

Binge Eating Among Gastric Bypass Patients at Long-term Follow-up

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Background: A better understanding of the relationship of eating behavior and attitudes to weight loss following gastric bypass (GBP) will enable the development of interventions to improve outcome. Thus, the present study sought to characterize the postoperative weight, eating behavior, and attitudes toward body shape and weight in a cross-section of GBP patients. A second objective was to examine the relationship of postoperative binge eating to surgery outcome.

Methods: 99 patients who underwent GBP >2 and <7 years before the study start date completed the Eating Disorder Examination-Questionnaire (EDE-Q) and the Three-Factor Eating Questionnaire (TFEQ). Subjects self-reported their current body weight, weight change over the past 3 months, and lowest weight since surgery.

Results: BMI remained significantly below the preoperative level, but significant weight regain was reported at long-term follow-up. 46% of participants reported recurrent loss of control over eating (objective or subjective bulimic episodes) on the EDE-Q. These patients constituted a distinctive subgroup with a less favorable outcome, including greater weight regain.

Conclusion: Self-reported loss of control over eating was related to weight regain after GBP and may be an important target for clinical intervention. The relationship of binge eating and related psychopathology to outcome following GBP warrants further investigation.

Key words: Morbid obesity, eating behavior, loss of control, weight maintenance, bariatric surgery

Presented in Part at the 9th International Conference on Eating Disorders, Academy of Eating Disorders, New York, NY, May 4-7, 2000.

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Introduction

In light of the poor long-term maintenance of weight loss associated with non-surgical treatment of obesity, the National Institutes of Health Consensus Development Conference Panel recommended that bariatric surgery be considered for well-informed, motivated, severely obese individuals with acceptable operative risks and for moderately obese individuals with high-risk comorbid conditions such as severe sleep apnea or severe diabetes mellitus.¹ The Panel endorsed the procedures of gastric bypass (GBP) and vertical banded gastroplasty (VBG). GBP involves restricting stomach capacity and bypassing parts of the stomach and intestine, and VBG involves restriction only. Most of the medical complications associated with severe obesity such as hypertension, diabetes, dyslipidemia, asthma, heart failure, and sleep apnea are reduced or eliminated with weight loss following bariatric surgery.² However, numerous independent, randomized studies have demonstrated superior weight loss following GBP vs VBG.³ Five years postoperatively, GBP patients lose 50 to 60% of their excess weight, whereas VBG patients lose 40 to 50%.²

The mechanisms whereby bariatric surgery produces weight loss may include malabsorption of nutrients, food aversion, decreased intake, altered

metabolism, or a combination of mechanisms.¹ Mean weight loss peaks at 16 months after operation.⁴ Overall failure rates, defined as “failure to lose significant weight or weight regain after significant weight loss”, have been estimated at 20%.³ This statistic highlights the importance of examining factors associated with poor weight loss or weight regain. It has been hypothesized that eating disorders such as binge eating disorder (BED) may account for poorer outcomes.² However, there is little information on the relationship of binge eating and related psychopathology to weight loss among bariatric surgery patients.

Our previous research documented that 39% of patients reported binge eating at least once per week before GBP, and binge eaters constituted a distinctive subgroup.⁵ At follow-up 4 months after operation, no binge eating was reported.⁶ Surgery had a positive overall short-term impact on depression, eating behavior, and attitudes toward eating and body shape and weight in non-binge and binge eaters alike.⁶ Given the short duration of follow-up, however, it is not known if these global improvements are maintained.

Hsu and colleagues^{7,8} conducted two retrospective pilot studies examining the relationship of eating problems to weight loss after GBP and VBG. These studies documented that BED, bulimia nervosa, night eating syndrome, and excessive fluid intake were relatively common before operation. Although limited by retrospective assessment methods and small sample sizes, these data also suggested that bariatric surgery may be associated with short-term improvements in eating disturbances that begin to erode at 2 years and are associated with weight regain. Ultimately, a better understanding of the relationship of eating behavior to weight loss could lead to the development of interventions to improve outcome among surgery patients.

Thus, the first objective of the present study was to characterize the postoperative weight, eating behavior, and attitudes in a cross-section of GBP patients in the weight maintenance phase. Numerous factors were assessed by self-report questionnaire including dietary restraint, disinhibition, hunger, various forms of overeating and inappropriate compensatory behaviors, and attitudes toward eating and body shape and weight. The sec-

ond objective was to examine the relationship of binge eating at follow-up to weight loss and maintenance.

