
Meta-Analysis of Acupoint Massage in the Treatment of Dysphagia After Stroke

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Abstract: Background: At present, the burden of stroke is very heavy. Dysphagia is one of the complications of stroke, and its incidence is very high. Dysphagia can lead to malnutrition, aspiration pneumonia, and other conditions, which seriously affect the prognosis and quality of life of patients. Promoting the functional recovery of patients with dysphagia after stroke is one of the urgent clinical problems to be solved. Objective: To evaluate the efficacy of acupoint massage in the treatment of dysphagia after stroke, and to provide evidence for the rehabilitation training program of dysphagia. Methods The clinical randomized controlled trials (RCTs) in PubMed, EMBASE, Cochrane Library, CNKI, Wanfang, China biomedical literature database (CBM) and, VIP database were searched by computer for the effect of acupoint massage as a rehabilitation intervention on dysphagia after stroke. The retrieval period is from January 2010 to November 26, 2021. Revman 5.3 software for meta-analysis. Results: A total of 13 RCTs were included in this study, with 1003 samples (500 in the intervention group and 503 in the control group). Meta-analysis showed that, compared with the control group, The improvement effective rate of water swallowing test in the head, face, and neck acupoint massage intervention group [OR = 3.71, 95%CI (2.54, 5.40), P < 0.001] was significantly increased, The standard swallowing assessment function scale score (SSA) [MD = -3.37, 95%CI (-5.20, -1.53), p = 0.0003] decreased significantly, and the difference was statistically significant. Conclusion: Current evidence shows that head, face, and neck acupoint massage can effectively promote the swallowing function rehabilitation of post-stroke patients with dysphagia, and has a synergistic effect with other rehabilitation training. It is an effective rehabilitation training method for dysphagia intervention.

Keywords: Stroke, Dysphagia, Acupoint Massage, Meta-Analysis, Rehabilitation

1. Introduction

In 2019, there were 12.2 million new stroke cases worldwide, of which 6.55 million died due to stroke or post-stroke complications, accounting for 11.6% of the total human deaths [1]. Current research shows that 28%~67% of stroke patients may have swallowing disorders [2], which can cause complications such as malnutrition, imbalance of water and electrolyte, aspiration pneumonia, dehydration and affect their prognosis and quality of life. Stroke-related dysphagia is a thorny clinical problem. Although China's diagnosis and treatment guidelines recommend rehabilitation training methods including oral sensory training, airway protection,

acupuncture, balloon dilatation, low-frequency electrical stimulation, and surface electromyographic biofeedback [3], about 50% of patients still have long-term dysphagia [4]. Acupoint massage is a commonly used traditional Chinese medicine treatment. At present, there is still no particularly effective method for the treatment of dysphagia. Each method has its advantages and disadvantages, but its methods and implementation guidelines need to be further standardized and standardized. Conventional physical therapy cannot be popularized to the community or poor patients because of its high price, complex operation, and long treatment cycle.

In recent years, Traditional Chinese Medicine (TCM) technology has made some progress in the treatment of dysphagia after stroke, and also showed its unique advantages. As one of the commonly used TCM treatment methods, acupoint massage is particularly prominent in a series of rehabilitation methods because of its economic benefits and convenient operation. In recent years, rehabilitation research on post-stroke dysphagia has gradually increased, especially the theory of "tissue fluid circulation network" has been put forward, which shows that the specific functions of acupoints need to be further studied and summarized [5]. Therefore, the purpose of this study is to conduct a meta-analysis on the randomized controlled trials of acupoint massage in the treatment of post-stroke dysphagia, in order to provide an evidence-based basis for the clinical rehabilitation of post-stroke dysphagia patients.

2. Materials and Methods

2.1. Inclusion and Exclusion Criteria

2.1.1. Inclusion Criteria

According to the PICOS principle:

P (patient or population): the subjects were patients with stroke complicated with swallowing dysfunction, which was in line with the diagnostic key points of various cerebrovascular diseases revised at the 4th National cerebrovascular disease academic conference of the Chinese Medical Association in 1995;

I (intervention): the intervention measures are acupoint massage or acupoint massage combined with other measures;

C (comparison): the control group received routine treatment and nursing or other types of intervention measures;

O (outcome): the outcome indicators were the score of the swallowing function evaluation scale, water-swallowing test, standard function evaluation scale, and repeated salivary swallowing test.

