

Anemia Outcome After Laparoscopic Mini Bypass : Analysis of 107 Consecutive Patients

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Abstract

Background : The prevalence of obesity has dramatically increased globally. Weight loss procedures are known to be an effective and reliable method with relatively low complication rate and satisfactory results. Laparoscopic mini-gastric bypass (LMGB) is known as a modified Mason loop procedure with compatible results to laparoscopic Roux-en-Y gastric bypass (LRYGB), and is believed to have even less complication rate. Despite adequate and meticulous supplement therapy, anemia is one of the challenges in patients undergoing LMGB. Thus, we aimed to review the prevalence and severity of anemia in patients undergoing LMGB.

Method : A prospectively-maintained database of patients referring to Hazrat Rasoul Akram hospital who underwent LMGB from December 2013 to October 2014 was reviewed retrospectively.

Results : A total of 113 consecutive patients were included in the study. The mean age was 38.7 ± 9.8 years. Mean Body mass index (BMI) was 45.5 ± 6.1 kg/m² preoperatively and 36.7 ± 5.5 kg/m² and 33.0 ± 5.3 kg/m² three and six months after the procedure, respectively. ($P = 0.001$) Mean excess body weight loss after the procedure was 20% and 53% at three and six months post operatively. Serum hemoglobin (Hb) level decreased significantly in three months ($P = 0.036$) and remained unchanged in six months compared to 3-month ($P = 0.385$). Vitamin B12 level increased significantly in three months ($P = 0.010$) and then decrease in six months to the preoperative level ($P = 0.889$).

Conclusion : LMGB is a safe, feasible and an effective alternative weight loss procedure. Simply, anemia can be prevented by utilizing therapeutic dose of multivitamin in patients who underwent this procedure. (*Acta gastroenterol. belg.*, 2016, 79, 201-205).

Key words : gastric bypass, obesity, morbid, anemia, mini gastric bypass.

Introduction

Obesity has become one of the most challenging health issues in the entire world. Recent changes in life style and diet exchanges have caused high prevalence of metabolic disorders and obesity (1,2). A remote study in 2004-2005 in Iran demonstrated that 11.1% of men and 25.2% of female were found to have body mass index (BMI) greater than 30 kg/m². It also revealed that 3.2% were suffering from BMI 35-39.9 kg/m² and about 1% of general population had BMI greater than 40 kg/m² (3). Weight loss procedures are appropriate approaches for morbidly obese patients in order to obtain adequate weight loss and reduce obesity associated complications (4).

An effective and safe surgical approach seems to be an appropriate way in morbidly obese patients who failed medical and conservative management (5-8).

Currently, laparoscopic Roux-en-Y gastric bypass (LRYGB) is the most common weight loss procedure performed globally to reduce the complications like metabolic syndrome and type II diabetes mellitus (9).

Laparoscopic mini-gastric bypass (LMGB) or single anastomosis gastric bypass has gained significant attention among surgeons and clinicians due to easier technical aspect and safety of the procedure along with favorable outcomes (6,10-12).

However, relatively remarkable malabsorptive component of LMGB and its outcome, such as anemia, mandates to create an effective and reliable measurement tool in order to minimize this complication (5,13).

In our institution, LMGB is strongly considered for morbidly obese patients. The present study was designed to review our data of patients who underwent this procedure in terms of nutritional deficiency, anemia, and the role of multivitamin therapy to prevent this potential complication. Moreover, short-term surgical complications were also considered in this study.

Methods

Patients and study design

We retrospectively analyzed the records of 113 consecutive patients who underwent LMGB performed by our bariatric surgical team at a University-affiliated teaching Hospital, Hazrat Rasul Akram Hospital, from December 2013 to October 2014. Patients with previous history of gastroesophageal reflux (GERD), revision surgery, previous gastric procedure, and age greater than 65 were excluded from the study. Despite multiple attempts, one patient refused to have any follow-up after the

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procedure and five patients were lost for follow-up. Subsequently, 107 patients were included in the study (Fig. 1). This procedure was performed in similar technique to Rutledge's for every patient. Demographic data, such as age, sex, and BMI, were obtained from prospectively maintained database. More detailed information, including nutritional and metabolic status and different element levels, was obtained from individual chart review. All patients were fully evaluated by a bariatric surgeon, bariatric nutritionist, bariatric psychiatrist, and in appropriate and necessary situations, by a cardiologist and a pulmonologist. Every patient underwent esophago-gastroduodenoscopy (EGD), and abdominal ultrasonography. There was 94.3% and 92.5% follow-up three and six months after the procedure, respectively. All patients signed the informed consent form prior to participation in the study. Study protocol was approved by institutional ethics committee of the Iran University of Medical Sciences (IUMS) by the No. 93-02-140-24633.

