Asian Journal of Case Reports in Surgery

10(1): 11-16, 2021; Article no.AJCRS.69359

Laparoscopic Guided Trans-Gastric Balloon Deflation: A Novel Technique in the Emergency Retrieval of Intragastric Balloons

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Authors' contributions

This work was carried out in collaboration among all authors. All authors contributed equally to performing the literature review, writing the case report and completing the manuscript. All authors read and approved the final manuscript.

Article Information

Editor(s):
(1) Dr. Pandiaraja. J, Shree Devi Hospital, India.
Reviewers:
(1) Prasanna Kumar Reddy, Apollo Main hospital, India.
(2) Sujan Narayan Agrawal BRKM Government Medical College, India.
(3) Sagar Ramesh Ambre, TNMC Mumbai Nair Charitable Hospital, India.
Complete Peer review History: http://www.sdiarticle4.com/review-history/69359

Case Study

Received 17 April 2021
Accepted 22 June 2021
Published 29 June 2021

ABSTRACT

Introduction: Obesity is a global disease, causing a vast array of metabolic diseases and creating a significant burden on the individuals well being and the health system in general. Endoscopic adjuncts such as the intragastric balloon (IGB) have been developed to assist in weight loss. This device requires endoscopic placement and removal and although rare, can lead to complications during the treatment period.

Case presentation: A 27 years old patient with a history of smoking and excessive NSAIDS use presented with a gastric perforation, 6 weeks after placement of an intragastric balloon. She required an endoscopic / laparoscopic assisted balloon deflation and removal as well as laparoscopic abdominal washout, repair of gastric perforation and placement of intraperitoneal drains. Due to the unavailability of the endoscopic balloon deflation catheter, we used a laparoscopically guided transgastric Verres needle to puncture and deflate the balloon during the procedure, combined with endoscopic removal of the balloon through the oral route.

Discussion: Intragastric balloons are widely produced by different companies and may require manufacturer specific endoscopic needle tip deflation catheter to deflate the device and a specific endoscopic grasper to retrieve it. Due to its size, caliber and mechanism of action, the Verres needle

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might be a useful balloon deflation adjunct in case the proper equipment is not available in emergency situations.
Conclusion: Patients should be properly selected prior to balloon placement according to the probability of complication development and the benefit of the gastric balloon in comparison to other bariatric modalities. The Verres needle provides an additional tool, which may be used in certain situations to deflate the balloon, such as gastric perforations when the proper endoscopic tools aren't available.

Keywords: Obesity; body mass index; intragastric balloon; gastric perforation.

ABBREVIATIONS

IGB : Intragastric Balloon
BMI : Body Mass Index
ml : Milliliters

1. INTRODUCTION

Obesity is a global metabolic disease that increases the population's morbidity and mortality associated with excess weight. Age-adjusted prevalence of obesity and severe obesity (BMI ≥40 kg/m^2) was 42.4% and 9.2% respectively among adults aged 20 and over in the United States in 2017–2018. Obesity was similar among men and women but severe obesity was higher among women [1]. The incidence of some diseases such as diabetes mellitus, hypertension, coronary heart disease, sleep apnea, stroke, gastroesophageal reflux disease, non-alcoholic fatty liver disease, and certain types of malignancy have been proven to increase in obese populations [2]. The relation between those diseases and body fat was linear; it increases with increased body fat. In particular, severe obesity further increases the risk of obesity-related complications [3,4]. A ten percent decrease in body weight has shown to slow and even prevent the onset of obesity-related comorbidities [5].

With the global rise of obesity, different pharmacological, endoscopic, and surgical adjuncts have been developed to assist in weight loss. The Intragastric balloon (IGB), an endoscopic bariatric intervention, is an effective minimally invasive method used in the treatment of obesity and is associated with marked short-term weight loss with limited serious complications [6]. The mean change in weight and BMI were 15.7 +/- 5.3 kg and 5.9 +/- 1 kg/m2, respectively at the time of balloon removal [6].

