

Benign pneumatosis intestinalis with massive portomesenteric venous gas in a very old man. A case report

O. CAPONE¹, G.L. D'ALÒ², M. ANIBALLI¹, S. PLETTTO¹, M. VILLA¹,
A. DE MAJO¹, D. VENDITTI¹, M. GRANDE¹

SUMMARY: Benign pneumatosis intestinalis with massive portomesenteric venous gas in a very old man. A case report.

O. CAPONE, G.L. D'ALÒ, M. ANIBALLI, S. PLETTTO, M. VILLA,
A. DE MAJO, D. VENDITTI, M. GRANDE

Introduction. Pneumatosis intestinalis (PI) is described as the presence of air within bowel wall. PI aetiology is various: it can be associated with non-urgent or life-threatening conditions. Clinical management is based on physical examination, blood tests and radiology, in particular abdominal CT. The cause of PI suggests the correct therapy. When PI is linked to gas in portal and mesenteric venae (PMVG), bowel ischemia or infarction is possible, and surgery needed.

Case report. A 91 years-old man was admitted to Emergency Department reporting abdominal pain and vomit. Acute abdominal symptoms, radiological finding of small bowel PI with massive PMVG,

severe neutrophilia, and high serum lactate forced us to perform exploratory laparotomy, from which it was observed a diffuse band-like pneumatosis of all the small bowel and mesentery without ischemic or peritonitis signs. The patient was imposed to fast and treated with oxygen, intravenous fluid and antibiotic therapy, without performing further surgery, and was discharged to a rehabilitation facility after symptomatology resolution.

Discussion. Scientific literature underlines the importance of PMVG to consider as critic a patient with PI, but it is always essential to assess also physical examination, vital parameters, and blood exams. In our case, several signs were suggestive for bowel infarction: its absence and the swift recovery of the patient were unexpected.

Conclusion. Although non-surgical treatment is recommended for primary PI of unknown aetiology, in case physical examination and radiological signs aren't decisive surgery is necessary to rule out bowel infarction. This case stresses the difficulty of PI management.

KEY WORDS: Pneumatosis intestinalis - Portomesenteric venous gas - Small bowel - Exploratory laparotomy - Recovery.

Introduction

Pneumatosis Intestinalis (PI) is a very rare condition characterized by the presence of air within the bowel wall. The first case was reported in 1754 (1). Today, PI incidence is 0.3% based on computed tomography (2) and 0.03% as observed during autopsy sections (3). This condition affects especially the large bowel (46% of the cases) and secondarily the small bowel (27%); the onset of both conditions simultaneously is less frequent (7%) (1). The cause of

PI development is often unclear, but there are two main theories that try to explain it. The mechanical theory supposes that bowel wall is dissected by gas for an increase in air pressure due to an intestinal obstruction or to air blebs' break in case of Chronic Obstructive Pulmonary Disease (COPD). According to the bacterial theory, instead, some species of bacilli (*Clostridium spp.*) make such a lot of gas that air can pass through the mucosal barrier (4). PI is divided into idiopathic form (15%), in patients without important medical history or chronic disease, and secondary PI (85%), related to diverse gastrointestinal diseases or other pathological conditions (3). Clinically, PI can be associated with a benign condition (even completely asymptomatic) or a life-threatening status (mesenteric ischemia, bowel perforation, etc.), but it's very difficult, even with prediction models of mortality (as serum lactate con-

¹ Department of Surgery, University Hospital of Tor Vergata "PTV", Rome, Italy

² Section of Hygiene, Department of Biomedicine and Prevention, University of Rome "Tor Vergata", Rome, Italy

Corresponding author: Orazio Capone, e-mail: caponeorazio@gmail.com

centration, contrast-enhanced Computed Tomography – CT, etc.), to recognize patients who need immediate surgical procedure (2). In this case report, we show a patient with a severe clinical condition by initial body examination, blood exams and CT-scan, but who, finally, had a complete recovery. The evolution of this case is a further demonstration of how, in the PI, maximum care is needed to identify, case by case, the correct management.

This case report has been reported in line with the SCARE criteria (5).

