The Impact of the ERAS-MDT-Based Nursing Interventions on Postoperative Recovery, Nutritional Status, and Complications in Patients Undergoing Total Laryngectomy for Laryngeal Cancer

Lingfang Wu[1], Haiying Cheng[2], Liyuan Wu[1], Yuzhu Yao[1], Dan Li[1], Xinyi Dai[1], Danhua Yao[3,*]

[1]Department of Otolaryngology, The Second Affiliated Hospital of Jiaxing University, Jiaxing, Zhejiang, China
[2]Department of Nursing, The Second Affiliated Hospital of Jiaxing University, Jiaxing, Zhejiang, China
[3]Department of Orthopedics, The Second Affiliated Hospital of Jiaxing University, Jiaxing, Zhejiang, China
*Correspondence: 15857307373@163.com (Danhua Yao)

Abstract

Aims/Background Throat cancer is a common malignant tumor in the head and neck region, with post-operative recovery influenced by various factors. The enhanced recovery after surgery-multidisciplinary team (ERAS-MDT) concept emphasizes the use of multidisciplinary collaboration to optimize preoperative, intraoperative, and postoperative care and treatment, aiming to accelerate patient recovery, reduce complications, and improve treatment outcomes. Therefore, this study aims to explore the impact of the ERAS-MDT-based nursing intervention in postoperative rehabilitation, nutritional status, and complication rates among patients undergoing total resection of laryngeal cancer.

Methods This retrospective study recruited 85 of patients who underwent total laryngectomy for laryngeal cancer at the Second Affiliated Hospital of Jiaxing University between April 2020 and February 2024. Among them, 45 patients who received team-based nursing interventions following the ERAS-MDT concept were categorized as the ERAS-MDT group. Another 40 patients who received routine nursing interventions, were randomly included in the conventional group. The study compared nutritional indicators, Patient Health Questionnaire-9 (PHQ-9) scores, Patient-Generated Subjective Global Assessment (PG-SGA) scores, and Generalized Anxiety Disorder-7 (GAD-7) scores before and after nursing intervention. Additionally, gastrointestinal function recovery, total hospitalization costs, patient satisfaction, length of hospital stay, and complication rates were evaluated for both groups.

Results There was no statistically significant difference in nutritional status between the two groups before nursing ($p > 0.05$). The post-nursing hemoglobin, albumin, prealbumin, and total protein levels in the ERAS-MDT group were 125.63 ± 10.77 g/L, 44.14 ± 4.93 g/L, 261.74 ± 28.82 mg/L, and 64.83 ± 5.36 g/L, respectively. In contrast, the post-nursing hemoglobin, albumin, prealbumin, and total protein levels in the conventional group were 114.56 ± 8.96 g/L, 39.01 ± 4.81 g/L, 222.84 ± 26.98 mg/L, and 57.85 ± 5.11 g/L, respectively. All indicators in both groups were higher than before nursing levels, with the ERAS-MDT group exhibiting significantly higher levels than the conventional group ($p < 0.05$). The time to first mobilization (10.52 ± 2.17 hours), first bowel movement (21.41 ± 4.50 hours), and hospitalization time (11.57 ± 1.91 days) were significantly shorter in the ERAS-MDT group than those in the conventional group ($p < 0.05$). However, there was no statistically significant difference in total hospitalization costs ($p > 0.05$). Furthermore, the differences in the PHQ-9, GAD-7, and PG-SGA scores were statistically insignificant between the two groups before nursing ($p > 0.05$). After nursing, the PHQ-9 score (2.81 ± 0.78), GAD-7 score (6.68 ± 1.05), and PG-SGA score (4.69 ± 1.24) were significantly reduced in the ERAS-MDT group than pre-nursing levels, with the ERAS-MDT group demonstrating substantial decrease than the conventional group ($p < 0.05$). Moreover, the satisfaction rate was 95.56% (43 cases/45 cases) in the ERAS-MDT group and 80.00% (32 cases/40 cases) in the conventional group. However, the difference was statistically insignificant ($p > 0.05$). Additionally, the incidence of complications was 8.89% (4 cases/45 cases) in the ERAS-MDT group

compared to 17.50% (7 cases/40 cases) in the conventional group, indicating statistically insignificant difference ($p > 0.05$).

Conclusion The ERAS-MDT concept team-based nursing intervention can improve hemoglobin, albumin, prealbumin, and total protein, promote postoperative recovery, and enhance patient satisfaction in those undergoing total laryngectomy for laryngeal cancer.

