

CASE REPORT

Portomesenteric vein gas and pneumatosis intestinalis – a rare complication after neoadjuvant radiochemotherapy in oesophageal cancer

Duchon R, Pindak D, Sucha R, Bernadic M, Dolnik J, Pechan J

National Cancer Institute, Department of Surgical Oncology, Bratislava, Slovakia. robert.duchon@nou.sk

Abstract: Portomesenteric vein gas and pneumatosis intestinalis is most commonly caused by mesenteric ischemia and bowel necrosis but may have a variety of other causes. The etiology is multifactorial and the clinical presentation is variable. The diagnosis is based on a combination of clinical suspicion and radiographic findings. The finding of hepatic portal venous gas alone is not an indication for emergent exploration. We report portomesenteric venous gas as a rare complication after neoadjuvant radiochemotherapy of the oesophageal cancer (Fig. 3, Ref. 12). Full Text in free PDF www.bmj.sk.

Key words: portomesenteric vein gas, pneumatosis intestinalis, radiochemotherapy, oesophageal cancer, nonischemic enterocolitis.

Portal vein gas, mesenteric vein gas and pneumatosis intestinalis are rare conditions whose pathogenesis is not fully understood. The first description of hepatic portal vein gas was in an infant in 1955, following *E. coli* septicaemia, Wolfe and Evans described portomesenteric venous gas in a report of six infants who had died from intra-abdominal catastrophes, in 1963, Schorr described pneumatosis intestinalis (1). Since then, radiographic images of both conditions have been discussed in the literature, but usually as separate entities. Thus, little is known about the clinical importance of portomesenteric venous gas combined with pneumatosis intestinalis in acute bowel ischemia. In the late 1970s and 1980s, most reports of portomesenteric venous gas related to bowel ischemia were associated with extensive bowel necrosis and a fatal outcome (2). However, with technological advances, abdominal computed tomography has become a key imaging modality used in the diagnosis of acute bowel ischemia. Computed tomography (CT) also allows us to detect faint signs of portomesenteric venous gas or pneumatosis intestinalis at earlier stages of acute bowel ischemia. The etiology is multifactorial and the clinical presentation variable. Portomesenteric vein gas and pneumatosis intestinalis is most commonly caused by mesenteric ischemia and bowel necrosis but may have a variety of other cause (1). The primary causes are intestinal wall alterations (inflammatory bowel disease, mesenteric ischemia), bowel distension (gastric and bowel dilatation – spontaneous, traumatic and iatrogenic causes), sepsis (colitis, diverticulitis, abdominal

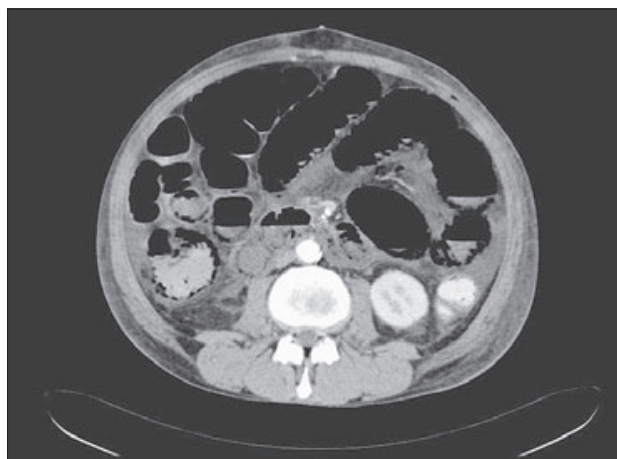
wall gangrene, pylephlebitis) and idiopathic in approximately 15 % of cases (transplantation, corticosteroid therapy, pneumatosis intestinalis, chronic pulmonary disease). The diagnosis is based on a combination of clinical suspicion and radiographic findings. Advanced imaging techniques as computed tomography have increased the sensitivity for detection of portomesenteric vein gas and pneumatosis intestinalis. Pneumatosis is associated with a mortality rate of 44 %, and portomesenteric venous gas is associated with a mortality rate of 56 %, in those patients who showed portomesenteric venous gas and pneumatosis by CT, the mortality rate increased to 72 % (1, 2). Findings of portomesenteric vein gas and pneumatosis intestinalis CT scan should be evaluated with clinical findings. When computed tomography demonstrates portomesenteric vein gas and pneumatosis intestinalis and clinical findings are not relevant, the prognosis is good and surgery is not required. But when computed tomography demonstrates portomesenteric vein gas and pneumatosis intestinalis and clinical findings suggest the presence of mesenteric ischaemia surgery is indicated (2, 3). We report a case of portomesenteric venous gas found with band-like pneumatosis on radiographic-computed tomography images and we review the literature to clarify the clinical relevance of this combination and emphasize the importance of performing early laparotomy.

