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Review Article

Short Term Impact of Laparoscopic Sleeve Gastrectomy versus Gastric Bypass on Body Weight and Common Associated Comorbidities

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Abstract

Background: While laparoscopic sleeve gastrectomy (LSG), a restrictive procedure used as a first step for patients with severe obesity, laparoscopic Roux-en-Y gastric bypass (LRYGB) is not, it is a hybrid method that combines gastric restriction with gastrectomy and malabsorption LRYGB is a hybrid procedure that combines gastric restriction with gastrectomy and malabsorption. Due of its greater effectiveness when compared to very restricted methods, it has emerged as the most popular and accepted method. Before undergoing a mal-absorptive procedure, patients with excessive obesity (body mass index (BMI) >50 kg/m2) first undergo the restricted LSG approach, Similar outcomes have been obtained from both bariatric surgical techniques in terms of reduced cardiovascular risk, weight loss, enhanced glucose metabolism, significant changes in serum lipid concentrations, hypertension, and nutritional status.

The only long-term, reliable therapeutic option for obese individuals who have a high cardiovascular mortality rate is bariatric surgery

This study compared the effects of gastric bypass and laparoscopic sleeve gastrectomy, two bariatric surgical techniques, on body weight and common related comorbidities in obese people.

Keywords: Obesity, Single-Anastomosis Gastric Bypass, Roux-en-Y Gastric Bypass

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Introduction

When compared to non-surgical therapies, bariatric surgery is the most successful treatment option for severe obesity. Prolonged weight loss, increased quality of life, and comorbidities related to obesity are the key advantages of this surgery. [1]
Laparoscopic sleeve gastrectomy (LSG), laparoscopic Roux-en-Y gastric bypass (LRYGB), and single-anastomosis gastric bypass are among the available surgical procedures at the moment.[2]

LRYGB is a hybrid procedure that combines gastric restriction with gastrectomy and malabsorption. Due of its greater effectiveness when compared to very restricted methods, it has emerged as the most popular and accepted method. Before undergoing a mal-absorptive procedure, patients with excessive obesity (body mass index (BMI) >50 kg/m2) first undergo the restricted LSG approach.[3]

Similar outcomes have been obtained from both bariatric surgical techniques in terms of reduced cardiovascular risk, weight loss, enhanced glucose metabolism, significant changes in serum lipid concentrations, hypertension, and nutritional status.[4]

The only long-term, reliable therapeutic option for obese individuals who have a high cardiovascular mortality rate is bariatric surgery.[5]
This study compared the effects of two bariatric surgery procedures on body weight and common related comorbidities (Type II Diabetes, Hypertension, and Hyperlipidemia) in obese patients: laparoscopic sleeve gastrectomy and laparoscopic gastric bypass

Obesity and metabolic syndrome: Obesity is a multifaceted medical disease that raises the likelihood of several coexisting illnesses that impact different bodily systems.[6]

Insulin resistance (IR): is one of the most important adverse consequences of obesity in type 2 diabetes mellitus. The metabolic syndrome, which also includes low high-density lipoproteins, obesity, hypertriglyceridemia, glucose intolerance, IR, hypertension, and accelerated atherosclerosis, has been shown to be characterized by IR. [6]

Early in the genesis of IR, one of the main causes is chronic low-grade inflammation of the adipose tissue. One of the main causes of the metabolic inefficiency that results in IR is persistent inflamemation. Clinically, inflammation is identified by increased blood indicators such as C-reactive protein. Reducing inflammation and enhancing the body's overall glucose metabolism are common outcomes of deleting or silencing genes that affect how well insulin functions. Adipose tissue inflammation is similarly reduced when there is less insulin in the blood. Changes in adiponectin levels can have an impact on chronic inflammation through weight gain or reduction. Adiponectin levels rise in response to weight reduction, which reduces inflammation. [7]

Dyslipidemia: is a lipoprotein metabolism condition characterized by abnormal blood lipid levels. Patients with obesity typically have dyslipidemia, which is one of the earliest indications that there may be a metabolic problem. Although the exact causes of hypertension in obese persons are unknown, there is compelling evidence linking the kidneys to the condition.[6]

Hypertension:evidence suggests a strong correlation between obesity and the rise in the prevalence of chronic kidney disease (CKD), including hypertension. CKD affects 20% of adult patients. Additionally, the two primary causes of chronic kidney disease (CKD), diabetes and hypertension, are directly linked to visceral fat. The following are some of the hypothesized mechanisms of obesity-related hypertension linked to diabetic cardiomyopathy: hyperleptinemia, angiotensin II activation, hyperinsulinemia, decreased baroreceptor sensitivity, and kidney compression from fat buildup. [8]

Atherosclerosis: As fat accumulates around the abdomen, it also does so around the heart. There is mounting evidence that suggests a rise in visceral fat, resulting in elevated levels of leptin and decreased levels of adiponectin, might be the trigger for the rapid accumulation of atherosclerotic plaques and their localized distribution inside the coronary arteries. It's also been demonstrated that a low adiponectin level is a hallmark of the metabolic syndrome.[9]

