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Original article

Quality of life and predictive factors for complications in patients undergoing abdominoplasty after gastric bypass: A retrospective cohort

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Abstract

Background: Obesity is a major health risk factor associated with medical complications, such as cardiovascular disease, that may compromise outcomes. Furthermore, obesity may lead to difficulties in daily life, altering the quality of life and generating psychological disorders such as devalued self-image and depression.

Objectives: This study evaluated the quality of life and predictive factors of postoperative complications in patients who underwent abdominoplasty after Roux-en-Y gastric bypass.

Setting: Bariatric and postbariatric center, North Wing Regional Hospital, Brasília, Brazil.

Methods: Data were analyzed from a prospective registry of postbariatric patients who underwent abdominoplasty from January 2011 to December 2016. Variables examined included age, sex, body mass index (BMI), complications, and comorbidities. Multivariate analyses were performed to assess outcome measures. The quality-of-life assessment was measured with the Moorehead-Ardelt quality-of-life questionnaire.

Results: One hundred and seven postbariatric patients were included. The mean age of the patients was 41 years. BMI at the time of abdominoplasty (current BMI) was 27.6 ± 3.7 kg/m^2, and the average weight loss before abdominoplasty was 47.7 ± 17.3 kg. Pre-weight loss BMI (max BMI) was 45.5 ± 7.6 kg/m^2, and ΔBMI was 18.6 ± 9.3 kg/m^2. The overall rate of complications was 23.4%. Among the studied factors in the multivariate analysis, amount of removed tissue in the abdomen >2000 g, ΔBMI >20 kg/m^2, and age >40 years significantly increased the rates of postoperative complications. In our study, abdominoplasty improved the quality of life of patients (mean quality-of-life scores, 2.1 ± 0.9).

Conclusion: The amount of removed tissue in the abdomen, ΔBMI >20 kg/m^2, and age >40 years led to significantly more complications in patients undergoing abdominoplasty after gastroplasty. In addition, this study demonstrated that abdominoplasty should be proposed to patients with massive weight loss to improve quality of life. (Surg Obes Relat Dis 2019;15:447–455.)

Keywords: Bariatric surgery; Plastic surgery; Abdominoplasty; Wound dehiscence; Body-contouring surgery; Postoperative complications

Obesity is a major health risk factor associated with medical complications, such as cardiovascular disease, hyperlipidemia, diabetes, high blood pressure, cancer, degenerative arthritis, and sleep apnea. Furthermore, obesity may lead to difficulties in daily life (e.g., clothing, walking, sex-

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ual activity, hygiene problems), altering the quality of life and generating psychological disorders, such as devalued self-image and depression [1,2].

With the increasing incidence of obesity, an increasing number of patients undergo bariatric surgery. However, one of the consequences of this surgery is a rapid and massive weight loss associated with functional and aesthetic sequelae, such as skin excess and poor skin tone. The goal of plastic surgical management after massive weight loss is to optimize the functional outcomes obtained from bariatric surgery or diet [3,4].

Abdominoplasty performed in patients who have previously undergone gastroplasty is increasingly common, resulting in improved body contours and self-esteem. Complications of abdominoplasty in patients after gastroplasty are much more common than complications with the same procedure performed in patients with no history of obesity [3,4].

To date, it seems necessary and essential to report the results of surgical techniques in terms of predictive factors for complications and also to present a functional assessment, including the benefits that abdominoplasty brings to the quality of life of patients after massive weight loss [5]. In this context, the evaluation of quality of life is a great way of measuring the contribution of a surgical technique. In the field of body-contouring surgery, the abdomen is the location with which postbariatric patients are the most dissatisfied [3,4]. It also seems necessary to improve knowledge about predictive factors for complications in patients undergoing abdominoplasty to achieve better patient management after massive weight loss. The aim of this study was to evaluate the predictive factors of postoperative complications and quality of life of patients who underwent abdominoplasty after massive weight loss.

