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# Effects of 6cm versus 2cm Resection Margin from Pylorus on Excess Weight Loss & Complication Rate for Laparo-Scopic Sleeve Gastrectomy: A Nine-Year Experience

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## ABSTRACT

**Introduction:** LSG is the gold standard sole bariatric procedure for morbid obesity. Small (2cm) and large (6cm) distance of resection margin from pylorus are both being used for neogastric sleeve formation however what is optimal distance remains controversial.

**Aims & Objectives:** To assess excess weight loss results and complication rate with 6cm and 2cm distance of staple line from pylorus during a prolonged surveillance period.

**Place and Duration of Study:** This retrospective cohort study was conducted at Fatima Memorial Hospital from Dec 2013 to Dec 2022 spanning 9 years.

**Material & Methods:** Medical records of 50 morbidly obese patients aged 41- 50 yrs were segregated into two groups of 25 each based on the LSG procedure conducted. Group 1 had LSG with 6cm resection margin from pylorus while group 2 had a staple line distance of 2cm from pylorus for neogastric sleeve formation. The patients were subsequently followed up for excess weight loss (EXL) and BMI at 6 months, 1 year, 2 years, 3 years & 4-year interval. Data was entered and analyzed using SPSS version 21.P value ≤ 0.05 was considered significant.

**Results:** EWL in Group 1 & 2 was 39.2± 6.77kg & 41.9± 4.35kg at 6 months,73.64± 6.49kg & 71.06± 7.77kg at 1 year, 65.52± 5.53kg & 63.92± 7.07kg at 2 years,58.16± 4.97kg & 57.28± 5.75kg at 3 years and 55.48± 3.39kg & 55.36± 3.72kg for 4 years were, not significant statistically. BMI in group 1 & 2 were 39.47± 5.11 & 35.88± 4.40 at 6 months, 29.22± 2.68 & 29.12± 2.00 at 1 year, 25.44± 1.96 & 24.73± 2.86 at 2 years, 22.84± 1.79 & 22.40±2.20 at 3 years and 21.66± 1.32, 21.67± 1.62 at 4 years were found to be statistically insignificant.

**Conclusion:** With regards to extra weight loss, distance of resection margin from pylorus of 2cm or 6cm have identical effects but the latter has lowest complication incidence after 4 yrs of surveillance. Hence, a distance of 6cm is favoured to ensure safety of LSG for morbidly obese patients. And the findings of this study will help bariatric surgeons to improve technique of LSG in a safe and successful way for effective weight loss in morbidly obese patients.

**Keywords:** Morbid obesity, laparoscopic sleeve gastrectomy (LSG), distance from pylorus, excess weight loss

## INTRODUCTION

Morbid obesity has now become a global problem affecting more than 300 million adults worldwide[1]. These patients have a greater tendency to face obesity related complications such as diabetes mellitus, Hypertension, ischemic heart diseases, joint problems, stroke, sleep apnoea and a myriad of metabolic syndromes. Although multiple regimes are available to reduce weight but to achieve successful and fruitful clinical weight loss, it is imperative to opt for surgical treatment as it is the only evidence-based option available[2]. Since the advent of laparoscopic surgery, bariatric surgery has been revolutionized and more of the morbidly obese patients are recommended to undergo surgical therapy by general physicians[3]. A number of surgical procedures have been documented in this regard in the literature like gastric banding, gastric bypass, sleeve gastrectomy, liposuction and duodenal switch. Out of these procedures, laparoscopic sleeve gastrectomy (LSG) has been declared most successful for being sole effective bariatric procedure. It involves removal of greater curvature of the stomach vertically to convert it in a small tube. It has become popular nowadays owing to the fact that it is only a resection surgery without necessitating bypass or anastomosis in the gastrointestinal tract. It is technically easier than

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bypass surgery and without the need to use any external implant as done in gastric banding[4]. Success of LSG is dependent on two factors, First, maximal restraint and early satiety is achieved by creating a short lumen with intact pylorus forming a high-pressure system. Second, removing gastric fundus eliminates ghrelin release causing less hunger[5]. Despite its proven success and safety, certain points remain disputed like distance of resection margin from pylorus and bougie size. As regards the distance from pylorus issue, many surgeons suggest keeping 6-7cm resection distance from pylorus. This is believed to boost gastric emptying, avoiding antral stasis and eliminating pyloric stenosis[6]. Some surgeons recommend a shorter distance of 2cm to achieve lesser gastric residue and enhance weight loss goals[7]. Data in this context is scanty in Pakistan. International data in this context is shown to have conflicting reports[8,9]. A new bariatric surgeon face this baffling scenario whether to use a small or large resection margin from pylorus. This study not only alleviates this research gap but also will be conducive to community`s benefit, considering that successful bariatric surgery has a pivotal part in effective weight loss for morbidly obese patients. it also helps in alleviating other medical co-morbid conditions.