Case report

A 91-years-old man was admitted to our Emergency Department at 3 o'clock p.m. reporting abdominal pain, vomit with liquid stools from the morning of same day. He denied a history of previous surgery, while his comorbidities were: hypertension, chronic kidney failure, COPD, diabetes mellitus treated with insulin and prostatic hypertrophy. Furthermore, he reported to have an abdominal aortic aneurism and to be a cardiac patient with pacemaker (PMK).

His vital signs were normal: afebrile, heart rate of 68 bpm, blood pressure of 105/50 mmHg and arterial oxygen saturation SaO₂ of 96%. His physical examination showed an extensive abdominal distension and tenderness, with augmented tympanitic sound and absent bowel sounds. Blood examinations showed no leukocyte increase but a severe neutrophilia (95% of white blood cells - WBC), and serum lactate of 2.3 mmol/L (normal values <2 mmol/L). The patient underwent Abdominal X-ray that showed no free intraperitoneal air but an important distension of the stomach and small bowel, indicating ileus. Since abdominal pain was getting worse until it became severe, the patient underwent Abdominal CT-Scan that showed the presence of air along both intra- and extra-hepatic ducts (Figure 1) and portal-mesenteric venous system (PMVG) (Figure 2), plus radiolucent clusters of small bubbles through the wall of the small bowel (Figure 2). In accordance to the radiologist this condition was a typical picture of intestinal infarction. The patient subsequently underwent exploratory laparotomy, from which it was observed a diffuse band-like pneumatosis of all the small bowel and mesentery (Figure 3), with complete absence of ischemic or peritonitis signs, and without any lesion of the large bowel. No

other surgical procedures have been performed. During the post-operative period, the patient was imposed to fast and treated with oxygen, intravenous fluid and antibiotic (ceftriaxone and metronidazole) therapy. He later went through a brief phase of acute kidney failure (serum creatinine value was 4.4 mg/dL during the first post-operative day) and at the third post-operative day he started to drink some water. Stool test was negative for *Clostridium difficile* and other pathogenic microorganism or toxins. He was discharged to a rehabilitation facility at the seventh post-operative day after the complete resolution of the abdominal symptoms.

Discussion

PI management is very difficult, since it is an ill-defined pathology without usual aetiology, symptomatology and prognosis. PI is often considered as a condition associated with other diseases or “a radiological finding” (6).

However, it is essential to distinguish a worrisome form from a benign one, in order to decide who has to undergo laparotomy, a procedure that is required in about 66% of PI cases. According to Mehdi Tahiri et al. (7), the parameters to evaluate the patient's need to undergo surgery are: age (≥ 60 years old), acute abdomen or hypotension, acute kidney injury, lactate (>2 mmol/L), bicarbonate (20 mmol/L), high WBC count (≥ 12000 /ml), CT-findings (bowel dilatation, ascites, portal venous gas). In the case that most of these markers are absent, the authors recommend against surgery, while antibiotic therapy, elemental diet and oxygen therapy are recommended during the observation period.

Consequently, which were the causes of PI? In a retrospective study, published in 2016 by Marc-Olivier Treyaud et al. (8) and reporting the CT-findings, and their clinical correlations, of 149 PI patients, the first cause was intestinal ischemia (53.7%), followed by infections (12.1%), obstructive (8.1%) and non obstructive (6.7%) bowel dilatation, unknown aetiology (5.4%), drugs (5.4%), inflammation (4.7%) and other causes (4%). In particular, mortality was correlated with intestinal ischemia ($p= 0.003$), so it is prominent to pay attention to this cause of PI through by investigating significantly correlated feature (clinical, radiological and etc.). The features proposed in this study (8) were: PMVG, decreased mural contrast-enhance-

