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Original Article

Application value of continuous nursing in the treatment of obese patients with laparoscopic sleeve gastrectomy

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Abstract: Aim: To explore the value and effectiveness of continuous nursing in obese patients undergoing laparoscopic sleeve gastrectomy. Methods: A total of 164 obese patients who were admitted to Nanjing Drum Tower Hospital and underwent planned laparoscopic sleeve gastrectomy in 2022 were retrospectively selected as the control group, and another 164 obese patients undergoing the same surgery in 2022 were chosen as the research group. The control group received routine care, while the research group received continuous nursing care. Comparisons were made between the two groups regarding the patient's body weight, fasting blood glucose levels, dietary habits, exercise and rest compliance, anxiety and depression status, quality of life and sleep, postoperative complications, and satisfaction. Results: Compared with the control group, the research group showed significant decreases in the patient's body weight, body mass index (BMI), and fasting blood glucose levels, with a significant increase in excess weight loss percentage (%EWL) (all $P<0.05$). Dietary, exercise, and rest compliance were significantly higher in the research group than those in the control group (all $P<0.05$). Additionally, patients in the research group scored higher in dimensions such as physical function, general health, social function, emotional role, and mental health compared to the control group (all $P<0.05$). The Pittsburgh sleep quality index (PSQI) was significantly lower in the research group than that in the control group ($P<0.05$). The Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS) scores were significantly lower in the research group than those in the control group (all $P<0.05$). The complication rate in the research group was significantly lower than that in the control group (all $P<0.05$). Patient satisfaction with outpatient continuous nursing care was significantly higher in the research group than that in the control group (all $P<0.05$). Conclusion: Continuous care applied following laparoscopic sleeve gastrectomy significantly improves patients' body weight, BMI, and %EWL. It can also effectively reduce fasting blood sugar levels and improve overall quality of life. Additionally, continuous care significantly enhances patients' compliance with dietary, exercise, and rest recommendations, thereby leading to a significant decrease in anxiety and depression symptoms, and an improvement in patient satisfaction and sleep quality.

Keywords: Continuous nursing, gastrectomy, obesity, anxiety, depression

Introduction

Laparoscopic sleeve gastrectomy is an effective treatment for morbid obesity, widely used in clinics for its minimally invasive nature and long-lasting effects [1]. According to statistics, it accounted for 82.3% of all weight-loss surgeries in the previous year. Research shows that it can help patients lose an average of 60% of excess body weight in the first year following the operation [2]. Weight loss offers significant health benefits, including improving diabetes control rates to 76%, achieving a 62% improvement in hypertension, and reducing cardiovascular risk significantly [3]. Obesity is associated with various metabolic diseases, such as type 2 diabetes, hypertension, and cardiovascular diseases. Additionally, it can significantly impact patients' quality of life and daily function [4]. With the progress of medical technology and enhancement of public health awareness, integrating surgery with postoperative management to improve treatment outcomes and patients' quality of life has become an important direction in treating obesity. However, despite the significant effectiveness of laparoscopic sleeve gastrectomy, patients still face various challenges postoperatively, such as dietary adjustments, weight management, and psychological adaptation, impacting postopera-

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tive recovery and long-term outcomes [5-7]. Currently, postoperative management for obese patients mainly relies on short-term hospitalization, and patients often lack systematic continuous care and support after discharge, which is crucial for long-term treatment outcomes.

Continuous nursing, as a care model that spans various stages, focuses on providing continuous, systematic health management and support to patients during their transition from hospital to home [8]. Despite numerous reports on continuous nursing for chronic diseases globally, research on continuous nursing after obesity surgery is relatively scarce [9-12]. Therefore, this study aims to comprehensively explore the application value and effectiveness of continuous nursing in managing obese patients undergoing laparoscopic sleeve gastrectomy. We also seek to provide robust evidence and references for the clinical practice of continuous nursing by systematically analyzing and comparing different nursing interventions, and evaluating the impact of such care on patients' recovery, complication rates, and quality of life.

Materials and methods

General information

A total of 164 obese patients who were admitted to Nanjing Drum Tower Hospital, the Affiliated Hospital of Nanjing University Medical School, in 2022 and required surgical treatment were retrospectively selected as the control group. Similarly, another 164 obese patients who were admitted to Nanjing Drum Tower Hospital in 2022 and required surgical treatment were chosen as the research group. The general information of all patients is presented in Section 2.1 of the Results. This study has been approved by the Ethics Committee of Drum Tower Hospital affiliated to Nanjing University Medical School.

