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Assessment of the role and effectiveness of nurse-led multimodal guidance in the rehabilitation of dysphagia in patients with brain tumors

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Research Article

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Abstract

BACKGROUND

Dysphagia is a common complication in patients with brain tumors, which has a profound adverse impact on patients' health status and quality of life. However, there is a relative lack of research on the rehabilitation of dysphagia in brain tumor patients, especially regarding the role and effectiveness of nurse-led multimodal guidances in the rehabilitation of dysphagia in brain tumor patients, which lacks systematic assessment and in-depth discussion.

METHODS

In this study, a randomized controlled trial (RCT) design was used to select 120 dysphagia patients among brain tumor patients admitted to our hospital during the period of January 2024 to May 2024 as the study subjects, and they were stratified and randomly divided into an guidance group (n = 60) and a control group (n = 60). While the control group received conventional nursing care and treatment protocols, the guidance group received a nurse-led multimodal guidance program, including personalized swallowing training, nutritional support, psychological care, and a family-participatory rehabilitation program, which was developed and dynamically adjusted by nurses, rehabilitation therapists, and dietitians. Differences in data before and after the guidance were analyzed using the paired t-test or Wilcoxon signed-rank test, and between-group comparisons were made using the independent samples t-test or Mann-Whitney U test.

RESULTS

Both the guidance and control groups showed improvement in swallowing function among the patients. The Kubota drinking test score, Saito's swallowing function grading, and the quality of life scores for patients in the guidance group showed a significant enhancement compared to those in the control group ($P < 0.05$), indicating that the guidance was more effective than the control When compared within groups, all scores in both the guidance and control groups improved gradually with the time of guidance ($P < 0.05$). The improvement was significantly higher in the guidance group than in the control group.

CONCLUSION

This study demonstrates that a nurse-led multimodal guidance is significantly effective in improving swallowing function and quality of life in patients with brain tumors. The guidance provides comprehensive rehabilitation support for patients through multidisciplinary collaboration and personalized care, and has certain clinical promotion value.

1 Introduction

Brain tumors, as a disease with a high risk of neurological deterioration, have attracted much attention in the field of cancer rehabilitation in recent years[1]. Since the mid-1970s, the incidence of brain tumors has shown an increasing trend worldwide[2]. Patients with brain tumors are often associated with a variety of neurological dysfunctions, among which dysphagia is a prevalent and serious quality-of-life symptom. Studies have shown that the prevalence of dysphagia in patients with brain tumors is as high as 63%[3, 4], and the difference in swallowing function between patients with benign and malignant tumors is not significant. The etiology of dysphagia is complex and may be due to focal neurological deficits or deterioration of the state of consciousness, such as tumor compression or treatment-related injuries[5]. Another part of the cause may be the patient's psychological dysphagia.

Dysphagia adversely affects the health status and quality of life of brain tumor patients. And its pathophysiologic mechanisms are complex and dynamically changing, involving the interaction of multiple neural, muscular, and sensory systems, which may overlap[6]. Dysphagia not only directly affects the patient's nutritional intake, hydration status, and medication compliance[7], but may also lead to serious complications such as aspiration pneumonia, dehydration, and malnutrition[8, 9]. For example, one study showed that the median time interval from dysphagia episode to death was only 21 days, suggesting that dysphagia may shorten the survival time of patients[10]. In addition, the loss of swallowing ability increases the risk of pulmonary aspiration, which affects the patient's nutritional and hydration supply, making it challenging to take medications, fluids, and food by mouth[11, 12]. The progress in medical technology has improved treatment options for brain tumor patients, leading to longer survival times. However, some patients still experience dysphagia, which can lead to significant psychological anxiety and panic, potentially hindering their recovery. Dysphagia not only imposes both physical and psychological burdens on the patients themselves, but also has a significant impact on the quality of life of caregivers, increasing the burden and stress of caregiving[13]. Some studies have shown[14] that postoperative care for patients can improve the success rate of surgery, increase patient motivation, and facilitate the recovery of the disease. However, systematic studies on their management and rehabilitation are still relatively scarce, especially for the practical effects of nurse-led guidances are even more insufficient, and research in related areas still needs to be further deepened.