In 1982, Nieben described the physiological concept of an intragastric balloon with his idea of the placement of an artificial gastric bezoar as a space-occupying device [7]. These balloons were endoscopically placed and filled with 220 mL of air and removed endoscopically after three months. The concept is that the mechanical gastric distension will increase satiety accordingly, decreasing food intake [8,9,10]. Although initially promising, older models of the IGB eventually were taken off the market due to an unacceptably high number of complications, including gastric perforations, gastric ulcers, small bowel obstruction, esophageal lacerations, balloon migration, vomiting, and abdominal pain [6]. Since then, the IGB concept and techniques have considerably evolved. Endoscopically placed, saline-filled, spherical balloons with volumes varying between 400 and 700 ml IGBs were the first to be approved by the Food and Drug Administration (FDA) as a primary weight-loss intervention in August 2015 [11,12]. Different types of intragastric balloons are available globally. They can be manufactured from different materials such as silicone or polyurethane. Depending on the type, some are fluid-filled, others are air-filled and a mixture of air and fluid-filled balloons also exist in the market.

The mechanism for removing an endoscopically placed Intragastric balloon from a patient is almost the same. It includes a through-the-scope suction catheter with a needle tip, used to puncture and deflate the balloon. A retrieval grasper is then advanced through the endoscope's side channel to grasp the intragastric balloon and remove it orally [13]. It is important to understand that most balloon manufacturers have a specific kit for the removal of their intragastric balloons. This is especially important due to the variety of materials used to manufacture the balloons, making specific suction catheter with a needle necessary to puncture and deflate the balloons (The caliber and strength of the needle may differ). On some occasions in which the patient does not know which balloon they received, and no retrieval kit is available in the hospital, surgeons will have to

figure out a way to deflate and remove the balloon.

In this case report, we present a 27 years old female with a perforated gastric ulcer after balloon insertion that was retrieved endoscopically after deflating the IGB with a veress needle placed transabdominal, through the gastric wall into the balloon.

2. CASE REPORT

We present a 27 years old female, a current smoker, who presented to the emergency department (ER) 6 weeks after the placement of a silicone based intragastric balloon at an outside hospital. She presented with a three days history of severe progressive epigastric and left upper quadrant pain. The pain was associated with nausea and vomiting. There was no fever or change in urinary or bowel patterns. She did not undergo any previous gastrointestinal surgeries, nor was she ever treated for gastritis or peptic ulcer disease. The patient reported excessive usage of NSAIDs due to pain post gastric balloon insertion. A CT with intravenous contrast was done showing perforated viscus and an intragastric balloon (Fig. 1), and her blood work showed an elevated creatinine of 314 mmol/L, which was previously normal. The patient was hemodynamically stable, afebrile, and maintained a saturation of 99% on room air. Her abdomen was diffusely tender with epigastric guarding. Her venous blood gas pH was 7.27 showing metabolic acidosis with a base defect of -6 and elevated lactate of 5.6. She was resuscitated with multiple fluid boluses. In addition, broad-spectrum antibiotics and omeprazole infusion were initiated.

The patient was shifted urgently to the operating room with a plan to undergo a combined endoscopic and laparoscopic gastric balloon removal and gastric ulcer repair with abdominal washout.

Intraoperative findings were: large amounts of succus entericus, pyogenic membrane, 5mm gastric ulcer at the fundus, and a perforated ulcer of 1cm at the body of the stomach (Fig. 2A,2B). In addition, pelvic, perisplenic, and perihepatic purulent collections were found. As the endoscopic retrieval kit, including the needle tip suction catheter was not available in our hospital, deflation was done using a transabdominal Veress needle.

The Veress needle was placed under laparoscopic and endoscopic visual guidance, percutaneously, transabdominal into the peritoneal cavity, then through the gastric wall into the intragastric balloon. We then connected the veress needle to an external suction tube and the methylene blue filled balloon was deflated. The retrieval was done endoscopically using a raptor grasper and the balloon was removed from the oral cavity. Both the gastric ulcer and the Verres needle entry site into the stomach were repaired using 2 layers of vicryl sutures. Copious suction and irrigation with saline was done, and a drain was placed at the perisplenic area and peri-hepatic area.

