Evaluation of the Outcomes of Roux-en Y Gastric Bypass Operation in Patients with Morbid Obesity

Ahmed M. Abdel Modaber*1
Ahmed Hammad1
Vusal Aliyev2

1 Department of General Surgery, Faculty of Medicine, Mansoura University Hospitals, Egypt
2 Department of General Surgery, Emsey Hospital, Istanbul, Turkey

Abstract
This study was with at least one year follow up period after surgery. The total number of patients in our study was 30 patients; 24 females (80%) and 6 males (20%). Their ages ranged from 21 to 50 years with a mean age of 37.4±7.3 years. All of our thirty patients underwent open Roux-en-Y gastric bypass operation. This study was conducted to evaluate the effectiveness of Roux-en-Y gastric bypass operation in the management of morbid obesity, study the complications that may result from the operation and monitor the changes in the complete blood count, blood glucose level, lipid profile, serum calcium, 25-hydroxyvitamin D and parathyroid hormone levels after surgery. Our patients were subjected to history taking, clinical examination, laboratory investigations, radiological investigations, electrocardiogram routinely, echocardiography, stress test, cardiac catheterization and upper GI endoscopy when indicated. Peri-operative blood loss ranged from (150 cc to 850 cc) with a mean blood loss of (2984 cc). The operation time ranged from (150 to 240 minutes) with a mean operation time of (175 min). Postoperative hospital stay ranged from (6 to 8 days) with a mean hospital stay of (7.1 days). The incidence of intra-operative complication was 6.6% and included one case (3.3 %) of splenic injury and one case (3.3 %) of liver injury. Early postoperative complications included; postoperative chest infection in two patients (6.6%), wound infection in two patients (6.6%) and partial wound dehiscence in two patients (6.6%). Late complications included; gallstones in one patient from 27 (3.7%), Stomal stenosis in one patient (3.3%) and incisional hernia in two patients (6.6%). One year after surgery; BMI decreased significantly from 48.38 kg/m² to 31.42 kg/m² with a mean reduction in BMI of 16.9 kg/m² (P-value < 0.001). The percentage of excess body weight loss was 60.6±1.5% one year after surgery. WBCs count decreased significantly, while HB concentration and platelets count decreased non-significantly. Fasting plasma glucose level decreased significantly among diabetic patients. The entire lipid profile was found to have a statistical significant improvement. Serum calcium level decreased non-significantly, while PTH, and 25 OH – vitamin D increased non-significantly. Comorbidities showed significant reduction in the prevalence of dyslipidemia and psychological upset, while, other preoperative co-morbidities related to morbid obesity decreased non-significantly. Roux-en-Y gastric bypass operation is an effective and efficient operation as regard to reduction of body weight.

Keywords
Roux-en-Y gastric bypass; Morbid obesity

Introduction
Obesity is an increasingly serious public health problem on a global level. Morbid obesity is defined as a Body Mass Index (BMI) of 40 Kg/m² or greater or a BMI of 35 Kg/m² or greater with obesity related comorbidities [1].

The etiology of morbid obesity is multifactorial and is related to inheritance, physiology, and metabolism, sociocultural, behavioral, and psychological factors [2].

Morbid obesity is associated with an increased incidence of a wide spectrum medical and surgical pathologies including: hypertension, coronary artery disease, peripheral vascular disease, cardiomyopathy, restrictive lung disease, sleep apnea, diabetes mellitus, hernias, gallstones, osteoarthritis, back pain, in addition to breast, prostate, and colorectal cancer [3].

None of the medical methods of weight reduction provide a lasting weight reduction. Surgery offers the only achievable long-term solution [4].

Bariatric surgery has demonstrated its efficacy in weight loss and in reducing the comorbidities in the morbid obesity patient [4].

Bariatric surgical techniques can be divided into restrictive, mal absorptive and combined (restrictive and malabsorptive) procedures. Commonly performed procedures include Laparoscopic Adjustable Gastric Banding (LAGB), Sleeve Gastrectomy (SG), Vertical Banded Gastroplasty (VBG), Roux-en-Y Gastric Bypass (RYGB), Biliopancreatic Diversion

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Roux-en-Y gastric bypass is currently considered the gold standard surgical option for the treatment of morbid obesity [6].

Roux-en-Y gastric bypass involves a combination of both restrictive and malabsorptive mechanisms and has become the procedure of choice for patients with morbid obesity [7].

The gastric partitioning reduces the amount of food that can be ingested, and the Roux-en-Y anastomosis allows food to bypass the duodenum and proximal jejunum resulting in global mal absorption over the bypassed portion of the intestine [8].

Roux-en-Y gastric bypass has been shown to normalize glucose intolerance in morbidly obese patients with type II diabetes [9].

It has been demonstrated that Roux-en-Y gastric bypass was followed by substantial decline in total serum cholesterol and triglyceride levels [10].

The aim of this study is to evaluate the effectiveness of roux-en-Y gastric bypass operation in the management of morbid obesity, study the complications that may result from the operation and monitor the changes in the complete blood count, blood glucose level, lipid profile, serum calcium, 25-hydroxy vitamin D and parathyroid hormone levels after surgery.

Patients and Methods

Patients were followed up for at least 1 year after surgery. The total number of patients included in our study was thirty patients with morbid obesity.

Morbid obesity was diagnosed on the base of Body Mass Index (BMI). BMI is calculated by dividing the weight in kilograms by the square of height in meters \(\text{BMI} = \frac{\text{weight (Kg)}}{\text{height (m}^2}\)).

Open Roux-en-Y Gastric Bypass (RYGB) procedure was done for all patients.

Inclusion criteria:
- Patients with a BMI of 40 kg/m\(^2\) or greater regardless of the comorbidities.
- Patients with a BMI of 35 kg/m\(^2\) or more with comorbidities.
- Failure of medical and conservative treatment modalities of weight loss.
- Patients should be mentally and psychologically stable.
- Cooperative motivated and agree for lifelong follow up.
- Fit for surgery.
- Aged 18 to 60 years.

Exclusion criteria:
- Patients unfit for general anesthesia.
- Mental incompetence that prevents the patient from understanding the procedure and psychological instability.
- Lack of motivation
- Uncooperative patients with noncompliant behaviour and inability or unwillingness of the patient to change lifestyle postoperatively.
- Drug, alcohol, or other substance addiction.

