Effect of Laparoscopic Sleeve Gastrectomy, One Anastomosis Gastric Bypass, and Single Anastomosis Sleeve Ileal Bypass; on Type II Diabetes in Obese Patients

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Introduction: Type II diabetes mellitus and obesity have a strong pathophysiological relationship, and both problems have become a major health issue in Egypt. Bariatric surgery is an excellent option for both problems. Herein, we compared five-year outcomes of the most common three bariatric procedures performed for patients harboring both problems.

Patients and methods: The five-year data of 93 cases were retrospectively reviewed. They underwent either "Laparoscopic sleeve gastrectomy" (LSG), "One Anastomosis Gastric Bypass" (OAGB), or "Single anastomosis sleeve ileal bypass" (SASI).

Results: Although weight loss outcomes were almost similar among the three groups for a three-year duration, subsequent assessment revealed the inferiority of LSG compared to the other two procedures, as some patients showed decreased excess weight loss. Diabetes showed similar changes, as its outcomes were comparable for three years. Nonetheless, recurrence occurred in 28% and 36% of cases four and five years after LSG, respectively, and the recurrent cases had the lowest weight loss values. The impact of the three procedures on the other comorbidities was statistically comparable. However, the incidence of reflux worsening, as well as de novo reflux, was higher in the LSG group.

Conclusion: On the long-term follow-up, both OAGB and SASI are associated with a significantly better impact on type II diabetes compared to LSG. Cases undergoing the latter procedure express recurrence in the long term, and they also express troublesome reflux manifestations. We recommend either OAGB or SASI in cases with type II diabetes and obesity.

Key words: Obesity, diabetes, bariatric surgery, long-term outcomes.

Introduction

Both obesity and diabetes mellitus constitute a major problem for the Egyptian healthcare authorities. The former is present in about 40% of adult Egyptians, according to the recent presidential "one million health" survey,[1] while the latter is present in about 11 million Egyptians, and that prevalence is expected to double in 2045 to reach 20 million.[2]

There is a documented association between obesity and type II diabetes, which motivated some researchers to call that association "Diabesity",[3,4] as the majority of individuals with type II diabetes are obese.[5] The pathophysiological association between these two problems could be explained by insulin deficiency, resistance, or both.[6,7]

Bariatric surgical procedures pose an excellent option for individuals having both problems.[8,9] Not only does it achieve effective weight reduction, but it also induces remission or improvement in their diabetic state,[10] which reaches 95% within two years after such procedures.[11] Multiple mechanisms could explain that beneficial impact, including weight-dependent and independent mechanisms.[12] That is why some surgeons prefer the term "metabolic surgery" for bariatric procedures, as it properly describes the metabolic changes occurring after these procedures.[13,14]

Bariatric procedures have become popular in Egypt, and they are performed on a daily basis in multiple governmental and private surgical centers. The majority of them are performed via the laparoscopic approach. Among these procedures, the most common ones include "Sleeve gastrectomy" (LSG), one anastomosis gastric bypass (OAGB), and single-anastomosis sleeve ileal bypass (SASI).[15-18]

Although the previously mentioned three procedures have a significant positive impact on diabetes,[19,20] Egyptian studies comparing their long-term impact on type II diabetes are scarce. Additionally, few studies have evaluated the long-term outcomes of the SASI procedure. That is why we conducted the current research to evaluate the five-year outcomes of the previous three procedures on weight loss and type II diabetes.

Patients and methods

This research is a retrospective analysis of 93 patients whose body mass index (BMI) was 35 kg/m2 and fulfilling the criteria of type II diabetes, as published by the "American Diabetes Association",[21] who underwent either primary LSG, OAGB, or SASI in the "Endocrine Surgery Unit" of Mansoura University Hospitals during the period between January 2017 and December 2018.