Inclusion criteria: The "Guidelines for Surgical Treatment of Obesity and Type 2 Diabetes in China (2019 Edition)" was utilized in formulating diagnostic criteria [13]. Patients aged 18 to 65 years undergoing laparoscopic sleeve gastrectomy with a body mass index (BMI) between 30 and 60 were included.

Exclusion criteria: Patients with severe heart, liver, or kidney diseases; pregnant or lactating women; those with gastric ulcers indicated by gastroscopy, and individuals recently involved in other clinical trials.

Methods

Surgical method: Laparoscopic sleeve gastrectomy was performed by experienced gastrointestinal surgeons under general anesthesia, using a five-port approach to access the abdominal cavity. During the surgery, standard forceps were used to gradually dissect along the greater curvature of the stomach, about 4 cm from the pylorus. Approximately 80% of the stomach body was removed while preserving the gastric fundus and pyloric function. After removing part of the gastric tissue, the remaining stomach along the lesser curvature was closed, forming a sleeve-shaped stomach with a volume of about 150-200 ml. Vital signs of the patient were closely monitored throughout the surgery, and the incision was checked for airtightness to prevent postoperative air leak and bleeding [14]. The postoperative management plan included anti-infection therapy, anticoagulant treatment, and intravenous nutritional support. On the first day following the surgery, the patient consumed about 400-500 ml of water. The intake increased on the second day post-surgery when the patient adhered to a clear-liquid diet, consuming 1000 ml of water. Subsequently, the patient's diet progressed gradually to a semi-liquid and solid diet. All patients received individualized dietary plans from a nutritionist after surgery, along with physical activity guidance at least once a week.

Nursing method: The control group received routine care, including initial assessments of body weight, blood sugar, and blood pressure by specialized weight reduction nurses, who also had preoperative discussions with patients and their families about precautions, monitored patients' activities and diet postoperatively, and provided guidance on wound care, dietary adjustments, and exercise before discharge.

The research group received continuous nursing on the basis of routine care, which included the following measures: (1) Forming a project team comprising a 10-person continuous care team consisting of the head of the surgical department, surgeons, head nurses, case managers (specialist nurses), endocrinologists, dietitians, and rehabilitation doctors; (2) Establishing patient records involving the

recording of patients' information such as name, admission number, age, diagnosis, date of surgery, type of surgery, admission and discharge times, treatment during hospitalization, physical recovery at discharge, contact phone number, and home address; (3) Formulating and distributing health manuals containing dietary, exercise, and psychological counseling, with an emphasis on consuming easy-to-digest foods, limiting mealtime to 20-30 minutes, recommending moderate exercise 30 minutes after meals, avoiding unrealistic expectations, and encouraging timely follow-up medical visits; (4) Providing regular counseling services, including a 30-40 minute "face-to-face" counseling session for patients every two weeks after discharge, covering topics such as postoperative recovery, diet adjustment, exercise recommendations and psychological counseling [15].

Outcome measures

The intervention effects of the two groups after 6 months of continuous care were compared.

Primary outcome measures: (1) The body weight, BMI, and %EWL 6 months post-surgery were compared between the two groups. %EWL = (initial weight - follow-up weight)/(initial weight - 25 × height^2) × 100%. Standard body weight (kg) = height (cm) - 105. Evaluation criteria: <20% indicates severe leanness, and ≥20% indicates obesity. BMI = weight/height^2 [15]. (2) Dietary, exercise, and rest compliance of both groups 6 months after surgery were compared. (3) The quality of life of the two groups 6 months post-surgery was compared. The 36-item Short Form Health Survey (SF-36) was utilized to assess patients' quality of life, with a total score of 100 points. A higher score indicates a better quality of life in the corresponding dimension [16].