## MATERIAL AND METHODS

This retrospective cohort study was carried out at Surgical Unit 1 of Fatima Memorial Hospital from December 2013 to December 2022, since the 6months- 4 yr followup of each patient was planned to see the long-term effects of LSG. IRB approval vide no: FMH-13/02/2023-IRB-1186 dated February 13,2023 was received. All the patient data with morbid obesity aged 20 to 60 years old who had undergone LSG was included in the study. Study design was quasi-experimental and sampling technique was purposive. An individual was considered morbidly obese if he or she was 20 % over his /her idea body weight, had a BMI of 40 or more, or 35 or more experiencing obesity related health conditions such as high BP, diabetes or joint problems. Patients under 20 years of age with some other abdominal pathologies were excluded. Patients who had alcohol or antidepressant addiction and with psychiatric illness were also excluded from the study. Patients were divided into two groups; Group 1 had neogastric tube creation with 6 cm resection margin from pylorus while in Group2, a resection distance of 2 cm was kept for this purpose. All surgeries were performed by same level 5 surgeon. A silk suture # 2/0 was used to measure and calibrate this distance. Staple line leakage(SLL) and bleeding was checked for 24 to 36 hrs by monitoring drain output & checking its contents and then oral intake was started. Patients were discharged when they felt fit, and had resumed liquid intake without any problem. The follow up visits were planned after 6 months for the 1st year and yearly thereafter. At each visit, excess weight loss (EWL) and BMI was calculated and all the data was gathered into purposefully developed sheets for statistical calculation. We used SPSS version 21 for data analysis in our study. Descriptive statistics were computed and described as mean ± SD. Categorical variables were stated using frequency distribution. Paired samples were subjected to t test. P value of less than 0.001 was taken as significant.

## RESULTS

A total of 50 patients were included in the study and categorized in two groups with 25 patients in each group. The demographic data of the patients included in the series along with their statistical significance is summarized in Table-1.

| Variables | Group 1 (N = 25) | Group 2 (N=25) | P-value |
|---|---|---|---|
| **Age (years)** | 42.96 ± 8.82 | 41.64 ±8.2 | 0.588 |
| **Sex (men: women)** | 1:4 | 1:1 | 1.000 |
| **Preoperative weight (kg)** | 144.84 ± 13.24 | 142.16± 15.5 | 0.515 |
| **Preoperative BMI (kg/m)** | 48.9 ± 4.18 | 47.6 ± 4.7 | 0.315 |
| **Operative time(minutes)** | 113.40 ± 19.6 | 101.80 ± 12.4 | 0.016 |
| **Oral intake (days)** | 1.40 ± 0.57 | 1.17 ± 0.35 | 0.038 |
| **Hospital stay (days)** | 2.75 ± 0.92 | 2.24 ±0.66 | 0.027 |

**Table-1: Showing Demographic Data.**

Post-operative BMI and excess weight loss in each group after LSG was measured in each follow up visit and its statistical significance is summarized in Table-2.

| Follow up Time | Group | Excess Weight loss(kg) | P-value | BMI (kg/m²) | P-value |
|---|---|---|---|---|---|
| **6 month** | 1 | 39.2± 6.77 | 0.092 | 39.47 ± 5.11 | 0.011 |
| | 2 | 41.9± 4.35 | | 35.88 ± 4.40 | |
| **1 year** | 1 | 73.64± 6.49 | 0.209 | 29.22 ± 2.68 | 0.887 |
| | 2 | 71.06± 7.77 | | 29.12 ± 2.00 | |
| **2 years** | 1 | 65.52± 5.53 | 0.378 | 25.44 ± 1.96 | 0.378 |
| | 2 | 63.92± 7.07 | | 24.73 ± 2.86 | |
| **3 years** | 1 | 58.16± 4.97 | 0.566 | 22.84 ± 1.79 | 0.443 |
| | 2 | 57.28± 5.75 | | 22.40 ±2.20 | |

| | | | | | |
|---|---|---|---|---|---|
| **4 years** | 1 | 55.48± 3.39 | 0.906 | 21.66 ± 1.32 | 0.992 |
| | 2 | 55.36± 3.72 | | 21.67 ± 1.62 | |

**Table-2: Weight Loss and BMI on Each Visit in Both Groups and Their Statistical Significance.**

Complications encountered in LSG preoperatively and postoperatively in both groups are summarized in Table-3.

