

**Postbariatric Body Contouring Surgery — Learn About the Dietitian's Important Role in Counseling and Educating Patients**  
**By Mireille Blacke, MA, RD, CD-N**

*Suggested CDR Learning Codes: 5125, 5370, 5390; Level 2*

*Suggested CDR Performance Indicators: 9.6.3, 9.6.4, 9.6.6, 10.2.5*

Most bariatric dietitians witness significant physical and behavioral transformations while working with patients throughout the preoperative and postoperative period. It can be gratifying to celebrate patients' rapid weight loss and the joy of those who have never lived within the normal BMI range. However, once this "honeymoon phase" passes, many patients become dissatisfied and discouraged despite this progress due to unsightly sagging, excess skin. Even for patients who anticipate this outcome, the loose skin can remain a distressing reminder of their preoperative selves. As a result, an increasing number of bariatric patients consider body contouring surgery (BCS) to remove excess skin that remains after rapid, massive weight loss.<sup>1,2</sup>

This continuing education course explores the dietitian's role in counseling and educating patients considering body contouring procedures after bariatric surgery and/or massive weight loss. Some bariatric patients seek body contouring procedures when excess skin from massive weight loss negatively affects body image and health-related quality of life (HRQoL). Dietitians can help patients optimize nutrition before BCS within the guidelines of the bariatric diet, educate them about nutrition and wound healing, and inform them about nutrition recommendations to maintain outcomes after surgery.

Excess skin may lead to significant physical and psychosocial impairments, particularly because patients find that they can't minimize skin laxity with increased physical activity or targeted exercise.<sup>1</sup> Residual skin limits mobility and physical activity, leading to discomfort, irritation, infection, impaired posture, and problems with the fit of clothing.<sup>3-6</sup> Barriers to psychosocial functioning include profound dissatisfaction with appearance, impaired self-esteem and body image, and diminished quality of life.<sup>1,6-9</sup> Excess skin also may impede further weight loss or trigger weight regain.<sup>3</sup>

Patients considering BCS aren't always required to meet with an RD before surgery, but as integral members of multidisciplinary treatment teams, dietitians working with postoperative bariatric patients considering BCS after massive weight loss can play an important role in enhancing optimal postsurgical outcomes, particularly in decreasing risk of delays and complications with wound healing through proper nutrition. In addition to reinforcing necessary long-term nutrition and lifestyle changes required to achieve weight loss goals, RDs have an opportunity to further educate patients about BCS procedures, discuss unrealistic expectations and limitations of BCS, and provide

additional support, especially when rapport between the RD and patient has been previously established.

Data concerning BCS following bariatric surgery and massive weight loss are limited, and most involve patients who had gastric bypass surgery. Existing research has shown significant improvements in body image and health- and weight-related quality of life after gastric bypass surgery.<sup>10</sup> However, there's additional evidence to suggest that as many as two-thirds of patients experience body image dissatisfaction from excess skin following bariatric surgery.<sup>5</sup> Dissatisfaction with excess skin in particular is a strong motivator in the decision to seek BCS after bariatric surgery.<sup>10</sup>

In a study on bariatric surgery and body contouring, body image, and quality of life, Song and colleagues found that patients undergoing bariatric surgery experience improvements in body image and quality of life, and BCS after bariatric surgery results in further improvements in body image.<sup>11</sup> de Zwaan and colleagues noted that patients who have BCS following bariatric surgery reported greater satisfaction with overall appearance, specific body areas, and physical functioning compared with bariatric surgery patients who didn't undergo BCS.<sup>8</sup>

Modarressi and colleagues found that patients' HRQoL after massive weight loss via bariatric surgery was impaired due to excess skin; HRQoL improved significantly after BCS compared with patients who had gastric bypass and no BCS.<sup>12</sup> In addition, this study showed significant improvement in all subdomains of HRQoL after BCS: self-esteem, social life, sexual activity, work ability, and physical activity.<sup>12</sup> These improvements remained stable over time, despite the visible scarring from BCS.<sup>12</sup>

### **Body Contouring Procedures**

According to the American Society of Plastic Surgeons, demand for BCS is on the rise;<sup>13</sup> more than 50,000 body contouring procedures after massive weight loss were performed in 2015.<sup>14</sup> Because patients often express greatest dissatisfaction with the excess skin at the waist/abdomen, abdominoplasty consistently has ranked as the most commonly performed BCS procedure after massive weight loss, and patients rated greater satisfaction with this area after BCS.<sup>4,8,14</sup>

