

# Phytobezoar-induced small bowel obstruction associated with a concomitant gastric phytobezoar and ulcer in an elderly woman



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**Phytobezoar-induced small bowel obstruction associated with a concomitant gastric phytobezoar and ulcer in an elderly woman**

*Bezoars are aggregates of indigested foreign material that accumulate in the gastroenteric tract, especially in the stomach and in the narrowest points of the small bowel. They often occur in subjects who follow a diet rich in fruit and vegetables and in those one who previously underwent gastric resective surgery for peptic ulcer. Bezoar formation has even been observed in case of reduced gastric motility and secretion due to diabetes, hypothyroidism, pernicious anemia, myotonic syndromes, and Guillain-Barré syndrome. As they are an uncommon cause of small bowel obstruction, phytobezoars are often not considered in the differential diagnosis of occlusive intestinal syndromes and so frequently come as an intra-operative finding. A consequence of this missed diagnosis in the preoperative period is an unnecessary diagnostic delay that can significantly increase morbidity and mortality. This case report illustrates the need to include phytobezoars in the preoperative diagnostic workout of intestinal obstruction in order to rule out the presence of multiple bezoars and prevent recurrent obstruction. Now that phytobezoars are becoming a less infrequent cause of small bowel obstruction than previously thought, such a diagnostic possibility should always be considered.*

**KEY WORDS:** Bezoars, Bowel occlusion

## Introduction

Bezoars are concretions of indigested foreign material that accumulate in the gastrointestinal tract, usually in the stomach. The term bezoar derives from the old Persian "pâdzahr"<sup>1,2</sup> (through the French "bezourd") meaning "to expel poisons" and was originally applied to a greenish hard concretion found in the fourth stomach of the Syrian goat. In ancient times (as early as 1000 BC)<sup>2</sup>

bezoars found in the gastrointestinal (GI) tract of ruminant animals (goats, sheep, gazelles) were used as charms or were ground up and ingested as antidotes to poisons or remedies for heterogeneous diseases, such as vertigo, epilepsy, *plague*, *dysentery* and leprosy<sup>1,3</sup>.

Although the first report of human bezoar is credited to Baudamant in 1779, it was not until 1854 that Swain made the first post-mortem diagnosis of phytobezoar in man<sup>4</sup>, while the first pre-operative diagnosis was made by Stelzner in 1896<sup>5</sup>. Rare finding in human medicine bezoars can be categorized into four types: phytobezoars, which are composed of vegetable matter (more precisely, "iniobezoar" if composed of seeds and/or fibers; "carpobezoars" if composed of fruits<sup>6</sup>; "diospyrobezoar" if composed of persimmon fibers), trichobezoars, which are composed of hair, pharmacobezoars, which are composed of medications or medication vehicles, and lactobezoars (or milk curd bezoars, unique to neonates) found in low-

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birth-weight neonates fed with a highly concentrated formula. A case of lactobezoar was quite recently reported in a 16-year-old boy following prolonged percutaneous endoscopic gastrostomy feeding<sup>7</sup>. Bezoar formation has also been described in early postoperative enteral feeding<sup>8</sup>.

Although one of the rarest mechanical causes of intestinal obstruction<sup>6</sup>, bezoars are considered the most common among the foreign bodies found within the GI tract<sup>5</sup>. Dervisoglou et al. report a casuistry of 369 cases of obstructive ileus of whom only a 2.39% were caused by bezoars<sup>9</sup>. And phytobezoars in turn are the most common type of bezoars and most often occur in subjects who follow a diet rich in fruit and vegetables, such as celery, leeks, beets, prunes, nuts, coconuts, cherry, tomatoes, raisins, mushrooms (high incidence in China)<sup>10</sup>, pineapple, cherry-laur<sup>5</sup>, oranges, persimmon (very high incidence in Israel where this fruit is particularly popular<sup>4</sup> and in Korea<sup>11</sup>, and (recently reported) jungle banana seeds<sup>12</sup>. These foods contain large amounts of non-digestible dietary fibers (cellulose, hemicellulose, lignin and tannins). Under exposure to the acid environment of the stomach monomeric tannins, if present in high concentration, polymerize forming a sticky coagulum that can constitute the starting point for bezoar development<sup>1</sup>. Malnutrition, especially in the mentally retarded or in the psychically disturbed, can also be a cause of bezoar formation<sup>13</sup>.

