

Reducing complications in post-bariatric plastic surgery: our experience and literature review

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Summary. *Background:* With the rise in obesity, there has been a similar increase in bariatric surgery. This resulted in numerous patients losing significant weight with accompanying circumferential body contouring issues. This has led to an amazing increase in the number of body contouring procedures performed. *Methods:* The aim of this work is to revise the cases of body contouring in 78 ex-obese patients who underwent body contouring surgery in the Department of Health Life and Environmental Sciences – Plastic Reconstructive and Aesthetic Plastic Surgery Section, from 2007 to 2016. *Results:* The authors have noticed a deep relationship between adverse events and cigarette smoking and with pre-operative BMI. Regardless of these variables, the authors focused on the protocol for the management of patients, which required a collaboration between medical and nursing staff. *Conclusions:* Ex-obese patients have an important risk for complications, but the comparison of our personal data with those of the international literature confirms the efficacy of our management protocol with regard to the prevention of complications. (www.actabiomedica.it)

Key words: obesity, body contouring surgery, prevention of complications, nursing management, treatment protocol

Introduction

At the other end of the malnutrition scale, obesity is a major health problem emerging today, but yet very underestimated. It is, in fact, a major risk factor for a number of chronic diseases. Bariatric surgery is indicated for morbidly obese patients (BMI \geq 40) who fail to respond to dietary, behavioral, nutritional, and medical therapies (1, 2). Weight-loss operations may cause restriction of food intake, malabsorption, or a combination of the two. Given the scarcity of data that compare the different bariatric operations, it remains impossible to make definitive guidelines for one procedure over another (3-6). With the increasing number of weight loss surgery, there is a higher number of patients who desire a body contouring surgery, since that the weight loss often results in a cutaneous ex-

cess that invalidates patients in their daily life: it causes mechanical limitation of physical activities, hygienic problems, infections, intertrigo or maceration. The goal of post-bariatric body contouring is to ameliorate the discomfort due to the bariatric surgery with removal of the excess tissue (7) and it should become a routine part of the multi-disciplinary approach for these patients. Post-bariatric plastic surgery is recommended for patients with a BMI $<$ 35 Kg/m², a weight loss $>$ 30 Kg and stable weight for 6 months to 1 year, in good nutritional conditions and good health (8-10).

Materials and methods

The aim of the study was to revise the cases of body contouring in the ex-obese patients. We first col-

lected the data of patients who underwent bariatric surgery between 2007 and 2016 in our reference private hospital (Casa di Cura Privata "Di Lorenzo srl" - Avezzano, AQ) (11). Then, we analyzed how many of these patients presented for plastic surgical correction of contour abnormalities. From 2007 to 2016, 307 patients underwent bariatric surgery in the Operative Unit of General Surgery. Among these, 186 (60.6%) patients underwent gastric bypass, 77 (25.1%) patients underwent gastric banding and 44 (14.3%) patients underwent sleeve gastric resection. All these operations were performed laparoscopically by the same surgeon.

Of the 307 patients, 78 (25.4 %) underwent body contouring surgery in the same hospital with a time interval of at least 2 years following the bariatric procedure. In particular, the distribution of bariatric surgical procedures among these 78 patients was as follows: 44 (56.4%) gastric bypasses, 20 (25.6%) gastric bandings, 14 (17.9%) sleeve gastric resections. The following data and variables were collected: patient's age, sex, BMI at the time of body contouring surgery, the type of body contouring procedure, smoking habits, complications and interventions associated with each complication. Surgical procedures that we have considered in our study included: abdominoplasty, vertical thigh lift, brachioplasty, breast lift with implants and complete body contouring. The occurrence of adverse events was obtained and associated with the smoking habit and with the BMI at the time of body contouring surgery. We have considered the medical and nursing management and treatment of patients in the various stages (pre-, intra- and post-operative), according to a protocol that was developed by our research group and that has been validated by the ethics committee of the hospital used as a reference. The protocol we have used is shown in Table 1. We have categorized our outcomes into 4 grades (Excellent, Good, Moderate and Poor), according to the following criteria:

- Clinical outcome
- Visual Analog Scale for Pain (VAS Pain) (12)
- Patient satisfaction
- Presence and type of complications.

A - Clinical outcomes, evaluated six months after surgery: we have taken into account symmetry of the scar, positioning of the scar, harmony of the body pro-

file, and we expressed a rating on a scale from 1 (poor) to 10 (excellent).

B - Visual Analog Scale for Pain (VAS Pain), administered at the time of hospital discharge: from "no pain" (score of 0) to "worst imaginable pain" (score of 10).