Diabetes-related cardiomyopathy, or DCM: is an advancing condition. The early central flaw is the activation of protein kinase C, which modifies the myocardium's response to stress. The pathop-

hysiology of DCM is caused by modifications to contractile proteins, elevation of reactive oxygen species, reduction of aerobic energy generation, and changes in calcium homeostasis. [10]

Sleeve Gastrectomy:

For individuals with lower BMIs, LSG is also being employed as the main weight-loss technique. This operation is now being carried out as part of an exploratory protocol for this patient group with a lower BMI because it is a more recent use of the technique.[11]

There are several reasons why a sleeve gastrectomy could be done: There is a larger than 35 body mass index.-severe concomitant conditions (liver, lung, and cardiac)-old age-Crohn's disease (inflammatory bowel illness)-Requirement to continue taking particular drugs (anti-inflammatory drugs, transplant drugs)-Requirement for ongoing stomach monitoring (that was not possible to assess following a gastric bypass)-During the procedure, a severely enlarged liver was discovered.-severe adhesions to the colon that were discovered following surgery-any mix of the aforementioned factors that considerably raises the patient's risk. [11]

With minimal long-term problems and less concerns about nutrition, the sleeve gastrectomy is a very simple treatment that shrinks the stomach and produces great weight reduction outcomes. To put it simply, gastric bypass increases the benefit of weight loss but also increases the danger of problems. The hazards associated with gastric bypass surgery are just too much for some patients to bear. [12]

Surgical Technique:

During the general anesthesia procedure, the patients were placed on an operating table that could support a maximum weight of 450 kg. With the table in reverse Trendelenburg position and the patients in a supine position, the patients were kept from slipping caudally down the operating table by cushioned foot plates. Pneumatic calf compressors were used intermittently, and a prophylactic intravenous cephalosporin was given before the incision and after the introduction of a Foley catheter. [13]

The surgeon's right hand instrument was inserted in a 12-mm port at the level of the left midclavicular line (MCL), his left hand instrument was placed in a right MCL port, and his assistant's tools and/or liver retractor were placed in a bilateral anterior axillary line (AAL). The carbon dioxide (CO2) was infused and maintained at a pressure of 12–16 mmHg. Using a Harmonic scalpel (Ethicon Endo-Surgery Inc., Cincinnati, OH, USA) or the Ligasure device (Tyco, New Haven, CT, USA), the greater omentum was separated medial to the gastroepiploic arcade and near to the stomach wall. The dissection, which begins opposite the Latarjet nerve on the antrum and extends 6 cm proximal to the laparoscopic sleeve gastrectomy (LSG), entails a longitudinal resection of the stomach on the larger curvature up to the angle of His (Figure1).[14]

The segmentation of the gastro-colic and gastro-splenic ligaments near the stomach allows for the division of the vascular supply of the stomach's larger curvature, which is the first stage in the process. To fully resect the gastric fundus, which houses the stomach's ghrelin-secreting cells, the greater curvature must be released all the way to the left crus of the diaphragm. The longitudinal gastrectomy, which reduces the stomach to a thin tube by "sleeving" it, is the second stage of the treatment (Figure 2).[15]

To ensure accurate calibration and prevent gastric stenosis after a gastric plasty, a naso-gastric tube is utilized. There is disagreement about the best place to begin a gastric bypass and the appropriate naso-gastric tube caliber. Various writers have reported on naso-gastric tube calibres ranging from 32 Fr to 60 Fr. Starting the gastrectomy 10 cm in front of the pylorus was Gagner's recommendation. When considering a duodenal switch (DS), Neagoe et al. suggested beginning 4 cm from the pylorus, and 6 cm from it if the LSG is to be the only bariatric treatment.[16]

In order to make the surgery more restrictive, the gastric tube should be fashioned utilizing a small diameter bougie and started closer to the pylorus. The gastric tube's ultimate capacity can range from 60 mL to 200 mL, according to reports. To lessen the likelihood of bleeding or leakage, sutures can be used to strengthen the staple line. [17]

