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Biopsy-proven progressive fatty liver disease nine months post mini-gastric bypass surgery: A case study

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ABSTRACT

INTRODUCTION: Mini-gastric bypass (MGB) is a popular bariatric procedure. Its effect on non-alcoholic fatty liver disease (NAFLD), however, has not yet been comprehensively studied.
PRESENTATION OF CASE: A 57 year-old non-alcoholic female with a body mass index of 42.8 kg/m^2 underwent MGB without any incident. A concurrent liver biopsy showed an NAFLD activity score (NAS) of 2/8 without fibrosis. She presented at postoperative month eight with edema, vague abdominal pain, nausea, and vomiting and was hospitalized. Her BMI had dropped to 25.7 kg/m^2. Her blood workup revealed mild anemia, mildly elevated liver enzymes, and hypoalbuminemia (2.5 g/dL). Liver ultrasound revealed grade-2 fatty liver. She received parenteral nutrition and intensive nutrient supplementation. Nevertheless, with regard to unsuccessful supportive measures and rising liver enzymes, revisional surgery –gastrogastrostomy- was performed. Her liver biopsy demonstrated a NAS of 7/8 at the time of revisional surgery. Her postoperative course was uneventful and she was discharged after one week.
DISCUSSION: Bariatric surgery has shown favorable results regarding improvement of NAFLD in morbid obesity. This beneficial effect has been linked to the amount of weight loss. However, case reports have shown deteriorating liver function and NAFLD even after significant weight loss. They all have in common significant weight loss in a relatively short period of time. There may also be a connection between specific bariatric surgery procedures and this phenomenon.
CONCLUSION: Future studies comparing the effect of various bariatric procedures, including MGB, are necessary to help clinicians decide the optimal procedure for patients with this liver condition.

1. Introduction

While bariatric surgery is widely accepted as the treatment of morbid obesity, effectively lowering body weight and resolving obesity-related comorbidities, the choice of bariatric technique is still debatable, as many factors must be taken into account. Compared to the gold standard Roux-en-Y gastric bypass (RYGB), laparoscopic mini-gastric bypass (MGB) is a relatively new and popular method in some centers, owing to its easier technique, shorter learning curve and operative times, impressive weight loss (WL), and lower complications [1].

This technique incorporates a long gastric tube created from the incisura angularis to the angle of His over a 36-F bougie and an antecolic loop gastroenterostomy approximately 200 cm distal to the ligament of Treitz, causing malabsorption and consequently WL. More than 200 cases have been performed in our center with successful results; however, WL is sometimes achieved at the price of malnutrition and its related problems. Its effect on liver function, moreover, has not specifically been studied yet, including its possible effect on non-alcoholic fatty liver disease (NAFLD).

We hereby present a case of morbidly obese patient undergoing MGB, who showed biopsy-proven progression of NAFLD nearly nine months after surgery. This work has been reported in line with the SCARE criteria [2].

2. Presentation of case

A 57 year-old middle-eastern nonalcoholic morbid obese female presented to our bariatric center with an initial body mass index (BMI) of 42.8 kg/m^2 (weight = 118 kg, height = 166 cm) and obesity related health problems including hypertension (under treatment by metoprolol and captopril) and diabetes mellitus (diagnosed 6

Abbreviations: RYGB, Roux-en-Y gastric bypass; MGB, mini-gastric bypass; WL, weight loss; NAFLD, non-alcoholic fatty liver disease; BMI, body mass index; NAS, NAFLD activity score.

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Table 1
Liver biopsy reports at the time of primary and revisional surgeries (at 9 months) and NAFLD activity score (NAS).

Biopsy details				MGB	Revisional surgery (9 months)
Item		Extent	SCORE		
Steatosis	Grade[a,b]	<5%	0		
		5–33%	1	√	
		>33–66%	2		√
		>66%	3		
	Location	Zone 3	0	√	√
		Zone 1	1		
		Azonal	2		
		Panacinar	3		
	Microvesicular steatosis[b]	Not present	0	√	
		Present	1		√
Inflammation	Lobular inflammation[a,b]	No foci	0		
		<2 foci/200x	1	√	
		2–4 foci/200x	2		
		>4 foci/200x	3		√
	Microgranulomas[b]	Absent	0	√	
		Present	1		√
	Large lipogranulomas	Absent	0	√	√
		Present	1		
	Portal inflammation[c]	None to minimal	0		√
		More than minimal	1	√	
Liver cell Injury	Ballooning[a,b]	None	0	√	
		Few balloon cells	1		
		Many cells/prominent ballooning	2		√
	Acidophil bodies	None to rare	0	√	√
		Many	1		
	Pigmented macrophages[c]	None to rare	0		√
		Many	1	√	
	Megamitochondria	None to rare	0	√	√
		Many	1		
Other findings	Mallory's hyaline	None to rare	0	√	√
		Many	1		
	Glycogenated nuclei[b]	None to rare	0	√	
		Many	1		√
	Iron deposition	Absent	0	√	√
		Present	1		
Fibrosis stage		None	0	√	√
		Perisinusoidal or periportal	1		
		Mild, zone 3, perisinusoidal	1A		
		Moderate, zone 3, perisinusoidal	1B		
		Portal/periportal	1C		
		Perisinusoidal and portal/periportal	2		
		Bridging fibrosis	3		
		Cirrhosis	4		
Total score				2	7