Methods

Our patients were subjected to:
- Full history taking.
- Clinical examination.
- Measurement of weight, height, body mass index, excess body weight, excess body weight loss, percent of excess weight loss and body circumferences.
- Laboratory investigations including complete blood count, liver function tests, renal function tests, blood glucose level, serum cholesterol and triglycerides, serum calcium, 25-hydroxy vitamin D and parathyroid hormone.
- Radiological investigations including chest X-ray and abdominal ultrasonography.
- Electrocardiogram (ECG).
- Echocardiography, stress test, and perhaps even cardiac catheterization.
- Upper GI endoscopy.
- Patient’s photos.

Preoperative preparation

1. DVT prophylaxis.
2. Heparin 5000 units SC one hour before operation.
3. Elastic stocking.
4. Bowel preparations and enemas.
5. Urinary catheter and nasogastric tubes were applied just before operation or with induction of anesthesia.
6. Fasting for 24 hours with adequate hydration using iv fluids 35 ml/kg/day.
7. Two grams of cefazolin was parentally administered to all patients approximately 30 to 60 minutes before wound incision and another one gram is added every two hours of operation time. Also, 500 mg of metronidazole was given intravenous just before skin incision (Figure 1 and 2).

Operative technique

All our thirty patients were subjected to open Roux-en-Y gastric bypass operation. We mainly followed the techniques of open Roux-en-Y gastric bypass operation described by Obeid et al. and Sarr except for the technique performed for jejunojejunostomy and gastrojejunostomy we used the hand-sewn technique instead of staplers for economic purposes.

1. All patients were placed in supine position.
2. General anesthesia was given. Induction using sodium thiopental and succinyl choline as muscle relaxant, then Endo tracheal tube was inserted, then maintenance using isoflurance and pancronium as a muscle relaxant.

![Figure 1: Preoperative view of morbidly obese female patient: (a) Anterior and (b) lateral view](image1)

![Figure 2: Preoperative view of morbidly obese male patient: (a) Anterior and (b) lateral view](image2)
3. Sterilization of the abdominal wall was done using povidone iodine.

4. Abdominal incision was marked, started from 2 cm below xiphoid process and extended downwards towards the umbilicus.

5. Linea alba was cleared from fat to identify the decussation Linea alba was opened in the midline.

6. The abdominal cavity was entered then abdominal and pelvic exploration was undertaken in every patient, including examination of the liver and gall bladder.

7. The ligament of Treitz was identified and the jejunum is divided 40 cm beyond the ligament.

8. End to side jejunooejunostomy was done 100 cm from initial point of jejunal division. The stump of roux limb was closed using 2 layers anastomosis outer seromuscular and inner through and through.

9. Devascularization of the upper port of the greater curvature was done.

10. The space between the first and second branch of the left gastric artery was identified as a landmark for location of gastric staple line (about 5 cm of gastro-esophageal junction) both to ensure that pouch was not larger than 30 ml and to prevent injury to left gastric artery, which usually runs cephalad to this location. Blunt dissection was used, using right-angle clamp that is admitted behind the stomach to catch Foleys (18 F) catheter which was passed from angle of his to encircle the stomach.

11. Linear stapler TA90, heavy wire, Ethicon was used in all cases. The wide opening of Foleys catheter was applied to the lower blade of TA90 stapler to guide it. When the stomach was ready for stapling, nasogastric tube must be withdrawn, the stapler was fired. The same steps were repeated to apply 2 staple lines superimposed rows.

12. Two rows of hand sewn interrupted prolene sutures were applied to reinforced staples.

13. The Roux limb was brought through the transverse mesocolon or brought anterior to the colon and then brought up to the proximal stomach.

14. Side to side anastomosis was done (one cm in diameter) between the gastric pouch and the Roux limb with an outer layer is interrupted 3-0 silk sutures and an inner layer continuous 2-0 polyglycolic acid suture (Vicryl). When posterior aspect of the anastomosis was complete Nasogastric tube was advanced and passed through the anastomosis then the anterior aspect is completed.

15. All mesenteric defects at jejunooejunostomy, at the mesocolon and behind the Roux limb were closed to prevent internal hernia using interrupted suture using 2-0 polyglycolic acid sutures.

16. Cholecystectomy was done three patients showed to have chronic calicular cholecystitis by pre operative ultrasonography.

17. Tube drain was inserted near to gastrojejunostomy.

18. The peritoneum was closed using continuous 2-0 polyglycolic acid suture.

19. The linea alba was closed by continuous proline suture superimposed by interrupted polyglycolic acid irrigation of subcutaneous tissue by crystalloid solution and antibiotic otherwise subcutaneous suction drain was used.

20. Hernioplasty was done in three patients had associated paraumbilical hernia

21. The skin was closed by continuous sub cuticular or interrupted vertical mattress suture.

Postoperative course:
1. All patients were given intravenous fluids 35 ml/kg body weight during the first postoperative day then according to their fluid chart in the subsequent days
2. Patients were admitted to regular nursing floor
3. Ryle tube is removed after one day
4. Early ambulation was advised on first postoperative day
5. Drain was removed on 6th postoperative day after ensure that no leak
6. H2 blockers were given iv early postoperative and continued for one week after discharge. While proton pump inhibitors were given, only if there were postoperative bleeding from the Ryle tube or the patients complaining of persistent pain during their Postoperative course.
7. SC heparin was continued postoperatively, 4 hours after the operation (if no bleeding) by dose 5000 µg/12 hours till the patient was discharged
8. Drinking clear fluids was begun on the third postoperative day.
9. The patients were discharged 6–8 days postoperative according to Postoperative course (Figure 3)

After discharge

1. Diet:
   • Patients continued on clear fluids for one week (sugar free)
   • Then full fluids during the second week
   • Then soft food during the third week
   • Then began regular food

2. Supplementation:
   • Calcium 1000 mg per day orally
   • Vitamin D 800 IU per day orally
   • Vitamin B12 and iron supplementations must be given also

3. Advices were given for our patients

a. Diet:
   • Consumption of large amount of water between meals especially during first 45 days helps weight loss.
   • Three small nutritious meals every day: lots of vegetables and fruits, high protein, small amount of carbohydrates and very small amount of fats.
   • Drinking water is avoided 30 minutes before and 30 minutes after meal
   • Stop eating once feel full
   • Avoid eating up to edge (small frequent meals)

Figure 3: Post-operative midline scar two weeks after the operation
• Chewing food thoroughly before swallowing

b. Exercise:
   Walking for 30 minutes a day, at least 3 times a week is very beneficial for weight loss.

