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Case Report

Gastric phytobezoar presenting one week after an uneventful robotic hiatal hernia repair: a case of successful dissolution with Coca-Cola beverage

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ABSTRACT

Bezoars are conglomerates of undigested foreign material that are not commonly found in the stomach or intestines. Although there are different classifications of bezoars, 40% are due to phytobezoars which are made of indigestible fibers. Predisposing factors such as gastric surgery, medication or other medical conditions may aid in the development of bezoars. Here we describe a case of a gastric phytobezoar in a patient just one week after a robotic hiatal hernia repair, successfully treated by chemical dissolution using Coca-Cola. The patient was admitted to the surgical services with nasogastric decompression, intravenous resuscitation and antibiotics after an abdominal-pelvic computed tomography demonstrated a large amount of food in the stomach. Subsequent kidneys, ureters, and bladder (KUB) images showed a persistent large amount of retained food, and the patient underwent an Esophagogastroduodenoscopy (EGD) on day 3 of admission. Coca-Cola was infused on day 5 and day 6 of admission and the subsequent KUB showed improved gastric distension. Patient underwent another EGD on day 7 of admission which revealed an empty stomach. She was then advanced to a full liquid diet, had a bowel movement and was discharged on day 8 of admission. Bezoars are conglomerates of undigested material with gastric surgery being cited as the most common risk factor. However, it is not commonly found after a hiatal hernia repair. Chemical dissolution with Coca-Cola is a successful non-invasive alternative to the surgical removal of the phytobezoar.

Keywords: Gastric bezoar, Chemical dissolution, Cola-cola

INTRODUCTION

Bezoars are conglomerations of undigested foreign materials uncommonly found in the stomach or the intestines. In 1978, Kadian et al reported six cases of gastric bezoars in a four-year period among 1,400 gastroscopies.[1] More recently, after retrospective examination of medical records, Mihai et al found only 48 cases of gastric bezoars over a period of 20 years, 0.068% of which were from endoscopies.[2] Based on their composition, they are typically classified into four main types: phytobezoar, trichobezoar, lactobezoar and pharmacobezoar.[3,4] 40% of reported bezoars are due to phytobezoars, often linked to excessive consumption of digestive fibers.[3–8] Previous gastric surgery appears to be the most common cited risk factor, contributing by either reducing the acidity and quality of gastric juices, thus adversely affecting peptic activity, or resulting in a wide gastric outlet and the potential facilitation of the passage of undigested large food boluses to the duodenum and the small intestine.[4,5,7,9–13] Less common predisposing conditions include the use of medications that delay gastric motility, rapid swallowing of large amounts of food, poor mastication due to artificial dentures, psychiatric conditions (e.g., trichotillomania), hypothyroidism, diabetes mellitus, renal failure, or postoperative adhesions.[9,11,12,14] Certain studies have described patients without identifiable predisposing

factors.[12] Patients may be asymptomatic or may develop epigastric discomfort or pain, nausea, vomiting, diarrhea, dysphagia, weight loss, early satiety, or gastrointestinal ulceration resulting in anemia and tarry or bloody stools.[5,7,10–12] Here, we describe a case of a gastric phytobezoar in a patient just one week after a robotic hiatal hernia repair, successfully treated by chemical dissolution using Coca-Cola.

CASE REPORT

A 49-year-old woman presented to the emergency department with severe, worsening diffuse abdominal cramping pain not responding to analgesics, associated with an episode of emesis, obstipation, constipation, and subjective fevers. She had a recent robotic hiatal hernia repair a week prior at another institution. Her past medical history included arthritis, anxiety, insomnia, and Crohn's disease with constipation. Her past surgical history consisted of an appendectomy, wrist ganglion excision, bilateral breast augmentation with implants, and abdominoplasty.

