



Review

Twelve key nutritional issues in bariatric surgery

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SUMMARY

In morbidly obese patients, i.e. body mass index ≥ 35 , bariatric surgery is considered the only effective durable weight-loss therapy. Laparoscopic Roux-en-Y gastric bypass (LRYGBP), laparoscopic sleeve gastrectomy (LSG), and biliopancreatic diversion with duodenal switch (BPD-DS) are associated with risks of nutritional deficiencies and malnutrition. Therefore, preoperative nutritional assessment and correction of vitamin and micronutrient deficiencies, as well as long-term postoperative nutritional follow-up, are advised. Dietetic counseling is mandatory during the first year, optional later. Planned and structured physical exercise should be systematically promoted to maintain muscle mass and bone health. In this review, twelve key perioperative nutritional issues are raised with focus on LRYGBP and LSG procedures, the most common current bariatric procedures.

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1. Introduction

Overweight and obesity have reached global epidemic proportions. Their prevalence is increasing in the emerging countries. In the United States, the prevalence of morbid obesity, defined as body mass index (BMI) ≥ 40 , was 6% in 2010 [1]. The first line therapy for overweight and obese patients is the modification of dietary habits and the encouragement of physical activity [1,2]. However, this strategy often fails in maintaining weight loss (WL). Laparoscopic Roux-en-Y gastric bypass (LRYGBP) and other surgical procedures allow maintaining WL [3] and decrease obesity-related mortality [4] (hazard ratio adjusted for sex, age, and risk factors: 0.71 ($P = 0.01$)) [4]. Biliopancreatic diversion with duodenal switch (BPD-DS) is associated with the best sustained weight loss at mid-term (1–3 years) [3]. LRYGBP also reduces or resolves related comorbidities, such as diabetes [5,6], hypertension [5], obstructive sleep apnea syndrome [5,7], and dyslipidemia [5–8], in the range of 24–86% in mid- or long-term follow-up [5–8]. Thus, in patients with morbid obesity, i.e. body mass index ≥ 40 or ≥ 35 with comorbidities, bariatric surgery is presently considered the only effective therapy. In 2011, 340'768 procedures were performed worldwide, including 101'645 in the US and Canada [9]. LRYGBP (47%) and laparoscopic sleeve gastrectomy (LSG) (28%) were the

most frequently performed procedures [9]; in comparison, BPD-DS represents only 0.7% of the procedures [9]. Despite their beneficial effects, LRYGBP and LSG are associated with complications such as reoperations (7%) and deaths (30-day mortality 0.3%) [3]. More importantly, these procedures are tightly related to a risk of nutritional deficiencies and malnutrition with fat-free mass (FFM) depletion [10,11][12–18] which were generally already present before surgery. These consequences are associated with obesity, but are frequently worsened by the surgical procedure. The lower level of evidence of the risk of nutritional deficiencies after LSG than after LRYGBP or BPD-DS does not mean lower risk. Therefore we recommend the same awareness regarding the risk of nutritional deficiencies for both procedures. Their prevention is critical and necessitates dedicated management. This review raises twelve key nutritional issues with a specific focus on LRYGBP and LSG procedures, the most frequently performed. The present review aims to form guidelines based on the current literature, published recommendations, as well as the authors' own opinion."

2. What is the relevance of the preoperative evaluation?

Most of obese patients have a long history of restrictive diets, large body weight fluctuations, and FFM depletion [18]. Sedentaryism associated with obesity worsens the risk of FFM depletion and impaired muscle function. Bariatric surgical procedures could further induce nutritional deficiencies and malnutrition [10–16]. For these reasons, a routine preoperative assessment of nutritional

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status should be recommended. In case of severe malnutrition (i.e., involuntary WL ≥ 10% of usual body weight over 12 weeks and albumin <30 g/l), an uncommon situation before bariatric surgery, the adjournment of surgery should be discussed.

