



## RESEARCH ARTICLE

## Is Revisional Bariatric Surgery Effective as Primary Surgery?

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### Abstract

**Background:** To assess outcomes of laparoscopic sleeve gastrectomy (LSG) as primary surgery (PS) versus revisional surgery (RS) emphasizing weight loss, modification of comorbidities and complications.

**Methods:** The study included randomly selected 350 PS patients for control group and 35 RS patients for study group. Prospectively-collected patient data were retrospectively reviewed. To measure the efficacy of the procedure, we calculated the excess weight loss percentage (EWL%). Effective weight loss was accepted as more than 50%. The changes in the status of the comorbid diseases, complications (leakage, bleeding and stenosis), weight loss, % excessive weight loss (EWL) and mortality were recorded.

**Results:** Mean BMI before PS and RS were  $47.59 \pm 6.46$  kg/m<sup>2</sup> and  $44.52 \pm 6.75$  kg/m<sup>2</sup> ( $p = 0.07$ ). The mean operation time was more in the RS group than in the PS group. The amount of weight given in the RS group was higher one year after surgery. Diabetes mellitus (DM) and Dyslipidemia (DL) remission rates were higher in revision surgery group. There was one mortality in RS group.

**Conclusions:** To summarize the first to systematically discuss results of primary surgery versus revisional surgery from Turkey and we showed the evidence that revisional surgery can be successfully completed with acceptable postoperative morbidity risks comparing with primary surgery. There is a need for long-term follow-up outcomes of large randomized controlled studies to define the related to weight loss and delayed complications.

### Keywords

Laparoscopic sleeve gastrectomy, Outcome, Revisional surgery

### Abbreviations

LSG: Laparoscopic Sleeve Gastrectomy; PS: Primary Surgery; RS: Revisional Surgery; EWL%: Excess Weight Loss Percentage; DM: Diabetes Mellitus; HT: Hypertension; DL: Dyslipidemia; BS: Bariatric Surgery; BMI: Body Mass Index

### Introduction

Obesity is the fifth leading risk for death. It threatens to quality of life, longevity and public health [1]. Bariatric surgery (BS) is considered to be the most effective treatment modality in maintaining long-term weight loss and reducing obesity-related comorbidities in morbid-obese population [2].

Bariatric surgeries have increased in the last ten years. Laparoscopic sleeve gastrectomy (LSG) has become increasingly popular due to its efficacy in weight loss simplicity and relative safety [3-6]. With the increase in the numbers of BS, increasing numbers of patients require revisional surgery (RS) due to unwanted outcomes of primary surgery (PS). Revision rates after PS are reported from 10 to 25% [7].

In this study, we reviewed our experiences related to revisional BS. The aim of this study was to compare outcomes of patients who had RS to PS as a control group in the terms of weight loss, remission of comorbid disease and complications.

### Methods

All patients who underwent BS at our clinic were investigated in a prospectively-updated database and patients from June 2015 to March 2018 were included. Local ethics committee permission was obtained in order to assess investigation results. All patients consented to their surgical pathologies being included in the study before surgery. Patient demographics, body mass index (BMI), accompanying comorbid diseases (DM: Diabetes mellitus, HT: Hypertension DL: Dyslipidemia) were retrospectively investigated.

Detailed information about procedures was given to patients before surgery. Endocrine and psychiatry consultations were held. Detailed history related to weight loss after primary BS, psychosocial factors and variations in comorbidities was taken. Additionally, all patients had upper gastrointestinal (GI) endoscopy and radiography.

All procedures were performed fully laparoscopically by two bariatric surgeons using the standard technique. For all techniques, anastomosis or stapler lines were checked with methylene blue with the aim of predicting leaks.

Patients who underwent LSG in our clinic due to morbid obesity were include at PS group. The indication for RS was insufficient weight loss or renewed weight gain for all initial procedures. Types of RS were laparoscopic mini gastric by-pass, laparoscopic re-sleeve gastrectomy, LSG, laparoscopic Roux-en-Y gastric bypass. In this study, RS group was consisted of patients who was previously not in our PS group.

