REVIEW/DERLEME

CURRENT APPROACHES IN BARIATRIC SURGERY

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ABSTRACT

Obesity is a complex and multifactorial disease characterized by excessive fat accumulation, which negatively affects overall health. Bariatric surgery has become a cornerstone treatment for morbid obesity, particularly when conventional methods fail. This review outlines the primary types of bariatric procedures—restrictive, malabsorptive, and combined techniques and examines their mechanisms, indications, and complications. Particular attention is given to the management of both short-term complications (e.g., vomiting, reflux, early dumping syndrome) and long-term issues such as micronutrient deficiencies, weight regain, and malnutrition. With a multidisciplinary approach involving nutritional planning, psychological support, and long-term follow-up, bariatric surgery can yield sustainable weight loss and substantial metabolic benefits, including improvements in type 2 diabetes and cardiovascular risk.In the treatment of morbid obesity, bariatric surgery stands out as an effective method for achieving weight loss. Successful outcomes require new nutritional habits, regular follow-up, and a multidisciplinary approach. Surgical techniques may be restrictive, malabsorptive, or a combination of both. In the postoperative period, complications such as micronutrient deficiencies, protein malnutrition, weight regain, and other issues may occur. These complications vary according to the surgical method and lifestyle changes. It is crucial for patients who undergo bariatric surgery to maintain nutritional balance through regular monitoring and supplementation. This review discusses bariatric surgery and its potential complications.

Keywords: Obesity, Bariatric surgery, Vitamin and mineral deficiencies

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INTRODUCTION

Obesity is defined by the World Health Organization as an abnormal or excessive fat accumulation that poses a threat to health. Its rapid increase in both developed and developing countries has turned it into a significant public health challenge. This multifaceted condition stems from a complex interplay of genetic predisposition, environmental factors, socioeconomic and psychological influences, sedentary lifestyles, and hormonal imbalances (1). Research consistently confirms that obesity elevates the risk of serious health issues, including cancer, metabolic syndrome, type 2 diabetes, cardiovascular diseases, and psychological disorders (2).

Body Mass Index (BMI) is one of the most commonly used measures to diagnose and classify obesity. Individuals with a BMI exceeding 30 kg/m² are considered obese, while those with a BMI over 40 kg/m² are classified as morbidly obese (3). Traditional treatment approaches include medical nutrition therapy, behavioral modifications, pharmacotherapy, and increased physical activity (4). However, when these strategies fail especially in patients with a high risk of morbidity (i.e., those with a BMI above 35 kg/m² with at least one chronic disease or a BMI exceeding 40 kg/m² regardless of comorbidities) surgical intervention becomes a compelling option (5). In this context, bariatric surgery has emerged as a highly effective solution for achieving durable weight loss.

The term “bariatric surgery” comes from the Greek words “bar” (weight) and “iatria” (treatment) (2). In the treatment of morbid obesity, bariatric procedures have demonstrated superior outcomes compared to diet or pharmacotherapy alone. This approach is delivered through a multidisciplinary team that addresses both the physiological and psychological

aspects of the condition. Each surgery is meticulously tailored to the individual, ensuring a personalized treatment plan (6).

Bariatric procedures are broadly categorized into three types: restrictive, malabsorptive, and combination techniques. Restrictive methods reduce stomach capacity to limit food intake, malabsorptive procedures interfere with nutrient absorption in the gastrointestinal tract, and combination techniques harness both mechanisms for enhanced effectiveness.

Following surgery, patients must adopt new dietary patterns and lifestyle habits. Studies suggest that, after 18–24 months, some degree of weight regain may occur until the target body weight is stabilized (7, 8). Therefore, strict adherence to nutritional guidelines is essential. Despite often high energy intakes, morbidly obese individuals frequently suffer from micronutrient deficiencies, which can be exacerbated postoperatively. Identifying and correcting these deficiencies before surgery with a balanced nutrition plan is crucial (6-8).