Secondary outcome measures: (1) The anxiety levels of both groups were evaluated 6 months after surgery using the Self-Rating Anxiety Scale (SAS), where an SAS score of ≥50 indicates the presence of anxiety symptoms. A higher score reflects a more severe anxiety level [17]. (2) The depression levels of both groups were assessed 6 months post-surgery using the Self-Rating Depression Scale (SDS), which categorizes depression as mild (53-62 points), moderate (63-72 points), or severe (>72 points), with higher scores indicating a more severe depression [18]. (3) The fasting blood glucose levels of both groups were examined 6 months after surgery. Finger-tip blood samples were collected in the morning after waking and before eating or drinking using a Roche glucose monitor for rapid monitoring [19]. (4) The sleep quality of both groups was assessed using the Pittsburgh Sleep Quality Index (PSQI) [20]. (5) The complications of the two groups within 6 months after surgery were compared, including wound infection, postoperative bleeding, gastric leak, lung infection, deep vein thrombosis, cholecystitis, intestinal obstruction and malnutrition. (6) Patients' satisfaction levels in the two groups were compared 6 months after surgery. Patients were asked to complete a satisfaction scale developed by our hospital. The scale has a content validity of 0.87 and a Cronbach's α coefficient of 0.89 to assess nursing satisfaction, which is categorized as satisfied (90-100 points), basically satisfied (60-89 points), or dissatisfied (<60 points). Satisfaction rate = (number of satisfied + basically satisfied) cases/total cases × 100%.

Statistical analysis

SPSS20.0 was used for data statistics and $P<0.05$ was considered to be statistically significant. The measurement data following a normal distribution were represented by the mean ± standard deviation (M ± SD), and t-tests were used for pairwise comparisons. Count data were presented as percentages (%), and the χ^2 test was adopted.

Results

Comparison of general baseline data between the two groups

The comparison of age, gender, average body weight, average BMI, average waist circumference, and complications between the two groups revealed no statistically significant differences ($P>0.05$), and the two groups were comparable (**Table 1**).

Comparison of body weight, BMI, and %EWL between the two groups

Compared with the control group, the research group showed significantly lower body weight (98.61 kg), BMI (32.38 kg/m^2), and fasting blood glucose levels (6.79 mmol/L), while the %EWL (43.87%) was significantly higher than

Table 1. Comparison of general baseline data between the two groups (n, $\bar{x}$ ± sd)

Indicators	Research group (n=164)	Control group (n=164)	χ^2/t	*P*
Age (years)	32.8±3.1	33.1±3.2	0.862	0.390
Sex			0.089	0.929
Male	83	79		
Female	81	85		
Average body weight	113.88±19.84	114.07±18.85	0.521	0.603
Average BMI	39.47±8.47	38.98±8.55	0.672	0.503
Average abdominal circumference	126.15±12.05	127.04±11.95	0.042	0.838
Complication			0.167	0.683
Diabetes	12	14		
Hypertension	10	11		
Hyperlipemia	8	9		
Fatty liver	5	7		
Sleep apnea syndrome	6	5		

Table 2. Comparison of body weight, BMI and %EWL between the two groups ($\bar{x}$ ± sd)

Group	Body weight (kg)	BMI (kg/m^2)	EWL%	Fasting blood glucose (mmol/L)
Research group (n=164)	98.61±6.89	32.38±6.46	43.77±7.12	6.56±1.65
Control group (n=164)	110.96±5.04	37.05±5.44	33.51±9.76	7.75±3.03
t	-18.527	-7.081	10.876	-4.417
P	<0.001	<0.001	<0.001	0.001

Note: BMI: Body Mass Index; EWL%: Excess Weight Loss Percentage.

Table 3. Comparison of dietary, exercise and rest compliance between the two groups [n (%)]

Group	Cases	Diet		Exercise		Rest	
		Compliance	Non-Compliance	Compliance	Non-Compliance	Compliance	Non-Compliance
Research group (n=164)	164	40 (24.39%)	124 (75.61%)	35 (21.34%)	129 (78.66%)	50 (30.49%)	114 (69.51%)
Control group (n=164)	164	130 (79.27%)	34 (20.73%)	140 (85.37%)	24 (14.63%)	125 (76.22%)	39 (23.78%)
χ^2		98.913		135.058		68.908	
P		<0.001		<0.001		<0.001	

the control group, with statistically significant differences (all P<0.05) (**Table 2**).

Comparison of dietary, exercise, and rest compliance between the two groups

The research group showed significantly higher compliance with dietary, exercise, and rest (79.27%, 85.37%, and 76.22%, respectively) compared with the control group (all P<0.05) (**Table 3**).

Comparison of quality of life between the two groups

The scores for physical function, general health, social function, emotional role, and mental health in the research group were 78.22, 91.62, 72.33, 63.86, and 68.56 points, respectively, significantly higher than those in the control group (all P<0.05) (**Table 4**).