Methods

This investigation was approved by and conducted in accordance with the statements of the research ethics committee of the Health Stated Secretary, Federal District, by the number CAAE: 57798716.4.0000.5553, and it complied with the 1975 Declaration of Helsinki as amended in 1983. There were 124 patients who looked for abdominal surgery in the Plastic Surgery Department of North Wing Regional Hospital, Brasília, DF. Seventeen patients were excluded of the study based on the exclusion criteria (3 patients for smoking habits, 2 patients for gestational intention, 4 patients for incomplete data, and 8 patients for instability of the weight). Our study included 107 patients who underwent abdominoplasty after Roux-en-Y gastric bypass (RYGB) between January 2011 and December 2016, following the inclusion criteria.

All patients had either open or laparoscopic gastric bypass surgery at least 18 months previously and were in good health. These individuals were enrolled in our institutional investigation at the North Wing Regional Hospital, Brasília, Federal District, over a 6-year period. The North Wing Regional Hospital is academic practice setting and a public hospital. Patients who had undergone an abdominoplasty procedure with or without others plastic procedures were selected for analysis in retrospective cohort fashion. The North Wing Regional Hospital has a database, which is actualized by the authors since it had been created in 2011. All patients had their weight stabilized over a period of at least 6 months. Patients who succeeded in massive weight loss, defined as a 50% reduction in excess weight by 18 months after bariatric surgery, were included in this study. The sample size calculation was done based in a prevalence of major complications of 5% for the sample studied. The studied sample was appropriate.

Exclusion criteria were a history of hemorrhagic disease, use of anticoagulants, use of alcohol, use of illegal drugs, and patients who were smokers. Active use of medications expected to adversely affect surgical outcomes (e.g., corticosteroids) was generally a contraindication to surgery.

Demographic, anthropometric, and clinical information, including age, sex, weight, height, prebariatric surgery body mass index (max BMI), preabdominoplasty BMI (current BMI), weight loss before abdominoplasty, change in body mass index (ΔBMI), and co-morbidities, were included for analysis. Operative details, such as length of procedure, concomitant body-contouring procedures, weight of the removed surgical specimen, and postoperative complications, were also analyzed.

The diagnoses of systemic arterial hypertension, dyslipidemia, type 2 diabetes, and metabolic syndrome were based on parameters established in the respective guidelines of The Brazilian Society of Cardiology and currently described in the First Brazilian Guideline for the Diagnosis and Treatment of Metabolic Syndrome [6,7].

For deep venous thrombosis prophylaxis, conservative measures were done, and low-molecular weight heparin was not employed for any patient. Routinely, all cases had sequential compression devices placed before the induction of anesthesia. A single preoperative weight-adapted dose of antibiotic (Kefazol, cefazolin sodium, União Química Farmacêutica Nacional, S.A) for the prevention of surgical site infections was given.

Surgical technique

Surgery was performed under general anesthesia, and the patient was placed in the supine position. We performed infiltration by lidocaine-adrenaline to reduce bleeding during surgery. The abdominoplasty included a panniculectomy combined with wide undermining of the upper abdominal flap, diastasis recti correction, and umbilical transposition. The fleur-de-lys or “in anchor” variant included a vertical midline resection. If the patient had had an open gastric bypass in the past, this scar was used for the

procedure. In all cases of diastasis rectus, the fascia was plicated.

The technique chosen was determined by the type of abdominal deformity presented by each patient, taking into account the patient's opinion and the yearnings. In the case of a great transverse excess of skin flaccidity, we performed anchor abdominoplasty. When the abdominal contour deformity had as its main component the excess of vertical flaccidity, we performed a conventional abdominoplasty with a suprapubic transversal scar. Liposuction was not performed in our cases, although lipoabdominoplasty is an already widely used and well-described technique. We believe that the evidence is still lacking as to whether additional liposuction is good for the outcome of postbariatric patients.

The wound edges were subsequently reapproximated and closed in layers over a closed-suction drain.

