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CORRELATION BETWEEN PREOPERATIVE DIETARY BEHAVIOR AND WEIGHT LOSS AFTER LAPAROSCOPIC SLEEVE GASTRECTOMY

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ABSTRACT

Purpose: *The study aimed to investigate the relationship between preoperative dietary habits and weight loss in individuals with simple obesity who have undergone laparoscopic sleeve gastrectomy.*

Methods: *From January 2020 to August 2021, the clinical data of 75 patients with simple obesity who underwent laparoscopic sleeve gastrectomy at the Department of Gastrointestinal Surgery, The First Affiliated Hospital of Chongqing Medical University were retrospectively analyzed, including gender, age, height, weight, calculated percentage of total weight loss (TWL), percentage of excess weight loss (%EWL), and the three-factor diet questionnaire, and correlation tests were performed.*

Results: *At 1 month, 3 months, and 1 year postoperatively, postoperative follow-up weight and BMI were considerably reduced (P 0.001), while %TWL and %EWL levels were significantly higher (P 0.001). Emotional eating (EE) and unrestrained eating habits (UE) reduced considerably 1 month postoperatively (P 0.001). There was no significant link between preoperative CR and %TWL and %EWL at 1 month, 3 months, or 1 year postoperatively, while preoperative EE and UE were marginally positively connected with %TWL and %EWL at 1 month ($r > 0.3$, $P < 0.05$).*

Conclusions: *Following LSG, dietary habits improved dramatically, and preoperative EE and UE were shown to be weakly closely connected with early weight loss in obese patients after LSG.*

INTRODUCTION

The percentage of overweight and obese individuals is rising annually as urbanization and national living standards rise; by 2030, it is predicted that China's adult and child obesity rates would be 70.5% and 31.8%, respectively[1]. Obesity and overweight have become chronic disorders that are significantly linked to the occurrence of a variety of diseases, including cardiovascular disease, diabetes, chronic renal disease, and even many forms of cancer[2, 3].

Although bariatric surgery has been proven to be beneficial in treating obesity, some individuals continue to have poor post-operative weight reduction results. There is still a lot of research being done on the preoperative assessment of obese people, such as preoperative blood indicators, fundic tissue biopsies, and hormone testing for stomach hunger hormones like ghrelin[4-6]. Obesity is characterized by an excessive buildup of body fat as a result of

