Application of dietary training combined with acupuncture based on syndrome differentiation for treating dysphagia in stroke rehabilitation patients

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Abstract

Introduction: Stroke-induced dysphagia significantly impacts patients' nutritional status, quality of life, and rehabilitation outcomes. Conventional therapy primarily involves dietary training, while acupuncture and moxibustion have been used in complementary medicine. This study aims to evaluate the efficacy of combining dietary training with acupuncture and moxibustion based on syndrome differentiation in improving dysphagia outcomes in stroke rehabilitation patients.

Material and methods: A retrospective cohort study, conducted from June 2021 to December 2023, included 206 stroke patients (aged 40 to 80 years) with stable dysphagia. Patients were divided into two groups: an individual treatment group (n = 102) receiving standard dietary training, and a combination treatment group (n = 104) receiving dietary training with acupuncture and moxibustion. The intervention lasted 6 weeks. Nutritional status, swallowing function (evaluated via Kubota drinking test and videofluoroscopic swallowing study – VFSS), quality of life, depression, self-esteem, and patient satisfaction were assessed before and after treatment.

Results: Pre-treatment demographics and clinical characteristics showed no significant differences between groups. Post-treatment results indicated significant improvements in the combination group compared to the individual group across all parameters: nutritional status (triceps skin fold – TSF, middle arm muscle circumference on the healthy side – AMS, hemoglobin – Hb, serum albumin – ALB, serum prealbumin – PA), swallowing function (Kubota test, VFSS scores: higher in combined, p = 0.028), quality of life (SF-36 scores), depression (SDS scores: lower, p = 0.022), self-esteem (SES scores: higher, p = 0.005), and patient satisfaction (70.19% vs. 54.9%, p = 0.034). Correlation analysis confirmed the positive associations between combined treatment and outcomes (e.g., post-TSF r = 0.196, p = 0.005).

Conclusions: Combining dietary training with acupuncture and moxibustion based on syndrome differentiation significantly enhances nutritional status, swallowing function, quality of life, and patient satisfaction among stroke rehabilitation patients with dysphagia, compared to dietary training alone. This integrative approach presents a promising adjunctive therapy for post-stroke dysphagia, warranting further investigation in larger, randomized controlled trials.

Key words: stroke rehabilitation, dysphagia, acupuncture, moxibustion, nutritional status, quality of life.

Introduction

Stroke is a leading cause of disability and mortality worldwide, affecting millions of individuals annually [1]. A significant and often debilitating consequence of stroke is dysphagia, or difficulty swallowing, which impacts approximately 30% to 65% of stroke survivors in the acute phase and about 11% to 50% in the chronic phase [2]. Dysphagia substantially increases the risk of malnutrition, dehydration, aspiration pneumonia, and reduced quality of life, thereby complicating the rehabilitation process and impeding overall recovery [3–5]. Given these dire implications, effective management of dysphagia is paramount in stroke rehabilitation.

Current strategies for managing dysphagia primarily involve dietary modifications, swallowing exercises, and, in severe cases, enteral feeding methods such as nasogastric or percutaneous endoscopic gastrostomy tubes [6, 7]. While these approaches are critical, their efficacy can be limited, and they often require supplementation with adjunctive therapies [8]. Emerging research suggests that integrating traditional and complementary medical practices, such as acupuncture, can enhance rehabilitation outcomes for stroke patients suffering from dysphagia [9, 10].

Acupuncture, rooted in traditional Chinese medicine (TCM), involves the insertion of fine needles at specific points on the body to stimulate anatomical regions [11]. According to TCM principles, stroke-induced dysphagia is often tied to disruptions in the flow of qi (vital energy) and blood, particularly within the meridians governing the upper digestive tract. Acupuncture aims to restore balance and promote healing by regulating these flows [12, 13]. Modern biomedical research supports acupuncture's potential benefits through mechanisms such as neuroplasticity enhancement, anti-inflammatory effects, and autonomic nervous system modulation [14, 15].

The integration of acupuncture into stroke rehabilitation frameworks has garnered attention due to its non-invasive nature and minimal side effects [16]. Previous studies have demonstrated acupuncture's efficacy in improving various aspects of post-stroke recovery, including motor function, spasticity, and cognitive function [17–19]. However, there is a paucity of robust clinical data specifically addressing the impact of acupuncture on post-stroke dysphagia.

The concept of syndrome differentiation, or "Bian Zheng", is fundamental in TCM, allowing for personalized treatment plans that align with patients' specific pathological states. This tailored approach ensures that acupuncture therapy is directed towards the unique manifestation of dysphagia in each patient, potentially enhancing therapeutic outcomes [20, 21].

Dietary training, focusing on modifying food textures and employing specific swallowing techniques, remains the cornerstone of dysphagia management in conventional medicine. It serves to retrain the swallowing muscles, improve safety during eating, and adapt the patient's diet to their swallowing capabilities [22, 23]. Combining dietary training with acupuncture based on syndrome differentiation may offer a synergistic effect, optimizing both the physiological and psychological aspects of dysphagia recovery [24].

The present study was designed to explore the efficacy of dietary training combined with acupuncture based on syndrome differentiation in treating dysphagia among stroke rehabilitation patients. It was hypothesized that this integrative approach would yield superior outcomes in swallowing function, nutritional status, quality of life, psychological well-being, and patient satisfaction compared to dietary training alone.

