

Review Article

The Effect of Preoperative Weight Loss before Gastric Bypass: A Systematic Review

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Background. Many insurance companies require obese patients to lose weight prior to gastric bypass. From a previous study by the same authors, preoperative weight at surgery is strongly predictive of weight loss up to one year after surgery. This review aims to determine whether preoperative weight loss is also correlated with weight loss up to one year after surgery. *Methods.* Of the 186 results screened using PubMed, 12 studies were identified. A meta-analysis was performed to further classify studies (A class, B class, regression, and rejected). *Results.* Of all 12 studies, one met the criteria for A class, six were B class, four were regression, and one was rejected. Six studies supported our hypothesis, five were inconclusive, and no study refuted. *Conclusions.* Preoperative weight loss is additive to postsurgery weight loss as predicted from the weight at the time of surgery.

1. Introduction

According to the latest statistics, one out of every three adults (33.8%) in US is obese. Additionally, the rate of morbid obesity is 5.7% in adults [1]. Bariatric surgery is a very effective intervention for the morbidly obese. More than 220,000 people underwent some form of bariatric surgery in 2008 [2]. Age, gender, race, height, initial body weight, postoperative behaviors, type of operation, and surgeon have been reported to affect weight loss following surgery. However, no consideration of factors impacting weight loss outcomes would be complete without attention to the importance of preoperative weight loss. Although the California Department of Managed Care explicitly states that “there is no literature presented by any authority that mandated weight loss, once a patient has been identified as a candidate for bariatric surgery, is indicated,” yet the majority of insurance payers continue to require prolonged dietary efforts as a prerequisite to surgical treatment [3]. A reduction in the size of the liver after four weeks of dieting and an increase in ease of surgical exposure are well documented [4, 5]. The impact on overall weight loss is less

clear. Numerous papers dealing with the subject provide an array of experimental models that make a comparison of results difficult. Our paper evaluates the existing publications and separates them into four groups for comparison.

In a previous publication, we showed that weight loss in the first year after gastric bypass is a percent of initial body weight [6]. The following review attempts to determine the effect of short-term preoperative weight loss on weight loss following surgery and the effect of initial body weight.

2. Methods

The study was done using PubMed search for those papers which dealt with aspects of preoperative weight loss before bariatric surgery. The search terms used were (“preoperative weight loss” or “pre-operative weight loss” or “preoperative weight” or “pre-operative weight”) and (“gastric bypass” (meSH) or “bariatric surgery” (meSH) or “obesity surgery” or “weight reduction surgery” or “predicting”).

Each abstract was analyzed to include only those studies which satisfied all set criteria. Criteria for abstract review

were as follows. All studies reviewed were from a peer-reviewed source and published either in English or Spanish. Studies were required to have one of the following designs: randomized control trials, case control studies, or series/cohort studies. Additionally, the majority of study participants had to be greater than 18 years old. Accepted abstracts included both open and laparoscopic cases.

Articles were obtained for the remaining abstracts and were further analyzed. Each article was expected to have more than ten patients in each group of study (preoperative weight loss versus weight gain) or >20 patients in a regression analysis. Information on pre/post-operation weight loss had to be available for article selection. Papers were also excluded that did not stratify the data such that gastric bypass weight loss results were separated from alternate weight loss procedures such as gastric banding or sleeve gastrectomy (Figure 1). The selected studies were further searched for their references to identify more papers pertaining to our study.

The selected studies were divided into different classes: class A, class B, and regression studies. The classification was based on the patient's weight at initial consultation and the weight at surgery. Both class A and class B studies grouped patients into two follow-up cohorts, one that lost weight and the other that did not.

In class A studies, the weight loss and weight gain groups both had the same mean weight at initial consultation but different at the time they went for surgery. This is demonstrated in Figure 2 by using two groups with five hypothetical patients in each group. Both groups initially begin with similar mean weights and differ directly prior to surgery with different average weights (confidence interval 95%).