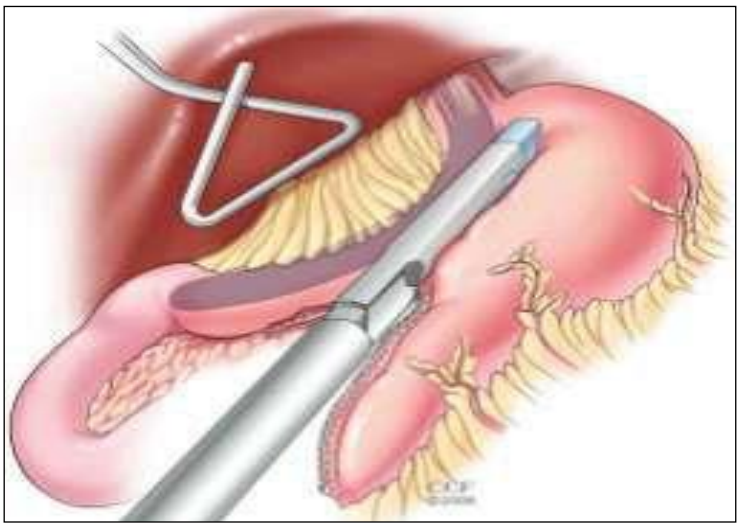

Figure 1: Laparoscopic sleeve gastrectomy. The stapler is fired successively from the antrum to the angle of His adjacent to an intragastric bougie [14]

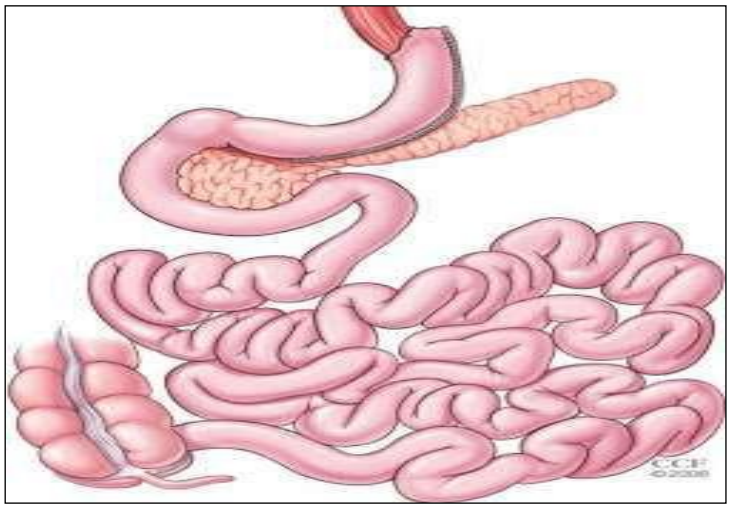

Figure2: Completed sleeve gastrectomy demonstrating a tubularized stomach [15]

Gastric Bypass:

There has long been a history of attempts at different surgical treatments to treat obesity. But as a means of treating extreme obesity, contemporary bariatric surgery just started to take shape in the middle of the 20th century. The 1960s and 1970s saw the development of the first bariatric procedures, including the jejuno-ileal bypass and vertical banded gastroplasty (VBG). By changing the structure of the digestive tract, these operations sought to cause weight reduction (Figure 3).[18]

In the 1960s and 1970s, Drs. Edward Mason and Chikashi Ito invented the Roux-en-Y Gastric Bypass in its current form. Often referred to as the "father of obesity surgery," Dr. Mason improved the process and increased its efficacy and safety. The surgical method employed in the process is referred to as "Roux-en-Y". In the small intestine, a Y-shaped link must be made. The term "Roux-en-Y" comes from the Swiss surgeon César Roux, and the letter "Y" stands for the intestinal arrangement. [18]

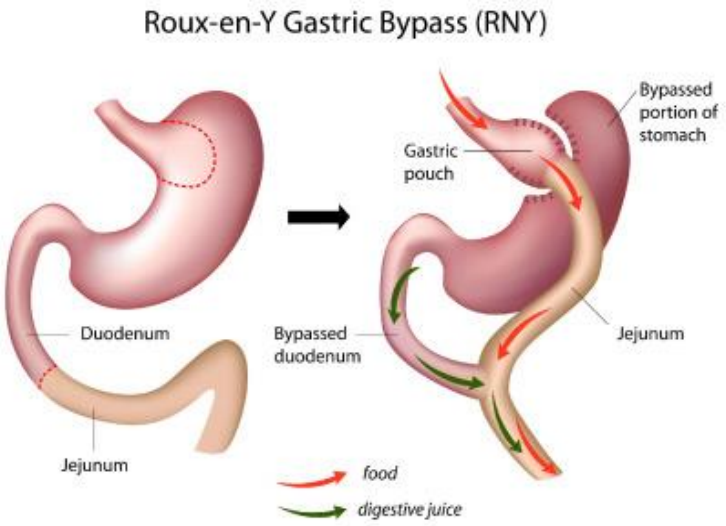

Figure 3: ROUX-EN-Y Gastric Bypass (RYGB) [19]

Types of gastric bypass:

The Roux-en-Y Gastric Bypass (RYGB) is a popular and successful bariatric procedure that modifies the small intestine and stomach's structure to aid in weight loss in obese patients. Although there is a conventional RYGB method, many versions and adjustments have been created to cater to certain patient requirements or preferences. [20]

