

ORIGINAL ARTICLE **AESTHETIC**

The effectiveness of criteria-based, publicly funded abdominoplasty after massive weight loss: a prospective cohort study

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Background

With the rising incidence of obesity and bariatric surgery, there has been an increase in body contouring procedures. Abdominoplasty following massive weight loss has been shown to improve body image and health-related quality of life. However, the inclusion criteria for this surgery is varied, and the role for public funding is controversial. The aim of this pilot study was to evaluate the benefits of strict, criteria-based and publicly funded abdominoplasty following massive weight loss using patient-reported outcome measures (PROMs).

Methods

In this prospective cohort study patients who qualified for abdominoplasty completed a general health PROM (short form 36; SF-36) and a body contouring specific PROM (BODY-Q) pre- and postoperatively at three, six and twelve months. Complications were recorded. PROM scores were analysed using the Wilcoxon Signed Rank Test ($p < 0.05$). The study was approved by the Central Adelaide Health Network Human Research Ethics Committee [HREC/16/TQEH/133].

Results

Twenty-three patients were included in the analysis. The mean follow-up time was four months. The body contouring-specific (BODY-Q) scores improved in eight of nine domains. The general (SF-36) scores improved in six of nine domains. The complication rate was low and minor in nature.

Conclusion

This pilot study suggests that publicly funded abdominoplasty with specific criteria restrictions has a role in significantly improving body satisfaction and health-related quality of life in patients after massive weight loss.

Introduction

Body contouring procedures are commonly performed throughout the world.¹ Given the rising incidence of obesity and corresponding increase in bariatric surgery, there has been a renewed demand and desire for body contouring.²⁻⁴ More than the traditional, cosmetic ‘tummy tuck’, body contouring surgery (BCS) procedures are used to address the redundancy of skin and soft tissue seen after massive weight loss, and its significant sequelae. Patients suffer from physical symptoms such as limited mobility, skin fold rubbing, ulceration and intertrigo.^{2,5,6} There is also significant psychological distress caused by skin excess and the unsightly shape and contour⁷ of the abdominal, breast, arm and thigh skin redundancy.² Some 74 per cent of patients have been reported to desire BCS following gastric bypass, demonstrating high demand.⁸

Body contouring operations in massive weight loss patients are, however, associated with high complication rates. Regardless of the method of weight loss (diet and exercise or bariatric surgery), this patient group is at higher risk of seroma, wound dehiscence, operative site infection, skin flap necrosis and venous thromboembolism when compared to non-massive weight loss patients.⁹⁻¹¹ Balancing the goal of restoring health-related quality of life with the extra risks of body contouring procedures in this patient group can therefore be challenging.

Recognising the patients’ view in evaluating their intervention has led to the development of patient-reported outcome measures (PROMs) in a bid to better understand a treatment’s effectiveness. These questionnaire-based scoring systems can be used to measure the effect of procedures that are difficult to evaluate using objective examination or investigations.¹² Surgical interventions that affect body image, such as abdominoplasty, have now been shown to improve body satisfaction and health-related quality of life in many studies using PROM scores,¹²⁻¹⁴ including a recent meta-analysis by El Abd and colleagues.¹⁵

The National Health Service funds BCS in the United Kingdom. Recognising substantial variation in local protocols for approval, the NICE-accredited national commissioning guidelines for BCS¹⁶ were first published in 2014 to standardise funding approval across the UK. A more recent survey by Dunne and colleagues, however, demonstrated that there is still a substantial variability in criteria and therefore a disparity remains in

