

## Bariatric Nutrition: Right Amount at Right Time

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### Abstract

Sometimes Diet and exercise is not much effective for people with extreme and excessive obesity. Bariatric surgery help such individuals to reduce their weight. Bariatric procedures cause weight loss by restricting the amount of food the stomach can hold, causing malabsorption of nutrients, or by a combination of both gastric restriction and malabsorption. After bariatric surgery eating patterns of patient changes. Initially after surgery the main goal is to meet fluid and protein needs from a liquid protein diet. As the diet progresses to variety of foods which are low in sugar and fat, it will meet the nutrition needs better for long term health. It is vital to follow diet progression to maximize healing and minimize risk for complications. This review recapitulates the present protocol for nutrition care in bariatric patients to escalate safe practice in preoperative and long-term postoperative periods

**Keywords:** Obesity; Bariatric Surgery; Nutrition; Eating Pattern; Diet Progression.

### Introduction

Obesity is a complex disease caused by many factors. Due to the shortcomings of diet and exercise

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approaches, bariatric surgery has become recognized as the most effective solution for long-term weight loss. Weight loss has important medical benefits, including normalizing blood glucose in patients with type 2 diabetes [1] preventing the future development of diabetes [2] improving or normalizing blood pressure in patients with hypertension, improving or eliminating obstructive sleep apnea, [3] decreasing joint pain, and improving health-related quality of life [4].

Bariatric surgery is currently the most effective and sustainable method of weight loss for the treatment of morbid obesity [5]. The U.S. National Institutes of Health recommends bariatric surgery for obese people with a body mass index (BMI) of at least 40, and for people with BMI of at least 35 and serious coexisting medical conditions such as diabetes [6]. It helps to lose weight by making changes to digestive system. Some types of bariatric surgeries make stomach smaller, allowing to eat and drink less at one time and making feel full sooner. Other bariatric surgeries also change small intestine that absorbs calories and nutrients from foods and beverages [7]. Bariatric surgery impacts the nutritional status of patients in number of ways from decreased food intake, food intolerances, food aversions, sugar cravings, to decreased absorption of nutrients, vitamins, and minerals [8]. The patient's diet after surgery follows a specific progression to help avoid food intolerances and other nutrition complications.

### Pre-Operative Nutritional Guidelines

Duration of pre-op diet will vary from patient to patient. Usually Bariatric surgeon will decide when to start pre-surgery diet based on patient situation and how much weight he needs to lose before surgery. For gastric band patients, the pre-op diet may start two to three weeks before surgery, while for the more involved procedures such as gastric sleeve

or gastric bypass pre-op diet may start sooner. The specific dietary components should be tailored for each patient by the bariatric medical team [9].

Pre-operatively, it is essential that all patients follow a high protein, low carbohydrate diet for at least 7–10 days. Pre-operative diet would ideally include a low carbohydrate intake 1000 kcals or less, a high protein intake approximately 75–80 g protein/day, and plenty of low-calorie fluids. Pre-operative diet is also called as Liver shrinkage diet. Liver shrinkage' diet; a strict carbohydrate and energy-restricted diet reduces the amount of glycogen, water and fatty deposits in the liver, which allows the liver to be safely moved aside during the operation [10].

#### The motive of the Liver Shrinking Diet is to

- Reduce body fat around the stomach and liver, as well as shrink the liver itself;
- Reduce surgical risk by reducing fatty triglycerides from around the liver and spleen, reduce potential surgical bleeding, and improve recovery time;
- Increase protein intake–will preserve muscle tissue and aid in recovery.

Thus this diet is essential as it results in decreasing the size of the liver and helps the patients prepare for nutritional restriction post-surgery.

The 1-2 week pre-op diet may include the following elements:

- Protein shakes or meal replacement shakes will be the diet's primary component.
- Only sugar-free beverages are allowed
- No caffeinated or carbonated beverages are permitted.
- Soup broth with no solid pieces of food may be consumed.
- Vegetable juices.
- Extremely thin cream of wheat or cream of rice may also be eaten.
- One or two daily servings of lean meat and/or vegetables might be okay, but only if they are approved by surgeon or registered dietician.

Preoperative weight loss leads to an improved glycemic state before surgery [10]. The "very-low-calorie diet," which includes a total of 450–800 kcal/d was related to a 10% preoperative weight loss, a 9% reduction in BMI, and a 15–20% reduction in liver volume. It was also found to be a positive factor for improving cardiovascular risk factors in diabetic patients [11].

#### Post Bariatric Diet Progression

Protein is a cornerstone of the post-bariatric surgery diet. Postoperative dietary recommendations are based on gradual progression in food consistency and texture over 1 to 2 mo [12]. The diet for a post-op bariatric patient consists of four stages:

Stage One	Stage Two	Stage Three	Stage Four
Clear Liquids Estimated Duration ***	Pureed Foods Estimated Duration ***	Soft Foods Estimated Duration ***	Solid food Estimated Duration ***
1 to 7 days immediately after surgery	Aooroximately 14 days after stage one is completed	2 weeks up to 2 months after stage two is completed	For the remainder of the patient's lifetime

Immediately following surgery, patient will begin with a clear liquid diet and gradually start adding thicker liquids. Two weeks following surgery, diet consistency should progress to blended and puréed foods. Use high-protein (more than 20 grams protein), low-calorie (less than 200 calories) liquid supplement drinks or powders to meet the protein requirements during this period.