Rehabilitation of patients with brain tumors is essential to improve their functional prognosis and quality of life. Although physicians and therapists play a central role in the rehabilitation process, an integrated rehabilitation model with multidisciplinary collaboration has been shown to significantly improve rehabilitation outcomes[15, 16]. In this model, nurses play an integral role. Not only do nurses need to collect and integrate patients' individualized needs and functional status, but they also need to work closely with other healthcare professionals (e.g., physical therapists, speech therapists, dietitians, etc.) [17, 18] in preventing and managing a variety of symptoms and therapeutic problems caused by the disease. The nurse's role is also characterized by addressing patient compliance issues, providing continuity of care, and reducing patient distress and psychological stress[19]. For example, nurses can

help patients cope with impaired functioning due to brain tumors by developing individualized care plans that closely integrate nursing guidances with the patient's life needs. In addition, education and supportive care provided by nurses are crucial to patient recovery. These guidances not only integrate rehabilitation into patients' daily lives, but also promote functional recovery and quality of life[20]. Through nurse-led multimodal guidances, patients' swallowing function, nutritional status, and psychological status can be comprehensively improved, thus providing strong support for their overall recovery.

The mechanism of dysphagia in brain tumor patients involves many factors such as direct tumor damage, treatment side effects and systemic status, etc. Currently, there are obvious limitations in routine clinical care methods, and monolithic guidances cannot cover the overall needs of swallowing as a complex physiological process. Multi-modal guidance realizes the synergistic improvement of multiple links through the integration of rehabilitation, medication, diet, psychology and other means, the goal is to enhance treatment effectiveness, minimize complications, and elevate the quality of life for patients. Nurse-led multimodal guidances are capable of integrating multiple rehabilitation strategies, including individualized swallowing training, nutritional support, psychological care, and family participatory rehabilitation programs[21]. These measures, through multidimensional guidances, may have a positive effect on the recovery of swallowing function, the improvement of nutritional status, the alleviation of psychological stress, and the improvement of overall quality of life in brain tumor patients. However, the actual effects of such guidances and their impact on the long-term prognosis of patients still need to be further verified.

Therefore, this study aims to systematically investigate the role of nurse-led multimodal guidances in the rehabilitation of dysphagia in patients with brain tumors and to scientifically assess their effectiveness. The study will focus on the role of the guidance in improving patients' swallowing function and quality of life, and explore its feasibility and sustainability in clinical practice. The results of this study will provide a new scientific basis for the rehabilitation management of brain tumor patients, fill the research gaps in the related fields, and at the same time provide a guiding guidance plan for clinical practice, so as to improve the rehabilitation level and quality of life of brain tumor patients.

2 Data and Methods

2.1 Basic information of patients

In this study, 120 patients with dysphagia among 581 inpatients with brain tumors admitted to our hospital during the period of January 2024 to May 2024 were selected as the study subjects.In order to control the interference of confounding factors and ensure the credibility of the results, we used a randomized controlled trial (RCT) to randomly divide into an guidance group and a control group, with 60 cases in each group, and chose a sample of balanced and comparable in terms of age and gender. The control group received the usual nursing care and treatment regimen and the guidance group received a nurse-guided multimodal nursing care and treatment regimen. The study was conducted in accordance

with the Declaration of Helsinki and was approved by the Ethics Committee of The First Affiliated Hospital of Soochow University (Approval No: 2023-CC-03).

2.2 Inclusion and exclusion methods

Inclusion criteria: (1) aged 18 to 75 years, admitted to the hospital within 24 hours after the onset of the disease, and hospitalization time of greater than or equal to 7 days and less than or equal to 28 days; (2) after admission to the hospital for surgery, the vital signs were stable and there was no obvious cognitive impairment or impaired consciousness; (3) postoperative Kubota drinking water test ≥ grade III[22, 23]; Saizo's seven-grade rating scale ≤ 5; (5) no psychiatric history or history of central nervous system injury; (6) participants and their families were informed about the study and voluntarily provided their consent by signing an informed consent form.

Exclusion criteria: (1) severe cognitive or consciousness disorders; (2) other neurological disorders; (3) expected survival < 6 months; (4) patients found to have no dysphagia in the trial; and (5) poor compliance and withdrawal from the treatment.

