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Case Report

Postoperative Complications in Metabolic Surgery

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Abstract

Objective: The objective of this study is to demonstrate the major contribution of metabolic surgery in the treatment of obesity and the improvement or even complete remission of its associated comorbidities.

Patients and Methods: The study base of this thesis comprises a cohort of 272 patients diagnosed and treated at various stages of obesity at the Bariatric Surgery Center in Bucharest between January 2018, and June 2019.

Results: A higher prevalence of female patients (71%) and urban origin (88%) is a general characteristic of candidates for bariatric surgery. Patient compliance tends to favor laparoscopic vertical sleeve gastrectomy, with the decisive factor being the short hospital stay duration. Laparoscopic vertical sleeve gastrectomy requires thorough preoperative patient education regarding potential complications. A postoperative complication rate of 35.7% was observed, which aligns with rates reported in multicenter studies. All patients experienced significant weight loss 12 months after undergoing laparoscopic vertical sleeve gastrectomy, with an average excess weight loss percentage of 59.6%. The success of the surgical procedure showed higher values in diabetic patients compared to non-diabetic patients 12 months postoperatively, with marked weight loss during the first three months after surgery. More than half of the studied cohort (53.67%) presented with a BMI corresponding to grade II obesity, indicating a correlation between weight status awareness and the timing of seeking medical advice. Average plasma HbA1c levels demonstrated a consistent decline throughout the follow-up period. Dyslipidemia resolved in 48.8% of the patients. Both the short median hospitalization duration (2 days) and direct costs support the use of laparoscopic vertical sleeve gastrectomy.

Conclusion: The revision rate for vertical sleeve gastrectomy largely depends on the patient's eating behavior. Skipping the preoperative psychiatric evaluation significantly reduces the success rate at 12 months postoperatively due to the adoption of harmful behaviors by patients.Recognizing that bariatric surgery is the only viable solution for sustained weight loss and improved quality of life in patients with morbid obesity underscores the need to incorporate these procedures into treatment guidelines and expand public access to this treatment option.

Keywords: Metabolic Surgery; Obesity; Postoperative Complications; Surgical Techn

Introduction

Definition

Obesity is a disorder of metabolic processes with a mixed etiology—genetic, nervous, and caused by external factors—which leads to an alteration of energy balance. This process manifests through an increase in nutritional intake and/or a decrease in caloric consumption, resulting in an increase in fat stores. In the weight maintenance phase, a reduced energy intake is sufficient to maintain obesity. In this phase, new alterations in metabolism regulation and comorbidities may appear. Therefore, obesity is a chronic and recurrent disease that requires sustained treatment for weight

loss and maintenance. The disease develops slowly and gradually through weight gain of adipose tissue from normal body weight, later from an overweight state. After weight loss treatment, body weight can return to the initial or even higher levels due to energy control disorders and may persist into old age.The ideal weight, according to tables published by insurance companies (Metropolitan Health Insurance), corresponds to a minimum mortality rate based on age, sex, and height. It is easily observed that the weight thus determined is lower than the average weight of the Western population, corresponding to a lower risk of morbidity and mortality.

Epidemiology

The number of people classified as overweight based on BMI measurement is rapidly increasing and constitutes an important health problem in both developed and developing countries. Currently, obesity is recognized as a chronic condition, with less emphasis placed on its long-term impact on health at the individual or population level. Being overweight increases the risk of developing certain conditions and exacerbating others, generally increasing risk as BMI increases.

The diagnosis of obesity and the determination of the need for treatment should be based on quantitative (statistical and epidemiological) data specific to each patient and on objective (metabolic, vascular, rheumatological) and subjective (ethnic, familial, cultural) information.

Romania has the lowest adult obesity rate among European Union countries, with a child obesity rate estimated at around 15%. In June 2014, the Ministry of Health issued a press release containing the conclusions of a study conducted in May 2013 over three weeks among 8-year-old children. The study found that the prevalence of overweight and obesity was higher in urban areas than in rural areas, with obesity being more common in boys [1].

In the USA, the prevalence of overweight is 32%, and obesity is 22.5%. It is estimated that approximately 6 million American citizens have morbid obesity, with a BMI of at least 40 kg/m^2 [2]. The USA records the highest obesity rate in the world, with 35.7% of adults being obese [3]. The average weight of an American is 11 kg higher than in 1960. Eighteen percent of deaths in the 40-85 age group are caused by obesity. It is involved in six of the ten most common causes of death in the USA: cardiovascular diseases, type II diabetes, cancer, hypertension [4]. Among American children and adolescents aged 2-19 years, 35% are overweight and obese, of which 17% are obese. One in eight preschoolers in the USA is obese [3,5]. Twenty percent of obese infants become obese children, 40% of obese children become obese adolescents, and 80% of obese adolescents become obese adults.

In Europe, one in two adults is overweight, and one in three children is overweight or obese. The most affected countries by obesity are Hungary, the United Kingdom, Ireland, Malta, Iceland, Luxembourg, Greece, with an adult population obesity rate between 18.1-24.5%, while at the opposite end are Denmark, Sweden, Norway, Bulgaria, Italy, and Romania, with an obesity rate between 10 and 15% [6]. The UK has one of the highest levels of obesity, while Italy and France have one of the lowest [7]. Recent epidemiological studies conducted in France have shown an obesity prevalence of 10%, with a tendency to increase from 8.55% in 1997 to 10% in 2000 [8].

Clinical manifestations

Weight gain can be due to the accumulation of interstitial fluid (edema) or an increase in the amount of fat tissue (adiposity). Weight gain caused by fluid retention is characterized by edema or the rapidity of weight gain, with an increase of more than 1 kg/day clearly indicating fluid retention.

Regarding hormonal factors, obesity can be associated with numerous endocrine changes. Most of these changes are secondary, potentially induced by overeating in previously normal individuals and being irreversible by weight loss. Only pre-existing endocrine changes can be considered causes of obesity. In most cases, there is no evidence of endocrine imbalances that could represent causes of obesity.

Complications

The risk related to obesity is influenced not only by the mass of adipose tissue but also by its perivisceral or abdominal distribution. The distribution of adipose tissue can be abdominal or gluteo-femoral.

- **Abdominal obesity (apple-shaped or android type):** This represents the deposition of adipose tissue in the abdominal region and is associated with a risk of type II diabetes mellitus, hyperlipidemia, hypertension, myocardial infarction, and, in women, an increased risk of breast cancer.

Condition	Clinical manifestation
Hypothyroidism	Hypometabolism due to hypothyroidism can lead to weight gain due to secondary fluid retention and infiltration of the skin with mucopolysaccharides.
Metabolic Hypercorticism	Obesity associated with hypertension and menstrual cycle disorders, redistribution of adipose tissue, and moderate weight gain (facio-truncal obesity). Stenic obesity characterized by adipose tissue development and muscle hypertrophy.
Central Hypercorticism	Itenko-Cushing syndrome with possible hypothalamic involvement.
Hyperinsulinism	
Hypogonadism	Obesity begins after puberty, progresses slowly, with fat distribution in the lower abdominal area, buttocks, and thighs, of a soft, fluffy type.
Adiposogenital dystrophy	Presupposes hypothalamo-gonadal determinism, obesity similar to that in hypogonadism with prepubertal manifestation.
Virilizing Polycystic Ovary	Android obesity mainly in the upper half of the body, firm and elastic, without folds, associated with developed hair and menstrual disorders.
Type II Diabetes Mellitus	Obesity is a predisposing factor for the development of diabetes mellitus, not vice versa.

Table 1: Endocrine Conditions Associated with Obesity and Their Clinical Manifestations.

- **Gluteo-femoral obesity (pear-shaped or gynoid type):** This represents the distribution of adipose tissue in the thigh and buttock regions and is not associated with an increased risk.

The morbidity associated with obesity is divided into various groups of conditions, including diabetes mellitus, cardiovascular diseases, hypertension, gallbladder diseases, and certain forms of

Cardiovascular	Ischemic heart disease Hypertension Stroke Deep vein thrombosis Pulmonary embolism Congestive heart failure Neurovegetative dystonia Sudden death
Respiratory	Respiratory insufficiency Sleep apnea syndrome Hypoventilation syndrome Pulmonary hypertension
Metabolic	Insulin resistance Type II diabetes mellitus Hyperlipidemia Changes in homeostasis with reduced fibrinolysis
Cancer	In men: prostate, colorectal, bile ducts In women: endometrial, gallbladder, cervical, ovarian, breast, colorectal
Digestive	Gallstones Fatty liver disease Gastroesophageal reflux
Locomotor	Low back pain Osteoarthritic disease (gonarthrosis)

Skin	Lymphedema Leg edema Excessive sweating Mycoses
Renal	Proteinuria Glomerulosclerosis
Endocrine	Menstrual cycle disorders Hyperandrogenism Acanthosis nigricans Infertility Hypogonadism
Psychosocial	Reduced quality of life Discrimination Impaired self-image Depression Anorexia nervosa Bulimia
Other	Increased intracranial pressure Obstetric complications Anesthetic risk Surgical risk

Table 2: Major Complications of Obesity and Associated Pathology.

Increased Risk (Relative Risk 1-2)	Cancer, Polycystic Ovary Syndrome, Infertility, Low back pain, Increased surgical risk
Moderately Increased Risk (Relative Risk 2-3)	Angina, Hypertension, Osteoporosis, Hyperuricemia
Very High Risk (Relative Risk >3)	Diabetes mellitus, Gallstones, Dyslipidemia, Insulin resistance, Dyspnea, Sleep apnea syndrome

Table 3: Relative Risk of Morbidity Associated with Obesity.

cancer. Increased body weight involves an increase in cardiovascular risk factors, confirmed by epidemiological data showing the relationship between obesity, cardiovascular risk factors, and cardiovascular diseases. Morbidity, especially cardiovascular morbidity, increases when BMI is greater than 30 kg/m^2. This relationship is influenced by age, sex, the duration of obesity, and the timing of weight gain (third or fourth decade of life).

Mortality is in accordance with BMI; thus, for the 18-25 kg/m^2 range, the level is low. The relative risk of early mortality is doubled in both sexes when the BMI exceeds 30 kg/m^2. An increase in body weight by 10% over normal leads to increased mortality, and the mortality rate doubles with a 40% increase over the average weight.

Cardiovascular complications

Prospective studies based on multivariate analyses have confirmed the correlation of obesity with an increased risk of developing cardiovascular diseases [9].

In women, a large-scale prospective study by Manson., *et al*. [10] found a correlation between BMI and the risk of coronary heart disease; additional weight gain significantly increases the risk.

In men, the Framingham study [11] confirmed body weight as the third predictive factor for coronary heart disease (after age and serum cholesterol level) and identified obesity as an independent risk factor for the development of coronary heart disease; body weight was a better predictor of coronary heart disease than hypertension, smoking, or glucose intolerance.

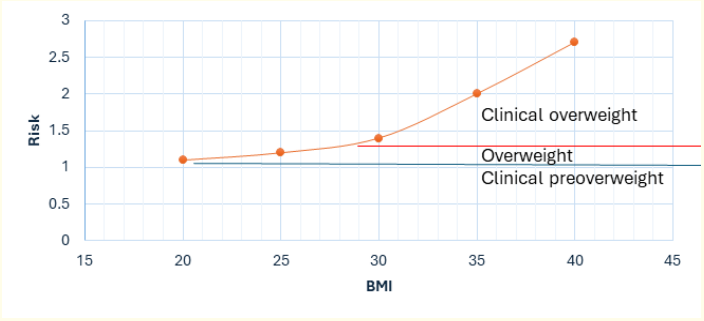


Figure 1: Correlation of BMI with Relative Mortality Risk.

BMI (kg/m^2)	Relativ cardiovascular risk
<21	-
21-23	Slightly grown
23-24,9	Grown over 50%
25-28,9	Double
>29	Triple

Table 4: Correlation between BMI and Relative Cardiovascular Risk.

Waist (cm)		BMI (kg/m^2)	Waist/hip ratio		Cardiovascular Risk
Men	Women		Men	Women	
>94 cm	>80 cm	> 25	>0,95	>0,80	double
>102 cm	>88 cm				4 time higher

Table 5: Cardiovascular Risk Correlated with Waist Circumference, BMI, and Waist-to-Hip Ratio.

There is a positive association between the waist-to-hip ratio and the incidence of myocardial infarction, angina pectoris, stroke, and sudden death. This association is independent of age, BMI, smoking, cholesterol, triglycerides, and systolic blood pressure.

