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CLINICAL STUDY

Surgical treatment of phytobezoars causes acute small intestinal obstruction

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Abstract: *Purpose:* Our aim was to perform a clinical analysis of small intestinal obstructions caused by surgically treated phytobezoars.
Methods: Twenty-four patients, with small intestinal obstructions caused by phytobezoars, underwent surgery in our department between 1998 to 2008, were reviewed retrospectively.
Results: Twenty (83.3 %) of 24 patients had previous gastric surgery. Preoperative computed tomography (CT) was performed in nine patients and seven (77.8 %) patients, showed results consistent with a bezoar and subsequently, underwent surgery on the same day. The remaining patients had no preoperative diagnosis of a phytobezoar were typically followed-up for postoperative adhesion intestinal obstruction. Only those patients who showed no response to nonoperative treatment options underwent surgery. The phytobezoar was fragmented and milked into the cecum in 11 (45.8 %) patients or extracted via longitudinal enterotomy in 12 (50 %) patients; the remaining patient (4.2 %) was treated via laparoscopy. Three patients had gastric phytobezoars, which were extracted via gastrotomy. There was no postoperative mortality. Two patients with previous enterotomy had either postoperative wound infection or wound infection and evisceration.
Conclusions: Phytobezoars should be considered in the differential diagnosis of acute small ýntestinal obstruction in patients with prior gastric surgery, poor dentition, or consume fiber-rich foods. Abdominal CT is useful for both diagnosis and for the decision to perform emergency surgery. When possible, the phytobezoar should be fragmented and milked into the cecum. Laparoscopic fragmentation may be useful in such cases *(Tab. 3, Ref. 28).* Full Text (Free, PDF) *www.bmj.sk.*
Key words: phytobezoar, small intestinal obstruction, surgery.

Small intestinal obstructions comprise the primary cause of admission to surgical clinics. However, because various factors may cause small intestinal obstructions, they can be difficult to diagnose and treat. The majority of small intestinal obstructions are caused by postoperative adhesions and strangulation of abdominal wall hernias, particularly in the elderly. Other causes of small intestinal obstruction include tumors originating from the small intestinal wall, ingested foreign materials, bezoars, and gallstones entering the small intestine (1).

A bezoar is a mass of undigested food, hair, or other material that becomes lodged in the gastrointestinal tract. According to their content, bezoars are classified as phytobezoars, trichobezoars, lactobezoar, mixed medication bezoars, or bolus food bezoars (2). Phytobezoars, the most common type of bezoar, are masses of undigested vegetable material (3), and are most commonly observed in patients who have undergone gastric surgery and show impaired gastric emptying (4). Gastric bezoars are also observed in diabetic neuropathy, myotonic dystrophy, and hypothyroidism, which result in gastric stasis (5, 6). Most reported cases of bezoars originate in Mediterranean countries, where persimmons, oranges, and vegetables are commonly ingested (7).

Although phytobezoars are commonly found in patients with a previous history of gastric surgery, they are uncommon but important causes of small intestinal obstruction. Bezoar-induced small intestinal obstruction remains an uncommon diagnosis that poses a major diagnostic and management challenge (8). The treatment objective for intestinal bezoars is to extract the mas surgically or nonsurgically and to prevent recurrence; however, this is dependent upon making an accurate preoperative diagnosis.

Here, we review the diagnostic and treatment modalities of 24 patients who underwent surgery due to small intestinal obstructions caused by phytobezoars.

Patients and methods

Twenty-four patients who underwent surgery due to small intestinal obstructions caused by phytobezoars from January 1998 to March 2008 were reviewed retrospectively. Gender, age, radiological and clinical signs, location of the phytobezoar, treatment modality, and morbiditiy and mortality rates were investigated.

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Results

Twenty-three (4.7 %) of 480 patients who underwent surgery due to small intestinal obstruction from 1998–2008 had phytobezoars. The average age was 63 years (range, 4074 years). Ten (41.7 %) patients were female, and 14 (58.3 %) patients were male. Twenty (83.3 %) patients had a history of gastric surgery 620 years prior to the obstruction. These previous surgical procedures were summarized in Table 1. Four patients had no surgical history and one patient had diabetes mellitus. Coincidental diseases included diabetes mellitus in three patients, hypertension in five patients, and chronic pulmonary disease in one patient.

Twenty-three patients showed symptoms of small intestinal obstruction (i.e., nausea, vomiting, abdominal distension, colic-type abdominal pain, and constipation) and one patient showed indications of partial obstruction.

Twenty-three patients showed a single small intestinal phytobezoar, whereas one patient had two ileal phytobezoars. Three patients also had gastric phytobezoars. The results of diagnostic procedures are summarized in Table 2. Plain abdominal X-ray radiography revealed air-fluid levels in all patients. Preoperative abdominal ultrasonography (USG) was performed in 11 patients, all of whom showed dilated small intestinal segments. USG revealed bezoar causing ileus in two (18.2 %) patients. Preoperative CT was performed in nine (37.5 %) patients, all of whom showed dilated small intestinal segments. An accurate diagnosis was made in seven (77.8 %) patients and gastric bezoar was determined in one patient.

