Obstructing Small Bowel Bezoars Due to an Agar Diet: Diagnosis Using Double Balloon Enteroscopy

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Abstract

Primary small bowel bezoars are rare and may cause acute abdomen due to small bowel obstruction (SBO). A 70-year-old Japanese woman presented to the emergency room with abdominal pain, nausea and vomiting. The patient reported that she had eaten a large amount of highly-concentrated, agar dissolved in boiling water two days prior to presentation. Double balloon enteroscopy (DBE) revealed that white-colored, hard bezoars were clogged in the jejunum. At surgery, many bezoars were found impacted in the distal jejunum, and enterotomy was performed. The bezoars were elastic hard, crystallized objects. These bezoars were considered to have formed from highly-concentrated, dissolvable agar.

Key words: small bowel obstruction (SBO), double balloon enteroscopy (DBE), agar diet

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Introduction

Primary bowel bezoars are very rare. Small bowel bezoar is an uncommon cause of acute small bowel obstruction (SBO). Bezoars are usually concretions of foreign material found in the stomach and they most often develop in patients who have undergone gastric surgery. Bezoars usually become impacted in the narrowest portion of the small bowel, which is 50-75 cm proximal to the ileocecal valve, or at the valve itself (1, 2). Preoperative diagnosis of SBO due to bezoars is difficult.

Double balloon enteroscopy (DBE), a new insertion method developed by Yamamoto and colleagues in 2001 (3), allows for complete visualization and therapeutic interventions in the entire small bowel and to-and-fro examination. We present here the first reported case of SBO due to primary small bowel bezoars that had formed from highly-concentrated, dissolvable agar detected by DBE.

Case Report

A 70-year-old Japanese woman was admitted through the emergency room after sudden onset of abdominal pain, nau-

sea and vomiting. She had a history of giving birth by cesarean operation. On examination, her height was 150 cm and weight was 67 kg. There was slight tenderness in the left lower quadrant of the abdomen. The patient had been diagnosed with hypertension and type 2 diabetes six years earlier, and she has been taking a Ca channel blocker and meglitinides. Laboratory evaluation on admission revealed a white blood cell count of 13,600/mm³, C-reactive protein of 2.8 mg/dl, fasting blood sugar (FBS) level of 203 mg/dl and glycosylated hemoglobin (HbA1c) level of 6.7%. Other chemistry and liver function tests were normal. Plain abdominal radiograph was unremarkable. Computed tomography (CT) showed a dilated small bowel loop proximal to the site of the obstruction and intraluminal masses outlined by fluid (Fig. 1). The small bowel loops distal to the obstruction had a normal appearance. The patient reported that she had eaten a large amount of highly concentrated, agar dissolved in boiling water two days prior to the admission. Antegrade DBE (Fujinon EN-450T5/20; Fujinon Corp., Saitama, Japan) was performed and showed that white-colored, hard bezoars were clogged in the distal jejunum (Fig. 2). However, it was difficult to milk and fragment the bezoars. Radiography of the small intestine under DBE showed that bezoars were clogged in a 10-cm segment of the distal jeju-

Figure 1. Enhanced computed tomography (CT) scan of the abdomen shows a dilated small bowel loop proximal to the site of the obstruction and intraluminal masses outlined by fluid.

Figure 3. Photo-radiography of the small intestine reveals that about 10 cm of the distal jejunum was occluded with bezoars.

Figure 2. Endoscopic view shows that white-colored bezoars are clogged in the distal jejunum.

Figure 4. Endoscopic view showing our attempt to smash the bezoars using forceps (A) and a snare (B).

num (Fig. 3). Retrograde DBE was performed two times in an attempt to smash the bezoars to fragments, but the bezoars were too hard and could not be fragmented using a forceps and a snare (Figs. 4A, B). At surgery, many phyto-bezoars were found impacted in the distal jejunum, and enterotomy with extraction was performed. The resected jejunum had postoperative adhesion of cesarean section. Bezoars of various sizes (max. size 5×4×3 cm) were removed. The bezoars were elastic hard, crystallized objects (Fig. 5). Part of a bezoar was analyzed and we found that it was ho-

mogeneously composed of a large amount of dietary fibers. These bezoars were therefore considered to have concreted from the highly-concentrated dissolvable agar that the patient had eaten.

Discussion

Bezoars are usually found in the stomach, but they may also pass into the small bowel. Primary small bowel bezoars are very rare and may cause acute abdomen due to SBO (1,

Figure 5. Bezoars of various sizes that had been removed from the jejunum of the patient (max. size, 5×4×3 cm). The bezoars were elastic hard.

2). The associated clinical signs and symptoms include vomiting, nausea, abdominal pain, fever, and elevated leukocyte count. Phytobezoars are concretions of fruit and vegetable fibers in the alimentary tract. Other predisposing factors are ingestion of high-fiber foods (4). Agar, a popular food in the traditional Japanese diet called *kanten*, is produced from red algae and has a high dietary fiber content. It dissolves when heated and forms a gel when cooled. Because it dissolves in water of temperatures above 60°C, its fiber falls into the water-soluble category. Raw agar is white and semi-translucent. To make jelly, it is boiled in water at a concentration of about 0.7-1%. It was reported that dietary agar caused weight loss and reduction in total cholesterol level in obese patients with impaired glucose tolerance and type 2

diabetes (5). It is thought that dietary fibers inhibit increases in blood glucose by retarding the movement of glucose from the stomach to the small intestine or by obstructing (6) or retarding (7) digestion and absorption of glucose in the small intestine. The present patient had been diagnosed with type 2 diabetes six years earlier, and she sometimes takes dietary agar. SBO occurred due to the formation of bezoars, which had resulted from intake of a large amount of highly-concentrated, dissolvable agar.

SBO can be diagnosed by various modalities. To date, computed tomography (CT) imaging has been reported to be useful for imaging patients with SBO as this modality is very effective for determining the presence or absence of SBO as well as the level and cause of SBO (8-12); however, there are only a few reports regarding the CT findings of bezoars associated with SBO (13, 14). DBE is a safe, feasible diagnostic tool that allows high-resolution endoscopic imaging and total enteroscopy, and provides the capability of obtaining tissue for histological studies (3, 15). DBE also appears to be a safe and useful diagnostic tool in patients with SBO, and the findings of DBE influence the strategy of therapy in patients in whom the cause of SBO could not be determined by conventional radiography (16). Most bezoars in the stomach are treated by endoscopic destruction or removal. Endoscopic-guided EHL (electrohydraulic lithotripsy) which has gained acceptance in the treatment of biliary and urinary stones, was reported to be a safe and effective for treatment of large and hard gastric bezoars (17). EHL might have been useful for the treatment of small bowel bezoars in this patient. Recently, it was reported that DBE could recover entrapped endoscopy capsules in some patients (18-20). In the future, if new devices and methods that can smash or remove primary small bowel bezoars safely are developed, endoscopic therapy using DBE might be more easily performed.

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