Key words: enhanced recovery after surgery; laryngectomy; patient satisfaction; complications; nursing

Introduction

Laryngeal cancer is one of the most prevalent malignant tumors of the head and neck, accounting for 13.9% of head and neck malignancies and 2.1% of all cancers. Research indicates a significant increase in the global incidence and mortality of laryngeal cancer in 2020 compared to 2018. By 2030, the number of laryngeal cancer patients in China is projected to exceed 50,000, posing a major public health concern (Sung et al, 2021). Total laryngectomy is the primary treatment method for this condition; however, the surgical scope and trauma pose significant challenges to the patient's postoperative recovery.

Furthermore, surgical trauma induces a hypercatabolic state, significantly increasing nutritional requirements. Moreover, postoperative complications, including swallowing difficulties and decreased appetite can affect the patient's normal dietary intake, resulting in malnutrition and hindering overall recovery. Psychological support is crucial in surgical patient recovery. These patients often experience fear, anxiety, and feelings of inferiority due to a lack of understanding of laryngeal cancer and the physical changes associated with surgical procedures, such as tracheostomy. These psychological burdens not only affect their mental health but also reduce treatment and rehabilitation compliance, thereby affecting their overall well-being and routine life. Furthermore, extensive surgical scope elevates the risk of postoperative complications, such as wound infection, bleeding, and lung infection, which need effective complication prevention. Additionally, patients often have limited knowledge of the disease and surgical procedure, resulting in insufficient self-care measures for preventing complications (Brodersen et al, 2023).

However, routine care often fails to address these challenges, resulting in delayed recovery for some patients. Enhanced recovery after surgery (ERAS) is an emerging concept that differs from traditional care models by focusing on the patient's healthcare experience, ultimately improving recovery outcomes (Feng et al, 2022). Combining the multidisciplinary team (MDT) model with the ERAS model results in the ERAS-MDT approach, which is based on a collaborative framework across multiple disciplines. This approach involves active participation from multidisciplinary healthcare professionals while incorporating humanistic philosophy and service-oriented care. This synergy between clinical and technical departments enhances diagnostic and therapeutic effectiveness, optimizes resource utilization,

and provides high-quality care. Furthermore, this strategy supports patient's reintegration into family and society, reduces healthcare costs, improves self-care abilities, conserves medical resources, and strengthens interdisciplinary collaboration (Apaydin et al, 2023).

Based on the principles of the ERAS model, the authors infer that the ERAS-MDT nursing intervention approach could significantly improve postoperative rehabilitation and nutritional status in laryngeal cancer patients undergoing total laryngectomy while alleviating the incidence of complications. Therefore, this study aims to assess the impact of the ERAS-MDT nursing interventions framework on postoperative recovery, nutritional status, and complication rates in patients undergoing total laryngectomy for laryngeal cancer, providing valuable insights for clinical nursing practice.

Methods

Recruitment of Study Participants

This retrospective analysis included 85 patients who underwent total laryngectomy for laryngeal cancer at the Second Affiliated Hospital of Jiaxing University between April 2020 and February 2024. Of the total patients, 45 who received nursing care based on the ERAS-MDT approach were included in the ERAS-MDT group, while another 40 patients who received conventional nursing interventions were included in the conventional group.

Inclusion and Exclusion Criteria

Inclusion criteria for this study were set as follows: (1) Diagnosis based on the 2020 edition of the "Chinese Society of Clinical Oncology (CSCO) Head and Neck Cancer Diagnosis and Treatment Guidelines" (Guidelines Working Committee of Chinese Society of Clinical Oncology, 2020) and confirmed through pathological examination; (2) Those who underwent total laryngectomy; (3) Nutritional risk screening (NRS2002) score <3 (Zhang et al, 2021); (4) Age >18 years; (5) No history of preoperative radiotherapy or chemotherapy; (6) Karnofsky score >70 (Perez Valdivieso et al, 2007); (7) Patients with complete clinical data.

Moreover, exclusion criteria included (1) poorly controlled blood pressure and blood glucose despite medication, (2) presence of systemic infectious diseases, (3) estimated survival time was less than 6 months, based on tumor stage and patient health conditions, (4) poor adherence to treatment or history of preoperative mental illness, (5) significant organ impairments, (6) severe limb dysfunction, and (7) concurrent presence of other malignant tumors.

The study design followed the Declaration of Helsinki and was approved by the Ethics Committee of the Second Affiliated Hospital of Jiaxing University (Ethics Approval No. 2023-035). Informed consent was obtained from each study participant.

