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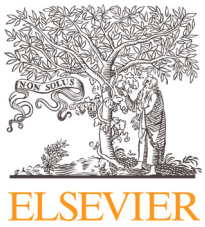

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Health-related quality of life in patients having undergone abdominoplasty after massive weight loss

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Summary *Background:* Due to lack of validated body contouring-specific patient-reported outcome (PRO) instruments, the outcomes of abdominoplasty after massive weight loss have been evaluated rather rarely and mainly using generic health-related quality of life (HRQoL) instruments. The aim of the current study was to examine, using body contouring-specific (BODY-Q) and generic (15D) HRQoL instruments, the HRQoL, and key factors related to HRQoL among patients having undergone massive weight loss and abdominoplasty.
Methods: Altogether 52 patients who underwent abdominoplasty due to massive weight loss completed the BODY-Q and the 15D HRQoL instruments. The 15D scores were compared to those of age-, gender-, and BMI-adjusted control sample of the general population.
Results: The mean score of the BODY-Q Abdomen scale was 50.7 out of 100 (SD 24.4). The HRQoL of abdominoplasty patients was lower than that of age-, gender-, and BMI-adjusted general population ($p = 0.001$). Sleeping, discomfort and symptoms, depression, excretion, and sexual activity were the patients' main concerns. Body image and psychological well-being were strongly associated with the perceived HRQoL. The satisfaction with appearance of the abdominal area was not associated with generic HRQoL.

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Conclusions: The HRQoL of abdominoplasty patients is lower than that of general population with similar age, gender and BMI. The most important factors associated with the HRQoL of the patients were body image, psychological well-being, and physical function.

Introduction

Surgical contouring of the abdominal area is one of the most common body contouring procedures.[1] In the year 2017, the estimated number of abdominoplasty procedures was 802,234 world-wide.[2] The yearly number of abdominal area contouring operations has been rapidly rising as the increase between years 1997 and 2014 was 382% in the U.S.[3] A major reason for the abdominal contouring procedure is excess skin after massive weight loss or bariatric surgery.[4] Patients having lost a large amount of weight often suffer from problems caused by excess skin. In many cases, the skin does not necessarily tighten during the weight loss and can form hanging skin folds. Thus, the patient may need body contouring surgery removing the excess skin and contouring the abdominal area.[5] As many as 75% of the patients who have undergone bariatric surgery have been reported to seek body contouring surgery [4] and 11% have undergone body contouring surgery during a follow-up of 4–5 years.[5]

Body contouring surgery and removal of excess skin have been shown to improve body image and health-related quality of life (HRQoL) of the patients who have undergone massive weight loss, for instance, after bariatric surgery.[6-9] Patients have reported improved physical ability, work and career performance, social interplay and psychosocial status, and sexual and intimacy perceptions.[10] In addition, several studies report improvements in psychological measures such as body image, self-esteem, depression, and anxiety.[10,11] The comparability and generalizability of these findings are, however, limited by the inconsistencies in the methods used to assess the measures. Small sample sizes and lack of adequate controlling weakens the evidence supporting body contouring surgery.[8,9,12] Additionally, the lack of well-developed validated patient-reported outcome (PRO) instruments specifically developed to assess body contouring outcomes has further limited the generalization of the HRQoL outcomes after body contouring. Previous studies have mainly utilized generic, not body contouring-specific HRQoL instruments.[13] However, after the development of the BODY-Q PRO instrument, the knowledge on the association between HRQoL and body contouring surgery is increasing.[14]

The aim of the current study was to examine the association of satisfaction with abdominoplasty and HRQoL among patients having undergone abdominoplasty after massive weight loss utilizing the BODY-Q and the 15D instruments, and to compare the generic HRQoL outcomes with the general population.

Materials and methods

Adult patients having undergone abdominoplasty due to massive weight loss either voluntarily or after bariatric surgery in the Helsinki University Hospital between 2009 and 2017 were included in the study. Patients having undergone abdominoplasty due to hernia repair or childbirth as a primary indication were excluded. An electronic search from the hospital discharge register was conducted to identify the appropriate patients.

A questionnaire package including the applicable BODY-Q scales, the 15D, and clinical and demographic questions were sent via mail to patients. Participants filled in the questionnaires and returned them together with a signed informed consent in a prepaid envelope. Clinical information of the patients was retrieved from the electronic patient records retrospectively.