S (study design): clinical randomized controlled trial (RCT) study.

2.1.2. Exclusion Criteria

- (1) Repeated publication;
- (2) There is a research design defect or statistical method error;
- (3) The data of the article are incomplete and the outcome indicators are not clear;
- (4) Conference abstracts, research plans, and documents for which the full text is unavailable.

2.2. Literature Search

With the combination of subject words and free words, the computer searches Cochrane Library, PubMed, EMBASE,

CNKI, CBM, VIP, and Wanfang databases. The language is limited to Chinese and English, and the search scope is limited from January 2010 to November 26, 2021. The search terms include stroke, apoplexy, cerebral stroke, cerebrovascular accident, cerebrovascular apoplexy, vascular accident brain, cerebrovascular disorders, intracranial arteriosclerosis, intracranial embolism thrombosis, dysphagia, deglutition disorders, swallowing disorders, acupressure, acupoint massage, massage, tuina.

2.3. Literature Screening and Data Extraction

Two researchers independently screened the literature, extracted data and cross-checked. During literature screening, first, read the title. After excluding the irrelevant literature, further read the abstract and the full text to determine whether it is included. The contents of data extraction include (1) Basic information included in the study: research topic, first author, published journals; (2) Baseline characteristics and interventions of subjects; (3) Key elements of bias risk assessment; (4) Concerned outcome indicators and outcome measurement data.

2.4. Bias Risk Assessment

The quality of literature was evaluated by two researchers according to the "bias risk assessment tool for randomized controlled trials" developed in Cochrane manual 5.1. The methodological quality of the included studies was evaluated and cross-checked after independent evaluation. The evaluation contents include random method, allocation concealment, blind method, incomplete data, selective reporting results, and other biases.

2.5. Statistical Treatment

Revman5.3 software was used for meta-analysis. The effect indicators are as follows: the ratio (OR) is used as the effect analysis statistic for the second classification data, and the mean difference (MD) is used as the effect analysis statistic for the measurement data. Each effect is expressed in 95% confidence interval (CI). First, use the χ^2 test for statistical heterogeneity analysis (the test level is $\alpha=0.1$), and quantitatively judge the heterogeneity with I^2 . If there was no statistical heterogeneity among the results, the fixed-effect model was used for meta-analysis; If there is statistical heterogeneity among the research results, the sources of heterogeneity will be further analyzed. After excluding the influence of obvious clinical heterogeneity, the random effect model will be used for meta-analysis. The level of Meta-analysis is set as $\alpha=0.05$. Significant clinical heterogeneity was treated by subgroup analysis or sensitivity analysis, or only descriptive analysis. If more than 10 articles were included, funnel plots were drawn to evaluate publication bias.

