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Patient Factors Associated with Undergoing Laparoscopic Adjustable Gastric Banding vs Roux-en-Y Gastric Bypass for Weight Loss

Caroline M Apovian, MD¹, Karen W Huskey, MPH², Sarah Chiodi, MPH², Donald T Hess, MD, FACS³, Benjamin E Schneider, MD, FACS⁴, George L Blackburn, MD, PhD, FACS⁵, Daniel B Jones, MD, MS, FACS⁴, and Christina C Wee, MD, MPH²

¹Evans Department of Medicine, Section of Endocrinology, Diabetes and Nutrition, Boston Medical Center and Boston University School of Medicine, Boston MA

²Division of General Medicine and Primary Care, Department of Medicine, Beth Israel Deaconess Medical Center and Harvard Medical School, Boston MA

³Department of Surgery, Boston Medical Center and Boston University School of Medicine, Boston MA

⁴Division of Minimally Invasive Surgery, Department of Surgery, Beth Israel Deaconess Medical Center and Harvard Medical School, Boston MA

⁵Center for the Study of Nutrition Medicine, Beth Israel Deaconess Medical Center and Harvard Medical School, Boston MA

Abstract

Background—Roux-en-Y gastric bypass and laparoscopic adjustable gastric banding are two commonly performed bariatric procedures in the US with different profiles for risk and effectiveness. Little is known about factors that might lead patients to proceed with one procedure over the other.

Study Design—We recruited and interviewed patients seeking bariatric surgery from 2 academic centers in Boston (response rate 70%). We conducted multivariable analyses to identify patient perceptions and clinical and behavioral characteristics that correlated with undergoing gastric banding (n=237) versus gastric bypass (n=298).

Results—After adjustment for sociodemographic and clinical factors, we found that older patients [OR 1.03 (95 % CI 1.00-1.05)] and those with higher quality of life (QOL) scores and higher levels of uncontrolled eating were more likely to undergo gastric banding as opposed to gastric bypass. In contrast, patients with type 2 diabetes [0.46 (0.28,0.77)] those who desired greater weight loss, and those who were willing to assume higher mortality risk to achieve their ideal weight were less likely to proceed with gastric banding. After initial adjustment, male sex and lower BMI were associated with likelihood to undergo gastric banding; however, these factors

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Correspondence address: Christina C. Wee, MD, MPH, Beth Israel Deaconess Medical Center, 330 Brookline Ave, Boston, MA 02215, Tel: 617-754-1409, Fax: 617-754-1440, cwee@bidmc.harvard.edu.

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were no longer significant after adjustment for other significant correlates such as patients' perceived ideal weight, predilection to assume risk to lose weight, and eating behavior.

Conclusions—Patients' diabetes status, quality of life, eating behavior, ideal weight loss, and willingness to assume mortality risk to lose weight were associated with whether patients proceeded with gastric banding as opposed to gastric bypass. Other clinical factors were less important.

Introduction

The worldwide rise in obesity prevalence over the past 30 years has spurred much progress in obesity treatment including behavioral strategies, pharmacotherapy and bariatric surgery. [1] Bariatric surgery results in more dramatic and sustained weight loss than other modalities and has gained increasing popularity. Until recently, the Roux-en-Y gastric bypass and the laparoscopic adjustable gastric banding were two most commonly performed bariatric procedures in the United States, although the use of gastric banding has declined in recent years.[2, 3]

Although both gastric banding and gastric bypass result in sustained weight loss, the degree of weight loss as well as the mechanism of achieving it differs, with gastric bypass producing greater and more sustainable weight loss over time.[4] Research in both animal models and humans of bariatric surgery shows an anatomic restriction in the quantity of food that can be ingested as well as neural changes in appetite, satiety, and food preferences. [5] These neural shifts vary among procedures, accounting for some of the differences in weight loss and weight maintenance.

