

# Effect of Bougie Size and Level of Gastric Resection on Weight Loss Post Laparoscopic Sleeve Gastrectomy

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## Abstract

**Objectives:** To study the effect of bougie size and level of gastric resection on the outcome of laparoscopic sleeve gastrectomy (LSG) in morbid obese patients.

**Methods:** A prospective randomized trial on 90 patients with morbid obesity who underwent LSG between February 2010 and April 2012. The Patients were prospectively randomized into two groups, the first group in which a bougie size of 34 French was used and resection of the stomach was performed 4 cm from pylorus. In the second group, a bougie size of 36 French was used, and resection of the stomach was performed 6 cm from the pylorus. A comparison between the two groups was carried out by assessing percentage of excess weight loss (%EWL), mean body mass index changes (mean BMI) at 6 months and one year post-operative, and complications of surgery .

**Results:** Out of 45 patients in first group, 15 were males (33.3%) and 30 were females (66.7%), mean age was 31.3 years and mean BMI 46.1 kg/m<sup>2</sup> (range 40-55.6). out of 45 patients in second group, 14 were males (31.2%) and 31 were females (68.8%) with mean age of 32.3 years and mean BMI 45.4 kg/m<sup>2</sup> (range 40-56). Six months after LSG, the %EWL in first group was 79% while in second group was 68% (*P*-value=0.011), and the mean BMI change was 10.1 kg/m<sup>2</sup> (range 5-11) and 8.3 kg/m<sup>2</sup> (range 4-9) respectively (*P*-value=0.009). One year after LSG, the %EWL in first group was 84% while in second group was 76 % (*P*-value=0.015), and the mean BMI change was 14.3 kg/m<sup>2</sup> (range 7-15) and 11.2 kg/m<sup>2</sup> (range 5-13) respectively (*P*-value=0.012). In both groups, the duration of operative time, bleeding, gastric leak, Intensive care unit admission, and hospital stay were similar in which statistically insignificant (*p*-value>0.05).

**Conclusion:** Using bougie size 34fr and gastric resection at 4cm from the pylorus is safe and results in greater weight loss and higher change in BMI.

**Keywords:** Sleeve gastrectomy; Bougie; Excess weight loss; Body mass index

## Introduction

Laparoscopic Sleeve Gastrectomy (LSG) has recently evolved as standalone procedure for morbid obesity [1,2]. LSG works by reducing the size of the stomach to create satiety with small amount of food intake as it cannot accommodate a larger meal. Small intragastric volume leads to decreased food consumption and earlier distension of the stomach which causes firing of stretch receptors leading to perception of satiety [3]. Other mechanisms include decreased level of ghrelin due to resection of gastric fundus which is the main site of ghrelin production [4].

Generally accepted method of LSG is removing 80 to 90% of the stomach including the greater curvature and fundus while leaving a thin sleeve of stomach [5]. There is no consensus on how much stomach should be resected and which size of bougie to be used. The introduction of resection of the stomach over a bougie was to standardize a procedure to achieve desirable outcome. Most bariatric surgeons use bougie size 32 to 40fr in sleeve gastrectomy [6]. It has been suggested by some studies that decreasing the size of the bougie may lead to a greater percent excess weight loss [7]. Theoretically smaller size of bougie may lead to leak and subsequent stricture formation, but current studies do not support this view [8].

This study was constructed to determine if bougie size and level of gastric resection affects the outcome, measured by percentage of excess weight loss (%EWL), mean body mass index change (mean BMI) and the postoperative complications.

## Methods

This is a prospective randomized study of 90 patients who underwent

LSG by two surgeons at King Abdulaziz University Hospital in Jeddah, Saudi Arabia, between February 2010 and April 2012. All patients with morbid obesity in which the BMI of 40 kg/m<sup>2</sup> and more were included in the study. Patients with contraindication for laparoscopic surgery were excluded.

The Patients were prospectively randomized into two groups. First patient will be operated by first surgeon and will be in group one, and the second patient will be operated by the second surgeon and will be a signed in group two and etc. forty five (45) patients were in group (1) were bougie size 34fr was used and resection of the stomach was performed 4 cm from the pylorus, while 45 patients in group (2) in which bougie size 36 french was used, and the resection was performed 6 cm from the pylorus. Preoperative assessment for co-morbid conditions was carried out in all cases. Detailed history of obesity, its duration, medical treatment, dieting and exercise trial to control obesity and medical co-morbidity were also reviewed.

A comparison between the two groups was carried out by assessing % EWL, in which we measured the pre-operative weight and estimated the excess weight above the ideal weight, and compared it to post-

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operative weight, and BMI change at 6 months and one year post surgery. Operative assessment was achieved by looking at operation time, intensive care unit (ICU) admission, hospital stay and complications during and after surgery. A standard local protocol for preoperative, intraoperative and postoperative was used for both groups. An approval from the local ethics committee in our hospital to conduct the study was obtained.

The data was entered and analyzed using the statistical package for social sciences (SPSS Inc., Chicago, IL, USA), version 20.00. The quantitative data was presented in the form of mean, standard deviation and range. Chi-square test was done to compare qualitative data. Independent t-test and Pearson's correlation test was also used in the analysis. It was considered statistically significance when p-value is >0.05 and confidential interval of 95 percent.

