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CASE REPORT **OPEN ACCESS**

CLINICAL FEATURESAND MANAGEMENT OF HEPATIC PORTAL VENOUS GAS--ACASE REPORT AND CUMULATIVE REVIEW OF LITERATURE

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ABSTRACT

Hepaticportal venous gas (HPVG)has traditionally been considered an inevitable harbinger of death. Recently, an increasing number of cases of HPVG have been reportedin patients with various clinical conditions. We herein report the case of a patient inwhom HPVG developed after radical resection of esophageal cancer.Abdominal CT revealed a massive amount of gas in the hepatic portal venoussystem and extensively throughout the small intestinal wall, especially in the wall of the small intestine in the pelvic cavity. This case report provides a deep understanding of HPVG.HPVG is not always associatedwith profound abdominal sepsis requiring surgical intervention.

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INTRODUCTION

Hepatic portal venous gas (HPVG) was originally reported in adults in the 1960s and was almost exclusively associated with mesenteric ischaemia (1). HPVG has been described as signifying an intra-abdominal catastrophe and usually need an immediate laparotomy. Mortality rates in patients with HPVG approached 90% and approximately 75% even in 18 years later (2). More recent reports still show HPVG to be a very poor prognostic sign (30–40% mortality) although the frequent use and improved resolution of abdominal computed tomography (CT) and magnetic resonance imaging (MRI) have led to an increasing frequency of detection of HPVG in patients with various conditions and usually accompanies severe or lethal conditions. It has been reported in inflammatory bowel disease, pancreatitis, diverticulitis, perforation of gastric ulceration, obstruction and even endoscopic evaluation of the gastrointestinal system. Hiroyuki reviewed 182 patients with HPVG which only 46% patients underwent surgical treatment, however, mortality was not significantly different from those managed conservatively (3). This highlights the emerging belief that HPVG is not always associated with profound abdominal sepsis requiring surgical intervention. We herein report the case of a patient with esophageal carcinoma in whom HPVG developed after radical resection without anastomotic leakage.

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Case presentation: A 65-year-old male patient underwent radical resection of esophageal carcinoma in our hospital. Peripherally inserted central catheter (PICC) was placed to obtain nutrition and removed 52 days after the operation. The patient had a hyperpyrexia and slight abdominal pain on the 97th day. When admitting our hospital, the patient had a blood pressure of 144/82 mmHg, a heart rate of 123 beats per minute (BPM), and a body temperature of 39.8°C. A physical examination showed a distended abdomen with slight abdominal pain. Abdominal CT revealed a massive amount of gas in the hepatic portal venous system and extensively throughout the small intestinal wall, especially in the wall of the small intestine in the pelvic cavity. However, portal vein thrombosis (PVT) was not seen. (Fig 1a,1b). There were no signs of anastomotic leakage and acute peritonitis, so we decided to use conservative therapy with fasting and

antibiotics. We selected Piperacillin/sulbactam as an antibiotic since the admission. Although the blood was taken for the blood culture, the blood culture was negative on the 7th day after the admission. During the whole course of treatment, the patient's liver function was always within the compensation range. As neither abnormal laboratory data findings nor complaints were seen, this patient was discharged on the 7th day after the admission. The patient revisited the hospital again on 101st day after discharge. Abdominal CT showed that the portal vein system was completely recover to normal (Fig 1c).

