

Finding hepatic portal venous gas in an adult patient: its significance

Gan H N, Tan K Y, Chong C K, Tay K H

ABSTRACT

Portal venous gas is a well-established radiological finding in neonates. With the advancement in diagnostic imaging, more cases are being reported in adults. We present a 55-year-old man with radiological findings of both portal venous gas and pneumatosis intestinalis secondary to ischaemic necrotising enterocolitis, with subsequent fatality. The significance of finding portal venous gas and its possible aetiology is discussed.

Keywords: bowel ischaemia, computed tomography, hepatic portal venous gas, ischaemic necrotising colitis, pneumatosis intestinalis, portal venous gas

Singapore Med J 2006; 47(9):814-816

INTRODUCTION

The finding of portal venous gas in neonates with necrotising enterocolitis is well documented. This finding is less common in adults and is often ominous. There is usually significant associated pathology. We present a 55-year-old man with portal venous gas and discuss the significance of such a finding.

CASE REPORT

A 55-year-old Chinese man was admitted for acute coronary syndrome with congestive cardiac failure. He had a background of ischaemic dilated cardiomyopathy with two previous acute myocardial infarctions. The most recent episode occurred one month prior to this admission. Transthoracic echocardiography showed poor ejection fraction of 10-15%. His comorbidities included hypertension, diabetes mellitus and hyperlipidaemia.

He initially responded to treatment with low molecular weight heparin and intravenous diuretics but subsequently went into cardiogenic shock on the 12th day of admission, requiring inotropic support and intensive care. Systolic and diastolic blood pressure readings ranged from 86-97 and

66-74 mmHg, respectively. On the 14th day of admission, he developed acute abdominal pain localising to the right side. There was no associated melaena or per rectal bleeding. Physical examination revealed a distended abdomen with tenderness over the right side of the abdomen and absent bowel sounds.



Fig. 1 Abdominal radiograph shows streaky air shadows (arrow) in the liver parenchyma.

Blood investigations revealed a normal serum amylase level of 48 U/L. The total white count was 9,700 U/L. Results of liver function tests were: total bilirubin 83.2 μ mol/L, alkaline phosphatase 167 U/L, aspartate transaminase 139 U/L, and alanine transaminase 139 U/L.

An abdominal radiograph revealed air within the liver parenchyma, which may be secondary to aerobilia or portal venous gas (Fig. 1).

Department of
General Surgery
Changi General
Hospital
2 Simei Street 3
Singapore 529889

Gan H N, MBBS
Medical Officer

Tan K Y, MRCSE,
MMed
Registrar

Chong C K, FRCSE,
MMed, FAMS
Consultant

Tay K H, FRCSE,
FRCSCG, FAMS
Head

Correspondence to:
Dr Tan Kok Yang
Tel: (65) 6850 3551
Fax: (65) 6260 1709
Email: kok_yang_tan@
cgh.com.sg

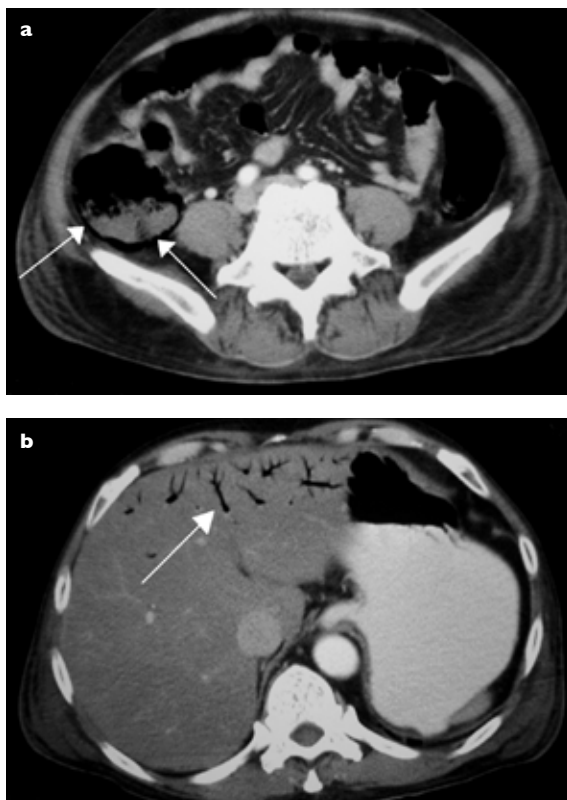


Fig. 2 Axial CT images show (a) pneumatosis intestinalis (arrows) and (b) peripheral distribution of air (arrow) within the hepatic parenchyma.