2.3 Randomization grouping

In order to reduce bias, this study adopted a randomization method, and the randomization process was implemented by the clinical research coordinator of the hospital, which was first stratified according to the Kubota Drinking Water Trial grading (grade III/IV/V) as well as Saito's seven-grade evaluation method, and then a computer was used to generate a table of random numbers from 1 to 120, which corresponded to the numbering of the 120 participants, within each stratum. Participants with odd random numbers were allocated to the control group, whereas those with even numbers were placed in the guidance group. The allocation scheme was restricted by the nature of nursing guidance and completely blinded, and the blinding principle was implemented in this study: (1) the assessment of swallowing function indicators such as the Kubota drinking test and the Saito's seven-grade evaluation method was completed independently by a full-time rehabilitator, and the information about the participants' subgroups was completely concealed during the assessment process, to avoid the influence of the results of the assessment due to the subjective cognition; (2) the swallowing contrast examination (VFSS) was interpreted by the radiologists individually, and the research team The background of participants' grouping was not provided to ensure the independence of the analysis of imaging results; (3) the grouping information was kept in a separate seal by the statistician designated by the research team.

2.4 Research guidance

The control group used conventional nursing and treatment protocols, which firstly included basic nursing care: condition monitoring condition monitoring, daily recording of patients' symptoms of swallowing disorders (e.g., frequency of choking and coughing, feeding status), and regular review of cranial CT/MRI to assess the impact of tumor progression on swallowing function; patients' position management, taking a seated position or a semi-recumbent position of 30°~45° when eating, and

maintaining the position after meals for 30 minutes to avoid aspiration[24]. Secondly, nutritional support management is carried out: dietary adjustments are made according to the results of the Kubota drinking test and the Saito's seven-grade evaluation method to adjust the patient's food (such as fluid, semi-fluid, soft food) and limit the rate of water consumption; nasogastric management is carried out, and the patients with severe dysphagia are fed by nasal feeding, and the amount of gastric residual volume is evaluated every day to prevent reflux[25, 26]. Patients were again targeted for routine rehabilitation training: ice stimulation of the posterior pharyngeal wall and passive massage of the lingual muscles were instructed by a rehabilitation therapist twice a week[27, 28]; a dysphagia care manual was given to patients and their families to inform them of the basic dietary precautions.

The guidance group received a nurse-led multimodal care and treatment program. Firstly, nurses used the Kubota drinking test, Saito's seven-level evaluation method, and the Swallowing Disorders Quality of Life Scale (SWAL-QOL) to conduct a comprehensive assessment at the one-week, one-month, and three-month nodes postoperatively, and then combined with a rehabilitation therapist and a dietitian to formulate a personalized guidance plan. The guidance plan is dynamically adjusted according to the needs and updated every 2 weeks based on the assessment results, e.g., for patients with Saito's grades 3 and 4, intensive oral muscle training and instruction in feeding posture; for patients with Saito's grades 5 and 6, priority is given to nasal nutritional support and indirect swallowing training (Saito's seven-grade evaluation method is assessed by trained nurses using a standardized process). Secondly, the guidance was aimed at the patients' swallowing rehabilitation: uniformly trained nurses instructed the patients to perform the “Mendelssohn swallowing method” and the “supraglottic swallowing method” three times a day for 15 minutes each time, and to use foods of different textures (e.g., pudding, rice pudding, crumbled soft food) for ingestion training, and the patients were given the “Mendelssohn swallowing method” for 15 minutes each time. Soft food) for ingestion training, and record the amount of food eaten at each meal and the situation of misglottation, the nurse instructed the patient and his family members to target the patient for oral muscle training, the use of tongue depressor plate for tongue muscle resistance training, chewing muscle massage, etc., and the nurse or instructed the patient's family members to touch the patient's palatine arches and posterior pharyngeal wall gently with a frozen swab, two times a day, to enhance the swallowing reflex[29]. Again, individualized nutritional and malabsorption management was adopted for patients: nurses and dietitians worked together to formulate a high-protein, high-calorie diet plan, and implemented the “nurse-dietitian double-checking” system for nasogastric feeding patients to ensure that nasogastric solution was at the appropriate temperature and speed, and instructed patients to turn their heads to the affected side (unilateral brain tumors) during meals to help food pass through, and after meals, implemented the “Nurse-Dietitian Double-Checking” system to ensure that food passed through. When feeding, the patient was instructed to turn his head to the affected side (one side of the brain tumor) and to utilize gravity to help the food to pass, and the “3-3-3” principle was implemented after meals: three empty swallows, three seconds of head-down posture, and 30 minutes of postural management. Finally, the quality of life score (QoL) was used to assess the patient's status, and cognitive-behavioral guidances were carried out twice a week to correct the false cognition that swallowing disorders are irreversible and to increase the confidence of the patients and

their families. We also organized family members to participate in swallowing training courses, taught them hand-to-hand feeding techniques, and established a home care log (recording daily food intake and completion of training).