Standard Roux-en-Y Gastric Bypass (RYGB): Procedure: In a typical RYGB, the stomach's capacity is decreased by stapling its top portion, forming a tiny stomach pouch. The small intestine is then split, with the upper part being rejoined further down the jejunum to form the "biliopancreatic limb" and the lower part (jejunum) connected to the small stomach pouch to form the "Roux limb." The Y-shaped configuration allows food to bypass a significant portion of the stomach and duodenum, limiting the amount of food that can be eaten as well as the absorption of calories and nutrients. [20]

Single Anastomosis Sleeve Ileal bypass (SASI): Procedure: A less complex surgical version of RYGB is the small gastric bypass. Similar to a sleeve gastrectomy, a tubular stomach is produced rather than a little stomach pouch. After that, the tubular stomach is joined to the small intestine, obviating a section of the intestine. Although less complicated, this method is nevertheless useful for losing weight. [21]

One Anastomosis Gastric Bypass (OAGB): Procedure: Known by another name, the Omega Loop Gastric Bypass, this operation entails making a single anastomosis, or link, between the small intestine and the stomach pouch. Compared to the typical RYGB, it features a single point of attachment between the intestine and the stomach, which can make surgery easier. But in contrast to the conventional RYGB, it has certain special dangers and advantages. [22]

Indications:

Guidelines for providing bariatric surgery were published by the National Institute for Clinical Excellence in the UK. Similar standards are also found in the US. All of the following must be present in the indications:

BMI >40 kg/m^2 or 35–40 kg/m^2 with a condition that responds to weight loss-For more than six months, no non-operative strategy has been able to keep weight loss stable.-overseen by a specialized obesity service.-Sufficient to endure anesthetic and surgical procedures.-promises to follow up for a long time.

It is challenging to evaluate follow-up process commitment prior to surgery. There is no proven way to predict success in weight loss with medical supervision. [23]

Restrictions:

Psychosocial problems such as drug or alcohol use disorders, as well as Crohn's disease, might be considered relative contraindications. Patients with significant intellectual disabilities are unlikely to be effective candidates for surgery because a high degree of patient knowledge of the risks and

lifestyle consequences of the procedure needs to be demonstrated. Patients who have epilepsy should reassess their drug regimen since bypass surgery alters the absorption. Therefore, it is important to seek out meticulous decision-making before to surgery with the assistance of neurologists and pharmacists. [24]

One of the absolute contraindications is being pregnant. Patients with severe incapacitating systemic disorders are not eligible for surgery. [24] These diseases include end-stage renal disease, unstable coronary artery disease, severe heart failure, cirrhosis, portal hypertension, and/or aggressive malignancy.

Preparation:

When it comes to the treatment of bariatric patients, the interprofessional team is essential. Bariatric surgeons, bariatric doctors, bariatric nurses, specialized anesthetists, and psychologists make up the team. Attending support groups is also recommended for a lot of patients. The group educates the patients on various surgical procedures, including their ramifications, reversibility, and complications. [19]

Finding and optimizing the surgical candidate's treatable comorbidities is another responsibility of the team. Managing type 2 diabetes mellitus and obstructive sleep apnea should be the main priorities.The American Society of Anesthesiology (ASA) grade, which measures anesthetic risk, can be lowered with medical optimization.[19]

An area of study focused on improving which patient groups receive an offer for bariatric surgery is risk classification of patients. Patients are scored out of five for the male sex, age greater than or equal to 45, BMI greater than or equal to 50, presence of hypertension, and known risk of venous thromboembolic illness on the Obesity Surgery-Mortality Risk score (OS-MRS), which has been validated for use in gastric bypass surgery.Class A (0–1) low-risk individuals had a 12-fold lower mortality risk than class C (4-5 points). [25]

It's interesting to note that class C patients have bypass surgeries far more frequently, according to statistics from the National Bariatric Surgery Registry (NBSR) in the UK and Ireland.A two-week milk diet is recommended for patients since it minimizes the size of the liver and eases resistance and mobility restrictions during laparoscopic procedures. The patient is given venous thromboembolism prophylaxis the day of the procedure, and bilateral application of stockings or intermittent pressure calf compression devices is performed. [25]

Postoperative care of bariatric surgery:

Early problems following bariatric surgery may include nausea, vomiting, leakage, bleeding, and venous thromboembolisms (VTEs). With the use of many antiemetics and opioid-free anesthesia, nausea and vomiting can be lessened, depending on the patient and surgical parameters. Anastomotic leaks can dramatically raise morbidity and death rates; they are more likely in individuals undergoing revision surgery or with a high body mass index. Obese individuals are especially susceptible to postoperative pulmonary problems, even though postoperative bleeding only happens in a tiny number of cases. In order to avoid deficits, post-surgery nutritional monitoring is essential. [26]

Initial post-operative phase; one to three days following bariatric surgery:

When a bariatric procedure is completed, patients are brought right away to the post-anesthesia care unit (PACU). Following the gastrografin leak test, oral treatment is often started on postoperative day (POD) one in tablet or crushed-tablet and liquid form if there is a naso-gastric tube. Every 12 hours during the first two PODs and every 24 hours for the next three days, a basic metabolic profile (such as the complete blood count, electrolytes, renal function, liver function, prothrombin time, and partial thromboplastin time) should be collected. After receiving oxygen using a nasal cannula, the patient is weaned. [27]

The type of surgery, the anesthetic methods employed, and the patient's prior illnesses all influence the chance that an early specific complication may occur for a particular patient.

