True Primary Enterolith Treated by Balloon-assisted Enteroscopy

Mitsuaki Ishioka, Mario Jin, Tamotsu Matsuhashi, Suguru Arata, Yusato Suzuki, Noboru Watanabe, Masayuki Sawaguchi, Noriyoshi Kanazawa, Kengo Onochi, Natsumi Hatakeyama, Shigeto Koizumi, Hirosato Mashima and Hirohide Ohnishi

Abstract

Primary enterolith is a rare condition that can induce ileus and intestinal perforation. We report the first case of a true primary enterolith treated by balloon-assisted enteroscopy. The patient presented with a small intestinal ileus. After its improvement following the insertion of an ileus tube, radiography with amidotrizoate sodium meglumine detected a round, movable defect in the ileum measuring 42 mm diameter. The patient was diagnosed with a primary enterolith based on her past history. The enterolith was fractured and removed using balloon-assisted enteroscopy. This case suggests that balloon-assisted enteroscopy may be an effective non-invasive treatment option for enteroliths.

Key words: enterolith, balloon-assisted enteroscopy


Introduction

Enteroliths are classified into primary and secondary types. Primary enteroliths are further subdivided into the true and false subtypes (1, 2). Primary true enteroliths are originally created in the intestine by substances present in the normal intestine such as choleric acid and calcium (1, 2). The production of these substances in the intestine may increase in response to anatomical changes including surgical interventions such as enteroanastomosis and afferent or Roux loop operations and inflammatory conditions such as stricture and stenosis (1, 2). Conversely, secondary enteroliths occur as a result of the migration of cholelithiasis or urolithiasis through a fistula (1, 2). Enteroliths are uncommon, and primary enteroliths are extremely rare. This may be attributed to the fact that they are asymptomatic in most cases. Once symptoms appear, however, critical clinical conditions which require surgical treatment, such as ileus and intestinal perforation may arise (2). Recently, several reports have suggested that conventional endoscopy carries certain limitations in the approach to the whole small intestine, the application of balloon-assisted enteroscopy to enterolith management has been expected (2). We herein present the first report of a primary enterolith case treated by balloon-assisted enteroscopy.

Case Report

An 88-year-old woman visited her family doctor complaining of abdominal pain and vomiting. She was diagnosed with ileus according to plain abdominal radiography, and was referred to our hospital. She had a history of total gastrectomy with a Roux-en-Y reconstruction and cholecystectomy for gastric cancer and cholelithiasis, respectively. She had also been taking ursodeoxycholic acid (UDCA) for hepatitis C virus-induced cirrhosis. Although the ileus was still apparent on admission (Fig. 1A), it was conservatively managed with an ileus tube; neither peritoneal irritation nor intestinal blood flow disturbance were observed on contrast-enhanced CT (data not shown). On the 7th day after admission, the ileus improved to allow defecation after which a...
round movable defect was detected by radiography with amidotrizoate sodium meglumine injected through the ileus tube (Fig. 1B). Furthermore, abdominal ultrasonography under fluoroscopic guidance revealed a round structure with an acoustic shadow of 42 mm diameter (Fig. 1C). Taking into account the patient’s past history of total gastrectomy and cholecystectomy, we diagnosed the defect to be a primary enterolith. We next attempted to remove the enterolith by using balloon-assisted enteroscopy. CT, which was conducted to determine whether to perform the enteroscopy perorally or transanally, showed that the enterolith had moved to the distal ileum (Fig. 1D). We thus performed enteroscopy via the transanal route using a double-balloon endoscope (EC450-B15®, Fujifilm, Tokyo, Japan). We used a short-type balloon-assisted enteroscope EC450-B15®, since the stone was present at the distal ileum and because of the availability of a greater range of devices for use in lithotripsy with the EC450-B15®. Furthermore, in order to enable the removal of the enterolith from the intestine by pulling it out with the scope itself through the over-tube, we utilized an over-tube balloon rather than an enteroscope balloon. Balloon-assisted enteroscopy revealed that the enterolith was present at the distal ileum (Fig. 2A, B). It was fractured using snare forceps (Snaremaster®, Olympus, Tokyo, Japan) and a stone basket catheter (Trapezoid®, Boston Scientific, Marlborough, USA) (Fig. 2C). The fractured fragments were removed using a rotatable retrieval device (Roth Net Platinum®, Olympus) through the over-tube (Fig. 2D). An infrared spectrophotometric analysis of a component of the removed enterolith fragments revealed that the enterolith was composed of UDCA. It was thus diagnosed as a true primary enterolith. There was no recurrence of symptoms after the initiation of the oral intake on the day after enteroscopy.