The Ethics Committee of the Helsinki and Uusimaa Hospital District and the head of the department of the Musculoskeletal and Plastic Surgery Research Center of Helsinki approved the study protocol. Patients provided an informed consent to agree to participate in the present study adhering to the Declaration of Helsinki.

BODY-Q

The BODY-Q is a PRO instrument, which has been rigorously developed and validated especially for assessing the HRQoL of patients undergoing body contouring surgery after weight loss.[15] In a recent systematic review, the BODY-Q was recommended over other PRO instruments for measuring body contouring outcomes because of its strongest evidence for quality of good measurement properties.[16] The BODY-Q consists of 21 independently functioning scales scored from 0 to 100 with higher scores indicating a more positive outcome. Overall, three domains are measured: Satisfaction with appearance, HRQoL, and patient experience of care. The appearance scales include 11 scales measuring satisfaction with different body parts: abdomen, back, buttocks, chest, hips, inner thighs, nipples, upper arms, skin, scars, and overall body. The HRQoL scales include satisfaction with body image, psychological, physical, social, and sexual well-being. Since our study focused on abdominoplasty patients, we utilized the appearance scales concerning abdomen, scars, and excess skin as well as all five HRQoL scales. The BODY-Q has previously been translated and linguistically validated for use in Finnish body contouring patients, and it is described in detail elsewhere.[17]

15D instrument

The 15D is a generic, self-administered instrument that has been developed for measuring HRQoL.[18] The 15D has previously been used in assessing the treatment effectiveness of abdominoplasty in treating excess skin in Finnish patients.[6] It consists of 15 subscales measuring the following

dimensions of HRQoL: Moving, Seeing, Hearing, Breathing, Sleeping, Eating, Speech, Excretion, Usual activities, Mental function, Discomfort and symptoms, Depression, Distress, Vitality, and Sexual activity. Each item contains options from 1 to 5 with 1 representing the best state and 5 representing the worst state. The total 15D score (15D score) indicating the overall HRQoL and the dimension level values, both on a 0-1 scale, was calculated using the Finnish valuation algorithm. The total score ranges from 0 equivalent to being dead to 1, indicating the best HRQoL state. The 15D was chosen for the study, as there are 15D data available from Finnish general population.[19]

Statistical methods

Missing values for single items of the BODY-Q scales were replaced by the mean value of other items in the given subscale. The BODY-Q scores were converted into 0-100 with higher scores indicating a better outcome.

The means of the 15D variables of the patients were compared to those of an age-, gender-, and body mass index (BMI) -adjusted control sample of the general Finnish population obtained from the Health 2011 Survey.[19] The statistical significance of the differences in the means between these groups was examined using independent samples *t*-test.

To examine the association between satisfaction of body contouring outcomes and HRQoL, Spearman's correlation coefficients were calculated between BODY-Q scales and the 15D score. A bootstrap method with 1000 replications was used to estimate the 95% confidence intervals (95% CI) for correlation coefficients. The correlations were interpreted as follows: 0.00-0.30 negligible, 0.30-0.50 low, 0.50-0.70 moderate, 0.70-0.90 high, and 0.90-1.00 very high correlation.

To examine the strength of association between satisfaction with body contouring and HRQoL, linear regression analyses were run with the 15D score as the dependent variable and each BODY-Q scale, one at a time, alongside age, post-operative BMI, and gender as independent variables. To facilitate comparability between BODY-Q scales, the regression coefficient beta values were calculated as units of standard deviations (SD) of the scale scores. The beta values of (±) 0.10, 0.30, and 0.50 represent weak, moderate, and strong relationships, respectively.

R (3.6.1) and IBM SPSS 25.0 statistics software were used to perform the analyses. *P*-values <0.05 were considered statistically significant.

Results

The database search resulted in a total of 82 patients who met the inclusion criteria. Fifty-two patients completed the questionnaires (response rate 64%). The median time from surgery was 15 months (IQR 2-33). The sociodemographic and clinical characteristics of the patients are presented in Table 1. Excess skin after massive weight loss or bariatric surgery was the most common cause of abdominoplasty. The average BMI before the abdominoplasty procedure was 31.4 (range 19.9-51.3). None of the patients had any surgery-related complications.