[a] Components of liver biopsy used in NAS calculation.
[b] Signifying deterioration.
[c] Signifying improvement.

months previously and under control at the time of presentation by lifestyle modifications). She was taking 50 mcg levothyroxine pills daily for hypothyroidism and was euthyroid. She had been selected as part of the Tehran Obesity Treatment Study (TOTS), which enrolls and follows up morbidly obese patients requiring surgical intervention [3].

Her preoperative evaluations revealed grade-I fatty liver with increased liver echogenicity and span in ultrasonography. Other evaluations including cardiac, pulmonary, and blood biochemistries were insignificant. Viral markers were also negative for hepatitis viruses. Moreover, no other cause for liver disease was identified. She underwent MGB without any incidents, and wedge and needle liver biopsies were performed at the time of the operation (Table 1). The biopsy was assessed by a specialized liver pathologist using hematoxylin & eosin, Masson's trichrome, and Iron staining, and was scored according to the NAFLD activity score (NAS) criteria [4], which is the sum of steatosis grade (0–3), hepatocyte ballooning grade (0–2), and lobular inflammation grade (0–3) in microscopic assessment (Table 1). Result showed a score of 2 from a possible maximum of 8. Steatosis was seen in 5–33% of the specimen and inflammation in <2 foci/200x, with no signs of ballooning. Moreover, there were no features of fibrosis (Fig. 1A).

She was under routine postoperative follow-up at 1, 3, 6, and 12 months, and received supplementation for vitamins and minerals (Pharmaton®, Boehringer Ingelheim Inc., Ingelheim am Rhein, Germany), as well as ursodiol, regularly. She was also following her post-operative protocol of at least 70–100 g/day of protein intake without any difficulties. Her blood indices and WL results are provided in Table 2.

At postoperative month eight, she presented with edema, vague abdominal pain, nausea, and vomiting and was admitted. She had lost significant weight during this period, approximating her ideal body weight (BMI = 25.7 kg/m^2, excess weight loss = 95.9%). Her blood workup revealed mild anemia, mildly elevated liver enzymes, as well as moderate to severe hypoalbuminemia (2.5 g/dL). Hepatitis markers were rechecked and confirmed negative. A liver ultrasound study revealed grade-II fatty liver. Upper endoscopic assessment was insignificant and showed the small stomach pouch

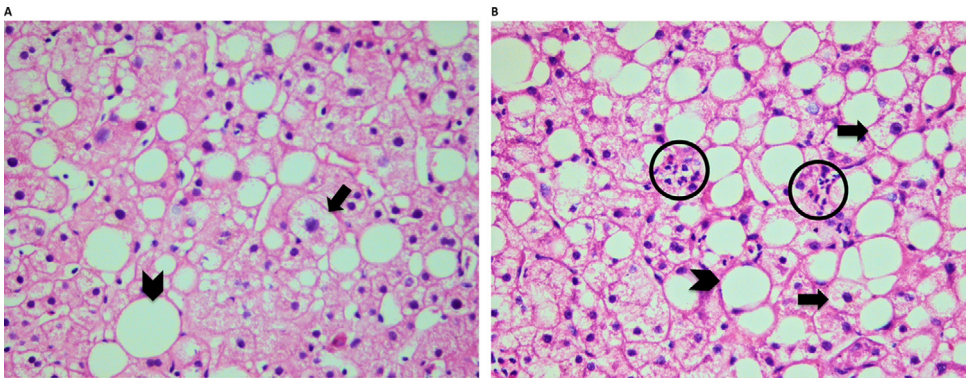

Fig. 1. (A) Photomicrograph at primary bariatric surgery, showing ballooning (arrow) and steatosis (arrowhead). (B) Photomicrograph at revisional surgery, showing more prominent ballooning (arrows), steatosis (arrowhead), and neutrophilic satellitosis (circles).

Table 2
Patient's preoperative and postoperative weight indices and blood values.

