



Case report

Intestinal volvulus secondary to pneumatosis intestinalis: A case report

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ABSTRACT

Introduction and importance: Pneumatosis intestinalis (PI) is a rare but important medical condition that is defined as a collection of individual gas cysts in the submucosa and subserosa of the intestine. PI can be primary or secondary; however, this condition is secondary to underlying diseases most of the time.

Case presentation: This article presents a 30-year-old man as a case report complaining of generalized abdominal pain and several episodes of non-bilious bloodless vomiting. The patient was admitted to the surgical service department for further investigation, and his abdominal CT scan revealed PI.

Clinical discussion: The patient underwent emergency laparotomy surgery due to progressive abdominal pain and peritonitis. The involved segment of the small intestine was resected, and ileo-ileal anastomosis was performed. The patient was discharged from the hospital after a week, stable, and in good medical condition.

Conclusion: This article intends to emphasize that although most of the patients with PI are asymptomatic or show unspecific symptoms, surgeons must take into account rare but lethal complications of PI such as intestinal volvulus. Early recognition of such complications is so crucial and can be life-saving.

1. Introduction

Pneumatosis intestinalis (PI) is a very rare condition defined as a collection of gas cysts in the submucosa or subserosa of the gastrointestinal tract [1]. This involvement can extend anywhere in the gastrointestinal tract from the esophagus to the anus, with the small intestine most frequently affected (42%), followed by large bowel (36%) and synchronous involvement of the small intestine and colon (22%) [2]. PI has been associated with severe conditions such as bowel obstructions, infections, ischemia, and in some cases, Crohn's disease. Furthermore, PI may be associated with non-surgical conditions such as collagen vascular diseases, respiratory diseases like chronic obstructive pulmonary disease (COPD), asthma, and cystic fibrosis (CF) [3].

Based on the underlying causes of the PI, this condition can be divided into two categories, life-threatening pneumatosis intestinalis (LTPI) and benign pneumatosis intestinalis (BPI). Patients with benign pneumatosis intestinalis may present to the hospital complaining of chronic, mild, and unspecific symptoms like abdominal pain, abdominal distention, constipation, diarrhea, and hematochezia. However, patients with life-threatening pneumatosis intestinalis may present to the hospital with obstruction, volvulus, peritonitis [4]. This case report has

been reported in line with the SCARE 2020 Criteria [5].

2. Case presentation

The patient was a 30-year-old man who presented to the emergency department with a 24-hour history of abdominal pain and several episodes of non-bilious bloodless non-feculent vomiting with normal consistency. The patient did not have any past surgical or drug history, but his social history was positive, and he mentioned addiction to methamphetamine. On general examination, vital signs were stable and normal. Abdominal examination confirmed generalized tenderness with no rebound tenderness or guarding.

Blood investigation revealed elevated CRP level (119 mg/L), leukocytosis ($19.2 \times 10^9/L$), and arterial blood gas analysis proved acidosis (pH: 7.34, PCO_2 : 31.1 mmHg, HCO_3^- : 16.9 mEq/L). Other lab data were urea: 35 mg/dL, creatinine: 1.09 mg/dL, sodium: 140.7 mEq/L, potassium: 4.8 mEq/L. In the performed abdominopelvic CT with intravenous and oral contrast, a moderate amount of free fluid in abdomen and pelvis, pneumatosis intestinalis along the wall of ileum, and twist of ileum around its mesenteric pedicles were reported (Fig. 1).

Due to the patient's progressive abdominal pain and reported

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volvulus, the patient was taken for laparotomy, and bloody free fluid in the abdomen was detected. Moreover, rotation of a 70-cm segment of the ileum around its mesentery, forming a closed-loop volvulus 30 cm proximal to the ileocecal junction, was noted (Fig. 2). The torsion of the ileum was distorted, but because of significant discoloration, lack of peristaltic movement, and lack of intestinal vascular pulses, the involved segment of the ileum was resected, and an ileo-ileal anastomosis was performed.

Pathology report of the resected segment confirmed multiple cysts along the ileum wall with normal-appearing overlying mucosa. Ultimately, according to all the examinations, tests, and shreds of evidence, a diagnosis of pneumatosis cystoid intestinalis (PCI) was made that seemed to be the main cause of the ileal volvulus. The patient was discharged home from the hospital stable and in good medical condition one week after the surgery.

3. Discussion

PI is caused by the accumulation of gas cysts in the submucosa or subserosa of the gastrointestinal tract. Factors such as mucosal integrity, intraluminal pressure, bacterial flora, etc., are all effective factors that play an important role in the incidence of the disease. This condition usually occurs in the setting of the underlying disease; however, the severity of the PI does not relate to the severity of the underlying disease [4].

Pneumatosis intestinalis is not accompanied by any specific symptoms. Patients may be asymptomatic or may show abdominal pain, diarrhea, bowel obstruction, hematochezia, lack of appetite, tenesmus, and peritonitis [6]. In very rare conditions, PI may cause severe complications such as volvulus [7]. Routinely, the clinical approach to pneumoperitoneum is immediate laparotomy exploration; however, PI is one of the rare medical conditions in which the presence of pneumoperitoneum is not a laparotomy induction if the patient's vital signs are stable and abdominal examination is normal and does not confirm peritonitis [2,8].

The most common imaging intervention for detecting PI is plain radiography. PI can be easily diagnosed by plain abdomen radiography. However, an abdominal CT scan is the best imaging modality for diagnosing the disease because of having greater sensitivity than other imaging interventions. Nevertheless, physical examination is not very helpful in diagnosing PI [4,9].