Major skin excess over many areas of the body after massive weight loss develops after a stressful process of expansion during obesity, followed by deflation during rapid, massive weight loss.<sup>6</sup> Skin laxity and tissue retraction are due to fractured elastin fibers and influenced by multiple factors, including the patient's age, gender, age before weight loss, amount of weight loss, speed of weight loss, degree of sun exposure, and genetic predisposition.<sup>5,6,15</sup> After massive weight loss, the typical patient experiences significant changes in form, shape, and contour of the face, arms, breasts, abdomen, back, buttocks, and thighs.<sup>4</sup> Because skin in these areas after massive weight loss doesn't contract adequately, minimally invasive contouring procedures don't provide satisfactory results in correction of lost shape or form, and excisional procedures are required.<sup>1</sup> In addition, for optimum results, BCS often requires multiple procedures, many of which are complex and labor intensive.<sup>2</sup>

### **Lower Body**

As noted, the areas of greatest concern to most patients after massive weight loss are the waist and abdomen.<sup>1</sup> The most basic BCS to address excess skin in the abdominal area and any medical conditions resulting from skin-fold irritation is the panniculectomy, the excision of the pannus, or apron of excess skin hanging below the umbilicus.<sup>1</sup>

Because this procedure involves only excision and doesn't tighten the abdominal muscles, an abdominoplasty may be preferable for better abdominal contour and more aesthetically pleasing results.<sup>1</sup> Women considering abdominoplasty who plan to become pregnant should be advised that future pregnancy will minimize the results of abdominoplasty.

A lower body lift is a more extensive, complex BCS procedure that combines circumferential abdominoplasty with a lateral (outer) thigh and buttock lift.<sup>1</sup> In addition to contour enhancement from abdominoplasty, the lower body lift is indicated for improvement of outer thigh ("saddlebag"), groin, and buttock ptosis (drooping).<sup>1</sup>

A medial (inner) thigh lift is indicated to improve the contour of excess skin and localized fat deposits and may be combined with a lower body lift.<sup>1</sup>

### **Upper Body**

Brachioplasty (arm lift) is indicated to correct sagging of the upper arms ("bat wings") that generally prove resistant to exercise. It should be noted that brachioplasty (and medial thigh lifts) often result in extensive and hypertrophic scarring.<sup>1</sup>

Massive weight loss can lead to considerable changes in breast shape and volume in both male and female patients.<sup>1</sup> Mastopexy (breast lift) will elevate and reshape sagging breasts, and breast augmentation can be performed at the time of mastopexy in female patients interested in this procedure.<sup>1</sup> Because breast skin in male patients can become quite ptotic, reduction also is an option for men after massive weight loss.<sup>6</sup>

The notion of combining multiple BCS procedures may appeal to many patients due to an assumed reduction in total recovery time, cost, and time off from work.<sup>6</sup> However, combined procedures may involve extended surgical times and administration of anesthesia, increased blood loss, greater postoperative pain, and increased risk of complications (eg, deep venous thrombosis and pulmonary embolus).<sup>6</sup>

### **Candidates, Contraindications, and Complications**

Careful evaluation and selection of BCS candidates is critical to achieving successful patient outcomes and maximum patient benefit.<sup>1</sup> When patients are considering BCS, they should be advised to reach their ideal body weight (+/- 3 kg) and maintain it over a six- to 12-month period after massive weight loss.<sup>1,5,6</sup> For patients who follow nutrition and physical activity guidelines, this typically occurs 12 to 24 months after bariatric surgery.<sup>1,5</sup>

Smoking is considered a chief contraindication to any surgical procedure and is associated with higher complication rates in BCS; candidates must be nonsmokers to

facilitate recovery and wound healing.<sup>1,6</sup> Additional contraindications to single or combined BCS procedures include history of deep venous thrombosis or clotting disorders, high residual BMI, uncontrolled diabetes, or substantial medical risk factors (eg, adverse reactions to anesthesia).<sup>1,6</sup>

Patients considering BCS must be psychologically stable with reasonably accurate body perception, adequate supports, realistic expectations, and an understanding of the possible risks and benefits of BCS.<sup>1,6</sup> Patients should be counseled preoperatively about limitations and potential complications associated with each considered BCS procedure, including inevitable (and possibly hypertrophic) scarring, risk of skin relaxation over time, and the possibility that multiple procedures or revisions may be necessary to achieve desired results.<sup>1,5,6</sup>