C. Pregnancy:
   Better avoided during the period of rapid weight loss (first 12 months after surgery).

4. Follow up:
   • Subsequent follow-up visits are usually scheduled for two weeks, three months, six months, and one year after surgery, then regular visits every six months after that.
   • The focus of postoperative visits is documentation of outcomes and testing for postoperative nutritional deficiencies.
   • Weight loss was assessed by decrease in BMI and percentage of excess body weight loss.
   • Patients taking medications for type 2 diabetes, dyslipidemia and hypertension should be monitored to determine if reduction or disconnection of their medication is indicated.

Two weeks postoperative visit include:
   • Wound care
   • Detection of complication
   • Complete blood picture
   • Fasting blood glucose
   • Serum electrolytes if there was frequent vomiting

One month postoperative visit:
   • Body weight and BMI
   • Wound care
   • Detection of complication
   • Complete blood picture
   • Fasting blood glucose
   • Serum electrolytes if there was frequent vomiting
   • Gastrograffin meal if there was frequent vomiting or failure of weight loss

Three and six month postoperative visit:
   • Body weight and BMI
   • Complete blood picture
   • Fasting blood glucose
   • Serum creatinine

One year postoperative visit:
   • Body weight and BMI
   • Liver function test
   • Serum creatinine
   • Complete blood picture
   • Fasting blood glucose
   • Complete lipid profile
   • Serum calcium
   • PTH
   • 25 OH-vitamin D
   • Serum proteins, iron, ferritin, vitamin B₁₂ and folic acid

Statistical Analysis
   The data were collected, presented and analyzed using SPSS-PC (version 10) software.

   Comparisons between measures (mean ± SD) were done using paired t-test for two paired groups,
   Comparisons between measures (mean ± SD) between multiple paired groups were done by one way ANOVA test.
   Comparisons between paired data were done by McNemar’s test.

Also, qualitative categories were expressed in the form of frequency and percentage.

The test results were considered significant when p value < 0.05, while the test results were considered non significant when p value > 0.05 (Figure 4-8).
One year after surgery, BMI was 33.5 kg/m².

Demographic characteristics of the studied cases (30 cases)

The total number of patients was 30 patients; 24 females (80%) and 6 males (20%). Their ages ranged from 21 to 50 years with a mean age of 37.4 ± 7.3 years (Table 1).

Preoperatively the weights of our patients ranged from 108 kg to 181 kg with a mean weight ± SD of 136.55 ± 12.64 kg. Height ranged from 1.58 to 1.85 meter with a mean height ± SD of 1.68 ± 0.08 meters. BMI ranged from 42.6 to 72.3 kg/m² with a mean BMI ± SD of 48.38 ± 7.82 kg/m². The mean Ideal Body Weight (IBW) was 62.1 ± 13.4, while the mean Excess Body Weight (EBW) was 74.45 ± 12.64 (Table 2).

The peri-operative blood loss ranged from (150 cc to 850 cc) with a mean blood loss of (208.4 ± 107.8 cc). The operation time ranged from (150 to 240 minutes) with a mean operation time of 175 ± 21.4 minutes. Postoperative hospital stay ranged from (6 to 8 days) with a mean hospital stay of 7.1 ± 0.6 days (Table 3).

The incidence of intra-operative complication was 6.6% and included one case (3.3%) of splenic injury for which splenectomy was done and one case (3.3%) of liver injury which was managed by suturing the tear. We did not report any case of bowel injury or bowel ischemia (Table 4).

The mean weight of our patients decreased significantly from 136.55 ± 12.64 kg preoperatively to 91.43 ± 10.92 kg one year after surgery (p-value < 0.001) with a mean reduction in weight of 40.09 kg. The mean BMI decreased significantly from 48.38 ± 7.82 kg/m² preoperatively to 31.42 ± 6.93 kg/m² one year after surgery (p-value < 0.001) (Table 5).

The mean excess body weight decreased significantly from 74.45 ± 10.6 kg preoperatively to 29.53 ± 8.9 kg one year after surgery (p-value < 0.001) with a mean excess weight loss of 45.12 ± 6.7 kg (Table 6).

From the baseline to one year after surgery, the mean hemoglobin concentration decreased non-significantly from 13.41 ± 1.1 gm/dl to 12.98 ± 1.6 gm/dl (p-value = 0.077), the mean White Blood Cell (WBC) count decreased significantly from 6.65 ± 1.3 (x 10³/µl) to 5.42 ± 1.2 (x 10³/µl) (p-value = 0.006) and the mean platelet count decreased non-significantly from 208 ± 21 (x 10³/µl) to 198 ± 13 (x 10³/µl) (p-value = 0.086) (Table 7).

One year after surgery as compared to baseline there was a highly statistical significant reduction in the mean fasting plasma glucose levels in diabetic patients (p-value = 0.037), while the reduction was non-significant in non-diabetic patients (p-value = 0.059). The mean fasting blood glucose level of diabetic patients decreased significantly from 164.8 ± 39.6 mg/dl preoperatively to 119.4 ± 26.7 mg/dl one year after surgery (p = 0.037) with a mean reduction of 45.4 mg/dl. On the other hand, the mean fasting blood glucose level of non-diabetic patients decreased non-significantly from 96.2 ± 8.6 mg/dl preoperatively to 86.2 ± 7.5 mg/dl one year after surgery (p = 0.059) with a mean reduction of 10 mg/dl (Table 8).

From the baseline to one year after surgery, the mean total cholesterol decreased significantly from 224.56 ± 32.1 mg/dl to 201.43 ± 41.3 mg/dl (P=0.018), the mean LDL decreased significantly from 141.73 ± 55.8 mg/dl to 124.3 ± 31.6 mg/dl (p = 0.049), the mean TG decreased significantly from 173.69 ± 54.8 mg/dl to 61.9 ± 5.51 mg/dl (p = 0.022), and the mean HDL increased significantly from 39.53 ± 141.73 ± 35.8 mg/dl to 124.3 ± 31.6 mg/dl (p < 0.001) (Table 9). The mean weight of our patients decreased significantly from 136.55 ± 12.64 kg preoperatively to 91.43 ± 10.92 kg one year after surgery (p-value < 0.001) with a mean reduction in weight of 40.09 kg (Table 10).

