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Predictors of Alcohol Use after Bariatric Surgery

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Abstract

Patients undergoing bariatric surgery are at risk for developing an alcohol use disorder (AUD). The purpose of this study was to investigate pre-surgical psychosocial risk factors for post-surgical alcohol consumption and hazardous drinking. Participants ($N = 567$) who underwent bariatric surgery between 2014 and 2017 reported their post-surgical alcohol use. Information was collected from the pre-surgical evaluation including history of alcohol use, psychiatric symptoms, and maladaptive eating behaviors (i.e., binge eating, purging, and emotional eating). Younger age and pre-surgical alcohol use predicted post-surgical alcohol use and hazardous drinking. In addition, higher levels of depressive symptoms and maladaptive eating patterns predicted post-surgical binge drinking. Clinicians conducting pre-surgical psychosocial evaluations should be aware of the multiple risk factors related to post-surgical problematic alcohol use. Future research should evaluate whether preventive interventions for high-risk patients decrease risk for post-surgical alcohol misuse.

Keywords Bariatric surgery · Alcohol use · Psychiatric symptoms · Maladaptive eating

Introduction

Bariatric surgery is the most effective treatment for weight loss and medical co-morbidity remission among those with severe obesity (Clark et al., 2005; Gloy et al., 2013; Maciejewski et al., 2016). Patients who undergo bariatric surgery are recommended to adhere to lifestyle changes to reduce surgical risk and maintain weight loss, including abstinence from alcohol (Sogg, Lauretti, & West-Smith, 2016). This recommendation is based on research demonstrating that patients who undergo bariatric surgery may be at higher risk for developing alcohol use disorder (AUD). Despite the recommendation to abstain from alcohol, 60 to 83%

of patients still consume alcohol after undergoing bariatric surgery (Buffington, 2007; Miller-Matero et al., 2019), leaving many patients at risk of developing an AUD. The prevalence of AUD of approximately 7% at 1-year post-bariatric surgery is similar to the rate in the general population (King et al., 2012; Substance Abuse Mental Health Services Administration, 2017), yet the rate of those meeting criteria increases over time with over 16% meeting criteria for AUD 7 years following surgery (King et al., 2017). Many of these patients did not have a history of AUD, suggesting that they are experiencing new onset AUD after surgery (Ivezaj, Saules, & Schuh, 2014; King et al., 2012; Wee et al., 2014). The increased risk for AUD is likely multifactorial including alterations in alcohol absorption (Acevedo et al., 2018; Hagedorn, Encarnacion, Brat, & Morton, 2007; Sarwer & Heinberg, 2020; Steffen, Engel, Pollert, Cao, & Mitchell, 2013), changes in the reinforcing properties of alcohol (Blackburn, Hajnal, & Leggio, 2017), an addiction transfer from food to alcohol (Steffen, Engel, Wonderlich, Pollert, & Sondag, 2015), and/or use of alcohol as a coping strategy (Scholtz, Goldstone, & le Roux, 2015).

Understanding pre-surgical predictors of a post-surgical alcohol use and hazardous drinking behaviors could assist with the identification of patients who may be at increased

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risk before problematic alcohol use is observed. Consuming alcohol prior to surgery and having a pre-surgical AUD are both associated with a post-surgical alcohol use and AUD (Cuellar-Barboza et al., 2015; King et al., 2012; Steffen et al., 2015; Suzuki, Haimovici, & Chang, 2012; Woodard, Downey, Hernandez-Boussard, & Morton, 2011). Some research also suggests that the type of surgery is a risk factor for AUD, with those undergoing gastric bypass at higher risk than gastric banding (Conason et al., 2013; King et al., 2012, 2017). However, those undergoing sleeve gastrectomy (now the most common form of surgery in the United States), experience similar changes in absorption as gastric bypass. Furthermore, males and younger age have been consistently associated with post-surgical alcohol consumption and AUD (King et al., 2012, 2017; Lent et al., 2013; Spadola et al., 2015; Steffen et al., 2015).

