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Binge eating in surgical weight-loss treatments
- Long-term associations with weight loss, health related
quality of life (HRQL), and psychopathology

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treatments

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ABSTRACT

Objective Previous studies that have investigated the relationship between binge eating and the long-term outcome of bariatric surgery have shown mixed results. Does binge eating before or after bariatric surgery affect long-term BMI, health-related quality of life (HRQL), or psychopathology after surgery? The objective of the present study was to address these questions to determine the extent to which binge eating needs to be addressed in the context of bariatric surgery

Methods. We assessed 173 bariatric patients before and three years after weight loss surgery with regard to weight, binge eating, HRQL, and psychopathology.

Results. Binge eating habits before and after weight loss surgery were unrelated to the long-term BMI outcome. Binge eating after weight loss surgery was associated with more psychopathology and a lower HRQL.

Conclusion. Binge eating before or after weight loss surgery does not predict long-term BMI outcome. Therefore, exclusions from surgery for this reason alone are difficult to motivate. However, results show that binge eating after weight loss surgery is common and is associated with both more psychopathology and a lower HRQL. The poor psychological health status of patients that binge eat after weight loss surgery motivates studies with longer follow-up periods to investigate whether post-surgical binge eating might increase the vulnerability to future weight regain and complications at time points beyond three years. The high rate of binge eating after surgery and its negative association with the HRQL and psychopathology indicate that we need to be observant of the occurrence and potential effects of binge eating in the context of bariatric surgery.

BACKGROUND

Weight loss surgery (i.e., bariatric surgery) is considered to be the most effective long-term treatment for obesity ¹, which is shown to alleviate medical risks ^{2, 3} and improve psychological conditions ^{4, 5}, psychosocial status ^{2, 6, 7}, and health related quality of life (HRQL) ^{3, 6, 8}. A 10-year follow-up in the Swedish Obese Subjects (SOS-study) study also concluded that bariatric treatment has positive effects on mortality ¹. In spite of the large weight losses that have repeatedly been documented in bariatric surgery, considerable variability in the outcome leads to difficulties in predicting weight-loss outcome on an individual basis ^{9, 10}.

Eating disorders and binge eating have been shown to be common in bariatric surgery patients ^{9, 11}, and they are thought to play influential roles in postoperative outcome ^{12, 13}. It has therefore been suggested that an evaluation of patients' pre-surgical eating behaviour should be included in the assessments for bariatric surgery ^{14, 15}. The well-established guidelines from the National Institute for Health and Clinical Excellence (NICE) also recommend that patients with severe psychological problems (like eating disorders) should not be offered bariatric treatment, in spite of the insufficient scientific support for the hypothesis that pre-treatment eating disorders have a negative effect on treatment outcome ¹¹. Studies of how eating disorders or binge eating are associated with weight loss outcome have shown mixed results. While some have shown no weight-loss difference ^{7, 16-20} in binge eaters, others have shown less weight loss ^{12, 21, 22}, more weight regain ^{11, 19}, or even more weight-loss in binge eaters ⁷.

In studies of eating behaviour, outcome (changes pre- to post bariatric treatment) results are also mixed. A number of studies have described patients that have developed eating disorder symptoms post-surgery ²³⁻²⁶, but most studies show fewer cases of eating disorders and binge eating after bariatric surgery ^{4, 5, 20, 27-29}. Hsu et al. ²¹ compared "eating disturbances" pre- and post- bariatric treatment and found an overall trend that patients seemed to retain their pre-treatment eating disturbance after bariatric treatment. They also concluded that eating disturbances that persist after treatment may be linked to a worse long-term weight-loss outcome. A number of studies have thereafter confirmed the association between weight-loss (or weight regain) and binge eating after, rather than before, surgery ^{19, 29, 30}.

In addition to weight loss and eating behaviour, HRQL ^{3, 31} and other psychopathologies ^{2, 32} have frequently been used to measure weight loss treatment outcomes. In general, studies using these measures have shown that weight loss is associated with improvements in HRQL ^{3, 33} and psychopathology ⁵. However, in a number of case-studies, successful post-bariatric weight loss has also been associated with

increased eating pathology ^{25, 34}. Consequently, the associations between weight loss and improvements in HRQL and psychopathology need to be investigated more thoroughly.