**Discussion**

Most of the primary enteroliths that are observed are false enteroliths composed of orally ingested substances such as hair balls, fruits seeds and barium sulfate. Bezoars and trichobezoars are examples of primary false enteroliths. In contrast, primary true enteroliths are extremely rare. They are defined as stones made of the precipitants and/or deposits that normally exist in the intestine and are divided into cholic acid stones and calcium stones (1, 2). In the present case, the stone was diagnosed to be a true primary cholic acid stone since its main component was identified to be UDCA. It is assumed that the formation of true primary enteroliths is related to intestinal stricture and stenosis due to

---

**Figure 1.** (A) A plain abdominal radiograph showing the ileus. (B) The round defect was revealed with amidotrizoate sodium meglumine injected through an ileus tube (black arrows). (C) The round structure, with an acoustic shadow of 42 mm in diameter (white arrows). (D) The round structure in the distal ileum contrasted with amidotrizoate sodium meglumine (black arrows).
Crohn’s disease, radiation enteritis or intestinal tuberculosis (2). In addition, bowel hypomotility or stasis, due to the existence of Meckel’s diverticulum or afferent loops after surgery, may cause the formation of true primary enteroliths (2, 7-9). Under these conditions, intestinal bacterial overgrowth can readily occur, resulting in the promotion of bile salt deconjugation (10). The conversion of soluble cholic acid to insoluble deoxycholic acid promotes the precipitation of these unconjugated bile acids, leading to the formation of true primary cholic acid stones (10). Accordingly, in the present case, it is reasonable to speculate that the afferent loop in the Roux-en-Y reconstruction may have contributed to the formation of the enterolith. The prolonged administration of UDCA for hepatitis C virus-induced cirrhosis may have also played a role.

In most cases, surgical management remains the main treatment for enteroliths because they are not noticed until the occurrence of clinical conditions such as ileus and intestinal perforation. In contrast, a comparatively large number of cases are diagnosed by laparotomy or at autopsy (2). Although the diagnosis of asymptomatic enteroliths is difficult due to their rarity and because cholic acid enteroliths are often radiolucent, once an enterolith is diagnosed, enteroscopy may provide an effective and minimally invasive treatment option. It is generally believed that stones with a diameter of greater than 25 mm may cause intestinal obstruction in the absence of luminal stricture or stenosis; stones with a diameter of less than 20 mm can typically pass without symptoms (2). Thus, even if an enterolith cannot be removed completely, simply fragmentizing it using a device through an enteroscope may be an effective treatment; however, there is a possibility that remnants may become a nidus for future stones (2). While there have been many reports of bezoars treated endoscopically using a basket, electrohydraulic lithotripsy, a laser and even Coca-Cola, and some reports of afferent loop syndrome caused by enteroliths being treated endoscopically with electrohydraulic lithotripsy, there are no reports of the treatment of enteroliths using an enteroscope (6, 7). Thus, to the best of our knowledge, this is the first report of the treatment of an enterolith using balloon-assisted enteroscopy. The benefits of using balloon-assisted enteroscopy for the treatment of enteroliths are as follows: 1) the accessible range of the scope in the small intestine is less restrictive; 2) the risk of the procedure is relatively low; and 3) the recovery period after the treatment procedure may be shorter than that of the cases treated by surgery (7). These benefits warrant the further application of enteroscopy in the treatment of select enterolith cases.

The authors state that they have no Conflict of Interest (COI).

Mitsuaki Ishioka, Mario Jin and Tamotsu Matsuhashi contributed equally to this work.
References


© 2015 The Japanese Society of Internal Medicine
http://www.naika.or.jp/imonline/index.html