Most of the research examining predictors of post-surgical alcohol use has focused on pre-surgical alcohol use, age, gender, or type of surgical procedure, largely ignoring modifiable psychosocial factors that might contribute to whether a patient is at risk for post-surgical alcohol use and hazardous drinking. For example, depression and anxiety are common among those who present for bariatric surgery (Kalarchian et al., 2007; Rosik, 2005; Sarwer et al., 2004). In addition, a significant proportion of patients undergoing bariatric surgery endorse a history of maladaptive eating patterns including binge eating and emotional eating (Miller-Matero et al., 2014; Niego, Kofman, Weiss, & Geliebter, 2007). Although some work has found that lower levels of pre-surgical social support may contribute to post-surgical alcohol use, other psychosocial variables (i.e., depression and binge eating) did not predict post-surgical alcohol use (King et al., 2012, 2017). Other research has found that disinhibition, poor coping skills and life stressors after surgery may lead to problematic alcohol use post surgery (Ivezaj et al., 2014; Reaves, Dickson, Halford, Christiansen, & Hardman, 2019). We need additional research on these commonly occurring variables, as well as other problematic eating patterns, as these factors can be intervened upon prior to surgery. Specifically, purging and emotional eating have yet to be studied as potential predictors of post-surgical alcohol use. Following surgery, patients may no longer be able to use these maladaptive behaviors to cope with negative emotionality and may replace these behaviors with alcohol use. Thus, the purpose of the current study was to examine similar variables as previous research that predict post-surgical alcohol use (i.e., age, gender, pre-surgical alcohol use, depression, binge eating) and extend upon this by considering additional potential predictors of post-surgical alcohol use and hazardous drinking (i.e., anxiety, emotional eating, and purging).

Methods

Participants and Procedure

This study was an extension of a previous project in which patients were recruited to complete a brief, online survey regarding alcohol use after bariatric surgery. The initial project examined whether patients who underwent surgery recalled receiving information regarding abstinence from alcohol after surgery and the rate of post-surgical alcohol use (Miller-Matero et al., 2019). Patients were contacted by email to participate if they underwent bariatric surgery from 2014 to 2017 at a single institution. Thus, patients could have been up to 4 years post surgery. For the current study, after participants completed the survey ($N=567$; response rate of 39.2%), additional data were collected from the routine pre-surgical psychological evaluation via medical record review. As a part of the pre-surgical evaluation, all patients are required to complete a psychosocial evaluation composed of a semi-structured interview and standardized measures. The evaluation is conducted by a licensed psychologist or a trainee (i.e., psychology intern or fellow) who is supervised by a licensed psychologist. This evaluation includes a history of alcohol use, psychiatric symptoms (i.e., depression and anxiety), and maladaptive eating patterns (i.e., binge eating, purging, and emotional eating). This project was approved by the health system's IRB and informed consent was obtained from all participants.

Measures

Pre-surgical Binge Eating and Purging

As a part of the routine pre-surgical psychological evaluation, a semi-structured interview using criteria from the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition was used to identify patients who endorsed pre-surgical binge eating and purging episodes (American Psychiatric Association, 2013). Participants were dichotomously categorized into either reporting or denying a lifetime history of binge and purging episodes.

Pre-surgical Depression and Anxiety

Pre-surgical levels of anxiety and depression were measured with the Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983), which has been used for patients pursuing bariatric surgery (Burgmer et al., 2007; Miller-Matero et al., 2014, 2018). Each subscale consists of 7 items, with a range of 0–21 on each subscale. Higher scores indicate greater severity of symptoms. The anxiety and depression

subscales have adequate internal consistencies of 0.83 and 0.82, respectively (Bjelland, Dahl, Haug, & Neckelmann, 2002).