2.1. Class A Study Supporting/Refuting Criteria. Studies were deemed to support our hypothesis if both groups of patients had a persistent statistical difference in the average weight within the first 12 months, and the mean weight values did not crossover in this time frame. Refuting studies would have crossing over of the means (e.g., the weight loss group having a higher mean weight after surgery at six months than the weight gain group). Inconclusive studies lacked 50% followup during the first year or proper notation to elicit a definitive conclusion.

In class B studies weight loss and weight gain groups had different mean weights ($P < 0.05$) at initial consultation but similar means at the time of surgery. This is demonstrated in Figure 3 by using two groups with five hypothetical patients in each who begin with different weights at initial consultation but eventually enter the surgery with similar mean weights.

2.2. Class B Study Supporting/Refuting Criteria. Studies were deemed to support our hypothesis if both groups of patients did not have any statistical difference in their mean weight for the first 12 months. Refuting studies would have a statistically different differences between the weight loss and weight gain

group. Inconclusive studies lacked 50% followup during the first year or proper notation to elicit a definitive conclusion.

2.3. Regression Studies. Regression studies do not have to utilize groups of patients and may look at preoperative weight loss as a variable. In regression studies the patients are no longer grouped into weight loss/gain groups or dieters/nondieters groups. The focus is on individual performance of each patient. The following concept has been explained by using six hypothetical patients who undergo gastric bypass surgery (P1, P2, P3, P4, P5, and P6). Each of these hypothetical patients had different amounts of preoperative weight loss with the exception of one patient who did not lose or gain weight.

The preoperative weight loss is considered to be a continuous variable and can be plotted on the x -axis (Figure 4). The outcome is also a continuous variable percent of initial weight loss, plotted on y -axis (Figure 5) for a period of one year after surgery. For explanation and standardization, we use percent of initial weight at surgery as the outcome for y -axis.

2.4. Regression Study Supporting/Refuting Criteria. Regression studies were judged based on the variables included and the results reported by the authors. Analysis was hampered due to absence of data or modeling protocol. Inconclusive studies were defined as <50% followup or too complex for us to interpret without additional input from the author.

Classification of studies was required to define criteria needed to support and refute our hypothesis.

A flow chart used to arrive at the chosen classification is provided in Figure 5.

3. Results

3.1. Class A Studies. The study by Solomon et al. [7] and Alami et al. [19] was a randomized control trial conducted at Stanford Medical University. The study was done for a year comparing postoperative weights between two groups, one which lost weight preoperatively and other which gained weight. The statistical difference between both groups was maintained up to 3 months. At one year, the patients in both arms of the study showed no difference in excess weight loss. But when patients were divided according to those who had lost at least five percent of their excess body weight preoperatively, the one-year results for excess weight loss were much lower for the weight-loss group. This class-A study shows that weight loss is a percent of initial body weight at the time of surgery (Table 1).

3.2. Class B Studies. In the study by Martin et al. [8], the subjects were divided into dieters and nondieters. Here, also the data show that weight loss after surgery is a percent of body weight at the time of surgery. The only statistically significant difference in mean weight between the two groups was at initial presentation (Table 2). The study by Still et al. [9] was done at Geisinger Medical Center in Danville, Pennsylvania. This study was considered

