



New-Onset Substance Use Disorder After Gastric Bypass Surgery: Rates and Associated Characteristics

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Abstract

Background Substance use disorder (SUD) may develop de novo for a subgroup of weight loss surgery patients, particularly those who have had the Roux-en-Y gastric bypass (RYGB) procedure. The present study examined the rate of SUD in a broad sample of RYGB patients and identified associated behavioral and psychological factors.

Methods Participants included 143 RYGB patients; the majority were women ($n=120$; 83.9 %) and white ($n=135$; 94.4 %). Participants completed a web-based survey assessing retrospective accounts of presurgical substance use, eating pathology, family history, and traumatic history, postsurgical substance use, life stressors, and global trait-like measures (emotion dysregulation, impulsivity, sensation-seeking, and coping skills).

Results A subgroup ($n=28$, 19.6 %) of post-RYGB patients met criteria for probable SUD; however, the majority of those who met SUD criteria postsurgery ($n=19$, 68 %) did not report a pre-RYGB SUD history. Family history of substance abuse, poor coping skills, and potential life stressors were related to post-RYGB SUD, particularly for the new-onset group. Additionally, the majority of those who met criteria for pre-

RYGB SUD ($n=21$, 70 %) did not continue to meet SUD criteria following RYGB.

Conclusions Findings highlight a subgroup of post-RYGB patients reporting new-onset SUD, which is unexpected among middle-aged women. Importantly, findings also indicate that many patients with presurgical SUD did not relapse postsurgery. Assessing for family history of SUD and coping skills at the presurgical evaluation is recommended. Future research should identify psychological and physiological risk factors for SUD postsurgery and examine protective factors of those who discontinue substance use postsurgery.

Keywords Alcohol use disorders · Bariatric surgery · Gastric bypass · Substance use disorders · Weight loss surgery

Introduction

Alcohol abuse following weight loss surgery (WLS) is a burgeoning research area [1–7], yet still in its infancy. Preliminary support from both animal and human models suggests an increased risk of developing alcohol use disorders (AUDs) post-WLS, particularly for the Roux-en-Y gastric bypass (RYGB) procedure [4, 8, 9]. With respect to animal studies, alcohol consumption [9] and positive reinforcement [8] increased in rats with RYGB relative to rats with a sham surgery. Additionally, findings from a prospective human study indicate a significant twofold increased risk of AUD 2 years post-RYGB, relative to the rate observed among laparoscopic adjustable gastric band (LAGB) patients [4]. Although the magnitude and severity of AUDs postsurgery is unknown, WLS patients appear to be overrepresented in inpatient chemical dependency programs [6, 7, 10], raising cause for concern.

Risk of developing AUDs [1, 4, 7, 10] and seeking alcohol-related inpatient treatment [6] is higher among RYGB than

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LAGB patients. This may be due, in part, to physiological changes following RYGB. That is, alcohol is absorbed differently among gastric bypass patients [11]; even after a small amount of alcohol, RYGB patients have been shown to reach high blood alcohol levels, exceeding legal driving limits within only 2–10 min postconsumption [12]. Although changes in alcohol absorption clearly occur post-RYGB, less is known about absorption changes of other substances following RYGB.

Examining post-RYGB substance use disorders (SUDs) more broadly than AUDs may be important. In particular, it appears that the use of pain medications increases following WLS [13], and nearly half of WLS patients in a chemical dependency program reported that pain medications were more available postoperatively [14]. Furthermore, when assessed in combination, drug, alcohol, and cigarette use increases post-WLS [1]. These findings highlight the importance of examining substance use more generally to help elucidate the relationship between RYGB and potential for postsurgical SUDs.