| | | | |
|---|---|---|---|
| **Intraoperative complications (N=50)** | **Splenic injury** | Group1 | 0 |
| | | Group 2 | 0 |
| | **Bleeding from short gastric vessels** | Group 1 | 2 (4%) |
| | | Group 2 | 10 (20%) |
| | **Staple line bleeding** | Group 1 | 0 |
| | | Group 2 | 10 (20%) |
| | **Staple line leakage** | Group 1 | 0 |
| | | Group 2 | 0 |
| **Postoperative complications (N=50)** | **Staple line leakage** | Group 1 | 0 |
| | | Group 2 | 2 (4%) |
| | **Staple line bleeding** | Group 1 | 0 |
| | | Group 2 | 2 (4%) |
| | **GERD** | Group 1 | 3 (5 %) |
| | | Group 2 | 15 (30%) |
| | **Pulmonary embolism** | Group 1 | 0 |
| | | Group 2 | 0 |
| | **Port site infection** | Group 1 | 0 |
| | | Group 2 | 0 |
| | **Port site hernia** | Group 1 | 0 |
| | | Group 2 | 0 |
| | **Death** | Group 1 | 0 |
| | | Group 2 | 2 (4%) |

**Table-3: Showing Complications Encountered During LSG In Both Groups**

Based on data shown above, resection distance from pylorus in both groups have equal EWL while higher complication incidence is seen with latter group suggesting that a distance of 6cm from pylorus for resection is favoured as the best choice to ensure safety &effectiveness of LSG.

## DISCUSSION

Laparoscopic sleeve gastrectomy is the gold standard procedure for the management of patients with morbid obesity. It not only has a low complication rate but also ensures early discharge from hospital and return to work and social life rapidly. Even though laparoscopic sleeve gastrectomy has been accepted as sole bariatric procedure for patients with morbid obesity, certain issues in its methodology have not been finalized yet. One of these issues is distance of resection margin from pylorus. Some consider a 2cm distance between pylorus and staple line more effective in causing excess weight loss[10]. On the other hand, many suggest a distance of 6cm from pylorus enhance gastric emptying by preserving gastric antrum[11]. Baumann et al. proposed a new method to check gastric emptying while preserving antrum during LSG[12]. Magnetic resonance imaging (MRI) was done on 6 days before and 6 months after LSG showing accelerated gastric emptying after resecting antrum completely. However, some reports contradict this finding[13].As regards the relationship between antral length and weight loss results, some studies proposed better weight loss results for resection near pylorus. Sioka et al. conducted a study and concluded that by the end of 2 years postoperatively, enhanced gastric emptying and better improved weight loss are achieved by complete antral resection in comparison to antral conservative method[7].Abdullah et al. also concluded that if gastric antrum is resected in greater volume, weight loss results show improvement[8]. However, our study results contradict these findings as there was no significant difference in outcome of weight loss between both groups even after 4 years follow up interval (55.48± 3.39 in the 6cm group and 55.36± 3.72 in the 2cm group, p=0.992). Our study results are also favoured by Garay et al. who also concluded that there is no substantial difference statistically between the two groups who had antral resection and those who had antral preservation (54.9±15 in the 2cm group and 57.7± 23,p=0.74)[14].
In a review study, Adil et al stated that about 73% of surgeons opt for a distance of 3-5cm from the pylorus. Determination of this distance is not yet validated by the data available. It is demonstrated in literature that antrectomy results in effective weight loss in LSG. So, surgeons started practicing gastric division as close to pylorus as possible in order to achieve more effective weight loss. But Adil et al used a distance of 2cm or less from pylorus and achieved excellent weight loss without encountering complications of nausea, vomiting and dyspepsia[15].
However, some authors stated that keeping a very close margin during antral resection may disturb pylorus physiology[16]. However, there is no scientific data to support this statement. Some named complications reported to be associated with LSG are bleeding , staple line leakage( SLL), nausea, wound infection and dyspepsia. The controversy still exists about merits and demerits of LSG for GERD. Some patients with mild GERD are reported to benefit by LSG but morbidly obese patients after LSG experience severe reflux esophagitis leading to problem of persistent GERD[17]. These findings are inconsistent with our findings as we have also inferred that GERD is a problem found in both groups. However, we also

noticed that GERD incidence is more in the 2cm group as compared to 6cm group.

Lately, American Society for Metabolic and Bariatric Surgery reported that mortality rate for sleeve gastrectomy varied from 0-1.2% and morbidity rate ranged from 0-17.5%[18]. In our study, group 2 showed a mortality of 4% which is much higher than reported mortality. In a literature review study, the mortality rate following sleeve gastrectomy was 0.6% while reoperation remains the most common complication (45%)[19]. None of our patients in either of the groups needed revisional surgery. We owed this achievement to following fruitful literature guidelines and effective dietary programme postoperatively.

Our study has the limitation of comparatively small sample size of patients included in our research work. However, long follow up period of patients is the strength of our study. We strongly recommend a larger sample size with extensive follow up in a multi-institutional setup.

## CONCLUSION

With regards to extra weight loss, distance of resection margin from pylorus of 2cm or 6cm have identical effects but the latter has lowest complication incidence over a four-year period. Hence, a distance of 6cm is favoured to ensure safety of LSG for morbidly obese patients with effective weight loss.

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