Obesity contributes to the development of hypertension as part of the metabolic syndrome X. The effects of obesity on hypertension are mediated through hyperinsulinemia or insulin resistance, which can determine an increase in peripheral vascular resistance via the sympathetic nervous system. Central obesity is also associated with changes in the lipoprotein profile, predisposing to cardiovascular diseases.

Hippocrates observed the higher frequency of sudden death in obese patients compared to normoweight subjects. The Framingham study indicates obesity as a predictive factor for sudden death. Obese patients with eccentric left ventricular hypertrophy have a tenfold incidence of arrhythmias (especially tachycardia and ventricular fibrillation) compared to normoweight subjects.

An analysis of the Framingham study suggests that obesity is a risk factor for stroke. More recent data indicate that obesity is a predictive factor for ischemic stroke but not for hemorrhagic stroke, a fact confirmed by a prospective study that even establishes a relationship between BMI and stroke risk. For example, it has been shown that the risk of ischemic stroke is 75% higher in women with a BMI >27 kg/m^2 and 137% higher in patients with a BMI >32 kg/m^2 compared to women with a BMI <21 kg/m^2. In a study conducted in Sweden, it was found that 50% of hypertensive men with abdominal fat distribution and maternal history of stroke suffered a stroke during the 18-year follow-up period, seven times more frequently compared to normotensive subjects in the same age group.

In obese subjects, an increase in the frequency of venous diseases in the lower limbs has been observed, but not an increase in arterial diseases. Pulmonary hypertension is common among these patients. Deep vein thrombosis is the most severe condition for which obesity is both a risk factor and a diagnostic obstacle [11].

Respiratory complications

Effort dyspnea is frequently encountered in overweight individuals; obesity limits the expansion of the chest cavity and the movement of the diaphragm, resulting in restrictive ventilatory dysfunction, initially causing effort dyspnea, then resting dyspnea, and right ventricular dysfunction.

The most common complications are:

- Sleep apnea syndrome (SAS) encountered in 20-40% of patients with grade III obesity, manifesting as noisy snoring, frequent nighttime awakenings, daytime sleepiness often associated with morning headaches, cognitive impairment. SAS has also been associated with an increased risk of myocardial infarction.
- Alveolar hypoventilation associated with Pickwick syndrome, where pulmonary ventilatory capacity decreases, hypercapnia, cyanosis, sleepiness occur (patients have repeated nocturnal apnea episodes leading to hypoxemia, hypertension, and cardiac arrhythmias).
- Pulmonary embolism**.**

Cancer and obesity

Increased cancer mortality has been frequently observed in obese patients (relative risk of 1.33 in men and 1.5 in women). Obese women have an increased risk of endometrial, ovarian, and possibly breast cancer, while obese men may develop prostate cancer. The increased incidence of these cancers in the obese population is a direct consequence of the endocrine changes associated with obesity [12].

Among the factors contributing to the increased incidence of digestive cancers are excessive consumption of dietary fats, smoking, family history, adipose tissue distribution, and a high degree of obesity. The incidence of colorectal cancer is closely correlated with BMI; studies by Frentzel., *et al*. [13] have shown a reduced risk of digestive cancer in the normoweight population compared to the obese.

Hepato-gastro-digestive complications

Gallstones are a common complication of obesity. Approximately 50% of patients with a high degree of obesity have gallstones or a history of biliary pathology [14]. In women, the frequency of gallstones is higher when BMI is increased. While the association of obesity with increased incidence of gallstones is established in women, this correlation is less proven in men. However, Barbara., *et al*. [15] have shown the existence of a correlation between obesity and the prevalence of gallstones in male patients. Most often, the stones are cholesterol-based. In lithogenesis, metabolic imbalances are involved, including impaired solubility, kinetic factor involvement, and bile stagnation in the gallbladder. The increased risk of gallstones in obese patients is mainly associated with impaired solubility, leading to bile supersaturation.

In addition to biliary conditions, obese patients frequently exhibit morphological liver changes, classified into four histological groups: fatty liver, fatty hepatitis, fatty liver fibrosis, and fatty liver cirrhosis. Most patients present with only hepatic steatosis, and although the percentage of liver morphological alteration is very high in patients with a high degree of obesity (hepatic steatosis occurs in moderate and android obesity), most often, steatosis is asymptomatic, and liver tests are normal. Also encountered in this sphere are gastroesophageal reflux disease (GERD) in grade III obesity, and due to bulimia and hyperphagia, constipation, flatulence, and dyspepsia.

Treatment

- **The treatment is based on four pillars:** Hypocaloric diet, increased physical activity, psychological and occupational therapy, and medication. In patients with morbid obesity, bariatric surgery is considered.

Surgical treatment

Classic surgery applied to obese individuals for weight loss is called bariatric surgery and produces weight loss by modifying the normal appearance of the digestive tract. Indications are represented by BMI >40 kg/m^2 or BMI >35 kg/m^2 with obesity-related diseases with no response to diet combined with medication. Recently, international guidelines lowered the threshold to a BMI >30 kg/m^2 for diabetic patients.

Procedures used include:

- **Gastric Banding (adjustable gastric band):** A band is laparoscopically placed around the upper portion of the stomach, which can be adjusted by injecting saline into a reservoir placed subcutaneously.

Comorbidities	Therapeutic Objectives and Strategies
Non-insulin-dependent diabetes	Normalization of glycemic values and lipid parameters (diet, regular physical activity, ADO ± insulin)
Hyperlipidemia	Normalization of lipid metabolism parameters (hypolipidemic diet, physical activity, hypolipidemic medication, behavioral change)
Hypertension	Normalization of blood pressure values (antihypertensive treatment)
Peripheral venous insufficiency	Treatment of infections in skin folds, leg vein compression and treatment
Sleep apnea syndrome	Oxygen therapy, respiratory physical therapy
Osteoarthropathies	Physical therapy, mobilization, analgesics ± anti-inflammatories
Endocrine, gynecological, and oncological conditions	Screening and early diagnosis of cancer
Psychosocial aspects	Psychotherapy, depression treatment
Effort intolerance	Improving cardiorespiratory function
Surgical risk	Prevention of DVT, ensuring optimal ventilation

Table 6: Treatment of Conditions Associated with Obesity.

- **Vertical Gastrectomy (sleeve gastrectomy):** This procedure narrows the stomach by resecting a part of it in the form of a sleeve.
- **Gastric Bypass:** A major surgical procedure that creates a bypass for a large portion of the stomach and duodenum, allowing food to go directly to the small intestine, significantly reducing nutrient absorption. This procedure results in more significant weight loss than gastric banding but also has more postoperative complications.
- **Biliopancreatic Diversion:** Similar to gastric bypass, it creates a bypass to reduce nutrient absorption.

The main issues related to surgical treatment of obesity are that it cannot be used for all obese patients (especially those with multiple comorbidities who have a high postoperative mortality risk), it depends heavily on the surgeon's experience, and there are numerous postoperative complications that can even lead to patient death. Another issue is the cost of the intervention and the lack of coverage by the health insurance system.

Gastric band

This surgical technique shows its effectiveness only by reducing food intake capacity. The best results are obtained in compliant patients who later visit the doctor for band diameter adjustment. The procedure is completely reversible and does not involve nutritional risks like other procedures.

The mortality rate of this procedure is lower than that of RYGBP, namely 0.1%. Excessive weight loss is less than in gastric bypass or malabsorptive procedures. An improvement in comorbidities such as type II diabetes, asthma, SAS, hyperlipidemia can be observed, but much less visible than in the gastric bypass procedure.

Advantages

- The possibility of adjusting or even removing the band
- Can be used in the population at high risk for RYGBP
- Minimal nutritional complications
- Loss of 50% of excess weight within a year

Complications

- **Intraoperative**: Hemorrhage, possible trauma to the spleen, stomach, or esophagus, conversion to open surgery
- **Postoperative:** Band slippage (gastric prolapse), perforation of one of the band components, port infection, infection grafted on the band, occlusion, nausea, and vomiting
- **Late:** Band erosion into the stomach, esophageal dilatation (megadolicoesophagus/ Barrett), therapeutic failure of weight loss.

RYGBP (Roux-en-Y Gastric Bypass)

Other clinically significant deficiencies of this procedure, in addition to calcium deficiency and insufficient iron absorption, include vitamin B1 and B12 deficiency. To prevent nutritional complications, lifelong administration of multivitamin supplements is required.

Half of the excess weight expected to be lost is eliminated in the first 6 months postoperatively, oscillating between 18-24 months. Comorbidities that benefit from this procedure include type II diabetes, hypertension, hypercholesterolemia, arthritis, DVT, urinary incontinence, liver diseases, headaches, and SAS.

Normally, the RYGBP procedure involves little malabsorption; however, to enhance effects and accelerate weight loss, it can be modified, changing its name to distal gastric bypass.

Most patients report a decrease in appetite and a feeling of early satiety after surgery. Eating behavior changes are largely due to hormonal alterations (ghrelin, GIP, GLP-1, PYY) and signals received from the digestive tract that inhibit the hunger center. Dumping syndrome is considered another „useful" mechanism in the weight loss process.

The risk of morbidity in the first postoperative month is approximately 0.2-0.5% in specialized centers.

Advantages of RYGBP

- Loss of 60% of excess weight in the first postoperative year
- Maintenance of 50% weight loss after 2.5 years postoperatively
- Rapid resolution of metabolic syndrome X and obesity comorbidities
- Better weight loss efficiency compared to restrictive procedures
- Low incidence of protein-calorie malnutrition and diarrhea
- Decreased appetite

Complications of RYGBP

- **Ea**rly: Anastomotic fistula, pulmonary embolism, wound infection, digestive hemorrhage, respiratory failure, death
- La**te:** Intestinal obstruction, incisional hernia, stoma stenosis, marginal ulcer, nutritional deficiencies

Gastric sleeve (Sleeve Gastrectomy)

Advantages of gastric banding

- Absence of anemia and dumping syndrome
- Reduced degree of malabsorption
- Few hospitalization days required
- Very low mortality rate

Complications

- Gastric perforation
- Incisional hernia
- Stoma stenosis
- Band slippage
- Band erosion into the stomach
- Need for revision or conversion intervention

Duodenal switch and biliopancreatic diversion

The duodenal switch is a modification of biliopancreatic diversion to reduce the incidence of ulcers, dumping syndrome, and the severity of protein-calorie malnutrition. A preferential benefit of the duodenal switch is increased absorption of iron and calcium compared to biliopancreatic diversion, but it is also much riskier due to duodenal sectioning. These two procedures have the highest incidence of nutritional complications compared to Roux-en-Y gastric bypass or purely restrictive procedures.

Advantages of DS and BPD

- Faster weight loss than gastric banding procedures (60-80% of excess weight)
- A larger volume of food that can be ingested
- More effective long-term weight loss, the most effective therapy for morbid obesity
- Less food intolerance

Complications of BPD and DS

- Diarrhea and foul-smelling flatulence, averaging 3-4 stools per day
- Malabsorption of fat-soluble vitamins (A, D, K, E)
- Vitamin A deficiency, which can cause night vision difficulties
- Vitamin D deficiency, leading to osteoporosis
- Iron deficiency, similar to RYGB

- Protein-calorie malnutrition, which may require reoperation to lengthen the Roux limb
- Ulcers (fewer in DS)
- Dumping syndrome (less manifested in DS)

Other nutritional complications following bariatric surgery

Refractory Hypoglycemia	Functional Pancreatic Insufficiency
Vitamin C Deficiency (Scurvy)	Accelerated Weight Loss
Selenium Deficiency	Hydro-Electrolyte Imbalances
Copper Deficiency	Hepatic Insufficiency
Severe Protein-Calorie Malnutrition	

Table a

Other postoperative complications following bariatric surgery

Anastomotic Fistula or Hemorrhage (1–2%)	**Diffuse Abdominal Pain**
Strictures or Stenoses (10–15%)	Intestinal Ischemia or Entero-Mesenteric Infarction
Severe Diarrhea	Gastric Erosion or Ulceration
Intestinal Telescoping (Intussusception)	Hiatal or Incisional Hernias
Short Bowel Syndrome	

Table b

Non-Nutritional Psychosocial Complications Following Bariatric Surgery

Depression	Night Eating Syndrome
Alcoholism	Binge Eating Syndrome
Suicide	

Table c

Recommendations for patient monitoring

- **Clinical and paraclinical reassessment:** Every 3 months at most.
- **Weight measurement:** More frequent during the first 6 months.
- **Laboratory tests:** Complete blood count (CBC), electrolytes, BUN/creatinine ratio, Cr, Ca, Mg, K. Blood glucose, transaminases, albumin. Fat-soluble vitamins (A, D, K, E).Vitamins B1 and B12.Iron levels (serum iron and ferritin).Vitamin C, selenium, zinc. Prealbumin or transferrin if the patient has renal pathology.
- **Annual assessments:** Height measurement. DEXA (bone mineral density measurement). Parathyroid hormone (PTH), 1,25-hydroxy vitamin D, urinary calcium/24 hours.