Scant data are available on how patients choose one bariatric procedure over another. One recent study concluded that health related quality of life does not vary among patients seeking different surgical procedures for weight loss.[6] This is counterintuitive as one would expect patients who experience greater impairment of quality of life due to obesity might be more willing to undergo invasive and risky surgical procedures in exchange greater weight loss. Our recent work[7] corroborates this hypothesis; patients who had lower quality of life scores were more willing to accept higher risk for bariatric surgery when queried prior to surgery.

Examining data from this same cohort, we sought to determine whether there were clinical, quality of life, or behavioral characteristics that distinguished bariatric surgery candidates who chose to proceed with the lower risk gastric banding as opposed to the higher risk gastric bypass. We hypothesized that patients with lower BMI, higher quality of life scores, lower illness burden, and who report less emotional and dis-inhibited eating would favor gastric banding over gastric bypass.

Methods

Study Sample, Recruitment, and Data Collection

The Assessment of Bariatric Surgery (ABS) Study –not to be confused with LABS--is a longitudinal cohort study of patients who were being evaluated for bariatric surgery. The goals of ABS are to understand patients' perception and decision-making around bariatric surgery and the longitudinal effect of surgery on quality of life and other health outcomes. Study subjects were systematically recruited from the bariatric surgery centers of two academic medical centers in Boston, one of which serves a large socially disadvantaged racial minority urban population. Our recruitment has been previously described in detail.[7] Eligible patients had to be age 18 to 65 years of age at the time of recruitment, English-speaking, and have the permission of their physician for us to contact the patient. The

participation rate was 70%. Of the 543 study participants (83%) who proceeded with surgery within 18 months of enrollment (between June, 2008 and October, 2011), 535 patients underwent either gastric bypass or gastric banding. Data were collected via a one hour telephone interview at baseline. A trained study nurse also conducted medical record reviews to abstract additional clinical information including comorbidities.

The institutional review boards at Beth Israel Deaconess Medical Center, Boston Medical Center, and the University of Massachusetts Center for Survey Research (all in Boston, MA) approved the study.

Measures

Demographic Factors—Patients were queried about their race and ethnicity, marital status, education, income, and insurance status. Sex, date of birth, and insurance type were abstracted via medical record review. Age was calculated using date of birth and date of the interview.

Clinical Factors and Illness Burden—Body mass index (BMI) was calculated based on pre-surgical weight and height as abstracted from the clinical record. Comorbidities abstracted from the medical record included heart disease, obstructive sleep apnea, hypertension, dyslipidemia, diabetes, asthma, gastroesophageal reflux disease/esophagitis/Barretts esophagus, arthritis, chronic back pain, depression, anxiety, psychological disorders, liver disease or cirrhosis, and leukemia/ non-skin cancer / HIV.

Patient Perceptions and Motivation—Patients were asked about their perceived health risk (none to extremely high), their perceived life expectancy, and the perceived ideal weight. We used the standard gamble method to assess patients' predilection or aversion to taking risks to achieve weight loss. The standard gamble is the gold standard approach to assessing the value patients attach to a certain health outcome in terms of the a universal metric of risking death.[8] In this case, the desired health outcome is their perceived ideal weight loss. We used the standard gamble approach to assess patients' willingness to undergo a hypothetical treatment that would produce the necessary weight loss to achieve their ideal weight but was associated with a small risk of death. For those who respond affirmatively, we then ascertained through an iterative process the highest risk of dying they were willing to take to undergo this treatment. Details of our standard gamble approach have been detailed previously.[7, 9]

In addition, patients were asked about what factors were “very important” in motivating them to lose weight such as health/medical reasons, psychosocial factors, appearance/embarrassment, physical limitations/fitness, and sex life. They were also asked what the most important source of information that contributed to their decision to undergo bariatric surgery i.e. their primary care doctor, other doctor or health provider, family, friends, media or internet, and other source.

