

HEPATIC PORTAL VENOUS GAS AND PNEUMATOSIS INTESTINALIS: ULTRASOUND AND RADIOGRAPHIC FINDINGS IN ISCHEMIC BOWEL

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Introduction

Hepatic portal venous gas (HPVG) occurs in different clinical scenarios ranging from benign causes to potentially lethal conditions that need prompt surgical intervention. Ultrasound (US) and abdominal radiograph are helpful as the initial radiological investigations to detect the presence of HPVG.

Case Report

A thirty-six year old woman was admitted for acute abdominal pain for one day. The pain was colicky and gradually increased in severity. She had normal menses and had no fever, vomiting and diarrhoea. She was alert and conscious with normal vital signs. The clinical examinations were unremarkable except for mild tenderness at the right hypochondrium. The blood investigations and urine microscopic examination were normal.

An ultrasound of the abdomen was done on the following day. During the scan, the abdomen was tender and guarded. The spleen, pancreas and both kidneys were normal. There were numerous hyperechogenic moving signal in the lumen of the main portal vein and its intrahepatic branches (Fig. 1). The bowel loops were dilated with thickened wall. There were similar hyperechogenic signal in the bowel

wall as well (Fig. 2). There was difficulty to identify the superior mesenteric vein and artery due to the dilated bowel. Abdominal radiograph showed dilated bowel loops with thumbprinting sign (Fig. 3). There were fine air network in the region of liver parenchyma (Fig. 3). Based on the US and abdominal radiograph, the diagnosis of HPVG and pneumatosis intestinalis due to bowel ischemia was made.

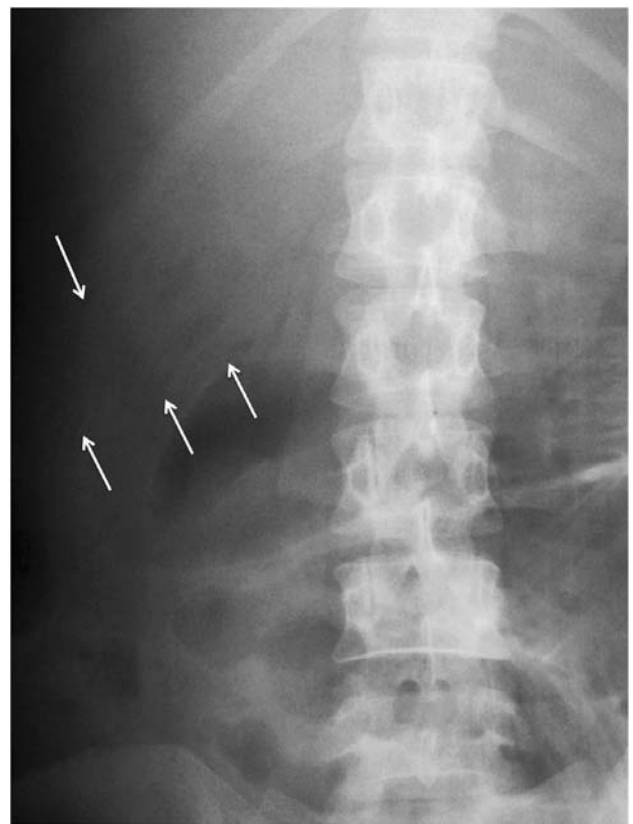


Figure 1A:

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Figure 1B: Abdominal radiograph (a) with magnified area of the right hypochondrium (b) showing dilated bowel loop with features of bowel oedema and ischemia. There are branching lucencies or ramifications (arrow) at the liver region caused by air in the portal vein.

The patient had emergency laparotomy and intra-operatively found to have gangrenous bowel 90cm from the duodenum-jejunum junction until mid portion of the transverse colon caused by superior mesenteric

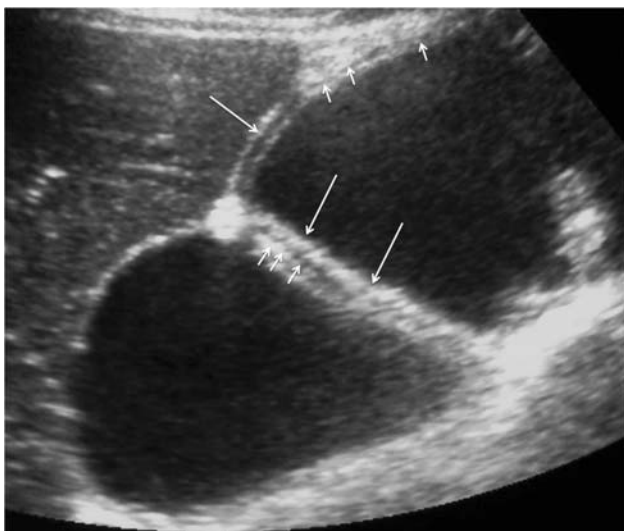


Figure 2: US image of the dilated bowel loop (long arrow) and thickened bowel wall with bright foci due to air in the bowel wall (short arrow).