Postoperative monitoring

- **Weight-loss progression:** Target weight loss of 0.45-0.9 kg/day during the first month.
- **Adequate protein intake:Target:** 1-2 g/kg of adjusted body weight; 60 g for gastric bypass surgery and 75 g for duodenal switch.
- **Nutritional intake goals:**
  - **Proteins:** 1-2 g/kg body weight (adjusted).
  - **Fats:** 25% of total calorie intake.
  - **Carbohydrates:** 15-30 g/day, divided into 4-6 meals.
  - **Fluids:** 1.89 L/day.
- **Potential nutritional limitations:** Meat and dairy intolerance. Nutritional malabsorption. Vomiting, constipation, dehydration.

Postoperative supplements

- **Vitamin B12:** 12,500 mcg orally, daily.
- **Vitamin D:** 400 IU orally, daily.
- **Calcium carbonate:** 500 mg orally, three times daily.
- **Iron with polysaccharides:** 150 mg orally, twice daily for women.
- **Multivitamin with minerals:** 2 tablets/day.

Challenges in nutritional monitoring

There are few randomized protocols addressing nutritional monitoring in bariatric patients. Debate continues over the balance between monitoring effectiveness and associated costs. Standard intervals for patient reassessment have yet to be determined. The field of bariatric medicine is continuously evolving, with ongoing improvements and research. Individual patient characteristics make it challenging to standardize guidance toward a specific sur-

gical technique. To reduce surgical risks, physicians often recommend less invasive operations, such as gastric sleeve (GS), gastric balloon, or gastric band, as a preliminary step before performing more complex procedures like RYGBP (Roux-en-Y gastric bypass) or duodenal switch (DS). Encouraging preoperative weight loss is also key to improving surgical outcomes.

Postoperative care and recovery

Postoperative Time	Required Measures
Day 1	Ingestion of contrast substance.
Day 7/8	Removal of cutaneous sutures.
Weeks 4-8	Nutritional counseling and adjustment of the gastric band under imaging guidance.
Month 3	Clinical examination and gastric band adjustment if needed.
Months 6-9	Clinical examination and gastric band adjustment if needed.
Annual Visit	Clinical examination, abdominal ultrasound, and control with contrast substance.

Table d

Additional considerations

Gastric band dysfunction

If the gastric band system is non-functional, patients may receive adjunctive pharmacological therapy with Orlistat (120 mg, three times daily) to prevent weight regain until a revision surgery is performed. Experimental studies have shown that patients who followed this treatment regimen continued to lose weight.

Gastric bypass patients

- **Anticoagulation Therapy:** Low molecular weight heparin (Lovenox 6000 IU) is administered starting from the preoperative day and continues for 4 weeks postoperatively.
- **Hospital Discharge:** Patients are discharged on the 5th postoperative day after receiving specialized nutritional counseling.
- **Proton Pump Inhibitors (PPIs):** Prescribed for 4 weeks postoperatively.
- **Vitamin Supplementation:** Recommended for the remainder of the patient's life.
- **Annual Psychiatric Evaluation:** Encouraged for long-term psychological support.

Revision procedures

Sleeve gastrectomy

Revision procedures following sleeve gastrectomy are performed due to postoperative complications such as.

Stapler line dehiscence

- **Clinical Symptoms:** General condition deterioration. Abdominal pain. Patients may also present with localized or diffuse peritonitis, sepsis (due to abscess or hematoma).
- **Predisposing Factors:** Ischemia in the proximal gastric portion. The fistula's location can be assessed based on its origin.
- **Prevention:** At the slightest suspicion of ischemia in the stapler suture line, manual suturing or grafting with an omentum segment is recommended.
- **Management:** For a fistula near the gastroesophageal junction (GEJ), endoscopic stent implantation is required. Alternatively, the fistula can be sealed with a cranially pulled Roux-en-Y segment. If these methods fail, the last option is creating a distal esophageal stump with a jejunostomy and draining the esophagus with a nasogastric (NG) tube.

Large subphrenic abscess

- **Predisposing Factors:** Subphrenic hematoma.
- **Management:** Percutaneous drainage for non-fistulized or encapsulated abscesses. Laparoscopic drainage is indicated if percutaneous drainage is not feasible.

Retrosternal heartburn, regurgitation, and ineffective PPIs

- **Predisposing Factors:** Exact causes are unclear but may include slowed food passage and functional pyloric obstruction.
- **Prevention:** Begin dissection at least 4-6 cm from the pyloric orifice.
- **Management:** If the patient is at risk of malnutrition, gastric bypass surgery is recommended.

Persistent dysphagia, retrosternal heartburn, and regurgitation

- **Imaging Findings:** A significant continuous stenosis extending from the antrum to the gastric fundus.

- **Predisposing Factors:** Incorrect placement of the calibration balloon. Ischemic gastric wall. Distal stenosis often caused by the stapler suture line, while proximal stenosis can arise from inflammatory or ischemic causes.
- **Management:** Initially, dilation with bougies, which is effective in most cases. If dilation fails, a gastric bypass or seromyotomy is performed.

Revision procedures for inadequate weight loss

Frequency

Rare, as sleeve gastrectomy often precedes biliopancreatic diversion or duodenal switch. If no second procedure follows, slight dilation of the upper gastric pouch is expected and generally insignificant

Fistulas

- **High-Risk Locations:** Most commonly occur in the antrum, where the gastric wall is thinnest.
- **Prevention:** Manual suturing with absorbable thread along the stapler line.
- **Considerations for Redo Surgeries:** Increased gastric wall fragility due to fibrosis from the previous surgery requires careful handling.

Strictures or stenosis

- **Prevention:** Using a properly positioned calibration tube with a diameter of 32-40 Fr reduces stenosis risks.
- **Management:** Endoscopic dilation. Esojejunal anastomosis with a Roux-en-Y loop in severe cases.

Hemorrhage

- **Causes:** Splenic trauma. Dissection of short gastric vessels. Stapler line bleeding.
- **Prevention Measures:** Dissection of adhesions in the posterior gastric tunnel for optimal surgical field visibility. Methods such as Seamguard, fibrin glue, continuous sutures, or electrocoagulation for suture line bleeding.

Leaks

- **Significance:** Major complication of sleeve gastrectomy.
- **Treatment Options:** Total parenteral nutrition. Suturing and omental grafting. Peritoneal drainage. Self-expanding stents for leaks at the gastroesophageal junction.
- **Severe Cases:** Gastric dehiscence with generalized peritonitis and septic shock may require: Total gastrectomy. Esojejunal T-T (termino-terminal) or T-L (termino-lateral) anastomosis.

Long-term considerations

- **Stomach Dilation:** Slight gastric dilation over time may lead to inadequate weight loss.
- **Management Strategies for Inadequate Weight Loss:** Some authors recommend redo sleeve gastrectomy, blaming oversized calibration tubes during the initial surgery. Others suggest placing an adjustable gastric band in cases where part of the gastric fundus remains. For restrictive procedure failure, a malabsorptive procedure such as Roux-en-Y gastric bypass or biliopancreatic diversion is the best option for weight loss.
- **Contraindications for Bypass:** Absolute-Liver cirrhosis. Relative-Advanced age.

Biliopancreatic diversion

Revision procedures after biliopancreatic diversion with duodenal switch are rare, with a reported rate of 2-4.7% in a group of 1,400 patients over a 10-year postoperative follow-up

Indications for revisions

- **Hypoproteinemia or diarrhea:** These issues are less frequent if the common channel measures 100 cm instead of the "classic" length of 50 cm
- **Insufficient weight loss or weight regain:** The common channel length should equal 10% of the total length of the small intestine. The alimentary limb length (from the duodeno-ileal anastomosis to the cecum) should be 40% of the total intestinal length. Redo Sleeve Gastrectomy: Reducing the gastric pouch volume leads to satisfactory weight loss outcomes

Categories of revision procedures

Revision procedures following biliopancreatic diversion can be categorized based on the issue being addressed. These include adjustments to: The length of the common channel. The alimentary limb length. The gastric pouch volume (redo sleeve gastrectomy).

Revision procedures for surgical (Technical) issues

- Complications after Sleeve Gastrectomy
- Duodenoileal Anastomosis Dehiscence

- Duodenoileal Anastomosis Stenosis
- Duodenal Stump Fistula
- Ileoileal Anastomosis Dehiscence
- Ileus

The most unfavorable outcomes are observed in duodenoileal anastomosis dehiscence and duodenal stump fistula.

Revision procedures for negative effects on the digestive tract

- **Common Reasons:** Refractory malabsorption syndrome unresponsive to treatment. Uncontrolled weight loss.
- **Patient Presentation:** Most patients exhibit both causes simultaneously.
- **Surgical Objective:** To extend the common channel by creating a new L-L entero-enteric anastomosis at a point 100 cm proximal to the previous one, referred to as the "Kissing-X anastomosis".

Revision procedures for absence or inadequate weight loss

- **Modification:** The common channel is shortened to approximately 50 cm by performing a new ileo-ileal anastomosis.
- **Additional Measures:** If the gastric sleeve is dilated, a redo sleeve gastrectomy is considered

Sleeve gastrectomy with Roux-en-Y gastric bypass

Laparoscopic Roux-en-Y gastric bypass has successfully led to weight loss in the vast majority of patients. However, studies report that up to **29%** of patients may experience weight regain or complications, necessitating a redo surgery.

Common indications for redo surgery

- **Gastric Pouch Dilation:** The most frequent cause.
- **Stapler Line Dehiscence with Gastro-Gastric Fistula:** A common postoperative complication.
- **Marginal Ulcers:** Secondary to bile reflux or poor nutrition.

Less common indications

- **Gastro-Jejunal or Jejuno-Jejunal Anastomosis Stenosis:** Narrowing causing food passage issues.
- **Gastro-Jejunal Anastomosis Dilation:** Weakening and expansion of the anastomosis over time.
- **Risks of Redo Surgery:** The risk of complications following redo bariatric surgery is significantly higher compared to the initial surgery.
- **Surgical Approach:** Laparotomy or laparoscopy may be chosen based on: The patient's surgical history. The specific complication being addressed.

Reconstruction of the proximal gastric pouch

- **Dissection:** Start by dissecting hepatic adhesions using an ultrasound dissector. Identify and dissect the old gastric pouch carefully. Note: During dissection, the posterior wall of the pouch may give a false impression of a lumen.
- **New Pouch Creation:** The new pouch should have a volume of 15-20 cm^3. Use green stapler cartridges (60 mm length), as the tissue is thin.
- **Avoiding Ischemia:** Preserve the blood vessels along the lesser curvature to maintain pouch functionality and prevent ischemia.

Reconstruction of the gastro-jejunal anastomosis

- **Resection:** Resect the proximal portion of the Roux limb until healthy tissue is reached.
- **Adjustments:** If the remaining Roux limb is too short after resection, reposition the patient out of the anti-Trendelenburg position and divide the mesentery for a retrocolic approach.

Reconstruction of the jejuno-jejunal anastomosis

- **Procedure:** Pull the common channel loop cranially to create a jejuno-jejunal anastomosis with the Roux limb.
- **Stenosis Management:** If the lumen diameter is small, resect the stenotic portion and perform a manual end-to-end (L-L) suture.
- **Dilation Management:** In cases of post-obstruction dilation, place a decompression tube, which remains in place for the entire hospitalization period.

Patient follow-up

It is estimated that the morbidity rate for bariatric interventions is 4%, while the mortality rate is less than 0.3%.

Challenges in patient follow-up

- **Emergence of Complications:** The adoption of new surgical techniques has led to the occurrence of rare and, in some cases, completely new complications.
- **Education Deficit in Bariatric Surgery:** Bariatric surgery is a relatively new field, practiced only in highly specialized centers. Medical education has not yet fully adapted to include this area, resulting in a knowledge gap among clinicians.

- **Emergency Cases:** Patients presenting to emergency departments are often operated on in other centers, creating additional challenges for proper diagnosis and management.

