Comparative Study between the Outcomes of Laparoscopic Sleeve Gastrectomy in Middle Aged and Elderly Obese Patients

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ABSTRACT

Background: Bariatric surgery is still the only reliable treatment for permanent losing weight in patients suffering obesity, leading to longer weight loss as well as lowering morbidity and mortality.

Aim of the work: To evaluate the effectiveness and safety of laparoscopic sleeve gastrectomy in elderly obese patients.

Patients and methods: This study included 15 participants with severe obesity who performed laparoscopic sleeve gastrectomy at Sayed Galal University Hospital. These participants were matched by gender, BMI, and a 1:2 ratio to young patients. Patients were divided into two groups: Group (1), which included 5 patients over the age of 50, and Group (2), which included 10 patients between the ages of 18 and 50.

Results: Both groups showing significant difference between pre and post-operative weight in 3 , 6 , 12 and 18 months as in elderly group; pre-operative weight and BMI was 110.20±9.88kg and 38.26±0.73kg/m^2 respectively and after 18 month was 82.20±8.04 kg and 28.50±0.68 kg/m2 respectively in group 2 pre-operative weight was 115.40±10.90 kg and BMI was 39.48±1.41 kg/m^2 and after 18 month weight loss was 77.70±8.001kg and BMI was 26.58±1.20 kg/m^2, But statistically insignificant difference of mean weight and BMI was found between two groups of the study.

Conclusion: The LSG is a satisfactory effective and reliable surgical option for the elderly due to its low major risk of complications and excellent weight loss and comorbidity advancement.

Keywords: *Laparoscopic Sleeve Gastrectomy; Obesity; Elderly.*

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INTRODUCTION

As developed-country life expectancy increases, the elderly make up a larger proportion of the global population. Morbid obesity is on the rise in this population, resulting in increased obesity-related comorbidities and mortality as well as a lower standard of living. According to a number of studies, the global population has gained 1.5 kg of weight per year on average, indicating an obesity epidemic. Over 640 million obese people are estimated to exist in the world today.[1]

Laparoscopic Sleeve Gastrectomy (LSG) is a weight loss surgery that reduces the size of the stomach by approximately 85 percent. Patients with less stomach capacity will feel full faster and eat less food as a result. Furthermore, the stomach will be unable to secrete as many hunger-stimulating hormones.[2]

(LSG) is the world's 2nd most frequent bariatric technique, following Roux-en-Y gastric bypass (RYGB). Although both surgeries are efficient regarding to weight loss and comorbidity resolution, long-term weight gain back remains a serious issue.[3]

The achievement of a sleeve gastrectomy may be restricted if the remaining gastric tube is dilated, limiting the procedure's restrictive impact. This is more common in super obese individuals with a preoperative Body - mass index of more than 50 kg/m^2 and 3 to 5 years after the major surgery.[4]

Comparing SG to other less invasive and more severe bariatric procedures, it is an uncomplicated surgical technique that is associated with a low complication rate and very mild long-term nutritional insufficiency. [5] Stapled-line leakage, strictures, and stapleline leaks are the most significant side effects of this procedure. As high as 1.4–2.5 percent of primary sleeve gastrectomies have been reported, and as high as 16–20 percent of re-operative gastric surgery after a previous gastric operation.[6]

This work was aiming to evaluate the effectiveness and safety of laparoscopic sleeve gastrectomy in elderly obese patients.

PATIENTS AND METHODS

This study involved 15 patients with morbid obesity that had laparoscopic sleeve gastrectomy at Sayed Galal University Hospital between May 2019 and April 2020. Patients were matched by gender, BMI, and a 1:2 ratio to young patients, and all patients were followed for 12 months.Patients were grouped into: Group (1): 5 patients > 50 years old, and Group (2): 10 patients >18 and <50 years old.

Patients were examined for anaesthesia prior to surgery, as well as obesity-related diseases, all had a Mass index over than forty kg/m2 or higher than thirty five kg/m2.

• All surgeries were done by an experienced minimally invasive surgeon using the same surgical method on all patients.

• All of the patients were given general anaesthesia.

• Patients chose to have a laparoscopic sleeve gastrectomy on their own after our experts carefully counselled them about the various options.

• All patients signed an informed consent form.

Exclusion criteria: Age < 18 years, pregnancy, alcoholic or substance abuse, current malignancy, and hypothyroidism.