Case report

53-years old man with squamous cell oesophageal carcinoma staged as cT3cN1cM0 was treated by neoadjuvant chemoradiation with otherwise unremarkable history. The neoadjuvant therapy was based on radiotherapy and chemotherapy treatment. A total dose of 45 grays (Gy) was given in fractions of 1.8 Gy, 5 fractions per week and intravenous 5-fluorouracil, cisplatin and

National Cancer Institute, Department of Surgical Oncology, Bratislava, Slovakia

Address for correspondence: R. Duchon, MD, National Cancer Institute, Department of Surgical Oncology, Klenova 1, SK-833 10 Bratislava, Slovakia.



Figs 1 and 2. Intrahepatic portal vein gas, mesenteric vein gas and gas collection in the bowel wall.

leucovorin. On the 20th day the radiochemotherapy was interrupted, because of swallowing problems and nutritive jejunostomy was indicated. This was performed after adequate preparation (correction of leuco- and thrombocytopenia, hypocoagulation and hypoalbuminemia). In the next ongoing laboratory tests elevations of inflammatory markers were observed signaling an ongoing inflammation, which resulted in septic state and rapid deterioration. Next follow up showed continuing abdominal discomfort with no peritoneal irritation and negative abdominal ultrasound. Contrast radiography through jejunostomy was performed without pathological result. High fever and leucopenia continued until haematemesis occurred. Because of that a CT scan was done, which showed gas within intrahepatic portal vein, mesenteric vein and gas collection in the bowel wall (Figs 1, 2). Patient underwent surgical emergent exploration. Black-colored bowel was a surprise (Fig. 3). Pulsations of mesenteric arteries were good. Empiric antibiotic therapy was started. In the next hours patient was observed at intensive care unit with high doses of noradrenaline. Due to rapid alteration and deterioration patient died 6 hours after the surgery.

Review of the literature

The computed tomography findings of pneumatosis intestinalis and portomesenteric vein gas usually indicate the presence of mesenteric infarction (4). However, both findings may also be observed occasionally in nonischemic conditions.

Pneumatosis and portomesenteric venous gas may occur after damage of the gastrointestinal wall caused by infection and inflammation, but also by neoplastic bowel wall damage, ulceration, or overdistention. Portomesenteric vein gas may occur without pneumatosis in cases of mesenteric abscess formation, portal pylephlebitis, sepsis, abdominal trauma and, especially, after gastrointestinal surgery and liver transplantation (5, 7, 8).

Pneumatosis intestinalis and portomesenteric venous gas are impressive, but uncommon radiologic findings that most commonly develop because of bowel ischemia. The presence of



Fig. 3. Black-colored bowel.

portomesenteric venous gas on radiographs has been associated with a mortality rate of more than 75 % in earlier studies (3, 4). Over the last decade, detection of pneumatosis intestinalis and portomesenteric venous gas has improved due to use of CT, and therefore, these two processes may be detected in earlier stages.

Pneumatosis intestinalis may logically occur without portomesenteric venous gas in bowel ischemia because accumulation of intramural gas in an ischemic bowel segment does not automatically mean that the intramural gas has also found its way into some mesenteric veins (6). However, if this scenario develops, portomesenteric venous gas usually occurs as an additional finding with pneumatosis. Nonetheless, even if rare, occasionally after an ischemic damage to the intestinal wall intraluminal gas may enter the portomesenteric veins directly without producing a radiologically detectable pneumatosis.

