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Original article

Relationship between depression, weight, and patient satisfaction 2 years after bariatric surgery

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Abstract

Background: Findings regarding longer term symptoms of depression and the impact of depression on outcomes such as weight loss and patient satisfaction, are mixed or lacking.

Objectives: This study sought to understand the relationship between depression, weight loss, and patient satisfaction in the two years after bariatric surgery.

Setting: This study used data from a multi-institutional, statewide quality improvement collaborative of 45 different bariatric surgery sites.

Methods: Participants included patients (N = 1991) who underwent Roux-en-Y gastric bypass (RYGB) or sleeve gastrectomy (SG) between 2015–2018. Participants self-reported symptoms of depression (Patient Health Questionnaire-8 [PHQ-8]), satisfaction with surgery, and weight presurgery and 1 year and 2 years postsurgery.

Results: Compared to presurgery, fewer patients' PHQ-8 scores indicated clinically significant depression (PHQ-8 ≥ 10) at 1 year ($P < .001$; 14.3% versus 5.1%) and 2 years postsurgery ($P < .0001$; 8.7%). There was a significant increase in the prevalence of clinical depression from the first to second year postsurgery ($P < .0001$; 5.1% versus 8.7%). Higher PHQ-8 at baseline was related to less weight loss (%Total Weight Loss [%TWL] and %Excess Weight Loss [%EWL]) at 1 year postsurgery ($P < .001$), with a trend toward statistical significance at 2 years ($P = .06$). Postoperative depression was related to lower %TWL and %EWL, and less reduction in body mass index (BMI) at 1 year ($P < .001$) and 2 years ($P < .0001$). Baseline and postoperative depression were associated with lower patient satisfaction at both postoperative time points.

Conclusions: This study suggests improvements in depression up to 2 years postbariatric surgery, although it appears that the prevalence of depression increases after the first year. Depression, both pre- and postbariatric surgery, may impact weight loss and patient satisfaction. (Surg Obes Relat Dis 2021;17:366–371.) © 2020 American Society for Bariatric Surgery. Published by Elsevier Inc. All rights reserved.

Key words: Depression; Weight loss; Psychological; Patient satisfaction

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As the most effective treatment for severe obesity, bariatric surgery has a substantial impact on both resolution of medical co-morbidities and improved quality of life (QOL). Nonetheless, compared to the general population, there are higher rates of depression among patients with morbid obesity [1–4] and even higher rates among bariatric surgery candidates [1,5–7]. Findings regarding the longer-term impact of depression on outcomes, such as weight loss and patient satisfaction after bariatric surgery, are mixed or lacking. Thus, this study sought to examine the trajectory of depression from presurgery to 2 years postsurgery, and to understand the relationship between depression, weight loss outcomes, and patient satisfaction.

A 2016 meta-analysis by Dawes et al. concluded that the majority of prior research (11 of 12 studies) has found improvements in depression after bariatric surgery, both in terms of depression prevalence and frequency and severity of symptoms [4]. The majority of studies examined depression 1–3 years postoperatively. It is especially important to manage depression after bariatric surgery given the higher relative risk of suicide attempts [2,8] and completed suicide [9,10] in bariatric surgery patients. Furthermore, depression may impact other postoperative outcomes such as weight loss or patient satisfaction.

Prior research examining the relationship between depression and weight loss in the year after bariatric surgery is mixed, with some studies suggesting there is no relationship between depression and weight outcomes [11–13]. It is possible that depression may not influence weight loss in the short-term because initial weight loss is more driven by metabolic changes than psychological or behavioral factors. Indeed, more longitudinal research by White et al. [13] and Legenbauer et al. [14] found that depression was associated with poorer weight loss outcomes 2 and 4 years postsurgery, respectively.

Not surprisingly, more weight loss is typically associated with higher patient satisfaction [15], an increasingly important measure of quality healthcare. To date, there is no research examining the relationship between depression and patient satisfaction after bariatric surgery. Because negative schemas about one's self, others, and the world are associated with clinical depression [16,17], it could be expected that depression would also lead to negative thoughts about bariatric surgery and therefore lower patient satisfaction. There were 2 aims to this study: 1) To examine how prevalence of depression changes from presurgery to 1 year and 2 years postsurgery and 2) To investigate how depression is related to weight loss and patient satisfaction with surgery.

Methods

Patients and procedure

This study used data from a multiinstitutional, statewide quality improvement collaborative of 45 different bariatric surgery sites, including patients who underwent

Roux-en-Y gastric bypass (RYGB) or sleeve gastrectomy (SG) between 2015–2017. Procedures were completed with Institutional Review Board approval. All patients across all sites were invited to participate. Patients completed surveys before surgery and 1 and 2 years postsurgery. Surveys were either sent by mail or administered via telephone, and patients self-reported demographic information, medical co-morbidities, symptoms of depression, satisfaction with surgery, and BMI.

