Impact of Roux-en-Y Gastric Bypass on Vitamin D and Iron Metabolism

A Systematic Review Literature

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Master Degree in ***General Surgery***

By

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INTRODUCTION

Obesity has become an important public health priority because it increases the risk of comorbid conditions, including diabetes, cardiovascular disease and several types of cancers. In addition, it affects life quality and expectancy[1]. The impact of obesity on life expectancy has been well documented. Worldwide, over 2.5 million deaths annually can be attributed to obesity. Of particular concern is the growing economic burden that the care of obesity and its complications imposes on society and the health care system[2].

Over the past decades, Roux-en-Y gastric bypass (RYGB) has been a classical bariatric surgery with 85% of patients receiving this restrictive / malabsorptive procedure.[3-4] In this procedure, gastric capacity is reduced by 90–95%. However, adverse effects such as nutritional deficiencies and gastrointestinal symptoms have been observed following RYGB, including disturbances of anatomical and physiological functions.[5] A wide range of prevalence and severity of anemia after RYGB surgery has been reported and the related causes are not yet fully understood.[6]

Vitamin D, the primary regulator of calcium metabolism in humans, maintains adequate calcium and phosphate levels required for bone formation—thereby enabling proper functioning of parathyroid hormone by promoting calcium absorption in the intestines. [7] Vitamin D deficiency has been

described as a common cause of disorders of calcium metabolism and metabolic bone disease after weight loss surgery that can result in clinically significant long-term morbidity, leading to bone loss and possibly fractures.[8]

According to a recent report from the American Society of Hematology, people who have undergone bariatric procedures show the highest risk for anemia, with 33%-49% of operated patients presenting anemia within 2 years after surgery[9]. As expected, the average prevalence of anemia is lower following LSG (17%) and reaches 45%-50% after RYGB and BPD. It should be noted that, as underlined for other nutrient deficiencies, up to 10%-12% of obese patients already have anemia before surgery [10]; thus, baseline screening for anemia is recommended in all patients who are scheduled for bariatric procedures.

AIM OF THE WORK

Systematic review on Impact of Roux-en-Y gastric bypass on vitamin D and iron metabolism.

MATERIALS AND METHODS

This systematic review is to evaluate the Impact of Roux-en-Y gastric bypass on vitamin D and Iron metabolism

- Pubmed, Medline, Google Scholar, Cochrane searches will be done on the following keywords:
    - Roux-en-Y Gastric bypass
    - Vitamin D deficiency
    - Iron deficiency anemia
    - Post Roux-en-Y mal-absorption syndrome
- Inclusion criteria for the search will include:
    1. English literature only.
    2. Human study only.
    3. Randomized control trial & case series related to post-operative follow up of vitamin D and anemia post Roux-en-Y gastric bypass
- The exclusion criteria for the search will include:
    1. Duplicated articles by the same authors unless with longer follow-up studies.
    2. Non English studies.

Articles in this study will include up to date the Impact of Roux-en-Y gastric bypass on vitamin D and Iron metabolism.

Roux-en-Y gastric bypass (RYGB)

Among the bariatric procedures, the RYGB (Figure 1) is currently the most commonly performed in the USA and Canada. With RYGB, the native stomach is divided completely using a surgical stapler—the resulting gastric pouch should provide a volume of less than 30 ml. The jejunum is then divided 30–70 cm distal to the native duodeno-jejunal junction. Use of an open versus a laparoscopic surgical technique can alter the site and orientation of the gastro-jejunal anastomosis. To facilitate the construction of the anastomosis and possibly decrease the risk of an anastomotic leak, anastomosis is now often constructed with the use of surgical staplers rather than being hand sewn. The location of the jejuno-jejunal anastomosis determines the length of the Roux limb, and, equally important, the length of the common channel that extends from this second anastomosis to the ileocecal valve. A short common channel (≤100 cm long) results in a more severe malabsorptive condition. The complexity of the RYGB surgical procedure means that there are serious and potentially preventable perioperative complications that physicians must be aware of. The increasing use of bariatric surgery means that, when consulted, gastrointestinal physicians should be able to assess and refer patients as appropriate. The worst-case

scenario is the potential to overlook a life-threatening anastomotic leak or bowel strangulation secondary to an internal hernia, so much so that some postoperative exploratory laparoscopy or laparotomy may be justifiable, even if the findings are negative. Several complications are specific to bariatric surgery and to morbidly obese patients, who may respond or present differently symptomatically and systemically than non-obese individuals. When perioperative complications do occur, the best outcomes result from early diagnosis and aggressive treatment. When evaluating and managing the chronic complications and adverse effects of bariatric surgery, it is worth noting that RYGB alters both the anatomy and physiology of the stomach and small intestine. The approach to the recognition, expectation and/or prevention of chronic complications or adverse effects should, therefore, be based on a basic understanding of the effect of RYGB on gastric and intestinal function. This Review provides an overview of the complications and adverse effects of RYGB, discussing the spectrum of postoperative disorders for physicians who see patients postoperatively. As many of the sub-acute complications of RYGB are similar to the acute post-operative complications, it is important for gastrointestinal physicians to understand both the various presenting symptoms of these complications and the appropriate diagnostic approaches. The most serious symptoms including peritonitis, tachycardia, hypotension, vomiting, hemorrhage, fever, dyspnea, oliguria and diarrhea—are discussed individually

below with their various presentations. With any of these post-operative disorders, the first priority is to consider and exclude potentially life-threatening complications, including anastomotic leak, intestinal obstruction, wound problems, and postoperative emergencies, to avoid the serious morbidity of delayed diagnosis (and its potential medico-legal implications).

