



The Research Effect Of Chewing Function Nursing Techniques In Improving Swallowing Dysfunction Among Children With Cerebral Palsy

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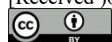
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Abstract: The objective of this study was to analyze the efficacy of chewing function nursing techniques in improving swallowing dysfunction among children with cerebral palsy. A total of 60 children with cerebral palsy and swallowing disorders, admitted to our hospital from January 2020 to December 2022, were included in the study. The children were randomly divided into an observation group and a control group using a random number table. The control group received routine rehabilitation nursing, while the observation group received additional nursing measures focusing on chewing function techniques in addition to the routine rehabilitation nursing. Both groups underwent interventions for a period of 3 months. Swallowing dysfunction, eating ability, and oral motor function were evaluated and compared between the two groups before and after treatment. Specifically, the Dysphagia Diet Scale (DDS) was used to assess swallowing dysfunction, the Eating and Drinking Ability Classification System (EDACS) was used to evaluate eating ability, and the Structured Oral Motor Assessment (SOMA) was used to assess oral motor function. The results showed that before rehabilitation nursing, there was no significant difference in DDS scores between the two groups. However, after rehabilitation nursing, both groups exhibited lower DDS scores compared to before, and the observation group had lower scores than the control group, indicating a significant difference ($P < 0.05$). Similarly, before rehabilitation nursing, there was no significant difference in EDACS ratings between the two groups. After rehabilitation nursing, both groups of children showed improvement in EDACS ratings, with the observation group demonstrating better outcomes than the control group. The difference between the two groups was significant ($P < 0.05$). Prior to rehabilitation nursing, there was no significant difference in SOMA scores between the two groups ($P > 0.05$). However, after rehabilitation nursing, both groups exhibited improved SOMA scores, with the observation group scoring higher than the control group. The difference between the two groups was also significant ($P < 0.05$). In conclusion, compared to routine nursing care, chewing function nursing techniques can alleviate swallowing dysfunction among children with cerebral palsy, enhance their swallowing function, and improve their quality of life. Therefore, this approach is worthy of clinical application and promotion.

Keywords: Chewing Function Nursing Techniques; Children with Cerebral Palsy; Swallowing Dysfunction.

Introduction

Cerebral palsy is a disorder that affects the development of motor and postural functions due to non-progressive injuries to the brain during the fetal or infantile period. Children with cerebral palsy often exhibit functional impairments that affect their quality of life, including intellectual, linguistic, swallowing, and behavioral difficulties [1]. Among these functional impairments, swallowing dysfunction is relatively prominent, often manifesting as chewing and swallowing difficulties, drooling, recurrent respiratory infections, oral sensory difficulties, and feeding difficulties, which can impact the child's growth and development. Relevant data indicates that the incidence of swallowing dysfunction among children with cerebral palsy is as high as 85% [2]. This is primarily related to central nervous system damage, impaired coordination of oral muscles, impaired coordination between breathing and swallowing, abnormal muscle tone, and sensory disorders in children with cerebral palsy [3]. Given the high probability of swallowing dysfunction in children with cerebral palsy and its association with impaired swallowing and chewing functions, it is necessary to explore and apply chewing function nursing techniques to provide nursing interventions for the swallowing function of these children, aiming to reduce the severity of swallowing dysfunction and improve their living abilities and quality of life. Against this backdrop, our hospital has organized a study on chewing function nursing techniques for children with cerebral palsy. Through the application of these nursing techniques, we have achieved good results in improving swallowing function.



Recent data suggests that the incidence of swallowing disorders among infants with cerebral palsy is the highest, with 1 in every 15 requiring non-oral tube feeding. [1] Additionally, aspiration pneumonia is the leading cause of death among children with cerebral palsy, highlighting the crucial importance of swallowing management for them. Addressing feeding skills and reducing the potential risk of aspiration are urgent issues that we need to tackle at this stage. A novel motor learning-based oral sensorimotor intervention known as functional chewing training nursing techniques can effectively improve chewing problems, increase tongue muscle strength, and reduce the risk of aspiration.[2] Aligned with current ideas about motor learning, this intervention encompasses direct intervention, indirect intervention, sensory stimulation, and compensatory intervention. [3] Direct intervention involves using nursing techniques and methods to directly assist children with cerebral palsy in swallowing management, while indirect intervention utilizes assistive devices to develop chewing skills. Regardless of the nursing method or technique, the ultimate goal is to enhance chewing skills, unleash their potential, improve their quality of life, and alleviate the burden on families and society. [4] In recent years, experts and scholars both domestically and internationally have paid more attention to improving the functions of children with cerebral palsy, enhancing their self-care abilities, and using improved quality of life as a criterion for evaluating rehabilitation outcomes. Functional chewing nursing techniques can effectively shorten feeding time, improve malnutrition, comprehensively enhance physical skills and the effectiveness of rehabilitation nursing, promote the overall functional recovery of children with cerebral palsy, and represent a new revolution in the field of pediatric rehabilitation nursing. This approach can foster harmonious doctor-patient relationships and comprehensively enhance patient satisfaction.[5]

