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Impact of Restrictive Bariatric Surgery on Depression

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Abstract: ***Background: Obesity is a rapidly growing public health problem because of its prevalence, costs, and health effects as it adversely affects nearly all physiological functions of the body. Nonsurgical therapy leads to modest and transient weight loss .Surgery has been advocated as the only effective treatment for obesity. Laparoscopic sleeve gastrectomy (LSG), also known as longitudinal or vertical gastrectomy, is a relatively new and effective surgical option for the management of morbid obesity in spite of its costs and complications. Objectives: The aim of this study is to promote psychological health among the studied group of morbidly obese patients during the present study in New Dammietta University hospital. Patients and Methods: Between January 2016 and December 2020, (40) obese patients at surgery department, Al - Azhar University Hospital (New Damietta) were randomly divided into two equal groups. Group A underwent laparoscopic sleeve gastrectomy (LSG), while Group B underwent laparoscopic greater curvature plication (LGCP). Patients data, operative time, complications, percentage of excess weight loss (EWL %), and level of depression were documented. Results: There is insignificant statistical difference between the two groups as regard, postoperative oral feeding and hospital stay. The operative time was longer for gastric plication group. The EWL% was more or less similar in the two groups. Vomiting was occurred more with greater curvature plication, hemorrhage and leak noticed only with sleeve gastrectomy. Depression with variant degrees and loss of hunger feeling were more with sleeve gastrectomy. Conclusion: Sleeve gastrectomy and greater curvature plication were having more or less similar results regarding (EWL) %. The extra benefits for greater curvature plication are its safety, low complication rates, cost efficiency and its reversibility. The role of Ghrelin hormone which decreased after sleeve gastrectomy, must be kept in mind, due to its role as antidepressant, cardio - protective, and anti - proliferative for breast cancer. Long - term results and more studies are needed to determine the ideal operation for each patient.***

Keywords: obese; morbidity; Laparoscopic, Depression

1. Introduction

Obesity is an abnormal accumulation of body fat (usually 20% above the normal ideal body weight) to the extent that it may have an adverse effect on health (***Chooi et al., 2019).***

It is a rapidly growing public health problem affecting an increasing number of countries worldwide because of its prevalence, costs, and health effects (***Agha and Agha, 2017).***

Obesity adversely affects nearly all physiological functions of the body and comprises a significant public health threat. It increases the risk for developing multiple disease conditions, such as diabetes mellitus (***Chooi et al., 2019).***

Nonsurgical therapy leads to modest and transient weight loss and surgery has been advocated as the only effective "large - scale" treatment for obesity (***Banka et al., 2012).***

Bariatric surgery today is considered as the most effective way of management for persistent weight loss and for relieving the associated comorbidities and to improve the quality of life (***Abdallah and El Nemr, 2018).***

Over the last several years, numerous prospective and longitudinal studies have demonstrated the benefits of bariatric surgery on weight loss, mortality, and other chronic diseases. Even though the mechanisms underlying many of these beneficial effects remain poorly understood, surgical management of obesity continues to increase given its efficacy (***Albaugh and Abumrad, 2018).***

Laparoscopic sleeve gastrectomy (LSG), which is one of the most popular bariatric surgery worldwide, has 2 serious complications; leakage and bleeding from staple line with variable incidence ranging from 1.2 and 3.6 % respectively and can lead to serious outcome (***Buchwald and Oien, 2013).***

In an attempt to reduce these serious complications, another gastric restrictive technique came into view, notably, gastric plication that was first used as weight reducing procedure through an open approach (***Agha and Agha, 2017*).**

The idea of laparoscopic greater curvature plication (LGCP) is apparently similar to that of LSG, in formation small gastric tube by elimination of the greater curvature without gastrectomy (***Grubnik et al., 2016).***

Cost savings and affordability have also been promoted, as plication does not require the use of stapling devices, adjustable gastric bands, or prolonged hospitalization **(*Agha and Agha, 2017).***

Reports regarding LGP are scarce worldwide and we have few data of LGP in Egyptian patients and surgeons still have debates regarding the ideal weight loss procedure (***ElGeidie and ElHak, 2013).***

The association between obesity and depression is bidirectional. Ameta - analysis in 2010 reported that obese individuals have a 55% increased risk for developing depression and conversely, depressed persons had a 58 % increased risk of developing obesity (***Luppino et al., 2010).***

Depression with variant degrees and loss of hunger feeling were more with sleeve gastrectomy. Bariatric surgery is a domain of complex interventions in high - risk patients. An ideal procedure does not exist and the key to successful treatment lies in a careful assessment of the individual risk jointly by the surgeon and the patient, as well as in providing intensive care and information before the operation and particularly in the long - term after a bariatric operation (***Susmallian et al., 2019).***

The present study was designed to promote psychological health among the studied group of morbidly obese patients during the present study in New Dammietta University hospital. To highlight laparoscopic greater curvature plication as comparable weight loss procedure with the most widely used procedure laparoscopic sleeve gastrectomy regarding safety, efficacy, morbidity (with special emphasis on depression) and mortality.