Material and methods

Inclusion and exclusion criteria

Participants were selected based on the following criteria: had a disease duration ranging from 2 to 6 months and were aged between 40 and 70 years, no history of mental illness, normal cognitive function (Mini-Mental State Examination (MMSE) score ≥ 16 points), conscious (GCS score ≥ 12 points) and ability to cooperate with treatments and examinations. Clinically, they were diagnosed with either initial cerebral infarction or cerebral hemorrhage, confirmed by head computed tomography (CT) or magnetic resonance imaging (MRI). Their dysphagia, rated between levels 2 and 6 on the Dysphagia Outcome and Severity Scale (DOSS), was mild to moderate and identified in the pharyngeal or oropharyngeal phase via videofluoroscopic swallowing study (VFSS). The subjects demonstrated the ability to elicit swallowing and coughing reflexes. In the Wakita water drinking test, they achieved a grade of three. Excluded from the study were individuals with malignant tumors, severe internal diseases, other neurological disorders, cognitive impairments, non-stroke-related swallowing disorders, those who had undergone head, neck, or gastroesophageal surgery, and those with pulmonary infections.

This retrospective cohort study included 206 patients with stable dysphagia in the recovery phase following a stroke, who were treated at our hospital in the period from June 2021 to December 2023. Data on patients' demographics, general information, nutritional indicators, swallowing function, adverse reaction symptoms, quality of life (as measured by the SF-36 score), depression (as measured by the Self-Rating Depression

Scale (SDS), and self-esteem (as measured by the Self-Esteem Scale, SES) were collected through medical records. Given that this retrospective study utilized de-identified patient data, there was no potential harm or impact on the medical care of the patients; thus, informed consent was waived.

Grouping methods

Based on the different treatment methods employed, patients were divided into two groups: an individual treatment group (n = 102) and a combination treatment group (n = 104). The individual treatment group, henceforth referred to as the "individual group", received dialectical acupuncture therapy six times per week, with an interval of 1 day, for a total duration of 21 days. In contrast, the combination treatment group, referred to as the "combined group", underwent feeding training in addition to the treatment received by the individual group. This training consisted of sessions lasting 15 to 20 min, conducted twice daily, six times per week, also for a total duration of 21 days.

Acupuncture treatment regimen

Subjects in the control group received acupuncture treatments six times per week, with 1 day between sessions, over a course of 21 days.

1. Treatment for Oral Cavity Disorders: The therapeutic approach focused on draining excess to stimulate the Yangming meridian, thereby promoting the circulation of qi and blood.

Acupoints: Primary acupoints included Dicang (ST4), Jiache (ST6), Daying (ST5), Xiaguan (ST7), Fenglong (ST40), Shenmen (HT7), and Tongli (HT5).

Procedure: Participants were positioned supine. Aseptic procedures were applied before inserting 0.3 mm × 40 mm filiform needles. Dicang was punctured in a transverse direction towards Jiache or Daying, to a depth of 35–38 mm. The needles were manipulated using the twisting-draining technique until a sensation of soreness and distension was achieved. The needle was retained for 4–6 h. Xiaguan was directly punctured to a depth of 30–35 mm, aiming for radiating sensations toward the lips. Other acupoints were punctured following standard needling techniques with a retention time of 30 min. This process was repeated six times weekly, with 1 day of rest between sessions. Following acupuncture, while seated, patients were instructed to protrude their tongues. Using a 0.35 mm × 40 mm fire needle, three points along the midline of the tongue, each spaced one inch apart, were punctured after heating the needle until white-hot. The depth was approximately 2 mm, causing visible muscle contractions. This procedure was conducted once per week.

2. Treatment for Throat Disorders: The approach aimed to harmonize the exterior and interior regions, invigorate the Shaoyang meridian, and facilitate qi and blood circulation.

Acupoints: Primary acupoints were Tianrong (SI17), Tianyou (TE16), Waiguan (TE5), Guangming (GB37), Taichong (LR3), and Daling (PC7).

Procedure: Patients assumed a supine position, and standard disinfection was performed. A 0.3 mm × 75 mm filiform needle was inserted transcutaneously at the Tianyou acupoint to a depth of approximately 60 mm. Given the abundance of nerves and blood vessels at this site, needles were inserted slowly without employing thrusting or twisting techniques. Standard needling was used on other acupoints; Waiguan and Guangming were stimulated using the lifting-thrusting draining technique until the arrival of qi was felt. At Tianrong and Daling, needling was performed without supplemental or draining techniques, with a retention time of 30 min. Following the same frequency as above, a 0.35 mm × 75 mm fire needle was used post-acupuncture. The nasal cavity was opened using a nasoscope, allowing an electric pen to be used to locate the orifice of the eustachian tube. The fire needle was heated and inserted to a depth of about 70 mm, targeting a sensation radiating to the throat and eyes, achieving optimal results when patients reported eye moisture and clarity. This was performed weekly.

3. Treatment for Esophageal Disorders: The focus was on nourishing with supplementation to strengthen the Yangming meridian and replenish qi and blood.

Acupoints: The "Three Protrusion Points" – Shuitu (ST10), Tiantu (CV22), Futuo (ST30) – were used in conjunction with Danzhong (CV17) and Chize (LU5) to open the orifices and benefit the throat.

Procedure: While the patient was supine, routine aseptic procedures were conducted. A 0.30 mm × 40 mm filiform needle was inserted horizontally at Danzhong to a depth of 30–38 mm, with other acupoints receiving standard needling techniques. For Chize, the twisting-draining method was used, with needles retained for 30 min, applied according to the same treatment frequency as mentioned above. With the patient seated, the throat's posterior wall was examined using an electric pen. A 0.35 mm × 75 mm fire needle, heated until white-hot, was used to puncture the wall for bloodletting, extracting approximately 1 ml of blood in a session, conducted weekly.

Feeding training protocol

1. Pre-training Assessment: The initial assessment is conducted by a specialized rehabilitation nurse using the Food Volume-Viscosity Swallow

Test Assessment Form. This evaluation determines the optimal viscosity and volume of liquids suitable for the patient.