Early postoperative consequences after bariatric surgery frequently involve respiratory issues. Respiratory compromise is more common in patients with major comorbidities, especially in the form of neuromuscular, pulmonary, or cardiac issues; nonetheless, hypoxemia following bariatric surgery can occur in any patient. After bariatric surgeries, prophylaxis against Deep Venous Thrombosis (DVT) involves ultrasound evaluation for all

patients, application of the D-dimer test for suspected patients with DVT, particularly after extended operative times, and possible need for repeat ultrasound or venography for patients with suspected calf vein DVT and a negative initial ultrasound investigation.[26]

Late post operative monitoring:
Most patients are sent to the inpatient surgical postoperative unit following their stay in the PACU. The postoperative priority over the next 24 to 72 hours include ruling out an anastomotic leak after laparoscopic SG or RYGB. Patients are permitted to begin a clear liquid diet and soft drinks if no leak is seen. The following are under the purview of the postoperative care team: pain management, wound care, blood pressure monitoring, intravenous fluid management, pulmonary hygiene, and ambulation.

The duration of the operation is directly associated with post-bariatric nausea and vomiting, which also rises in females, non-smokers, and patients with a history of vomiting or motion sickness. Preventive medication therapy administered before to the onset of post-operative nausea and vomiting substantially lowers the likelihood of this occurring following surgery. [27]

After hospital discharge Nutrition
Patients are typically released 4-6 days following surgery. Patients should be instructed to continue keeping an eye on their urine output and hydration levels as most patients are usually released from the hospital after being given just a liquid diet. After surgery, the diet is progressively switched to soft, solid meals for two to three weeks. During the first month, the typical calorie intake varies from (400) to (800) kcal/d, significantly lowering the daily glycemic load. We recommend that patients follow a daily diet of salads, fruits, vegetables, and soft protein. [26]

Patients should be taught to eat slowly, to stop as soon as they are satisfied, and to avoid consuming food and liquids at the same time in order to manage their epigastric discomfort and vomiting.
Consideration should be given to prokinetic treatment and proton-pump inhibitors (PPIs) for the majority of individuals with persistent vomiting. Individuals who have had SG, OAGB, or RYGB procedures gain from a carefully thought-out dietary supplement. Patients should be aware that although their body has changed due to surgery, their surroundings have not. They should make appropriate dietary choices, eat meals at regular intervals, and see a dietician often in the first 12 months following surgery. On the other hand, patients may decide to adopt a more vegetarian diet if they acquire a food intolerance. [28]

Fresh fruits and vegetables, however, are typically accepted without issue. A daily protein intake of 1.0 to 1.5 g/kg of ideal body weight is recommended. For both macro- and micronutrients, the biliopancreatic diversion/duodenal switch (BPD/DS) operation is malabsorptive. Therefore, we recommend a greater daily protein consumption of 1.5 to 2.0 g of protein/kg of ideal body weight, resulting in an approximate daily protein need of 90 g. In the first six to twelve months following surgery, alcohol is best avoided. [29]

Monitoring: Until the fast weight loss period subsides, which typically happens in 4-6 months, patients should have their blood pressure and weight checked weekly. After that, they should have these measurements done annually and again at 8, 10, and 12 months. Diabetic patients are advised to monitor their blood sugar levels every day. After bariatric surgery, glucose control usually becomes better quite quickly. At the time of discharge, patients who are still on antihypertensive or diabetic drugs should be closely watched for hypotension and hypoglycemia, respectively, and their dosage should be changed appropriately. A complete blood count, electrolytes, glucose and glucose tolerance test, complete iron studies, vitamin B12, aminotransferases, alkaline phosphatase, bilirubin, GGT, total protein and albumin, complete lipid profile, 25-hydroxyvitamin D, parathyroid hormone, thiamine, folate, zinc, and copper are among the laboratory tests that we recommend be carried out at three, six, and nine months, as well as every year after that. [28]

The complications that arise from surgical therapy for extreme obesity differ depending on the specific method used. Common late-phase complications following bariatric surgery include infection, esophagitis, reflux, vomiting, dumping syndrome, renal failure, gastric prolapse, hypocalcemia, gastric remnant distension, stomal stenosis/ obstructtion, marginal ulcerations, cholilithiasis, ventral

incisional hernia, internal hernia, and hitus hernia.[27]

Nonetheless, the physician has to be cognizant of the unique risks associated with each bariatric operation. The physician should be aware that there is little data about how different bariatric procedures affect drug absorption and metabolism before to starting treatment. However, RYGB and other malabsorptive techniques that severely omit the small intestine's proximal region reduce the surface area where the majority of drug absorption takes place and may lower the medication's systemic bioavailability. [29]

