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Bariatric Surgery: Nutritional Concerns on the Weigh Down

Kelly O'Donnell

Obesity is a burgeoning epidemic in the United States. Gastric bypass surgery is an effective treatment for losing weight and maintaining weight loss in the morbidly obese. Equally important is the improvement in diabetes, cholesterol, hypertension and pulmonary disease. With the increased use of laparoscopic technique over the past five years, complications and length of hospital stay have decreased. This article describes the selection criteria for patients considering bariatric surgery, the anatomical changes associated with the surgery, resulting nutritional deficiencies followed by dietary guidelines and recommended supplementation.

INTRODUCTION

Obesity is reaching epidemic proportions in the United States. Approximately 97 million adults are obese and the number continues to rise (1). Body mass index (BMI) or weight in relation to height has become the standard of measurement for obesity. Obesity is defined as BMI greater than 30 kg/m^2 and morbid or extreme obesity as a BMI greater than 40 kg/m (2,5) (Table 1). Data collected from the National Health and Nutrition Examination survey (NHANES III) found that between 1988–1994, 22.9% of adults were obese, 55.9% were overweight and 2.9% were extremely obese (2). A more recent survey of 4,115 adults between 1999–2000 showed an increase in these numbers with 30.5% as obese, 64.5% overweight, and 4.7% extremely obese (2). While the number of obese adults has doubled since the 1980s, the number of extremely obese adults has *quadrupled,* currently affecting one in every 50 adults (3). An estimated 300,000 people in the United States die annually from obesity-related diseases and it is expected that mortality related to obesity will soon exceed that of smoking (4). There are many diseases caused or exacerbated by obesity such as Type 2 diabetes, hypertension, hyperlipidemia, heart disease and stroke (4) (Table 2).

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Table 1
Body Mass Index Categories

Category	BMI kg/m^2
Normal	18.5–24.9
Overweight	25.0–29.9
Obesity	30.0–39.9
Morbid/Extreme obesity	40.0–49.9
Super obesity	>50

Calculating BMI

$$\text{BMI} = \frac{\text{weight (kg)}}{\text{height (m)}^2}$$

OR

$$\text{weight (in pounds)} / \text{height (in inches}^2) \times 703$$

For easy calculation
http://nhlbisupport.com/bmi/bmicalc.htm
From: National Institutes of Health, National Heart, Lung, and Blood Institute Website. Accessed July 7, 2003.

MEDICAL THERAPY

The expert panel of the Obesity Education Initiative reviewed randomized, controlled trials and found that low calorie diets produce approximately an 8% weight loss over a 3 to 12 month period in the overweight and obese and is extremely difficult to maintain in the long term (1). The panel also found that diets, pharmacotherapy, and weight loss programs for sustained weight loss in morbidly obese individuals is ineffective. Bariatric surgery may be the best option for the morbidly obese patient who has failed standard, conservative weight loss attempts (6).

HISTORY OF BARIATRIC SURGERY

Bariatric surgery dates back to the 1950s when intestinal bypasses were first performed. Total weight loss achieved correlated to the length of small bowel bypassed (7). Typically, 90% of the small bowel was bypassed, however, due to complications including severe diarrhea, dehydration, electrolyte abnormalities, liver dysfunction, protein malnutrition, and renal disease, this procedure has largely been abandoned. Currently, there are several different types of bariatric surgery which are classified as restrictive, malabsorptive, or both (Table 3).

Gastric bypass (GBP) is the most common weight loss surgery performed in the United States (5). The first GBP was performed by Mason in 1967 after noticing that patients lost weight after gastrectomies for peptic ulcer disease (7). The procedure has been modified since then. Because of staple-line disruption, many surgeons now physically divide the stomach into a small proximal pouch and the longer fundus and antrum (5). The 15–30 mL pouch is directly attached to the jejunum in a Roux-en-Y configuration via a narrow anastamosis (approximately 10 mm). The distal end of the jejunum is then anastamosed 50–75 cm below the gastrojejunostomy. Ninety percent of the stomach as well as the entire duodenum are bypassed (8,9) (Figure 1). A longer roux limb (>75 cm) is especially advantageous for those patients with a BMI >50 kg/m^2 (10). The longer distal roux limb decreases the amount of intestine available for absorption thereby promoting more weight loss but also increasing the risk of protein malabsorption and nutrient deficiencies (5,8,11). Roux-en-Y gastric bypasses combine restrictive and malabsorption principles (12).