All patients were subjected to:

History and Clinical Examination: Patients were subjected to pre-designed questionnaire for full medical history and physical examination with stress on: age, sex, special habits (e.g. smoking), history of hypertension, history of DM, history of OSA, history of osteoarthritis, history of ischemic heart disease, physical inactivity, body mass index, and waist circumference (measured at the level of umbilicus).

BMI was calculated by the following Equation: $Body\ mass\ index\ (BMI) = Weight\ (kg)/Height\ (m^2)$

Blood pressure was measured twice using a standard mercury manometer after the participants had been rest at least for 5 minutes.

Laboratory investigations: CBC, blood glucose levels; fasting, 2 h. post-prandial, and HbA1c, plasma lipid profile, liver function tests; liver transaminases (AST and ALT), S. albumin, S. bilirubin (Total and Direct), prothrombin and INR, and kidney function tests (serum creatinine, blood urea).

Imaging: Abdominal ultrasound, and echocardiography.

Statistical Analysis:

SPSS (Statistical Package for Social Sciences) version 22 for Windows® was used to code, process, and analyse the obtained data (IBM SPSS Inc, Chicago, IL, USA). The Shapiro Walk test was used to determine if the data had a normal distribution. Frequencies and relative percentages were used to depict qualitative data. To calculate the difference between two or more sets of qualitative variables, use the Chi square test (2). The mean and standard deviation (SD) were used to convey quantitative data (Standard deviation). The independent samples t-test was used to evaluate 2 independent groups of normally distributed variables, and it was shown to be effective (parametric data). For continuous normally distributed variables, one-way ANOVA is used. The Tukey test was used to do post-hoc analysis following the ANOVA. For the post hoc analysis, the Mann–Whitney U test was employed. A significant result was considered as one with a p value below 0.05.

RESULTS

Demographic data		Study group (n=15)
Age (years)	Mean ± SD Range	45.9 ± 8. 2 34-60
Males **Females**	N (%) N (%)	6 (40%) 9 (60%)
Height (cm)	Mean ± SD Range	170.4 ± 7. 1 160-185
Weight (kg)	Mean ± SD Range	113.7 ± 10. 5 98-132
BMI (kg/m^2)	Mean ± SD Range	39.1 ± 1.3 36.9-41.8
Group: **Group 1 (> 50 years)** **Group 2 (< 50 years)**	 N % N %	 5 (33.3%) 10 (66.7%)

Table 1: Demographic data and classification of the study group.

The study group consists of 15 patients; 6 males (40%) and 9 females (60%), presented with morbid obesity and underwent laparoscopic sleeve gastectomy at Sayed Galal University hospital to assess the effectiveness and safety of laparoscopic sleeve gastrectomy in elderly obese patients. Age of cases ranges from 34 to 60 years with mean 45.9 ± 8.2 years. Weight ranges from 98 to 132 kg with mean 113.7 ± 10.5 kg. BMI ranges from 36.9 to 41.8 kg/m2 with mean 39.1 ± 1.3 kg/m2. 33.3% of the patients were > 50 years old, and 66.7% were >18 and <50 years old (Table 1).

Intraoperative effects	Group 1 (n=5)		Group 2 (n=10)		P.value
	N	%	N	%	
Need blood transfusion	1	20	0	0	0.1573
Splenic injury	1	20	0	0	0.1573

Adhesions	1	20	0	0	0.1573
Intestinal injury	0	0	0	0	---
Trocker site bleeding	2	40	1	10	0.1859

Table 2: Comparing intraoperative difficulties between two groups by Chi square test.

Regarding intraoperative effects, there is no statistically significance between the two groups (Table 2).

Operative time (min)	Group 1 (n=5)	Group 2 (n=10)	P.value
Mean	85	50	< 0.001*
SD	10	9.5	

Table 3: Comparing operative time between two groups by ANOVA test.

Regarding operative time, there is statistically significant increase of operative time in group 1 (85 minutes) than group 2 (50 minutes) (P.>0.05) (Table 3).

All group	Weight (kg)		P.value
	Mean	SD	
(1) Pre-operative	113.67	10.52	<0.001* 1~2,3,4,5 2~3,4,5 3~4,5 4~5
(2) 3 months	94.93	8.55	
(3) 6 months	87.47	8.03	
(4) 12 months	83.53	7.92	
(5) 18 months	79.20	8.02	

Table 4: Comparing between pre and postoperative weight in All group by ANOVA test (n=15).