Assessment Procedure:

Step 1: A thickening agent is mixed with water to prepare solutions of 1% low viscosity, 2% medium viscosity, and 3% high viscosity. Patients are first given 3 ml, 5 ml, and 10 ml of medium-viscosity food to swallow. If the patient exhibits issues such as inability to completely close the lips, multiple swallows, food residue in the oropharyngeal region, or coughing, the test is deemed unsafe, and the procedure moves to Step 2. If the patient successfully swallows, it is considered safe, and the procedure advances to the next stage.

Step 2: The same volume sequence (3 ml, 5 ml, 10 ml) is repeated using low-viscosity food. If any signs of compromised effectiveness or safety arise, the test proceeds to Step 3. Successful swallowing indicates safety, allowing progression to the next stage.

Step 3: The process is repeated with high-viscosity food. If issues persist, the test is deemed unsafe and concluded. Successful swallowing here indicates that the testing procedures have been completed safely.

2. Food Preparation: The food is adjusted to the required consistency by adding an appropriate amount of thickening agent and mixing thoroughly. For instance, 200 g of liquids such as water, milk, or juice are heated to 80°C, mixed with a packet of thickener, and blended for 30 s. For 200 ml of rice porridge, 1 g of thickener is added and blended using a high-speed blender for 30 s. Solid foods such as rice or noodles (200 ml by volume) are soaked in boiling water twice, then mixed with 1 g of thickener and blended for uniformity, also for 30 s.
3. Feeding Training Content: Each training session lasts 15–20 min, conducted twice daily, six times a week, over 21 days. Before beginning training, patients must clean their mouths and perform five dry swallows. The swallowing position should be tailored to the individual, such as sitting or reclining at angles of 30°, 45°, 60°, or 80° according to their swallowing disorder. Specific swallowing strategies are advised based on patient symptoms: patients prone to aspiration are guided to flex their head and neck forward with their chin brought toward the sternum; those unable to propel the food bolus with their tongue are instructed to elevate their chin with extended neck; and those with unilateral oral or pharyngeal dysfunction are taught to turn their head toward the unaffected side during swallowing.

The training should be conducted in a quiet, distraction-free environment to maintain patient focus. The viscosity of the food is selected based on the volume-viscosity swallow test results. Training involves the use of a long-handled metal spoon, and the amount of food per swallow is individually adjusted. The next swallow is only initiated after the previous one is fully completed, and patients should not take two bites at once. Initial feeding volumes range from 35 to 50 ml and may be increased to 100–200 ml, depending on patient adaptation. After feeding, patients should perform five dry swallows and clean their mouth to avoid residue. Healthcare personnel provide one-on-one guidance to patients and their families on feeding training techniques and food preparation. If the patient can consume 200 ml of the prescribed consistency without coughing within 5 min, they may progress to a thicker puree. Completing 70% of the meal volume within 30 min without coughing allows advancement to finely minced foods, maintaining the same bite size. Success in consuming 70% of a meal of finely minced food within 30 min without symptoms permits transition to soft foods. After training, patients should rinse their mouth thoroughly and perform dry swallows, coughing immediately afterward to clear residues, repeating 10-20 times.

National Institutes of Health Stroke Scale (NIHSS)

The scale assesses a range of neurological functions, including consciousness, language, movement, sensation, ataxia, eye movement, and visual field, among other areas, scoring from 0 to 42. Higher scores indicate more significant neurological deficits. Specifically, a score of 4 or below denotes a mild stroke, whereas a score of 21 or above signifies a severe stroke. However, the scale has limitations, such as its insensitivity to posterior circulation infarctions and its omission of cognitive function and gait abnormalities. The scale has demonstrated a Cronbach's α coefficient of 0.6885 [25], reflecting its internal consistency.

Dysphagia Outcome and Severity Scale (DOSS)

The DOSS scale [26] categorizes swallowing function into seven distinct levels, which align with three degrees of swallowing impairment. Levels 4 and 5 reflect a mild swallowing disorder, levels 2 and 3 indicate a moderate swallowing disorder, and level 1 denotes a severe swallowing disorder.

Videofluoroscopic swallowing study (VFSS)

The videofluoroscopic swallowing study (VFSS) is widely recognized as the gold standard for evaluating swallowing function [27]. In the VFSS procedure, 200 mg of barium is mixed with 286 ml of

water to create a 60% radiopaque solution; rice flour is added to produce a thin liquid, thick liquid, or solid food consistency. Participants are seated upright in a fluoroscopy chair, maintaining a neutral position for the head and neck, with the chest and abdomen aligned in the true lateral plane. Patients consume the prepared liquids in a sequential manner, starting with 2 ml, then increasing to 5 ml, and finally 10 ml. Swallowing is imaged using fluoroscopy from both lateral and anteroposterior views. The fluoroscopic imaging captures the area from the lips to the posterior pharyngeal wall, and from the soft palate to the 6th cervical vertebra. These images are recorded at a frame rate of 30 frames per second and digitally stored for detailed frame-by-frame analysis by a physiatrist experienced in VFSS interpretation. VFSS scores range from 0 to 10, where higher scores denote better swallowing function.

Nutritional indicator

All patients were evaluated within 24 h of their hospital admission and again after 6 weeks of continuous treatment. A patient is considered malnourished if any two out of the following five indicators fall below the normal range.