Gastric bypass procedures are not without complications. Operative mortality ranges from 0.3% to 1.6%

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Table 2
Obesity-associated Medical Conditions

Cardiomyopathy	Degenerative joint disease
Coronary artery disease	Immobility
Dyslipidemia	Depression
Hypertension	Low self-esteem
Diabetes mellitus	Malignancies
Infertility	Dyspnea
Gastroesophageal reflux	Obstructive sleep apnea
Gallstones	Obesity hypoventilation
Hepatic steatosis	Deep vein thrombosis
Chronic fatigue	Pulmonary embolus
Urinary stress incontinence	Venous stasis

Adapted from Reference 5

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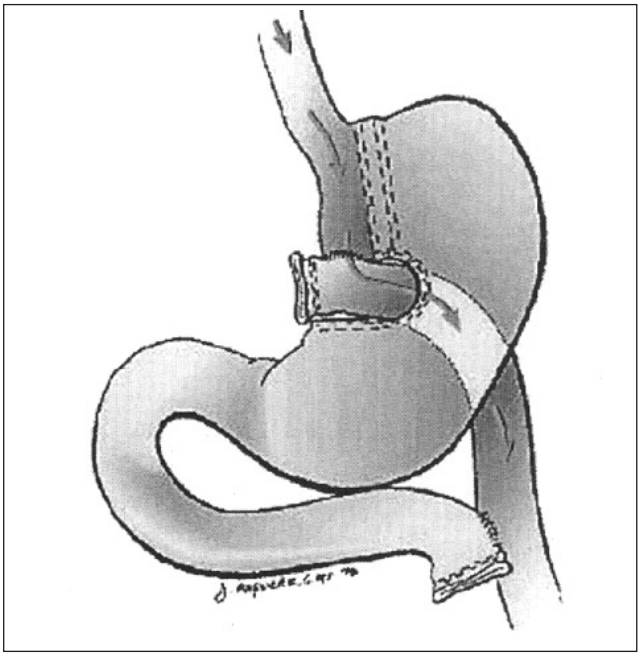

Figure 1. Adapted from Reference 5.

Table 3
Current Surgical Procedures

Purely Restrictive
- Gastric balloons*
- Vertical-banded gastroplasty
- Gastric adjustable banding

Restrictive > Malabsorptive
- Proximal Roux-en-Y gastric bypass
- Distal Roux-en-Y gastric bypass

Malabsorptive < Restrictive
- Biliopancreatic diversion (BPD)
- BPD with duodenal switch
- Very long limb Roux-en-Y gastric bypass

Purely Malabsorptive
- Jejunoileal bypass**
- Jejunocolonic bypass**

*Not approved for use in the United States
**No longer considered a safe surgical option
Adapted from Reference 5

while perioperative complications occur in approximately 10% of patients (7) (Table 4). Long-term considerations in GBP surgery include vitamin and mineral deficiencies, anemia, nausea, vomiting, diarrhea and dumping syndrome (7).

LAPAROSCOPY

Over the past five years, laparoscopic bariatric surgeries have become increasingly popular. This minimally invasive approach has decreased complications such as hernia or wound infection from 30% with open surgery to <1% with laparoscopy (5). DeMaria found that 75% of patients were discharged within three days with fewer wound-related complications than open procedures (13). Another study reported a hernia rate of 0.7% with a median hospital stay of two days (14). In a study randomizing patients to receive open or laparoscopic GBP, there was a shorter hospital stay as well as fewer wound-related complications in the laparascopic group. Weight loss was comparable between groups but quality of life was rated better for the laparoscopic group (15).

PATIENT SELECTION

The National Institute of Health set forth stringent criteria for patients considering bariatric surgery. Potential candidates must have a BMI >40 or BMI >35 plus high risk comorbidities such as sleep apnea, Pickwickian syndrome, cardiomyopathy, diabetes mellitus, or physical problems like joint disease interfering with

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Table 4
Perioperative Complications of Gastric Bypass

Splenic or other organ injuries	Pulmonary failure
Pneumonia	Cardiac events
Wound Infection	Wound dehiscence
Thromboembolic events	Thrombocytopenia
Anastomotic leaks	Intraabdominal sepsis
Hemorrhage	Death

Adapted from Reference 7

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lifestyle, employment or ambulation (6). In addition, patients must demonstrate repeated failures in weight control programs. Candidates should also be evaluated by a multidisciplinary team including an internist, psychologist, dietitian, and surgeon. Patients with significant psychiatric disorders may be considered if they respond favorably to therapy (7). At University of Virginia Health System (UVAHS), a detailed psychological exam is required prior to surgery. The psychologist performs a full assessment, including weight history, 24 hour dietary recall, binge eating assessment, trigger foods, and expectations after surgery. Postoperative follow up greatly improves patient compliance and outcomes.

