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Case Report
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A Rare Case of Radiochemotherapy - Induced Pneumatosis Intestinalis and Hepatic Portal Venous Gas in an Asymptomatic Patient

Cheong J, Nicolle C and Sgroi A*

Department of Surgery, Groupement Hospitalier de l'Ouest Lémanique (GHOL), Nyon Hospital, Switzerland

Abstract

Background: Pneumatosis Intestinalis (PI) is an infrequent radiological finding described as the presence of intramural gas located either in the small or large bowel, with radiochemotherapy known to be one of the rare causative agents. Hepatic Portal Venous Gas (HPVG) can in some cases be associated with PI. Both PI and HPVG can indicate the presence of severe life-threatening intra-abdominal pathology such as intestinal perforation, ischemia, obstruction or volvulus in symptomatic patients.

Case Report: A 73-year-old man, recently diagnosed with localized lower esophageal carcinoma and undergoing combined radiochemotherapy, presented with mild abdominal discomfort. Clinical examination, vital signs and laboratory tests were unremarkable and reassuring. Abdominal CT scan showed PI, HPVG and pneumoperitoneum. Given the patient's reassuring clinical status, he was managed conservatively as an outpatient and regularly followed up. Subsequent repeat CT scans showed spontaneous and complete resolution of PI, HPVG and pneumoperitoneum. The patient thereafter completed his neoadjuvant chemotherapy regimen with no complications and later underwent an Ivor-Lewis esophagectomy.

Discussion: PI associated with HPVG can result in a fatal outcome in symptomatic patients if not identified promptly and managed properly. We herein report a rare case of radiochemotherapy-induced PI with HPVG in an asymptomatic patient. Although most cases can be managed conservatively, emergency exploratory laparoscopy or laparotomy should not be delayed if bowel ischemia is clinically suspected in presence of PI and HPVG.

Keywords: Pneumatosis intestinalis; Hepatic portal venous gas; Radiochemotherapy; Esophageal cancer

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Correspondence:
Julia Cheong, Department of Surgery, Groupement Hospitalier de l'Ouest Lémanique (GHOL), Nyon Hospital, Chemin Monastier 10, 1260 Nyon, Switzerland, Tel: +41 (0) 76 447 34 52

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Introduction

Pneumatosis Intestinalis (PI) is a radiological finding described as the presence of intramural gas located either in the small or large intestine. Other terminology used interchangeably include pneumatosis coli, pneumatosis cystoides intestinalis or pneumatosis cystoides coli [1], where pneumatosis cystoides intestinalis specifically alludes to the presence of gaseous cysts anywhere along the small or large bowel wall [2]. PI was first clinically described in the literature by German anatomist Johann Georg Duvernoy around 1731 as incidental findings on autopsies [3], with Lerner and Gazin later describing PI findings radiologically in 1946 [4].

PI is a relatively rare finding, with a documented incidence of 0.3%, however this figure is largely accepted to be an underestimate as most patients with PI are asymptomatic. 15% of cases are of idiopathic nature, also known as primary PI. This is usually asymptomatic and resolves spontaneously. The rest of the 85%, known as secondary PI, is of varied etiology and its exact pathophysiology still remains poorly understood [5]. Diseases associated with secondary PI are innumerable, from acute abdominal causes such as intestinal perforation, infarction or necrotizing enterocolitis, to endoscopic procedures, infections caused by *Clostridium difficile*, pulmonary disorders and immunological disruption arising secondary to AIDS, steroids and chemotherapy [2]. Hepatic Portal Venous Gas (HPVG), also described as portal pneumatosis, is thought to arise secondary to intramural intestinal gas emboli migrating through the portal venous system *via* the mesenteric veins [6,7].

Several chemotherapeutic agents have been directly linked to the development of secondary PI and hepatic portal venous gas, ultimately increasing the risk of bowel perforation [8,9]. A commonly suggested hypothesis is the induction of mucosal defects by chemotherapeutic agents, leading to denuded Peyer's patches in the small intestine, in turn allowing facilitated entry of gas within the bowel wall. Indeed, a number of studies focusing on patients with colorectal cancer undergoing chemotherapy with fluorouracil and leucovorin have reported cases of ileal ulceration. A systematic review conducted in 2022 by Gazzaniga et al. showed that fluorouracil was the most common cytotoxic drug associated with PI [10]. In addition, neutropenia is also thought to be an important factor contributing to PI, however this was not the case in our patient [11,12]. PI has also been observed following standalone radiotherapy [10].