Methodology

Introduction

Morbid obesity is a multifactorial chronic disease that requires treatment. I believe that the implantation of a gastric band is the ideal solution for most candidates for bariatric surgery. The late metabolic complications are minimal, and weight loss and food intake can be individually adjusted according to the patient's needs. Approximately 80% of those operated on can expect a weight loss of 50-60% of excess weight. The band can be easily removed, and normal anatomy can be restored. In bariatric surgery, the operating time is the beginning of the treatment and not the resolution of the pathology.

To perform bariatric surgeries safely, it is crucial that all potential complications are excluded from the outset. Procedures must follow certain standards, and all participants must know exactly what to do at all times to reduce overall risks. The rate of revision procedures in classic gastric bypass is 2%. Anastomotic dehiscences occur in less than 1% of cases and are lethal if not diagnosed early, with tachycardia sometimes being the only clinical sign. In extreme obesity (BMI ≥ 60 kg/m^2), a gradual treatment should be considered: gastric sleeve reducing the operative risk for subsequent interventions.

With an operating time of almost 3 hours, a partial gastrectomy with 2 intestinal anastomoses, and an operation performed in 4 quadrants of the abdomen, biliopancreatic diversion with duodenal switch remains a technical challenge. The benefits for the patient include reduced hospitalization time, early mobilization, and a low risk of abdominal wall complications. However, careful patient selection for this procedure is crucial to avoid complications arising along the learning curve.

Research objective

The objective of this study is to demonstrate the major contribution of metabolic surgery in the treatment of obesity and the improvement or even complete remission of its associated comorbidities. The aspects followed in the study are:

- The efficiency of metabolic surgery combined with drug treatment
- The advantages and disadvantages of each surgical technique
- The rate of improvement of comorbidities
- Postoperative evolution and short- and long-term complications
- Social reintegration and improvement of the patient's quality of life
- Direct and indirect costs of obesity.

Material and Method

The study base of this thesis comprises a cohort of 272 patients diagnosed and treated at various stages of obesity at the Bariatric Surgery Center of the Provita Clinic in Bucharest between January 1, 2018, and June 12, 2019.

The study material consisted of the following data sources:

- Data included in the observation sheets of the Provita Bariatric Surgery Center, systematized in the computerized database
- Results of imaging investigations (X-ray, upper digestive endoscopy, computed tomography, nuclear magnetic resonance, abdominal ultrasonography) from the Radiology Department of the Provita Clinic.
- The operating protocols register and digital data from the Provita Bariatric Surgery Center

Type of study

The type of study conducted is retrospective, based on data from patients included at different times. The selected cohort for the study comprises 272 patients, of which 193 are female and 79 male. After dividing by age categories, the following intervals were chosen: 20-35 years, 35-50 years, and over 50 years.

Studied parameters

The following parameters were analyzed: Age, sex, urban or rural background,number of hospitalization days, body mass index (BMI), HbA1C analysis value, surgical technique used, postoperative complications.Each of the presented parameters was studied individually, but correlations between these variables and the patients' evolution were also made.

Diagnostic methods used

Patients underwent a complete clinical and bio-humoral assessment. The imaging investigations performed on the patients are:

- Abdominal ultrasonography
- Upper digestive endoscopy
- Abdominal X-ray with and without contrast substance depending on the case
- In selected cases, CT and MRI were used
- Intraoperatively, in cases of suspicion, tissue fragments were taken for histological analysis.

Direct and indirect costs of obesity treatment

Obesity treatment costs

Obesity is a significant public health issue with major financial implications in social, healthcare, and economic sectors. Evaluating the costs of treating obesity is challenging due to insufficient epidemiological data on its consequences, especially in certain regions.

In industrialized countries, obesity is estimated to consume approximately 5% of the healthcare budget [23,24]. These economic estimations influence decisions regarding healthcare management, prevention strategies, and treatment programs for obesity. Efforts have been made to systematically present the available data to better understand the economic impact.

Categories of obesity costs

- **Direct Costs:** Associated with healthcare services, medical treatments, surgeries, and medications for managing obesity and its complications: type II diabetes mellitus; gallbladder diseases; cardiovascular diseases; cancer; musculoskeletal disorders
- **Indirect Costs:** Morbidities-costs related to reduced productivity, absenteeism, and disability caused by obesity-related health conditions. Mortality-economic losses due to premature death resulting from obesity-related diseases [25].

Population attributable factor (PAF)

Hudge., *et al*. [26] and Hubert Hes., *et al*. [27] developed a metric called the Population Attributable Factor (PAF). This parameter estimates the correlation between disease-related costs and the risk factor (in this case, obesity).

In each population:

- 61% of Type II diabetes cases occur in obese individuals.
- 94% of Type II diabetes can be attributed to obesity.

This means that 57% of the care costs for Type II diabetes in this population can be attributed to obesity [26,27].

Relative risk and population attributable factor (PAF) for diseases in obese patients

- **Cost-Effectiveness Evaluation:** Soinburn., *et al*. [28]: Investigated the cost-effectiveness of obesity treatment programs. They concluded that the best way to assess these programs is by combining their effects on life expectancy and quality of life, resulting in the indicator: Quality-Adjusted Life Years (QALY).

Condition	Relative risk	PAF %
Type II Diabetes Mellitus	16,7	66
Gallstone Disease	10	52
Ischemic Heart Disease	3,3	22
Hypertension	4,3	29
Postmenopausal Breast Cancer	1,3	6
Colon Cancer	1,3	4

Table 7: Relative risk of disease among obese patients and the Population Attributable Factor (PAF) [23].

- **Challenges in Prevention:** Despite being theoretically preventable, obesity remains inadequately managed. Establishing cost-effective prevention and treatment methods would justify investments in achieving these goals. Epidemiological studies are needed to determine: the prevalence of obesity in specific populations and the relative risk of diseases associated with obesity. These values vary significantly across countries due to psychosocial and cultural differences.
- **Actionable Steps:** Obesity is a modifiable factor contributing to increased healthcare costs. Identifying and implementing the most effective prevention methods is essential. Weight gain prevention programs for adults and children are critical as they: rapidly reduce healthcare costs and improve patients' quality of life significantly.

Gastric Band: Intraoperative and postoperative complications

Hematoma or Bleeding typically results from trauma to the left hepatic lobe caused by the liver retractor during manipulation. Patients with a large liver (BMI >50 kg/m^2) are at higher risk due to the liver's size, which must be retracted to create a visible working field. Management-bleeding can be stopped using electrocautery

hooks or plasma-argon coagulation. Conversion to open surgery is generally unnecessary, although these measures may extend the operating time. Prevention-always position the liver retractor under optical guidance. Ensure the traction force is evenly distributed on the posterior liver surface, avoiding pressure on the edges. Anatomical Challenges and Dissection Difficulties: a large left hepatic lobe or perigastric adipose tissue can obscure visibility. Solutions: add a second liver retractor and enlist an additional assistant if necessary; if perigastric adipose tissue obstructs the identification of the pars flaccida or the right diaphragmatic pillar, the perigastric approach is considered a last resort, as it poses greater risks of: bleeding or gastric perforation.

Immediate Postoperative Complications after Gastric Banding

- **Gastric Wall Trauma and Perforation:** Results from posterior gastric wall trauma, particularly with the perigastric approach. Perforation may require emergency intervention and is a severe postoperative complication.
- **Esophageal Perforation:** Occurs during gastroplication of the anterior gastric wall over the band. Insufficient dissection may result in suturing between the esophagus and stomach, creating tension and leading to esophageal wall perforation.
- **Management:** Esophageal stent placement or thoracic cavity drainage.
- **Phrenic Nerve Injury:** Suture of the anterior gastric wall to the diaphragm may damage the phrenic nerve, causing persistent hiccups (singultus) or Postoperative scapulohumeral joint pain.

Gastric band slippage

- **Dilated Gastric Pouch:** Over time, the dilation of the upper gastric pouch creates a valve-like mechanism that obstructs the passage of food. Portions of the anterior or posterior gastric wall can block food passage, leading to partial or complete obstruction. As the gastric pouch enlarges, the gastrostomy is repositioned, eventually resulting in its occlusion. Inflammatory phenomena can also contribute to this process.

Clinical manifestations

- **Chronic Symptoms:** Dysphagia for solids, repeated postprandial vomiting episodes regurgitation of food, gradual inability to ingest liquids, significant weight loss, dyspeptic syndrome, fatigue, chronic forms may escalate into acute manifestations.
- **Acute Symptoms:** Complete restriction of food passage. Electrolyte imbalances. Subacute renal insufficiency. Mendelson's aspiration syndrome (gastric content aspiration).

Treatment

- **Conservative Management:** Proton Pump Inhibitors (PPIs) to reduce gastric acidity and inflammation. Volume and Electrolyte Replenishment: to correct imbalances.
- **Nasogastric (NG) Tube Placement:** For gastric decompression. Surgical Intervention: laparotomy or laparoscopy to remove or reposition the gastric band.

Gastric band migration

- **Causes:** Gastric wall trauma. Necrosis due to increased pressure from the band. Secondary infection.
- **Treatment:** Removal of the gastric band. Subtotal or polar superior gastrectomy if the gastric wall is necrotic.

Esophageal dilation

Anatomical and functional alterations of the esophagus may occur due to an increased intraesophageal pressure or exacerbation of gastric acid aggression on the esophageal mucosa, leading to gastroesophageal reflux disease (GERD).

Treatment

Removal of the band. Transition to a more invasive bariatric procedure, such as proximal Roux-en-Y gastric bypass (RYGBP).

Gastric pouch dilation

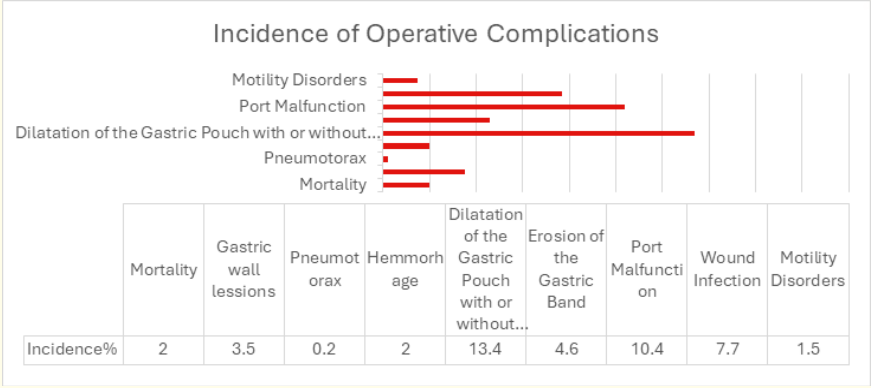
- **Early Dilation:** Occurs within weeks postoperatively. Caused by incorrect positioning of the gastric band.
- **Late Dilation caused by:** Chaotic eating habits. Occluded gastrostomy. Rolling hiatal hernias not addressed during the initial surgery.

Stoma occlusion

Food fragments that are not properly chewed can lead to complete stoma occlusion. Certain foods must be strictly avoided under specific circumstances.

Therapeutic Management:

- **Endoscopic Intervention:** Perform an upper digestive endoscopy to dilate the stoma.
- **Gastric Band Adjustment:** If congestion persists for more than 6 hours, release the gastric band to avoid: gastric perforation or emergency procedures like gastrectomy.



	Mortality	Gastric wall lessions	Pneumot orax	Hemmorh age	Dilatation of the Gastric Pouch with or without...	Erosion of the Gastric Band	Port Malfuncti on	Wound Infection	Motility Disorders
Incidence%	2	3.5	0.2	2	13.4	4.6	10.4	7.7	1.5

Figure 2: Complications After Adjustable Gastric Band Placement.

The incidence of surgical complications, such as band erosion or slippage, has decreased significantly due to the use of the pars flaccida approach [29].

Perioperative and late complications of adjustable gastric banding

Perioperative complications

- **Mortality**: Gastric wall perforation or necrosis, cardiogenic shock, pulmonary embolism.
- **Gastric Wall Trauma**: Occurs during surgical confusion or early in the learning curve, with perforation reported in the first 50 surgeries performed (1-2 cases). Management: distal perforations- suture the trauma site and implant the band, use atraumatic instruments. During difficult procedures or unclear anatomy, inject 5 ml methylene blue solution mixed with 15 ml saline via the gastric tube for verification before positioning the band.
- **Other Perioperative Complications**: Bleeding and pneumothorax, though rare, can occur as in conventional abdominal surgeries. Laparoscopic procedures have a lower complication rate than open surgeries.

