

Research Progress of Acupuncture in the Treatment of Post-Stroke Swallowing Disorder

Wanli WANG^{1*}, Hongan ZHANG¹, Zihao YU², Xuewu LIN³

1. Bengbu Traditional Chinese Medicine Hospital, Bengbu 233400, China; 2. Anhui University of Chinese Medicine, Hefei 233000, China; 3. First Affiliated Hospital of Bengbu Medical University, Bengbu 233400, China

Abstract Post-stroke swallowing disorder is an important factor affecting the rehabilitation of stroke patients. There are many clinical treatment methods such as physical therapy and acupuncture. From the literature in recent years, acupuncture points, acupuncture manipulation, acupuncture amount, combined with other treatment methods, and acupoint selection based on syndrome differentiation are reviewed. It is clinically proved that acupuncture is effective in treating stroke accompanied by swallowing disorder. Different acupuncture methods need to select different acupoints, and different doctors have different acupuncture techniques, which reflects the syndrome differentiation and treatment of traditional Chinese medicine. Summarizing the literature is convenient in guiding patients to select acupoints more precisely and easily in treatment. In the future, more patient samples, multiple clinical centers and more standardized controlled clinical trials will be adopted to find out the theoretical basis of traditional Chinese medicine for acupuncture treatment of post-stroke swallowing disorder and the specific effective acupoints in acupuncture treatment, so as to facilitate learning, communication, popularization and application in primary clinical practice.

Key words Stroke sequelae, Swallowing disorders, Acupuncture therapy, Review

1 Introduction

Stroke refers to a cerebral circulatory disorder caused by sudden cerebrovascular occlusion or thrombosis. Partial or complete damage to brain function leads to limb function paralysis, and swallowing disorder is a common complication^[1]. Swallowing disorder refers to the process in which the function or coordination of swallowing organs is impaired, resulting in the inability to form swallowing action and the inability of food to pass through the mouth-esophagus-stomach^[2]. The incidence of difficulty in swallowing and swallowing disorder during acute attack of stroke is about 40%, and the incidence of bulbar palsy swallowing disorder caused by brainstem lesions is 51%^[3], which is one of the most common complications. Swallowing disorder can lead to coughing in drinking water, difficulty in eating, uncoordinated swallowing movements, accidental inhalation into esophagus, aspiration pneumonia and serious suffocation. Some patients are afraid to eat, resulting in malnutrition and even systemic failure, which is life-threatening^[4]. This paper summarized the literature on acupuncture treatment of post-stroke swallowing disorder in the past five years, so as to facilitate the understanding of the research progress and existing problems of post-stroke swallowing disorder, and provide an effective basis for clinical treatment and research.

2 Acupuncture therapy

Ding Xuehui *et al.*^[5] clinically studied 88 patients with swallowing disorder after stroke, and randomly divided them into treat-

ment group and control group with 44 cases each. The treatment group was given acupuncture treatment, selecting acupoints such as Fengchi, Yingxiang and Xiaguan. The observation group was given rehabilitation training in oropharynx and maxilla. After treatment, the swallowing function and quality of life of the two groups were improved, and the total effective rate of the treatment group was 93.18%, while the total effective rate of the control group was 81.82%.

Wang Zhijie *et al.*^[6] randomly divided 80 patients with stroke accompanied by swallowing disorder into treatment group (40) and control group (40). Both groups of patients had cough and swallowing disorders after drinking water. The treatment group was given acupuncture treatment, and the acupoints were selected at Wangu, Lianquan, Hegu, and Sanyinjiao. The observation group was given respiratory muscle, swallowing muscle training, and swallowing organ cold stimulation treatment. The total effective rate of the treatment group was 87.5%. The improvement in swallowing function and cough symptoms after drinking water was better than that of the control group (75%), and the score of swallowing disorder in the control group was higher than that in the treatment group, and the difference was statistically significant.

