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Optimizing long-term weight control after bariatric surgery: A pilot study

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Abstract

Background—Although bariatric surgery is associated with significant overall weight loss, many patients experience suboptimal outcomes.

Objectives—To document the preliminary efficacy of a behavioral intervention for bariatric surgery patients with relatively poor long-term weight loss and explore factors related to outcome.

Setting—Academic Medical Center, United States.

Methods—Patients with a BMI ≥ 30 who had undergone bariatric surgery at least 3 years prior to study entry and had less than 50% excess weight loss were enrolled. Participants were randomly assigned to a 6-month behavioral INTERVENTION or WAIT list control group. Assessments were conducted at baseline (pre-intervention), 6 months (post-intervention) and 12 months (6-month follow-up).

Results—On average, participants ($N = 36$) had surgery 6.6 years prior to study entry. Average age was $52.5 (\pm 7.1)$ years and BMI was $43.1 (\pm 6.2)$ kg/m²; most participants were female (75%) and White (88.9%). INTERVENTION patients had greater percent excess weight loss than WAIT at 6 months ($6.6 \pm 3.4\%$ versus $1.6 \pm 3.1\%$) and 12 months ($5.8 \pm 3.5\%$ versus $0.9 \pm 3.2\%$), but differences were not significant and results were variable. INTERVENTION patients with more depressive symptoms ($p = .005$) and less weight regain prior to study entry ($p = .05$) experienced greater percent excess weight loss.

Conclusions—Behavioral intervention holds promise in optimizing long-term weight control after bariatric surgery. More research is needed on when to initiate intervention and to identify which patients will benefit from this type of approach.

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Keywords

Bariatric surgery; gastric bypass; weight loss; long-term follow-up; lifestyle intervention; behavioral weight control

Although bariatric surgery has been associated with reductions in obesity and its comorbidities,^(1, 2) a significant minority of patients experience inadequate weight loss or long-term weight regain.^(3–5) Currently, treatment options for individuals with suboptimal outcomes after bariatric surgery are limited, and research is needed to inform the management of this subgroup of patients.

Weight loss requires sustained changes in energy balance, and both compliance with postoperative dietary guidelines⁽⁶⁾ and greater physical activity⁽⁷⁾ have been related to outcome after bariatric surgery. Accordingly, interventions that target diet and physical activity may help to optimize postoperative weight control. Moreover, available data suggest that postoperative patients may be more receptive to behavioral intervention than preoperative patients.⁽⁸⁾

Comprehensive lifestyle interventions that include diet, physical activity, and behavior modification strategies induce losses of approximately 10% of initial weight with nonsurgical samples.⁽⁹⁾ Weight losses of this magnitude have been associated with significant short-term improvements in obesity-related health parameters such as a reduction in the incidence of diabetes in persons at high risk⁽¹⁰⁾ and improvement in cardiovascular risk factors among severely obese individuals.⁽¹¹⁾

In summary, there are compelling reasons to evaluate behavioral approaches to optimizing long-term weight control after bariatric surgery. We conducted a randomized, controlled pilot study to document the preliminary efficacy of an evidence-based lifestyle intervention adapted for bariatric surgery patients with suboptimal outcomes.⁽¹²⁾ In light of findings indicating that binge or “loss of control” eating⁽¹³⁾ and depression⁽¹⁴⁾ may be associated with postoperative weight loss, we explored the impact of these and other factors on intervention outcome.

Materials and Methods

Participants

Patients over age 21 years were eligible to participate if they had undergone bariatric surgery at least 3 years prior to study enrollment and had lost less than 50% excess weight from presurgery to study enrollment. Patients were excluded for: 1) BMI < 30; 2) Participation in a weight management program in the 6 months prior to study enrollment; 3) Psychiatric problems sufficiently severe to require immediate treatment (e.g., severe depression or suicidality); 4) Pregnant or lactating in the previous 6 months, or planning to become pregnant in the next year; 5) Taking a medication known to affect body weight in the previous 6 months (e.g., oral steroid or antipsychotic); 6) Mental retardation or psychosis; and 7) Participation in a conflicting research protocol in the past 6 months. Patients were required to obtain written clearance from their primary care physician (PCP) to participate in the study. Additionally, each patient’s bariatric surgeon was contacted to provide historical information and clearance to participate, including an upper gastrointestinal (GI) series to document that surgical anatomy was intact.