Potential postoperative complications such as reflux and dumping syndrome can be minimized through carefully designed nutritional protocols. Thus, a comprehensive, surgery-specific preoperative and postoperative dietary plan is vital. Ultimately, bariatric surgery aims not only to achieve significant and lasting weight loss but also to instill lifelong, sustainable healthy eating habits (8).

OBESITY

Definition and Classification of Obesity

Obesity is defined by the World Health Organization (WHO) as "an abnormal or excessive fat accumulation that may negatively impact health" and is commonly assessed using the Body Mass Index (BMI) criteria. Recognized as one of today's leading causes of morbidity and

mortality, obesity contributes to the development of numerous health conditions and places a significant burden on public health budgets (9).

Treatment Methods for Obesity

There are five primary treatment options for obesity: dietary therapy, physical activity and exercise, pharmacotherapy, behavioral modification therapy, and surgical treatment (10).

Dietary therapy:

The cornerstone of obesity management is a personalized dietary regimen that ensures a balanced intake of fats, carbohydrates, and proteins. Diet plans are tailored based on individual factors such as gender, age, the severity of obesity, and any existing health conditions (10,11).

Physical activity and exercise therapy:

In conjunction with a proper diet, physical activity plays a vital role in mitigating obesity-related health issues. The World Health Organization (WHO) (9). recommends that adults engage in at least 150-300 minutes of moderate-intensity aerobic activity per week, or alternatively, 75-150 minutes of vigorous-intensity aerobic activity per week (11).

Pharmacotherapy:

Pharmacological treatment may be considered when no significant weight loss is observed after three months of diet and exercise. To qualify, an obese patient should have a BMI greater than 30 kg/m^2 and at least one obesity-related complication, such as cardiovascular disease, diabetes, or hypertension (10).

Behavioral modification therapy:

This therapy focuses on fostering long-lasting, healthy lifestyle habits. By promoting and sustaining positive behavioral changes, patients are better equipped to manage their weight over the long term (10,11).

Surgical treatment:

Surgical intervention is typically considered for individuals with a BMI exceeding 40 kg/m², particularly when other treatment methods have failed. It is also an option for patients with obesity-related complications (11).

Bariatric Surgery

In recent years, the role of bariatric surgery as metabolic surgery has become increasingly emphasized. These surgical interventions not only facilitate weight loss but also significantly improve metabolic disorders such as type 2 diabetes, dyslipidemia, and hypertension. Procedures like Roux-en-Y gastric bypass and BPD-DS show marked remission rates for type 2 diabetes, independent of weight loss. This has shifted the paradigm from solely treating obesity to managing metabolic disease (12).

Indications and Contraindications for Bariatric Surgery

For bariatric surgery to be both successful and effective, careful patient selection is paramount. A period of preoperative observation is essential to optimize surgical outcomes. During this phase, indications and contraindications must be meticulously reviewed, while the patient's adherence to dietary therapy, follow-up visits, and overall commitment are assessed (13).

Indications for bariatric surgery include:

- A Body Mass Index (BMI) exceeding 35 or 40 kg/m².
- Failure to achieve significant results despite years of diet and medical treatments.
- Adequate psychological and social support systems.
- Absence of substance or alcohol dependency.
- A high level of patient education regarding the surgical process.
- The ability to understand and accept the associated risks.

Contraindications for bariatric surgery include:

- Patients with diagnosed psychiatric disorders.
- Individuals with substance or alcohol dependency.
- Those with eating disorders, such as bulimia nervosa.
- Patients under 18 or over 65 years of age.
- The presence of significant medical risks or endocrine causes of obesity.
- Individuals who have difficulty comprehending the surgical procedure.
- Patients with unrealistic expectations regarding treatment outcomes.
- Individuals exhibiting emotional instability.
- Those unable to comply with the necessary follow-up and long-term care requirements, including self-care or additional support when needed.
- Pregnancy (12).