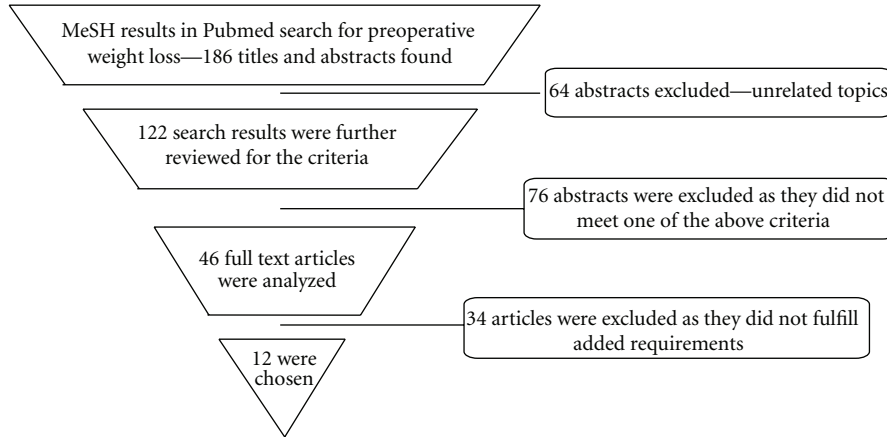


FIGURE 1: Diagram representing the inclusion and exclusion of PubMed search results.

TABLE 1: Class A studies.

Lead author	Study design	Group	Patients	Mean age (yr)	Female (%)	Results
Solomon [7]	RCT	WL	26	42.4	88.5%	Supportive
		WG	35	44.9	80.0%	

WL: weight loss; WG: weight gain; RCT: randomized controlled trial.

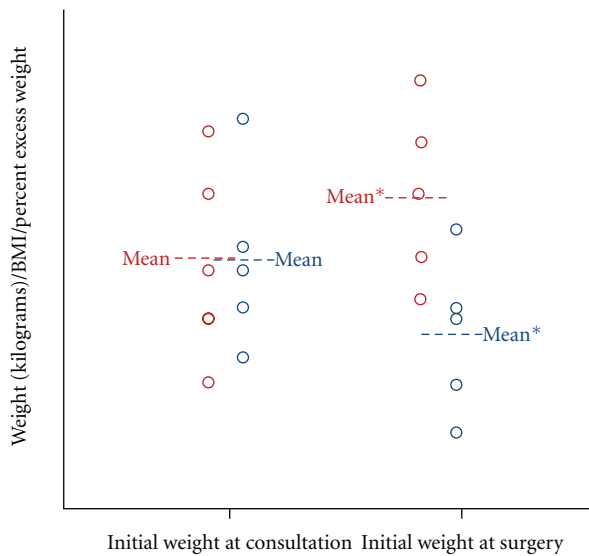


FIGURE 2: Example of Class A study. Graph showing ten hypothetical patients in Class A study that have been divided into weight loss (blue) and weight gain (red) groups. The weight loss group was statistically different from the weight gain group at surgery. *Confidence Interval 95%.

inconclusive because its postoperative assessment was carried out in percentages of patients meeting their weight loss goal as opposed to actual weight values making analysis difficult.

Ali et al. [10] had 351 subjects who were divided into 4 groups based on the percent EWL (excess weight loss). At surgery, no significant differences were found among the 4 groups in total body weight and BMI or EBW except for a BMI difference in group 1 and 3. At 6 and 12 months, no significant difference was found in the total body weight or

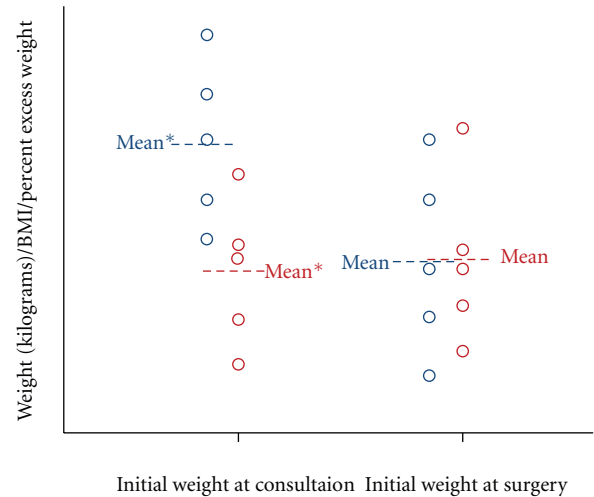


FIGURE 3: Example of class B study. Graph showing ten hypothetical patients in class B study who have been divided into weight loss (blue) and weight gain (red) groups. The weight loss group was statistically different from the weight gain group at initial consultation. *Confidence interval 95%.