the access to BCS among regions.⁶ The criteria for BCS in North America appears to be highly variable, and largely determined by individual insurance providers and individual surgeons.¹⁷ On review of the literature from the United States of America, it appears common for outcome measure-based studies to lack information about inclusion criteria for abdominoplasty beyond massive weight loss, defined as loss of over 50 per cent of the excess weight above the ideal body weight,^{5,18,19} with high inter-study variability.²⁰ A recent study has shown that individual US health insurance providers used different criteria for approving BCS.¹⁷ In Australia there is restricted federal funding for abdominoplasty via a Medicare rebate in the private sector. At the time of writing, the restrictions to this rebate include weight loss of at least five BMI units, presence of a skin fold-related skin condition that has failed three months of conservative management, redundant skin that interferes with activities of daily living, and weight stability for six months.²¹ Rebated surgery in the private sector, however, requires prior purchase of private health insurance or a significant ‘self-funded’ contribution by the patient to cover their inpatient hospital stay, rendering it unaffordable to many.

In contrast, our plastic and reconstructive surgery unit functions within the framework of a bariatric surgery multidisciplinary team, which includes general surgery, dietetics and allied health support for bariatric patients, to provide publicly funded recontouring procedures for patients following massive weight loss as per local commissioning guidelines.²² In order to gain the maximum benefit of BCS within the limit of a small-volume, publicly funded service, the unit applies specific patient eligibility criteria. This study was designed with the aim of evaluating outcomes when these selection criteria were used.

Methods

Participant recruitment and data collection

This is a prospective cohort study evaluating patients who underwent publicly funded abdominoplasty in a single, tertiary metropolitan centre in Australia between 2017 and 2020. The study was approved by the Central Adelaide Health Network Human Research Ethics Committee [HREC/16/TQEH/133]. All patients who were referred for consideration of abdominoplasty post-massive weight loss were screened against

the criteria in **Table 1**. These criteria were decided after consultation with members of the bariatric multidisciplinary team, and reflect a combination of federal Medicare funding criteria, state-based criteria and international guidelines.^{22,23} Informed consent to participate in the study was obtained. Patient demographics and medical history were recorded, including age, sex, maximum BMI, preoperative BMI and significant comorbidities. Patients completed both the BODY-Q abdominoplasty and SF-36 questionnaires at the preoperative appointment and at three, six and twelve months postoperatively. Any complications were recorded at each follow-up appointment.

The primary outcome measures were health-related quality of life as quantified by two PROMs: BODY-Q and SF 36.

BODY-Q

The BODY-Q abdominoplasty questionnaire has been thoroughly validated in body contouring surgery post-massive weight loss^{14,24–27} and is specific to this area of plastic surgery. It provides detailed scoring across nine domains of body image satisfaction and function, both physical and psychological.

SF-36

The SF-36 item questionnaire scores general health-related quality of life over eight domains of physical, social and psychological function.²⁸ The SF-36 has been used widely and was chosen to compare scores against other healthcare interventions.

The secondary outcomes are the incidence of complications, including return to the operating theatre, haematoma, operative site infection, wound dehiscence, seroma, perioperative venous thromboembolism and all-cause mortality. These complications were explicitly audited at each postoperative visit.

Statistical methods

A priori power analysis was performed using an assumed moderate effect size, with alpha and beta of 0.05 and 0.20 respectively. This resulted in an estimated sample size of $n = 28$ to adequately power the study. BODY-Q and SF-36 surveys were scored across each domain using questionnaire-specific scoring rules. Pre- and postoperative scores were compared using the Wilcoxon signed rank test and were considered statistically significant if $p < 0.05$. Statistical analysis was performed

Table 1. Inclusion and exclusion criteria for abdominoplasty

Inclusion criteria
Starting BMI (prior to weight loss) > 40, or > 35 if the patient had significant comorbidities.
Massive weight loss of > 50 per cent of the patient's excess weight (based on calculated ideal body weight).
Presence of functional skin excess issues, such as skin fold intertrigo, unresponsive to topical treatments
Stable weight (± 5 kg) for over six months
At least 18 months post any bariatric surgery
Age > 18 years
Exclusion criteria
Current tobacco smoker
Active mental health condition that would benefit from treatment prior to body contouring surgery, for example body dysmorphic disorder

using IBM®SPSS® software (v26; IBM Australia, Sydney, 2000, Australia). Due to a high rate of attrition, each interval (three, six and twelve months postoperative) group was too small for subgroup analysis. Where multiple postoperative questionnaires were completed, the furthest from the date of surgery was used for analysis to better estimate the long-term result.