Upon physical examination, she was hemodynamically stable and afebrile, her abdomen was distended, diffusely tender to palpation with clean and dry incisions. Her laboratory results were within the normal ranges with slightly elevated liver enzymes (leukocyte 10.6×10^3/µl, Hgb 11.3 g/dl, Hct 34.2%, Plt 340×10^3 K/µl, glucose 86 mg/dl, AST 34 U/l, ALT 102 U/l, ALP 111 U/l, lactate 0.67 mmol/l, T. Bil 0.5 mg/dl, Amylase 40 U/l, Lipase 70 U/l, Alb 4.1 g/dl, Mag 2.1 mg/dl, Phos 4.0 mg/dl, BUN 10 mg/dl and creatinine 0.5. Her electrocardiogram (EKG) showed sinus brady (QTC 436 ms). Abdominal-pelvic computed tomography (CT) scan was performed, which demonstrated a large amount of retained food in the stomach, wall thickening of terminal ileum, and constipation, without bowel obstruction or ileus (Figure 1).

The patient was admitted to the surgical service with the presumptive diagnosis of gastric bezoar, started on nasogastric decompression by a nasogastric tube (NGT), intravenous fluid resuscitation, and antibiotics. Her initial 24-hour NGT output was 500 ml. Reglan and Protonix were added. In the following days, a persistent large amount of retained food/debris in the stomach remained on kidneys, ureters, and bladder (KUB), despite the progression of oral contrast in the colon (Figure 2a). She underwent an esophagogastroduodenoscopy (EGD), with findings of a large amount of food (residue) in the stomach and erythematous mucosa in the gastric body and antrum (Figure 3) and a normal pylorus, duodenal bulb, and second portion of the duodenum. Pathology results revealed intestinal metaplasia and mild chronic gastritis. Erythromycin was added on day 4 without improvement. Coca-Cola (237 ml) were infused on day 5 and 6 of admission and the KUB showed improved gastric distension (Figure 2b). A subsequent EGD performed on day 7 revealed an empty stomach (Figure 4). The patient was advanced to a full liquid diet and subsequently had a bowel movement. She was discharged on day 8 and was seen two weeks later, doing well.

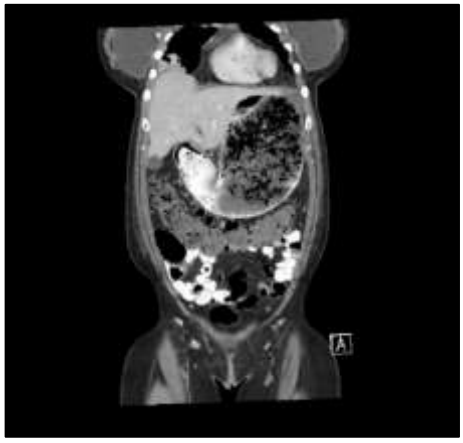

Figure 1: CT results day 1 of admission.

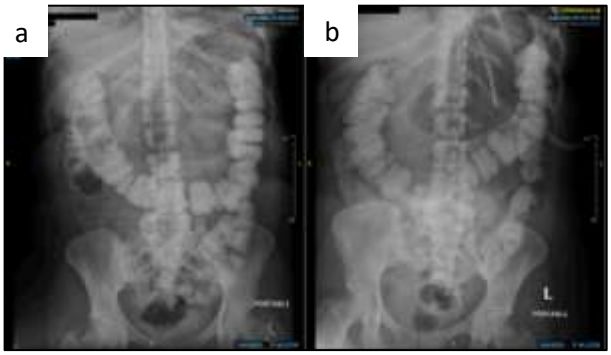

Figure 2: (a) KUB results day 3 of admission, (b) day 6 of admission.

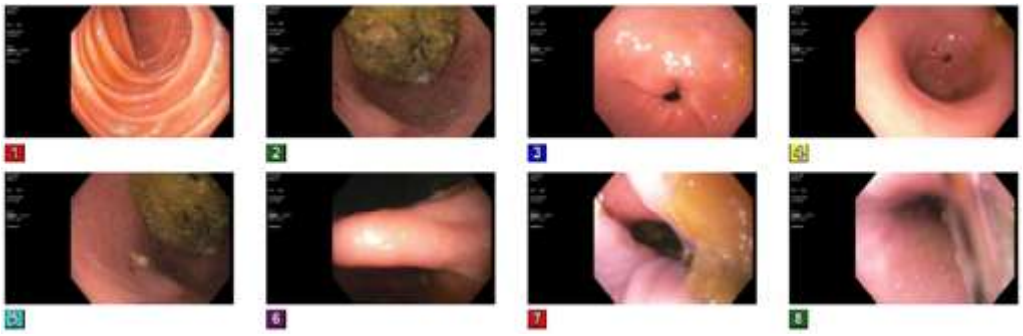

Figure 3: EGD results on day 4 of admission.