Due to significant attrition from year 1 to year 2 after surgery, participants were included only if they completed the baseline presurgical questionnaire as well as the postoperative questionnaires at both year 1 and 2 after surgery. Despite attempts to retain participants over time via reminder phone calls and mailings, the response rate dropped from 50.3% at year 1 to 24.3% at year 2 after surgery. Because an attempt to impute missing data for the year 2 time-point would require imputing over two thirds of the year 2 sample, we restricted the sample to those participants with complete data for our variables of interest. Participants were excluded if they were missing postoperative questionnaires, underwent a surgical procedure other than RYGB or SG, or were pursuing a revisional bariatric procedure.

Measures

The first 8 items of the Patient Health Questionnaire (PHQ-8) were used to assess symptoms of depression. The PHQ-8 reflects the criteria for major depressive disorder (MDD) as stated in the *Diagnostic and Statistical Manual of Mental Disorders* [18]. The full PHQ-9 includes one item assessing suicidal ideation, excluded from this study due to inability to further assess or quickly intervene if suicidal ideation was indicated. To denote clinical depression, we used a PHQ-8 score of 10 or greater as has been done in other work [19].

Patient satisfaction was assessed with 1 item asking participants, “Overall, how satisfied are you with your bariatric surgery?” Responses were given on a 5-point Likert scale ranging from “very dissatisfied” to “very satisfied.”

Weight loss outcomes, including change in BMI (Δ BMI = baseline BMI – postoperative BMI), total weight loss (TWL = baseline weight – postoperative weight), percent total weight loss (%TWL = [(baseline weight) – (postoperative weight)] / [(baseline weight)] \times 100), and percent excess weight loss (%EWL = [(baseline weight) – (postoperative weight)] / [(baseline weight) – (ideal weight)], in which ideal weight is defined by the weight corresponding to a BMI of 25 kg/m²) were calculated using patients' self-reported weight pre and postsurgery.

Analyses

Patient demographic characteristics were examined for all patients who had PHQ scores at baseline, year 1 and year 2 after surgery. McNemar tests [20] were used to determine

Table 1
Presurgical demographic characteristics by surgery type

	Total (N = 1991)		RYGB (n = 324)		Sleeve (n = 1667)		P Value
	M	SD	M	SD	M	SD	
Age at surgery	47.61	11.63	47.72	11.20	47.58	11.72	.8431
Baseline BMI	47.42	8.04	48.55	8.42	47.20	7.94	.0058
Baseline PHQ-8	4.53	4.66	4.44	5.11	4.55	4.57	.7322
	n	%	n	%	n	%	P Value
Gender							
Female	1573	79.0	262	80.86	1311	78.64	.4122
Male	418	21.0	62	19.14	356	21.36	
Race/Ethnicity							
White	1603	81.3	258	79.88	1345	81.61	.5686
Black	219	11.1	36	11.15	183	11.10	
Other	149	7.6	29	8.98	120	7.28	

RYGB = Roux-en-Y gastric bypass; Sleeve = sleeve gastrectomy; SD = standard deviation; BMI = body mass index; PHQ-8 = Patient Health Questionnaire-8.

Bold value indicates statistical significance.

differences in prevalence of clinical depression (those with a PHQ-8 score ≥ 10 versus those with a PHQ-8 score < 10) before and after bariatric surgery. Longitudinal multiple linear regression was used to determine if there was a significant change in depression over time while controlling for surgical procedure and other baseline patient characteristics (gender, white race, employment status, college versus no college, marital status, age, income, and private insurance).

To test the relationship between depression scores and weight over time we calculated the Pearson correlation coefficients between PHQ-8 and weight at each time point (baseline, 1 year and 2 years postsurgery), and between PHQ-8 and BMI at each time point. Spearman's rho correlation coefficients were also calculated to examine the association between depression scores and patient satisfaction scores.

All statistical analyses were performed using SAS software version 9.4 (SAS Institute Inc, Cary, North Carolina, USA).

Results

Participants (N = 1991) had a mean age of 48 years, were predominantly female (79%), white (81%) and had a mean preoperative BMI of 47.4 kg/m² (see Table 1). Approximately 84% of patients underwent SG, with the remaining patients undergoing RYGB. Bypass patients lost significantly more weight as measured in TWL (45.4 kilograms versus 38.7 kilograms, $P < .001$), %TWL (35.59% versus 28.81%, $P < .001$), %EWL (70.63% versus 56.65%, $P < .001$), and Δ BMI (17.88 versus 13.74, $P < .001$). Despite attrition from 1 year to 2 years after surgery, this sample was demographically similar to bariatric patients across institutions in the collaborative.

