

CLINICAL STUDY

The Effects of Age on Weight Loss after Sleeve Gastrectomy

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ABSTRACT

Introduction: Laparoscopic sleeve gastrectomy is a primary treatment of obesity among older adults and its satisfactory outcomes would be the main reason behind the popularity of this procedure. We aim to evaluate the impact of age on excess weight loss in adult morbidly obese subjects older than 60 years old following LSG. **Methods:** In this retrospective survey, 3,072 subjects were included in the study that underwent LSG in Erfan Hospital. Screening follow-up period was 12 months. The level of statistical significance was set at $P < 0.05$. We hired comorbid conditions to avoid bias results including hypertension, diabetes mellitus and dyslipidemia. **Results:** Of 3072 patients, 1879 cases were females (61.2%) and 1193 subjects were males (38.8 %). Mean %EBMIL of the group 12 months after surgery was 78.9 %. In younger than 60 years old group, mean %EBMIL 12 months postoperative 83 % and patients over 60 years demonstrated mean %EBMIL 74.9 %. There was an obvious difference among age groups in presence of diabetes mellitus and hypertension in the older group which was more frequent. **Conclusion:** To sum up, laparoscopic sleeve gastrectomy is safe procedure for older groups. Albeit, %EBMIL was significantly lower in older group compared to younger subjects, but resolution in comorbidities was satisfactory.

KEYWORDS: Sleeve Gastrectomy; Elderly; Weight loss; Age ≥ 60 years

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INTRODUCTION

Bariatric surgery especially sleeve gastrectomy, which is a primary treatment of obesity among older adults, well-known for its satisfactory outcomes among surgeons and patients (1), leading to reduction in comorbidities and sustained weight loss with negligible disadvantages (2). Based on National Health and Nutrition Examination Survey, around 40% of American adults over 20 years of age suffer from obesity and more than 70% of adults aged 20 and over are overweight, including obesity in 2020 (3). In the United States, among those older than 65 years old, more than 35% are obese (4). In adults older than 65 years of age, obesity is more sophisticated due to sarcopenia, defined as the loss of muscle mass and strength with age (5). Sarcopenia could also restrict efficient postoperative weight loss in elderly populations. Previous studies demonstrates that morbid obese subjects could lose up to 50 to 70 percent of excess weight or experience 25 to 35 percent body weight loss (6). Based on reports, older adults achieve weight loss same as younger ages but due to limited information on postoperative outcomes of laparoscopic sleeve gastrectomy, there is a general belief

that all types of bariatric surgery is not good options for this population, while studies have illustrated that laparoscopic sleeve gastrectomy is a safe method for morbid obese subjects older than 60 years of age (7,8). When it comes to the relation of age and weight loss in bariatric surgery subjects, on the one hand, a former study reported that, adult morbid obese subjects over 45 demonstrated less excess BMI loss (EBMIL) after 12 months compared to younger group (9). In another survey, %EBMIL after 12 months was significantly lower in over 65 years of age group in comparison to the control group below 40 years old (7). Also a recent study showed that excess weight loss (EWL) is around 62% in 65-69 years old compared to 18% in over 80 years of age ($P < 0.001$) which is significantly lesser than younger subgroups (8). On the other hand, it has been mentioned that age is not a significant factor in weight loss at 6, 12 and 24 months follow-up (4). Nonetheless, another report showed the safety and efficacy of bariatric surgery as a treatment for morbid obesity in patients ≥ 65 years of age, which experienced a clinically significant reduction in weight,

with an average of 55% EWL at 1 year (10). It was suggested in previous studies to limit the target group to a specific type of surgery (i.e. RYGB or sleeve gastrectomy) with longer period of follow up time to obtain more accurate results. Due to the paradoxical results reported in previous literatures, this survey focused on post surgical %EWL of laparoscopic sleeve gastrectomy in patients aged 60 years and older to determine if age should be considered as selection criteria for laparoscopic sleeve gastrectomy. It was also hypothesized that older age does not have an impact on weight loss after this procedure.