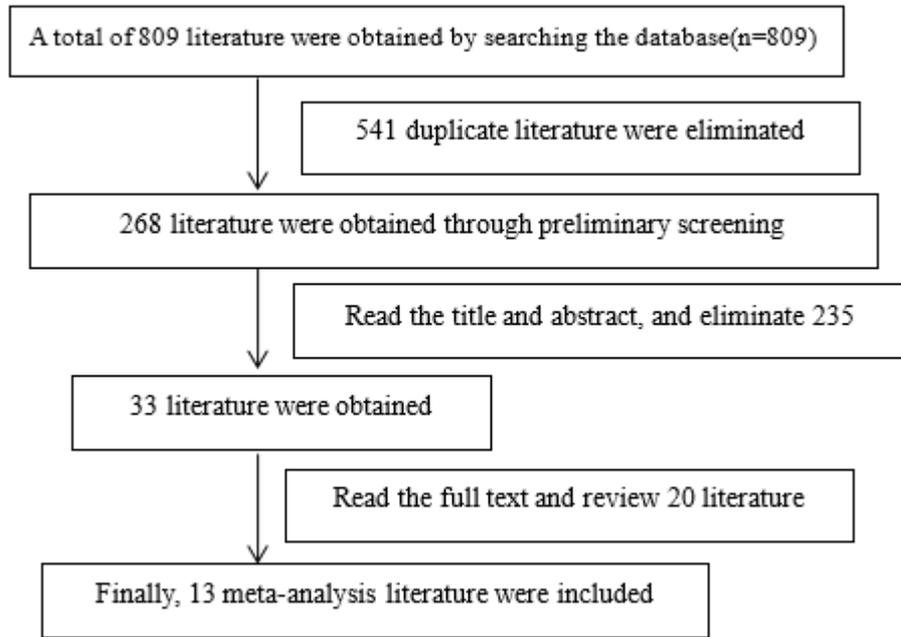


Figure 1. Document screening flow chart.

3. Results

3.1. Literature Inclusion Results

There were 715 Chinese documents and 94 English documents, a total of 809. With the help of the duplicate checking function of NoteExpress software, 541 duplicate literature were eliminated and 268 were included; Based on the inclusion and exclusion criteria, after reading the article title and abstract, 235 articles that do not conform to the theme, or that are combined with other therapies, intervention measures and outcome indicators that are obviously inconsistent, were excluded, and 33 articles were included; After further reading the full text, 13 articles were finally included in the literature, excluding 12 articles without inclusion criteria or unclear description of baseline data, 8 articles with the inconsistent or unclear description of intervention measures. The flow chart of literature screening is shown in Figure 1.

3.2. General Information Included in the Study

The total sample size of 13 included studies was 1003 cases (500 cases in the intervention group and 503 Cases in the control group).

The rehabilitation nursing measures of the control group included eating training, hyperbaric oxygen therapy, traditional Chinese medicine rehabilitation training, routine swallowing rehabilitation training, acupuncture treatment, ice stimulation, feeding training, and psychological nursing.

The intervention group increased acupoint massage based on the control group. The acupoints of the intervention group were mainly Lianquan, Fengchi, Tiantu, Fengfu, Jiache, Chengjiang, Renying, Xiaguan, Yamen, and Baihui. See Figure 2 for the selection times of main massage points.

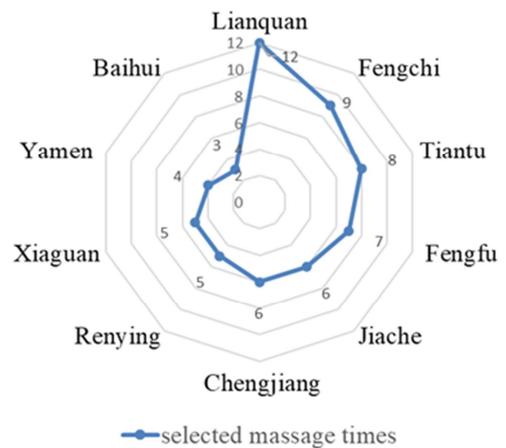


Figure 2. Acupoint massage times.

In terms of acupoint massage techniques, there are three literature [6-8] that use single massage techniques, such as pressing or kneading; Five literature [9-13] mainly focus on pressing and kneading, while the rest [14-18] combine point method, pressing method, pushing method and kneading method, and three literature [9, 14, 18] describe the specific massage operation methods in detail.

In the course of the massage, the time and frequency of acupoint massage are generally controlled at 5-20 minutes each time, about 1-3 times a day, and each acupoint is massaged for 3-5 minutes. The course of treatment is mostly about one month.

In terms of curative effect observation: eleven papers [7-16, 18] expressed the total effective rate of the water-swallowing test, and three papers [10, 14, 17] expressed it with the standard dysphagia rating scale, and two papers [9, 15] counted the incidence of aspiration pneumonia. Table 1 for the general information of the study.

Table 1. Basic characteristics of 13 literature included in the meta-analysis.