Most of the studied group showed significant reduction in the prevalence of dyslipidemia and psychological upset after surgery (76.9% and 71.4% respectively), while the incidence of other preoperative co-morbidities decreased but not significantly (Table 10).

Discussion

Obesity is an epidemic health care problem all over the world. World Health Organization have defined obesity as a BMI ≥ 30 Kg/m², where obesity is classified into 3 classes including; class I obesity as a BMI 30-34.9 Kg/m², Class II obesity as a BMI 35-39.9 kg/m² and Class III obesity as a BMI ≥ 40 Kg/m²[11].

Individuals with a BMI of 35 or greater who have concomitant, obesity-associated disease or those with a BMI of 40 or greater, regardless of co-morbidities, are described as morbidly obese [12].

Morbid obesity is associated with a number of comorbidities such as hypertension, coronary artery disease, peripheral vascular disease, cardiomyopathy, dyslipidemia, type-2 diabetes mellitus, obstructive

Table 1: Demographic characteristics of the studied cases (30 cases)

<table>
<thead>
<tr>
<th>Studied Group</th>
<th>N (30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>37.4 (7.3)</td>
</tr>
<tr>
<td>Median</td>
<td>39</td>
</tr>
<tr>
<td>Min-max</td>
<td>21 – 50</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male Number (%)</td>
<td>6 (20)</td>
</tr>
<tr>
<td>Female Number (%)</td>
<td>24 (80)</td>
</tr>
<tr>
<td>M / F Ratio</td>
<td>1 / 4</td>
</tr>
</tbody>
</table>
sleep apnea, asthma, osteoarthritis, gallbladder stones and gastro- esophageal reflux disease, in addition to an increased incidence of various cancers such as those of the uterus, breast, colon, and prostate [13].

Bariatric or weight loss surgery is the only treatment for morbid obesity that confers definitive weight loss at long-term follow- up. In addition to weight reduction there is a strong possibility of amelioration or even cure of various co-morbid conditions associated with obesity [14].

Among the many operations designed to affect weight loss, Roux-en-Y Gastric Bypass (RYGB), which combines gastric restriction with mild malabsorption, is considered to be the optimal procedure due to its satisfying long-term weight loss and acceptable complication rate. RYGB is currently considered to be the gold standard for the surgical treatment of morbid obesity [15].

The total number of was 30 patients; 24 females (80%) and 6 males (20%). Their ages ranged from 21 to 50 years with a mean age of 37.4 ± 7.3 years. All of our thirty patients underwent open Roux-en-Y gastric bypass operation.

This study was conducted to evaluate the effectiveness of Roux-en-Y gastric bypass operation in the management of morbid obesity, study the complications that may result from the operation and monitor the changes in the complete blood count, blood glucose level, lipid profile, serum calcium, 25-hydroxyvitamin D and parathyroid hormone levels after surgery.

<table>
<thead>
<tr>
<th>Weight (kg)</th>
<th>Total (30)</th>
<th>Male (6)</th>
<th>Female (24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean ± (SD)</td>
<td>136.55 ± (12.64)</td>
<td>145.2 ± (13.2)</td>
<td>129.64 ± (11.8)</td>
</tr>
<tr>
<td>Median</td>
<td>135.5</td>
<td>145.5</td>
<td>131.5</td>
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</table>

<table>
<thead>
<tr>
<th>Height (meter)</th>
<th>Total (30)</th>
<th>Male (6)</th>
<th>Female (24)</th>
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<tbody>
<tr>
<td>Mean ± (SD)</td>
<td>1.68 ± (0.08)</td>
<td>1.72 ± (0.08)</td>
<td>1.64 ± (0.07)</td>
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<tr>
<td>Median</td>
<td>1.69</td>
<td>1.71</td>
<td>1.68</td>
</tr>
<tr>
<td>Min-Max</td>
<td>1.58 – 1.85</td>
<td>1.64 – 1.85</td>
<td>1.58 – 1.74</td>
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</table>

<table>
<thead>
<tr>
<th>BMI (kg/m²)</th>
<th>Total (30)</th>
<th>Male (6)</th>
<th>Female (24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean ± (SD)</td>
<td>48.38 ± (7.82)</td>
<td>49.1 ± (9.3)</td>
<td>48.2 ± (8.7)</td>
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<tr>
<td>Median</td>
<td>48.5</td>
<td>50.4</td>
<td>47.8</td>
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<td>Min-max</td>
<td>42.6 – 72.3</td>
<td>45.2 – 72.3</td>
<td>42.6 – 69.7</td>
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<table>
<thead>
<tr>
<th>Ideal Body Weight (IBW)</th>
<th>Total (30)</th>
<th>Male (6)</th>
<th>Female (24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean ± (SD)</td>
<td>62.1 ± (13.4)</td>
<td>68 ± (12.3)</td>
<td>60.53 ± (10.2)</td>
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<tr>
<td>Median</td>
<td>63.76</td>
<td>67.47</td>
<td>62.68</td>
</tr>
<tr>
<td>Min-max</td>
<td>57.3–74.98</td>
<td>63.71–74.98</td>
<td>57.3–65.9</td>
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<table>
<thead>
<tr>
<th>Excess Body Weight (EBW)</th>
<th>Total (30)</th>
<th>Male (6)</th>
<th>Female (24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean ± (SD)</td>
<td>74.45 ± (12.64)</td>
<td>77.2 ± (13.2)</td>
<td>69.11 ± (11.8)</td>
</tr>
<tr>
<td>Median</td>
<td>71.74</td>
<td>78.03</td>
<td>68.82</td>
</tr>
<tr>
<td>Min-max</td>
<td>50.7–120</td>
<td>51.29–120</td>
<td>50.7–104.1</td>
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Table 2: Anthropometric characteristics of the studied cases (30 cases)