MATERIALS AND METHODS

Data Collection

In this retrospective study, data were obtained from adult 3432 obese subjects underwent laparoscopic sleeve gastrectomy in Erfan Hospital between Jan 2016 and Jan 2018, according to the current procedural Terminology code: LSG (43,775). Approval for the use of the data in this study was obtained from the Erfan Hospital and all subjects signed patient consent forms to be involved in this survey.

Study Subjects

All subjects were performed as a stand-alone surgery and were evaluated by their surgeon and multidisciplinary team before and after the operation.

Obese subjects with BMI ≥ 35 kg/m² and related comorbidities or BMI ≥ 40 kg/m² with or without related comorbidities from 18 to 75 years of age were included in this survey. All information including age, height, BMI, weight and any existing comorbidities including hypertension, diabetes mellitus and dyslipidemia were recorded at the first preoperative appointment. Subjects with incomplete (Less than 12 months of follow up) and unclear data or due exclusion criteria including any background of osteoarthritis and any disorders that made subjects unable to carry out regular training and exercise. The follow up period defined at least 12 months to 36 months.

Definition of Weight Loss

Based on previous reports, Percent of EBMIL is currently the best and most reliable method for comparisons. Hence, %EBMIL was hired to report and evaluate weight loss results after laparoscopic sleeve gastrectomy.

Study Design

Of 3432 subjects, 360 cases were excluded for not reaching the selection criteria and 3072 patients who underwent laparoscopic sleeve gastrectomy by Dr. Taha Anbara and his team were considered as a study group in this survey. We divided this population into two age subgroups including younger than 60 years and over 60 years of age.

Surgical Technique

Laparoscopic sleeve gastrectomy was performed for all subjects based on the standard protocol under supervision of a specific surgeon with similar tools and same duration of operation. More details on the process of surgery has been published in our recent study (11).

Statistical Analysis

All descriptive findings are presented as mean/median and SD for quantitative variables and count and percentage for qualitative variables. After checking the normality of variables using histogram graphs and the Kolmogorov-Smirnov test, the Wilcoxon rank test was used to compare

the non-parametric variables and *t* test to compare other continuous variables before and after laparoscopic sleeve gastrectomy. The statistical significance level is defined as 0.05 ($\alpha=0.05$). Statistical analysis was performed using IBM SPSS Statistics 25 (SPSS Inc., Chicago, IL).

RESULTS

Of 3072 patients, 1879 cases were females (61.2%) and 1193 subjects were males (38.8%). Age had a non-normal distribution, with median of 49 years, mean age 45.2 years (± 12.4) and range between 21 and 74 years with 1792 (58.3%) age <60 years and 1280 (41.7%) age over 60. Mean preoperative BMI 46.2 (± 4.9) and range between 31.5 and 72.4 kg/m² for the population. Mean %EBMIL of the group 12 months after surgery was 78.9% (± 31 %) with a range between 18.2 and 187.3%.

In younger than 60 years old group, mean preoperative BMI was 42.4 kg/m² (± 7.7 ; range, 30.8–65.2) and mean %EBMIL 12 months postoperative 83% (± 31.4 %; range, 32.5–175.6%). Patients ≥ 60 years showed mean preoperative BMI 43.2 (± 6.4 ; range, 31.8–74.2) and mean %EBMIL 74.9% (± 29.8 ; range, 13.1–119.7%). In terms of clinical characteristics, there was no difference between both age groups regarding gender, preoperative BMI, nor presence of dyslipidemia (Table 1). There was an obvious difference among age groups in presence of diabetes mellitus and hypertension in the older group which was more frequent (Table 1).

Table 1. Clinical Characteristics of Patients by Age Group.