GASTRIC BYPASS DIET

Limited gastric capacity and a narrow anastomotic gastrointestinal stoma necessitate certain dietary modifications particularly in the early post-operative period. Diet progression varies amongst health care professionals. A standardized GBP diet does not exist. Generally, most patients begin with a liquid diet due to the small, edematous gastric outlet. This phase of the diet may range from one day up to 6 weeks (16–18). Afterwards, pureed textures are introduced and the diet is slowly advanced to soft-textured foods by about 12 weeks. Small, frequent meals rich in protein are emphasized (7,9,16,17) (Table 5). Liquids are usually consumed between meals to allow greater intake of calories and protein with solid foods. Carbonated drinks may cause distension and discomfort from the carbon dioxide. Red meats, tough meats, breads and milk products may be difficult for some patients to tolerate (16,18). Until solid food intake is adequate, high protein liquid supplements such as sugar free Carnation Instant Breakfast (mixed with low lactose milk if necessary) are often recommended (See Stage 2 of the diet in Appendix A).

During the first six to 12 months after surgery, patients generally consume 900 to 1000 calories (5,9,18). Calorie consumption slowly increases due to a change in the pouch size and stoma size, gastric emptying rate and intake of solid food. Flanagan observed a stabilization in pouch size at two years with the average size holding six ounces (17). There are very few recommendations in the literature regarding protein intake. Shikora (7) recommends 60–80 grams of protein daily. At UVAHS, patients are encouraged to consume 50–60 grams of protein daily based on the Recommended Dietary Allowances (19).

Sugar and concentrated sweets are discouraged in order to prevent dumping syndrome. Because the pyloric sphincter is bypassed, simple sugar is dumped into the small intestine causing an increase in the osmotic load, thereby drawing fluid into the intestine leading to diarrhea, nausea, diaphoresis and abdominal cramps (8,16). The shunting of blood to the intestines and the perceived decrease in blood volume 30 minutes to one hour after a meal prompts many patients to lie down in an effort to improve cardiac output. This negative feedback mechanism typically occurs during the first six months after surgery and occurs in variable percentages in GBP patients (16). See Appendix A–F for the University of Virginia Health System's Gastric Bypass Diet Guidelines.

Table 5
High Protein, Low Fat Foods

Food	*Serving Size*	*Protein (g)*
Fat free refried beans	1/2 cup	8.0
Beans—black, pinto, kidney, white, garbanzo	1/2 cup	7.5
Reduced fat peanut butter	2 tbsp	8.5
Hummus	1/3 cup	4.0
Low fat cottage cheese	1/2 cup	5.0
Skim milk	1 cup	8.0
Low fat, sugar free yogurt	1/2 cup	4–6
Sugar free pudding	1/2 cup	4.0
Carnation instant breakfast	1 packet with 1 cup skim milk	12.0
Egg	1 medium	7.0
Tuna, chicken, fish, lean beef, pork	1 oz	7.0

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Table 6
Nutrient Recommendations

Nutrient	*Recommendation*
Iron	As part of multiple vitamin/mineral* every day +325 mg iron sulfate BID
Vitamin B_{12}	As part of multiple vitamin* every day
Folate	As part of multiple vitamin* every day
Calcium	1200–1500 mg calcium in divided doses over the day (no > 500 mg/dose) if intake of dietary calcium is low. Calcium citrate is better absorbed in low acid environment (9)

*As Centrum or Equivalent

SURGERY RESULTS

Gastric bypass patients generally lose 50%–75% of excess body weight and are usually successful with weight maintenance (7,11,13,20,21). One study reported an average weight loss of 55% at two years (22). Pories, et al found 49% excess weight loss was maintained at 14 years in a group of 600 patients (23). In a study of almost 300 superobese patients with a BMI >50, Brolin found 60% excess weight loss at five years in those patients with a distal GBP (N = 47), 51% weight loss with a 150 cm roux limb (N = 52) and 45% weight loss in the short-limb (50–75 cm) group (N = 99) (24). Twenty to twenty-five percent of GBP patients experience weight loss failure primarily due to dietary noncompliance (5).

DIABETES

Diabetes management improves greatly after GBP surgery. In the Pories study, 83% of the NIDDM patients and 99% of those with glucose intolerance maintained normal levels of plasma glucose, glycosylated hemoglobin and insulin seven years after surgery (23). DeMaria found that 88% of his patients with diabetes no longer required medication one year post op (13). In the Swedish Obese Subjects study, weight loss of 28 kg at two years post op led to improved glycemic control in 118 patients with diabetes mellitus and the incidence of diabetes mellitus was reduced 30-fold (25,26). In a recent report from the University of Pittsburgh School of Medicine, 83% of Type 2 diabetics had fasting plasma glucose and glycosylated hemoglobin return to normal with 80% decreasing their oral agents or insulin 20 months after surgery (N = 190) (27).

