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Effects of Neuromuscular Electrical Stimulation Combined with Oral Function Training on the Recovery of Swallowing Function in Patients with Neurogenic Dysphagia and Key Points of Nursing Intervention

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Abstract: *Objective:* To analyze the effect of neuromuscular electrical stimulation combined with oral function training on the recovery of swallowing function in patients with neurogenic dysphagia, and summarize the key points of nursing intervention. *Methods:* From January to December 2025, 74 patients with neurogenic dysphagia were selected to participate in the study. They were divided into groups using a random number table, with 37 patients in each group. The experimental group applied neuromuscular electrical stimulation combined with oral function training, and the control group applied oral function training. The data differences between the groups were compared. *Results:* Compared with the control group, the SSA score of the experimental group after nursing was significantly lower, the FOIS score after nursing was significantly higher, the Kubota drinking water test grade was significantly better, and the complication rate was significantly lower, $P < 0.05$; comparing the SSA scores and FOIS scores before nursing between the two groups, $P > 0.05$. *Conclusion:* The application of neuromuscular electrical stimulation combined with oral function training in patients with neurogenic dysphagia has a greater impact on the recovery of swallowing function, which is reflected in the significantly lower SSA score after nursing, the significantly higher FOIS score after nursing, the significantly better Kubota drinking test grading, and the significantly lower complication rate, which is worthy of clinical use and promotion.

Keywords: Neuromuscular electrical stimulation; Oral function training; Neurogenic swallowing disorder; Swallowing function recovery; Key points of nursing intervention

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1. Introduction

Patients with neurological diseases such as stroke, traumatic brain injury, and Parkinson's disease are prone to neurogenic dysphagia due to central or peripheral nervous system lesions. They have difficulty eating and drinking due to swallowing-related muscle dysfunction. Patients are prone to insufficient nutritional intake and dehydration. They are also prone to

serious complications such as aspiration and aspiration pneumonia. Their quality of life is significantly reduced and even life-threatening [1]. At present, functional training is mainly used in the clinical treatment of patients with neurogenic dysphagia to target the patients' oral muscles and improve their movement coordination. However, clinical studies have found that single training has a slow onset of effect, and some patients have poor recovery effects. Clinical research on neuromuscular electrical stimulation uses low-frequency electrical stimulation to exert effects on swallowing-related neuromuscles [2] and reshape neuromuscular function. This study recommends its application in the rehabilitation treatment of patients with neurogenic dysphagia. This study selected 74 patients to analyze the effect of neuromuscular electrical stimulation combined with oral function training on the recovery of swallowing function in patients with neurogenic dysphagia, and summarized the key points of nursing intervention.

2. Materials and methods

2.1. Information

In our hospital from January to December 2025, 74 patients with neurogenic dysphagia were selected to participate in the study. They were divided into two groups using a random number table, with 37 patients in each group. The experimental group information: 20/17 men and women, aged 45–78 (62.35 ± 7.13) years old, and the control group information: 21/16 men and women, aged 44–76 (62.31 ± 7.14) years old. Comparing the two sets of data, $P > 0.05$ was obtained.

Inclusion criteria: consistent with the disease diagnostic criteria, and the method of diagnosing the disease is swallowing imaging; disease duration of 1 to 6 months; clear consciousness, able to actively cooperate with training and treatment; informed consent.

Exclusion criteria: severe organic lesions of the oral cavity and throat; severe heart, liver, kidney, and other organ dysfunction; cognitive dysfunction and inability to cooperate with treatment; intolerance to neuromuscular electrical stimulation treatment.

2.2. Methods

The control group applied oral function training: (1) Lip training: Provide patients with guidance on mouth opening, mouth closing, pouting, cheek puffing, and other movements, each movement for 5 seconds, 10 times/group, 3 groups/d. (2) Tongue muscle training: Provide patients with guidance on tongue extension, retraction, left and right swing, and lift. Each action is 5 seconds, 10 times/group, 3 groups/d. (3) Mastication training: Provide patients with chewing action simulation and bite practice guidance, 5 minutes/time, 3 groups/d. (4) Soft palate training: Instruct the patient to pronounce, including "ah," "oh," etc., 3 minutes/time, 3 groups/d. The above are maintained for 4 weeks.

The experimental group applied neuromuscular electrical stimulation combined with oral function training. Based on the intervention in the control group, the following additions were made: VitalStim neuromuscular electrical stimulator was used, and electrode patches were placed on the skin corresponding to the swallowing-related muscles in the patient's neck. The swallowing mode was set. The frequency and pulse width were 30–80 Hz and 300 μs in sequence. The stimulation standard was: muscle contraction without significant pain, 20 min/time, once/d, for 4 weeks.