Bariatric Surgery Techniques

Robot-assisted bariatric surgery is an emerging field that utilizes robotic systems to perform precise and minimally invasive procedures. Robotic systems enhance dexterity and

visualization, especially in complex or revisional surgeries. They offer ergonomic advantages for surgeons and may result in improved outcomes in select patients (13).

Endoscopic Sleeve Gastroplasty (ESG) is a newer, minimally invasive bariatric technique that uses an endoscope to place sutures in the stomach, reducing its volume without surgical incisions. This procedure offers benefits such as a quicker recovery time, fewer complications, and no permanent anatomical alterations. However, long-term outcomes are still being evaluated, and ESG is currently recommended for patients with a lower BMI or those who are not suitable candidates for traditional bariatric surgery (12).

Bariatric procedures are primarily categorized into three groups: malabsorptive techniques, restrictive techniques, and combined approaches that incorporate elements of both.

Restrictive techniques:

These methods reduce the stomach's volume, thereby limiting food intake and promoting weight loss.

Laparoscopic adjustable gastric banding (LAGB): An adjustable silicone band is placed around the cardia to create a small gastric pouch, effectively limiting food intake. This method is less invasive than other surgical options and has a lower risk of malnutrition. However, initial weight loss is generally slower. Reported weight loss ranges from 40–50% during the first year and 30–50% by the fifth year (13- 14).

Vertical band gastroplasty (VBG): In this procedure, a small opening is created in the lower part of the stomach, and the anterior and posterior walls are sutured together to form a pouch. A band is placed at the pouch's opening to prevent dilation, which leads to a quicker sense of satiety. Although once popular, VBG is now less commonly performed (15-16).

Intragastric balloon: This device is inserted into the stomach via endoscopy or laparoscopy and is then inflated with isotonic saline, creating a feeling of fullness that curbs appetite and reduces the secretion of appetite-stimulating hormones. It is one of the least invasive methods, typically remaining in place for about six months before being removed endoscopically (15-16).

Malabsorptive techniques:

These procedures achieve weight loss by shortening the length of the small intestine, thereby reducing nutrient absorption.

Jejunoileal bypass (JIB): Historically foundational in bariatric surgery, this method reduces the effective length of the intestine. However, its inability to control hyperphagia and the associated severe complications—such as liver failure and high mortality rates—led to its discontinuation in the early 1970s.

Biliopancreatic diversion (BPD): In this procedure, approximately two-thirds of the stomach is resected in a distal horizontal fashion, leaving a small gastric pouch with a maximum volume of 500 mL. Although gastric resection is performed, the relatively large remaining pouch means this procedure cannot be strictly classified as restrictive (17).

Combined (restrictive and malabsorptive) techniques:

Biliopancreatic diversion with duodenal switch (BPD-DS): This technique combines vertical gastrectomy with the creation of a common channel measuring 75–100 cm, thereby providing both restrictive and malabsorptive effects. While it yields significant long-term weight loss—with an average reduction of 75% in the first year and 70–90% by the fifth year—and improvements in type 2 diabetes, hypertension, and dyslipidemia, it is associated with a high

risk of nutritional deficiencies, including vitamin and protein shortages. Consequently, it is performed only in experienced centers. This procedure is irreversible but can be modified if necessary (18-19).

Table 1. Comparison of bariatric surgery methods (15-17)

Procedure	**AGB**	**SG**	**RYGB**	**BPD DS**
Mechanism of surgery	Restrictive (volume limiting)	Restrictive; also exerts metabolic effects	Restrictive/Malabsorptive	Malabsorptive
Weight loss	First year: 40–50% 5th year: 30–50%	First year: 60–67% 5th year: 53–65%	First year: 70% 5th year: 60%	First year: 75% 5th year: 70–90%
Advantages	- Easily performed, less invasive technique - No need for gastric or intestinal resection - Low risk of malnutrition - Reversible	- Safe and simple - Low ghrelin, high GLP-1 levels - Appetite reduction - Preserved pylorus - No dumping	- Suitable for super obese patients and those with Crohn's disease - Induces hormonal changes that support weight loss (decreased ghrelin, increased GLP-1 and PYY) - High weight loss - Long-term data available	- Reversible technique - Maximum weight loss - Best metabolic outcomes