Literature	Interventions		frequency	Assessment
	experiment group	control group		
Du J [14]	Routine treatment and nursing + ice stimulation + acupoint massage	Routine treatment and nursing + ice stimulation	36 times per acupoint, 15~20 min each time, 3 times a day, 3 weeks	①②
Zhao P [9]	Hyperbaric oxygen therapy + acupoint massage	Hyperbaric oxygen therapy	20 times per acupoint, 5S each time, 1 time each day in the morning and evening, 30 days	① ④
Wang YX [10]	TCM rehabilitation training + acupoint massage	TCM rehabilitation training	5 min each time, once a day, 20 days	①⑤
Li LQ [6]	Routine treatment and nursing + acupuncture + acupoint massage	Routine treatment and nursing + acupuncture	20 min each time, 5 times a week, 4 weeks	①
Luo LL [15]	Routine treatment and nursing + acupuncture + acupoint massage	Routine treatment and nursing + acupuncture	15 min each time, twice a day, 5 days a week, 30 days	① ④⑦⑧
Zhao D [7]	Routine treatment and nursing + acupoint massage	Routine treatment and nursing	each point for 5min, twice a day, 5 days a course of treatment, 3 weeks	①
Wan T [11]	Routine treatment and nursing + ice stimulation + acupoint massage	Routine treatment and nursing + ice stimulation	20~30 min each time, 2-3 times a day, 4 weeks	①
Li P [12]	Eating training therapy + acupoint massage	Eating training therapy	10~15 times for each acupoint, 10~20 minutes for each time, once a day, 10 days	⑥
Xu W [8]	Routine treatment and nursing + acupoint massage	Routine treatment and nursing	3-5 min for each acupoint, 270 days	①⑨
Pu HP [13]	Routine treatment and nursing + acupoint massage	Routine treatment and nursing	20 times per acupoint, 5S each time, 1 time each day in the morning and evening, 21 days	①
Zhao YC [16]	Swallowing rehabilitation training + acupoint massage	Swallowing rehabilitation training	30 min each time, once a day, 2 months	①
Wang KL [17]	Swallowing rehabilitation training + acupuncture treatment + acupoint massage	Swallowing rehabilitation training + acupuncture treatment	20 min each time, 5 times a week, 4 weeks	②
Yan L [18]	Routine treatment and nursing + acupoint massage	Routine treatment and nursing	20 min each time, twice a day, 4 weeks	①⑤⑥

* ①Total effective rate of the water-swallowing test;②SSA score;③SWAL-QOL score;④Incidence of aspiration pneumonia;⑤Evaluation form for swallowing efficacy of Ichiro Fujishima;⑥Repeated salivary swallowing test;⑦Assessment of swallowing function;⑧Assessment of feeding function;⑨laboratory examination;

3.3. Bias Risk Assessment

The methodological quality of the included studies was evaluated using the Cochrane bias risk assessment tool. Among the 13 studies included in this meta-analysis, three studies [11, 15, 18] adopted the random number table method, studies [6, 9] adopted the lottery method, Wang [17] adopted the random number method, and the rest only described

"random" without specifying the specific random method; Yan [18] blinded the evaluator of the results, and the rest were not blinded; All studies did not account for allocation concealment; studies [8, 18] reported the number of cases and reasons for loss of follow-up or withdrawal, and the data and results reported in other studies were complete. Figure 3 for the quality evaluation results of the included research methodology.

