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One Anastomosis Gastric Bypass Versus Roux-En-Y Gastric Bypass: A New Limb Length Modification, is it Effective? A Prospective Cohort Study

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ABSTRACT

Introduction: Bariatric surgeries are effective in treating obesity and its associated co-morbidities. The ideal bariatric surgery with satisfactory weight or BMI loss and with few complications and nutritional deficiencies still does not exist. Modifications in one anastomosis gastric bypass (OAGB) and Roux-en-Y gastric bypass (RYGB) are still under study for best BMI loss with few complications.

Objective: The aim of the current work was to compare both surgeries, OAGB and RYGB, after limb length modification regarding postoperative complications, resolution of comorbidities, BMI and weight loss, and operative time.

Patients and Methods: In this prospective cohort study, we reviewed medical records of 200 patients undergoing mini gastric bypass (MGB) and RYGB with limb length modification. Patients were then followed postoperatively for BMI loss, estimated weight loss, resolution of comorbidities, and postoperative complications. Patients were phone called and asked to attend next day for follow-up.

Results: A total of 200 patients were included. Thirteen patients were lost during follow-up. OAGB group has a statistically significant lower BMI and weight at 3, 6, 12, 24 months compared to RYGB group. Regarding operative time, minutes, OAGB group has a significantly lower operative time compared to RYGB group (p=0.0001). Patients who had OAGB had a significantly higher EWL compared to RYGB at 3, 6, 12, 24 months. Regarding resolution of comorbidities and postoperative complications, no significant difference between both groups, MGB vs RYGB (p=0.89) and (p=0.98), respectively.

Conclusion: It could be concluded that OAGB is superior to RYGB in BMI and excess weight loss at 3, 6, 12, 24 months, OAGB had lower operative time. No difference between both surgeries in postoperative complications and resolution of comorbidities.

Keywords: One anastomosis gastric bypass, Roux-en-Y gastric bypass, Limb length modification

INTRODUCTION

According to the WHO, the growing incidence of global obesity is a major source of health burden and death [(1)]. Obesity has become much more common over the world, impacting 42.4 percent of individuals in the United States. According to the Centers for Disease Control and Prevention (CDC), 30 percent of the adult population in the United States is morbidly obese (body mass index greater than 30) [(2, 3)]. Obesity and its related co-morbidities can be effectively treated with bariatric surgery.

The ideal bariatric surgery with satisfactory weight or BMI loss and with few complications and nutritional deficiencies still does not exist. Modifications in one anastomosis gastric bypass (OAGB) and Roux-en-Y gastric bypass (RYGB) are still under study for best BMI loss with few complications. Regarding OAGB, **Boyle *et al.*[(4)]** compared 150 and 200 cm biliopancreatic limb in 343 patients for 24 months. Both groups outcome were comparable.

However, **Ahuja *et al.* [(5)]** compared three different lengths of biliopancreatic limb: 150, 180, and 250 cm. the authors reported a significant difference between biliopancreatic limb lengths regarding nutritional deficiencies (higher in 250 cm) and total weight loss. No difference between three groups in resolution of comorbidities. Several studies agreed that biliopancreatic limb <200 cm is associated with lower nutritional deficiencies, and different lengths of biliopancreatic limb had comparable BMI loss and comorbidities resolution [(6–10)].

On the other hand, studies had shown that longer biliopancreatic limb in RYGB is associated with higher excess weight loss, but comparable postoperative complications. **Darabi *et al.* [(11)]** studied 313 morbidly obese patients who were divided into 3 groups regarding biliopancreatic and alimentary limb length. Authors concluded that longer biliopancreatic limb had a higher excess weight loss than shorter counterpart during 36 months of follow-up. **Zerrweck *et al.*[(12)]** study on 210 patients showed more BMI loss, higher excess weight loss, and more total weight loss in longer biliopancreatic limb.

The aim of the current work was to compare both surgeries, OAGB and RYGB, after limb length modification regarding postoperative complications, resolution of comorbidities, BMI and excess weight loss, and operative time.

PATIENTS AND METHODS

From January 2018 to January 2020, the medical records of 200 patients undergoing Laparoscopic one anastomosis gastric bypass (OAGB), and Laparoscopic Roux en Y gastric bypass (RYGB) were reviewed at Department of Bariatric Surgery, Ain Shams University Hospitals.

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The included subjects were divided into two groups;
Group 1 (OAGB) consisted of 100 patients, and
Group 2 (RYGB) consisted of 100 patients.

Inclusion criteria: patients above 18 years old with BMI (>40) or >35 with one or two of obesity related co-morbidities such as diabetes mellitus, hypertension, dyslipidaemia, osteoarthritis, infertility, and severe sleep apnoea.

Exclusion criteria: Patients who had previous bariatric or gastro-intestinal surgery, psychiatric contraindications, pregnancy, and other medical reasons denying laparoscopy.

