

## Original Article

# Swallowing function and neuropsychological status in patients with dysphagia after stroke: literature review and nursing intervention

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**Abstract:** Objective: To observe the effect of swallowing nursing intervention plus psychological assistance on swallowing function and neuropsychology of patients with dysphagia after stroke. Methods: A total of 120 hospitalized patients with dysphagia after stroke from January 2021 to December 2021 were randomly divided into the observation group and the control group according to the digital table method, with 60 cases in each group. The control group received routine clinical nursing, while the observation group received systematic swallowing nursing intervention, including basic training before eating, swallowing training and psychological strengthening. After 4 weeks of treatment, the degree of nerve defect, swallowing function, anxiety and depression were evaluated, and the total effective rate was calculated. Results: The total effective rate of the observation group was 95%, while that of the control group was 81.67%, with significant difference ( $P < 0.05$ ). The NIHSS score of the observation group was significantly lower than that of the control group ( $P < 0.05$ ). The swallowing function score was significantly increased ( $P < 0.05$ ). SAS score and SDS score were lower than those in the control group ( $P < 0.05$ ). Conclusion: Swallowing nursing intervention plus psychological support better improved the swallowing function of stroke patients, promoted the recovery of neurological function, and reduced the degree of anxiety and depression.

**Keywords:** Stroke, dysphagia, nursing intervention, NIHSS score, SAS score, SDS score, curative effect

## Introduction

Clinically, the incidence of dysphagia in stroke patients is about 22%-65%, and symptoms include choking while drinking and eating difficulties. About 1/3 of stroke patients with dysphagia die within 6 months after stroke, in contrast, the mortality of patients without dysphagia within 6 months is less than 10% [1]. Dysphagia refers to the obstruction and stagnation of the pharynx, sternum or esophagus caused by the obstruction of food from the mouth to the stomach. Dysphagia with cough can be seen in brain diseases, esophageal diverticulum and esophageal cardiac achalasia caused by retention of food reflux. Additionally, esophageal bronchial fistula and myasthenia gravis triggered by esophageal cancer can also cause masticatory muscle, throat muscle and tongue muscle weakness, and then lead to

chewing and dysphagia, with a cough while drinking. Dysphagia gradually increases with the prolongation of eating time.

Rehabilitation treatment of neuromuscular diseases (such as stroke) related to swallowing includes: (1) Mild dysphagia: assuming a position conducive to eating; emphasizing the nature of food, and gradually transiting from flowing food to general food. (2) Moderate and severe dysphagia: increasing the movement of oral and facial muscles, tongue movement and mandibular opening and closing movement; throat cold stimulation; empty swallowing exercise training; respiratory function training. Recently, nasal feeding is often used in clinical practice. The advantage of nasal feeding is that it is simple to operate. Nevertheless, long-term nasal feeding can result in hypostatic pneumonia, which brings great suffering to patients,

and it can even be life-threatening. It is easy to cause malnutrition in stroke patients, affecting the clinical treatment of patients, making them depressed, irritable, and even leading to food entering the respiratory tract, resulting in aspiration pneumonia, thereby endangering the life of patients.

Stroke patients have significant psychological changes; generally they have the following psychological characteristics: First, stroke patients generally have apparent depression. Nothing can make them happy, and they are relatively indifferent to the surroundings. Second, some stroke patients will have a significant sense of inferiority, a clear sense of guilt, and feel sorry for their families. Third, there are also patients with anxiety, panic attacks, such as repeated chest tightness, suffocation, and some die, but medical examination cannot find obvious lesions. Psychological changes in stroke patients seriously affect their prognosis, so that patients cannot cooperate with treatment and rehabilitation training, so early intervention is necessary.

At present, there are quite a few measures to treat dysphagia after stroke; nevertheless, psychological intervention seems to have not received enough attention [2]. Therefore, a case-control study was conducted to investigate pre-eating basic training, eating swallowing training and psychological support for 120 hospitalized patients with dysphagia after stroke in our hospital from January 2021 to December 2021.