Luo Jing *et al.*^[7] randomly divided 72 cases of brainstem infarction complicated with swallowing disorder into treatment group and control group. The treatment group was treated with acupuncture, selecting acupoints such as Baihui, Shenting and Yintang, while the control group was treated with routine rehabilitation training, such as oral and tongue muscle training, swallowing function training and eating training. In the acupuncture treatment group, swallowing disorder was significantly improved. Chinese medicine believes that if mental function cannot work normally, discomfort occurs in the throat, the acupuncture method for regulating the mind and relieving sore-throat can be used to regulate the

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* Corresponding author. Wanli WANG, attending physician, research fields: traditional Chinese medicine acupuncture and massage.

governor meridian, stimulate the brainstem function, and repair the damaged glossopharyngeal nerve and central nervous system.

Huang Hailong^[8] clinically studied 80 patients with swallowing disorder after stroke, and the control group was given rehabilitation training including pharyngeal stimulation and ice stimulation. On this basis, the treatment group received acupuncture treatment, and the selected acupoints included Wangu, Yiming and Tianrong. After treatment, the swallowing function and quality of life of patients were significantly improved, and the total effective rate of the treatment group (97.5%) was significantly better than that of the control group (80%), the curative effect was significant.

Li Yan *et al.*^[9] clinically observed 80 patients with stroke accompanied by swallowing disorder, and they were randomly divided into treatment group (40 cases) and control group (40 cases). The control group was given conventional acupuncture treatment, and the middle line of vertex and 1/5 below the anterior oblique line of the parietal temporal of acupuncture point on the head, Fengchi, Lianquan, Jinjin and Yuye were selected for acupuncture and bleeding. The control group was treated with acupuncture alone. The overall effective rate of the treatment group was 85%, and the total effective rate of the control group was 62%. The swallowing function of the treatment group was obviously recovered.

3 Electroacupuncture therapy

Liang Jing *et al.*^[10] believed that after stroke, the cortical medullary tract was damaged, causing dysfunction of tongue muscle and soft palate, swallowing disorder, choking and coughing after drinking water, congestion of wind and phlegm, blood stasis blocking brain collaterals, resulting in brain disorders, poor function of the tongue, and swallowing disorder. Electroacupuncture was performed at Lianquan, Jialianquan and four acupoints in the throat, to replenish qi and activate blood circulation, and dissipate phlegm for resuscitation. The swallowing function of the 62 cases in the treatment group was completely recovered, and the total effective rate was 93.55%, higher than that of the control group (73%). Electroacupuncture at Lianquan and Jialianquan points could significantly improve the swallowing function of patients.

Yang Ying *et al.*^[11] believed that electroacupuncture could stimulate brainstem function and repair the central nervous system of swallowing function. In a clinical study, 60 patients with post-stroke swallowing disorder were studied. The treatment group was given electroacupuncture to stimulate auricular points (heart and throat) with a current of 1 mA and a frequency of 5 Hz. Intermitent waves were selected for 30 min. The control group was treated with simple acupuncture, taking Lianquan, Yuye and other acupoints. The total effective rate of swallowing function in the treatment group was improved (86.7%), which was significantly higher than that in the control group (60%). Electroacupuncture

promoted the repair of brainstem function and was more conducive to the recovery of swallowing function.

4 Special acupuncture

4.1 Tongue acupuncture therapy Bao An'an^[12] randomly divided 77 patients with ischemic stroke with swallowing disorder into treatment group (36 cases) and control group (41 cases). On the basis of routine rehabilitation training in the control group, tongue acupuncture treatment was added in the treatment group, and the acupoints Jinjin and Yuye were selected and punctured for bleeding, with Lianquan and Fengchi retaining the needle for 20 minutes. Tiantu and Yamen were deeply pricked, and traditional Chinese medicine was given to reduce phlegm and promote blood circulation. The total effective rate of the treatment group was 91.67%, which was significantly higher than that of the control group (82.93%). Tongue acupuncture therapy can directly act on the glossopharyngeal nerve and the surrounding paralyzed tongue muscle groups, promote the recovery of glossopharyngeal function and repair swallowing function.