Patients and Methods

Our prospective study conducted to investigate the impact of bariatric surgery on depression among a representative sample of (40) obese patients, 20 of them (groupA) were undergon LSG and the other 20 (groupB) were undergon LGCP at general surgery department, Al - Azhar University Hospital (New Damietta), over a period of five years from Januray 2016 to December 2020.

Inclusion criteria

- Age ranging between 18 - 50 years.
- Fit patients for surgery.
- Had a body mass index (BMI) of 40 - 50 kg/m2.
- Absence of significant psychopathology that could limit their ability to understand the procedure and comply with the medical, surgical, and/or behavioral recommendations.

Exclusion criteria

- Pregnancy or lactation.
- Drug and/or alcohol abuse.
- Previous malabsorptive or restrictive procedures performed for the treatment of obesity.
- Severe uncontrollable depression.

Technique Sample

A non - probability (convenient) sample technique was done to investigate the study. All obese patients matching the inclusion and exclusion criteria was recruited to participate in this study after taking the informed consent until the total target sample size was reached.

Research tools

All Patients were subjected to the following:

Pre - operative: Full history, complete examination and Psychiatric assessment.

Depression was assessed with **Hamilton Depression (HAM - D)** scale (**Hamilton, 1960).** HAM - D scale is a 17 item - questionnaire, and was administered by a psychiatrist during a face to face interview. The minimum score is 0 and the maximum score is 53 points. Each item on the questionnaire is scored on a 3 or 5 point scale, depending on the item, and the total score is compared to the corresponding descriptor. A score of zero represents an absence of the depressive symptom being measured, a score of one indicates doubt concerning the presence of the symptom, a score of two indicates mild symptoms, a score of three indicates moderate symptoms, and a score of four represents the presence of severe symptoms. The remaining items are scored on a three - point scale, from zero to two, with zero representing absence of symptom, one indicating doubt that the symptom is present, and two representing clear presence of symptoms. Assessment time is estimated at 20 minutes. Scores from 0 - 7 = Normal, 8 - 13 = Mild Depression, 14 - 18 = Moderate Depression, 19 - 22 = Severe Depressionore and a score of> 23 = Very Severe Depression.

Investigations

Laboratory investigations

Diurnal Cortisol level, Thyroid function tests, CBC (complete blood count), Coagulation profile, Kidney function tests, Fasting and 2 hours post prandial blood glucose and Liver function tests.

Radiological investigations

Abdomino - pelvic ultrasound, Echo cardiography and Lower limb venous duplex.

Upper GIT endoscopy

Spirometry

All patients received intravenous antibiotics, subcutaneous anticoagulant and lower limb compression with elastic bandages preoperatively.

Intra - operative

The following were observed;
Operative technique, Operation time, complications and Conversion to open surgery

Operative technique

As regard operative details for group (A); Patients were placed in an anti - Trendlenburg position, French position (operator between legs) and two assistants one for each side of the patient, under general anesthesia; using veress needle the abdomen was insufflated with CO2, five - ports were inserted into peritoneal cavity; one 10 mm optical port above the umbilicus, two 12 mm operating ports in the mid - clavicular lines on both sides, two 5 mm assistant ports one in the left hypochondrium and the other subxiphoid for liver retraction. The pylorus was identified, and an area approximately 4 cm from the pylorus was chosen to begin coagulating and transecting the greater omentum with a vessel sealing device. The greater curvature of the stomach was mobilized to the angle of His, with particular attention paid to mobilizing the entire fundus to the left crus of diaphragm. A 32 - French bougie was passed and positioned in the distal antrum in line with the lesser curvature of the

stomach, Resection of the antrum was started tangentially from the right lateral port using a stapler with a green load, the body and fundus of the stomach were achieved using blue or golden loads to the angle of His, Extraction of bougie and insertion of Ryle tube was done. Clips or over - sew the staple line were used for hemostasis. Competence of staple line was tested with injection of methylene blue through the Ryle tube. Extraction of excised part of stomach. Drain was inserted in the left hypochondrium and port sites were closed with sutures.

As regard operative details for group (B); under general anesthesia, using veress needle, the abdomen was insufflated with CO2, five - ports were inserted into peritoneal cavity; one 10mm optical port above the umbilicus, one10mm operating port in the right midclavicular line, one 5mm port in the left midclavicular line, two 5mm assistant ports one in the left hypochondrium and the other subxiphoid for liver retraction.

The same steps as group (A) till mobilization of greater curvature of stomach, then 32 - French bougie was passed and positioned in the distal antrum.

Plication was started 2 cm from the gastroesophageal junction and carried down to 4cm from the pylorus. Applying a first row of seromuscular non - absorbable 0 interrupted sutures, so that it was far away from gastric acid. The distance between the sutures varied between 1.0 and 1.5 cm, interrupted sutures provide better calibration, better control of the tension applied on the stomach and better alignment. The technique was similar to that of **Talebpour et al., 2012**, invagination of three sections of gastric wall illustrated schematically in, in order to have three sections (AB, BC and CD), it was obviously needed to have four separation points of A, B, C and D (which represent the locations of suture bites). There would be four bites at each transverse level; two (A and B) in anterior and two (C and D) in posterior gastric wall. This was reinforced by a second row of non - absorbable running 0 sutures, to strengthen the plication and prevent herniation between the sutures. The final shape of stomach was like a sleeve gastrectomy, but slightly larger. Finally drain was inserted in the left hypochondrium and port sites were closed with sutures.