For triceps skin fold (TSF) and arm muscle circumference (AMC) measurements, the subject's upper arm hangs naturally. Measurements are taken 1–2 cm above the midpoint between the peak of the shoulder and the olecranon of the ulna. The skin and underlying tissues at the testing site are pinched using the left hand, while the skinfold thickness is measured with a caliper just below the point where the skinfold is lifted. To measure the mid-arm muscle circumference, the protruding bone at the top of the shoulder (the humeral head) is located, and a measuring tape is gently wrapped around the upper arm about 2–3 cm below the humeral head.

For hemoglobin (Hb), serum albumin (ALB), and serum prealbumin (PA) detection, 5 ml of venous blood is drawn from the fasting patient before 8 AM. Hemoglobin levels are measured using a DxH800 blood analyzer (Beckman Coulter, Inc., Brea, CA, USA). The blood sample is then centrifuged at 3000 r/min for 5 min, and the supernatant is analyzed for serum albumin and serum prealbumin levels using an automated biochemical analyzer (Beckman Coulter, Inc., Brea, CA, USA) and immunoturbidimetry.

Criteria of swallowing function

In this study, the Kubota drinking test was employed to assess swallowing function at both the first week and the sixth week after the commencement of rehabilitation exercises. The criteria for evaluating therapeutic efficacy were categorized as follows: cured, markedly effective, effective, and ineffective. The Kubota drinking test procedure involves the patient sitting upright and drinking 30 ml of warm water. The grading is as follows: Grade 1 – the patient can swallow the water in one go within 5 s; Grade 2 – the patient can drink the water in one go but takes more than 5 s, or needs multiple attempts to drink without choking; Grade 3 – the patient can swallow the water in one go but experiences coughing; Grade 4 – the patient requires multiple attempts and experiences coughing; Grade 5 – the patient frequently coughs and has difficulty swallowing the full amount of water. A cure is defined as achieving Grade 1 in the drinking test. Markedly effective is defined as achieving Grade 2. Effective is defined as improving from Grade 4 or 5 to Grade 3. Ineffective is indicated by no change in the drinking test evaluation.

Quality of Life Scale

The SF-36 Quality of Life Scale was employed to assess various aspects of patients' quality of life, including social functioning, self-management, mental health, and daily living activities. Higher scores on this scale indicate a better quality of life. The scale demonstrated a Cronbach's α coefficient of 0.814 [28].

SDS and SES

The Self-Rating Depression Scale (SDS) was used to assess the negative emotions experienced by patients during treatment, with scores ranging from 0 to 100. Higher scores indicate a greater degree of negative emotions. The SDS demonstrated a Cronbach's α coefficient of 0.92 [29].

The Self-Esteem Scale (SES) was employed to measure the patient's self-esteem levels during nursing care, with higher scores signifying a greater level of self-esteem. The SES demonstrated a Cronbach's α coefficient of 0.86 [30].

Satisfaction

The satisfaction score was derived from a hospital-developed questionnaire that evaluated nursing methods and the comfort level experienced during the patient's care. Scores ranged from 0 to 100 points, with scores below 80 indicating dissatisfaction, scores between 80 and 95 indicating basic satisfaction, and scores above 95 indicating full satisfaction. Higher scores reflect a greater level of satisfaction with nursing care.

Statistical method

The Shapiro-Wilk test was adopted to test normal distribution; normally distributed measures

were depicted as mean ± standard deviation. Non-normally distributed measures were depicted as median with interquartile range. Categorical data are represented by frequency and percentage. Unpaired *t*-tests were used to compare continuous variables between two groups. Additionally, univariate and multivariate logistic regression analyses were performed to determine the odds ratio (OR) and 95% confidence interval (CI) for each parameter treated as a continuous variable. Statistical significance was set at $p < 0.05$. All statistical analyses were conducted using SPSS version 19 (IBM Corp., Armonk, NY, USA) and R software version 3.0.2 (Free Software Foundation, Inc., Boston, MA, USA).

Results

Comparison of general information

The general demographic and clinical characteristics of patients in the individual group ($n = 102$) and the combined group ($n = 104$) are summarized in Table I. There were no statistically significant differences between the two groups in terms of general information (all $p > 0.05$). These results indicate comparable baseline characteristics between the individual and combined groups.

Comparison of nutritional status before and after treatment

The nutritional status of patients before and after treatment in both the individual and combined groups is detailed in Table II and Figure 1, respectively. Before treatment, there were no significant differences between the individual group and the combined group in triceps brachii skin fold thickness (TSF), middle arm muscle circumference on the healthy side (AMS), hemoglobin (Hb) levels, serum albumin (ALB) levels, and serum prealbumin (PA) levels (all $p > 0.05$). After treatment, compared with the individual group, the combined group showed significant improvements in all measured nutritional parameters. The combined group had better results in terms of TSF, AMS, Hb, ALB, and PA levels (all $p < 0.05$). These results suggest that dietary training combined with acupuncture based on syndrome differentiation is more effective in improving the nutritional status of stroke rehabilitation patients with dysphagia compared to dietary training alone.

Comparison of swallowing function

The efficacy of treatment in terms of swallowing function was evaluated and compared between the individual group and the combined

