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Case report

Diagnostic laparoscopy for pneumatosis intestinalis in a very elderly patient: A case report

Shuhei Ito [a, b, *], Takaaki Masuda [b], Noboru Harada [a], Ayumi Matsuyama [a], Motoharu Hamatake [a], Takashi Maeda [a], Shinichi Tsutsui [a], Hiroyuki Matsuda [a], Koshi Mimori [b], Teruyoshi Ishida [a]

[a] Department of Surgery, Hiroshima Red Cross Hospital and Atomic Bomb Survivors Hospital, Hiroshima, Japan
[b] Department of Surgery, Kyushu University Beppu Hospital, Beppu, Japan

HIGHLIGHTS

- Pneumatosis intestinalis (PI) may be associated with life-threatening emergencies.
- It is difficult to completely rule out the fatal conditions associated with PI without surgery.
- Very elderly patients are at high risk for a fatal outcome if surgery is delayed.
- Laparoscopy may be a useful option for diagnosing PI in very elderly patients.

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ABSTRACT

Introduction: Pneumatosis intestinalis is rare but may be associated with life-threatening intra-abdominal conditions such as intestinal ischemia or perforation. However, it can be difficult, particularly in the very elderly, to identify candidates for immediate surgical intervention.

Presentation of case: A 94-year-old man with abdominal distension underwent abdominal computed tomography, which demonstrated accumulation of air bubbles within the intestinal wall and some free intraperitoneal air, suggestive of pneumatosis intestinalis. His vital signs showed evidence of systemic inflammatory response syndrome, and laboratory examination revealed inflammation and hypoxia. As the patient was frail, with his age and concomitant conditions which may have masked the symptoms and severity of his illness, immediate diagnostic laparoscopy was performed, which confirmed the diagnosis of pneumatosis intestinalis, with multiple gas-filled cysts seen within the subserosa of the small intestine. No additional surgical procedure was performed. His symptoms improved postoperatively.

Discussion: Optimal management of pneumatosis intestinalis in a timely manner requires a comprehensive evaluation of factors in each individual. In patients with severe symptoms, PI might be a sign of a life-threatening intra-abdominal emergency. Despite the contrast-enhanced CT and prediction markers in previous reports, it considered to be difficult to completely rule out these fatal conditions without surgery, especially in very elderly patients with poor performance status.

Conclusion: Diagnostic laparoscopy may be a useful option for definitively ruling out the lethal conditions associated with pneumatosis intestinalis in frail elderly patients with severe conditions in the emergency setting.

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1. Introduction

Pneumatosis intestinalis (PI) is a rare condition; its incidence is reportedly 0.3% based on computed tomography (CT) results [1] and 0.03% based on an autopsy series [2]. PI is defined as the presence of gas within the wall of the gastrointestinal tract. PI in adults is

* Corresponding author. Department of Surgery, Kyushu University Beppu Hospital, 4546 Tsurumihara, Beppu, 874-0838, Japan.
E-mail address: sito@med.kyushu-u.ac.jp (S. Ito).

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classified as idiopathic PI (15%), in which patients have no significant medical history or underlying disease, and secondary PI (85%), associated with a wide variety of gastrointestinal and non-gastrointestinal conditions [2–4]. PI may occur in a benign context, and in this case, PI is not considered a disease but rather a sign. However, PI can sometimes be considered a surrogate marker for a life-threatening intra-abdominal emergency such as intestinal ischemia or perforation. The seriousness of PI needs to be determined according to each patient's individual clinical condition and laboratory data. To prevent unnecessary surgery for patients with PI, in previous reports, authors have proposed the prediction models of mortality [4,5], mesenteric ischemia [6] and pathologic PI [7] based on the predictive markers. Even with these models and contrast-enhanced CT, it remains difficult to definitively identify patients who need immediate surgical intervention. This is particularly true in very elderly patients in whom severe abdominal symptoms might be masked. In addition, unfortunately, these patients are at high risk of a fatal outcome if surgical intervention is delayed. In this case report, we discuss the role of diagnostic laparoscopy in elderly patients with this rare but potentially life-threatening intra-abdominal condition. This report is consistent with the SCARE (consensus-based surgical case report guidelines) criteria [8].