Post - operative
Postoperative radiological studies were done on day one, mainly to rule out early leakage. Upper gastrointestinal endoscopy was done to rule out stricture. For first two weeks liquids were permitted, and then semi - solids for two weeks, well grinded solid foods were started after that.

The following items also observed;

Bleeding, Leakage, Hospitalization period and post operative oral feeding, EWL% (percentage of excess weight loss), Morbidity, Psychiatric assessment, Mortality.

Implementation phase:
During this phase the following steps were done:

Pilot study:
A Pilot study was carried out. A preliminary questionnaire used for (4) obese patients (about 10 % of sample size). After applying the pilot study, no modifications to the questionnaire were done. It was carried out before data collection for the following purposes;

- To test the validity of the questionnaire form and to find any modification needed or addition of questions.
- To estimate the time needed to obtain the required information.
- To indicate what kind of difficulties were likely to arise and what problems were likely to be met.

Data collection:
The methods used for data collection through the questionnaire, clinical and laboratory investigations.
After taking a formal consent from each participant, assuring confidentiality of the study results, all participants were interviewed to fulfill a questionnaire through a structured interview.

Evaluation Phase (Data management phase):
During this phase Data entry and analysis were done:
Statistical analysis of data was performed including coding, data entering and sorting by Microsoft office 2010 and statistical analysis program IBM SPSS (Statistical package for social studies) version 16. For quantitative variable, mean and standard deviation were calculated. For categorical variable, number and percentage were calculated. Analytical statistics were performed using chi square ($\chi 2$) Differences were considered statistically significant at P value ≤ 0.05.

Ethical consideration: Oral and written consent were obtained from each chosen subject before data collection, Aim and methodology of this study explained to the selected subjects, All data which was obtained from the present study been in private consideration and for scientific purpose only.

2. Results

The mean age of all participants n = 40 was 35.6 ±8.9 years, and the age range was 18 to 50 years. Most of the study subjects (65%) were females. The mean body mass index at time of surgery was 45.6 ± 1.4 kg/ m^2 (Table I).

Table (I): Personal data of the studied groups

Variable	Group A	Group B	Total	Test	P Value
Gender					
Male	6 (30%)	8 (40%)	14 (35%)	0.55	0.61
Female	14 (70%)	12 (60%)	26 (65%)	0.72	0.49
Age/ Year Mean ± St. D	36.1 ± 9.1	34.1 ± 8.6	35.6 ± 8.9	1.18	0.14
Body Mass Index (BMI) (kg/ m^2) Mean ± St. D	44.7 ± 1.2	46.5 ± 1.6	45.6 ± 1.4	0.86	0.44

The mean operative time was 111 minutes for group (A) and 131 minutes for group (B). Mean hospital stay was 3.2 days for group (A) and 2.9 days for group (B). No conversion (0%) occurred in any of the 40 patients but four patients (10%) 3 in group (A) and 1 in group (B) underwent

laparoscopic cholecystectomy for associated gallbladder stone and only two patients (5%) in group (B) had Para umbilical hernia repair using transfascial closure of the defect with non - absorbable sutures as associated procedures (Table II).

Table (II): Operative data of the studied groups

Variable	Group A	Group B	Total	Test	P Value
Operative time (minute)	111 ± 24	131 ± 21	121 ± 22	2.89	0.004*
Hospital Stay (day) Mean ± St.D	3.2 ± 0.8	2.9 ± 0.6	3 ± 0.7	1.18	0.14
Follow up (months) Mean ± St.D	24 ± 4.2	24 ± 6.6	24 ± 5.4	1.8	0.16
Associate Procedure					
1) Laparoscopic Cholecystectomy	3 (7.5%)	1 (2.5%)	4 (10%)	1.01	0.85
2) Para Umbilical hernia repair	0 (0%)	2 (5%)	2 (5%)	1.01	0.85

The main post - operative complications were nausea in 3 patients (7.5%) in group (A) and 7 patients (17.5%) in group (B) which managed by ondansetron, vomiting 1 patient (2.5) in group (A) and 4 Patients (10%) in group (B) which managed with proton pump inhibitors, antiemetic and prokinetics, port site infection 2 patient (5%) in group (A) managed with local antibiotics with daily dressing, cholelthiasis 2 patients (5%) one in each group which was managed by laparoscopic cholecystectomy, postoperative bleeding 2 patient (5%) in group (A) in one of them Abdominal drain revealed 600 cc within the first 24 hours and was managed conservatively with anti - hemorrhagic measures, The patients passed free for follow up, the second one was reexplored laparoscopically to control persistent bleeding from the dissected greater omentum at the site of short gastric vessels, 1 patient (2.5%) in group (A) had suffered from post - operative stricture and was managed by repeated endoscopic Pallone dilatation, post - operative GERD was noticed in 3 patents (7.5) in group (A) and 2 patients (5%) in group (B) managed with life style modification, PPI, and prokinetics, one patient of group (B) had symptoms of GERD for longer duration and upper GIT endoscopy was done revealed sever gastritis and esophagitis, however the patient eventually improved on the same management. Post - operative leak occurred in 2 patients of group (A) (5%) one patient presented with minor leak at post - operative day 4 and managed conservatively with NOP, PPI, IV hydration, broad spectrum antibiotic, the other patient was presented with early leak at post - operative day 2 and was explored laparoscopically, peritoneal lavage and drainage was done and over sewing of the leaking staple line (Table III).