Hernias were repaired in all cases by the plastic surgeon. Hernias were dissected with lysis of adhesions performed, ensuring complete dissection of incompetent fascia and protection of intraabdominal contents. Interrupted figure 8, No. 1 braided, permanent suture was used to approximate the hernia defect. Plication of the midline abdominal wall from xiphoid to pubis was performed, approximating adjacent fascia over the hernia repair, reinforcing the repair [8]. No mesh was used in any case.

Drains were placed under the abdominal skin flap for continuous suction (Portovac, Incomepe Industria de Materiais Cirúrgicos, LTDA) in all patients. The drainage in the postoperative period was measured by drain output every 24 hours, until the output was <50 mL in a 24-hour period and the drain could be removed. Closed suction drains were used for approximately 1 week in most abdominoplasty procedures.

At the end of each surgery, the weight of the removed surgical specimen was determined in grams. Finally, an elastic abdominal belt was applied immediately after wound closure and dressing and was worn for 3 months postoperatively.

Complications

According to the Clavien-Dindo classification, postoperative complications were categorized as major whenever they presented a grade ≥3 and as minor whenever the grade was <3 [9]. A comparative outcome analysis between abdominoplasties with and without complications was subsequently performed. Complications were assessed and categorized by the attending surgeon at the time of postoperative follow-up [10]. Major complications were those requiring a new surgical procedure for hematoma drainage, seroma drainage, suturing of dehiscence areas, or rehospitalization for systemic antibiotic therapy. All patients had postoperative follow-up of at least 12 months. The senior surgeons (S.C.R. and J.L.S.M.) performed all the procedures and analyzed all the complications and classified by the Clavien-Dindo Classification.

Quality-of-life assessment

The quality-of-life assessment was measured with the Moorehead-Ardelt quality-of-life questionnaire II. This questionnaire was initially developed and incorporated into the Bariatric Analysis and Reporting Outcome System questionnaire for the evaluation of changes after bariatric surgery. This questionnaire was validated and translated in Portuguese [11]. The questionnaire was applied in prospective fashion, 18 months after the operation. The questionnaire evaluated the improvement of quality of life on the following 6 domains: self-esteem, physical activity, social contact, work ability, sexual interest, and relationship with food. For each question, the central column represents no changes after surgical intervention and was scored by no points. The improvements by surgery gave partial positive points, whereas the negative effects induced by surgery gave negative points and diminished the total score. The questionnaire has a rating scale ranging from −3 (greatly diminished result) to 3 (greatly improved result). The result was analyzed as greatly diminished (−3 to −2.25), diminished (−2 to −.5), with no change (−.5 to .5), improved (.75–2), or greatly improved (2.25–3). This questionnaire has a minimum value, called the minimal clinically important difference, which is .75, from which it can be stated that there was in fact a chance in quality of life [12].

Statistical analysis

All statistical analysis was performed using SPSS software version 21.0 (Statistical Package for Social Studies; IBM Corp., Armonk, NY, USA). A descriptive analysis of all data was first carried out. Differences between groups were considered significant for values of $P < .05$. Univariate logistic regression was used to examine the impact of individual factors on the development of any complication, with multivariate regression then used to control for possible confounders. Two-sample t tests (continuous variables) and X^2 tests (categoric variables) were used to determine the difference between groups. Pearson correlation was used between BMIs. All statistical tests were 2-sided and significance was set to the level of $P < .05$.

Results

Our series included 107 consecutive patients with massive weight loss after RYGB who underwent abdominoplasty alone or in combination with other body-contouring procedures. In relation to RYGB, 55.8% (60 patients) by videolaparoscopy and 44.2% (47 patients) by laparotomy. Ninety-eight patients (91.6%) were women and 9 (8.4%) were men, with an average age of 40.9 ± 9.8 years. The

Table 1
Patient demographic characteristics and clinical characteristics (N = 107).

