Synergistic effect of multiple predisposing risk factors on the development of bezoars

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Abstract

AIM: To describe the clinical characteristics of patients with gastric or intestinal bezoars recently treated in our hospital.

METHODS: In this study, a retrospective chart review of consecutive patients with gastrointestinal bezoars who were treated at the Samsun Education and Research Hospital between January 2006 and March 2011, was conducted. Data on demographic characteristics, clinical presentation, history of risk factors, diagnostic procedures, localization of bezoars, treatment interventions, and postoperative morbidity and mortality rates were collected and evaluated.

RESULTS: Forty-two patients [26 (61.9%) males and 16 (31.1%) females] with a mean ± SD (range) age of 55.8 ± 10.5 (37-74) years were enrolled in this study. Thirty-six patients (85.7%) had one or more predisposing risk factors for gastrointestinal bezoars. The most common predisposing risk factor was a history of previous gastric surgery which was identified in 18 patients (42.8%). Twenty three patients (54.8%) had multiple predisposing risk factors. Phytobezoars were identified in all patients except one who had a trichobezoar in the stomach. Non-operative endoscopic fragmentation was performed either initially or after unsuccessful medical treatment in 14 patients with gastric bezoars and was completely successful in 10 patients (71.5%). Surgery was the most frequent treatment method in our study, which was required in 28 patients (66.7%). Intestinal obstruction secondary to bezoars was the most common complication (n = 18, 42.8%) in our study.

CONCLUSION: The presence of multiple predisposing factors may create a synergistic effect in the development of bezoars.

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Key words: Bezoar; Diospyrobezoars; Persimmon; Phytobezoar; Trichobezoar

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INTRODUCTION

Bezoars can be defined as masses of indigestible, hard materials formed in the gastrointestinal tract. Etymologically, the word bezoar came from the Persian word “padzahr” meaning to expel poison. In some societies, animal bezoars were formerly considered a useful medicine and possessed certain magical properties [1]. In 1854,
Quain reported an intragastric alimentary mass in an autopsy and called it a “bezoar”.

Bezoars can be classified as phytobezoars (undigested vegetables), trichobezoars (hairs), lactobezoars (milk) and pharmacobezoars (medications) according to their composition[1]. They usually form in the stomach and can pass into the small bowel where they occasionally cause obstruction. Phytobezoars are composed of undigested food fibers, such as cellulose, hemicellulose, lignin and fruit tannin. These fibers occur in fruits and vegetables such as celery, pumpkin, prunes, raisins, leeks, beets and persimmons.

The aim of this study was to describe the clinical characteristics of patients with gastric or intestinal bezoars recently treated in our hospital.

MATERIALS AND METHODS
A retrospective chart review of consecutive patients with gastrointestinal bezoars, who were treated at the Samsun Education and Research Hospital between January 2006 and March 2011, was conducted. Data on the demographic characteristics, clinical presentations, history of predisposing risk factors, diagnostic procedures, localization of bezoars, treatment interventions, morbidity and mortality rates were collected and evaluated. In addition, the patients were contacted by phone to determine any recurrence of bezoars after treatment.

In this study, previous gastric surgery, excessive consumption of some types of fruit and vegetables, diabetes mellitus, mastication problems, long-term antacid treatment and mental disorders were considered predisposing risk factors in the development of bezoars.

All calculations were performed in Microsoft Office Excel 2007. Continuous variables were summarized as mean ± SD or median when appropriate, and categorical variables as frequency and percentage (%).

RESULTS

Demographic characteristics and presentation
Forty-two patients [26 (61.9%) males and 16 (31.1%) females] with a mean ± SD (range) age of 55.8 ± 10.5 (37-78 years) were enrolled in this study. The peak incidence was in the 6th decade of life (51-60 years). Twelve patients (28.6%) were in the 6th decade.

The most common presenting symptom was abdominal pain which was noted in 40 patients (95.2%). Dyspeptic symptoms other than epigastric pain were found in 32 patients (76.2%). Mild to severe nausea and vomiting were observed in 29 cases (69%). Loss of appetite was found in 19 patients (45.2%) and a significant weight loss history was identified in 5 (11.9%) patients. Some degree of abdominal distention as a sign of intestinal obstruction developed in 18 patients (42.9%). Two patients presented with acute gastric outlet obstruction.