The data of these patients were collected from our

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medical archive, keeping in mind to include the data till December 2023, which provides a five-year follow-up period for all cases. Patients with missing data, non-adherence to the follow-up period, not fulfilling the criteria of type II diabetes, and who had other bariatric procedures, including revisional ones, were excluded from our data collection. Before we started data collection, our study protocol was approved by the "local ethical committee" of our university (IRB code:R.23.02.2071.R1).

As a routine protocol in our department, all patients were clinically, radiologically, and biochemically assessed prior to the procedure. The latter focused on serum glucose and glycosylated hemoglobin levels. Patients with uncontrolled glycemic status were admitted to the department, where they were commenced on insulin infusion to adjust their glucose levels before the procedure. Additionally, they signed a written consent explaining the indication and possible adverse events of the planned procedure.

The surgical procedures were chosen based on the acceptance of both the surgeon and the patient after the advantages and disadvantages of each were simply explained. All procedures were performed laparoscopically. During the LSG, gastric resection was performed 4 – 6 cm from the pylorus over a 38-Fr bougie **(Fig. 1A).** In the OAGB group, the gastric pouch was created, and the gastrojejunal anastomosis was created two meters from the Treitz ligament **(Fig. 1C).** In the SASI group, LSG was performed as before, followed by an antro-ileal anastomosis. However, our procedure was a modification, with the anastomosis was performed 3.5 meters from the ileocecal junction, in contrast to the original technique, which used a length of 2.5 meters **(Fig. 1B).** The details of the technical steps are mentioned in previous studies published by other surgeons from other surgical departments in our university.[15,22-24]

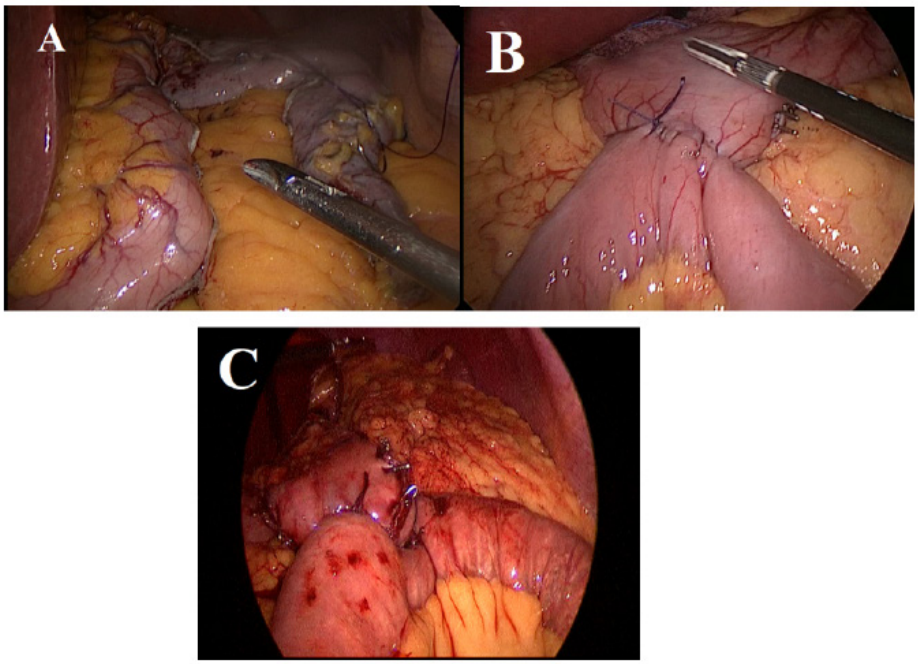

Fig 1: A) Sleeve gastrectomy. B) Single Anastomosis sleeve ileal bypass. C) Omega Anastomosis Gastric Bypass.

The majority of the patients were discharged on the second or third postoperative day unless major complications were encountered. Dietary, multivitamin and micronutrient intake was recommended according to the published guidelines.[25] Additionally, oral protein supplementation was commenced for the OAGB and SASI cases. Any adverse events encountered in early postoperative were recorded.

