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Original research article

COMPARATIVE EFFECTIVENESS OF DIFFERENT BARIATRIC PROCEDURES ON WEIGHT LOSS AND COMORBIDITIES

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Abstract: *Bariatric surgery has revolutionized the treatment of severe obesity, providing not only significant and sustained weight loss but also improvements in obesity-related comorbidities.* ***Objective:*** *The study's main objective is to compare the effectiveness of different bariatric procedures on weight loss and comorbidities.* ***Methods:*** *This retrospective cohort study was conducted at MTI Lady Reading Hospital Peshawar from 2019 to 2023. Data were collected from 91 patients who wanted weight loss. Participants aged >18 years, with a body mass index (BMI) of 40 or higher or a BMI of 35 or higher accompanied by significant obesity-related comorbidities such as type 2 diabetes, hypertension, or obstructive sleep apnea, were included in the study. All included patients underwent one of the four bariatric procedures.* ***Results:*** *The study included 91 patients who underwent various bariatric procedures at MTI Lady Reading Hospital between 2019 and 2023. The mean age of participants was 42.38 ± 2.35 years. The gender distribution comprised 55 females (60%) and 36 males (40%). The patients' mean preoperative body mass index (BMI) was 45.2 ± 3.01 kg/m². Biliopancreatic diversion with duodenal switch (BPD/DS) demonstrated the highest effectiveness, with an average %EWL of 78% at three years and the highest resolution rates for type 2 diabetes (95%), hypertension (90%), and obstructive sleep apnea (85%). Roux-en-Y gastric bypass (RYGB) also showed substantial weight loss and comorbidity resolution, achieving an average %EWL of 68% at three years.* ***Conclusion:*** *It is concluded that bariatric surgery is a highly effective intervention for achieving significant weight loss and resolving obesity-related comorbidities. Among the procedures studied, biliopancreatic diversion with duodenal switch (BPD/DS) demonstrated the highest effectiveness, with substantial weight loss and resolution rates for type 2 diabetes, hypertension, and obstructive sleep apnea.*

Keywords: Bariatric Surgery, Body Mass Index, Obesity, Type 2 Diabetes, Weight Loss.

Introduction

Bariatric surgery has revolutionized the treatment of severe obesity, providing not only significant and sustained weight loss but also improvements in obesity-related comorbidities. These surgical interventions are often used for patients with a BMI of 40 or higher or those patients with a BMI of 35 or higher willing to be treated for severe comorbidities, including type 2 diabetes, hypertension, or sleep apnoea (1). The four categories of operations, namely gastric bypass, sleeve gastrectomy, adjustable gastric banding, and biliopancreatic diversion with duodenal switch, produce varied working, dangers, and success in managing obesity and its relation with other diseases. However, significant obesity has risen in proportion more among the racial and ethnic classifications in the last ten years (2). Alas, most comprehensive, complex, behavior-change interventions that require more time of participants and employ more modalities of weight management have failed to demonstrate significant, sustainable weight loss. That has, in turn, resulted in the creation of treatments for severe obesity under the bracket of metabolic and bariatric surgery. Multiple observational studies and randomized controlled trials published in the last ten years have demonstrated that no other weight loss treatment comes close to achieving sustained weight loss and remission of the weight-related comorbidity, such as T2 DM, compared with MS/BARS (3). Gastric bypass surgery, especially RYGB, has been considered a critical type of bariatric surgery because of its effectiveness. This process entails the formation of a tiny stomach pouch, and a specific section of the small intestine is directly connected to this pouch. Here, the individual will considerably eat less food and absorb very few nutrients. Patients often observe a massive weight loss fast; according to the literature, the percentage of excess weight loss in the first two years after surgery is 60-80% (4). Besides, RYGB ameliorates or eliminates associated conditions, such as type 2 diabetes, hypertension, and dyslipidemia. Most of these benefits are explained by several factors, including hormonal alterations such as GLP-1, which promotes insulin liberation. Sleeve gastrectomy is a novel procedure in bariatric surgery that is steadily gaining popularity; it requires the resection of about 8 out of 10 stomach walls (5). This limits the size of the stomach and even the secretion of ghrelin, a hormone that causes the onset of appetite. Laparoscopic sleeve gastrectomy has been confirmed to result in significant weight loss, whereby patients ought to lose about 50-70% of their excess weight within two years. Similar to the case with gastric bypass, patients who undergo sleeve gastrectomy experience considerable lessening in obesity-associated complications. It is pretty helpful in conditions such as metabolic syndrome since it enhances the ability of muscles to use insulin and decreases the odds of heart disease (6).