The prevalence of clinical depression at each time-point can be found in Table 2. Preoperatively, 14.3% of patients'

PHQ scores were consistent with clinically significant depression. Prevalence of postoperative clinical depression at 1 year was significantly lower, 5.1% ($P < .0001$). Though prevalence of clinical depression at 2 years postsurgery was still significantly lower than preoperative ($P < .0001$), it was also significantly higher than prevalence of clinical depression at 1 year postsurgery, 8.7% ($P < .0001$). Longitudinal multiple regression showed no significant differences in depression scores based on surgery type when controlling for other patient characteristics ($P = .6079$). Among participants with clinically significant depression scores at 1 year, 52.9% were newly emerging cases that did not report depression presurgery whereas the rate of newly emerging cases was 64.7% at 2 years.

Findings regarding the association between depression and weight loss outcomes can be found in Table 3. With regard to preoperative depression and weight loss, higher PHQ-8 scores at baseline were related to less TWL at 1 year postsurgery and 2 years postsurgery. Higher baseline PHQ-8 scores were also associated with less %TWL at 1 year, with a trend toward clinical significance at 2 years ($P = .06$). Findings regarding the relationship between postoperative depression and weight loss were more robust. At year 1 postsurgery, higher depression scores were related

Table 2
Prevalence of clinical depression (PHQ-8 ≥ 10)

	Clinically depressed		No clinical depression		P value	
	n	%	n	%	versus baseline	versus Y1
Baseline	243	14.3	1455	85.7	-	-
Year 1	87	5.1	1611	94.9	< .0001	-
Year 2	148	8.7	1550	94.2	< .0001	< .0001

PHQ-8 = Patient Health Questionnaire-8.

Bold values indicate statistical significance.

Table 3
Pearson correlation coefficients depicting associations between depression and weight loss outcomes

	Y1 TWL	Y1 %TWL	Y1 %EWL	Y2 TWL	Y2 %TWL	Y2 %EWL	Y2 ΔBMI
Baseline Depression	-.07*	-.06 [†]	-.04	-.05 [†]	-.05	-.03	.04
Y1 Depression	-.08*	-.09 [‡]	-.08 [‡]	-.06*	-.08*	-.08*	.06*
Y2 Depression	-	-	-	-.12 [‡]	-.14 [‡]	-.14 [‡]	.11 [‡]

TWL = total weight loss; %TWL = percent total weight loss; %EWL = percent excess weight loss; ΔBMI = change in body mass index; Y1 = 1 year after surgery; Y2 = 2 years after surgery.

* $P < .01$.

[†] $P < .05$.

[‡] $P < .001$.

to less TWL, %TWL, and %EWL. Higher PHQ-8 scores at year 1 were also related to less TWL, %TWL, %EWL, and ΔBMI at year 2. Finally, even after controlling for baseline depression, higher PHQ-8 scores at 2 years after bariatric surgery were associated with less %TWL ($P < .001$) and %EWL ($P < .0001$) at the second year mark.

Over 3 quarters of patients were very satisfied with their surgery at both postoperative time points (88.1% at year 1, 79.9% at year 2). RYGB patients reported slightly higher patient satisfaction at year 1 ($M_{RYGB} = 4.84$, $SD = .53$; $M_{SG} = 4.78$, $SD = .62$) and year 2 ($M_{RYGB} = 4.76$, $SD = .67$; $M_{SG} = 4.64$, $SD = .81$). As expected, patients who lost more weight reported higher levels of patient satisfaction at 1 year ($r_s = .25$, $P < .0001$) and 2 years ($r_s = .34$, $P < .0001$) after surgery. Baseline depression was also associated with lower patient satisfaction after 1 ($r_s = -.08$, $P < .0001$) and 2 years ($r_s = -.10$, $P < .0001$). Postsurgical depression related to lower patient satisfaction at both time points (year 1 $r_s = -.31$; year 2 $r_s = -.31$; $P < .0001$), even after controlling for weight loss and other patient factors which were significantly related to satisfaction (i.e., race, marital status, age, and income).

Discussion

The purpose of this study was to understand the relationship between depression, weight loss, and patient satisfaction in the 2 years after bariatric surgery. This work is important because findings regarding medium to longer term symptoms of depression and the impact of depression on outcomes, such as weight loss and patient satisfaction, are mixed or lacking.