Quality of Life and Health Behaviors—To assess quality of life, we administered a telephone-administered version of the Impact of Weight on Quality of Life-lite Questionnaire (IWQOL-lite).[10] The IWQOL-lite is a 31-item quality of life instrument that was developed to capture five domains specific to obesity namely physical function, self-esteem, sexual life, public distress, and work. Responses were scored on a 0-100 scale according to standard methods and higher scores indicate better quality of life.

We administered the Three Factor Eating Questionnaire (TFEQ) Instrument[11] revised for obese subjects from the Swedish Obese Subjects study (SOS-TFEQ-18).[12] The SOS-

TFEQ-18 is an instrument that incorporates measures of cognitive restraint in eating (6 items), uncontrolled eating (9 items), and emotional eating (3 items). One question asks patients to rate their restrained eating on a scale from 0-8. We adjusted the response rating scale to this question to be on a more intuitive 0-10 scale, and then rescaled answers to match the 0-8 scoring. All other responses for each of the three domains are scored from 1 to 4, summed, and transformed to a 0-100 scale for ease of interpretation. Higher scores denote higher levels of cognitive restrained eating, uninhibited or uncontrolled eating, and emotional eating, respectively.

Statistical Analysis

Descriptive statistics were used to characterize our sample by type of surgery. Wald chi-square tests were used to evaluate differences in proportions, while t-tests were used to evaluate differences in means for continuous variables.

We conducted a series of multivariable logistic regression models to assess the relationship between patient characteristics and the likelihood of undergoing gastric banding versus gastric bypass. All models were adjusted for age, sex, race/ethnicity, marital status, education, insurance status, and surgeon. We first considered the contribution of clinical factors (BMI, comorbidities), IWQOL-lite scores, and patient perception of life-expectancy and health risk. Comorbidities were assessed first through a stepwise selection model using all variables. Variables were considered for entry into the model at a level of significance of 0.10, and remained in the model only if they achieved a 0.05 level of significance.

In the next series of models, we considered patients' perceived ideal weight loss, motivations for weight loss and primary source of information regarding bariatric surgery. We also considered eating behavior in terms of cognitive restraint, uncontrolled eating, and emotional eating. We subsequently considered patients' willingness to risk death (continuous measure) to achieve their ideal weight loss as a proxy measure for their predilection or aversion to risk.

In sensitivity analyses, we adjusted our primary models for income among the subset with complete data (97% of sample). Findings were similar and are not presented.

Results

Of 543 patients in our study who underwent bariatric surgery, 297 (55%) underwent Roux-en-Y gastric bypass and 238 (44%) underwent laparoscopic adjustable gastric banding. Table 1 presents baseline characteristics of patients who underwent each surgery type. Men and patients with lower BMI and higher educational levels, and those who were married were significantly more likely to undergo gastric banding than gastric bypass before adjustment for other factors. Patients who underwent gastric banding were more likely to have dyslipidemia whereas patients who chose gastric bypass were more likely to have diabetes and asthma. Patients who proceeded with gastric banding also had lower perceived ideal weights, higher perceived life-expectancy, and viewed their weight as a lower health risk than patients who underwent gastric bypass (Table 2). Motivation to undergo bariatric surgery and primary source of information about surgery did not differ between the two groups.

Table 3 presents factors associated with whether patients underwent gastric banding versus gastric bypass after adjustment. As expected, older patients and those with lower BMI and who perceive a lower adverse risk from their weight were more likely to undergo gastric banding after adjustment for other demographic factors (model 1). Patients with Medicaid or equivalent insurance were significantly less likely to undergo gastric banding. Diabetes was

the only comorbidity associated with surgery type along with quality of life score. Perceived life-expectancy and perceived of health risk posed by weight were not significant correlates after adjustment. Interestingly, men were more likely to favor gastric banding after initial adjustment for sociodemographic factors, quality of life and comorbidity but patient sex was no longer significant once we accounted for patient preferences and eating behavior in subsequent analyses (Model 2). BMI also became non-significant after additional adjustment.