Materials and Methods

Subjects

All patients who underwent Roux-en-Y gastric bypass (RYGBP) performed by the surgeon on the research team (REB) at least 2 years, but no more than 7 years, before the study start date were selected. The time window was chosen to capture the first years of the weight maintenance period. Of 190 eligible patients, 2 had died, and 6 others were excluded because they had a reversal of RYGBP or a subsequent surgery to improve weight loss.

Measures

The study was conducted primarily by self-report questionnaire in order to screen the large number of patients efficiently and to maximize the response rate.

Assessment of Weight-Related Variables:

Height, preoperative weight, and lowest weight recorded at an office visit at least 6 months after surgery were gathered from patients' medical records. A weight questionnaire was developed for this project and used to document current body weight at follow-up and lowest weight since surgery. Bariatric surgery patients' self-reported weights have been shown to be strongly and significantly correlated with their weights measured at the surgeon's office.^{9,10} Thus, the BMIs used for data analysis were based on patients' height and weight measured preoperatively (PRE), their lowest postoperative weight, either self-reported or measured (LOW), and self-reported weight at follow-up 2 – 7 years after operation (CURR).

Assessment of Binge Eating and Related Psychopathology:

The Eating Disorder Examination-Questionnaire (EDE-Q)¹¹ was used to assess the specific psychopathology of eating disorders over the previous 28 days. EDE-Q items are rated on a seven point,

forced choice scale ranging from 0 to 6, with higher numbers indicating greater severity or frequency of symptoms. Individual items are averaged to generate four subscales: Restraint, which pertains to conscious efforts to limit food intake; Eating Concern, which covers areas such as preoccupation with food and fear of eating in public; and Shape and Weight Concern, which involve dissatisfaction or preoccupation with body shape and weight, respectively. Several different forms of overeating are assessed: *an objective bulimic episode (binge)* is defined as consumption of a large amount of food accompanied by a sense of loss of control; *an episode of objective overeating* is consumption of a large amount of food without loss of control; and *a subjective bulimic episode* refers to the uncontrolled consumption of an amount of food that the subject, but not the interviewer, considers to be large. Inappropriate compensatory behaviors, including self-induced vomiting, laxative misuse, and diuretic misuse are also recorded. The Three-Factor Eating Questionnaire (TFEQ)¹² was used to obtain ratings of three dimensions of eating behavior including cognitive restraint, disinhibition, and hunger.

Procedure

Patients were mailed a package with a cover letter from the research team soliciting their informed consent along with the questionnaires and a postage-paid return envelope. Those who did not return their package within 2 weeks were called to encourage participation. Subjects who did not want to complete the questionnaires, but who were willing to provide information by telephone, were asked their current weight and a screening question about binge eating ("If I define a binge as eating within a concentrated period of time what most people would regard as an unusually large amount of food, how often have you binged in the past month?"). Those who could not be reached by telephone were sent a follow-up letter encouraging their participation.

The hallmark of a binge is a sense of loss of control over eating, and there has been debate in the literature as to whether the distinction between objective and subjective binges is clinically useful.¹³ In light of RYGBP patients' restricted capac-

ity to eat large amounts, objective and subjective bulimic episodes were combined for classification of patients as binge eaters. Patients were classified as binge eaters based on a cutoff of at least one episode of loss of control (objective *or* subjective bulimic episode) per week over the past 4 weeks on the EDE-Q.

Results

Participation Analysis

Of the 182 packages of questionnaires mailed to patients, 26 were returned because the individuals had moved without leaving a forwarding address. Thus, the final sample included 156 patients: 99 (63.5%) participants who returned the questionnaires, 15 (9.6%) partial participants who provided limited information by telephone, and 42 (26.9%) non-participants. Analyses of variance (ANOVAs) indicated that the groups did not differ in terms of preoperative BMI and lowest postoperative BMI measured at an office visit. However, there were significant differences in age, with the three groups aged 41.6, 37.8, and 37.0 respectively ($F(2, 153) = 3.3, p < .05$). A Tukey Test indicated that non-participants were significantly younger than participants before operation; partial participants did not differ from either group. A 2 X 2 repeated measures ANOVA comparing change in self-reported BMI for participants vs partial participants revealed a significant main effect for time only ($F(1, 110) = 288.8, p < .0001$), indicating that both groups reported a significant reduction in BMI at long-term follow-up.