Impact of Gastric Bypass and Sleeve Gastrectomy on Body Mass Index:

Both gastric bypass and sleeve gastrectomy are powerful bariatric surgery weight reduction treatments that significantly lower body mass index (BMI). [22]

As regard sleeve gastrectomy,after surgery, most patients lose between 60 and 70 percent of their extra weight in the first year. Depending on the starting weight, there is typically a significant drop in BMI, generally amounting to a loss of 5 to 15 points or more. Additionally, long-term research indicates that while some weight gain is normal, the majority of patients maintain considerable weight decrease over time.[30]

As regard gastric bypass,patients who have gastric bypass surgery can lose up to 70–80% of their extra weight, which is often more weight reduction than sleeve gastrectomy.

BMI indicates that this frequently results in a more notable BMI decrease, with patients perhaps losing up to 10 to 20 BMI points, depending on their starting weight. Even while gastric bypass has a somewhat greater incidence of long-term weight reduction, some individuals may regain weight years later. [30]

In a recent research, the mean BMI considerably dropped from baseline to 5 years post-operation (from 43.5 to 32.5 in the group that had a sleeve gastrectomy and from 44.3 to 31.6 in the group that had a Roux-en-Y gastric bypass; $P < .001$. [22]

Impact of Gastric Bypass and Sleeve Gastrectomy on Comorbidities Associated with Obesity: Diabetes Mellitus Type 2

Before beginning either the RYGB or LSG procedure, comorbid conditions are assessed in each patient. Type 2 diabetes mellitus (T2DM) is a highly common comorbidity in this patient population; T2DM is defined as hemoglobin A1C (HbA1C) greater than 6.5%, fasting plasma glucose (FPG) greater than 126 mg/dL, or plasma glucose greater than 200 mg/dL following a two-hour glucose tolerance test. [31]

Numerous studies on the impact of bariatric surgery on type 2 diabetes have demonstrated great outcomes in terms of total disease remission as well as a reduction in medication use in individuals who did not achieve remission. [31] Additional evidence points to the possibility that bariatric surgery might work well as a first-line treatment for managing comorbid illnesses and obesity. [32]

Hyperlipidemia:

It has been demonstrated that bariatric surgery extends the positive impact it has on other comorbidities, such as hyperlipidemia (HLD). defined as above 190 mg/dL of low density lipoprotein (LDL) cholesterol, or above 160 mg/dL and 130 mg/dL in the presence of one or two main risk factors for cardiovascular disease, respectively. Secondary or "acquired" HLD is significantly associated with central obesity and is mostly caused by dietary sources of cholesterol or saturated fats. It is characterized by notable test results of increased LDL cholesterol or low HDL cholesterol (Chacon et al., 2022).

Hypertension:

Initially, the majority of patients receiving bariatric surgery had hypertension (HTN) as a cooccurring condition with obesity. defined by the American Heart Association.[33] as a systolic blood pressure (SBP) of 130-139 mmHg or a diastolic pressure of 80-89 mmHg. Pharmacological therapy recommendations start at 140/90 mmHg, with a therapeutic aim that is lower than that number. Following surgery, blood pressure readings are monitored continuously, and the diagnosis is reevaluated at every appointment. Patients' HTN has been demonstrated to improve after bariatric surgery using RYGB or SG, either by a complete remission of the illness or a reduction in the need for medication. [34]

Impact of sleeve gastrectomy on the state of nutrition:

Resection of the stomach hinders the absorption and digestion of iron, vitamin B12, and other nutrients that are attached to proteins by reducing acid secretion and mechanical digestion. Moreover, a transient mid-gastric stricture may result in persistent vomiting. Additionally, post-operative modifications to the gastrointestinal tract may result in issues such food intolerance, and a decrease in food intake may lead to nutritional deficits.(35)

Following bariatric surgery, iron, vitamin B12, calcium, vitamin D, folic acid, copper, zinc, and inadequate calorie and protein intake are the most prevalent nutritional deficits in patients. Before and after surgery, individuals with morbid obesity frequently have these dietary inadequacies. To avoid nutritional deficits, preoperative supplements and ongoing nutritional follow-up are necessary.(36)

Although bariatric surgery improves diabetes and hypertension and has many other favorable therapeutic effects, it also restricts food intake and increases the risk of food intolerance, which manifests as nausea, vomiting, and regurgitation. (37)

Resection of the stomach's gastric body lowers acid secretion and mechanical digestion, which hinders the absorption and digestion of iron, vitamin B12, and other nutrients attached to proteins. Furthermore, there is a decrease in the production of intrinsic factors, which leads to an even greater impairment of the absorption of vitamin B12. Following surgery, vitamin B12 levels were likewise found to be stable or improved in other instances. Furthermore, it may take up to four years for vitamin B12 storage to diminish if prescription is stopped and unhealthy eating habits are resumed.(37)