<table>
<thead>
<tr>
<th>Peri-operative blood loss (cc)</th>
<th>150 - 850</th>
<th>208.4</th>
<th>107.8</th>
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</thead>
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<tr>
<td>Operation time (Min)</td>
<td>150 - 240</td>
<td>175</td>
<td>21.4</td>
</tr>
<tr>
<td>Post operative hospital stay (days)</td>
<td>6 – 8</td>
<td>7.1</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Table 3: Operative and postoperative data

<table>
<thead>
<tr>
<th>Complications</th>
<th>Patient Group (30)</th>
<th>Case of morbid obesity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>%</td>
</tr>
</tbody>
</table>

| Splenic injury | 1 | 3.3 |
| Liver tear     | 1 | 3.3 |
| Bowel injury   | 0 | 0   |
| Bowel ischemia | 0 | 0   |
| Total          | 2 | 6.6 |

Table 4: Frequency of intraoperative complication
The mean perioperative blood loss was 208.4 cc that was very near to that reported in the study conducted by Nguyen et al. [16] which was 203 cc, while it was less than the mean peroperative blood loss reported by Sundbom and Gustavsson [17] in their study which was 250 cc.

The mean operation time was 175 minutes, which was a little shorter than that reported in the studies done by Hutter et al. [18] and Sekhar et al. [19] who reported a mean operation time of 188.4 minutes and 195 minutes, respectively.

On the other side, it was longer than that reported in the studies done by Agaba et al. [4] and Lancaster and Hutter [20] who reported a mean operation time of 90 minutes and 127.7 minutes, respectively. This marked variation may be attributed to the differences in experience and the learning curve among centers. In addition, this may be due to the variation in availability of staplers for doing every anastomosis, for example, in our study the cases in which we used in addition to the linear stapler of gastric partitioning additional staplers for jejunojejunostomy and gastrojejunostomy the operation time was shorter than that of cases in which these anastomoses done by hand-sewn technique.

The length of postoperative hospital stay showed marked variations among studies according to the different circumstances concerning patients and facilities among different centers. In our study the mean length of post operative hospital stay was 7.1 days that was a little shorter than that reported in the study done by Luján

**Table 5:** Changes of weight and BMI among the studied group before and after operation

<table>
<thead>
<tr>
<th>Changes of weight and BMI</th>
<th>One way ANOVA (F statistic)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weight (kg)</strong> Mean±(SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before</td>
<td>136.55 (12.64)</td>
<td></td>
</tr>
<tr>
<td>3 months after</td>
<td>114.86 (11.57)</td>
<td></td>
</tr>
<tr>
<td>6 months after</td>
<td>98.06 (11.3)</td>
<td></td>
</tr>
<tr>
<td>1 year after</td>
<td>91.43 (10.92)</td>
<td></td>
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<tr>
<td></td>
<td>74.78 **</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td><strong>BMI (kg/m²)</strong> Mean±(SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before</td>
<td>48.38 (7.82)</td>
<td></td>
</tr>
<tr>
<td>3 months after</td>
<td>40.71 (8.12)</td>
<td></td>
</tr>
<tr>
<td>6 months after</td>
<td>34.08 (7.41)</td>
<td></td>
</tr>
<tr>
<td>1 year after</td>
<td>31.42 (6.93)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>33.97 **</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

**There is a highly statistical significant difference between mean scores of weight and BMI before surgery and (three, six and twelve) months after surgery.**

**Table 6:** Changes of excess body weight

<table>
<thead>
<tr>
<th>Changes of excess body weight</th>
<th>One-way Anova</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weight (kg)</strong> Mean±(SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before</td>
<td>136.55 (12.64)</td>
<td></td>
</tr>
<tr>
<td>3 months after</td>
<td>114.86 (11.57)</td>
<td></td>
</tr>
<tr>
<td>6 months after</td>
<td>98.06 (11.3)</td>
<td></td>
</tr>
<tr>
<td>1 year after</td>
<td>91.43 (10.92)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>74.78</td>
<td>&lt; 0.001 *</td>
</tr>
<tr>
<td><strong>Excess Body Weight (EBW)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (kg)</td>
<td>74.45 (10.6)</td>
<td></td>
</tr>
<tr>
<td>3 months after</td>
<td>52.76 (9.3)</td>
<td></td>
</tr>
<tr>
<td>6 months after</td>
<td>35.96 (9.7)</td>
<td></td>
</tr>
<tr>
<td>1 year after</td>
<td>29.33 (8.9)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>140.8</td>
<td>&lt; 0.001 *</td>
</tr>
<tr>
<td><strong>Excess Body Weight Loss</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (kg)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>3 months after</td>
<td>21.69 (5.2)</td>
<td></td>
</tr>
<tr>
<td>6 months after</td>
<td>38.49 (6.4)</td>
<td></td>
</tr>
<tr>
<td>1 year after</td>
<td>45.12 (6.7)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>117.2</td>
<td>&lt; 0.001 *</td>
</tr>
</tbody>
</table>

Excess weight loss = Operative weight – Follow-up weight
Percent Excess Weight Loss = [(Operative weight – Follow-up weight) / Operative excess weight] x 100.

**Table 7:** Complete blood count changes after surgery

<table>
<thead>
<tr>
<th>CBC</th>
<th>Pre operative</th>
<th>2 week after surgery</th>
<th>3 months after surgery</th>
<th>6 months after surgery</th>
<th>1 year after surgery</th>
<th>One way ANOVA (F statistic)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HB (gm/dl)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean±(SD)</td>
<td>13.41 (1.1)</td>
<td>12.65 (1.5)</td>
<td>12.46 (1.15)</td>
<td>12.84 (1.3)</td>
<td>12.98 (1.6)</td>
<td>2.15</td>
<td>0.077</td>
</tr>
<tr>
<td><strong>WBCs (X10^3/ul)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean±(SD)</td>
<td>6.65 (1.3)</td>
<td>6.48 (2.6)</td>
<td>5.83 (1.4)</td>
<td>5.52 (0.9)</td>
<td>5.42 (1.2)</td>
<td>3.73</td>
<td>0.006 *</td>
</tr>
<tr>
<td><strong>Platelets (X10^3/ul)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean±(SD)</td>
<td>208 (21)</td>
<td>199 (18)</td>
<td>204 (9)</td>
<td>202 (11)</td>
<td>198 (13)</td>
<td>2.08</td>
<td>0.086</td>
</tr>
</tbody>
</table>

*One year after surgery as compared to baseline, there was a statistical significant reduction in the mean WBCs count, while the reduction in the mean HB concentration and mean platelets count were not significant.