Though BCS after bariatric surgery is related to improvements in quality of life, self-confidence, and body image,<sup>3,8,10,11</sup> it also can cause some patients to become dissatisfied with other parts of their bodies; this may be because as patients approach their ideal appearance, their ideals may shift.<sup>16</sup> Some patients may desire BCS due to an erroneous belief that a correction in physical appearance will lead to a problem-free life.<sup>3</sup> Therefore, body dysmorphic disorder, a condition involving an obsessive preoccupation with and distorted perception of one's own appearance, is a contraindication to BCS after massive weight loss.

Complication rates of 20% to 75% have been reported in patients after BCS following bariatric surgery, involving several categories of wound healing, including wound healing disturbance, delayed wound healing, wound infection, hematoma, and seroma.<sup>17-21</sup> There are several reasons for this increased rate of complications in this patient population. Complications occur more frequently in postbariatric surgery patients with the removal of large volumes of tissue, as in extensive BCS operations and multiple procedures combined in two or more stages.<sup>22</sup> A BMI of >25 may triple a patient's risk of postoperative complications.<sup>23</sup> Furthermore, many bariatric patients considering BCS may be deficient in certain macronutrients and micronutrients that are essential for wound healing.<sup>24</sup>

A thorough nutrition assessment is critical to ensure adequate nutritional status before BCS, as malnourished patients are at greater risk of postoperative wound healing issues and infection following bariatric surgery and BCS.<sup>1,5</sup> Because adequate protein intake is essential in this patient population, patients demonstrating aversion to protein-rich foods aren't ideal candidates for BCS.<sup>5</sup>

### **Nutritional Risks and Deficiencies**

Types of bariatric procedures typically are categorized by mechanisms of action: restrictive, malabsorptive, or a combination of procedures that restrict stomach capacity and alter gut-brain communication (eg, gut hormone secretions).<sup>25</sup> The adjustable gastric band (AGB) is a purely restrictive procedure, while the Roux-en-Y gastric bypass (RYGB) and vertical sleeve gastrectomy (VSG) are combined procedures with more favorable long-term weight loss outcomes. RYGB and AGB were the two most

requested bariatric procedures in the United States in recent years.<sup>25</sup> The AGB has diminished in popularity due to banding complications (eg, erosion, slippage), lack of patient compliance, and lower relative long-term weight loss compared with combined procedures.<sup>26,27</sup> As AGB procedures have decreased, RYGB has remained the gold standard of bariatric surgery procedures, and VSG has become the fastest-growing bariatric surgery procedure worldwide.<sup>28</sup>

Regardless of procedure, current data indicate that many patients develop protein-calorie malnutrition as well as various vitamin and mineral deficiencies after bariatric surgery.<sup>5,27,29</sup> These deficiencies may begin to present as early as the latter half of the first postoperative year.<sup>5,18</sup>

The following factors contribute to the risk of nutritional deficiencies in patients following any type of bariatric surgery:

- All forms of bariatric surgery restrict calorie and nutrient intake. At the one year postoperative point, most patients set a minimum daily protein goal of 60 to 80 g per day.<sup>25</sup> A 1,000 kcal/day average intake isn't uncommon at this postoperative stage.<sup>30,31</sup>
- Many patients experience food intolerance after bariatric surgery, including intolerance to red meat and/or dense proteins and dairy products.<sup>15,24</sup> Others practice extreme carbohydrate restriction<sup>15</sup> or develop other maladaptive eating behaviors.<sup>9,32</sup>
- Despite emphasis on vitamin and mineral guidelines beginning in preoperative nutrition visits, postoperative patient compliance with daily multivitamin supplementation is notoriously low and inconsistent across all procedures (60% or less).<sup>30</sup>
- Though several sets of bariatric nutrition practice guidelines and recommendations exist from the American Association of Clinical Endocrinologists, The Obesity Society, and the American Society for Metabolic and Bariatric Surgery, there's no universal bariatric diet.<sup>28,33</sup> This variability in recommended dietary guidelines may contribute to inconsistent patient compliance; patients often seek online support and share/compare their own recommendations with one another.