Model 2 presents results from additional multivariable analyses that considered patients' preferences and eating behaviors in addition to baseline demographic and clinical factors. Of the additional factors considered, patients who had higher perceived ideal weight loss and a higher predilection for assuming risk to undergo treatment were less likely to undergo gastric banding whereas those who reported a higher level of uncontrolled eating were more likely to do so. Patients' motivation for weight loss and their level of dietary cognitive restraint and emotional eating were not significantly associated with surgery type. Income was not a confounder of the relationship between the significant factors we identified and surgery type.

Discussion

In our study of more than 500 patients, we found that patients who were older, who had a better quality of life, and who reported higher levels of uncontrolled eating behavior tended to proceed with gastric banding over Roux-en-Y gastric bypass. In contrast, patients with type 2 diabetes, those who desired more weight loss, and those who were more willing to assume mortality risk to lose weight tended to choose gastric bypass over gastric banding.

A few small qualitative studies have examined patients' perspectives on weight loss and bariatric surgery suggesting that patients who do not pursue tend to overestimate the risk of surgery [13, 14] and underestimate the risk of their obesity to their health [14]. However, few studies have sought to understand potential factors that could predict patient preference for gastric banding over gastric bypass. The risk:benefit ratio of the two procedures are markedly different. Gastric banding has a lower peri-operative mortality and morbidity rate but also produces less absolute weight loss on average than gastric bypass [15]. Despite these differences, the two procedures are generally recommended for patients with the same obesity profile i.e. BMI ≥ 40 kg/m² or ≥ 35 kg/m² with at least one serious comorbidity such as type 2 diabetes or obstructive sleep apnea [16]. Although the Food and Drug Administration (FDA) Devices Panel did recently approve the use of gastric banding for a lower BMI indication (as low as BMI of 30 kg/m² with comorbidities) [17], insurance carriers have generally not approved coverage for patients with BMI below 35 kg/m². Thus much of the choice between the two procedures relies on patient preference and the input from the surgical team. Since the average weight loss with gastric bypass is higher than with gastric banding, however, many academic centers, surgeons, and surgical teams reserve gastric banding for lower BMI ranges.

The results of our study suggest that factors other than BMI influence which bariatric procedure patients undergo and that these factors may be as or more influential than BMI in the decision making process for patients. While other studies have examined differences between obese individuals who seek bariatric surgery versus lifestyle interventions, data on factors associated with undergoing one bariatric procedure over another are sparse. Moreover, prior studies have not considered the role of patients' motivations, preferences, and perceptions. Previous studies for the most part suggest that bariatric surgery seekers have higher BMI, are more often diagnosed with comorbidities, and report poorer quality of life [18-20] than those who seek non-surgical weight loss treatment.

Several of our results were intuitive and predictable. Patients on Medicaid insurance were substantially less likely to undergo this procedure likely because some Medicaid insurance products in Massachusetts do not cover gastric banding. In addition, patients who stood to benefit the most from the greater weight loss associated with gastric bypass tended to proceed with gastric bypass i.e., those with poorer quality of life, with type 2 diabetes, and who perceived themselves as further away from their perceived ideal body weight. In our prior study of the same cohort, we also found that patients with poorer quality of life scores had more unrealistic expectations of weight loss from bariatric surgery and were more willing to accept higher mortality risk to achieve weight loss[7]. Our present study suggests that patients' predilection to assume mortality risk to achieve weight loss -- above and beyond their preferences for the desired level of weight loss -- affects which bariatric procedure they underwent.

