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The Safety and Efficacy of One Anastomosis Gastric Bypass as a Revision for Sleeve Gastrectomy

Mohammad H. Jamal¹  · Rawan Elabd¹ · Rawan AlMutairi¹ · Aqeel Albraheem¹ · Ahmad Alhaj¹ · Haytham Alkhatat¹ · Obaid AlHarbi¹ · Husain Almahmeed¹

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Abstract

Introduction Failure of sleeve gastrectomy poses a potential challenge for surgeons as variable options exist for revision. One anastomosis gastric bypass (OAGB) is a potential revisional option, and in this study, we sought to determine the safety and efficacy of OAGB post sleeve gastrectomy.

Method Prospective study on our initial experience with a consecutive group of patients who underwent OAGB as a revisional surgery for sleeve gastrectomy in the period between January 2015 and December 2018 was carried out. Morbidity and mortality data were recorded as well as the effect on comorbidities and weight loss.

Results A total of 56 patients underwent OAGB as a revision of sleeve gastrectomy. The average weight prior to OAGB was 112 ± 24.6 kg. The minimum weight they have reached after is 85 ± 21.3 kg after a duration of 19 ± 9.2 months. Percentage of total weight loss (TWL%) at 1, 3, 6, and 12 months postoperatively was found to be 7.6%, 9.8%, 14.1%, and 28.8%, respectively. TWL% on the last day of follow-up was 24%. Two patients had marginal ulcers, in which one had a perforation.

Conclusion OAGB is safe and effective for weight regain post sleeve gastrectomy.

Keywords Bariatric · One anastomosis gastric bypass · Sleeve revision · Weight regain

Background and Introduction

The state of Kuwait is ranked one of the top 7% of countries worldwide with the highest obesity prevalence according to the International Comparisons data from the WHO Global Infobase [1]. Sleeve gastrectomy is the most widely used metabolic surgery in the Middle East since it started as a first-step operation in the super morbid obese prior to duodenal switch and is the most widely performed bariatric surgery in the USA since 2014 [2]. Sleeve surgery is very effective in the short term at weight loss with relative technical simplicity and low

morbidity [3]; it is however associated with weight regain [4, 5] with more follow-up and with the development of gastroesophageal reflux disease (GERD), with a postoperative incidence reported to be between 7% and 20% [6, 7] [8]. Studies in the literature consistently reported weight regain, which was defined by most as an increase of 10 kg or more from weight loss nadir [5], with examples from 10-year follow-up studies documenting a drop of the percentage of excess weight loss (EWL%) from 71% at 12 months to 53% at 10 years of follow-up [4] and a percentage of total weight loss (TWL%) of 23.2% at 2 years that dropped to 16.1% by 10 years [9]. Different revision options are suggested for sleeve failure including roux-en-Y gastric bypass (RYGB), single anastomosis duodeno-ileal bypass (SADI), duodenal switch, and re-sleeve. One-anastomosis gastric bypass (OAGB) is also a possible revision option for sleeve failure, where it avoids a second anastomosis as in the RYGB and the duodenal switch. However, OAGB is thought to be associated with high risk of bile reflux and other comorbidities, and studies showing its effectiveness for sleeve failure are lacking. In this study, we aim to assess the effect of OAGB on patients' body mass index (BMI) and obesity-related co-morbidities as well as its safety as a revisional surgery post sleeve failure.

Presented at the annual meeting for the International Federation for the Surgery of Obesity and Metabolic Disorders, Dubai 2018

A study examining the effect of one anastomosis gastric bypass as a revision for sleeve gastrectomy, with short- and medium-term effects on weight loss along with a mean follow-up approaching 2 years

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Methods

Study Design, Participants, and Selection Methods

A retrospective cohort study was carried out in Mubarak Al-Kabeer and Farwaniya hospitals on patients who underwent OAGB as a revision surgery after sleeve gastrectomy. The inclusion criteria for this study were sleeve gastrectomy failure patients aged 18–60 years, with gastric sleeve as a primary bariatric surgery, and OAGB as a revision surgery. Sleeve gastrectomy failure was defined as more than 50% regain of the weight lost post sleeve gastrectomy. Exclusion criteria included patients who had a primary bariatric surgery other than sleeve, such as gastric banding or plication, and those who had a subsequent, third, bariatric procedure.