Liu Wenyu *et al.*^[13] clinically studied 96 patients with post-stroke swallowing disorder. The control group was given simple rehabilitation training, such as swallowing training, while the treatment group was given three tongue needles (Shanglianquan, Zuolianquan and Youlianquan), acupoint on the tongue, spleen acupoint and other auxiliary acupoints on the basis of treatment in the observation group, and evaluated the improvement in swallowing disorder and water swallow test in the two groups. After treatment, the effective rate of treatment in the observation group (95.83%) was significantly higher than that in the treatment group (81.25%). The three tongue needles directly acted on the hyoid bone muscle group and laryngopharyngeal muscle group, promoting the repair of tongue-laryngopharyngeal movement and improving swallowing function.

Chen Zhixiu *et al.*^[14] randomly divided 64 patients with post-stroke swallowing disorder into a treatment group of 32 cases and a control group of 32 cases. The control group was given swallowing rehabilitation training, and the treatment group was given tongue acupuncture treatment on this basis, taking acupoints Lianquan, Haiquan, Juquan, *etc.* Clinical studies have shown that tongue acupuncture can effectively stimulate the excitation of cerebral cortex nerves, promote the contraction of swallowing target muscles, and improve the overall swallowing function.

4.2 Elongated needle therapy Liu Xing *et al.*^[15] clinically studied 65 patients with swallowing disorder after stroke, and divided them into two groups. 32 cases in the control group were treated with conventional acupuncture, and 33 cases in the treatment group were treated with elongated needle therapy, taking acupoints Tiantu, Zusanli and Sanyinjiao. The amplitude of surface electromyography in the treatment group increased significantly, and the swallowing function was improved. The total effective

rate of the treatment group was 81.82% , which was significantly higher than that of the control group (56.25%). The amount of acupoint stimulation was large for elongated needle therapy, the cerebral cortex stimulation was obvious, and the muscle strength and coordination of swallowing muscles were significantly improved.

Yu Haozhe *et al.*^[16] used elongated needle at acupoints Tiantu and Fengchi, combined with acupuncture with three tongue needles, to promote the rise of Yang meridian, accelerate cerebral blood flow, perfuse adequately, and nourish the marrow. Elongated needle at Tiantu could promote glossopharyngeal blood circulation, relieve glossopharyngeal muscle spasm, and improve swallowing function.

Jiang Zhongyan *et al.*^[17] randomly divided 90 patients with post-stroke swallowing disorder into 30 cases in elongated needle therapy group, 30 cases in ordinary acupuncture group and 30 cases in swallowing training group. The commonly used water swallow test score was used. In the elongated needle therapy group, acupoints Tiantu, Zusanli and Shanglianquan were pricked. The effective rate of the elongated needle therapy group was significantly better than that of the filiform needle group and conventional rehabilitation group.

4.3 Acupuncture method of inducing resuscitation Liu Qiu *et al.*^[18] used the acupuncture method of inducing resuscitation combined with acupuncture and bloodletting to treat post-stroke swallowing disorder. 86 patients were clinically studied. The treatment group added the acupuncture method of inducing resuscitation on the basis of routine rehabilitation training in the control group. The main acupoints were Shuangneiguan, Shuigou and Sanyinjiao, and Jinjin and Yuye were punctured for bleeding. The total effective rate of the treatment group was 93.02% , and the total effective rate of the control group was 69.77% . The acupuncture method of inducing resuscitation could obviously improve the blood circulation of the brain, enhance the healthy atmosphere of the whole body's viscera, refresh the brain, regulate the mind and dredge the collaterals, restore the central regulation function of glossopharyngeal nerve, promote the repair of glossopharyngeal nerve and improve swallowing function.