Literature Review

Swallowing disorders in children with cerebral palsy (CP) are a common complication, with reported incidences ranging widely from 19% to 99%, and even studies indicating that up to 80% to 100% of children with CP have concurrent swallowing difficulties. This high incidence underscores the significant challenges faced by children with CP in terms of their swallowing function, further complicating their daily lives and increasing the need for medical care.[6]

The impacts of swallowing disorders on children with CP are multifaceted. They can lead to physiological issues such as dehydration and malnutrition, as well as severe complications like aspiration pneumonia and choking, posing a direct threat to the child's life safety. Over time, these complications can also affect the child's physical growth, nutrient absorption, overall health, and quality of life, placing a heavy burden on their families and society.[7]

In response to the management of swallowing disorders in children with CP, scholars and researchers from around the world have conducted numerous studies and explorations, aiming to effectively improve the swallowing function of these children through scientific assessments, personalized rehabilitation training, nutritional support, and other measures. The goal is to enhance the quality of life of these children and alleviate the burden on their families and society.[8]

In the management and treatment of swallowing disorders for children with cerebral palsy, professional assessment tools like the Japanese Rehabilitation Dysphagia Screening Scale are used to comprehensively evaluate the swallowing function. Based on the results, personalized rehabilitation training plans are tailored, encompassing oral motor training and swallowing skill enhancement. Adequate nutritional support is also provided to meet the specific nutritional needs of these children. For any psychological issues stemming from the swallowing disorder, such as anxiety or depression, necessary psychological interventions and support are administered. This integrated approach aims to improve the swallowing function and overall health of children with cerebral palsy.[9]

Functional chewing training nursing technique, a sensorimotor-based intervention method, has emerged as a key strategy in enhancing chewing and swallowing functions among children with cerebral palsy. This nursing technique encompasses a comprehensive range of approaches, including direct and indirect interventions, sensory stimulation, and compensatory measures.[7]

The technique is applied in various forms, including direct interventions such as oral massage and tongue muscle training, which provide direct assistance to children with cerebral palsy in managing their swallowing function. Indirect interventions, on the other hand, involve the use of assistive devices like chewing aids and straws to develop chewing skills and improve chewing efficiency. Sensory stimulation techniques, which utilize different food textures and flavors, aim to promote the improvement of chewing and swallowing functions by stimulating oral senses. For children with severely impaired swallowing function, compensatory measures like nasogastric tubes and gastrostomy are implemented to ensure adequate nutritional intake.[10]

Research and Methodology:

The study was conducted on 60 children with cerebral palsy and swallowing disorders admitted to our hospital from January 2020 to December 2022. The inclusion criteria were: (1) Meeting the diagnostic criteria for cerebral palsy specified in the "Chinese Rehabilitation Guidelines for Cerebral Palsy (2015): Part I" [4] and confirmed as cerebral palsy; (2) Meeting the diagnostic criteria for swallowing disorders specified in the "Epidemiological Investigation Report on Swallowing Dysfunction in Specific Populations in China" [5] and clinically assessed as having swallowing dysfunction; (3) Age ranging from 3 to 12 years; (4) Able to eat orally. The exclusion criteria were: (1) Coexisting with other

psychiatric disorders and poor behavioral compliance; (2) Presence of other diseases that affect swallowing function. All parents of children with cerebral palsy were informed of the study and signed informed consent forms. The study was approved by the hospital's ethics committee.

The children were randomly divided into an observation group and a control group using a random number table. In the observation group, there were 17 males and 13 females; their ages ranged from 3 to 10 years, with an average of (7.52±2.13) years; their body weights ranged from 3 to 30 kg, with an average of (14.29±1.38) kg. The types of cerebral palsy were: 4 cases of ataxia, 8 cases of spastic quadriplegia, 10 cases of spastic diplegia, 5 cases of dyskinesia, and 3 cases of mixed type. In the control group, there were 15 males and 15 females; their ages ranged from 4 to 9 years, with an average of (6.49±1.21) years; their body weights ranged from 4 to 32 kg, with an average of (16.53±1.05) kg. The types of cerebral palsy were: 5 cases of ataxia, 7 cases of spastic quadriplegia, 9 cases of spastic diplegia, 6 cases of dyskinesia, and 3 cases of mixed type. There were no significant differences in general information between the two groups ($P > 0.05$), indicating comparability.