Converging lines of evidence suggest that the majority of postsurgical SUD may be newly developed [3, 4, 10, 14], referred to as new-onset SUD [10]. For instance, one study [4] found that while 8 % of all patients reported new AUDs, 60.5 % of those who reported postoperative AUDs did not report preoperative AUDs; additional studies have documented similar rates of potential new-onset SUD [3, 10, 14, 15]. Research on new-onset SUD post-RYGB is scant. Thus, the purpose of the present study was to assess the rates of new-onset SUD among RYGB patients and to identify associated behavioral and psychological factors.

Method

Participants

The majority of participants were women ($n=120$; 83.9 %), white ($n=135$; 94.4 %), married ($n=94$; 65.7 %), and employed at least part time ($n=94$; 66.2 %) with a mean age of 48.97 years ($SD=10.50$) and a current BMI of 32.05 ($SD=6.32$). The mean age at surgery was 46.28 years ($SD=10.53$), and the mean time since surgery was 2.69 years ($SD=2.25$).

Procedures

Participants were recruited primarily through St. Vincent Caramel Hospital's Bariatric Center of Excellence and an online bariatric support group; appropriate IRB approval was obtained. Participants completed an online questionnaire, with paper copies available upon request. This study was not associated with any presurgical evaluations; participants were post-RYGB patients who were asked to recall substance use and

eating pathology. All participants were compensated with a \$25 gift card.

Measures

Demographic Information Demographic information obtained included age, sex, ethnicity, current marital status, and current employment status.

Eating Pathology Eating pathology before surgery was assessed using the Questionnaire on Eating and Weight Patterns-Revised (QEWP-R) [16] and the Emotional Eating Scale (EES) [17]. All directions indicated, "Before you had bariatric surgery..." The QEWP-R is a self-report screening measure for binge eating disorder (BED) and bulimia nervosa in accordance with DSM-IV criteria. The EES is a 25-item self-report measure assessing the relationship between negative emotions and problematic eating behaviors; total scores range from 0 to 100.

Substance Use A modified version of the Michigan Alcoholism Screening Test (MAST) [18], the Michigan Assessment Screening Test for Alcohol and Drugs (MAST-AD) [19], was used to incorporate drug use. The MAST-AD is comprised of 24 items with a "yes" or "no" response. Scores of 5 or more are indicative of probable SUD, which was our criterion for SUD in the present study. Participants answered these questions pertaining to "Before you had bariatric surgery..." and again as "After you had bariatric surgery..."

Family SUD History Two items assessed family history of substance abuse. "Do you have a family history of substance abuse (drugs or alcohol)?" "If yes: What family members suffered from substance abuse problems (i.e., mother, father, grandfather, sibling, etc.)?"

Depression The Patient Health Questionnaire (PHQ-9) [20] is a nine-item scale developed to measure depression severity over the past 2 weeks. A four-point Likert-type scale is used with total scores ranging from 0 to 27.

Life Stressors This scale was derived from three life events scales [21–23] and consisted of 34 items pertaining to major life events such as moving, death, divorce, etc.

Difficulties in Emotion Regulation Scale (DERS) [24] The DERS is a 36-item measure that assesses emotion regulation. The overall score was used for the present study.

Barratt Impulsiveness Scale Version 11 (BIS-11) [25] The BIS-11 consists of 30 items, and the total score was used for the present study. Higher scores are indicative of greater impulsivity.

Brief Sensation Seeking Scale (BSSS) [26] The BSSS is an eight-item measure assessing sensation seeking.

Brief COPE [27] The Brief COPE is a 28-item questionnaire developed to assess ways that people cope with stress. It consists of 14 subscales that reflect different forms of coping.

Trauma History Questionnaire (THQ) [28] The THQ was adapted to assess whether specific traumas occurred prior to or after bariatric surgery. The THQ contains 24 items focusing on three trauma areas: crime-related trauma, general disaster, and unwanted physical and sexual experiences. The present study queried whether traumas occurred before and/or after surgery.

Data Analyses

First, all analyses were conducted using a two-group comparison, comparing those who met SUD criteria post-RYGB with those who did not. Second, analyses were repeated using a four-group comparison (never SUD, recovered, relapsed/continued, and new-onset groups); group definitions are described below.

