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Severe fatal protein malnutrition and liver failure in a morbidly obese patient after mini-gastric bypass surgery: Case report

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ABSTRACT

INTRODUCTION: Mini-gastric bypass (MGB) is a bariatric surgical technique popular in many centers due to shorter duration, easier technique, and excellent weight loss results. However, it may be associated with postoperative malnutrition. This case describes the clinical course and unfortunate outcome of a morbidly obese patient who underwent MGB and developed malnutrition in the first postoperative year.
PRESENTATION OF CASE: A 37 year-old female patient with a BMI of 44 kg/m^2 successfully underwent MGB surgery in June 2015 and was discharged uneventfully. She presented with lower extremity edema and generalized weakness 8 months later, with a blood albumin level of 3.1 g/dL, compared to a normal preoperative value. She was admitted and received a high-protein diet, and her clinical condition improved. Three months after her discharge, she was readmitted with the same complaints, as well as pancytopenia. She was also hypocupremic. After unsuccessful intensive supportive measures, she finally underwent revisional gastrogastrostomy. However, she developed signs and symptoms of profound liver failure postoperatively (albumin 1.8 g/dL; total bilirubin 7.5 mg/dL; prothrombin time 34 s) and pancytopenia persisted. All resuscitative measures were unsuccessful and she expired in July 2016.
DISCUSSION: Multiple factors can contribute to postoperative malnutrition and liver dysfunction after MGB, including the presence of baseline liver disease, inadequate diet supplementation, leaving a too-short common small intestinal channel, and ethnic variations in small bowel length. These factors should also be considered when deciding to perform corrective surgery.
CONCLUSION: Careful, individualized treatment and follow-up plans may help to prevent such catastrophic consequences.
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1. Introduction

Given the widespread magnitude of obesity, bariatric surgery is now a common procedure worldwide. It effectively lowers body weight and resolves obesity-related complications, and is superior to other means of weight loss. However, as with any invasive procedure, bariatric surgical techniques are not without risks.

There are different techniques of bariatric surgery, and mini-gastric bypass (MGB)[1] is a newly developed method. This technique uses a long gastric tube with an antecolic loop gastrojejunostomy. A long gastric tube is created using an Endo GIA® stapler approximately 1.5 cm to the left of the lesser curvature from the antrum to the angle of His. Then, a loop gastroenterostomy is created with the small bowel about 200 cm distal to the ligament of Trietz. MGB is shorter in operative time than conventional Roux-en-Y gastric bypass (RYGB) and also sleeve gastrectomy, with comparable or even better weight loss results [1–5]. However, this method is associated with a greater post-op malnutrition rate of approximately 1% requiring reoperation, due to the longer bypassed limb [5–7]. We hereby report a case of severe malnutrition nearly 1 year after MGB, who presented to us and was managed in an academic setting, in line with the SCARE criteria [8].

2. Presentation of case

Our patient was a 37 year-old Middle Eastern morbidly obese female who presented with a body mass index (BMI) of 44 kg/m^2 (height 166 cm, weight 115.5 kg). She was referred to our obesity clinic to be considered for bariatric surgery, as part of the Tehran Obesity Treatment Study [9]. Her past history was significant for diabetes since 5 years ago, dyslipidemia, hypothyroidism, and a history of nephrolithiasis. She received oral glycemic

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[1] MGB – mini-gastric bypass, RYGB – Roux-en-Y gastric bypass, BMI – body mass index.

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Table 1
Pre- and postoperative weight, hematologic, and biochemical indices after mini-gastric bypass and corrective surgery.

Variables	Normal values	Course of progression							
		Mini-gastric bypass						Corrective surgery	
		Preoperative	Postoperative					Postoperative	
			1 mo	3 mo	6 mo	9mo	12 mo	12.5 mo	13 mo
Weight (kg)		115.5	104.1	84.7	76.2	72.8	63	–	63.7
BMI (kg/m^2)	25–25	44	39.7	32.3	29	27.8	24	–	24.3
EWL (%)	–	–	22.8	61.7	77.7	–	104.1	–	103
Albumin (g/dL)'	3.5–5.2	4.1	–	–	2.3	2.4	1.8	2.9	1.7
Ferritin (ng/mL)	11–307	12.7	–	–	–	–	–	109	
AST (U/L)	Up to 31	16	–	–	30	31	43	83	29
ALT (U/L)	Up to 31	23	–	–	29	30	60	64	33
ALP (U/L)	100–290	64	–	–	56	70	395	312	78
Total bilirubin (mg/dL)	Up to 1.3	0.7	–	–	–	–	1.1	1.28	7.5
PT (s)	13-Nov	12	–	–	–	11.3	10	16.3	34
Copper (μg/dL)	70–140	103	–	–	62	–	44	–	40
Calcium (mg/dL)	50–170	9.1	–	–	–	8.7	8.3	8.6	8.7
FPG (mg/dL)	70–110	137	91	98	87	85	81	92	94
HbA1c (%)	5–7.5	6.8	6.5	6.1	4.9	4.7	4.8	–	4.6
Red blood cells (10^6/mL)	4.2–5.4	3.97					3.77	2.9	–
Hemoglobin (g/dL)	14–17.5	11.9	–	–	13.4	9.1	8	7.4	8.6
Hematocrit (%)'	42–52	36.9	–	–	41	27.1	25.5	25	25.7
MCV (fl)		86.4					85.4	86.2	–
Platelets (×1000/micL)	150–450	144	–	–	128	78	55	83	68