Variables	Group <60 yr	Group ≥ 60 yr	p
% EBMIL	83% ($\pm 31.4\%$)	74.9% ($\pm 29.8\%$)	<0.002
Hypertension	720 (40.1%)	872 (68.1%)	<.00001
Diabetes mellitus	139 (7.7%)	851 (66.4%)	<.00001
Dyslipidemia	1132 (63.1%)	762 (59.5%)	.04136

here was statistically significant difference in %EBMIL 12 months after surgery between both groups ($p < 0.002$) in favor of younger group, who present greater BMI loss than the subjects older than 60 years of age (Table 2). We analyzed the impact of age on presence of comorbidities (independent variables) and %EBMIL 12 months after laparoscopic sleeve gastrectomy (dependent variable) using multiple regression techniques. There was a significant interaction effect between hypertension and %EBMIL ($p < .00001$) and between presence of diabetes mellitus and age ($p < .00001$) 12 months after procedure. The other analyzed variable, dyslipidemia did not modify the association between age and %EBMIL ($p = 0.041$) (Table 2).

Table 2. Relationship between age group and %EBMIL 12 months after laparoscopic sleeve gastrectomy (analysis using multiple regression techniques; level of significance, 95%)

Variables	Group <60 yr	Group ≥ 60 yr
N	1879 (61.2%)	1193 (38.8%)
Sex	f 1125 (62.8%), m 667 (37.2%)	f 754 (58.9%) m 526 (41.1%)
BMI	42.4 kg/m ² (± 7.7 ; range, 30.8–65.2)	43.2 kg/m ² (± 6.4 ; range, 31.8–74.2)
Hypertension	598 (33.4%)	915 (71.5%)
Diabetes mellitus	134 (7.5%)	531 (41.5%)
Dyslipidemia	697 (38.9%)	635 (49.6%)

DISCUSSION

This survey illustrated a statistically significant difference in %EBMIL 12 months after surgery between patients younger and older than 60 years in favor of the younger group. To sum up, these subjects may have a potential greater EBMI after laparoscopic sleeve gastrectomy compared to older group. In order to support the idea of the difference is clinically relevant; a study protocol to all cases and selection criteria including nutritional controls, an exercise program, and psychological support were applied to make both groups comparable. These criteria helped us to control some selection bias avoiding subjects that are unable to perform exercise or will not follow nutritional guidelines.

Most of previous studies had some shortcomings that make results interpretation impossible. For instance, low statistical population, no focusing on specific types of Bariatric surgery, and no review on selection criteria can result in bias results. In some studies on patients who underwent Bariatric surgery including sleeve gastrectomy (most common procedure), gastric bypasses, and gastric banding there was no significant difference in EWL between groups younger than 65 and over 65 years of age in 6, 12 and 24 months period of time (4,8). In some other reports, subjects over 45 showed less EBMI after 12 months in comparison to younger group (7,9), which were in line with our results.

This survey may have some limitations. Even if patients were sorted applying selection criteria to limit bias, there are factors that can interfere our results, such as analysis of comorbid conditions such as hypertension, which demonstrates interaction with the primary endpoint, the level of adherence to physical activity nor dietary recommendations, using some medications after surgery which can bias result exegesis, and it is not equally distributed among groups. We encourage other researchers to work on other types of Bariatric surgery, extended

period of follow up, analysis of medications that are taken by patients during follow up period, physical activities and nutritional records to put forward ideas clearly and concisely to advance our understanding of the relation of age and Bariatric surgery outcomes in morbid obese subjects.

CONCLUSION

To conclude that, based on this survey and previous studies laparoscopic sleeve gastrectomy is for older people as safe procedure as younger groups. A significant difference in %EBMI 12 months after laparoscopic sleeve gastrectomy between patients younger and older than 60 years in favor of the younger group can be seen in our results. There was an obvious difference among hypertension, diabetes mellitus and %EBMI 12 months after procedure. The interaction effect of dyslipidemia between age and %EBMI was not statistically significant.

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AUTHORS' CONTRIBUTIONS

The participation of each author corresponds to the criteria of authorship and contributorship emphasized in the [Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly work in Medical Journals of the International Committee of Medical Journal Editors](#). Indeed, all the authors have actively participated in the redaction, the revision of the manuscript, and provided approval for this final revised version.

