The role of dumping syndrome in weight loss after gastric bypass surgery

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Abstract

Background Roux-en-Y gastric bypass is the most commonly performed operation for the treatment of morbid obesity in the US. Dumping syndrome is an expected and desired part of the behavior modification caused by gastric bypass surgery; it can deter patients from consuming energy-dense food. In this study we assessed the role dumping has in weight loss and its relationship with the patient's eating behavior.

Methods Fifty patients who underwent gastric bypass between January 2008 and June 2008 were enrolled. Two questionnaires, the dumping syndrome questionnaire and the Three-Factor Eating Questionnaire (TFEQ), were used to record the patients' responses. The diagnosis of dumping syndrome was based on the Sigstad scoring system, where a score of 7 and above was considered positive. TFEQ evaluated the patients' eating behavior under three scales: cognitive restraint, uncontrolled eating, and emotional eating. The results were analyzed with descriptive and parametric statistics where applicable.

Results The prevalence of dumping syndrome was 42 %, with 66.7 % of the subjects being women. The nondumpers were observed to have a greater mean decrease in body mass index than the dumpers at 1 and 2 years (18.5 and 17.8 vs. 14.4 and 13.7 respectively). There was no definite relationship between the presence of dumping syndrome and the eating behavior of the patient. However, the cognitive restraint scores, greater than 80 %, were associated with an average decrease in BMI of 19 and 20.8 at 1 and 2 years compared with 14.6 and 12.4 in those with scores less than 80 % ($p = 0.01$ and $p = 0.03$, respectively).

Conclusion The presence of dumping syndrome after gastric bypass does not influence weight loss, though eating behaviors may directly influence it.

Keywords Dumping syndrome · Roux-n-Y gastric bypass · Morbid obesity · Weight loss

The pandemic of obesity has risen by 75 % among adults around the globe since 1980 [1]. It appears to have transcended the barrier of age to afflict children at a much faster pace [2]. As a result, the popularity of bariatric surgery has surged over the last decade, with the most common weight loss procedure being Roux-en-Y gastric bypass (RNYGB). RNYGB is restrictive and malabsorptive surgery that is known to cause a multitude of adverse effects secondary to the deficiency of key micronutrients [3]. Dumping syndrome is one such complication that has traditionally been associated with gastric and esophageal surgery. It refers to symptoms and signs that are elicited due to rapid transit of calorie-dense food to the small bowel, which exerts an intense local osmotic and delayed hyperinsulinemic effect [4]. The RNYGB patient normally experiences rapid and dramatic weight loss in the immediate postoperative period when the simultaneous presence of early dumping is not uncommon [5]. In most cases, the symptoms of dumping syndrome resolve completely

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between 18 and 24 months when a concomitant regain of lost body weight is also observed in the same subpopulation. Thus, dumping syndrome is believed to result in a desired behavior modification post RNYGB that prevents individuals from consuming calorie-dense foods and thereby contributes to weight loss [6, 7].

Adherence to rigorous diet is also believed to contribute to improved postoperative outcome, with psychosocial and eating behaviors playing an influential role in the long-term results [8, 9]. In view of this background, we conducted a study with the primary objective of determining the correlation between dumping syndrome and weight loss after RNYGB. The secondary objectives were to assess the role of dumping syndrome on the eating behavior of the postoperative patients and to evaluate the role of eating behavior in weight loss after RNYGB.

Methods

Patient selection

Upon obtaining approval from the Institutional Review Board (IRB), 50 consecutive patients were enrolled in the study over the phone between September 2010 and March 2011. The included study subjects, aged between 18 and 80 years, were treated with laparoscopic RNYGB for morbid obesity between January 2008 and June 2008. The patients with a history of previous upper gastrointestinal surgery were excluded from the study. Upon giving informed consent, the patients were presented with two questionnaires over the phone and their responses were noted.

The dumping syndrome questionnaire

The Sigstad clinical diagnostic index was used to assess dumping syndrome [10]. This validated scoring system was developed for the diagnosis of dumping syndrome in partial gastrectomy patients and had later been extended to other different surgeries [11, 12]. It had been used to assess this condition in the bariatric surgery population [13]. The questionnaire asked about symptoms associated with dumping syndrome that the subjects have suffered from before RNYGB, immediately after RNYGB, and 2 years post surgery (Appendix 1). The presence of dumping syndrome was determined if the score was greater than or equal to 7.