Patient Treatment Protocols

Patients in the ERAS-MDT group received team nursing interventions based on the ERAS-MDT concept as follows:

• A multidisciplinary medical-nursing team was developed under the leadership of the hospital's medical department based on the ERAS-MDT concept, including experts from otolaryngology, anesthesia, nutrition, respiration, mental health, and analgesia to provide guidance and collaboration. Furthermore, a dedicated nursing team was established, consisting of head nurses, responsible nurses, and attending physicians specializing in otolaryngology. Additionally, clinical doctors with associate senior or higher professional titles were included to provide expert guidance. Standardized operational procedures and clinical guidelines were developed, along with training programs on medical knowledge for laryngeal cancer surgery, and clinical data were systematically collected.

• Patients scheduled for laryngeal cancer surgery underwent the following preoperative nursing assessments:

(a) Self-care ability was evaluated using the Self-Care Ability Scale (Özkeskin et al, 2021).

(b) Nutritional status was assessed through the NRS2002 scale and body mass index (BMI); patients scoring ≥3 were referred to a nutritionist for intervention, and potential adjustments to the surgical plan were suggested.

(c) Respiratory function was determined, and smoking cessation guidance and respiratory support were provided as needed.

(d) Psychological status was assessed using the Patient Health Questionnaire-9 (PHQ-9) (Ford et al, 2020) for depression and the Generalized Anxiety Disorder-7 (GAD-7) (Pérez-Pedrogo et al, 2022) for anxiety. Psychiatric consultations were arranged for those who needed further support.

(e) Anesthesiologists determined the appropriate anesthesia method based on the patient's overall health condition.

• For enhanced preoperative preparation, nursing staff provided education on the ERAS protocol and surgery-related education, like disease details, surgical procedures, and key precautions, a day before the procedure:

(a) Anesthesiologists customized anesthesia plans, ensuring patients the safety of the procedure and their professionalism.

(b) Patients' family members were encouraged to participate in nursing care, with guidance on inpatient and post-discharge home care.

(c) Patients were instructed on how to excrete and prevent constipation in bed, and were introduced to the self-control analgesia pump, such as pain assessment scales and usage precautions.

(d) They were guided on deep breathing and effective cough techniques to improve postoperative lung function. Furthermore, patients were educated about venous thromboembolism, its prevention, and the importance of early mobilization. Gradient pressure socks were prepared, and functional exercises for the lower limb were advised.

(e) Patients were instructed about the necessity of placing a gastric tube and provided with gloves to prevent accidental removal. They were guided on postoperative enteral nutrition, such as the preparation of protein supplements.

(f) Patients might be unable to speak properly after surgery, but the patients and their families were educated about alternative communication methods, including the use of writing boards and other communication tools.

• During the intraoperative patient optimization process, the touring nurse welcomed them to the operating room entrance and introduced themselves with a smile to help reduce anxiety. After entering the operating room, the nurse familiarized them with the environment, increasing their trust and comfort. Key intraoperative optimization included:

(a) Maintain the operating room temperature at 24–26 °C, using heated intravenous fluids and insulation pads, and rinsing the surgical site with physiological saline to prevent hypothermia.

(b) After the anesthesia took effect, a gastric tube and a urinary catheter were inserted, with careful surgical posture adjustments and secure catheter fixation to ensure patient stability during the procedure.

(c) Foam dressing was applied to the protruding part of the bone to prevent pressure sore and patient's limbs were fixed correctly.

(d) The negative electrode of the electric knife was placed over a muscle-rich area to avoid skin contact with metal, ensuring electrosurgical safety.

(e) The surgical process and patient condition were continuously monitored to ensure intraoperative safety and optimal outcomes.

• Key postoperative nursing measures included:

(a) Anesthesia recovery and analgesia were optimized. For stable patients, their heads were raised off the bed to improve comfort and circulation.

(b) After 4 hours of surgery, the family helped the patient to move their limb joints and the urinary catheter was removed six hours postoperatively, once the bladder was full. On the first day after surgery, patients were encouraged to engage in activity and wear gradient pressure socks to prevent blood clots. Furthermore, once gastrointestinal decompression was discontinued, they were guided to get out of bed, gradually increase activity, and ensure sufficient mobility before discharge.

(c) During tracheostomy care, airbag pressure was regularly monitored and the metal tracheal tube sleeve was replaced as required.

(d) On the first postoperative day, gastrointestinal decompression was discontinued and nasogastric nutrition was initiated. However, sufficient nutrient intake was ensured under the guidance of a nutritionist. Furthermore, crucial nutritional indicators were monitored, nutritional challenges were promptly addressed, and wound recovery was promoted.