		syndrome - Fewer vitamin and mineral deficiencies - Low malnutrition risk		
Disadvantages	- Frequent band-related complications (slippage, perforation, port separation) - Esophageal spasms - Gastroesophageal reflux - Port infection - Stoma obstruction	- Limited long-term data (>5–10 years) - Leaks from the stapler line - Irreversible	- Complicated and challenging technique - Leaks from the stapler line - Stoma obstruction - Dumping syndrome	- Higher risk of vitamin and mineral deficiencies - High malnutrition risk - Risk of chronic diarrhea and foul-smelling gas, which may be irreversible

AGB: Adjustable Gastric Banding, BPD-DS: Biliopancreatic Diversion with Duodenal Switch, RYGB: Roux-en-Y Gastric Bypass, SG: Sleeve Gastrectomy.

Life After Bariatric Surgery

Nutrition:

All patients must undergo a comprehensive nutritional assessment both preoperatively and postoperatively. This evaluation is especially critical in malabsorptive procedures, where perioperative nutritional status significantly influences outcomes. A dietitian plays an essential role within the bariatric team by developing individualized nutritional plans and providing tailored dietary education during both the pre- and postoperative phases (17,18).

In the preoperative period, low-calorie diets (1000–1200 kcal/day) are implemented to reduce liver volume and enhance the success of laparoscopic surgery. For patients with a history of eating disorders, surgical decisions should be made by a multidisciplinary team. Postoperatively, the focus shifts to helping patients adapt to healthy eating habits and the new surgical lifestyle (19). The primary goals during this period are to facilitate healing and prevent muscle loss by designing personalized diet plans that ensure sufficient energy, macronutrients, and micronutrients. Adherence to a structured, balanced diet significantly reduces postoperative complications. Typically, a five-stage dietary regimen is followed after bariatric surgery: clear liquids, full liquids, pureed foods, soft foods, and finally, solid foods (19,20).

Clear liquid diet: Recommended during the first two postoperative days, this phase allows only water, broths, protein supplements, and non-carbonated, caffeine-free, sugar-free beverages. Carbonated, caffeinated, sugary drinks, tomato paste, and solid foods are strictly prohibited. Liquids should be consumed in small, frequent sips throughout the day (15,16).

Full liquid diet: After the clear liquid phase, patients transition to a full liquid diet, which includes low-sugar beverages along with milk, dairy products, and suitable dairy alternatives. This diet is generally maintained for about one week, during which patients should aim for 60–80 g of protein and 1800 ml of fluids daily. Recommended fluids include water, lean meat or

chicken broth, decaffeinated coffee, light tea, skim milk, almond milk, soy milk, lactose-free milk, nonfat yogurt, and low-fat cheese, while restrictions on carbonated, caffeinated, and sugary drinks, as well as tomato paste and solid foods, continue (18, 20).

Pureed diet: This phase involves a high-protein diet where foods such as nonfat yogurt, chicken, and broth are blended into a smooth puree. Patients typically have 3–6 meals per day, with fluids allowed approximately 30 minutes after each meal (18-20).

Soft diet: Serving as a transitional phase, the soft diet includes foods that are either pureed or soft-solid and easy to chew. Cooked foods should be finely chopped or easily mashed with a fork. Emphasis is placed on protein sources such as meat, fish, and eggs, along with soft vegetables, mashed potatoes, and cream-free soups. Fried foods, hard fruits, white bread, and carbonated, caffeinated, or sugary beverages remain prohibited. Low-fat or nonfat dairy products are preferred over full-fat alternatives (14,15).

Solid food diet: This final phase is tailored to the patient's tolerance of solid foods and marks the gradual return to a regular diet. During this phase, patients are advised to consume foods at moderate temperatures (avoiding extremely hot or cold items) and to refrain from drinking liquids during meals to prevent nausea and vomiting (20).