Twelve patients with intestinal or gastric outlet obstruction (47.6%) were admitted to our emergency service. Five patients (11.9%) were referred by gastroenterologists. The remaining patients (n = 17, 40.4%) were admitted to the general surgery clinic.

During the study period, 257 patients with mechanical bowel obstruction due to various reasons were admitted to our emergency service. Bezoars were the cause of mechanical bowel obstruction in 18 of these patients (7%).

History of predisposing factors
Thirty-six patients (85.7%) had one or more predisposing risk factors (Table 1). The most common predisposing risk factor was previous gastric surgery which was identified in 18 patients (42.8%). Excessive persimmon consumption was another significant predisposing risk factor in our study. A history of excessive persimmon consumption was observed in 17 patients (40.5%). Mastication problems and diabetes mellitus were identified in 16 (38.1%) and 12 (28.6%) patients, respectively. Twenty-three patients (54.8%) had multiple predisposing risk factors. All predisposing risk factors are summarized in Table 1.

Diabetic procedures
Initial diagnosis was made by gastroscopy in 15 patients (35.7%). Abdominal sonography was the first diagnostic method used in 7 patients (16.7%), which was carried out in 12 patients as the first imaging method. Plain abdominal radiography (PAR) showed air-fluid levels in 18 patients (40.5%). The typical bezoar image on PAR, involving a mottled air pattern, was identified in only two patients. Abdominal tomography was carried out in 16 patients and bezoars were revealed in 14 of these patients (87.5%).

Localization and composition
A single bezoar was found in 38 (90.4%) patients. Four patients (9.6%) had multiple bezoars in different locations.
Bezoars were mainly located in the stomach ($n = 28$). Other locations were the ileum, jejunum and colon ($n = 14$, $n = 3$ and $n = 1$, respectively). Phyto-bezoars were identified in all patients except one who had a trichobezoar in the stomach. The patient with the trichobezoar was a 43-year-old woman, who had a history of psychiatric problems and trichotillomania.

**Intervention**

Medical treatment with various enzymatic agents (including cellulase and cola) was initially tried in 15 cases with small gastric bezoars, however, enzymatic treatment was completely successful in only 4 patients (26.7%). Nonoperative endoscopic fragmentation was performed either initially or after unsuccessful medical treatment in 14 patients and was completely successful in 10 patients (71.5%).

Surgery was the most frequent treatment method in our study, which was required in 28 patients (66.7%). Bezoars were removed from the stomach by gastrotomy in 8 patients. Preoperatively diagnosed small bezoars which were located in the distal ileum were carefully milked into the cecum in 8 cases. In 9 cases, it was not possible to milk the bezoars into the large intestine and an enterotomy was required. The patient who had a colonic bezoar in the ascending colon was treated with colotomy. In these 18 patients with intestinal bezoars and additional gastric bezoars were found and extracted via gastrotomy in 4 patients.

Coexisting gastric ulcers were identified in 5 (20.8%) of the patients with gastric bezoars. While anti-ulcer medication was prescribed in endoscopically treated patients, $n = 3$, wedge resection of ulcers was added to the gastrotomy in operated patients $n = 2$. Histopathological examinations of the ulcers revealed benign findings in all 5 patients.

**Postoperative outcomes and complications**

The mean postoperative hospital stay was 6.1 ± 1.7 d (range, 3-12 d) in our study. Postoperative complications developed in 7 (25%) patients (surgical site infection in 3 (10.7%) cases, chest infection in 2 (7.1%) patients and prolonged ileus in 2 (7.1%) patients.

We were only able to contact 32 (76.2%) patients by phone. There were no clinical recurrences in these patients during a median follow-up time of 25 mo (range, 3-63 mo).

