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Nutrition Issues After Bariatric Surgery for Weight Loss

George John Bitar and Sally Myers

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65.1 Introduction

Recently, we have started seeing adult diseases such as Type II Diabetes mellitus and gall bladder disease in adolescents, and even children [1]. Obesity is the main culprit. It is no secret that obesity has become a major problem in the United States affecting health care, lifestyle, and the economy. With the rise of obesity, we have witnessed a rise in bariatric surgery as the most effective way to manage morbid obesity. On average, it takes a person a year to 18 months to lose 60–80% of their excess weight after a bariatric procedure. The pattern of weight loss varies in individuals and rebound weight gain may occur in about 20% of them [2]. During the weight loss phase, there is an improvement in the medical profile of the patient ranging from a decrease in hypertension to increased mobility, along with resolution or improvement in other comorbidities [3]. It is very important for the bariatric surgeon, as well as the plastic surgeon, to understand the nutritional issues that can arise after the different types of bariatric surgery in order to better manage the patient's care. After bariatric surgery, the myriad of nutritional deficiencies that can develop may present serious, and sometimes, life threatening problems to a patient who had just begun to enjoy life after being morbidly obese. The nutritional issues are especially important for patients seeking plastic surgery after weight loss because optimal results can only be obtained when the nutritional status of the weight loss patient has been optimized. The following will be an overview of the types of bariatric surgery for weight loss and possible nutrition issues that can occur with each one. Suggestions for improvement of the postbariatric patient diet, as well as recommendations for both patients and surgeons, will be discussed.

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65.2 Types of Bariatric Procedures

There are essentially three types of bariatric surgery for weight loss:

Restrictive

- Laparoscopic adjustable gastric banding (LAGB)
- Vertical banded gastroplasty (VBG)
- Sleeve gastrectomy (SG)

Restrictive/mildly malabsorptive – combination

- Roux-en-Y gastric bypass, proximal (RYGBP)

Restrictive/predominately malabsorptive

- Roux-en-Y gastric bypass, extended (RYGBP-E)
- Biliopancreatic diversion (BPD)
- Biliopancreatic diversion/duodenal switch (BPD/DS)

65.3 Description of Procedures

Restrictive

1. LAGB

A band is placed around the upper part of the stomach to create a pouch that can only hold ½–1 cup of food in a single eating period. The band is adjusted by injecting fluid into a small port implanted beneath the skin in the abdominal region.

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2. VBG
The upper stomach near the esophagus is stapled vertically approximately 2.5" to create a small pouch. The outlet from the pouch is restricted by a band or ring to slow the emptying of the food resulting in early satiety. Pouch capacity: 4–8 oz.

3. SG
The outer margin of the stomach is removed (vertical incision) leaving a sleeve of stomach with the pylorus. Pouch capacity: 1–1.5 cups.

65.4 Restrictive/Mildly Malabsorptive (Combination)

1. RYGBP
The upper part of the stomach is stapled or transected leaving a one to two ounce pouch. The small intestine is divided around the proximal/medial jejunum (typically 100 cm). The lower section of the small intestine (alimentary limb) is attached to the pouch by a small outlet or anastamosis. The upper section of the small intestine is connected to the jejunum (Roux limb), creating the Y connection. This allows the digestive liquids from the stomach, bile from the liver, and pancreatic enzymes to mix with the food coming down the alimentary limb and liquefy/process the food. Pouch capacity: 4–8 oz.

65.5 Restrictive/Predominantly Malabsorptive

1. RYGBP-E
Same as the RYGBP, except that a larger amount of the small intestine is bypassed. Often the stomach pouch is made larger also because of increased malabsorption and greater nutritional needs. Length of bypass and pouch size vary by surgeon. Pouch capacity: 1–1.5 cups.

2. BPD
The stomach is transected horizontally and 70% is removed along with the pylorus. This helps decrease stomach acid production. The stomach left is much larger than the RYGBP pouch. The small intestine is divided approximately in half and reconfigured into two channels. One channel is attached to the pouch and carries the food (alimentary limb). The other channel carries the digestive juices from the liver and the pancreas (biliopancreatic limb). The two limbs are connected as a common channel to the ileum. Pouch capacity: 1–1.5 cups.