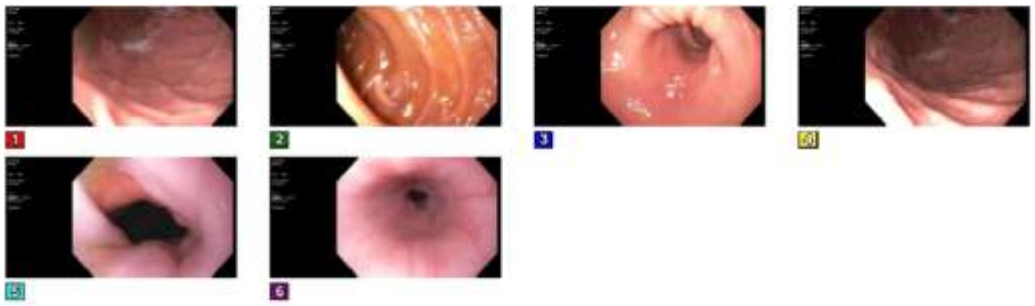

Figure 4: EGD results on day 7 of admission.

DISCUSSION

Bezoars consist of conglomerations of undigested foreign materials uncommonly found in the gastrointestinal tract. In 1978, Kadian et al reported that they found six cases of gastric bezoars in a series of 1,400 gastroscopies within a four-year period.[1] Ahn et al reported a similar incidence in 1987: fourteen cases of gastric bezoars in 3,247 esophagogastroduodenoscopy examinations over a seven-year period.[15] More recently, Mihai et al found only 48 cases of gastric bezoars over a period of 20 years after retrospective examination of medical records, 0.068% of which were from endoscopies.[2]

Numerous factors may contribute to the formation of bezoars. Previous gastric surgery appears to be the most common risk factor: 20-93% of the patients diagnosed with bezoars have a relevant history, and these may build up within 9 months to 30 years after gastric surgery. However, it is not commonly found after a hiatal hernia repair.[4,13,16] Specifically, vagotomy and partial gastrectomy in bariatric procedures substantially reduce the acidity and quantity of gastric juices, thus adversely affecting peptic activity and/or limiting the mechanical fragmentation of food particles.[5,10,12,13] Concomitantly, pyloroplasty, antrectomy or gastrojejunostomy result in a wide gastric outlet as the pylorus can no longer act as a doorkeeper that deters the passage of large bolus's.[5,10,12,13]

Ultimately, maldigested large food boluses pass into the duodenum and the small intestine, predisposing to bezoar formation.[12] Rapid swallowing in association with poor mastication due to artificial dentures, mainly in the elderly but also in people with mental and psychological disorders (e.g., trichobezoars) have been cited the most.[12] In addition, conditions such as peptic ulcer disease, chronic gastritis, Crohn's disease, gastrointestinal carcinoma, Guillain-Barre syndrome, myotonic dystrophy, hypothyroidism, diabetes mellitus, renal failure, postoperative adhesions and medications that delay gastric motility should also be considered as potential contributors to bezoar formation.[5,10,12,13] Most interestingly, certain studies have described patients developing bezoars without predisposing conditions, suggesting that temporary eating habits or acid alterations in the stomach may play a role as well.[12]

In rare cases, bezoars may appear primarily in the small intestine causing intermittent or permanent intestinal obstruction.[12] In these instances, intestinal motility is significantly impeded by pathological disturbances such as diverticula, strictures, or neoplasms.[12] Based on their composition, bezoars are typically classified into four main types: phytobezoar, trichobezoar, lactobezoar, and pharmacobezoar.[3,4] Trichobezoars are formed from compressed hair and hair-like fibers whereas Lactobezoars are composed of synthetic milk and formula in low-birth weight and premature neonates.[3,5,17] Pharmacobezoars are built from medications containing cholestyramine, kayexalate, bulk-forming laxatives (perdiem, psyllium, guar gum), or extended-release drugs coated with cellulose acetate.[3,5] 40% of reported bezoars are due to phytobezoars, which develop from excessive consumption of indigestive fibers such as cellulose, hemicellulose, lignin, or tannins seen in plant and fruit seeds, roots, leaves, pulp such as celery, grape, prune, persimmon and pineapple.[3–8] 78% of phytobezoars are located in the stomach and 17% can be found in the small intestine.[4]