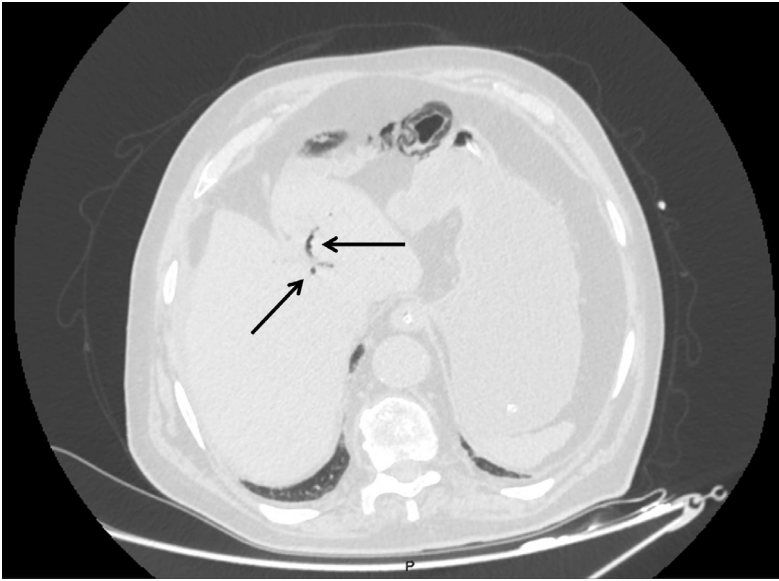


Figure 1 - CT-scan image showing air in hepatic ducts (see arrows).

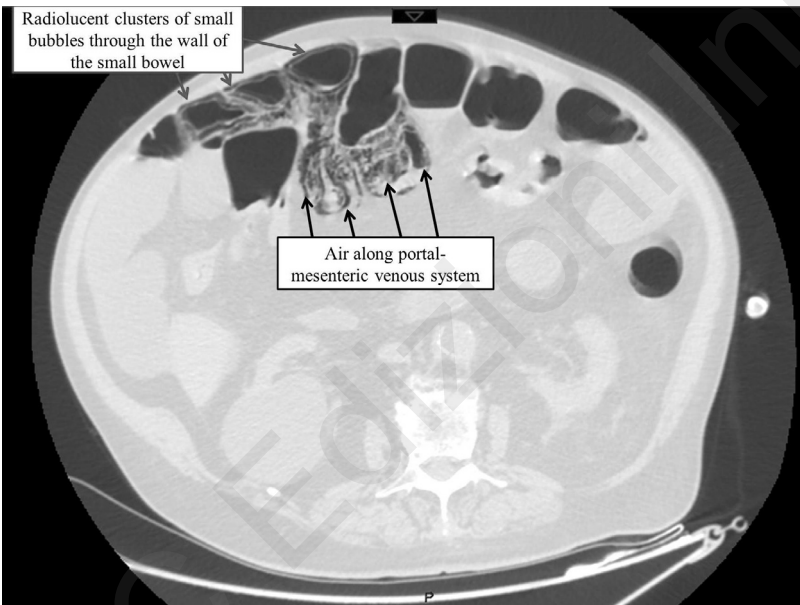


Figure 2 - CT-scan image showing air in portal-mesenteric venous system (see black arrows) and radiolucent clusters of bubbles through the wall of the small bowel (see grey arrows).

ment, the degree of calcified atherosclerosis, laboratory tests (serum lactate, pH, blood urea, WBC). PMVG with PI and “decreased mural contrast-enhancement” were necessarily, significantly correlated with underlying ischemia ($p=0.009$ and $p<0.001$, respectively). The degree of calcified atherosclerosis stressed a statistical tendency to be associated with ischemic cause of PI, too ($p=0.08$). Among blood tests, the only one significantly associated with bowel ischemia was $WBC >12000$ cells/ mm^3 ($p=0.03$), the same parameter evaluated by Mehdi Tahiri for defin-

ing life-threatening PI ($WBC >12000/mm^3$). Other parameters as Serum lactate >2.4 mmol/L, Arterial pH <7.34 and BUN (blood urea nitrogen) >7.7 mmol/L did not reach statistical significance (8).

Both these articles (7, 8) underlined the importance of PMVG to consider as critical a patient with PI, but it's always essential to assess also physical examination, vital parameters and blood exams. A paper by Soo-Kyung Yoo et al. proposed APACHE II score to decide whether surgical intervention is necessary or not (9).