The skin stitches were removed after two weeks, and then the patients were re-assessed at a three-month interval during the first year, then yearly for the subsequent four years, unless they encountered complications. During these visits, their weight was assessed, and the "Percentage of weight loss" (%EWL) was recorded. In addition, laboratory assessment was done (focusing on hemoglobin, albumin, serum electrolytes, lipid profile, serum glucose, and glycosylated hemoglobin), and these values were recorded in the patient's medical records. The glycemic parameters were collected and then used to assess changes in their diabetic state, as published by Brethauer and his associates.[26] The diabetic state was classified as remission (Complete or partial), improvement, unchanged, or recurrence, as mentioned in the previous publication **(Table 1).** We combined complete and partial remission in one category for the simplicity of the results.

The impact of the procedures on other comorbidities, like hypertension, dyslipidemia, and reflux, was also defined according to the same authors.[26] In patients

without preoperative reflux, postoperative de novo reflux was subjectively diagnosed when the patient reported reflux manifestations that were not present preoperatively.[27]

Data collection

The following data were collected from the patient's files: Age, gender, preoperative comorbidities, duration of type II diabetes, operation type, operative time, early postoperative complications, %EWL, and yearly changes in diabetes and other comorbidities over five years.

Study outcomes

The main outcome of our research was changes in the diabetic state, while other outcomes included weight loss (%EWL) and changes in other obesity-associated morbidities other than type II diabetes.

Sample size calculation

We calculated the proper sample size via the "Clinicalc" online website. Based on the findings of Mahdy et al., diabetic improvement was encountered in 71.4% of LSG cases and 97.9% of SASI cases.[28] We needed 28 patients in each group to achieve an 80% study power and 0.05 significance level, and a 10% dropout rate was expected. Therefore, we increased the number to 31 cases in each group.

Statistical analysis

The SPSS software was used to compare the three groups. We used the Chi-square and the Anova tests to compare frequencies and means, respectively. The obtained p-values were considered statistically relevant if they were less than 0.05.

Results

Age, gender, BMI, duration of diabetes, hypertension and reflux were insignificantly different among three groups Operative time was significantly lower in LSG group than (LMGB groups and SASI group) (P <0.001) **(Table 2).**

Table 3 shows that weight loss at one year, two years and three years were insignificant different among three groups and at four and five years was significantly lower in LSG group than (LMGB and SASI groups) (P<0.05). At the 4- and 5-year marks, the percentage of excess weight loss (%EWL) showed significant differences between the groups. As shown in **Table 3**, by the fourth year, patients in the LSG group had a mean %EWL of 59.6±8.65%, significantly lower than both the LMGB group (67.1±11.32%) and the SASI group (71.4±10.23%) (P< 0.001). Similarly, at the 5-year mark, the %EWL for the LSG group decreased further to 56.3±8.65%, which was again significantly lower than both the LMGB group (65.4±11.41%) and the SASI group (70±10.03%) (P<0.001).

Diabetes mellitus at two years and three years were insignificantly different among three groups and at one, four and five years were significantly different among three groups (P <0.05) **(Table 4).**

Hypertension at two, three, four and five years were insignificantly different among three groups and was significantly different among three groups at one year (P<0.001) **(Table 5).**

All cases with preoperative dyslipidemia showed either remission or improvement with comparable incidence among the three groups **(Table 6).**

GERD at one year, two years, three years, four years and five years were insignificant different among three groups **(Table 7).**

De novo reflux was significantly different among three groups (P=0.022) **(Table 8).**

Table 1: Definition of diabetic outcomes used in the current study

Outcome	Definition
Complete remission	Normal glycemic parameters with no antidiabetic drugs (Fasting serum glucose < 100 mg/dl and glycosylated hemoglobin < 6%).
Partial remission	Subdiabetic state with no antidiabetic drugs (Fasting serum glucose between 100 and 125 mg/dl, and glycosylated hemoglobin between 6 and 6.4%).
Improvement	A decline in the dose of antidiabetic drugs or a decline in fasting serum glucose and glycosylated hemoglobin does not meet the remission criteria.
Unchanged	Absence of any of the previous criteria.
Recurrence	Recurrent need for antidiabetic drugs or fasting serum glucose and glycosylated hemoglobin within the diabetic range (≥126 mg/dL and ≥ 6.5 %, respectively) after any period of remission.