The patient had a slow, progressive course in the hospital, requiring further CT guided drainage of multiple abscess cavities in the pelvic and peri-hepatic hepatic region with the assistance of interventional radiology. Antibiotic therapy, proton pump inhibitors, and nutritional support were also provided to the patient. She was then discharged from the hospital after 25 days in a stable condition once all the drains were removed and her nutritional status was adequate.

3. DISCUSSION

Intragastric balloons are produced widely by different companies and have different techniques for insertion. Currently, the Orbera® IGB which is filled with saline and endoscopically placed intragastrically is the most commonly used one worldwide. The ReShape Duo® is two-balloons filled with equally distributed methylene blue-mixed saline. Another device, the Spatz adjustable silicone balloon system, is also inflated by saline through a filling catheter that is extractable endoscopically, which permits an intragastric volume adjustment to improve the patient's tolerance and increase weight reduction. A swallowable, self-draining, and naturally expelled intragastric balloon device, The Elipse™, is also available. A 250 ml Air-filled balloon, The Obalon Gastric Balloon®, is a self-sealing valve linked to a catheter and is set inside a gelatin capsule. Additionally, the Heliosphere Bag® is a double-bagged polymer covered with an external silicone pouch slowly filled air. The widely used endoscopically placed intragastric balloons require endoscopic transoral retrieval after placement in the stomach, the duration of which is either 6 or 12 months depending on the manufacturer.

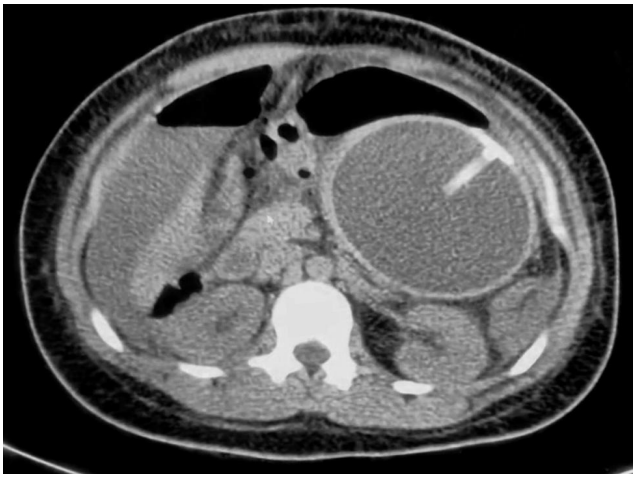

Fig. 1. CT scan showing intragastric balloon, with pneumoperitoneum and moderate intraabdominal fluid collection in the perihepatic and perisplenic area

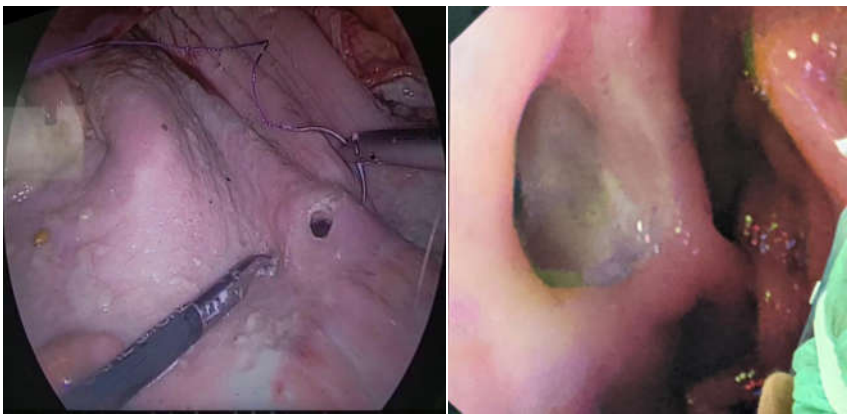

Fig. 2. A. Laparoscopic view showing a 1 cm gastric perforation, B. Endoscopic view showing the perforated gastric ulcer