3. BPDVDS
A SG is the first part of the procedure. The duodenum is then divided so that pancreatic and bile drainage is bypassed. The proximal end of the alimentary limb is then attached to the beginning of the duodenum just past the pylorus. The bile and pancreatic juices move through the biliopancreatic limb. A common limb is created by connecting the alimentary and biliopancreatic limbs to the ileum. Food mixes with the digestive juices in this portion of the intestine and is absorbed. Limb lengths vary by surgeon. Pouch capacity: 1–1.5 cups.

65.6 Effects of Nutrient Uptake

65.6.1 Absorption

The small intestine is the primary organ for absorption. It is divided into three sections: the duodenum, jejunum, and ileum. The nutrients absorbed in the duodenum [4] include calcium; phosphorus; magnesium; iron; copper; selenium; thiamin; riboflavin; niacin; biotin; folate; and vitamins A, D, E, and K. The nutrients absorbed in the jejunum are:

1. Proximal – Lipids, monosaccharides, amino acids, small peptides
2. Medial – Thiamin; riboflavin; niacin; pantothenate; biotin; folate; B6; vitamin C; vitamins A, D, E, and K; calcium; phosphorus; magnesium; iron; zinc; chromium; manganese; molybdenum
3. Distal – Lipids, monosaccharides, amino acids, small peptides

The nutrients absorbed in the ileum include Medial/Distal – Vitamin C, folate, vitamin B12, vitamin D, vitamin K, magnesium, lipids, bile salts, and acids. Other nutrients may be absorbed depending on transit time.

There are multiple sites and methods of absorption for many nutrients. Limb length plays a critical role in

absorption after bariatric surgery. It should be noted that the small intestine ranges in length from 15 to 30 feet, which will also have an effect on absorption. Over time, the intestine will adapt to its new configuration and will try to accommodate by improved absorption.

65.6.2 Malabsorption

Malabsorption is the incomplete uptake of calories and nutrients which may occur in one of two ways:

1. Diversion of bile, pancreatic enzymes, and/or stomach acid away from ingested food. This reduces the capability for complete breakdown and absorption of macro and micro nutrients.
2. Decreasing the amount of small intestine through which the ingested food passes. Less contact with intestinal surface area results in lower absorption. Fat calorie malabsorption occurs in the RYGBP-E, BPD, and BPD/DS, although it has been seen in the RYBGP. Undigested fat, carbohydrate, and/or protein can cause excessive gas and abdominal bloating. Fat malabsorption can cause loose, foul-smelling bowel movements.

65.7 Nutrient Deficiencies

65.7.1 Labs

In general, weight loss surgery (WLS) patients should have preoperative labs done before their surgery, so there is an established baseline to compare to after surgery. Typical pre and postoperative labs are a CBC, a complete metabolic profile (CMP), cholesterol panel, thyroid panel, folate, ferritin, B12, thiamin, and vitamin D. Labs are typically drawn every 3 months the first year postop, semi-annually the second year postop, then annually for life. Other labs to consider are TIBC, serum iron, CRP, methylmalonic acid, vitamin A, zinc, and copper as some studies have shown deficiencies of these nutrients, especially in malabsorptive surgeries.

Several studies [5, 6] have shown patients are often deficient in several nutrients before bariatric surgeries. Currently, the ones that have been identified are as follows:

- Ferritin (9%)
- Thiamin (29%)
- Vitamin D (40–68%)
- Vitamin A (11%)
- Vitamin B12 (13%)
- Zinc (30%)
- Selenium (58%)
- Folate (6%)

Studies [7, 8] have reported the following percentages of deficiency 1 year after gastric bypass surgery:

- Ferritin (30–50%)
- Thiamin (11.2%)
- Vitamin D (7–21%)
- Vitamin A (8–17%)
- Vitamin B12 (3%)
- Zinc (36%)
- Selenium (3%)
- Folate (11%)
- Vitamin C (35.4%)

There are many reasons for these deficiencies such as poor nutrition and/or malabsorption due to medication intake or other medical conditions such as irritable bowel syndrome.

Pre and postoperatively, patients should have a consultation with a dietitian to work on improving their nutrition status. All bariatric surgery patients will need to take vitamin/mineral supplements secondary to decreased consumption of foods and/or malabsorption. Many patients may end up with subclinical deficiencies vs. overt clinical signs of deficiencies that will still need to be addressed.