Surgical operation and diet

Long gastric tube was created along lesser curvature from antrum to angle of His by using multiple application of surgical stapler. Then, jejunum was measured 200 cm from ligament of Treitz and was approximated to distal end of gastric tube. Subsequently, an end-to-side gastrojejunostomy anastomosis was created. Therapeutic multivitamin mineral capsule was started on fifth post-operative day for every patient (Table 1).

Table 1. — **Micronutrients in Multivitamin Therapeutic (Iran Daru, Tehran, Iran)**

Element	Amount
Vitamin A	2500 IU
Vitamin E	10 IU
Vitamin D	100 IU
Vitamin C	150 mg
Vitamin B ₁	20 µg
Vitamin B ₁₂	50 µg
Vitamin B ₆	10 µg
Folic Acid	1 mg
Ferrous Fumarate	10 mg
Zinc	0.5 mg
Magnesium	5 mg

IU : International Unit, mg : milligram.

Statistical analysis

Package for the social science (SPSS) was utilized to analyze all patients' data. (SPSS Inc., Chicago, IL, version 11.5). Quantitative data were presented as mean with standard deviation (SD) and median with interquartile range (IQR) for variables with and without a normal distribution ; also qualitative data was present as frequency with percent. Analysis of the data distribution was assessed by Kolmogorov-Smirnov test ; Logarithmic transformation was used to improving the normality of variables. GLM Repeated Measures was used to analyze related dependent variables that represent different

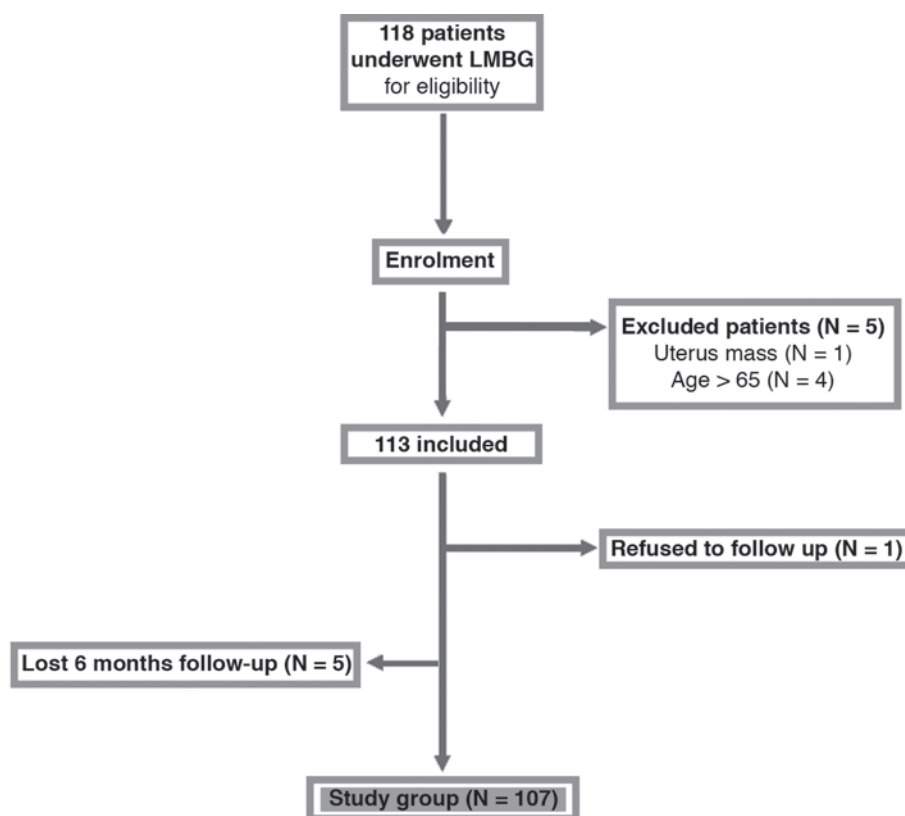


Fig. 1. — Flow diagram of patients in the trial.