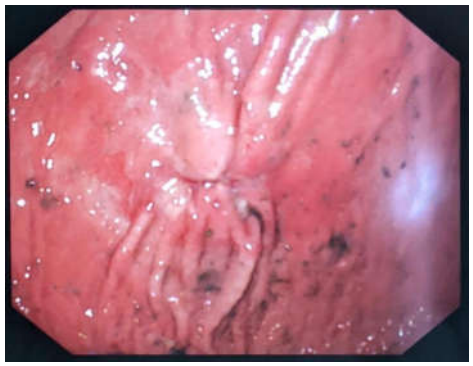

Fig. 3. Endoscopic view of the laparoscopically repaired perforated gastric ulcer

As with any medical intervention, intragastric balloons have some complications that can affect the duration of treatment leading to the early removal before completing the advised duration of treatment as seen in our patient [6]. In a systematic review of intragastric balloon for management of obesity done by Ekua Yorke et al. the researchers found that the most common complications experienced by patients during the full duration of treatment were: nausea/vomiting

(23.3 %), abdominal pain (19.9 %), and GERD (14.3 %). Moreover, some patients experienced deflation of the intragastric balloon with distal displacement of the balloon (1.9 %). Although rare but serious complications were also found including gastric ulcers (0.3 %) and gastric perforations (0.1 %) [6]. Premature removal of IGB was observed in 3.5% of patients, most commonly due to abdominal pain (17.3 %), nausea/vomiting (13.8 %), balloon deflation (12.8 %), and patient intolerance (12.0 %). Also, some patients require early removal of IGB due to inefficacy (8.3 %), gastric ulcer (5.8 %), gastroparesis (4.4 %), gastric perforation (3.19 %) [6].

The continuous contact of the balloon and constant pressure on the gastric wall may result in a gastric ulcer and induce perforation [14]. In addition, common causes of peptic ulcer disease may contribute to gastric perforation in patients with intragastric balloons.

In this reported case, our patient had many risk factors for gastric perforation including smoking and using NSAIDs excessively due to abdominal discomfort. NSAID use by itself causes COX-1 inhibition in the gastrointestinal tract resulting in a reduction of prostaglandin secretion, hindering its protective effects in gastric mucosa and increasing the susceptibility to mucosal injury, ulceration, and perforation [15]. Moreover, cigarette smoking has been linked to the development, maintenance, and recurrence of peptic ulcer disease. Moreover, cigarette smoking interferes with the action of histamine-2 antagonists, accelerates gastric emptying, promotes duodenogastric reflux, reduces mucosal blood flow, and inhibits both pancreatic bicarbonate secretion and mucosal prostaglandin production [16].

Accordingly, to reduce the risk of gastric ulceration and its complication, patients with intragastric balloons are investigated for helicobacter pylori and treated prior to placement of the balloon. In addition, it is common practice at our institution to place the patient on a prophylactic low dose proton pump inhibitor throughout the duration of the balloon placement. They are also advised to stop smoking to decrease the risk of gastritis and gastric ulcer formation while the intra-gastric balloon is in place.

With regards to balloon extraction due to any surgical emergency such as gastric perforation, it is essential for medical centers to be well equipped with endoscopy towers as well as tools necessary to deflate and retrieve the balloon intra-operatively. As in our situation, if complete balloon deflation tools are not available, the Veress needle can be used as mentioned in our case report. Verres needles are inexpensive and readily available in many centers which provide laparoscopic surgical care. Limitations to this technique include the fact that it requires additional laparoscopic access and views to ensure the safety of the technique.

4. CONCLUSION

In conclusion, endoscopy units and specialized balloon removal kits should be available in general hospitals due to the increase in the number of people undergoing balloon placement and presenting with complications that may require emergent removal of the balloon under less optimal circumstances. The Verres needle provides an additional tool, which may be used in certain situations to deflate the balloon, such as gastric perforations when the proper endoscopic tools aren't available. Patients should be properly selected prior to balloon placement according to the probability of complication development and the benefit of the gastric balloon in comparison to other bariatric modalities. Post IGB insertion, regular follow-up, PPI use and abstinence from smoking, and the use of NSAIDs throughout the duration of placement are crucial.

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author.

ETHICAL APPROVAL

The case was reviewed by the local ethical committee.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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PMID: 3053883.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/69359