Binge eating is the core symptom of Bulimia Nervosa, Binge Eating Disorder, and most other eating disorders in obese patients and is defined by the DSM ³⁵ as the following: a) in a discrete period of time, eating an amount of food that is definitely larger than most people would eat in a similar period of time under similar circumstances and b) feelings of loss of control over eating. A fundamental diagnostic issue that has been raised in the specific area of bariatric surgery is concerned with how binge eating should be defined post-surgery ^{11, 36}, considering the fact that bariatric surgery profoundly restricts gastric capacity and thus the patient's capacity to eat large amounts of food. In a review by Niego et al. ¹¹, the authors showed that a number of studies using the binge eating definition above found binge eating to decrease or cease post-surgery. This finding was explained by Niego and colleagues as a consequence of the fact that these patients no longer are physically able to eat large amounts of food (i.e., binge) after bariatric surgery. In the DSM definition of binge eating, the amount of food eaten is required to be large in relation to the circumstances (in this case, the post-bariatric period). However, what constitutes a large size is difficult to operationalise ³⁷ and has not been established post-surgery to the best of our knowledge. This contextual definition of binge eating (i.e., a large amount of food relative to what is normal for the circumstances) might also be difficult for the patients to grasp and report adequately, given the dramatic changes in their gastric capacity and psychological effects of the surgery. A number of studies ^{11, 38, 39} have instead argued for focusing on the feature of loss of control while eating both subjectively and objectively large amounts of food. This is supported by studies showing that loss of control over eating is more closely associated with psychological distress than the amount of food eaten ³⁸. With focus placed on the loss of control over eating both subjectively and objectively large amounts of food, post-bariatric eating behaviours (e.g., "grazing" ³⁹) would also be included as binge eating. "Grazing" has been described as a post-bariatric eating behaviour in which the patient eats small amounts of food continuously and feels a loss of control over this consumption ^{12, 39}.

In addition to the diagnostic difficulties described above, the large differences in the length of follow-up may, in part, account for the mixed results found in previous research. In treatments of obesity (where the objective is to produce sustainable long-term health benefits), a long-term focus is essential ³⁶. Still, follow-up in studies of eating behaviour in weight loss treatment settings have often been less than two years and sometimes even less than one year ¹¹. Short-term improvements after bariatric treatment (e.g., in depression and eating behaviour) are very common. Buddeberg-Fischer and colleagues ¹⁶ explain that these improvements represent a

“psychological honeymoon” that often is followed by a return to the initial values. Eighteen to twenty-four months after surgery has been shown to be an important phase in which binge eating may re-emerge with subsequent weight regain ^{30, 39, 40}.

The scientific support for the association between eating behaviour and weight loss in bariatric surgery is weak and far from conclusive ¹¹. Sarwer et al. ³⁶ describes the research area and associated literature as fraught with methodological problems, which include issues of diagnostics and assessments. Different instruments have generated different estimates within the same patient group, and different modes of assessment have found different rates of disorders ⁴¹. Large variations in design, timing, and assessment methods have led to significant variations in results ^{7, 11}. These variations have led to difficulties comparing results between studies.

The objective of the present study was to investigate the long-term associations between binge eating and outcome in bariatric surgery. Our specific research questions were:

a) is pre- or post-treatment binge eating associated with long-term weight loss and b) is post-treatment binge eating associated with the long-term health related quality of life (HRQL) and general psychopathology?