Preoperative Preparation and Operative Technique

All patients were seen preoperatively by a dietician specialized in post-bariatric surgery diet follow-up with knowledge in eating disorders assessment and management. All patients underwent a radiological barium swallow, gastric endoscopy, and routine laboratory tests including nutritional, vitamins, liver, endocrine, and coagulation profile.

All patients had OAGB laparoscopically with four ports and surgeon standing on the right side of the patient with the assistant on the left. Surgery started by lysis of adhesions of the previous gastric sleeve, taking care to remove all previous clips, and then we use the EndoGIA 45-mm stapler approximately 1.5 cm to the left of the lesser curvature to transect the gastric sleeve transversely in order to create the gastric pouch. An antecolic end-to-side gastrojejunal anastomosis is then performed with a 30-mm EndoGIA stapler to a jejunal loop 175 cm distal to the ligament of Trietz. The gastroenterostomy is then closed with continuous suture. A 36-French bougie (Ethicon) is then advanced to the efferent jejunal loop, to inject blue dye to check for anastomotic leak. We do not divide the omentum and we do not perform any re-sleeve in our patients.

Postoperative Care

All of the patients received care under a standard pathway. Patients were encouraged to ambulate right after surgery and oral feeding was allowed to start on postoperative day 1 after the performance of a gastrograffin swallow leak test. Patients were discharged home on the third postoperative day. Patients were followed up by a surgeon and a dietician, once a month for the first 2 postoperative months and every 3 months thereafter. Patients were advised to take a daily multivitamin tablet as a supplement (iron, vitamin B₁₂, calcium, and vitamin D supplement). For the first 6 months only, patients were prescribed a proton pump inhibitor and a bile salt in the form of ursodeoxycholic acid. Routine laboratory tests included

nutritional, vitamins, and liver. Endocrine and coagulation profile were performed once every 3 months in the first year, once every 6 months in the second year, and once yearly thereafter.

Ethical Consideration, Data Collection, and Statistical Analysis

Ethical approval for the conduction of this study was granted from Kuwait University Ethical Committee and the Ministry of Health. OAGB was first conducted in the included hospitals in 2015, so a list of all the patients who underwent OAGB since January of 2015 onwards was taken from the operation theater surgical cases database. Patients were screened back in time and those who have had a primary bariatric procedure, with it being sleeve gastrectomy, were selected for this study. This gave a total of 56 patients. Comorbidity status was measured as hypertension if blood pressure >120/80 requiring medication for control, and diabetes if fasting blood sugar >6.9, HbA1c >6.5, or 2-h OGTT plasma glucose >11 requiring oral hypoglycemic agents or insulin for control. Resolution of comorbidity was measured as omitting the need of taking medication while improvement was measured as requiring less medication to control the condition. All information was derived from patients' medical file records.

Statistical analysis was conducted using IBM SPSS version 25. As the mean weight and BMI before and after OAGB was normally distributed, the independent samples *t* test statistic was used to examine the difference in means among both groups. *P* < 0.05 was considered significant.

Results

Our sample size was 56 consisting of 89% females with a mean age of 38 ± 10.3 years (22–60 years) (Table 1). The

