Rare Association of Hepatic Portal Venous Gas in Acute Appendicitis: a case report

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Hepatic portal venous gas (HPVG) is usually associated with acute fatal abdominal disease. It has not previously been reported to be associated with acute appendicitis. We reported a case of acute appendicitis associated with HPVG in a middle-aged man who recovered uneventfully after appendectomy. We described the CT findings and emphasized that an HPVG resulting from appendicitis may not as ominous as previously believed if surgery was performed promptly.

Key words: Appendicitis; Computed tomography; Hepatic portal venous gas

Hepatic portal venous gas (HPVG) is a rare condition, in which gas accumulates in the portal venous system due to iatrogenic or non-iatrogenic causes. The most common non-iatrogenic cause is an acute abdominal illness, which often has a fatal outcome with a mortality rate of 85% [1,2,3]. Although intraabominal sepsis is one of the etiologies of non-iatrogenic HPVG, to our knowledge, appendicitis associated with HPVG has not been reported in the English literature before. In this article, we are presenting the first case of acute appendicitis showing HPVG in a patient who survived the surgery.

CASE REPORT

A 44-year-old healthy man presented at our emergency room with progressive abdominal pain and diarrhea for 3 days. He had a fever of 38°C, chills, and shifting pain in the right lower quadrant of the abdomen. Physical examination revealed tenderness in the right lower quadrant of the abdomen without rebound pain. Digital examination of the rectum was unremarkable, and no psoas or obturator signs were noted. Laboratory studies showed a white blood cell count of 12,600 per mm³ (neutrophil 73%, lymphocyte 22%, monocyte 3% and eosinophil 2%). A plain abdominal film revealed no significant findings. Enhanced CT scans of abdomen showed swelling of the appendix with stranding of the adjacent pericolic fat (Figure 1), suggesting acute appendicitis. Linear and branching gas densities were clearly seen in the left hepatic lobe, indicating HPVG (Figure 2). There was no abnormal gas in the bowel wall, mesenteric vessels or the intraperitoneal cavity. The patient immediately underwent appendectomy. The pathological diagnosis was ruptured acute appendicitis. The postoperative course was uneventful, and the patient was discharged on postoperative day nine.
DISCUSSION

HPVG was first described in infants with necrotizing enterocolitis in 1955 [4] and in adults in 1960 [5]. It has been described in the literature as portal vein gas, pneumoportogram or gas embolization of the portal vein. Gas in the portal venous system can be clearly noted as radiolucency only in the intrahepatic portal radicles of the liver, hence the use of the descriptive term “hepatic” in - HPVG [1].

The pathogenesis of HPVG is still not fully understood. The causes of this rare condition can be categorized into iatrogenic and non-iatrogenic processes [3,6]. Non-iatrogenic HPVG occurs in a variety of clinical settings. Necrotic bowel (72%) is the most common, followed by ulcerative colitis (8%), intraabdominal abscess (6%), small bowel obstruction (3%), and gastric ulcer (3%) [1]. However, to our knowledge, HPVG occurring in appendicitis has not been reported. Our case may be the first to document HPVG associated with acute appendicitis, which was diagnosed by preoperative CT.

The pathophysiology of HPVG remains obscure. Two major theories predominate: The first is that intestinal wall alterations with mucosal damage or the mechanical distension of the small bowel so that the increased intraluminal pressure allows intraluminal gas to enter the mesenteric vessels and the portal veins directly [1,2,3]. The second is that intraabdominal sepsis caused by the gas-forming microorganisms may violate the mesenteric veins to reach the portal system [5].

No intraabdominal abscess was demonstrated in the enhanced CT scan and no life threatening sepsis was present in our patient clinically. The possibility of gas-forming microorganisms inducing HPVG cannot be regarded as a reasonable explanation in our patient. Thus, according to the first theory, HPVG in our patient was due to a raised intraluminal pressure that resulted from a swollen appendix causing obstruction proximally at appendiceal orifice. In our case, intraluminal gas or mesenteric gas was not shown in the preoperative CT scan, which was probably owing to the subtle movement of gas that could be visualized before it entered the portal system via the small appendiceal vein. Thus, if the gas bubbles were too tiny, it would be hard to detect in the vessels before they reached the small branches of the portal veins. It seemed to be a reasonable explanation for the observation in our patient, which showed an absence of mesenteric gas on the preoperative CT scan.

Acute intraabdominal sepsis is the most common cause of non-iatrogenic HPVG. The portal gas composition has been analyzed and found to have a high CO2 content in patients with Aerobacter aerogenes septicemia due to acute intraabdominal sepsis [7]. This highly soluble gas would be expected to show up only briefly in the vascular system before being absorbed or removed by bulky flow, unless the gas production persisted.

Acute appendicitis is a very common cause of acute abdomen illness. However, it has not been reported that acute appendicitis presented with HPVG. This may be due to the fact that patients received treatment quickly once upon the diagnosis of acute...
appendicitis being established. It usually occurs the intraluminal pressure of the appendix is elevated or before intraluminal gas has a chance to enter into the mesenteric vessels and the portal venous system. On the other hand, careful imaging studies by the CT is rarely used in patients with a typical clinical presentation of acute appendicitis. The diagnosis of acute appendicitis is usually made easily, except when there are unusual clinical findings. In our particular case of acute appendicitis, the clinical manifestations were ambiguous so we used CT to confirm our diagnosis. Finally, we found the HPVG associated acute appendicitis but without seeing mesenteric venous gas on the CT.

HPVG is a rare imaging finding but should be considered as another diagnostic clue in patients suffering from acute abdominal pathology. The approach to the patient with HPVG should be directed to the underlying disease. Due to the high mortality in the non-iatrogenic cases of HPVG, the presence of gas in the portal system is believed by clinical physicians and surgeons to be with fatal outcome. Therefore, surgeons are not willing to proceed with further treatment, as they believe that any attempt may be futile. However, we have shown that HPVG resulting from acute appendicitis may not suggest an ominous prognosis as previously thought.

**REFERENCES**

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罕見的急性闌尾炎合併肝門靜脈積氣

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致命的急性腹部疾病常引起肝門靜脈積氣，過去沒有肝門靜脈積氣發生於急性闌尾炎的病例報告。我們現在報告發生在一中年男性急性闌尾炎併發肝門靜脈積氣的病例，他接受闌尾切除術後完全康復，我們描述急性闌尾炎併發肝門靜脈積氣的電腦斷層影像，相信迅速的外科手術治療急性腹部疾病可改變以往出現肝門靜脈積氣是致命的觀念。

關鍵詞：闌尾炎，電腦斷層掃描，肝門靜脈積氣