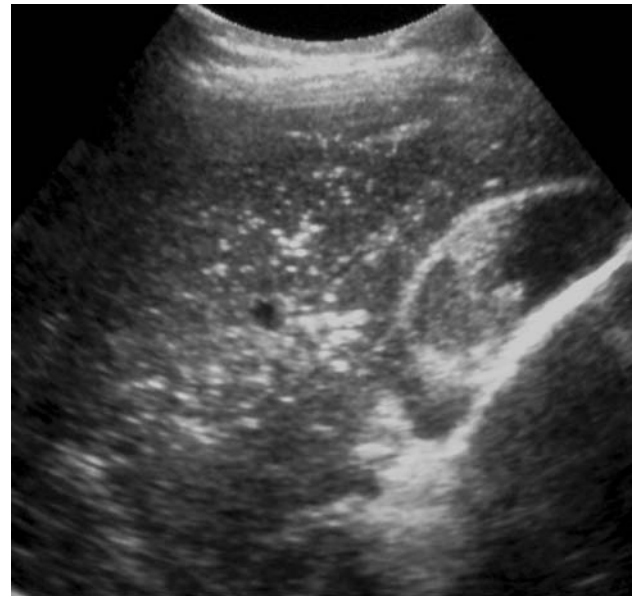


Figure 3: US images of the liver showing numerous bright foci in the intrahepatic branches of portal vein formed by air.

artery thrombosis. She had extended right hemicolectomy and double-barrel ileocolostomy. A week later she had relaparotomy because of severe abdominal pain. There was gangrenous distal transverse colon and she had transverse colectomy with colostomy. Currently, she is on anti-coagulant drug and is under follow-up as out-patient after being admitted about two months in Intensive Care Unit and general ward.

Discussion

HPVG is an important radiological finding and is a diagnostic clue in patients often with serious abdominal problem. It was first reported in neonate with necrotizing enterocolitis in 1955 by Wolfe and Evens. It is a rare entity in adult and the first adult case was reported by Susman and Senturia in 1960.¹⁻⁴ HPVG by itself is not a disease and not an indication for surgery. The prognosis of a patient is related to the underlying individual disease and is not influenced by the presence of HPVG.^{3,4}

HPVG is associated with ischemia and various non-ischemic abdominal diseases. HPVG with the presence

of pneumatosis intestinalis is usually associated with bowel ischemia. It can occur without pneumatosis intestinalis such as in intra-abdominal and retroperitoneal abscess, sepsis, abdominal trauma and after liver and cardiac transplantation.¹⁻⁵ The pathogenesis of HPVG and pneumatosis intestinalis was not fully understood. The conditions might due to increase intraluminal pressure, gas-producing enteric organisms within the portal venous system and alteration of the mucosal integrity. These conditions allow the intraluminal gas to enter the bowel wall and into the portal venous system via the mesenteric veins.^{1-4,6}

The high acoustic impedance of air results in intense hyperechogenic foci flowing within the lumen of the portal vein, its intrahepatic branches and liver parenchyma most apparent in the non-dependent part.^{4,6} Due to the centrifugal flow of blood within the portal vein, the gas is seen to extend to within 2 cm of the hepatic capsule.²⁻⁴ The gas could also be seen as dot-like, streak-like and fruit-pulp-like patterns.⁵ The gas in the portal vein produced sharp bidirectional vertical spikes superimposed on the normal monophasic portal vein wave pattern on spectral Doppler US.^{3,4} In the case of aerobilia, the gas in the biliary tract moves with the centripetal flow of the bile and appear more central in the liver.²⁻⁴

Abdominal radiograph has low accuracy to US in demonstrating HPVG and pneumatosis intestinalis.^{2,5} The HPVG is seen as extremely fine network of branching radiolucency or ramifications of veins in the liver area. Gas in the biliary tract never shows the fine ramifications.⁷⁻⁹ The radiograph can show signs of ischemia such as oedematous bowel wall, thumbprinting sign (appears as if a thumb has been pressed against the side of bowel caused by submucosal haemorrhage and oedema), ileus and gasless abdomen.^{5,10} The findings of HPVG and transmural gas on abdominal radiograph were suggestive of a poor prognosis and commonly associated with infarction.^{2,4}

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