Table I. Comparison of general information

Parameter	Individual group ($n = 102$)	Combined group ($n = 104$)	*T*	*P*-value
Age [years]	63.48 ±13.57	60.75 ±13.97	1.422	0.156
Gender			0.156	0.693
Male	68 (66.67%)	73 (70.19%)		
Female	34 (33.33%)	31 (29.81%)		
BMI [kg/m^2]	24.73 ±3.30	25.02 ±3.06	0.669	0.504
Hypertension			0.034	0.854
Yes	36 (35.29%)	39 (37.50%)		
No	66 (64.71%)	65 (62.50%)		
Education level [years]	13.36 ±3.62	13.32 ±2.85	0.092	0.927
Valvular heart disease			0.023	0.88
Yes	46 (45.10%)	49 (47.12%)		
No	56 (54.90%)	55 (52.88%)		
Diabetes mellitus			0.062	0.804
Yes	37 (36.27%)	35 (33.65%)		
No	65 (63.73%)	69 (66.35%)		
Smoking history	56 (54.90%)	60 (57.69%)	0.069	0.792
Drinking history	59 (57.84%)	57 (54.81%)	0.089	0.765
Previous stroke	53 (51.96%)	56 (53.85%)	0.017	0.895
NIHSS score	12.36 ±4.12	12.68 ±4.16	0.550	0.583
VFSS score	3.23 ±1.07	3.17 ±1.02	0.410	0.682
DOSS (level)	3.15 ±1.11	3.06 ±1.15	0.582	0.561

NIHSS – National Institutes of Health Stroke Scale, VFSS – videofluoroscopic swallowing study, DOSS – Dysphagia Outcome and Severity Scale.

Table II. Comparison of nutritional status before treatment

Parameter	Individual group (n = 102)	Combined group (n = 104)	T	P-value
TSF [mm]	11.43 ±1.03	11.35 ±1.05	0.560	0.576
AMS [cm]	24.15 ±1.38	24.38 ±1.41	1.144	0.254
Hb [g/l]	121.16 ±10.17	122.39 ±10.96	0.835	0.405
ALB [g/l]	32.78 ±3.89	32.06 ±3.58	1.379	0.169
PA [mg/l]	219.82 ±29.36	216.69 ±28.36	0.779	0.437

TSF – triceps brachii skin fold thickness, AMS – middle arm muscle circumference on the healthy side, Hb – hemoglobin, ALB – serum albumin, PA – serum prealbumin.

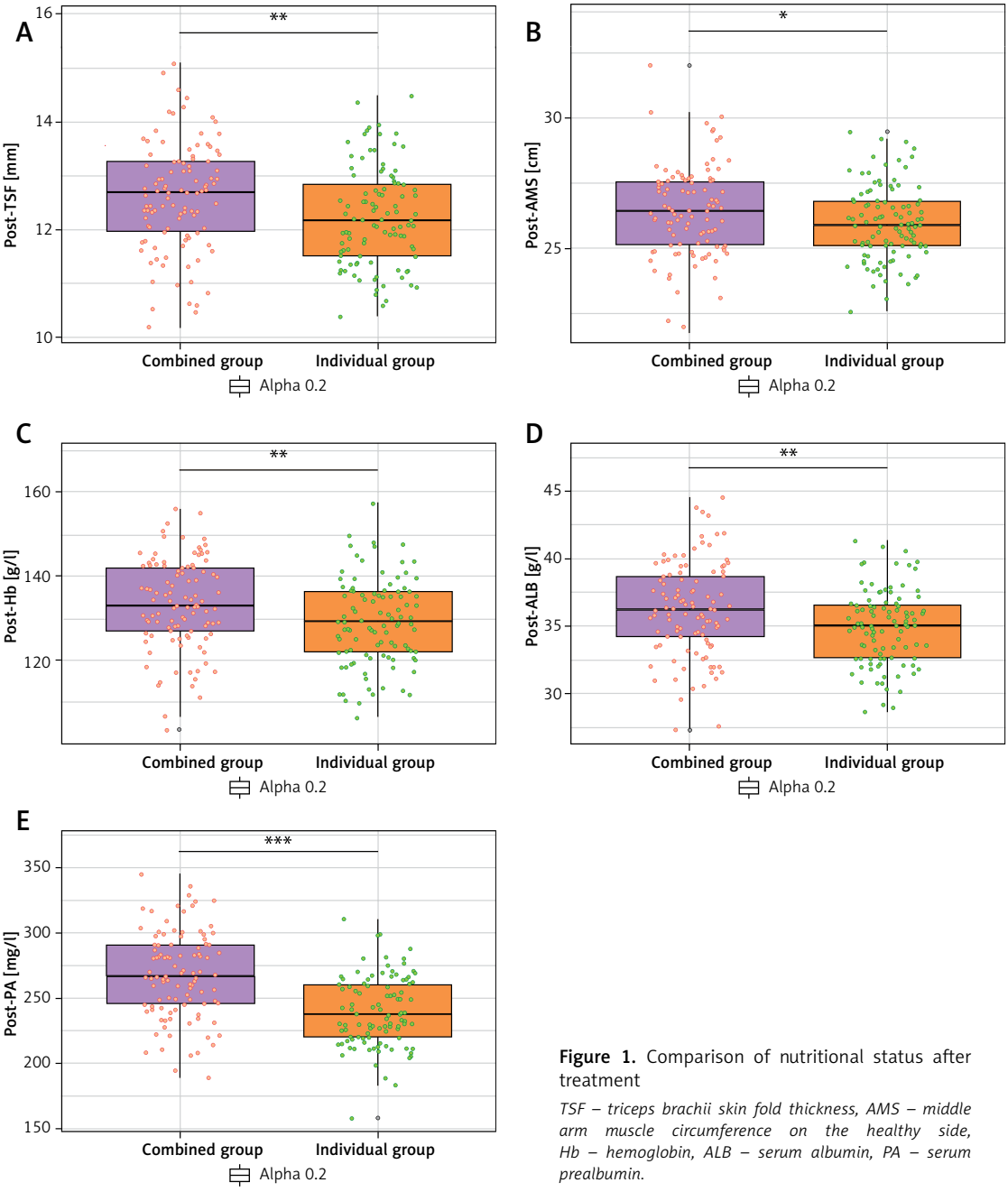

Figure 1. Comparison of nutritional status after treatment

TSF – triceps brachii skin fold thickness, AMS – middle arm muscle circumference on the healthy side, Hb – hemoglobin, ALB – serum albumin, PA – serum prealbumin.

group, as shown in Table III. The combined group had a higher number of patients who were cured (15 vs. 11) and who experienced markedly effective (35 vs. 29) or effective outcomes (41 vs. 36), while the individual group had a higher number of patients with ineffective outcomes (26 vs. 13). The total efficacy rate was significantly higher in the combined group (91/104, 87.50%) compared to the individual group (76/102, 74.51%) ($p = 0.028$). These results indicate that dietary training combined with acupuncture based on syndrome differentiation is more effective in treating dysphagia in stroke rehabilitation patients than dietary training alone.

