4-13-2021

Long-Term Weight Loss with Body Contour Surgery After Roux-en-Y Gastric Bypass

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Recommended Citation

Luker J, Tajran J, Marquette L, Tepper D, Carlin A, Darian V, and Siddiqui A. Long-Term Weight Loss with Body Contour Surgery After Roux-en-Y Gastric Bypass. Obes Surg 2021.

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Obesity Surgery
https://doi.org/10.1007/s11695-021-05405-x

ORIGINAL CONTRIBUTIONS

Long-Term Weight Loss with Body Contour Surgery After Roux-en-Y Gastric Bypass

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Received: 30 November 2020 / Revised: 31 March 2021 / Accepted: 31 March 2021

Abstract

Background Bariatric surgery is accepted as an evidence-based treatment for morbid obesity. Many patients seek out body contour surgery afterwards to correct acquired deformities. This study seeks to better define the impact of body contour surgery on long-term weight loss.

Methods This study is a single-center retrospective review of 78 patients who underwent body contouring surgery post-Roux-en-Y gastric bypass compared with 221 matched control patients who underwent Roux-en-Y gastric bypass only. Data was collected for patients at least 7 years post-Roux-en-Y gastric bypass.

Results Patients who underwent both bariatric surgery and body contour surgery maintained mean long-term weight loss of 58 kg. The matched control group mean weight loss over the same time interval was 42 kg. The difference was statistically and clinically significant ($p = 0.005$). Change in body mass index, percent total weight loss, and percent excess body mass index loss were all statistically significant between the 2 groups.

Conclusion Patients who underwent body contour surgery better maintained long-term weight reduction in comparison to those who only had gastric bypass. Further understanding of the etiology of this association is important for patients contemplating body contouring surgery.

Keywords Obesity · Bariatric surgery · Roux-en-Y gastric bypass · Body contouring surgery

Introduction

Obesity remains a health epidemic affecting an estimated 30% of the adult population in the USA [1, 2]. Bariatric surgery has established itself as the standard treatment for this condition by directly impacting weight loss as well as documented improvement in obesity-associated comorbidities. The most common bariatric procedures performed include laparoscopic sleeve gastrectomy, Roux-en-Y gastric bypass (RYGB), and gastric banding. In comparison, RYGB has been shown to achieve better long-term outcomes [3–5]. Most weight loss occurs in the first 2 years postoperatively. Unfortunately, it is not uncommon for patients to regain up to 15% of the previous weight lost [3, 6, 7].

Many factors impact weight gain after initial postsurgical success. Educational efforts, close follow-up, programmatic infrastructure, and support groups work with patients, family, and friends around the time of surgery and long after for just that reason [8]. Recruiting family and friend support and initiating behavioral changes are part of the preoperative optimization and informed consent in successful programs [9, 10]. Most US programs use presurgical screening and psychological testing to support the decision process to identify those patients most likely to succeed [11]. Even with stringent pretesting and close follow-up, long-term data shows a gradual regain of weight. In one study, the percent of excess

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Published online: 13 April 2021

weight loss decreased from 70% at 1 year to 49% by 14 years [12]. Based on these statistics, more strategies are needed to improve long-term weight loss.

For some patients, the success of bariatric surgery may be tampered by new problems as a result of loose redundant, irritated skin [13]. The positive feedback from successful weight loss may be countered by episodes of intertrigo, rashes, ill-fitting clothes, and general dissatisfaction with the new body image. In one study, 75% of female and 68% of male patients expressed interest in body contouring surgery (BCS) after massive weight loss [14]. BCS encompasses a variety of procedures to include abdominoplasty, panniculectomy, brachioplasty, back lift, buttock lift, thighplasty, liposuction, mastopexy, and breast reduction. All of which can be performed alone or in variable combinations and stages. BCS has been shown to improve quality of life through improving aesthetic outcomes and functionality as well. We previously reviewed our 4-year results, which showed a trend towards improved weight loss for bariatric surgery patients who underwent BCS [15]. We now review our 7-year results. Patient characteristics, including the amount of tissue surgically removed, for this population were also explored and detailed. The aim of this study was to explore the long-term outcomes of body contouring surgery in patients whom have undergone bariatric surgery specifically looking at maintained weight loss.