Pre-surgical Emotional Eating

Emotional eating was measured with the Emotional Eating Scale, which has three subscales, each with adequate internal consistency: eating in response to anger/frustration, anxiety, and depression (Arnow, Kenardy, & Agras, 1995). Participants are presented with different emotions and respond on a 5-point Likert scale their urge to eat in response to that emotion. Higher scores indicate greater levels of emotional eating.

Alcohol Use

Pre-surgical alcohol use was captured in the semi-structured clinical interview. Frequency of alcohol use was categorized into whether the participant consumed alcohol less than monthly or at least once per month. The average number of pre-surgical drinks consumed per day was also recorded. On the post-surgical online survey, participants reported whether they consumed any alcohol since undergoing surgery. They also completed the AUDIT-C in the post-surgical survey, which is a 3-item tool to identify patients who are engaging in problematic alcohol use (Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998). On the AUDIT-C, participants responded about their alcohol use in the month prior to completing the survey regarding their frequency of

alcohol use, average number of drinks consumed in a sitting, and frequency of consuming six or more drinks in a sitting. Women with a score of three or higher and men with a score of four or higher were categorized as engaging in hazardous drinking. The AUDIT-C detects heavy drinking similarly to the full scale.

Analyses

Logistic regressions, independent samples *t* tests, and correlations were conducted to determine which variables were associated with alcohol use outcomes. Significant univariate relations were then tested in either multiple regression or multivariate logistic regression models.

Results

Participant demographics are in Table 1. Participants were predominantly female with a mean age of 45 years and a majority underwent a sleeve gastrectomy compared to a Roux-en-Y gastric bypass (RYGB).

Participants who endorsed consuming alcohol since undergoing bariatric surgery (57.7%, $n = 325$) were more likely to be younger (OR 0.98, $p = 0.01$) and consumed alcohol more frequently (OR 2.43, $p < 0.001$) and in greater amounts prior to surgery (OR 1.69, $p < 0.001$). Gender, surgery type, psychiatric symptoms, and maladaptive eating patterns were not significantly related to whether participants consumed alcohol after surgery ($p > 0.05$). A

Table 1 Participant demographics and pre-surgical symptoms

	<i>M</i>	SD
Age, years	45.73	10.33
	%	<i>n</i>
Gender		
Female	83.9	476
Male	15.7	89
Unidentified	0.4	2
Surgery type		
Sleeve gastrectomy ¹	67.0	378
Roux-en-Y gastric bypass	33.0	186
History of binge eating	10.9	62
History of purging	4.9	28
	<i>M</i>	SD
Depression symptoms	3.60	3.16
Anxiety symptoms	4.26	3.10
Eating in response to anger/frustration	18.28	7.85
Eating in response to anxiety	15.94	6.04
Eating in response to depression	10.67	4.16

multivariate logistic regression ($X^2 = 39.26, p < 0.001, R^2 = 0.11$) revealed that the frequency and amount of pre-surgical alcohol use remained statistically significant in predicting whether participants consumed alcohol after surgery and indicated that those who consumed alcohol in greater amounts and at least once per month prior to surgery with more likely to engage in post-surgical alcohol consumption (Table 2).

Twenty-three participants (4.1%) reported engaging in binge drinking (i.e., six or more drinks in a sitting) in the past month. Participants were more likely to engage in post-surgical binge drinking if they had higher levels of pre-surgical depression (OR 1.14, $p = 0.02$), higher levels of eating in response to depression (OR 1.11, $p = 0.03$), and a history of purging (OR 4.88, $p = 0.01$). There was a trend suggesting that those with a history of binge eating (OR 2.56, $p = 0.08$) and those with higher levels of eating in response to anxiety (OR 1.06, $p = 0.07$) may also be more likely to engage in binge drinking post surgery. Age, gender, surgery type, and pre-surgical alcohol use were not significantly related to whether participants engaged in post-surgical

binge drinking ($p > 0.05$). A multivariate logistic regression was statistically significant in predicting whether participants engaged in post-surgical binge drinking ($X^2 = 11.28, p = 0.04, R^2 = 0.08$). Although there was a trend for a history of purging predicting post-surgical binge drinking with an odds ratio of 3.32, none of the univariate predictors were statistically significant in this model, likely due to the low prevalence of those endorsing binge drinking in the month prior to completing the survey (Table 2).