65.8 Specific Nutrient Issues

65.8.1 Protein

Protein malnutrition can occur in malabsorptive procedures secondary to the bypass of the duodenum and all or most of the jejunum. Reasons for protein malnutrition in restrictive/combination procedures are as follows:

- Prolonged vomiting
- Food intolerance
- Substance abuse
- Depression
- Fear of weight regain
- Anorexia
- Socioeconomic status

If patients are unable to consume adequate protein, they can supplement with modular protein supplements. Caution should be used with products containing collagen as these products may not contain all the essential amino acids that are necessary to build protein. Overall, about 25% of WLS patients are at risk of developing protein–calorie malnutrition for many months after surgery because of the low protein intake [9]. In postbariatric body contouring patients, protein deficiency impairs wound healing because protein is needed for fibroblast proliferation, angiogenesis, and collagen production [10]. A higher protein intake is indicated postbariatric surgery due to stress of surgery, extensive wound healing, and consumption of 600–800 calories initially. A minimum of 70 g/day of protein is needed to avert malnutrition for RYGBP [11]; 90 g for BPD and BPD/DS [12]. A common formula used is 1.5 g/protein per kilogram of ideal body weight or adjusted body weight.

65.8.2 Copper

Copper is absorbed by the stomach and the duodenum. Most reported cases of copper deficiency were associated with taking supplemental zinc of greater than 50 mg daily. There are no specific guidelines for the use of copper in postbariatric patients; however, copper is important for optimal immune system function. If a patient presents with signs and/or symptoms of neuropathy, copper should be tested. Other reasons for copper malabsorption are anemia, infection, or low B12 and iron levels.

65.8.3 Zinc

Zinc is required for multiple aspects of cellular growth and replication. It is a mineral that depends on fat absorption as well as vitamins A, D, E, and K. Patients with fat malabsorptive procedures may have deficiencies secondary to delayed mixing of gastric and pancreatic enzymes, as well as bile. Fat malabsorption also alters the transport of fat soluble tissues reliant on lipid components. BPD surgery has been reported to decrease fat absorption by 72%. A few studies have found suboptimal levels of zinc in BPD/DS patients and RYGBP after 1 year, which may manifest as hair thinning and loss [13]. Supplementation of zinc is dependent on lab findings and should be monitored as it affects copper absorption.

65.8.4 Vitamin E

Most studies evaluated postoperative values and did not assess preoperative values. Currently, most patients appear to be maintaining adequate levels of vitamin E providing 100% of the daily recommended intake. It is important to stress to patients that taking excess supplementation of vitamin E can be harmful because it can inhibit collagen synthesis and decrease wound healing ability; vitamin E has anti-inflammatory properties similar to steroids [14].

65.8.5 Vitamin C

Approximately 35% of patients have vitamin C deficiency a year to 2 years after a Roux-en-Y gastric bypass surgery [7]. Vitamin C plays an important role in wound healing, specifically in collagen synthesis and angiogenesis, so a vitamin C deficiency is associated with capillary leakage due to decreased collagen production, and thus, susceptibility to wound infections [10]. It is recommended to have vitamin C supplements of 1–2 g daily for the perioperative period until convalescence is complete [10]; afterward, the dietary reference intake (DRI) is 60 mg daily.

65.8.6 Vitamin K

In a study by Slater et al. [12], 68% of BPD patients had less than the measurable range of serum vitamin K levels after 4 years. One study found RYGBP patients had a lower prothrombin time percentage [8].

65.8.7 Vitamin A

Studies [8, 12] have shown a 52–68% deficiency in BPD patients postoperatively. One study [8] reported a 52% deficiency in RYGBP and 25% in AGB. Typically, the number of patients who follow-up after 1 year declines, so while reviewing data this must be kept in mind. Clinical consequences of vitamin A deficiency appear to be rare; however, vitamin A is an essential factor in the healing process, as it functions as an immunostimulant enhancing wound healing. The DRI for vitamin A is 3,000 IU; however, it may be increased in postsurgical patients.