**Table 7:** Complete blood count changes after surgery

The mean perioperative blood loss was 208.4 cc that was very near to that reported in the study conducted by Nguyen et al. [16] which was 203 cc, while it was less than the mean peroperative blood loss reported by Sundbom and Gustavsson [17] in their study which was 250 cc.

The mean operation time was 175 minutes, which was a little shorter than that reported in the studies done by Hutter et al. [18] and Sekhar et al. [19] who reported a mean operation time of 188.4 minutes and 195 minutes, respectively.

On the other side, it was longer than that reported in the studies done by Agaba et al. [4] and Lancaster and Hutter [20] who reported a mean operation time of 90 minutes and 127.7 minutes, respectively. This marked variation may be attributed to the differences in experience and the learning curve among centers. In addition, this may be due to the variation in availability of staplers for doing every anastomosis, for example, in our study the cases in which we used in addition to the linear stapler of gastric partitioning additional staplers for jejunojejunosotomy and gastrojejunosotomy the operation time was shorter than that of cases in which these anastomoses done by hand-sewn technique.

The length of postoperative hospital stay showed marked variations among studies according to the different circumstances concerning patients and facilities among different centers. In our study the mean length of post operative hospital stay was 7.1 days that was a little shorter than that reported in the study done by Luján
One way ANOVA was reported in two patients (6.6%) that was similar to that reported by Weller and Rosati [21] in their study which was 6%. On the other hand, it was longer than that reported in the studies done by McAuliffe et al. [22] and Agaba et al. [4] in which the mean length of post operative hospital stay was 6 days, 6.3 days and 4.3 days, respectively. The length of hospital stay in our study was longer than the last studies because the residence of most of our patient was in villages away from the hospital. In addition, most of them suffered from lack of enough medical and economic facilities which could enable them to manage the early post operative period as successful as in hospital. We preferred to keep them at hospital till be sure that they were no longer in need of meticulous medical care.

The incidence of intraoperative complication was 6.6% and included one case of splenic injury for which splenectomy was done and one case of liver injury which was managed by suturing the tear.

Our incidence of intraoperative complication was very near to our incidence which was 7.9 days.

On the other hand it was a little higher than the incidence reported by Sundbom and Gustavsson [17] which was 10%. On the other hand it was slightly lower than the incidence of postoperative chest infection reported by Hutter et al. [18] which were 5.9 and 4.9%, respectively.

Wound infection was reported in two patients (6.6%) that incidence was similar to that reported by Lancaster and Hutter [20] and was 6.3% while it was less than that reported by Sekhar et al. [19], and was 9.2%.

Partial wound dehiscence was reported in two patients (6.6%), in agreement with Sundbom and Gustavsson [17] who reported wound dehiscence in 6.7% of cases.

Anastomotic leak, acute distal gastric dilatation, cardiovascular complication, bleeding, return to the operating room, deep venous thrombosis, pulmonary embolism and mortality were not reported in our study, while at least one of these complications were reported in the studies done by Agaba et al. [4], Siddiqui et al. [8]; Hutter et al. [18]; Weller and Rosati [23] and Nguyen et al. [24].

Stomal stenosis was reported in one patient (3.3%).

Table 8: Changes in fasting plasma glucose levels after surgery among those with and without diabetes mellitus

<table>
<thead>
<tr>
<th>Patient Group</th>
<th>Preoperative</th>
<th>1 year Postoperative</th>
<th>Paired t - test</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diabetic</strong></td>
<td>Mean ± (SD)</td>
<td>Mean ± (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Cholesterol (mg/dl)</td>
<td>224.56 ± 32.1</td>
<td>201.43 ± 41.3</td>
<td>5.88</td>
</tr>
<tr>
<td>Non diabetic</td>
<td>LDL-Cholesterol (mg/dl)</td>
<td>39.53 ± 12.4</td>
<td>53.82 ± 8.3</td>
<td>28.23</td>
</tr>
<tr>
<td></td>
<td>HDL-Cholesterol (mg/dl)</td>
<td>141.73 ± 35.8</td>
<td>124.3 ± 31.6</td>
<td>4.01</td>
</tr>
<tr>
<td></td>
<td>Fasting Triglycerides (mg/dl)</td>
<td>173.69 ± 54.8</td>
<td>138.63 ± 61.9</td>
<td>5.51</td>
</tr>
</tbody>
</table>

** There is a statistically significant difference between mean ± SD of different parameters of the lipid profile including; total cholesterol, HDL, LDL, and fasting triglycerides before surgery and one year after surgery.

Table 9: Effect of surgery on hyperlipidemias.

<table>
<thead>
<tr>
<th>Co-morbidities</th>
<th>Before</th>
<th>After</th>
<th>Significant improvement or resolution</th>
<th>Mc Nemar’s test</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>8</td>
<td>26.67</td>
<td>4</td>
<td>13.3</td>
<td>4</td>
</tr>
<tr>
<td>Hypertension</td>
<td>10</td>
<td>33.3</td>
<td>7</td>
<td>23.3</td>
<td>3</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>13</td>
<td>43.3</td>
<td>3</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Obstructive sleep apnea</td>
<td>5</td>
<td>16.7</td>
<td>1</td>
<td>3.3</td>
<td>4</td>
</tr>
<tr>
<td>Reproductive disorders</td>
<td>3</td>
<td>10</td>
<td>2</td>
<td>6.6</td>
<td>1</td>
</tr>
<tr>
<td>Psychological upset</td>
<td>14</td>
<td>46.6</td>
<td>4</td>
<td>13.3</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 10: Prevalence of co-morbidities related to morbid obesity before and after surgery.

et al. [21] in which the mean length of post operative hospital stay was 7.9 days. On the other hand it was longer than that reported in the studies done by McAuliffe et al. [22] and Agaba et al. [4] in which the mean length of post operative hospital stay was 6 days, 6.3 days and 4.3 days, respectively. The length of hospital stay in our study was longer than the last studies because the residence of most of our patient was in villages away from the hospital. In addition, most of them suffered from lack of enough medical and economic facilities which could enable them to manage the early post operative period as successful as in hospital. We preferred to keep them at hospital till be sure that they were no longer in need of meticulous medical care.