For the two-group comparisons, *t* tests and chi-square analyses were used as appropriate to compare groups on variables of interest. For the four-group comparison, one-way ANOVAs were used to compare group differences, and Tukey's test was used for post hoc differences. Separate 2×2 chi-square analyses were conducted for the four-group comparison.

Results

Participants

From a total of 156 respondents, two participants provided only demographic data and 11 reported undergoing a procedure other than RYGB, yielding data from 143 post-RYGB patients available for analysis; 58.0 % ($n=83$) and 42.0 % ($n=60$) were recruited from each of the two recruitment sites, which did not differ on sex ($p=0.278$), race ($p=1.00$), BMI change ($p=0.645$), education ($p=0.482$), or SUD rates ($p=0.651$). Age significantly differed by site (45.73 ± 8.80 and 53.45 ± 11.1); however, age was not related to postsurgical SUD and was not used as a covariate; the two subgroups were combined for all analyses.

Post-RYGB SUD Classification

As shown in Table 1, using a MAST-AD score ≥ 5 as representing probable SUD, 65.7 % ($n=94$) never met SUD

criteria, 14.9 % ($n=21$) met SUD criteria before but not after RYGB ("recovered"), 6.3 % ($n=9$) met SUD criteria before and after RYGB ("continued/relapsed"), and 13.3 % ($n=19$) met SUD criteria only after RYGB ("new onset"). These are the four groups discussed below after the two-group comparison. The two-group comparisons refer to post-RYGB SUD history-positive versus history-negative groups, i.e., (never+recovered=no SUD-current; $n=115$, 80.4 %) versus (continued/relapsed+new onset=SUD-current; $n=28$, 19.6 %).

Examining Post-RYGB No SUD-Current Versus SUD-Current Groups

Relative to the no SUD-current group, the SUD-current group had more time elapse since surgery (3.68 ± 2.61 vs. 2.45 ± 2.09 years since surgery; $t=-2.65$ (141), $p<0.01$). There were no statistically significant group differences for sex ($p=0.08$) or family history ($p=0.07$); however, the SUD-current group had a greater total number of family members (mother, father, sister, brother, etc.) with a SUD history (1.46 ± 1.55) than did the no SUD-current group (0.73 ± 1.14), $t(34.45)=-2.35$, $p<0.05$. There were no statistically significant differences for SUD history pre-RYGB, impulsivity, sensation seeking, or trauma.

The SUD-current group reported a greater number of stressful life events post-RYGB (6.11 ± 5.14) than did the no SUD-current group (3.86 ± 3.33 ; $t=-2.20$, $p<0.05$). As expected, the two groups also differed on coping through substance use; with the SUD-current group having higher scores (3.46 ± 2.08) than the no SUD-current group (2.19 ± 0.61 ; $t=-3.21$, $p<0.01$). Finally, the two groups did not differ on emotional eating, history of BED, depression, coping through denial, emotional dysregulation, current BMI, or presurgical BMI.

Examining Post-RYGB SUD by Four-Group Comparisons

More fine-grained analyses were conducted to better understand the new-onset group by comparing it to the other three groups described above and in Table 1. Regarding time since surgery, there was an overall group effect ($F(3, 139)=3.08$, $p<0.05$, $\eta^2=0.06$), with the recovered/continued group having had surgery significantly more recently than did the new-onset group (1.81 ± 1.78 vs. 3.63 ± 2.41 years since surgery, respectively; $p=0.048$). Despite differences in time since surgery, age did not differ across groups. Group differences are presented in Table 2.

When comparing the four groups, there was an overall group effect ($F(3, 139)=4.61$, $p<0.01$) for the number of family members with a SUD history. The new-onset group had the most categories of family members with a SUD history (1.68 ± 1.53), differing significantly from the never SUD group (0.63 ± 1.08).

