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*Original Article*

# Comparison of dietary intake following laparoscopic one anastomosis gastric bypass between groups with different pre-operative body mass index

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## Abstract

**Background and Aim:** One anastomosis gastric bypass (OAGB) is considered as a surgical treatment option for patients with morbid obesity. However, significant decreases in dietary intake and nutrient malabsorption after OAGB may potentially lead to nutritional deficiencies. This study was therefore conducted to assess and compare the mean values of dietary intake over 12 months following OAGB in patients with different pre-operative body mass index (BMI).

**Methods:** The study was performed on 60 patients with morbid obesity (88.3% female) that underwent OAGB between January 2011 and November 2018. The average daily nutrient intake values were obtained from food frequency questionnaires. Other data were drawn from the National Obesity Surgery Database.

**Results:** The mean (SD) pre-operative age, weight and BMI were 41.08 (9.41) years, 121.43 (21.01) kg, and 46.77 (6.17) kg/m$^2$, respectively. Participants were divided into two groups based on their pre-operative BMI (1: BMI≤ 45 kg/m$^2$, n=29; and 2: BMI> 45 kg/m$^2$, n= 31). The mean %EWL at one year postoperatively was 52.37±8.63 and 50.82±8.75 in groups 1 and 2, respectively. However, there was no significant difference in %EWL between groups (p=0.49). Additionally, the percentage of energy consumption from carbohydrates, protein and fats after surgery was 55.49±6.19%, 16.18±2.60% and 32.05±5.97%, respectively. No significant difference was observed in average daily energy and macronutrient intakes between groups (p>0.05 for all).

**Conclusion:** Pre-operative BMI values probably had no significant effect on post-operative %EWL, nor on energy and macronutrient intake.

**Keywords:** Gastric bypass, Bariatric surgery, Nutritional status, Weight loss

## Introduction

The global obesity rate is increasing dramatically, leading to major epidemics during the 20th and 21st centuries. Numerous pieces of evidence from clinical and basic research show that obesity significantly contributes to hypertension, type 2 diabetes, cardiovascular disease, dyslipidemia, osteoarthritis, kidney failure, liver disease, and cancer (1, 2). Although nonsurgical management approaches (such as lifestyle changes, balanced dietary intake, physical activity, behavioral changes and pharmaceutical therapy) are always recommended in the management of obesity and overweight, bariatric surgery (BS) is currently the only successful treatment for losing weight and improving health in severely obese people (3). A growing number of studies have demonstrated that bariatric surgery improves obesity-related comorbidities through long-term weight control, and by its beneficial effects on blood glucose, inflammation, and intestinal hormones (4).

One Anastomosis Gastric Bypass-mini gastric bypass (OAGB-MGB) is an effective surgical treatment for patients with morbid obesity, and has been approved by the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO) (5). It is generally accepted that OABG-MGB has several advantages over other bariatric procedures, such as shorter operation time and hospital stay, and fewer potential sites for anastomotic leaks and internal herniation. However, after OAGB-MGB, many concerns remain regarding nutritional deficiencies, the incidence of marginal ulcers, and reflux esophagitis (6-8). After this operation, there are common factors which can potentially lead to nutritional deficiencies including alterations in the anatomical architecture of gastrointestinal (GI) tract, possible decrease in GI villi height, restricted dietary intake, red meat intolerance, reduced stomach acidity, chronic medication use to suppress gastric acid secretion, malabsorption, and incorrect nutritional knowledge (6, 8-10). Therefore, a dietary intake aimed at achieving the desired weight and health seems to be crucial. However, there are neither sufficient data nor specific nutritional guidelines to prevent adverse nutritional consequences following this procedure. Additionally, despite previous studies in different population on differences in dietary intake among several body mass index (BMI) groups (11, 12), it is not yet clear whether post-bariatric surgery dietary intake is different in various pre-operative BMI categories. In this study, the researchers therefore examined and compared dietary intake over 12

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months following OAGB-MGB in patients with different pre-operative body mass index (BMI). A secondary aim was to assess the percentage of excess weight loss (%EWL), total weight loss (%TWL) and biochemical parameter changes after surgery.