Late complications

- **Gastric Pouch Dilation with Band Slippage**: Common in the posterior gastric wall near the omental bursa. Frequency reduced from 30% to 2.5% by: fixation sutures, placing the band above the omental bursa without surpassing the gastro-phrenic ligament. Typically occurs 8 months postoperatively. Diagnosed via abdominal X-ray, revealing an asymmetric pouch.
- **Gastric Pouch Dilation without Band Slippage**: Incidence depends on pouch volume at initial surgery: 33% complication rate with 25 cm^3 pouch vs. 5.1% with 15 cm^3 pouch.
- **Causes:** Overeating, rapid eating, induced vomiting, or carbonated drinks.
- **Band Erosion**: Band migration into the stomach treated by band removal or in severe cases, gastrectomy.
- **Diagnostic indicators:** Weight regain, heartburn, or abdominal pain.
- **Incidence:** 0.6% in 3,800 LapBand patients.
- **Causes:** Increased band pressure or trauma during dissection, suturing, or clipping.
- **Esophageal Achalasia**: Pre-existing esophageal achalasia or hiatal hernia predisposes patients to revision surgeries.
- **Revision rate:** 33% for these conditions.
- **Immediate Postoperative Dysphagia**: Excess residual fluid in the band system at the end of surgery. Management: deflate the band if dysphagia persists beyond 24 hours; use hydrocortisone (100 mg, twice daily for 2 days); if unresolved, perform laparoscopic intervention to replace the band with a larger one.
- **Postoperative Sepsis and Pain**: Use 0.5% bupivacaine for local anesthetic blockade of the abdominal rectus sheath. Persistent pain may indicate: hematoma or diaphragm suture involvement-diagnostic imaging or exploratory laparotomy if pain persists despite normal imaging.

- **Immediate Postoperative Bleeding**: Usually at the largest port (left upper quadrant). Requires laparotomy or laparoscopy for lavage and hemostatic sutures if bleeding does not stop spontaneously.
- **Port-Site Infections:** Ranges from superficial issues to device-related infections. Management: device removal and antibioprophylaxis for Staphylococcus aureus and reimplantation after 3 months.
- **Band Device Perforation**: Rare, primarily with older Swedish balloons. Diagnosed via contrast X-ray. Management: laparoscopic replacement of the band without removing fixation sutures.

Severe complications

Esophageal and gastric pouch dilation

Caused by: excessive gastric/esophageal pressure or overly tight bands. Management: partial deflation and patient education on meal volume and consistency. Severe cases may mimic partial band slippage and require further investigation.

Partial band slippage

- **Management:** Complete deflation and band repositioning near the cardia. If no weight loss was achieved before slippage, consider band removal and a different bariatric procedure.

Total band slippage

- **Surgical Emergency:** Leads to gastric necrosis, fistula, and potential death.
- **Management**: Immediate fluid and electrolyte correction. Laparoscopic band removal and excision of necrotic fundus tissue if necessary.

Band Erosion or Migration into the Gastric Lumen

- **Description:** Band erosion or migration into the stomach lumen is often preceded by partial band slippage, which can cause stretching and pressure necrosis of the gastric wall over the band's upper edge.
- **Mechanism of Erosion:** Sustained tension and pressure on the gastric wall from the band lead to tissue breakdown and necrosis. Partial Slippage- creates conditions for erosion by compromising the integrity of the gastric wall.
- **Management:** Endoscopic Removal: The band is cut endoscopically and introduced into the stomach, from where it can be extracted.
- **Laparoscopic Removal:** If endoscopic removal is not possible, a laparoscopic approach is employed to remove the band.
- **Prevention Tips:** Careful band placement to avoid excessive pressure on the gastric wall. Early detection and correction of partial slippage. Regular follow-up to monitor for signs of erosion.

Gastric Bypass: Intraoperative and postoperative complications

Intraoperative challenges

Bleeding

- **Common sites**: Stapler suture line: Managed with simple sutures. Mesentery: Controlled with coagulation. Retro-gastric area: usually resolves spontaneously. Small omentum: can form compressive hematomas that compromise gastric pouch viability.
- **Prevention and Management:** Avoid excessive hemostasis during dissection. Carefully inspect the Roux limb and gastric pouch for signs of ischemia or hematoma.

Hematoma formation near the lesser curvature

- **Predisposing Factors:** Use of ultrasonic scissors before achieving adequate hemostasis.
- **Prevention:** Begin dissection along the lesser curvature using a monopolar hook. Gradually dissect through adipose tissue to identify and secure vessels under optical guidance.
- **Management:** Hematomas can cause ischemia and compromise sutures.

Roux limb ischemia

- **Causes:** Excessive removal of mesentery. Volvulus of the Roux limb.
- **Management:** Abandon the current anastomosis, reposition the segment, and recreate the anastomosis.

Revision procedures for gastric bypass

Based on anatomical site

- Gastric pouch, enteroenteral anastomosis, or blind loop complications.
- Complications of the remaining stomach or duodenum.
- Perianastomotic complications.
- Intestinal complications.

Based on clinical signs

- Septic complications (e.g., necrosis or fistulas).
- Hemorrhage.
- Intestinal obstruction or ileus.
- Special cases.

Septic complications

Necrosis of the gastric pouch

- **Predisposing Factors:** Compressive hematoma. Overuse of hemostatic measures.
- **Management:** Excise the pouch and create an esophageal stump with an NG tube. Form a jejunostomy in the blind Roux limb. Close the Roux limb, create a gastrostomy in the remaining stomach, and provide esophageal drainage. After stabilization, consider sleeve gastrectomy with esogastric anastomosis.

Gastroenteral anastomosis fistula

- **Predisposing Factors:** High BMI, older age, and antecolic Roux limb approach.
- **Management:** Conservative: Total parenteral nutrition, broad-spectrum antibiotics, and appropriate drainage.
- **Relaparoscopy:** Resuture the anastomosis or drain the fistula through a gastrostomy with a Foley catheter.

Enteroenteral anastomosis fistula

- **Causes:** Intestinal obstruction upstream or technical surgical errors.
- **Management:** Simple sutures or segmental resection in cases of perifocal inflammation, followed by a new anastomosis.

Hemorrhagic complications

Upper gastrointestinal hemorrhage (e.g., Mallory-Weiss Syndrome)

- **Predisposing Factors:** Recurrent vomiting causing esophageal mucosal damage.
- **Management:** Endoscopic hemostasis with adrenaline injection. Antiemetic medications.

Emergency admission for melena, hypotension, and tachycardia

- **Prevention:** Lifelong PPI therapy is recommended to prevent duodenal ulcers.
- **Management:** Preferred approach: Angiographic embolization.

Intestinal obstruction or ileus

- Blind loop syndrome
- Jejuno-jejunostomy stenosis
- Littré hernia
- Adhesions
- Roux limb stenosis in the mesocolon

Altered general condition and dysphagia

- **Imaging Findings:** Dilated blind loop with contrast accumulation and reduced transit time through the Roux limb.
- **Predisposing Factors:**
- Blind loop positioned above the Roux limb, causing volvulus, obstruction, and dysphagia.
- Blind loop excessively long, leading to food accumulation.
- **Prevention:** Ensure the blind loop remains below the Roux segment during gastroenteral anastomosis. Keep the blind loop as short as possible.
- **Management:** Surgical excision of the dilated segment and reconstruction of the gastroenteral anastomosis.

Nausea and vomiting with dysphagia

- **Imaging Findings:** Obstruction of the Roux limb.
- **Predisposing Factors:** Complete obstruction caused by volvulus or herniation (especially with a retrocolic approach).

- **Prevention:** Use an antecolic approach. Perform duodenal switch or distal gastric bypass in patients with BMI >50 kg/m^2, short mesocolon, and abundant adipose tissue.
- **Management:** Treat complete Roux limb obstruction surgically by reconstructing the anastomosis using a linear stapler for an end-to-end (L-L) anastomosis.

Complete obstruction around enteroenteral anastomosis

- **Predisposing Factors:** Stenosis at the jejuno-jejunostomy due to surgical error.
- **Prevention:** Use two linear staplers, one oriented caudally and the other cranially, to ensure the anastomosis opening remains central, minimizing stenosis risk.
- **Management:** Create a new enteroenteral anastomosis between the biliopancreatic segment upstream and the Roux limb downstream of the stenosis.

Dysphagia, nausea, and vomiting

- **Imaging Findings:** Complete intestinal obstruction with dilated bowel loops.
- **Predisposing Factors:** Most common cause: Incarcerated Littré hernia and peritoneal adhesions.
- **Prevention:** Suture all artificial mesenteric openings during surgery.

Vomiting of bilious content and nausea

- **Imaging Findings:** Dilated pouch and obstruction of the Roux limb near the gastroenteral anastomosis.
- **Exploratory Laparoscopy Findings:** Misconnection of the biliopancreatic limb instead of the Roux limb to the stomach.

Special cases (Gastro-Gastric Fistula)

- Incomplete gastric division.
- Suture line slippage at the upper gastric pouch.
- Penetrating perianastomotic ulcers.

Prevention

If an ulcer is detected endoscopically, place the patient on lifelong PPI therapy. Ensure complete dissection of the left His angle during surgery.

Management

Begin therapy when symptoms arise, such as: altered weight loss trajectory. Diffuse abdominal pain. Refractory perianastomotic ulcer.

Therapeutic Options

Fistula excision. Total or subtotal gastrectomy. Reconstruct enteroenteral anastomosis with fistula removal.

Revision procedures due to anatomical changes in the digestive tract

Dumping syndrome or refractory hyperinsulinemia

- **Symptoms:** Postprandial fatigue, profuse sweating, abdominal spasms. Symptoms mimic dumping syndrome or postprandial hypoglycemia.
- **Predisposing Factors:** Nesidioblastosis: Hyperinsulinemia due to β-cell pancreatic hypertrophy. Delayed gastric emptying syndrome.
- **Prevention:** Monitor patients with dumping-like symptoms, especially after ingesting sweets.
- **Management:** Multidisciplinary evaluation is necessary, involving endocrine and surgical teams. Reconstruction of the gastroduodenal passage. Partial caudal pancreatectomy.

Inadequate weight loss or weight regain

- **Symptoms:** Persistent or renewed weight gain despite prior surgery. Imaging may reveal minor dilation of the upper gastric pouch.
- **Predisposing Factors:** 20% of patients struggle with weight loss without any obvious causes.
- **Management:** Implantation of an adjustable band around the upper gastric pouch. Extension of the Roux limb. Conversion to a biliopancreatic diversion.

Intestinal obstruction

- **Causes:** Incarcerated hernia or adhesive band syndrome. Can lead to gastric distension.
- **Management:** Requires emergency surgery due to potential complications. Percutaneous gastrostomy tube placement is only considered in exceptional circumstances when operating rooms are unavailable.

Intraluminal or extraluminal hemorrhage

- **Diagnostic Challenges:** Hemorrhage diagnosis can be difficult. Focus on identifying the bleeding site rather than oversuturing.
- **Management:** Hemorrhage typically stops during surgical exploration.

Marginal ulcers

- **Symptoms:** Chronic pain. Bleeding or perforation.
- **Management:** Conservative: Proton pump inhibitor (PPI) therapy. Endoscopic coagulation. Surgical (for perforation): Omental grafting. Peritoneal drainage. Total parenteral nutrition. Retractile Ulcers: Require revision of the gastrojejunal anastomosis. Reduction of the gastric pouch volume.

Complication rates

- Global complication rate for Roux-en-Y gastric bypass: 20-25% [32].
- For single-anastomosis gastric bypass (209 cases): Complication rate: 5%.
- Complication rate reduced to 3% after gaining experience (learning curve) [33,34].

Gastric Sleeve: Complications

Massive hemorrhage during dissection of the greater curvature

- **Cause:** Injury to gastroepiploic or short gastric vessels.
- **Prevention:** Dissect in the avascular space within the gastrocolic ligament up to the splenic artery. Preserve short gastric vessels through careful handling of the stomach.
- **Management:** Hemorrhage from the greater omentum can be easily controlled. Hemorrhage from short gastric vessels poses serious intraoperative challenges and may necessitate splenectomy.

Diffuse hemorrhage during gastric dissection

- **Predisposing Factors:** Perisplenitis with adhesions between the splenic capsule and the greater omentum.
- **Prevention:** Remove adhesions before beginning gastric dissection.
- **Management:** The most frequent complication is accidental removal of the splenic serosal membrane, causing diffuse bleeding. Hemostasis: use plasma-argon coagulation, and cover the surface with a hemostatic patch containing thrombin and fibrinogen.

