recovery of all functions in facial nerves governing area.

**Marked effect:** Obvious improvement of all facial symptoms and signs, with substantial recovery of all functions in facial nerves governing area.

**Effective:** Partial improvement of facial symptoms and signs.

**Invalid:** No improvement of facial symptoms and signs.

Total effective rate = (Cured cases + Marked effect cases + Effective cases) ÷ Total cases × 100%.

### 3.3 Results

#### 3.3.1 Comparison of clinical efficacy

There were 26, 32 and 38 effective cases in the high frequency group, moderate frequency group and low frequency group respectively, the total effective rate was 65.0%, 80.0% and 95.0% respectively, and the between-group comparisons showed statistical significance ( $P < 0.05$ ), (Table 2).

#### 3.3.2 Comparison of the TFGS

Before treatment, the between-group comparisons of TFGS showed no statistical significance ( $P > 0.05$ ). The intra-group comparisons of TFGS in the three groups at each observation point showed statistical significance (all  $P < 0.05$ ). After 2 weeks and 4 weeks of treatment, the TFGS score in the low frequency group was significantly higher than that in the other two groups, and the between-group comparisons showed statistical significance (all  $P < 0.05$ ), (Table 3).

#### 3.3.3 Comparison of the nerve conduction velocity

Before treatment, the between-group comparisons of the MCV, SCV and MAP showed no statistical significance (all  $P > 0.05$ ). After treatment, the intra-group comparisons of MCV and SCV showed statistical significance (all  $P < 0.05$ ), and those in the low frequency group were significantly better than those in the other two groups (all  $P < 0.05$ ). After 4 weeks of treatment, the comparison of MAP among the three groups showed no statistical significance ( $P > 0.05$ ), (Table 4).

**Table 2. Comparison of clinical efficacy among the three groups (case)**

Group	n	Cured	Marked effect	Effective	Invalid	Total effective rate (%)
High frequency	40	16	8	2	14	65.0
Moderate frequency	40	16	8	8	8	80.0
Low frequency	40	24	10	4	2	95.0
$\chi^2$ -value						6.920
P-value						0.031

**Table 3. Comparison of the TFGS score among the three groups ( $\bar{x} \pm s$ , point)**

Group	n	Before treatment	After 2 weeks of treatment	After 4 weeks of treatment	F-value	P-value
High frequency	40	35.41±2.32	65.39±2.81 <sup>1)3)</sup>	80.34±1.55 <sup>1)2)3)</sup>	4006.13	0.000
Moderate frequency	40	35.85±2.58	64.57±2.11 <sup>1)3)</sup>	79.68±1.78 <sup>1)2)3)</sup>	4166.48	0.000
Low frequency	40	35.32±1.89	75.69±2.35 <sup>1)</sup>	90.54±1.67 <sup>1)2)</sup>	8245.90	0.000
F-value		0.309	144.731	266.053		
P-value		0.735	0.000	0.000		

Note: Compared with the same group before treatment, 1)  $P < 0.05$ ; compared with that after 2 weeks of treatment in the same group, 2)  $P < 0.05$ ; comparison with that in the low frequency group at the same time point, 3)  $P < 0.05$

**Table 4. Comparison of the nerve conduction velocity among the three groups ( $\bar{x} \pm s$ , m/s)**

Group	n	Before treatment			After 4 weeks of treatment		
		MCV	SCV	MAP	MCV	SCV	MAP
High frequency	40	21.32±5.85	16.38±3.64	29.34±2.14	53.21±2.67 <sup>1)2)</sup>	58.38±2.38 <sup>1)2)3)</sup>	60.32±2.31 <sup>1)</sup>
Moderate frequency	40	20.18±4.88	16.78±1.32	29.38±2.32	52.98±2.04 <sup>1)2)</sup>	59.78±2.32 <sup>1)2)</sup>	59.44±1.85 <sup>1)</sup>
Low frequency	40	19.34±3.99	16.11±2.89	29.15±2.87	69.34±1.89 <sup>1)</sup>	66.11±2.49 <sup>1)</sup>	59.15±3.11 <sup>1)</sup>
F-value		0.801	0.292	0.050	355.173	59.015	1.228
P-value		0.454	0.748	0.951	0.000	0.000	0.301

