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The Effect of Marital Status on Weight Loss After Bariatric Surgery is Moderated by Depression

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Abstract

Background: Presence of depression and /or a lack of appropriate social support may exert deleterious effects on postoperative weight loss in bariatric surgery patients. The purpose of this study was to investigate the interactive effects of surgical procedure and marital status on weight loss in these patients, and to assess the impact of depression on these effects.

Methods: A retrospective review was performed of patients who underwent laparoscopic gastric bypass or banding surgery (LRYGB or LAGB) at a single institution from 2005-2007. Our sample included 62 patients who had values for all time points for percent excess weight loss (%EWL) preoperatively, and 1, 3, 6, 12, and 18 months postoperatively. Data were analyzed using SAS 9.1, where %EWL was tested in mixed models for effects of marital status, surgical procedure, time, and all interactions of the three. Correlation analyses were used to examine the relationship between baseline depression and %EWL within categories of marital status.

Results: Interactions were found between surgery-type and time, and marital status and time. LRYGB patients had greater %EWL compared to LAGB at all postoperative time points, and %EWL for Married patients was less than that of Singles at 12 and 18 months. There was a marked, inverse relationship between depression and %EWL for the Single group, but not the others.

Conclusions: Interactions between these variables suggests that the effects of marital status on %EWL may be modulated by depression. Further studies are needed in order to examine these relationships in samples including more even distributions of sex and marital status.

Keywords: Laparoscopy; Bariatric surgery; Gastric bypass; Weight loss; Marital status; Depression; Depressive disorder

Introduction

The increasing prevalence of obesity in the United States and worldwide poses a significant threat to public health. Bariatric surgery is recognized by many as the predominant treatment option for severe obesity and its related mortality and comorbidities [1-3]. Advances in surgical technique, preoperative evaluation and postoperative care have improved the quality of bariatric surgery programs, while subsequently increasing public receptiveness [4,5].

Despite the presence of established guidelines designed to optimize consistency in bariatric surgery programs, much disparity in weight-loss outcomes exists between individual patients. Whereas some differences can be attributed to the nature of the surgical procedure itself [6-11], there are also non-surgical factors that influence success with weight loss including psychosocial status of the patient [12-14]. Appropriate social relationships (spouse, significant other) are generally considered to be essential in order to minimize attrition [15] and achieve good results from surgical treatment and the postoperative period [16,17], although a lack thereof is not necessarily perceived as a specific contraindication to weight loss surgery [18]. Similarly, depression (often occurring concomitantly with obesity [19]) may lead to inferior treatment outcomes [20], and in contrast to social support, is viewed by many practitioners to preclude surgical obesity intervention [18]. It is unknown, however if depressive and marital status' interactively affect weight loss after surgery and it is possible that the social support provided by marriage may attenuate the deleterious effects that depression may exert on bariatric outcomes. The purpose of this study therefore, was to investigate the interactive effects of surgical procedure and marital status on weight loss in bariatric surgery patients. A secondary aim was to explore the relationship between preoperative depression and postoperative weight loss in the context of marital status.

Materials and Methods

After obtaining institutional review board approval from the Summa Health System Institutional Review Board, we conducted a retrospective chart review of patients who had undergone laparoscopic Roux-en-Y gastric bypass (LRYGB) or adjustable gastric banding (LAGB) bariatric procedures at a single, tertiary bariatric center and its affiliated Department of Psychiatry.

All operative procedures were performed by two American Society for Metabolic and Bariatric Surgery (ASMBS), Center of Excellence (COE), board certified surgeons. Consistent with ASMBS requirements for Bariatric Surgery COE's [21], all patients underwent an extensive preoperative evaluation, including a psychological assessment conducted by a licensed psychologist familiar with bariatric surgery. As a component of this evaluation, a subgroup of patients completed the Beck Depression Inventory (BDI), a self-administered questionnaire

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commonly used to assess the presence of depression, with higher scores indicating a greater number of depression symptoms [22].

Patients who underwent LAGB or LRYGB were followed during office visits that took place at baseline and approximately 1, 3, 6, 12 and 18 months after surgery. The data collected included patient demographics (marital status and sex), anthropometric information, results from the BDI assessments, and perioperative weight loss (percent excess weight loss, %EWL) at the time points listed previously. For %EWL calculations, ideal body weight was considered as the patient's body weight that corresponded with a BMI of 24.0 kg/m^2.

