

# Does Age Influence Weight Loss After RYGB and Sleeve Surgery?

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## Abstract

### Background

The conflicting evidences on age as a determinant in predicting the weight loss, limited research comparing the weight loss after bariatric surgery across different age groups, insists on conducting this study.

### Objective

To compare the effect of age on postoperative weight loss among subjects undergoing bariatric surgery.

### Methodology

This was a longitudinal study conducted among 185 obese study subjects who underwent either RYGB or sleeve gastrectomy bariatric surgeries at two tertiary care hospitals in the Department of Laparoscopic and Bariatric Surgery, Bangalore, for a period of 4 years. The patients who were not available for follow-up were excluded from the study. The outcomes of bariatric surgery viz., total weight loss, excess weight loss and percent of Excess Body Mass Index loss (% EBML) were compared using independent t- test. Chi-square test was used to compare categorical variables and logistic regression was used to analyze the influence of all the variables on significant excess weight loss. A *P* value of <0.05 was taken as statistically significant.

### Results

The mean age of the study participants was 43.2 years ( $\pm 12.6$ ) and ranged between 19 and 72 years with 102 (55.1%) younger than 45 years and 83 (44.9 %) aged  $\geq 45$  years. Though the mean excess weight loss was slightly higher in age group  $\geq 45$  yrs, it was not significant. We

found none of the variables except presence of hypertension as significant independent predictor ( $P < 0.05$ ) for a significant excess weight loss of  $>50.0\%$ .

## Conclusion

The age did not determine the post-operative weight loss after 12 months following bariatric surgery.

**Keywords:** Bariatric Surgery; Excess Weight Loss; Post-Operative Weight Loss; Total Weight Loss; Percent of Excess Body Mass Index Loss

## Introduction

Obesity has been a worldwide health problem at all stages of life in both developed and developing countries [1]. With rise in life expectancy the prevalence of chronic diseases, including obesity increases [2]. Obesity contributes to the early onset of chronic morbidities and functional impairment among the elderly that leads to premature mortality. It is also noted that after the age of 20-30 years and up to 40% of fat free mass (FFM) (primarily skeletal muscle) decreases, whereas fat mass increases during the period of 20-70 years of age [3]. Considering the evidences for age as a determinant factor, in prediction of weight loss, some studies report no difference and some others establish less excess weight loss among patients older than 60 years in comparison to younger ones [1]. Moreover, there is very limited research that investigates the health impacts of bariatric surgery with older adults compared with younger age groups [4]. In addition, there is also need for a better understanding on determinants of weight loss.

Wool D et al., has observed that the excess weight loss after 1 year was not significantly different on comparing the males with age groups aged above 60 yrs and 50-59 yrs [5]. Sosa JL et al., reported that among those with  $>60$ -year group at an average of 12 months follow-up, the weight loss, change in BMI and excess weight losses were 43.2 kg 16.5 kg/m<sup>2</sup>, and 65% respectively. They also have noted that diabetes resolved in 75.0% of the patients, hypercholesterolemia in 60.0% and hypertension in 91.0% of the patients. They also have concluded that though higher morbidity and mortality were noted among the patients with age  $>60$  years their risk/benefit ratio was acceptable [6].

Sugerman HJ et al., has found that at 1 year post surgery follow up, patients lost weight of 30.0% among those aged  $\geq 60$  yrs and 35.0% among those aged  $<60$  yrs similarly, excess body weight losses were 57.0% and 65.0% among those aged  $\geq 60$  yrs and  $<60$  yrs respectively and excess BMI lost were 72.0% and 64.0% among those aged  $\geq 60$  yrs and  $<60$  yrs respectively. Although there is a significant percentage weight loss and the percentage excess weight loss in amount and improvement in hypertension, it was comparatively lesser than that seen in our younger patients, while there were no differences in the improvements in the other obesity comorbidities [7].

St Peter SD et al., recorded more weight loss and significantly greater reduction in body mass index among younger patients and they also demonstrated more complete resolution of comorbid conditions and older patients, who had more comorbid conditions requiring more medication at the time of surgery, experienced a greater medication reduction during follow-up, although these were not statistically significant. They noted a mean weight loss of 86.35 lb

and 96.96 lb among the age groups of  $\geq 60$  yrs and  $< 60$  yrs which was not significant however the mean BMI loss of 12.61 Kg/m<sup>2</sup> and 15.53 Kg/m<sup>2</sup> among the age groups of  $\geq 60$  yrs and  $< 60$  yrs were significant [8].