Table (III): Operative complications of the studied groups

Operative Complications	Group A	Group B	Total	Test	P Value
Post Site infection	2 (5%)	0 (0%)	2 (2.5%)	1.01	0.85
Nausea	3 (7.5%)	7 (17.5%)	10 (25%)	1.01	0.85
Vomiting	1 (2.5%)	4 (10%)	5 (12.5%)	.08	0.004*
Postoperative bleeding	2 (5%)	0	2 (5%)	1.9	0.76
Stricture	1 (5%)	0	1 (2.5%)	1.9	0.76
Ulcer	0	0	0	1.6	0.56
Leak	2 (5%)	0	1 (5%)	1.9	0.76
Cholelthiasis	1 (2.5%)	1 (2.5%)	2 (5%)	2.2	0.26
GERD	3 (7.5%)	2 (5%)	5 (12.5%)	4.08	0.004

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The mean estimated Excess body weight loss percentage [EBWL%] was [7±2.6] after one month, [19±4.5] after third month, [38±8.2] after six month, [56±11.2] after one year and [62±9.3] after two year (Table IV).

Table (IV): Percentage of distribution of estimated excess body weight loss (EBWL %) at postoperative intervals

EBWL%	Group A	Group B	Total	Test	P Value
First Month	6.6±2.5	7.2± 2.8	7 ± 2.6	0.18	0.14
Third Month	18.7±4.2	19.5± 5.6	19 ± 4.5	0.8	0.16
Six Month	37±6.2	39± 9.2	38 ± 8.2	0.45	0.41
One Year	58±14.2	55± 7.2	56 ± 11.2	0.87	0.23
Two Year	66±9.8	60 ± 9.0	62 ± 9.3	0.82	0.53

Depression was noticed preoperatively with variant degrees in 6 patients (15%) of group (A) and in 5 patients (12.5%) of group (B). Postoperatively, depression in group (A) was reported in 2 cases (5%) 1mild case and 1moderate, and 1case (2.5%) in group (B) as mild case. There was no significant difference between both groups as regard preoperative depression while postoperatively, there was significant decrease of depression in group B when compared to group A. In addition, the decrease in depression was significant in group B when comparing postoperative to preoperative values. (Table V).

Table (V): Psychiatric data of the studied groups

Variables	Group A	Group B	Total	Test	P Value
Preoperative Depression					
Mild (HAM-D) 8-13	4 (10%)	2 (5%)	6 (15%)	0.21	0.69
Moderate (HAM-D) 14-18	2 (5%)	3 (7.5%)	5 (12.5%)	0.22	0.76
Postoperative Depression					
Mild	1 (2.5%)	1 (2.5%)	2 (5%)	6.6	0.013(5%)
(HAM-D) Score	10	9			
Moderate	1 (2.5%)	0 (0%)	1 (2.5%)	7.9	0.011*
(HAM-D) Score	17				

3. Discussion

Obesity reaches an epidemic level throughout the developed, as well as many of developing countries. This could be attributed to changes in diet habits and a more sedentary lifestyle. A very high rate of obesity has been reported among Egyptians, especially among hypertensive Egyptian women ***(Ibrahim et al, 2010).***

Morbid obesity is one of the major health problems of the 21st century. Formally recognized by the WHO as a global epidemic in 1997, it was estimated that in 2008, 1.5 billion adults, 20 and older, were overweight. Of these, over 200 million men and nearly 300 million women were obese, with higher rates among women than men (***CDC, 2012).***

As the most effective means for excess weight loss available, bariatric surgery has been growing continuously, with more and more patients opting for surgical treatment of their condition, new operations and techniques being developed, and new instruments being produced (***Brody, 2012).***

LSG is an innovative procedure for the management of obesity. It was originally developed as a first - stage bariatric procedure to reduce surgical risk in high - risk patients through the induction of dramatic weight loss. Advantages of LSG include: technical efficiency, lack of an intestinal anastomosis, normal intestinal absorption, no risk of internal hernias, no implantation of a foreign body, pylorus preservation (prevents dumping syndrome), and finally LSG may be considered the most appropriate option in extremely obese patients. Concerns remain however, regarding the risks and important major complications associated with LSG including staple line leak (1.17%), post - operative hemorrhage (3.57%), and the irreversibility of LSG (***Cottam et al., 2013).***

A new technique was presented, initially named total vertical gastric plication, and better known today as laparoscopic greater curvature plication. Developed in Iran by ***Talebpour*** as a cheap alternative to Laparoscopic Sleeve Gastrectomy, it appears to be gaining ground as its theoretical advantages of technical simplicity and low complication rate are of major importance (***Talebpour and Amoli, 2012).***

In ***2012 Talebpour et al*** believed that laparoscopic gastric plication (LGP) is less invasive and more conservative, with lower risk for complications such as leakage compared with stapler resection procedures and with reversible potency.