CARDIOVASCULAR DISEASE

Gastric bypass surgery also improves indices of cardiovascular disease. One study showed a 15% decrease in total cholesterol, a 50% decrease in triglycerides by six months and an increase in HDL by 12 months (22). In one study, 14% of patients were treated for hypertension after surgery versus 58% before surgery, while another study found improvement or resolution of hypertension in 70% of patients four years post op (20,23). DeMaria found that most co-morbid conditions including hypertension, diabetes, GERD, orthopedic problems and urinary incontinence improved or resolved one year after surgery (13).

PULMONARY DISEASE

Morbid obesity can greatly increase the risk of developing obesity-hypoventilation syndrome and sleep apnea. One study found that preoperatively, 14% of patients had at least one of these disorders and postoperatively, there was an improvement or cure in most of the patients (28).

NUTRITIONAL CONSEQUENCES

Malnutrition is much less common after gastric bypass than intestinal bypass. Two hundred GBP patients were followed up to seven years post op without a documented case of calorie or protein malnutrition (29). Another study found the incidence of hypoalbuminemia to be negligible (30). Fat malabsorption, along with deficiencies in B_{12}, folate, fat-soluble vitamins, calcium, and thiamin appear to be more common in the distal GBP procedure (18, 24) See Table 6 for specific recommendations for individual nutrients.

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Table 7
Additional Resources

American Society of Bariatric Surgeons
http://www.asbs.org/

Statistics related to Obesity
http://www.niddk.nih.gov/health/nutrit/pubs/statobes.htm

Obesity law and advocacy center
http://www.obesitylaw.com/

Obesity Help
http://www.obesityhelp.com/

Weight loss surgery information
http://www.weightlossurgeryinfo.com/

Iron

Approximately 33% of gastric bypass patients develop iron deficiency and up to 30% develop anemia (31). The primary site of iron absorption is the duodenum, which is completely excluded in gastric bypass patients. Iron absorption is enhanced by gastric acid secretion which is greatly reduced in the remaining pouch (31). In addition, dietary iron usually in the form of meat, is often poorly tolerated in this group. In two separate studies, Brolin found that multivitamin supplements did not consistently protect against iron deficiency, especially in menstruating women (31,32). Prophylactic oral iron supplementation has been shown to be beneficial in preventing iron deficiency (32). One study found that compliance with oral iron supplements was poor, but when given to those with iron deficiency, iron levels returned to normal in all patients (N = 56) (32). The addition of 50 mg of Vitamin C, either in the form of food or supplements, may enhance iron absorption.

Vitamin B_{12}

Approximately 37% of GBP patients develop B_{12} deficiency (31). Normally, gastric acid helps free B_{12} from the food source after which it binds to intrinsic factor in the duodenum and is later absorbed in the distal ileum (33). These mechanisms are disrupted after GBP surgery. Although low serum B_{12} levels may be common, few patients develop symptoms of the deficiency (31,33,34,35). Oral supplements containing 500 mcg of B_{12} improve deficiencies in 80% of patient (31). Smith found normal absorption of free synthetic vitamin B_{12} in GBP patients (21). At UVAHS, B_{12} levels are checked on an annual basis.

Folate

A wide variation in folic acid deficiency has been reported, ranging from 0% to 38% of patients, predominately as a result of decreased oral intake and possible malabsorption (7,31). It occurs less often in meat eaters (29). In one study of 348 patients, 35% had folate deficiency based on serum folate levels but no patient had symptoms of the deficiency (33). Folate deficiencies can be corrected with a simple multivitamin, which typically contain 400 mcg of folate.

Calcium

Calcium is primarily absorbed in the duodenum and upper jejunum and a deficiency may result when these areas are bypassed. In addition, poor dietary intake of calcium and malabsorption of Vitamin D may also play a role. In one case study, a patient was found to have elevated alkaline phosphatase levels, decreased serum calcium levels, decreased 25-OH Vitamin D levels, and increased PTH along with radiographic evidence of osteomalacia 17 years after surgery (36). A review of 26 patients 10 years after GBP surgery found all had decreased calcium levels, increased alakaline phosphatase and decreased 25-OH Vitamin D levels (37). The author recommended yearly monitoring of these lab values. However, metabolic bone disease after GBP surgery has not been well defined.