Comparison of quality of life scores before and after treatment

The quality of life scores for stroke rehabilitation patients with dysphagia were assessed before and after treatment in both the individual group and the combined group, as detailed in Tables IV and V. Before treatment, there were no statistically significant differences between the groups in self-management, mental health, physical function, and social function (all $p > 0.05$). After treatment, significant improvements were evident in the combined group compared to the individual group in self-management, mental health, physical function, and social function (all $p < 0.05$). These findings suggest that combining dietary training with acupuncture based on syndrome differentiation leads to greater enhancements in quality of life for stroke rehabilitation patients with dysphagia compared to dietary training alone.

Comparison of SDS and SES scores before and after treatment

The SDS and SES scores of stroke rehabilitation patients with dysphagia were assessed before and after treatment in both the individual group and the combined group (Figure 2). Prior to treatment, there were no statistically significant differences in SDS scores and SES scores (all $p > 0.05$) between the individual and combined groups. After treatment, significantly better results were observed in the combined group compared to the individual group in both SDS scores (39.78 ±4.15 vs. 41.34 ±5.46; $p = 0.022$) and SES scores (26.93 ±5.06 vs. 24.98 ±4.72; $p = 0.005$). These results indicate that the combination of dietary training and acupuncture based on syndrome differentiation is more effective in alleviating depression and enhancing self-esteem in stroke rehabilitation patients with dysphagia than dietary training alone.

Comparison of adverse reactions between two groups of patients

The incidence of adverse reactions was compared between the individual group and the combined group, as shown in Table VI. The individual group reported 1 case of pain, 2 cases of dizziness, 1 case of bleeding, 1 case of faintness, and 2 cases of discomfort, while the combined group re-

Table III. Comparison of swallowing function after treatment

Outcome	Individual group ($n = 102$)	Combined group ($n = 104$)	*T*	*P*-value
Cured (cases)	11	15		
Markedly effective (cases)	29	35		
Effective (cases)	36	41		
Ineffective (cases)	26	13		
Total efficacy rate	76 (74.51%)	91 (87.50%)	4.847	0.028

Table IV. Quality of life scores before treatment

Parameter	Individual group ($n = 102$)	Combined group ($n = 104$)	*T*	*P*-value
Self-management	41.27 ±7.11	41.13 ±7.32	0.135	0.893
Mental health	8.34 ±2.78	8.59 ±2.81	0.645	0.519
Physical Function	65.54 ±7.75	66.79 ±7.43	1.186	0.237
Social Function	59.22 ±7.54	60.89 ±7.01	1.645	0.101

Table V. Quality of life scores after treatment

Parameter	Individual group ($n = 102$)	Combined group ($n = 104$)	*T*	*P*-value
Self-management	65.61 ±7.01	69.13 ±8.32	3.281	0.001
Mental health	11.52 ±3.04	12.54 ±3.16	2.349	0.020
Physical Function	69.56 ±9.70	76.01 ±10.43	4.592	< 0.001
Social Function	66.79 ±7.01	69.22 ±6.54	2.569	0.011