Variable	Mean ± SD
Age, yr	40.9 ± 9.8
BMI before massive weight loss	45.5 ± 7.6
BMI before abdominoplasty	27.6 ± 3.7
Weight before massive weight loss, kg	120.8 ± 24.2
Weight before abdominoplasty, kg	73.1 ± 12.5
Weight loss, kg	47.7± 17.3
ΔBMI	18.6 ± 9.3
Percentage of excess weight loss, %	78.8 ± 12.6

SD = standard deviation; BMI = body mass index (kg/m^2); ΔBMI = change in BMI calculated by subtracting current BMI from max BMI.

mean weight before massive weight loss was 120.8 ± 24.2 kg, and the mean weight before abdominoplasty was 73.1 ± 12.5 kg. The mean preabdominoplasty BMI was 27.6 ± 3.7 kg/m^2, with an average weight loss before abdominoplasty of 47.7 ± 17.3 kg and a ΔBMI of 18.6 ± 9.3 kg/m^2 (Table 1).

Among our patients, 100% underwent RYGB. The mean length of follow-up was 50.3 ± 15.1 months, ranging from 11 to 85 months.

Eighty patients (74.8%) underwent classical abdominoplasty and 27 patients (25.2%) were submitted to the "in anchor" technique. Single-procedure cases accounted for 91 (85.2%), while the remaining 16 (14.8%) patients had associated operations in the same surgical procedure. Other body-contouring procedures performed in conjunction with abdominoplasty included mastoplasty (9 cases), brachioplasty (4 cases), and thighplasty (3 cases). Approximately 11 (10.3%) involved repair of a hernia, 7 cases of incisional (6.5%) and 4 cases of umbilical (3.8%) hernia. We performed the herniorrhaphy along with the abdominoplasty. No case required the use of mesh. No recurrence was seen in our study population. Hernia repair had an influence on the development of postoperative complications (Table 3).

The mean surgical time was 3 hours and 10 minutes and ranged from 160 to 270 minutes. We used vacuum drains in all abdominoplasty cases.

We used general anesthesia in 88 patients (82.2%) and epidural in 19 (17.8%). The mean hospitalization time was 2 days in 98 (91.6%) cases. Only 9 (8.4%) patients remained hospitalized for a longer period.

The mean weight of the flap of the abdomen removed in the abdominoplasty was 2.034 ± 1.350 g (range, 350–7.880 g). Abdominal flaps weighing 1.000 to 1.999 g were the most frequent, followed by those from 2.000 to 3.000 g, both of which accounted for 69.1% of the sample. The flaps weighing <1.000 g were 18.7% of the sample, and flaps weighing >3.000 g constituted 12.2% of the sample.

Regarding the complications of the abdominoplasty, the overall complication rate was 23.4%. The major complication rate was 8.5% (9 patients), consisting of 2 cases of dehiscence with need for operative revision, 2 cases of seroma requiring reoperation, 3 cases of internal hernia with intestinal obstruction, and 2 cases of wound infection requiring treatment with intravenous antibiotic therapy. The rate of minor complications was 14.9% (16 patients), comprising 6 cases of dehiscence without need for operative revision, 5 cases of seroma requiring repeated punctures, 2 cases of hematoma with drainage or spontaneous resolution, and 3 cases of wound infection requiring treatment with oral antibiotic therapy alone (Table 2).

Table 2
Complications after abdominoplasty after gastroplasty (N = 107).

Variable	n patient	%
Seroma		
With operative revision	2	–
With aspiration	5	–
Total	7	6.5
Dehiscence		
With operative revision	2	–
Without intervention	6	–
Total	8	7.5
Infection		
Deep infection	2	–
Minor infection	3	–
Total	5	4.7
Hematoma		
With operative revision	–	–
Without intervention	2	–
total	2	1.9
Internal hérnia		
With intervention	3	2.8
Overall	25	23.4

Most wound dehiscence were superficial skin edge separations managed in the office with dressing changes, except for 4 cases. There were no cases of necrosis, deep venous thrombosis, pulmonary embolism, or deaths in the present study.

As the first step in the statistical analysis, we verified the influence of all risk factors for complications in abdominoplasty. Posteriorly, multivariate analysis was performed controlling for covariates found to be relevant on univariate regression.