Consequently, for the majority of patients, taking a multivitamin supplement that contains vitamin B12 may be enough to maintain a normal level. Due to hypochlorhydria and skipping important iron absorption sites including the duodenum and proximal jejunum, bariatric surgical operations decrease the absorption of dietary iron. Due to a general decrease in appetite and the emergence of dietary intolerances, including a significant iron source like meat, there is also a reduced intake of oral iron. Menstruating women who have had a sleeve gastrectomy, a Roux-en-Y gastric bypass, or biliopancreatic diversion with duodenal switch should take 45–70 mg of elemental iron per day to avoid iron deficiency.(38)

Following bariatric surgery, vitamin D insufficiency can occur in up to 100% of cases. After undergoing bariatric surgery, 10%–25% and 25%–48% of patients, respectively, have been observed to suffer calcium shortage at the end of two and four years, whereas 17%–52% and 50%–63% of patients experience vitamin D deficiency in the same time frame.(37)

Impact of gastric bypass surgery on nutritional status:

Changes in calcium levels following bariatric surgery may be caused by accelerated bone remodeling following the procedure, as well as by a reduction in mechanical bone loading that follows the procedure as a result of weight loss. Additional potential pathways for the effects of gastric bypass on nutritional status might include malabsorption, subsequent abnormalities in calciotropic hormones, or hormone changes in the gut and adipose tissue.(39)

According to a recent study, iron and vitamin B12 deficits were the two main causes of anemia in 15–20% of patients. The significant variations in mean corpuscular volume, erythrocyte count, and the amounts of iron, haemoglobin, ferritin, and transferrin suggest that RYGB and LSG both affect erythropoiesis and iron metabolism.

Even though a large number of the observed differences are statistically significant, it's not always apparent what the differences mean clinically. (39)

This limits the absorption of vitamins B1, B2, B6, folate, vitamin C, calcium, iron, and so on. The duodenum and proximal jejunum are skipped. Furthermore, shortages in fat-soluble vitamins, particularly vitamin D, are brought on by the pancreatic and biliary fluids' inability to combine with dietary fat in the proximal jejunum. (40)

Gastric bypass and sleeve gastrectomy's complications and management:

Sleeve gastrectomy complications and their treatment Initial complications:

Bleeding,the most common side effect following a laparoscopic sleeve gastrectomy (LSG) is bleeding. It generally develops in the staple line, although it can also result from improper blood vessel coagulation, harm to the liver and spleen, or problems with hemostasis. The most common cause of gastrointestinal hemorrhage is bleeding from the staple line. Patients exhibit melena and hematemesis, two signs of upper gastrointestinal bleeding. (41)

Blood loss into the peritoneal cavity then shows up as hypotension, tachycardia, and low hemoglobin levels. Usually, injuries to the liver and spleen, bleeding from the trocar site, or injuries to the staple line are the causes of peritoneal hemorrhage. It is advised that the staple line be strengthened with sutures and that blood pressure be kept between 140 and 150 mm Hg during the last part of the procedure in order to prevent postoperative haemorrhage.(41)
Blood transfusions and revision surgery are two methods of managing bleeding that are used to identify the bleeding cause. (41)

Leakage , although leaks can appear anywhere along the staple line, they most frequently form immediately below the gastroesophageal junction in 85% of cases. This is most likely related to the elevated intragastric pressure brought on by ischaemia and decreased peristalsis. Leaks following laparoscopic self-gastrectomy (LOSG) are linked to changes in surgical technique (removal of the staple line, distance from the pylorus to the start of the stomach resection, size of the gastric tube) as well as the co-existence of metabolic syndrome components, primarily type 2 diabetes. (41)

Furthermore, it has been demonstrated that immunosuppressive medication, smoking, poor postoperative nutrition, and corticosteroid usage all raise the risk of fistula and leak development. (42)

The patient's condition determines how best to treat patients with stomach leaks. Patients in stable condition may be started on conservative therapy, which consists of intravenous hydration, broad-spectrum antibiotics, proton pump inhibitors, and restriction of food and fluids. An indication for endoscopic intervention (Endoclips or endoprosthesis) is the absence of improvement in clinical and radiological parameters following conservative therapy. Laparoscopic or open lavage and peritoneal cavity draining should be done on an unstable

The development of fistulas and abscesses is the primary result of leak formation.(43)
An upper gastrointestinal tract contrast X-ray is part of the diagnostic management. However, because to the contrast's quick transit, the results may be accurate in many circumstances, particularly if the leak is in the upper left stomach region. Usually, the leakage is apparent in the left subdiaphragmatic area or over the staple line. (43)