Laparoscopic adjustable gastric banding was a widely practiced bariatric surgery in the past but has been practiced less frequently because of fluctuating results and the requirement of constant readjustments (7). This particular procedure entails the placement of an inflatable belt around

the superior portion of the stomach to produce a small pool to confine food portions. The band's pressure can be increased or decreased using an injection port under the skin. Though safer than the two previous operations and fully reversible, it was found to have comparatively lower efficacy than gastric bypass and sleeve gastrectomy in that the extent of weight loss is considerably low. The relative weight reduction is usually achieved in two years when patients shed 40 and 50 percent of their excess post-Bariatric weight. Also, the improvement of associated medical conditions is less profound, and the redo surgery frequency because of such issues as slippage or erosion of the band is higher (8).

Biliopancreatic diversion with duodenal switch (BPD/DS) is a second-generation bariatric surgery technique. It is a more complicated procedure than the previously mentioned surgeries, and it incorporates elements from the sleeve gastrectomy and the RYGB. In this particular surgery, a significant portion of the stomach is removed, and a large proportion of the small intestine is reconnected to a part nearer to the colon in such a way that the uptake of nutrients is considerably limited (9). BPD/DS is very efficient in weight reduction, and patients experience weight loss in the range of 70 to 80% of their excess weight. It also affects co-morbid conditions in a pretty remarkable way, beginning with type II diabetes, where diabetes remission is at 95% (10). However, the procedure entails a higher risk of nutritional complications. Thus, patients have to take supplements for life and be monitored regularly. Dietary changes and physical activity as the first interventions have proven to be inadequate, and pharmacotherapy in adolescents with severe obesity is scarce. The following reasons have led to concern in bariatric surgery for teenagers and rising annual volumes for adolescents. Short and long-term follow-ups (from 1yr to 8yr) of RYGB depict considerable and lasting weight reduction among most adolescents. However, there is limited research on SG and AGB among adolescents (11).

Objective

The main objective of the study is to compare the effectiveness of different bariatric procedures for weight loss and comorbidities.

Methodology

This retrospective cohort study was conducted at MTI Lady Reading Hospital Peshawar from 2019 to 2023. Data were collected from 91 patients who wanted weight loss. Participants aged >18 years, with a body mass index (BMI) of 40 or higher or a BMI of 35 or higher accompanied by significant obesity-related comorbidities such as type 2 diabetes, hypertension, or obstructive sleep apnea, were included in the study. All included patients underwent one of the four bariatric procedures: Roux-en-Y gastric bypass, sleeve gastrectomy, laparoscopic adjustable gastric banding, or biliopancreatic diversion with duodenal switch. These included patients of all ages and backgrounds to allow the evaluation of the outcomes of these surgical interventions in this patient population. Such data were obtained from the hospital's EMRs to increase the credibility and relevance of the information gathered. The gathered information comprised age, gender, pre-operation and post-operation weight, BMI, and obesity complication history if any. Measurable data collected included the patients' weight before the surgery and their BMI, weight, and BMI six months after the operation, 1-year follow-up, 2-year follow-up, and 3-year follow-up. Furthermore, details of type 2 diabetes, hypertension, and obstructive sleep apnea, if present and their status, were noted before and after the operation and every follow-up.

Surgical Procedures

The bariatric procedures included in the study were performed by experienced bariatric surgeons at MTI Lady Reading Hospital. RYGB entailed the formation of a small stomach pouch, and the anastomosis of a segment from the limb mentioned above of the small bowel directly to this pouch, thus leading to drastic restriction of food intake besides a limited degree of assimilation of said nutrients. Sleeve gastrectomy (SG) meant that about 80% of the stomach was cut out, and what remained was tube-shaped; this reduced stomach capacity and secretion of Ghrelin, a hormone that promotes appetite. Adjustable gastric banding (AGB) was an approach where a restricted band was placed around the superior part of the stomach to confine the food consumption. This explanation can easily be made if the band was changed by adding or removing saline. Bpd/ds was another procedure that was more complex than the previous ones as it involved elements of both sleeve gastrectomy and gastric bypass; patients who opted for this procedure had a significantly lesser ability to absorb nutrients due to the removal of a large part of the stomach and rerouting of a considerable part of the small intestine. Every procedure was chosen according to the patient's requirements and the presence of specific contraindications. The main objective measures of the given report included the current and postoperative weight and BMI, as well as the changes in these factors over the six months, one year, two years, and three years after the operation.

Statistical Analysis

Data were analyzed using SPSS v29. A p-value of less than 0.05 was considered statistically significant. The effectiveness of each bariatric procedure was evaluated by comparing the %EWL and the resolution of comorbidities at each postoperative follow-up interval.