The clinical presentation of PI and HPVG can be extremely varied although most patients will remain asymptomatic. Symptomatic individuals can present with abdominal fullness and mild abdominal pain but more alarming clinical features such as bowel obstruction, bowel ischemia, pneumoperitoneum or peritonitis, with or without hemodynamic instability can also occur [2]. Although 50% of patients with PI can be managed conservatively, promptly identifying individuals requiring emergent management is essential [13].

Through this case report, we aim to convey our experience of successfully managing PI and HPVG conservatively in a mildly symptomatic and clinically stable patient, despite initially alarming radiological findings suggesting small bowel perforation. This report has been written in line with the Surgical Case Report (SCARE) guidelines where applicable [14].

Case Presentation

A 73-year-old man with localized esophageal adenocarcinoma (initial stage uT3 uNI1) presented with mild abdominal discomfort during his follow up appointment with the oncologist, having undergone neoadjuvant external-beam radiotherapy three weeks prior. He had received a total dose of 50.4 Gy in 28 fractions over the course of five weeks. The patient was also on the third cycle of a concurrent course of neoadjuvant chemotherapy with FOLFOX (folinic acid, fluorouracil and oxaliplatin) at the time of the scan.

The contrast CT scan ordered by the oncologist showed new right colonic angle pneumatosis (Figure 1), multiple pneumoperitoneum cysts and hepatic portal venous gas bubbles in liver segments I and II (Figure 2). There were no signs of intestinal obstruction, peritonitis or intra-abdominal free fluid and no distant metastases were identified. The patient was immediately referred to the on-call surgical team for review as the radiological findings were initially compatible with potential intestinal ischemia and perforation.

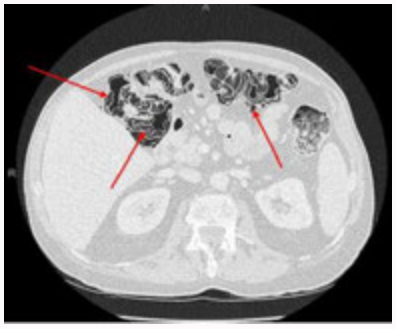

Figure 1: Abdominal CT-scan showing right colonic angle pneumatosis cysts and pneumoperitoneum at initial time of diagnosis.

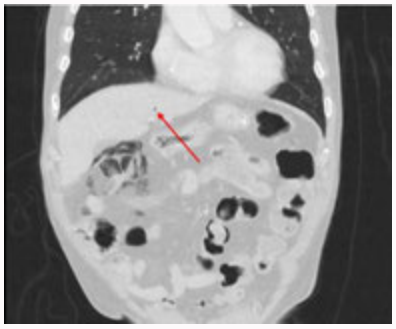

Figure 2: Initial coronal view of the abdominal CT-scan demonstrating intrahepatic air bubbles (hepatic portal venous gas).

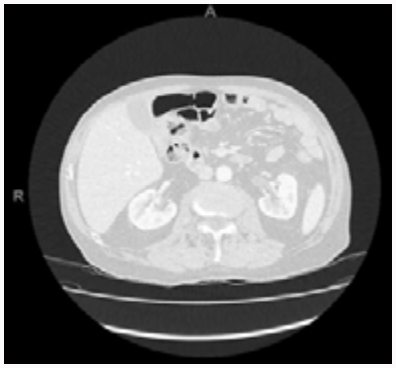

Figure 3: Follow up abdominal CT-scan at 10 months showing complete resolution of PI.

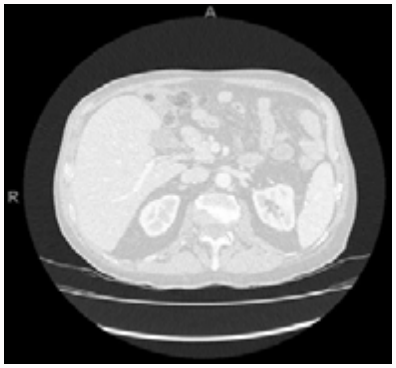

Figure 4: Follow up abdominal CT-scan at 10 months showing complete resolution of HPVG.