Acute pancreatitis ,typically experience fever, nausea, vomiting, and epigastric pain that radiates to the back. The intraoperative manipulation of peripancreatic tissue is likely linked to the development of acute pancreatitis following bariatric surgery. Secondly, following a gastrectomy, it could have something to do with decreased pancreatic microcirculation. On the basis of computed tomography, the diagnosis is determined. The best course of action for treating acute pancreatitis includes replacing lost fluids, balancing electrolytes, giving antibiotics, and maintaining a healthy diet. (44)

Venous thromboembolism following surgery (VTE) : One of the main causes of early death following bariatric surgery is ventilator-associated pneumonia (VTE), a potentially fatal consequence. Following bariatric surgery, the incidence of VTE varies from 0.06% to 2.20%. Longer operating times, transfusions, and a history of deep vein thrombosis (DVT) have been shown by Gambhir et al. to be linked to an increased risk of DVT or pulmonary embolism (PE).(45)

Asymmetrical swelling, warmth, and discomfort in the lower limbs are the hallmark symptoms of deep vein thrombosis (DVT). Pulmonary embolism symptoms are non-specific and can occur in other illnesses as well. Symptoms of pneumonia include dyspnea, hypoxemia, tachycardia, and chest discomfort. Since D-dimer has a strong negative predictive value, it is recommended that all patients who are suspected of having PE or DVT have their levels checked. For DVT, ultrasonography is the first-line imaging modality; for pulmonary embolism, computed tomographic angiography is the preferred approach.

Anticoagulation is a crucial component of thromboembolic event prevention and management.[45]

Late complications:
Stomach stenosis, After LSG, the incidence of gastric stenosis is about 1%; however, in cases of revision surgery, this rises dramatically to as high as 10%. Patients exhibit dysphagia, nausea, vomiting, and food intolerance symptoms. Leak and abscess presence, excessively tight gastric sleeve, mediastinal migration of the cardia, and intramural hemorrhage following oversewing of the staple line are all indicative of an organic stenosis. Axial torsion of the stomach tube, blockage at the incisura angularis, and volvulus of the small intestine are the causes of functional gastric stenosis. [46]

Management: Endoscopic pneumatic dilation is the first-choice therapy for gastric stenosis and is thought to be a safe and efficient procedure. [46]

Gastroesophageal reflux disease (GERD) is also linked to the onset or exacerbation of laparoscopic sleeve gastrectomy. 213 individuals who had undergone LSG were included in the study by Althuwaini et al. Of the group, 47.06% reported having heartburn for the first time. Following surgery, the frequency of regurgitation and dysphagia also rose. Reduced oesophageal sphincter tension, blunting of the His angle, slower gastric emptying, and decreased gastric volume and compliance are all linked to an increased incidence of GERD following LSG, which raises intragastric pressure. [47]

Gastric bypass complications and their management:
Leakage , A potentially lethal consequence of gastro-jejunal anastomosis is an anastomotic leak. It can happen in up to 3% of instances and usually shows up within 24 hours. There is a good probability that bleeding from staple lines and anastomoses will stop on its own. Iatrogenic stricture at the JJ anastomosis, port site hernia, and small bowel volvulus may all cause early intestinal blockage. [48]

Management:
foremost things foremost, stabilize the patient by treating any sepsis or fluid imbalance. NPO (Nil Per Os): Patients are often maintained on a fast to give their digestive tracts a break. Antibiotics: Both infection treatment and prevention are initiated with broad-spectrum antibiotics. Surgical repair: Occasionally, particularly in situations involving big leaks or individuals who are unstable, surgical intervention may be necessary to fix the leak. Endoscopic techniques: For minor leaks or in individuals who are medically stable, endoscopic stent implantation or clipping may be alternatives. Drainage: In cases when there is a substantial fluid accumulation or an abscess, percutaneous drainage may be required.[49]

Nutritional deficits ,one of the possible side effects of Roux-en-Y Gastric Bypass (RYGB) surgery is nutritional deficits. Although RYGB is useful in treating obesity-related illnesses and helping people lose weight, it can change the structure of the digestive tract, which can impact how well nutrients are absorbed.[50]

Management:
Monitoring and Supplementation: Patients with RYGB usually need lifelong monitoring and supplementation to reduce the risk of nutritional deficits. As directed by their medical professionals, they might need to take vitamin and mineral supplements, including multivitamins, calcium, iron, vitamin B12, and others. [50]

Dietary Changes: Patients also need to make substantial dietary changes, such as eating a balanced diet high in nutrients, focusing on their protein consumption, and consuming foods high in nutrients. To guarantee sufficient nutrition, it is frequently advised to eat frequent, modest meals and snacks. [50]

In conclusion:
-LGB and LSG were useful modes of treatments for managing obesity in obese patients over the short term. Both methods work well for maintaining post-surgical comorbidities, iron, ferritin A, HDL, and LDL levels, as well as HbA1c percentage. with over advantages of sleeve gastrectomy in terms of a quicker recovery period and sustaining levels of calcium, iron, and ferritin A, even a year following surgery.

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