The incidence of intraoperative complication was 6.6% and included one case of splenic injury for which splenectomy was done and one case of liver injury which was managed by suturing the tear.

Our incidence of intraoperative complication was very near to that reported by Hutter et al. [18] in their study which was 6.6%.

On the other hand, our incidence was slightly lower than the incidence of surgical complication reported by Lancaster and Hutter [20] which were 7.4% and 8%, respectively, while it was higher than that reported by Weller and Rosati [21] in their study which was 3.34%. Matching with our studies all the intraoperative complication in these studies included splenectomies or liver tear.

Two patients (6.6%) developed postoperative chest infection. This incidence was less than that reported by Sundbom and Gustavsson [17] which was 10%. On the other hand it was a little higher than the incidences of postoperative chest infection reported by Hutter et al. [18] which were 5.9 and 4.9%, respectively.

Wound infection was reported in two patients (6.6%) that incidence was similar to that reported by Lancaster and Hutter [20] and was 6.3% while it was less than that reported by Sekhar et al. [19], and was 9.2%.

Partial wound dehiscence was reported in two patients (6.6%), in agreement with Sundbom and Gustavsson [17] who reported wound dehiscence in 6.7% of cases.

Anastomotic leak, acute distal gastric dilatation, cardiovascular complication, bleeding, return to the operating room, deep venous thrombosis, pulmonary embolism and mortality were not reported in our study, while at least one of these complications were reported in the studies done by Agaba et al. [4], Siddiqui et al. [8]; Hutter et al. [18]; Weller and Rosati [23] and Nguyen et al. [24].

Stomal stenosis was reported in one patient (3.3%). Our incidence
of stomal stenosis was less than that reported by Siddiqui et al. [8] in their study which was 4.7%.

In our study, one patient from the 27 patients who did not have gallstones preoperatively (3.7%) developed gallstones 6 months after surgery. Our incidence of developing new gallstones was less than that reported by Puzziferri et al. [25] in their study which was 5%.

**Incisional hernia** was reported in 6.6% of our patients that was similar to the incidence of Incisional hernia reported by Jones et al. [26] which was 6.4%.

On the other hand it was less than the incidence reported by Siddiqui et al. [8] in their study which was 8.6%.

In our study, **reoperation** was needed for only one case (3.3%) for revision of the gastrojejunostomy after failure of endoscopic dilatation for the anastomosis stricture. Our reported incidence of reoperation was mid way between that reported by Puzziferri et al. [25] which was 2%.

**Marginal ulceration, internal herniation and bowel obstruction and mortality** were not reported in our study, while at least one of these complications were reported in the studies done by Siddiqui et al. [8] and Yan et al. [27].

Weight loss was assessed by decrease in BMI and percentage of excess body weight loss.

**One year after surgery**, we reported that the mean BMI decreased significantly from 48.38 ± 7.82 kg/m² preoperatively to 31.42 ± 6.93 kg/m² (p-value < 0.001) with a mean reduction in BMI of 16.96 kg/m².

Our results were found to be close to those reported by Fleisher et al. [28]; Mumme et al. [29] and Androu et al. [30] who reported a mean reduction in BMI of 16.1 kg/m², 16.6 kg/m² and 16.2 kg/m², respectively.

On the other hand, our mean reduction in BMI was found to be a little higher than that reported by Mahdy et al. [31] which was 15.4 kg/m² and 15 kg/m², respectively.

We reported that the mean excess body weight decreased significantly from 74.45 ± 10.6 kg preoperatively to 29.33 ± 8.9 kg one year after surgery (p-value < 0.001) with a mean excess weight loss of 45.12 ± 6.7 kg. One year after surgery, the mean percentage of excess body weight loss was 60.6%.

Our results were found to be close to those reported by Khabieh et al. [6] who reported a percentage of excess body weight loss of 61% one year after surgery.

Our mean percentage of excess body weight loss was higher than that reported by Selhar et al. [19] which were 57% ± 13.5% one year after surgery.

On the other hand, it was lower than mean percentage of excess body weight loss reported by Garcia-Mariirrodriga et al. [32] which was 67.6 ± 1.5% one year after surgery. These variations might be because of the use of different formulas for calculation of ideal body weight and consequently excess body weight among different studies.

It was found that the mean hemoglobin concentration decreased non-significantly from 13.41 ± 1.1 gm/dl at baseline to 12.98 ± 1.6 gm/dl one year after surgery (p-value = 0.077), which was consistent with the results of studies conducted by Goupaye et al. [33] and Toh et al. [34] who reported non-significant decrease in hemoglobin concentration one year after surgery from 13.1 ± 1.2 gm/dl to 12.8 ± 1.4 gm/dl and from 14.6 ± 1.31 gm/dl to 14 ± 1.57 gm/dl, respectively.

In our study, it was found that the mean White Blood Cell (WBC) count decreased significantly from 6.65 ± 1.3 (x10³/µl) before surgery to 5.42 ± 1.2 (x10³/µl) one year after surgery (p-value = 0.006). Although the WBC count decreased significantly in our study, but it was still within the normal range.

Our results were consistent with those of the studies conducted by Johansson et al. [35] who reported significant decrease in WBCs count one year after surgery from 7 (x10³/µl) to 5.6 (x10³/µl) and from 7.78 (x10³/µl) to 6.90(x10³/µl) respectively. In spite of the significant decrease in WBC counts in these studies, they were also still within the normal range.

In our study, it was found that mean platelet count decreased non significantly from 208 ± 21 (x10³/µl) before surgery to 198 ± 13 (x10³/µl) one year after surgery (p-value = 0.086). Although the platelet count in our study decreased, it was still within normal range and we did not report any de-novo thrombocytopenia cases after surgery during the follow up time.

In the study conducted by Dallal et al. [36], they reported significant decrease in platelet counts from 281 (X10³/µl) at baseline to 250 (x10³/µl) one year after surgery. In spite of the significant decrease in platelet count in the last study, it was also still within normal range without any clinical significant symptoms. This difference may be because their patients had a higher platelet count preoperatively.