The literature search by De Jong MM and Hinnen C have pointed out that an estimated 20% of patients showed less improvement post-bariatric surgery adherence to post-surgery behavioural recommendations which may be of special importance among younger patients and patient's ability to voluntarily comply with a dietary regimen for maintaining weight loss have emerged as factors of significance in predicting weight loss. They also have noted in their study that mean percentage weight loss was 30.2% and 35.6% respectively for laparoscopic sleeve gastrectomy and laparoscopic Roux-en-Y gastric bypass respectively. Adherences to postoperative dietary recommendations were observed to be declined over the years significantly and explained 8.3% of the variance in weight loss [9].

## Objectives

To compare the effect of age on postoperative weight loss among the study subjects undergoing bariatric surgery procedures.

## Methodology

This was a longitudinal study conducted at two tertiary care hospitals in the Department of Laparoscopic and Bariatric Surgery, Bangalore, from January 2012 to December 2015. A total of 185 obese study subjects who underwent either RYGB or sleeve gastrectomy bariatric surgeries in the two tertiary care hospitals selected by convenient sampling during the study period were included in the study. The patients who were not available for 12 months follow-up was excluded from the study.

Ethical approval was obtained from the Institutional Ethics committee. After obtaining the written informed consent, detailed clinical history was taken from the study subjects using a pre-tested semi-structured questionnaire. All the patients were examined clinically, and patients were evaluated preoperatively by a multidisciplinary team according to an established protocol.

## Surgical Techniques

All the subjects underwent Bariatric surgeries viz., SLEEVE GASTRECTOMY or Roux-en-Y Gastric Bypass (RYGB). We performed standardized techniques for both procedures. In RYGB, we create a gastric pouch of 30-50-ml volume using a 36 French (Fr) bougie with an alimentary limb of 100 cm in length and a biliary limb of 150 cm in length. Both gastrojejunal and jejunojejunum anastomosis are created using mechanical stapling devices (Endo GIA™ by Covidien™) and reinforcement of gastrojejunal anastomosis with V-Loc 180™ 3.0 (Covidien™) maxon 2-0 suture and endostitch(polysorb). Mesenteric and Peterson defect closed with prolene 2-0. We leave Jackson pratt drain near the gastrojejunal anastomosis. SG is fashioned using a 32 Fr calibration gastric tube, excising an estimate 90 % stomach. We begin gastric resection 6.0 cm proximal to the pylorus using either Duet TRS™ or Endo GIA™ staplers (both by Covidien™), with suture line reinforcement using endostitch (polysorb).

## Outcome

After the surgery all the subjects were followed up for a period of 12 months to study the weight loss pattern among different age categories.

## Weight Loss

Body weights were measured at baseline i.e., 1-week pre-surgery and 6- and 12-months post-surgery. Our primary endpoint was comparison of percentage of excess weight loss, mean change in weight, Percent of Excess Body Mass Index (BMI) Lost (%EBMIL) 12 months after surgery between groups.

## Operational Definitions

Excess body weight was defined as measured body weight minus the body weight that would result in a BMI of 25 kg/m<sup>2</sup>, which in simple terms would mean measured body weight minus Ideal Body Weight (IBW).

Excess BMI loss after bariatric surgery was defined as a %EBMIL  $\geq 50$  % 12 months after surgery.

%BWL  $\geq 50$  % 12 months after surgery was considered as significant excess weight loss.

## Statistical Analysis

The collected data were entered an excel sheet. The data were expressed in means and proportions and presented in the form of tables and graphs where ever necessary. The outcomes of bariatric surgery for means and standard deviations of the parameters viz., excess weight loss, total weight loss, Percent of Excess Body Mass Index (BMI) Lost (%EBMIL) were compared using independent t- test. Chi-square test was used to assess the association of significant excess weight loss with the age groups. Logistic regression was used to analyze the influence of all the variables on significant excess weight loss. The analysis was done using standard statistical package. A *P* value of  $<0.05$  was taken as statistically significant.