Table 1 Groups classified by MAST-AD scores

	Never SUD	Recovered SUD	SUD history+(relapsed/continued)	New-onset SUD
<i>n</i> (%)	94 (65.7)	21 (14.9)	9 (6.3)	19 (13.3)
Score	<5 pre- and postsurgery	≥5 presurgery and <5 postsurgery	≥5 pre- and postsurgery	<5 presurgery and ≥5 postsurgery

MAST-AD scores of ≥5 are indicative of problematic substance use

Discussion

Rates of SUD Among RYGB WLS Patients

In the present study, the lifetime SUD rate was approximately 34.5 %. Only 21 % of the group endorsed SUD criteria before WLS, comparable to a preoperative report of high-risk drinking in a prospective WLS study [29] (19 %). Of those with presurgical SUD, however, only 30.3 % continued to endorse SUD criteria post-RYGB, meaning that approximately 70 % of patients who met SUD criteria at some time before surgery did

not endorse SUD criteria postsurgically. These findings mirror those from another report [29] wherein 71 % of those who reported high-risk drinking pre-RYGB did not continue high-risk drinking postsurgery, suggesting that protective mechanisms may be at play. In fact, one animal study showed a similar phenomenon among alcohol-preferring rats: all rats consumed the same amount of alcohol preoperatively, but alcohol-preferring rats who underwent RYGB consumed significantly less alcohol than did their sham surgery counterparts [30].

Despite the fact that many of our pre-RYGB SUD cases did not evidence SUD post-RYGB, 13.3 % of the overall group

Table 2 Descriptive statistics for variables analyzed across four SUD classification groups

	Never SUD (<i>n</i> =94)	Recovered (<i>n</i> =21)	Relapsed/continued (<i>n</i> =9)	New-onset SUD (<i>n</i> =19)	Test statistic	<i>p</i>	Post hoc difference
Sex (female)	85 (90.4 %)	15 (71.4 %)	5 (55.60 %)	15 (78.9 %)	χ^2 (3, <i>N</i> =143)=11.09	<0.05	1>2* 1>3*
Family history	30 (31.9 %)	14 (66.7 %)	3 (33.3 %)	13 (68.4 %)	χ^2 (3, <i>N</i> =143)=14.90	<0.01	2>1** 4>1**
Impulsivity ^a	56.72±9.90	60.95±8.39	58.38±13.94	63.47±15.06	<i>F</i> (3, 132)=2.51	0.06	
Sensation seeking ^b	19.51±5.04	21.05±5.02	18.33±7.87	22.26±7.53	<i>F</i> (3, 137)=1.76	0.16	
Trauma ^c	3.41±3.15	4.71±3.44	4.11±3.55	3.26±3.91	<i>F</i> (3, 139)=1.02	0.39	
Emotional eating ^d	47.30±25.09	62.90±20.80	47.00±19.12	54.53±20.14	<i>F</i> (3, 139)=2.76	<0.05	2>1*
BED ^e	24 (26.4 %)	11 (52.4 %)	1 (11.1 %)	7 (38.9 %)	χ^2 (3, <i>N</i> =139)=10.39	0.06	
Emotional dysregulation ^f	66.72±22.10	81.85±24.27	66.86±25.54	73.17±21.79	<i>F</i> (3, 127)=2.61	0.06	
Depression ^g	4.16±4.70	6.57±5.08	5.67±6.04	5.84±5.39	<i>F</i> (3, 139)=1.80	0.15	
Life stressors	3.68±3.33	4.67±3.29	3.33±2.78	7.42±5.52	<i>F</i> (3, 139)=5.80	0.001	4>1*** 4>3*
COPE substance use ^h	2.19±0.63	2.19±0.51	3.67±2.65	3.37±1.83	<i>F</i> (3, 136)=10.67	<0.001	3>1*** 4>1*** 3>2** 4>2**
BMI current	31.51±6.27	32.24±4.71	33.33±9.63	34.01±6.38	<i>F</i> (3, 132)=0.91	0.44	
BMI presurgery	48.35±7.62	50.72±6.06	48.96±10.96	54.92±13.43	<i>F</i> (3, 135)=3.17	<0.05	4>1*