Only very rarely bezoar formation takes place in an intact GI tract<sup>1,14</sup>. In most cases the ingestion of large amounts of indigestible material is not enough for bezoar formation; usually a combination with a predisposing factor is also required. It has been demonstrated that bezoars are most commonly found in patients after gastric surgery for gastro-duodenal peptic ulcer (gastrectomy, bilateral truncal vagotomy plus pyloroplasty<sup>1,15,16,17</sup>). As for phytobezoars the most common predisposing factor is an altered gastric motility due to a modified GI anatomy and function for previous surgery (70-94%), which causes altered gastric motility, delayed emptying, and poor gastric mixing (the incidence of post-gastrectomy phytobezoars attains 50%)<sup>18</sup>. Bezoar formation has been observed in case of reduced gastric motility and secretion due to diabetes, hypothyroidism, pernicious anemia, myotonic syndromes, and Guillain-Barré syndrome<sup>1,14</sup>. Bezoar formation has been also reported in case of poor mastication (edentulous subjects, badly fitted dentures)<sup>1</sup>. Patients presenting a small bowel obstruction (SBO) with one or more of the above predisposing factors should be considered at high risk for phytobezoar as a causative agent and in a complete diagnostic workout this possible etiology should be looked for preoperatively. Phytobezoars commonly reside in the stomach but they can be found everywhere else along the GI tract. From the stomach they can migrate into the small bowel (secondary bezoars) and cause an obstruction. Primary small bowel bezoars are rarely found in the absence of an underlying small bowel disease (diverticulum, stricture or tumour)<sup>19</sup>.

Phytobezoars constitute masses that vary considerably in shape and size, being ovoid, cylindric, oblong or pyramidal and ranging from 5-10 cm long and 3-6 cm wide. They are usually dark brown or black with a smooth, rough or pitted surface. Although firm and compact when freshly removed they tend to be friable and crumble early after drying. When sectioned they are found to be composed of an amorphous gummy material interspersed with cellulose fibers and occasionally seeds and fruit skin are found.

In most cases gastric phytobezoars induce clinical manifestations such as epigastric discomfort (80%), anorexia, nausea, vomiting, dysphagia, early satiety, and weight loss and in up to 25% large ones may cause gastric ulcers from pressure necrosis<sup>1</sup>. Phytobezoars account for 0.3-6% of all intestinal obstructions<sup>9,20</sup>. Sometimes however gastric phytobezoars can run without symptoms. Small bowel phytobezoars are less frequent but very often (60-80%)<sup>5,21</sup>, if not almost always, obstructive<sup>19,22</sup>. They occur in 4% of all surgical admissions for small bowel obstruction<sup>10</sup> and usually are localized in its narrowest portion (in a decreasing order of frequency, terminal ileum – where the smallest diameter combines with a less strong peristaltic wave – or at the ileocecal valve and jejunum).

The true incidence of phytobezoars causing small bowel mechanical obstruction is not known and probably varies with the geographical location correlating with a higher ingestion of bezoar-inducing food<sup>10</sup>. No particular age or sex prevalence have been observed with phytobezoars<sup>19</sup>.

Physical exams are usually not revealing and lab results are not specific (slight anemia, mild leukocytosis), while abdomen plain X-rays (outline of bezoar or obstruction), sonography, Computed Tomography (CT) imaging, and upper gastrointestinal (UGI) series with barium (gastric filling defect) are more useful. CT technique is quite accurate in showing bezoar-specific features (presence of an ovoid, short intraluminal mottled mass up to 5 cm in length at the transitional zone of the obstruction) and is able to reveal the presence of additional gastrointestinal (GI) bezoars<sup>18</sup>. Endoscopy is usually diagnostic<sup>1</sup>. Several researchers are currently advocating the use of magnetic resonance imaging (MRI) for the evaluation of SBO because the advances in fast imaging techniques coupled with breath-holding can give a good visualization of bezoars, equal or even superior to CT<sup>23</sup>.