MATERIALS AND METHODS

Participants

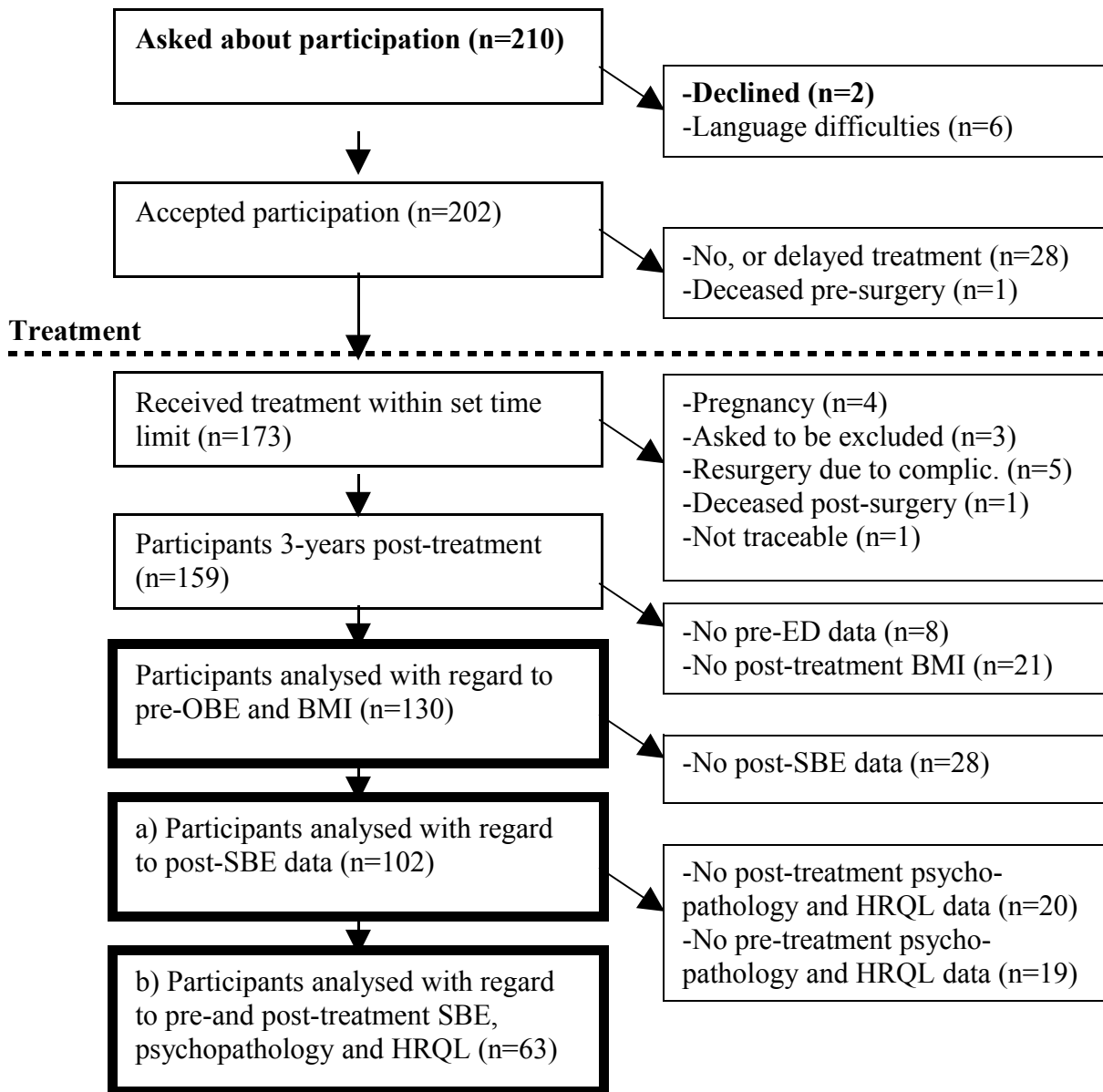
A total of 210 consecutive bariatric weight-loss surgery patients from four surgical clinics in Sweden were asked to participate. Of these potential participants, 202 gave their written consent to participate in the study and 173 received treatment in sufficient time to allow three years to have passed until the follow-up period. Of those receiving treatment, information on pre-treatment binge eating and weight loss was available for 130 (75.1%) participants. The 43 participants that received treatment but were excluded from further analysis did not differ from the 130 that were analysed with regard to sex, mean age, pre-treatment BMI, or prevalence of pre-treatment binge eating.