1=never SUD, 2=recovered, 3=relapsed/continued, 4=new-onset SUD

p*<0.05; *p*<0.01; ****p*≤0.001

^a BIS-11

^b BSSS

^c THQ

^d EES

^e QEWP-R

^f DERS total score

^g PHQ-9

^h Brief COPE

fell into the new-onset SUD category, whereas only 6.3 % showed continued (or relapsed) SUD from pre- to post-RYGB. The present findings replicate several studies [3, 4, 10, 14, 15] suggesting that about two thirds of those developing post-RYGB SUD are of the new-onset variant. In contrast, one study [29] found that only 6–7 % of their overall sample and approximately half of those reporting high-risk drinking postsurgery were new-onset cases. These discrepancies, however, may be due to methodological differences, namely, study design and measurement (frequency vs. consequences) differences. In addition, rather than focusing solely on alcohol use [29], our study attempted to capture SUD more broadly, given evidence suggesting an increased use of pain medications [13] and other substances [1] post-WLS.

Variables Related to Post-WLS SUD

Overall, the time since surgery differed between groups. The primary variables associated with postsurgical SUD were family SUD history, major life events, and coping through substance use. The following section will discuss each finding in more detail.

When examining time since surgery, the SUD-current group had RYGB longer ago than the no SUD-current group. In addition, when comparing the four SUD classification groups, the new-onset group had surgery significantly longer ago relative to the recovered group. Given these significant time differences, with SUD perhaps emerging gradually over time, it is possible that some recovered patients might become “relapsed” patients as time progresses, because SUD is widely recognized as a chronically relapsing condition.

With respect to family SUD history, the SUD-current group reported more categories of family members with a SUD history. For the four-group comparison, the recovered and new-onset groups were more likely to report family SUD history than were those who never endorsed SUD. The new-onset group also reported significantly more categories of family members with a SUD history than the never SUD group. As such, the new-onset group may have a greater predisposition to develop SUD because of familial vulnerability.

Additionally, the SUD-current group reported a significantly greater number of major life events post-RYGB than did the no SUD-current group; further analyses indicated that the new-onset group reported significantly more major life events than both the relapsed/continued and never SUD groups. In terms of coping, the SUD-current group was more likely to cope through substance use than was the no SUD-current group, which mirrors findings of a report that drinking to cope was the most powerful predictor in a model for alcohol abuse [31]. Notably, there is a well-established relationship between drinking to cope and social anxiety [32, 33]; therefore,

measuring social anxiety and RYGB may be an important research endeavor.

Limitations of the Present Study

The present study was not without limitations. First, due to the small cell sizes of some of the groups (relapsed/continued and new-onset), further research is necessary to replicate and extend these findings. Second, for those meeting SUD criteria, it is unknown when the SUD began and what specific substances were problematic. Third, patients were asked to retrospectively recall eating and SUD patterns, rather than tracking them prospectively. Lastly, those at the most severe end of the SUD spectrum may not have volunteered to participate in a lengthy online survey.

Conclusion and Future Research

Overall, findings highlight the development of post-WLS SUD among a subgroup of individuals without a reported SUD history. Results suggest that developing adaptive coping skills to manage life stressors may be important for this particular group. Greater follow-up care may also be needed post-WLS, and WLS patients in the new-onset group may have unique treatment needs. In addition, assessing family history and coping during the presurgical assessment or postsurgically may help identify those at risk for developing a postsurgical SUD. Future research is needed to better understand physiological changes that may confer risk for developing a SUD following surgery. Finally, a large percentage of patients who met SUD criteria presurgically did not continue use postsurgery; future research should investigate factors that may protect this group from continued substance use.

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Conflict of Interest The authors declare no conflicts of interest.

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