Results

Thirty-five patients underwent abdominoplasty over the four-year period. Twelve patients were excluded from analysis due to incomplete questionnaires (6), declined participation (4) and failure to attend any follow-up (2), resulting in 23 patients suitable for analysis (**Figure 1**). Comparison between demographics of the included and excluded participants is summarised in **Table 2**. There were no statistical differences between the groups on demographic analysis with chi square.

The mean maximum BMI prior to massive weight loss was 40.9 and the mean BMI at the time of abdominoplasty was 30.1. Fifty-two per cent of patients had undergone prior bariatric surgery (5 gastric sleeve and 7 gastric bypass procedures) with the remaining 48 per cent having achieved their weight loss with diet and lifestyle modification alone.

The mean age at the time of surgery was 40.9 years (range 28–75). There was a high female representation in this cohort of 87 per cent. The average time between surgery and the longest follow-up postoperative survey was four months.

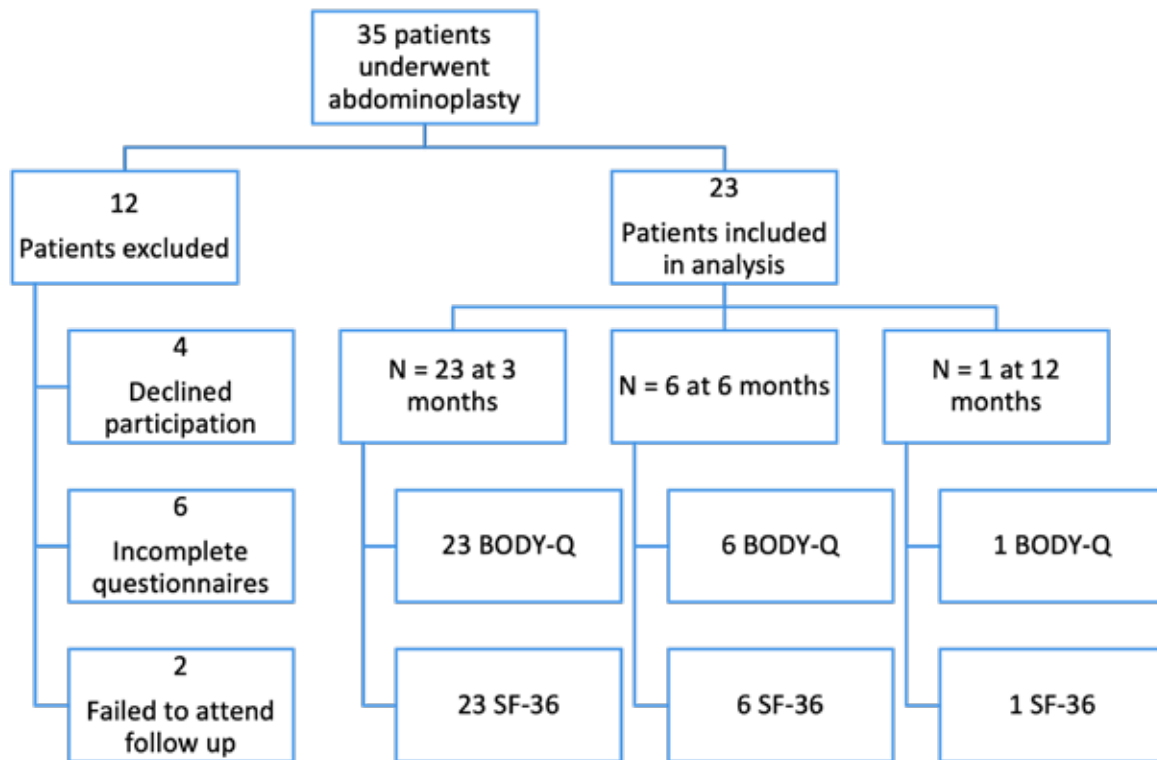


Fig 1. Excluded participants and data loss during the study

Table 2. Demographic comparison between excluded and included participants

	Excluded	Included	<i>p</i> value
N	12.00	23.00	
% female (number)	75% (9.00)	87% (20.00)	0.08
Mean age (SD)	51.9 (8.72)	49.1 (11.50)	0.47
Mean BMI at heaviest preoperative (SD)	43.4 (8.50)	40.4 (7.80)	0.75
Mean BMI at surgery (SD)	30.4 (2.90)	31.3 (6.70)	0.67

There was a high attrition rate with respect to planned follow-up with just one patient returning for their 12-month follow-up appointment. Surgery was performed by three surgeons and surgical techniques included standard abdominoplasty (17), *fleur-de-lis* abdominoplasty (5) and apronectomy (1).

BODY-Q scores

Statistically significant improvements in BODY-Q scores were noted in the following sections: appearance-related psychological distress, body image, physical function, social function, satisfaction with the abdomen and overall satisfaction with body image. The domains that did not show statistical significance included physical symptoms, psychological function and sexual function; however, these still showed a trend towards a positive effect (Figure 2).

SF-36 scores

Statistically significant improvements in SF-36 scores were found in the following domains: physical function, role limitations, bodily pain, social functioning, vitality and energy and general health (Figure 3). The remaining domains (mental health and role limitations due to emotional problems) showed a trend towards improvement.

Complications

There were three documented instances of seroma which required drainage and were resolved. Three patients were managed for minor wound infection with oral antibiotics. Partial wound dehiscence was noted in two cases and these healed with dressings in the community (Table 3).

Table 3. Complication profile for patients who underwent abdominoplasty

Complication	N
Return to theatre	0
Haematoma	0
Seroma	3
Wound infection	3
Wound dehiscence	2
Perioperative venous thromboembolism	0
Mortality	0

Discussion

Principal findings

BODY-Q scores showed significant improvement across six of the nine domains. The domains that did not reach statistical significance still showed a trend towards improvement. Of note were the large improvements in the satisfaction with abdomen, overall body image and satisfaction with body domains, which increased by 300, 116 and 96 per cent respectively. Abdominoplasty broadly improved body-specific patient-reported