BMI; body mass index, EWL; excess weight loss, AST; aspartate aminotransferase, ALT; alanine aminotransferase, ALP; alkaline phosphatase, PT; prothrombin time, FPG; fasting plasma glucose, MCV; mean corpuscular volume.

agents (metformin, pioglitazone) as well as insulin, atorvastatin, levothyroxine, and aspirin daily. She was evaluated by a multidisciplinary team of obesity experts.

Her initial assessment demonstrated a normal pulmonary function test and electrocardiogram. Upper GI endoscopy was normal. Abdominal ultrasound study revealed grade 3 fatty liver with an increased liver span of 15.6 cm.

She underwent mini-gastric bypass with the method described above successfully in June 2015, and was discharged in good health after 3 days. She received routine postoperative follow-up visits by a standard protocol at 1, 3, and 6 months, and various measurements were made at each visit including blood indices. These values are presented in Table 1. She received oral multivitamin-mineral capsules daily postoperatively (Pharmaton®, Boehringer Ingelheim Inc., Ingelheim am Rhein, Germany), which contains 2 mg copper (200% recommended daily allowance (RDA)), 10 mg ferrous sulfate (71% RDA), 100 mg folic acid (50% RDA), and 1mcg vitamin B12 (40%), as well as vitamins A, B group, C, D, E, nicotinamide, biotin, and minerals, calcium, magnesium, zinc, and selenium.

She had lost weight significantly throughout her follow-up (Table 1) and her diabetes was completely resolved. It was not until the 8th month after surgery that she presented with lower extremity edema, weakness, and generalized fatigue. She was admitted to hospital and found to have an albumin value of 3.1 g/dL, as compared to a preoperative value of 4.1 g/dL. She received a high-protein diet and intensive measures and was discharged after two weeks. She was well until 3 months later, at which time she presented again with persistent lower extremity edema despite supportive measures. Her complete blood count showed a platelet count of 55,000/μl, as well as a hemoglobin level of 8 g/dL. Her liver function tests showed slightly increased aspartate aminotransferase (AST) level of 43 U/L, alanine aminotransferase (ALT) level of 60 U/L. She was also found to be hypocupremic (44 μg/dL).

During workup for pancytopenia, a bone marrow biopsy was done, which showed adequate maturation in all cell lines, and was not in favor of any specific diagnosis. Liver biopsy was done and showed non-specific inflammation in portal spaces and fatty change. Corrective surgery was initially postponed to address the thrombocytopenia; however, such surgery was deemed necessary as the patient was deteriorating and not responding to supportive measures such as erythropoietin administration. Her prothrombin time (PT) rose to 16.3 s and total bilirubin to 1.28 mg/dL (direct bilirubin 0.71 mg/dL).

She underwent gastrogastrostomy 13 months after her first bariatric surgery and nearly four months after showing early signs and symptoms of liver failure. After the surgery, her liver function did not improve, and her albumin level dropped to 1.7 g/dL. All supportive measures failed to reverse this downhill course, and overt liver dysfunction developed with a total bilirubin of 7.5 mg/dL and a PT of 34 s, extensive ecchymosis, dyspnea, and multi-organ failure. She expired in July 2016. Her autopsy examination revealed a common intestinal channel of 108 cm.

3. Discussion

Although RYGB is considered the gold standard of bariatric surgery for many years, MGB, a relatively new modification of loop gastric bypass first described by Rutledge in 2001 [10], is popular in some centers due to multiple benefits such as shorter operative times, easier technique, and impressive weight loss results [6,10]. However, besides from the inherent risk of bile reflux, marginal ulcers, and long-term risk of gastric cancer, malnutrition is a major concern. Kruschitz et al. recently published their results [11] of comparison between MGB and RYGB regarding liver parameters after surgery in 50 patients. They found significantly poorer liver function in patients undergoing MGB in the first year not associated with weight loss, a finding that may necessitate a more intensive postoperative care in MBG patients. However, in our experience, this procedure has been performed successfully in our center for a couple of years with excellent weight loss results and correction of obesity-related complications, and this is our first and only unfortunate outcome.