CONCLUSION

The obese population, especially the morbidly obese, is increasing at an alarming rate in the United States. Weight loss programs have been found ineffective in this group. In an effort to improve the quality of life and decrease comorbidities associated with this patient

population, gastric bypass surgery may be an option. This article provides a review of GBP surgery, dietary principles and the specific nutrients affected by surgery. See Table 7 for additional resources. ■

References

1. Expert Panel on the Identification, Evaluation, and Treatment of Overweight in Adults: Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults. Executive Summary. *Am J Clin Nutr,* 1998;68:899-917.
2. Flegal KM, Carroll M, Ogden C, et al. Prevalence and Trends in Obesity Among US Adults, 1999-2000. *JAMA,* 2002; 288:1723-1272.
3. Sturm R: Increases in Clinically Severe Obesity in the United States, 1986-2000. *Arch Int Med,* 2003;163:2146-2148.
4. Obrien P, Dixon J. The extent of the problem of obesity. *Am J Surg,* 2002;184: S4-S8.
5. Kim J, Tarnoff M, Shikora S. Surgical treatment for extreme obesity: Evolution of a rapidly growing field. *NCP,* 2003;18:109-123.
6. Gastrointestinal surgery for severe obesity. National Institutes of Health consensus development conference statement. *Am J Clin Nutr,* 1992; 55:615S-619S.
7. Shikora S: Surgical treatment for severe obesity. The state-of-the-art for the new millennium. *NCP,* 2000;15:13-22.
8. Woodward B. Bariatric sugery options. *Crit Care Nurse Q,* 2003;26:89-100.
9. Kushner R. Managing the obese patient after bariatric surgery: A case report of severe malnutrition and review of the literature. *JPEN,* 2000;24:126-132.
10. Choban P, Flancbaum L. The effect of roux limb lengths on outcome after Roux-en-Y gastric bypass: A prospective, randomized clinical trial. *Obese Surg,* 2002;12:540-545.
11. Deitel M, Shikora S. The Development of the Surgical Treatment of Morbid Obesity. *J Am Coll Nutr,* 2002;21:365-371.
12. Fisher B, Schauer P. Medical and surgical options in the treatment of severe obesity. *Am J Surg,* 2002;184:9S-16S.
13. DeMaria D, Sugerman H, Kellum J, et al. Results of 281 consecutive total laparoscopic Roux-en-Y gastric bypasses to treat morbid obesity. *Ann Surg,* 2002;235:640-647.
14. Schauer P, Ikramuddin S, Gourash W. Outcomes after laparoscopic Roux-en-Y gastric bypass for morbid obesity. *Ann Surg,* 2000;232:515-529.
15. Nguyen N, Goldman C, Rosenquist C, et al. Laparoscopic versus open gastric bypass: A randomized study of outcomes, quality of life and costs. *Ann Surg,* 2001;234:279-291.
16. Elliot K. Nutritional considerations after bariatric surgery. *Crit Care Nurs Q,* 2003;26: 133-138.
17. Flanagan L. Understanding the function of the small gastric pouch. *Surgery for the morbidly obese patient.* Toronto, Canada; Lea & Febiger:1998:147-160.
18. Collene A, Hertzler S. Metabolic outcomes of gastric bypass. *NCP,* 2003;18:136-139.
19. Committee on Dietary Reference Intakes. Dietary Reference intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids. Washington, D.C.. National Academies Press, 2002.
20. Brolin R. Bariatric surgery and long-term control of morbid obesity. *JAMA,* 2002;288: 2793-2796.
21. Smith CD, Herkes S, Behrns K, et al. Gastric acid secretion and Vitamin B_{12} absorption after vertical Roux-en-Y gastric bypass for morbid obesity. *Ann Sur,* 1993;218:91-96.
22. Brolin R, Bradley L, Wilson A, et al. Lipid risk profile and weight stability after gastric restrictive operations for morbid obesity. *J Gastrointest Surg,* 2000;4:464-469.
23. Pories W, Swanson M, MacDonald K, et al. Who would have thought it? An operation proves to be the most effective therapy for adult-onset diabetes mellitus. *Ann Sur,* 1995; 3:339-350.
24. Brolin R, LaMarca L, Kenler H, et al. Malabsorptive gastric bypass in patients with superobesity. *J Gastrointest Surg,* 2002;6:195-205.
25. Sjostrom CD, Lissner L, Wedel H. Reduction in incidence of diabetes, hypertension and lipid disturbances after intentional weight loss induced by bariatric surgery: the SOS intervention study. *Obes Surg,* 1999;7;477-484.
26. Pinkney J, Sjostrom CD, Gale E. Should surgeons treat diabetes in severely obese people? *Lancet,* 2001;357:1357-1359.
27. Schauer P, Burguera B, Ikramuddin S, et al. Effect of Laparoscopic Roux-en-y gastric bypass on Type 2 diabetes mellitus. *Ann Sur,* 2003;238:467-485.
28. Sugarman H, Fairman R, Baron P, et al. Gastric surgery for respiratory insufficiency of obesity. *Chest,* 1986;90:81-86.
29. Avinoah E, Ovnat A, Charuzi I. Nutritional status seven years after Roux-en-Y gastric bypass surgery. *Surgery,* 1992;111:137-142.
30. Skroubis G, Sakellaropoulos G, Pouggouras K. Comparison of nutritional deficiencies after Roux-en-Y gastric bypass and after biliopancreatic diversion with Roux-en-Y gastric bypass. *Obes Surg,* 2002;12:551-558.
31. Brolin R, Gorman R, Milgrim L. Multivitamin prophylaxis in prevention of post-gastric bypass vitamin and mineral deficiencies. *Int J Obesity,* 1991;15:661-667.
32. Brolin R, Gorman J, Gorman R, et al. Prophylactic iron supplementation after Roux-en-Y. *Arch Surg,* 1998;133:740-744.
33. Brolin R, Gorman J, Gorman R, et al. Are Vitamin B_{12} and folate deficiency clinically important after Roux-en-Y gastric bypass? *J Gastointest Surg,* 1998;2:436-442.
34. Brolin R, Leung M. Survey of vitamin and mineral supplementation after gastric bypass and biliopancreatic diversion for morbid obesity. *Obes Surg,* 1999;9:150-154.
35. Rhode B, Arseneau P, Cooper B. Vitamin B_{12} deficiency after gastric surgery for obesity. *Am J Clin Nutr,* 1996;63:103-109.
36. Goldner W, O'Dorisio T, Dillon J, et al. Severe metabolic bone disease as a long-term complication of obesity surgery. *Obes Surg,* 2002;12:685-692.
37. Ott M, Fanti P, Malluche H, et al. Biochemical evidence of metabolic bone disease in women after Roux-en-Y gastric bypass for morbid obesity. *Obes Surg,* 1992;2:341-348.