The revised Three-Factor Eating Questionnaire (TFEQ-R18)

This instrument was a shortened and revised version of the original 51-item TFEQ [14]. The questionnaire measured

three different aspects of the patient's eating behavior: cognitive restraint (conscious restriction of food intake in order to control body weight or to promote weight loss), uncontrolled eating (tendency to eat more than usual due to a loss of control over intake accompanied by subjective feelings of hunger), and emotional eating (inability to resist emotional cues). The TFEQ-R18 comprised 18 items on a 5-point response scale [15]. Responses to each of the 18 items were given a score between 1 and 4 and item scores were summated into scale scores for cognitive restraint, uncontrolled eating, and emotional eating. The raw scale scores were converted to a 0–100 scale ([(raw score–lowest possible raw score)/possible raw score range] $\times$ 100) for the purpose of standardization. Higher scores in the respective scales were indicative of greater cognitive restraint, uncontrolled eating, or emotional eating (Appendix 2).

Data collection

The patients were asked about the dumping syndrome symptoms, which usually followed ingestion of sweets, at three points in time: preoperative, immediately postoperative, and 2 years after surgery. TFEQ-R18 was completed on the basis of their diet at the time of execution of the study. After obtaining their responses to the questionnaires, the medical records of the enrolled patients were reviewed to collect pertinent data on demographics, including their body weights and body mass index (BMI). BMI loss was calculated at 1, 6 months, 1 year, and at 2 years post surgery.

Statistical analysis

Statistical analysis of the data was performed using SPSS ver. 18.0 (SPSS Inc., Chicago, IL). The normality of the data was evaluated with the help of a Shapiro–Wilk test. The continuous variables were expressed as mean and standard deviation or range and median. χ^2 tests and t tests were performed to determine the significance of the relationships between the nominal and continuous variables, respectively. A p value less than 0.05 was considered significant.

Results

Twenty-one of 50 patients (42 %), with a mean age of 49.7 $\pm$ 11.4 years, were found to suffer from dumping syndrome. Twelve of these 21 patients (57.1 %) complained of early dumping only, while the rest experienced symptoms of both early and late dumping. All the patients experienced resolution of their symptoms between 1 and 2 years post RNYGB. Women comprised 76 % (38 of 50) of the entire

study population. The median ASA score of the patients during RNYGB surgery was 3 (range = 2–4). The mean preoperative weight of the patients was 309.2 ± 69.1 lbs. and the preoperative BMI was 50.6 ± 9.6 kg/m^2. The average decrease in BMI at 1 month post surgery was 3.7 ± 1.8 kg/m^2 while that at 6 months was 13.2 ± 3.8 kg/m^2. The mean BMI loss at 1 year was 16.7 ± 5.8 kg/m^2 while that at 2 years was 16.4 ± 8.2 kg/m^2. Table 1 gives the patient demographics and the decrease in BMI over time of the dumpers and the nondumpers. At 1 month post RNYGB, the dumpers lost an average of 4.1 kg/m^2 in their BMI compared to 3.3 kg/m^2 for nondumpers ($p = 0.29$). However, at the remaining points of observation, the nondumpers were observed to have a greater decrease in BMI than the dumpers, i.e., 13.8 versus 12.5 kg/m^2 at 6 months ($p = 0.39$), 18.5 versus 14.4 kg/m^2 at 1 year ($p = 0.57$), and 17.8 versus 13.7 kg/m^2 at 2 years post surgery (p = 0.39) (Table 2). There was no statistically significant difference in weight loss between dumpers and nondumpers throughout the period of observation. We did not observe any significant relationship between dumping and weight loss on the basis of gender as well.