## Results

A total population of 185 patients, 134 females (72.4%) and 51 males (27.6 %) were studied. The mean age of the study participants was 43.2 years ( $\pm 12.6$ ) and ranged between 19 and 72 years with 102 (55.1%) younger than 45 years and 83 (44.9 %) age  $\geq 45$  years.

Majority among 185 patients with age  $\leq 45$  underwent Sleeve Gastrectomy (62.5%) and  $>45$  underwent Roux-en-Y Gastric bypass (56.2%) and the difference in the surgical techniques conducted were statistically significant ( $P < 0.01$ ). On comparing clinical characteristics, we found no significant difference between both age groups with respect to gender, preoperative BMI, nor presence of dyslipidemia (DL). However significant differences were found among the age groups with respect to the presence of diabetes mellitus (DM) and hypertension (HTN) and were more frequent in the older group. (Table-1)

Variables	Age <45	Age ≥45 years	P- Value
	n=102	n=83	
<b>Gender (%)</b>			
Males	23 (45.1)	28 (54.9)	0.09
Females	79 (59.0)	55 (41.0)	
<b>BMI</b>	42.04±7.55	41.65±8.09	0.74
<b>HTN (%)</b>	13 (33.3)	26 (66.7)	0.002*
<b>DM (%)</b>	23 (41.1)	33 (58.9)	0.01*
<b>DL (%)</b>	96 (53.9)	82 (46.1)	0.09
<b>Surgical Technique (%)</b>			
Sleeve Gastrectomy (SG)	70 (62.5)	42 (37.5)	0.01*
Roux-en-Y Gastric bypass (RYGB)	32 (43.8)	41 (56.2)	

**Table 1:** Clinical characteristics of the patients with age groups of <45 years and ≥45 years

For continuous variables: mean±standard deviation, categorical variables in absolute numbers and proportions (%) showing the greatest frequency; level of significance - 95.0 %

Mean %EBWL of the two groups 12 months after surgery were 113.59% (±54.66%) and 123.39% (±56.95%) respectively and was higher among those with age ≥45 yrs compared to < 45 yrs and mean %TWL of the two groups post-surgery were 60.34% (±7.07%) and 59.98% (±6.87%) respectively and were nearly same among both the groups. Only five (4.9 %) among <45 yrs age group and three (3.6%) patients aged ≥45 yrs age group lost less than 50 % EBMIL in this group. The proportion of patients with significant excess weight loss was higher in <45 yrs age group. There was no significant difference in the significant excess weight loss among the different age groups of <45 yrs and ≥45 yrs. (Table-2)

Variables	Age <45	Age ≥45 years	P- Value
	n=102	n=83	
	(Mean ± SD)	(Mean ± SD)	
<b>Mean Total Weight loss (%)</b>	60.34±7.07	59.98±6.87	0.73
<b>Mean Excess Weight loss (%)</b>	113.59±54.66	123.39±56.95	0.27
<b>&gt;50.0% BMI loss (%)</b>	97 (54.8)	80 (45.2)	0.67

**Table 2:** Comparison of descriptive of weight loss after bariatric surgery.

BMI-Body Mass Index; SD - Standard Deviation; %TWL - % Total Weight Loss, calculated as  $100 \times (\text{Weight Reduction} / \text{Initial weight})$ ; %EWL - % Excess Weight Loss, calculated as  $100 \times [\text{BMI Reduction} / (\text{Initial BMI} - 25)]$ .

<b>Probable Variables predicting Weight loss &gt; 50.0% (significant excess weight loss)</b>	<b>P-value</b>	<b>Odds Ratio</b>	<b>95% CI</b>
<b>Age Group (&gt; 45 yrs.)</b>	0.38	0.47	0.09-2.54
<b>Gender (Females)</b>	0.19	2.86	0.59-13.79
<b>Type of Surgery (Sleeve Gastrectomy)</b>	0.14	3.51	0.68-18.22
<b>With HTN</b>	0.04*	5.39	1.07 - 27.17
<b>With DM</b>	0.07	0.11	0.01-1.19
<b>With DL</b>	<b>0.48</b>	<b>0.39</b>	<b>0.03-5.49</b>
<b>*indicates a significant statistical difference between the groups with P&lt;0.05</b>			