Procedure and Measures

Participants were recruited from flyers distributed to local bariatric surgeons and newspaper advertisements. Patients who called the study were provided with a brief overview and screening. Those who appeared to be interested and eligible were invited to attend an informational meeting where they provided written informed consent prior to beginning the baseline assessment. The study was approved by the University of IRB.

Participants were compensated for participation in study assessments. After completing the baseline assessment, patients were randomized to INTERVENTION or WAIT list control. Follow-up weights were collected at 6 months (post-intervention) and 12 months (6-month post-intervention follow-up).

Patient Characteristics

An investigator-designed questionnaire was used to collect demographic data including sex, age, race/ethnicity, education and marital status. Patients' surgeons provided historical information including type of procedure, date of surgery, preoperative body weight, and postoperative low weight (nadir).

Body Weight and Height

Weight was measured at each assessment point using a digital scale. Height was measured at study entry using a mounted stadiometer. Participants were weighed and height measured in street clothes, without shoes. BMI was calculated as weight in kilograms divided by the square of height in meters. Percent excess weight was based on reference to the 1983 Metropolitan Insurance Tables for a person of medium frame.

Eating Disorder Examination (EDE⁽¹⁵⁾)

The overeating section was used to assess episodes of binge eating over the last 6 months. Due to bariatric surgery patient's restricted gastric capacity, a binge was defined as uncontrolled overeating independent of whether the amount consumed was rated as "subjectively" or "objectively" large.

Beck Depression Inventory (BDI⁽¹⁶⁾)

The original version of this widely used, psychometrically sound self-report questionnaire was used to assess current depressive symptoms.

Behavioral Intervention

The intervention was based on a behavioral weight control program developed by the University of Obesity and Nutrition Research Center (ONRC), and a description of the program has been published previously.⁽¹²⁾ The program was designed to instill realistic expectations regarding weight loss outcome (5% to 10% of initial body weight), or 1 – 2 pounds per week.

The objective was to decrease caloric intake through diet and increase energy expenditure through physical activity. Participants were given a calorie range of 1200–1400 calories per day and instructed to maintain a balanced diet based on the Food Guide Pyramid and postoperative dietary guidelines. Patients were prescribed an exercise program based on their choice of activity (e.g., walking or swimming). Strategies for increasing lifestyle activity (e.g., taking the stairs) and increasing involvement in activities of daily living also were emphasized. Participants were assisted in self-monitoring and setting small, incremental goals for lifestyle change. The skills required to make the recommended behavior changes were modeled, practiced, and reinforced throughout the program.

Key adaptations for bariatric surgery patients with suboptimal outcome included 1) information about how surgery facilitates weight loss and the role of long-term self-management; 2) addressing specific post-surgery eating behaviors associated with poor weight loss such as binge or “loss of control” eating, frequent eating episodes, and over consumption of high calorie liquids; and 3) utilizing the group to enhance social support for behavior change.

A combination of face-to-face group meetings and telephone coaching were utilized to minimize participant burden while maximizing the intensity of counseling. The intervention occurred in 12 weekly group meetings followed by 5 bi-weekly telephone coaching sessions, extending over approximately 6 months. Group meetings lasted 1 hour, consisting of a weigh-in, review of self-monitoring records and homework, and a didactic presentation. Telephone coaching was shorter in duration (15 – 20 minutes). Interventionists were master’s level therapists who received training in obesity treatment and bariatric surgery.

Statistical Analysis

We first compared baseline characteristics between the two groups by using the Wilcoxon rank sum test for continuous variables and the Fisher’s exact test for categorical variables (non-parametric tests were used because of small sample size and marked variability in patient body weight). Mixed effect models were used to examine percent excess weight loss during the study period. We used SAS to fit mixed models with fixed effects, including terms for group, time and group by time. Planned contrasts were used to compare differences in percent excess weight loss over time between the two groups. We also compared patients who attended at least 75% of group sessions (9 out of 12) to those who attended fewer than 75%. Finally, we explored the relationships between percent excess weight loss and baseline variables (demographics, weight regain since postoperative nadir, years since surgery, depressive symptoms and binge eating) within each group by using the Wilcoxon test for categorical baseline variables and the Spearman’s correlation coefficients for continuous covariates.