Table 1 Patients' sociodemographic and clinical characteristics.

	$N = 52$
Age (years), mean (SD)	48.8 (12.4)
Women, n (%)	44 (84.6)
Lost weight before operation (kg), mean (SD)	48.3 (15.9)
BMI before operation, mean (SD)	31.4 (6.1)
Indication for surgery, n (%)	
Functionality problems due to excess skin	47 (90.4)
After weight loss due to diet and exercise	32 (61.5)
After weight loss due to bariatric surgery	15 (28.8)
Problems with hygiene or eczema due to excess skin	5 (9.6)
15D Total score (0-1), mean (SD)	0.873 (0.093)

The mean 15D dimension level values of patients compared to the age-, gender, and BMI-adjusted control sample (mean 15D profiles) are presented in Figure 1. There was high variation in the 15D dimension level values, which is manifested by wide SD. The mean level values of the individual 15D dimensions of the patients were lower than those of the general population on all other dimensions except for Eating and Mental function. The scores of Sleeping (0.695 vs. 0.848, $p < 0.000$), Discomfort and symptoms (0.663 vs. 0.789, $p = 0.001$), Excretion (0.816 vs. 0.908, $p = 0.004$), Depression (0.825 vs. 0.896, $p = 0.010$), and Sexual activity (0.843 vs. 0.928, $p = 0.017$) dimensions of the patients were statistically significantly lower than those of the control sample, while the mean Mental function score (0.925 vs. 0.851, $p = 0.001$) of the patients was higher than that of the control sample. The mean 15D total score of the study sample was lower than that of the control sample (0.874 vs. 0.919, $p = 0.001$). The difference is also clinically important.[20]

The mean BODY-Q scores and statistics are presented in Figure 2. The lowest mean scores were in the scales concerning satisfaction with Body image (mean score 36.2), Sexual function (48.9), Abdomen (50.7), and Excess skin (51.5). The highest average scores were in Physical function (mean score 80.2) and Scars (78.3) scales.

Table 2 presents the correlation coefficients between BODY-Q and the 15D total score. All scales, except satisfaction with Scars, Excess skin, and Sexual function correlated at least moderately with the 15D total score. The highest correlations with the 15D score were observed in the BODY-Q scales concerning satisfaction with Body image, Psychological, and Physical function. All correlations were statistically significant (Table 2).

The gender-, age-, and BMI-adjusted regression coefficient betas of the BODY-Q scales predicting the 15D score are presented in Figure 3. All BODY-Q scales' betas were equal to or above 0.3, indicating at least a moderate relationship with the 15D total score, while the beta of Body image scale ($\beta = 0.55$) exceeded 0.5, indicating strong

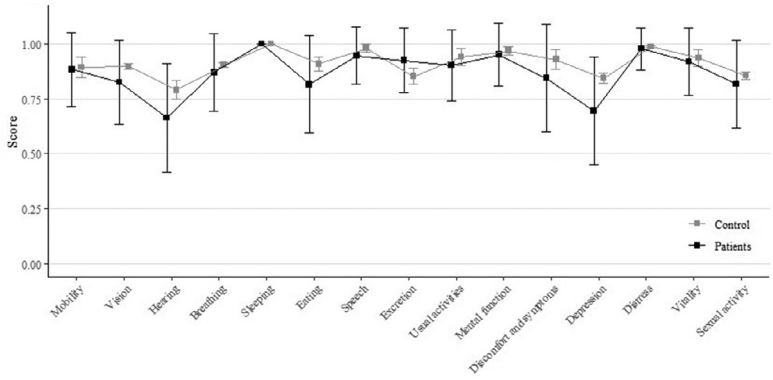

Figure 1 The 15D dimension-level values of the patients and those of the age-, gender-, and BMI-adjusted control population (mean 15D profiles). The boxes indicate the means and the whiskers SD.