Though VSG is a more recent bariatric procedure and research is comparatively limited, available data suggest that VSG and RYGB are similar in terms of nutritional risk of protein and micronutrient deficiencies.<sup>27,28</sup> Despite AGB's categorization as a restrictive procedure, patients who undergo it are still at risk of nutritional deficiencies; studies have shown patients after gastric band surgery with folate, vitamin B<sub>12</sub>, and iron deficiencies, as well as bone loss.<sup>15,29</sup> These studies and others highlight the importance of RDs' ongoing assessment of patient adherence to recommended guidelines for protein intake and vitamin and mineral supplementation after any form of bariatric surgery. With careful monitoring and follow-up, RDs should individualize supplementation recommendations for each patient based on nutritional intake and status.<sup>25</sup>

Thiamine (vitamin B<sub>1</sub>) deficiency is seen more frequently in bariatric patients, particularly those with prolonged episodes of vomiting, excessively low carbohydrate intake, or malabsorption issues.<sup>15,30,34</sup> A dose of 50 to 100 mg daily is recommended for patients at risk of thiamine deficiency.<sup>15,29</sup>

Over time, bariatric patients decrease contact with their bariatric team members and many discontinue follow-up, which makes nutritional monitoring difficult. Bariatric patients are encouraged to seek annual screening for nutrient deficiencies.<sup>35</sup> Without regular follow-up and monitoring, these patients may seek BCS unaware of or unconcerned about potential deficiencies that could affect wound healing, infection risk, and immune system suppression, and these risks may increase over time.<sup>35,36</sup> Several studies have reported that significant deficiencies in protein, vitamin A, vitamin B<sub>12</sub>, 25-hydroxy vitamin D, zinc, iron, ferritin, selenium, and folate are present in patients one year after bariatric surgery.<sup>15,35,37</sup> Additional studies of bariatric patients have shown deficiencies in vitamin A, vitamin B<sub>12</sub>, and iron when those patients were evaluated one month before scheduled reconstructive surgery.<sup>36,38</sup>

All forms of bariatric surgery markedly increase a patient's risk of iron deficiency anemia.<sup>15</sup> In terms of supplementation, patients are encouraged to pair 2,000 mg of vitamin C (ascorbic acid) with the recommended oral iron tablet to enhance absorption by increasing acidity levels.<sup>25</sup> (It should be noted that calcium inhibits iron absorption, so patients taking calcium citrate with vitamin D supplements as recommended should take them at least two hours apart from iron supplements.)<sup>25</sup> In addition to its role in iron absorption, vitamin C is extremely beneficial for wound healing as well, as it helps to reduce collagen deficiency and wound infections.<sup>15,39</sup> Moreover, copper deficiency, an underlying cause of anemia in patients who have had bariatric surgery, may be present, but low levels of this trace element aren't easy to detect.<sup>40</sup> Supplementation with a daily multivitamin containing 2 mg copper is recommended when indicated.<sup>33</sup>

Several studies have found that wound healing and immune system optimization are enhanced by specific nutrients, including protein, the amino acids arginine and glutamine, vitamin A, vitamin B<sub>12</sub>, thiamine, vitamin C, folate, iron, zinc, and selenium.<sup>15,21,29,36,38</sup> Supplementation with these nutrients has been shown to reduce postoperative complication rates in bariatric patient populations.<sup>15,29,36</sup>

Surgeons evaluating this patient population for BCS must be informed of these nutritional deficiencies, which can be minimized by adhering to recommended nutrition guidelines.<sup>36</sup> Surgeons who perform BCS must be aware of the patients' bariatric procedures and ensure appropriate intake for wound healing and successful recovery.<sup>5</sup> While optimal nutrient values to promote wound healing in patients who have had bariatric surgery haven't been established, current data suggest that protein, arginine, glutamine, and associated micronutrients mentioned above have beneficial effects on wound healing and the immune system.<sup>15</sup>

## **RD Impact: Windows of Opportunity**

Dietitians frequently have the most patient contact of any bariatric team member preoperatively, providing numerous opportunities to frankly discuss realistic weight loss goals and expectations with patients. As bariatric surgery increases in popularity, more often patients initiate conversations about excess skin and BCS during preoperative visits. They increasingly want to know if dietary modification or certain exercises will prevent excess skin after massive weight loss. Patients will benefit from counseling about the possibility of BCS in the early stages of the preoperative bariatric surgery process.<sup>5</sup> By establishing rapport with these patients and approaching them with this discussion early, RDs teach patients to trust them to provide evidence-based and current information and offer a supportive, but reality-based, focus. Dietitians should clearly explain to patients that bariatric surgery is not a magic bullet and that maintaining weight loss requires sustained effort. Similarly, RDs should advise patients considering BCS that attention to nutrition and physical activity recommendations is required, as returning to former eating habits and weight regain will minimize the appearance of the recontoured areas.<sup>4</sup>