Laparoscopic Sleeve Gastrectomy (LSG) has been in many ways the Holy Grail of Bariatric Surgery. A relatively simple technique, with short operating time, few complications, and very good results in Excess Weight Loss; LGCP is being proposed as a different way to reproduce the same results with even fewer complications according to the Third International Summit on the status of LSG (***Deitel et al., 2011).***

Demographic data and obesity

In the current study, there was a gender difference between the studied groups, being predominantly females; this finding coincided with (***Boza et al, 2012).*** This may be explained by the fact that, females are more prone to psychosocial problems, and concerned about the cosmetic negative effects of obesity. Different factors drive gender differences in food consumption and women often report consume more sugar - laden foods than men. Furthermore in some countries cultural values favor larger body size among women as a sign of fertility and healthfulness. Women are often overprotected and due to cultural or religious barriers cannot publicly participate in physical activity. Greater cultural acceptance of excess weight gain among women than men has also been observed in Egypt (***Galal, 2012).***

Operative Complications

In our study Complication rate appears to be low, and it was as follows, in group (A) Port site infection occurred in 2 (10%) cases, Nausea in 3 (15%) cases, Vomiting in 1 (5%) case, Postoperative bleeding in 2 (10%) cases, Stricture in 1 (5%) case, Leak in 2 (10%) cases, Cholelthiasis in 1 (5%) case and GERD in 3 (15%) cases. While in group (B), Nausea was present in 7 (35%) cases, Vomiting in 4 (20%) cases, Cholelthiasis in 1 (5%) case and GERD in 2 (10%) cases, generally minor complications as nausea (25%) and persistent vomiting (12.5%) are the most common complications.

Chouillard et al., 2016 reported nausea and vomiting in 20% after LGCP and 7.5% after LSG. (***Abdelbaki et al, 2014)*** noted that 15% had nausea and vomiting in LGCP group and 1.5% in LSG group. The key difference between LSG and LGCP is the presence of the end luminal fold.

Skrekas et al., 2011 reported that the nausea and vomiting improved greatly after the modified LGCP technique by constructing a double or triple plication of the apposed gastric wall in the first row of stitches.

In the study of ***Talebpour and Amoli, 2012*** complications included one case with persistent vomiting, which, on reoperation, was found to be caused by a single adhesion causing a kink in the plicated stomach.

In our study there were 2 (5%) cases of leakage as post - operative complication in group (A) occurred at the esophagogastric junction. One patient presented with minor leak at post - operative day 5 and managed conservatively with NPO, PPI, IV hydration, broad spectrum antibiotic, and the other patient was presented with early leak at post - operative day 2 and was explored laparoscopically, peritoneal lavage and drainage was done and oversewing of the leaking staple line. Booth patients passed free for follow up. No leaks occurred in group (B).

The reported incidence in literatures varies according to the procedure; LGBP (0.7–5.3%) and for LSG were (1.1–7.1%) (***Jacobsen et al., 2014).***

The esophagogastric junction has been reported as the usual site of leak after LSG. Particular attention should be paid to this area at the time of staple firings. It is important to use staples of an adequate height and to avoid stapling the esophagus (***Edholm, 2019).***

Giuliani et al., 2019 reported that, acute leakages are the most hazardous complication with potentially fatal outcome and there are no standardized guidelines for its management. The leak usually occurs at the proximal or the distal ends of the staple line. Proximal gastric leaks, however, represent more than 90 % of post - LSG leaks.

Gagner et al., 2013 reported that, mechanical causes are attributed to high intragastric pressure in the constructed sleeve due to the mechanical obstruction by L - shaped sleeve, physiologic pyloric obstruction, haematoma or oedema formation, too small bougie size or reinforcing sutures causing excessive narrowing. They are responsible

for leaks in the first two postoperative days. They added that, tissue causes are responsible for leaks up to the sixth post - operative day. Reports documented an average incidence of 1.1 % for post - LSG leaks.

In the current study the incidence of post - operative bleeding was 5% as it occurred in 2 cases in group (A), in one of them abdominal drain revealed 600 cc within the first 24 hours and was managed conservatively with anti - hemorrhagic measures, The patient passed free for follow up, the other one was re-explored laparoscopically to control persistent bleeding from the dissected greater omentum at the site of short gastric vessels.

It was reported that the incidence of bleeding after obesity surgery ranges from 0.6 to 3 % (***Bakhos et al., 2010).*** The small number of cases could be responsible for exaggerated rate of complications. Stapling through a thick, vascular gastric wall can be followed by considerable amount of intra as well as extra - luminal bleeding.

Weight loss

EWL results of the present study are comparable to other studies. It was for group (A) at the first month 6.6 ± 2.5%, at the third month 18.7 ± 4.2%, at the six month 37 ± 6.2%, at one year 58 ± 14.2%, and at two years 66 ± 9.8%.