65.8.8 Vitamin D/Calcium

The percentage of patients having a vitamin D deficiency before surgery can be as high as 68%. Possible mechanisms of vitamin D deficiency include inadequate sun exposure, inadequate dietary intake, and/or decreased availability secondary to fat mass. It is important to ensure that patients are taking adequate amounts of vitamin D and calcium pre and postop. Serum calcium will not be expected to decrease until bone disease has severely depleted skeletal calcium stores. Low levels of vitamin D and calcium may increase risk of cancer (colon, breast, and prostrate), chronic inflammation and autoimmune disorders (diabetes mellitus type, inflammatory bowel disease, arthritis), metabolic disorders (hypertension and metabolic syndrome), as well as peripheral vascular disease. Patients with a history of using the following prescribed medications should also be monitored for metabolic bone disease: methotrexate, heparin, cholestyramine, thyroid hormone, glucocorticoid, and/or antiseizure medications.

65.8.9 Iron

Reasons for iron deficiency are multifactorial and not fully explained in published studies. For malabsorptive surgeries including RYGBP, it is thought that there are fewer receptors for absorption due to bypass of the duodenum and proximal jejunum, the major sites of absorption for iron. Lack of acid in the gastric pouch can affect the reduction of iron from the ferric to ferrous. Vitamin C can enhance absorption of iron, so it is often recommended to take an iron supplement containing vitamin C. Although not well studied, the breakdown of fatty tissues releases hormones and causes chemical changes. One of the authors remembers RYGBP patients who have had menstrual periods lasting 6 weeks or longer after surgery possibly secondary to hormone shifts. The excessive blood loss significantly reduces iron stores. Patients are told not to donate blood after surgery for precisely this reason unless they have unusually large stores. Serum iron and total iron binding capacity are the preferred tests for determining iron status as ferritin can fluctuate with age, inflammation, and infection.

65.8.10 Vitamin B12 and Folate

Vitamin B12 deficiency is most prevalent in RYGBP patients secondary to inadequate production of intrinsic factor and insufficient stomach acid to convert pepsinogen to pepsin and release B12 from protein foods. Proton pump inhibitors also reduce absorption of B12, on which many RYGBP patients are put prophylactically after surgery.

Folic acid stores can be depleted within a few months postoperatively if intake is insufficient from supplements and/or diet. Preoperatively, deficiencies have been reported as high as 56% in RYGBP patients [15]. It has been suggested by several sources that homocysteine is the most sensitive marker of folic acid status in conjunction with serum folate.

Vitamin B complex and folate deficiencies are fairly prevalent after bariatric surgery with Vitamin B12 deficiency ranging from 3–37% at 1 year after RYGBP and folate deficiency with an incidence of 9–35% after bypass operations [16]. In patients with severe Vitamin B12 and folate deficiency, megaloblastosis and megaloblastic anemia can occur, a condition that affects the nonhematopoietic cells, such as the gastrointestinal mucosal cells. The molecular basis for the occurrence of megaloblastosis is that folate and Vitamin B12 are required for the formation of *S*-adeno-sylmethionime, which is critical for the stabilization of DNA and many other proteins. Thus, deficiencies of these vitamins can contribute to poor cellular proliferation and repair in

the postbariatric body contouring patient. Furthermore, the associated anemia will adversely affect circulation in the healing tissues [15]. Recommendations for post-surgical patients are 500 μg/day of Vitamin B12 and 800 μg of folate [7, 17].

65.8.11 Thiamine

Thiamine deficiency occurs mainly secondary to persistent vomiting and/or inadequate dietary intake. A deficiency can occur in as little as 2 weeks if a patient is vomiting daily and not replenishing one's store with food/and or supplementation. Because of the high likelihood of low dietary thiamine intake, it is suggested that patients be supplemented with thiamin. One of the authors has documented in the patients' dietary histories that many RYGBP patients were consuming less than 50% of the recommended intake for all of the B vitamins after 1 year postop.

65.9 Recommended Vitamin/Mineral Supplementation

	Restrictive	Combination	Malabsorptive
Multivitamin	Yes	Yes	Yes
Calcium citrate	[a]	Yes	Yes
B12	[a]	Yes	[a]
Iron	[a]	[b]	[a]
Vitamin D	[a]	Yes	Yes
Vitamin A	[a]	[a]	Yes
Fish oil	[a]	[a]	Yes

[a]If indicated by labs or inadequate dietary intake

[b]If anemic or menstruating

Recommended intake will vary by practice. Be sure to obtain your patient's guidelines for nutrient intake. Calcium must be divided into doses of 500–600 mg at one time as the body cannot absorb more than that at one time. Calcium should not be taken with any product containing iron as it will block iron absorption. Leave at least 2 h between taking iron and calcium products. If patients do not eat fish, they should be taking fish oil supplements. Patients with malabsorptive surgeries should take fish oil regardless, since they are malabsorbing fat.