Participants with higher post-surgical AUDIT-C scores were younger ($r = -0.13, p = 0.004$), underwent a sleeve gastrectomy ($t = 2.02, p = 0.04$, Cohen's $d = 0.18$), had higher levels of pre-surgical anxiety ($r = 0.09, p = 0.04$), and consumed alcohol at least once per month ($t = -7.66, p < 0.001$, Cohen's $d = -0.32$) and in greater amounts prior to surgery ($r = 0.30, p < 0.001$). There was also a trend suggesting that those who had a history of binge eating may have higher post-surgical AUDIT-C scores ($t = -1.86, p = 0.06$, Cohen's $d = -0.23$). In a multivariate model ($F = 13.84, p < 0.001, R^2 = 0.16$), pre-surgical drinking frequency and amount of pre-surgical alcohol use remained statistically significant,

Table 2 Multivariate analyses of pre-surgical predictors of post-surgical alcohol consumption

	β	SE	OR	<i>p</i>
Post-surgical alcohol use				
Age	-.01	.01	.99	.40
Number of drinks per day	.40	.11	1.50	<.001
Frequency of alcohol use				
At least once per month	.49	.23	1.63	.03
Less than monthly				
Post-surgical binge drinking				
Depressive symptoms	.10	.06	1.10	.13
Eating in response to depression	.07	.06	1.07	.20
History of purging				
Yes	1.20	.65	3.32	.06
No				
<hr/>				
	β		<i>t</i>	<i>p</i>
Post-surgical AUDIT-C scores				
Age	-.06		-1.25	.21
Surgery type	-.01		-.12	.91
Anxiety	.06		1.45	.15
Frequency of alcohol use	.24		5.12	<.001
Amount of alcohol use per day	.22		4.56	<.001
<hr/>				
	β	SE	OR	<i>p</i>
Hazardous drinking				
Age	-.02	.02	.98	.34
Number of drinks per day	.19	.12	1.21	.11
Frequency of alcohol use				
At least once per month	1.70	.41	5.49	<.001
Less than monthly				

suggesting that consuming alcohol at least once per month and in higher amounts prior to surgery is associated with higher post-surgical AUDIT-C scores (Table 2).

Among the entire sample, 8.3% ($n = 47$) had scores indicating hazardous drinking behavior post surgery. Participants who were more likely to engage in hazardous drinking after bariatric surgery were younger (OR 1.14, $p = 0.04$) and consumed alcohol more frequently (OR 7.53, $p < 0.001$) and in greater amounts prior to surgery (OR 1.42, $p = 0.001$). Gender, surgery type, psychiatric symptoms, and maladaptive eating patterns were not significantly related to whether participants engaged in post-surgical hazardous drinking ($p > 0.05$). A multivariate logistic regression ($X^2 = 35.09$, $p < 0.001$, $R^2 = 0.16$) revealed that the frequency of pre-surgical alcohol use was the sole predictor of hazardous drinking after surgery (Table 2).

Discussion

Younger adults and individuals who use alcohol more frequently and in higher amounts prior to surgery appear to be at higher risk for post-surgical alcohol consumption and development of hazardous drinking behavior. In addition, patients with higher levels of pre-surgical depressive symptoms and pre-surgical maladaptive eating patterns, including emotional eating and purging, were more likely to engage in binge drinking following bariatric surgery. Findings related to post-surgical drinking are mostly consistent with previous studies regarding predictors of alcohol consumption following bariatric surgery (Ivezaj et al., 2019; King et al., 2012; Lent et al., 2013; Spadola et al., 2015). Specifically, those that consume alcohol prior to bariatric surgery are more likely to consume alcohol, and have problematic alcohol use, after surgery. Pre-surgical sustained abstinence may be a protective factor against post-surgical problematic drinking; however, future research could evaluate this.