Next, we attempted to ascertain the effect of dumping syndrome on the long-term eating behavior of the patients. We did not observe any statistically significant difference

Table 1 Patient characteristics

Age (years)	49.7 ± 11.4
Sex	76 % women
ASA score	2.75 ± 0.5
Preoperative weight (lbs.)	309.2 ± 69.1
Preoperative BMI	50.6 ± 9.6
Change in BMI at 1 month	3.7 ± 1.8
Change in BMI at 6 months	13.2 ± 3.8
Change in BMI at 1 year	16.7 ± 5.8
Change in BMI at 2 years	16.4 ± 8.2
Cognitive restraint	81.7 ± 10.9
Uncontrolled eating	16.8 ± 9.5
Emotional eating	7.1 ± 11.6

Values are mean ± SD

Table 2 Effect of dumping on loss of BMI

	Dumpers (n = 21)	Nondumpers (n = 29)
Change in BMI at 1 month	4.1 (2.3)	3.3 (1.3)
Change in BMI at 6 months	12.5 (3.9)	13.8 (3.6)
Change in BMI at 1 year	14.4 (4.5)	18.5 (6.2)
Change in BMI at 2 years	13.7 (6.7)	17.8 (8.8)

$\chi^2 = 0.51$; $p = 0.92$

Table 3 Effect of dumping on eating behavior of patients

	Dumpers (n = 21)	Nondumpers (n = 29)	Significance
Cognitive restraint	81.2 (10.7)	81.9 (11.2)	t −0.25* $p = 0.81$
Uncontrolled eating	16.4 (9.8)	17.1 (9.4)	t −0.26* $p = 0.79$
Emotional eating	6.9 (11.9)	7.3 (11.6)	t −0.12* $p = 0.91$

*df = 48

in the scores of cognitive restraint and uncontrolled eating between the dumpers and the nondumpers (Table 3).

Finally, we tried to assess the association between eating behavior and the decrease in BMI of the study subjects. Patients who demonstrated more restraint toward food (score ≥ 80) experienced significantly greater weight loss at 1 and 2 years than those who lacked restraint ($p = 0.01$ and $p = 0.03$, respectively) Similarly, those who showed decreased uncontrolled eating scores (<10) experienced a greater decrease in their BMI at 6 months (15.7 vs. 12.4, $p = 0.01$) and at 1 year (20.9 vs. 15.1, $p = 0.003$). Though we observed an increased loss of BMI at other points of observation with higher cognitive restraint scores and lower uncontrolled eating scores, these failed to attain statistical significance. We did not observe any association between the emotional eating score and weight loss during the 2 years post RNYGB (Tables 4, 5). The comparison, based on gender, of dietary habits with weight loss was identical to that of the entire study population and did not demonstrate any sex-specific variability.

Discussion

Dumping syndrome is a well-established complication of upper gastrointestinal surgery and has again become prevalent in recent times with the increased popularity of bariatric surgery [16]. Clinically significant dumping can cause grave distress to the patient when sugar-dense foods are ingested. This gave rise to the belief that dumping adversely conditioned the patients against consuming calorie- and sugar-dense foods, thus contributing to weight loss. With the advent of science, it became evident that the weight loss associated with RNYGB was multifactorial. Apart from the restriction of food intake due to a smaller gastric pouch and malabsorptive effects resulting from the distortion of the gastrointestinal anatomy, changes in the entero-endocrine axis have been increasingly held responsible for weight loss. Bypass patients have been found to elicit exaggerated PYY and GLP-1 responses to a small meal, which contribute to premature satiety and weight loss

Table 4 Effect of eating behavior on weight loss at 1 and 6 months post RNYGB

	Change in BMI at 1 month	Stats	Change in BMI at 6 months	Stats
Cognitive restraint score				
≥80	3.9 (1.9)	t 0.95*	13.9 (4.2)	t 1.22**
<80	3.4 (1.7)	p = 0.35	12.6 (3.2)	p = 0.23
Uncontrolled eating score				
≥10	3.6 (1.8)	t −0.59*	12.4 (3.3)	t −2.7**
<10	3.9 (1.9)	p = 0.55	15.7 (4.3)	p = 0.01
Emotional eating score				
≥10	3.7 (1.9)	t 0.21*	12.3 (2.9)	t −1.2**
<10	3.6 (1.7)	p = 0.83	13.7 (4.1)	p = 0.24