Table 2. — Participants demographic characteristics base on gender

Variables	Female (n = 96)	Male (n = 17)	Total (n = 113)	P-value*
Age (year), mean \pm SD	39.3 \pm 10.0	35.5 \pm 7.9	38.7 \pm 9.8	0.143
Weight (kg), mean \pm SD	139.2 \pm 24.2	118.1 \pm 17.43	121.3 \pm 20.0	< 0.001 ^A
BMI (kg/m ²), mean \pm SD	45.2 \pm 6.5	45.5 \pm 6.1	45.5 \pm 6.1	0.849

* = Independent-Sample t test was used.

measurements of the same attribute such as serum levels of B₁₂, ferritin and hemoglobin. Least Significant Difference (LSD post hoc test) was used to perform all pairwise comparisons between pre-operation and post-operation means. We Compared prevalence of anemia at two periods of follow-up based on pre-operative prevalence using the McNemar test. The level of significance was considered at P < 0.05.

Results

A total of 113 patients were included in the study with mean age of 38.7 \pm 9.8 years. The patient population consisted primarily of female (96 patients, 85%) (P-value = 0.143). The mean preoperative total body weight was 121.3 \pm 20.0 kg and the mean BMI was 45.5 \pm 6.1 kg/m² (Table 2). Preoperatively, 19 patients (16.8%) suffered from hypertension, 18 (15.9%) from diabetes mellitus type II and 21 (18.6%) from obstructive sleep apnea. All the patients underwent mini-gastric bypass (LMGB). In our follow-up, the patients' rate of 3- and 6-month visit response was 94.7% (n = 107 ; 91 females and 16 males). Excess weight loss (EWL) loss in three and six months follow-up was 36.8 \pm 9.7% and 52.4 \pm 13.2%, respectively. The mean BMI dropped to 36.7 \pm 5.5 kg/m² in three months and to 33.0 \pm 5.3 kg/m² in six months postoperatively (Table 2) as shown in Table 2 ; LSD post hoc tests showed that the differences in BMI means for each pair of periods of follow-up was significant (P-value < 0.001 for all pairs) (Table 3).

Post-hoc test demonstrated that serum hemoglobin (Hb) level decreased significantly in three months (P-value = 0.036) and remained unchanged in six months compared to 3-month (P-value = 0.385).

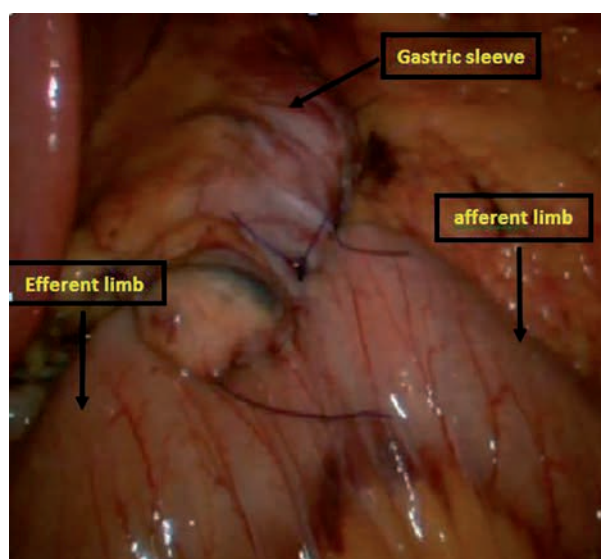


Fig. 2. — Gasterojejunostomy

Serum level of vitamin B₁₂ changed significantly during six months follow-up (Repeated Measurers : P-value = 0.002) : It increased significantly in three months (P-value = 0.010) and then decreased in six months to the pre-operative level (P-value = 0.889) (Table 3).

Serum ferritin level was significantly different during six months follow-up (Repeated Measurers : P-value = 0.005) : In three months postoperative follow-up, its increase was not statistically significant (P-value = 0.262), and it decreased not significantly in six months follow-up, compared to the preoperative level (P-value = 0.292). But there was a significant difference between three and

Table 3. — Weight loss and biomarkers pre and post operation

	Preoperative (n = 113)	3 month follow up (n = 107)	6 month follow up (n = 107)	P-value [§]
Weight (kg), Mean \pm SD	121.3 \pm 20.0	98.5 \pm 18.4*	88.3 \pm 16.3* ^A	< 0.001
BMI (kg/m ²), Mean \pm SD	45.5 \pm 6.1	36.7 \pm 5.5*	33.0 \pm 5.3* ^A	< 0.001
Hemoglobin (mg/dl), Mean \pm SD	13.6 \pm 1.3	13.3 \pm 1.1*	13.1 \pm 1.2*	< 0.001
Vitamin B ₁₂ (ng/lit), Median (IQR)	299 (192.0-400.9)	359.3 (254.0-447.5)*	325 (238.0-412.0)	0.002
Ferritin (μ g/lit), Median (IQR)	50.8 (23.5-94.50)	60.18 (31.0-103.0)	44 (20.0-89.0) ^A	0.005

§ = Repeated Measures analysis was used.