Our study also explored the role of patients' control over their eating in determining the choice of bariatric procedure. Dietary restraint is very common in Western societies and has been suggested to play a role in the development of eating disorders as well as obesity. In our study, we used the SOS Three Factor Eating Questionnaire (SOS-TFEQ-18) which was developed in populations with obesity to evaluate three domains of eating behavior: dietary restraint, uncontrolled eating, and emotional eating.[13, 21, 22] Data indicate that eating behavior that involves a high degree of cognitive restraint as measured by the TFEQ is associated with the achievement of a recommended dietary intake for weight loss in behavioral and medical treatment programs.[23]

Based on their mechanism of action, we postulate that gastric bypass would be a better procedure than gastric banding for patients with poor control over their eating. Therefore, we were surprised to find that patients in our study who scored higher for uncontrolled eating in the SOS-TFEQ-18 were more apt to undergo gastric banding rather than gastric bypass. Patients' cognitive restraint and predilection for emotional eating on the other hand did not seem to favor either procedure. Perhaps those subjects who exhibited uncontrolled eating were unwilling to undergo an irreversible procedure that would impair their ability to eat large quantities of food. Unlike the Roux-en-Y gastric bypass, gastric banding is adjustable in that the band restricting the proximal gastric pouch can be loosened or tightened by accessing the port and withdrawing or adding saline so that mechanical restriction can be altered. Thus, patients may perceive this operation to be more "reversible" and allow for the possibility of being able to continue uncontrolled eating when needed or desired. Studies using the SOS-TFEQ-18 in lifestyle interventions show that an increased level of cognitive restraint and decreased levels of uncontrolled, emotional, and binge eating are associated with weight loss and weight maintenance.[24] Future studies should investigate the effect of bariatric surgery on these eating behaviors and how it affects weight loss and maintenance after surgery.

Our findings must be interpreted in the context of its limitations. Although the study was conducted at two academic centers, the centers were both in Boston and therefore the generalizability of our findings may be limited. In addition, we were not able to examine or consider the preferences of the clinicians involved in the care of individual patients in our study although models were adjusted for surgeon so that any systematic predilection by individual surgeons for one surgery type over another is accounted for. Nonetheless, it is possible that the patient factors we identified influenced how providers direct and counsel patients about the two procedures rather than the factors themselves being a direct determinant of patients' preferences for one particular bariatric procedure over another. Finally, while sleeve gastrectomy is one of the two most common bariatric procedures at the present time displacing gastric banding to a large degree,[3] it was uncommon at the time

when we conducted our study and so we were unable to study the correlates of undergoing sleeve gastrectomy.

In conclusion, our study demonstrates that BMI plays a lesser role than patient preferences and behavioral characteristics in determining whether patients undergo gastric banding or Roux-en-Y gastric bypass. The factors that seem to have greatest influence on decision-making are the presence of type 2 diabetes, how much weight the patient desires to lose, patients' predilection to assume mortality risk to achieve their ideal weight, and the presence of uncontrolled eating. Future studies should confirm our findings in other bariatric populations and examine the effect of different bariatric procedures on eating behaviors post-surgery.

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Table 1
Sample Characteristics

	Gastric banding, n=239	Gastric bypass, n=297
Mean age, y	45.0	43.0
Mean BMI, kg/m ² *	46.1	47.4
Race/ethnicity, % *		
White	75	63
African American	12	22
Hispanic	9	12
Other	5	3
Female, % *	70	81
Insurance, % *		
Private	84	65
Medicare	8	12
Medicaid or equivalent	8	20
Marital status, % *		
Married	54	40
Divorced/widowed/separated	18	26
Never married	28	34
Education, % *		
High school or less	21	29
Some college or 2 year degree	34	38
4 year college diploma or more	45	33
Annual household income, % *		
\$20,000	8	23
\$20,001-\$60,000	27	32
\$60,001-\$100,000	28	23
\$100,000+	34	19
IWQOL –lite Overall Summary Score *	57.4	51.8
SOS Three Factor Eating Questionnaire Subscale scores		
Cognitive Restraint *	46.1	51.9
Uncontrolled Eating *	47.0	37.3
Emotional Eating	55.2	50.5
Comorbidities, %		
Diabetes *	24	37