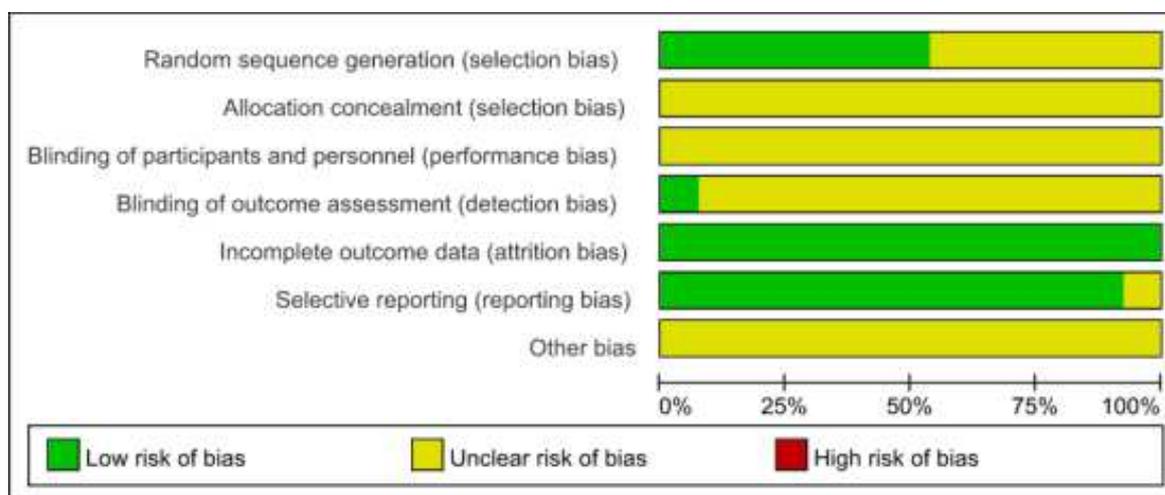


Figure 3. Quality bias risk diagram.

3.4. Meta-Analysis Results

3.4.1. Effectiveness of Water-Swallow Test

There were 11 RCTs [7-16, 18], including 878 patients. The results of meta-analysis of the fixed effect model showed that

the effective rate of acupoint massage combined with rehabilitation training was significantly higher than that of rehabilitation training alone [OR=3.71, 95%CI (2.54, 5.40)], P<0.001].

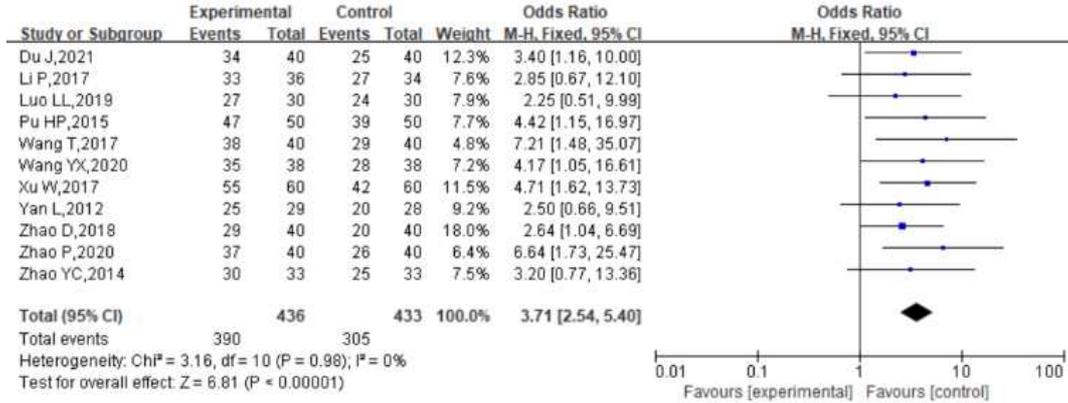


Figure 4. Effect of acupoint massage on swallowing function (effective rate).

3.4.2. SSA Swallowing Function Score

Three RCTs were included [6, 14, 17], including 205 patients. The results of meta-analysis of the random effect model showed that compared with rehabilitation training

alone, acupoint massage combined with rehabilitation training had a lower mean SSA swallowing function score, representing a better improvement of swallowing function [MD = -3.37, 95%CI (-5.20, -1.53), P = 0.0003].

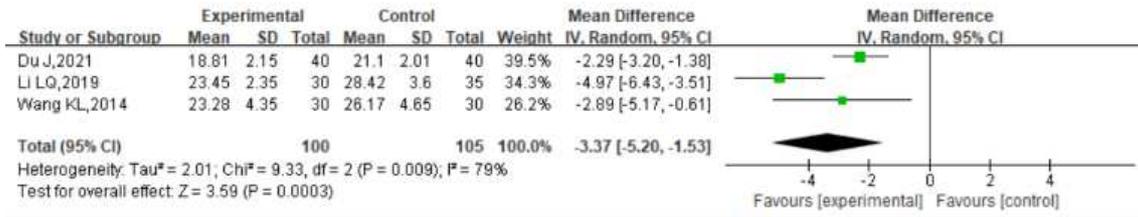


Figure 5. Effect of acupoint massage on swallowing function (Rating scale).

