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CASE REPORT | LIVER

Intragastric Balloon Improves Steatohepatitis and Fibrosis

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ABSTRACT

Obesity is a major risk factor for nonalcoholic steatohepatitis (NASH). Although weight loss has been shown to reverse histologic features of NASH, lifestyle intervention alone is often challenging and unfeasible. In this case report, we discuss the effects of intragastric balloon (IGB) therapy on steatosis, fibrosis, and portal pressures. We also demonstrate that improvement in histologic features persist at least 6 months after IGB removal. Although there are little data thus far to support IGB therapy in the treatment of NASH, our case provides evidence of the potential benefit of IGB on improving metabolic parameters and markers of liver fibrosis.

INTRODUCTION

Nonalcoholic fatty liver disease (NAFLD) is the most common cause of liver disease in the United States and worldwide.[1] The presence of hepatic steatosis and inflammation in patients with NAFLD is known as nonalcoholic steatohepatitis (NASH). The primary therapy recommended by guidelines is weight loss through dietary and lifestyle changes.[2] However, weight loss through lifestyle modification alone is difficult to achieve and even harder to sustain.[2] Recently, endoscopic bariatric therapies with higher efficacy for weight loss and low adverse events have emerged as a potential option. The intragastric balloon (IGB) is one such therapy, but little data exist to support its use for NASH.[3] Here, we present the case of a patient who experienced significant improvement in markers of NASH after IGB treatment. In addition, we assessed the effect of IGB on portal pressures before and after balloon treatment.

CASE REPORT

A 45-year-old man with obesity (body mass index [BMI] 35 kg/m^2) and a history of hypertension, type 2 diabetes (A1c 8.3% on insulin), and NASH initially presented to gastroenterology clinic for elevated transaminases but otherwise normal chemistry and complete blood count (Table 1). Given his elevated transaminases, the patient elected to obtain a liver biopsy. Before IGB placement, Masson trichrome stain showed formation of fibrous septa and remarkable perisinusoidal fibrosis, severe steatosis, and multiple ballooned hepatocytes and necroinflammatory foci per hepatic lobule (Figure 1). There was also mild portal inflammation. These features were diagnostic of steatohepatitis.

The patient proceeded with a single 600-mL fluid-filled IGB for weight loss. At the time of balloon removal, total body weight loss was 9% and excess weight loss was 27%. Six months after the IGB was removed, total body weight loss and excess weight loss were 7% and 21%, respectively. A repeat liver biopsy was obtained demonstrating significant improvement in his NASH. The fibrosis became limited to the portal tract, perisinusoidal fibrosis was significantly decreased, steatosis reduced to mild, necroinflammatory foci were rare, and portal inflammation was minimal (Figure 1). Hemoglobin A1c also improved, and the patient was no longer dependent on insulin. Interestingly, portal pressures remained the same before and after treatment (Table 1).

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Table 1. Comparison of laboratory measurements and histology before and after IGB placement

	Before IGB	12 mo afterward (6 mo after IGB removal)
Weight and BMI	242 lb BMI 34.7	225 lb BMI 32.3
		TBWL 7% EWL 21%
Liver transaminases (AST/ALT/Alk Phos-T. Bili/D. Bili)	41/113/103-0.4/0.2	63/136/115-0.6/0.2
	Albumin 4.5	Albumin 4.6
INR	0.98	1.03
A1c (%)	7.3	6.2
Lipids	Chol 175 Tg 95 HDL 45 LDL 120	NA
Portosystemic gradient	7–9 mm Hg	8 mm Hg
Steatosis grade	3: >66%	1: 5%–33%
Steatosis location	2: azonal	0: zone 3
Lobular inflammation	2: 2–4	1: <2
Chronic portal inflammation	1: mild	1: mild
Ballooning	2	1
Fibrosis	2: sinusoidal, periportal, or portal	1A: mild, zone 3, perisinusoidal "delicate" fibrosis
Histological score by steatohepatitis	12	5
Histopathologic NAS	8	3

Alk Phos, alkaline phosphatase; ALT, alanine transaminase; AST, aspartate transaminase; BMI, body mass index; Chol, cholesterol; D. Bili, direct bilirubin; EWL, excess weight loss; HDL, high-density lipoprotein; IGB, intragastric balloon; INR, international normalized ratio; LDL, low-density lipoprotein; NAS, nonalcoholic fatty liver disease activity score; T. Bili, total bilirubin; TBWL, total body weight loss; Tg, triglycerides.

DISCUSSION

Although fibrosis has historically been thought of as irreversible, studies have demonstrated that weight loss >7%-10% through lifestyle modification correlates with improvements in NASH and fibrosis regression.[2] To the best of our knowledge, our case is the first to describe a patient who underwent IGB placement, experienced modest weight loss results, but had remarkably improved steatohepatitis and fibrosis that persisted for at least 6 months from IGB placement.