Results

Recruitment and Retention

Patient recruitment and flow are shown Figure 1. Of note, the main reason for ineligibility among interested callers to the study (80/99; 80.8%) was reporting greater than 50% excess weight loss since surgery. Thirty six patients met all eligibility criteria, completed the baseline assessment, and were randomized. Retention was 33/36 (91.7%) at 6 months and 29/36 (80.5%) at 12 months. Retention did not differ by group at 6 or 12 months (p ’s = 0.23 and 0.40, respectively).

Patient Characteristics

Patient characteristics are shown in Table 1 and did not differ by group (all p ’s > .06). Participants ($N = 36$) had previously undergone gastric bypass surgery ($n = 29$; 80.6%), revision of their primary surgery to a secondary gastric bypass ($n = 4$; 11.1%), laparoscopic adjustable gastric banding ($n = 2$; 5.6%), and vertical banded gastroplasty ($n = 1$; 2.8%).

Attendance and Weight Change

Participants randomized to INTERVENTION attended 7.8 ± 3.8 out of 12 face-to-face group meetings. Mean weight change was -3.3 ± 8.1 kg (range -20.2 to 5.9) at 6 months and -3.6 ± 9.6 kg (range -21.1 to 8.8) at 12 months. The corresponding values in WAIT were -1.3 ± 6.8 (range -22.9 to 5.8) and -0.6 ± 6.7 (range -15.0 to 8.2 kg), respectively.

Patients who gained weight during the intervention did not differ from those who lost weight in baseline characteristics (all p 's > .06).

Modeled outcomes for percent excess weight loss by group over time are shown in Figure 2 [$F(1,32) = 0.12$, $p = 0.28$]. INTERVENTION had greater excess weight loss than WAIT at 6 months ($6.6 \pm 3.4\%$ versus $1.6 \pm 3.1\%$, $p = .29$) and 12 months ($5.8 \pm 3.5\%$ versus $0.9 \pm 3.2\%$, $p = .32$). The corresponding effect sizes were 0.35 and 0.33, respectively.

INTERVENTION patients who attended at least 75% of the group meetings ($n = 10$) had the greatest excess weight loss, but results were not significant.

Factors Related to Weight Change

Higher levels of depressive symptoms at baseline were associated with greater excess weight loss in INTERVENTION, but not WAIT. The Spearman coefficients were 0.54 ($p = 0.04$) between the baseline BDI and percent excess weight loss from baseline to 6 months and 0.73 ($p = 0.005$) at 12 months in INTERVENTION. Presence of at least one binge per week over the 6 months prior to study entry was unrelated to percent excess weight loss in either group.

Greater weight regain from post-surgery nadir to study entry was associated with significantly lower percent excess weight loss from baseline to 12 months in INTERVENTION, but not WAIT. The Spearman coefficients were -0.28 ($p = 0.31$) at 6 months and -0.55 ($p = 0.05$) at 12 months in INTERVENTION. Number of group sessions attended was unrelated to percent excess weight loss in INTERVENTION (p 's = 0.16 and 0.61 at 6 and 12 months, respectively). Age, sex, race, years since surgery, and type of surgery were unrelated to excess weight loss in either group.

Discussion

This pilot study reports the preliminary efficacy of a behavioral intervention for bariatric surgery patients with relatively poor weight loss. Study strengths include documentation of an intact surgical procedure, a randomized controlled design, an evidence-supported intervention, and good retention of participants. Excess weight loss was promising during the 6-month intervention, with patients who completed at least 75% of sessions exhibiting the best trajectory. Results are consistent with data indicating that attendance and compliance are related to success in obesity investigations of nonsurgical samples.^(17, 18) Thus it may be possible to improve the results of postoperative behavioral intervention with additional strategies to improve patient motivation and engagement.