Dietitians have another opportunity to meet patients previously lost to follow-up at a critical time period. Often, patients hit a weight loss plateau at the nine-month to one-year point after bariatric surgery. At this time, maladaptive eating habits may reemerge, concurrently with feelings of discouragement and disappointment from excess skin.<sup>5</sup> If patients don't have adequate coping skills, the potential for weight regain, substance abuse, emotional eating, or other problematic behaviors increases. Life-threatening comorbidities that existed before bariatric surgery may be replaced with concerns about excess skin.<sup>16</sup> This skin can discourage patients after massive weight loss and derail motivation and weight maintenance; providing appropriate preoperative education, RDs share the responsibility to prepare patients for the possibility of excess skin, help them develop coping skills, and increase chances of keeping that weight off.

A surgeon's definition of a satisfactory outcome may not match a patient's, and patient and surgeon may not perceive BCS outcomes in the same way. When dietitians engage in an open discussion early in preoperative nutrition counseling sessions about potential BCS procedures, they can better inform patients about the limitations of BCS and help them develop, set, and modify realistic expectations and goals for achievable outcomes of their selected procedures.<sup>1,5</sup>

The RD's role is to educate patients about optimizing nutrition before BCS within the guidelines of a bariatric diet,<sup>5</sup> the link between nutrition and wound healing complications, as well as other concerns related to BCS.<sup>41</sup> Dietitians can reinforce the importance of preventing weight regain, especially for those considering BCS in the abdominal area. Educating potential bariatric surgery patients about excess skin after significant weight loss and the possible need for BCS may help them form more realistic expectations for bariatric surgery outcomes and be better prepared for BCS.<sup>4</sup>

## **Multidisciplinary Team Approach**

To adequately prepare and inform bariatric patients who are considering BCS, however, extensive preoperative education by the entire multidisciplinary team of health care providers is required.<sup>6</sup> As members of multidisciplinary teams, dietitians, in collaboration with other health care providers, can make an impact on patients before, during, and after bariatric or BCS procedures.

Follow-up visits should be coordinated and monitored with the cosmetic surgeon and the bariatric team, including the bariatric surgeon, physician assistant, RD, registered nurses, and behavioral health professionals.

Many RDs facilitate or cofacilitate support groups along with other staff members of bariatric center teams to provide patients with comprehensive education along with a familiar face and supportive guidance. In safe, confidential environments, support groups offer patients at all stages of the bariatric surgery process a chance to communicate with others struggling with similar challenges.<sup>42</sup> In the case of BCS, bariatric support group facilitators welcome guest speakers such as reconstructive surgeons to give presentations about body contouring procedures directly to patients.

Just as some patients who seek bariatric surgery are deemed inappropriate candidates, certain patients who desire BCS also may be inappropriate. Some patients have an erroneous belief that, similar to bariatric surgery and massive weight loss, BCS will solve all of life's problems. Patients with this ingrained "quick fix" mentality may benefit from a referral to behavioral health counseling. Depending on the RD's interaction with the other members of the bariatric team, patient referrals to behavioral health providers may be a simple process or require multiple steps. This referral process varies by bariatric center.

Like massive weight loss, BCS may affect patient relationships and coping skills.<sup>16</sup> Patients also may receive increased attention following BCS, and this may disrupt relationships. For some patients, this attention is positive, but for other people in patients' lives, such as romantic partners, it may be a negative experience. Furthermore, the attention is temporary; RDs must help patients prepare for the inevitable fact that at some point the compliments and attention will stop coming.<sup>16</sup> Because many body image problems develop or recur at 12 to 18 months after bariatric surgery, a time when weight is stabilizing, this is a critical period for interventions.<sup>16</sup> It's important to monitor patients during this time period and refer to behavioral health counseling as appropriate (eg, for relationship counseling, depression, body image disturbance, and medication management).<sup>43</sup>

An inability to obtain insurance reimbursement and overall expenses prevent many patients from having BCS.<sup>41</sup> Though most insurance carriers will cover well-documented "medically necessary" procedures in this patient population (such as panniculectomy), other procedures are rarely covered.<sup>6</sup> RDs should remind patients that BCS procedures usually result in a significant out-of-pocket expense.<sup>3,10</sup> Some bariatric centers refer



patients to financial counselors, and some cosmetic surgeons offer installment plans to assist with financing BCS procedures.