The authors believe this case report highlights the importance of a more individualized approach to bariatric surgery and MGB. Selection of a 200 cm efferent limb may be suitable for most, but not for all patients. An alternate and safer approach may be careful inspection of each case to assure not to leave a too-short common channel to the ileocecal valve, as there may be differences in the

length of small bowel in different populations, to prevent severe malnutrition. Lee et al. reported a tailored bypass limb approach according to BMI [12]. They incorporated different bypass limb lengths according to the patients' BMI, which affects the excess weight loss percentage and presumably postoperative malnutrition rates. This may have practical implications, since the amount of desired weight loss differs in various BMI ranges (e.g. a morbidly obese versus a super obese patient). As revealed in the autopsy of our patient, choosing an efferent limb of 200 cm led to a common channel of only 108 cm – which might have been prevented using a tailored approach – causing short bowel syndrome and severe malnutrition.

Moreover, careful evaluation of preoperative condition can guide to the postoperative care. The presence of baseline liver disease may necessitate more intense postoperative care and prompt treatment when needed. Elnahas et al., evaluated 38,875 patients retrospectively from the American College of Surgeons' National surgery quality improvement program database and concluded that the severity of baseline liver disease may affect the postoperative 30-day surgery outcomes [13]. Although their report is short term, it alerts the physicians to look for liver problems more carefully after surgery.

The authors believe that the timing of action, as well as the treatment plan, is particularly of great significance. Although our patient was under standard follow-up care with multiple visits, and was hospitalized and treated multiple times, the course of her disease signifies the importance of prompt and early attention to this problem. She partially responded to diet and supportive measures, which postponed a more definitive treatment that could have potentially saved her life. Dang et al. in their report of a case of severe malnutrition 5 years after MGB [14], suggested placement of a feeding gastrostomy tube initially to improve the patient's protein status and then proceed with the corrective procedure. However, the real challenge remains as the optimum timing for corrective intervention. Too early correction puts the patient at risk of regaining weight, and too late action can risk the patient's life. Once profound liver dysfunction – rising bilirubin, thrombocytopenia, severe hypoalbuminemia, etc. – occurs, any intervention may be doomed to failure, as in our case.

One more aspect of this downhill progression may be linked to concurrent abnormalities. Of special importance is the occurrence of hypocupremia. Reports of this phenomenon are becoming more common with increasing rates of obesity and consequently gastric bypass surgeries with resultant postoperative malnutrition states [15–17]. The greatly diminished copper absorption capacity (probably duodenum and proximal jejunum) [18] and inadequate supplementation of copper can be related to this problem. Although copper deficiency usually comes to attention as presentation of neurologic and gait abnormalities from a few to as much as 20 years after surgery [15,17], it also causes various blood abnormalities and a myelodysplastic-like picture [17]. We first detected a thrombocytopenia, later accompanied by anemia and pancytopenia. Despite receiving supplementation of 2 mg daily copper, she was found to be severely hypocupremic, and this might have added to the extent of her liver dysfunction and death.

4. Conclusion

MGB is mostly a malabsorptive bariatric technique and popular in many centers. While having multiple advantages, the surgeon must be aware of its complications as well, to maximize patient benefit and minimize risks. This report serves to alert clinicians in the field of obesity to the potential risks associated with MGB and its follow-up, especially malnutrition and liver failure. It would be more advisable that this procedure be considered for the patients with no or mild baseline liver problems, and in the case of undergoing MGB, patients be followed strictly with the decision on revisional surgery at a much earlier stage to prevent such catastrophic consequence.

Consent

Informed consent was obtained from the individual included in the study. Ethical approval for this study was obtained from the Human Research Review Committee of the Endocrine Research Center, Shahid Beheshti University of Medical Sciences (No. 2ECRIES 93/03/13).

Author contributions

MAKM – data collection and interpretation, writing the paper, critical revision of the manuscript

MB – study design, data collection and interpretation, critical revision of the manuscript

ME – study design, data collection, final approval of the manuscript

RE – study design, data collection, final approval of the manuscript

AK – IFSO-certified surgeon, study design, data collection, final approval of the manuscript

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Ethical approval

This study has been approved by the Human Research Review Committee of the Endocrine Research Center, Shahid Beheshti University of Medical Sciences, No. 2ECRIES 93/03/13.

Guarantor

Maryam Barzin, MD, PhD.

Conflict of interest

None.

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