## Results

Out of 45 Patients in the first group, 15 were males (33.3%) and 30 were females (66.7%), with mean age 31.3 years (range 20-50), and mean BMI 46.1 kg/m<sup>2</sup> (range 35-55.6). In the Second group, 14 were males (31.3%) and 31 were females (68.8%), with mean age 32.3 years (range 21-48), and mean BMI 45.4 kg/m<sup>2</sup> (range 35-56) (Table 1). Six months after LSG, the %EWL in first group was 79% while in second group was 68% (P-value=0.011) and the mean BMI change was 10.1 kg/m<sup>2</sup> (range 5-11) in first group and 8.3 kg/m<sup>2</sup> in the second (P-value=0.009). One year after LSG, the %EWL in first group was 84% while in second was 76% (P-value=0.015). The mean BMI change was 14.3 kg/m<sup>2</sup> (range 7-15) in first group and 11.2 kg/m<sup>2</sup> (range 5-13) in the second (p-value=0.012) (Table 2). Operative time, intra-operative bleeding, gastric leak, ICU admission and hospital stay were similar in both groups and were statistically insignificant (p-value>0.05). In the first group, mean operative time was 197 minutes, one case of bleeding, no gastric leak, one patient admitted to ICU for two days because of at electasis which required respiratory support, and mean hospital stay was 4.8 days. In the second group, mean operative time was 134.6 minutes, one case of bleeding, no gastric leak, and no ICU admission and mean hospital stay was 4.4 days (Table 3).

## Discussion

As there is no consensus on how much stomach should be resected and which size of bougie is to be used, this study was designed to assess the safety and the outcome of bougie size 34fr and 4 cm gastric resection from pylorus as compared to bougie size 36fr and 6 cm resection from the pylorus. The preoperative characteristics in first group [bougie-34] were similar to second group [bougie-36] as similar age, sex ratio and BMI. This makes these two groups similar in construction to be compared for the effect of bougie size and the level of resection on the outcome of LSG.

After LSG, the most significant effect of the smaller size bougie [34fr] was on %EWL and mean BMI. Atkins et al. reported a decrease in weight up to 60% treated with a 40fr bougie, while 45% with 50fr bougie 4 years after surgery [9]. Weiner et al. [7] compared three groups of patients (one with no bougie, other with 44fr and third with 32fr) and conclude that, while there are no differences in short-term results, after two years, more weight loss was seen in the smaller size bougie. This study also supports the mechanism of more weight loss in smaller size bougie and persistent weight loss even after two years. Parikh et al. described that the bougie size (40 vs. 60 fr) does not result in significant greater weight loss in the short term [10]. There are other studies which also show more weight loss in smaller size bougie such studies include Roa et al. (2006) who used a 52fr bougie, reported an average of 52.8% EWL after 6 months [11]. Serra et al. [12] using a 32fr catheter, obtained a 61% EWL. A systematic review by Brethauer et al. [13] which included 36 studies of LSG using catheters from 32 to 60Fr, reports an EWL from 33% to 85%. This study not only compares bougie size but also resection point from the pylorus. This study found that the smaller bougie with the closer resection of the stomach from the pylorus achieved the greater loss of excess weight within a year.

Other factors might also play a part when choosing the type of surgical technique such as mean operating time which in this study was more for the smaller size bougie than the larger bougie. This may be explained by the fact that more time is usually needed to construct a tight sleeve over a smaller bougie. As far as complications are

	Group 1 (Bougie 34 and 4 cm resection level)	Group 2 (Bougie 36 and 6 cm resection level)
<b>Age</b>	Mean 31.3 years Range 20-50	Mean 32.2 years Range 21-48
<b>Sex</b>		
Males	15 (33.3%)	14 (31.1%)
Females	30 (66.7%)	31 (68.8%)
<b>BMI (kg/m<sup>2</sup>)</b>	Mean 46.1 Range 40 -55.6	45.4 Range 40-56

Table 1: Comparison of demographic data and BMI between the study groups.

	Mean BMI change Kg/m <sup>2</sup>	% EWL	p-value	Group 1	Group 2	p-value
	Group 1	Group 2				
<b>6 months after LSG</b>	10.1 (range 5-11)	8.3 (range 4-9)	0.009	79	68	0.011
<b>1 year after LSG</b>	14.3 (range 7-15)	11.2 (range 5-13)	0.012	84	76	0.015

Table 2: Mean BMI changes and % EWL at 6 month and 1 year after LSG.

	Group 1	Group 2	p-value
<b>Operation time</b>	197 min	134.6 min	0.13
<b>Bleeding</b>	1	1	0.15
<b>Leak</b>	0	0	0.50
<b>ICU admission</b>	1	0	0.09
<b>Hospital stay</b>	4.8 days	4.4 days	0.10

Table 3: Comparison of the operative and post-operative data between the study groups.

concerned bleeding was similar in both groups at 2.2%, and no injury to nearby organs, and no gastric leak in both groups. Gagner describe an inverse relation between the size of the bougie and the rate of leaks and advocate the use of catheters between 50 and 60fr [14].

## Conclusion

Using bougie size 34fr and gastric resection at 4 cm from the pylorus is safe and results in greater weight loss and higher change in BMI.

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