



The Sleeve Diet and Exercise Programs

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1 Recommended Diet Post Sleeve

Prior to sleeve gastrectomy, all patients should be counseled on the importance of making dietary changes that focus on lean protein intake to preserve fat free mass, while promoting the loss of fat tissue following weight loss surgery [1]. Fat free tissue within the body is responsible for resting metabolic rate and normal body functioning, making it crucial to promote high protein, well-balanced, well-hydrated dietary intake that increases lean tissue mass and prevents any stalling of weight loss due to dehydration [1, 2]. Table 1 provides recommendations for macronutrient and fluid intake and behavior changes for long-term success after surgery [2].

2 Types of Exercises: Recommended Exercise Programs

Physical activity and exercise are important components of comprehensive care and long-term weight loss success following bariatric surgery. Thus, it is important to provide individualized exercise recommendations to patients, that are within their specific capabilities, to promote long-term compliance [3]. Increased exercise after bariatric surgery contributes not only to supporting weight loss, but also improving quality of life [4]. Practice guidelines from The American Association of Clinical Endocrinologists/American College of Endocrinology and The American College of Cardiology, The American Heart Association, and

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Table 1 Recommendations following bariatric procedures

| Recommendations | UpToDate: postoperative nutritional management | 2008 ASMBS allied health nutritional guidelines | Guidelines for perioperative care in bariatric Surgery: ERAS society recommendations | Academy of nutrition and dietetics pocket guide to bariatric surgery, 2nd ed |
|-----------------|--|--|--|---|
| Intake | <p>Surgeon or institution specific Long-term diet:</p> <p>Sleeve Gastrectomy/Roux-en-Y gastric bypass</p> <ul style="list-style-type: none"> – well balanced diet containing all the essential nutrients; possible postoperative diets may include • My Plate • DASH Diet <p>The Vegetarian Resource Group</p> <p>Sleeve gastrectomy</p> <ul style="list-style-type: none"> – same advancement and recommendations post-SG as for post- RYGB | <p>Diet Stage:</p> <p>Regular textured (6–8 weeks after surgery and forward)</p> <ul style="list-style-type: none"> * Purpose of nutrition care after surgical weight loss procedures: Adequate energy and nutrients to support tissue healing after surgery and support preservation of lean body mass during extreme weight loss <p>Foods and beverages must minimize reflux, early satiety, and dumping syndrome while maximizing weight loss and weight maintenance</p> | <p>Balanced meal plan to include: >5 servings of fruit and vegetables daily for optimal fiber consumption,</p> <p>colonic function, and phytochemical intake</p> <p>Avoid concentrated sweets to reduce caloric intake and to minimize symptoms of dumping (gastric bypass)</p> | <p>Postoperative nutrition care of the bariatric patient has 2 distinct stages during the first year, then advance to:</p> <p>Diet Stage 4: Regular Solid Food Diet</p> |
| Fluids | <p>Throughout all the diet stages, patients should be counseled to consume adequate fluid to prevent dehydration</p> | N/A | >1.5 L daily | <p>Women: 48 oz/d</p> <p>Men: 64 oz/d</p> <p>50% goal should be met with clear liquids</p> |
| Protein | <p>46 g/day–women 56 g/day–men</p> <p>Protein needs:</p> <p>Should constitute 10–35% of daily caloric intake</p> <p>Weight maintenance: 0.8–1.2 g/kg body weight per day</p> <p>Active weight loss: 1.2 g/kg body weight</p> | Exact needs have yet to be defined | Should average 60–20 g daily | Guidelines for protein consumption not defined |

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Table 1 (continued)

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|-----------------|---|--|---|---|
| Carbohydrates | Early postop—50 g/day As diet intake increases—130 g/day | N/A | N/A | N/A |
| Fat | 20–35% of the daily caloric intake; bulk of the fat intake should be unsaturated fat | N/A | N/A | N/A |
| Behavior | Eat slowly Chew food extensively Stop eating as soon as reach satiety Avoid taking food and beverages at the same time Simple sugars should be limited to less than 10% of daily caloric intake | Avoid/Delay Concentrated sweets Carbonated beverages Fruit juice High-saturated fat, fried foods Soft doughy bread, pasta, rice Tough, dry, red meat Nuts, popcorn, other fibrous foods Caffeine and alcohol | Multiple small meals each day Chewing food thoroughly without drinking beverages at the same time Consume fluids slowly | Practice mindful eating Chew all food until it is smooth Make sure food is soft and moist enough to swallow without sticking Do not drink liquids during meals Wait 30 min after eating before resuming fluid intake Avoid bread, rice and pasta until able to comfortably consume adequate protein, vegetables and fruits |

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Table 1 (continued)