Zhang Jun *et al.*^[19] adopted the acupuncture method of inducing resuscitation summarized by Academician Shi Xuemin, and believed that this acupuncture method could regulate the mind and guide qi, promote resuscitation and remove phlegm. 86 patients with post-stroke swallowing disorder were clinically studied. The observation group was given the acupuncture method of inducing resuscitation, which deeply punctured Shuigou, Yifeng, Neiguan and other points, and kept the needle for 30 min, significantly improving symptoms such as swallowing disorder and cough after drinking water. The acupuncture method of inducing resuscitation could regulate the governor meridians, induce the resuscitation and calm the mind, promote blood supply to the brain, improve swallowing muscle strength and restore swallowing function.

Zheng Wei *et al.*^[20] believed that the acupuncture method of inducing resuscitation could regulate vertebrobasilar artery blood supply and increase cerebral blood circulation, and clinically studied 120 patients with swallowing disorder after stroke. In the treatment group, the acupuncture method of inducing resuscitation was adopted, and the points were selected at Chize, Shuigou and Sanyinjiao, which mainly improved the ischemia of the medulla oblongata, refreshed the brain, and regulated the nerve function of the cerebral cortex and brainstem bundle, and had obvious curative effect on the improvement of swallowing function.

5 Comprehensive therapy

5.1 Acupuncture combined with rehabilitation therapy Cai Chang *et al.*^[21] believed that acupuncture in the cerebral cortex localization area could resolve phlegm and clear orifices, promote qi, promote blood circulation and relieve the pharynx, and promote the recovery of medulla oblongata function. 36 patients with post-stroke swallowing disorder were studied clinically. The control group was given oral and facial muscle training, including swallowing training, throat ice stimulation training, breathing training, *etc.* The treatment group was given acupuncture treatment (Baihui, sensory area, motor area), Fengchi, Lianquan and other points, and the efficacy was judged after 30 d of continuous treatment in both groups. After treatment, the cerebral hemodynamic indicators increased and the SSA score decreased in both groups, and the cerebral hemodynamic indexes were more obvious and the SSA score was lower in the treatment group than that in the observation group, and the difference was statistically significant ($P < 0.01$); after treatment, the total score of brain-derived neurotrophic factor (BDNF) level in both groups increased, and the BDNF in the treatment group was higher than that in the control group after treatment, with significant difference; the surface electromyography scores of subhyoid muscle group and submental muscle group increased, and the increase in the treatment group was significantly higher than that in the control group.

Ye Xiucan^[1] believed that acupuncture at Lianquan point could stimulate the repair of superior laryngeal nerve and parasympathetic nerve. 80 patients with post-stroke swallowing disorder were clinically studied. The control group received swallowing and feeding training, and the treatment group received acupuncture combined with traditional Chinese medicine rehabilitation training. The acupoints Lianquan and Fengchi were punctured, and Jinjin and Yuye were pricked for slight bleeding. The throat wall cotton swab stimulation training was used as traditional Chinese medicine training, the total effective rate in the treatment group (97.5%) was significantly higher than that in the control group (80.0%), and the swallowing function recovery in the treatment group was better than that in the control group.

5.2 Acupuncture therapy combined with traditional Chinese medicine treatment Zhao Yongjun^[22] used acupuncture therapy

combined with Bushen Huoxue Decoction to treat 60 patients with swallowing disorder after cerebral infarction, selecting acupoints such as Fengchi, Wangu and Yifeng, and comparing the patients according to the water swallow test. The effect of the treatment group was significantly better than that of the control group. Chinese medicine decoctions such as Astragalus membranaceus, Codonopsis pilosula and Atractylodes macrocephala had the curative effects of tonifying liver and kidney, cultivating the yuan and consolidating the foundation. Acupuncture had the effects of refreshing the brain, inducing resuscitation, relieving sore-throat, improving vertebrobasilar artery blood supply and increasing cerebral blood flow.

Ding Yong *et al.* [23] used acupuncture combined with traditional Chinese medicine ice stimulation to treat 92 patients with swallowing disorder after ischemic stroke, puncturing Fengfu, Yamen and other points. The Chinese medicine (musk and borneol) was frozen at -4°C , and the throat wall was stimulated with Chinese medicine sticks. The treatment results showed that the cerebral blood flow in the cerebral infarction area increased, the amplitude of surface electromyography increased, and swallowing disorders were relieved. The treatment group had significant curative effect.