Initially, on univariate regression, age >40 years, pregastroplasty weight >135 kg, weight loss >60 kg, ΔIMC >20 kg/m^2, amount of removed tissue in abdomen (g), incisional hernia repair, and co-morbidities had influence on the development of postoperative complications (Tables 3 and 4).

Multiple logistic regressions were performed to identify predictive factors for complications. The parameters that significantly predicted complications were amount of removed tissue >2000 g, ΔBMI >20 kg/m^2, age >40 years, and dyslipidemia. All other variables failed to predict an increased risk of complications (Table 5).

Table 3
Univariate analysis of predictive factors of the development of postoperative complication after abdominoplasty after gastric bypass, demographic, and anthropometric aspects.

Variable	Frequency (N = 107)	Prevalence of complication after plastic surgery, %	*P* value	OR	95%CI
Sex					–
Female	98	32.65	–	–	[.51;
Male	9	33.33	.604	1.27	3.14]
Age					–
≤40 yr	50	20.00	–	–	[1.30;
>40 yr	57	43.86	.007*	2.58	5.14]
Weight before massive weight loss, kg					
≤135	81	27.16	–	–	–
>135	26	50.00	.019*	1.89	[1.11; 3.22]
Premassive weight loss BMI, kg/m²					
≤50	81	28.40	–	–	–
>50	26	46.15	.128	1.54	[.88; 2.70]
Weight loss, kg					–
≤60	85	27.00	–	–	[1.14;
>60	22	54.54	.015*	1.94	3.30]
ΔBMI, kg/m²					–
≤20	72	26.39	–	–	[1.05;
>20	35	45.71	.032*	1.82	3.14]
Preabdominoplasty BMI, kg/m²					
≤30	85	32.94	–	–	[.47;
>30	22	31.81	.829	.93	1.81]

OR = odds ratio; CI = confidence interval; BMI = body mass index, kg/m^2); Δ BMI = change in BMI was calculated by subtracting current BMI from max BMI.
*$P < .05$.

In the group of patients with complications, a mean of 2.726 ± 1.601 g of tissue had been resected, whereas a mean of 1.603 ± 846 g was resected in those without complications ($P < .001$).

Abdominoplasty improved the quality of life of patients (mean quality-of-life scores, 2.10). Furthermore, all the quality-of-life domains were improved by surgery. We observed that >90% of the patients reported an improvement in the quality of life (Table 6).

Discussion

The number of body-contouring procedures performed globally continues to rise as patients seek correction of the residual deformities associated with massive weight loss. Body-contouring procedures help to promote social and psychological reintegration for these patients. In addition, restorative plastic operations after gastroplasty aim to optimize the functional results obtained by bariatric surgery by removing excess skin. Surgical procedures in plastic surgery play an important role in stabilizing the quality of life of patients with massive weight loss after bariatric surgery and maintaining the improvement in quality of life in the long term [1,5].

Abdominoplasty in the postbariatric patient is a procedure that allows the patient to overcome functional disorders that hinder social interactions. Abdominoplasty also enables the patient to achieve a balance in psychological functioning and improved image perception. Surgical correction of excess hanging abdominal tissue is frequently requested, but the outcome can be optimized only if predictors for potential complications are identified [13,14].

The present study showed that 91.6% of the patients consisted of women, as in other studies. Likewise, the mean age of 41 years was similar to that of other works [13,15] but was below the age of 44 years in an American study [16] and 48 years evidenced by other series [1,17]. The mean BMI before plastic surgery of 27.6 kg/m^2 was similar to that found by other authors [1,10,15] but well below the BMI of 35.6 kg/m^2 verified by Shermak et al. [3] Likewise, the mean ΔBMI of our patients, of 18.6 ± 9.3 kg/m^2, was below the 20.7 kg/m^2 and 22.3 kg/m^2 verified in other studies [10,17]. The mean weight loss before the restorative surgery of 47.7 kg was similar to that verified by Kerviler et al. [1] and greater than the 33 to 40 kg observed by other authors [13,18]. However, this was below the 51 to 53 kg found in other studies [14,17]. The mean percentage excess weight loss of 78.8% was similar to the 82.9% verified by Felberbauer et al. [2].