Note: Compared with that before treatment in the same group, 1)  $P < 0.05$ ; compared with the low frequency group at the same time point, 2)  $P < 0.05$ ; compared with the moderate frequency group at the same time point, 3)  $P < 0.05$

#### 4 Discussion

Intractable facial paralysis is usually caused by delayed or improper treatment. A number of treatments have been invented to treat this disease including conventional acupuncture<sup>[10]</sup>. Conventional acupuncture may induce muscle spasm or even cause perversion in later stage of facial paralysis, and thus shouldn't be overused<sup>[11]</sup>. Superficial needling has gained its popularization in clinic in recent years. As a new acupuncture treatment, it is based on cutaneous regions theory in TCM which was documented in *Guan Zhen* chapter in *Ling Shu (Spiritual Pivot)* and modern clinical researches<sup>[12]</sup>. According to the peripheral treatment theory and treating where pain locates, as well as the holism concept in TCM, meridian routes, and directing qi to where disease locates, the blood circulation can be improved, and the swelling and pain can be eliminated by this treatment<sup>[7]</sup>.

In this research, the comparison of the TFGS score among the three groups before treatment showed no

statistical significance. After treatment, the TFGS scores all dropped obviously in the three groups, and the improvement of the TFGS score in the low frequency group was more significant than that in the high frequency group and moderate frequency group, indicating that low frequency superficial needling has a better treatment effect in improving TFGS in intractable facial paralysis patients. A further comparison of nerve conduction velocity showed that after treatment, MCV, SCV and MAP in the three groups all improved significantly. Moreover, the improvements of MCV and SCV in the low frequency group were more significant than those in the other two groups. Such results may be related to the therapeutic mechanism, in which superficial needling has the functions including dredging meridians, promoting qi and blood circulation, eliminating inflammation and pain, and reducing edema. Such treatment can alleviate pain in a short time and adjust the nervous and humoral systems to gain a better clinical effect<sup>[13-14]</sup>. Besides, superficial needling therapy only manipulates on superficial fascia region,

and thus can avoid repeated damage to skin-muscle tissues. Since patients won't feel obvious discomfort, this treatment has wide acceptance<sup>[15-16]</sup>. While the reasons causing the difference of clinical effect when using different frequencies during treatment still require further investigation.

Concerning the clinical effect, our research showed the comparison of overall clinical effect had statistical significance among the three groups. With an effective rate of 95.0%, the low frequency superficial needling group ranked the highest. While the difference between the low frequency group and the moderate frequency group showed no statistical significance, indicating that the low frequency superficial needling has a better treatment effect for intractable facial paralysis, and therefore such treatment is recommended.

Clinical studies have showed that superficial needling also has a satisfactory clinical efficacy for other diseases besides intractable facial paralysis<sup>[17-20]</sup>. For example, He QT, *et al*<sup>[17]</sup> used superficial needling plus rehabilitation training to treat post-stroke shoulder pain, and the result showed that such method could enhance the effective rate and reduce complication and relapse, and therefore improve patients' satisfaction. Xiang CY, *et al*<sup>[18]</sup> used superficial needling to treat lumbar disc herniation, and the result showed that compared with filiform needle, superficial needling had a better effect for lumbar disc herniation. Zhou ZH, *et al*<sup>[19]</sup> used superficial needling plus rehabilitation training to treat post-stroke shoulder-hand syndrome, and the result showed that patients' upper limb movement function gained a satisfactory recovery after treatment. About safety, a large number of clinical studies showed that superficial needling was both safe and effective, together with high patient acceptance<sup>[21-23]</sup>.

Above all, superficial needling is effective for intractable facial paralysis<sup>[24-25]</sup>. Moreover, for treating multiple positive points in the same or related areas, low frequency superficial needling can achieve the same therapeutic effect with fewer puncturing sites<sup>[26-27]</sup>. This method is safe and effective, and worth clinical popularization.

#### Conflict of Interest

There was no potential conflict of interest in this article.

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#### Statement of Informed Consent

Informed consent was obtained from the patients in this study.

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