2.5 Key indicators

(1) Kubota Drinking Test Score: we tested the patients by grading their pre-guidance Kubota Drinking Test, Kubota Drinking Test (one week), Kubota Drinking Test (one month) and Kubota Drinking Test (three months). The change in the scores of the Kubota drinking test at different time points in the two groups was compared to assess the improvement in swallowing function. A decrease in score would indicate an improvement in swallowing function. For example, if the patient's pre-guidance score was 4, and the score gradually decreased to 2 over time, this indicates a more significant improvement in swallowing function.

(2) Saito's seven-level evaluation method score: To ensure the accuracy of the score, we tested the degree of dysphagia based on the Saito's seven-level evaluation method (pre-guidance), the Saito's seven-level evaluation method (one week), the Saito's seven-level evaluation method (one month), and the Saito's seven-level evaluation method (three months) at the same time. Lower scores implied improved swallowing function. For example, if the score was 6 before the guidance and subsequently decreased to 3, it means that the swallowing function has improved.

(3) Quality of life indicators: we measured patients' scores on pre-guidance quality of life scores, post-guidance quality of life scores (one week), post-guidance quality of life scores (one month) and post-guidance quality of life scores (three months). Increases and decreases in quality of life scores at different stages were analyzed to see how patients' quality of life was affected by dysphagia and the guidance. If the score increases, this indicates that the guidance positively impacts the enhancement of the patient’s quality of life.

(4) BMI: We calculated and evaluated the BMI value of the patients through the weight follow-up records of the patients, and the stabilization or reasonable increase of the BMI value can reflect the nutritional intake of the patients to a certain extent, which can also reflect the impact of the improved swallowing function on the nutritional absorption. If BMI rises gradually from a low level to the normal range, it may indicate that the patient is able to consume sufficient nutrition after the improvement of swallowing function.

(5) We also compared the effects of different subgroups: according to the guidance subgroups (0 is the control group and 1 is the guidance group), we compared and analyzed the two groups of patients on each of the above mentioned observational indexes (such as Kubota Drinking Water Test Score, Saito's Seven-Level Evaluation Method Score, Quality of Life Score, BMI, etc.). Observe whether the guidance group has a significant improvement trend in each index compared with the control group, so as to judge the effectiveness of the nurse-led multi-modal guidance.

2.6 Statistical methods

Data were processed and analyzed using excel and R 4.4.2 software. Continuous variables were expressed as mean and standard deviation (mean ± sd) and categorical variables were expressed as frequency and constitutive ratio [n (%)], and differences between groups of categorical variables were compared using the $\chi 2$ test. The Shapiro-Wilk test with QQ plots was used for all continuous variables to see if they conformed to normal distribution, and the Levene test was used for the test of chi-square. For variables that conformed to normal distribution and had chi-square variance, the T-test was used for between-group comparisons, and for those that did not, the Mann-Whitney U-test was used for between-group comparisons. Comparisons of pre- and post-guidance differences were made using paired t-tests for variables that met normal distribution and had chi-squared variances, otherwise Wilcoxon signed rank tests were used. $p < 0.05$ indicates a statistically significant difference.

High-quality care models can positively influence patients' psychological well-being, greatly enhance the quality of care, and produce favorable outcomes. High-quality nursing treatments in a supportive environment can significantly improve patients' psychological status and promote overall health and improved health results. These guidances consist of effective communication, compassionate care, patient education, pain management, and a holistic approach. Enhanced communication, safety measures, continuity of care, and standardized protocols contribute to this effort.

3 Results

In this study, the difference between the guidance and control groups in terms of age, gender, and BMI was not statistically significant (P>0.05); the postoperative tube-feeding extubation rates of the guidance and control groups were 75% and 66.67%, respectively, with no statistically significant difference, whereas the extubation rates of the experimental and control groups after different guidances were 95% and 81.67%, and the experimental group was higher than the control group, and the difference was statistically significant (P=0.04). The average length of hospitalization was 16.64 and 15.31 days respectively and the difference between the two study groups was not statistically significant,p value was 0.15; The mean values of the quality of life scores of the experimental and control groups before the nurses implemented the different modes of guidance were 51.07 and 50.45, respectively, and the difference between the two groups was not statistically significant, showing a p-value of 0.78. (see Table 1 for details).

