Comparison of Comorbidity Resolution and Improvement between Laparoscopic Sleeve Gastrectomy and Laparoscopic Adjustable Gastric Banding

AHMED M. HASSAN, M.Sc.; AHMED M. HUSSEIN, M.D. and HANY A. BALAMOUN, M.D.
The Department of General Surgery, Faculty of Medicine, Cairo University

Abstract

Background: Obesity is considered one of the most common global health problems. There are a lot of bariatric surgeries to achieve the desirable weight loss. These operations are classified as either restrictive or malabsorptive, the restrictive procedures such as, Laparoscopic Adjustable Gastric Banding (LAGB) and Laparoscopic Sleeve Gastrectomy (LSG).

Methods: This study was conducted in Kasr El-Aini Hospital on 60 patients with morbid obesity with BMI of 40 Kg/m$^2$ or more, or BMI of 35Kg/m$^2$ with obesity related comorbidities and had failed trials of conservative management and all of them are bulk eater. Patients were randomly divided into 2 equal Groups, A and B of 30 patients each. Group A underwent laparoscopic sleeve gastrectomy, while Group B underwent laparoscopic adjustable banded gastroplasty. All patients were followed-up regularly for 6 months and both groups were compared as regard effect of both procedures on obesity related comorbidities.

Results: Both of the procedure significantly improved the patient co-morbidities. The two patients with joint pain had improvement after LAGB, 9 patients were hypertensive 7 of the had improvement and begin to decrease medication, 7 patients were diabetics 6 of them had improvement after the procedure, the patient with hyperlipidemia show improvement of lipid profile and the patient with renal impairment improved after the procedure and creatinine level begin to decrease.

Conclusion: Both LSG and laparoscopic adjustable gastric banding resulted in postoperative improvement or resolution of comorbidities associated with obesity.

Key Words: Morbid obesity – Bariatric surgery – Sleeve gastrectomy – Adjustable gastric band.

Introduction

OBESITY is a disease, and as such is in many respects not preventable. The components of this disease likely include a combination of environmental and genetic factors. The pathophysiology of obesity is complex and poorly understood, but it includes genetic, behavioral, psychological, and other factors [1].

The degrees of obesity are defined by Body Mass Index, (BMI) (calculated as weight in kilograms divided by height in meters squared), which correlates body weight with height. An internationally accepted definition of severe or morbid obesity is a BMI of $>35$Kg/m$^2$. Superobese is a term sometimes used to describe individuals who have a BMI of $>50$Kg/m$^2$ [2].

Overweight and obesity are emerging in developing countries as a result of rapidly changing lifestyle patterns, such as those of diet and physical activity, leading to an accelerated increase in overweight, obesity, and related chronic diseases. A transition in diet and physical activity patterns, leading to an energy-dense diet and a sedentary lifestyle, is known as the nutrition transition, the nutrition transition as a global phenomenon has been documented to include the industrialized nations of Europe and North America as well as lower-and middle-income countries of Asia, Latin America, the Caribbean, Africa, and the Middle East [3].

Obesity is one of the leading preventable causes of death worldwide. Large-scale American and European studies have found that mortality risk is lowest at a BMI of 20-25Kg/m$^2$ in non-smokers and at 24-27Kg/m$^2$ in current smokers, with risk increasing along with changes in either direction [4].

Bariatric surgery proved effective in providing weight loss of large magnitude, correction of co-morbidities and excellent short-term and long-term
Comparison of Comorbidity Resolution & Improvement between LSG & LAGB outcomes, decreasing overall mortality and providing a marked survival advantage [5].

Bariatric operations produce weight loss through two mechanisms. The most common is restriction of intake. Malabsorption of ingested food is the second mechanism. Restrictive operations may include no or only a modest malabsorptive component. Malabsorptive operations may have some restrictive component, but it is secondary to the malabsorptive aspect of the operation [6].

Restrictive operations as Laparoscopic Adjustable Gastric Banding (LAGB), Sleeve Gastrectomy (LSG), gastric plication and Vertical Banded Gastroplasty (VBG). Malabsorptive operations as Biliopancreatic Diversion (BPD), Jejunooileal Bypass (JIB). Combined restrictive and malabsorptive operations as Roux-en-Y Gastric Bypass (RYGB), biliopancreatic diversion with Duodenal Switch (DS). The most commonly performed procedures are gastric banding, Roux-en-Y gastric bypass, sleeve gastrectomy, and biliopancreatic diversion. Vertical banded gastroplasty (stomach stapling) is rarely if ever performed now because of its high long term failure rate [7].