Comparison of anxiety and depression between the two groups

Before the intervention, there were no statistical differences in SAS and SDS scores between the two groups. Following the intervention, the SAS and SDS scores in the research group were 47.24 and 46.99, respectively, which were significantly lower than those in the control group, as shown in **Figure 1**.

Comparison of sleep quality between the two groups

Before the intervention, there was no statistical difference in sleep quality scores between the

Table 4. Comparison of physical function, general health, social function, emotional role, and mental health between the two groups (score, $\bar{x} \pm sd$)

Quality of life score	Research group (n=164)	Control group (n=164)	*t*	*P*
Physical function	78.22±11.32	65.79±9.30	10.865	<0.001
General health	91.62±10.21	85.51±12.27	4.902	<0.001
Social function	72.33±11.28	65.49±10.31	5.732	<0.001
Emotional role	63.86±9.23	55.96±7.24	8.624	<0.001
Mental health	68.56±10.22	57.46±7.41	11.261	<0.001

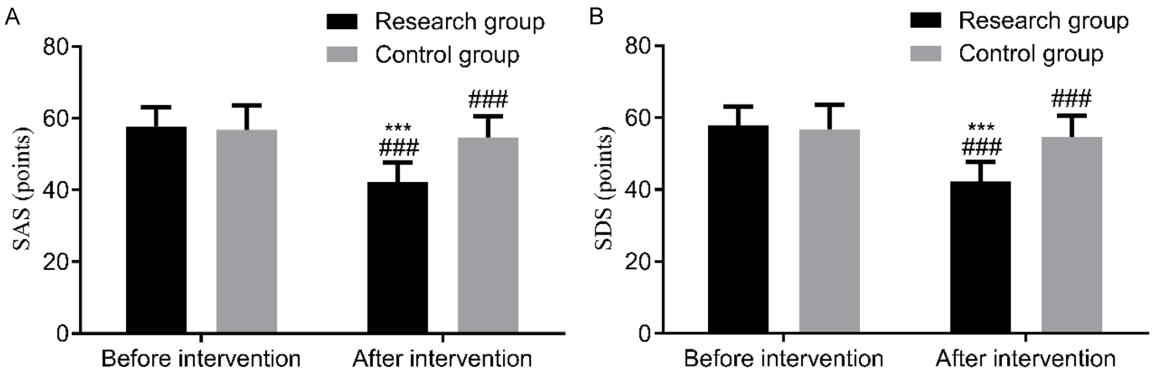

Figure 1. Comparison of anxiety (SAS score) and depression (SDS score) levels between the two groups. A: Comparison of SAS scores between the two groups; B: Comparison of SDS scores between the two groups. Compared with the control group, ***P<0.001; Compared with before intervention, ###P<0.001. SAS: Self-Rating Anxiety Scale; SDS: Self-Rating Depression Scale.

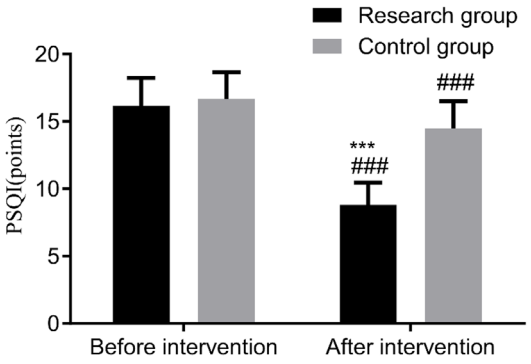

Figure 2. Comparison of PSQI scores between the two groups. Note: Compared with the control group, ***P<0.001; Compared with before intervention, ###P<0.001. PSQI: Pittsburgh Sleep Quality Index.

two groups. After the intervention, the research group had significantly lower sleep quality scores (8.80) compared with the control group (P<0.001) (**Figure 2**).

Comparison of postoperative complications between the two groups

The incidence of postoperative complications such as wound infection, postoperative bleeding, gastric leak, lung infection, deep vein thrombosis, cholecystitis, intestinal obstruction and malnutrition in the research group was significantly lower than that in the control group (P<0.05) (**Figure 3**).

Comparison of nursing satisfaction between the two groups

The satisfaction rate in the research group was 93.90%, significantly higher than that in the control group (80.49%), with statistical significance (P<0.001) (**Table 5**).