Postoperative complications of gastric sleeve surgery

- **Hemorrhage:** Ligated vessels. Stapler suture lines. Unclipped branches of the gastroepiploic artery or short gastric vessels. Management: hemorrhage from a splenic rupture in two stages is rare but critical. Upper gastrointestinal bleeding manifests as hematemesis or melena, treated endoscopically with: Electrocoagulation. Vasoconstriction therapy using adrenaline.
- **Suture Line Leaks:** Occurs in 0-5% of cases. Risk is higher in the antral region due to the thin gastric wall, where sutures may fail to capture all four layers.
- **Strictures and Stenoses:** Can occur both postoperatively and as late complications.
- **Dilations:** Late complication often related to eating behavior or excessive pouch size.

Biliopancreatic diversion: Complications

Difficulty measuring intestinal segments due to lower abdominal adhesions

- **Prevention:** Measure the intestines before gastric incision. Ensure the Roux limb can be tension-free before proceeding with sleeve resection.
- **Management:** Completing the procedure with a gastric sleeve and scheduling reoperation in 4-6 months after weight loss. Switching to a more conventional approach. Performing a single anastomosis gastric bypass, provided the first 2 meters of the intestine are adhesion-free.

Intestinal perforation during enteroenteral anastomosis

- **Predisposing Factors:** High intra-abdominal adipose tissue volume. Anatomical challenges of the ileum (thin and rigid wall).
- **Prevention:** Insert stapler jaws parallel to the intestine. Use the thicker jaw in the biliopancreatic limb and the thinner one in the Roux limb.

- **Management:** Perforation in the biliopancreatic limb: resect the perforated segment using a linear stapler and ultrasonic scissors. Perforation in the Roux limb: suture if the defect is small and not near the mesentery. Resect the segment if perforation is large or near the mesentery.

Duodenoileal anastomosis ischemia

- **Predisposing Factors:** Excessive skeletonization of the pylorus. Anatomical vascular peculiarities (e.g., short mesentery with high adipose content).
- **Prevention:** Preserve the right gastric artery whenever possible.
- **Management:** If ischemia is suspected: reopen the anastomosis. Remove the distal end of the gastric sleeve. Create a new ileogastroanastomosis.

Bile leak through the drain in the first 10 postoperative days

- **Diagnosis:** Duodenal stump fistula or dehiscence of the enteroenteral anastomosis.
- **Management:** Emergency laparotomy or laparoscopy to remove the old anastomosis and create a new one. For duodenal stump fistula: inspect the biliopancreatic segment to rule out mechanical obstruction. Close the fistula using interrupted or U-shaped sutures. If sutures fail, use an omental graft or insert a Foley catheter to drain the stump externally.

Cloudy, opalescent drain fluid with fever and inflammatory parameters

- **Additional Diagnostics:** abdominal CT with contrast.
- **Diagnosis 1: Duodenoileal Anastomosis Dehiscence**
  - **Management:** Conservative: Anastomosis stenting ± abscess drainage. Surgical: Resection of the distal gastric sleeve and anastomosis, followed by a new ileogastric anastomosis.
- **Diagnosis 2: Peritoneal Abscess Without Anastomotic Dehiscence**
  - **Management:** Abscess drainage using interventional or surgical methods.

Severe abdominal cramps and nausea

- **Additional Diagnostics:** Contrast X-ray to identify duodenoileal anastomosis stenosis or intestinal obstruction.
- **Diagnosis 1: Duodenoileal Anastomosis Stenosis**
  - **Prevention:** Use a 21- or 25-mm circular stapler for the anastomosis. Maintain an NG tube for 3 days postoperatively.
  - **Management:** For incomplete stenosis: NG tube, total parenteral nutrition, and sometimes hydrocortisone therapy. For complete obstruction: endoscopic dilatation under imaging guidance. If unsuccessful, excise the distal gastric sleeve and the anastomosis, and perform a new ileogastroanastomosis.
- **Diagnosis 2: Intestinal Obstruction**
  - **Prevention:** Close all artificial mesenteric openings to prevent Peterssen hernias common during weight loss.
  - **Management:** early intervention to resolve Roux limb obstruction.

Persistent abdominal pain and meteorism

- **Diagnosis:** Duodenal dilation due to biliopancreatic limb obstruction.
- **Causes:** Adhesions. Segment volvulus. Stenosis or internal herniation at the enteroenteral anastomosis.
- **Management:** Identify the exact site of obstruction (alimentary limb, biliopancreatic limb, or both).Determine appropriate surgical interventions to resolve the obstruction.

Gastric Pacing: Complications

Electrode dislocation

- **Symptoms:** Abdominal pain and muscle contracture. Pain location depends on electrode migration.
- **Diagnosis:** Ultrasound and contrast-enhanced abdominal X-ray (fluoroscopy) to check if the electrode moves with peristalsis.
- **Management:** Turn off the device (pain resolves immediately, but muscle contracture may persist). Reposition the electrode or remove the entire system.

Penetration into the stomach

- **Incidence:** 0.75% of asymptomatic patients, detected during routine postoperative exams.
- **Management:** Suture the stomach after electrode removal.
- **Causes:** Gastric contractions or trauma during implantation.

Inflammation of the IPG socket

- **Cause:** Infectious origin.
- **Management:** Complete removal of the system.

Gastric balloon: Complications

Severe complications (gastric/esophageal perforation, obstruction, massive hemorrhage from Mallory-Weiss syndrome) are extremely rare. Reported mortality rate: 0-0.2%. Initial phase: Epigastric pain, heartburn, and vomiting are common, lasting approximately 2 weeks, even with PPI, spasmolytics, analgesics, and antiemetics.2-8% of patients abandon this procedure due to symptoms. Some patients require emergency hospitalization for fluid-electrolyte imbalances.

Hematemesis and melena after balloon implantation

- **Cause:** Mallory-Weiss syndrome due to repeated vomiting, often from an overfilled balloon.
- **Prevention:** Educate patients to report vomiting promptly. Inflate the balloon with 500-600 mL saline in patients with BMI 30-35 kg/m^2.
- **Management: E**ndoscopic therapy with vasoconstriction (e.g., adrenaline injection).

Loss of gastric fullness sensation during meals

- **Cause:** Sharp foods (e.g., fish bones) can perforate the balloon.
- **Prevention:** Educate patients on avoiding certain foods.
- **Management:** Immediate removal of the balloon to prevent intestinal migration and ileus. Use of saline with methylene blue aids in detecting perforations.

Sudden onset abdominal cramps and nausea

- **Diagnosis:** CT scan reveals intestinal obstruction due to a foreign body and absence of the balloon in the stomach.
- **Management:** Surgical enterotomy for balloon removal. Rare, as perforated balloons usually pass spontaneously through the digestive tract.

Weight loss outcomes

Men	BMI	Weight (kg)	Excess Weight Lost (kg)	Excess Weight Lost %	Low BMI
A1 n = 17	32.3	101	16	52	5.2
A2 n = 18	37.8	118	19	39	6.2
A3 n = 18	46.2	145	26	35	8.2
S0 n = 19	60.9	191	38	31	12.1

Table 8: BMI Reduction in Male Patients Undergoing Gastric Balloon Therapy.

Women	BMI	Weight (kg)	Excess Weight Lost (kg)	Excess Weight Lost %	Low BMI
Excess Weight Lost n = 23	27.4	77	14	77	5.1
A1 n = 52	32.6	92	15	44	5.3
A2 n = 49	37.3	105	17	36	6.2
A3 n = 33	46.1	130	21	29	7.5
S0 n = 8	57	161	27	26	9.6

Table 9: BMI Reduction in Female Patients Undergoing Gastric Balloon Therapy.

Weight loss and secondary interventions after sleeve gastrectomy

Average weight loss

- **BMI Reduction:** the average BMI loss after sleeve gastrectomy is 20 kg/m^2. Patients with an initial BMI > 50 kg/m^2 (morbidly obese) or > 60 kg/m^2 (super-obese) often require a second intervention.

Second surgical interventions:

- **Indications:** For patients with insufficient weight loss or weight regain. Addressing remaining comorbidities.
- **Options for Second Intervention:**
  - **Biliopancreatic Diversion (BPD):** Effective for further weight loss in super-obese patients.
  - **Roux-en-Y Gastric Bypass (RYGB):** Alternative for managing weight loss and comorbidities.
- **Optimal Timing:** Second interventions are best performed 1 year after the initial surgery, when weight loss has plateaued. This timing reduces surgical risks and improves management of obesity-related comorbidities.

Reconstructive plastic surgery post weight loss

- **Importance:** Both functional and aesthetic benefits. Excess skin, improving quality of life.
- **Common Challenges:** Patients often present with: persistent comorbidities (e.g., hypertension, GERD, hypothyroidism, asthma, diabetes, depression). Preexisting scars and nutritional deficiencies. Hernias, requiring simultaneous repair (in 50% of cases).
- **Skin Retraction:** Limited to the first few weeks to months post-weight loss. Factors influencing skin elasticity: patient age. Speed of weight loss.
- **Timing for Plastic Surgery:** Requires at least 12 months of weight stabilization. Patients must be informed about the potential for large postoperative scars.

Surgical objectives and procedures

- **Goals:** Improve tissue form and function. Use excisional techniques and parietal defect closure. Residual fat deposits are addressed with liposuction.
- **Most Common Procedure:** Abdominoplasty: standard incision across the lower abdomen, extended into the flanks. Additional xiphoid-to-umbilical incisions may be required.
- **Challenges of Combined Procedures:** Prolong surgery duration, increase blood loss, and extend recovery time. Procedures may need to be staged based on patient recovery and progress.
- **Multiparous Patients:** Require tightening of aponeuroses and abdominal wall fascia to achieve anatomical realignment.

Complications of body contouring surgery

- **High Complication Rates:** Approximately 50%, even in specialized clinics.
- **Most Common Complications:** Wound Dehiscence and Seroma: ~30% of cases. Skin Necrosis: ~10% of cases.
- **Rare Complications:** Inflammation and Thromboembolism: Occur in 1-3% of cases.
- **Impact on Recovery:** Patients should be counseled about the potential risks and recovery timeline.

Type II diabetes mellitus (T2DM)

The role of metabolic surgery

Metabolic surgery has become a cornerstone in the treatment of severe obesity and associated comorbidities like Type II Diabetes Mellitus (T2DM). Procedures such as sleeve gastrectomy (SG) are increasingly preferred worldwide due to their simplicity, safety, and effectiveness.

Epidemiology

Global impact of diabetes

- In 2010, 285 million adults globally had diabetes; this number is projected to rise to 438 million by 2030.
- In 2012, the estimated cost of treating diabetes exceeded $245 billion, a 40% increase over the previous decade.

Global obesity epidemic

- Obesity prevalence is predicted to reach 18% by 2025.
- Strong association between obesity and T2DM: patients with BMI > 35 kg/m^2 have a 40x higher risk of developing T2DM compared to those with normal BMI.
- Approximately 1 in 3 bariatric surgery patients have T2DM.

Metabolic surgery as standard treatment

- Bariatric surgery is recognized as the most effective long-term treatment for obesity.
- Supported by 45 international societies, including the American Diabetes Association (ADA) and the International Diabetes Federation (IDF).

Sleeve gastrectomy and T2DM

Procedure overview

Introduced as a two-step approach for high-risk morbidly obese patients (BMI > 60 kg/m^2). Now a standalone procedure due to its effectiveness and safety, particularly in managing T2DM.

Technique

Laparoscopic removal of ~80% of the stomach, creating a narrow gastric sleeve. Resection starts 3-6 cm from the pylorus and extends along the greater curvature, calibrated with a bougie of 32-60 Fr.

Safety and complications

- **Mortality:** 0.05% at 30 days post-op.
- **Morbidities:** 2.4%, with fistulas (0.6-1%) and hemorrhage (0.7-1.4%) being the most common. Larger bougie sizes (≥38 Fr) and stapler line reinforcement (manual sutures) reduce risks.

Long-term weight loss:

- **Studies show consistent Excess Weight Loss (EWL):**
  - 57% EWL at 6 years in a small cohort.
  - 48% EWL at 6 years in larger cohorts.
- **BMI Reduction:** ~8 kg/m^2 over 6 years in T2DM patients.

Factors affecting long-term success

- **Behavioral and psychological adaptations:** Compensatory eating behaviors may cause late weight regain.
- **Anatomical considerations:** Overly wide sleeves or retained fundus portions can lead to weight regain.
- **Hormonal effects:** Suppression of ghrelin (hunger hormone) may diminish over time due to gastric dilation or extra-gastric secretion.

Comparison with Roux-en-Y Gastric Bypass (RYGB):

- Both procedures are comparable in medium-term weight loss (3-5 years).
- However, SG demonstrates superior weight loss at 5+ years compared to RYGB.