Patients and Methods

This comparative prospective study was conducted in the Surgery Department, Kasr El-Aini Hospital in the period between December 2012 and March 2014.

The study groups were selected from the Surgery Department inpatients, Kasr El-Aini Hospital. The study was on patients suffering from morbid obesity. They were diagnosed as morbidly obese according to BMI of more than 40Kg/m² with or without obesity related comorbidities, or with BMI of more than 35Kg/m² with obesity related comorbidities and all of them had failed trials of conservative management.

In this study we discussed the effectiveness of both procedures on obesity related comorbidities as diabetes mellitus, hypertension, obstructive respiratory sleep apnea, bronchial asthma, dyslipidemia, ischemic heart disease, after both procedures.

Target population:

It included 60 morbidly obese patients fulfilling the following inclusion and exclusion criteria:

Inclusion criteria:
1. BMI >40Kg/m².
2. BMI >35Kg/m² with significant co-morbidity.
3. Age between 18-60 years.
4. No endocrinal causes for obesity.
5. Psychologically stable.
6. Sufficient non-surgical trials to reduce weight.
7. Motivation and acceptance of surgical risks.

Exclusion criteria:
1. Previous mal-absorptive or restrictive procedures performed for the treatment of obesity.
2. Women of childbearing potential who are pregnant or lactating at the time of screening or at the time of surgery.
3. Any condition which precludes compliance with the study; i.e. significant longstanding heart/lung disease other, severe systemic disease, or severe psychiatric illness.
4. Younger than 18 years or older than 60 years.

The included patients were basically subjected to written informed consent, full history taking, full clinical examination, body weight measurement and BMI calculation, full laboratory investigations, abdominal ultrasonography, pulmonary function tests, they are either subjected to either laparoscopic sleeve gastrectomy or laparoscopic adjustable gastric band.

Preoperative preparation:
1. Antibiotic prophylaxis in the form of intravenous injection of third generation cephalosporin with induction of anaesthesia.
2. Thromboprophylaxis in the form of low molecular weight heparin 12 hours before operations.

Operative technique:
1. After prophylactic antibiotics and general anaesthesia were administered, patients were positioned in the Lloyd-Davis position with the surgeon standing between the legs.
2. Elastic bandages were placed for DVT prophylaxis. A Foley catheter was inserted to monitor the urine output and an 18-Fr orogastric tube was also inserted to decompress the stomach to have an adequate working space.

Laparoscopic adjustable gastric band:
1. The pars flaccida approach was used in the dissection behind the cardia, after which the band was introduced and threaded through. A retrogastric tunnel was created by a very gentle blunt dissection. The tunnel entrance opened directly on the right crus and well above the bursa omentalis (pars...
flaccid technique). Every step was done under full vision of a 30-degree endoscope, and retrogastric tunnel was kept as small as possible. The band was then locked and the anterior stomach seromuscular oversewn to prevent slippage. The connecting tube was then threaded through the right epigastric port and connected to the injectable port which was then secured to the rectus sheath. Closure of the rectus sheath at the port sites 15mm and 10mm and skin of all wounds.

- We routinely put a drain in one of the trocar site after the procedure beside stomach to monitor for leakage or bleeding and then we remove the drain after 24 hours.

Laparoscopic sleeve gastrectomy:

- The first step consisted of exploration of the entire intrabdominal cavity then we opened the gastrocolic ligament attached to the stomach, usually starting 10-12cm from the pylorus toward the lower pole of the spleen. Then the gastric greater curvature was freed up to the cardio-oesophageal junction close to stomach sparing the gastro-epiploic vessels. Meticulous dissection was performed at the angle of his with full mobilization of the gastric fundus. The mobilization of the stomach continues dissecting the greater gastric curve toward the antrum up to 4-6cm from the pylorus.

- At this time an orogastric tube is inserted then the first stapler (6cm, 60, golden stabler if Ashlon or green stabler if Covedian) is applied through Rt trocar starting 4-6cm far from pylorus. Then, the stomach is stabled with linear staplers (6cm, 60, golden stabler if Ashlon or blue stabler if Covedian) parallel to orogastric tube along the lesser curve. The orogastric bougie is positioned to perform a methylene blue test. The transection line was inspected to search dye leakage.