Table 1.Baseline characteristics of the study population				
	guidance group □60□	control subjects □60□	χ^2/t	*P*
age	59.02(11.87)	54.65(11.98)	2.01	0.05
genders(n/%)			0.31	0.58
male	28(46.67)	24(40.00)		
female	32(53.33)	36(60.00)		
BMI	24.87(2.92)	25.18(2.88)	0.58	0.56
Postoperative extubation or not			0.65	0.42
yes	45(75.00)	40(66.67)		
no	15(25.00)	20(33.33)		
Whether to extubate after guidance			3.96	0.04
yes	57(95.00)	49(81.67)		
no	3(5.00)	11(18.33)		
Length of hospitalization (days)	16.64(5.22)	15.31(4.79)	1.45	0.15
Pre-guidance quality of life scores	51.07(11.87)	50.45(12.34)	0.28	0.78

It was found that the quality of life scores of the patients with dysphagia in brain tumors increased gradually after the nurses implemented the multimodal guidance, from 51.07 before the guidance to 63.77 three months after the implementation of the guidance, while the quality of life scores of the patients with the implementation of the conventional model of nursing care did not change much in the three follow-up visits. After one week, one month, and three months, the quality of life scores for patients in the test group were higher than those in the control group, with statistically significant differences. Specifically, the scores for the two groups were 55.27 and 50.18 after one week, respectively; the p-value was 0.03; the quality of life scores were 59.02 and 50.15 after one month, respectively, with $p<0.01$; and the quality of life scores were 63.77 and 50.02 after three months, respectively, with $p<0.01$, and the differences were all statistically significant (see Table 2).

Table 2.Comparison of quality of life scores before and after the implementation of nursing guidances in the two groups of patients				
	guidance group (n=60)	Control group (n=60)	*t*	*P*
pre-guidance	51.07±11.87	50.45±12.34	0.27	0.78
1 week later	55.27±12.70	50.18±13.39	2.13	0.03
1 months later	59.02±12.82	50.15±13.85	3.64	<0.01
3 months later	63.77±13.25	50.02±14.66	5.37	<0.01

From the table of changes in the scores of the Puddle Drinking Test in Table 3 we can see that there was an improvement in swallowing function in both the test and control groups. The difference between the scores of the two groups before the guidance was not statistically significant, while with the nurse guidance, the difference between the two groups gradually appeared, in the implementation of multi-modal guidance group of patients after 3 months of the mean value of the score of 2.55 points, while the implementation of the conventional guidance of the patients of the score of 3.48 points, the score of the experimental group is better than the control group, P < 0.01, the difference is statistically significant.

Table 3.Comparison of Puddle Drinking Test scores before and after the implementation of nursing guidances in the two groups of patients				
	guidance group (n=60)	Control group (n=60)	*U*	*P*
pre-guidance	3.88(0.78)	4.02(0.81)	1962.5	0.37
1 week later	3.42(0.87)	3.9(0.93)	2331.5	<0.01
1 months later	2.97(1.04)	3.63(1.02)	2431	<0.01
3 months later	2.55(1.08)	3.48(1.10)	2623.5	<0.01

Table 4 shows the Talento's seven scale scores of the guidance and control groups, in this study we found that dysphagia in brain tumor patients decreases with the implementation of nursing guidances by the nurses, which highlights the importance of nursing guidances. The score of the test group decreased from 4.03 to 2.35 and the score of the control group decreased from 4.10 to 3.25, which indicates that the nursing guidance made the swallowing function of the patients in a good direction, and at the same time, we discovered that the test group's score was superior to that of the control group, with a statistically significant difference of P<0.01. which indicates that multimodal guidances have a significant improvement in the swallowing function of patients with brain tumors.