### **Future Considerations**

The issue of excess skin after bariatric surgery is underappreciated, and its impact on patient HRQoL and body image is underexamined. Though weight loss after bariatric surgery is linked with initial improvement in patient quality of life, excess skin can lead to increased dysphoria and depression.<sup>9,16,43</sup> Research to date largely has been focused on gastric bypass patients; further studies involving patients who had VSG procedures are warranted. More research is needed concerning the effect of body contouring after bariatric surgery on HRQoL and related areas to increase awareness of this topic, improve patient outcomes, and enable health care providers to develop more compassionate and comprehensive programs that address the needs of bariatric patients.

*- Mireille Blacke, MA, RD, CD-N, is an adjunct professor at the University of Saint Joseph in West Hartford, Connecticut; a bariatric dietitian at Bariatric Center at Saint Francis in Farmington, Connecticut; and a freelance health and nutrition writer.*

### **References**

1. Borud LJ, Warren AG. Body contouring in the postbariatric surgery patient. **J Am Coll Surg**. 2006;203(1):82-93.
2. Kitzinger HB, Abayev S, Pittermann A, et al. The prevalence of body contouring surgery after gastric bypass surgery. **Obes Surg**. 2012;22(1):8-12.
3. Kitzinger HB, Abayev S, Pittermann A, et al. After massive weight loss: patients' expectations of body contouring surgery. **Obes Surg**. 2012;22(4):544-548.
4. Steffen KJ, Sarwer DB, Thompson JK, Mueller A, Baker AW, Mitchell JE. Predictors of satisfaction with excess skin and desire for body contouring after bariatric surgery. **Surg Obes Relat Dis**. 2012;8(1):92-97.
5. Abela C, Stevens T, Reddy M, Soldin M. A multidisciplinary approach to post-bariatric plastic surgery. **Int J Surg**. 2011;9(1):29-35.
6. Chandler SK. Considerations for body contouring after massive weight loss. **Bariatric Nurs Surg Patient Care**. 2006;1(4):283-286.
7. Song AY, Rubin JP, Thomas V, Dudas JR, Marra KG, Fernstrom MH. Body image and quality of life in post massive weight loss body contouring patients. **Obesity (Silver Spring)**. 2006;14(9):1626-1636.

8. de Zwaan M, Georgiadou E, Stroh CE, et al. Body image and quality of life in patients with and without body contouring surgery following bariatric surgery: a comparison of pre- and post-surgery groups. **Front Psychol**. 2014;5:1310.
9. Sarwer DB, Dilks RJ. Psychological issues and eating behavior before and after bariatric surgery. In: Kushner RF, Still CD, eds. **Nutrition and Bariatric Surgery**. Boca Raton, FL: Taylor & Francis Group; 2015:229-240.
10. Sarwer DB, Wadden TA, Moore RH, Eisenberg MH, Raper SE, Williams NN. Changes in quality of life and body image after gastric bypass surgery. **Surg Obes Relat Dis**. 2010;6(6):608-614.
11. Song P, Patel NB, Gunther S, et al. Body image & quality of life: changes with gastric bypass and body contouring. **Ann Plast Surg**. 2016;76 Suppl 3:S216-S221.
12. Modarressi A, Balagué N, Huber O, Chilcott M, Pittet-Cuénod B. Plastic surgery after gastric bypass improves long-term quality of life. **Obes Surg**. 2013;23(1):24-30.
13. American Society of Plastic Surgeons. Massive weight loss patients create mass appeal for body contouring procedures. ScienceDaily website. <https://www.sciencedaily.com/releases/2005/03/050323151250.htm>. Published March 24, 2005.
14. American Society of Plastic Surgeons. 2015 plastic surgery statistics report: ASPA National Clearinghouse of Plastic Surgery procedural statistics. <https://d2wirczt3b6wjm.cloudfront.net/News/Statistics/2015/plastic-surgery-statistics-full-report-2015.pdf>
15. Agha-Mohammadi S. Nutrition and body contouring procedures. In: Kushner RF, Still CD, eds. **Nutrition and Bariatric Surgery**. Boca Raton, FL: Taylor & Francis Group; 2015:241-254.
16. Mitchell J, Olbrisch ME, Pino H, Ritz S, Rowen L, Taylor R. Roundtable discussion: body image. **Bariatr Nurs Surg Patient Care**. 2008;3(4):241-248.
17. Araco A, Gravante G, Araco F, Delogu D, Filingeri V, Cervelli V. Body contouring after weight loss: the plastic-bariatric surgery symbiosis. **Aesthetic Plast Surg**. 2006;30(3):374-376.
18. Shermak MA, Chang D, Magnuson TH, Schweitzer MA. An outcomes analysis of patients undergoing body contouring surgery after massive weight loss. **Plast Reconstr Surg**. 2006;118(4):1026-1031.
19. Fraccalvieri M, Datta G, Bogetti P, et al. Abdominoplasty after weight loss in morbidly obese patients: a 4-year clinical experience. **Obes Surg**. 2007;17(10):1319-1324.