### Material and methods

#### *Subjects*

The protocol was conducted in The Affiliated Hospital of Qingdao Binhai University, and Ningxia People's Hospital. This study was in accordance with the Declaration of Helsinki, and approved by the review board and ethics committee of Qingdao Binhai University Affiliated Hospital and Ningxia People's Hospital (2020ACU089). Written informed consent was provided by all participants.

A total of 120 hospitalized patients with dysphagia after stroke in our hospital from January 2021 to December 2021 were randomly selected and randomly divided into two groups

according to the digital table method: the observation group and the control group, with 60 cases in each group. The male/female ratio of the observation group was 31:29, aged 45-67 years old, with an average age of (55.2±4.5) years old, the course of disease was 18-33 days, and the average course of disease was (22.3±9.2) days. The ratio of males/females in the control group was 29:31, the age was 46-66 years old, the average age was (55.7±4.8) years old, the course of disease was 19-31 days, the average course of disease was (24.6±9.8) days; among them there were 83 cases of cerebral infarction, 37 cases of cerebral hemorrhage; hemiplegia site: left 68 cases, right 52 cases. There was no significant difference in gender, age, course of disease and disease between the two groups ( $P>0.05$ ), indicating comparability.

#### *Inclusion criteria*

Based on the diagnostic criteria and curative effect criteria of traditional Chinese medicine issued by the State Administration of Traditional Chinese Medicine, all patients were diagnosed with stroke by CT and MRI; all patients had different degrees of swallowing dysfunction; patients and their families signed informed consent on the basis of careful reading of the nursing plan.

#### *Exclusion criteria*

Patients with severe heart, liver, kidney and other important organ dysfunction; patients with previous mental diseases; patients with mental retardation; patients with unstable vital signs; those who could not sign the informed consent.

#### *Swallowing nursing intervention*

Patients in the observation group received swallowing rehabilitation nursing intervention in addition to the routine nursing given in the control group. The cooperation among the patients and their families was obtained first, and then the basic training before eating, swallowing training after eating and psychological assistance was carried out. The specific measures are as follows:

(1) Psychology: counseling for patients with anxiety and depression and other negative

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emotions, reduce the psychological pressure of patients, explain about successful cases of swallowing nursing, help patients see the hope of stroke rehabilitation, enhance the confidence to overcome the disease, guide the family members of patients to participate in nursing and functional exercise, let patients feel the care and support of family members, a sense of belonging, and gradually establish the sense of ability to overcome stroke.

(2) Swallowing function: training on the basic pronunciation function of patients and guiding them to master swallowing skills.

(3) Swallowing muscle training: the facial muscles of patients were improved by exercising the buccal muscle, tongue muscle and chewing muscles of patients.

(4) Cognition: Illustrating the specific causes, characteristics and feelings of dysphagia through language or image.

Pre-eating basic training and swallowing training require a tranquil and comfortable environment, avoiding noise, and ensuring the individual concentration. Secondly, patients are requested to relax. Each action was demonstrated 3-5 times, and patients were encouraged to carry out actions together and help the patients establish confidence.

Basic training before eating: First of all, swallowing muscle exercises were performed twice a day, the following seven items five consecutive times:

(1) Tongue movement: the tongue's forward extension and backward contraction (when the tongue is not fully extended, the tip of the tongue can be wrapped in gauze gently pulled), down pressure, side delivery, lifting, by licking around the lips with the tip of the tongue, exercise the flexibility of the tongue, push on the tongue plate (with the pressure tongue plate to resist the root of the tongue, practice tongue root uplift).

(2) Double lip movement: nodding lips, spreading lips, bulging cheeks, and upturning lip corners (smiling).

(3) Ice stimulation: Frozen cotton sticks with a little water, for stimulating the soft palate, palatal arch, tongue root and posterior pharyngeal

wall, have the patient do swallowing action, if the patient vomits immediately stop.