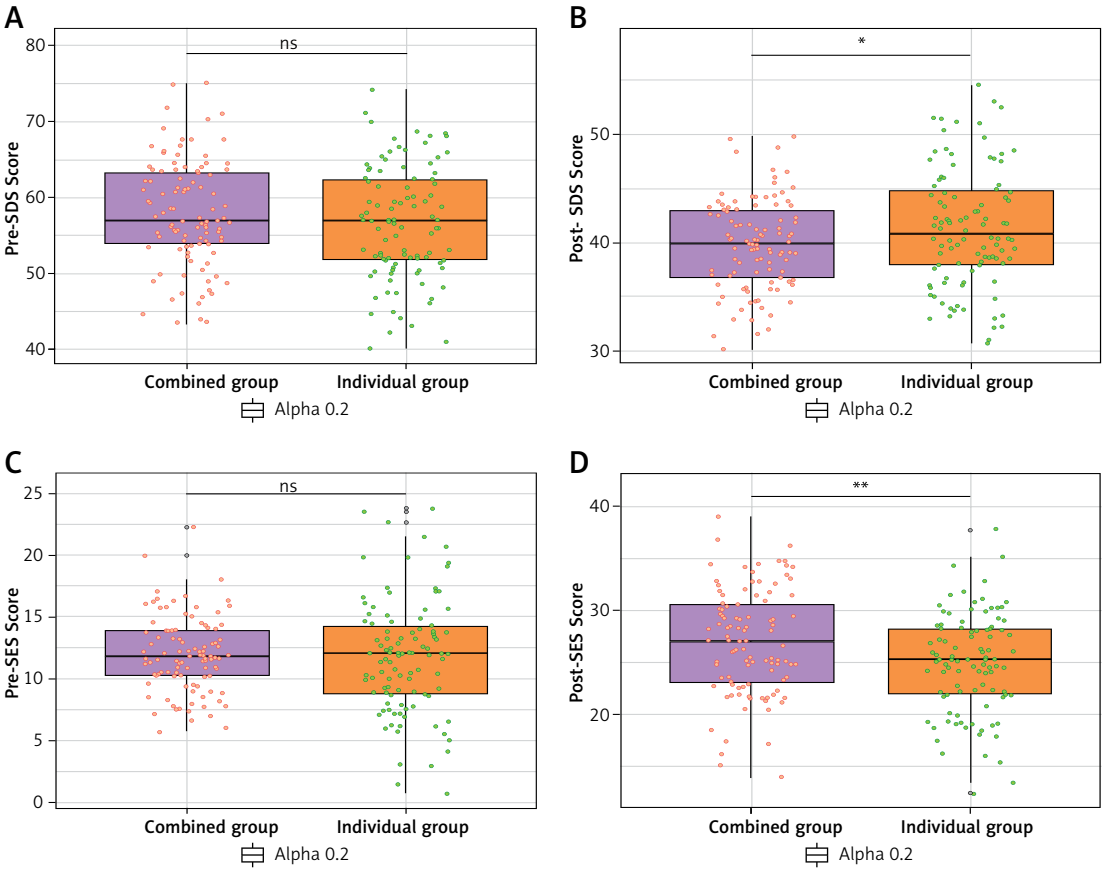

Figure 2. Comparison of Self-Rating Depression Scale (SDS) and Self-Esteem Scale (SES) scores before and after treatment

ported 2 cases of pain, 3 cases of dizziness, 2 cases of bleeding, 1 case of faintness, and 2 cases of discomfort. The total number of adverse reactions was 7 in the individual group and 10 in the combined group, with no statistically significant difference between the groups (p = 0.642). These findings suggest that the combination of dietary training with acupuncture based on syndrome differentiation does not significantly increase the risk of adverse reactions compared to dietary training alone.

Comparison of nursing satisfaction

Nursing satisfaction levels were compared between the individual group and the combined group, as shown in Table VII. In the individual group, 23 (22.55%) patients were satisfied, 33 (32.35%) patients were generally satisfied, and 46 (45.10%) patients were dissatisfied. In the combined group, 29 (27.88%) patients were satisfied, 44 (42.31%) patients were generally satisfied, and 31 (29.81%) patients were dissatisfied. The overall satisfaction rate was significantly higher in the combined group (70.19%) compared to the individual group (54.9%) (p = 0.034). These results indicate that dietary training combined with acupuncture based on syndrome differentiation leads to significantly higher nursing satisfaction among stroke rehabilitation patients with dysphagia compared to dietary training alone.

Table VI. Comparison of adverse reactions between two groups of patients

Adverse reactions	Individual group (n = 102)	Combined group (n = 104)	T	P-value
Pain (case)	1	2		
Dizziness (case)	2	3		
Bleeding (case)	1	2		
Faintness (case)	1	1		
Discomfort (case)	2	2		
Total adverse reactions	7	10	0.216	0.642

Table VII. Comparison of nursing satisfaction

Satisfaction level	Individual group (n = 102)	Combined group (n = 104)	T	P-value
Satisfied	23 (22.55%)	29 (27.88%)		
Generally satisfied	33 (32.35%)	44 (42.31%)		
Dissatisfied	46 (45.10%)	31 (29.81%)		
Satisfaction	54.90%	70.19%	4.511	0.034

Table VIII. Correlation analysis of feeding training combined with dialectical acupoint selection acupuncture and moxibustion and post-treatment parameters

Parameter	r	P-value
Post-TSF [mm]	0.196	0.005
Post-AMS [cm]	0.143	0.040
Post-Hb [g/l]	0.203	0.004
Post-ALB [g/l]	0.202	0.004
Post-PA [mg/l]	0.429	< 0.001
Post-self-management	0.224	0.001
Post-mental health	0.162	0.020
Post-physical function	0.306	< 0.001
Post-social function	0.177	0.011
Post-SDS score	–0.160	0.022
Post-SES score	0.196	0.005
Total effective rate	0.166	0.017
Satisfaction %	0.158	0.023

Correlation analysis

A correlation analysis was conducted to assess the relationship between feeding training combined with dialectical acupoint selection acupuncture and moxibustion and various post-treatment parameters (Table VIII). Significant positive correlations were observed with post-treatment triceps skin fold thickness (post-TSF) (r = 0.196, p = 0.005), middle arm muscle circumference (post-AMS) (r = 0.143, p = 0.040), hemoglobin levels (post-Hb) (r = 0.203, p = 0.004), serum albumin levels (post-ALB) (r = 0.202, p = 0.004), and serum prealbumin levels (post-PA) (r = 0.429, p < 0.001). Additionally, positive correlations were found with post-treatment self-management scores (r = 0.224, p = 0.001), mental health scores (r = 0.162, p = 0.020), physical function scores (r = 0.306, p < 0.001), social function scores (r = 0.177, p = 0.011), self-esteem scores (SES) (r = 0.196, p = 0.005), total effective rate (r = 0.166, p = 0.017), and satisfaction rate (r = 0.158, p = 0.023). A negative correlation was found with post-treatment SDS scores (r = –0.160, p = 0.022). These results indicate that the combination of feeding training and dialectical acupoint selection acupuncture and moxibustion is significantly associated with improved nutritional status, quality of life, treatment efficacy, and patient satisfaction in stroke rehabilitation patients with dysphagia.

Discussion

The current study explored the application of dietary training combined with acupuncture based on syndrome differentiation as an interventional approach to ameliorate dysphagia in stroke rehabilitation patients. The findings indicate that combining these methods yields superior outcomes in nutritional status, swallowing function, quality of life, depression, self-esteem, and nursing satisfaction compared to dietary training alone. This discussion aims to elaborate on the underlying mechanisms and potential reasons for these observed benefits.