20. Hurwitz DJ, Agha-Mohammadi S, Ota K, Unadkat J. A clinical review of total body lift surgery. ***Aesthet Surg J***. 2008;28(3):294-303.
21. Greco JA 3rd, Castaldo ET, Nanney LB, et al. The effect of weight loss surgery and body mass index on wound complications after abdominal contouring operations. ***Ann Plast Surg***. 2008;61(3):235-242.
22. Neaman KC, Hansen JE. Analysis of complications from abdominoplasty: a review of 206 cases at a university hospital. ***Ann Plast Surg***. 2007;58(3):292-298.
23. Arthurs ZM, Cuadrado D, Sohn V, et al. Post-bariatric panniculectomy: pre-panniculectomy body mass index impacts the complication profile. ***Am J Surg***. 2007;193(5):567-570.
24. Kaidar-Person O, Person B, Szomstein S, Rosenthal RJ. Nutritional deficiencies in morbidly obese patients: a new form of malnutrition? Part B: minerals. ***Obes Surg***. 2008;18(8):1028-1034.
25. Cummings S, Isom KA, eds. ***Academy of Nutrition and Dietetics Pocket Guide to Bariatric Surgery***. 2nd ed. Chicago, IL: Academy of Nutrition and Dietetics; 2015.
26. Heber D, Greenway FL, Kaplan LM, Livingston E, Salvador J, Still C. Endocrine and nutritional management of the post-bariatric surgery patient: an Endocrine Society Clinical Practice Guideline. ***J Clin Endocrinol Metab***. 2010;95(11):4823-4843.
27. Moizé V, Andreu A, Flores L, et al. Long-term dietary intake and nutritional deficiencies following sleeve gastrectomy or Roux-en-Y gastric bypass in a Mediterranean population. ***J Acad Nutr Diet***. 2013;113(3):400-410.
28. Craggs-Dino L. Vertical sleeve gastrectomy — considerations and nutritional implications. ***Today's Dietitian***. 2014;16(5):44-49.
29. Agha-Mohammadi S, Hurwitz DJ. Nutritional deficiency of post-bariatric surgery body contouring patients: what every plastic surgeon should know. ***Plast Reconstr Surg***. 2008;122(2):604-613.
30. Bloomberg RD, Fleishman A, Nalle JE, Herron DM, Kini S. Nutritional deficiencies following bariatric surgery: what have we learned? ***Obes Surg***. 2005;15(2):145-154.
31. Dias MC, Ribeiro AG, Scabim VM, Faintuch J, Zilberstein B, Gama-Rodrigues JJ. Dietary intake of female bariatric patients after anti-obesity gastroplasty. ***Clinics (Sao Paulo)***. 2006;61(2):93-98.