### Post-operative follow-up

All patients began clear fluids on the 1<sup>st</sup> day postop. Patients with no evidence of sepsis on follow-up and who tolerated oral intake were discharged on the third day after surgery. No patient had nasogastric tube inserted. After surgery, clear fluids were begun in the first week, then pureed food was added for one week and in the third week solid food was permitted. One week after surgery, all patients were administered multivitamins, calcium and vitamin B12. Proton pump inhibitor treatment was prescribed for three months.

Follow-up of patients was performed at 1, 6, and 12 months after surgery. Hospital stay, operation time, complications (leakage, bleeding and stenosis), weight loss, % excessive weight loss (EWL) and mortality were recorded. Resolution of comorbidities was accepted as normalization of preoperative comorbidities at the end of follow-up.

### Results

Five hundred and eighty BS were performed study period. The study included randomly selected patients who had not revisional surgery 350 PS patients for control group and 35 RS patients for study group. Five patients in RS group were referred to our clinic from external centers. The clinical features of patients before surgery are shown in [Table 1](#). Two groups were similar in terms of demographic characteristics. Mean BMI before PS and RS were  $47.59 \pm 6.46$  kg/m<sup>2</sup> and  $44.52 \pm 6.75$  kg/m<sup>2</sup> ( $p = 0.07$ ).

The mean operation time was more in the RS group than in the PS group ( $p = 0.00^*$ ). No statistically significant difference was found between the groups in terms of hospital stay and postoperative complications ([Table 2](#)).

At the end of the first year, the amount of weight given in the RS group was higher ( $p = 0.001$ ), but in the EWL% follow-up, were similar for both groups. DM and DL remission rates were higher in revision surgery group, although HT remission rates were similar in both groups ( $p = 0.04^*$ ,  $p = 0.03^*$  and  $p = 0.33$ , respectively). The detailed follow-up parameters after surgery shown in [Table 3](#).

**Table 1:** Demographic characteristics of groups.

		Primary surgery group (n = 350)	Revisional surgery group (n = 35)	p
Age (years)		40.59 ± 10.79	43.79 ± 9.38	0.092
Sex (n)	Male	71	9	0.45
	Female	279	26	
BMI (kg/m <sup>2</sup> )		47.59 ± 6.46	44.52 ± 6.75	0.07
Comorbidities [n(%)]	DM	127 (36.29%)	11 (31.43%)	0.212
	HT	93 (26.57%)	9 (25.71%)	0.91
	DL	142 (40.57%)	13 (37.14%)	0.69

BMI: Body mass index; DM: Diabetes mellitus; HT: Hypertension; DL: Dyslipidemia.

**Table 2:** Surgery outcomes of groups.

		Primary surgery group (n = 350)	Revisional surgery group (n = 35)	p
Hospital stay (days)		4.07 ± 1.50	4.86 ± 2.37	0.84
Operation time (minutes)		75.22 ± 21.65	135.52 ± 47.37	0.001
Complications (n)	Leak	7	1	0.07
	Hemorrhage	6	2	0.33
	Stenosis	6	2	0.33

**Table 3:** Follow-up of weight loss in both groups.

		Primary surgery group (n = 350)	Revisional surgery group (n = 35)	p
Weight loss (kilograms)	1 <sup>st</sup> month	11.79 ± 1.59	9.38 ± 6.01	0.051
	6 <sup>st</sup> month	36.63 ± 4.19	27.28 ± 10.14	0.061
	1 <sup>st</sup> year	47.87 ± 6.29	33.76 ± 13.29	0.001
EWL (%)	1 <sup>st</sup> month	18.89 ± 7.94	18.86 ± 8.58	0.281
	6 <sup>st</sup> month	58.69 ± 20.91	56.74 ± 15.92	0.170
	1 <sup>st</sup> year	76.70 ± 31.42	70.79 ± 20.96	0.062
Remission rate [n(%)]	DM	63 (50.39)	2 (87.82)	0.04
	HT	47 (49.46)	3 (66.67)	0.33
	DL	60 (57.75)	3 (76.92)	0.03
Mortality n(%)		0 (0%)	1 (2.85)	0.15

EWL: Excess weight loss; DM: Diabetes mellitus; HT: Hypertension; DL: Dyslipidemia.