**DISCUSSION**

A number of predisposing factors may contribute to the risk of bezoar formation. Previous gastric surgery was reported in 20% to 93% of patients with bezoars and the incidence of bezoar formation after gastric surgery ranged from 5% to 12% [4,7]. Similar to previous published studies, the most common predisposing risk factor was previous gastric surgery which was identified in 42.8% of the patients in our study. Altered anatomy and physiology of the gastric remnant after vagotomy and partial gastrectomy are largely responsible for bezoar formation. Vagotomy and partial gastrectomy diminish the ability of the stomach to break up and digest food. Both the quantity and the acidity of the gastric juice are reduced and peptic activity is adversely affected [10,14]. Additionally, the antrum has an important role in the mechanical fragmentation of ingested material, and the pylorus prevents large boluses from reaching the small intestine. Resection of the antrum and pylorus may lead to the passage of a non-fragmented, large bolus to the small intestine. The interval between gastric surgery and bezoar detection was 9 mon to 30 years [4,7]. In our study, the mean interval between surgery and bezoar detection was 7.4 ± 2.3 years (5-11 years).

Excessive consumption of persimmon was identified in 40.5% of our patients. Persimmon, which grows in many areas in our region and widely consumed, is the fruit of a number of species of trees belonging to the genus Diospyros. The word Diospyros means “the fruit of the gods” in ancient Greek. Persimmon bezoars are also known as diospyrobezoars. Unripe persimmons contain soluble tannin. Tannin polymerizes in an acidic environment to form a glue-like coagulum, which can affix to other materials in the stomach [4]. In 1986, Krausz et al. [4] reported that 91.2% of 113 patients with phyto-bezoars had a history of persimmon intake. Erzurumlu et al. [2] from our country reported that 17.6% of their 34 patients with bezoars had a history of persimmon or cherry laurel intake.

Mental retardation and trichotillomania are major risk factors for the development of trichobezoars [13]. In our study, there was only one patient with trichobezoar who had a history of psychiatric disorders and trichotillomania. The other predisposing factors observed in our study included mastication problems, diabetic gastroparesis and antacid drug use. Consequently, 85.7% of patients had one or more predisposing factors in our study. While about one third of our patients had only one predisposing risk factor, over fifty percent had multiple predisposing risk factors. In our opinion, these results may indicate that the presence of multiple predisposing risk factors creates a synergistic effect in the development of bezoars. On the other hand, 14.3% of the patients in our study had no apparent predisposing risk factors. Erzurumlu et al. [2] reported that only 5.9% of the patients in their study had no apparent predisposing risk factors. Bezoar formation is postulated to be provoked by dietary and eating habits in patients without predisposing factors [14].

Until only a few decades ago, the differential diagnosis of intestinal obstruction secondary to bezoars was difficult before surgery, because the clinical and radiographic findings are similar to those of intestinal obstruction attributable to other causes [11,13]. However, findings from recent studies suggest that sonography or computed tomography (CT) can assist radiologists in diagnosing bezoars before surgery [16,16,16]. In our study, PAR showed air-fluid levels in 18 patients with intestinal obstruction. The typical bezoar image on PAR, involving a mottled air pattern, was identified in only two patients (11.1%). Abdom-
obstruction include gastric ulcer, gastritis, gastric perforation and gastric outlet obstruction. In our study, coexisting gastric ulcers were identified in 20.8% patients with gastric bezoars. While anti-ulcer medication was prescribed in endoscopically treated patients, wedge resection of ulcers was added to the gastrotomy in operated patients. Two patients with gastric outlet obstruction were treated with gastrotomy and extraction of bezoars.

Although, there was no clinical recurrence of bezoars during a median follow-up time of 25 mo after treatment in our study, Klamert et al[20] reported recurrence in approximately 20% of patients with gastric bezoars after initial treatment. Therefore, patients should be instructed to avoid a high fiber diet, persimmons and certain medications to minimize the potential risk of recurrence.

In conclusion, over fifty percent of the patients in our study had multiple predisposing factors for gastrointestinal bezoars. In light of these results, it may be concluded that the presence of multiple predisposing factors create a synergistic effect in the development of bezoars. Intestinal obstruction is the most common complication of bezoars. Although the prevalence of intestinal obstruction secondary to bezoars is quite low, differential diagnosis of intestinal obstruction secondary to adhesions is important in patients with previous abdominal surgery; CT can help to make this differentiation. Therefore, CT should be obtained whenever possible in all patients with bowel obstruction to establish the diagnosis and avoid inappropriate treatment.