For group (B) at the first month 7.2 ± 2.8%, at the third month 19.5 ± 5.6%, at the six month 39 ± 9.2%, at one year 55 ± 7.7%, and at two years 60 ± 9.0%.

Talebpour and Amoli, 2012 reported a mean EWL for LGCP of 21.4% at 1 month, 54% at 6 months, 61% at 12 months, 60% at 24 months, and 57% at 36 months.

In the publication of ***Skrekas et al., 2011*** the mean EWL after LGCP was 51.7% at 6 months, 67.1% at 12 months, and 65.2% at 24 months. ***Ramos et al., 2011*** in their series of 42 cases, reported a mean %EWL after LGCP of 20% for the first month, 32% at 3 months, 48% at 6 months, 60% at 12 months, and 62% at 18 months.

EWL results after LSG was, 47.36 ± 12.95% in 3 months, 57.97 ± 19.28% in 6 months, 66.28 ± 25.42% in 12 months (***Shen et al., 2013).***

Failure after surgery

Failure after bariatric surgery is defined as; less than 50% of excess weight lost (EWL) with or without BMI greater than 35 kg/m^2 at 18 months postoperation.

In our study there was 1 patient (5%) in group (A) and 3 patients (15) in group (B) cannot loss more than 40 % of EBW and categorized as failed operation which may be referred in group (A) to, lack of patient's compliance with life style modifications or physical activity, or due to removed fundus while failure in group (B) may be due to gastric dilatation, failed patients in group (A) were arranged for reparation for completion of sleeve with bypass, failed patients in group (B) were arranged for laparoscopic sleeve gastrectomy.

In line with this study ***Verdi et al., 2015*** reported insufficient weight loss [EWL<50 %] and were in 60 % of cases after LGCP [27 patients] and in 8.8 % of cases after LSG [4 patients]. ***Skrekas et al., 2011*** also reported a failed operation [EWL<30%] in 6% of patients, and an insufficient weight loss [EWL <50 %] in greater than 21 % of patients underwent LGCP.

Mortality after surgery

It has been reported that the most frequent causes of death in bariatric surgery are pulmonary embolism, cardiac or respiratory failure and gastric fistula (***Hamoui et al., 2016***).

In our study no mortality was recorded.

Role of ghrelin hormone

Human studies on ghrelin and stress suggest the coordinating role of ghrelin on behavioral response to stress by modulating energy intake. In one study, patients suffering from major depression had lower plasma ghrelin levels and antidepressant effects were reported following ghrelin administration (***Barim et al., 2012).***

Increasing evidence supports a functional role of ghrelin in myocardial growth associated with improved cardiac function. Also it had been detected in the aorta and myocardium, indicating that ghrelin may modulate cardiovascular parameters. Recent evidence indicates that ghrelin inhibits apoptosis in cardiomyocytes and endothelial cells (***Katugampola and Davenport, 2013).***

Cassoni et al., 2012 documented an anti - proliferative effect of ghrelin in breast cancer cells. In their study specific binding for ghrelin in human breast carcinomas and cell lines was observed. This entity of binding was independent of histologic type, stage, ER status, proliferative index of the tumor, or pre - or postmenopausal status of the patients, but it was directly related to grade of tumor differentiation.

4. Depression

In our study Depression was noticed preoperatively with variant degrees in 6 patients (30%) of group (A) and in 5 patients (25%) of group (B). Postoperatively, depression in group (A) was reported in 2 cases (10%) 1 mild case and 1 moderate, and 1case (5%) in group (B) as mild case. There was no significant difference between both groups as regard preoperative depression while postoperatively, there was significant decrease of depression in group B when compared to group A. In addition, the decrease in depression was significant in group B when comparing postoperative to preoperative values.

Depression with variant degrees and loss of hunger feeling were more with sleeve gastrectomy.

Bariatric surgery is a domain of complex interventions in high - risk patients. An ideal procedure does not exist and the key to successful treatment lies in a careful assessment of the individual risk jointly by the surgeon and the patient, as well as in providing intensive care and information before the operation and particularly in the long - term after a bariatric operation (***Mohamed, 2012).***

5. Conclusion

Obesity and depression share a complex relationship. Bariatric surgery patients specifically are afflicted with higher depression rates compared to the general population. Significant weight loss following bariatric surgery, in the early years, is associated with significant improvement in depressed mood symptomology. The role of Ghrelin hormone which decreased after sleeve gastrectomy must be kept in mind, due to its role as antidepressant, cardio - protective, and anti - proliferative for breast cancer.

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References

[1] **Abdallah AM and El Nemr ME (2018):** Laparoscopic greater curvature plication as a stomach sparing gastric sleeve: Is it a worthy weight losing procedure for morbid obesity? International Surgery Journal; 5 (6): 2005 - 2010.

[2] **Abdelbaki T, Sharaan M and Khaled K (2014):** Laparoscopic gastric greater curvature plication versus laparoscopic sleeve gastrectomy: Early outcome in 140 patients. J Surg Obes Relat Dis; 10: 1141–1146. DOI: 10.1016/ j. soard.2014.03.014.