C - Patient satisfaction: the Moorehead-Ardelt Quality of Life Questionnaire II (13). Six key areas were examined: 1) general self-esteem, 2) physical activity, 3) social contacts, 4) satisfaction concerning work, 5) pleasure related to sexuality, and 6) focus on eating behavior. Each of these questions offered 10 possible answers, from 1 (poor) to 10 (excellent). The Questionnaire was administered on the day of surgery and six months after surgery. We compared the average value of the first questionnaire with the average value of the second, to evaluate the increase in the average score (from 0 to 10).

D - Complications, assessed at 6 months: their presence or absence, if it was simply an outpatient treatment or if it required a surgical treatment.

We have established for each of the criteria the thresholds and the overall evaluation was based on the following rule:

"Excellent" if:

A >= 8

B <=4

C >=1,5

D: no complications

"Good" if:

A >=6

B <=5

C >=1

D: if there was a complication, it did not require a surgical treatment

"Moderate" if:

A >=5

B <=8

C >= 0.5

D: no complications or presence of any type of complication

"Poor" if:

all the thresholds of "moderate" were not reached.

Table 1. Medical and nursing management and treatment protocol

<p>1. Pre-operative stage:</p> <ul style="list-style-type: none"> - Medical history with attention to comorbidities and drugs (steroids, contraceptives, antihypertensives, anticoagulants, hypoglycemic agents, antibiotics, sedatives, stimulants) - Check of the BMI and of any changes in the last 6-12 months - Blood chemistry and instrumental screening - Evaluation of diet and / or nutritional deficiency - Visit by the anesthetist - Psychiatric / psychological counseling - Suspension of drugs containing acetylsalicylic acid 30 days prior to surgery - Abstention from smoking at least 30 days before and 30 days after surgery - Topic therapy in skin folds (infections, intertrigo or maceration) - Discussion and signing of informed consent
<p>2. In the 24 hours before surgery:</p> <ul style="list-style-type: none"> - Complete bathroom / shower with antiseptic soap (possibly early in the morning and in any case within 24 hours) - Fasting from midnight
<p>3. On the day:</p> <ul style="list-style-type: none"> - Trichotomy 2 hours before entering the operating room - Preoperative planning - Antithrombotic therapy (low molecular weight heparin, first administration 5.000U / 30' before inducing anesthesia)
<p>4. Intraoperative surgical strategies:</p> <ul style="list-style-type: none"> - Ligation of the perforating arteries - "Quilting sutures" - Intraoperative microcirculation check with spectrophotometer laser - Compression dressing
<p>5. Post-operative management:</p> <ul style="list-style-type: none"> - Heating of the patient - Garments and compression dressing - Antithrombotic, antibiotic and pain therapy - Early mobilization of the patient - Ordinary discharge (if the weight loss is <50 Kg) - Assisted discharge (if the weight loss is >50 Kg) - Nutritional protocol - In the first 10-15 days night's sleep with suggested posture (angle of 30 degrees) and abstention from driving - Abstention from sport for at least a month - Cleaning shower only after the stitches' removal - Compression dressing for 4-6 weeks - It is recommended to avoid direct exposure to sunlight or heat sources for at least 4-6 weeks

Results

We reviewed a total of 78 patient charts (Table 2). There were 8 men (10%) and 70 women (90%), and the mean age was 39. 14 patients (17.95%) were smokers. 48 patients (61,54%) had a BMI >25 kg/m² and 30 patients (38,46%) had a BMI <25 kg/m².

With reference to the bariatric procedures used, the BMI delta was analysed between the preoperative period and 2-year follow-up, when the post-bar-

iatric procedure was performed. The average decrease in BMI in case of gastric bypass was 40%; in case of gastric banding was 29% and in case of sleeve gastric resection was 57%. The average BMI at the time of post-bariatric surgery was 31.4 kg/m² in case of gastric bypass; 32.9 kg/m² in case of gastric bending; 28.9 kg/m² in case of sleeve gastric resection. So, we noticed that the average BMI at the time of post-bariatric surgery was similar, regardless of the bariatric procedure used. All these patients were asked to keep their

Table 2. Patient characteristics

Patient characteristics	N	%	Mean
Patients	78		
Males	8	10%	
Females	70	90%	
Age			39
Interval between bariatric and body contouring surgery (months)			20

weight stable for at least 6 months before body contouring surgery.

