Original article

Effect of Resected Gastric Volume on Postoperative Excess Body Weight Loss after Laparoscopic Sleeve Gastrectomy

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ABSTRACT

Background: Laparoscopic sleeve gastrectomy (LSG) is an effective bariatric procedure for achieving weight loss and improving obesity-related comorbidities. While the resected gastric volume (RGV) is thought to influence weight loss outcomes, its precise role remains uncertain. This study aimed to evaluate the relationship between RGV and % excess body weight loss (%EBWL) six months post-LSG.

Patients and Methods: This prospective cross-sectional study was conducted in the General Surgery Department at Shifa International Hospital, Islamabad, from June 2023 to June 2024. Adult patients undergoing primary LSG were included, excluding those with prior bariatric surgery or incomplete follow-up data. Data collected included demographics, comorbidities, pre- and postoperative BMI, RGV, and %EBWL. RGV was measured intraoperatively by creating a gastrotomy at the antral end of the resected stomach, filling it with water via a Toomey syringe until maximum capacity, and measuring the volume in a graded container. %EBWL was calculated as [(initial weight – postoperative weight) ÷ (initial weight – ideal weight)] × 100. Procedures were performed by experienced surgeons, and patients were followed up for six months.

Results: Among 41 patients (mean age 35.3 ± 12.9 year) 51% (21) were male and 49% (20) were female, mean preoperative BMI was 40.9 ± 7.3 kg/m², decreasing to 32.9 ± 5.7 kg/m² postoperatively. Comorbidities included diabetes (49%), hypertension (41%), and sleep apnea (73%). Mean RGV was 891.8 ± 187.6 mL, and mean %EBWL was 52.1 ± 31.1%. A weak, inverse correlation between RGV and %EBWL (r = -0.085, p = 0.793) was observed, indicating no significant association.

Conclusion: The findings suggest that RGV does not significantly predict short-term weight loss after LSG. Further research is needed to explore other determinants of weight loss, including patient characteristics and postoperative behaviors.

Keywords:

Laparoscopic sleeve gastrectomy, resected gastric volume, % excess body weight loss.

INTRODUCTION

Obesity, defined as excessive fat accumulation harmful to health, is a leading global health challenge and a major risk factor for diseases like cardiovascular disease, diabetes, and certain cancers.[1,2] The World Health Organization classifies obesity by BMI, with Type I starting at BMI ≥30 kg/m² and Type III exceeding 40 kg/m².[3,4] By 2035, 1.53 billion adults are projected to be affected, disproportionately impacting low- and middle-income countries with limited care resources.[1,5]

Bariatric surgery is the most effective long-term treatment for obesity, offering significant health improvements and mortality reduction.[6–9] Laparoscopic sleeve gastrectomy (LSG), initially introduced by Gagner for high-risk, super-obese patients, is now widely performed as a standalone procedure.[9–11,14] LSG reduces comorbidities, supports lasting weight loss, and prevents weight regain, with studies showing a one-year average excess body weight loss of 59.3% and low mortality rates comparable to laparoscopic cholecystectomy.

Research on the relationship between resected gastric volume (RGV) and weight loss after laparoscopic sleeve gastrectomy (LSG) remains inconclusive. While Gómez-Ruiz and others., Du and others, and D'Ugo and co-researchers found no significant correlation, McCracken and others linked RGV to demographic factors but not BMI changes, Kwon and others suggested larger sleeves might slightly enhance weight loss, whereas Pawanindra and others reported a modest correlation between excised stomach volume and early weight loss, Yilmaz and others' meta-analysis

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emphasized the lack of consensus[15-21]. These discrepancies, combined with limited exploration of long-term outcomes and confounding factors, underscore the need for this study to evaluate the correlation between RGV and excess body weight loss to provide clearer evidence for optimizing bariatric outcomes.

PATIENTS AND METHODS

This prospective, descriptive cross-sectional study was conducted in the General Surgery Department at Shifa International Hospital, Islamabad, from June 2023 to June 2024. The sample size was calculated to be 41, based on a correlation coefficient of 0.48, a 5% significance level, and 90% power.[12] Using consecutive (non-probability) sampling, eligible participants included adults aged 20–60 years with a BMI ≥30 kg/m², categorized as morbidly obese if BMI ≥40 kg/m² or ≥35 kg/m² with associated comorbidities. Both genders were included, and participants had comorbid conditions such as diabetes, hypertension, sleep apnea, or arthralgia. Patients with deranged coagulation profiles, high anesthesia risk, psychiatric illness, or substance abuse were excluded.

Ethical approval was obtained, and informed consent was secured before enrollment. A multidisciplinary preoperative evaluation was conducted, including specialist counseling, gastrointestinal endoscopy, and anesthesia assessment. During laparoscopic sleeve gastrectomy (LSG), resected gastric volume (RGV) was measured using a consistent method by making a small gastrotomy at the antral end of the resected stomach, which was gradually filled with tap water through a Toomey syringe to its maximum capacity. The volume of water was then measured in a graded container. This method was consistently applied to all study participants to maintain standardization.