2. Presentation of case

A 94-year-old Japanese man complaining of abdominal pain and distension was brought by ambulance to our hospital at night. He had no apparent abdominal tenderness or nausea, but he did have abdominal distension and dyspnea on arrival. His comorbidities included diabetes mellitus, hypertension, glaucoma and a previous cerebral infarction; he had no history of previous surgery. He was taking an α-glucosidase inhibitor (α-GI) for diabetes and an antiplatelet agent. His vital signs were as follows: temperature of 37.4 °C, heart rate of 106 beats/min, respiratory rate of 22/min, and blood pressure of 197/110 mm Hg; these vital signs indicated the presence of systemic inflammatory response syndrome (SIRS); therefore a urinary catheter was inserted to measure his urinary output. Laboratory examination revealed inflammation (white blood cell count, 11800/mm^2; C-reactive protein, 11.5 mg/dL). Arterial blood-gas analysis revealed pH of 7.425, bicarbonate of 30.3 mmol/L, base excess of 5.5 mmol/L, PaO_2 of 61.3 mm Hg, $PaCO_2$ of 47.1 mm Hg, oxygen saturation of 91.7% on 5 L/min oxygen via face mask and lactate level of 0.9 mmol/L, indicating acute respiratory distress syndrome (ARDS) with PaO_2/fraction of inspired oxygen (FiO_2) ratio of 153; there were no evidence of metabolic acidosis or hyperlactatemia. There were no other sings of organ failure. Plain radiography of the abdomen revealed “bubble” appearances in the lumen of the bowel (Fig. 1a). Abdominal CT showed accumulation of air bubbles within the wall of the distal small intestine and ascending colon (Fig. 1b) and a tiny amount of free intraperitoneal air. There was no apparent portal vein gas, ascites or bowel ischemia on contrast-enhanced CT.

In addition to the presence of SIRS, an elevated C-reactive protein level and free intraperitoneal air, the patient was frail, and his age and coexisting conditions may have masked the symptoms and severity of his illness. We therefore decided to perform a diagnostic laparoscopy immediately to completely rule out perforation and bowel ischemia. Under laparoscopy, multiple gas-filled cysts were observed at the subserosa of the small intestine (Fig. 2), a finding compatible with PI. There was no sign of peritonitis or bowel ischemia. No additional surgical procedure was performed. The patient's postoperative course was uneventful. The symptoms, such as abdominal distension, improved postoperatively. After recovering from the pneumonia that accompanied his initial presentation, the patient was discharged on postoperative day (POD) 15. At 3.5 months after surgery, the signs of PI on CT had substantially improved (Fig. 3). All diagnostic and surgical procedures concerning the patient were carried out after informed consent had been obtained. The patient anonymity was preserved.

3. Discussion

Multiple pathogenic mechanisms, including mechanical, bacterial, and biochemical, are involved in the formation of PI. The most likely underlying cause in our patient is a mechanical intestinal obstruction. CT revealed voluminous feces in the ascending and transverse colon, which were the distal side of the small intestine where we detected PI. He started to defecate in large quantities on POD 2, and abdominal distention was improved. Another possible cause is biochemical. The patient was administered an α-GI for diabetes, which reportedly suppresses the digestion of carbohydrates. Intestinal luminal bacteria produce a large volume of gas through carbohydrate fermentation, and this gas may be forced directly into the intestinal wall.

Given the potentially fatal outcome of PI, optimal management in a timely manner requires a comprehensive evaluation of factors in each individual, such as past history, underlying disease, clinical condition, physical examination findings, and laboratory and radiologic findings. Most patients with PI are asymptomatic and no specific therapy is needed. If patients are mildly symptomatic, clinicians may consider conservative treatment such as antibiotics therapy, an elemental diet, oxygen inhalation, and hyperbaric oxygen; surgical intervention is unnecessary. However, in patients with severe symptoms, PI might be a sign of a life-threatening intra-abdominal emergency such as intestinal ischemia or perforation. Although some previous reports describe successful nonoperative management, the mortality in patients with PI who do not undergo surgical intervention is 16.7–39.3% (Table 1) [1,3–7,9,10] indicating that it is essential to identify patients who need immediate surgical intervention.

To date, CT is the preferred imaging technique, and decreased bowel enhancement on CT, which is defined as decreased or absent enhancement after administration of contrast material, is considered the most useful finding to detect the bowel wall ischemia. This finding has a specificity of 95–100% but a variable sensitivity of 33%–78% [11]. In addition, decreased enhancement of the bowel wall during the arterial phase is difficult to evaluate, considering the rate of interobserver agreement [12]. Although the predictive markers for mortality or fatal conditions, such as pathologic PI and bowel necrosis, were reported in previous papers (Table 1), these predictive markers are not available universally. The P-POSSUM model is also useful for predicting postoperative mortality. Unfortunately, this risk prediction model cannot be used preoperatively; intraoperative information is required to predict mortality. Therefore, we considered that it was difficult to completely rule out the fatal conditions without surgery.

Using the prediction markers described in previous reports, abdominal distention [10] and vascular disease score ≥ 4 [6] indicate that surgery was necessary in our patient. In addition, the patient was very advanced age (94 years old) and he had hearing and vision disabilities, with Eastern Cooperative Oncology Group performance status of 3. These individual factors might have prevented the medical staff from sufficiently obtaining the background information, such as drug use, underlying diseases and co-morbidity. The information includes the conditions which are associated with PI, such as mucosal disruption (peptic ulcer disease, Crohn's disease, ulcerative colitis), infection (tuberculosis), pulmonary disorders (chronic obstructive pulmonary disease, asthma) and immunological disturbances (AIDS, steroids, chemotherapy), as well as co-morbidities that predict the mortality after surgery, such

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