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The Effectiveness of Bariatric Surgery for Weight Loss in Morbidly Obese Young Adult Patients.

By

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Capstone Project

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Introduction

Obesity is a worldwide issue that contributes to the development of many diseases including diabetes mellitus type 2, heart disease, and certain cancers¹. By 2030 an estimated 38% of the world's adult population will be overweight (BMI>25) and another 20% will be obese (BMI≥ 30)¹. Many of those individuals may fall into the morbidly obese category which is defined as 100 pounds over his/her ideal body weight, has a BMI≥ 40 or more, or ≥35 and experiencing obesity-related health diseases. Fortunately, several approaches to managing obesity are currently available. Some of the more popular methods include pharmaceutical therapy and lifestyle modifications such as diet and exercise. While lifestyle modifications are essential for losing weight, some people find it extremely difficult to lose weight with lifestyle changes alone. Moreover, morbidly obese patients may have difficulty both with initiating lifestyle changes and maintaining weight loss. Therefore, surgical intervention may sometimes be required to aid in weight loss for certain individuals. The two most common bariatric surgery procedures are Roux-en-Y Gastric Bypass (RYGB) and Laparoscopic Sleeve Gastrectomy (LSG). Whether one procedure is more effective for weight loss has been debated for years. It is important that patients know the benefits and disadvantages of the two procedures so that they can prevent adverse outcomes. Several studies have addressed the short and mid-term effects (1-3 years) of both procedures but few have addressed long-term effectiveness (≥ 5 years). The purpose of this

inquiry is to determine if gastric bypass or gastric sleeve is more effective for producing weight loss at five years in morbidly obese young adults.

Discussion

Literature studies of long-term effectiveness on weight loss for both RYGB and LSG were obtained by searching PubMed and Google Scholar databases. Search terms used included: “bariatric surgery,” “gastric bypass,” “gastric sleeve,” “Roux-en-Y gastric bypass,” “weight loss,” and “long-term.” Four articles were discovered for LSG, three for RYGB, and one, comparing both procedures. All the articles examined LSG or RYGB independently were retrospective cohort studies. The study comparing the two procedures was a meta-analysis. These studies were analyzed to ascertain whether 5-year weight losses in morbidly obese 20 to 40-year-old individuals was greater with LSG or RYGB. In all the articles weight loss was measured as percent excess weight loss (%EWL) which is the most common method amongst the surgical community. A %EWL greater than 50% is considered successful. %EWL is calculated by the following method: $[(\text{Initial Weight}) - (\text{Postop Weight})] / [(\text{Initial Weight}) - (\text{Ideal Weight})]$ where the ideal weight is defined by a BMI of 25 kg/m². Weight loss is also measured by examining change in BMI which is simply the patient’s initial BMI minus their post-operative BMI².

The Effectiveness of Laparoscopic Sleeve Gastrectomy

Similar surgical techniques were used in the four articles evaluating LSG long-term effectiveness. Minor differences in techniques included the number of ports used, the size of the bougie, and the transecting distance away from the pylorus. The procedures were all performed endoscopically using anywhere from 4-6 ports in the abdomen. The greater curvature of the stomach was completely separated from the omentum. The insertion of a calibration tube, such as a bougie, was then inserted into the stomach to aid with transecting. The stomach was then transected using an endoscopic linear stapler device starting proximal to the pylorus and ending at the point where the fundus begins. The transected portion of the stomach would then be removed and a leak test was performed using either methylene blue or air to assess whether further suturing was necessary³⁻⁶. An illustration of the procedure is shown in figure 1.