Outcomes of sleeve gastrectomy in T2DM patients

Short-term glycemic index outcomes

Effectiveness of sleeve gastrectomy (SG)

- SG and Roux-en-Y Gastric Bypass (RYGB) are highly effective in short-term management of Type II Diabetes Mellitus (T2DM).
- **SLEEVE-PASS Trial:**
  - 84% of patients achieved improved diabetes control 6 months postoperatively.
- **SM-BOSS Multicenter Study:**
  - Similar improvements at 1 year post-op.
- **STAMPEDE Trial:**
  - At 1 year post-op:
  - 37% of patients achieved HbA1c < 6%.
  - 27% were in complete remission (HbA1c < 6% without anti-diabetic medication).

Mid-term outcomes (3 Years)

- SG achieved diabetes resolution rates of 20-70% after 3 years.
- **STAMPEDE Trial at 3 Years:**
  - 24% of patients had HbA1c < 6%.
  - 20% were in sustained remission without medication.

Long-term glycemic index outcomes

- Data from SLEEVE-PASS and SM-BOSS Trials
  - Results from these trials are pending for follow-ups beyond 5 years.
- STAMPEDE Trial Results at 5 Years:
  - 23% of patients maintained HbA1c < 6%.
  - 15% remained in remission without anti-diabetic medication.
- Additional Cohort Studies:
  - In a cohort of 134 patients followed for 5 years: Glycemic targets were achieved in 66% of patients. Complete remission (HbA1c < 6% without medication) was seen in 11%. Only 3% were considered fully cured of diabetes.

Challenges and observations

Recurrence of diabetes

- Studies indicate a 30-50% recurrence rate of T2DM after bariatric surgery over several years.
- Recurrence does not signify failure, as metabolic and cardiovascular risk factors improve significantly post-surgery.

Metabolic memory effect

A phenomenon where early, aggressive glycemic control leads to sustained benefits in reducing cardiovascular complications, even if glycemic control diminishes later.

Reduction in diabetic complications

Long-term follow-ups indicate decreased incidence of multi-organ failure (MSOF) and other severe complications associated with diabetes.

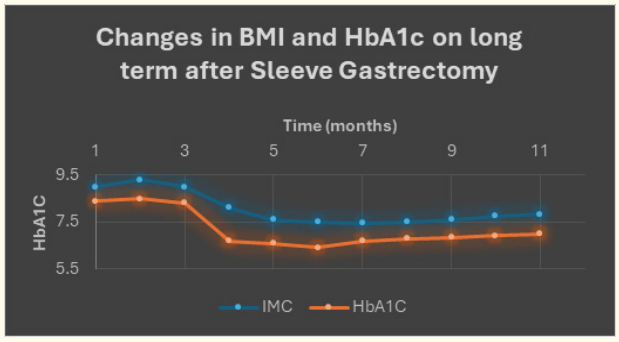


Figure 3: Changes in BMI and HbA1c After Sleeve Gastrectomy.

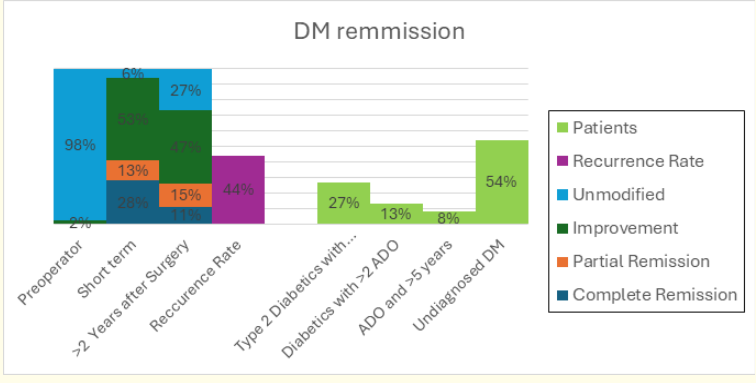


Figure 4: Remission Rates of Type 2 Diabetes Mellitus.

Predictive factors for long-term remission of type II diabetes mellitus (T2DM)

Key predictors of remission

- **Massive Weight Loss:** Substantial weight reduction is strongly associated with improved glycemic control and remission of T2DM.
- **Shorter Duration of Diabetes (<5 years):** Patients with a shorter history of diabetes have better outcomes, likely due to less β-cell damage and preserved pancreatic function.
- **Limited Use of Anti-Diabetic Medications (≤2 agents):** Patients treated with fewer oral anti-diabetic drugs (ADO) have higher remission rates.

Implications of early metabolic surgery

- **Target Group:** Early surgical intervention in patients with preserved β-cell function and manageable diabetes.
- **Improved Outcomes:** Early intervention is critical for maximizing remission potential and preserving long-term β-cell functionality
- **Observations in Gastric Bypass Patients:** Similar findings suggest that early bypass surgery yields better results for long-term diabetes remission.

Predictive models for T2DM remission

DiaRem score (Validated for Gastric Bypass)

A widely recognized tool for predicting remission in T2DM patients undergoing Roux-en-Y Gastric Bypass (RYGB). Factors include age, HbA1c levels, type of anti-diabetic medication, and insulin use.

ABCD score (Tested for Sleeve Gastrectomy)

Specifically tested for patients undergoing Sleeve Gastrectomy (SG).

Based on:

- **BMI:** Higher BMI predicts better outcomes.
- **C-Peptide Levels:** Indicative of β-cell reserve.
- **Duration of Diabetes:** Shorter duration correlates with better remission.
- **Age:** Younger patients are more likely to achieve remission.

Importance of early intervention

- **Preserved β-Cell Reserve:** Early surgery, ideally during the phase of high β-cell reserve, significantly improves the likelihood of T2DM remission.
- **Timely Treatment:** Delayed interventions reduce the chances of remission due to progressive β-cell dysfunction.

Limitations of predictive models

While tools like DiaRem and ABCD are useful for initial predictions, they do not reliably predict long-term remission outcomes.

Comparison with pharmacological treatment

- **Effectiveness of Bariatric Surgery:** Numerous randomized controlled trials (RCTs) have repeatedly demonstrated the superiority of bariatric surgery over lifestyle changes and pharmacological therapy in managing Type II Diabetes Mellitus (T2DM).

STAMPEDE trial findings

- At 5 years post-surgery, Sleeve Gastrectomy (SG) showed: Glycemic Control: 23% of patients achieved HbA1c < 6% compared to 5% in the intensive medical therapy group. Cardiovascular Risk and Quality of Life: SG significantly outperformed medical therapy in reducing risk factors and improving quality of life.
- These advantages led to the formal approval of metabolic surgery for treating T2DM by the American Diabetes Association (ADA) and the International Diabetes Federation (IDF).

Comparison with other bariatric procedures

Meta-Analyses of SG vs. Roux-en-Y Gastric Bypass (RYGB)

- **Short-Term Outcomes:** A meta-analysis of 33 studies, including RCTs and observational studies, reported no significant difference between SG and RYGB in T2DM remission at 3 years (80% vs. 81%).
- **Long-Term Outcomes:** Another meta-analysis suggested RYGB had superior T2DM resolution compared to SG at 5 years post-op.
- **Limitations of Meta-Analyses:** These studies included heterogeneous data with varying HbA1c thresholds and definitions of remission.

Results from ongoing RCTs

- Trials such as SLEEVE-PASS and SM-BOSS are actively comparing SG and RYGB outcomes.
- STAMPEDE Long-Term Results:
  - After 5 years: Glycemic Control: 23% of SG patients achieved HbA1c < 6%, compared to 29% with RYGB. Remission Without Medication: 15% after SG vs. 22% after RYGB.
  - Although RYGB showed slightly better outcomes, differences were not statistically significant, and the trial design may have lacked the power to detect modest differences.

Medication independence

A higher percentage of RYGB patients were off anti-diabetic medications compared to those undergoing SG, indicating a potential metabolic advantage for bypass procedures.

Key insights

SG vs. RYGB in T2DM management

- Both SG and RYGB are effective in achieving glycemic control and T2DM remission.

- RYGB may offer slight advantages in medication independence and long-term remission rates, but the differences are often modest and context-dependent.

Strength of bariatric surgery

SG and RYGB far surpass pharmacological therapy in improving glycemic control, cardiovascular risk factors, and quality of life, solidifying their roles as front-line treatments for obese T2DM patients.

Long-term monitoring

Continued follow-up is essential to understand the durability of remission and the potential for recurrence, especially as differences between SG and RYGB may emerge over extended timeframes.

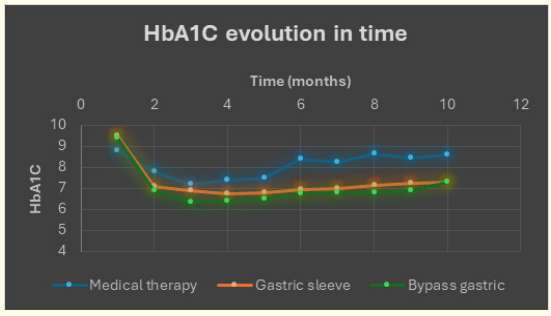


Figure 5: HbA1C value in progress.

Mechanism of antidiabetic action-role of weight loss and caloric restriction

- **Weight Loss:** Improved glycemic control has been clearly linked to significant weight reduction.
- **Weight-independent mechanisms:**
  - Certain glycemic improvements occur independently of weight loss.
  - **Gastric Sleeve (GS):** Alters digestive hormones such as ghrelin, peptide YY, and glucagon-like peptide-1 (GLP-1) to levels similar to Roux-en-Y Gastric Bypass (RYGB). Long-term T2DM remission correlates with increased postprandial GLP-1 response.

- **Bile acids and gut microbiota**

  - **Bile Acids:** Influence energy balance via Farnesoid X receptors (FXR), which increase post-GS.
  - **Microbiota Diversification:** Bile acids also diversify gut microbiota, contributing to metabolic benefits.

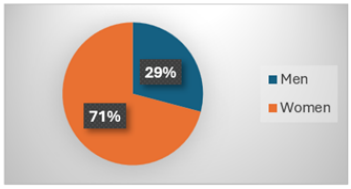
Impact on Type I diabetes (T1DM)

- **Limited Effects:** GS shows more modest outcomes in T1DM patients. A review of 17 studies on 100 T1DM patients showed significant glycemic control improvement, reduced insulin requirements, and lower HbA1c levels.
- **Advantages of GS in T1DM:** Provides more predictable absorption of carbohydrates and fats compared to malabsorptive procedures. Considered a safer option for T1DM patients prone to postoperative hypoglycemia.
- **Postoperative Complications in T1DM:** Risks include diabetic ketoacidosis, hypoglycemia, and gastrointestinal motility issues (e.g., prolonged ileus or acute gastric dilation).

Results

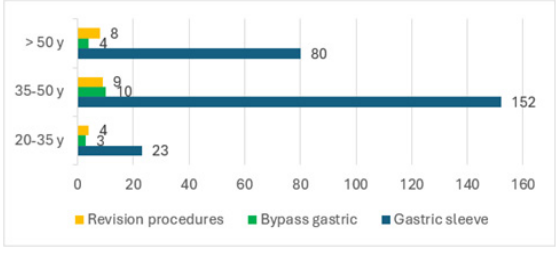
Based on sex and the type of intervention, the following were observed:

- The number of patients who underwent gastric sleeve was 255 (93.75%), of which 74 were men (29.01%) and 181 were women (70.98%), predominantly female.
- The number of patients operated on by gastric bypass was 17 (6.25%), of which 5 were men (29.41%) and 12 were women (70.58%), predominantly female.
- The number of revision procedures was 21 (7.72%), of which 2 were men (9.52%) and 19 were women (90.47%), predominantly female.



		Cases	Gastric sleeve	Gastric bypass	Revision Procedures
Sex	M	79	74	5	2
	F	193	181	12	19
Total		272	255	17	21

Figure 6



	Gastric sleeve		Bypass gastric		Revision procedures	
Sex Age	M	F	M	F	M	F
20-35	3	20	0	3	0	4
35-50	49	103	1	9	2	7
>50	22	58	4	0	0	8

Figure 7

Distribution by age

From the presented graph regarding the age distribution of the study cohort, it can be observed: in the 20-35 age interval, there were 30 patients (11.02%), in the 35-50 interval, there were 162 patients (59.55%), and the number of those over 50 years old was 84 subjects (30.88%).