## Methods

***Participants:*** Participants were patients with morbid obesity who had undergone OAGB-MGB surgery between January 2011 and November 2018 (with mean (SD) biliopancreatic limb length of 179.08±11.81 cm; range: 150-210 cm) and who attended scheduled follow-up visits (with physicians, nutritionist, sport medicine specialist and mental health workers) after surgery. The same protocol for nutrition and supplement therapy was performed for all patients. As well, all of them received the same physical activity recommendations. Sixty patients were recruited from the obesity clinic of Hazrat-e Rasool General Hospital (European Center of Excellence Branch of the International Federation for Surgery of Obesity), Tehran, Iran. Key inclusion criteria were patients aged over 18 years with BMI>40 kg/m$^2$ (calculated as weight in kilograms divided by height in meters squared), or BMI≥35 kg/m$^2$ with any comorbidities, and at least one year had passed since their surgery. The patients were excluded from the study if they had revisional OAGB-MGB procedures. Pregnant or lactating women were also excluded. Each patient was informed about the research procedure and gave written informed consent in the obesity clinic prior to participating in the study. All procedures performed in the study were in accordance with the ethical standards of the Research Ethics committee of Iran University of Medical Sciences, Tehran, Iran (Ethics number: IR.IUMS.REC 1395.95-03-140-28809) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

***Data Collection:*** Dietary intake was collected through face-to-face interview by a trained nutritionist. A validated semi-quantitative food frequency questionnaire (FFQ) was used to assess the usual daily intake of foods and nutrients. The participants were asked to report the frequency and amount of each food item intake during the previous year on a daily, weekly, or monthly basis (13).

Demographic information, anthropometric indices and biochemical parameter data were drawn from a high-quality database (National Obesity Surgery Database; obesitysurgery.ir). Demographic information included age, education level, marital status, smoking, alcohol consumption, and comorbidities. Anthropometric measurements including height, weight and BMI were measured pre- and post-operatively using standardized equipment (14). Blood samples were taken after overnight fasting to measure fasting blood sugar (FBS), total cholesterol (TC), high-density lipoprotein-cholesterol (HDL-c), low-density lipoprotein-cholesterol (LDL-c), and triglycerides (TG) by standard laboratory methods. The percentage of excess weight loss (%EWL) and total weight loss (%TWL) were calculated using previously reported methods (15).

***Statistical Analysis:*** All eligible patients whose dietary intake data were available were entered into the study. SPSS statistical software Ver.22.0 (Armonk, NY: IBM Corp) was used for statistical analysis of the data. Continuous data were presented as mean (± standard deviation: SD), and categorical data were presented as frequencies and percentages. The independent sample t test or Mann-Whitney U test was used to compare differences between two studied groups. Differences in participant biochemical parameters at the beginning and end of the study were analyzed using a paired sample **t**-test or Wilcoxon test. P<0.05 was considered statistically significant.

## Results

***Basic Patient Characteristics:*** A total of 60 patients (88.3% female) with mean (SD) age, weight, height and BMI of 41.08 (9.41) years, 121.43 (21.01) kg, 160.90 (8.85) cm and 46.77 (6.17) kg/m$^2$, respectively, were enrolled in the study and were divided into two groups based on their pre-operative body mass index (Group 1: BMI≤ 45 kg/m$^2$, n=29; and Group 2: BMI> 45 kg/m$^2$, n= 31). In both groups, there were more women than men. The majority were married, had high school diploma level of education, and did not smoke or drink alcohol. The basic characteristics of both groups (age, sex, education, marital status, alcohol consumption, smoking and comorbidities) were comparable (Table 1).

***Weight Loss and Dietary Intake One Year after OAGB-MGB Surgery:*** The mean body weight and BMI were reduced from a pre-operative 121.43±21.01 kg and 46.77±6.17 kg/m$^2$ to post-operative 79.85±14.21 kg and 30.81±4.64 kg/m$^2$, respectively. Furthermore, patients lost a high percentage of excess weight and total body weight (%EWL: 51.57±8.65; %TWL: 34.05±5.76) one year after surgery. However, using independent samples t-test, no significant difference was observed in % EWL (P=0.49) and % TWL (P=0.09) between groups (% EWL: 52.37±8.63, %TWL: 32.75±5.21 in Group 1 with pre-operative BMI≤ 45 kg/m$^2$ vs. %EWL: 50.82±8.75, %TWL:35.27±6.05 in Group 2 with pre-operative BMI> 45 kg/m$^2$) .