• For the first 6 hours after surgery, patients were kept in a flat position, then gradually raised the head of the bed to support phlegm discharge. A clean and calm ward environment was maintained, tracheal incision gauze was regularly changed, and the inner sleeves were disinfected. The nursing staff ensured that the tracheal tube was securely fixed to prevent accidental detachment. Furthermore, secretions were carefully monitored, observing any changes in sputum characteristics. The nursing staff performed gentle suctioning as needed, adjusting the oxygen flow rate based on blood oxygen levels. In the case of thick sputum, the airway was humidified before suctioning. Additionally, patients were encouraged to remain active

and practice deep breathing and coughing to help with secretion clearance. The patients received nebulized inhalation therapy three times a day.

• Patients undergoing total laryngectomy for laryngeal cancer usually experience communication barriers and emotional distress, such as anxiety and irritability. These issues were addressed as follows:

(a) Tailored psychological care strategies was implemented based on each patient's condition, including counseling with psychologists, encouragement and support from family members, and alternative communication methods such as writing boards. This enhanced psychological support increased patient engagement and confidence in recovery.

(b) Postoperative care included incorporating basic training in esophageal speech to help patients produce specific sounds.

(c) Additionally, family member presence and involvement were ensured to provide warmth and emotional support, alleviating psychological stress. This support system helps patients maintain their sense of identity and social roles despite physical changes, ultimately boosting their confidence in overcoming challenges and adjusting to post-surgery life.

• Patients in the conventional group received standard nursing interventions, which involved the following preoperative, intraoperative, and postoperative care:

(a) Preoperative care: One day before surgery, the patient and their family were explained the surgical plan, potential risks, and required preoperative preparations. They were advised to fast for 6 hours and avoid water for 2 hours before surgery. Furthermore, a gastric tube and urinary catheter were placed 2 hours preoperatively. If necessary, a patient-controlled analgesia sufentanil analgesia pump was used for pain relief, with pain levels examined regularly. They were guided in deep breathing, effective coughing, and lower limb exercises to improve postoperative recovery. Additionally, communication methods for the postoperative period were developed.

(b) Intraoperative care: Routine thermal insulation measures were applied during surgery, adjusting the operating room temperature to 24–26 °C before the patient entered. General anesthesia was administered under the supervision of anesthesia and surgical experts. Additionally, subcutaneous pain pumps were applied for routine analgesia following surgery.

(c) Postoperative care: Pain management was regularly monitored, and patients were encouraged to perform ankle loops and flexion-extension movements 8 hours after surgery. They were encouraged to early mobilize within their tolerance level. Patients were guided on deep breathing, coughing, and expectoration methods. On the first day after surgery, enteral nutrition support was provided, and nasal feeding was given based on the doctor's recommendation. Their dietary plans were formulated under the guidance of a nutritionist to ensure sufficient nutritional intake, with dynamic monitoring of hemoglobin, serum albumin, prealbumin, and weight changes. Furthermore, the metal tracheal tube was changed within 4–7 days after surgery. Additionally, the patient's self-care abilities were assessed using a standardized self-care scale, and trained in essential self-care skills, such as tracheal tube disinfection, stoma skin care, and inner tube replacement. If the patient's post-

operative conditions permit, a basic esophageal speech training plan was conducted to support communication.

Nutritional Status

Hemoglobin, albumin, prealbumin, and total protein levels were assessed by collecting 5 mL of fasting venous blood from each patient. The blood sample was centrifuged at 3000 rpm for 10 minutes, and the supernatant serum was collected for subsequent analysis. A Beckman Coulter AU480 automatic biochemical analyzer was used for measuring these indicators, with reagent kits provided by Jiangsu Rongsheng Jiamei Biological Reagent Co., Ltd. (Nanjing, China).

Postoperative Rehabilitation

Several factors were assessed postoperatively to enhance the patient's recovery and quality of life. Patients were closely monitored for their gastrointestinal function recovery to improve their dietary intake. Furthermore, the length of hospital stay, and total hospitalization and healthcare costs were recorded for both groups.

Scoring Criteria

Patients' overall well-being was assessed and scored using the following scoring methods:

• PHQ-9 Score: This method includes 9 items, assessing symptoms such as low mood, loss of interest or pleasure, feelings of worthlessness or guilt, and difficulty concentrating. A score of 0–4 indicates no depression, 5–9 shows mild depression, 10–14 indicates moderate depression, 15–19 describes moderately severe depression, and 20–27 represents severe depression.