Patients who develop phytobezoars may be asymptomatic or may develop epigastric discomfort or pain, nausea, vomiting, diarrhea, dysphagia, weight loss, early satiety, or gastrointestinal ulceration resulting in anemia, tarry or bloody stools. They can also present with a gastric outlet obstruction (GOO) and perforation.[5,7,10–12,17] Gastric outlet obstruction has an incidence of 0.4 to 4% compared to obstructions caused by malignant neoplasm (50-80%), but the incidence of bezoars post hiatal hernia repair is not known.[3,9–11,13] When an obstructive pattern occurs, it is mostly in the small intestines, mainly 50-70 cm proximal to the ileocecal valve.[13,16] Rancourt et al reported a bezoar and secondary esophagitis after an elective paraesophageal hernia repair due to intraesophageal migration of Teflon pledgets 11 months after the procedure.[18] Our patient developed a gastric outlet obstruction from a phytobezoar one week after a hiatal hernia repair.

Although barium X-ray, ultrasonography, and CT scans can be used to diagnose phytobezoars, upper gastrointestinal endoscopy is the gold standard, as it can directly visualize and treat the condition.[4,9] Barium studies can aid in the localization and appearance of

bezoars, but they can exacerbate peritonitis in the setting of perforation and increase complete bowel obstruction symptoms.[12,13]

In these studies, bezoars would appear as an intraluminally-filling defect or a mottled appearance similar to a villous tumor.[16] On ultrasonography, bezoars appear as a hyperechoic acoustic shading, but this imaging modality has low sensitivity and image accuracy is operator- dependent.[13] Abdominal CT can assist with excluding other causes of intestinal obstruction, and a pathognomonic finding of bezoar is a round or ovoid intraluminal mottled mass with air bubbles at the site of obstruction.[11–13] In an upper endoscopy, bezoars typically appear as a single mass within the gastric fundus and may vary in color depending on their composition (green, black, beige, or other colors).[12]

The treatment of bezoars will depend on their chemical synthesis, location, volume, and associated pathology and can be categorized into four types: chemical dissolution, endoscopic removal, adjuvant prokinetics, and surgery (laparotomy and/or laparoscopic surgery).[5,12,17] In the event of an intestinal or gastric obstruction, fluid and electrolyte resuscitation in addition to gastric and intestinal decompression should be the initial therapeutic step prior to bezoar removal to correct any chemical imbalances that may have occurred from vomiting or fluid accumulation.[12] In the past, surgical intervention was considered the treatment of choice for phytobezoars, but conservative management with chemical dissolution or enzymatic agents is now preferred as it is effective, non-invasive, and inexpensive.[3,5,7,12,17,19]

Chemical dissolution agents are carbonated beverages (Coca-Cola), saline solution, hydrochloric acid, enzymatic agents such as cellulase, papain (a proteolytic enzyme extracted from the Carica papaya plant), or N-acetylcysteine.[3,5,7,12,17] Of all the agents available, Coca-Cola has shown to be the most efficacious.[14] The first successful treatment using Coca-Cola lavage was described by Ladas et al.[20] It has been suggested that certain ingredients within the beverage such as sodium bicarbonate, carbonic acid, and phosphoric acid play a role in the dissolution process.[5,7] Sodium bicarbonate is believed to have a mucolytic effect whereas carbonic and phosphoric acid's acidity (pH 2.6), similar to the gastric pH, enhance the breakdown of the bezoar.[5,7,14] Additionally, the carbon dioxide bubbles assist in penetrating the pores of the bezoar aiding in digestion, hence not surprisingly, patients with decreased gastric acidity have an increased risk of developing phytobezoars.[5,7,14]