Table 2: Basic demographic data and operative time of studied groups

	LSG group (n=25)	OAGB group (n=30)	SASI group (n=38)	P	Post Hoc
Age (years)	45.7 ± 6.61	47.4 ± 7.08	46.1 ± 7.07	0.672	-
Gender					
Male	8 (32%)	13 (43.33%)	13 (34.21%)	0.635	-
Female	17(68%)	17(56.67%)	25 (65.79%)		
BMI (kg/m^2)	46.1 ± 6.13	44.2 ± 5.49	45.5 ± 6.34	0.513	-
Duration of diabetes (years)	7.9 ± 1.66	7.8 ± 1.8	7.7 ± 1.54	0.881	-
Hypertension					
Yes	8 (32%)	8 (26.67%)	10 (26.32%)	0.870	-
No	17 (68%)	22 (73.33%)	28 (73.68%)		
Reflux					
Yes	9 (36%)	9 (30%)	10 (26.32%)	0.870	-
No					
Operative time (min)	62.8 ± 8.67	80.8 ± 13.71	83.7 ± 10.05	< 0.001*	P1<0.001* P2<0.001* P3=0.47

Data is presented as Mean±SD or frequency (%). BMI: Body mass index. *: Significant as P<0.05.

Table 3: Weight loss outcomes (expressed as %EWL)

	LSG group (n=25)	OAGB group (n=30)	SASI group (n=38)	P	Post Hoc
One year	57.7 ± 14.15	59.8 ± 16.23	62.9 ± 14.1	0.473	-
Two years	64.3 ± 9.51	66.6 ± 10.33	69.1 ± 9.87	0.240	-
Three years	65.7 ± 9.64	68.1 ± 10.47	70.7 ± 10.14	0.220	-
Four years	59.6 ± 8.65	67.1 ± 11.32	71.4 ± 10.23	< 0.001*	P1=0.043* P2<0.001* P3=0.328
Five years	56.3 ± 8.65	65.4 ± 11.41	70 ± 10.03	< 0.001*	P1=0.003* P2<0.001* P3=0.346

Data is presented as Mean±SD. *: Significant as P<0.05.

Table 4: Changes in the diabetic state

	LSG group (n=25)	LMGB group (n=30)	SASI group (n=38)	P
One year				
Remission	14 (56%)	19 (63.33%)	24 (63.16%)	0.022*
Improvement	7 (28%)	11 (36.67%)	14 (36.84%)	
Unchanged	4 (16%)	0 (0%)	0 (0%)	
Recurrence	0 (0%)	0 (0%)	0 (0%)	
Two years				
Remission	15 (60%)	19 (63.33%)	25 (65.79%)	0.073
Improvement	7 (28%)	11 (36.67%)	13 (34.21%)	
Unchanged	3 (12%)	0 (0%)	0 (0%)	
Recurrence	0 (0%)	0 (0%)	0 (0%)	
Three years				
Remission	15 (60%)	20 (66.67%)	26 (68.42%)	0.228
Improvement	8 (32%)	10 (33.33%)	12 (31.58%)	
Unchanged	2 (8%)	0 (0%)	0 (0%)	
Recurrence	0 (0%)	0 (0%)	0 (0%)	
Four years				
Remission	10 (40%)	21 (70%)	26 (68.42%)	<0.001.*
Improvement	6 (24%)	9 (30%)	12 (31.58%)	
Unchanged	2 (8%)	0 (0%)	0 (0%)	
Recurrence	7 (28%)	0 (0%)	0 (0%)	
Five years				
Remission	6 (24%)	21 (70%)	26 (68.42%)	<0.001.*
Improvement	8 (32%)	9 (30%)	12 (31.58%)	
Unchanged	2 (8%)	0 (0%)	0 (0%)	
Recurrence	9 (36%)	0 (0%)	0 (0%)	

Data is presented as frequency (%). *: Significant as P<0.05.