In the revision surgery group, a patient who died due to ARDS secondary to aspiration pneumonia couldn't be excluded during the intensive care follow-up. There was no mortality in PS group.

## Discussion

BS has had more than 10 fold growth all over the world. Increasing numbers of interventions, BS have led to an increase of primary bariatric operations as well as RS after various primary bariatric procedures [8].

Choice of the revisional procedure of should depend on several factors, including history of the patient and intraoperative findings. The most common reason of the revisional procedure was insufficient weight loss or weight gain. The else most common reason was stenosis. However, these indications are not fully independent of each other and many patients have a combination of complications [9].

In our bariatric center, RS accounted for 5.17% (30/580) of all bariatric surgeries during the study period. Different types of PS lead to different reasons for conversion; however, in our series, insufficient weight loss and weight gain were the most common reason for revisional BS.

As previously defined, successful weight loss is arbitrarily defined as weight-loss equal/greater than 50 percent of excess body weight after BS. In a prospective study, Himpens, et al. reported that EWL was 53.3% 6 years after LSG [10]. Similarly, the results of 52 RS cases in 6 years, in which 96% of cases were laparoscopic procedures, EWL was 31.8% and the complication rate was 5.8% [11]. In our study, the PS and RS provide successful results in 12 months follow-up. The percentage of EWL was 76.70% and 70.79% after one year. EWL% values were similar in the LSG group compared to the RS group in the first year, although there was a statistically significant loss of weight in the LSG group (33.76 kg and 47.87 kg respectively,  $p = 0.001$ ).

Complications that may occur after LSG during long-term follow-ups are stenosis, reflux and weight gain [12]. Leaks are usually the most common complication and tend to occur at a much earlier stage after surgery. Besides RS is widely accepted as a complex and technically difficult procedure. Generally, complication rates after laparoscopic revision range from 14.3 to 46.3%, which is much higher than the complication rates after primary procedures [13].

Our observed complication rates, such as leak, hemorrhage and stenosis were similar in RS group and controls. The complication rate was lower than most reported studies but within ranges observed by high experienced centers referenced [14,15]. In addition, hospital stay days were similar in both group. Our operative times are longer than those reported in the Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program (100 minutes for revisional SG) [16]. Adhesion and scar tissue secondary to previous operations have been an inevitable problem for revision surgery. With the development of laparoscopic surgical skills, several recent studies have shown that RS can be performed reliably well by educated and well-qualified bariatric surgeons at BS centers [16,17].

Although there is evidence that LSG is excellent in short-term follow-up in DM control, long term data are limited. Juodeikis, et al. reported fully remission of DM in 58.9% of patients [18]. In a systematic review of the effect of LSG on HT found complete remission in 58% and improvement in 75.7% of patients [19]. In a study by McKenna, et al. 100% DM and 74% HT remissions were detected [20]. Our results were consistent with the literature regarding the remission of comorbid diseases (Type 2 DM, HT, DL). However, type 2 DM and DL remission rates were higher in RS group ( $p = 0.04$  and  $p = 0.03$  respectively). We predict that one of the reasons this statistically significant difference occurred is the usage of the malabsorptive

methods in the RS group.

In the literature, there are higher mortality rates defined for RS compared to primary surgery. Owens, et al. reported the mortality rate for primary procedures was 0.5% and was 1.3% after revisions [21]. In our series, one case developed mortality due to non-surgical respiratory problems.

There are some limitations to our study. First, it is a retrospective study of a single center and the number of patients is relatively low. Second, the follow-up duration is slightly short and there is still a need to collect long-term outcomes. The major power of this article is that it is first study that reports the results of RS compared to LSG as primary surgery.

## Conclusion

RS performed using the laparoscopic approach can be successfully completed with acceptable postoperative morbidity risks and shows successful short-term weight loss, DM resolution and DL improved comparing with PS. There is a need for long-term outcomes related to weight loss and delayed complications.

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## Conflict of Interest

Hakan Seyit, Halil Alis declare that they do not have any conflict of interest.

## Author Contributions

Study conception and design: Seyit H

Critical revision: Alis H.

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