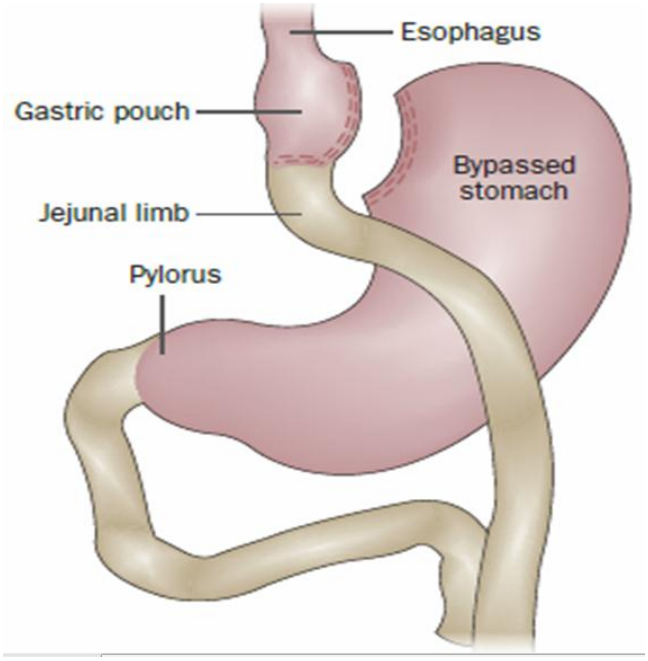

Figure 1: RYGB

Macronutrient and micronutrient disorders

Too rapid a weight loss induced by RYGB is not uncommon and occurs from inadequate calorie intake (owing to gastric restriction), possibly combined with a relative protein and fat malabsorption (dependent on the length of the common channel). The rapid phase of weight loss occurs within the first

6–12 months after RYGB in most individuals. Maintaining proper nutrition after RYGB is, therefore, a complex challenge currently facing physicians. The requirement for proper nutritional surveillance is especially important in those individuals who have undergone a malabsorptive bariatric procedure, such as a duodenal switch (a type of bilio-pancreatic diversion) or a distal gastric bypass. Despite the routine use of postoperative nutritional supplements, a substantial number of postoperative patients develop common macronutrient and micronutrient deficiencies that can lead to preventable morbidity. Routine postoperative laboratory testing and surveillance for the detection of nutrient deficiencies is, therefore, advised for all patients who have undergone bariatric surgery. As the extent of the malabsorptive surgical procedure often induces a variable deficiency of essential fatty acids and the fat-soluble vitamins (A,D, E and K), the frequency of laboratory testing must be determined on a case-by-case basis. In general, laboratory testing is advised at the 3-month postoperative visit, every 6 months for the first 3 years, and then once yearly thereafter. Common short-term complications include protein malnutrition exacerbated by insufficient postoperative protein intake, the presence of preoperative deficiency of micronutrients (for example, vitamin D and thiamine [vitamin B1] and postoperative deficiency of micronutrients for which there are minimal body stores, such as thiamine. The more common, long-term complications involve

deficiencies of micronutrients of which there are large body stores, including calcium, iron and vitamin B12.

Protein deficiency

In standard protocols, patients are instructed to maintain a daily intake of 60–70 g of protein after RYGB. Achieving this goal is not easy for the patient and may require intensive counseling with a nutritionist. In patients who have a short common channel (malabsorptive procedure), protein intake is even more important, because the subsequent relative protein malabsorption may further increase the risk of protein malnutrition. A common, early manifestation of protein malnutrition after any type of bariatric surgery can be hair loss. Long-term manifestations of protein malnutrition can include symptoms and signs of muscle-mass wasting. Severe protein deficiency similar to Kwashiorkor has been described after RYGB and especially after a distal gastric bypass. No specific parameters should necessarily be monitored via blood testing for protein malnutrition. The serum albumin concentration can be checked, but this may be of limited use in certain situations because it is an acute phase reactant.63 Regular follow-up of the overall health of patients, with emphasis on their protein intake and specific attention given to the condition of their skin and hair and also the presence of generalized edema (supporting the presence of hypoproteinemia) are the most important steps in preventing and recognizing protein malnutrition. In patients with hypoalbuminemia, which is an