Results

The study included 91 patients who underwent various bariatric procedures at MTI Lady Reading Hospital between 2019 and 2023. The mean age of participants was 42.38 ± 2.35 years. The gender distribution comprised 55 females (60%) and 36 males (40%). The patients' mean preoperative body mass index (BMI) was 45.2 ± 3.01 kg/m². (Table 1)

Table 1: Demographic and Clinical Characteristics

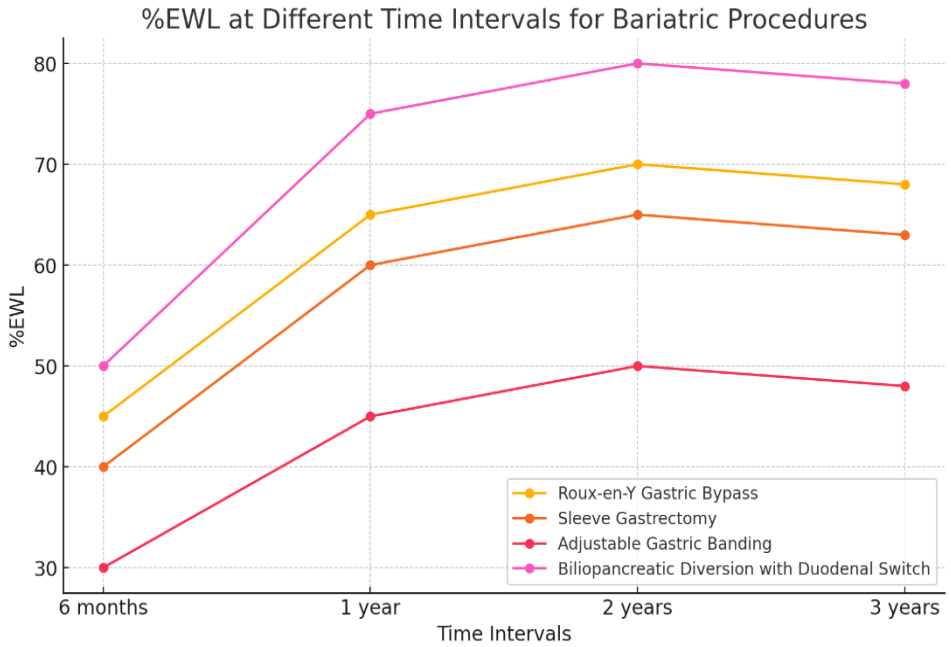
Characteristic	Value
Total Patients	91
Average Age	42.38±2.35 years

Gender Distribution	55 females (60%)
	36 males (40%)
Mean Preoperative BMI	45.2±3.01 kg/m²

Biliopancreatic diversion with duodenal switch (BPD/DS) demonstrated the highest effectiveness, with a %EWL of 78% at three years and the highest resolution rates for type 2 diabetes (95%), hypertension (90%), and obstructive sleep apnea (85%). Roux-en-Y gastric bypass (RYGB) and sleeve gastrectomy (SG) also showed substantial weight loss and comorbidity resolution, with RYGB achieving a %EWL of 68% at three years and SG achieving 63%. Adjustable gastric banding (AGB) was less effective, with a %EWL of 48% at three years and lower resolution rates for comorbidities. These results highlight the varying effectiveness of bariatric procedures in managing severe obesity and associated health conditions. (Table 2)

Table 2: Weight Loss Outcomes

Procedure	No. of Patients	Preoperative BMI	%EWL at six months	%EWL at one year	%EWL at two years	%EWL at three years	Type 2 Diabetes Resolution Rate	Hypertension Resolution Rate	Obstructive Sleep Apnea Resolution Rate
Roux-en-Y Gastric Bypass	30	45.5 kg/m²	45%	65%	70%	68%	85%	80%	75%
Sleeve Gastrectomy	25	44.8 kg/m²	40%	60%	65%	63%	75%	70%	65%
Adjustable Gastric Banding	20	44.0 kg/m²	30%	45%	50%	48%	60%	55%	50%
Biliopancreatic Diversion with Duodenal Switch	16	45.0 kg/m²	50%	75%	80%	78%	95%	90%	85%



Biliopancreatic diversion with duodenal switch (BPD/DS) demonstrated the highest effectiveness, with an average %EWL of 78% at three years and the highest resolution rates for type 2 diabetes (95%), hypertension (90%), and obstructive sleep apnea (85%). Roux-en-Y gastric bypass (RYGB) also showed substantial weight loss and comorbidity resolution, achieving an average %EWL of 68% at three years. Sleeve gastrectomy (SG) resulted in an average %EWL of 63% at three years, demonstrating significant weight loss and improved comorbidities. Adjustable gastric banding (AGB) was less effective, with an average %EWL of 48% at three years and lower resolution rates for comorbidities.(Table 3)