REFERENCES

1. Williams RS. The fascinating history of bezoars. Med J Aust 1986; 145: 613-614
Bedioui H, Daighfous A, Ayadi M, Noomen R, Chebhi F, Rebai W, Makni A, Ferliche F, Ksantini R, Ammous A, Jouini M, Kacem M, Bensafta Z. A report of 15 cases of small-bowel obstruction secondary to phytobezoars: predisposing factors and diagnostic difficulties. *Gastroenterol Clin Biol* 2008; 32: 596-600

Andrus CH, Parnsky JL. Bezoars: classification, pathophysiology, and treatment. *Am J Gastroenterol* 1988; 83: 476-478

Krausz MM, Morial EZ, Ayalon A, Pode D, Duret AL. Surgical aspects of gastrointestinal persimmon phytobezoar treatment. *Am J Surg* 1986; 152: 526-530

Gayà J, Barranco L, Llompart A, Reyes J, Obrador A. Persimmon bezoars: a successful combined therapy. *Gastrointest Endosc* 2002; 55: 581-583

Ripollés T, García-Aguayo J, Martínez MJ, Gil P. Gastrointestinal bezoars: sonographic and CT characteristics. *AJR Am J Roentgenol* 2001; 177: 65-69

Buchholz RR, Haisten AS. Phytobezoars following gastric surgery for duodenal ulcer. *Surg Clin North Am* 1972; 52: 341-352

Bowden TA, Hooks VH, Mansberger AR. The stomach after surgery. An endoscopic perspective. *Ann Surg* 1983; 197: 637-644

Saeed ZA, Rabassa AA, Anand BS. An endoscopic method for removal of duodenal phytobezoars. *Gastrointest Endosc* 1995; 41: 74-76

Quiroga S, Alvarez-Castells A, Sebastià MC, Pallisa E, Barluenga E. Small bowel obstruction secondary to bezoar: CT diagnosis. *Ahdan Imaging* 1997; 22: 315-317

Verstandt GP, Kijko B, Bloom RA, Hadass I, Libson E. Small bowel phytobezoars: detection with radiography. *Radiology* 1989; 172: 705-707

Erzurumlu K, Malazgirt Z, Bektas A, Dervisoglu A, Polat C, Senyurek G, Yetim I, Ozkan K. Gastrointestinal bezoars: a retrospective analysis of 34 cases. *World J Gastroenterol* 2005; 11: 1813-1817

Alsafwah S, Alzein M. Small bowel obstruction due to tri-chobezoar: role of upper endoscopy in diagnosis. *Gastrointest Endosc* 2000; 52: 784-786

Lee JF, Leow CK, Lai PB, Lau WY. Food bolus intestinal obstruction in a Chinese population. *Aust N Z J Surg* 1997; 67: 866-868

Escamilla C, Robles-Campos R, Parrilla-Paricio P, Lujan-Monpean J, Liron-Ruiz R, Torralba-Martinez JA. Intestinal obstruction and bezoars. *J Am Coll Surg* 1994; 179: 285-288

Gayer G, Jonas T, Apter S, Zissin R, Katz M, Katz R, Amitai M, Hertz M. Bezoars in the stomach and small bowel--CT appearance. *Clin Radiol* 1999; 54: 228-232

Sechopoulos P, Robotis JF, Kokkas T. Gastric bezoar treated endoscopically with a carbonated beverage: case report. *Gastrointest Endosc* 2004; 60: 662-664

Yau KK, Siu WT, Law BK, Cheung HY, Ha JP, Li MK. Laparoscopic approach compared with conventional open approach for bezoar-induced small-bowel obstruction. *Arch Surg* 2005; 140: 972-975

Lo CY, Lau PW. Small bowel phytobezoars: an uncommon cause of small bowel obstruction. *Aust N Z J Surg* 1994; 64: 187-189

Goldstein SS, Lewis JH, Rothstein R. Intestinal obstruction due to bezoars. *Am J Gastroenterol* 1984; 79: 313-318

Robles R, Parrilla P, Escamilla C, Lujan JA, Torralba JA, Li- ron R, Moreno A. Gastrointestinal bezoars. *Br J Surg* 1994; 81: 1003-1001

Klamer TW, Max MH. Recurrent gastric bezoars. A new approach to treatment and prevention. *Am J Surg* 1983; 145: 417-419

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