Materials and Methods

We conducted a retrospective analysis of our bariatric surgery database from January 1, 2003, to December 31, 2018. During this time period, 3668 patients underwent RYGB at our institution. Of these patients, 722 underwent post-gastric bypass BCS. Seventy-eight patients met the inclusion threshold criteria of 20 kg weight loss after RYGB, BCS, documentation of tissue removed, and follow-up of 7 years or more. In the control group 34% and in the BCS 49% were still in the system. Exclusion criteria included those who underwent gastric bypass at our institutions, but the follow-up was at an institution we could get information from, those who underwent non-RYGB weight loss surgery, and those without clear documentation of the weight of tissue excised during BCS. For the control group, we used patients from our own institution who underwent RYGB, which had a documented minimum 20 kg weight loss. For those patients who did not follow-up long-term in the system, we obtained most recent weight and body mass index (BMI) information from their respective primary care provider with informed consent. For the matched control group, we matched the study group patients for age (± 5 years), gender, and initial BMI (± 3 kg/m^2). We identified the amount of weight removed for each patient at the time of BCS. For excised tissue, the specimen weight was used. For suction-assisted lipectomy, 0.9 kg/ml was used for density [16].

The primary outcomes measured were patient weight, BMI, change in BMI, percent total weight loss, and percent excess BMI loss at 7 years post-RYGB [17]. The Yale Food Addiction Scale 2.0 was used as a validated measure to compare the patients [15, 18, 19]. Mean time from RYGB to BCS for the study population was 2 ± 1.6 years. Demographic and clinical data were collected for the study, and control populations were reviewed via the electronic health record. The study was performed under institutional review board approval, and all guidelines were followed.

Statistical Analysis

Statistical analysis was performed using SPSS version 16 (IBM, Armonk, NY). Patient demographics, such as age, height, weight, BMI, and gender, were compared using Student's *t*-test and chi-square test. We also performed a univariate repeated measures analysis of variance that looked for overall differences in BMI due to condition and time and then explicitly tested the interaction between condition and time.

Results

For the study interval, 78 patients met inclusion criteria. The matched control population had 221 patients for the same interval. Comparative demographic information is shown in Table 1. Populations were compared with respect to age, gender, initial BMI and weight, comorbidities, and standardized screening tool. There was no statistical difference regarding any of the characteristics for the 2 populations.

Table 1 Patient demographics

	BCS (n = 78)[a]	Control (n = 221)
Age, years	46 ± 9	48 ± 11
Female gender %	78%	84%
Body mass index, kg/m^2	49 ± 3	48 ± 4
Weight, kg	136.3 ± 17	138.6 ± 18
Diabetes diagnosis %	27%	31%
Hypertension diagnosis %	46%	45%
Food addiction diagnosis[b]	32%	34%
Length of follow-up, years	8 ± 4	9 ± 3

BCS, body contouring surgery

[a] None of the values were statistically different between BCS group and control group $p > 0.05$ (range 0.2–1.0)

[b] Food addiction diagnosis by the Yale Food Addiction Scale version 2.0 [17]

The patients who underwent BCS each underwent 1 or more of 8 different procedures (Table 2). In most cases, patients underwent a combination of procedures (86%). None of the patients sustained serious complications. Eleven patients (15%) had minor complications, including cellulitis, seroma, and minor wound dehiscence. Three patients required surgical intervention related to the complication (4%). The most common procedure alone or in combination was abdominoplasty/panniculectomy (68 patients) followed by liposuction (18 patients). The total weight removed was 4.2 ± 2.9 kg (range 2.2 to 9.8 kg) for all patients in the BCS group.

Primary outcomes were weight and BMI and relative changes in these values for each patient individually from baseline to 7 years post-RYGB (Table 3). For both groups, weight and BMI were substantially lower than pre-RYGB weights at all time points. By year 7, there was a statistically significant difference in weight between the 2 groups, 19 kg (p = 0.001). Relative to the pre-bariatric surgery baseline, the BCS group lost an average 58.6 kg, and the matched control group lost 41.7 kg. The statistical significance was maintained even when we corrected for excised tissue weight in the BCS group. The corrected BCS group weight loss at 7 years was 81.9 kg, and the difference from the control group was 15 kg (p = 0.03). At year 7, the BMI difference between the cohorts was also statistically significant (p = 0.02). Change in BMI, percent total weight loss, and percent excess BMI loss were all statistically significant in favor of the BCS compared to the control group. Percent excess BMI loss was 27% higher for the BCS group (p = 0.009).