Table 4.Comparison of Tsaito's seven scores before and after the implementation of nursing guidances in the two groups of patients				
	guidance group (n=60)	Control group (n=60)	*U*	*P*
pre-guidance	4.03(1.01)	4.1(0.95)	1900	0.58
1 week later	3.45(0.91)	3.9(0.93)	2290.5	0.01
1 months later	2.92(0.10)	3.62(1.01)	2480.5	<0.01
3 months later	2.35(0.90)	3.25(1.02)	2665	<0.01

Table 5 shows the results of comparing the scores before and after the implementation of the multimodal guidance in the experimental group. Firstly, the quality of life scores were higher than the pre-guidance scores at one week, one month and three months after the implementation of the guidance, and the differences were statistically significant (P<0.01). In the Kubota Drinking Water Experiment scores, we found that the scores at one week, one month and three months after the implementation of the multimodal guidance were close to 2, which was better than the pre-guidance scores, and the difference was statistically significant (P<0.01). In the Saito's seven-stage evaluation method score, several of the post-guidance score values were also superior to the pre-guidance score, and the differences were statistically significant (P<0.01), and these results proved that the multimodal guidance approach that we have implemented is effective for the improvement of dysphagia.

Table 5.Comparison of the scores of patients in the test group after the implementation of nursing guidance and before the guidance			
groups	marking time	*t/u*	*P*
Quality of Life Score	pre-guidance		
	1 week later	11.07	<0.01
	1 months later	13.88	<0.01
	3 months later	21.75	<0.01
Scoring of Puddle Field Drinking Water Trials	pre-guidance		
	1 week later	406	<0.01
	1 months later	903	<0.01
	3 months later	1275	<0.01
Saito's seven-point scale	pre-guidance		
	1 week later	561	<0.01
	1 months later	1035	<0.01
	3 months later	1596	<0.01

Table 6 shows the results of the comparison of the scores before and after the implementation of conventional guidance in the control group of patients, the study shows that in the control group, the changes in the quality of life scores of patients before and after the implementation of the guidance were not significant, and the difference was not statistically significant (P>0.05). In the Kubota drinking water test scores, we found that the effect of the guidance gradually appeared as the time of the routine guidance passed, for example, the difference between the score values after one week of the guidance and the pre-guidance was not statistically significant (P=0.24), whereas the score values at one and three months after the guidance were better than the pre-guidance, and the difference was statistically significant. We found a similar phenomenon in Saito's seven-level evaluation method, where the difference between the scores one week after the routine guidance and before the guidance was not statistically significant, P=0.07, and the scores at 1 and 3 months after the guidance were better than the scores before the guidance, and the difference was statistically significant in both cases (P<0.01).

Table 6.Comparison of the scores of the patients in the control group after the implementation of the nursing guidance and before the guidance			
groups	marking time	*t/u*	*P*
Quality of Life Score	pre-guidance		
	1 week later	0.67	0.51
	1 months later	0.46	0.65
	3 months later	0.51	0.61
Scoring of Puddle Field Drinking Water Trials	pre-guidance		
	1 week later	378	0.24
	1 months later	577.5	0.01
	3 months later	814.5	<0.01
Saito's seven-point scale	pre-guidance		
	1 week later	482	0.07
	1 months later	708	<0.01
	3 months later	1008	<0.01

4 DISCUSSION

The results of this study indicate that a nurse-led multimodal guidance significantly improved swallowing function and quality of life in brain tumor patients. Specifically, the quality of life scores of the guidance group significantly improved within three months after the implementation of the nurse guidance, with a mean score of 63.77, while the score of the control group was only 50.02, and the difference between the two groups was statistically analyzed and shown to be significant ($P < 0.01$). In addition, the Kubota drinking test score and Saito's swallowing function grading in the guidance group also showed a significant trend of improvement, which fully demonstrated the important role of multimodal nursing guidances in enhancing patients' swallowing function. These findings are consistent with the existing literature and confirm the effectiveness of multimodal nursing guidances in the rehabilitation of patients' swallowing function. Relevant literature[30] indicates that patients' quality of life can be systematically enhanced by improving the assessment methods of dysphagia and implementing dietary guidances.

In the present study, the reliability of the results is provided by the non-significant difference between the guidance and control groups in terms of basic demographic characteristics such as age, gender and BMI ($P > 0.05$), which implies that the baseline characteristics of the patients in the two groups are basically

the same and the observed treatment effects are more likely to be related to the guidance itself. In addition, the extubation rates in the guidance group were significantly higher than those in the control group, at 95% and 81.67%, respectively (P = 0.04), a result that not only reflects the effectiveness of the multimodal guidance in improving swallowing function, but also illustrates the positive role of the guidance in facilitating patients' clinical recovery. Study[31] further emphasized that nurse-led multimodal care in swallowing rehabilitation has advantages, which provides strong support for the results of this study.