The complications of bezoars include obstruction, ulceration, hemorrhage, perforation<sup>24</sup>, peritonitis and even strangulation if diagnosis is delayed<sup>25</sup>. The higher incidence of obstruction in patients with phytobezoars is probably due to the fact that they tend to be multiple<sup>26</sup> and of a harder consistency. Gastroduodenal ulceration is only slightly less frequent than intestinal obstruction and their characteristics are similar to those of peptic ulcers.

Being uncommon, bezoar-induced SBO represents a diagnostic and management challenge (over and above

its clinical presentation lacks specificity). This condition should be suspected in patients at increased risk of formation of gastrointestinal bezoars (previous gastric surgery, poor dentition, and /or a suggestive history of increased fibre intake). CT imaging should be performed early in these at-risk patients and in patients presenting with SBO with or without a history of abdominal surgery in order to eliminate unnecessary delays before appropriate surgical intervention.

Notably, bezoar-induced SBO in subjects with history of gastric surgery may lead to an erroneous diagnostic hypothesis of adhesive obstruction for which a conservative treatment is often adopted, with the false expectation of a spontaneous resolution. Thus in a situation that would require an early operative approach a delayed definitive treatment may lead to increased morbidity.

Depending on its clinical presentation phytobezoar treatment can be: conservative (nasogastric lavage, clear liquid diet and prokinetic drugs); lytic (enzymatic: chymopapain, cellulase; non-enzymatic: N-acetylcysteine, Coca Cola)<sup>1,27,28</sup>, endoscopic (fragmentation and digital milking/retrieval; using large-diameter suction channel, if necessary<sup>1,29</sup>) or surgical (gastrotomy and removal; enterotomy and removal/segmental resection; both in case of multiple bezoars). In the vast majority of cases the operative approach is decisive.

Among alternative treatments success has been recorded in some cases using extracorporeal shock wave lithotripsy<sup>1,3</sup>. As mentioned before, phytobezoars with multiple locations have sometimes been described and even though such an occurrence is deemed relatively uncommon, it is strongly recommended, in a complete diagnostic work-out, to explore the entire gastrointestinal tract. Notably, the stomach and the small bowel could be the locations of a concomitant bezoar formation in the same subject, so both of them should always be explored. A good example of the validity of such a procedure is presented in the following case report.

## Case report

A 62-year-old woman was referred to our hospital for SBO. She arrived with a ten-day history of epigastric cramps and discomfort; awakened early in the morning with hunger pangs and heartburn that disappeared after taking a meal. She had no history of gastro-intestinal surgery.

Two days after she suffered a sudden sharp epigastric pain and vomiting of food residues streaked with fresh blood. Upon referral to an Emergency Room (ER), she was submitted to esophagogastroduodenoscopy (EGD) which revealed the presence of a hiatal hernia, a gastric ulcer (diameter 0.5 cm) with elevated borders and fibrin-covered base next to pylorus and widespread mucosal petechiae. Two biopsy samples (angulus and fundus gastric mucosa, respectively) were taken. A phytobezoar of undescribed characteristics was also noted within the



Fig. 1: Plain X-ray exam of the abdomen: multiple air fluid levels; no free air in the abdominal cavity.

gastric fundus. Duodenal mucosa was described as congested and edematous. The examination of the bioptic samples showed signs of non-specific mucosal inflammation, more evident in the antral area, and foveolar hyperplasia. The following day the patient was discharged with a diagnosis of non-atrophic gastritis and a prescription of acid-suppressing medications (proton pump inhibitor plus antacid) and a diet regimen.

Four days after, symptoms worsened, vomiting became almost continuous and abdominal pain and distension soon followed. She had had no bowel movements for three days. Finally she presented fecal vomiting. Then, she was referred to our Surgical Department.