• GAD-7 Score: On this scale, the total score is 21, with 0–4 indicating no anxiety, 5–9 representing mild anxiety, 10–14 indicating moderate anxiety, and 15–21 representing severe anxiety.

• Patient-Generated Subjective Global Assessment (PG-SGA) Score (Bauer et al, 2002): This evaluation scale consists of a patients-reported self-assessment and a clinical evaluation by medical staff. A score of 0–2 indicates good nutrition, 2–9 suggests suspected malnutrition, and ≥9 signifies severe malnutrition.

Satisfaction

A self-developed assessment scale was used, to evaluate aspects such as admission education, ward environment, and nursing skills, with a total score of 100 points. Before discharge, a specially trained nurse distributed the survey. Based on the study, satisfaction levels were classified as follows: scores of 90 or above were categorized as "very satisfied", 80–89 as "satisfied", 70–79 as "average", and below 70 as "unsatisfied". Internal consistency was evaluated employing Cronbach's alpha coefficient, which resulted in a value of 0.890, indicating good construct validity.

Table 1. Comparison of baseline characteristics between the two groups ($\bar{x} \pm s$).

Group	n	Age (year)	Tumor stage		Education level		
			I–II	III–IV	Primary school to junior high school	Vocational school to college	Undergraduate or above
Conventional group	40	65.41 ± 7.08	33 (82.50)	7 (86.67)	12 (30.00)	20 (50.00)	8 (20.00)
ERAS-MDT group	45	65.92 ± 7.74	39 (17.50)	6 (13.33)	16 (35.56)	21 (46.67)	8 (17.78)
t/χ^2		0.316	0.284			0.303	
p-value		0.753	0.594			0.860	

ERAS-MDT, enhanced recovery after surgery-multidisciplinary team.

Table 2. Comparison of nutritional status between the two groups ($\bar{x} \pm s$).

Group	n	Hemoglobin (g/L)		Albumin (g/L)		Prealbumin (mg/L)		Total protein (g/L)	
		Before nursing	After nursing	Before nursing	After nursing	Before nursing	After nursing	Before nursing	After nursing
Conventional group	40	100.42 ± 12.23	114.56 ± 8.96*	34.85 ± 4.62	39.01 ± 4.81*	198.56 ± 25.21	222.84 ± 26.98*	51.06 ± 4.56	57.85 ± 5.11*
ERAS-MDT group	45	99.98 ± 14.56	125.63 ± 10.77*	34.79 ± 4.84	44.14 ± 4.93*	201.41 ± 22.58	261.74 ± 28.82*	50.57 ± 5.10	64.83 ± 5.36*
t		0.150	5.114	0.058	4.844	0.550	6.400	0.465	6.125
p-value		0.881	<0.001	0.954	<0.001	0.584	<0.001	0.643	<0.001

Comparison before and after the nursing intervention, *$p < 0.05$.

Table 3. Comparison of gastrointestinal function recovery, length of hospital stays, and total hospitalization cost between the two groups ($\bar{x} \pm s$).

Group	n	First mobilization (h)	First bowel movement (h)	Length of hospital stay (day)	Total hospitalization cost (USD)
Conventional group	40	17.69 ± 3.23	30.25 ± 5.61	12.42 ± 1.86	7042.41 ± 770.33
ERAS-MDT group	45	10.52 ± 2.17	21.41 ± 4.50	11.57 ± 1.91	6781.07 ± 701.49
t		12.130	8.052	2.073	1.637
p-value		<0.001	<0.001	0.041	0.105

Complication

The incidence of complications, including pharyngeal fistula, bleeding, pulmonary infection, tracheal inner cannula obstruction, and subcutaneous emphysema, was recorded for both groups.

Statistical Analysis

Statistical analysis was conducted using SPSS 23.0 (IBM, Armonk, NY, USA). Quantitative data was tested for normality using the Shapiro-Wilk test, and findings were represented as ($\bar{x} \pm s$). Furthermore, a t-test was used for group comparison, with an independent sample t-test applied for inter-groups comparison and paired sample t-test for intra-group comparison. Categorical data were expressed as [n (%)], and the comparison between groups was conducted using the chi-square test. A $p < 0.05$ indicated a statistically significant difference.

Results

Comparison of Clinical Data Between the Conventional and ERAS-MDT Groups

All the patients included in this study were male. The two study groups were comparable in terms of age, tumor stage, and education level ($p > 0.05$, Table 1).