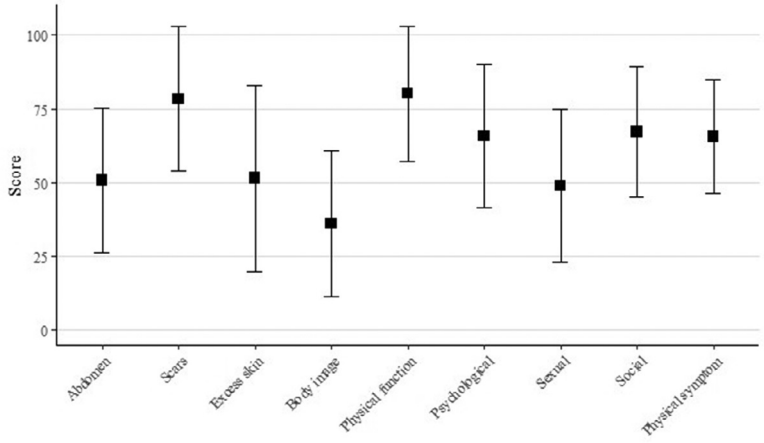

Figure 2 The distributions of BODY-Q scale scores scaled into 0–100. The boxes represent means, and whiskers represent standard deviations.

Table 2 Spearman's correlation coefficients between the BODY-Q scales and the 15D total score.

Variables	15D, r (95% CI)
Abdomen	0.52 (0.26–0.72) ***
Scars	0.36 (0.08–0.61) *
Excess skin	0.47 (0.20–0.68) **
Body image	0.65 (0.41–0.81) ***
Physical function	0.64 (0.41–0.79) ***
Psychological	0.66 (0.42–0.82) ***
Sexual	0.33 (0.02–0.59) *
Social	0.50 (0.23–0.73) ***
Physical symptom	0.47 (0.18–0.69) **

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

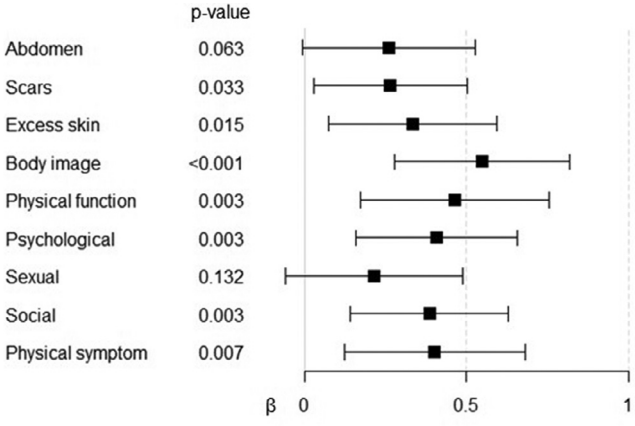

Figure 3 The regression coefficient betas (β) in the units of SD and 95% confidence intervals of BODY-Q scales and 15D total score adjusted by gender, age, and BMI. The boxes represent means and whiskers represent standard deviations.

relationship with the 15D total score. All associations were statistically significant (Figure 3). According to the regression coefficients, all BODY-Q scales had a significant association with the 15D total scores.

Discussion

Overall, our results suggest that the HRQoL of patients having undergone abdominoplasty is impaired compared to the age-, gender-, and BMI-adjusted general population, although variation in the 15D dimension level values of the patients was higher than that in the control population. According to the 15D results, the patients' main concerns were sleeping, discomfort and symptoms, depression, excretion, and sexual activity.

The BODY-Q scores indicated that the most prominent causes of patients' dissatisfaction were problems with Abdomen and Excess skin as well as Body image and Sexuality. The abdominoplasty procedure aims to improve the physical appearance of the abdominal area. According to our findings, it seems that dissatisfaction with the abdomen and excess skin still exists after the procedure. Further, the appearance scores observed here are notably lower than previously reported for post-operative abdominoplasty patients.[14] Our finding may reflect the complex nature of the dissatisfaction with body shape, a problem suggested to be affected by several factors, such as body image and self-esteem rather than the actual body shape.[21,22] Low scores in the Body image and Sexuality scales also support the concept of psychological factors underlying the dissatisfaction of one's body. Interestingly, our patients did not report dissatisfaction with their abdominal scars, a post-operative issue highlighted in several previous studies.[23-25]