32. Ziegler O, Sirveaux MA, Brunaud L, Reibel N, Quilliot D. Medical follow up after bariatric surgery: nutritional and drug issues. General recommendations for the prevention and treatment of nutritional deficiencies. **Diabetes Metab.** 2009;35(6 Pt 2):544-557.
33. Mechanick JI, Youdim A, Jones DB, et al. Clinical practice guidelines for the perioperative nutritional, metabolic, and nonsurgical support of the bariatric surgery patient — 2013 update: cosponsored by American Association of Clinical Endocrinologists, The Obesity Society, and American Society for Metabolic & Bariatric Surgery. **Surg Obes Relat Dis.** 2013;9(2):159-191.
34. McGinley LD. The essential role of thiamine in the postoperative management of Roux-en-Y gastric bypass patients. **Bariatr Nurs Surg Patient Care.** 2006;1(3):211-214.
35. Xanthakos SA, Inge TH. Nutritional consequences of bariatric surgery. **Curr Opin Clin Nutr Metab Care.** 2006;9(4):489-496.
36. Agha-Mohammadi S, Hurwitz DJ. Potential impacts of nutritional deficiency of postbariatric patients on body contouring surgery. **Plast Reconstr Surg.** 2008;122(6):1901-1914.
37. Malone M. Recommended nutritional supplements for bariatric surgery patients. **Ann Pharmacother.** 2008;42(12):1851-1858.
38. Faria SL, Faria OP, de Almeida Cardeal M, de Gouvea HR. Nutritional management related to plastic surgery among bariatric patients: a meta-analysis. **Bariatr Times.** 2012;9(8):4-19.
39. Marinella MA. Anemia and bariatric surgery. In: Kushner RF, Still CD, eds. **Nutrition and Bariatric Surgery.** Boca Raton, FL: Taylor & Francis Group; 2015:61-76.
40. Crowley N, Petitpain D, Axiotis D. Making sense out of copper: a background guide to copper deficiency after bariatric surgery. **Weight Manag Matters.** 2013;12(1):1-5.
41. Ellison JM, Steffen KJ, Sarwer DB. Body contouring after bariatric surgery. **Eur Eat Disord Rev.** 2015;23(6):479-487.
42. Tempest M. Counseling the outpatient bariatric client. **Today's Dietitian.** 2012;14(1):38-41.
43. Yen YC, Huang CK, Tai CM. Psychiatric aspects of bariatric surgery. **Curr Opin Psychiatry.** 2014;27(5):374-379.

## Quiz

**1. What is the most commonly requested body contouring surgical procedure after bariatric surgery?**

- A. Abdominoplasty
- B. Brachioplasty
- C. Circumferential body lift
- D. Mastopexy

**2. Primary nutritional risks of the postbariatric surgery patient contemplating body contouring surgery (BCS) are due mainly to which of the following?**

- A. Inconsistent use of protein supplement shakes
- B. Increased daily intake of saturated fat and processed foods
- C. Deficiency from restriction, malabsorption, or digestion problems
- D. Sedentary lifestyle or physical inactivity

**3. Postoperative risk of nutrient deficiency is most commonly seen after which of the following procedures?**

- A. Restrictive
- B. Malabsorptive
- C. All bariatric surgery procedures carry postoperative risk of nutrient deficiency.
- D. Current bariatric surgery procedures present no postoperative risk of nutrient deficiency.

**4. The chief contraindication to BCS (eg, abdominoplasty) after massive weight loss is which of the following?**

- A. Smoking
- B. Anxiety disorder
- C. Unrealistic expectations of surgical outcomes
- D. Uncontrolled diabetes

**5. What is ptosis?**

- A. Abdominal wall laxity
- B. Drooping of a body part
- C. Scarring
- D. Deficiency from malabsorption

**6. A deficiency of which of the following micronutrients can be an underlying and often undetected cause of anemia in patients who have had bariatric surgery?**

- A. Copper
- B. Ascorbic acid
- C. Riboflavin
- D. Calcium

**7. Ideal candidates for abdominoplasty after massive weight loss do which of the following?**

- A. Plan to become pregnant within five years after surgery
- B. Approach a BMI in the overweight range
- C. Report 60 minutes of physical activity at least four days per week
- D. Have realistic expectations of BCS outcomes

**8. What two amino acids most significantly affect optimal healing of surgical wounds after BCS?**

- A. Methionine and cysteine
- B. Arginine and glutamine
- C. Lysine and glutamine
- D. Lysine and proline

**9. Two thousand milligrams of vitamin C are recommended daily for wound healing after body contouring procedures to reduce which of the following?**

- A. Collagen deficiency and wound infections
- B. Anemia-related fatigue and weakness
- C. Blood coagulation problems
- D. Risk of macrocytic anemia

**10. Which postoperative time period is the most critical for interventions involving body image?**

- A. 3 to 6 months
- B. 6 to 12 months
- C. 12 to 18 months
- D. 18 to 24 months