**One year after surgery**, it was found that the mean fasting blood glucose level of non-diabetic patients decreased non significantly from 96.2 ± 8.6 mg/dl preoperatively to 86.2 ± 7.5 mg/dl (p = 0.059) with a mean reduction of 10 mg/dl. On the other hand, the mean fasting blood glucose level of diabetic patients decreased significantly from 164.8 ± 39.6 mg/dl preoperatively to 119.4 ± 26.7 mg/dl one year after surgery (p = 0.037) with a mean reduction of 45.4 mg/dl.

Our results were found consistent with results of the studies conducted by Yan et al. [27]; Mumme et al. [29] and Buchwald et al. [37]. All of these studies showed significant decrease in the mean fasting blood glucose level in diabetic patients one year after surgery.

One year after surgery, it was found that the entire lipid profile consisting of total cholesterol, LDL, TG, and HDL was found to have a statistically significant improvement between baseline and one year postoperatively. The mean total cholesterol decreased significantly from 224.56 ± 32.1 mg/dl to 201.43 ± 41.3 mg/dl (p = 0.018), the mean LDL decreased significantly from 141.73 ± 35.8 mg/dl to 124.3 ± 31.6 mg/dl (p = 0.049), the mean TG decreased significantly from 173.69 ± 54.8 mg/dl to 61.9 ± 5.51 mg/dl (p = 0.022), and the mean HDL increased significantly from 39.53 ± 12.4 mg/dl to 53.82 ± 8.3 mg/dl (p < 0.001) during this time period.

Our results were found consistent with results of the studies conducted by Puzziferri et al. [25]; Yan et al. [27] and Segal et al. [38] who reported significant improvement of the lipid profile one year after surgery compared to baseline.

**One year after surgery**, it was found that the mean serum calcium decreased non significantly from 9.56 ± 0.62 mg/dl preoperatively to 9.31 ± 0.47 mg/dl one year after surgery (p = 0.069), the mean serum Parathyroid Hormone (PTH) increased non-significantly from 38.24 ± 4.28 pg/ml preoperatively to 40.53 ± 5.64 pg/ml one year after surgery (p = 0.078) and the mean serum 25-hydroxy vitamin D increased non- significantly from 18.79 ± 4.13 ng/ml to 20.53 ± 3.76 ng/ml one year after surgery (p = 0.09).

Our results were consistent with the results of the studies conducted by Johnson et al. [39] who reported non significant decrease in serum calcium level and non significant increase in serum PTH and serum 25-hydroxy vitamin D levels one year after surgery as compared to the baseline.

On the other hand, Fleisher et al. [28] described a decrease of calcium level and an increase in PTH without changes in 25OH D levels, while Riedt et al. [40] described a decrease in calcium level without changes in PTH and 25OH D.

Most patients in our study (70%) had comorbidities such as diabetes, hypertension, dyslipidemia, obstructive Sleep Apnea Syndrome (SAS), gall bladder stones, hernia, reproductive disorders, osteoarthritis, and psychological upset. The incidence and the types of comorbidities in our study were nearly similar to those reported in most studies such as Puzziferri et al. [25] and Yan et al. [27].

Eight patients (26.7%) had type 2 diabetes mellitus, one year after surgery, 4 patients (50%) achieved complete resolution of diabetes mellitus (all of them had a history of mild recently discovered diabetes within one year preoperatively) while the remaining 4 patients showed a significant improvement of their blood glucose level and decreased
their dose of anti-hypoglycemic drugs but still diabetic (all of them had a history of diabetes at least 5 years before surgery).

Our results were lower than those reported by Mumme et al. [29] and Buchwald et al. [37] who reported of complete resolution diabetes in 59% and 78% of their patients, respectively one year after surgery. This variation may be due to differences in the mean blood glucose levels and the duration of diabetes in the patients preoperatively among different studies (the longer the duration of diabetes the less the expected resolution).

Ten patients (33.3%) had hypertension; one year after surgery, 3 patients (30%) achieved complete resolution of hypertension.

Our incidence of resolution of hypertension was more than that reported by Yan et al. [27] in their study which was 23%. On the other hand it was lower than that reported by Hinojosa et al. [41] which was 46%. This variation may be due to variation in the percent of hypertensive patients to the whole patients preoperatively and the degree of hypertension among studies.

Five patients (16.6%) had obstructive sleep apnea syndrome (SAS). One year after surgery, 4 patients (80%) achieved complete resolution of SAS.

Our incidence of resolution of (SAS) was similar to that reported by Buchwald et al. [42] who reported remission of SAS in 80.4% of their patients one year after surgery while it was a little lower than that reported by Puzziferri et al. [25] who reported remission of SAS in 88% of their patients one year after surgery.

Thirteen patients (43.3%) had dyslipidemia. One year after surgery, the lipid profile became normal in 10 patients (76.9%) and they discontinued their lipid-lowering medications, while the remaining 3 patients showed a significant improvement in their lipid profile but did not reach the normal levels yet.

Our results were slightly lower than those reported by Athyros et al. [43] who reported a return to normal range of lipid profile and discontinuation of lipid-lowering medications in 82% and 88% of their patients, respectively. Our incidence of resolution of dyslipidemia was slightly lower than these studies might be because the preoperative BMI and levels of lipid profile components might be higher in our patients than in these studies.

Three patients (10%) had reproductive problems. One year after surgery, one female patient with primary infertility (33.3%) got pregnant. Our incidence of resolution of infertility was a little lower than that reported by Puzziferri et al. [25] who reported resolution of infertility in 40% of their patients.

Fourteen patients (46.6%) had psychological upset. One year after surgery, 10 patients (71.4%) achieved a great improvement of the Psychological upset after achieving adequate weight loss and having a better appearance. Our results were similar to those reported by Puzziferri et al. [25] who reported improvement of depression in 71% of their patients one year after surgery.

**Conclusion**

We can conclude that:

Roux-en-Y gastric bypass operation is an effective and efficient operation as regard to reduction of body weight.

In addition to body weight reduction, RYGB is effective in amelioration or even cure of obesity related comorbidities.

The complication of the operation is reasonable and accepted as compared to its benefits in decreasing body weight, reducing or even curing obesity related comorbidities and improving quality of life.

RYGB has an excellent and effective role in reducing blood glucose level and even curing some diabetic patients, controlling and even curing hypertension in some hypertensive patients and improving lipid profile in patients with Hyperlipidemias.

Postoperative supplementation of calcium, vitamin D, iron and vitamin B12 mandatory following this procedure.

**References**