	Gastric banding, n=239	Gastric bypass, n=297
Cardiac Disease	6	4
Obstructive sleep apnea	47	45
Hypertension	49	56
Dyslipidemia *	68	56
Asthma *	20	27
GERD, esophagitis, Barretts	46	46
Arthritis	31	30
Chronic back pain	44	44
Depression	54	52
Anxiety	40	37
Other Psychiatric disorder *	11	21
Liver disease	53	45
Malignancy, AIDS *	6	2

* $p < 0.05$ for significant difference between gastric bypass and laparoscopic banding surgery based on Wald Chi-square test for difference in proportions or t-test for difference in means.

Table 2
Patient Perceptions and Motivations Stratified by Bariatric Procedure

	Gastric banding, n=239	Gastric bypass, n=297
Mean ideal weight loss (% of current weight) *	38.2	42.9
Perceived life-expectancy, y *	23	21
Perception of weight as health risk, % *		
Moderate, Slight, or none	13	7
High	50	44
Extremely high	38	48
Motivations to undergo bariatric surgery/lose weight, % rating "very important"		
Health/medical concerns	90	93
Psychosocial concerns	18	24
Appearance / embarrassment concerns	65	70
Physical limitation /fitness concerns	70	76
Sex life	25	29
Most important source of information contributing to surgery decision		
Media (TV, newspaper, magazines, internet)	7	9
Your friends	11	13
Your family	19	16
Your primary care physician	27	22
Other doctor or non-physician health provider	11	10
Anything else	26	31

* p<0.05 for significant difference between gastric bypass and laparoscopic banding surgery based on Wald Chi-square test for difference in proportions or t-test for difference in means.

Table 3
Patient Characteristics Associated with Likelihood of Undergoing Gastric Banding vs Gastric Bypass

	Model 1, adjusted for demographics + illness burden (n=510), Odds Ratio (95% CI)	Model 2, additionally adjusted for patient preferences + behavioral factors (n=487), Odds Ratio (95% CI)
Age, y	1.03 (1.01,1.05) *	1.03 (1.00,1.05) *
BMI, kg/m ²	0.97 (0.94,1.00)	1.01 (0.98,1.05)
Race / ethnicity		
Non-Hispanic White	1.00	1.00
Non-Hispanic AA	0.96(0.52,1.77)	0.87 (0.45,1.68)
Hispanic	1.15 (0.57,2.32)	1.18 (0.55,2.54)
Other	1.84 (0.62,5.45)	1.32 (0.39,4.44)
Sex		
Male	1.45 (0.89,2.35) *	1.02 (0.59,1.77)
Female	1.00 *	1.00
Insurance		
Private	1.00	1.00
Medicare	0.80 (0.38,1.72)	0.84 (0.37,1.88)
Medicaid or equivalent	0.43 (0.22,0.84) *	0.47 (0.24,0.94) *
Has diabetes	0.48 (0.30,0.77) *	0.46 (0.28,0.77) *
Quality of Life, per 10 point rise in IWQOL-lite score	1.18 (1.05,1.32) *	1.23 (1.08,1.40) *
Uncontrolled Eating, per 10 rise in SOS-TFEQ-18 score**	-	1.24 (1.12,1.38) *
Ideal Weight Loss (% of current weight)	-	0.95 (0.93,0.98) *
Highest acceptable risk of death (%) to achieve ideal weight [†]	-	0.99 (0.97,1.00) *

* Results were statistically significant at a level of p<0.05. Each model was adjusted and listed in its respective column in addition to education, marital status and surgeon.

[†] For every 1% higher mortality risk patients are willing to assume to achieve their ideal weight loss, the odd ratio of their undergoing gastric banding instead of gastric bypass is 0.98; similarly, for every 5% higher risk, the odds is (0.98)⁵ or 0.90.