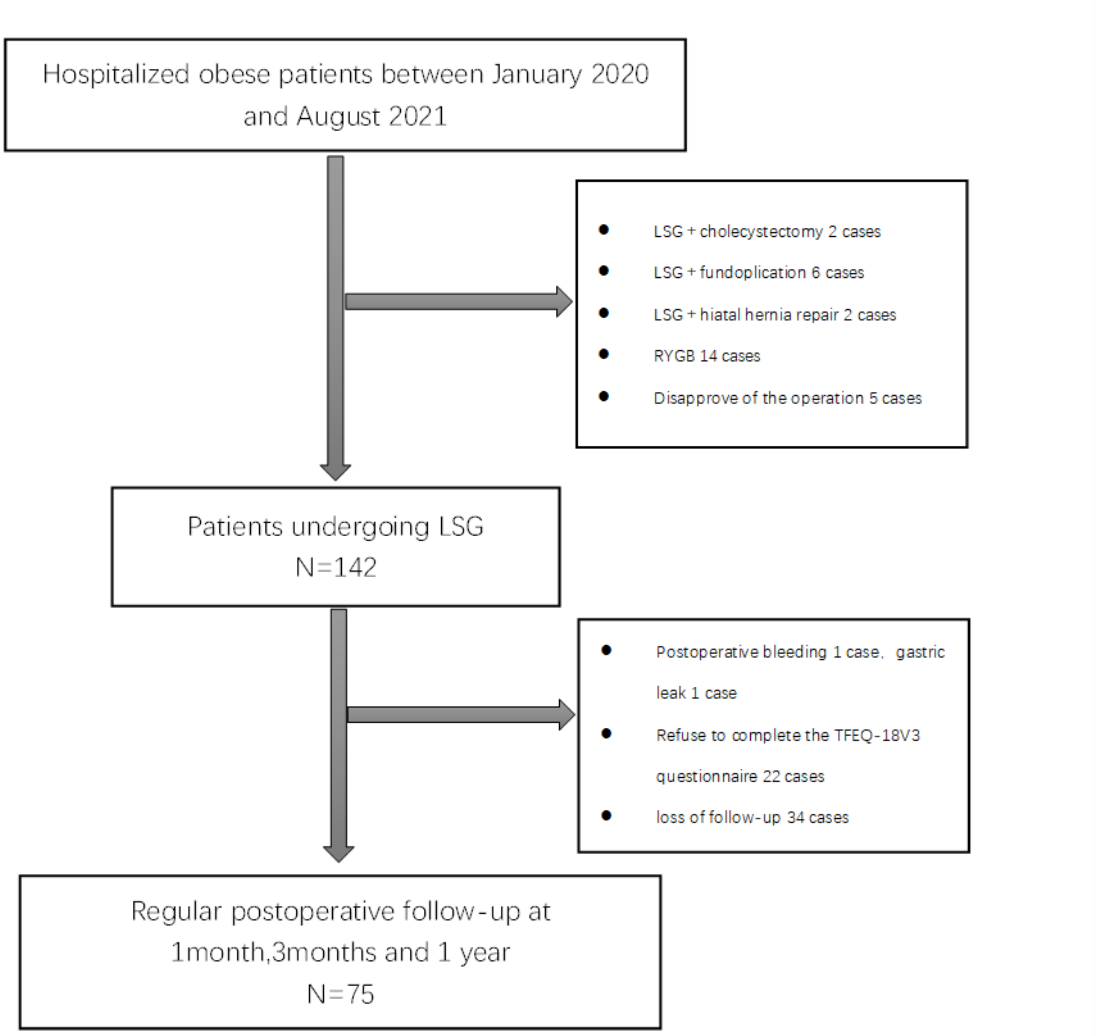
an imbalance between energy intake and energy expenditure, and poor eating habits may play a role in energy intake. The Three Factor Eating Questionnaire (TFEQ) is extensively used in the field of eating behaviors research as it can objectively analyze the eating behavior of obese and non-obese adults[7, 8].

There has been few research on the preoperative eating habits of obese individuals and the weight loss outcome of laparoscopic sleeve gastrectomy（LSG）. As a result, the purpose of this study is to investigate the relationship between preoperative eating habits and weight loss outcomes following laparoscopic sleeve gastrectomy in patients with simple obesity, to give a reference for preoperative evaluation of obese patients for improved weight loss outcomes.

METHODOLOGY

The study group included 75 patients who underwent surgery between January 2020 and August 2021(Figure 1). All patients provided written informed consent prior to the study and additional written informed consent was obtained before the surgical procedure. The study was approved by the Ethics Committee of the First Affiliated Hospital of Chongqing Medical University (No.2022-K374) in accordance with the guidelines of the Helsinki Declaration and its later amendments.

Figure 1 The Follow Chart



The inclusion criteria are as follows: (1) obese patients admitted to the Department of Gastroenterology, The First Hospital of Chongqing Medical University from January 2020 to August 2021; (2) consented to the surgery and signed the informed consent form for the

surgery; (3) informed and agreed to complete the Chinese version of the Three-Factor Eating Questionnaire R18V3 (TFEQ-R18V3); (4) completed outpatient or telephone follow-up at 1 month, 3 months and 1 year after the surgery, with clinical information was complete. Exclusion criteria: (1) diagnosis of secondary obesity; (2) previous history of gastrointestinal surgery; (3) taking psychotropic or steroidal drugs that affect body weight; (4) intellectual impairment or behavioral abnormality; (5) postoperative complications. All qualified patients underwent laparoscopic sleeve gastrectomy performed by the same operating team – the operator and 1 assistant. 36 Fr calibrating tubes was used to control the diameter of the remaining stomach. The procedure included dissection of the major curvature that started 2 or 6 cm from the pylorus and continued toward the left crus of diaphragm, leaving the remnant of the stomach in a "banana" shape, without routine postoperative abdominal drainage.