#### Phase I- Clear Liquids and Full Liquids

Clear liquids are liquids that can see through, such as water, tea, diluted non-acidic fruit juices (apple, grape, cranberry), broth (beef, chicken, vegetable),

protein fruit drinks, sugar-free gelatins, and artificially sweetened non-carbonated drinks. Clear liquids will progress to full liquids depending on the tolerance of patients. Full liquids are fluids that cannot see through, such as low-fat cream soups, protein shakes and skimmed milk.

The goal is to consume small portions that will empty easily from pouch. Begin with 1 tablespoon portion sizes and increase to 2 tablespoons as tolerated. Begin drinking 1/4 cup of liquid at a time and increase to a 1/2 cup as tolerated. Daily calorie intake should not exceed 400 calories. It is also very important to stay well hydrated. Drink 1 to 1.5 liters of water or other non-caloric liquids per day.

**Recommended Full Liquids**

- Non fat or 1% milk
- Lactose-free or soy-based low-calorie drinks
- Sugar-free pudding
- Sugar-free, nonfat yogurt
- Low-fat cottage cheese
- Blended broth-based soup or other low-fat soups
- Refined hot cereals that are low in fiber, such as cream of rice or cream of wheat. Make them with extra liquid to create a soup-like consistency.
- Optional high-protein, low-calorie liquid supplement drinks (drinks containing less than 200 calories and more than 20 grams of protein in an 8- to 11-ounce serving).

To increase protein intake, add 2 tablespoons non-fat dry milk powder, egg substitute or powdered egg, or other protein powder to each 1/2 cup of nonfat or low-fat milk. These can also be added to soups, hot cereal and other thick liquids.

**Guidelines for Fluid Consumption**

- No liquids at meals; wait at least 30 minutes after a meal to start fluids. It is important to avoid overfilling and stretching the stomach pouch.
- Sip beverages; do not use a straw, which increases swallowed air.
- The daily goal is at least 1.4 L (6 cups) of fluids. This should include high-protein liquid supplement, skim milk, and sugar-free noncarbonated beverages. Decaffeinated coffee or tea is preferred.
- Stop eating and drinking when a full feeling occurs. Overfilling the stomach pouch will cause it to stretch, which often leads to increased intake.
- Avoid carbonated beverages, as the gas bubbles may stretch the pouch.

**Phase II- Pureed Foods**

Once patient is able to tolerate liquids for a few days, start giving strained and pureed foods.

- *Pureed Foods:* Pureed foods do not contain any chunks and have been blended into the smooth consistency of baby food. At this stage chunks of food can get stuck in the stomach opening and cause pain and vomiting. To puree foods, combine high-protein foods with broth, skimmed milk or low-calorie sauces in a blender and puree until smooth.

To puree foods, choose foods that will blend well, such as:

- Lean ground meats
- Beans
- Fish
- Eggs
- Soft fruits and cooked vegetables
- Cottage cheese

Blend solid foods with a liquid, such as:

- Water
- Skim milk
- Juice with no sugar added
- Broth

**Stage III-Soft Diet**

- *Soft food:* Consistency will gradually move on to soft foods, which are foods with texture but tender and easy to chew. Soft foods might include ground or finely diced meats, fish, canned or soft fruit (without seeds or skin), scrambled eggs and cooked vegetables (without skin).

**Recommended Puréed and Soft Foods**

- Applesauce
- Yogurt
- Cottage cheese
- Well-cooked, puréed vegetables
- Hot cereals
- Mashed potatoes
- Scrambled egg whites or egg substitute
- Canned fruits
- Canned tuna fish
- Lean fish
- Tofu
- Lean ground meats or poultry

Avoid all bread and meats that are not easily chewed.

Recommended Meal Plan for Weeks Two to Eight until Two Months Post-Surgery.

At this time, your calorie intake will probably be no more than 500 calories a day, divided into six to eight small meals. Recommended portion sizes are 1/4 cup for solids and 1/2 cup for liquids.

*Sample Menu*

This sample menu includes different foods that are safe for you to eat. You may adjust the menu to fit your tastes and tolerance.

*Breakfast*

1/4 cup hot cereal made with non-fat milk

*Mid-Morning*

1/2 cup non-fat milk\*

*Late-Morning*

Two scrambled egg whites

*Lunch*

1/2 cup low-fat chicken soup

*Mid-Afternoon*

1/4 cup low-fat cottage cheese

*Late-Afternoon*

1/4 cup sugar-free, nonfat yogurt

*Dinner*

2 ounces lean ground meat

1/4 cup pureed or well-cooked vegetables

*Bedtime*

1/4 cup non-fat milk

\* Add 1 tablespoon non-fat dry milk powder to each 1/4 cup nonfat milk for additional protein.