[3] **Agha M and Agha R (2017):** The rising prevalence of obesity (part A): Impact on public health. International journal of surgery. Oncology; 2 (7): 17.

[4] **Albaugh VL and Abumrad NN (2018**): Surgical treatment of obesity. F1000 research j. Vol.7, FacultyRev - 617. doi: 10.12688/f1000research.13515.1.

[5] **Bakhos C, Alkhoury F, Kyriakides T, Reinhold R and Nadzam G (2010):** Early postoperative hemorrhage after open and laparoscopic roux - en - y gastric bypass. Obes Surg; 19 (2): 153 - 157.

[6] DOI: 10.1007/s11695 - 8 - 9580 - 1.

[7] **Banka G, Woodard G, Hernandez - Boussard T and Morton JM (2012):** Laparoscopic vs open gastric bypass surgery: Differences in patient demographics, safety, and outcomes. Archives of Surg; 147 (6): 550–556.

[8] **Barim A, Aydın S, Colak R, Dag E, Deniz O and Sahin I (2012):** Ghrelin, paroxonase and arylesterase levels in depressive patients before and after citalopram treatment. Clin Biochem; 42: 1076 - 1081.

[9] **Boza C, Gamboa C, Salinas J, Achurra P, Vega A and Pérez G (2012):** Laparoscopic Roux - en - Y gastric bypass versus laparoscopic sleeve gastrectomy: A case–control study and 3 years of follow - up. Surg Obes Relat Dis; 8 (3): 243–249. DOI: 10.1016/j. soard.2011.08.023.

[10] **Bradnova O, Kyrou I, Hainer V, Vcelak J, Halkova T and Sramkova P (2014):** Laparoscopic greater curvature plication in morbidly obese women with type 2 diabetes: Effects on glucose homeostasis, postprandial triglyceridemia and selected gut hormones. Obes Surg; 24: 718–7126. DOI: 10.1007/s11695 - 013 - 1143 - 4.

[11] **Brody F (2012):** "Minimally invasive surgery for morbid obesity, " Cleveland Clinic Journal of Medicine; 71 (4): 289– 298.

[12] **Buchwald H and Oien DM (2013):** Metabolic/bariatric surgery worldwide. besity Surg; 23: 427 - 36.

[13] **Carr W and Mahawar K (2016):** Bariatric surgery in type 2 diabetes mellitus: A systematic review. Obesity surgery; 26 (1): 196 - 204.

[14] **Cassoni P, Papotti M, Ghè C, Catapano F, Sapino A, Graziani A and Muccioli G (2012):** Identification, characterization, and biological activity of specific receptors for natural (ghrelin) and synthetic growth hormone secretagogues and analogs in human breast carcinomas and cell lines. The Journal of Clinical Endocrinology and Metabolism; 86 (4): 1738 - 1745.

[15] Centers for Disease Control and Prevention (CDC) (2012): CDC's Vision for Public Health Surveillance in the 21st Century. MMWR; 61: 1 - 40

[16] **Chooi YC, Ding C and Magkos F (2019):** The epidemiology of obesity. Metabolism; 92: 6 - 10.

[17] **Chouillard E, SchoucairN, Alsabah S, Alkandari B, Montana L andDejonghe B (2016):** Laparoscopic gastric plication (LGP) as an alternative to laparoscopic sleeve gastrectomy (LSG) in patients with morbid obesity: A preliminary, short - term, case - control study. Obes Surg; 26 (6): 1167 - 1172. DOI: 10.1007/s11695 - 015 - 1913 - 2.

[18] **Cottam D, Qureshi FG and Mattar SG (2013):** Laparoscopic sleeve gastrectomy as an initial weight - loss procedure for high - risk patients with morbid obesity. Surg Endosc; 20 (6): 859–863.

[19] **Deitel M, Gagner M and Crosby RD (2011):** Third International Summit. Current status of sleeve gastrectomy. Surgery for Obesity and Related Diseases; 7 (6): 749– 759.

[20] **Edholm D (2019):** Systematic Review and Meta - analysis of Circular and Linear Stapled Gastro - jejunostomy in Laparoscopic Roux - en - Y Gastric Bypass. Obes Surg; 29 (6): 1946 - 1953. DOI: 10.1007/s11695 - 019 - 03803 - w.

[21] **ElGeidie AA and ElHak NG (2013):** Laparoscopic Gastric Plication in Obese Egyptian Patients: Technique and Initial Short - Term Outcome. Surgery Current Research; 3 (5): 2161 - 1076.

[22] **Gagner M, Deitel M, Erickson A and Crosby R (2013):** Survey on laparoscopic sleeve gastrectomy at the Fourth International Consensus summit on sleeve gastrectomy. Obes Surg; 23 (12): 2013 - 2017. DOI: 10.1007/ s11695 - 013 - 1040 - x.

[23] **Galal O (2012):** The nutrition transition in Egypt: Obesity, undernutrition and the food consumption context. Public Health Nutr; 5: 141–148. (PubMed) (Google Scholar).