*df = 46; **df = 44

Table 5 Effect of eating behavior on weight loss at 1 and 2 years post RNYGB

	Change in BMI at 1 year	Stats	Change in BMI at 2 years	Stats
Cognitive restraint score				
≥80	19 (6.7)	t 2.59*	20.8 (9.3)	t 2.40**
<80	14.6 (4)	p = 0.01	12.4 (4.6)	p = 0.03
Uncontrolled eating score				
≥10	15.1 (4.9)	t −3.2*	15.3 (7.3)	t −1.1**
<10	20.9 (6.2)	p = 0.003	21.1 (12.4)	p = 0.28
Emotional eating score				
≥10	15.4 (5.2)	t −1.02*	16.5 (6.7)	t 0.06**
<10	17.4 (6.2)	p = 0.31	16.3 (9.2)	p = 0.95

*df = 39; **df = 15

[17]. The role of the serum ghrelin level in weight loss post RNYGB is widely debated. Multiple studies have shown reduction [18, 19], no change [20], and an increase [21] in serum ghrelin following bypass.

The incidence of dumping syndrome in our study population following laparoscopic gastric bypass was 42 %. There is a degree of variability in its incidence following gastric bypass in the literature. It has been found to range between 15.7 and 76 % [5, 13, 22]. The etiology causing such inconsistency is yet to be described.

Our current questionnaire-based study failed to show any relationship between the presence of dumping syndrome and loss of body weight, which was measured as a decrease in BMI. Contrary to popular assumption, we observed a trend of a greater loss of BMI in the nondumpers compared to the dumpers (Table 2). A couple of earlier studies had also contradicted this popular belief when they could not show any significant association between dumping and concomitant weight loss [13, 23]. Mallory et al. [13] had further demonstrated the lack of association between the severity of dumping and the extent of weight loss.

It was expected that the presence of dumping would result in long-term changes in the dietary habits of the patients. It should compel the subject to show restraint toward consuming calorie-dense foods and should cause the patient to refrain from eating significant quantities as

well. Surprisingly, we did not observe any difference in the scores of the dumpers and the nondumpers in analyzing the TFEQ-R18. We had used this instrument to assess their eating behavior at a time when all the patients had undergone resolution of their dumping symptoms, based on the Sigstad score. This could have resulted in the lack of difference in the eating behavior of the two groups. The dumpers may have resumed their preoperative diet, which resulted in less weight loss in the long term.

It is well known that the dietary habits of an individual are the best predictors of their overall health and long-term weight loss. Apart from the mean weight loss at 1 month, where the drop in BMI was comparable, patients with greater levels of cognitive restraint experienced greater weight loss at all other times of observation postoperatively. The weight loss was observed to be statistically significant in the long term (at 1 and 2 years) with individuals who had the capacity to adhere to a strict postoperative diet. Sarwer et al. [8] conducted a similar study, assessing the role of eating behavior on weight loss after bypass surgery. They found a positive correlation between cognitive restraint and postoperative weight loss with individuals high in dietary adherence, losing 4.5 % more weight in the long term [8]. Similarly, patients with greater control over satiety and quantity of food, i.e., with lower uncontrolled eating scores, were found to experience greater weight loss at all points in

time, with the difference in mean decrease in BMI at 6 and 12 months attaining statistical significance.

Our study had its inherent limitations. Since the study was based on questionnaires, we could not perform objective tests to confirm the presence of dumping syndrome. We relied completely on the recollection of the patient to diagnose the presence of dumping syndrome with the Sigstad index. This could have resulted in diagnostic errors due to the erroneous inclusion or exclusion of symptoms that were required to achieve a score of 7 or more. We used the TFEQ-R18 instrument to assess the eating behavior of the patients at 2 years or more after surgery. Ideally, the results would have been better if we could have obtained their baseline scores to compare and assess any changes induced by the surgery and resulting dumping syndrome.

In conclusion, we observed increased weight loss in patients who did not experience dumping. Also, there was no change in the eating behavior of the dumpers when compared with the nondumpers 2 years post surgery. Eating behavior was the biggest predictor of continued weight loss at 1 and 2 years post surgery. The risk of dumping causes significant apprehension in patients, even to the point of declining surgery preoperatively. Despite this fear, dumping has not been found to result in improved weight loss. Modification of eating behavior appears to be the biggest predictor of continued long-term weight loss.