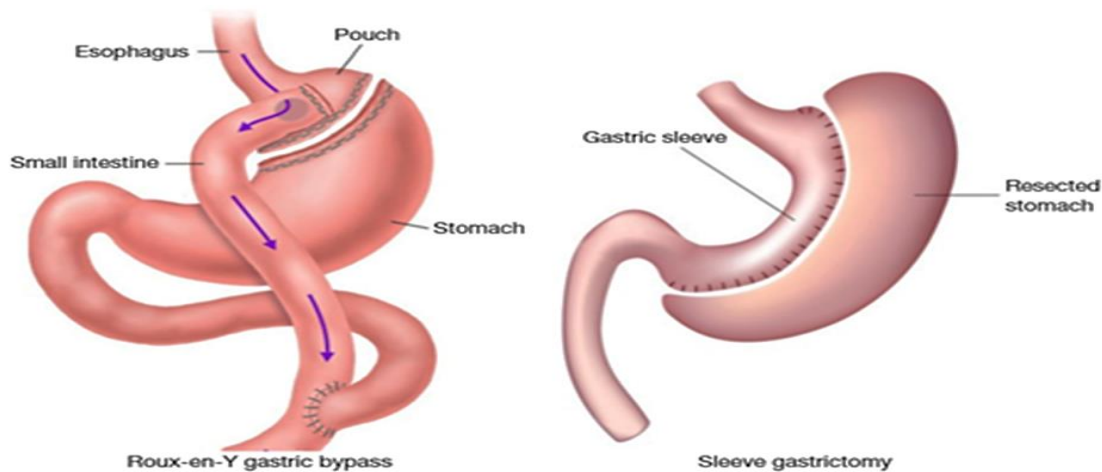


Figure 1: Comparison of Roux-en Y gastric bypass and Sleeve gastrectomy procedures. Excerpted from Levine JW, Feng Z, Feng DP, Melvin WV. Perioperative patient care involved with robotic-assisted bariatric surgery. *Annals of Laparoscopic and Endoscopic Surgery*. 2017;2:136. doi:10.21037/ales.2017.07.13

The long-term weight loss effectiveness of LSG after five years was the primary outcome measured in these studies³⁻⁶. The researchers collected data from electronic medical records (EMR). Three of the four studies evaluated patient data from a single institution³⁻⁶ while the other study used a researched registry which included patient information from several hospitals. The total pooled sample size of the studies included was 287 (n=148 for Casella G, et al, n=51 for Hoyuela C. et al, n=49 for Rawlins L, et al, and n=39 for Golomb I, et al) with a final %EWL of 70.2%, 60.3% (± 28.9), 86%, and 56.2% respectively³⁻⁶. The final BMI recorded was 29.7 kg/m² (± 7.8), 30.1 kg/m² (± 6.1), 35 kg/m², and 32.3 kg/m² (± 5.1) respectively. After LSG surgery, significant weight reductions after 5 years were reported in all four studies.

A %EWL greater than 50% was considered successful; thus, according to the results of these four studies, LSG was effective in significantly decreasing BMI and maintaining long-term weight loss in morbidly obese young adults. The common flaw in these studies was lack of patient follow up. All studies began with larger sample sizes that gradually decreased due to poor follow up as the 5-year mark approached³⁻⁶.

The Effectiveness of Roux-en-Y

Although Roux-en-Y gastric bypass is a very common surgery with the same basic steps some surgeons perform the procedure with minor variations. Usually, this procedure involves the dissection of the angle of HIS, the lesser curvature, and the greater curvature of the stomach away from the omentum to allow for easy mobility. A linear stapler is then used to form a small gastric pouch from the already existing stomach. Unlike the LSG procedure, the remainder of the transected stomach is not removed. A specific length of the jejunum is measured from the ligament of Treitz and then transected. The distal end of the jejunum is then pulled up to attach to the gastric pouch forming the gastrojejunostomy, therefore bypassing the stomach and jejunum. Lastly, an anastomosis is formed between the proximal jejunum, that was previously transected, and the distal jejunum part of the gastrojejunostomy. An illustration of the procedure is shown in figure 1. The studies selected to examine gastric bypass all used similar procedures.

Three studies assessed the effectiveness of gastric bypass on long-term weight loss in morbidly obese young adults⁷⁻⁹. One of the studies was a prospective cohort study and the other two were retrospective cohort studies. All three studies collected documents from databases that stored patient information who underwent Roux-en-Y from a single university hospital. The total pooled sample size between the studies was 682 (n=184, n=458, and n=40) with a final %EWL of 59% (± 23), 62%, and 75.2% (± 24.5) respectively⁷⁻⁹. The final BMI recorded was 34 kg/m²

(± 6), 31 kg/m², 30.5 kg/m² (± 8.5) respectively. A %EWL greater than 50% was determined to be successful weight loss; therefore all three studies revealed that gastric bypass was effective in weight loss and significantly reducing BMI at 5 years for morbidly obese individuals. The largest effects on BMI were seen in the Aftab H, et al. study whereas the largest effects on the %EWL were seen in the Christou N, et al study⁷⁻⁹.

A Meta-Analysis Comparing the Effectiveness of LSG vs RYGB

Many studies compare weight losses with LSG to RYGB, but few examine the long-term effectiveness at 5 years or greater. Golzarand M, et al is a meta-analysis published in 2017 that compared the long-term weight losses of LSG and RYGB surgeries. The inclusion criteria for this study included a minimum age of 19 years as well as a BMI of 40 or above¹⁰.