(4) Cough training: strengthen with cough which can exercise laryngeal muscles.

(5) Empty swallowing: patients with inhalation risk need to do empty swallowing.

(6) Neck activity training: neck activity can increase neck muscle strength, respiratory control, tongue movement and laryngeal movement, and the neck flexion and extension activities can help patients with the subpharyngeal reflex to prevent aspiration.

(7) Pronunciation training, teach patients to pronounce a, i, u, l and so on, 3 times/d, 20 minutes each time.

Feeding and swallowing training: taking a semi-sit position, food is concentrated in the healthy side of the oral cavity by gravity, reducing the residue of food in the paralyzed side, so that the swallowing action can be successfully completed. The best position is the trunk being supine at 30-60°, so that the patient's head is flexed.

Food selection: Choose uniform density, appropriate viscosity, not easy to loosen, easy to swallow, is conducive to the induction of swallowing reflex food, that is not sparse and dry, good taste. When feeding, a small spoon should be used. The food accounts for one third of the spoon. The feeding process should be slow to ensure that the patients have sufficient chewing time and swallowing time. The swallowing process: first, the food is put into the mouth, and fully mixed with the saliva to form a food mixture, and the energy is focused to swallow. Do not use suction tubes to avoid coughing.

The routine group received routine neurological care, including life, oral care and facial nerve function training.

### *Neurological function evaluation*

The National Institutes of Health Stroke Scale (NIHSS) was used to evaluate the neurological function before and 4 weeks after swallowing nursing intervention. This scoring system has 15 sub-items, with a total score of 0-42. Among them, 0-1 is no neurological disorder, 2-4 is mild injury, 5-15 is moderate injury, 16-20 is

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moderate to severe injury, and more than 20 is severe injury.

## *Swallowing function evaluation*

*Swallowing function grading (six degrees):* The first level is the most severe level, patients cannot even swallow saliva. The second level is food mishaps, patients can not drink water. The third level is drinking water mispharyngeal, but under the guidance of physicians, the application of mispharyngeal prevention is somewhat helpful, but changing the character of food has a certain effect. The fourth level is the opportunity to mispharynge, patients eat in a general way prone to mispharynge, if patients change eating posture or change the amount of food or eat less, mispharynge can be reduced. The fifth level is oral difficulty, Patients have moderate or severe oral disorders when swallowing. Changing the chewing mode and slowing down the eating speed may cause the patients to swallow and have no wrong swallowing. At this time, other people are required to feed or supervise eating. The sixth level is also eating with mild mispharyngeal, changing the shape of food does not easily cause mispharyngeal. The seventh level is that patients have no difficulty eating, and swallowing is very smooth and unobstructed.

Video fluoroscopic swallowing study (VFSS) is the gold standard for dysphagia assessment [4]. Patients sit quietly and swallow 5 ml of 60% barium sulfate suspension; X-ray lateral observation was conducted to observe whether there was obvious swallowing difficulty (barium residual in bilateral pyriform sinus). Those who swallowed smoothly were instructed to swallow 30 ml again, and those who failed VFSS were stopped.

The whole swallowing process was recorded as an anteroposterior and lateral image, 30 frames s<sup>-1</sup>. Two radiologists analyzed imaging data and reported normal swallowing function according to imaging data. VFSS score was 0-10 points, 10 points were normal.

## *Mental state assessment*

Self-rating anxiety scale (SAS) and self-rating depression scale (SDS) was used to evaluate the mental state of patients.

## *Statistical analysis*

All data in this study were analyzed and processed by SPSS 18.0 statistical software. The measurement data are expressed as 'mean  $\pm$  standard deviation' ( $\bar{x} \pm S$ ), and the enumeration data are expressed as percentage. The data were tested by F test for homogeneity of variance; if the variance is homogeneous, one-way ANOVA is used for comparison between groups; if the variance is not uniform, nonparametric statistics are used.  $P < 0.05$  indicated that the difference was significant.