Table 5: Changes in the hypertensive state

	LSG group (n=25)	LMGB group (n=30)	SASI group (n=38)	P
One year				
Remission	7 (28%)	20 (66.67%)	26 (68.42%)	
Improvement	8 (32%)	9 (30%)	12 (31.58%)	< 0.001*
Unchanged	2 (8%)	0 (0%)	0 (0%)	
Recurrence	8 (32%)	1 (3.45%)	0 (0%)	
Two years				
Remission	2 (25%)	3 (37.5%)	4 (40%)	
Improvement	3 (37.5%)	3 (37.5%)	4 (40%)	0.931
Unchanged	3 (37.5%)	2 (25%)	2 (20%)	
Recurrence	0 (0%)	0 (0%)	0 (0%)	
	LSG group (n=8)	**LMGB group (n=8)**	**SASI group (n=10)**	**P**
Three years				
Remission	2 (25%)	3 (37.5%)	4 (40%)	
Improvement	3 (37.5%)	3 (37.5%)	4 (40%)	0.931
Unchanged	3 (37.5%)	2 (25%)	2 (20%)	
Recurrence	0 (0%)	0 (0%)	0 (0%)	
Four years				
Remission	3 (37.5%)	4 (50%)	5 (50%)	
Improvement	3 (37.5%)	2 (25%)	3 (30%)	0.977
Unchanged	2 (25%)	2 (25%)	2 (20%)	
Recurrence	0 (0%)	0 (0%)	0 (0%)	
Five years				
Remission	3 (37.5%)	4 (50%)	5 (50%)	
Improvement	3 (37.5%)	2 (25%)	3 (30%)	0.977
Unchanged	2 (25%)	2 (25%)	2 (20%)	
Recurrence	0 (0%)	0 (0%)	0 (0%)	

Data is presented as frequency (%). *: Significant as P<0.05.

Table 6: Changes in the dyslipidemic state

	LSG group (n=8)	LMGB group (n=8)	SASI group (n=10)	P
One year				
Remission	3 (37.5%)	3 (37.5%)	5 (50%)	0.916
Improvement	3 (37.5%)	2 (25%)	3 (30%)	
Unchanged	2 (25%)	3 (37.5%)	2 (20%)	
Two years				
Remission	3 (37.5%)	3 (37.5%)	5 (50%)	0.916
Improvement	3 (37.5%)	2 (25%)	3 (30%)	
Unchanged	2 (25%)	3 (37.5%)	2 (20%)	
	LSG group (n=13)	**LMGB group (n=12)**	**SASI group (n=19)**	**P**
Three years				
Remission	6 (46.15%)	7 (58.33%)	12 (63.16%)	0.629
Improvement	7 (53.85%)	5 (41.67%)	7 (36.84%)	
Unchanged	0 (0%)	0 (0%)	0 (0%)	
Four years				
Remission	7 (53.85%)	8 (66.67%)	13 (68.42%)	0.679
Improvement	6 (46.15%)	4 (33.33%)	6 (31.58%)	
Unchanged	0 (0%)	0 (0%)	0 (0%)	
Five years				
Remission	8 (61.54%)	8 (66.67%)	13 (68.42%)	0.919
Improvement	5 (38.46%)	4 (33.33%)	6 (31.58%)	
Unchanged	0 (0%)	0 (0%)	0 (0%)	

Data is presented as frequency (%). *: Significant as P<0.05.