Discussion

Patients who underwent BCS after bariatric surgery lost achieve 13% higher total weight loss and 27% excess BMI compared to those who did not undergo BCS over the same interval. The statistical difference was maintained even when we factored in the amount of tissue removed by the BCS. The differences were less profound at the earlier measured time points. For the BCS group, there was a downward trend in weight for each of the time points. This group achieved over 50 kg loss from pre-bariatric surgery baseline. For the control group, the weight trend was upward at the time points reviewed. BMI followed a similar trend.

In our institution, approximately 19% of gastric bypass patients elected to undergo BCS. This is higher than the national trend published in 2017 of 6% [20]. Individuals undergo bariatric surgery for many reasons including quality of life, discomfort, self-esteem, and body image dissatisfaction [21, 22]. For those motivated strongly by body image, bariatric

Table 2 Specific operations for body contouring surgery after weight loss

Procedure	Frequency	Weight removal (kg)
Abdominoplasty	10	2.4 ± 2.0
Abdominoplasty, back lift	3	4.0 ± 2.1
Abdominoplasty, back lift, brachioplasty	1	5.7
Abdominoplasty, back lift, brachioplasty, breast reduction	1	9.8
Abdominoplasty, back lift, brachioplasty, liposuction, mastopexy	1	8.5
Abdominoplasty, back lift, brachioplasty, liposuction, thighplasty	1	7.1
Abdominoplasty, back lift, thighplasty	1	6.6
Abdominoplasty, brachioplasty	4	4.9 ±2.4
Abdominoplasty, brachioplasty, breast reduction	1	3.2
Abdominoplasty, brachioplasty, liposuction, thighplasty	2	5.2 ± 4.6
Abdominoplasty, brachioplasty, mastopexy	1	4.6
Abdominoplasty, breast reduction	4	3.7 ±2.2
Abdominoplasty, liposuction	2	3.5 ± 0.9
Abdominoplasty, mastopexy	2	2.9 ± 1.5
Breast reduction, liposuction	6	6.5 ±3.7
Panniculectomy	26	4.8 ± 5.2
Panniculectomy, back lift, brachioplasty	1	7.1
Panniculectomy, brachioplasty, liposuction, mastopexy	3	6.4 ± 2
Panniculectomy, buttock lift, thighplasty	1	6.9
Panniculectomy, liposuction	4	4.6 ± 3.2
Panniculectomy, mastopexy	1	6.1
Panniculectomy, thighplasty	2	5.5 ± 2.7
Total	78	4.2 ± 2.9

Table 3 BMI and weight at follow-up

Group	4 years	5 years	7 years	*p* value
BCS, body mass index, kg/m^2	33 ± 7	33 ± 8	30 ± 6	0.002[a]
Control, body mass index, kg/m^2	34 ± 6	35 ± 6	36 ± 7	
BCS, kg	85 ± 14	81.3 ± 26	77.7 ± 23	0.001[a]
Control, kg	86 ± 21	92.2 ± 16	96.9 ± 19	
BCS, kg; corrected[b]			81.9 ± 26	0.03[a]
BCS, change in BMI[c]			20 ± 4	0.02[a]
Control, change in BMI			12 ± 8	
BCS, percent total weight loss [c]			43%	0.04[a]
Control, percent total weight loss			30%	
BCS, percent excess BMI loss [c]			79%	0.01[a]
Control, percent excess BMI loss			52%	

BCS, body contouring surgery; *BMI*, body mass index

[a] Statistically significant at $p < 0.05$

[b] Patient weight adjusted for tissue excised in conjunction with BCS. Only performed for year 7 because some patients did not have surgery performed at the earlier time points.

[c] The correct BCS weight at 7 years was use for this calculation.

surgery may not be the end of the struggle. Many of these patients are left with excess hanging skin, displaced fatty tissue, and new sites of intertrigo. For this population, excess skin may be a negative motivator for the maintenance of weight loss. Patients who are medically, emotionally, and financially able to undergo BCS are able to eliminate the negative effects of this unintended consequence of bariatric surgery. Removing the excess tissue can serve as a positive motivator in this population [23]. This sets up a positive feedback loop with other positive consequences. Alzahrani et al. showed that there was a statistically significant and progressively incremental decrease in the rate of depression in those patients sustaining > 30 kg weight loss [24]. There was also a statistically significant increase in the patients' social life, sex life, daily activities, and job performance. These changes can also feedback as positive reinforcement for further weight loss.

