Phytobezoars in the Small Intestine: CT and US Appearances

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Purpose: To describe CT and ultrasound (US) appearances of phytobezoar in the small intestine.

Materials and Methods: During the past two years, CT and US scans of six patients with phytobezoars of the small intestine were retrospectively reviewed. All patients presented symptoms of bowel obstruction, and four had a history of gastric surgery. Four phytobezoars were found in the jejunum and two in the ileum at surgery. We evaluated CT and US findings of phytobezoar and compared these with CT images of the removed phytobezoars.

Results: In three patients, US studies showed a curvilinear echogenic mass within the lumen of the dilated small bowel, with a clear posterior acoustic shadow. In six, CT scans revealed an intraluminal mass seen as having a thin soft tissue rim at the periphery and numerous aggregated low attenuation areas representing gas in the central portion. CT findings of the specimens were the same as those of phytobezoars in vivo.

Conclusion: US and CT appearances of small intestinal phytobezoars are sufficiently distinctive to advocate the preoperative routine use of US and CT for diagnosing this entity.

Index Words: Bezoar, Intestines, CT, Intestines, stenosis or obstruction

Phytobezoars result from ingestion of vegetable and plant material of certain types. By far the most common cause is the persimmon (1, 2). It has been recognized that phytobezoar formation is common after a gastric operation, and causes gastric ulceration, bleeding, and gastrointestinal obstruction. Phytobezoars are likely to pose diagnostic difficulties in surgical patients when they enter into the differential diagnosis of disorders that cause abdominal pain and small bowel obstruction, particularly in patients who have previously undergone a gastric operation.

Several reports have described the radiographic findings of phytobezoar after the administration of a barium study, but few have described ultrasound (US) appearances (3, 4, 5). To evaluate the usefulness of US and CT in diagnosing this entity, this report reviews the US and CT features of small intestinal phytobezoars in six patients.

Materials and Methods

Over a recent two-year period, phytobezoars obstructing the small intestine were confirmed at surgery in eight patients. Six of these, who had undergone either CT or US scans, form the basis of this study. Four were men and six were women; their ages ranged from 35 to 87 (mean, 51). CT (n=6) or US (n=3) images, including clinical findings, were retrospectively reviewed. All patients reported abdominal pain, vomiting and indigestions, symptoms suggestive of intestinal obstruction. Four of the six had a previous history of gastric surgery for peptic ulcer between one
and thirty years before admission. Of the other two with no such history, one was diabetic. Four patients had a recent history of persimmon ingestion. Phytobezoar was founded only in the small bowel of four patients, and in the stomach and small bowel of two. At surgery, four phytobezoars were found in the jejunum and two in the ileum.

In all patients, CT scans were obtained by using GE 9800 or High Speed Advantage (General Electric, Milwaukee, Wisconsin) and other third generation CT scanners. After intravenous bolus injection of nonionic contrast material (Ultravist—300, Schering, Berlin, Germany), images were obtained with 10mm thickness and at 10mm intervals from the level of the dome of the liver to the pelvis. Two removed phytobezoars were also scanned with 3–5mm thickness and at the same intervals. In three patients, sonographic examination was performed with a 3.5 or 5.0MHz sector or linear transducer(Spectra, Diasonic, Milpitas, USA). The CT and US appearances of small intestinal bezoars were analysed and compared with radiographic findings of the specimen.

Results

US findings
In all three cases, US examination of the abdomen demonstrated multiple fluid-filled, dilated, hyperperistaltic small bowel loops, ascites and an intraluminal echogenic mass. (Fig. 1A, 2A). The masses were seen as a hyperechoic arc with a clear posterior acoustic shadow.

CT findings
In all six cases, CT showed well-marginated round or oval intraluminal masses, with a relatively homogeneous thin soft tissue portion at the periphery and an aggregation of numerous tubular or round low attenuation areas in the central portion (Fig. 1B, 2B). The peripheral portions of the mass were less than 3mm thick and their mean attenuation number was 40HU. The density of the central portion was about —200HU, suggesting that air was trapped within the mass. Small bowel loops proximal to the mass were dilated and filled with fluid. Mean bezoar diameter was 5cm (range, 3–8cm).

CT findings of the specimens
In two patients, CT of the specimen, revealed a soft tissue mass mixed with multiple irregular low attenuation areas representing gas (—200—400HU). These CT findings of the specimens were the same as those of phytobezoars in vivo(Fig. 2C).

Discussion
A phytobezoar is a large conglomerate of vegetable fibers. The formation of a persimmon phytobezoar is due to a soluble tannin termed shibuol, which forms a glue-like coagulum when astringent unripe fruit comes in contact with dilute hydrochloric acid in the stomach. The unripe fruit is found to contain a high concentration of the tannin monomer that undergoes polymerization in the stomach, resulting in a tannin-cellulose-hemicellulose-protein complex (1).

Fig. 1. A 58-year-old man with intermittent abdominal pain, vomiting, and constipation for a week. A. Transverse sonogram of right mid abdomen shows a hyperechoic, arc-like echo within the lumen of the ileum with clear posterior acoustic shadow. B. Contrast enhanced axial CT scan at the level of mid abdomen shows two intraluminal masses (arrows) with multiple low attenuation areas in the ileum and markedly distended proximal small bowel loops.
Phytobezoar formations have commonly been found after a gastric operation, particularly where bilateral truncal vagotomy plus pyloroplasty has been employed, and in hypomotility disorders of the stomach (4). The reasons for this are still not clear. Vagotomy, by reducing gastric acidity and motility, retarding gastric emptying and lengthening the exposure of gastric contents to dilute hydrochloric acid, may enhance the formation of phytobezoar. The drainage procedure, pyroloplasty or gastroenterostomy, eliminates pyloric sphincter function and facilitates the passage of large bezoars into the small bowel, and this may lead to intestinal obstruction. An intact pylorus usually prevents the transition of food particles large enough to obstruct the small bowel (6, 8).

In four cases, a history of persimmon ingestion was obtained one day to several weeks before the onset of symptoms; two patients had no history of previous gastric operation or persimmon ingestion. Diagnosis of phytobezoar is rarely made before surgical intervention, since phytobezoar is radiolucent and clinical symptoms and plain radiographs are similar to those of intestinal obstruction by other causes. US or CT may be utilized in patients with small bowel obstruction, especially when these is no history of previous gastric operation or persimmon ingestion.

Sonographically, phytobezoars were seen as an intraluminal mass with a hyperechoic arc-like surface echo casting a clear posterior acoustic shadow, as described in several case reports (4, 5, 9). The obstructed small bowel loops usually contained a large amount of air, and so phytobezoars could be overlooked if sonographic examination was not meticulously performed.

CT showed phytobezoar as an intraluminal mass of homogeneous soft tissue attenuation with aggregated low attenuation areas in the center. A lower resolution CT scanner, however, may show it as a round or oval mass with a central low attenuation area. An aggregation of numerous low attenuation areas may be seen as one large low attenuation area.

The curvilinear echogenic intraluminal mass with a clear postacoustic shadow on US and CT findings seen in our study may be specific for diagnosis of small in-
intestinal phytobezoar. Especially in patients with no previous history of gastric operation, persimmon ingestion, or diabetes mellitus, these findings could be a clue to the specific cause of bowel obstruction. Bezoars are much less likely to respond to conservative methods, and to prevent decubitus ulceration and pressure necrosis of the bowel wall, early surgery is recommended.

In conclusion, US and CT appearances of small intestinal phytobezoars are sufficiently distinctive to advocate the preoperative routine use of US and CT for diagnosing this entity.

References