5.3 Acupuncture therapy combined with machine Zhang Zhihao *et al.* [24] divided 180 patients with post-stroke swallowing disorder into treatment group (62 cases) and control group (58 cases). Acupuncture combined with low-frequency pulse electrical stimulation was used as the treatment group, and compared with the acupuncture group, the results showed that both could improve the symptoms of swallowing disorder, and the improvement in the treatment group was better.

Wei Yayun *et al.* [25] used acupuncture combined with muscle electrical stimulation physiotherapy instrument for treatment. Lianquan, Jinjin, Yuye, Fengchi and other acupoints were selected for acupuncture treatment. The results showed that neuromuscular electrical stimulation combined with acupuncture treatment could effectively improve swallowing disorders.

Xie Lei *et al.* [26] used acupuncture-assisted neuromuscular electrical stimulation to treat swallowing disorder after brainstem infarction, and Fengchi and Lianquan were taken for acupuncture, Jinjin and Yuye were punctured for bleeding. It was believed that acupuncture could improve local blood supply, increase neurotrophs, neuromuscular electrical stimulation of throat muscles, repair glossopharyngeal nerve, rebuild reflex arc, integrate the coordination of glossopharyngeal muscle groups, and significantly improve swallowing function. The total effective rate of the treatment group (93.3%) was better than that of the control group (77.8%).

5.4 Acupuncture therapy combined with moxibustion Yao Lulu *et al.* [27] used acupuncture therapy combined with moxibustion to treat post-stroke swallowing disorder. Acupuncture and moxibustion selected specific points on the hands and feet, Quchi, Hegu, Zusanli, Yanglingquan, *etc.* In the treatment group, 152

cases achieved obvious curative effect, with a total effective rate of 91.47%, which was higher than the total effective rate of 82.95% in the control group. Nerves were plastic, moxibustion and acupuncture could promote nerve function repair, improve swallowing disorder, promote spleen and stomach to transport qi and blood, and improve body nutrition.

5.5 Acupuncture combined with acupoint injection therapy

Ma Feixiang *et al.* [28] randomly divided 98 patients with post-stroke swallowing disorder into acupoint injection treatment group (35 cases), electrical stimulation group (31 cases) and combination group (32 cases). The "swallowing point" was selected as treatment point, and 1 mL of mecobalamin liquid was slowly injected. The electrical stimulation group was treated with the therapeutic instrument for subhyoid muscle group swallowing disorder, and the VFSS and tongue muscle thickness of patients with swallowing disorder were observed before and after treatment. Both acupoint injection therapy and electrical stimulation therapy could improve the VFSS score and reduce the tongue muscle thickness, and the combined therapy of the two was more effective.

6 Conclusion

Swallowing disorder after stroke is an important complication of cerebral infarction, and it falls into the category of inflexible tongue in TCM. At present, clinical treatment by Western medicine has no obvious curative effect, and the curative effect of Western rehabilitation medicine treatment such as balloon dilatation and oral ice stimulation is uncertain. Chinese medicine is a unique method and theoretical basis for acupuncture and moxibustion in the treatment of post-stroke swallowing disorder. There are many clinical reports, and its curative effect has been clinically verified, so it is well received by grassroots doctors and patients. At present, the treatment mode of combining conventional acupuncture therapy with modern rehabilitation therapy will be the trend of treatment of this disease.

However, in the existing clinical research, there are also areas worthy of consideration and further improvement. (i) The clinical efficacy standards of post-stroke swallowing disorder vary, some use the water swallow test to evaluate the efficacy standards, and some use the swallowing disorder examination to evaluate the efficacy. (ii) The sample size of clinical research is small and the course of treatment is short, so long-term follow-up observation is recommended. (iii) There are few studies on the mechanism of acupuncture and moxibustion, and more basic research and functional magnetic resonance are needed to confirm the therapeutic effect of acupuncture on neurologic impairment.

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