Our results compare favorably to those reported in the literature. Others have confirmed the longitudinal benefits of BCS in the massive weight loss population [13, 14, 25–28]. However, our work does vary from other published work. Our 7-year follow-up is on the longer end of most published literature. The majority of the large cohort longitudinal studies were conducted in Europe. The European experience differs in many ways from that in the USA. Our baseline pre-bariatric surgery starting mean BMI and weight were 49 kg/m^2 and 133 kg, respectively. This was about 10–15% higher than the European studies reviewed. Although this may not be a statistical difference, it may represent a clinical difference with respect to lifestyle choices, body self-image, and motivation. Most reviewed studies did not include the amount of resected tissue. In those in which the information was included, it was often incomplete. Our mean excision of almost 5 kg was larger than that in any of the studies we reviewed. This higher value may be driven by the fact that the majority of US patients must pay out of pocket for BCS (other than panniculectomy) and theses patients are motivated to remove as much as possible. We think it is important to include tissue excision information. Without it, an adjusted weight cannot be calculated. For us, this is an important comparison of the 2 populations. Our corrected post-BCS weight maintained statistical difference at 7 years, reinforcing the study conclusions. The implication is that the excised tissue is not the sole reason for the clinical differences identified. Without an explicit calculation of the excised tissue, such a conclusion is not possible for other studies. Not surprisingly, our post-procedure weights and BMI were higher at all time points than most of the European studies reviewed. Since we started out with a higher baseline, a higher endpoint is understandable. Some studies showed statistical difference between test and control populations at earlier time points than us. This may be related to the wider range and later interval for BCS among our patients compared to the other studies. In many European nations, the BCS is a covered benefit and, therefore, more routinely performed once patients meet the criteria. For many of our patients, their surgery is self-financed. This probably contributes to the delay in treatment. Our bariatric population did not differ much from the European studies with respect to age, gender distribution, comorbidities, surgical complications, and overall BMI trends.

Limitations of our study include its retrospective nature and potential for selection bias. Cost of body contour surgery is a definite confounding factor. Patients who underwent the surgery need access to funds to pay for the surgery and protected time to recover from it. Interestingly, the 2 populations did not vary much with respect to demographics reviewed in Table 1. We believe this information may limit the impact, to some degree, with respect to selection bias. Our choice of time

points differs from the earlier time points in the literature, making it difficult to compare among different published studies. There does not appear to be a time point standard in the literature. For us, the BCS represents a new starting point for weight loss. Because these operations begin 1 year after bariatric surgery and span up to 3 years, the first 4 years of weights for the BCS group was difficult to interpret and have a very large range. Trying to match for this in the control group was difficult. We therefore elected to begin data collection at year 4 after bariatric surgery to get beyond the disparate first and second surgery dates. This also required us to limit our BCS group inclusion to the first 3 years after bariatric surgery. Another limitation was the study size. Because of our strict inclusion criteria, only 8% of the BCS at our institution were included. They may also have impacted the reported outcomes. Our overall population of patients undergoing BCS after bariatric surgery was 19%, higher than the USA reported 6% but under the European 30–40% [19].

We believe BCS is an important factor for long-term weight loss. Although we speculate this is true, we cannot assign causation based on this work. It is also possible that patients most motivated to maintain weight loss after bariatric surgery are also self-selecting for BCS. We are working with our bariatric colleagues to see if a different methodology, including different screening tools, may help answer this.

Our institution uses the Yale Food Addiction Scale as one of many screening tools. We included it in the study design because it is well-documented in the literature for bariatric surgery screening. Future work is underway to investigate if other scales may be more useful in identifying patients who may or may not benefit from BCS after massive weight loss.

Conclusion

Patients undergoing BCS following RYGB have better long-term weight loss when compared to patients who only undergo RYGB. We posit that post-bariatric BCS is linked to improved success of bariatric surgery by impacting long-term maintenance of weight loss. The exact mechanism is unclear, and further investigation is warranted. The role of BCS in the massive weight loss population appears to be more than just aesthetic and may have quantifiable long-term health benefits.

Acknowledgement We would like to thank Stephanie Stebens for her editorial assistance.

Declarations

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study

Conflict of interest The authors declare no competing interests.

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