Table 7: Changes in GERD

	LSG group (n=13)	LMGB group (n=12)	SASI group (n=9)	P
One year				
Remission	8 (61.54%)	8 (66.67%)	13 (68.42%)	
Improvement	5 (38.46%)	4 (33.33%)	6 (31.58%)	0.919
Unchanged	0 (0%)	0 (0%)	0 (0%)	
Worsening	0 (0%)	0 (0%)	0 (0%)	
Two years				
Remission	8 (61.54%)	8 (66.67%)	13 (68.42%)	
Improvement	5 (38.46%)	4 (33.33%)	6 (31.58%)	0.919
Unchanged	0 (0%)	0 (0%)	0 (0%)	
Worsening	0 (0%)	0 (0%)	0 (0%)	
	LSG group (n=9)	**LMGB group (n=9)**	**SASI group (n=10)**	**P**
Three years				
Remission	1 (11.11%)	2 (22.22%)	4 (40%)	
Improvement	1 (11.11%)	3 (33.33%)	4 (40%)	0.192
Unchanged	2 (22.22%)	1 (11.11%)	2 (20%)	
Worsening	5 (55.56%)	3 (33.33%)	0 (0%)	
Four years				
Remission	1 (11.11%)	2 (22.22%)	4 (40%)	
Improvement	1 (11.11%)	3 (33.33%)	4 (40%)	0.172
Unchanged	2 (22.22%)	2 (22.22%)	2 (20%)	
Worsening	5 (55.56%)	2 (22.22%)	0 (0%)	
Five years				
Remission	1 (11.11%)	2 (22.22%)	4 (40%)	
Improvement	1 (11.11%)	3 (33.33%)	4 (40%)	0.172
Unchanged	2 (22.22%)	2 (22.22%)	2 (20%)	
Worsening	5 (55.56%)	2 (22.22%)	0 (0%)	

Data is presented as frequency (%). *: Significant as P<0.05.

Table 8: Incidence of de novo reflux

	LSG group (n=9)	LMGB group (n=9)	SASI group (n=10)	P
De novo reflux	5 (20%)	4 (13.33%)	0 (0%)	0.022*

Data is presented as frequency (%). *: Significant as P<0.05.

Discussion

This is the first study to compare LSG, OAGB, and SASI in patients with type II diabetes over a five-year follow-up period, which constitutes a major advantage in favor of our study. Despite its retrospective, non-randomized nature, one could notice no notable statistical differences regarding preoperative variables, which should decrease the bias risk and strengthen the integrity of our findings.

The recorded operative time in the OAGB and SASI groups was significantly longer than LSG, and that could be explained by the relative complexity of the initial two procedures compared to the latter, as they entail the creation of gastro-enteric anastomosis.

Although our findings revealed comparable weight loss outcomes between the three procedures till the three-year follow-up visit, the subsequent assessment revealed a higher %EWL in the OAGB and SASI groups than LSG. The superiority of long-term weight loss in OAGB and SASI procedures over the LSG could be explained by their restrictive and malabsorptive elements,[28,29] rather than the only restrictive component achieved by LSG.[30] That could also explain the decrease in the %EWL in the four- and five-year follow-up visits, which could be due to sleeve dilatation and changes in eating behavior.[31] On the other hand, the presence of the malabsorptive element in the other two procedures acts as a guard against weight regain. Additionally, the patient is more obliged to follow a certain type of diet in order to avoid the distressing dumping syndrome.[29,32]

Castro et al. confirmed the superiority of OAGB in the long term as the reported excess BMI loss was 97.6% compared to only 68.8% after LSG on the five-year follow-up assessment.[33]

To the best of our knowledge, the only study that assessed long-term outcomes of SASI was published in 2023 by Aghajani et al., who assessed the cases four years after the procedure. These authors reported that the %EWL had mean values of 93.7%, 110.5%, 94.1%, and 93.3% at one, two, three, and four years after the procedure.[34] The previous values are much higher than ours. One could expect some heterogenicity in the %EWL after SASI compared to other procedures. Firstly, there is a lack of technique standardization.[15] Additionally, the presence of two pathways for the ingested nutrients makes it impossible to predict the amount of food passing through each pathway, as there are many determinants for that action, including the diameter of each outlet, intraluminal pressure, frictional forces, content density, and velocity.[35] Consequently, early nutrient escape to the ileum is different, and thus, there are different weight loss outcomes.