Table 4
Univariate analysis of predictive factors of the development of postoperative complication after abdominoplasty after gastric bypass, comorbidities and surgical aspects.

Variable	Frequency (N = 107)	Prevalence of complication after plastic surgery, %	*P* value	OR	95%CI
Interval between gastroplasty and plastic surgery					
≤48 mo	82	31.70	–	–	–
>48 mo	25	36.00	.508	1.22	[.68; 2.17]
Combined procedures					
No	92	31.52	–	–	–
Yes	15	40.00	.607	1.20	[.60; 2.40]
Incisional hernia repair					
No	100	21.0			
Yes	7	57.1	.024	2.09	[1.53; 3.12]
Weight of removed tissue ≥2000 g*					
No	61	20.75	–	–	–
Yes	46	53.84	<.001†	3.44	[2.13; 5.54]
Anchor abdominoplasty					
No	80	30.00	–	–	–
Yes	27	40.74	.067	1.69	[.96; 2.96]
Diabetes					
No	101	30.70	–	–	–
Yes	6	66.67	.027†	2.22	[1.10; 4.49]
Arterial hypertension					
No	95	30.53	–	–	–
Yes	12	50.00	.212	1.55	[.78; 3.08]
Dyslipidemia					
No	105	31.43			
Yes	2	100.00	<.001†	3.81	[2.88; 5.04]
Metabolic syndrome					
No	101	30.70	–	–	–
Yes	6	66.67	.026†	2.07	[1.09; 3.94]
Diabetes/hypertension‡					
No	89	16.85			
Yes	18	55.56	.004†	2.23	[1.29; 3.86]

OR = odds ratio; CI = confidence interval.
* Weight of removed tissue after abdominoplasty.
† $P < .05$.
‡ Presence of diabetes and/or hypertension.

The overall complication rate seen in this investigation is not insignificant but is within the range of previously published reports [1,15,18]. Seroma and wound dehiscence were the most common complications encountered, constituting more than half of all complications seen in our patient population.

However, it should be noted that the minor complications were successfully managed conservatively, including seromas were aspirated in the office and resolved after single or multiple needle aspirations and wound dehiscences were managed with dressing changes that healed uneventfully.

Our rate of major complications (8.5%) was similar to the complication rate of 10.2% found by Parvizi et al. [18] but relatively low compared with the results from Neaman et al. (16%) [19].

The low rate of major complications in this study, such as thromboembolic events, flap necrosis, and the low number of reoperations may be associated with the low number of associated surgeries. Studies with the highest rates of complications generally had a higher percentage of associated procedures [3,16]. The association of operations leads to increased surgical time (>6 hr), greater blood loss, and need for blood transfusions, factors that may increase the rate of postoperative complications [10,16].

The rates of dehiscence, seroma, infection, and necrosis correlated with the number of surgical procedures [16]. The comparison of the patients subjected to one surgical procedure and those subjected to multiple procedures after bariatric surgery revealed a significant increase in the rate of postoperative complications in the latter group [16].

In the present study, 85.2% of the patients underwent only 1 surgical procedure per stage, and only 14.8% had associated operations in the same surgical procedure. We usually do not recommend associated surgical procedures,

Table 5
Multivariate analysis of predictive factors of the development of postoperative complication after abdominoplasty after gastric bypass.