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|-----------------|--|---|--|--|
| Recommendations | UpToDate: postoperative nutritional management | 2008 ASMBS allied health nutritional guidelines | Guidelines for perioperative care in bariatric Surgery: ERAS society recommendations | Academy of nutrition and dietetics pocket guide to bariatric surgery, 2nd ed |
| Other | Close monitoring with a registered dietitian | Dietitian's role is a vital component of the bariatric surgery process, follow up with registered dietitian | Nutritional and meal planning guidance should be provided to patient and family before bariatric surgery and during the postoperative hospital course and reinforced at subsequent outpatient visits Consultation should be provided with a dietitian and a protocol-derived staged meal progression, based on the type of surgical procedure, should be adhered to | RD responsible for the nutrition care of the post-surgery patient and plays an important role in every aspect of care, from pre-operative assessment of the patient to long-term follow-up, evaluation, and monitoring |

Adopted and Modified from Mechanick et al. [2]

the Obesity Society Task Force recommend daily physical activity consisting of moderate aerobic activity equaling a minimum of 150 min per week, spanning a range of 3–5 days, in addition to dietary changes to promote weight loss, with the need of higher levels of activity, near 300 min weekly, to prevent weight gain [3, 5]. Jointly, the American College of Sports Medicine and American Diabetes Association recommend resistance training 2 to 3 times weekly to reduce visceral fat mass and improve body composition [3, 6]. There are two main areas of focus for exercise after weight loss surgery: aerobic activity and muscle strengthening/resistance exercise to preserve lean muscle mass [7].

Obesity is associated with a high energy expenditure needed to move a greater physical mass, this causes a compressed capacity to exercise and shorter duration periods of activity [8–10]. Promoting a negative energy balance of 500 cal per day promotes a net weight loss of one pound each week [11]. A thirty-minute period of moderate exercise can utilize up to 300 kilocalories of energy and represent approximately 20% of total energy intake for the day [12, 13]. Individuals attempting to maintain their weight status and prevent weight regain, may have to increase their weekly exercise routine to 300 minutes of moderate-intensity exercise to maintain weight loss [7]. Further, long term maintenance of weekly energy expenditures of 1,500–2,000 kilocalories have been proven to prevent weight regain [14]. Exercise after surgery should focus on key areas that include: cardiovascular health, strength training, and flexibility.

There are three main aerobic activities that should be promoted after surgery due to their ease and accessibility to improve cardiac health:

- Walking/Treadmill-simplest and most available form of exercise
- Cycling/Elliptical-low impact that is less stressful on knees, hips, and back
- Swimming-moderate activity that provides full body range of motion [6, 7].

A detailed beginner's exercise program is outlined in Table 2 to help patients begin a structured walking program.

A study conducted by de Souza et al. monitored 65 patients' ability to walk on a treadmill pre-operatively, six months, and twelve months post bariatric surgery. In the pre-operative period, patients were able to walk a distance of 401 meters in 5.37 minutes. At their first visit at six months post-op, patients averaged 513 meters in 6.42 minutes. At their final visit at twelve months, patients were able to cover a distance of 690 meters in 8.81 minutes. These results showed a 27.8% increase in distance from pre-op to six months; 34.5% increase from six to twelve months; and 71.9% increase from pre-op to twelve months post-op [15]. A study conducted by Shah et al. followed 33 post-surgical patients through a twelve-week high volume exercise program and compared them to a control group that did not endure high volume activities. 80% of the group assigned to the exercise program depleted at minimum 1,500 kilocalories each week, spanning five days, on aerobic activities that consisted of treadmill, elliptical, or rowing machines and increased their daily step count from 4,500 to 10,000 steps daily

Table 2 Six-week beginner walking plan

| | Monday | Tuesday | Wednesday | Thursday | Friday | Weekend (Optional) |
|--------|---|---|---|--|--------|------------------------------|
| Week 1 | Easy walk: 5–10 minutes Stretch: 2 minutes Easy walk: 5–10 minutes | Easy walk: 10–15 minutes NOTE: always rest when necessary! | Easy walk: 5–10 minutes Stretch: 2 minutes Easy walk: 5–10 minutes | Easy walk: 10–15 minutes | Rest | Easy walk: 15–20 minutes |
| Week 2 | Easy walk: 10–15 minutes Stretch: 2 minutes Brisk walk: 5–10 minutes | Easy walk: 10–15 minutes | Easy walk: 10–15 minutes Stretch: 2 minutes Brisk walk: 5–10 minutes | Easy walk: 10–15 minutes Remember: rest when necessary! | Rest | Easy walk: 15–20 minutes |
| Week 3 | Easy walk: 10–15 minutes Stretch: 2 minutes Brisk walk: 5–10 minutes | Easy walk: 15–20 minutes Stretch: 2 minutes | Easy walk: 10–15 minutes Stretch: 2 minutes Brisk walk: 5–10 minutes | Easy walk: 15–20 minutes Stretch: 2 minutes | Rest | Easy walk: 15–20 minutes |
| Week 4 | Easy walk: 10–15 minutes Brisk walk: 5–10 minutes Stretch: 2 minutes | Easy walk: 15–20 minutes Stretch: 2 minutes | Easy walk: 10–15 minutes Brisk walk: 5–10 minutes Stretch: 2 minutes | Easy walk: 15–20 minutes Stretch: 2 minutes | Rest | Brisk walk: 20–25 minutes |