Within all group, there is statistically significant decrease of post-operative weights at 3 months (94.93 kg), 6months (87.47 kg), 12 months (83.53 kg), and 18 months in comparison (79.20 kg) pre-operative weight (113.67 kg) (P.< 0.05) (Table 4).

All group	BMI (kg/m2)		P.value
	Mean	SD	
(1) Pre-operative	39.07	1.34	<0.001* 1~2,3,4,5 2~3,4,5 3~4,5 4~5
(2) 3 months	32.63	1.01	
(3) 6 months	30.08	1.03	
(4) 12 months	28.73	1.22	
(5) 18 months	27.22	1.39	

Table 5: Comparing between pre and post-operative BMI in All group by ANOVA test (n=15).

Within all group, there is statistically significant decrease of post-operative BMI at 3 months (32.63 kg/m2), 6months (30.08 kg/m2), 12 months (28.73 kg/m2), and 18 months (27.22 kg/m2) in comparison to pre-operative BMI (39.07 kg/m2) (P.< 0.05) (Table 5).

Intraoperative effects	Group 1 (n=5)		Group 2 (n=10)		P.value
	N	%	N	%	
Need blood transfusion	1	20	0	0	0.1573
Splenic injury	1	20	0	0	0.1573
Adhesions	1	20	0	0	0.1573
Intestinal injury	0	0	0	0	---
Trocker site bleeding	2	40	1	10	0.1859

Table 6: Comparing intraoperative effects between two groups by Chi square test.

Regarding intraoperative effects, there is no statistically significance between the two groups (Table 6).

Operative time (min)	Group 1 (n=5)	Group 2 (n=10)	P.value
Mean	85	50.5	< 0.001*
SD	10	9.5	

Table 7: Comparing operative time between two groups by ANOVA test.

There was statistically significant increase of mean operative time in group 1 (85 minutes) than group 2 (50.5 minutes) (P. <0.05) (Table 7).

Weight (kg)	Group 1		Group 2		P.value
	Mean	SD	Mean	SD	
Pre-operative	110.20	9.88	115.40	10.90	0.387
3 months	94.20	8.49	95.30	9.01	0.824
6 months	88	8.27	87.20	8.35	0.863
12 months	85.40	8.20	82.60	8.05	0.539
18 months	82.20	8.04	77.70	8.001	0.324

Table 8: Comparing weight loss between two groups by ANOVA test.

There is no statistically significant difference of mean weight loss between two groups, but weight loss was more at 6 months, 12 months and 18months in group 2 in comparison to group 1 (Table 8).

Postoperative correction of comorbidities	Group 1 (n=5)		Group 2 (n=10)		P.value
	N	%	%	%	
Dyslipidemia	5	100	10	100	1
NAFLD grade 1	5	100	10	100	1
Respiratory diseases	3	60	9	90	0.1859
Obstructive sleep apnea	5	100	9	90	0.4795
Reproductive function	0	0	10	100	0.0002*
Osteoarthritis	3	60	10	100	0.0379*
Gout	2	40	7	70	0.2801

Table 9: Comparing postoperative correction comorbidities between two groups by Chi square test.

Regarding postoperative correction of comorbidities, all of group 2 (100%) had correction for reproduction function abnormalities and osteoarthritis, statistically significant higher than group 1 (0%, 60% respectively) (P. <0.05) (Table 9).

Preoperative morbidity	Group 1 (n=5)		Group 2 (n=10)		P.value
	N	%	N	%	
Dyslipidemia	5	100	10	100	1
NAFLD	5	100	10	100	1
Bronchial asthma	0	0	1	10	0.4795
COPD	2	40	0	0	0.0379*
Dyspnea on exertion	3	60	9	90	0.1859
Obstructive sleep apnea	5	100	9	90	0.4795
Menstrual irregularity	2	40	7	70	0.2801
Sexual dysfunction	3	60	3	30	0.2801
Osteoarthritis	5	100	10	100	1
Gout	2	40	7	70	0.2801

Table (10): Comparing preoperative morbidity between two groups by Chi square test.

Regarding preoperative morbidity, 40% of group 1 has COPD, statistically significant higher than group 2 (0%) (P. <0.05) (Table 10).