On arrival, a physical examination revealed a painful distended abdomen with upper quadrant guarding and rigidity. The general physical condition of the patient was poor, but her vital signs were stable. A plain X-Ray exam of the abdomen showed multiple air-fluid levels and no free air in the abdominal cavity (Fig. 1). An ultrasonographic scan showed considerably dilated small bowel loops within the lower abdominal quadrants. A CT scan confirmed the presence of a notable distension



Fig. 2



Fig. 4

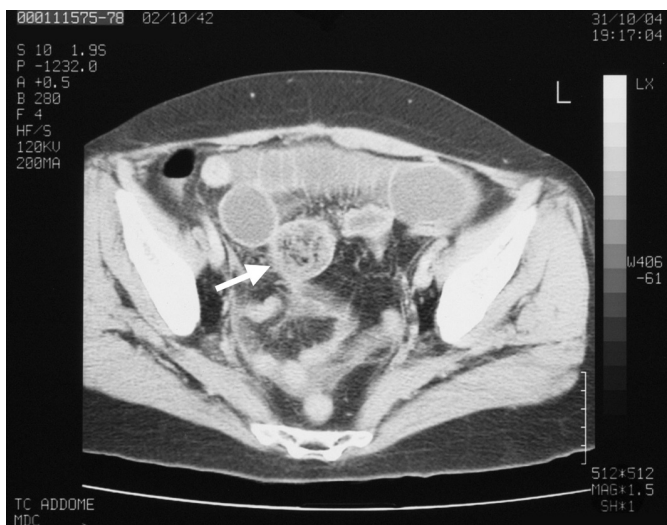


Fig. 3



Fig. 5

Figs. 2, 3, 4, 5: CT scan: notable distension of the jejunum and of the proximal ileum with several air-fluid levels due to mechanical obstruction probably caused by a foreign body. Ileal segments distal to the obstruction and colonic tracts are of a normal caliber. A large foreign body is also visible at the level of the gastric body.

of the jejunum and of the proximal ileum, with several air-fluid levels (Figs. 2, 3, 4). Distal segments of the ileal tract and colon were of normal diameter. Endoperitoneal effusion was visible within the perihepatic area and the pelvis Douglas pouch.

A preoperative EGD confirmed the presence of a gastric ulcer (1 cm Ø) with a fibrin-covered base, elevated and hyperemic borders and congested gastric mucosa. A bioptic sample was taken. Within the gastric fundus a mass of undigested material with the superficial appearance of a bezoar was noted. The mucosal lining of the first and second portions of the duodenum was edematous and hyperemic. At this level signs of a compression of the intestinal tract were present.

An urgent operative treatment approach was adopted. A median upper laparotomy showed dilated small bowel loops down to a site about 2 meters distant from the angle of Treitz, where a foreign body obstructed the intestinal lumen (Figs. 5, 6). Beyond that site the intestinal loops were of a normal caliber. A longitudinal jejuno-tomy allowed the extraction of a 7 x 2 cm foreign body ovoid in shape (Fig. 7).

A second foreign body round in shape and about 8 cm in diameter was removed from the stomach after a longitudinal gastrotomy at the level of the gastric body. Both foreign bodies presented with a smooth surface, a green-brownish marbling, and a firm and compact consistency.

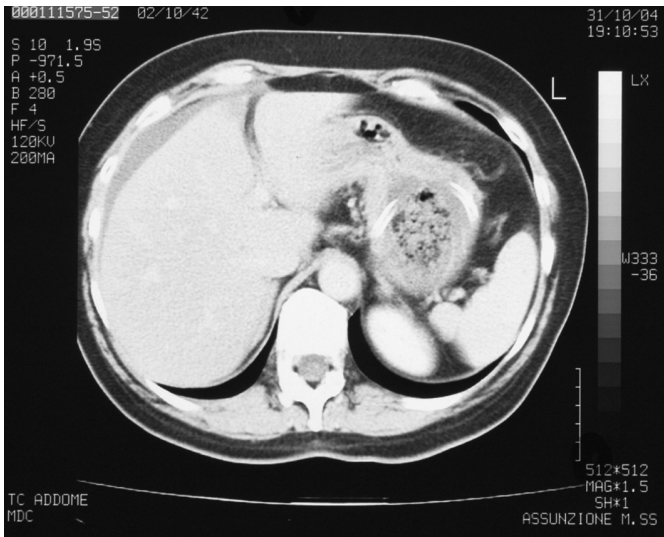


Fig. 6



Fig. 7

Figs. 6, 7: Intraoperative findings: mechanical small bowel obstruction due to a foreign body; the intestinal loop proximal to the obstruction is dilated while the distal one is of a normal caliber.