Appendix 1

Sigstad clinical diagnostic index for the diagnosis of dumping syndrome

Shock	+5
Almost fainting, syncope, unconsciousness	+4
Desire to lie or sit down	+4
Breathlessness, dyspnea	+3
Weakness, exhaustion	+3
Sleepiness, drowsiness, yawning, apathy, falling asleep	+3
Palpitation	+3
Restlessness	+2

Appendix 1 continued

Dizziness	+2
Headaches	+1
Feeling of warmth, sweating, pallor, clammy skin	+1
Nausea	+1
Fullness in the abdomen, meteorism	+1
Borborygmus	+1
Eructation	−1
Vomiting	−4

A score of +7 or more indicated the presence of dumping syndrome

Appendix 2

The three-factor eating questionnaire—revised 18-item

1. When I smell a sizzling steak or juicy piece of meat, I find it very difficult to keep from eating, even if I have just finished a meal.

| Definitely true (4) | Mostly true (3) | Mostly false (2) | Definitely false (1) |

2. I deliberately take small helpings as a means of controlling my weight.

| Definitely true (4) | Mostly true (3) | Mostly false (2) | Definitely false (1) |

3. When I feel anxious, I find myself eating.

| Definitely true (4) | Mostly true (3) | Mostly false (2) | Definitely false (1) |

4. Sometimes when I start eating, I just can't seem to stop.

| Definitely true (4) | Mostly true (3) | Mostly false (2) | Definitely false (1) |

5. Being with someone who is eating often makes me hungry enough to eat also.

| Definitely true (4) | Mostly true (3) | Mostly false (2) | Definitely false (1) |

6. When I feel blue, I often overeat.

| Definitely true (4) | Mostly true (3) | Mostly false (2) | Definitely false (1) |

7. When I see a real delicacy, I often get so hungry that I have to eat right away.

| Definitely true (4) | Mostly true (3) | Mostly false (2) | Definitely false (1) |

8. I get so hungry that my stomach often seems like a bottomless pit.

| Definitely true (4) | Mostly true (3) | Mostly false (2) | Definitely false (1) |

9. I am always hungry so it is hard for me to stop eating before I finish the food on my plate.

| Definitely true (4) | Mostly true (3) | Mostly false (2) | Definitely false (1) |

10. When I feel lonely, I console myself by eating.

| Definitely true (4) | Mostly true (3) | Mostly false (2) | Definitely false (1) |

11. I consciously hold back at meals in order not to gain weight.

| Definitely true (4) | Mostly true (3) | Mostly false (2) | Definitely false (1) |

Appendix 2 continued

12. I do not eat some foods because they make me fat.

| Definitely true (4) | Mostly true (3) | Mostly false (2) | Definitely false (1) |

13. I am always hungry enough to eat at any time.

| Definitely true (4) | Mostly true (3) | Mostly false (2) | Definitely false (1) |

14. How often do you feel hungry?

| Only at meal times (1) | Sometimes between meals (2) | Often between meals (3) | Almost always (4) |

15. How frequently do you avoid "stocking up" on tempting foods?

| Almost never (1) | Seldom (2) | Usually (3) | Almost always (4) |

16. How likely are you to consciously eat less than you want?

| Unlikely (1) | Slightly likely (2) | Moderately likely (3) | Very likely (4) |

17. Do you go on eating binges though you are not hungry?

| Never (1) | Rarely (2) | Sometimes (3) | At least once a week (4) |

18. On a scale of 1 to 8, where 1 means no restraint in eating (eating whatever you want, whenever you want it) and 8 means total restraint (constantly limiting food intake and never "giving in"), what number would you give yourself?

The 1–2 scores were coded 1; 3–4 scores were coded 2; 5–6 scores were coded 3; 7–8 scores were coded 4

The cognitive restraint scale was composed of items 2, 11, 12, 15, 16, and 18. The uncontrolled eating scale was composed of items 1, 4, 5, 7, 8, 9, 13, 14, and 17. The emotional eating scale was composed of items 3, 6, and 10

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