Exercise:

In addition to a structured nutritional program, exercise is a critical component for achieving healthy weight loss and maintaining weight postoperatively. During the rapid weight loss phase following surgery, exercise helps preserve muscle mass, enhance cardiopulmonary capacity, and improve overall functional mobility (21). Furthermore, regular physical activity contributes to an improved quality of life and supports the recovery process.

While there is no universal exercise guideline for bariatric patients, both aerobic and strength training exercises are integral to preoperative and postoperative care. The American College of Sports Medicine (ACSM) recommends that individuals undergoing obesity treatment engage in at least 250 minutes of moderate-intensity aerobic exercise per week. The American Heart Association (AHA) advises low- to moderate-intensity exercise for at least 20 minutes per day, three to four days per week prior to surgery (21). Additionally, the Obesity and Metabolic Surgery Guideline suggests starting with 150 minutes of aerobic exercise per week and progressing to 300 minutes over the long term, coupled with strength training 2–3 days per week (22).

Preoperative exercise can improve surgical outcomes, and despite potential resistance to diet and exercise among bariatric patients, postoperative exercise has been shown to positively affect weight loss, body composition, cardiovascular fitness, and quality of life. The type, frequency, duration, and timing of exercise should be carefully planned according to the patient's recovery stage. Initially, patients may begin with walking, with strenuous abdominal exercises being avoided for the first two months. Strength training can be introduced after the first month, followed by a balanced regimen incorporating both aerobic and resistance exercises (17).

Psychosocial status:

Psychological issues related to obesity are common among individuals seeking bariatric surgery. Conditions such as binge eating, compulsive overeating, anxiety, and substance or alcohol abuse become increasingly prevalent as the severity of obesity rises. While bariatric surgery can lead to beneficial metabolic and psychological changes, improvements in self-esteem are not universally observed. Notably, 38–59% of bariatric surgery candidates exhibit

emotional eating disorders, and depression and anxiety remain among the most frequently encountered psychiatric conditions post-surgery (23).

Postoperative Nutritional, Metabolic, and Gastrointestinal Complications

Bariatric surgery can lead to a range of nutritional, metabolic, and gastrointestinal complications, with long-term weight regain being a significant concern. Restrictive procedures generally cause fewer micronutrient deficiencies compared to malabsorptive techniques. In malabsorptive surgeries, resection of segments of the small intestine responsible for the absorption of specific nutrients can result in deficiencies (1).

Deficiencies are particularly common following malabsorptive procedures such as Roux-en-Y Gastric Bypass (RYGB) and Biliopancreatic Diversion with Duodenal Switch (BPD-DS), which impair the absorption of key nutrients including folate, vitamin B12, vitamin D, iron, and calcium. In contrast, malnutrition is less frequent after Sleeve Gastrectomy (LSG). One of the most serious complications associated with malabsorptive procedures is protein malnutrition. Protein deficiency, chronic diarrhea, and fat-soluble vitamin deficiencies are common after BPD-DS. Contributing factors include reduced nutrient intake, poor dietary choices, food intolerances, excessive vomiting, and insufficient portion sizes. Severe vomiting, in particular, can precipitate an acute thiamine deficiency.

Since obesity itself is a risk factor for malnutrition and micronutrient deficiencies, rigorous preoperative and postoperative nutritional monitoring and management are essential for all bariatric surgery patients. Lifelong supplementation is necessary to prevent micronutrient deficiencies. A daily regimen typically includes a multivitamin containing iron, folic acid, and thiamine, along with 1200–1500 mg of calcium (as calcium citrate) and 3000 IU of vitamin D. Additionally, vitamin B12 should be administered via sublingual, oral, subcutaneous, or

intramuscular routes (24). Patients identified as having a high nutritional risk (Nutrition Risk Score ≥3) should receive extra nutritional support. These supplements help maintain a balanced nutritional status and safeguard overall health.