Upon direct questioning, the patient described a 2-week history of mild intermittent abdominal discomfort in the right hypochondriac and epigastric regions, with no associated vomiting or change in bowel habits. No other symptoms were reported. There was no recent history of surgical or endoscopic procedures over the last 5 years. His past medical history included ischemic heart disease, hypertension and hypercholesterolemia. His current medical treatment consisted of dual antiplatelet therapy and a proton pump inhibitor.

Clinical examination and vital signs were strictly normal. There was no abdominal tenderness, fullness or signs of peritonitis. Full blood count, liver function tests, electrolytes, C-reactive protein and oncologic marker CA19-9 were unremarkable. Considering the

reassuring nature of the clinical and laboratory findings, the patient was managed conservatively and was discharged home on the same day with safety-netting advice and close follow-up. He was seen again as an outpatient at 48 h, where repeat clinical examination, laboratory testing and abdominal CT scans did not show any significant changes. Subsequent CT scans showed complete resolution of PI and HPVG at 10 months (Figure 3, 4).

Meanwhile, the patient completed a total number of 6 neoadjuvant chemotherapy cycles with FOLFOX. Two months later, he underwent a minimally invasive Ivor-Lewis esophagectomy with gastric transplant, with no immediate postoperative complications. Three months postoperatively, he was started on a 1-year course of adjuvant immunotherapy with nivolumab which was overall well-tolerated.

Around 1-year post-esophagectomy, the patient developed a persistent cough with no associated pyrexia or shortness of breath. A barium swallow, CT scan and an esophagogastroduodenoscopy showed non-malignant postoperative anastomotic stenosis, for which he underwent esophageal dilatation sessions. There was no evidence of recurrence of the esophageal adenocarcinoma at the time of writing.

Discussion

Due to the wide-ranging presentation and etiology of PI and HPVG, subsequent management of affected patients will largely depend upon combined clinical, laboratory and radiological findings. Whilst persistent abdominal pain should raise suspicion for bowel ischemia and/or perforation and therefore prompt surgical management, surgery can be delayed in selected patients with 'benign' pneumatosis, for whom there are no signs of clinical and biological ischemia, peritonitis, infection or inflammation [15,16].

Symptom severity in patients with PI should be assessed in priority, along with biological markers. Although most patients presenting with PI and HPVG can be managed conservatively, it is also important to note that the overall mortality linked to symptomatic PI still remains relatively high at 33% to 40%. In addition, short-term mortality also rises in the presence of colonic PI combined with HPVG on imaging in patients where intestinal ischemia is already suspected [6,7]. Ruling out a life-threatening cause for PI is therefore essential, as well as treating its underlying cause [17].

Emergency diagnostic exploratory laparotomy or laparoscopy is indicated in patients with PI and any one of: Peritonitis signs (such as abdominal rigidity or rebound tenderness), hyperlactatemia levels above 2.0 mmol/L, evidence of metabolic acidosis, that is, arterial pH below 7.3 and bicarbonate levels below 20 mmol/L or portal venous gas. Moreover, mortality climbs to 80% if lactate levels rise above 2 mmol/L at the time of diagnosis [13].

Clinically stable patients with none of the emergency criteria listed above but who remain symptomatic will require hospital admission for antibiotic treatment and potential inhalation oxygen therapy. Metronidazole remains the most commonly used antibiotic; other regimens include ampicillin, vancomycin and tetracyclines [5]. A short course treatment using inhalation oxygen therapy or hyperbaric oxygen therapy has also been shown to contribute to cyst deflation but should be used with caution due to the associated risks of oxygen toxicity [2].

For patients presenting even milder symptoms, a conservative approach with close follow up and watchful waiting can be adopted. Antibiotics based on local guidelines can be initiated in patients presenting symptoms not interfering with activities of daily living. In asymptomatic patients, clinical surveillance with no additional therapy is deemed sufficient, with repeat abdominal imaging every 1 to 3 months until complete symptom and PI resolution.

If symptoms persist despite conservative measures at 3 months or in case of worsening clinical status, exploratory laparoscopy with or without surgical resection of the affected bowel section should be considered, depending on the patient's age, current functional status, medical history and the extent of bowel involvement.