In addition, there was a notable improvement in our patient's diabetic control in the setting of modest weight loss. It is well known that insulin resistance promotes the progression from NAFLD to NASH.[4] Conversely, excessive hepatic lipid accumulation promotes the activation of macrophages which exacerbate insulin resistance.[4] Therefore, the improvement in steatohepatitis might have been a mechanism for improved insulin sensitivity in our patient. The majority of our patient's weight loss was maintained after balloon removal, largely due to altered and sustained improvements in dietary habits. Although liver enzymes increased despite an improvement in steatohepatitis, liver enzyme levels do not necessarily correlate with histopathology.[5,6]

Bariatric surgery is widely applied to those with a BMI higher than 40 kg/m^2 or 35 kg/m^2 with comorbidities, and metabolic parameters are often improved after surgery. Although bariatric surgery has potential to lead to fast and dramatic weight loss results, surgery itself comes with multiple risks and not all patients with obesity are surgical candidates. IGBs are indicated for patients with lower BMI (30-40 kg/m^2) and offer a safer therapeutic option for those who do not meet criteria for surgery and are unable to achieve sufficient weight loss from lifestyle changes and pharmacotherapy alone. IGBs may also allow for earlier intervention before more advanced metabolic and liver disease sets in. On the other hand, there have been concerns about the impact of gastric balloons on increases in portal hypertension and its complications. Our own experiments in pigs showed a 30% increase in inferior vena cava pressure after IGB placement.[7] However, there are distinct differences in the anatomy between the porcine and human portal circulation. In addition, the observed changes in pigs may have been temporary, with compensation occurring over time. With regards to our patient, there was no appreciable change in portal pressure.

In addition to demonstrating sustained improvement in steatohepatitis and fibrosis, this is the first case to evaluate the effect of the IGB on hepatic portosystemic pressures and report on its safety. Given that IGBs have limited serious complications, they may therefore be a suitable, less invasive option for the treatment of NASH.[8] Further studies of IGBs and other endoscopic bariatric therapies are indicated.

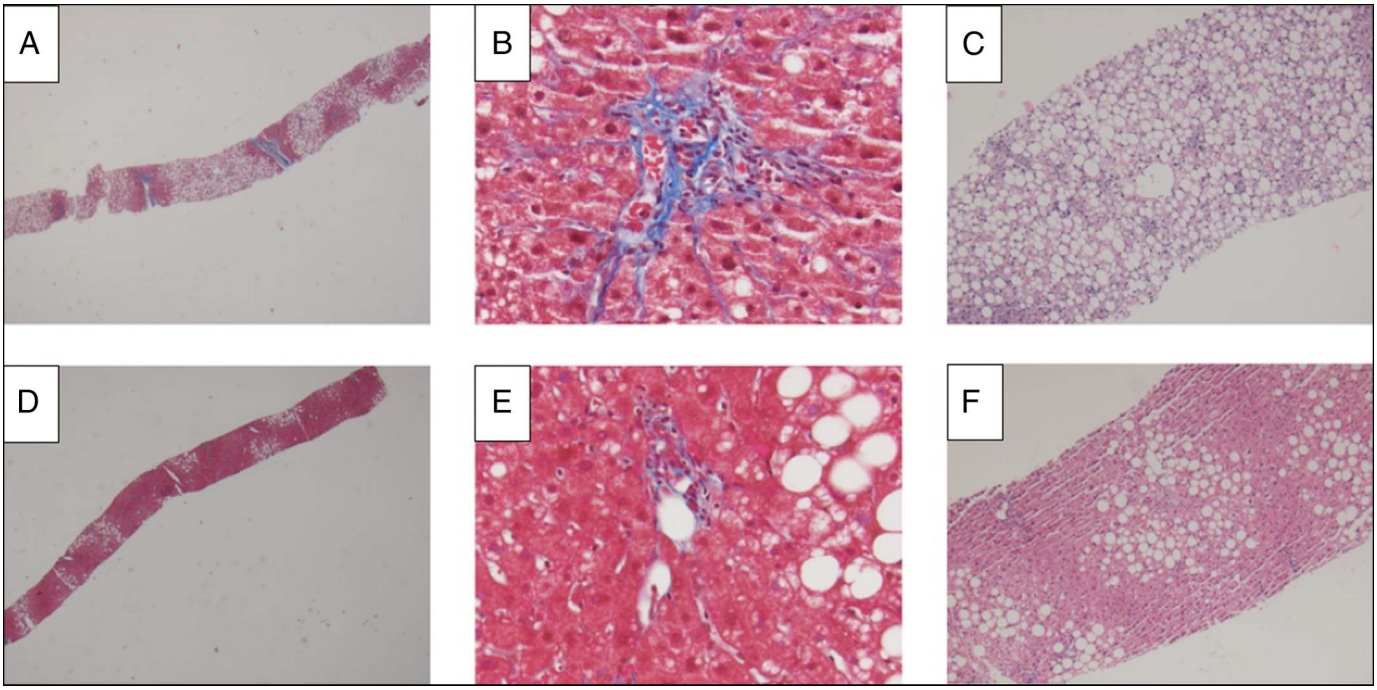

Figure 1. Histopathologic changes in liver biopsy (A–C) before and (D–F) after treatment. (A and D) Masson trichrome staining, 2× magnification; (B and E) Masson trichrome staining 40× magnification; (C and F) H&E, 10× magnification.

DISCLOSURES

Author contributions: E. Lin and V. Popov wrote the manuscript. X. Huang, Z. Pei, and J. Gross revised the manuscript for intellectual content. V. Popov is the article guarantor.

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