In addition, at one year following surgery in all patients, the percentage of energy from carbohydrates, protein, and fats was 55.49±6.19% (range 41.72% to 68.32%), 16.18±2.60% (range 10.80% to 23.53%) and 32.05±5.97% (range 20.93% to 46.20%), respectively. A significant difference was found in the percentage of energy from carbohydrates between the two groups (P=0.04). The average daily energy intake and macronutrient consumption and distribution for both groups are shown in Table 2.

***Serum Biochemical Changes:*** In each group, the level of FBS, total cholesterol and triglycerides decreased, while the level of HDL increased slightly following surgery.

Table 1. Basic Patient Characteristics by BMI

| Characteristics | | Groups: BMI ≤ 45 (kg/m$^2$) (n=29) | BMI > 45(kg/m$^2$) (n=31) | p-value |
|---|---|---|---|---|
| Age, years | | 41.34 (±9.13) | 40.84 (± 9.81) | 0.92$^{\&}$ |
| Weight, kg | | 108.33 (±12.03) | 133.68 (±20.30) | <0.001$^{\&}$ |
| Gender, n (%) | Female | 27 (93.1) | 26 ( 83.9) | 0.27 |
| | Primary & Secondary education | 5 (17.2) | 11 (35.5) | |
| | High School Diploma | 20 (69) | 16 (51.6) | |
| | University education | 4 (13.8) | 4 (12.9) | 0.27 |
| Education, n (%) | | | | |
| | Married | 26 (89.7) | 26 (83.9) | |
| Marital Status, n (%) | Single | 1 (3.4) | 2 (6.5) | 0.52 |
| | Divorced | 1 (3.4) | 3 (9.7) | |
| | Widowed | 1 (3.4) | 0 (0) | |
| Alcohol consumption$^{\$}$ n (%) | | 2 (6.9) | 4 (12.9) | 0.44 |
| Smoking, n (%)$^{\$}$ | | 3 (10.3) | 4 (12.9) | 0.76 |
| | Type 2 diabetes mellitus | 10 (34.5) | 4 (15.4) | 0.06 |
| Comorbidities, n (%) | Cardiovascular diseases | 0 (0) | 1 (3.2) | 0.33 |
| | Hypertension | 6 (23.1) | 3(11.5) | 0.27 |
| | Hypothyroidism | 3 (10.3) | 9 (29) | 0.07 |
| | Obstructive sleep apnea | 7 (24.1) | 8 (25.8) | 0.88 |

Data expressed as n (%) or mean (±SD).$^{\$}$ Those who consumed alcohol or smoked in the past 30 days. $^{\&}$P-value obtained through the Mann-Whitney test. Other p-values derived from chi-square test. P-values less than 0.05 were considered statistically significant.

Table 2. Energy Intake and Macronutrient Consumption and Distribution One Year after OAGB-MGB (estimated using validated FFQ)

| | Groups: Total | BMI ≤ 45 (kg/m$^2$) (n=29) | BMI > 45(kg/m$^2$) (n=31) | p-value |
|---|---|---|---|---|
| Energy (kcal/day) | 1962.25±613.68 | 2005.93±695.91 | 1921.39±533.93 | 0.84 |
| Protein (g/day) | 78.88±26.04 | 79.89±28.98 | 77.94±23.42 | 0.84 |
| Carbohydrate (g/day) | 272.62±94.26 | 288.25±112.17 | 258.38±72.68 | 0.48 |
| Fat (g/day) | 70.00±26.04 | 68.29±26.13 | 71.60±26.28 | 0.68 |
| Percentage of daily kcal as protein | 16.18±2.60 | 16.05±2.45 | 16.30±2.78 | 0.78 |
| Percentage of daily kcal as carbohydrates | 55.49±6.19 | 57.21±6.49 | 53.88±5.53 | 0.04 |
| Percentage of daily kcal as fats | 32.05±5.97 | 30.73±5.72 | 33.29±6.02 | 0.10 |

Data expressed as mean ±SD. P-value obtained through the Mann-Whitney test. P-values less than 0.05 were considered statistically significant.