Blacks were significantly less likely to participate than Whites were ($X^2(1, N = 156) = 4.1, p < .05$). Of the 156 patients who were invited into the study, 17 were Black (10.9%) and 139 were White (89.1%). However, of the 99 participants, only 7 were Black (7.1%) and 92 were White (92.9%).

Comparison of Binge and Non-Binge Eaters

At follow-up, 52 participants were classified as non-binge eaters (NBE), 44 were classified as

binge eaters (BE), and 3 could not be classified because they failed to rate subjective bulimic episodes on the EDE-Q. Two subjects failed to self-report their current body weight. NBE and BE did not differ significantly on any of the demographic variables presented in Table 1.

Repeated measures ANOVAs were used to compare BMI of the groups (BE, NBE) over time (PRE, LOW, and CURR). We found a main effect for time ($F(2, 184) = 605.3, p < .0001$) and a group by time interaction ($F(2, 184) = 3.1, p = .05$). Post-hoc analyses were then conducted. All pairwise comparisons of mean PRE, LOW and CURR BMI were significant, i.e. BMI was significantly reduced after operation (PRE vs LOW, $p < .0001$), and at follow-up BMI was significantly higher than the postoperative value (CURR vs LOW, $p < .0001$), yet BMI remained significantly lower than the preoperative value (PRE vs CURR, $p < .0001$). ANOVAs indicated that BE and NBE did not differ in their decrease in BMI after operation (PRE – LOW), but BE reported greater increases in BMI than NBE at follow-up (CURR – LOW). Specifically, BE reported a mean increase in BMI of 5.2 (4.4) from their postoperative low, whereas NBE reported a lesser increase of 2.5 (2.8), $F(1, 92) = 12.7, p < .001$. Translated into pounds, BE reported a regain of 13.9 (11.0) pounds from their postoperative low weight, whereas NBE reported a regain of 7.1 (7.9) pounds, $F(1, 92) = 12.0, p$

$< .001$. Similarly, when asked to report any weight change over the past 3 months, BE reported gaining 4.0 (4.6) pounds, whereas NBE reported a weight loss of 1.5 (7.5) pounds, $F(1, 91) = 18.1, p = .0001$.

Weight regain in BE vs NBE is shown in Figure 1. Finally, BE and NBE differed significantly with respect to TFEQ Restraint, Disinhibition, and Hunger in addition to EDE-Q Eating, Shape and Weight Concern as shown in Table 2.

Discussion

The present study sought to characterize the post-operative body weight, eating behavior, and attitudes in a cross-section of RYGBP patients and examine eating behavior at follow-up 2 through 7 years after operation. Similar to other investigations, patients in the present study experienced significant weight loss, but also reported significant weight regain at longer-term follow-up.^{4,14,15} However, the present investigation is notable in that we have documented that binge eating is associated with greater weight regain and robust differences in eating attitudes and behavior among a group of patients studied several years after surgery. Specifically, those who reported binge eating at long-term follow-up also reported gaining more since their preoperative low weight than non-bingers did. Moreover, binge eaters reported gaining weight over the 3 months before assessment, whereas non-bingers reported losing weight over the same 3-month period. Similarly, binge eaters

Table 1. Comparison of binge and non-binge eaters: Demographics

	NBE M (SD)	BE M (SD)
N	52	44
Male/Female	6/46	13/31
Age at operation (years)	42.8 (11.2)	40.4 (10.2)
Follow-up (years)	4.0 (1.4)	4.0 (1.5)
Body Mass Index (BMI)		
Preoperative ^a	49.7 (8.5)	48.8 (8.1)
Current ^b	33.1 (6.7)	34.4 (7.8)
Lowest ^c	30.7 (6.6)	29.1 (5.5)

Note: NBE=non-binge eaters, defined as less than 1 episode of loss of control per week (objective or subjective bulimic episode) over the past 4 weeks on Eating Disorder Examination-Questionnaire. BE=binge eaters, defined as at least 1 episode per week. ^abased on weight measured at surgeon's office, ^bbased on self-reported weight, ^cbased on weight measured at office of self-reported, whichever lower.