BMI among the 4 groups indicating again that weight loss is a function of weight at the time of surgery (Table 2).

The study by Fujioka et al. [11] divided the patients into two groups based on whether patients lost or gained weight preoperatively. Both groups had similar mean weights at surgery. When these patients were followed after surgery, no significant differences in the mean EWL were found at any follow-up point in the first 12 months thus supporting our hypothesis. Harnish's et al. [12] study also had similar structure and findings to that of Fujioka (Table 2).

TABLE 2: Class B studies.

Lead author	Study design	Group	Patients	Mean age	Female (%)	Results
Martin [8]	Prospective	WL (dieters)	47	40.2	74.5%	Supportive
		WG (nondiet)	53	38.8	92.5%	
Still [9]	Prospective	5–10% EBWL	67	43	77.6%	Inconclusive
		5% EBWL	86	43	74.4%	
		0–5% EBWG	137	43	78.8%	
		>5% EBWG	169	45	79.9%	
Ali [10]	Retrospective	WL > 10% TBW	23	42.7	73.9%	Supportive
		WL 5–10% TBW	102	43	87.3%	
		WL 0–5% TBW	135	42.8	95.5%	
		WG % TBW	91	42.1	96.7%	
Fujioka [11]	Retrospective	WL (>0 lbs)	55	49	80.0%	Supportive
		WG (<0 lbs)	66	48	86.4%	
Harnisch [12]	Retrospective	WL (≥ 10 lbs)	88	44	84.1%	Supportive
		WG (≥ 10 lbs)	115	41.4	85.2%	
Huerta [13]	Retrospective	WL	15	50	33.3%	Inconclusive
		WG (non-WL)	25	50	28.0%	

WL: weight loss; WG: weight gain; EBW: excess body weight; TBW: total body weight.

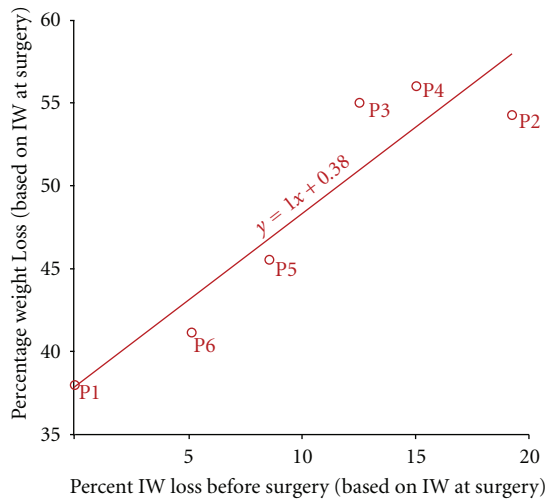


FIGURE 4: Example of regression. Study includes six hypothetical patients who lost weight preoperatively. The preoperative weight loss is graphed against their complete program weight loss (from initial consultation to one year after operation).

The B class study by Huerta et al. [13] was considered inconclusive as the followup was less than 50% during the first year and only had postoperative data for the second and fourth years after surgery.

3.3. Regression Studies. The study by Alger-Mayer et al. [16], which was done at Albany, NY, was analyzed using regression. Even though the year 3 and 4 results supported our hypothesis, the results were considered inconclusive

because the paper lacked postoperative data in the first year after gastric bypass.

The study by Jantz et al. [14] was inconclusive because they were not looking at immediate preoperative weight loss.

Carlin et al. [17] published a paper that changed weight loss requirements based on the initial BMI. Those individuals that had BMI greater than 60 had to lose more than those that were less than 50 kg/m². Thus, the study was considered inconclusive due to difficulty interpreting the methodology.

The study by Alvarado et al. [15] identified a 1.8% increase in the % EWL one year after gastric bypass with each 1% total body weight lost preoperatively. This retrospective study was considered supportive due to the positive effect preoperative weight loss would have on postoperative weight loss in the absence of controlling for initial weight at surgery. Results are summarized in Table 3.