All patients underwent surgery. One patient was treated laparoscopically, whereas the remaining patients required open surgery. Surgery revealed a phytobezoar in the ileum in 19 (79.2 %) of 24 patients and in the jejunum in five (20.8 %) patients (Tab. 3).

One patient was treated laparoscopically and the phytobezoar was fragmented using a grasper. The patient was discharged on the sixth postoperative day without any complication. In the remaining 23 patients treated via open surgery, phytobezoars were fragmented and milked into the cecum in 11 (47.8 %) patients and extracted via enterotomy in 12 (52.2 %) patients, according to fragmentability or at the discretion of the surgeon. One patient was diagnosed with two phytobezoars (in the stomach and ileum) via preoperative CT. Initially, an attempt was made to extract the gastric bezoar via endoscopy, but it failed due to the large size of the mass. Instead, the phytobezoar was extracted via gastrotomy and the ileal bezoar was fragmented and milked into the cecum. Abdominal exploration revealed that two patients with ileal phytobezoars also had gastric bezoars, which were extracted via gastrotomy. No patient showed any symptoms of small intestinal ischemia.

Patients who underwent enterotomy had a median hospital stay of 7±1 days, whereas patients who underwent fragmentation and milking into the cecum stayed 4±2 days. Complications were observed in two patients who had undergone enterotomy; one patient developed a postoperative wound infection and the second developed a wound infection with evisceration. The remaining patients recovered without complication. All patients were advised regarding feeding habits. No recurrence was observed over a mean 5-year follow-up period (range, 1–9 years).

Tab. 1. Previous gastric surgeries.

Type of previous gastric surgery	(n=20)	n %
Bilateral truncal vagotomy + gastroenterotomy	10	50
Truncal vagotomy + pyloroplasty	4	25
Omentopexy for peptic ulcus perforation	1	5
Distal subtotal gastrectomy or antrectomy + Billroth II anastomosis	1	5
Unknown	4	20

Tab. 2. Summary of diagnostic procedures.

	n	%
Direct abdominal radiography (n=24)		
Intestinal air-fluid levels	24	100
Ultrasonography (n=11)		
Intestinal dilation and wall thickness	11	100
Intraluminal bezoar	2	18.2
CT (n=9)		
Dilated intestinal segment	9	100
Intraluminal mass with gas bubbles and hypodense areas in: – intestine	6	66.7
– intestine and stomach	1	11.1

Tab. 3. Localization of phytobezoars.

Localization	(n=24)	n %
Ileum	17	70.8
Jejunum	41	6.7
Ileum + stomach	2	8.3
Jejunum + stomach	1	4.2

Discussion

Phytobezoars are formed by insufficiently digested fruit or vegetable residues. They are commonly found in the stomach, but may form in the intestine after fiber-rich food intake (9). The incidence of post-gastrectomy bezoar formation ranges from 5 to 12 % in a previous report (11). Previous gastric surgery contributes to bezoar formation by diminishing gastric motility, and vagotomy contributes by reducing gastric acid secretion (12, 13). Other contributing factors include insufficient chewing, eating too fast, and reduced pyloric function (14). Cellulose is difficult to digest even in healthy indivduals; thus, impaired cellulose digestion in gastrectomy patients may result in bezoar formation (15). Phytobezoars may remain in the stomach or be partially or totally transported into the small intestine, resulting in partial or

total intestinal obstruction. However, intestinal obstruction due to bezoars is rare (8), and responsible for only 0.44 % of all small intestinal obstructions (13, 14). In the present study, bezoars accounted for 4.7 % of all small intestinal obstructions.

Phytobezoars are thought to cause more intestinal obstructions than other bezoar types because they are typically more solid, more amorphous, and more likely to cause multiple blockages.14 However, only one of our patients developed more than one small intestinal phytobezoar, and three patients also had gastric phytobezoars.

Although the possibility of bezoars moving into the small intestine in post-vagotomy patients is low, pyloroplasty and gastroenterostomy facilitate the passage of gastric bezoars through the intestine by increasing gastric output (9, 14). In addition, postoperative adhesion may prevent the phytobezoar from moving through the intestine, resulting in an obstruction at a proximal site (14). An intact pyloric valve prevents the passage of large particles that are more likely to result in an intestinal obstruction (12). However, several cases of phytobezoars forming in the intact gastrointestinal tract have been reported (21). In the present study, four (16.7 %) patients had no previous history of abdominal surgery. One of these patients, one with diabetes developed two phytobezoars (gastric and ileal).

Gastric phytobezoars are usually identified during upper gastrointestinal endoscopy. At this stage, phytobezoars may remain asymptomatic until reaching a large size, at which point they may cause upper gastrointestinal distension and dyspepsia. During this period, a palpable mass may be present in the epigastric region.