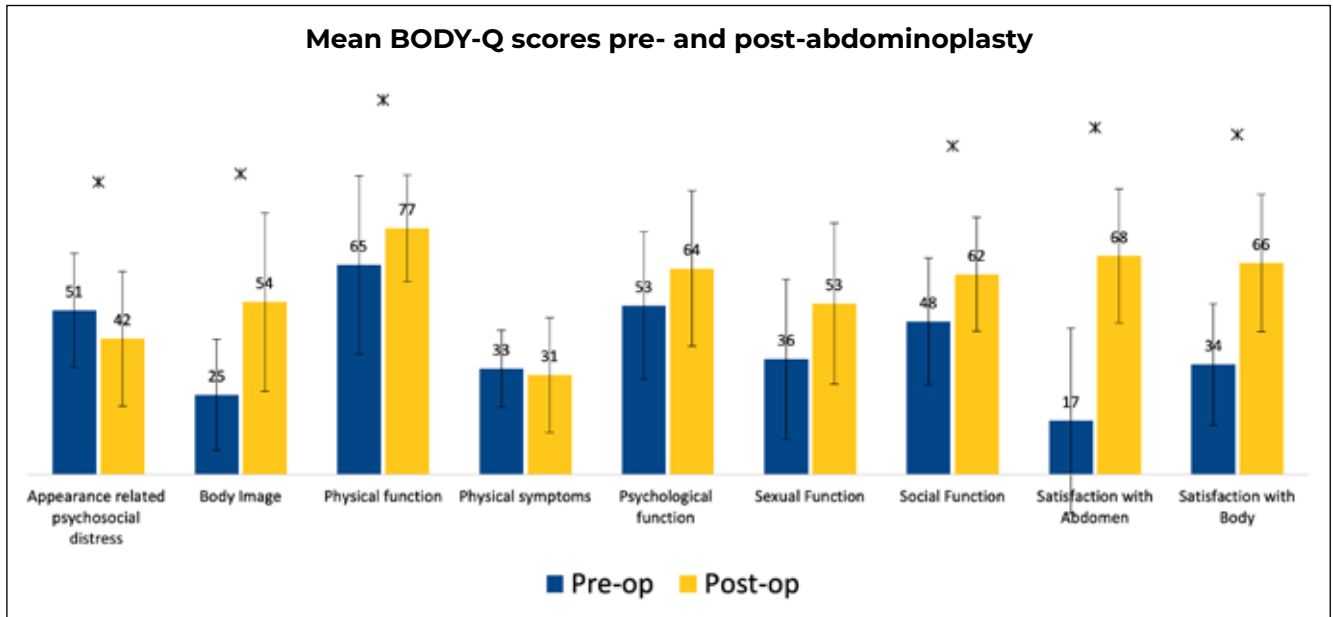


Fig 2. BODY-Q scores pre- and post-abdominoplasty. * Indicates a statistically significant improvement $p < 0.05$; error bars indicate standard deviation; for appearance-related psychosocial distress and physical symptoms domains, a decrease in score represents improvement.

