A case of hepatic portal venous gas: When time is gold

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ABSTRACT

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CASE REPORT

A 67-year-old male with history of type 2 diabetes mellitus, stroke, gastrointestinal bleed secondary to esophageal ulcer and distant cholecystectomy, was transferred to our hospital from outside facility due to one day of severe abdominal pain associated with nausea but no vomit.

Physical examination of the patient showed blood pressure 110/70 mmHg, heart rate 124 beats per minute, respiratory rate 20 breaths per minute, oxygen saturation of 95% on room air. He was awake, alert and oriented in three dimensions. Abdomen massively distended, with diffuse tenderness, rigidity, rebound and no bowel sounds on auscultation. He had a computed tomography scan of abdomen done which showed extensive amount of portal venous gas (Figure 1) associated with extensive dilated fluid-filled small bowel and diffuse pneumatosis of the intestinal wall (Figure 2). His lab work showed lactate 3.9 mmol/L, white blood cell count $20.8 \times 10^3/\mu\text{l}$ with 22% of bands, hemoglobin 11.2 g/dl platelets $304 \times 10^3/\mu\text{l}$. Sodium 128 mmol/L, potassium 4.3 mmol/L, chloride 101 mmol/L, bicarbonate 15 mEq/L, creatinine 1.4 mg/dl, blood urea nitrogen 15 mg/dl, glucose 432 mg/dl, AST 47 U/L, ALT 28 U/L, total bilirubin 0.4 mg/dl, alkaline phosphatase 95 U/L, total protein 7 g/dl, albumin 3.4 g/dl, calcium 9 mg/dl, prothrombin time 14 sec, INR 1.1. The patient was taken to operating room urgently and exploratory laparotomy showed small bowel ischemia that

required removal of 9 feet of medial small bowel, leaving 6 feet of it (3 feet of jejunum and 3 feet of ileum) with primary end to end anastomosis. He was then transferred to intensive care unit, was started on vancomycin and piperacillin/tazobactam, did not require vasopressors.

The patient had no complications during postoperative period, spent uneventful days on intensive care unit and was then transferred to medical floor and eventually discharged.

DISCUSSION

Hepatic portal venous gas (HPVG) is a rare imaging finding first described in 1955 in neonatal necrotizing enterocolitis by Wolf and Evans [1].

As new studies were done on the subject, it was noticed that HPVG was also present in the adult population in cases of bowel necrosis and had a high mortality rate of 90% [2].

Figure 1: Computed tomography scan of the abdomen showing hepatic portal venous gas with branching pattern and a peripheral distribution.

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Figure 2: Computed tomography scan of the abdomen showing multiple air fluid levels with evidence of pneumatosis intestinalis at the level of small bowel.

Although HPVG may be diagnosed by conventional radiography, detection is difficult and it is easily overlooked, it fails to detect air in portal system in approximately 80% of cases [3]. The increased use of computed tomography (CT) scan has allowed early and highly sensitive detection of HPVG, and in relation to a wider range of etiologies, such as ulcerative colitis (8%), intra-abdominal abscess (6%), small bowel obstruction (3%) and gastric ulcer (3%), with bowel necrosis still being the most common one (72%) [2–8].

The earlier detection of HPVG and increased relation with other pathologies other than bowel ischemia has led to a decrease in its mortality rate. The earlier detection of it, made possible rapid intervention with laparotomy in cases of bowel ischemia as it happened in the case presented in this paper.

The HPVG is a rare radiological sign that has multiple etiologies. Bowel ischemia is the primary etiology of HPVG (70% of cases) and when associated, they are related with transmural necrosis in 91% of cases and to a high mortality rate (85% of patients) [5]. These facts signify that HPVG is an absolute indication for surgery in the context of mesenteric ischemia.

The pathophysiology of HPVG is not fully understood, the factors that seem to be related with it are intestinal ischemia resulting in damage to the mucosal barrier in association with over-distension of the bowel loops and gas-forming bacterial proliferation, all of these leading to gas moving from the intestinal lumen to the mesenteric veins and flowing through it to the portal system and hepatic parenchyma [2–5].

The composition of portal gas is rich in CO_2 , which makes it a highly soluble gas that should rapidly dissolve in the circulation, the reasons by which it would remain in the circulation in cases of HPVG is the constant gas production and also increased intraluminal pressure forcing the intra-luminal gas towards the circulation, as HPVG has been reported as a complication of endoscopic balloon dilation [2, 3, 9].

The presence of HPVG, however, does not provide any information concerning the extent of bowel necrosis. In all cases, CT findings should be correlated with the clinical signs and with laboratory parameters to reach a high sensitivity and specificity level for intestinal necrosis [4], and in the cases where mesenteric ischemia is suspected, such as ours, rapid surgical intervention is required. Conservative management can be applied in settings where bowel ischemia is unlikely [7, 9].

Another important feature of HPVG is that it can be mistaken with gas in the biliary tract (pneumobilia). It is important to know how to differentiate them. The radiologic pattern of HPVG is described as branching radiolucency extending near the liver capsule, within 2 cm of it, due to the centrifugal pattern of blood flow, while gas in the biliary tract tends to remain in central portions of the liver due to the centripetal flow of the bile [3, 9].

CONCLUSION

Hepatic portal venous gas (HPVG) is a rare radiological sign for which computed tomography scan has a high sensitivity. Hepatic portal venous gas can be caused by different conditions, such as ulcerative colitis, intra-abdominal abscess, small bowel obstruction and gastric ulcer. It is, however, more commonly seen in the setting of bowel ischemia (72%), in which case there is high mortality rate but a positive outcome is possible if good analysis of clinical presentation, laboratory data and imaging is done and prompt surgical intervention is performed.

Keywords: Distant cholecystectomy, Esophageal ulcer, Gastrointestinal bleed, Hepatic portal venous gas (HPVG), Severe abdominal pain, Small bowel ischemia

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Guarantor

The corresponding author is the guarantor of submission.

Conflict of Interest

Authors declare no conflict of interest.

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