From 2005 to 2007, approximately 413 patients underwent LRYGB or LAGB surgeries, however the current study included only those patients (n= 62) who had complete data for the demographic variables, BDI assessment, and body weight (%EWL) for all time points, including baseline (preoperatively), and one, three, six, twelve and eighteen months postoperatively. As such, analyses were conducted on this reduced set, and excluded any patients who had 5 incomplete or missing weight loss or demographic information, or who were not assessed for depression with the BDI

Data analysis

Outcomes were analyzed using the Statistical Analysis System (SAS Version 9.0, Cary, NC).

Data were analyzed using the mixed model analysis of variance (ANOVA) procedure to test for effects of surgery type (LAGB or LRYGB), marital status (Single, Married or Divorced), time (repeated measures; baseline, and 1, 3, 6, 12 and 18 months postoperatively) and all interactions of these variables, with a primary endpoint of %EWL. A value for $P < 0.05$ was considered to be statistically significant for interaction terms and where significant effects of marital status were found, adjusted P values were calculated via a modified Bonferroni procedure (i.e., to maintain a family-wise error rate of 0.05; adjusted $P = 1 - (1 - P)^2$,[23]), in order to compare LS Means between single, married and divorced groups. Data given in the text, figure and tables are LS Means (± SEM) from the mixed models unless stated otherwise. We were unable to assess for interactions with sex as a covariate in the model, as there were no men in the Divorced group, and only two men in the Single group. Thus, we also conducted sensitivity analyses with men removed from the data set.

The general linear model (GLM) procedure was used to test for differences in baseline (preoperative) characteristics between marital status, with post hoc analyses performed via T-tests with the aforementioned modified Bonferroni procedure. The correlation procedure was used to examine the relationship between depression and %EWL within each category of marital status.

Results

The final data set was composed of 13 (21%) men and 49 (79%) women and included 23 (37%) LAGB patients and 39 (63%) LRYGB patients. Baseline characteristics of the patients are presented in Table 1 for each category of marital status, and for the combined groups (All). There were no baseline differences in patient age, baseline BMI or BDI score between the three marital status groups (P = 0.1, P = 0.21 and P = 0.91, respectively).

%EWL and surgical procedure

The three-way interaction of surgery type, marital status and time on %EWL was not significant (P = 0.24) and was subsequently removed from the model. As expected, there was a significant two-way interaction of surgery type and time ($P < 0.0001$). When compared to the LAGB group, LRYGB patients demonstrated greater postoperative %EWL at 1 month (16.0 ± 6.5% vs. 21.2 ± 5.2%, P = 0.04), 3 months (23.1 ± 9.5% vs. 37.0 ± 7.3%, $P < 0.0001$), 6 months (30.7 ± 13.1% vs. 51.9 ± 11.6%, $P < 0.0001$), 12 months (40.2 ± 15.0% vs. 64.8 ± 16.9%, $P < 0.0001$) and 18 months (42.6 ± 16.2% vs. 66.6 ± 18.0%, $P < 0.0001$). Significant increases in %EWL were found within both LAGB and LRYGB groups, between all consecutive, postoperative time points (P's < 0.02) with the exception of the 12-month to 18-month time points (P's > 0.1) (data not shown).