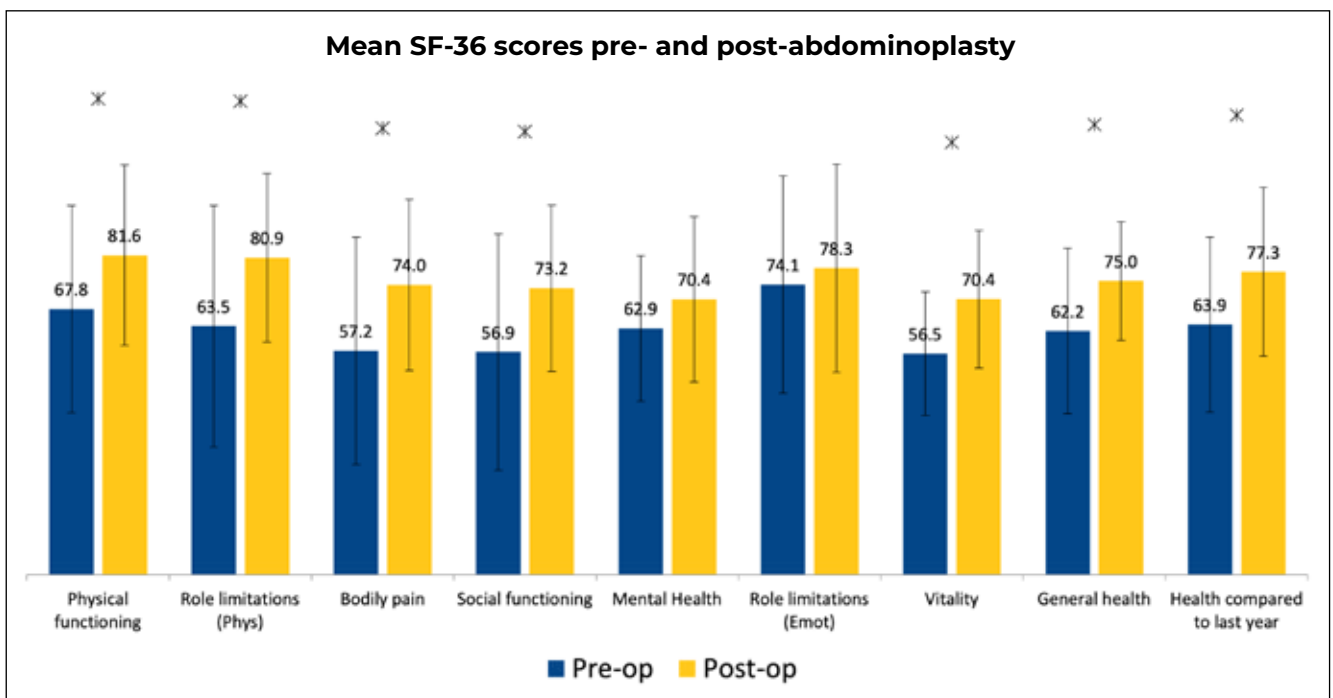


Fig 3. SF-36 scores pre- and post-abdominoplasty. * Indicates a statistically significant improvement $p < 0.05$; error bars indicate standard deviation

outcomes in this patient group and these findings are consistent with those previously reported in the literature.^{13,26}

The SF-36 questionnaire gives a more general view of health-related quality of life. Although the improvement in SF-36 scores were more modest than that of the BCS-specific PROM, statistical significance was seen across seven out of the nine domains. Abdominoplasty had a positive impact on general health-related quality of life and this has not previously been demonstrated with the SF-36.

The complication rate and profile in this study was 30 per cent, which is lower than expected compared with previous reports of complication rates for abdominoplasty in patients with high BMI.^{9,11} An overall complication rate of up to 56 per cent has previously been described.¹⁰ It may be that the inclusion criteria in this study selected patients who had lower baseline risk. This effect is likely to be independent of BMI as the patients in our study group had similar preoperative BMI to other studies.

Patient selection criteria for body contouring procedures after massive weight loss have been inconsistent across studies and health systems. Our results confirm that, when the specific criteria designed by our unit are applied, publicly funded abdominoplasty for post-bariatric patients did improve health-related quality of life as reflected in both body specific and general outcome measures.

Strengths and limitations

The strengths of this study are its prospective design and consistently applied selection criteria for abdominoplasty. To the authors' knowledge, this is the first study that has clearly defined specific criteria to BCS in the context of massive weight loss. There are limitations of the study, such as a lack of randomisation and data loss in the form of incomplete surveys. This may reflect patient inattention considering the combined length of both surveys. Future data collection will include improved staff training in the body contouring clinic to check for missed sections and reduce incomplete data. The sample size