Regarding the technique used by gender in the three age categories, the following can be observed:

- Gastric sleeve is much more commonly used, with a percentage of 93.67% in males and 93.78% in females compared to gastric bypass, which has only 6.32% among males and 6.21% among females.
- Gastric bypass was used in the 20-35 age interval only in female subjects, and in those over 50 years old, only in males.
- Revision procedures were found in all three age intervals in females, accounting for 90.47% of the total, and in males, 9.52% only in the 35-50 age interval.

From the graph regarding the distribution of patients based on the type of surgery, the following can be observed:

- Patients operated on for gastric sleeve numbered 255 (93.75%), and those for gastric bypass numbered 17 (6.25%).

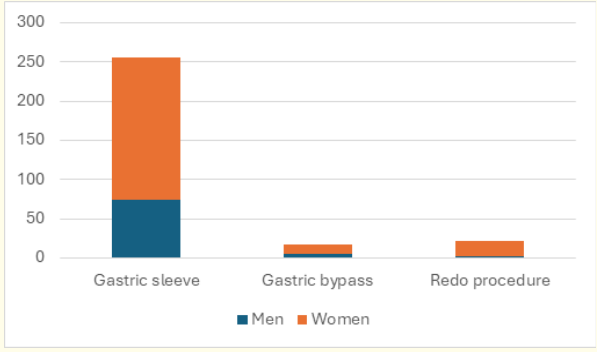


Figure 8

- Of the 272 patients included in the study cohort, the revision rate was 7.72%. Only those who were part of the cohort operated on for gastric sleeve or gastric bypass between January 1, 2018, and June 12, 2019, were included in this study.

The percentage difference between the two surgical techniques is the result of better patient compliance in favor of the gastric sleeve as well as the surgical technique or potential complications that may arise.

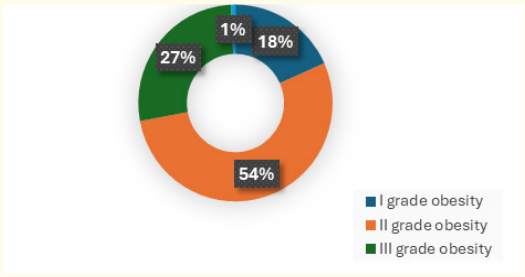


Figure 9

From the presented graph regarding the distribution of patients by BMI, the following were observed: those with grade I obesity were 50 (18.38%), with grade II obesity 146 (53.67%), grade III obesity 74 (27.2%), and morbid obesity 2 (0.73%). A percentage of 88% of the total came from urban areas.

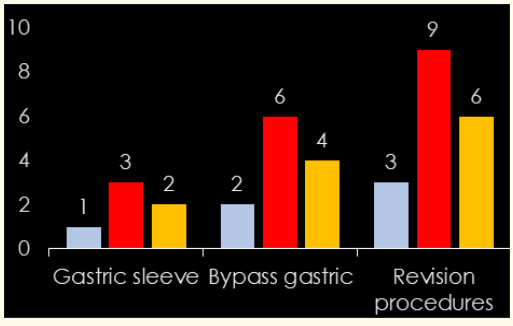


Figure 10

Regarding the average hospital stay in the surgery department, it was found that patients operated on for gastric sleeve were discharged after an average of 2 days, gastric bypass patients after 4 days, and those with revision procedures after approximately 6 days.

Between January 2010 and July 2012, 320 patients underwent bariatric surgery, distributed as follows:

- 112 (35.6%) Roux-en-Y gastric bypass (RYGB),
- 95 (30.2%) gastric sleeve (GS),
- 76 (24.1%) duodenal switch (DS),
- 28 (8.9%) laparoscopic gastric plication (LGP),
- 4 (1.3%) biliopancreatic diversion (BPD).

Emergency Department Visits:

- 53 patients (16.6%) visited the emergency department at least once within the first 30 postoperative days: 49 (92.5%) were admitted once,3 (5.7%) were admitted twice,1 (1.9%) was admitted three times.
- A total of 58 admissions were recorded among these patients.

The distribution of admissions by the type of bariatric procedure is summarized in Figure, which shows that RYGB and DS patients accounted for the majority of admissions (74% of total admissions). Statistical analysis confirmed that admission distribution was not homogeneous (p = 0.016).

Procedure performed	Location of defect	Number of cases
Upper digestive endoscopy with stenting	Stenosis with perianastomotic occlusion	1
Resleeve	Dilatation of the upper gastric pouch	2
Upper digestive endoscopy	Hemorrhage from duodenal ulcer	5
Suture and verification with methylene blue	Gastro-gastric fistula	1
Suture line repair	Staple line slippage in the antral area	1
Surjet	Hemorrhage from gastric branches	2
Fistula excision and surjet	Fistula on the sleeve transection	3
Exploratory laparoscopy	Postoperative inflammatory syndrome with septic focus	6

Table e

Reasons for admission

Abdominal pain was the leading cause, reported in 29 patients (50%).Wound complications were the second most common cause, occurring in 13 cases (22.4%).Complementary emergency investigations are described in Table, showing non-uniform distribution across surgical procedures. Notably, 10 patients (17.2%) required neither complete blood count (CBC) nor imaging.

Discharge diagnoses

The most common discharge diagnosis was nonspecific abdominal pain (46.6%), often attributed to altered intestinal motility following RYGB or DS. Reduced appetite in some patients was linked to dietary changes rather than digestive obstruction. Patients with peritoneal infection were treated with image-guided percutaneous drainage. Wound complications (e.g., minor infections) were manageable with outpatient care.

Rehospitalization

90 patients (35.84% of the study group; 5.94% overall) required rehospitalization in the surgical unit:

- 7 RYGB and 6 DS patients.
- 5 patients (9.4%) required emergency reoperation: 3 with incarcerated hernias (all DS), 1 with hemoperitoneum (GS),1 with intestinal obstruction (RYGB).

Hospitalization duration

4 days for study group patients,3 days for those not presenting to the emergency department. Univariate analysis identified surgical procedure type as the only variable predicting readmission (p = 0.0016).

Discussion

The emergency department sees an average of 254 patients daily (92,808 admissions in 2013). The 53 bariatric surgery patients in this study represent:0.06% of total emergency admissions, 0.7% of surgical patient admissions. The study showed an emergency admission rate of 16.6% for scheduled bariatric patients, consistent with morbidity rates defined by the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO).

Observed complications

Range from acute or subacute hemorrhages to sepsis caused by fistulas and obstructive manifestations due to incarcerated hernias. Emergency physicians must be equipped to diagnose and manage bariatric surgery patients effectively.

Emergency investigations

75.9% underwent CBC, 70.7% had an abdominal X-ray, These two tests alone allowed screening for complex complications. 27.6% of patients underwent CT, predominantly those with DS suspected of obstruction. Upper digestive endoscopy and contrast ingestion were the least used diagnostic tests.

Diagnostic and treatment protocols

The American Society for Metabolic and Bariatric Surgery (ASMBS) emphasizes treatment of primary symptoms. Morbidly obese patients require rapid and aggressive diagnostic and treatment approaches due to limited physiological reserves.

Challenges in examination

- **Anthropometric characteristics**: Large subcutaneous adipose tissue complicates physical and imaging evaluations. Difficult peripheral and central venous access.
- **Imaging Equipment Limitations:** Many imaging systems have weight restrictions, necessitating evaluation in specialized centers.

		Admitted from ER dep	Admitted by appointment
Patients number		53	267
Age (average,interval)		46 (19-65)	46 (17-65)
Hospitalization days (average,interval)		4 (3-14)	3 (2-46)
BMI (average, interval)		44 (35-67)	45 (35-72)
Sex	M	14	97
	F	39	170
Surgery technique	Bypass Y a la Roux	19	112
	Gastric sleeve	20	95
	Duodenal switch	5	76
	Gastroplication	2	28
	Biliopranceratic diversion	7	4
Comorbidities	Hypertension	29	121
DM	12	69	
Dislypidemia	11	80	
SleepApneeaSdr.	25	129	
Morbidity		6	22
Mortality		0	0

Table 10: Characteristics of admitted patients.

	Blood tests	Rx abdomen	CT	Upper Endoscopy	Imaging with constrast medium
Gastric sleeve	3	3	3	0	1
Diversie B-P	1	1	0	1	1
Gastroplicare	6	6	1	1	0
Switch duodenal	17	14	7	0	0
Bypass gastric în Y a la Roux	17	17	5	2	1
Total (%)	44 (75,9%)	41 (70,7%)	16 (27,6%)	4 (6,9%)	3 (5,2%)

Table 11: Paraclinic investigations postOP.

	Presentation nr. 1	Presentation nr. 2	Presentation nr. 3	Total (%)
Diffuse abdominal pain	23	3	1	27 (46,6%)
Wound complications	10	0	0	10 (17,2%)
Postoperative inflammatory syndrome	4	0	0	4 (6,9%)
Food intolerance	4	0	0	4 (6,9%)
Peritonitis	3	1	0	4 (6,9%)
Wound pain	3	0	0	3 (5,2%)
Hernia	3	0	0	3 (5,2%)
Hemoperitoneum	2	0	0	2 (3,4%)
Intestinal obstruction	1	0	0	1 (1,7%)

Table 12: Diagnoses in ER.

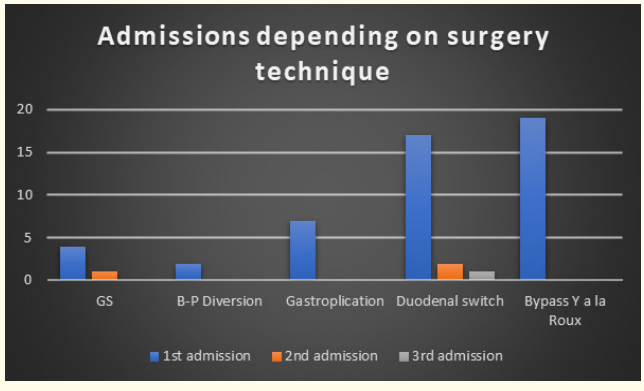


Figure 11: ER department admissions depending on technique.

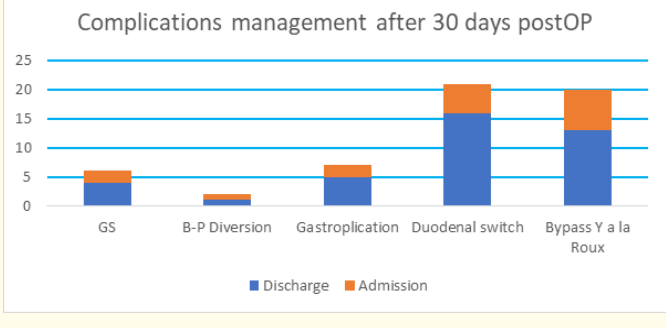


Figure 12: Management after ER dep.

Conclusions

Based on the results of this study, the following conclusions can be drawn:

- A higher prevalence of female patients (71%) and urban origin (88%) is a general characteristic of candidates for bariatric surgery.
- Patient compliance tends to favor laparoscopic vertical sleeve gastrectomy, with the decisive factor being the short hospital stay duration.
- Laparoscopic vertical sleeve gastrectomy requires thorough preoperative patient education regarding potential complications. A postoperative complication rate of 35.7% was observed, which aligns with rates reported in multicenter studies.
- All patients experienced significant weight loss 12 months after undergoing laparoscopic vertical sleeve gastrectomy, with an average excess weight loss percentage of 59.6%.
- The success of the surgical procedure showed higher values in diabetic patients compared to non-diabetic patients 12 months postoperatively, with marked weight loss during the first three months after surgery.
    - More than half of the studied cohort (53.67%) presented with a BMI corresponding to grade II obesity, indicating a correlation between weight status awareness and the timing of seeking medical advice.
- Average plasma HbA1c levels demonstrated a consistent decline throughout the follow-up period.
- Dyslipidemia resolved in 48.8% of the patients.
- Both the short median hospitalization duration (2 days) and direct costs support the use of laparoscopic vertical sleeve gastrectomy.
- Recognizing that bariatric surgery is the only viable solution for sustained weight loss and improved quality of life in patients with morbid obesity underscores the need to incorporate these procedures into treatment guidelines and expand public access to this treatment option.
- The revision rate for vertical sleeve gastrectomy largely depends on the patient's eating behavior.
- Imaging investigations for follow-up require patients with a high BMI to seek specialized private medical services equipped for such evaluations.
- Skipping the preoperative psychiatric evaluation significantly reduces the success rate at 12 months postoperatively due to the adoption of harmful behaviors by patients.
- Given most female patients (71%) undergoing bariatric surgery, the role of postoperative plastic surgery should be discussed as part of the preoperative plan.

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