There are many options for treating PI: antibiotics, surgery, bowel rest, and hyperbaric oxygen therapy. Thorough study and correct diagnosis of the underlying causes of PI is the most important factor for determining the right treatment approaches [10]. PI is not always an indication for surgical interventions. One of the most important

challenges for physicians in dealing with PI is to determine whether the patient is indicated for surgical intervention or not. In some medical conditions such as respiratory problems, not only is there no need for surgery, but also it is not helpful to perform surgery, and treating the underlying disease is sufficient [4,9].

Surgery is the treatment of choice in patients who failed medical therapy and patients with acute abdomen, ischemia, gas in the portal vein, and obstructions [9]. Pneumoperitoneum is not necessarily an indication for surgery because the presence of free gas in the abdomen is not always a sign of the lumen's perforation. It can sometimes be the result of rupturing of the gas cysts.

In the aforementioned patient, it seems that PI was the main cause of twisting of the mesenteric pedicle of intestine on itself and occurring of volvulus, and subsequently bowel obstruction. Because of the complicated condition of the patient, surgery was the preferred intervention.

4. Conclusion

Patients with pneumatosis intestinalis do not often require emergency surgical interventions except for complicated and life-threatening conditions. Many cases with benign PI and almost stable conditions are followed up with supportive treatments. In this rare case report, ileal volvulus seemed to be secondary to PI. To the best of our knowledge, these are very rare complications of PI. This article emphasizes the importance of complete and precise clinical evaluation of patients with PI presentation to avoid missing its very rare but lethal complications. Early recognition of such complications can be life-saving.

Ethical approval

This report does not contain any personal information that could lead to the identification of the patient. Therefore, it is exempt from ethical approval.

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CRediT authorship contribution statement

All of the authors contributed to the case study, research, and writing of the manuscript.

Guarantor

AM, FC, LM, KN, HZM.

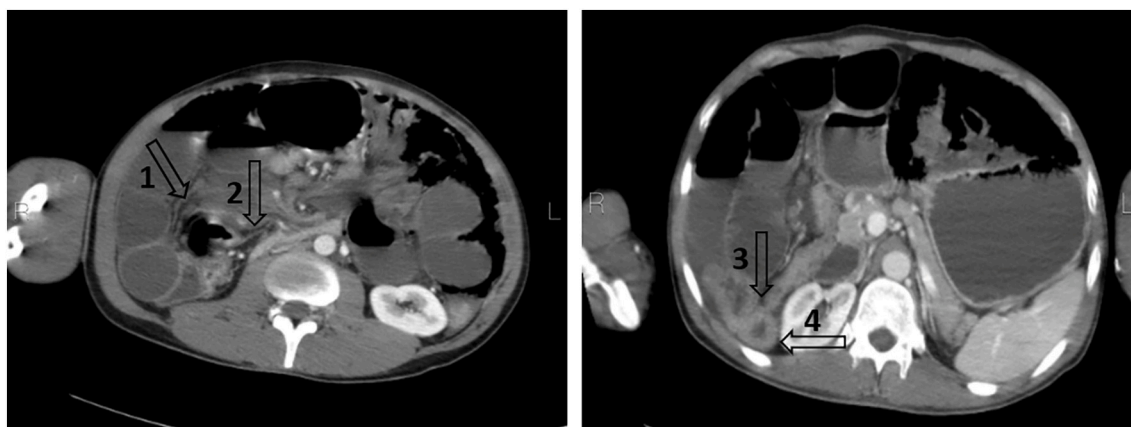


Fig. 1. Abdominopelvic CT scan of the patient. Arrow 1 indicates a collapsed intestinal loop. Arrow 2 indicates ileum twisting around its mesenteric pedicles. Arrow 3 shows the transitional zone and location of obstruction; arrow 4 shows the thickening of intestinal wall.

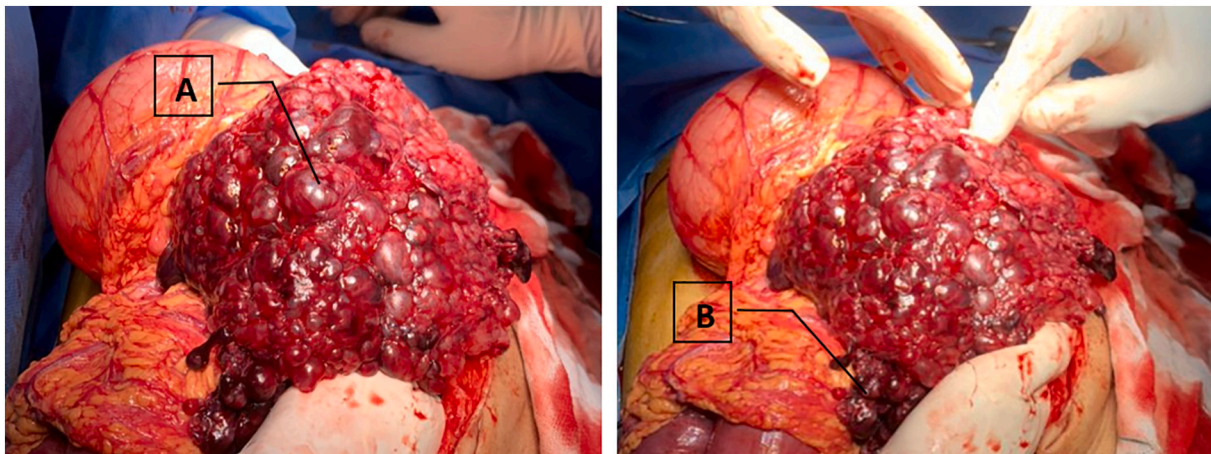


Fig. 2. Intestinal appearance at laparotomy. (A) Pneumatosis intestinalis; (B) discoloration of intestinal loop.

Research registration

Not applicable.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Declaration of competing interest

The authors have no conflicts of interest to declare.

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