[24] **Giuliani A, Romano L, Marchese M, Necozione S, Cianca G, Schietroma M and Carlei F (2019):** Gastric leak after laparoscopic sleeve gastrectomy: management with endoscopic double pigtail drainage. A systematic review. Surg Obes Relat Dis; 15 (8): 1414 - 1419. DOI: 10.1016/j. soard.2019.03.019.

[25] **Grubnik VV, Ospanov OB, Namaeva KA, Medvedev OV and Kresyun MS. (2016):**

Randomized controlled trial comparing laparoscopic greater curvature plication versus laparoscopic sleeve gastrectomy. Surg Endoscopy; 30: 2186 - 91.

[26] **Hamilton M (1960):** A rating scale for depression. J Neurol Neurosurg Psychiatry; 23: 56–62.

[27] **Hamoui N, Anthone GJ, and Kaufman HS and Crookes PF (2016):** Sleeve gastrectomy in the high - risk patient. Obes Surg; 16: 1445–1449.

[28] DOI: 10.1381/096089206778 870157.

[29] **Ibrahim M, Appel L, Rizk H, Helmy S, Mosley J and Ashour Z (2010):** Cardiovascular risk factors in normotensive and hypertensive Egyptians. J Hypertension; 19: 1933–1940.

[30] **Jacobsen H, Nergard B, Leifsson B, Frederiksen S, Agajahni E, Ekelund M, Hedenbro J and Gislason H (2014):** Management of suspected anastomotic leak after bariatric laparoscopic Roux - En - Y gastric bypass. Br Surg J; 101 (4): 417 - 423. DOI: 10.1002/bjs.9388.

[31] **Katugampola and Davenport (2013):** Emerging roles for orphan ghrelin coupled receptors in the cardiovascular system. Trends in Pharmacol Sci; 24: 30–35.

[32] **Lakdawala MA, Bhasker A, Mulchandani D, Goel S and Jain S (2010):** Comparison between the results of laparoscopic sleeve gastrectomy and laparoscopic Roux - en - Y gastric bypass in the Indian population: A retrospective 1 - year study. Obes Surg; 20 (1): 1 - 6. DOI: 10.1007/ s11695 - 009 - 9981 - 9.

[33] **Lemanu D, Srinivasa S, Singh P, MacCormick A and Ulmer S (2012):** Single stage laparoscopic sleeve gastr - ectomy: Safety and efficacy in the super - obese. J Surg Res; 177: 49 - 54. DOI: 10.1016/j. jss.2012.01.011**.**

[34] **Luppino FS, de Wit LM, Bouvy PF, Stijnen T, Cuijpers P and Penninx BW (2010):** Overweight, obesity, and depression: A systematic review and meta - analysis of longitudinal studies. Arch Gen Psychiatry; 67 (3): 220 - 9. doi: 10.1001/archgenpsychiatry.2010.2**.**

[35] **Mohamed H (2012):** Laparoscopic Sleeve Gastrectomy: An Ideal Procedure for Control of Morbid Obesity. World J Lap Surg; 5 (2): 89 - 101.

[36] **Ramos A, Galvao Neto, Galvao M, Evangelista L, Campos J and Ferraz A (2010):** Laparoscopic greater curvature plication: initial results of an alternative restrictive bariatric procedure. Obes Surg; 20 (7): 913 - 918.

[37] **Sarkhosh K, Switzer N, El - Hadi M, Birch D, Shi X and Karmali S (2013):** The impact of bariatric surgery on obstructive sleep apnea: A systematic review. Obes Surg; 23 (3): 414 - 423. DOI: 10.1007/s11695 - 012 - 0862 - 2.

[38] **Shen D, Ye H, Ji Y, Zhan X, Zhu J and Wang Y (2013):** Comparison of short - term outcomes between laparoscopic greater curvature plication and laparoscopic sleeve gastrectomy. Surg Endosc; 27 (8): 2768–74.

[39] DOI: 10.1007/ s00464 - 013 - 2805 - y.

[40] **Skrekas G, Antiochos K and Stafyla V (2011):** Laparoscopic gastric greater curvature plication: Results and complications in a series of 135 patients. Obes Surg; 21 (11): 1657–63. DOI: 10.1007/s11695 - 011 - 0499 - 6.

[41] **Susmallian S, Nikiforova I, Azoulai S and Barnea R (2019):** Outcomes of bariatric surgery in patients with depression disorders. Plos one; 14 (8): e0221576.

[42] **Talebpour M and Amoli BS (2012):** Laparoscopic total gastric vertical plication in morbid obesity. J Laparoendosc Advs. Surge Tech; 17: 793 - 798.

[43] **Talebpour M, Motamedi SM, Talebpour A and Vahidi H (2012):** Twelve year experience of laparoscopic gastric plication in morbid obesity: Development of the technique and patient outcomes. Ann Surg Innov Res; 6: 7.

[44] **Tretbar L, Taylor T and Sifers E (1976):** Gastric plication for morbid obesity. J Kans Med Soc; 77: 488–490.

[45] **Verdi D, Prevedello L, Albanese A, Lobba A and Foletto M (2015):** Laparoscopic gastric plication vs sleeve gastrectomy: A single institution experience. Obes Surg; 25 (9): 1653 - 1657. DOI: 10.1007/s11695 - 015 - 1600 - 3.