There was marked variability in outcomes among study participants, with some patients continuing on an upward weight trajectory despite behavioral intervention. We explored whether binge eating⁽¹³⁾ and depressive symptoms,⁽¹⁴⁾ two factors that have been associated with weight loss after bariatric surgery, were associated with weight trajectory during the study. Binge eating was not associated with excess weight loss in either group. However, individuals with more depressive symptoms at study entry had better intervention outcome, suggesting that the cognitive-behavioral strategies utilized may carry particular benefits for these patients. Additionally, patients with the least weight regain prior to initiating the intervention exhibited better outcomes. Additional research is needed to understand who may or may not benefit from strategies for self-management and to identify the best time to initiate behavioral intervention in the post-surgical course.

Recruitment data indicate that patients with relatively successful outcomes also may be receptive to postoperative behavioral intervention. That is, over half of interested callers were ineligible for the study because they did not meet the criterion for suboptimal weight

loss. Research has suggested that patients who maintain a substantial weight loss after bariatric surgery report more fat consumption and less physical activity than those who lose weight without surgery.⁽¹⁹⁾ Therefore even patients with relatively successful weight loss may benefit from strategies for self-management of behavior.

Conclusions

Although weight loss in response to the behavioral intervention was encouraging, outcomes were variable. Due to the small sample and lack of information on changes in dietary intake, the factors associated with weight loss are not understood fully. Additionally, because the large majority of participants were female, results may not generalize to males. It should also be noted that the pilot study included patients who had undergone a variety of surgical procedures, including secondary ones. Results require replication, and larger scale trials are needed to document whether type of bariatric surgery, timing and magnitude of weight regain, compliance with diet and physical activity recommendations, or other patient characteristics are related to intervention outcome.

Our experience suggests that bariatric surgery patients would be likely to benefit from ongoing management with sequential application of techniques that have proven useful in obesity studies utilizing a chronic care model.^(20, 21) It may be useful to provide behavioral strategies for self-management earlier in the postoperative course to address modest weight regain before it becomes a continuing problem with long-term consequences. Additional strategies to promote compliance might include meal replacements, home exercise equipment, behavioral techniques, or pharmacotherapy. Findings from this pilot investigation support the utility of developing evidence-based programs to enhance and extend the health benefits of bariatric surgery for all patients.

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Figure 1.
Participant recruitment, randomization and follow-up.

Figure 2.
Modeled outcomes over time.

Table 1

Participant Characteristics (N = 36)

	INTERVENTION (n = 18)	WAIT (n = 18)	p
	Mean (SD)	Mean (SD)	
Age (years)	51.0 (7.6)	53.9 (6.6)	.24
Preoperative BMI (kg/m ²)	54.3 (8.8)	52.1 (8.8)	.38
Preoperative weight (kg)	150.5 (32.9)	139.8 (26.1)	.30
Postoperative low weight (kg)	105.3 (22.2)	97.2 (20.4)	.17
Years since surgery	6.6 (3.4)	6.6 (4.8)	.46
Weight at study entry (kg)	124.3 (26.5)	111.0 (16.6)	.07
BMI at study entry (kg/m ²)	44.9 (7.0)	41.4 (5.0)	.16
% excess weight loss at study entry	29.5 (8.9)	34.1 (14.1)	.07
Excess weight at study entry (kg)	62.5 (23.3)	50.8 (14.7)	.08
BDI score at study entry	11.1 (10.3)	11.6 (8.8)	.53
Binge episodes/week over 6 months prior to study entry	3.4 (6.8)	2.7 (4.9)	.67
	%	%	
White	77.8	72.2	> .99
Female	83.3	94.4	.60
Married	76.5	61.1	.47
College educated	35.3	38.9	> .99
Self-reported history of substance problems	0.0	7.1	> .99
Self-reported history of depression	33.3	50.0	.49
BDI > 14 at study entry	22.2	27.8	> .99
weekly binges at study entry	50.0	33.3	.49

Legend. BMI = Body Mass Index; BDI = Beck Depression Inventory.