Conclusions

- Chemotherapy and radiotherapy induced PI is a known but rare complication in the oncologic population. Nevertheless, it remains a radiological finding and does not in itself constitute a diagnosis.
- PI and HPVG, even in asymptomatic patients, should always be monitored since it can lead to serious complications including bowel perforation, ischemia and ultimately death.
- Conservative outpatient treatment with close follow-up should be considered in selected patient groups with reassuring clinical and laboratory examination.
- Emergency exploratory laparoscopy or laparotomy should not be delayed if bowel ischemia is clinically suspected in presence of PI and HPVG.

Acknowledgement

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References

1. Chang YT, Chang MC, Wei SC, Wong JM. Pneumatosis cystoides coli. Gastrointest Endosc. 2006;64(5):820.
2. Heng Y, Schuffler MD, Haggitt RC, Rohrmann CA. Pneumatosis intestinalis: A review. Am J Gastroenterol. 1995;90(10):1747-58.
3. Du Vernoy JG. Aer intestinorum tam sub extima quam intima tunica inclusus: Observationes anatomicae: Comment. Acad Acient Imp Petropol. 1730;5:213-25.
4. Lerner HH, Gazin AI. Pneumatosis intestinalis; its roentgenologic diagnosis. Am J Roentgenol Radium Ther. 1946;56:464-9.
5. Pneumatosis intestinalis - UpToDate [Internet]. 2023.
6. Hou SK, Chern CH, How CK, Chen JD, Wang LM, Lee CH. Hepatic portal venous gas: Clinical significance of computed tomography findings. Am J Emerg Med. 2004;22(3):214-8.
7. Sebastià C, Quiroga S, Espin E, Boyé R, Alvarez-Castells A, Armengol M. Portomesenteric vein gas: Pathologic mechanisms, CT findings, and prognosis. Radiographics. 2000;20(5):1213-24; discussion 1224-6.
8. Kung D, Ruan DT, Chan RK, Ericsson ML, Saund MS. Pneumatosis intestinalis and portal venous gas without bowel ischemia in a patient treated with irinotecan and cisplatin. Dig Dis Sci. 2008;53(1):217-9.
9. Mimatsu K, Oida T, Kawasaki A, Kano H, Kuboi Y, Aramaki O, et al. Pneumatosis cystoides intestinalis after fluorouracil chemotherapy for rectal cancer. World J Gastroenterol. 2008;14(20):3273-5.

10. Gazzaniga G, Villa F, Tosi F, Pizzutilo EG, Colla S, D'Onghia S, et al. Pneumatosis intestinalis induced by anticancer treatment: A systematic review. Cancers (Basel). 2022;14(7):1666.

11. Tamura N, Kojo H, Miyoshi Y, Fukumoto S, Hirayama C. Pneumatosis cystoides intestinalis: Report of 3 cases with special reference to its non-surgical treatment. Z Gastroenterol. 1980;18(12):617-24.

12. Galm O, Fabry U, Adam G, Osieka R. Pneumatosis intestinalis following cytotoxic or immunosuppressive treatment. Digestion. 2001;64(2):128-32.

13. Hawn MT, Canon CL, Lockhart ME, Gonzalez QH, Shore G, Bondora A, et al. Serum lactic acid determines the outcomes of CT diagnosis of pneumatosis of the gastrointestinal tract. Am Surg. 2004;70(1):19-23; discussion 23-24.

14. Agha RA, Franchi T, Sohrabi C, Mathew G, Kerwan A; SCARE Group. The SCARE 2020 Guideline: Updating Consensus Surgical CAse REport (SCARE) Guidelines. Int J Surg. 2020;84:226-30.

15. Dibra R, Picciariello A, Trigiante G, Labellarte G, Tota G, Papagni V, et al. Pneumatosis intestinalis and hepatic portal venous gas: Watch and wait or emergency surgery? A case report and literature review. Am J Case Rep. 2020;21:e923831.

16. Ito N, Masuda T, Yamaguchi K, Sakamoto S, Horimasu Y, Nakashima T, et al. Pneumatosis intestinalis following radiation esophagitis during chemoradiotherapy for lung cancer: A case report. Case Rep Oncol. 2021;14(3):1454-9.

17. Ho LM, Paulson EK, Thompson WM. Pneumatosis intestinalis in the adult: Benign to life-threatening causes. AJR Am J Roentgenol. 2007;188(6):1604-13.