Case Reports in Gastroenterology

Case Rep Gastroenterol 2015;9:361–365

DOI: 10.1159/000441999
Published online: November 14, 2015

1662–0631/15/0093–0361$39.50/0
www.karger.com/crg

Spontaneous Pneumoperitoneum due to Constipation

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Key Words
Spontaneous pneumoperitoneum · Constipation · Abdominal pain · Intestinal cystic pneumatosis · Differentiation

Abstract
We report a rare case of spontaneous pneumoperitoneum. An 82-year-old Japanese male patient was referred to our hospital because of constipation and abdominal pain. Abdominal computed tomography revealed a large amount of feces in the colon and rectum, and free air in the abdomen. Based on these findings, the patient was diagnosed with gastrointestinal perforation. Emergency exploratory laparotomy was performed. Neither perforation nor ischemic changes were recognized in the digestive tract. The patient's defecation was managed postoperatively until discharge on the 13th postoperative day. The authors assumed that free air, which was released after a mucosal injury due to the internal pressure caused by the presence of a large amount of feces in the colon and rectum, had penetrated the bowel wall through the bowel mucosa. We herein report the present case while also reviewing the pertinent literature.

Introduction

Pneumoperitoneum is often caused by the perforation of the digestive tract. Gastric or duodenal perforations due to peptic ulcer are the most common causes of pneumoperitoenum. The presence of pneumoperitoneum usually indicates the need for emergency laparotomy. However, surgery is not required in cases of pneumoperitoneum where there is no evidence of visceral perforation caused by a physiological process. This status, termed spon-

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DOI: 10.1159/000441999

taneous pneumoperitoneum (SP), is reported to occur in 14–23% of all patients with pneumoperitoneum [1, 2]. Generally, SP is not complicated by peritonitis, is benign and can be treated conservatively. In addition, pneumoperitoneum without peritonitis is a rare phenomenon which creates a management dilemma for the treating surgeon. The diagnosis of SP is difficult; thus, SP patients may undergo unnecessary surgery. The dilemma in the treatment of SP lies in deciding between a laparotomy and a conservative line of management. So far, various reports with causes of SP have been discussed, and they have not been clear yet. In our case, although computed tomography (CT) showed free air in the abdomen, the perforation of the digestive tract was not recognized during the exploratory laparotomy. The aim of this report is to present a case of SP of undetermined origin, and to discuss the possible etiology.

Case Report

An 82-year-old Japanese male patient was referred to our hospital due to constipation and abdominal pain for 3 days. A physical examination revealed lower abdominal tenderness and distention. Muscular defense was not recognized. The patient's medical history included distal gastrectomy for gastric ulcer (20 years previously) and community-acquired pneumonia (3 weeks previously). The patient did not take any medications and did not smoke or consume alcohol. The laboratory data showed an abnormal white blood cell (WBC) count of 16,500/μl (normal range: 3,900–9,800), and a procarcitonin level of 0.26 ng/ml (normal range: <0.05). All of the other laboratory data were within the normal ranges. Abdominal CT revealed a large amount of feces in the colon and rectum, and free air in the abdomen (fig. 1a). Intestinal cystic pneumatosis was recognized in the colon (fig. 1b). A diagnosis of gastrointestinal perforation was suspected based on the imaging findings. Three hours after coming to the hospital, emergency exploratory laparotomy was subsequently performed but revealed no evidence of perforation or ischemic changes in the digestive tract (fig. 2). Finally, because the cause of the pneumoperitoneum could not be identified, the operation was completed by placing a closed drain in the abdomen. The postoperative course was uneventful. The patient's defecation was managed until discharge on the 13th postoperative day.

Discussion

Pneumoperitoneum without peritonitis is a rare phenomenon which creates a management dilemma for the treating surgeon. As a result of this diagnostic dilemma, the patient may be subjected to unnecessary laparotomy.

Gantt et al. [3] suggested that the origin of SP indicated intra-thoracic, intra-abdominal, gynecological, and iatrogenic causes. The intra-thoracic causes include barotrauma pneumothorax [4], bronchoperitoneal fistula [5], pneumomediastinum [6], and mechanical ventilation [7]. The intra-abdominal causes include abdominal emphysematous cholecystitis [8], spontaneous bacterial peritonitis [9], intestinal cystic pneumatosis [10–15], and liver abscess [16]. The gynecological causes include rupture of pyometra [17]. The iatrogenic causes include endoscopic procedures such as colonoscopy [18]. Most of the reported cases of SP occurred as iatrogenic complications.