Appendix A
Gastric Bypass Diet
(Used with permission by the University of Virginia Health System, Department of Nutrition Services)

This diet is designed for use after gastric bypass surgery. The stomach pouch created by surgery is the size of a large walnut. You will be on a liquid or semi-liquid diet for about three weeks to allow healing of the stomach pouch. This diet will help keep you healthy while losing weight. **Advances in your diet should be made only with the approval of your physician.**

Diet Stages:

Stage 1	Clear liquids—start ~1 day after surgery.
Stage 2	Gastric bypass liquids (semi-liquids)—start ~2 days after surgery.
Stage 3	Semi-solid diet—start when directed by your physician (usually 2–3 weeks after surgery).
Stage 4	Low-fat solid diet—start when directed by your physician (usually 3–4 weeks after surgery).

Stage 1: Clear Liquids
About one day after your surgery, you will be started on sips of clear liquids (apple juice, cranberry juice, grape juice, tea, coffee, water, sodas, etc.). Take small sips and be aware of feelings of fullness. If you tolerate clear liquids, the next day you will be advanced to the "gastric bypass liquids/semi-liquids" as described below.

Stage 2: Gastric Bypass Liquids/Semi-liquids
All foods must be of a consistency of thinned mashed potatoes.

Protein Goal = _____ grams/day

Examples:
- Skim milk shakes
- Unsweetened Instant Breakfast made with skim milk
- Blenderized soups (make with skim milk instead of water)
- Blenderized fruit added to shakes made with skim milk
- Blenderized meat added to blenderized cream soups
- Cooked cereal thinned with skim milk (oatmeal, grits, cream of wheat, farina, cream of rice)
- Thin blenderized casseroles
- Yogurt shakes made with sugar-free yogurt and fruit juice
- Unsweetened applesauce
- Baby food
- Mashed potatoes made with milk
- Blended sugar-free yogurt
- Sugar-free pudding
- Add non-fat dry milk powder to foods and beverages to increase the protein

You will start with small amounts of these liquids because you will feel full quickly. At first you will have to drink small amounts frequently (2–4 ounces at a time). After a few days your daily intake of the liquids listed above should be at least **24 ounces** (3 cups). Eventually you will be able to take 3 liquid meals of 6-8 ounces each. ***Drink slowly. It should take 30 minutes or more to drink 6–8 ounces (3/4 to 1 cup).***

AT LEAST one quart (4 cups) of low calorie liquids should be consumed gradually throughout the day to prevent dehydration.