Other possible chemical dissolutions are papain and cellulase. Papain hydrolyzes the proteins allowing for rapid fragmentation and dissolution of the bezoar; however, papain therapy can cause gastric ulceration and esophageal perforation and safe maximum doses have not been defined.[5,14] Cellulase cleaves the glycosidic bonds of the polysaccharides within the cellulose in the fibers within vegetables and plants, a major component of phytobezoars, but it is unavailable in many countries.[5,7,12,14] Guidelines or consensus regarding the quantity and timing for each of these solutions are lacking.[12] A precautionary measure is to monitor for small bowel obstruction as smaller fragments formed afterwards can migrate distally so mandatory hospitalization and monitoring of patients is necessary.[19]

If chemical dissolution of phytobezoars fails, the next choice is to remove the bezoar via endoscopy. This was first performed by McKechnie in 1972 and successfully reported as a treatment by Kurt et al.[17,21,22] A variety of endoscopic devices are used to aid in bezoar fragmentation, such as biopsy and alligator forceps, polypectomy snare, basket catheter, argon plasma coagulation device, and electrohydraulic lithotripsy device.[3–5,9] Initially, the phytobezoars are broken down into fragments through the use of a water jet, endoscopic spraying, or injection of Coca-Cola and then suctioned through a large channel endoscope.[5,12,17] The smaller fragments are then removed using snares, Dormia baskets, endoscopic large-bore nasogastric tubes or by passing through the gastrointestinal tract.[12,19] One of the limitations of endoscopic removal is that it requires patients to have a functional pylorus with no duodenal obstruction, as large fragments can cause impaction during the removal process leading to intestinal obstruction and/or perforation.[3,12,23]

For some patients, the use of adjuvant prokinetic agents such as itopride, mosapride, and metoclopramide have aided gastric bezoar dissolution by increasing the frequency of gastrointestinal contractions that leads to gastric emptying, if the bezoar composition can be softened through peristalsis.[17] When the bezoar is refractory to all other treatment modalities, or if it is a giant mass or located in the lower gastrointestinal tract causing ileus, ischemia, obstruction and perforation, surgical intervention via enterotomy, laparotomy or laparoscopic removal is the only treatment of choice.[4,5,12,13,17,23] The type of surgery will depend on the size and number of bezoars, and if there are any current or previous complications.[13] Laparoscopy provides better visualization of the whole abdomen and results in fewer complications and a shorter length of stay, but requires technical experience and a detailed preoperative evaluation.[12,13]

Enterotomy is the surgical method of choice for bezoar-induced intestinal obstruction.[12,13] The milking technique advances the bezoar proximally towards the stomach or distally through the ileocecal valve, but laceration of the intestinal mesentery, serosa or mucosa causing bleeding can be a complication.[4,12] The successful combination of laparoscopic and endoscopic surgery has been described in two cases of gastric trichobezoar extraction as endoscopy increases visualization of the mass and offers

better intraoperative control during fragmentation and extraction.[12]

Successful combination of endoscopic removal or gastric lavage in conjunction with pharmacotherapy such as L-cysteine, cellulase, metoclopramide have been reported.[3,23] The recurrence rate of gastric bezoars has been reported to be approximately 14%.[10] To prevent the formation of bezoars post-bariatric surgery, proper mastication and sufficient fluid intake of at least 1.5 liters daily, and minimizing or avoiding ingestion of particular fibers in food such as persimmon fruits, vegetables, and citrus fibers have been suggested.[10,11] There are no set guidelines regarding the follow-up timing post-treatment, which ranges from two weeks up to 72 months, leaving it to the discretion of the surgeon, on a case-by-case basis.[4,9,14,16,20,24]

CONCLUSION

Gastric phytobezoars are a rare conglomeration of undigested fibers in bulk that can be asymptomatic or present uncommonly with gastric outlet obstruction. It is imperative to remember that previous surgery within a period of 9 months to 30 years is the most common predisposing factor, although it has not been described after robotic hiatal hernia. Chronic conditions such as Crohn's disease and constipation likely make patients more prone. Chemical dissolution with Coca-Cola is a successful non-invasive alternative to the surgical removal of the phytobezoar.

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