Fig. 8: The foreign body cause of small bowel mechanical obstruction in the reported case: a 7 x 2 cm phytobezoar ovoid in shape.

After surgery intestinal mobility and transit were normalized and the patient rapidly recovered.

Histologic examination of the two foreign bodies revealed that they were both composed of vegetable fibers of nutritional origin. The examination of the bioptic sample only showed an hyperplasy and a mild chronic inflammation of the foveolar epithelium. The search for *Helicobacter pylori* proved negative.

A subsequent enquiry of the patient's nutritional habits revealed that for many years she had been eating quite a substantial proportion of raw or poorly cooked long-stemmed vegetables.

A diagnosis of phytobezoar-induced SBO associated with a concomitant gastric phytobezoar and ulcer was made and the patient was discharged with the appropriate dietary advice.

## Discussion

Phytobezoars are an uncommon cause of SBO and are often seen in subjects with previous gastric surgery. In almost all cases of SBO in subjects with previous gastric surgery for peptic ulcer (gastrectomy, pyloroplasty, gastro-enterostomy, truncal vagotomy) the cause is a phytobezoar<sup>1,30</sup>.

In the absence of a history of gastric surgery, phytobezoars can also be a relatively common cause of SBO in Asian countries where the dietary habit of ingesting large amounts of vegetables and fruit (oranges and persimmons, in particular) favors the accumulation of undigested vegetable fibers in the stomach from where they can pass into the small bowel causing obstruction.

In western countries phytobezoars in subjects without a history of gastric surgery are a rare cause of SBO, unlike trichobezoars which may be relatively more frequent in psychologically-disturbed subjects.

This is the reason why in subjects with usual western dietary habits and no previous gastric surgery, phytobezoars are generally not considered among the possible causes of SBO and almost always come as an intraoperative surprise.

The present case is no exception. Although the phytobezoar has been noted in the gastric fundus during the previous esophago-gastro-duodeno-scopy, the suspicion of a relation with the clinical presentation didn't raise. The presence of the bezoar in the patient's stomach (described in the endoscopy report) did not deserve a mention in the final diagnosis! Unavoidably, that attitude ended in an inappropriate therapeutic behavior: the prescription of acid-suppressing drugs. If the bezoar etiology of her symptomatology had been suspected, probably an emergency surgical treatment wouldn't have been necessary. A less compelling surgical treatment approach might have been adopted in a patient with better physical condition.

The rest of this report illustrates part of the spectrum of bezoar-induced GI conditions: the phytobezoar pre-

sent in the stomach was associated with an ulceration (most probably a bezoar-caused pressure ulcer) near the pylorus area. Both phytobezoars had gone asymptomatic until few days before the SBO obstruction that caused the urgent admission of the patient into our department.

The take-home lesson we must learn from this case is the recommendation to change our diagnostic attitude and consider bezoars as being among the possible etiologies of SBO and, subsequently, to look carefully for any associated gastric bezoars during the pre-operative endoscopy. When a phytobezoar-induced SBO diagnosis is ascertained, either endoscopically or intraoperatively, a thorough exploration of the small bowel, duodenum and stomach is mandatory as phytobezoars can be multiple<sup>4,26</sup>, as in the case reported here. Overlooking a bezoar in one of these sites could mean running the risk of a new intervention for a recurrent phytobezoar-related SBO episode<sup>17,18,30</sup>. This is a risk that cannot be overemphasized; in fact, some authors recommend an annual endoscopic follow-up and a continuous prokinetic drug intake in such patients<sup>31</sup>.