3.4.3. Funnel Diagram

Whether there is publication bias in this study is investigated by drawing the effective funnel. The symmetry of the funnel means that there is no publication bias. The

funnel chart results is symmetrical, the possibility of publication bias is small, and the conclusion is reliable, the result are shown in Figure 6.

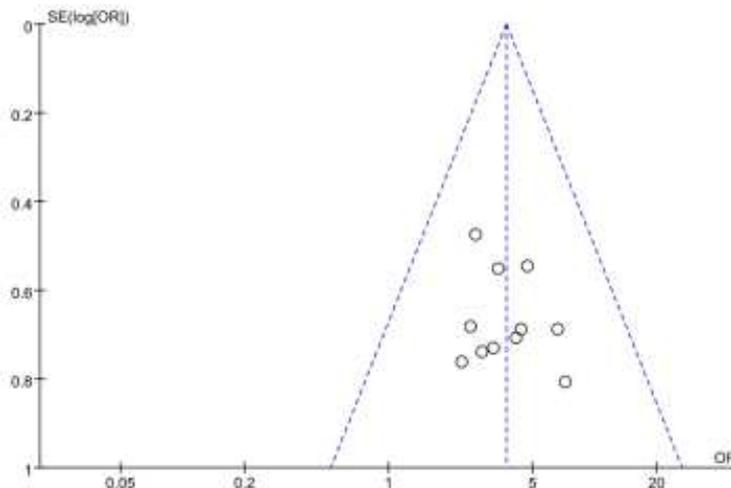


Figure 6. Funnel diagram (effective rate).

4. Discussion

4.1. Acupoint Massage Can Improve the Swallowing Function of Stroke Patients with Dysphagia

In the current research, acupoint massage is applied to patients with constipation [19], parturients [20], stroke patients [21-22], postoperative patients [23], and patients with insomnia, anxiety, and depression associated with the disease [24]. The research on stroke patients mostly focuses on the rehabilitation intervention of acupoint massage on limb disorders, and now the hot spot gradually appears on patients' swallowing disorders. A meta-analysis of acupuncture treatment for dysphagia after stroke shows that [25], Lianquan, Waijinjin, Waiyuye, and Yifeng have the highest frequency in the literature. Lianquan, Fengchi, Tiantu, and Fengfu are frequently used in this research. *The Tongren Acupoint Acupuncture Manual* explains Lian Quan can cure mouth silence, the root of the tongue shrinks rapidly, and it is difficult to eat. *Acupuncture And Moxibustion Gather Ying* explains that Fengchi can cure apoplexy, angry aphasia, Faint and danger. Therefore, there is a basis for stimulating these acupoints to effectively treat dysphagia.

The results of this meta-analysis suggest that when the effective rate of the water-swallowing test is used as the evaluation index, the 95%CI horizontal line of the effective rate of swallowing function of acupoint massage combined with other rehabilitation training in the treatment of post-stroke dysphagia falls on the right side of the ineffective line [OR=3.71, 95%CI (2.54, 5.40)], $p < 0.001$, and the overall effect is statistically significant ($Z=6.81$, $P < 0.001$). It shows that the point massage combined with rehabilitation therapy group can improve the swallowing function of stroke patients with dysphagia and improve the effective rate. The obvious effect of acupoint massage may be since acupoint massage follows the meridian theory, uses the same principle as acupuncture to treat energy channels in organs and muscle groups and acupoints on the body, and combines with anatomical and pathological diagnosis to enhance the tension of cheek muscles, enhance the coordination ability of mouth, lip and tongue, induce swallowing action and promote the recovery of swallowing sensation [26]. At the same time, some studies [27] pointed out that low-intensity electroacupuncture stimulation of Zusanli acupoint in mice can activate the vagus nerve and adrenal gland to open the anti-inflammatory pathway, which reflects the mechanism of mutual regulation of peripheral organ functions in the central nervous system. What is particularly noteworthy is that according to the physical distribution characteristics of such nerves, it provides a modern neuroanatomical basis for the existence of relative specificity of acupoints.