Table 3. Biochemical Parameter Changes One Year after OAGB-MGB

| | BMI ≤ 45 (kg/m$^2$) (n=29) | | p-value | BMI > 45(kg/m$^2$) (n=31) | | p-value |
|---|---|---|---|---|---|---|
| | Pre-Op | Post-Op | | Pre-Op | Post-Op | |
| FBS (mg/dl) | 124.93±40.87 | 98.71±31.40 | 0.004$^{\$}$ | 106.02±18.56 | 89.91±13.79 | <0.001$^{\$}$ |
| TC (mg/dl) | 196.00±41.11 | 182.73±29.99 | 0.35$^{*}$ | 182.32±35.54 | 164.35±35.80 | 0.27$^{*}$ |
| LDL-C (mg/dl) | 108.67±41.11 | 101.57±24.89 | 0.56$^{*}$ | 104.79±24.63 | 104.79±24.63 | 0.92$^{*}$ |
| HDL-C (mg/dl) | 46.07±10.29 | 47.00±6.40 | 0.69$^{*}$ | 47.6±12.82 | 48.88±12.93 | 0.23$^{*}$ |
| TG (mg/dl) | 193.21±87.39 | 108.73±35.61 | 0.001$^{\$}$ | 143.23±80.76 | 102.81±42.03 | 0.008 |

Data expressed as mean ±SD.FBS: Fasting blood sugar; TC: Total cholesterol; LDL-C: Low-density lipoprotein cholesterol; HDL-C: High-density lipoprotein cholesterol; TG: Triglyceride; P-values are resulted from paired sample t-test (*) or Wilcoxon signed-rank test ($^{\$}$). P-values less than 0.05 were considered statistically significant.

However, only the reduction in FBS and triglycerides was statistically significant (Table 3).

## Discussion

The current study investigated the average daily energy and macronutrient intake, as well as weight loss, in two groups of patients who had undergone OAGB-MGB and been divided based on pre-operative BMI. The main results indicate that pre-operative BMI level had no effect on the average amount of energy and macronutrient intake at one year after OAGB-MGB. However, the percentage of energy from carbohydrates was significantly higher in Group 1, whose pre-operative BMI was ≤45 kg/m$^2$. In this context, no previous evidence was observed to confirm or challenge these results. The higher percentage of energy from carbohydrates in Group 1 seems to be highly dependent on patient food choice. However, in both groups, this percentage is higher than the recommended amount of 40-45% for gastric bypass surgery patients (16). Likewise, despite the non-significant difference in daily protein intake between the two groups, all patients consumed enough protein, which was in agreement with the previously recommended amount of 60 to 80 grams per day (17). This fact may be due to the regular nutritional assessments carried out at different time points by the specialized nutrition team at the obesity clinic. Unlike the present study, prior experience with Roux-en-Y gastric bypass (RYGB) has shown patients consuming an average of 47±20 grams of protein per day at 12 months after surgery (18). It is worthwhile noting that the daily energy, carbohydrate and fat intake of these studies were much lower than the present study's patients at one-year post-operation. Additionally, inadequate daily macronutrient consumption has also been reported by Frehner et al. after RYGB (19). These variations in dietary intake may point to differences in the type of surgery (OAGB-MGB vs. RYGB). On the other hand, the present study showed that patients in both groups had successful EWL (≥50% EWL) and TWL (≥20% TWL) at one year following surgery, and no significant difference was found between groups. This successful weight loss after surgery in groups with different pre-operative BMI seems to be related to the post-operative percentage of energy coming from the various macronutrients. In this regard, prior experience with RYGB has indicated that the percentage of calories from fat in a group with the lowest weight loss (%EWL<50) was higher than those who lost more weight (%EWL ≥50) (20), and higher than the recommended range of 20%-35% (21). The percentage of energy from fat (less than 35%) in the two groups of the present study was, however, consistent with the above-mentioned recommended ranges (Table 2). Along with the optimal proportion of total energy from fat, the length of the biliopancreatic limb (LBL) has been previously reported to be associated with successful weight loss after OAGB-MGB at one-year follow-up (22). However, the present study's findings are inconsistent with a previous study showing that higher vs. lower pre-operative BMI group had greater total weight loss but lower %EWL at all post-operative time-points (23). These inconsistencies may be due to the smaller sample size in the present study. In addition, the current study found that the level of FBS, total cholesterol, triglycerides, and HDL improved in both groups at one year post-OAGB-MGB. However, only the reduction in FBS and triglycerides was statistically significant. Improvements in levels of FBS and lipid profiles have been previously shown after OAGB-MGB (15). Notably, however, there are few studies evaluating these changes between groups with different pre-operative BMI ranges. Events such as reduced food intake and nutrient absorption, and increased levels of insulin and/or glucagon-like protein-1 secretion, may explain these positive effects (24, 25). The main strength of the present study was that the differences in dietary intake between two separate groups with different pre-operative BMI ranges were evaluated for the first time. The single-center nature of the current study may be viewed as a limitation, although patients are referred to the clinic from across the country, so the results may be seen as generalizable with minimal bias. Another limitation was that the number of male participants was much lower than women, which is common in populations who have undergone weight-loss surgery.