Variable	Normal values	Preoperative	Postoperative		
			3 months	8 months	Revisional surgery
Weight, kg	55–69	118	96	71	70
BMI, kg/m^2	20–25	42.8	35.1	25.7	25.4
EWL%	–	–	44.8	95.9	97.9
FBS, mg/dL	70–100	110	82	90	66
HbA1c, %	<5.7	5.5	5	–	–
ALT, U/L	7–55	31	28	38	64
AST, U/L	8–48	28	26	33	104
ALP, U/L	45–115	167	167	82	68
Total bilirubin, mg/dL	0.4–1.5	1	1.1	1.5	1.2
TSH, U/mL	0.39–6.16	2.5	–	3.6	–
Total Protein, g/dL	6.3–7.9	–	–	5.2	5.2
Albumin, g/dL	3.5–5	5.2	–	2.5	3.3
Calcium, mg/dL	8.5–10.2	10.1	–	8.1	8.5
Magnesium, mg/dL	1.6–2.9	2	–	2.1	1.9
Zinc, mcg/dL	70–110	101	–	89	135
Copper, mg/dL	80–155	119	–	131	–
Vitamin B12, pg/mL	211–946	175	–	–	1196
Vitamin D3, ng/mL	>30	66.7	–	–	70
Plasma Iron, mcg/dL	39–149	88	–	91	–
WBC, 10^3/mcL	4–10	6.15	3.8	5.21	5.71
RBC, 10^6/mcL	4.2–5.4	4.1	–	3.89	3.02
Hemoglobin, g/dL	12–15.5	14	11	11.2	8.8
Hematocrit, %	35–45	42.4	33.8	33.8	27.1
MCV, fL	77–98	–	–	86.9	89.7
Platelet, 10^3/McL	150–450	262	219	314	278

BMI, body mass index; EWL, excess weight loss; FBS, fasting blood sugar; HbA1c, glycosylated hemoglobin level; ALT, alanine aminotransferase; AST, aspartate aminotransferase; ALP, alkaline phosphatase; TSH, thyroid stimulating hormone; WBC, white blood cells; RBC, red blood cells; MCV, mean corpuscular volume.

with mild erythema at gastro-jejunal anastomosis site. Other evaluations failed to find an etiology for her liver dysfunction. She received total parenteral nutrition and intensive intravenous protein, lipid, and nutrient supplementation. Her condition had not improved one week later, with rising liver enzymes, at which time revisional surgery was decided. A gastrogastrostomy was performed successfully, and another liver biopsy done concurrently, demonstrating a NAS of 7/8 (Table 1). Steatosis was seen in 33–66% of the specimen with >4 foci/200× of inflammation and prominent ballooning. No features of fibrosis were present (Fig. 1B).

She began to recover afterwards, and her liver function normalized. She was discharged from the hospital after one week in good health.

3. Discussion

NAFLD is an extremely prevalent counterpart of morbid obesity, in up to 90% of this population, and ranges from mild fatty liver changes and steatosis to non-alcoholic steatohepatitis (NASH), with the possibility of progression to liver fibrosis with longstanding disease [5]. Bariatric surgery in general has shown impressive results on resolution of this condition, in up to 85% of the patients [6]. However, evidence regarding the effect of various bariatric techniques on NAFLD is incomprehensive, and nearly nonexistent regarding MGB. This report provides a probably unprecedented effect of MGB on liver function, proven by histology.

This overall beneficial effect of bariatric surgery has been shown in different parameters of the liver function, including histologic features of NAFLD, asparate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase, and gamma glutamyl transferase [6,7]. This improvement has been shown to be similar in the few available studies between malabsorptive (RYGB) and restrictive techniques (sleeve gastrectomy) [8,9], with the exception of adjustable gastric banding, which demonstrated lower improvement rates [10]. This can probably be explained by the lower WL achieved by this procedure.

The association between improvement of NAFLD and the magnitude of WL has been consistently observed in the literature [6]. However, it is suggested that NAFLD improvement could be through non-weight dependent mechanisms as well [11], and a

link was also observed between significant improvement of NAS and ALT normalization much sooner than significant WL goals have been achieved [12]. On the other hand, three case reports have been published for deteriorating liver function after bariatric surgery despite successful weight loss results, one after bilio-intestinal bypass surgery [13], another after biliopancreatic diversion surgery [14], and the third was a patient of ours after MGB. The present case, however, is surprising because it shows severe deterioration of liver histology from NAS 2–7, as early as nine months after surgery.

Although there is no convincing explanation for this presentation, rapid WL is a common feature; our patient achieved her ideal body weight in as early as 9 months. There may also be a link between the mechanism of weight loss and specific bariatric procedures, as shown in a study of comparison between RYGB and MGB in 50 patients, where MGB patients demonstrated significantly poorer liver function tests at one year, despite better WL results [15]. In addition, the surgical technique itself is of particular importance and will affect the postoperative course. Similar to what Lee et al. reported in their experience with a tailored bypass limb length according to BMI [16], we suggest individualizing the MGB surgical technique in each patient by measuring bowel length during the operation and then deciding the length of bypassed limb. This may lead to a more controlled and sustained WL, which can help minimize unfavorable postoperative events.

4. Conclusion

This case report serves to highlight the importance of future comprehensive studies comparing the effect of different procedures on liver function, NAFLD, and NASH. Their results may consequently affect the choice of bariatric technique for individuals with liver conditions such as NAFLD.

Conflict of interest

None.

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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.

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 contribution

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.

NR –data collection, final approval of the manuscript.

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

Guarantor

Maryam Barzin, MD, PhD.

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