is small, which did not allow for any subgroup analysis. Data collection is ongoing and there will be a repeat analysis with a larger cohort in the future. There was a very high rate of attrition postoperatively as many patients did not attend long-term follow-up. This limits the applicability of the results to patients in the long term, although the small amount of long-term follow-up data does suggest that the benefits are maintained over time. The unit now places more emphasis on the importance of long-term data collection when obtaining informed consent for this study in order to increase longevity of participation. Future areas of expansion include increased recruitment for long-term follow-up data so that health-related quality of life following abdominoplasty can be better compared with other commonly performed, publicly funded procedures, such as major joint replacement, using the SF-36. Patients who did not meet unit criteria were not reviewed clinically and therefore the quality-of-life outcomes of this group were outside the scope of this study. Future research could examine the parallel comparison of people with skin excess who underwent abdominoplasty compared to those who desired abdominoplasty but were not eligible per the criteria in this study.

Conclusion

Publicly funded body contouring surgery after massive weight loss is controversial due to its perceived cosmetic nature, lack of clear inclusion guidelines and the underlying funding pressures. This pilot study shows that, with our unit's eligibility criteria, health-related quality of life was significantly improved as demonstrated by the body-specific BODY-Q and the more general SF-36 outcomes. The complication rate was low, suggesting a favourable risk-benefit balance. Criteria-restricted, public funding is likely to have a significant role in providing the health-related quality of life benefit of abdominoplasty for patients following massive weight loss.

Consent statement

Patients/guardians have given informed consent to the publication of images and/or data.



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Disclosure statement

The authors have no conflicts of interest to disclose.

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