Of the 78 patients, 14 underwent more than one surgical post-bariatric procedure. We adopted the multi-staged approach that we consider more rational and prudent: the procedures were performed in more than one surgical session and the time required between two surgical sessions was 3–6 months. Surgical procedures included: abdominoplasty, medial thigh lift, brachioplasty and mastopexy. A total of 94 body contouring procedures were performed in 78 patients: 64 patients (82%) underwent 1 operation, 13 (16%) underwent 2 operations, and 1 (1.3%) patient underwent a complete body contouring (4 operations). The distribution of procedures performed can be found in Table 3. According to the criteria described above, the results were independently scored by two blinded observers. The outcomes obtained in our patients are shown in Table 4. On a total of 94 procedures performed, complications occurred in 12 cases (12,76%). There was no post-operative mortality. The surgical procedure most frequently associated with complications was abdomi-

Table 4. Classification of outcomes

OUTCOME	N	%
Excellent	31	32,98
Good	52	55,32
Moderate	9	9,57
Poor	2	2,13
Total	94	

noplasty. Wound dehiscence and seroma have been the most common complications, which occurred in 7 and 5 patients, respectively. Among smoking patients (14 patients), complications occurred in 5 cases (3 cases of dehiscence and 2 cases of seroma), with an incidence rate of 35,71%, while in the population of non-smoking patients (64 patients), complications occurred in 7 cases (2 cases of dehiscence and 5 cases of seroma), with an incidence rate of 10,94%. In 9 cases complications occurred in patients with a pre-operative BMI >25 kg/m², but we have not observed a possible relationship of the complications with the bariatric technique performed.

Table 3 - Distribution of procedures performed

BODY CONTOURING PROCEDURE	TOTAL AMOUNT	MALES	FEMALES	%
Abdominoplasty	64	4	60	82,05
Abdominoplasty + Medial thigh lift	7		7	8,97
Abdominoplasty + Brachioplasty	2		2	2,56
Abdominoplasty + Mastopexy	2	2		2,56
Abdominoplasty + Belt lipectomy	2	2		2,56
Complete body contouring	1		1	1,28
Total	78	8	70	

Discussion

Our study showed that 25.4% of all patients had undergone body-contouring surgery after massive weight loss due to bariatric surgery. At the time of plastic surgery, the average BMI of these patients was comparable, regardless of the bariatric procedure performed, and the required weight stability time was in all cases 6 months - 1 year, so we could hypothesize that the bariatric procedure did not influence the outcome of post-bariatric body contouring surgery.

The abdominoplasty is the most required procedure, as documented in our study in which all the 78 patients submitted it. In our experience, the overall complication rate was 12.76%, with wound dehiscence (7 cases, 7.45%) and seroma (5 cases, 5.32%) being the most common complications. Among cases of seroma, it has also been reported a case of persistent lymphorrhea, in a patient with altered blood protein level and hypoalbuminemia, that has been treated with drainage followed by the use of compression garments and then with surgical revision. The operation most frequently associated with complications was abdominoplasty, and the central region of the surgical wound is particularly exposed to the risk of dehiscence. The information from the review of the international literature, regarding the post-bariatric plastic surgery, reported an overall complication rate of 44.93% (14-20), while our complication rate (12.76%) is much lower. We have noticed a deep relationship between development of complications and cigarette smoking (Table 5). In fact, smoking has detrimental effects on wound healing processes and increases the risk of wound dehiscence (21). We have observed that the incidence rate of complications among smoking patients is more than 3 times higher than among non-smokers patients (35.71% vs 10.94%).

Although, as previously stated, a possible relationship of the final outcomes with the different bariatric techniques performed has not been detected, we have noticed instead a connection between development of complications and pre-operative BMI. Arthurs et al. (22) found that patients with a BMI greater than 25 kg/m² are at nearly three times the risk of postoperative wound complications. According to this study, we selected 25 kg/m² as a reference BMI value. We noted that 9 cases of complications (18.75%) occurred among 48 patients with a BMI >25, whereas among patients with BMI <25 complications occurred in 3 cases (10%). We have observed that the incidence rate of complications among patients with a BMI greater than 25 kg/m² is about 2 times higher than among patients with a smaller BMI (18,75% vs 10%). Another interesting finding is the influence of a stable weight prior to surgery. From the literature, it appears that patients having a stable weight plateau for 3 months or longer before body contouring surgery experience less complications in comparison to patients with a pre-operative variable weight (22, 23). One hypothesis is that the nutrition status is better in patients with a stable weight (24-26). These relationships with smoking, pre-operative BMI and stable weight point out that the first criterion for the prevention of complications is correlated with the selection of patients, in agreement with the literature (21-27). To select patients, we also believe appropriate to collect medical history with particular attention to the presence of comorbidity and to the use of drugs. We recommend the suspension of drugs containing acetylsalicylic acid 30 days prior to surgery and abstaining from smoking at least 30 days before and 30 days after surgery. Regardless of these variables, we would like to focus on the protocol that we have proposed for the management and treatment of patients, which requires a close collaboration between medical and nursing staff. In the pre-operative stage, it has a great importance and significance the patient's preparation as the complete bathroom / shower with antiseptic soap (possibly early in the morning and in any case within 24 hours) and trichotomy 2 hours before entering the operating room, because if the shaving is performed more than two hours before there is an increased risk of infections (28). Regarding the intraoperative surgical strategies,