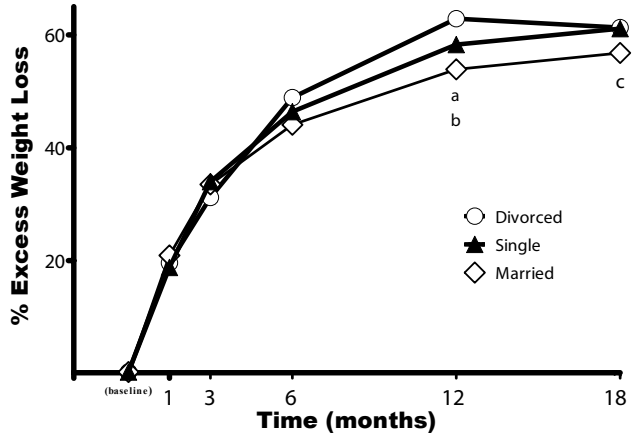
%EWL and Marital Status

There was also a significant two-way interaction of marital status and time on %EWL (P = 0.008, Figure 1). %EWL for the Married group was significantly less than Single group at 18 months (55.0 ± 21.1 vs. 60.7 ± 15.3%, P = 0.04) and tended to be less than the Single group at 12 months (52.5 ± 20.2 vs. 60.7 ± 15.3%, P = 0.06). %EWL for the Divorced group exceeded that of the Married at 12 months (64.3 ± 25.2 vs. 52.5 ± 20.2%, P = 0.04), but was not different from Married or Single groups at any other time point. %EWL did not differ significantly between any three marital status groups at baseline or at 1, 3 and 6 months postoperatively (P's > 0.05). As previously mentioned, the sample included a relatively smaller proportion of men, however when we examined data from women only, this pattern was still evident (P = 0.047) for the interaction of marital status and time (data not shown).

	Divorced	Married	Single	*All*
	(*n* = 7)	(*n* = 42)	(*n* = 15)	(*n* = 61)
Variable				
Age (y)	49.9 ± 7.2	49.9 ± 11.7	42.4 ± 14.1	48.2 ± 11.7
BMI (kg/m^2)	47.6 ± 6.7	48.6 ± 6.9	52.2 ± 7.6	49.3 ± 7.1
Beck Depression Inventory (BDI)	8.6 ± 5.5	8.4 ± 5.7	9.1 ± 5.3	8.6 ± 5.4

Data shown are LSMeans ± SD. There were no significant differences in Age, baseline BMI or BDI score between marital status groups (*P*'s > 0.1).

Table 1: Baseline Patient Characteristics by Marital Status.



[a] Significant difference between Divorced and Single groups in pair-wise comparison (*P* = 0.007).
[b] Trend for significant difference between Married and Single groups in pair-wise comparison (*P* = 0.064).
[c] Significant difference between Married and Single groups in pair-wise comparison (*P* = 0.036).
Figure 1: Percent excess weight loss (%EWL) (LS Means) by marital status (Divorced, *n* = 7; Single, *n* = 14; Married, *n* = 41) and post-operative time. A significant two-way interaction was found between marital status and time on %EWL (*P* = 0.008).

%EWL, Marital Status and Depression

Correlation analyses revealed a strong inverse relationship between baseline depression and weight-loss outcomes at 18 months postoperatively in the Single marital status group (Figure 2), where increased ratings of depression were associated with a decreased loss of excess weight. This relationship was not significant in the Divorced or Married groups. Further analysis showed this pattern to be present at both 6 and 12-month postoperative time points, for all patients and for women only (Table 2).

Discussion and Conclusions

Our results demonstrated that excess weight loss in LRYGB patients surpassed that of LAGB patients by approximately 25% at both 12 and 18 months postoperatively.

These outcomes were expected and are consistent with previous studies showing differences between 17% and 34% [6-8,24].

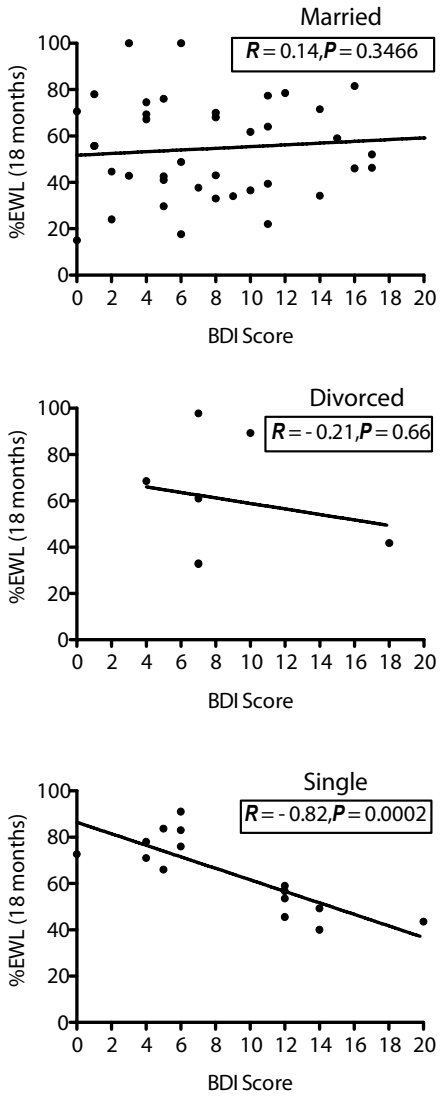


Figure 2: Correlation analyses revealed a significant inverse relationship between Beck Depression Inventory (BDI) scores and percent excess weight loss (% EWL) in the patients of Single marital status, but this relationship was not present in either the Divorced or Married groups.