65.10 Dietary Recommendations

65.10.1 Restrictive Procedures

With restrictive procedures, patients will be able to consume ½ cup to 1 cup per meal lifelong. With the limited capacity to eat, it is imperative that these patients eat a well balanced diet with adequate protein intake. They should be taking a daily multivitamin and calcium (if dietary intake is inadequate). They initially may need other nutrients if they do not consume them from their diet such as protein, B12, vitamin D, and iron.

65.10.2 Restrictive/Mildly Malabsorptive

With RYGBP, patients will be able to consume ½ cup to one cup per meal by 6 months postoperatively. The typical eating pattern for a meal is:

- 2–3 oz of protein
- ¼–½ cup of vegetables
- ¼–½ cup of starch

If patients need a planned snack, it will typically be protein based or a vegetable or fruit. They will need lifelong supplementation of the following vitamins/minerals daily:

- Multivitamin with iron
- B12 (500 μg sublingual, monthly shot 1,000 μg or nasal spray)
- 1,500 mg of calcium citrate daily split into three doses of 500 mg. This cannot be taken with iron/iron containing supplements as calcium will block iron absorption at this dosage. Leave at least 2 h between calcium and iron supplements.
- Iron (if a menstruating female or anemic). Typical dosage: 65 mg. A product compounded with vitamin C is suggested to increase absorption. Prescription iron may be needed if iron depletion is severe.
- B50 complex

Long term, it is suggested that patients consume 1 g of protein per kilo of ideal body weight. Some may still need to consume a daily protein supplement if they are unable to consume adequate protein due to food intolerances. A suggested minimum daily protein intake regardless of height, weight, or sex is 70 g.

Also consider an essential fatty acid supplement like fish oil as many patients do not consume fish in their diet. Some may need a vitamin D supplement lifelong if they consume adequate amounts or get it from the sun.

65.10.3 *Restrictive/Predominantly Malabsorptive*

These patients typically have larger pouches to accommodate the extra malabsorption, so they tend to eat normal portions. Patients in this group are also fat malabsorbing which includes vitamin A, vitamin D, vitamin E, and vitamin K. Protein, zinc, and essential fatty acid deficiency can occur more often in this group also, so supplements and diet remain important to lifelong health.

Required vitamins are the same for this group as the previous, with the addition of higher doses of vitamin D and vitamin A. Suggested minimum daily protein requirement is 90 g daily, so many may end up using a daily protein supplement long term.

65.11 Questionnaire for Prospective Postbariatric Patients

1. What type of bariatric procedure did you have?
2. What was the date of your surgery?
3. What was your starting weight? Lowest weight obtained? Current weight?
4. Please list all vitamins/minerals you take daily.
5. Have you been working with a Registered Dietitian (RD) pre and postoperatively?
6. When was the last time you had your labs done?
7. Do you currently have any nutrient deficiencies? If so, what and how are you correcting it?
8. How often do you exercise? What type of exercise are you doing?
9. Please write down a typical day of eating.
10. How much fluid do you drink daily? What do you drink?
11. Do you drink alcohol? If yes, how much/how often?
12. Do you smoke? If yes, how much/how often?
13. Do you have any problems with food tolerations? If yes, what food?
14. Do you vomit when you eat? If yes, how often?
15. Do you chew your food and spit it out? If yes, how often?
16. Do you have any problems with hypoglycemia?

If patients have not had their labs done, they will need to have them done to determine their nutrition status. If they are not compliant with their diet and/or vitamin/mineral supplements, they should consult with a RD to work with until their nutrition is adequate and they have reestablished their required eating patterns and vitamin/mineral intake. A RD can outline what vitamins and minerals they should be taking, along with amounts and eating patterns.