Our results indicated that the proportion of patients with PHQ-8 scores indicating clinically significant depression is lower in the 2 years after bariatric surgery compared with the proportion of preoperative depression. However, it appears that the proportion of patients with clinical depression begins to increase between year 1 and 2 postoperatively. Previous studies have showed similar trends to our findings, with depression increasing at the 2–3-year mark, although among our patients, it appears that depression may begin to return sooner [13,21].

There are several potential explanations for changes in depression over time. Lower depression scores postsurgery likely reflect improved self-esteem, physical functioning, and QOL, which have been demonstrated after significant weight loss from bariatric surgery [22]. Furthermore, the majority of excess weight loss occurs in the first year after surgery [23], and this time of rapid weight loss can be exciting and rewarding for patients who have struggled with obesity for many years. The finding that the proportion of participants with clinical depression began to increase from year 1 to year 2 postoperatively could similarly be explained in that this is when weight loss often begins to plateau and some patients will begin to experience weight regain [23]. Indeed, we found that postoperative depression was related to less total weight loss at both 1 and 2 years after surgery. Thus, weight regain may lead to relapse of depression in some patients.

Another explanation for increase of depression after surgery is the change in absorption of psychotropic medications, with many patients requiring psychotropic medication adjustments after bariatric surgery [24]. Relatedly, if patients prematurely terminate psychotherapy or medication management due to initial improvement in mood after surgery, symptoms of depression may relapse. Symptoms such as changes in appetite, low motivation and energy, sleep disturbance, and feelings of helplessness may lead to poor adherence to the postsurgical regimen. Furthermore, higher rates of postsurgical substance use including alcohol use may negatively impact mood [25]. Other potential contributors to increasing depression in the years after surgery include excess skin and associated body image dissatisfaction as well as changes in relationships including a higher divorce rate [26]. Additional longitudinal research is needed to better understand the trajectory of depression and weight regain after bariatric surgery.

Similar to previous research finding that the vast majority of patients are satisfied with bariatric surgery [27,28] we found high rates of patient satisfaction postoperatively. As expected, less weight loss was related to lower patient satisfaction. Interestingly, depression both before and after bariatric surgery was correlated with lower patient satisfaction. Postoperative depression was related to lower

satisfaction, even after controlling for weight loss. This may be explained by negative cognitions which are a hallmark of depression. That is, individuals who are clinically depressed are more likely to have a negative worldview and thus may perceive the results of bariatric surgery less positively. Lower patient satisfaction may also be related to excess skin, persistent negative body image despite weight loss [28,29], or continued weight stigma as BMI typically remains in the overweight range following bariatric surgery [30].

This study contributes to the existing literature on the relationship between depression and weight loss after bariatric surgery, and provides novel insights into the relationship between depression and patient satisfaction. Nonetheless, there are several limitations. Depression was measured at discrete time points utilizing a self-report questionnaire; though the PHQ is a validated measure of depression, we were unable to capture symptoms of depression between the 1- and 2-year time points or a history of depression before the administration of the baseline questionnaire. The cross-sectional PHQ scores potentially explain the finding that over half of participants with clinically significant depression scores did not endorse depression presurgery; these individuals may have a lifetime history of depression that is not captured by the one-time preoperative assessment. Furthermore, we did not examine whether patients were engaged in psychiatric treatment such as psychotherapy or medication management, which could influence changes in depressive symptoms over time. Psychotropic medications can also be associated with weight gain, which could have influenced our results. There were also high rates of attrition postsurgery and a significant number of patients who were excluded due to missing data. We are unable to determine if those lost to follow-up or excluded were in some way systematically different from those retained. For example, it is possible that patients with depression were less likely to participate or that those who were more satisfied were more likely to complete postoperative questionnaires. Though we reported statistically significant correlations between weight loss and satisfaction, the relationships should be characterized as weak to moderate associations. The measurement of patient satisfaction is also a notable limitation as this study utilized one question assessing overall satisfaction on a 5-point Likert scale rather than a more comprehensive measure which would allow assessment of satisfaction related to different domains (e.g., satisfaction with weight loss versus satisfaction with improvements in medical co-morbidities). Finally, as noted previously, the analyses were correlational and we are unable to determine if weight regain leads to resurgence of depression, or vice versa.

Conclusions

Depression postoperatively was associated with less weight loss and less satisfaction with bariatric surgery. Preoperative depression, though related to less weight loss at

year 1, was not significantly associated with weight loss at year 2. Though the proportion of patients with clinical depression decreased from pre- to postsurgery, the proportion of patients with depression was significantly higher 2 years after bariatric surgery compared with 1 year postoperatively. Further longitudinal study of depression, weight, and patient satisfaction will be important in determining sustainability or recidivism.

Disclosures

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