The calculation of the percentage of excess weight loss (%EWL), the percentage of total weight loss (%TWL) were performed using the following formulas:

1) %EWL = (body mass before the surgery – body mass during follow-up)/(body mass before the surgery – ideal body mass) × 100%,ideal body mass was calculated as a BMI of 23kg/m^2[9].
2) %TWL=(body mass before the surgery – body mass during follow-up)/(body mass before the surgery) × 100%.

Statistical analysis

Data analysis was conducted using SPSS Statistics v26.0 software. Continuous variables with normal distribution are presented as mean, standard deviation (SD) and 95% confidence interval (95% CI) and those with skewed distribution were expressed as median (quartiles). Student's *t* test was used to compare continuous variables between groups or the Mann-Whitney test for skewed ones. Correlation tests were performed using Spearman's rank sum correlation analysis, and a *p*-value of < 0.05 was considered to be statistically significant.

RESULTS AND DISCUSSION

A total of 75 patients were eventually included, 13 males and 62 females, aged (31.3±8.1), with a minimum age of 16 years and a maximum age of 55 years. The lowest preoperative weight was 70 kg and the highest weight reached 201 kg, with a mean preoperative weight of 99.9 kg and a mean BMI of 37.3 kg/m^2. Patients' weight and BMI were significantly lower at 1 month, 3 months and 1 year postoperatively, with statistically significant differences compared to the previous time point ($P < 0.001$). The %TWL and %EWL levels were significantly higher at 1 month, 3 months and 1 year postoperatively, with a statistically significant difference compared to the preoperative and previous time points ($P < 0.001$), as present in Table1.

Table 1 Baseline and post-operative information

	baseline	1 months	3 months	1 year
Gender（male/female）	13/62			
Age（years）	31.3±8.1			
Height（m）	1.63±0.06			
Body weight（kg）	99.9±19.4	88.7±17.3**	80.3±15.1**	71.7±13.1**
BMI（kg/m^2）	37.3±6.0	33.1±5.2**	30.0±4.5**	26.8±4.2**
TWL(%)	0	11.2±3.3	19.3±5.9**	27.7±8.7**
EWL(%)	0	30.7±8.9	53.0±14.3**	75.8±22.2**

** indicates comparison with previous time point, p < 0.001; %TWL: % total body weight loss; %EWL: % excess weight loss; BMI: body mass index

Patients' eating behaviors were assessed preoperatively, at 1 month, 3 months and 1 year postoperatively by administering the TFEQ-18V3 electronic questionnaire (Figure 2). There

was no significant change in cognitive restrictive eating (CR) postoperatively, and the difference was not statistically significant when compared to the previous time point ($p > 0.05$). Emotional eating (EE) decreased at 1 month postoperatively, with a statistically significant difference compared to the preoperative period ($p < 0.001$). EE was elevated at 1 year postoperatively, with a statistically significant difference compared to 3 months postoperatively ($P < 0.05$). Restrictive eating behaviors (UE) and the total TFEQ-18V3 score decreased significantly at 1 month postoperatively, with a statistically significant difference ($P < 0.001$). There was no significant change at 3 months and 1 year post-operatively compared to the previous time point ($P > 0.05$). (Table 2)