Early studies of hepatic portal venous gas were based on plain abdominal radiography and a literature survey in 1978 found an associated mortality rate of 75 %, primarily due to ischemic bowel disease (7, 9). Modern abdominal CT has resulted in the detection of hepatic portal venous gas in more benign conditions, and

a second literature survey in 2001 found a total mortality of only 39 % (4). While the pathophysiology of hepatic portal venous gas is, as yet, unclear, changing abdominal imaging technology has altered the significance of this radiologic finding. Therefore hepatic portal venous gas predicts high risk of mortality (>50 %), if detected by plain radiography or by CT in a patient with additional evidence of necrotic bowel. If detected by CT in patients after surgical or endoscopic manipulations, the clinician is advised that there is no evidence of increased risk. If hepatic portal venous gas is detected by CT in patients with active peptic ulcer disease, intestinal obstruction and/or dilatation, or mucosal diseases such as Crohn disease or ulcerative colitis, caution is warranted, as risk of death may approach 20 % to 30 %. The finding of hepatic portal venous gas alone can not be an indication for emergency exploration (9).

Non occlusive mesenteric ischemia is also a serious complication of long term hemodialysis. Patients with long-term hemodialysis often have many risk factors for the development of mesenteric ischemia, including severe arteriosclerosis, organic heart disease, the use of medications associated with mesenteric ischemia, and the need to remove large volumes of fluid from the intravascular space, leading to relative hypovolemia and hypotension (12).

Conclusion

The most frequent cause of portomesenteric vein gas and pneumatosis intestinalis in adults is mesenteric ischemia. However several other conditions have been described as causes of portomesenteric vein gas and pneumatosis intestinalis. In the majority of cases surgery is not required and the prognosis is favorable. Findings of portomesenteric vein gas and pneumatosis intestinalis at computed tomography should be carefully evaluated in the context of clinical findings. The finding of hepatic portal venous gas alone should not be an indication for emergent exploration

References

1. Wiesner W, Mortele KJ, Glickman JN, Ji H, Ros PR. Pneumatosis intestinalis and portomesenteric venous gas in intestinal ischemia: Correlation of CT findings with severity of ischemia and clinical outcome. *Am J Roentgenol* 2001; 177: 1319–1323.
2. Liebman PR, Patten MT, Manny J, Benfield JR, Hechtman HB. Hepatic-portal venous gas in adults: Etiology, pathophysiology and clinical significance. *Ann Surg* 1978; 187: 281–287.
3. Sebastian C, Quiroga S, Espin E, Boyé R, Alvarez-Castells A, Armengol M. Portomesenteric Vein Gas: Pathologic Mechanisms, CT Findings, and Prognosis, *RadioGraphics* 2000; 20: 1213–1224.
4. Yamada K, Saeki M, Yamaguchi T et al. Acute mesenteric ischemia: CT and plain radiographic analysis of 26 cases. *Clin Imaging* 1998; 22: 34–41.
5. Chezmar JL, Nelson RC, Bernardino ME. Portal venous gas after hepatic transplantation: sonographic detection and clinical significance. *Am J Roentgenol* 1989; 153: 1203–1205.
6. Blumgart LH et al. Surgery of the liver, biliary tract and pancreas. Vol. 2. Saunders 2007: 1135–1141.
7. De Carvalho Fabrício V, Amado F, Del Giglio A. Low-cost outpatient chemotherapy regimen of cisplatin, 5-fluorouracil and leucovorin for advanced head and neck and esophageal carcinomas. *Sao Paulo Med J* 2008; 126 (1): 63–66.
8. Zielke A, Hasse C, Nies C, Rothmund M. Hepatic–portal venous gas in acute colonic diverticulitis. *Surg Endosc* 1999; 32: 278–280.
9. Nelson AL et al. Hepatic Portal Venous Gas – The ABCs of Management. *Arch Surg* 2009; 144 (6): 575–581.
10. Varghese SJ et al. Portomesenteric venous gas. *JNZ Med Ass* 2006; 119 (1246).
11. Lai WH, Hwang TL, Chen HW. Portomesenteric Venous Gas in Acute Bowel Ischemia: Report of a Case. *Surg Today* 2008; 38: 656–660.
12. Sato M et al. Transient Portomesenteric Venous Gas in Long-term Hemodialysis Patients. *Radiation Med* 2005; 23 (8): 570–573.

Received October 21, 2010.

Accepted April 4, 2011.