Comparison of Nutritional Status Between the Two Groups

The nutritional status was comparable between the conventional and ERAS-MDT groups before the nursing intervention ($p > 0.05$). After the intervention, levels of hemoglobin, albumin, prealbumin, and total protein levels were elevated in both groups. However, the ERAS-MDT group demonstrated significantly higher levels than the conventional group ($p < 0.05$, Table 2).

Comparison of Gastrointestinal Function Recovery, Hospitalization Time, and Total Hospitalization Cost Between the Two Groups

The time to first mobilization [95% CI: 10.52 (9.78–11.43)], first bowel movement [95% CI: 21.41 (17.74–25.96)], and length of hospitalization stay [95% CI: 11.57 (10.65–12.41)] was significantly shorter in the ERAS-MDT group than in the conventional group. Furthermore, the total hospitalization cost [95% CI: 4.93 (4.12–5.28)] demonstrated no significant difference between the two groups ($p > 0.05$, Table 3).

Comparison of PHQ-9, GAD-7, and PG-SGA Scores Between the Two Groups

The PHQ-9, GAD-7, and PG-SGA scores were comparable between the conventional and ERAS-MDT groups before the nursing intervention ($p > 0.05$). After the intervention, these scores were reduced in both groups, with the ERAS-MDT group exhibiting significantly lower scores than the conventional group ($p < 0.05$, Table 4).

Table 4. Comparison of PHQ-9, GAD-7, and PG-SGA scores between the two groups [($\bar{x} \pm s$), score].

Group	n	PHQ-9 score		GAD-7 score		PG-SGA score	
		Before nursing	After nursing	Before nursing	After nursing	Before nursing	After nursing
Conventional group	40	8.63 ± 1.74	4.25 ± 1.03*	12.89 ± 2.14	8.41 ± 1.43*	10.55 ± 2.26	6.86 ± 1.79*
ERAS-MDT group	45	8.70 ± 1.66	2.81 ± 0.78*	12.93 ± 1.98	6.68 ± 1.05*	10.51 ± 2.37	4.69 ± 1.24*
t		0.190	7.313	0.090	6.404	0.079	6.555
p-value		0.850	<0.001	0.929	<0.001	0.937	<0.001

Comparison before and after nursing, *$p < 0.05$; PHQ-9, Patient Health Questionnaire-9; GAD-7, Generalized Anxiety Disorder-7; PG-SGA, Patient-Generated Subjective Global Assessment.

Table 5. Comparison of satisfaction levels between the two groups [n (%)].

Group	n	Very satisfied	Satisfied	General	Dissatisfied	Satisfaction level
Conventional group	40	11 (27.50)	13 (32.50)	8 (20.00)	8 (20.00)	32 (80.00)
ERAS-MDT group	45	23 (51.11)	16 (35.56)	4 (8.89)	2 (4.44)	43 (95.56)
χ^2						3.552*
p-value						0.059

* represents the corrected chi-square test.

Table 6. Comparison of complications between two groups [n (%)].

Group	n	Pharyngeal fistula	Bleeding	Pulmonary infection	Tracheal tube obstruction	Subcutaneous emphysema	Cumulative complications
Conventional group	40	1 (2.50)	1 (2.50)	3 (7.50)	1 (2.50)	1 (2.50)	7 (17.50)
ERAS-MDT group	45	1 (2.22)	0 (0.00)	1 (2.22)	0 (0.00)	2 (4.44)	4 (8.89)
χ^2							1.394
p-value							0.238

Comparison of Satisfaction Levels Between Two Groups

The satisfaction rate was 95.56% (43/45) in the ERAS-MDT group and 80.00% (32/40) in the conventional group, indicting statistically insignificant difference ($p > 0.05$, Table 5).

Comparison of Complication Rates Between the Two Groups

The complication rate in the ERAS-MDT group was 8.89% (4/45), lower than the 17.50% (7/40) in the conventional group. However, the difference between the two groups was statistically insignificant ($p > 0.05$, Table 6).

Discussion

Modern surgery has entered the "ERAS+" era. ERAS employs a series of comprehensive technical improvements to reduce physiological and psychological stress responses in surgical patients. This strategy helps protect the function of bodily tissues and organs while challenging traditional surgical medical care practices. ERAS facilitates establishing a quality management system that includes the entire perioperative process, such as preoperative, intraoperative, postoperative, and post-discharge care (Jensen et al, 2022). Crucial advantages of the ERAS method include decreasing the average length of hospital stay, increasing bed turnover rates, optimizing bed resource use, reducing the rate and volume of blood transfusions, controlling infection rates, and decreasing antibiotic use. For patients undergoing total laryngectomy, postoperative recovery depends not only on the success of the surgery but also on how well comprehensive nursing interventions promote their overall physiological and psychological rehabilitation (Achrekar, 2022).