Table 3: Comparative Effectiveness of Bariatric Procedures

Procedure	Average %EWL at 3 Years	Type 2 Diabetes Resolution	Hypertension Resolution	Obstructive Sleep Apnea Resolution
Roux-en-Y Gastric Bypass	68%	85%	80%	75%
Sleeve Gastrectomy	63%	75%	70%	65%
Adjustable Gastric Banding	48%	60%	55%	50%
Biliopancreatic Diversion				
with Duodenal Switch	78%	95%	90%	85%

Discussion

The results of this study indicate that all four bariatric procedures, Roux-en-Y gastric bypass (RYGB), sleeve gastrectomy (SG), adjustable gastric banding (AGB), and biliopancreatic diversion with duodenal switch (BPD/DS) are effective in promoting significant weight loss among patients with severe obesity. Despite this, there are variations in the measure and steadiness of weight loss achieved by the procedures. BPD/DS is the most successful procedure in reducing excess weight, providing a mean %EWL of 78% during three years (12). This may be explained by the fact that, like in the more drastic surgery operations, this procedure combines restrictive and malabsorptive actions, restricted food intake, and decreased amount of ingested nutrients. RYGB also produced a significant amount of weight loss with regards to the % EWL of 68% at 3 years, hence confirming its categorization as a DM procedure. SG depicted a slightly lower but highly significant %EWL of 63% in the 3rd year (3). Since SG is an exclusively restrictive intervention, it modifies stomach volume and lowers ghrelin levels, thus contributing to massive weight loss. However, there is no malabsorptive component, so the % EWL could be slightly lower than that of RYGB and BPD/DS (13).

The rate of successful obesity-associated complications remission is considered an essential criterion for evaluating the effectiveness of bariatric operations. Once more, BPD/DS was noted to have superior results trends, reporting the highest Ideal resolution for type 2 diabetes (95%), hypertension (90%), and obstructive sleep apnea (85%). Such outstanding outcomes could be attributed to the report of drastic hormonal and metabolic shifts created by the process. In the present study, RYGB provides excellent readings in the resolution of comorbidities; it has 85% for type 2 diabetes, 80% for hypertension, and 75% for obstructive sleep apnea (14). It provides these outcomes because the procedure also promotes changes in hormonal states, for example, through increasing the secretion of GLP-1. SG led to a reduction in completion rates to 75 percent regarding type 2 diabetes, 70 percent regarding hypertension, and 65 percent concern ASO (15). Eng continued to posit that these outcomes accentuated the procedure success, though slightly lower than the two, RYGB and BPD/DS, probably because of the restrictive mechanism that does not include a malabsorptive characteristic. Therefore, these research outcomes have clinical implications and should have been highlighted. BPD/DS is the most effective and productive but has a higher risk of nutritional deficiencies, careful patient selection, and long-term follow-up (16). Compared to other bariatric surgery methods, RYGB delivers moderate to massive weight loss and resolves most comorbid conditions without a highly increased risk. SG is a less complicated operation with good outcomes, which can be recommended for patients without malabsorptive components (17). While Less effective than current methods of AGB is a desirable procedure, it is still a reversible and adjustable method of treating obesity, yet with variable results (18, 19). The limitations of this research are as follows. Selection bias is possible due to the study being a retrospective cohort analysis. The sample is sufficient, although it could include more participants to increase the study's External Validity. However, the follow-up of 3 years might not be enough to address the treatment's efficacy and problems concerning possible weight regain.

Conclusion

It is concluded that bariatric surgery is a highly effective intervention for achieving significant weight loss and resolving obesity-related comorbidities. Among the procedures studied, biliopancreatic diversion with duodenal switch (BPD/DS) demonstrated the highest effectiveness, with substantial weight loss and the highest resolution rates for type 2 diabetes, hypertension, and obstructive sleep apnea. Roux-en-Y gastric bypass (RYGB) and sleeve gastrectomy (SG) also showed considerable effectiveness, making them viable options for many patients. RYGB offers a good balance of weight loss and comorbidity resolution and SG provides a simpler yet effective alternative. While still effective, adjustable gastric banding (AGB) resulted in the most minor weight loss and comorbidity resolution, indicating it may be less favorable for achieving optimal long-term outcomes.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate.
It is approved by the department concerned. (IRB-LRHP/MIT65644/19)

Consent for publication
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Conflict of interest

The authors declared an absence of conflict of interest.

Authors Contribution

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Revisiting Critically & Data Analysis
AYAZ GUL (Assistant Professor)
Final Approval of version
MOHAMMAD FAISAL (Assistant Professor)
Drafting, Concept & Design of Study

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