Regarding our diabetic outcomes, we noticed that OAGB and SASI yielded significant diabetic outcomes after four years compared to the LSG. Numerous studies confirmed the superiority of OAGB over LSG in improving type II diabetes in the long term. Kular and his associates reported that the five-year remission rate was 92% after OAGB compared to only 81% after LSG.[36] Castro et al. reported that diabetes remission occurred in 89.4% and 75.9% of OAGB and LSG cases, respectively ($p = 0.029$).[33]

Aghajani et al., in their four-year follow-up study, reported that SASI yielded a beneficial impact in all diabetic cases, with a 93% resolution rate and a 7% improvement rate.[34] In their two-year follow-up study, Khalaf and Hamed reported a 97.9% resolution rate and a 2.1% improvement rate for the same comorbidity.[35] In a one-year follow-up study, SASI yielded better diabetic outcomes compared to LSG, as remission or improvement occurred in 95.8% of SASI cases compared to 70% of LSG cases.[22] Furthermore, another one-year follow-up study reported that type II diabetes improvement occurred in 97.7% of SASI cases and 85.7% of OAGB cases, which was higher than LSG (71.4%).[28]

The improvement in the diabetic state after SASI occurs secondary to gastric volume reduction along with rapid delivery of nutrients into the terminal ileum, which induces hormonal changes to increase insulin secretion and decrease its resistance.[15,35] The same benefits are also provided by the OAGB procedure.[37] Complete or partial bypassing of the foregut, which is achieved in OAGB and SASI, respectively, is not achieved in LSG, which could compromise its efficacy in improving diabetes over time.[19]

On the five-year visit, we reported an incidence of 28% of diabetes recurrence in the LSG group, and these cases had lower %EWL values. Our incidence of relapse after LSG lies within the reported range in the literature, which is between 20.1% and 35%.[38-41] Watanabe et al. also documented the association between low %EWL values (Including weight regain) and diabetic relapse after LSG.[41] As weight loss is associated with improved beta cell function and insulin sensitivity, it was reasonable to encounter relapse in patients who had lower %EWL at later follow-up visits.[38]

Our findings revealed notable differences regarding the outcomes of hypertension. Mahdy et al. compared one-year outcomes after the same three procedures, reporting hypertension improvement rates of 64.3%, 84%, and 75% after LSG, OAGB, and SASI, respectively ($p=0.35$).[28]

All dyslipidemic patients in our study expressed positive changes that were comparable among the three procedures. In another study that compared the three procedures after one year, the rate of dyslipidemia improvement was 57.1%, 78.5%, and 76.9% after LSG, OAGB, and SASI, respectively

(p=0.6).[28] Moreover, Garay et al. reported long-term improvement or remission of dyslipidemia in the majority of cases after different bariatric procedures (93%).[43]

Although our analysis did not reveal significant differences regarding reflux changes, the incidence of worsening was higher in association with LSG. Multiple mechanisms could explain reflux worsening after LSG, including increased intraluminal pressure, disruption of the angle of His, decreased gastric compliance, esophageal motility dysfunction, and decline in low esophageal sphincter pressure.[44]

We encountered de novo reflux in 20% of LSG cases, which was higher than the other procedures. Our incidence of de novo reflux after LSG lies within the reported range, which is up to 35%.[44-46] In comparison with LSG, the SASI procedure is associated with decreased intragastric pressure secondary to gastro-ileal anastomosis.[15] Therefore, it is expected that there will be fewer reflux manifestations after the latter.

Our study has some limitations, manifested in the small patient sample collected from one surgical institution. Also, the study is retrospective in nature. More prospective trials should be conducted to address the previous limitations.

Conclusion

On the long-term follow-up, both OAGB and SASI are associated with a significantly better impact on type II diabetes compared to LSG. Cases undergoing the latter procedure express recurrence in the long term, and they also express significant reflux manifestations (Worsening of the existing and development of de novo ones). We recommend either OAGB or SASI in cases with type II diabetes and obesity.

Conflicts of interest: Nil.

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