Systematic nursing intervention was implemented for both groups of patients: (1) Pre-treatment care: (a) Psychological care: Patients have difficulty eating, worry about aspiration and other problems, and have serious negative emotions. Some patients resist eating and treatment. Before treatment, nurses should fully communicate with patients and their families, explain the disease and nursing knowledge in easy-to-understand language, list successful cases of clinical rehabilitation, relieve patients' emotions, encourage patients to actively express their feelings, and improve patients' confidence in recovery. (b) Assessment and preparation: Conduct a comprehensive assessment of the patient's condition, swallowing function, oral condition, cognitive function, and physical tolerance. Based on the results, develop a personalized electrical stimulation treatment and oral function training plan for the patient. Prepare the neuromuscular electrical stimulator, electrode pads, disinfectant supplies, and other treatment supplies, carefully check whether the instrument performance is

normal, assist the patient to clean the neck skin, remove grease and hair from the patient's skin surface, and fully contact the electrode pads with the skin to avoid skin burns or poor stimulation effects. (2) Nursing care during treatment: (a) Nursing care for electrical stimulation treatment: During the electrical stimulation treatment process, assist the patient to choose a sitting or semi-recumbent position, tilt the head forward slightly, accurately paste the electrode pads, set the instrument parameters for the patient according to the treatment plan, slowly adjust the stimulation intensity, closely observe the patient's reaction, ask the patient if there is any discomfort such as pain, numbness, etc., and stop treatment or reduce the stimulation intensity for patients who experience discomfort. During the treatment of patients, inspections should be strengthened to avoid electrode pads falling off and shifting. (b) Oral function training care: During the patient's oral function training, the rehabilitation nurse will guide the patient one-on-one on various training movements and standardize the essentials of the movements. If the patient has difficulty completing the movements, use manual assistance, such as using fingers to gently press the patient's tongue to guide the patient to perform tongue muscle movements. The training frequency and intensity will be adjusted based on the patient's tolerance to avoid overtraining. During the training, the patient will also be provided with timely encouragement to increase the patient's enthusiasm for training. (c) Condition observation: During the treatment, the patient's consciousness, complexion, breathing, etc., should be closely observed. If the patient shows signs of aspiration (choking, difficulty breathing, etc.), the treatment should be stopped immediately, the patient should be assisted to lie on his side, and secretions in the patient's mouth should be removed in a timely manner to ensure that the patient's respiratory tract is unobstructed. If necessary, the patient should be provided with oxygen inhalation, sputum suction, etc. (3) Post-treatment care: (a) Dietary care: Complete the formulation of a personalized diet plan based on the patient's swallowing function grading, provide patients with mild disabilities with semi-liquid diets such as porridge and rotten noodles, and then gradually transition to soft foods. When eating, assist the patient to position himself in a sitting or semi-recumbent position, tilt the head slightly forward, and inform the patient to eat small amounts more frequently and chew slowly. After eating, assist the patient to clean his or her mouth to avoid oral infection. (b) Skin and oral care: After the electrical stimulation treatment, assist the patient to clean the neck skin and observe whether the patient has redness, swelling, rash, burns, etc. External calamine lotion can be applied to the affected areas of the skin. In addition, the patient should be provided with intensive oral care. Use normal saline to clean the mouth twice a day. Clean the secretions of patients with a lot of oral secretions in a timely manner to ensure that the mouth is clean and moist, and effectively prevent oral infections and aspiration in patients. (c) Rehabilitation guidance: Explain in detail the methods and precautions of home rehabilitation training to patients and their families, distribute rehabilitation training manuals, assist in completing home oral function training step by step, and inform patients and their families of the precautions for electrical stimulation treatment at home. If the patient needs to carry out electrical stimulation treatment at home, training is required. Patients and their families should also be instructed on how to identify early signs of complications such as aspiration and coughing, and inform emergency treatment methods. (4) Continuing care after discharge: Construct a rehabilitation file for the patient, record the patient's treatment and care, conduct follow-up calls, WeChat, follow-up visits and other methods once a week after discharge, understand the patient's home rehabilitation training, diet and condition changes, answer questions in a timely manner, conduct rehabilitation training and diet plan timely adjustment based on the patient's swallowing function recovery, encourage the patient to actively participate in community rehabilitation activities, and further improve the patient's rehabilitation effect.

The nursing intervention period for both groups was 4 weeks.