## **Results**

### *Effectiveness comparison of swallowing nursing intervention for dysphagia after stroke*

After 4 weeks of swallowing nursing intervention, the effective rate of the observation group was 95.0%, and that of the control group was 81.67%. There was a significant difference between the two groups ( $\chi^2 = 4.32$ ,  $P < 0.05$ ), suggesting that the total effective rate of patients with dysphagia after swallowing nursing intervention was higher than that of routine nursing, as shown in **Table 1**.

### *Improvement of neurological function*

There was no significant difference in NIHSS between the two groups before treatment ( $P > 0.05$ ). After treatment, NIHSS scores in both the observation group and the control group were significantly lower than those before treatment ( $P < 0.05$ ). The NIHSS of the control group decreased significantly after 4 weeks, which showed that dysphagia with conventional treatment and nursing can also partially reduced the neurological damage caused by stroke. The NIHSS score of the observation group after nursing intervention for swallowing was significantly lower than that of the control group ( $P < 0.05$ ), indicating that the nursing intervention in the observation group can promote the recovery of neurological function more than conventional neurological nursing, as shown in **Table 2**.

### *Comparison of swallowing function*

There was no significant difference in VFSS score between the two groups before treatment ( $P > 0.05$ ). After treatment, VFSS in both

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**Table 1.** Comparison of effective rate between swallowing nursing intervention group and the control group (%)

Group	n	Cure	Effective	Relief	Effective rate (%)
Observation group	60	11	34	12	95.00
Control group	60	6	16	27	81.67

$\chi^2 = 4.32, P < 0.05$ .

**Table 2.** Comparison of NIHSS scores between two groups (points,  $\bar{x} \pm S$ )

Group	n	Before intervention	After Intervention
Observation group	60	7.85±0.63	3.33±0.54*
Control group	60	7.66±0.74	4.26±0.59*
t		0.24	3.76
P		>0.05	<0.05

Note: \*Compared with before swallowing nursing intervention,  $P < 0.05$ ; between two groups after intervention,  $P < 0.05$ .

**Table 3.** Comparison of VFSS scores between two groups (points,  $\bar{x} \pm S$ )

Group	n	Before intervention	After Intervention
Observation group	60	4.35±0.74	8.88±0.93*
Control group	60	4.46±0.89	6.96±0.74*
t		0.18	4.16
P		>0.05	<0.05

Note: \*Compared with before swallowing nursing intervention,  $P < 0.05$ ; between two groups after intervention,  $P < 0.05$ .

**Table 4.** SAS score comparison (points,  $\bar{x} \pm S$ )

Group	n	Before intervention	After Intervention
Observation group	60	63.35±9.74	49.88±6.93*
Control group	60	62.38±8.53	55.96±9.74*
t		0.18	4.16
P		>0.05	<0.05

Note: \*Compared with before swallowing nursing interventions,  $P < 0.05$ ; between two groups after intervention,  $P < 0.05$ .

groups increased to varying degrees ( $P < 0.05$ ), and the improvement of scores in the observation group was better than that in the conventional group ( $P < 0.05$ ), as shown in **Table 3**.

### *Depression and anxiety status of patients in the two groups*

There was no significant difference in the scores between the two groups before treatment ( $P > 0.05$ ), indicating that the two groups were comparable. Self-rating Anxiety Scale (SAS) score shows (**Table 4**) the control group

before treatment and after treatment, where there is a decreasing trend, and the intervention group also has the same trend; after intervention scores were decreased, the difference between the two groups was statistically significant ( $P < 0.05$ ). This shows that swallowing nursing intervention can reduce the anxiety of patients with dysphagia after stroke. As shown in **Table 4**.