Postoperative correction of comorbidities	Group 1 (n=5)		Group 2 (n=10)		P.value
	N	%	N	%	
Dyslipidemia	5	100	10	100	1

NAFLD grade 1	5	100	10	100	1
Respiratory diseases	3	60	9	90	0.1859
Obstructive sleep apnea	5	100	9	90	0.4795
Reproductive function	0	0	10	100	0.0002*
Osteoarthritis	3	60	10	100	0.0379*
Gout	2	40	7	70	0.2801

Table 11: Comparing postoperative correction comorbidities between two groups by Chi square test.

Regarding postoperative correction of comorbidities, all of group 2 (100%) had correction for reproduction function abnormalities and osteoarthritis, statistically significant higher than group 1 (0%, 60% respectively) (P. <0.05) (Table 11).

DISCUSSION

In the current study, we found more decrease in BMI and higher Wight loss in <50 years group. However, both groups showing significant difference between pre and post-operative weight in 3 , 6 , 12 and 18 months as in elderly group; pre-operative weight and BMI was 110.20±9.88kg and 38.26±0.73kg/m^2 respectively and after 18 month was 82.20±8.04 kg and 28.50±0.68 kg/m^2 respectively in group 2 pre-operative weight was 115.40±10.90 kg and BMI was 39.48±1.41 kg/m^2 and after 18 month weight loss was 77.70±8.001kg and BMI was 26.58±1.20 kg/m^2, But statistically insignificant difference of mean weight and BMI was found between two groups of the study.

The postoperative losing weight and Mass index decrease are more substantial in the younger group, as per Nevo et al.[7] research, which is also confirmed by Wang et al.[8] meta-analytical review. In a small case-control study, Luppi et al.[9] reported no significant variation in BMI among the older and younger groups at two years (33.2 vs. 31.5 kg/m2), but a substantial change in percentage EWL favouring the youngers (45 percent 9 vs. percent) (n=28).

Our findings are also consistent with those of the Bartosiak et al.[10] study, in that the elderly cohort lost less weight than the control group. However, we disagree with them because the study group's mean postoperative BMI was considerably higher (12 months after surgery) (36.38 kg/m3 7.07 vs 33.10 kg/m3 5.65).

In the current study, the difference in mean hospital stay (days) between group 1 (3.4 days) and group 2 (2 days) is statistically insignificant (P.>0.05).

There are no highly relevant variations in outcomes seen between two age groups, according to the findings of the Burchett et al.[11] analysis. The mean hospital LOS was two or three days following SG in all age groups and 5.8 days in elderly patients, which was smaller than the two or three days documented in past research in all age groups and 5.8 days in senior patients.

Nor Hanipah et al.[12]group, who studied a total of 19 participants aged seventy five and over who had laparoscopic bariatric surgery involving GS, found that the median hospital stay was two days. On the other hand, Gebhart et al.[13] found that the average length of hospital stay in old patients over sixty years was substantially greater (2.6 vs. 2.3 days) than in non-elderly patients.

In terms of intraoperative complications, 40% of group 1 required blood transfusions, which was statistically significantly greater than group 2 (0 percent). In addition, 60% of group 1 had adhesions, which is statistically significantly greater than group 2 (0 percent). In terms of operating time, group 1 (85 minutes) has a statistically significant longer operative duration than group 2. (50 minutes).

According to numerous researches, such as Mizrahi et al.[4], the elderly group had a longer operating time, and the operating time increment in their report was significantly longer compared to the other findings; Luppi et al.[9], Leivonen et al.[14], and Pequignot et al.[15]. Mizrahi et al.[4] observed a greater rate of hiatal hernia, which was identified during surgical operations, with no statistically significant difference in terms of adhesion.

The longer operating time and surgical skills were linked to a greater incidence rate of problems in the elderly, according to a meta-analysis by Wang et al.[8]. Turrentine et al.[16] discovered that when operating times lengthened, side effects such as cardiovascular events, pulmonary dysfunction, wound infections, and other problems occurred more often in the elderly. Meanwhile, they observed that the complexity of surgery had a factor in operation mortality in patients over 60. Aust et al.[17] demonstrated this by looking at the impact of surgical complexity on patient risk variables and found that it had a significant contribution. As a consequence, decreasing the time of operations and simplifying processes may be beneficial in minimising the rate of difficulties.