Fig.1 a. Abdominal CT revealed a massive amount of air in the hepatic portal venous system. b. The gas can also be detected throughout the small intestinal wall, especially in the wall of the small intestine in the pelvic cavity.However, portal vein thrombosis (PVT) was not seen.C.The portal venous system has completely returned to normal, no obvious signs of portal vein gas

DISCUSSION

HPVG is not a specific disease entity but merely another diagnostic clue in patients suffering acute abdominal pathology which was first reported in 1955 by Wolfe and Evans (4). Since then, it has traditionally been considered as an inevitable harbinger of death. Since 1978, when Liebman (2) reviewed 64 cases of HPVG and reported a mortality of 75%, the number of reported cases has been increasing. The overall mortality rate has decreased because of adequate therapy. HPVG is associated with numerous underlying abdominal diseases, ranging from benign causes to potentially lethal diseases that require prompt surgical intervention (3, 5-7). The mechanism for the appearance of gas in the hepatic portal vein is not fully illuminated. The proposed factors predisposing the hepatic portal venous system to the accumulation of gas include escaping of gas produced by gas-forming organisms in the intestinal canal or in an abscess which then circulate into the liver or the presence of gas-forming organisms in the hepatic portal venous system with passage of gas into the circulation (2). The diagnosis of HPVG is usually made by abdominal radiography, abdominal color ultrasonography, or CT scan. CT scan has a higher sensitivity for the detection of HPVG than plain radiography (8, 9). The characteristic finding on abdominal CT scan is a branching radiolucency extending to within 2 cm beneath the liver capsule. However, although HPVG may be diagnosed by conventional radiography, detection is difficult and it is easily overlooked (10).

In this case, the patient had difficulty in oral feeding after the radical resection of esophageal carcinoma so the PICC was placed to obtain nutrition and removed 52 days later. When admitting our hospital, the patient had a blood pressure of 144/82 mmHg, a heart rate of 123 beats per minute (BPM), and a body temperature of 39.8°C. Abdominal CT revealed a massive amount of gas in the hepatic portal venous system. However, PVT was not seen. Although some HPVG cases can be treated with conservative therapy, considering the differential diagnosis is important (11). When HPVG appears in any situation, we should consider not only the CT scan but also the patient’s general condition, including vital signs, physical findings, and laboratory examination. It is important to carefully observe patients with HPVG in conservative therapy because portal venous gas may be life-threatening.

There were no signs of anastomotic leakage in this case, so we decided to use conservative therapy with fasting and antibiotics. Mucosal damage could be the cause of the abnormal occurrence of gas-forming bacteria. In our present case, CT scan had shown inflammatory pneumatosis in the small intestinal wall, but the blood culture was negative, we suspect that the reason could be the blood culture is not repeated many times. Griffiths and Gough (12) state that HPVG can lead to a decrease in blood flow, which causing detoxification disorders in Kupffer cells. Therefore, when the bacteria increased in the blood, the patient tends to have severe blood poisoning. Hence, although the blood culture was negative in this case, we still selected Piperacillin/sulbactam as the antibiotic, considering the previously mentioned gas-forming bacteria. The underlying disease might be an important factor contributing to patient survival. There was a tendency toward association of degree of bowel necrosis with mortality. It is revealed that survival in potentially lethal cases was dependent on adequate treatment of the underlying disease associated with HPVG, and statistical analysis did not show a correlation between age, sex, heart rate on admission and survival rate (3). Since we began the conservative therapy, the patient's liver function is always within the normal range. The patient refused to have another abdominal CT scan, so we were unable to assess the patient's portal venous gas accumulation.

Nevertheless, the patient recovered and was discharged on the 7th day after the admission. On 101st day after discharge, the patient reviewed the abdominal CT, the portal venous system has completely returned to normal, no obvious signs of portal vein gas.

Conclusion

HPVG is not a specific disease entity but rather a diagnostic clue in patients with acute abdominal pathologic conditions. The treatment of patients with HPVG should be directed to the underlying disease, conservative treatment against HPVG can be reasonable for patients without signs of anastomotic leakage or bowel necrosis.

Data Availability: The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest: The authors declare that they have no competing interests.

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Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Consent: Not applicable

List of abbreviations used

HPVG: Hepatic portal venous gas;
CT: Computed tomography;
MRI: Magnetic resonance imaging;
PICC: Peripherally inserted central catheter;
BPM: Beats per minute;
PVT: portal vein thrombosis.

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