Because the 50–75-cm region proximal to the ileocecal valve is the most narrow segment of the small intestine, with relatively weak peristalsis, phytobezoars passing through the stomach are more likely to become impacted in this region. Larger bezoars cause obstruction in the proximal small intestine (9). Symptoms arise according to whether the obstruction is partial or total. In addition, common symptoms such as nausea, vomiting, abdominal pain, constipation, and abdominal distension may mimic those of peptic ulcus or carcinoma.810 Impacted phytobezoars may also impair intestinal wall perfusion, leading to intestinal perforation; this condition, which requires surgical intervention, is characterized by acute abdominal signs, fever, and increased white blood cell count (23). In the present study (19), (79.2 %) patients showed ileal phytobezoars, whereas jejunal obstructions were observed in 5 (20.8 %) patients. No patient showed signs of ischemia.

Conservative treatment of intestinal obstruction caused by postoperative adhesions and laparotomy when conservative treatment fails are widely accepted.16 High intake of cellulose-rich food and previous gastric surgery are important considerations in diagnosis.17 In our region, fiber-rich food is common and several local dishes include vegetables and fruit leaves. In addition, poor dentition becomes increasingly common after 50 years of age. Therefore, phytobezoars should be considered in the differential diagnosis of intestinal obstructions in patients over the age of 50 with a medical history of gastric surgery and eating fiber-rich food.

Although abdominal radiography is sufficient for the diagnosis of intestinal obstruction, differentiating between a bezoar versus postoperative adhesion via this modality is not possible (18). However, intestinal obstruction may be determined via abdominal ultrasonography, with a rate of 93 % in patients with intestinal bezoars (18). Abdominal ultrasonography is able to visualize intestinal luminal enlargement and the thin intestinal wall typical of intestinal bezoars. In a recently published case series, intraluminal bezoars were identified via ultrasonography in 15 (88 %) of 17 patients (18). In the present study, abdominal radiography revealed air-fluid levels indicative of intestinal obstruction in all patients. However, abdominal radiography was not sufficient to determine the presence of a bezoar in all cases. Preoperative USG was performed in 11 (45.8 %) patients, which confirmed the presence of an intraluminal bezoar in 2 (18.2 %) patients. This low rate of detection may reflect the lack of preoperative suspicion and performing USG only under emergency conditions.

Intraluminal bezoars can also be diagnosed via preoperative CT in patients with small intestinal obstructions (18, 20). In the present study, preoperative CT was performed in nine (37.5 %) patients, and revealed the presence of an intestinal intraluminal bezoar in seven (77.7 %) of nine patients. Therefore, CT appears to be useful in the diagnosis of patients with suspected intestinal bezoars and may help to prevent unnecessary delays before surgery.

Previous studies have reported successful outcomes for the medical treatment of selected patients with partial intestinal obstructions (24, 25). However, in the presence of a bezoar, medical treatment has a relatively low success rate and early surgical treatment is recommended to prevent strangulation.14 Surgical treatment options include extraction of the bezoar via enterotomy, fragmentation and milking to the ileocecal valve without enterotomy (in cases of solid phytobezoars), or segmental intestinal resection and end-to-end anastomosis for patients with impaired intestinal wall perfusion.1 In addition, recent studies have reported successful outcomes for laparoscopic and laparoscopy-assisted management of small intestinal bezoars (26, 27). In a study, Yau KK. at al reported that laparoscopic surgery produces better postoperative results compared to open surgery for the treatment of small intestinal bezoars (26). In our study, one patient who underwent gastric surgery 20 years prior to presentation was diagnosed via abdominal CT and treated by laparoscopy. The phytobezoar was located in the jejenum and fractured using a grasper. These results demonstrate that laparoscopy is useful in the diagnosis and treatment of intestinal phytobezoars.

A characteristic sign of intestinal obstruction during surgery is intestinal dilation proximal to the point of obstruction and collapse of the distal segment. If the obstruction is caused by a bezoar, it is palpable intraluminally. In some cases, fragmenting the bezoar and milking it through the cecum is possible. If this is not feasible, the bezoar is extracted via enterotomy (21, 22). In addition, examining of the entire intestinal and gastric regions to exclude the presence of any other bezoar is recommended. In our study, three patients also had gastric bezoars. Such obstruc-

tions should be extracted via gastrotomy (5). If examining the entire gastric segment is impossible due to excessive adhesions, performing preoperative gastroscopy may be useful.

Sometimes evacuation of the bezoar through an enterotomy may be difficult due to large size of bezoar and small bowel resection can be performed in this condition (28). Another indication of resection is small bowel infarction due to bezaor inpaction. There was not any indication of small bowel resection in our patient.

Following enterotomy, postoperative wound infection occurred in one patient, and a second patient developed a wound infection and evisceration. Because enterotomy involves the risk of intra-abdominal or dermal-epidermal contamination with proximal intestinal content, it should be avoided at all costs.

In conclusion, our results suggest that, phytobezoars should be considered in the differential diagnosis of acute small ýntestinal obstruction patients who have previously undergone gastric surgery, have poor dentition, or are in the habit of consuming fiber-rich food. Abdominal CT is useful in both diagnosis and the decision making to perform emergency surgery. When possible, the phytobezoar should be fragmented and milked through the cecum. Laparoscopic fragmentation may be useful in such cases.

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