Table 5. Distribution of complications in the populations

TYPE OF COMPLICATIONS	Smoking patients (14)	Non-smoking patients (64)
Seroma	2	5
Skin dehiscence	3	2
Total	5 (35,71%)	7 (10,94%)

we agree with the study of Rangaswamy M. (29) who suggest the routine use of “quilting sutures” to reduce the risk of seroma. In fact, this kind of multiple sutures which approximate the flap to the fascia eliminates dead space, leads to early adhesion, prevents shearing forces between the two layers and reduces the tension on wound closure. Even the ligation of the perforating arteries with clips or suture thread, instead of traditional diathermocoagulation, helps to reduce the formation of hematomas and seromas. Furthermore, we consider it necessary to place suction drains and we propose their removal after 48 hours for patients with a weight loss <50 Kg and after 5-6 days if the weight loss is greater. We recommend the use of garment or compression dressing for at least 4-6 weeks (30). In the post-operative stage, nursing staff must be properly educated about antibiotic, antithrombotic and pain therapy and about early mobilization of the patient. Finally, we cannot underestimate the nutritional aspect (30, 31). Wound healing is a nutrient-dependent process: protein plays a critical role in this process and protein deficiencies are known to lead to increased inflammation and may contribute to slow wound healing (32). But in the post-bariatric patient population there are often metabolic and nutritional deficiencies, so the use of protein supplementation is helpful to combat this problem. The literature confirms (31) that the greatest improvement in postoperative outcomes was observed in patients who received specialized nutritional support preoperatively.

Conclusion

With the increasing number of weight loss surgery, there is a higher number of patients who desire a body contouring surgery. Post-bariatric body contouring is an important component to the total care of the obese patient and it is significant to optimize results achieved from bariatric surgery. However, these patients have an important risk for complications, because of poor skin quality, comorbidities and metabolic and nutritional deficiencies. The comparison of our personal data with those of the international literature is positive and confirms the efficacy of our management protocol with regard to the prevention of com-

plications. It is still important to point out that the main strategy in the prevention of complications is the preliminary selection of patients, based on their medical history.

Conflict of interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article

References

1. <http://www.sicob.org>
2. <https://asmbs.org/patients/who-is-a-candidate-for-bariatric-surgery>
3. Giuliani A, Romano L, Papale E, et al. Complications of post laparoscopic sleeve gastric resection: review of surgical technique. *Minerva Chir* 2019 Jun; 74(3): 213-217. doi: 10.23736/S0026-4733.19.07883-0.
4. Giuliani A, Romano L, Marchese M, et al. Gastric leak after laparoscopic sleeve gastrectomy: management with endoscopic double pigtail drainage. A systematic review. *Surg Obes Relat Dis* 2019 Mar 20. pii: S1550-7289(19)30087-5. doi: 10.1016/j.soard.2019.03.019.
5. Carubbi F, Ruscitti P, Pantano I, et al. Jejunioileal bypass as the main procedure in the onset of immune-related conditions: the model of BADAS. *Expert Rev Clin Immunol* 2013 May; 9(5): 441-52. doi: 10.1586/eci.13.26.
6. Marchese M, Romano L, Giuliani A, et al. Corrigendum to “A case of intrasplenic displacement of an endoscopic double-pigtailstent as a treatment for laparoscopic sleeve gastrectomy leak” [*Int. J. Surg. Case Rep.* 53 (2018) 367-369]. *Int J Surg Case Rep* 2019; 56: 49. doi: 10.1016/j.ijscr.2019.02.027.
7. Colwell A.S. Current Concepts in Post-bariatric Body Contouring. *Obes Surg* 2010; 20: 1178-1182.
8. www.lobesita.com/chirurgia-plastica-ricostruttiva-post-bariatrica.html
9. <http://www.postbariatricsurgery.it/>
10. Modarressi A, Meia Rüegg E, Bezzola T, Pittet-Cuénod B. Circular abdominoplasty after massive weight loss: is it a risky procedure? *J Plast Reconstr Aesthet Surg* 2016
11. http://www.sicob.org/registro_obesi/default.aspx
12. McCormack HM, Horne DJ, Sheather S. Clinical applications of visual analogue scales: a critical review. *Psychol Med* 1988; 18: 1007-19.
13. Moorehead MK, Ardelt-Gattinger E, Lechner H, Oria HE. The Validation of the Moorehead-Ardelt Quality of Life Questionnaire II. *Obesity Surgery* 2003; 13: 684-692.
14. Breiting LB, Lock-Andersen J, Matzen SH. Increased morbidity in patients undergoing abdominoplasty after laparoscopic gastric bypass. *Dan Med Bul* 2011; 58(4): A4251.
15. Fearmonti RM, Blanton M, Bond JE, et al. Changes in dermal histomorphology following surgical weight loss versus