In the control group, conventional swallowing rehabilitation nursing was adopted. First, swallowing function organ stimulation was performed. Cotton swabs or fingers were used to touch the children's mouths to stimulate their tactile sensation, and then cold objects were used to touch the children's tongue root, soft palate, and posterior pharyngeal wall to guide them to attempt active swallowing. Second, eating awareness and ability were trained. While maintaining a therapeutic body position, the child's head was kept in a neutral position to avoid abnormal postures, and then pasty food was fed. As the child's eating ability improved, the consistency and hardness of the food were gradually increased to train eating and swallowing abilities.

The observation group received additional chewing function nursing measures based on conventional rehabilitation nursing. First, chewing ability was trained. A small piece of relatively hard food was placed between the child's teeth on one side, and they were guided to move their jaw and swallow the food, training their oral closure ability. Meanwhile, thin and long thick-sliced food was selected for the child to tear and bite. During the training, they were guided to slightly pull the food outwards or grind it with their teeth to stimulate the tearing and biting movements. Second, tongue lateral and rotational movement training was stimulated. The child was guided to touch their left and right cheeks or corners of the mouth with their tongue. Oral motor training devices such as bubble blowing and straw suction were used to exercise the flexibility and coordination of the child's tongue, enhance tongue muscle strength, and improve chewing and swallowing abilities. Third, gingival massage was performed. Using clean, damp gauze or a specialized gingival massager, the child's gums from the incisors to the molars were massaged. During this process, attention was paid to controlling the massage intensity to avoid excessive stimulation. Fourth, chewing training was conducted. The child was allowed to practice chewing using a chewing tube, gradually increasing the hardness and length of the tube to challenge their chewing ability. Fifth, increased chewing training with diverse foods was provided. During training, starting with soft foods, different textures and hardness of food were gradually introduced to help the child adapt to different flavors of food and exercise their chewing ability. When feeding, attention was paid to ensure that the shape and size of the food suited the child's mouth size and chewing ability, avoiding overly large or hard food that could cause difficulty or injury during chewing.

Comparison of DDS Scores

Before nursing, there was no significant difference in DDS scores between the two groups of children ($P > 0.05$). After nursing, the DDS scores of both groups were lower than before nursing, and the scores of the observation group were lower than those of the control group. The difference between the two groups was significant ($P < 0.05$). See Table 1 for details.

Table 1: Comparison of DDS Scores Before and After Treatment in Both Groups

Group	Before Treatment	After Treatment
Observation Group (n=30)	15.38±1.64	9.54±2.38*
Control Group (n=30)	15.26±2.35	11.58±1.59*
t	-4.597	3.254
P	0.584	0.023

Note: "*" indicates $P < 0.05$ compared with before treatment.

Comparison of EDACS Ratings

Before rehabilitation nursing, there was no significant difference in EDACS ratings between the two groups of children ($P > 0.05$). After rehabilitation nursing, both groups showed improvement in EDACS ratings, with the observation group demonstrating better outcomes compared to the control group. The difference between the two groups was significant ($P < 0.05$). See Table 2 for details.

Table 2: Comparison of EDACS Ratings Before and After Treatment in Both Groups

Group	Before Treatment					After Treatment				
	I	II	III	III	V	I	II	III	III	V
Observation Group (n=30)	0	5	10	11	4	16	5	7	2	0
Control Group (n=30)	0	2	13	12	3	8	7	11	3	1
Z	-0.259					-2.137				
P	0.582					0.028				

Note: The Z-value and P-value represent the results of the non-parametric test (Mann-Whitney U test or similar) conducted on the EDACS ratings.

Comparison of SOMA Scores

Before rehabilitation nursing, there was no significant difference in SOMA scores between the two groups of children ($P > 0.05$). After rehabilitation nursing, both groups showed improvement in SOMA scores, with the observation group scoring higher than the control group. The difference between the two groups was significant ($P < 0.05$). See Table 3 for details.