- We routinely put a drain in one of the trocar site after the procedure beside stomach to monitor for leakage or bleeding and then we remove the drain after 24 hours.

Postoperatively:

Post-operatively, the patient was monitored for any surgical or anaesthetic complications. To prevent vomiting in the immediate postoperative period, all patients received IV antiemetic before the end of anesthesia together with IV proton pump inhibitors. All patients were ambulated early post-operatively.

A water-soluble contrast swallow was routinely performed on the 1st postoperative day to rule out gastric leakage.

Results

This study is a randomized study including 60 morbidly obese patients who fulfilled the selection criteria and formed the study population. The included patients were selected from surgical department inpatients, Kasr El-Aini Hospital. The study was done in the period between December 2012 and March 2014. The patient population was divided into two groups, subgroup A & B.

- **Subgroup A**: It included 30 patients who had laparoscopic sleeve gastrectomy as a surgical management for their obesity.

- **Subgroup B**: It included 30 patients who had laparoscopic adjustable gastric band as a surgical management of their obesity.

Patients were selected randomly from Surgical Department inpatients, Kasr El-Aini Hospital and then had either laparoscopic sleeve gastrectomy or laparoscopic gastric band.

Regarding obesity related comorbidities in patients who had LSG, 5 patient were diabetics and 4 patients were hypertensive.

Regarding obesity related comorbidities in patients who had LAGB, 2 patients were diabetics, 5 patients were hypertensives, 1 patient had hyperlipidemia, 1 patient had joint pain and 1 patient had renal impairment.

<table>
<thead>
<tr>
<th>Table (1): HTN group.</th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(A) Sleeve</td>
<td>(B) Band</td>
<td></td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td>30</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td><strong>% within group:</strong></td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

There was no statistically significant difference as regard HTN between both groups. Both groups were matched with a p-value of 0.500.
There was no statistically significant difference as regard DM between both groups. Both groups were matched with a \( p \)-value of 0.212.

There was no statistically significant difference as regard Hyperlipidemia between both groups. Both groups were matched with a \( p \)-value of 0.491.

There was no statistically significant difference as regard osteoarthritis between both groups. Both groups were matched with a \( p \)-value of 0.237.

Both procedures significantly improved the patient co-morbidities and those changes were related to \% EWL. The 2 patients with joint pain had improvement after LAGB. 9 patients were hypertensive 7 of the had improvement and begin to decrease medication. 7 patients were diabetics 6 of them had improvement after the procedure. The patient with hyperlipidemia show improvement of lipid profile and the patient with renal impairment improved after the procedure and creatinine level begin to decrease.
Discussion

Obesity represents a global health-problem that represents a major cause of morbidity and mortality with indirect effect on individual income and general economy [8].

This trend is ominous, because morbid obesity predisposes patients to comorbid diseases which affect nearly every organ system, including: type 2 diabetes, cardiovascular disease, hypertension, hyperlipidemia, hypoventilation syndrome, asthma, sleep apnea, stroke, pseudotumor cerebri, arthritis, several types of cancers, urinary incontinence, gallbladder disease, and depression [9].

Obesity shortens life expectancy [10], with increasing Body Mass Index (BMI) resulting in proportionally shorter lifespan [11]. With over 300,000 victims in the USA each year, morbid obesity is projected to overtake smoking as the leading cause of death in the near future [12].

Bariatric surgery proved to be effective in providing weight loss of large magnitude, correction of comorbidities and excellent short-term and long-term outcomes, decreasing overall mortality and providing an improved survival rate with better quality of life [5].

Adjustable gastric banding (wrapping a synthetic silicon, inflatable band around the stomach to create a small pouch between 10 to 15ml with a narrow outlet), with insertion of a subcutaneous reservoir under the rectus sheath so that gastric restriction can be adjusted by means of sterile saline injections under aseptic precaution, the procedure can be either performed openly or laparoscopically (more popular) approach. The band size can be adjusted in an outpatient setting without anesthesia [13].