Nutritional deficiencies and nutrition-related complications:

Anatomical changes induced by bariatric surgery, especially within the first year postoperatively, can lead to deficiencies in numerous vitamins and minerals.

Thiamine: Postoperative anatomical alterations, particularly in procedures that bypass the jejunum, often result in thiamine deficiency. This deficiency is common after malabsorptive surgeries and may also develop in patients experiencing persistent nausea, vomiting, or inadequate nutritional intake. Thiamine levels tend to decline rapidly compared to other vitamins, and to normalize serum levels, patients should receive at least 12 mg of thiamine (25-24).

Folate (vitamin B9): Since folate is primarily absorbed along the small intestine, especially in the jejunum, deficiency of vitamin B9 is less common than vitamin B12 deficiency. Folate deficiency is rarely encountered following restrictive surgeries but is more prevalent after malabsorptive procedures. In patients undergoing RYGB and BPD-DS, serum folate levels should be monitored at 1, 3, and 6 months, and then between 6 and 12 months postoperatively. For treatment, an oral folate dosage of 1–5 mg daily is recommended (25-24)

Cobalamin (vitamin B12): Vitamin B12 is crucial for the development of red blood cells and the proper functioning of the nervous system. After bariatric surgery, reduced gastric acid production and decreased intrinsic factor impair B12 absorption. Additionally, intolerance to meat, vomiting, and altered taste or smell can contribute to deficiency. Under conditions of

adequate absorption, maintaining normal serum levels typically requires a daily dose of 350–500 µg of B12, although some cases may necessitate up to 1000 µg daily (24).

Fat-soluble vitamins: Fat-soluble vitamins are absorbed primarily in the jejunum and ileum, making deficiencies more common in patients undergoing RYGB and BPD-DS. Vitamin A deficiency is particularly prevalent in BPD-DS patients, and treatment generally involves 5000–10,000 IU per day orally. Vitamin D, also absorbed in the jejunum and ileum, poses a significant risk of deficiency in these procedures. Even before surgery, obese patients may exhibit vitamin D deficiency along with secondary hyperparathyroidism (24).

Calcium: Surgeries that reduce gastric acid production, such as RYGB, LSG, and BPD-DS, can lead to increased calcium malabsorption (25).

Iron: Obese patients commonly develop iron deficiency. Postoperatively, iron deficiency is observed in 40% to 75% of cases, leading to symptoms such as anemia, fatigue, and headaches (24).

Selenium: Selenium is absorbed in the duodenum and proximal jejunum. After RYGB and BPD-DS, selenium deficiency occurs in approximately 14% and 22% of patients, respectively.

Zinc: Zinc plays a vital role in DNA synthesis, wound healing, and protein synthesis, and it is absorbed in the duodenum and proximal jejunum. Malabsorptive procedures can lead to zinc deficiency. Over a 2–3 year postoperative period, zinc deficiency has been observed in about 11% of patients after BPD and BPD-DS, and between 6% and 40% after RYGB. Cases have also been reported following LSG (Sezer and Yazıcı, 2021). Annual screening for zinc deficiency is recommended for patients who have undergone RYGB and BPD-DS, regardless

of symptoms. Multivitamin supplements containing 8–22 mg of zinc daily are typically sufficient to prevent deficiency (24).

Copper: Copper is absorbed in the stomach and proximal jejunum. Deficiencies in copper have been reported following RYGB and BPD-DS. In severe cases, a six-day course of intravenous copper (3–4 mg per day) may be required. Since zinc supplementation can lead to copper deficiency, it is recommended to administer 1 mg of copper for every 8–15 mg of elemental zinc provided (24).

Metabolic and gastrointestinal complications:

Weight regain: Weight loss after bariatric surgery varies depending on the procedure. Rapid weight loss is typically observed during the first 1.5–2 years, after which the rate slows and eventually plateaus. For instance, following sleeve gastrectomy, patients may lose 4.5–7 kg per month during the first six months, with the rate declining to 2–3 kg per month in the following six months. Insufficient adherence to lifestyle changes is a major cause of weight regain. Additionally, consumption of sweet or fatty foods following RYGB can contribute to weight gain (26).