The time has finally come, even in our part of the world, for phytobezoars to be no more a "jack-in-the-box" discovery during SBO surgery, for these good reasons: first of all, a delayed diagnosis may have serious consequences on morbidity and mortality; secondly, such a delay today can be easily avoided given our disposal of diagnostic techniques such as CT scan<sup>22,25,32</sup>, MRI<sup>23</sup>, and endoscopy. In the case of phytobezoars of small diameter (less than 3 cm) endoscopy can also be a treatment since it allows easy removal of small foreign body; thirdly, it should be considered that according with the decrease of gastric surgery for peptic ulcers, also one of the risk factors for the pathogenesis of phytobezoars has diminished.

Finally, it can be reasonably hypothesized that the phytobezoar incidence is going to increase due to the currently spreading adoption of salutistic diet regimens based on raw vegetable or fiber-rich food intake<sup>33,34,35</sup>. Moreover, because of globalization, a rising number of patients is of Asian origin and maintains the dietary habits of their native countries.

In conclusion, whenever feasible, an accurate dietary history should be part of the pre-operative diagnostic workout<sup>21</sup> and in the presence of a case of SBO a possible diagnosis of phytobezoar as a causative agent should always be considered.

## Riassunto

I bezoari sono concrezioni di materiale indigerito che si accumulano nel tratto gastroenterico, in particolar modo a livello dello stomaco. In base alla composizione si possono distinguere quattro tipi di bezoari: fitobezoari (di cui fanno parte gli iniobezoari, i carpobezoari e i dio-

spirobezoari), tricobezoari, farmacobezoari e lattobezoari. La formazione dei fitobezoari riconosce due principali fattori di rischio: la pregressa chirurgia del tratto gastrointestinale e l'assunzione con l'alimentazione di elevate quantità di materiali indigeribili. Per quanto riguarda la prima condizione, un ruolo predominante è svolto dalla chirurgia resettiva gastrica per ulcera peptica, che determinando un'alterazione della motilità sarebbe responsabile di un ritardo nello svuotamento gastrico, creando così le condizioni favorevoli alla precipitazione dei componenti del bezoario. Questa ipotesi è suffragata dall'associazione significativa di questa patologia con altre caratterizzate da alterazioni della motilità GI come il diabete mellito, l'ipotiroidismo ed alcune malattie neurologiche.

In secondo luogo alcuni studi dimostrano che i monomeri di tannino presenti nei materiali indigeriti possono polimerizzare quando esposti all'acidità gastrica e formare un nucleo che si accresce per successiva deposizione di strati. I fitobezoari, che possono avere forme e dimensioni molto variabili, si formano prevalentemente a livello dello stomaco ma possono essere ritrovati anche nel piccolo intestino; o per migrazione o per formazione primaria in presenza di altre condizioni predisponenti come diverticoli, stenosi o neoplasie.

Nella maggior parte dei casi la presenza di bezoari è clinicamente silente ma può causare disturbi di tipo dispeptico e talora complicarsi con emorragie, perforazioni, ulcere da pressione e occlusione intestinale per arresto del transito nei punti di minor diametro o dotati di minore forza peristaltica.

L'esame obiettivo di questi pazienti è spesso negativo e si raggiunge la diagnosi grazie all'uso di Rx, ecografia, TC e RMN. La terapia può essere conservativa, endoscopica o chirurgica.

Il nostro gruppo ha descritto il caso di una donna di 62 anni che giungeva alla nostra attenzione con un quadro di occlusione intestinale. Un esame endoscopico eseguito la settimana precedente aveva messo in evidenza un quadro di gastrite e la presenza di un fitobezoario nel fondo gastrico. Nonostante questo riscontro la paziente veniva dimessa con una terapia a base di IPP e antiacidi.

La descrizione di questo caso clinico vuole porre l'accento sulla necessità di una diagnosi precoce basata sul sospetto clinico in pazienti che presentano i suddetti fattori di rischio e sull'utilizzo tempestivo di mezzi diagnostici come la TC per non dilazionare nel tempo l'intervento terapeutico, al fine di ridurre in maniera significativa la morbidità e la mortalità correlate alle complicanze.

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