The different subgroups that were analysed in this study (a and b) and the rates of dropout are presented in Figure 1. Out of the 130 participants above, 28 had no data on subjective binge eating after surgery (post-SBE); this led to a total of 102 participants being analysed with regard to post-treatment subjective binge eating and BMI outcome (a in Figure 1). Twenty of these 102 participants had no data regarding post-treatment psychopathology and HRQL, and an additional 19 had no pre-treatment data regarding psychopathology and HRQL; we therefore compared 63 participants with and without SBE with regard to psychopathology and HRQL (b in Figure 1).

Separate dropout analyses on the possible differences between dropouts and analysed patients were performed for each of the two subgroups (a and b). These analyses showed no differences between dropouts and analysed patients with regard to sex, pre-treatment BMI, or age.

The 130 included participants averaged 40.6 (SD=9.2) years old, with a BMI of 45.8 (SD=6.7) kg/m². Twenty-eight (21.5%) of the participants were male. The surgical procedures performed were: 100 Gastric Bypass (76.9%), 18 Gastric Banding (13.8%), 7 Vertical Banded Gastroplasty (5.4%), and 5 Biliopancreatic Diversion with Duodenal Switch (3.8%).

Figure 1. Rates of dropout in the entire sample and sub-samples



Instruments

The Eating Disorders in Obesity (EDO) is a self-report questionnaire⁴² assessing eating disorder symptoms based on the DSM-IV criteria³⁵. The EDO was constructed to assess eating disorder symptoms among patients in a weight loss treatment setting, and questions referring to underweight states were therefore excluded. The EDO consists of 11 questions, of which only eight apply to patients reporting binge eating episodes. Binge eating is defined in the beginning of the questionnaire in accordance with the DSM-IV definition³⁵. The EDO is shown to have good reliability and good concurrent validity in the assessment of eating disorders and binge eating.

The Eating Disorder Examination-Questionnaire (EDE-Q) ⁴³ is a self-report measure derived from the Eating Disorder Examination interview, which assesses the specific psychopathology of eating disorders over the previous 28 days. Several forms of binge eating behaviours, including subjective and objective bulimic episodes, are assessed. In both of these, there is a loss of control while eating objectively or subjectively large amounts. Research supports the validity of the EDE-Q ^{44, 45}.

The Short Form-36 (SF-36) is a self-rating questionnaire ⁴⁶ measuring Health-Related Quality of Life (HRQL). The SF-36 consists of eight dimensions, from mainly physical to mainly psychological: Physical Functioning (PF), Role-Physical (RP), Bodily Pain (BP), General Health (GH), Vitality (VT), Social Functioning (SF), Role-emotional (RE), and Mental Health (MH). The sum of the SF-36 item scores within each dimension is transformed into a scale ranging from 0 (poor health) to 100 (good health).

The Comprehensive Psychopathological Rating Scale - Self-rating Scale for Affective Syndromes (CPRS-S-A) is a 19-item self-reporting questionnaire ⁴⁷ measuring psychopathology. The CPRS-S-A was constructed by rephrasing the items from the interview-based Comprehensive Psychopathological Rating Scale (CPRS), covering depression (Dep), anxiety (Anx), and obsessive compulsive (OCD) symptoms. The depression and anxiety scales show a high degree of concordance with the interview-based CPRS rating.

Procedure

Patients accepted for bariatric treatment at any of the four surgical clinics involved in the project were informed and asked about participation. Those that agreed to participate filled out the EDO questionnaire and were given the CPRS-S-A and the SF-36 questionnaires with the instructions to fill them out and return them before treatment was initiated. Demographic and anthropometric data (including weight and length) were collected from patient records.

Participants were assessed over a long-term period via their completion of the EDE-Q, CPRS-S-A, and SF-36 3 years after the treatment. Available weight data were continuously collected from patient records. At the 3-year assessment, structured follow-up questions regarding long-term weight were included for all to permit the collection of data for patients who had no long-term clinical data regarding weight. Adding these questions was a divergence from the original plan and was done in response to the observation that many patients had no clinical weight data one year after treatment. Two to five months after the 3-year follow-up, those participants not returning the questionnaires were reminded and sent the EDE-Q and structured follow-up questions again. They were given the option of completing only these two questionnaires.