65.12 Recommended Labs

	Restrictive	Combination	Malabsorptive
Complet metabolic profile	Yes	Yes	Yes
CBC	Yes	Yes	Yes
Vitamin D OH	Yes	Yes	Yes
Serum retinol	[a]	[a]	Yes
Zinc	[a]	[a]	Yes
RBC folate	Yes	Yes	Yes
Ferritin	Yes	Yes	Yes
B12	[a]	Yes	Yes
Thiamin	[a]	Yes	Yes
Cholesterol panel	Yes	Yes	Yes
Thyroid panel	Yes	Yes	Yes
Parathyroid hormone	[a]	Yes	Yes
Zinc	[a]	[a]	Yes
Copper	[a]	[a]	[a]

(*continued*)

TIBC	Yes[b]	Yes[b]	Yes[b]
Serum iron	Yes[b]	Yes[b]	Yes[b]
Methylmalonic acid	[a]	[b]	[b]
CRP	[a]	[a]	[a]
Magnesium	[a]	[a]	Yes

[a]Optional

[b]Considered best test.

If a nutritional deficit is suspected from noncompliance or inadequate intake, go ahead and test

65.13 Plastic Surgery After Weight Loss

Patients who undergo bariatric procedures witness dramatic changes in their body weight and contour in a relatively short period of time – 12–18 months. It is logical that when they see the resultant excess skin, they are discouraged and would like to get rid of it to enjoy their new body. These patients are appropriate plastic surgery candidates in the 1–2 year period after their bariatric surgery; however, this is also the period in which most patients have minimal nutritional reserves following months of continual malabsorption of proteins, vitamins, and mineral [18]. The plastic surgeon and the nutritionist who are managing the postbariatric patient have to confirm that the patient has reached his/her plateau weight for several months and is nutritionally optimized before plastic surgery should be offered.

Postbariatric patients are usually prescribed a diet that contains adequate protein, vegetables, fruit, fiber, and essential fatty acids. Starches are often limited to two to three servings per day. Vitamin/mineral supplement guidelines are also given, as well as a discussion of food textures/tolerances and amounts. Increasing evidence shows that the postbariatric patients have fair to poor compliance with recommendations on nutrition that they receive from surgeons as evidenced by an article by Brolin and Leung [19], which noted that even when appropriate recommendations were made by surgeons to patients about multivitamin supplements, iron, protein, and calcium, compliance fell below 50%. Furthermore, some postbariatric patients can go the opposite direction and lose more than their excess weight to become malnourished after bariatric surgery, possibly secondary to a loss of interest in food/eating. The criteria for a new eating disorder diagnosis have been proposed, "postsurgical eating avoidance disorder" (PSEAD) [2]. This group of patients can have a complicated postoperative course, so they need to reach appropriate weight and improve their nutrition before they can undergo plastic surgery.

Preparing for plastic surgery after massive weight loss must be carefully undertaken from choosing the right board certified plastic surgeon, to discussing at length the procedures, to having a very good knowledge of the perioperative care and requirements [20]. When plastic surgery is undertaken after massive weight loss, protein malnutrition, coupled with vitamin and mineral deficiencies that have been asymptomatic, can lead to significant complications because now the stress of surgery is an added factor. In one study of postbariatric plastic surgery, complications relating to wound problems were noted in 66% of patients [21]! It has been well established in countless studies in the surgical literature that nutrition profoundly influences wound healing, with reports in the various surgical subspecialties of decreased postoperative hospital stay, infectious complications, morbidity, and mortality rates [22]. Measures should be taken to reduce stress after surgery, the nutrition optimized with the help of an RD, and frequent postoperative checkups done to insure that the healing is progressing as expected. If complications arise, early intervention, whether by draining a seroma, evacuating a hematoma, treating an infection with antibiotics, or administering appropriate wound care, while improving nutrition, will increase the success rate of postbariatric plastic surgery.

65.14 Conclusions

The epidemic of obesity continues to grow in the U.S. [23]. Obesity not only affects adults, but now affects teenagers and children. It is important for medical professionals and patients to understand the different types of bariatric procedures to appreciate the possible nutritional deficiencies that can ensue. We have presented the common nutritional deficiencies that may occur after bariatric procedures. Nutrition needs to be addressed when patients are considering postbariatric plastic surgery to improve their body contour, removal of

excess skin, and tightening of the lax muscles that are resistant to hard work at the gym. By providing education, proactive care, and guidance, a partnership is created between the patient, the bariatric surgeon, the plastic surgeon, the dietitian, and the rest of the support staff. This partnership will help ensure a happy ending to the long journey that our patients have endured.

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