Anemia: Even in the absence of significant blood loss during surgery, the etiology of anemia should be evaluated. Common causes include deficiencies in iron, folate, and vitamin B12. In the absence of these deficiencies, inadequate intake of protein, copper, selenium, and zinc should be investigated (24).

Vitamin D deficiency, osteomalacia, and osteoporosis: Vitamin D deficiency is common among obese individuals. Due to the large amount of adipose tissue acting as a reservoir for vitamin D, deficiency is prevalent even before surgery, leading to secondary

hyperparathyroidism. Patients experiencing osteoporosis after bariatric surgery may be prescribed calcium and vitamin D (25-24).

Vomiting: Approximately half of all patients experience early postoperative vomiting. This may persist for several months until patients adjust to their new gastric capacity (Kademligil and Genç, 2023).

Constipation: Constipation is commonly observed during the first week postoperatively. It can be attributed to factors such as medications, reduced fluid intake, low-fiber diets, and calcium-iron supplements (Kademligil and Genç, 2023). Increasing physical activity and fluid consumption, along with consuming fiber-rich fruits, vegetables, and whole grains, can help regulate bowel movements (24).

Diarrhea: Diarrhea often develops secondary to other complications, such as lactose intolerance. In such cases, avoiding dairy products containing lactose or switching to lactose-free alternatives may resolve the issue. Additionally, high-fat, high-sugar, and spicy foods should be avoided as they may trigger diarrhea (27-24).

Loss of appetite: A decreased appetite may occur during the transition from liquid to soft foods and finally to regular solid foods, due to changes in food volume and consumption habits after surgery (24).

Reflux: Following sleeve gastrectomy and AGB procedures, patients may develop gastroesophageal reflux (GERD) characterized by burning chest pain and regurgitation. GERD can manifest as an early or late postoperative complication (24).

Food intolerance: Food intolerance, particularly toward red meat, is commonly observed. As a result, some patients may opt for a vegetarian diet (24).

Dumping syndrome: Dumping syndrome is characterized by abdominal pain, cramps, nausea, diarrhea, flushing, tachycardia, and syncope following the consumption of high-calorie foods. It is most frequently seen in patients undergoing Roux-en-Y gastric bypass (RYGB).

Early dumping syndrome: Occurs rapidly, approximately 15 minutes after eating, due to the rapid transit of food into the small intestine.

Late dumping syndrome: Also known as postprandial hyperinsulinemic hypoglycemia, it is a rare complication occurring in 0.1–0.3% of patients, most commonly after RYGB. Symptoms such as dizziness, fatigue, sweating, and weakness typically emerge 1–3 hours after a carbohydrate-rich meal (26

Hypervitaminosis*:* Previous studies have reported instances of hypervitaminosis due to excessive vitamin intake. Elevated levels of vitamins B1, B6, B12, and folate have been observed, with B6 toxicity being linked to the development of sensory neuropathy (24).

Taste changes: Alterations in taste are common postoperatively as a result of reduced medication use and changes in food intake. These changes typically resolve after a period of adherence to the nutritional program (27).

CONCLUSION AND RECOMMENDATIONS

Bariatric surgery is an effective treatment for morbid obesity; however, for optimal outcomes, it is essential that patients modify their eating habits and adhere to long-term follow-up. Postoperative complications may include vitamin and mineral deficiencies as well as weight regain. Regular monitoring and appropriate supplementation are crucial for preventing these issues and maintaining patient health. Therefore, ongoing nutritional assessment is vital following bariatric surgery.

Abbreviations

AGB: Adjustable Gastric Banding

BPD-DS: Biliopancreatic Diversion with Duodenal Switch

RYGB: Roux-en-Y Gastric Bypass

SG: Sleeve Gastrectomy

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