For within-group comparisons, we further analyzed the changes in the quality of life scores and functional scores of the guidance group during the follow-up period, which showed that the quality of life scores of the guidance group were significantly higher than pre-guidance levels and swallowing function improved significantly, whether one week, one month, or three months after the guidance was implemented. This sustained positive effect demonstrates that the multimodal guidance implemented by the nurses not only improves the patient's symptoms immediately, but also continues to have an effect in the long-term rehabilitation process. This finding is consistent with the results of known studies[32] and emphasizes the importance of nurses being able to lead the necessary management measures and specific guidance methods in the recovery of swallowing function.

Based on the positive results of this study, it is recommended that nurses' training and education in dysphagia management be further strengthened to enhance their professional skills in the evaluation and guidance of patients' swallowing function[33]. Improving nursing staff's awareness of dysphagia and their ability to intervene can significantly improve patients' rehabilitation outcomes. In addition, promoting interprofessional collaboration between nurses and other healthcare professionals, such as speech therapists, is essential to comprehensively meet patients' rehabilitation needs[34]. Through teamwork, multidisciplinary expertise can be more effectively integrated to provide a comprehensive patient-centered care plan.

In summary, this study provides support for the clinical care of dysphagia in patients with brain tumors, as well as a foundation for future related research. These results emphasize the importance of nurses in the management of dysphagia and call for healthcare organizations to widely promote nurse-led multimodal guidance approaches in clinical practice to improve the quality of life and clinical outcomes of brain tumor patients.

5 Strengths and Limitations

This study has many strengths; first, the multimodal guidance used in this study can help patients cope with the multiple challenges posed by dysphagia, including swallowing dysfunction, malnutrition, and psychological stress. Second, this comprehensive guidance can significantly improve patients' compliance and rehabilitation effects, and to a certain extent reduce the psychological burden of patients and their families. Finally, this study provides a new scientific basis for the clinical nursing practice of dysphagia in brain tumor patients. The nurse-led multi-modal guidance program can

effectively improve patients' swallowing function and quality of life, which provides a certain basis for current research on clinical nursing practice.

Of course, there are some shortcomings in this study. First, the sample size of this study is relatively small and limited to a single medical institution, and it should be taken into account that the heterogeneity of the patient population may have an impact on the extrapolation of the results. Second, the relatively short duration of the guidance did not allow for a comprehensive assessment of the long-term effects of the multimodal guidance. Future research should increase the sample size and prolong the follow-up duration to better assess the long-term impacts of this guidance program across various clinical environments. Finally, this study did not fully explore the applicability of this guidance protocol in different clinical settings (e.g., different types of brain tumors, patients with different severity of dysphagia). Future studies should conduct subgroup analyses for different patient populations to assess the adaptability and effectiveness of the guidance program.

6 CONCLUSIONS

In this study, by evaluating the effectiveness of a nurse-led multimodal guidance in the rehabilitation of dysphagia in patients with brain tumors, it was found that the guidance had a significant effect on improving the patients' quality of life, swallowing function, and nutritional status. Specifically, after the implementation of the nurse-led multimodal guidance, the patients' quality of life scores, Kubota drinking test scores, and Saito's swallowing function grades were significantly improved compared with the pre-guidance period, indicating that the guidance program was effective in facilitating the recovery of the patients' swallowing function and the improvement of their quality of life. The results of this study provide a new scientific basis for the clinical nursing practice of dysphagia in brain tumor patients. Nurse-led multimodal guidance has certain clinical promotion value due to its high efficiency, individualization and multidisciplinary collaboration. This study provides a practical nursing guidance plan for the management of dysphagia in patients with brain tumors, and at the same time provides new ideas for optimizing the rehabilitation nursing model. In the future, the core role of nurses in the rehabilitation of brain tumor patients will be further highlighted, promoting the widespread application of the multidisciplinary collaboration model in clinical practice.

Declarations

Ethics approval and consent to participate

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki and received formal exemption approval from the Ethics Committee of The First Affiliated Hospital of Soochow University (Approval No: 2023-CC-03). All participants provided written informed consent.

Conflicts of Interest

The authors declared that they have no conflicts of interest regarding this work.

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Author Contribution

Yaping Lu: Investigation, Data Curation, Formal Analysis, Visualization, Software, Writing - Original Draft.Haifeng Wu: Conceptualization, Methodology, Resources, Validation, Supervision, Writing - Review & Editing.

Data Availability

Data will be made available on request.

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