* = Significant versus preoperative data based on LSD post hoc test (P-value < 0.05).

^A = Significant versus 3 month data based on LSD post hoc test (p-value < 0.05).

BMI, Body mass index.

Table 4. — Anemia prevalence per and post operation

	Anemia		P-value*
	Yes No. (%)	No No. (%)	
Pre-operative	17 (15%)	96 (85%)	
3 month follow up	18 (16.8%)	89 (83.2%)	0.832
6 month follow up	23 (21.5%)	84 (78.5%)	0.210

* = Using McNemar test, compared with pre-operative prevalence.

six months follow-up in the serum ferritin level (P-value = 0.032) (Table 3).

Preoperatively, anemia prevalence was 15% and it was raised to 16.6% in three months ($p = 0.832$) and 21.5% in six month ($p = 0.210$) postoperatively (Table 4).

The short-term complications consisted of two cases (1.8%): one case of leak from jejunal loop one day after the operation and the other one leak from opening gastro-jejunosomy suture line after endoscopy cauterization on fourth postoperative day, in which the leakage were healed laparoscopically by suture and drain insertion. There were no cases of wound infection, intestinal obstruction, marginal ulcer, anastomosis constriction, incisional hernia, and melena or pulmonary emboli.

Discussion

In the current study we reported 107 cases that underwent LMGB for weight reduction. As our results have shown, Hb levels have significantly decreased after three and six months, but B_{12} level, which increased after three months, has not changed after six months. LMGB is considered as a weight loss procedure with relatively easy technical aspect, an outstanding patient outcome, low short-term and long-term complication rate (5,9,14).

In a recent review of 2014 patients who underwent LMGB by Rutledge *et al.*, it revealed a very short operative time, short hospital stay and low complication rate (6). It also demonstrated 80% EBW loss in one year follow-up. However, anemia rate was as low as 4.9%. If LMGB is considered as less restrictive and more malabsorptive procedure, it significantly compromise absorption of essential factors such as iron, and vitamin B_{12} . Our study revealed this outcome can be prevented simply by taking a multivitamin tablet on daily basis.

Wang *et al.* reviewed 423 patients undergoing LMGB and it revealed decrease of mean BMI to 29.2 kg/m^2 and mean EWL to 69.3% after one year follow-up, while in the same time 41 patients (9.6%) experienced anemia (5). This is moderately higher than our study, which could reflect to our multivitamin therapy. They also reported seventeen minor complications (4.3%) and seven major complications (1.7%), while we reported 1.8% short-term complication.

In addition, Chen *et al.* evaluated nutritional status and anemia frequency in patients who underwent LMGB. It

revealed 4.1% of men and 26.6% of female patients experienced anemia. He recommended high protein diet and it was likely the reason to prevent anemia (13). Unlike our study, anemia had opposite corresponding with iron supplement.

Kular *et al.* have investigated 1054 patients who underwent LMGB and revealed 7.6% anemia (14). Likely, the different rate of anemia between different authors could be related to different diet habitus.

Reviewing 644 patients undergoing LMGB by Lee *et al.* resulted in anemia more severe in patients with BMI < 40 kg/m^2 two years after the surgery than patients with BMI 40-50 kg/m^2 or even in super morbidly obese patients with BMI > 50 kg/m^2 (15).

Lee *et al.* have compared two groups of bypass surgery (1163 LMGB and 494 LRYGB) and reported that both procedures had decrease in Hb, but LMGB had a lower level than LRYGB (10.1 ± 2.8 vs. 12.5 ± 1.4) five years after the surgery and have advised dietary supplements and multivitamins to improve the hemoglobin level in LMGB patients (10). In our study we also tried to achieve higher hemoglobin levels by supplementation of patients with multivitamin (13.6 changed to 13.3 and 13.1 three and six months after LMGB) as far as the longer limb predisposes the patients to nutritional deficiencies. Anemia is an important long-term complication which occurs due to duodenum bypass with malabsorption of iron. It potentially can be prevented by taking multivitamin supplement. We did not experience significant anemia after LMGB due to supplement taking (17% and 21% three and six months after LMGB).

More studies and data analysis will be needed to evaluate this matter in patients undergoing LMGB. We also acknowledge that is not a randomized design clinical study, which may make conclusive results due to lack of control group. In addition, more patients and longer follow-up will result in more accurate outcome and experience.

Conclusion

LMGB is a safe weight loss procedure with low complication rate and outstanding outcomes. Potential anemia complication is easily preventable by taking a multivitamin supplement.

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