Table 1 Descriptive data

Descriptive data	N = 56 (%)		
Gender			
Females	50 (89.3)		
Males	6 (10.7)		
Age (mean + SD)	37.6 (10.3)		
Complications of primary procedure			
Repeated vomiting	1 (1.8)		
Hiatal hernia	2 (3.6)		
Indication for revision			
Weight regain	56 (100)		
Co-morbid condition status	Before OAGB	After OAGB	
Hypertension		Resolved	Improved
Diabetes	19 patients	8 patients	11 patients
	5 patients	2 patients	3 patients

weight loss profile of our patients is presented in Table 2 and Fig. 1. The mean weight before the primary bariatric surgery (sleeve gastrectomy) was 117 ± 23.6 kg (80–180 kg), and patients reached a minimum mean weight of 87 ± 22.4 kg (54–166 kg) within a mean of 21 ± 13.9 months (3–60 months, median 12) postoperatively. The indication for revision surgery was due to weight regain. The mean duration between the primary and revision bariatric surgery was 82 ± 30.7 months (24–139 months, median 90.3), during which their average weight has increased from a mean of 87 kg to 112 ± 24.6 kg (77–186 kg). The starting mean BMI before OAGB was 42 ± 7.9 kg/m² (30–60). The minimum mean weight and BMI they have reached after OAGB as a revision surgery is 85 ± 21.3 kg (57–145 kg) and 31.2 ± 6.1 kg/m² (22.2–46.8 kg/m²) after a mean duration of 19 ± 9.2 months (2.5–40.7 months, median 18.1), respectively. TWL% at 1, 3, 6, and 12 months postoperatively was found to be 7.6%, 9.8%, 14.1%, and 28.8%, respectively. TWL% on the last day of follow-up after an average of 19 months was 24%.

At 1 year post-OAGB with a response rate of 48%, none of the patients had an EWL% of less than 25, while 33% had an EWL% between 25 and 49.9, and 67% had an EWL% of more than 50. When this data was analyzed at the last day of follow-up with a response rate of 77%, only one patient had an EWL% of less than 25, while 17 (39.5%) had an EWL% between 25 and 49.9, and 25 patients (58.1%) achieved an EWL% of more than 50 (Table 3).

Out of the 56 patients, 19 had hypertension treated with medication before OAGB, 8 (42%) of which had totally normalized their blood pressure after OAGB and dropped the need of taking any antihypertensive medication, and the other 11 (58%) had a decrease in their medication intake (1 pill instead of 2 previously) and had controlled blood pressure readings on clinic visits. Five out of the 56 patients were having type 2 diabetes before OAGB, 2 (40%) of which had dropped the need of taking medication for diabetes with a normal HBA1C of <6.5 on clinic visits, the other 3 (60%) patients had decreased the number of oral hypoglycemic agents (1 instead of 2 previously). The comorbid condition

status of our patients before their primary bariatric surgery (sleeve) was not documented in their files.

There was one complication reported after OAGB as a revision surgery which is a marginal ulcer in two patients; both were seen 1 year after the surgery, and one was treated with PPI and the other with laparoscopy and omental patch due to perforation. There were no reported cases of anastomotic leak, bile reflux, or mortality.

Discussion

In this study, we have examined the safety and effectiveness of OAGB as a revision post failed sleeve gastrectomy with a mean follow-up of 19 months. All patients in our cohort had their revision due to weight regain and we report that OAGB without re-sleeve was effective for sleeve failure due to weight regain.