COMPETING INTERESTS

The author declares no competing interests with this case.

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REFERENCES

- [1] Docherty NG, le Roux CW. Bariatric surgery for the treatment of chronic kidney disease in obesity and type 2 diabetes mellitus. *Nat Rev Nephrol*. 2020; 16: 709-720/ DOI: [10.1038/s41581-020-0323-4](https://doi.org/10.1038/s41581-020-0323-4)
- [2] Kheirvari M, Nikroo ND, Jaafarinejad H, Farsimadan M, Eshghjoo S, Hosseini S et al. The advantages and disadvantages of sleeve gastrectomy; clinical laboratory to bedside review. *Heliyon*. 2020;6(2):e03496. DOI: [10.1016/j.heliyon.2020.e03496](https://doi.org/10.1016/j.heliyon.2020.e03496)
- [3] Luo Y, Huang W, Liu X, Markevych I, Bloom MS, Zhao T et al. Greenspace with overweight and obesity: A systematic review and meta-analysis of epidemiological studies up to 2020. *Obes Rev*. 2020;21(11):e13078. DOI: [10.1111/obr.13078](https://doi.org/10.1111/obr.13078)
- [4] Gonzalez-Heredia R, Patel N, Sanchez-Johnsen L, Masrum M, Murphey M, Chen J et al. Does age influence bariatric surgery outcomes? *Bariatric Surg Pract Patient Care*. 2015; DOI: [10.1089/bari.2015.0004](https://doi.org/10.1089/bari.2015.0004)
- [5] St Peter SD, Craft RO, Tiede JL, Swain JM. Impact of advanced age on weight loss and health benefits after laparoscopic gastric bypass. *Arch Surg*. 2005; DOI: [10.1001/archsurg.140.2.165](https://doi.org/10.1001/archsurg.140.2.165)
- [6] Linnaus ME, Kindel TL. Does Weight Loss Prior to Surgery Accurately Predict Success Following Bariatric Surgery? In: *Difficult Decisions in Bariatric Surgery*. Springer; 2021. Available: DOI: [10.1007/978-3-030-55329-6_11](https://doi.org/10.1007/978-3-030-55329-6_11)
- [7] Bartosiak K, Rózańska-Wałędzia A, Wałędzia M, Kowalewski P, Paśnik K, Janik MR. The Safety and Benefits of Laparoscopic Sleeve Gastrectomy in Elderly Patients: a Case-Control Study. *Obes Surg* [Internet]. 2019 Jul 24;29(7):2233–7. DOI: [10.1007/s11695-019-03830-7](https://doi.org/10.1007/s11695-019-03830-7)
- [8] Susmallian S, Razieli A, Barnea R, Paran H. Bariatric surgery in older adults: Should there be an age limit? *Medicine (Baltimore)*. 2019 Jan;98(3):e13824. DOI: [10.1097/MD.00000000000013824](https://doi.org/10.1097/MD.00000000000013824)
- [9] Contreras JE, Santander C, Court I, Bravo J. Correlation between age and weight loss after bariatric surgery. *Obes Surg*. 2013 Aug;23(8):1286-9. DOI: [10.1007/s11695-013-0905-3](https://doi.org/10.1007/s11695-013-0905-3)
- [10] O'Keefe KL, Kemmeter PR, Kemmeter KD. Bariatric surgery outcomes in patients aged 65 years and older at an American society for metabolic and bariatric surgery center of excellence. *Obes Surg*. 2010 Sep;20(9):1199-205. DOI: [10.1007/s11695-010-0201-4](https://doi.org/10.1007/s11695-010-0201-4)
- [11] Kheirvari M, Akbarzadeh I, Eshghjoo S, Yazdanasab M, Alaniz RC, Hosseini S et al. Diagnostic value of erythrocyte sedimentation rate levels as a predictor of staple-line leakage in bariatric surgery. *Bariatric Surg Pract Patient Care*. 2020. DOI: [10.20517/2574-1225.2019.45](https://doi.org/10.20517/2574-1225.2019.45)