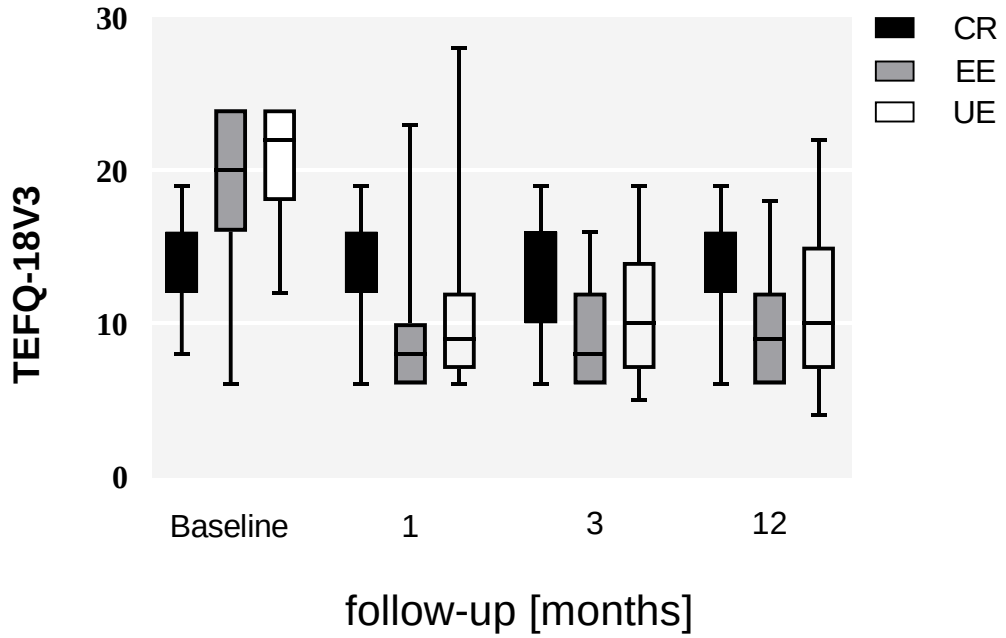
Table 2 TEFQ-18V3 changes in follow-up

	Baseline	1month	3months	12months
CR	14 (12,16)	14 (12,16)	13 (10,16)	14 (12,16)
EE	20 (16,24)	8 (6,10) **	8 (6,12)	9 (6,12) *
UE	22 (18,24)	9 (7,12) **	10 (7,14)	10 (7,15)
Total	55 (49,62)	32 (29,35) **	32 (25,39)	34 (27,41)

Emotional eating (EE), Restrictive eating behaviors (UE), Emotional eating (EE)

** indicates p value < 0.001; * indicates p value < 0.05

Figure 1 TEFQ-18V3 changes in follow-up



There was no significant correlation between preoperative CR and %TWL and %EWL at 1 month, 3 months and 1 year postoperatively, whereas preoperative EE, UE and total score were all positively correlated with %TWL and %EWL at 1 month postoperatively, which was statistically significant ($r > 0.3$, $p < 0.05$), as present in Table3.

Table 3 Correlation between preoperative eating behaviors and postoperative weight loss

	CR		EE		UE		Total	
Weight loss	*r*	*P*	*r*	*P*	*r*	*P*	*r*	*P*
TWL(%)								
1month	0.013	0.915	0.399*	0.001	0.333*	0.004	0.347*	0.002
3months	0.079	0.503	0.257	0.026	0.226	0.051	0.292	0.011
12months	-0.039	0.738	0.187	0.109	0.206	0.077	0.194	0.096
EWL(%)								
1month	0.071	0.546	0.368*	0.001	0.364*	0.001	0.324*	0.005

3months	0.201	0.084	0.210	0.071	0.243	0.036	0.278	0.016
12months	0.098	0.405	0.172	0.139	0.238	0.040	0.207	0.075

* indicates $r > 0.3$, p value < 0.05; %TWL, %EWL as in Table 1; CR: cognitively restricted eating; EE: emotional eating; UE: unrestricted eating

Discussion

In recent years, obesity has become more prevalent across the globe, and it now poses a serious health risk and financial burden to humanity[10, 11]. Due to the fact that obesity is not only a metabolism-related disease, but also a new socially and economically derived human challenge，the world of medicine has been intensively looking for the best methods to cope with this problem. Bariatric surgery has been shown in numerous worldwide studies to be the most successful treatment for morbid obesity and its co-morbidities in both short- and long-term observations[12]; yet, some patients' unsatisfactory weight reduction outcomes call for consideration by bariatric surgeons. LSG has become the mainstream bariatric surgery for morbid obesity due to its safety, low complication rate, and excellent weight loss results, accounting for about 80% of the total number of operations performed by bariatric centers in China in 2021.