Discussion

Laparoscopic sleeve gastrectomy is a surgical procedure designed for weight loss that significantly reduces stomach capacity by vertically resecting the greater curvature of the stomach using laparoscopic techniques. The main purpose of this surgery is to reduce food intake while preserving normal physiological and digestive functions of the gastrointestinal tract. Laparoscopic sleeve gastrectomy involves the removal of a large portion of stomach tissue to create a narrow tubular structure, thereby

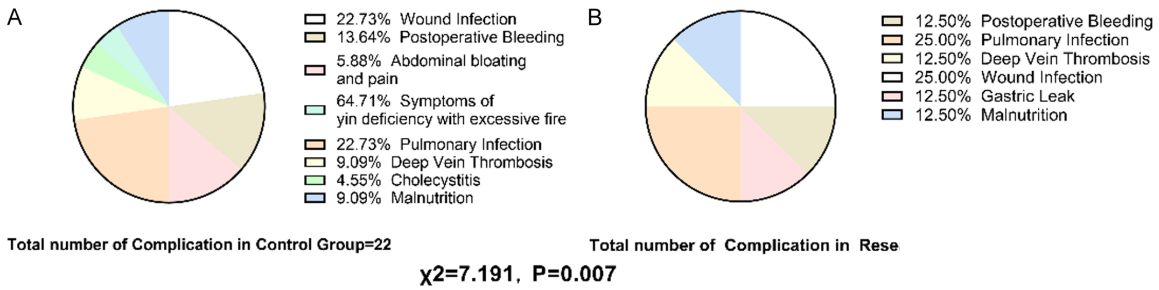

Figure 3. Comparison of postoperative complications between the two groups. A: Adverse reactions in the control group; B: Adverse reactions in the study group.

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

Group	Satisfaction	Basic satisfaction	Dissatisfaction	Satisfaction (%)
Research group (n=164)	87 (53.05%)	67 (40.85%)	10 (6.10%)	154 (93.90%)
Control group (n=164)	66 (40.24%)	66 (40.24%)	32 (19.51%)	132 (80.49%)
X^2				13.216
P				<0.001

restricting food intake and triggering a sensation of fullness soon after eating in patients. Despite the considerable decrease in stomach capacity following the surgery, the procedure preserves the main digestive functions of the stomach without affecting gastric acid secretion and normal food passage, thus maintaining postoperative nutritional absorption and digestive function. Additionally, laparoscopic sleeve gastrectomy results in minimal trauma, shorter recovery time, and fewer postoperative complications, significantly improving patients' postoperative quality of life. These characteristics have contributed to the widespread popularity of this surgery in the treatment of morbid obesity, establishing it as a commonly used method for weight loss surgery in clinical practice. Nursing plays a crucial supportive role in ensuring the smooth execution of the surgery and achieving expected therapeutic outcomes. In this process, the implementation of continuous nursing becomes particularly important. Providing continuous and systematic nursing care and support throughout the preoperative and postoperative stages helps patients adapt to life changes after surgery, ensuring rapid recovery and long-term health management. This comprehensive nursing approach not only improves the success rate of the surgery but also plays a crucial role in improving patients' postoperative dietary habits, psychological health, and quality of life.

Continuous nursing has a significant impact on the overall recovery and long-term treatment outcomes of obese patients after laparoscopic sleeve gastrectomy. Through a comparison of various indicators between the research group and the control group, this study has identified significant benefits of continuous nursing in improving postoperative recovery and enhancing quality of life. Patients in the research group exhibited a decrease in body weight from an average of 113.88±19.84 kg preoperatively to 98.61±6.89 kg, a reduction in BMI from 39.47±8.47 kg/m^2 to 32.38±6.46 kg/m^2, and %EWL of 43.32%±7.48. In contrast, the control group experienced a lower %EWL of only 33.48%±9.96 (P<0.001). The above findings align with the research results of Smith, Johnson, Lee, et al., all of which corroborate the substantial impact of continuous nursing care on facilitating weight reduction and enhancing quality of life [21-23]. This is due to the reason that continuous nursing provides ongoing dietary, exercise, and psychological support to help patients achieve and maintain their optimal weight. This underscores its crucial role in facilitating weight control among obese individuals.

The study also observed the effect of continuous nursing on patients' anxiety and depression. The results showed that the SAS and SDS scores of patients in the research group were

significantly lower than those in the control group (P<0.001). This is consistent with the research results of Smith, Johnson, Lee, et al. [21-23]. Improving patients' psychological well-being is essential for their overall recovery, especially during weight management and lifestyle changes. Psychological guidance and social support from continuous nursing not only help patients reduce psychological stress but also foster a positive outlook on surgical outcomes and lifestyle changes. This may be attributed to the multidimensional psychological intervention strategies and continuous psychological support offered in our practice.