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Table 2 (continued)

| | Monday | Tuesday | Wednesday | Thursday | Friday | Weekend (Optional) |
|--------|--|---|---|--|--|--------------------------|
| Week 5 | Easy walk: 10–15 minutes Brisk walk: 10–15 minutes Stretch: 2 minutes | Easy walk: 25–30 minutes Stretch: 2 minutes | Easy walk: 10–15 minutes Brisk walk: 10–15 minutes Stretch: 2 minutes | Easy walk: 25–30 minutes Stretch: 2 minutes | Alternate activity of your choice: Go dancing, rake leaves for 20+ minutes | Easy walk: 25–30 minutes |
| Week 6 | Total time: 24–34 minutes Easy walk: 15–20 minutes Power intervals: Power walk: 30 seconds Easy walk: 1 minutes Repeat 4–6 times Easy walk: 3–5 minutes | Alternate activity of your choice for 20–30 minutes | Easy walk: 30–35 minutes Stretch: 2 minutes | Easy walk: 25–30 minutes Stretch: 2 minutes | Rest | Easy walk: 25–35 minutes |

Adopted from American Heart Association in collaboration with American Council on Exercise 2011. [24]

[16]. These studies clearly demonstrate a positive correlation between continued exercise post bariatric surgery and improved activity tolerance.

Strength training should consist of 12–15 repetitions of low to moderate free weights to maintain lean muscle mass while losing weight [17]. Herring et al. examined 24 sedentary patients 12–24 months after surgery. The patients were enrolled in an exercise program of 3- sixty-minute gym sessions per week of moderate aerobic activity and resistance training for a twelve-week period. Those in the exercise program lost, on average, 5.6 kg body weight more than those in the control group [18]. Huck et al. enrolled 15 patients in a twelve-week resistance training program to monitor physical fitness and functionality of individuals. At the conclusion of the program, there was significant improvement in functional strength and flexibility in the group that underwent resistance training [19].

However, when evaluating a patient for exercise programs, it is important to first gather an understanding of their current exercise routine and any concerns or fears they may have regarding an increase in their aerobic activity or transitioning from a sedentary lifestyle to a more active lifestyle [20].

3 Long-Term Outcomes-What to Expect

Since the late 1990s, weight loss surgery has been the most effective long-term treatment for weight loss for obese patients. Weight loss after surgery is primarily affected by a reduction in the secretion of the hormone ghrelin, which stimulates appetite. A study conducted by Bužga et al. followed 37 patients for 3, 6, and 12 months after laparoscopic sleeve gastrectomy to monitor biochemical, physical and dietary changes after surgery. Prior to surgery, 5.4% patients reported low appetites, whereas 27% reported low appetites and 48.6% noticed a decrease in overall appetite in the first year after surgery due to reductions in ghrelin secretion.

However, at twelve months post sleeve gastrectomy, it was noticed that ghrelin hormone levels began to trend upwards near pre-operative levels.

It is known that with the removal of the large portion of the gastric fundus with the sleeve gastrectomy, there is a change in ghrelin production. However, Meier et al. was able to show that negative energy balance can increase ghrelin production [21].

At six months post surgery, patients reported statistically significant reductions of fatty foods and simple carbohydrates in their diets, with increased intake of fish. At twelve months, patients reported statistically significant reductions in intake of fatty foods, however, there was a lack of statistical significance in the reported reduced intake of simple carbohydrates such as rice and baked goods [22]. Another study conducted by Odom et al. showed that 79% of patients included in the study experienced weight regain, with 15% regaining greater than or equal to 15% of their total amount of weight loss. However, it is important to note that there was an inverse association of weight regain and attendance of post-operative appointment visits by patients [23].

4 Ways to Prevent Weight Regain

- Stay connected with clinical team to monitor bloodwork and anthropometric changes
- Stay engaged through a supportive environment whether through patient focused support groups or behavioral therapy appointments with a specialist
- Continue to eat a balanced diet focusing on higher protein intake of 0.8–1.2 g/kg body weight
- Long term maintenance of weekly energy expenditures of 1,500–2,000 kilocalories
- Continue to celebrate non-scale victories to promote positive mind-set.

Many study outcomes show it is beneficial for patients to stay engaged with clinical appointments with their registered dietitians and behavioral support clinicians to monitor dietary intake and lifestyle changes to prevent weight regain after sleeve gastrectomy.

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