Marital Status	*n*	%EWL – 6 mo.	%EWL – 12 mo.
Married			
♂ and ♀	42	*R* = 0.16	*R* = 0.18
♀ only	29	*R* = 0.17	*R* = 0.17
Divorced [a]			
♀ only	7	*R* = -0.4	*R* = -0.34
Single			
♂ and ♀	15	*R* = -0.74[b]	*R* = -0.74[b]
♀ only	13	*R* = -0.74[b]	*R* = -0.78[b]

♂ = men; ♀ = women; %EWL = percent excess weight loss
* Divorced group contained women only
** $p < 0.01$

Table 2: Correlations between BDI and postoperative %EWL.

In a similar manner, marital status appeared to modulate weight loss during the postoperative period. When compared to the Single and Married groups, Divorced patients lost the most amount of weight at 6, 12 and 18 months, but this pattern became attenuated over time. Compared to Single patients, those who were married achieved the least %EWL at 12 and 18 months (8% and 6%, respectively). This difference between groups was considerably less that the amount reported by Lufti and colleagues (2006) [12] in a sample of 180 gastric bypass patients, where %EWL in single patients exceeded that of married patients by approximately 23% at 12-months postoperatively. In a contrasting, subsequent study where a sample of 310 men and women were considered, Campos and colleagues (2008) [14] found that %EWL at 12 months postoperatively did not differ between Married and Single groups. It should be noted, however, that marital status in these two studies was categorized as "Single" or "Married" [12], and "Single" or "Other" [14], and did not contain a separate "Divorced" classification.

Unexpectedly, we found an inverse relationship between depression and %EWL for the Single group only, where %EWL declined as depressive symptomology increased. There was no relationship between these variables for either the Married or Divorced groups. These results suggest that depression may require more aggressive intervention in those that are not married and/or lack substantial social support, in order to optimize post-surgical weight loss outcomes.

There are several limitations to this study. When reporting marital status, patients chose from a close-ended listing which included only Single, Married or Divorced categories. As such, we were unable to assess effects for those who may have had substantive support via domestic partnerships or common-law/non-formalized marriages. Between 1950 and 2000 for example, U.S. households comprised of legally married couples declined from 78% to 52%. In the later year, approximately 5.5 million households were comprised of unmarried couples, and by 2006, households comprised of legally married couples further decreased to 50% of the total number [25]. As these relationship-classifications are prevalent in the US, it would be beneficial to assess their effects in future studies.

In addition, we did not have access to diagnostic information regarding preexisting clinical comorbidities such as diabetes or cardiovascular disease for our sample. Thus, were unable to conduct subgroup analysis, and it may be that the pattern of postoperative weight loss would have differed between those with significant preoperative diagnoses, and those without.

Finally, we acknowledge that our sample size was rather small, and only included a percentage of the initial study population. As such, the statistical power may have been impeded, and our results should be interpreted with caution until findings have been replicated on a larger scale.

Despite bariatric practitioners' perceptions that depressive disorders may contraindicate bariatric surgery [18], previous studies investigating the actual relationship between depression and weight loss are equivocal. Some research indicates that patients with psychiatric disorders (such as depression) are less successful at losing excess weight [26] while other research has demonstrated that a presence of depressive psychopathology does not affect outcomes [27,28]. Perhaps this inconsistency may be attributed in part, to the way that associations between depression and weight loss are modulated by external factors, such as social support and/or marital status. To our knowledge, this is the first study examining marital status as a mediating factor in the relationship between depression and surgical weight loss. Further studies are needed in order to examine this association in larger samples which include more even distributions of sex and marital status.

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JZ and RPK were Principle Investigators for this study and implemented study design and methodology, data collection, data analyses, and contributed to preparation of the manuscript. AD, MM, and DP assisted with study methodology, data collection and analyses, and preparation of the manuscript. JZ is a consultant lecturer for Covidien®. The authors claim no other commercial associations that might be a conflict of interest in relation to this article.

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