Examples:
- Water
- Crystal Light
- Diet sodas
- Diluted juices – 1/2 water, 1/2 juice
- Skim milk
- Sugar-free Kool-Aid

A vitamin/mineral pill, which includes iron and zinc, should be taken daily **FOR THE REST OF YOUR LIFE** to prevent hair loss and to improve overall nutrition. During the first few weeks after surgery, if you are having trouble swallowing pills, use the children's chewable vitamin/mineral pill instead.

Medications may be taken in liquid or chewable form, but most pills are easily swallowed.

Concentrated sugars and alcohol can cause vomiting and/or diarrhea (dumping syndrome) so avoid:
- Candy-including chocolate
- Sweets
- Regular sodas
- Honey
- Kool-Aid
- Molasses
- Cakes
- Preserves
- Sherbet
- Ice cream
- Alcohol (including beer)

Different people have different foods they can and cannot tolerate. Do not be disturbed if you find some foods do not agree with you at first. You may be able to tolerate those foods later.

If you are having trouble tolerating pureéd food:
1. Try slowing the speed of your eating.
2. Decrease your portion size.

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Appendix A (continued)

How to blenderize food:
1. Put food in a blender.
2. Add liquid such as skim milk, broth, or juice.
3. Blend until pureéd.

Pureéd baby food can be used instead of blenderized foods.

Stage 2: Sample Gastric Bypass Liquid/Semi-liquid Menu
(Consistency of thinned mashed potatoes)

Breakfast:	1 cup Diet Instant Breakfast mixed with skim milk	
Snack #1:	1/2 cup sugar-free pudding made with skim milk	
Lunch:	Blenderize-	1/4 cup pureéd vegetables 1/2 cup cream soup 1/4 cup nonfat dry milk powder
Snack #2:	Blended sugar-free yogurt	
Supper:	Blenderize-	1/4 cup meat 1/2 cup cream soup 1/4 cup nonfat skim milk powder 1 cooked egg white

You may have to drink more frequent meals and consume smaller amounts at each meal at first. But try to take in at least 24 ounces (3 cups) of nutritious liquids every day.

Between meals: ***at least*** 4 cups low calorie liquids, sipped slowly during the day.

Stage 3: Semi-solid Diet (to begin the 3rd week after surgery)

Remember to add one new food at a time and observe your reaction to it.
- Cooked eggs any type except fried
- Casseroles—such as macaroni and cheese or tuna
- Chopped lean meat
- Lowfat cottage cheese
- Cooked vegetables (peeled)
- Canned fruits (in their juices or water or drain off the syrup), juices
- Crackers, rolls, bread
- Skim milk, unsweetened instant breakfast, sugar-free lowfat yogurt
- Canned chicken

Specific Information:
- The diet consists of 4–6 small meals per day.
- Each meal should not exceed the volume of a measuring cup (8 oz.)
- **Eat and drink slowly.** Take at least 1/2 hour to eat a meal.
- **Take small bites and chew very well.** Sip on liquids often during meals, but don't drink large amounts during meals.
- Continue to take the vitamin/mineral supplement.
- Continue to drink low calorie liquids between meals—at least 4 cups per day.
- Avoid the skin of raw fruits and raw vegetables at this stage in your diet progression.
- Keep in mind that you are "re-educating" your stomach. When you eat too fast, too much, or don't chew enough, you will feel discomfort.

Stage 3: Sample Semi-Solid Menu

Breakfast	1/2 cup unsweetened canned fruit 1 egg 1/4 cup skim milk
Lunch	1/2 cup lowfat cottage cheese 1/4 cup unsweetened canned fruit 4 crackers 1/4 cup skim milk (*optional:* nonfat skim milk powder can be mixed in skim milk to increase protein)
Supper	1/4 cup tuna 1/2 cup cooked vegetables
Snacks	(between meals or after supper) sugar-free lowfat yogurt lowfat cottage cheese, sugar-free Jello or popsicles
Between meals	Drink at least 1 quart (4 cups) of liquids slowly during the day

Stage 4: Solid Foods (to begin the 4th week after surgery)

Again add one new food at a time and observe your reaction to it. Add breads and meats last, they tend to form a ball, which will not go through the pouch easily. Remember to chew very well and sip liquids with meals.

Appendix B
General Nutrition Information

A well-balanced diet is very important. Eat foods from all food groups:

- Dairy products
- Fruit and vegetables
- Breads and other starches, such as rice, pasta, cereal
- Meat, eggs

Protein
Protein is important, especially to heal after surgery and to help prevent hair loss. Many patients experience some hair loss two to four months after surgery. Hair loss is related to poor protein, iron, and zinc intake as well as some medications, experiencing shock, and having a long surgery. To avoid hair loss and to improve nutrition eat more protein foods including:

- Skim or lowfat milk
- Lowfat cottage cheese
- Lowfat or nonfat yogurt with artificial sweeteners
- Egg whites
- Lowfat cheese
- Fish
- Chicken and turkey (poultry)
- Other lean meats
- Legumes (dried beans)
- Nonfat dry milk powder (added to casseroles, soups, hot cereals, etc.)