The trial protocol was approved by the local ethical committees of the clinics involved and thus meets the standards of the Declaration of Helsinki in its revised version of 1975 and its amendments of 1983, 1989, and 1996.

Definitions

Pre-treatment objective binge eating (pre-OBE) was measured by the EDO questionnaire ⁴². In addition to confirming the presence of objective binge eating (according to the presented DSM definition ³⁵), pre-OBE participants were required to confirm a loss of control over eating as well as incidents of eating objectively large amounts of food in two additional questions.

The EDO was initially planned to be used for post-treatment assessments of binge eating as well. After the participants had been included, however, new research on post-bariatric eating behaviour was presented that convincingly argued for the importance of including subjective binge eating in post-bariatric assessments as well ^{11, 36, 41}. The EDO, which explicitly defines binge eating as eating objectively large amounts of food, was therefore exchanged for the EDE-Q. The EDE-Q has been used to assess objective (post-OBE) as well as subjective (which also includes objective) binge eating episodes (post-SBE) at follow-up.

Pre-treatment weight and length were extracted from patient records and registered as Body Mass Index ($BMI=kg/m^2$). Long-term BMI outcome was initially planned to be assessed through patient records, but continuous extraction of data from patient records soon showed that an insufficient amount of weight data could be found one year after treatment. For this reason, questions about self-reported weight were added in the 3-year follow-up period; the long term BMI outcome data are based upon answers to these questions. For increased statistical power, missing self-reporting data were supplemented with available data from patient records for the same approximate time period. If 3-year clinical data were missing, available data closest in time were used (as long as data considered weight from more than two and fewer than four years after treatment). Self-reported weight data from 111 out of 130 (85.4%) participants were used. The self-reported weight data used were all from 25 to 47 months after treatment. Seven of these data points were from 25-29 months post-treatment (5.3% of the total sample), nine from 30-42 months post-treatment (6.8% of the total sample), and three from 43-47 months post-treatment (2.3% of the total sample).

Previous studies have shown lower values for self-reported than clinically assessed weight ⁴⁸. In the present study, however, BMI data were used mainly for comparisons between those participants with or without eating disorders or binge eating. There were no differences in the proportion of self-reported and clinically assessed weight data

between participants with or without pre-OBE ($\chi^2(3)=0.10$, $p=0.75$) or between those with or without post-SBE ($\chi^2(3)=0.77$, $p=0.38$). The weight assessment method was therefore assumed not to differentially affect group results.

Statistics

Changes in BMI (pre-to post-treatment) were analysed by a paired t-test.

Differences in post-treatment BMI between participants with or without pre- or post-OBE as well as participants with or without post-SBE have been analysed by means of an ANCOVA with the corresponding effect sizes. In these analyses, the pre-treatment BMI was used as a covariate.

Differences in the post-treatment HRQL and psychopathology were compared between participants with and without post-SBE by means of an ANCOVA using the respective pre-treatment scores as a covariate. The corresponding effects sizes were also shown.

In addition to the main sample of 130 participants, two sub-samples (a (n=102) and b (n=63)) have been used in the different analyses due to the accumulated dropout from each measure. In each of these sub-samples, comparisons between those participants analysed and those not analysed were performed by means of a Student's t-test for continuous data (BMI, age) and by a Chi-2 test for categorical data (binge eating, sex).

RESULTS

Before surgery, the 130 participants had an average BMI of 45.8 (6.7) kg/m²; this value was 32.1 (6.6) kg/m² three years after treatment. This change (pre- to post-treatment) was statistically significant and had a very large corresponding effect size ($t(258)=16.5$, $p=0.0001$, $d=2.08$).

Pre- and post-treatment binge eating

Pre-treatment, 24 of the 130 participants (18.5%) were classified as pre-OBE. In the 102 participants that were also analysed with regard to post-SBE, 29 (28.4%) indicated post-SBE (18 (17.6%) of these 102 participants indicated pre-OBE). Thirteen of the post-SBE participants indicated objective binge eating post-treatment and were also classified as post-OBE.