3.4. Rejected Studies. The study by Riess et al. [18] was rejected as a study because the weight loss group and the weight gain group had statistically significant difference in mean weight at both initial consultation and the time before surgery. The difference was preserved postoperatively (see Table 4).

4. Discussion

Our study found that weight at the time of surgery, rather than the amount of weight lost preoperatively, determines the weight loss outcome postoperatively. Stated differently, weight at a given time period after surgery is the same percent of initial body weight independent of starting weight. For example, if a patient weighs 160 kg at the time of surgery, he will weigh approximately 62% of that at one year after surgery or 100 kg. If he lost 22.5 kg preoperatively

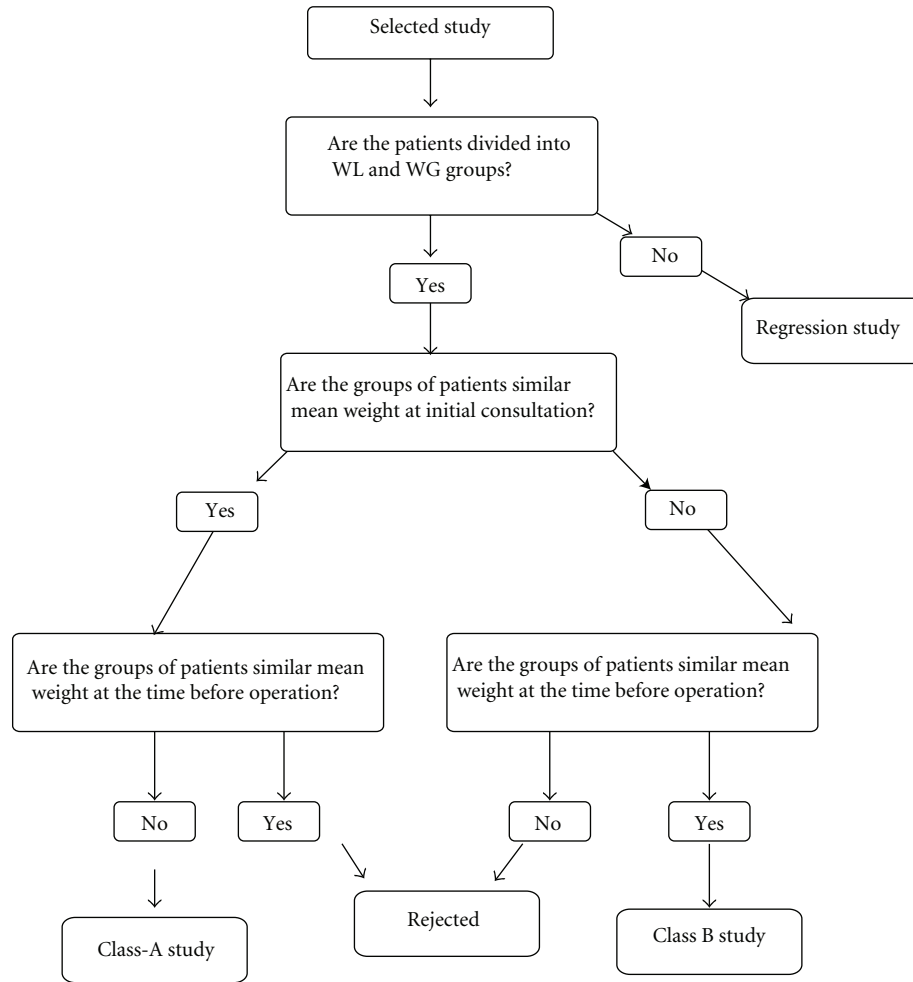


FIGURE 5: Flow chart depicting the classification of the selected studies into Class A, B, and regression studies. WL: weight loss; WG: weight gain.

TABLE 3: Regression studies.