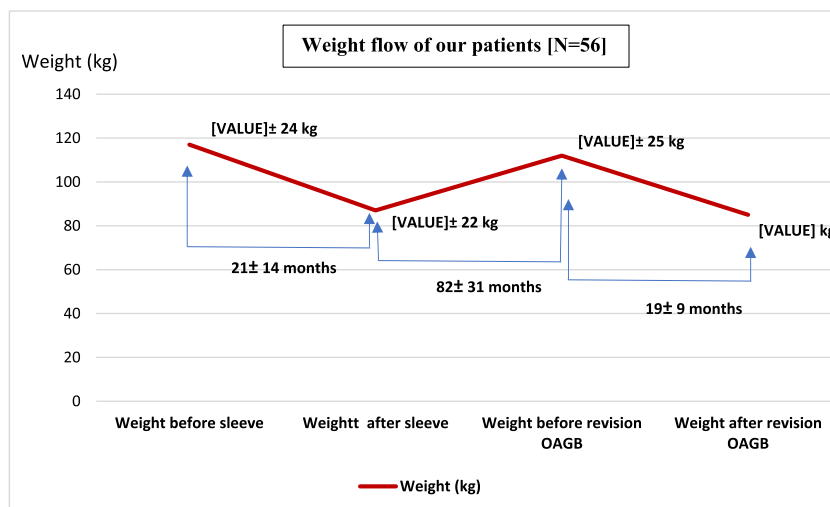
Sleeve gastrectomy is an effective metabolic procedure, but failure is reported and is divided into two main categories, the first being weight regain and the second is presence of unwanted symptoms mainly GERD [5, 10–12]. Patients with weight regain post sleeve gastrectomy are not homogeneous as the degree of weight regain varies, but they can be divided into those who primarily fail to lose more than 50% of their excess body weight in the first-year post surgery and those who are successful at losing more than 50% of their excess body weight in the first year but then start to regain it. Different operative strategies were proposed post sleeve failure, including fundectomy, re-sleeve surgery, RYGB, OAGB, and SADI [4, 13, 14]. One study that evaluated SADI for failed sleeve included 30 patients with a mean BMI of 40.1 with a follow-up on 22 (73.3%) patients at 12 months, but only on 16 (53.34%) patients at 24 months of follow-up showed a very good result in terms of weight loss where the %EWL was 78.93 ± 35.5 with resolution of comorbidities including diabetes (71.4%), dyslipidemia (31.2%), and hypertension (27.7%). However, four (13.34%) patients had early complications and three patients (10%) required revisional

Table 2 Weight loss profile

	Response rate <i>N</i> = 56 (%)	Weight Mean \pm SD	BMI Mean \pm SD	EWL% Mean \pm SD	TWL% Mean \pm SD
Before OAGB	56 (100%)	111.5 ± 24.6	41.9 ± 7.9		
At 1 month	41 (73%)	105 ± 28.3	38.4 ± 7.7	23.3 ± 14.6	7.6 ± 2.9
At 3 months	33 (59%)	103 ± 26.4	37.1 ± 6.9	30.9 ± 26.9	9.8 ± 5.8
At 6 months	32 (57%)	91 ± 27.2	35.7 ± 8.3	44.5 ± 38.5	14.1 ± 9.0
At 12 months	27 (48%)	85 ± 31.6	30.5 ± 9.4	84.9 ± 63.5	28.8 ± 16.2
At LDF*	43 (77%)	85 ± 21.3	31.2 ± 6.1	71.5 ± 46.6	24.0 ± 9.3
<i>P</i> value [#]		<0.000	<0.000		

*LDF: last day of follow up[#] *P* value of independent-samples *t* test examining difference in means of weight and BMI before OAGB and at last day of follow-up after OAGB

Fig. 1 Weight flow of our patients ($N = 56$)



surgery due to hypoalbuminemia. None of the patients in this study were revised due to unwanted sleeve symptoms [15]. In addition, a multi-institutional study by Zaveri et al. identified 96 patients who underwent SADI post sleeve gastrectomy. The follow-up of this cohort at 24 months identified an average %total body weight loss of 20.5%, with type II DM remission of 93.7% [16]. Another study by Parmar et al. examined 22 patients who were converted from sleeve to RYGB; 10 patients (45.5%) were converted due to GERD and the rest due to inadequate weight loss. In this study, the alimentary limb length was 150 cm, but the jejunojejunostomy was performed 50 cm from the ligament of Treitz. RYGB was reported to be very effective at GERD resolution where 100% of patients reported improvement of symptoms and 80% stopped their antacid medications. RYGB in this cohort was not effective for inadequate weight loss after sleeve as the EWL% was only 46 after 2 years of follow-up. One major complication, being an internal herniation requiring reoperation in the first month post RYGB, was reported [17].