The difference from using a binge eating definition based on eating objectively large amounts of food versus one that includes

subjectively large amounts of food was investigated by comparing these two groups. Out of the 29 participants with post-SBE, 16 indicated only subjective binge eating episodes and 13 also reported objective binge eating episodes. These two groups showed no differences with regard to post-treatment BMI (n=29), HRQL (n=20, 10 in each group), or other psychopathology (n=20, 10 in each group).

Binge eating and long-term BMI outcome

An ANCOVA was performed to compare the long-term BMI outcome in those participants with or without pre-OBE (controlling for pre-surgery BMI). This analysis showed no significant difference between the groups ($F(1, 129)=1.1$, $p=0.29$, $d=0.24$). An ANCOVA was also performed to compare the long-term BMI outcome in participants with and without post-SBE (controlling for pre-surgery BMI). This analysis showed no significant difference in the BMI outcome between the groups ($F(1,101)=0.05$, $p=0.83$, $d=0.05$). There was also no difference in the long-term BMI outcome when only those participants with or without post-OBE were compared ($F(1,101)=0.14$, $p=0.71$, $d=0.12$).

Subjective binge eating, HRQL, and psychopathology post-treatment

In Table 1, the scores of the other psychopathology (CPRS-S-A) and HRQL (SF-36) questionnaires are presented for participants with or without post-SBE, as along with differences between the groups regarding these measures. Thirteen out of the 63 participants analysed here (20.6%) were classified as SBE post-treatment.

Table 1. Pre- and post-bariatric treatment scores of Psychopathology and HRQL and differences in these measures between participants with and without post-treatment SBE.

	no post-SBE (n=50)		Post-SBE (n=13)		ANCOVA	d
	pre	post	Pre	post		
CPRS-S-A						
Dep	5.1 (3.8)	3.9 (4.4)	8.2 (4.5)	7.5 (4.8)	$F(1,62)=1.3$, $p=0.25$	0.3 7
Anx	7.2 (4.6)	4.7 (4.4)	10.5 (4.7)	9.7 (4.5)	$F(1,62)=7.6$, $p=0.01$	0.8 8
OCD	3.5 (3.0)	2.6 (3.6)	6.0 (4.5)	5.6 (4.0)	$F(1,62)=1.7$, $p=0.20$	0.4 2
Total	15.4 (10.2)	11.2 (12.1)	24.6 (13.0)	22.8 (13.0)	$F(1,62)=2.3$, $p=0.13$	0.5 0
SF-36						
PF	58.4 (19.2)	87.4 (17.6)	58.1 (21.4)	81.2 (17.1)	$F(1,62)=1.4$, $p=0.23$	0.3 7
RP	52.0 (37.0)	83.1 (34.3)	34.6 (34.7)	65.4 (40.2)	$F(1,62)=1.4$, $p=0.24$	0.3 7
BP	44.8 (23.4)	66.3 (28.4)	35.3 (22.0)	52.6 (30.5)	$F(1,62)=1.1$, $p=0.31$	0.3 2
GH	47.6 (21.3)	70.9 (27.0)	37.7 (20.1)	57.3 (20.5)	$F(1,62)=1.0$,	0.3

					p=0.32	2
					F(1,62)=6.0,	0.7
VT	39.2 (23.4)	61.7 (23.7)	27.3 (24.9)	39.6 (23.9)	p=0.02	7
					F(1,62)=0.1,	0.1
SF	73.2 (27.4)	83.3 (26.3)	50.0 (24.5)	72.5 (27.4)	p=0.74	1
					F(1,62)=4.9,	0.6
RE	71.3 (37.5)	87.1 (28.7)	52.8 (41.3)	56.4 (41.7)	p=0.03	9
					F(1,62)=4.0,	0.6
MH	68.5 (21.3)	79.5 (18.9)	52.6 (21.4)	60.9 (21.4)	p=0.05	4

These results show that participants with post-SBE had significantly more anxiety post-treatment than those with no post-SBE. In the CPRS-S-A dimensions of depression and OCD, medium effects sizes were shown for the differences. The results further show medium to large effect sizes for the HRQL dimensions, with the exception of the small effect found for Social Functioning (SF).