Variable	Frequency (N = 107)	Prevalence of complication after plastic surgery, %	*P* value	OR	95% CI
Age					
≤40 yr	98	20.00	—	—	—
>40 yr	9	43.86	.005*	2.64	[1.34; 5.19]
Weight before massive weight loss, kg					
≤135	81	27.16	—	—	—
>135	26	50.00	.453	1.21	[.35; 3.21]
Weight loss, kg					
≤60	85	27.00	—	—	—
>60	22	54.54	.563	1.29	[.54; 3.10]
ΔBMI, kg/m²					
≤20	72	26.39	—	—	—
>20	35	45.71	.016*	1.87	[1.12; 3.13]
Incisional hernia repair					
No	100	21.0			
Yes	7	57.1	.415	1.25	[.33; 3.12]
Weight of removed tissue ≥2000 g†					
No	61	20.75	–	–	–
Yes	46	53.84	<.001‡	2.65	[1.53; 4.61]
Diabetes					
No	101	30.70	–	–	–
Yes	6	66.67	.813	1.07	[061; 1.87]
Dyslipidemia					
No	105	31.43			
Yes	2	100.00	.003‡	1.86	[1.24; 2.81]
Metabolic syndrome					
No	101	30.70	—	—	—
Yes	6	66.66	.917	1.05	[.43; 2.54]
Diabetes/hypertension*					
No	89	16.85	—	—	—
Yes	18	55.56	.813	1.07	[.61; 1.87]

OR = odds ratio; CI = confidence interval; Δ BMI = change in body mass index (BMI) was calculated by subtracting current BMI from max BMI.

*Presence of diabetes and/or hypertension.

†Weight of removed tissue after abdominoplasty.

‡$P < .05$.

Table 6
Distribution of postbariatric patients according to the quality of life after abdominoplasty (N = 107).

Classification of quality of life*	n (%)
Much worse	0 (0)
Worse	3 (2.8)
Minimal or no change	5 (4.7)
Better	34 (31.8)
Much better	65 (60.7)
Total	107 (100)

*Score obtained from the Moorehead-Ardelt questionnaire II. Distribution in 5 categories: much worse, score range –3.00 to 2.2; worse, –2.00 to –.75; minimal or no change –.50 to +.5; better, .75–2.00; and much better, 2.25–3.00.

except in selected cases, and then only after careful analysis of clinical, nutritional, emotional, and social conditions. We also advocated and prioritized nonpharmacologic preventive management for deep venous thrombosis by reduced surgical time, early ambulation, and good preoperative patient preparation.

Coon et al. [10] studied 449 postbariatric patients with a complication rate of 41.8%; however, >50% of patients who sought plastic surgery had residual obesity, whereas in our study, only 23.6% (22 patients) had residual obesity at the time of abdominoplasty. Residual obesity is associated with a 3-fold greater risk for presenting wound complications in the postoperative period in postbariatric patients underwent abdominoplasty [20].

In addition, the previous bariatric surgical procedure may play a role in the occurrence of dehiscence in postbariatric patients underwent abdominoplasty. There was an increased susceptibility to develop postoperative wound dehiscence when a biliopancreatic diversion was previously performed [21]. In our study, all patients underwent gastric bypass. In fact, evaluations by Tambasco

et al. [21] have shown that postbariatric patients underwent gastric bypass had less incidence of postoperative wound dehiscence compared with biliopancreatic diversion in postoperative period of abdominoplasty [21].

It is intriguing to consider that different weight loss surgeries before body contouring may lead to different modifications of the tissues. Studies examining the effects biliopancreatic diversion showed tissue proteins significantly reduced both in the totality and hidroxyproline value. At the microscopic examination of the cutaneous tissue, there were anomalies concerning dermal elastic fibers (overgrowth, serpiginous, and polyfragmented aspect) and collagen fibers (thickened and sclerodermoid). In addition, the sclerosis was widespread in the hypodermis with collapsed adipocytes, fibrous septum thickening, and evidence of a persistent context of inflammation in the extracellular matrix [22]. On the contrary, another study on patients who had previously undergone RYGB, microscopically, there were a moderate number of collagen fibers and absolute absence of inflammation [23]. The reason for such considerable differences is based on the role of malnutrition, playing a relevant role after biliopancreatic diversion procedure.

Another studies suggest alternative techniques of abdominoplasty that allow reduction of complications in postbariatric patients, such as "vest over pants" [24,25]. Several advantages of this abdominal lipectomy method were noted in postbariatric patients, including high vascular safety with facilitated hemostasis thanks to an operating field always in view, excellent centering of the flaps, and short operating time [25,25].