***Ethical Consideration*:**

The study was approved by the Ethics Board of Ain Shams University and an informed written consent was taken from each participant in the study. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Pre-operatively, a multidisciplinary team evaluated the candidates based on medical, nutritional, endocrinological, and psychiatric workup. All patients underwent preoperative assessment included blood examinations, cardiology evaluation, and chest radiography. Psychiatric counselling was conducted to evaluate mental health contraindications to surgery. Patients were then followed postoperatively for BMI and excess weight loss (EWL), resolution of comorbidities, and postoperative complications. Patients were phone called and asked to attend next day for follow-up.

EWL (%) is calculated as follows: (preoperative weight – postoperative weight at each interval) *100/ (preoperative weight – ideal weight) where ideal body weight is defined at weight corresponding to BMI of 25kg/m^2.

Surgical procedures:

One anastomosis gastric bypass:

Laparoscopically, A long and narrow gastric tube calibrated with a 36- Fr bougie was performed using a linear stapler and began at the incisura angularis until the angle of His. Small bowel length was measured from the duodeno-jejunal flexure (ligament of Treitz) to the ileocecal valve. We used linear stapler to do Gastro-jejunal anastomosis, end-to-side anastomosis then we closed anastomotic anterior part with a running suture, is performed one-third small bowel length from ligament of Treitz leaving two-thirds of the small bowel distally.

Roux en Y gastric bypass:

Laparoscopically, we created a small gastric pouch (30 cm3) by linear stapler. Small bowel length was measured from the DJ flexure (ligament of Treitz) to the ileocecal valve. One-third of the small bowel length is used for biliopancreatic limb and alimentary limb (divided equally between both limbs) and two-thirds were used as a common limb. We mobilized the distal jejunal loop in antecolic position through an epiploic. Transection to perform the gastrojejunostomy. A linear stapler was used to do an end-to-side gastrojejunostomy, then we closed the Anterior opening by double layered running sutures. A side to side entero-enteric anastomosis was created with a linear stapler.

Statistical analysis was done through SPSS version26.0.

Statistical analysis

The collected data were coded, processed and analyzed using the SPSS (Statistical Package for Social Sciences) version 22 for Windows® (IBM SPSS Inc, Chicago, IL, USA). To ensure our data had normal distribution, we performed Kolmogorov-Smirnov test and Shapiro Wilk test. Data were tested for normal distribution using the Shapiro Walk test. Qualitative data were represented as frequencies and relative percentages. Chi square test ($\chi 2$) to calculate difference between two or more groups of qualitative variables. Quantitative data were expressed as mean ± SD (Standard deviation). Independent samples t-test was used to compare between two independent groups of normally distributed variables (parametric data). P value < 0.05 was considered significant.

RESULTS

We included 200 participants in our study, 100 in each group. Most of the participants were females (78%). Table 1 shows baseline characteristics of participants. Patients in RYGB group were significantly younger (p=0.005), and have less weight (p=0.014) and BMI (p=0.002) compared to MGB group. A significant difference between both groups regarding preoperative obesity co morbidities. No difference between both groups in postoperative hospital stay (p=0.73).few patients were lost during follow-up period, 8 in MGB group and 5 in RYGB group.

Table (1): Baseline characteristics of participants, MGB vs RYGB.

	OAGB	RYGB	P-value
Age (year) (mean ± SD)	46.8±4.2	44.7±5.8	0.005
Sex			0.51
Male	22	19	
female	70	76	
Weight, (kg) (mean ± SD)	111.5±23.1	104±18.1	0.014
Height, (m) (mean ± SD)	1.60±0.08	1.60±0.079	0.95
BMI (kg/m^2) (mean ± SD)	43.2±6.72	40.3±5.43	0.002
Comorbidities			0.039
No comorbidities	26	28	
Hypertension (HTN)	14	15	
Diabetes mellitus (DM)	13	8	
HTN & DM	11	12	
HTN& Dyslipidemia	6	7	
Dyslipidemia	18	8	
Dyslipidemia	4	17	
Mortality			NA
No	92	95	
Yes	0	0	
Hospital stay, in days (mean±SD)	2±0.82	2.1±0.79	0.73

Regarding operative time, minutes, OAGB group has a significantly lower operative time compared to RYGB group (p=0.0001) (Table 2).

Table (2): Operative time in both groups, OAGB vs RYGB.

	OAGB	RYGB	P-value
Operative time, in minutes (mean±SD)	72.7±14.7	86.4±16.8	0.0001

Table (3) shows, OAGB group has a statistically significant lower BMI and weight at 3, 6, 12, 24 months compared to RYGB group. Excess weight loss (EWL) is compared in both groups. Patients who had OAGB had a significantly higher EWL compared to RYGB at 3, 6, 12, 24 months.

Table (3): Hospital stay, BMI, Excess weight loss difference between both groups, OAGB vs RYGB.