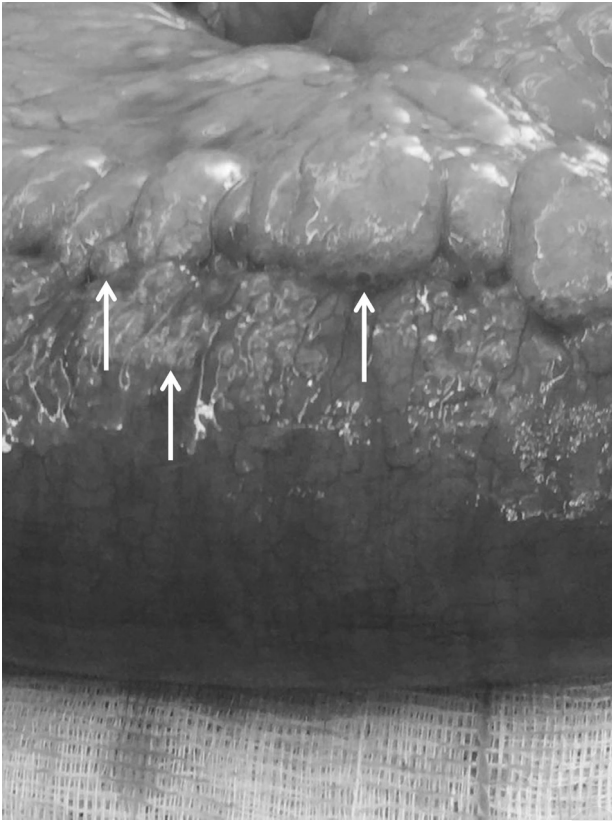


Figure 3 - Intraoperative finding of diffuse band-like pneumatosis of the entire small bowel and mesentery (see arrows).

In the case here presented, the decision to undergo laparotomy came from physical examination, characterized by extensive abdominal distension and tenderness without peristalsis, and, above all, CT-findings. The massive PMVG and PI of small bowel

were highly suggestive for bowel infarction: its absence and the swift recovery of the patient were unexpected.

Conclusion

PI can be associated with both a benign and a life-threatening condition, but in the case of a CT-scan finding of PMVG, the exclusion of a bowel ischemia or infarction is needed. When physical examination, blood tests and other radiological signs are not decisive, surgery is necessary.

Declarations of interest

None.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Disclosure

We attest to the fact that all Authors listed in the title page have contributed significantly to the work, have read the final manuscript, attest to the validity and legitimacy of the data and its interpretation, and agree to its submission.

The patient's informed consent was taken, while ethical approval was not needed for case report in this hospital.

References

1. Ho LM, Paulson EK, Thompson WM. Pneumatosis intestinalis in the adult: benign to life-threatening causes. *AJR Am J Roentgenol.* 2007 Jun;188(6):1604-13. doi: 10.2214/AJR.06.1309.
2. Hawn MT, Canon CL, Lockhart ME, Gonzalez QH, Shore G, Bondora A, Vickers SM. Serum lactic acid determines the outcomes of CT diagnosis of pneumatosis of the gastrointestinal tract. *Am Surg.* 2004 Jan;70(1):19-23; discussion 23-4.
3. Heng Y, Schuffler MD, Haggitt RC, Rohrmann CA. Pneumatosis intestinalis: a review. *Am J Gastroenterol.* 1995 Oct;90(10):1747-58.
4. Galandiuk S, Fazio VW. Pneumatosis cystoides intestinalis. A review of the literature. *Dis Colon Rectum.* 1986 May;29(5):358-63.
5. Agha RA, Fowler AJ, Saeta A, Barai I, Rajmohan S, Orgill DP; SCARE Group. The SCARE Statement: Consensus-based surgical case report guidelines. *Int J Surg.* 2016 Oct;34:180-186. doi: 10.1016/j.ijsu.2016.08.014.
6. Blair HA, Baker R, Albazaz R. Pneumatosis intestinalis an increasingly common radiological finding, benign or life-threatening? A case series. *BMJ Case Rep.* 2015 Feb 18;2015. doi: 10.1136/bcr-2014-207234.
7. Tahiri M, Levy J, Alzaid S, Anderson D. An approach to pneumatosis intestinalis: Factors affecting your management. *Int J Surg Case Rep.* 2015;6C:133-7. doi: 10.1016/j.ijscr.2014.12.007.
8. Treyaud MO, Duran R, Zins M, Knebel JF, Meuli RA, Schmidt S. Clinical significance of pneumatosis intestinalis - correlation of MDCT-findings with treatment and outcome. *Eur Radiol.* 2017 Jan;27(1):70-79.
9. Yoo SK, Park JH, Kwon SH. Clinical outcomes in surgical and non-surgical management of hepatic portal venous gas. *Korean J Hepatobiliary Pancreat Surg.* 2015 Nov;19(4):181-7. doi: 10.14701/kjhbps.2015.19.4.181.