After laparoscopic sleeve gastrectomy, blood sugar level is a crucial health indicator, especially for obese individuals with a history of diabetes or other metabolic complications. The incidence of diabetes is higher among obese individuals, and laparoscopic sleeve gastrectomy can significantly reduce weight, improving insulin resistance and achieving better blood sugar control. Postoperative blood sugar improvement depends not only on the surgical outcome but also on the influence of diet, exercise, and overall lifestyle adjustments. This aligns with the research findings of Wang, Zhang et al., confirming the effectiveness of continuous nursing in enhancing postoperative blood sugar control [24, 25]. This improvement may be attributed to the following reasons. First, laparoscopic sleeve gastrectomy significantly reduces the patient's weight, improving insulin sensitivity, reducing insulin resistance and effectively controlling blood sugar levels. Continuous nursing can further promote weight loss and boost insulin sensitivity with personalized dietary and exercise plans. During this process, the implementation of scientific dietary management helps patients choose low-sugar, low-fat, high-fiber foods to control calorie intake and stabilize blood sugar levels. Appropriate exercise interventions, such as aerobic and resistance exercises, enhance glucose intake and utilization by muscles, leading to reduced blood sugar levels. Additionally, psychological counseling and social support can reduce patients' psychological pressure and anxiety, improve their mental well-being, and ultimately help in managing blood sugar levels. Health education enhances patients' self-management capabilities, enabling them to acquire the knowledge and skills necessary for blood sugar management. This leads to improved control of blood sugar levels through self-monitoring and medication management. Regular follow-up and personalized adjustments facilitate early identification and treatment of potential problems, timely refinement of nursing strategies, and ultimately enhance the effectiveness of blood sugar regulation. These comprehensive interventions jointly enhance postoperative blood sugar control and patients' general health.

The study also observed the patients' adherence to diet, exercise, and rest. The research group showed a dietary compliance of 79.27% and exercise compliance of 85.37%, significantly higher than the control group's 24.39% and 21.34%, respectively (P<0.001). The results of the study demonstrate that continuous nursing effectively helps patients adhere to postoperative recovery plans through regular follow-up visits and personalized guidance, maximizing the effects of postoperative recovery. The quality of life assessment indicated that the research group scored higher than the control groups in physical function, general health, social function emotional role, and mental health. This highlights the benefits of continuous nursing in improving postoperative quality of life. The study also revealed that the research group had significantly better PSQI scores compared to the control group. This suggests that continuous nursing effectively improves patients' sleep quality by potentially alleviating anxiety and depression symptoms.

It was discovered that the continuous nursing group had a significantly lower complication rate (4.88%) compared to the routine nursing group (13.41%) within 6 months post-operation. This highlights the benefits of continuous nursing in reducing complications due to enhanced monitoring, timely intervention, and personalized care plans. These strategies aid in early complication detection and management, leading to improved postoperative recovery. These findings emphasize the crucial role of continuous nursing in postoperative care, effectively lowering the risk of complications following weight loss surgery.

Finally, this study also examined the satisfaction of patients in both groups with continuous nursing after discharge. The results showed that patients in the research group were significantly more satisfied with the nursing care

compared to the control group. This could be attributed to the continuous model enhancing various obesity indicators, quality of life after surgery, alleviating anxiety and depression symptoms, improving clinical prognosis, and leading to better long-term patient care experiences. Since patients' families also experience psychological pressure, their support significantly influences the patients' recovery process. However, this study did not observe the anxiety and depression levels of caregivers after discharge. Therefore, it is necessary to conduct research in the later stage to include caregivers in the continuous nursing plan, providing necessary information, training, and support. This is equally important for the overall recovery and long-term health management of patients, in order to validate the feasibility and importance of the continuous nursing model for patients and primary caregivers after laparoscopic sleeve gastrectomy.

Continuous nursing following laparoscopic sleeve gastrectomy has a significant positive impact on various outcomes of patients, including body weight, BMI, and %EWL. It can also effectively lower fasting blood sugar levels and enhance the overall quality of life for patients. Furthermore, continuous nursing significantly enhances patients' compliance with dietary, exercise, and rest recommendations, thereby significantly reducing anxiety and depression symptoms and improving patient satisfaction and sleep quality.

Disclosure of conflict of interest

None.

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