We repair incisional hernias using primary closure without mesh. Patients with massive weight loss have tissue excess, not deficiency, so the hernias are typically closed primarily without difficulty. We can reinforce the hernia repair with autologous tissue, importing adjacent fascia and placating it over the midline hernia repair. We find that mesh is not necessary and certainly puts patients at greater risk for postoperative infection, seroma, wound-healing problems, and pain, for little benefit. In our study, hernia repair had no influence on the development of postoperative complications.

The weight of the surgical specimen removed from the patient was a major predictor of complications in the postoperative course of an abdominoplasty after massive weight loss after gastroplasty. Others studies had a similar result [18,19,26]. Although this occurrence still cannot be prevented, all available measures should be taken to avoid resections and surgical time beyond what is strictly necessary.

On multivariate analysis, this study documented that patients with massive weight loss who underwent abdominoplasty with amount of removed tissue >2000 g, ΔIMC >20 kg/m^2, dyslipidemia, and age >40 years had significantly higher rates of postoperative complications.

In our study, abdominoplasty improved the quality of life of patients (mean quality-of-life scores, 2.1 ± .9). In addition, self-esteem, physical status, social life, labor, and sex life were improved by this operation.

Abdominoplasty improves physical activity of patients by allowing removal of local skin maceration, facilitating the wearing of clothing, and allowing improved walking and hygiene. The improvement in self-esteem necessarily translates into daily life by improving sociability and well-being at work, as shown in our series. We thought that excess skin on the abdomen could interfere with the patient's intimate life, especially during sexual activity [16].

Excess skin after massive weight loss is responsible for physical discomfort in postbariatric patients and is even more pronounced in patients with very high weight loss (>50 kg) and thus a high change in BMI (>20 kg/m^2) [27]. To respond to these problems, abdominoplasty has been established for several decades. The measurement of quality of life could bring us a useful tool with which to evaluate the functional results of abdominoplasty [19,26] and body image perception in previously obese patients [28].

The Moorehead-Ardelt quality-of-life questionnaire II was chosen because it is a simple, short, and easy-to-answer test for assessing quality of life after surgery that uses simple drawings to offer 5 answer options. Indeed, this questionnaire is easily translated into other languages, eliminating the cross-cultural and linguistic factors that influence the reliability of this type of instrument [5,11,27].

This quality-of-life instrument originally created for the analysis of quality of life after bariatric surgery is applicable to other types of surgery and can also be used separately. This questionnaire is a validated disease-specific instrument that is better suited to evaluate quality of life compared with a generic instrument, in which benefits provided to patients are more difficult to identify [12,27].

The limitations of our study include reduced sample size of the postbariatric patients underwent abdominoplasty after RYGB and the fact the study was conducted in a single institution. Our results may therefore not be representative of every practice setting. These limitations are commonly reported in the literature for this kind of cohort study. However, studies with larger sample size are crucial to determine the predictive factors on the development of postoperative complications in postbariatric patients undergoing plastic surgery procedures.

Conclusion

These data presented in this study suggest that the abdominoplasty promotes an improvement in the quality of life in patients with massive weight loss. In addition, the predictive factors for complications in our series included amount of removed tissue >2000 g, ΔBMI >20 kg/m^2,

dyslipidemia, and age >40 years at the time of abdominoplasty.

Postbariatric body contouring is an integral component of the total care of the patient with obesity and allows optimization of the results achieved from bariatric surgery. Plastic surgical evaluation should become a routine part of the multidisciplinary approach for these patients, as removing excess skin can be a life-changing event and complete the metamorphosis.

Finally, it must be said that body-contouring surgery in postbariatric patients can be best optimized with careful patient selection, preoperative planning, and recognition of the particular predictive factors for complications in this patient population.

Disclosures

The authors have no commercial associations that might be a conflict of interest in relation to this article.

Supplementary material

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.soard.2018.12.034.

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