2.3. Observation indicators

(1) Compare the SSA scores and FOIS scores of the two groups. Involving the Standard Swallowing Function Assessment Scale (SSA) and Functional Oral Intake Scale (FOIS).

(2) Compare the drinking water test grades of the two groups. Levels I to IV are normal, mild disorder, moderate disorder, and severe disorder.

(3) Compare the incidence of complications between the two groups.

2.4. Statistics

Data calculation was completed with SPSS 28.0 statistical software. Measurement data were described with mean ± standard deviation (SD), *t*-test, count data were described with %, χ^2 test, $P < 0.05$, statistically significant.

3. Results

Compared with the control group, the SSA score of the experimental group after nursing was significantly lower, the FOIS score after nursing was significantly higher, the Kubota drinking test grade was significantly better, and the complication rate was significantly lower, $P < 0.05$; comparing the SSA score and FOIS score before nursing between the two groups, $P > 0.05$. See **Tables 1** to **3**.

Table 1. Comparison of SSA scores and FOIS scores (points) between the two groups

Group	SSA score		FOIS score	
	Before nursing	After nursing	Before nursing	After nursing
Experimental group ($n = 37$)	38.52 ± 3.15	22.16 ± 2.89	2.05 ± 0.52	5.89 ± 0.65
Control group ($n = 37$)	38.26 ± 3.08	29.85 ± 3.12	2.02 ± 0.49	3.68 ± 0.58
t	0.3590	10.9989	0.2554	15.4312
P	> 0.05	< 0.05	> 0.05	< 0.05

Table 2. Comparison of the drinking water test grades of the two groups (%)

Group	Level I	Level II	Level III	Level IV
Experimental group ($n = 37$)	10(27.03)	21(56.76)	6(16.22)	0
Control group ($n = 37$)	2(5.41)	10(27.03)	20(54.05)	5(13.51)
χ^2	21.7750			
P	< 0.05			

Table 3. Comparison of complication rates between the two groups (%)

Group	Aspiration	Choking	Aspiration pneumonia	Total
Experimental group ($n = 37$)	1(2.70)	1(2.70)	0	2(5.41)
Control group ($n = 37$)	3(8.11)	4(10.81)	1(2.70)	8(21.62)
χ^2	-	-	-	4.1625
P	-	-	-	< 0.05

4. Discussion

Common complications of neurological diseases include neurogenic dysphagia. If patients are given single oral function training, although it can improve the coordination of the patients' oral muscles, it has problems of slow onset and poor recovery. Therefore, this study proposes to increase neuromuscular electrical stimulation and use low-frequency electrical signals to reshape the patient's swallowing neuromuscular function.

The results of this study show that after nursing, the SSA score of the experimental group was significantly lower than that of the control group, and the FOIS score was significantly higher than that of the control group. The above results confirm that patients using neuromuscular electrical stimulation combined with oral function training can significantly improve swallowing function. To carry out single oral function training for patients, you can exercise the oral cavity,

tongue muscles, soft palate, and other muscle groups through active exercises [3]. After combined with neuromuscular electrical stimulation, low-frequency electrical stimulation of the VitalStim neuromuscular electrical stimulator is used to produce precise stimulation of the swallowing-related muscles in the patient's neck. It has a quasi-effect, awakening the patient's damaged neuromuscular pathways [4,5], promoting nerve remodeling, and at the same time strengthening the patient's muscle contraction and coordination abilities. The coordinated active training and passive stimulation can effectively reduce the patient's swallowing dysfunction and improve oral eating ability [6].

In the grading results of the Kubota drinking water test, the proportion of grades I and II in the experimental group was significantly higher than that in the control group, confirming that the value of the combined regimen for patients is high, and the patients' actual swallowing ability has been significantly improved [7]. In terms of complications, the total incidence rate of the experimental group was 5.41%, which was much lower than that of the control group. Applying combined intervention to patients can accelerate the recovery of the patient's swallowing function and reduce the probability of aspiration and choking during eating. At the same time, systematic nursing intervention is carried out for the patient. Under the dual effect, the patient's risk of serious complications such as aspiration pneumonia is significantly reduced [8].

5. Conclusion

In summary, the application of neuromuscular electrical stimulation combined with oral function training in patients with neurogenic dysphagia has a greater impact on the recovery of swallowing function, as reflected in the significantly lower SSA score after care, the significantly higher FOIS score after care, the significantly better Kubota drinking test grading, and the significantly lower complication rate, which is worthy of clinical use and promotion.

Disclosure statement

The author declares no conflict of interest.

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