Lead author	Study design	Patients	Mean age	Operation type	Female (%)	Results
Jantz [14]	Retrospective	384	43.3	LRYGB	82.5	Inconclusive
Alvarado [15]	Retrospective	90	42	LRYGB	90	Supportive
Sharon Alger [16]	Prospective	150	45.3	RYGB*	80	Inconclusive
Carlin [17]	Retrospective	295	45	LRYGB	88.8	Inconclusive

LRYGB: laparoscopic roux-en-y gastric bypass; *RYGB: Roux en Y Gastric Bypass. the roux-en-y gastric bypass was an open procedure.

and weighed 136 kg at the time of surgery, he would weigh 62% of his initial body weight or 81.5 kg. His overall weight loss would be 13.5 kg greater for having lost 22.5 kg preoperatively. Since weight loss following gastric bypass tends to be negligible after one year, this probably represents a real gain. In this paper, we have detailed two classes of studies, A and B. Combining review data with previous work by Sczepaniak et al. [6], it is possible to create visual representation of both studies. Class A and class B studies are shown in Figures 2 and 3, respectively. Both groups changed

in mean weight at initial consultation, one group gaining weight and the other losing weight. Preoperative weight gain and loss were arbitrarily set for explanation purposes. In a B class study it is observed that the means of both the weight loss and weight gain groups is not different for the first year.

With regards to regression study, in the six hypothetical patients, the relationship to preoperative weight loss can now be clearly seen from Figure 6. The more preoperative percent initial body weight loss (based on initial weight at surgery), the more the percent total body weight loss (calculated from

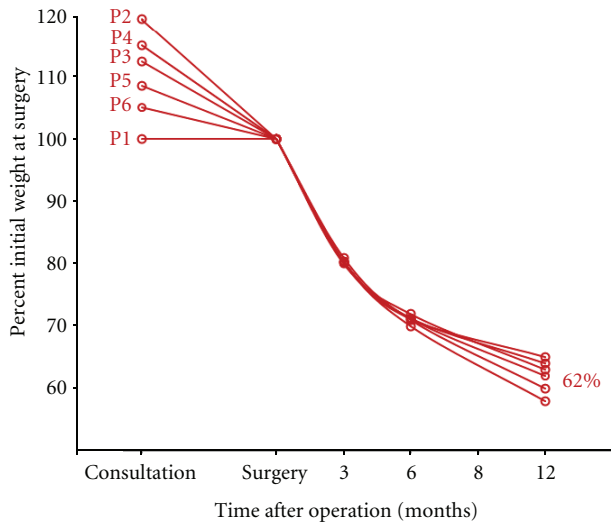


FIGURE 6: Hypothetical regression model. This model demonstrates the effect of preoperative weight loss in gastric bypass patients.

TABLE 4: Rejected Studies

Lead author	Study design	Group	Patients	Age	Female (%)
Riess et al. [18]	Retrospective	WL	74	43.4	70.3%
		WG (non-WL)	279	42.7	86.4%

WL: weight loss; WG: weight gain.

subtracting percent total body weight at initial consultation from achieved percent total body weight after surgery), see Figure 6.

From the graph on the hypothetical patients in Figure 4, it is now possible to see the benefit of losing preoperative weight on an individual level.

Our study has only dealt with studies having gastric bypass surgeries, but the preoperative weight loss might have a similar role in sleeve gastrectomy and sleeve plication (also current methods for weight reduction).

Losing weight leads to better outcomes because a patient entering surgery with a lower weight than someone entering surgery without weight loss will have more weight loss in total.

5. Conclusion

Our review of the literature supports the idea that weight loss after surgery for gastric bypass, and by extension other procedures as well, is a percent of initial body weight. Moreover, the literature is generally supportive of the idea that short-term preoperative weight loss is additive, that is, increases the total amount of weight lost.

Conflict of Interests

The authors have no commercial associations that might be a conflict of interest in relation to this paper.

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