If we compare the results of SADI and RYGB as revision surgeries post sleeve gastrectomy, a multicenter Dutch study reported their experience with that by evaluating 140 patients who underwent revisional surgery post sleeve gastrectomy. Of their cohort, 66 patients had SADI procedure and 74 underwent RYGB. The study found the TWL% at 24 months

to be 6.9% in the RYGB group compared to 26.4% in the SADI group with 16.7% complications rate post-SADI and 17.6% complications rate post-RYGB. Of note is that 29 patients in the RYGB group had the revision due to functional problems or GERD which constituted 39.1% of the RYGB group [18].

Alsabah et al. [19] reviewed the short-term effect of OAGB post sleeve gastrectomy on 29 patients and have shown an EWL% of 14.5%, 31.9%, 48.0%, and 58.9% at 2 weeks, 3 months, 6 months, and 1 year post-OAGB with only 1 year of follow-up and with less than 50% of patients reaching the 1-year follow-up. They performed their anastomosis at 175 cm to 200 cm from the ligament of Trietz. They reported no mortality but three morbidities including two leaks, one treated with stenting and one with percutaneous drainage, and one stenosis treated with balloon dilatation. They did not comment on the effect of OAGB on GERD although they reported operating on three patients for GERD only.

OAGB is still not widely accepted worldwide—a study by Mahawar et al. [20] surveyed 417 surgeons not doing the procedure to understand the objections to it. About 50% of respondents expressed fear of increased risk of gastric and esophageal cancers. There was also a concern of late complications (48.6%) and 19.2% of surgeons thought that OAGB is not an effective procedure for weight loss, while 21.3% thought that it is not an effective procedure for resolution of comorbidities.

In our study, we have revised the patients for weight regain to OAGB. Almost all of our patients achieved an EWL% of more than 25% at 19 months post-OAGB with 58% having an EWL% of more than 50. We observed not only an effective weight loss but also resolution of comorbidities including diabetes in two patients who achieved an HBA1c of less than 6.5 off medications post-revision, as well as hypertension. We do not report any mortality or short-term complications; however, we report two marginal ulcers, in which one required a

Table 3 Percentage of patients achieving successful weight loss (>50% EWL) after revision surgery (OAGB) at last day of follow-up

Excess weight loss (EWL)	At 12 months $N = 27$ (%)	LDF* $N = 43$ (%)
EWL% <25	0	1 (2.3)
EWL% 25–49.9	9 (33.3)	17 (39.5)
EWL% >50	18 (66.7)	25 (58.1)

*LDF: last day of follow-up

laparoscopy with omental patch and washout due to perforation. Both ulcers were seen more than a year after the OAGB. We did not observe any leaks, bleeding requiring transfusions, deep venous thrombosis, nor bile reflux.

Management of sleeve patients requiring revisions is complex with variable options. OAGB is a valid option especially for weight regain. Our current practice is to perform SADI if the BMI is above 50 post sleeve failure and the patient is without GERD. If GERD is present, RYGB is performed. For those with a BMI below 50 and without GERD, we prefer OAGB. We do not perform re-sleeve surgery.

The limitations in this study include the retrospective nature of the study as well as the lack of long-term follow-up data. We also do not have complete follow-up data on the laboratory nutritional profile on all patients; controversy still exists about the proper distance of anastomosis from the ligaments of Trietz fearing malnutrition with further distance. More studies examining the effect of different operative interventions post sleeve failure are needed including the comparison of long BP limb RYGB to OAGB.

Conclusions

OAGB is effective as a revision surgery for sleeve gastrectomy for weight regain; however, long-term data is needed, as our study is examining the short- to mid-term data. Although a maximum of 29% of TWL% was achieved in terms of weight loss post-OAGB, we observed a 5% regain of TWL% with longer follow-up. The safety of OAGB needs further studies as we had two major complications in this cohort of patients.

Compliance with Ethical Standards

Ethical Considerations Ethical approval for conducting the study was obtained from Kuwait University Ethical committee and the Ministry of Health.

Conflict of Interest The authors declare that they have no competing interests.

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