EE refers to the tendency to eat excessively in a negative emotional state. Studies have indicated that persons with emotional eating behaviors tend to choose to eat meals heavy in sodium, sugar, and fats, and are more likely to develop abdominal obesity[13]. In our study, EE dramatically decreased at 1 month after LSG compared to the preoperative period ($p < 0.001$), indicating that emotional eating behavior in obese individuals significantly improved in the early postoperative period following LSG，which is consistent with the findings of Opozda et al[14]. Moreover, a link between preoperative emotional eating behavior and early weight reduction in obese patients with LSG was also identified in this study (r=0.399, $P < 0.001$; r=0.368, P < 0.001). This finding suggests that the greater the preoperative EE level, the better the early weight loss benefit. Although EE was higher at 1 year postoperatively compared to 3 months postoperatively (P 0.05), weight reduction results at 3 months and 1 year post LSG were not found to be correlated with EE at any time point. According to Tien S. Dong et al., LSG may reduce anxious and sad psychological states in female obese patients[15], and EE alterations may be associated to this.

UE is a propensity to overeat while hungry or when triggered by outside events, and this eating pattern may be linked to genetics[16] and a deterioration in executive function[17]. In this study, UE fell dramatically after 1 month postoperatively ($P < 0.001$), showing that LSG was able to significantly lower preoperative UE in obese patients, which may be attributed to changes in postoperative food preference, meal frequency, and meal amount, consistent with prior findings[18]. Meanwhile, postoperative BMI reduced considerably ($p < 0.001$), possibly improving their capacity to regulate eating execution. At 1 month after LSG, there was a slight positive connection between preoperative UE and %TWL and %EWL (r=0.333, $P < 0.05$; r=0.364, $P < 0.001$), suggesting that higher preoperative UE levels were associated with better early weight loss after LSG. According to this research, in obese patients with a preoperative tendency toward non-restrictive eating behavior, LSG can increase a more pronounced feeling of satiety by narrowing the gastric lumen and limiting the volume of gastric contents in order to attenuate the preoperative tendency toward non-restrictive eating behavior and reduce food intake. Improved eating behavior, on the other hand, is associated with changes in brain activity in the putamen of the brain and core reward regions, as well as changes in the structure of the gut microbiota in obese women, and improvements in UE may be tied closely to brain-gut axis management. In this study, there were 62 female obese

patients (82.7%). Therefore, we suggests that LSG may regulate the brain networks affecting UE through this pathway and improve the preoperative UE tendency in obese patients[15]. The above suggests that early identification and intervention in this population may lead to better weight loss outcomes after LSG.

The limitation of our study was selection bias. There are considerably more women than men, which may contribute to selection bias, and the longest follow-up time is just one year. Furthermore, there are many factors influencing the weight loss effect after LSG, and confounding factors were not excluded, which may not accurately reflect the correlation between preoperative eating behavior and the weight loss effect of LSG in obese patients. Moreover, this study did not rule out the influence of other psychological factors influencing the weight loss effect of LSG, such as anxiety disorder, depression, and binge eating. These differences may affect weight loss outcomes and changes in metabolic profile parameters after LSG.

CONCLUSION

In summary, the dietary behavior after LSG was significantly improved, and the preoperative EE and UE were positively correlated with the early weight loss outcome after LSG in obese patients. Perhaps bariatric surgeons need to pay more attention to the mental health of obese patients, such as eating behaviors. This will bring health to obese patients more comprehensively, not just lose fat. Thus, determining the eating behaviors of bariatric surgery candidates may prove greatly beneficial acutely and lifelong. However, further research with a larger group and better patients' selection is needed to provide strong evidence of an association between the dietary behavior and results of laparoscopic sleeve gastrectomy.

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None.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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