Intestinal cystic pneumatosis was first described by Du Vernoi [10] in 1783 and documented in greater detail by Bang [11] in 1876. Intestinal cystic pneumatosis is mostly

asymptomatic. The etiology and pathogenesis of intestinal cystic pneumatosis have been controversial. Several theories have been suggested based on different observations, including the penetration of luminal gas through the bowel mucosa into the bowel wall after mucosal injury [12], pulmonary gas released from the ruptured alveoli dissecting the vascular channels in the mediastinum and tracking through the retroperitoneum into the mesenteric root [13], gas production of some bacteria that invade through the mucosal breaches into the intramural compartments or grow within microscopic cysts [14], and gas production related to defects in food digestion causing excessive fermentation [15].

In our case, abdominal CT revealed the presence of a large amount of feces in the colon and rectum, and free air in the abdomen. In addition, intestinal cystic pneumatosis was recognized in the colon. The authors assumed that free air, which was released after a mucosal injury due to internal pressure caused by the presence of a large amount of feces in the colon and rectum, had penetrated the bowel wall through the bowel mucosa. There are no reports of SP occurring secondary to intestinal cystic pneumatosis caused by a large amount of feces.

There are few reports of patients who were diagnosed with SP in the preoperative stage. Most SP patients undergo exploratory laparotomy. Chandler et al. [19] reported that 28% patients with misleading pneumoperitoneum findings were subjected to operations that, in retrospect, might not have been necessary. Mularski et al. [2] identified 196 case reports of SP patients, among which 45 underwent exploratory surgery without any evidence of perforated viscus. We therefore suggest that it is very difficult for surgeons to diagnose SP and indicate the correct course of treatment.

In conclusion, a thorough medical history, appropriate laboratory tests, radiological techniques and physical examinations might be valuable tools for diagnosing SP and avoiding unnecessary laparotomy. We suggest that in uncertain cases, SP should be differentiated from free air resulting from gastrointestinal perforation and patients should be referred for emergency exploratory laparotomy.

Statement of Ethics

The published research is compliant with the guidelines for human studies and animal welfare regulations.

Disclosure Statement

All authors report no conflict of interest related to this paper.

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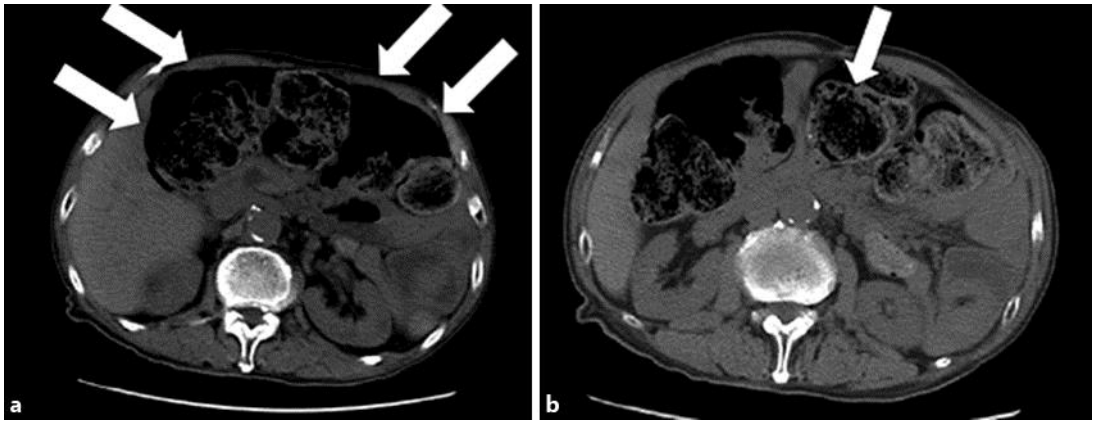

Fig. 1. **a** Abdominal CT revealed a large amount of feces in the colon and rectum and free air in the abdomen (arrows). **b** Intestinal cystic pneumatosis was recognized in the colon (arrow).

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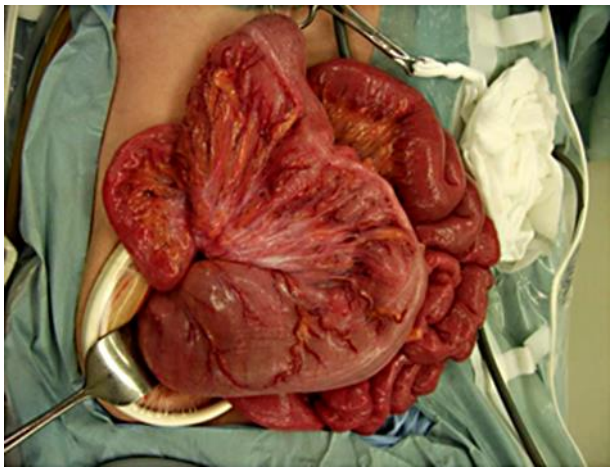

Fig. 2. At laparotomy, no evidence of perforation or ischemic change was recognized in the digestive tract.