## Conclusion

Post-operative %EWL, %TWL, and energy and macronutrient intake were not statistically different between two groups with differing pre-operative BMI ranges. Regular follow-up post-surgery appointments, paired with a tailored BMI biliopancreatic limb length, seem to play more important roles in achieving successful weight loss and receiving proper nutrients. Large-scale studies are needed to confirm these findings.


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### *Ethics and Consent Statements*

This study was conducted in accordance with the Helsinki declaration and approved by the Research Ethics committee (Ethics number: IR.IUMS.REC 1395.95-03-140-28809). Written informed consent form was received from all patients at the time of first registry in our database for any possible anonymous usage from their data.


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## References


1. Kolb R, Sutterwala FS, Zhang W. Obesity and cancer: inflammation bridges the two. Curr Opin Pharmacol. 2016 Aug;29:77-89.
2. Salimi Y, Taghdir M, Sepandi M, Karimi Zarchi AA. The prevalence of overweight and obesity among Iranian military personnel: a systematic review and meta-analysis. BMC Public Health. 2019 Feb 6;19(1):162.
3. Malek M, Yousefi R, Safari S, Seyyedi SHS, Mottaghi A. Dietary Intakes and Biochemical Parameters of Morbidly Obese Patients Prior to Bariatric Surgery. Obes Surg. 2019 Jun;29(6):1816-22.