The meta-analysis conducted by Golzarand M, et al. included 37 studies comparing LSG to RYGB. Twenty of the studies examined RYGB and its effect on the long-term (≥ 5 years) %EWL while the remaining 17 studies included LSG and its long-term (≥ 5 years) %EWL. The studies that included RYGB had a mean age of 40.8 ± 5.2 years and a mean pre-operative BMI of 47.2 ± 15.6 kg/m². Post-operative mean %EWL was 62.58% (95% CI 58.33-66.82, $P < 0.001$) with a change in BMI of -13.75 ± 6 kg/m² ($P < 0.001$). The 17 studies that included LSG had a mean age of 46.4 ± 11.2 years and mean BMI of 47.3 ± 7.1 kg/m² at baseline. Postoperative means %EWL was 53.5% (95% CI 50.27-56.18, $P > 0.001$) with a change in BMI of -11.32 ($P > 0.001$). In order to ensure no

publication bias occurred, Egger's symmetry test was performed which showed no significant bias ($P=0.65$)¹⁰. The study concluded that RYGB was more effective than LSG for long-term (≥ 5 year) weight loss in morbidly obese individuals, most of which were young adults¹⁰.

Summary and Key Findings

When independently evaluating the effects of both LSG and RYGB on long-term weight loss in young adults, the results were very similar. Four studies were used to evaluate the effectiveness of LSG³⁻⁶ and three were utilized to evaluate RYGB⁷⁻⁹. The LSG study with the most significant decrease in BMI was Rawlins L, et al with an average BMI of 35 kg/m² which also revealed the most significant %EWL of 86%⁵. Rawlins L, et al found a much higher %EWL than the other three studies that evaluated LSG but only included 55 patients which reduced the reliability of the study. The RYGB study with the most significant decrease in BMI was Aftab H, et al with an average BMI of 34 kg/m² (± 6) but it did not show the most %EWL⁷. The most significant %EWL was found in the Christou N, et al study, %EWL was 75.2% (± 24.5). While both procedures have proven to be successful for inducing weight loss (defined by %EWL $>50\%$), their results do not confirm that one procedure is more effective than the other for maintaining %EWL after five years. Nonetheless, LSG did have a higher change in BMI and %EWL. The lack of articles that evaluate long-term weight loss in LSG and RYGB, especially in young adults, limits the

reliability and the generalizability of the findings in the above studies. For example, the mean age for the LSG studies was 43.9 (\pm 12.2 years) and 38.6 (\pm 9.9) years for the RYGB studies. Unfortunately, there are no single studies that solely addressed weight loss in the young adult (20-40) population. All the studies included young adult patients but the participants were not exclusively from this age group. Likewise, all the studies included morbidly obese patients but some participants that did not fall into the morbidly obese category. Fortunately, the meta-analysis study which compared both bariatric surgical procedures minimized any disparities.

The Golzarand M, et al. study was a meta-analysis that directly compared the effectiveness of LSG to RYGB. This meta-analysis reviewed several studies that addressed long-term weight loss (\geq 5 years) of both LSG and RYGB. The inclusion criteria required patients to be morbidly obese and age 19 or above. As mentioned previously, RYGB had statistically significantly greater weight losses than LSG when comparing %EWL and BMI changes. This study seems to be reliable with a large number of studies for LSG (n=17) and RYGB (n=20) which offered a comprehensive literature review. It checked for publication bias using Egger's symmetry test and also showed that long-term %EWL was independent of BMI, age, or length of follow up therefore played no role in determining how much weight a patient would lose. However, there was a significant positive association between gender and %EWL after RYGB but not LSG. It should be noted that there have been other studies comparing weight loss between these two

bariatric procedures which found no difference during early follow-up. Zhang et al. was a meta-analysis study that showed no significant difference in %EWL during the first year and a half of follow-up but after that, LRYGB achieved higher %EWL than LSG¹¹.

Conclusion

In conclusion, the long-term (≥ 5 years) effectiveness of LSG and RYGB on weight loss in morbidly obese young adults was examined. Although several other factors, such as the complications, procedural time, and healing time, should be considered before undergoing a bariatric surgical procedure, the main focus for the patient and clinician is the achievement and maintenance of weight loss. The findings of the meta-analysis suggest that RYGB is the more effective method of weight loss after 5 years for morbidly obese young adults. However, both procedures are effective weight loss methods as evidenced by the sustained weight loss after five years as gauged by the significantly high %EWL's achieved with each surgery. In the clinical setting when an obese patient seeks a bariatric procedure that will yield the highest amount of weight reduction, RYGB should be the procedure of choice. However, patients should be informed that more post-operative complications are associated with RYGB than with LSG; therefore, these risks should be considered prior to making a decision to undergo RYGB⁴. Furthermore, there is uncertainty of how race and region correlate with weight loss and could be a topic investigated in future studies.

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