More recently developed treatment as a sole procedure for treatment of morbid obesity is the vertical (sleeve) gastrectomy, in which resection of much of the gastric body leaves a narrow tube of stomach as an alimentary conduit. Laparoscopic Sleeve Gastrectomy (LSG) is an irreversible restrictive form of weight loss surgery in which approximately 80% of the stomach is removed leaving a cylindrical or sleeved shaped stomach with a capacity ranging from about 80 to 120cc [14].

This study is a comparative randomized prospective study aiming at comparing two of the most popular bariatric operations namely laparoscopic sleeve gastrectomy versus laparoscopic adjustable gastric banding as regard effect on obesity related comorbidities.

As regards obesity related comorbidities in morbidly obese patients in the current study, as diabetes mellitus, hypertension, osteoarthritis and hyperlipidemia, all of obesity related comorbidities were matched in both groups.

A study reported that in a 41 super-obese patients (9 patients with BMI >60Kg/m²) following LSG, 60% of major comorbidities were resolved and 24% improved, 57.8% of patients were morbidity-free and 31.5% had only one major morbidity. Also, they showed a reduction in the operative risk (ASA score) after LSG [15].

Another study stated that major improvements in comorbid factors have also been reported in association with the LAGB, 64% of diabetic patients experience remission and 26% have major improvements in diabetic control [16].

In a study by Juan et al., [17] comparing the clinical outcome of LSG with that of LAGB show that The mean rate of resolution or improvement in comorbidities for the LSG group was 68.2% compared with 49.1% for the laparoscopic adjustable gastric banding group. In the LSG group, DM, HTN, and LPD resolved or improved at a higher rate. Other comorbidities such as OSA, GERD, and asthma resolved or improved at similar rates in both groups.

Conclusion:

Although both LSG and laparoscopic adjustable gastric banding resulted in postoperative improvement or resolution of comorbidities associated with obesity, LSG showed a higher rate of resolution or improvement of DM and HTN.

References

الملخص العربي

تعتبر السمنة من أهم المشاكل الصحية العالمية. هناك العديد من جراحات السمنة المفرطة وتعتبر التدبيس الكمي بالمنظار وتركيب حزام المعدة بالمنظار من أشهر العمليات الجراحية للسمنة المفرطة.

أجريت هذه الدراسة في قسم الجراحة العامة بمستشفى قصر العيني في الفترة من ديسمبر 2011 إلى مارس 2014.

الهدف من الدراسة الحالي: مقارنة بين اثنين من عمليات السمنة المفرطة وهي الاستئصال الكمي للعدة بالمنظار وحزام المعدة بالمنظار.

وتأثير العمليتان في النتائج المصاحبة لإنقاص أوزان المرضى والأعراض والأمراض المصاحبة للسمنة.

امستقبل الدراسة على: 100 مريض سمنة مفرطة. تم تقسيم المرضى إلى مجموعتين:

المجموعة المستهدفة (أ): تشمل 50 مريض سمنة مفرطة الذين سيقومون بإجراء جراحة الاستئصال الكمي للعضة بالمنظار.

المجموعة المستهدفة (ب): تشمل 50 مريض سمنة مفرطة الذين سيقومون بإجراء جراحة حزام المعدة بالمنظار.

تم عمل الآتي لجميع المرضى:

• تاريخ مرضي كامل.
• فحص إكلينيكي كامل.
• قياس الوزن ودبل على الكتلة الجسمية (BMI) للمرضى.
• قياسات عملية كاملة، صورة دم وظائف كبد ووظائف كل.
• أشعة تفوقية على الربط.
• وظائف تنفس.

ثم بعد ذلك تم إجراء جراحة الاستئصال الكمي للعضة بالمنظار للمجموعة المستهدفة (أ) أو جراحة حزام المعدة بالمنظار للمجموعة المستهدفة (ب).

تم معالجة المرضى وتأثير العمليتان في النتائج المصاحبة لإنقاص أوزان المرضى والأعراض والأمراض المصاحبة للسمنة.

جميع المرضى في المجموعتين المستهدفتين كانوا متطابقين من حيث الأعراض والأمراض المصاحبة للسمنة.

بالنسبة للمقارنة بين المجموعتين من حيث التأثير على الأمراض المصاحبة للسمنة: أظهرت الدراسة نتيجة ملحوظة إحصائياً في تحسن الأمراض المصاحبة للسمنة بعد الجراحة بالنسبة لكلتا العمليتين مع وجود نسب تحسن أعلى مع حالات التدبيس الكمي للعضة.