Table 3: Comparison of SOMA Scores in Both Groups

Group	Tongue Movement Score		Lip Movement Score		Jaw Movement Score	
	Before	After	Before	After	Before	After
	Treatment	Treatment	Treatment	Treatment	Treatment	Treatment
Observation Group (n=30)	7.13±1.83	10.35±1.39*	7.15±1.32	10.78±1.87*	9.85±1.32	12.23±1.45*
Control Group (n=30)	7.22±1.31	8.52±1.64*	7.23±1.21	8.94±1.19*	9.78±2.35	10.29±2.29*
Z	0.059	4.038	0.353	3.284	0.451	2.697
P	0.946	0.002	0.782	0.001	0.682	0.025

Note: "*" indicates $P < 0.05$ compared with before treatment.

Conclusion

Swallowing dysfunction is one of the common symptoms in children with cerebral palsy. The causes of this symptom mainly include the following aspects. Firstly, central nervous system impairment. Cerebral palsy is caused by non-

progressive damage during brain development, which affects the areas of the brain that control swallowing reflexes and related muscle movements, leading to swallowing dysfunction. Secondly, impaired coordination of oral muscles. Children with cerebral palsy may have problems such as insufficient strength and poor coordination of oral muscles, making it difficult for them to perform chewing, swallowing, and other actions. Thirdly, abnormal muscle tone. Children with cerebral palsy often have abnormal muscle tone, including increased or decreased muscle tone. Increased muscle tone may lead to increased tension in the muscles of the throat, affecting the coordination of swallowing movements; while decreased muscle tone may result in weakness of the oral muscles, unable to effectively support the swallowing process. Fourthly, sensory impairment. Some children with cerebral palsy may have oral sensory impairment, being insensitive to the texture, temperature, and other characteristics of food, making it difficult for them to accurately perceive food during eating, affecting swallowing function. Fifthly, impaired coordination between respiration and swallowing. Children with cerebral palsy may have problems with the coordination between respiration and swallowing, making them prone to choking, aspiration, and other complications during the swallowing process. Targeted nursing measures need to be taken to address these causes, in order to improve the swallowing function of children with cerebral palsy and enhance their quality of life.

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References

- [1] Li, X. J., Tang, J. L., Ma, B. X., Et Al. (2014). Definition, Diagnostic Criteria, And Clinical Classification Of Cerebral Palsy. *Chinese Journal Of Applied Clinical Pediatrics*, 29(19), 1520.
- [2] Huang, Y. Y. (2019). Application Effect Of Oral And Pharyngeal Function Training Combined With Electromyography Biofeedback In Children With Cerebral Palsy And Swallowing Disorders. *General Nursing*, 17(31), 3933-3935.
- [3] Zhou, Y. M. (2023). The Intervention Effect Of Oral Rehabilitation Nursing On Children With Cerebral Palsy And Swallowing Dysfunction. *Guide Of China Medicine*, 21(15), 29-32.
- [4] Tang, J. L., Qin, J., Zou, L. P., Et Al. (2015). Chinese Rehabilitation Guidelines For Cerebral Palsy (2015): Part I. *Chinese Journal Of Rehabilitation Medicine*, 30(7), 747-754.
- [5] Li, C., Zhang, M. Q., Dou, Z. L., Et Al. (2017). Epidemiological Survey Report On Swallowing Dysfunction In Specific Populations In China. *Chinese Journal Of Physical Medicine And Rehabilitation*, 39(12), 937-943.
- [6] He, Q. G., Luo, Y., Li, Y. Y., Et Al. (2020). Clinical Study Of Round Needle Hyoid Muscle Stimulation In The Treatment Of Drooling In Children With Cerebral Palsy. *Scientific And Technological Innovation*, (26), 79-81.
- [7] Chen, J., Tong, G. L. (2022). Grading System Of Eating Function And Analysis Of Malnutrition In Children With Cerebral Palsy. *Chinese Journal Of Child Health Care*, 30(5), 544-547+557.
- [8] Xu, H. B., Chen, Q. L., Sun, X. D. (2023). Effect Of Acupuncture Combined With Massage On Clinical Efficacy, Swallowing Function, And Limb Function Of Children With Cerebral Palsy And Swallowing Disorder. *Clinical Research*, 31(5), 109-112.
- [9] Barton, C., Bickell, M., & Fucile, S. (2018). Pediatric Oral Motor Feeding Assessments: A Systematic Review. *Physical & Occupational Therapy In Pediatrics*, 38(2), 190-209.
- [10] Liu, T. (2020). Effect Of Oral Muscle Training Games Combined With Swallowing Coordination Training On Drooling And Swallowing Function In Children With Cerebral Palsy. *Journal Of Baotou Medical College*, 36(10), 4.
- [11] Hoon, A. H., Jr Stashinko, E. E. (2015). Quality Of Life In Adolescents With Cerebral Palsy. *Lancet*, 385(9969), 670-672.