**Table 3:** Comparison of various parameters with weight loss using Logistic Regression.

On entering the variables viz., age group, gender, type of surgery, hypertension, diabetes, dyslipidemia into logistic regression model, we found none of the variables except presence of hypertension as significant independent predictor ( $P<0.05$ ) for a significant excess weight loss of  $>50.0\%$ . The adjusted OR for age group  $>45$  yrs, being 0.38, indicates that the significant excess weight loss was lesser in the age group  $>45$  yrs compared to those with age  $<45$  yrs. Similarly, among the females the significant excess weight loss was nearly 3 times higher compared to males and the significant excess weight loss was higher among those with no diabetes and dyslipidemia however all these parameters except hypertension did not predict the weight loss significantly ( $P>0.05$ ). The significant excess weight loss of  $>50.0\%$  was significantly 5 times higher among those with hypertension compared to those with no hypertension ( $P<0.05$ ).

## Discussion

Bariatric surgery among the elder age group ( $>60$  years old) has been underused and represented and only a few previous studies reported bariatric surgery outcomes in the elderly. In the current study, we determined the influence of age classes on weight loss results 1 year after RYGB and Sleeve gastrectomy. Contreras JE et al., in his study has reported mean age of 41.6 years  $\pm 10.8$  with age ranging between 19 and 65 years and 50.1 % were younger than 45 years and 49.9 % were aged  $\geq 45$  years which are similar to the current study findings [1]. In a study by Huang CK et al., majority i.e., 67.6% were females similarly in the present study majority i.e., 79.2% were females [10]. Pre-operative BMI were noted to be higher in the younger age group of  $<45$  yrs and similarly Sugerma HJ et al., has also noted higher pre-operative BMI among younger age group ( $<60$  yrs) but it was significantly higher however in the current study both the groups were comparable and the BMI between the two groups were not significantly different. The disparity may be due to the difference in the age group considered for the comparison [7]. The findings with respect to BMI are in line with the findings by Contreras JE et al [1]. It has been concluded by Praveenraj P et al., that LRYGB might offer better results than LSG in terms of weight loss in patients over 50 years of age which explains the probability of patients  $>45$  yrs undergoing RYGB and there may be

differences in the results with respect to selection of type of surgery as the presence of comorbidities are also considered as important factors in opting the type of surgery.<sup>10</sup> There was no significant association of dyslipidemia with age groups however significant differences was found among the age groups with respect to the presence of diabetes mellitus (DM) and hypertension (HTN) and were more frequent in the older group which are similar to the findings by Contreas JE et al., except for the difference in the presence of diabetes and the difference may be due to the other confounding factors like family history of diabetes, differences in the lifestyle [1].

De Jong MM and Hinnen C in their study have reported that young adult patients achieved weight loss comparable to weight loss in both adult and adolescent samples which are in correspondence to the current study findings.<sup>9</sup> Advancement of loss of BMI and excess BMI loss % (EBL%) from baseline to 1 year was not different between age groups and EBL% <50%, was not significantly different from the other age groups according to a study by Robert M et al., similar to the current study findings p [12]. Though not significant, the proportion of patients with significant excess weight loss was higher in <45 yrs age group and this may be due to the higher representation of patients from <45 yrs age group indicating the selection bias.

We analyzed the relation between age, surgical technique, gender and presence of comorbidities as independent variables and >50.0% BMI loss (significant excess weight loss) 12 months after surgery as dependent variable using binary logistic regression technique. There were no significant independent predictors of significant excess weight loss except for presence of hypertension (HTN) which are in line with the findings by Contreas JE et al., wherein the presence of HTN and age had significant interaction effect with %EBMIL (P=0.001) 12 months after surgery after applying multiple regression between age, surgical technique and presence of comorbidities (independent variables) and %EBMIL 12 months (dependent variable) after surgery [1]. The significant excess weight loss did not change in the current study and this may be due to the confounding effect of the type of surgery opted out as the proportion of subjects in different age group of  $\geq 45$  yrs and <45 yrs are significantly associated with the type of surgery. The other analyzed variables viz., surgical technique, presence of DM, and DL by Contreas JE et al., did not modify the association between age and %EBMIL like the current findings [1].

## Conclusion

The age did not influence the post-operative weight loss after 12 months after bariatric surgery. Bariatric surgery can be an effective procedure for weight loss even in the elderly. However due to its inherent limitations in the study design, it recommends further studies with different study designs considering the confounders and biases in the current study.

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