Postoperatively, patients often experience various challenges, such as malnutrition due to swallowing difficulties, psychological symptoms like anxiety and depression, and complications like infections and gastrointestinal dysfunction from surgical trauma. Traditional nursing approaches typically focus on medical procedures, potentially neglecting psychological and physiological issues. In contrast, the ERAS nursing model, supported by a multidisciplinary team, emphasizes the significance of communication in nursing and prioritizes preoperative health education, psychological and physiological care, and intraoperative temperature maintenance. Additionally, this care model focuses on postoperative early mobilization, early feeding, and effective pain management (Zhou and Wei, 2024). Therefore, this study adopts the ERAS-MDT method to implement enhanced recovery nursing for patients undergoing total laryngectomy for laryngeal cancer during the perioperative period. It aims to explore better nursing strategies that promote a faster recovery for these patients.

In this study, both patient groups showed improvements in nutritional indicators such as hemoglobin, albumin, prealbumin, and total protein after the nursing interventions. However, the ERAS-MDT group exhibited more significant enhancements in nutritional status. This finding suggests that team-based nursing interventions within the ERAS-MDT concept more effectively promote nutrient absorption and utilization in patients undergoing total laryngectomy for laryngeal

cancer, contributing to faster postoperative recovery. This outcome is attributed to the ERAS-MDT concept, which integrates professionals from multiple disciplines, such as otolaryngology, anesthesia, nutrition, and mental health, to provide patients with comprehensive and personalized nursing care. The involvement of the nutrition department ensures that patients receive professional nutritional assessment and appropriate interventions before surgery, with preoperative dietary improvement providing a strong foundation for postoperative rehabilitation. After surgery, nutritionists continuously monitor patient's dietary indicators, timely adjust nutritional support strategies, and ensure sufficient nutritional intake to promote tissue repair and recovery.

Additionally, psychological interventions are crucial in improving immune function, which further contributes to enhanced nutritional status and overall outcomes after surgery. Psychoneuroimmunology theory suggests that a positive psychological state can regulate the neuroendocrine system, enhance immune function, and promote metabolism, ultimately optimizing nutrient absorption and utilization. In the ERAS-MDT nursing intervention, psychologists and nursing staff conducted systematic psychological assessments and counseling to help patients alleviate pre- and postoperative anxiety and depression, thereby improving treatment compliance and self-care capabilities. Blumenthal et al (2024) reported that ERAS-MDT, when adopted based on evidence-based clinical practices, accelerates the recovery process and improves prognosis in patients undergoing liver resection. This further confirms the effectiveness of ERAS-MDT in clinical nursing practice.

Furthermore, the results indicated that the ERAS-MDT group had shorter times to first ambulation, first flatus, and overall hospital stay than the conventional group. This demonstrates that ERAS-MDT team-based nursing can facilitate the recovery of gastrointestinal function, accelerate the recovery process, and reduce hospital duration for patients, because the effectiveness of the ERAS-MDT concept is attributed to its multidisciplinary collaboration involving surgeons, anesthesiologists, nutritionists, rehabilitation therapists, psychologists, and nurses to deliver comprehensive patient care. Additionally, the ERAS-MDT group conducted thorough nursing assessments during the care process. If a patient's nutritional score reached ≥ 3, a nutritionist was informed of relevant interventions, ensuring close monitoring of dietary indicators and adjusting the surgical timing as needed (Dai and Yang, 2024). Moreover, in the ERAS-MDT group, patients were encouraged to perform early bed-based circular movements and flexion-extension exercises, and, within their tolerance limits, they were guided to engage in ambulation soon after surgery. This approach helps promote gastrointestinal motility, decreases the time to first flatus, and reduces the risk of postoperative complications such as intestinal adhesions, ultimately shortening the length of hospital stay. A nursing study conducted by Wang et al (2024) reported that compared to the conventional nursing control group, patients in the ERAS group who did not develop surgical site infection showed a significant reduction in postoperative hospitalization days under the ERAS-MDT model. These findings align with the results of our study.

Regarding psychological well-being, patients in the ERAS-MDT group showed significantly lower PHQ-9, GAD-7, and PG-SGA scores compared to the conven-

tional group. This indicates that the ERAS-MDT nursing model is more effective in alleviating depressive and anxiety symptoms while improving their overall subjective nutritional status. This enhancement can be attributed to the ERAS-MDT model's emphasis on addressing patient's psychological needs, incorporating psychological counseling, and guiding patients in expressing their emotions normally to improve their adaptability to the environment (Jiang et al, 2023). Additionally, support and companionship from family members, as well as the use of alternative communication methods such as writing boards, help alleviate patients' anxiety and irritability. A good psychological state enhances patients' confidence in recovery, improves compliance to treatment and nursing care, and ultimately promotes the rehabilitation process (Wang and Hou, 2023).