Pre- to post-treatment binge eating

Despite the methodological problems resulting from the use of different instruments for assessing binge eating pre- and post-treatment, a comparison of binge eating before and three years after surgery was inevitable. This comparison shows that only six out of the 29 post-SBE participants indicated pre-OBE. Two of these six participants indicated post-OBE. This comparison also shows that 6 of the 18 pre-OBE participants indicated post-SBE.

DISCUSSION

Our results show that objective binge eating was common before bariatric surgery. In agreement with some ^{12, 16-18, 49} but not all prospective studies ^{21, 22}, however, these binge eating participants did not have less successful long-term BMI outcomes. As mentioned above, comparison with previous research is difficult due to differences in methodology. The results once again force us to pay more attention to the rigor of the methodology used to address questions regarding the potential effects of objective or subjective binge eating on the long-term weight loss outcomes of bariatric surgery. Although our data show no significant relationships between objective binge eating and BMI three years after the surgery, important associations were found for objective binge eating post-surgery with the HRQL as well as level of psychopathology.

Subjective binge eating was also shown to be common after bariatric surgery, but the results fail to support the notion that subjective (or objective) binge eating post-treatment is associated with the long-term BMI outcome ^{11, 12, 19, 30}. However, only two studies suggesting such an association have used a diagnostic approach including subjective binge eating similar to that in the present study and

followed patients using a long-term approach for more than 2 years after treatment^{19, 30}. Both of these studies found that subjective binge eating post-treatment was associated with larger long-term weight regain; only in one of them³⁰, however, was subjective binge eating associated with long-term weight (not *regain* alone). An important difference between previous studies and the present one is that the previous studies only reported cases of binge eating that remained, re-emerged, or improved post-treatment. In spite of the obvious shortcomings resulting from the use of two different instruments in the present study, our data indicate that as many as 23 out of the 29 participants with post-SBE had no previous objective binge eating. If only objective binge eating post-treatment (post-OBE) is considered, the results show that as many as 11 out of the 13 participants that reported objective binge eating post-treatment did not report OBE pre-treatment. A potential explanation for these findings could involve the occurrence of subjective binge eating pre-treatment, but the validation of the EDO⁴² revealed that no participants denying objective binge eating pre-treatment exhibited subjective binge eating in the subsequent interview (Eating Disorders Examination: EDE). Thus, even considering the uncertainty of these data, the results indicate that a substantial number of post-treatment binge eaters most likely had no subjective or objective binge eating before surgery. A plausible explanation centres on the fact that the effect of surgery changes the context of eating dramatically. When patients are able to eat only very small amounts of food at one time, loss of control over eating might become more evident and allow new cases of SBE to emerge. Given the relationship between OBE/SBE and the HRQL and psychopathology, attention to patient eating habits and problems in the context of OBE and SBE should be considered an important part of the clinical assessment and post-surgical care of these patients instead of a matter of simple exclusion.

The present results further show that more than one out of every four participants in this study sample indicated subjective or objective binge eating post-treatment. The large number of binge eaters identified strongly questions studies that have shown that binge eating is markedly reduced or even absent post-treatment⁴⁹⁻⁵¹. These studies have all used the definition of binge eating in the DSM-IV³⁵, which requires the amount of food consumed to be objectively large. However, the definition states that the amount should be "...definitely larger than most people would eat /.../ *under similar circumstances*". "Similar circumstances" here would imply post-bariatric conditions, under which a normal amount of food for a person with no gastric restriction could be considered objectively large. While the wording of the DSM-IV definition does not prevent its use post-surgically, therefore, the difference between our results and those from studies using a subjective BE definition suggests that the post-bariatric *circumstances* may not be considered by the patients answering questions about binge eating. The use of a subjective binge eating

definition is thus suggested ^{11, 12}, and this definition is supported by research showing no differences in other aspects of psychopathology between patients with subjective and objective binge eating episodes ^{52, 53}. An ultimate remedy to these limitations and problems would be to conduct EDE interviews before and after surgery as well as at follow-up examinations.