Micronutrient deficiencies are prevalent in obese patients, as a result of restrictive diets and low intake of fruits and vegetables. Selective micronutrients status should be monitored before bariatric surgery (Table 1). Deficiencies must be corrected to optimize the clinical conditions at the time of surgery, and also because bariatric procedures induce micronutrient malabsorption which, in turn, worsens preexisting deficiencies. Minerals (calcium, iron) and micronutrient deficiencies (vitamins B1, B9, B12, D, ...) usually onset following surgery and can be severe [14–16,19]; e.g., vitamin B1 deficiency can lead to Gayet-Wernicke encephalopathy and is prevalent within the first 1–3 postoperative months, LSG included [16,19,20]. The risk of vitamin B1 deficiency should be prevented in case of large administration of glucose, persistent vomiting (food intolerance syndrome), or diarrhea, by delivering an intravenous dose of 500–1000 mg of vitamin B1. The risk of vitamin B12 deficiency is high, even after the first five postoperative years [21]. LRYGBP and LSG, as for other types of gastrectomy, and BPD-DS, as

for any type of intestinal malabsorption, are likely to induce iron, vitamins B9 and B12 deficiencies. Their plasma levels should be monitored (Table 1). Vitamin D status should also be assessed preoperatively since vitamin D deficiency is very frequent in obese patients and, in the absence of specific supplementation, could lead to osteomalacia and osteoporosis after bariatric surgery [12] (Table 1) (see paragraph #10).

3. Is medically prescribed preoperative weight loss (WL) advisable?

Preoperative WL was advocated in some bariatric surgery programs, particularly in the US, and is still requested by some insurance companies. Its postulated goals were: 1) to facilitate surgery itself by reducing the volume of intra-abdominal fat and liver size; and 2) to achieve better long-term WL results. A small body of literature, including few small-size randomized trials and two systematic reviews, led to contradictory results [22,23]. Even if it was shown that the volume of the liver could be reduced, the positive clinical relevance of this effect was weak at the most. The long-term (1 year) effect on WL was either weak or absent [24]. No

Table 1

Preoperative (Preop) and postoperative evaluation after laparoscopic Roux-en-Y gastric bypass (LRYGBP), laparoscopic sleeve gastrectomy, and biliopancreatic diversion with duodenal switch (BPD-DS): 2013 recommendations of the Swiss Society for the Study of Morbid Obesity and Metabolic Disorders (SMOB) (www.smob.ch). SMOB recommendations were established from the recommendations stated by the American Association of Clinical Endocrinologists (AACE), the American Society for Metabolic and Bariatric Surgery (ASMBS), and The Obesity Society (TOS). SMOB gave recommendations until the fifth postoperative year: however many experts recommend a life-long monitoring. DEXA, dual X-ray energy absorptiometry; M, month; W, week; Y, year. *for LRYGBP and BPD-DS patients; **for BPD-DS patients only.

	Preop	2W	4W	6W	8W	3M	6M	9M	1Y	1½Y	2Y	2½Y	3Y	3½Y	4Y	4½Y	5Y
Radiology																	
DEXA											*		*		*		*
Laboratory Testing																	
Hemogram																	
INR/Quick																	
Sedimentation Rate																	
C-reactive Protein																	
Potassium																	
Calcium																	
Urinary calcium							*		*		*		*		*		*
Magnesium									*		*		*	*	*		*
Phosphorus									*		*		*	*	*		*
Iron									*		*		*		*		*
Zinc									*		*		*		*		*
Glucose																	
Creatinin																	
Transferrin																	
Ferritin																	
Transthyretin							*	*	*		*		*		*		*
Vitamin A/cis-Retinol						**	**		**		**		**		**		**
Vitamin E																	
Vitamin D3/25-OH-calciferol																	
Vitamin B1																	
Vitamin B2																	
Vitamin B6																	
Vitamin B12																	
Holotranscobalamine																	
Folic acid in erythrocytes																	
Parathormone																	

SMOB-recommendations :

Mandatory	■
Helpful	■
Not recommended	□

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