Remember to drink 1 cup of water or other non-calorie fluids between meals.

**Stage IV - Solid Foods**

- *Solid Food Diet:* Once body has healed, bariatric surgeon/ dietician or nutritionist will put patient on a regular diet. Meals should always include high-protein food items such as lean meat, yoghurt, eggs, whole grains, fruits and vegetables [6]. After about eight weeks patient can gradually return to eating firmer foods. But foods must still be chopped or diced. Start slowly with regular foods to see what foods can be tolerated. Patient may still have difficulty eating spicier foods or foods with crunchy textures. Even at this stage, there are foods to avoid because they may cause gastrointestinal symptoms, such as nausea, pain or vomiting.

*Foods to Avoid:*

- Nuts and seeds
- Popcorn

- Dried fruits
- Carbonated beverages
- Granola
- Stringy or fibrous vegetables, such as celery, broccoli, corn or cabbage
- Tough meats or meats with gristle
- Fried foods
- Breads

**Guidelines for Each Stage of Bariatric Diet**

- *Eat and Drink Slowly.* Eating or drinking too quickly may cause dumping syndrome – when foods and liquids enter small intestine rapidly and in larger amounts than normal, causing nausea, vomiting, dizziness, sweating and eventually diarrhea. To prevent dumping syndrome, choose foods and liquids low in fat and sugar, eat and drink slowly, and wait 30 to 45 minutes before or after each meal to drink liquids. Take at least 30 minutes to eat meals and 30 to 60 minutes to drink 1 cup (237 milliliters) of liquid.
- *Keep Meals Small.* During the diet progression, eat several small meals a day and sip liquids slowly throughout the day (not with meals). First start with six small meals a day, then move to four meals and finally, when following a regular diet, decrease to three meals a day. Each meal should include about a half-cup to a cup of food. Make sure to eat only the recommended amounts and stop eating before feeling full
- *Drink Liquids between Meals.* Expect to drink at least 6 to 8 cups (48 to 64 ounces, or 1.4 to 1.9 liters) of fluids a day to prevent dehydration. Drinking liquids with meals can cause pain, nausea and vomiting as well as dumping syndrome. Also, drinking too much liquid at or around mealtime can leave feeling overly full and prevent from eating enough nutrient-rich food.
- *Chew Food Thoroughly.* The new opening that leads from stomach into intestine is very small, and larger pieces of food can block the opening. Blockages prevent food from leaving stomach and can cause vomiting, nausea and abdominal pain. Take small bites of food and chew them to a pureed consistency before swallowing. If can't chew the food thoroughly, don't swallow it.
- *Focus on High-Protein Foods.* Immediately after surgery, eating high-protein foods can help to heal. High-protein, low-fat choices remain a good

long-term diet option after surgery, as well. Try adding lean cuts of beef, chicken, pork, fish or beans to the diet. Low-fat cheese, cottage cheese and yogurts also are good protein sources.

- *Avoid Foods that are High in Fat and Sugar.* After surgery, it may be difficult for digestive system to tolerate foods that are high in fat or added sugars. Avoid foods that are high in fat (such as fried foods, ice cream and candy bars). Look for sugar-free options of soft drinks and dairy products.
- *Try New Foods One at a Time.* After surgery, certain foods may cause nausea, pain and vomiting or may block the opening of the stomach. The ability to tolerate foods varies from person to person. Try one new food at a time and chew thoroughly before swallowing. If a food causes discomfort, don't eat it. As time passes, patient may be able to eat this food. Foods and liquids that commonly cause discomfort include meat, bread, raw vegetables, fried foods and carbonated beverages.
- *Take Recommended Vitamin and Mineral Supplements.* Because a portion of small intestine is bypassed after surgery, body won't be able to absorb enough nutrients from food. Need to take a multivitamin supplement every day for the rest of life [13].

### Supplements

Supplementation should commence within a week to 15 days of the surgery depending on the tolerance of the patient and no later than 1 month after the surgery. Compulsory supplements are protein, complete adult multivitamins, calcium, and iron. Other supplementation should include those nutrients that were found deficient during the pre-operative phase. All pills must be crushed or cut into six to eight small pieces since it can be difficult for the pills to pass through new anatomy. Minimal daily nutritional supplementation post-bariatric surgery, according to the procedure, should include 1-2 adult multivitamin-plus-mineral supplements, 1200-2400 mg elemental calcium,  $\geq 3000$  IU vitamin D, and 250-350  $\mu$ g vitamin B-12/d or 1000  $\mu$ g vitamin B-12/wk (14).

### Conclusion

Moderate weight loss of five to ten percent of initial body weight has been shown to improve many of the adverse health effects of obesity [15]. Post bariatric nutrition follows gradual weaning from fluids to pureed foods then solid food allows patients to adjust

to a restricted portion size and a new way of eating [16]. Focus on low-fat, low-sugar and low-calorie foods and continue to count your calories every day. Eating the right foods can prevent complications, such as constipation and high blood glucose, and provide the necessary building blocks of protein to heal quickly. Appropriate nourishment is of utmost importance for successful weight loss and to avoid potential complications and deficiencies.

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