	OAGB	RYGB	P-value
BMI (kg/m^2) (mean±SD)	34.2±4.6	39.1±6.1	0.0001
3 months	31.4±4.3	35.5±5.6	0.0001
6 months	26.2±3.6	29.2±4.6	0.0001
12 months	22.7±3.1	25.7±4.3	0.0001
24 months			
EWL (%)			
3 months	42.9±10.5	21.9±5.7	0.0001
6 months	63.3±14.3	46.1±12.9	0.0001
12 months	97±21.7	86.9±23.4	0.003
24 months	122.7±27.4	106.8±29.7	0.0001
Hospital stay, in days (mean±SD)	2±0.82	2.1±0.79	0.73

Table 4 shows results of both resolution of preoperative comorbidities and postoperative complications in both groups. Regarding resolution of comorbidities, no significant difference between both groups, OAGB vs RYGB (p=0.89).

We compared postoperative complications between both groups, OAGB vs RYBB. No significant difference between both groups (p=0.98). In OAGB, six patients had postoperative bleeding, which is managed conservatively except 2 patients had Laparoscopic reoperation for evacuation of the hematoma, the bleeding was from stapler line, we did hemostatic sutures and drains were inserted. One patient had postoperative leakage which was managed laparoscopically by peritoneal toilet and oversewing of leakage after positive methylene blue testing and drains. Three patients had marginal ulcers which was diagnosed by upper GI endoscopy and were managed medically.

In RYGB, eight patients had postoperative bleeding, which is managed conservatively except 2 patients had Laparoscopic reoperation for evacuation of the hematoma with hemostatic measures and drains. One patient had postoperative leakage which was managed Laparoscopically by peritoneal toilet and oversewing of leakage after positive methylene blue testing and drains. Four patients had marginal ulcers which was diagnosed by upper GI endoscopy and we treated them conservatively.

Table (4): Results of both resolution of preoperative comorbidities and postoperative complications in both groups.

	MGB	RYGB	P-value
Resolution of comorbidities			
No change	10	8	0.89
Full resolution	45	46	
Partial resolution	13	13	
Postoperative complications	69	65	
No complications	4	5	
Iron def. anemia	6	8	
Bleeding	3	4	
Respiratory tract infection			0.98
Marginal ulcer	3	4	
Hypocalcemia	3	5	
Wound infection	3	3	
Leakage	1	1	

DISCUSSION

Several surgeries and techniques are proposed in bariatric surgeries to improve patient outcomes and decrease complication rates. Regarding BMI and weight loss in our study, OAGB had a significantly lower BMI and weight compared to RYGB at 3, 6, 12, 24 months, although preoperative BMI and weight was lower in RYGB group. Patients in OAGB had a significantly higher EWL compared to RYGB at 3, 6, 12, 24 months. OAGB had a significantly lower operative time compared to RYGB, so we depend on estimated weight loss. There was no difference between both groups regarding postoperative complications and resolution of comorbidities.

Many technical modifications for RYGB and OAGB are done including changing limb length, using banding, and using staplers vs hand-sewn anastomosis to improve outcome and decrease postoperative complications[13].

Ibrahim *et al.* [14] included 72 patients for either MGB or RYGB with long biliary limb (not equal biliary and alimentary limbs as our study). Their results showed no difference in BMI and weight loss at 3 and 6 months, but weight and BMI loss was significantly higher in MGB group at 12 months. OAGB group had significantly higher EWL at 12 months compared to RYGB but not at 3 and 6 months. Remission of comorbidities was equal in both groups but higher quality of life index at 6 and 12 months in RYGB group was found.

Several studies use different limb lengths (alimentary and biliopancreatic) to reach better outcomes at certain limb lengths. However, our technique, presented in this study, tried to provide an alternative by measuring small bowel length followed by using one third of bowel length from DJ flexure as biliopancreatic (MGB) or as both alimentary and biliopancreatic limbs (RYGB) with respect to the patient's bowel length. We believe this technique not only provides satisfactory weight and BMI loss but also few postoperative complications and might have less nutritional deficiencies.

In a recent metanalysis of 13 studies by ***Tourky et al.*** [15], authors concluded that MGB had significantly higher total weight loss and excess weight loss (heterogeneity I^2 =93 and 94% respectively) compared to RYGB, but MGB had higher nutritional deficiencies. These findings could be attributed to length of biliopancreatic limb in included studies. In MGB, included studies had biliopancreatic limb of 200 cm or more which, as we stated before, is associated with nutritional deficiencies. In RYGB group, patients had short biliopancreatic limb thereby unsatisfactory weight loss.

Study limitations:

Out study had followed the patients shortly for only 24 months. Data on nutritional deficiencies were not presented and finally preoperative characteristics differ in age, weight, BMI, and comorbidities. More studies are needed to compare this technique presented here with different biliopancreatic limb lengths.

CONCLUSION

Modifications for OAGB and RYGB are still proposed for better outcomes. Our study shows that OAGB is superior to RYGB in BMI reduction and weight loss at 3, 6, 12, 24 months and OAGB had lower operative time.no difference between both surgeries in postoperative complications and resolution of comorbidities.

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