We addressed possible differences arising from the use of a post-treatment binge definition based on eating either an objectively large amount of food ³⁵ or a subjectively large amount of food ^{38, 52, 53}. To do so, we compared the 16 participants that only indicated subjective binge eating with the 13 that also indicated objective binge eating post-treatment. There were no differences in the HRQL or other levels of psychopathology. This finding is in agreement with those from Colles and colleagues ³⁸, who argue that binge size is not associated with psychological distress. This comparison further shows that less than half of the patients with subjective or objective binge eating would have been classified as binge eaters post-surgery in the present study if only objective binge eating were considered. It is likely that more information regarding the association between binge eating and bariatric surgery outcomes will be obtained in the future if both objective and subjective binge eating are considered.

As discussed above, subjective binge eating post-treatment is shown to be common. However, patients engaging in this behaviour do not have less successful BMI outcomes. Subjective binge eating post-treatment was associated to more psychopathology and a lower HRQL. In light of these results, weight loss *per se* should not be sufficient for an outcome to be regarded as successful ³⁶. The overall success that has repeatedly been reported in bariatric treatment ²⁻⁸ may therefore require re-evaluation that takes into consideration post-treatment binge eating. As Mitchell and colleagues ³⁰ found an association between subjective binge eating and weight regain 13-15 years post-treatment, the influence of post-treatment binge eating on weight loss beyond 3 years after treatment also needs to be investigated further. Less successful treatment outcomes with regard to the HRQL and psychopathology indicate the need to address binge eating and other psychological health issues before and after bariatric weight loss treatments. Trained staff should assess and address these features using evidence-based methods both pre- and post-treatment.

The strengths of this study include its use of a large, naturalistic sample of patients who were prospectively assessed with validated instruments. The study has also had a long-term focus, following patients from before to three years after treatment. Another strength lies in the fact that the diagnostic difficulties of assessing binge eating, particularly those concerning binge eating after restrictive surgery, have been considered.

The main shortcoming is that two different, but validated, self-rating instruments of eating disorder symptoms have been used. Although both questionnaires assess binge eating according to the DSM-IV, the EDE-Q but not the EDO also assesses subjective binge eating. The change in instruments was motivated by results from recent research which has been discussed above. This change in instruments has unfortunately made direct comparisons of binge eating before and after difficult, but it has most likely improved the quality of the post-treatment assessments.

Since we aimed to obtain a large sample size and had limited resources, we chose to utilize self-report instruments for the assessment of eating behaviour. Although interview-based assessments would have been better, the EDE-Q is well validated^{44, 45} and the EDO was validated as a part of this research project⁴². Additionally, long-term weight figures were based primarily on self-report data. This deviation from the original plan occurred because clinical weight data were obtainable for an insufficient number of participants. Self-reported weights have previously been shown to differ from those assessed clinically. In the present study, the BMI was used to compare patients with and without binge eating. As the proportion of self-reported and clinically assessed data did not differ between groups, potential differences between these assessments are unlikely to have affected the results significantly.

A large number of participants were included in the project, but many of them never followed through with the treatment or underwent markedly delayed treatment. In addition, missing data across several variables during the three years of follow-up resulted in small subgroups for some of the comparisons. While dropout analyses indicated no significant differences between groups, such large dropout rates led to a loss of statistical power and potential uncertainty regarding the representative nature of the remaining sample.

Conclusion

In all, the results show that pre- and post-treatment binge eating behaviours were both unrelated to the long-term BMI outcome. However, post-treatment binge eating was common and was associated with higher levels of psychopathology and a lower quality of life. Despite satisfying weight loss in patients with post-treatment binge eating, the overall treatment outcome for these patients is unlikely to be experienced as successful. This finding suggests that the occurrence and potential negative effects of binge eating should be further addressed in the clinical practice of weight loss treatments as well as in future research.

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