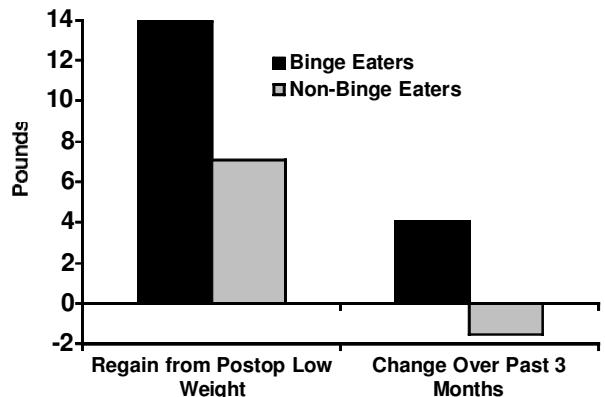


Figure 1. Weight maintenance as a function of binge eating.

Table 2. Comparison of binge and non-binge eaters: Questionnaires

	NBE N=52 M (SD)	BE N=44 M (SD)	F
TFEQ			
Restraint	12.7 (5.1)	10.1 (4.4)	7.3*
Disinhibition	5.7 (3.4)	10.0 (3.9)	34.0***
Hunger	4.1 (2.7)	7.6 (3.8)	27.6***
EDE-Q			
Restraint	2.4 (1.7)	2.3 (1.3)	NS
Eating Concern	1.3 (1.1)	2.6 (1.4)	24.9***
Shape Concern	3.4 (1.5)	4.5 (1.3)	15.7**
Weight Concern	2.6 (1.3)	3.6 (1.3)	14.9**

Note: NBE=non-binge eaters, defined as less than 1 episode of loss of control per week (objective or subjective bulimic episode) over the past 4 weeks on Eating Disorder Examination-Questionnaire. BE=binge eaters, defined as at least 1 episode per week. TFEQ=Three-Factor Eating Questionnaire. EDE-Q=Eating Disorder Examination-Questionnaire. NS=not significant, * $p<.05$, ** $p<.001$, *** $p<.0001$.

reported greater concerns related to eating, shape, and weight as well as less cognitive restraint, more disinhibition, and more hunger than non-bingers. Although longitudinal research is needed to determine if binge eating is a cause, correlate or consequence of poorer outcomes following surgery, these findings suggest that binge eating may be a marker of poorer outcome and an appropriate target for post-surgery intervention.

Study strengths include its large sample of patients having undergone a single procedure, RYGBP, and the use of standardized assessment instruments, the TFEQ and EDE-Q. However, it should be noted that the cross-sectional study design and reliance on self-report data limit interpretation of these findings. Research has called into question the accuracy of questionnaire-based assessment of binge eating in obese individuals.^{16,17} A binge is defined as uncontrolled consumption of a large amount of food, and much of the debate is focused on how one determines what constitutes a large amount of food. In the present study, this concern is mitigated by the fact that all patients had an operation that reduces gastric capacity. Thus, "binges" were defined by the subjective sense of loss of control rather than the quantity consumed.

As 26.9% of the patients targeted for the present study did not participate, findings may not be fully representative of gastric bypass patients. Non-participants were more likely to be Black and younger at the time of surgery than participants were. Minorities have demonstrated higher attrition and poorer weight losses than Whites in behavioral treatment programs.¹⁸ Researchers should aim to identify factors associated with drop-out and poor outcomes among minorities, and take this information into consideration when developing new surgical procedures or adjunctive treatments to improve outcome.

In summary, findings indicate that binge eating is relatively common in the weight maintenance phase and appears to be a behavioral source of variation in weight regain, suggesting an important target for intervention. As research to date has yielded virtually no predictors of outcome following RYGBP, these findings are significant, especially in light of other data suggesting that eating disturbances tend to persist after operation and are linked to poorer outcomes.^{7,8} Patients in the different phases – preoperative, postoperative, and longer-term adjustment – are likely to have unique concerns and treatment needs. Further study of the relationship of eating problems, such as binge eating, to outcome could contribute to the development of interventions to improve weight maintenance after gastric bypass.

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(Received August 10, 2001; accepted October 30, 2001)