4. Faria SL, Faria OP, Buffington C, de Almeida Cardeal M, Ito MK. Dietary protein intake and bariatric surgery patients: a review. Obes Surg. 2011 Nov;21(11):1798-805.
5. Runkel M, Runkel N. Esophago-Gastric Cancer after One Anastomosis Gastric Bypass (OAGB). Chirurgia (Bucur). 2019 Nov-Dec;114(6):686-92.
6. Khalaj A, Kalantar Motamedi MA, Mousapour P, Valizadeh M, Barzin M. Protein-Calorie Malnutrition Requiring Revisional Surgery after One-Anastomosis-Mini-Gastric Bypass (OAGB-MGB): Case Series from the Tehran Obesity Treatment Study (TOTS). Obes Surg. 2019 Jun;29(6):1714-20.
7. Soong TC, Lee MH, Lee WJ, Chen JC, Wu CC, Chun SC. One Anastomosis Gastric Bypass for the Treatment of Type 2 Diabetes: Long-Term Results and Recurrence. Obes Surg. 2020 Nov 3.
8. Luger M, Kruschitz R, Winzer E, Schindler K, Grabovac I, Kainberger F, et al. Changes in Bone Mineral Density Following Weight Loss Induced by One-Anastomosis Gastric Bypass in Patients with Vitamin D Supplementation. Obes Surg. 2018 Nov;28(11):3454-65.
9. Steenackers N, Van der Schueren B, Mertens A, Lannoo M, Grauwet T, Augustijns P, et al. Iron deficiency after bariatric surgery: what is the real problem? Proc Nutr Soc. 2018 Nov;77(4):445-55.
10. Mika A, Wilczynski M, Pakiet A, Kaska L, Proczko-Stepaniak M, Stankiewicz M, et al. Short-Term Effect of One-Anastomosis Gastric Bypass on Essential Fatty Acids in the Serum of Obese Patients. Nutrients. 2020 Jan 9;12(1).
11. Lee CL, Jr., Norimah AK, Ismail MN. Association of energy intake and macronutrient composition with overweight and obesity in malay women from klang valley. Malays J Nutr. 2010 Aug;16(2):251-60.
12. Rashidi AA, Heidari Bakavoli AR, Avan A, Aghasizade M, Ghazizadeh H, Tayefi M, et al. Dietary Intake and Its Relationship to Different Body Mass Index Categories: A Population-Based Study. J Res Health Sci. 2018;18(4):E00426-E.
13. Keshteli A, Esmaillzadeh A, Rajaie S, Askari G, Feinle-Bisset C, Adibi P. A Dish-based Semi-quantitative Food Frequency Questionnaire for Assessment of Dietary Intakes in Epidemiologic Studies in Iran: Design and Development. Int J Prev Med. 2014 Jan;5(1):29-36.
14. Zamaninour N, Ansar H, Pazouki A, Kabir A. Relationship Between Modified Body Adiposity Index and A Body Shape Index with Biochemical Parameters in Bariatric Surgery Candidates. Obes Surg. 2020 Mar;30(3):901-9.
15. Zamaninour N, Pazouki A, Kermansaravi M, Seifollahi A, Kabir A. Changes in Body Composition and Biochemical Parameters Following Laparoscopic One Anastomosis Gastric Bypass: 1-Year Follow-Up. Obes Surg. 2020 Sep 5.
16. Moizé VL, Pi-Sunyer X, Mochari H, Vidal J. Nutritional pyramid for post-gastric bypass patients. Obes Surg. 2010 Aug;20(8):1133-41.
17. Sherf Dagan S, Goldenshluger A, Globus I, Schweiger C, Kessler Y, Kowen Sandbank G, et al. Nutritional Recommendations for Adult Bariatric Surgery Patients: Clinical Practice. Adv Nutr (Bethesda, Md). 2017;8(2):382-94.
18. Nicoletti C, Junqueira-Franco M, Santos J, Marchini J, Junior W, Nonino C. Protein and amino acid status before and after bariatric surgery: A 12-month follow-up study. Surg Obes Relat Dis. 2013 11/01;9:1008-12.
19. Frehner C, Zaparolli M, Ramos M, Campos A, Filho A, Schieferdecker ME. Verification of Macro-and Micronutrient Intake in the First Year of Roux-En-Y Gastric Bypass Using MSM Method. Food Nutr Sci. 2017 04/24;8:392-401.
20. Novais PFS, Rasera I, Leite CVdS, Marin FA, de Oliveira MRM. Food intake in women two years or more after bariatric surgery meets adequate intake requirements. Nutr Res. 2012;32(5):335-41.
21. Medicine Io. Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids. Washington, DC: The National Academies Press; 2005. 1358 p.
22. Ansar H, Zamaninour N, Pazouki A, Kabir A. Weight Loss After One Anastomosis Gastric Bypass-Mini Gastric Bypass (OAGB-MGB): Patient-Related Perioperative Predictive Factors. Obes Surg. 2020 Apr;30(4):1316-23.
23. Ochner CN, Jochner MCE, Caruso EA, Teixeira J, Xavier Pi-Sunyer F. Effect of preoperative body mass index on weight loss after obesity surgery. Surg Obes Relat Dis. 2013;9(3):423-7.
24. Arble DM, Evers SS, Bozadjieva N, Frikke-Schmidt H, Myronovych A, Lewis A, et al. Metabolic comparison of one-anastomosis gastric bypass, single-anastomosis duodenal-switch, Roux-en-Y gastric bypass, and vertical sleeve gastrectomy in rat. Surg Obes Relat Dis. 2018 Dec;14(12):1857-67.
25. Solouki A, Kermansaravi M, Davarpanah Jazi AH, Kabir A, Farsani TM, Pazouki A. One-anastomosis gastric bypass as an alternative procedure of choice in morbidly obese patients. J Res Med Sci. 2018;23:84.