4.2. Acupoint Massage Can Reduce the Standard Dysphagia Score of Stroke Patients with Dysphagia

The standard swallowing function scale is an important index to comprehensively evaluate the intervention effect of

patients with dysphagia, and is often used as one of the main evaluation indexes by researchers. The results of this meta-analysis show that, compared with rehabilitation training alone, the 95%CI horizontal line of the standard swallowing function score of point massage combined with rehabilitation training in the treatment of post-stroke dysphagia falls to the left of the invalid line, [MD = -3.37, 95%CI (-5.20, -1.53), $P < 0.05$], and the overall effect measure has statistical significance ($Z = 3.59$, $P < 0.0003$), indicating that point massage can reduce the standard swallowing function score of post-stroke dysphagia patients and improve swallowing function, This is consistent with the research results of the scholar [28].

Acupoint massage is a treatment method for manual stimulation of designated acupoints, which has a significant effect on dysphagia, possibly because the selected acupoints of these included studies are related to the acupoints related to swallowing in the head, neck, and face. Chinese scholars [5] have shown through a series of morphological research data that the anatomical structure of human tissue fluid transmission path is closely related to the distribution of acupoints in the limbs, and can form a continuous channel from specific peripheral acupoints to internal organs. The above findings provide a new perspective for the study of acupoints and meridians. At the same time, domestic studies have also shown that stimulation of acupoints can dredge the meridians, regulate meridians and Qi, restore the balance of Qi and blood in the viscera, guide the somatic sensory system into impulses, and induce the reconstruction of central function and improve limb function through dual stimulation of the brain and periphery [29]. The above basis provides a theoretical basis for acupoint massage in the treatment of diseases.

4.3. Acupoint Selection and Manipulation Analysis of Acupoint Massage

The acupoint therapy of traditional Chinese medicine generally has the characteristics of taking acupoints near the body and along the meridians. At present, there is not enough research to clarify the optimal acupoint compatibility for certain symptoms. In the literature included in this meta-analysis, the acupoints of acupoint massage mainly include Lianquan, Yamen, Fengchi and Fengfu, Yifeng, Jinjin, and Yuye This is similar to the acupuncture point results of Ai [30] on the treatment of dysphagia after stroke through data mining technology. At the same time, Li [31] found that Fengchi, Lianquan, Yifeng, Jinjin, and Yuye have the highest utilization rate in acupuncture treatment of dysphagia through data cluster analysis and correlation analysis, and have a high probability of a combination, which can be regarded as the commonly used acupoints for dysphagia treatment.

From the perspective of modern medicine, Fengfu, Fengchi, Yifeng, Lianquan, and other acupoints are located in the glossopharyngeal and vagus nerve fiber innervation areas. Stimulating these acupoints can make their excitement reach

the intermediate neurons through the afferent neurons. After analysis and synthesis, they will send out impulses or increase the transmitted impulses to the effectors to make the effectors respond. In terms of manipulation, the literature mainly combines clicking and finger rubbing, which is in line with eleven kinds of massage techniques recorded in the ancient Chinese medicine book *Neijing*. When pressing and kneading, the strength of the thumb pulp is generally from light to heavy, and the patient has an acid swelling feeling and tolerance. It can stimulate specific acupoints to achieve the purpose of dredging meridians and activating collaterals, eliminating pathogenic factors and strengthening health, adjusting body functions, and accelerating the repair and reconstruction of swallowing reflex arc, to improve the swallowing function of patients with swallowing disorders.

5. Conclusion and Prospects

This meta-analysis verified that the effect of acupoint massage in improving the swallowing function of patients with dysphagia after stroke is accurate, which can be popularized in clinical rehabilitation. However, there are still some limitations to this study. Because acupoint massage belongs to traditional Chinese medicine, there are few foreign literature, and all of them are in Chinese; Secondly, the number of included literature is small, the sample size is insufficient, and the quality of some of them is low; Only two of the included literature described the incidence of aspiration pneumonia, and no other adverse reactions or complications were reported, which may adversely affect the accuracy of meta-analysis results. Future research can focus on improving the quality of methodology. Multi-center, large sample size research, and increasing the follow-up time can be added to the research.

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