The correlations between the BODY-Q scales and the 15D total score suggest that HRQoL may be associated with perceived satisfaction with one's body. The strongest correlations with the 15D score were in Body image, Psychological well-being, and Physical function scales. In addition, the regression coefficient of Body image showed close relationship with HRQoL, while also coefficients of Psychological well-being and Physical function scales suggested a relationship of moderate strength. According to our findings, it seems that psychological factors, such as body image and mental well-being, may have a considerable role in the HRQoL of patients after abdominoplasty. These factors were associated with HRQoL independent of satisfaction with physical appearance of the abdominal area measured by BODY-Q Abdomen, Scars, and Excess skin scales. The findings are in line with previous studies, which proposed an important role of psychosocial factors for the mental and physical health of patients having undergone bariatric surgery.[26] Previously, it has been found that weight loss surgery improves the physical health of the patients but does not improve mental health domains.[27] However, the high BODY-Q Physical function scores in our patient population indicate that improved physical function might be a major reason for satisfaction after abdominoplasty. This might be due to weight loss and removal of loose skin, which both facilitate functionality.

Previous studies have shown abdominoplasty to improve body image and HRQoL of patients after massive weight loss.[6-8] The present findings suggest that despite the weight loss and body contouring surgery of the abdominal area, the HRQoL of the patients is significantly lower than that of control population even 15 months after the operation. We did not, however, measure the HRQoL preoperatively and thus have no evidence on the influence of the abdominoplasty on HRQoL. The BODY-Q scores of the patients suggest that there might be dissatisfaction with one's body after abdominoplasty. However, this could be explained by our patient selection. The current study was conducted with a sample of Finnish patients treated in the publicly funded Finnish health care system for whom the abdominoplasty procedures were performed due to health reasons. In the Finnish publicly funded healthcare system, abdominoplasty and other body contouring procedures are provided based on health indications such as limitations in daily activities, intertrigo, or restrictions in physical activity due to excess skin, and with the precondition that the BMI is below 32 with some exceptions. Hence, it is likely that patients in our sample did not seek esthetic improvement but rather health benefits. Thus, it is possible that the effect of abdominoplasty on quality of life does not come via changes of appearance of one's body but rather by improving patients' physical function and state of health.

Even if the patients were obese (mean BMI 31.4), they had undergone massive weight loss recently before abdominoplasty (mean lost weight 48.3 kgs). Serious obesity might have affected adversely the body image and, however, physical health of the patients. Previous studies have shown that overweight and obesity is associated with sleeping problems and depression.[28] Hence, comparing the HRQoL of the patients to the control sample adjusted for current BMI of the patients after weight loss may have caused bias, as the obesity-related issues may not have improved necessarily at the same time as weight decreased. However, with high BMI, it may be difficult to achieve an esthetic outcome that satisfies the expectations of the patients by conducting abdominoplasty as the only procedure. Combining abdominoplasty with liposuction may provide more subtle tools to improve esthetic expression of abdominal area. Indeed, it has been found that the patient-reported improvement in the quality of life after abdominoplasty combined with liposuction is higher than that after abdominoplasty only.[29]

There were some limitations in our study. Only patients, who were post body contouring surgery, were included. Thus, we could not obtain pre-operative data. Due to the lack of baseline values, measurement of the change and the effect of abdominoplasty on quality of life were not possible. Furthermore, variability in the range of the patients' BMI values diminishes the generalizability of the results of the current study, as the sample might consist of different populations. Lastly, as we did not include patients with major complications, the effect of complications on the abdominoplasty outcomes could not be accounted. Nevertheless, the strength of this study is that we also utilized a generic HRQoL instrument and compared the HRQoL to that of the general population, which, to the best of the authors' knowledge, has not been done previously. In addition, the study included patients with a median follow-up of 15 months after abdominoplasty and thus reflects the mid- to long-term results of HRQoL and satisfaction with treatment. The response rate was relatively high and can be considered

sufficient to draw conclusions from the data. The study provides important information about the factors that influence patients' HRQoL after abdominoplasty.

Conclusions

The generic HRQoL of patients who have undergone abdominoplasty is lower than that of gender-, age-, and BMI-adjusted general population. Sleeping, discomfort and symptoms, depression, excretion, and sexual activity were the patients' main concerns. Moreover, especially body image and psychological well-being seemed to be strongly associated with perceived HRQoL, whereas satisfaction with the appearance of the abdominal region was not associated with generic HRQoL. Thus, psychological factors seem to be major determinants of HRQoL outcomes after abdominoplasty.

Declaration of Competing Interests

Harri Sintonen is the developer of the 15D and obtains royalties from its electronic versions. The other authors report no conflicts of interest.

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