Nutritional status significantly improved in the combined treatment group, which can be attributed to several factors. Firstly, dietary training inherently focuses on enhancing the patient's ability to consume and process food, thereby addressing nutritional deficiencies directly [22]. Acupuncture, meanwhile, has been shown to stimulate various physiological processes that may promote better nutrient absorption and metabolism [31].

From a traditional Chinese medicine (TCM) perspective, dysphagia is often seen as a disruption of qi (vital energy) and blood flow, especially in the upper digestive tract [13, 32]. Acupuncture points used in this study, particularly scalp acupoints such as MS 6, MS 8, and MS 9, are believed to invigorate qi and promote better circulation, thereby enhancing digestive function. Modern biomedical explanations posit that acupuncture may modulate the autonomic nervous system, improving gastrointestinal motility and secretory functions, which collectively contribute to better nutrient utilization and absorption [33, 34].

The significant improvement in swallowing function in the combined treatment group can be explained through several mechanisms: First, acupuncture has been suggested to facilitate neuroplastic changes and recover motor functions, which are critical in swallowing. This is accomplished potentially through the enhancement of neural connectivity and synaptic plasticity within the cerebral cortex and brainstem, areas that are instrumental in governing the swallowing process [15, 35]. Second, post-stroke inflammation and

edema can exacerbate dysphagia. Acupuncture has demonstrated anti-inflammatory properties, which can reduce edema and promote recovery of the afflicted swallowing muscles and nerves [36]. Third, the psychological impact of strokes can also impair swallowing ability. Acupuncture has been found to reduce anxiety and stress levels, potentially improving the patient's psychological readiness to participate in and benefit from dietary training [37].

The observed enhancements in quality of life in the combined group are multifaceted. Enhanced nutritional status and swallowing ability directly contribute to improved physical health and functionality, thereby allowing patients to engage more fully in daily activities and social interactions. First, better nutritional status and swallowing function reduce the risk of malnutrition and aspiration pneumonia, common complications in stroke patients with dysphagia. This lessens the need for medical interventions and hospital readmissions, allowing for a more stable recovery process [38, 39]. Second, improved swallowing function and reduced nutritional concerns can alleviate anxiety and depressive symptoms, as indicated by improved scores on the SDS. The reduction in depressive symptoms among patients can be attributed to acupuncture's effects on neurotransmitter regulation, particularly serotonin and dopamine, which play essential roles in mood stabilization [40, 41]. Third, as stroke patients regain their swallowing functionality and improve their nutritional status, they are more likely to re-engage with their environment, family, and social circles. This engagement is crucial for emotional support and community reintegration, critical components for long-term quality of life improvements [42]. Fourth, enhanced self-esteem observed in the combined group can be attributed to the regained autonomy in feeding and improved overall health status. Participating in dietary training and successfully improving swallowing abilities can foster a sense of achievement and self-worth among patients [22]. From a psycho-social aspect, self-esteem enhancement is essential for effective rehabilitation. Stroke survivors often face a diminished self-image due to their physical limitations. Acupuncture, by facilitating physical improvements, indirectly bolsters self-esteem by enabling patients to accomplish dietary training tasks more efficiently, thereby promoting positive self-perception [43].

The study also reports a higher satisfaction rate among patients receiving combined treatment. This can be linked to the holistic care framework adopted in the combined treatment approach, which integrates TCM principles with conventional rehabilitation techniques. The perceived increase in attention to patient needs and the multidisciplinary intervention approach likely contribute to higher satisfaction ratings [44].

The combined approach leverages the strengths of both dietary training and acupuncture. Dietary training offers a structured method for improving swallowing efficacy, while acupuncture provides additional support by potentially enhancing neural and muscular function [13]. Acupuncture's ability to modulate neurohormonal pathways, including the release of endorphins and other neuropeptides, likely plays a role in reducing pain, which can be pivotal for patient compliance with dietary training and overall rehabilitation [45]. Acupuncture's impact on inflammatory pathways can expedite the healing process of injured neural tissues after stroke. This complements the mechanical improvements brought about by dietary training, creating a conducive environment for recovery [36].

While the results are promising, the study is not without limitations. It employs a retrospective design, which carries inherent biases and limitations compared to prospective, randomized controlled trials. Future research should aim to corroborate these findings with larger, randomized controlled trials to establish causality more robustly. Furthermore, the mechanisms by which acupuncture aids in dysphagia recovery after stroke remain largely theoretical and necessitate more rigorous scientific inquiry. Investigations employing neuroimaging and biomarker studies could elucidate the exact neural and biochemical pathways involved. Additionally, exploring the individual variability in response to acupuncture and dietary training can provide insight into personalized rehabilitation strategies. Understanding the role of genetic, epigenetic, and psychosocial factors in treatment efficacy could lead to more targeted and effective interventions.

In conclusion, the integration of dietary training and acupuncture based on syndrome differentiation presents a compelling therapeutic strategy for managing dysphagia in stroke rehabilitation patients. This combined approach offers multifaceted benefits, addressing both the physical and psychological aspects of dysphagia. The observed improvements in nutritional status, swallowing function, quality of life, self-esteem, and patient satisfaction underscore the potential of this integrative therapeutic model. Future research directions include: in-depth exploration of the efficacy differences of various acupuncture methods; determination of the optimal treatment course for combined therapy; leveraging new technologies to clarify the mechanism of acupuncture-assisted recovery from swallowing difficulties; analyzing individual difference-related factors to achieve

personalized rehabilitation treatments and improve patient recovery outcomes.

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Conflict of interest

The authors declare no conflict of interest.

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