Note: You may not be able to tolerate meat or poultry after your surgery. Until you are able to eat meat and poultry, you must get protein from the other protein sources listed above.

*Also remember to take a vitamin/mineral supplement containing iron and zinc daily!

Fat
To help with weight loss and then to maintain your weight loss, remember to limit your fat and calorie intake.

Avoid these high fat foods *except* in small amounts:

- Olives
- Nuts
- Avocados
- Regular mayonnaise
- Sour cream
- Cream cheese
- Pie crust
- Whole milk
- Butter, margarine
- Peanut butter
- Granola
- Muffins
- Cole slaw
- Potato salad
- Whole milk cheese
- Snack crackers
- Ice cream
- Shortening, lard
- Regular salad dressings
- Sauces
- Fried foods
- Bacon, sausage, bologna
- Potato chips
- Doughnuts
- All oils
- Gravy

Learn to read labels on food for fat content. Aim for no more than 35 grams of fat/day.

Appendix C
Lowfat Cooking Tips
(for semi-solid diet and beyond)

Meat and Poultry:
- ***Use the leanest meat***
- Beef, top round
- Chicken and turkey breast, no skin (white meat is lower in fat than dark meat)
- ***Trim fat off meat***
- ***Use lowfat cooking methods***
- Bake, broil, grill, roast, sauté, stir fry (use vegetable spray, broth, water or small amounts of oil)
- ***Drain off excess fat after cooking***

Vegetables:
- Avoid high fat sauces made with cream, cheese, oil, or butter.
- Use cooking methods that require little or no added fat: steam, microwave, bake.
- Carefully choose and use salad dressings.
- Try baked potato with fat-free sour cream or lowfat cottage cheese. Then add chives or dill.
- Add balsamic vinegar, fat-free salad dressing, or lemon juice and herbs.
- Add vegetables such as green pepper, grated carrots, and fresh tomatoes to spaghetti sauces.

Soups:
- Let cool, then skim fat off the top.

Appendix D
Modifying Recipes

Look at the ingredients and find the ones high in fat.

- Is the ingredient necessary? If not, eliminate it.
  Examples: olives, nuts, meat, cheese, oil, salt
- Can the ingredient amount be reduced? Try using half the amount called for.
  Examples: meat, cheese, oil, shortening
- Can a substitute lowfat ingredients be used?
  Examples: **Fat-free** sour cream, yogurt, cottage cheese, and buttermilk
  Molly McButter or Butter Buds

Lowfat Substitutions

Ingredient	*Calories*	*Grams of Fat*
Mayonnaise (1 Tbsp.)	99	11
• use nonfat yogurt	8	0
Ground beef (4 oz.)	325	24
• use ground turkey breast	150	0.8
Whole egg (1)	80	5.5
• use egg whites (2)	30	0
Oil (1 Tbsp.)	126	14
• use fat-free chicken broth	3	0
Whole milk (1 cup)	150	8
• use skim milk	85	0

Appendix E
Stocking Your Kitchen

Cupboard
- Pasta
- Rice
- Potatoes
- Lowfat crackers
- Lowfat spaghetti sauce
- Tuna in water
- Canned beans
- Dry cereal
- Oatmeal
- Canola or olive oil
- Ginger snaps, vanilla wafers, fig bars, or fat-free cookies
- Herb or balsamic vinegar
- Fat-free tortilla chips
- Fat-free chicken broth
- Lemon juice
- Fat-free mayonnaise
- Onions
- Garlic

Refrigerator
- "Light" cheese
- Parmesan cheese
- Lowfat cottage cheese
- Nonfat yogurt
- Skim milk
- Eggs (for the whites)
- Fresh fruit
- Fresh vegetables
- V-8 juice
- Slices turkey or lean roast beef or ham
- Salsa
- Mustard
- Honey

Freezer
- English muffins
- Bagels
- Bread
- Frozen juice
- Vegetables
- Cut-up chicken
- Lean ground turkey
- Lowfat frozen yogurt

Appendix F
Setting Goals

1. _____

2. _____

3. _____

- Tell your local family doctor to check your Vitamin B_{12}, iron, transferrin, and albumin levels at least every year.
- You will visit with the dietitian during your follow-up appointments with your Dr. _____ .
- Call with any questions!

Dietitian: _____

Phone Number: _____