One of the most significant outcomes of bariatric surgery is the resolution of comorbidities, which improves not only quality of life but also life expectancy. In our study, all of the controls received surgical correction for reproduction function abnormalities and osteoarthritis, which was statistically significantly greater than the old group (0 percent , 60 percent respectively). All participants in both groups improved their dyslipidemia and NAFLD grade 1; OSA was treated in 100% of the elderly group and 90% of the control group; and gout was corrected in 40% and 70% of the elderly group and control group, respectively.

Our results are similar to those of St Peter et al.[18] and Dunkle-Blatter et al.[19,] who showed that younger patients lost more weight but required less medication, with the same complication rates and mortality rates in both groups. The incidence of comorbidity remission after twelve months was equivalent in both older and younger subjects, according to a research by Leivonen et al.[14.] The favourable benefits of bariatric surgery on the development of comorbidities seem to be unchanged by age, and the major benefit of bariatric surgery for elderly patients should be comorbidity management. In our research, COPD affects 40% of the elderly, which is statistically considerably greater than the control group.

At a twelve - month follow-up, Giordano and Victorzon[20] observed 54.5 percent remission of diabetic patients, 42.5 percent remission of hypertension, and 41 percent remission of dyslipidemia in a complete review of bariatric surgery in the elderly. Hutter et al.[21] also published the first American College of Surgeons research on SG outcomes in the general population (n=944) in 2011. After a year of follow-up, diabetes remission or recovery rates were 79 percent, hypertension 81 percent, and OSA and dyslipidemia 74 percent.

In the Navarrete et al.[22] series, there was no significant difference in remission or improvement of comorbidities between older and younger patients in diabetes (77.2 percent vs. 82.7 percent), hypertension (62.2 percent vs. 78.7%), or dyslipidemia (34.9 percent vs. 33.3). OSA remission was the only comorbidity with a significant difference favouring the younger group (60.8 percent vs. 76 percent, p= 0.02).

Identical outcomes with a 24-month follow-up, Pequignot et al.[15] were able to achieve 87 percent diabetic remission, 81 percent hypertension remission, and 94 percent dyslipidemia remission in the elderly, with no difference when compared to the control group. This disparity is likely affected by the fact that elderly individuals have greater chronic respiratory changes over time as a result of variables such as smoke or environmental factors.

The Burchett et al.[11] study found that SG is safe and beneficial in elderly obese individuals, with no significant differences in results between patients having SG at age <62 and ≥62 years.

Wang et al.[8] meta-analysis considered that the higher incidence rate of complications in the old patients was related to the longer operating time and surgical skills, as Turrentine et al.[16] found that an increase of operating duration would increase the occurrences of adverse events, such as cardiovascular events, respiratory dysfunction, wound infections, and other complications for the old patients. Meanwhile, he also found that operation complexity contributed to operation mortality in patients older than age 60. It was proven by Aust et al.[17] who studied the impact of operative complexity on patient risk factors and finally emphasized that operation complexity played a major role. Thus, simplifying procedures and shortening operation time could be effective to reduce incidence rate of complications

Resolution of comorbidities is one of the most important outcome metrics of bariatric surgery because not only does it improve quality of life, but also life expectancy. Regarding postoperative correction of comorbidities in our study, all of control group had correction for reproduction function abnormalities and osteoarthritis, statistically significant higher than elderly group (0%, 60% respectively). Dyslipidemia and NAFLD grade 1 were improved in all participants in both groups, OSA was corrected in 100% in elderly group and 90 % in control group and gout was corrected in 40% and 70% of elderly group and control group respectively

Our findings are in correlation with the studies by St Peter et al.[18] and Dunkle-Blatter et al.[19] who showed greater weight loss in younger patients, but a greater reduction in medication use in older patients, with similar complication rate and mortality in both groups. A report by Leivonen et al.[14] showed that comorbidity remission rate after 12 months was similar in older and younger patients. Positive influence of bariatric surgery on the course of the comorbidities seems not to be affected by age and comorbidity improvement should be considered as the major benefit from bariatric surgery for the elderly patients. As in our study with 40% of elderly have COPD, statistically significant higher than control group.

Furthermore, the authors feel that perioperative risk is determined more by the number and severity of comorbidities than by age. Clearly, medical optimization and continued attentiveness are critical variables in ensuring that older obese patients have a safe and effective outcome.[8]

CONCLUSION

We concluded that the relatively low major complication rate along with excellent weight reduction and comorbidity improvement make the LSG a reasonable effective and safe surgical option for the elderly.

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