- diet-induced weight loss in the morbidly obese patient. *Ann Plast Surg* 2012; 68: 507e12.
16. Greco III JA, 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: 235e42.
 17. Gusenoff JA, Coon D, Rubin JP. Implications of weight loss method in body contouring outcomes. *Plast Reconstr Surg* 2009; 123(1): 373-6.
 18. Staalesen T, Olsen MF, Elander A. Complications of abdominoplasty after weight loss as a result of bariatric surgery or dieting/postpregnancy. *J Plast Surg Hand Surg* 2012; 46: 416e20.
 19. Vastine VL, Morgan RF, Williams GS, et al. Wound complications of abdominoplasty in obese patients. *Ann Plast Surg* 1999; 42(1): 34-9.
 20. Vico PG, De Voogth A, Nokerman B. Circumferential body contouring in bariatric and non-bariatric patient. *J Plast Reconstr Aesthet Surg* 2010; 63: 814e9.
 21. Gravante G, Araco A, Sorge R, et al. Wound Infections in post-bariatric patients undergoing body contouring abdominoplasty: the role of smoking. *Obes Surg* 2007; 17(10): 1325-31.
 22. 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): 567-70.
 23. van der Beek ES, van der Molen AM, van Ramshorst B. Complications after body contouring surgery in post-bariatric patients: the importance of a stable weight close to normal. *Obes Facts* 2011; 4(1): 61-6.
 24. Reem Dina Jarjis, Bjørn Thomas Crewe, Steen Henrik Matzen. Post-bariatric abdominoplasty resulting in wound infection and dehiscence-Conservative treatment with medical grade honey: A case report and review of literature. *Int J Surg Case Rep* 2016; 20: 1-3.
 25. Hasanbegovic E, Sørensen JA. Complications following body contouring surgery after massive weight loss: a meta-analysis. *J Plast Reconstr Aesthet Surg* 2014; 67(3): 295-301.
 26. Persichetti P, Giglioflorito P, Brunetti B, et al. Complications in postbariatric body contouring based on different weight loss methods. *Plast Reconstr Surg* 2011; 128(6): 782e-3e.
 27. Jo M Ellison, Kristine J Steffen, David B Sarwer. Body contouring after bariatric surgery. *Eur Eat Disord Rev* 2015; 23(6): 479-87.
 28. Mangram AJ, Horan TC, Pearson ML, et al. Guideline for Prevention of Surgical Site Infection, 1999. Centers for Disease Control and Prevention (CDC) Hospital Infection Control Practices Advisory Committee. *Am J Infect control* 1999; 27(2): 97-132.
 29. Mohan Rangaswamy. Minimising complications in abdominoplasty: an approach based on the root cause analysis and focused preventive steps. *Indian J Plast Surg* 2013; 46(2): 365-376.
 30. Joseph Michaels V, Devin Coon, J. Peter Rubin. Complications in postbariatric body contouring: postoperative management and treatment. *Plast Reconstr Surg* 2011; 127: 1693.
 31. Siamak Agha-Mohammadi, Dennis J. Hurwitz. Enhanced Recovery after body-contouring surgery: reducing surgical complication rates by optimizing nutrition. *Aesth Plast Surg* 2010; 34: 617-625.
 32. Delle Monache S, Calgani A, Sanità P, et al. Adipose-derived stem cells sustain prolonged angiogenesis through leptin secretion. *Growth Factors* 2016 Aug; 34(3-4): 87-96. doi: 10.1080/08977194.2016.1191481.
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