The self-rating depression scale (SDS) score showed that there was a downward trend in the control group before treatment and after treatment, and the intervention group also had the same tendency: the scores were reduced after intervention, and the difference between the two groups was statistically significant ( $P < 0.05$ ). This indicated that swallowing nursing intervention could alleviate the depression of patients with dysphagia after stroke. See **Table 4**.

Therefore, nursing intervention for swallowing has a certain mitigation effect on depression and anxiety.

## Discussion

The damage of the cerebral cortex and subcortical nuclei after stroke leads to the decrease or even defect in the swallowing center of the medulla oblongata regulated by higher centers, thus resulting in pseudobulbar palsy.

Due to the damage of the brain stem bundles in the bilateral cerebral cortex, the swallowing function of the lower centers loses control by the higher centers, resulting in dysphagia, especially drinking water choking, causing serious complications such as aspiration pneumonia, affecting the prognosis of stroke recovery and even causing death.

The incidence of post-stroke dysphagia is 51%-73% [1, 2]. Early standardized swallowing nursing intervention and management are very important, which can reduce complications such as aspiration pulmonary infection and improve the quality of life and prognosis of

stroke patients [3]. Liu and colleagues [4] reported that the incidence of aspiration pneumonia in stroke patients with dysphagia was as high as 48.6%. Zhu and colleagues [5] reported that the relative risk of mortality and dysphagia in patients with stroke was 2.6 within three months of follow-up, suggesting that aspiration pneumonia and asphyxia caused by dysphagia was an important risk factor for death.

In this study, 120 patients with dysphagia after stroke were randomly selected and randomly divided into the observation group and the control group. The observation group received basic training before eating, swallowing training and psychological support. The control group received routine nursing in the neurology department.

After 4 weeks of swallowing nursing intervention, the total effective rate of the observation group was 95%, which was significantly higher than that of the control group (81.67%); in addition, the neurological function score as well as the swallowing function improved significantly.

Therefore, the implementation of nursing intervention for swallowing in patients with dysphagia after stroke improved the swallowing function of patients and promoted the recovery of neurological function.

Targeted nursing intervention was carried out according to the condition of patients with dysphagia caused by cerebral vascular pseudobulbar palsy, which was more effective than traditional general nursing. Patients had difficulty in eating and drinking water, and were easily anxious, irritable and depressed [6], so they were unwilling to cooperate with treatment.

After psychological counseling for patients and their families, the negative emotions of patients are eliminated, and the confidence of patients to overcome the disease is obtained by means of hints and encouragement. Yang and colleagues [7] randomly selected 98 cases for a control study and patients were given rehabilitation nursing intervention on the basis of care in the control group, which reduced the number of cases of grade IV and V; and after treatment, SAS and SDS scores were significantly lower than those in the control group. Ding and colleagues [8] reported 100 cases of stroke pa-

tients with swallowing function which were randomly divided into an experimental group and a control group, with 50 cases in each group. The control group received routine nursing, and the experimental group received rehabilitation nursing on the basis of the control group. The total effective rate of the experimental group was 94%, and the patient satisfaction was 96%. The results of this study are consistent with the literature, as is the use of NIHSS neurological function score and swallowing TV barium meal score and other objective indicators to observe the recovery of psychological and neurological function after nursing intervention for swallowing.

Early swallowing function training can prevent the occurrence of waste atrophy of subpharyngeal muscles [9-12], which greatly reduces the complications, mortality and infection rate.

Therefore, nursing intervention for swallowing after stroke is an important part of overall rehabilitation nursing. The formation of humanized nursing mode plays a very important role in the recovery of swallowing function of stroke patients, which is worthy of clinical promotion and application.

The limitations of this study were that it was only a case-control study performed retrospectively, with only a cross-sectional analysis, and no prospective observation. Second, the control group was only selected for the conventional treatment. Due to the limitation of this not being a blind study, it was impossible to confirm that the control group had proper treatment. Therefore, it is worth further clinical research.

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### Disclosure of conflict of interest

None.

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