Postoperatively, participants were followed for six months, with BMI recorded preoperatively and at 180 days post-surgery. Excess body weight (EBW) was calculated using formula.

EBW=Actual weight – Ideal body weight

Percentage excess body weight loss (%EBWL) was calculated using the formula:

%EBWL= {(Preoperative weight–Postoperative weight) ÷ (Preoperative weight–Ideal weight)} ×100

Ideal body weight was defined as weight which resulted in BMI equal to 24.9. Follow-up included regular outpatient visits and telephonic contact to ensure data completeness and patient compliance.

Data collection was recorded on a standardized questionnaire, and SPSS 25 was used for analysis. Descriptive statistics were calculated for qualitative and quantitative variables. Pearson correlation was employed to analyze the relationship between RGV and %EBWL, with statistical significance set at $p < 0.05$. The study assumed that a higher RGV would correlate positively with greater %EBWL, forming the basis for evaluating prediction and correlation.

RESULTS

The study enrolled 41 patients, with a mean age of 35.33±12.86 years. The demographic characteristics revealed that the mean preoperative weight was 98.13±31.35 kg, and the mean height was 178.25±14.8 cm. Among the participants, 21 were male (51.2%) and 20 females (48.8%). The mean preoperative BMI was 40.94±7.34, which decreased postoperatively to 32.88±5.7. Comorbidities included diabetes in 20 patients, hypertension in 17, sleep apnea in 30, arthralgia in 31, backache in 11, and reflux disease in 2 (Figure 1). The mean excess body weight was 44.32 ± 22.15 kg, while the mean resected gastric volume was 891.75 ± 187.61 ml. The mean percentage excess body weight loss (%EBWL) was calculated at 52.14 ± 31.11.

Correlation analysis using Pearson's method indicated a coefficient (r) of -0.085 (Table 1), suggesting a very weak and negative correlation between resected gastric volume and %EBWL. The p-value was 0.793, indicating that this correlation is not statistically significant and likely due to random chance rather than a true relationship.

Table 1: Pearson correlation between %EBWL and RGV

Correlations	%EBWL	RGV	Sig. (2-tailed	N
%EBWL	1.000	-0.085	-	41
RGV	-0.085	1.000	0.793	41

DISCUSSION

The relationship between resected gastric volume (RGV) and weight loss following laparoscopic sleeve gastrectomy (LSG) is increasingly scrutinized within bariatric research. This study found a correlation coefficient (r) of -0.085, indicating a weak and negative correlation between RGV and percentage excess body weight loss (%EBWL), with a p-value of 0.793. This indicates that the correlation is likely random rather than indicative of a true relationship, aligning with findings from previous study in which no significant association between RGV and %EWL at 24 months was described, emphasizing that preoperative comorbidities and postoperative complications might

have a greater influence on weight loss.[15] Yilmaz and co-researchers conducted a meta-analysis that reported mixed results regarding the RGV-weight loss connection, reiterating the need for further research in this area.[16] Similarly, Kwon and coauthors found that while RGV did not significantly affect %EWL, larger sleeve sizes correlated with marginally higher %EWL.[17] McCracken and colleagues reported that gastric specimen size did not correlate with initial BMI or changes in BMI at 3, 6, or 12 months. They noted that larger specimen sizes were more common among males, older patients, and those with diabetes mellitus.[18] One more study found in Chinese population sample, that weight loss at one year postoperative laparoscopic sleeve gastrectomy was not associated with RGV, emphasizing the importance of patient characteristics such as preoperative weight and BMI.[19]

D'Ugo and coworkers described these sentiments by reporting no correlation between the volume of the stomach removed and weight loss after LSG.[20] Notably, Pawanindra and coworkers suggested that early postoperative weight loss correlates with the volume of the excised stomach, with a correlation coefficient (r) of 0.481. This indicates that surgical technique and the amount of stomach excised may have a more immediate impact on early outcomes than sleeve characteristics.[21] In summary, this study indicates a negligible correlation between RGV and %EBWL, contributing to a growing body of literature. These findings highlight the need for a more nuanced approach to preoperative assessments and individualized treatment plans, taking into account the complex interplay of these variables. Future research should focus on the potential confounders identified in our study and explore how they may impact long-term outcomes in bariatric surgery, ultimately aiming to refine surgical protocols and enhance patient care.

CONCLUSION

Volume of gastric tissue resected during laparoscopic sleeve gastrectomy (LSG) does not significantly predict short-term weight loss outcomes, as evidenced by the weak correlation and lack of statistical significance between resected gastric volume (RGV) and percentage excess body weight loss (%EBWL).

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