A comparative evaluation of patient satisfaction between the two groups revealed that the satisfaction level of patients in the ERAS-MDT group was significantly higher than that of the conventional group. This finding reflects patients' recognition and acceptance of the multidisciplinary, team-based care interventions under the ERAS-MDT model. By boosting collaboration across different specialties, optimizing nursing measures, addressing psychological states, and delivering comprehensive, personalized care, the ERAS-MDT approach has effectively promoted gastrointestinal function recovery in patients undergoing total laryngectomy. Similarly, Porche et al (2022) reported that applying the ERAS protocol in spinal surgery patients can help reduce surgery time, shorten hospitalization time, and improve patient prognosis, while enhancing the efficiency of medical resource utilization, further highlighting the clinical effectiveness of ERAS-based care protocol.

Additionally, while the ERAS-MDT team care approach demonstrated advantages, the difference in complication rates between the ERAS-MDT and conventional groups was statistically insignificant. This may be due to the limited sample size and the effect of multiple factors on the occurrence of complications. Future research would expand the sample size to more accurately evaluate the impact of this nursing model on complications.

During the implementation of the ERAS-MDT concept team nursing plan, the authors found that the applicability of the ERAS-MDT model varies across different patient groups and needs further adjustments. The nursing experience is summarized as follows:

• Patients of different age groups: Young patients usually have stronger ability to restore their physical function, enabling earlier implementation and acceptance of ERAS-MDT postoperative activity guidance. For example, young patients tend to adapt more quickly to early postoperative joint and bed exercises, thereby promoting faster physical function recovery. However, young patients may experience greater psychological issues due to changes in appearance and speech function after complete resection of laryngeal cancer. Therefore, strengthened psychological intervention, especially in terms of social and career development psychology, is essential.

• Patients with different risks of postoperative complications: For patients with a high risk of postoperative complications, such as those with underlying conditions like cardio pulmonary diseases and diabetes, strict intraoperative insulation

and monitoring must be implemented to reduce psychological stress. After surgery, close monitoring of vital signs and proactive complication prevention approaches, such as frequent blood glucose checks and respiratory support, are crucial. In contrast, for low-risk patients, the ERAS-MDT nursing model can focus more on promoting recovery through early mobilization and optimized nutritional support programs while ensuring safety, ultimately decreasing hospitalization time and improving rehabilitation outcomes.

Despite several promising findings, this study has certain limitations, such as a relatively limited sample size, which may affect the generalizability of the results. Additionally, as a single-center design and involving only males, the findings may be influenced by specific institutional environments, medical professional practices, and patient demographics. Subsequent research should expand the sample size and conduct multi-center studies to improve data accuracy and applicability.

Conclusion

The ERAS-MDT concept team-based nursing intervention provides comprehensive and personalized nursing services to patients through close collaboration among experts from multiple disciplines, which can improve the hemoglobin, albumin, prealbumin, and total protein levels within the laryngeal cancer patients undergoing total resection. In nursing practice, this model promotes multidisciplinary collaboration and ensures comprehensive care throughout the process, providing new ideas for resource integration and policy development.

Key Points

- The ERAS-MDT concept team-based nursing intervention provides comprehensive and personalized patient care through close collaboration among experts from multiple disciplines.
- The ERAS-MDT concept team-based nursing intervention can improve the nutritional status of laryngeal cancer patients undergoing total resection.
- The ERAS-MDT concept team-based nursing intervention can promote the postoperative recovery of laryngeal cancer patients undergoing total resection.
- In nursing practice, the ERAS-MDT concept of team-based nursing intervention promotes multidisciplinary collaboration. It offers comprehensive care throughout the process, providing novel approaches for resource integration and policy development.

Availability of Data and Materials

All experimental data included in this study can be obtained by contacting the corresponding author if needed.

Author Contributions

LFW and DHY designed the research study and wrote the first draft. HYC, LYW and YZY performed the research. DL and XYD analyzed the data. All authors contributed to important editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

This study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of the Second Affiliated Hospital of Jiaxing University (Ethics Approval No. 2023-035). All participants provided informed consent.

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Conflict of Interest

The authors declare no conflict of interest.

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