Although multivariate analyses tended to suggest that pre-surgical alcohol use variables are the strongest predictors of post-surgical alcohol use, findings from this study extended previous literature and also suggested a role for psychiatric and eating behavior factors in predicting post-surgical alcohol use (i.e., binge drinking and higher AUDIT-C scores). Post-surgical alcohol use is likely multifactorial (Ivezaj et al., 2019). One hypothesis is that these patients may have previously used food as a coping strategy, and due to the restrictive nature of the surgery potentially limiting maladaptive eating patterns, patients may engage in alcohol use post surgery as an alternative to consuming food. To examine this, future research could investigate patterns of maladaptive eating after surgery and whether these vary with or are replaced with alcohol use.

Our findings should be considered in light of study limitations. Pre-surgical alcohol use was obtained via clinical interview as a part of the required pre-surgical psychological evaluation, and patients may want to present favorably to receive surgical clearance (Ambwani et al., 2013). As such, pre-surgical alcohol use may have been underreported. For similar reasons, patients may have also minimized some of their pre-surgical psychiatric symptoms and maladaptive eating patterns (i.e., binge eating, purging, emotional eating). Furthermore, patients could have also underreported their post-surgical alcohol use or chosen to not participate, given that they understand that they are not supposed to consume alcohol after surgery (Miller-Matero et al., 2019). Use of technology and online survey methodologies, however, can increase the likelihood of honest reporting, particularly on sensitive topics (Butler, Villapiano, & Malinow, 2009). As we cannot obtain drinking estimates for those who did not complete the post-surgery survey, it is possible that the group of non-responders included a larger proportion of frequent drinkers who did not want to report on their alcohol use. However, the demographics of responders are similar to the population undergoing surgery at our center, which mitigates the impact of selection bias. In addition, different types of measures (i.e., interviews versus questionnaires) were used before and post surgery, which could influence the data gathered. Finally, endorsement of binge drinking in the previous month was low, limiting the generalizability of these particular findings.

Overall, our study demonstrated that patients at higher risk for problematic post-surgical alcohol use were more likely to have used alcohol more frequently and in higher amounts prior to surgery. Higher levels of pre-surgical psychiatric symptoms and maladaptive eating patterns may also lead to problematic post-surgical alcohol use (i.e., binge drinking). Although there are no formal guidelines for the pre-surgical psychosocial evaluation, recommendations do suggest routine assessment of these factors (Sogg et al., 2016). High-risk patients can be identified prior to surgery during this evaluation and provided with education about their increased risk. Furthermore, because education alone may not be sufficient for decreasing the prevalence of post-surgical alcohol consumption (Miller-Matero et al., 2019), patients with risk factors could also be monitored routinely post surgery for problematic alcohol use and offered treatment, if indicated. The implementation of post-operative interventions may mitigate long-term problematic alcohol use (DuBreuil & Sogg, 2017). However, because many patients often do not follow through with post-surgical appointments, post-surgical monitoring may be challenging. Thus, identifying at-risk patients prior to surgery is crucial. Future research could evaluate whether identifying and managing high-risk patients prior to surgery decreases rates of alcohol use disorder after bariatric surgery.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approved by the health system's Institutional Review Board (#12104).

Informed Consent Informed consent was obtained from all individual participants included in the study.

Human and Animal Rights All research procedures were in accordance with the ethical standards of the responsible committee on human experimentation. This study was reviewed and approved by the Institutional Review Board (IRB) of the Henry Ford Health System. The study procedures were in accordance with the Helsinki Declaration of 1975, as revised in 2000 and 2008.

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