Urgent computed tomography (CT) of the abdomen showed pneumatosis intestinalis of the caecum and ascending colon. Air shadows were seen within the portal venous system in the liver (Figs. 2a & b). The peripheral distribution of the air in non-dependent areas was typical of portal venous gas.

In a setting of prolonged cardiogenic shock and inotropic support, the clinical and radiological picture was that of ischaemic necrotising colitis with ascending infection. Unfortunately, as he developed disseminated intravascular coagulopathy, and continuing cardiac instability, he was unable to be stabilised enough for surgery. He succumbed three days after the development of his abdominal signs. No postmortem was done.

DISCUSSION

Hepatic portal venous gas (HPVG) was first reported in 1955 in infants with necrotising enterocolitis by Wolf and Evans⁽¹⁾. It is more common in neonates than adults. The first adult case was reported in 1960 by Susman and Senturia⁽²⁾. With the advancement of imaging,

more cases are being reported. There are various conditions associated with HPVG. These include inflammatory bowel disease, gastric ulcer or dilatation, intra-abdominal or retroperitoneal abscesses, duodenal perforation, biliary infection, complications of endoscopic procedures, blunt abdominal trauma and intestinal ischaemia. When associated with pneumatosis intestinalis (PI), the cause is usually bowel ischaemia⁽³⁾.

In a review of 182 cases of HPVG in adults by Kinoshita et al⁽⁴⁾, the overall mortality rate was 39%, although the mortality rate was significantly higher at 75% in patients who also had underlying bowel necrosis. Interestingly, there was no mortality associated with inflammatory bowel disease, intraperitoneal tumour, cholangitis and pancreatitis or complications post-endoscopic procedures. Urgent work-up of the underlying cause of HPVG is essential as there is invariably a significant underlying pathological process. Urgent surgery is required in patients with bowel ischaemia.

Clinical suspicion of bowel ischaemia must be high when faced with a patient with prolonged shock requiring inotropic support, as in our case. Radiographical findings of bowel ischaemia include bowel wall thickening, submucosal focal mural thickening, dilated bowel loops, pneumatosis intestinalis, and mesenteric or portal venous gas. CT findings include the above as well as engorgement of mesenteric veins and mesenteric oedema, mesenteric arterial or venous thromboembolism, lack of bowel wall enhancement, increased enhancement of the thickened bowel wall, and infarction of other abdominal organs⁽⁵⁾.

The pathogenesis of HPVG and PI are not well understood. It has been proposed that mucosal integrity, intraluminal pressure, bacterial flora and intraluminal gas all contribute to these two entities⁽⁶⁾. Mucosal injury can result in increased gut permeability to air, thus allowing intrusion of intraluminal gas into the bowel wall in PI, and escape of gas into the portal venous system via the mesenteric veins in HPVG. Increased intraluminal pressure can also allow air to diffuse out of the bowel lumen, with or without mucosal injury. Presence of gas-forming bacteria is another postulated cause.

In our patient, cardiogenic shock and the use of high doses of inotropes are likely to have resulted in poor mesenteric perfusion, which led to the bowel ischaemia and finally bowel necrosis. The raised liver enzymes are likely due to ischaemic hepatitis. Urgent laparotomy and bowel resection were indicated but unfortunately his condition did not allow him to undergo surgery.

In conclusion, HPVG in adults warrants immediate attention as it can indicate a life-threatening process, even though it may be associated with benign conditions. It is therefore important to identify the underlying diseases and administer the appropriate treatment. In addition, early surgical intervention is indicated in symptomatic patients with a strong clinical suspicion of bowel ischaemia and who demonstrate these radiological signs, as the mortality in patients with associated bowel ischaemia is very high.

REFERENCES

1. Wolf JN, Evans WA. Gas in the portal veins of the liver in infants: a roentgenographic demonstration with postmortem anatomical correlation. *Am J Roentgenol* 1955; 74:486-9.
2. Susman N, Senturia HR. Gas embolization of the portal venous system. *Am J Roentgenol Radium Ther Nucl Med* 1960; 83: 847-50.
3. Peloponissios N, Halkic N, Pugnale M, et al. Hepatic portal gas in adults: review of the literature and presentation of a consecutive series of 11 cases. *Arch Surg* 2003; 138:1367-70.
4. Kinoshita H, Shinozaki M, Tanimura H, et al. Clinical features and management of hepatic portal venous gas: four case reports and cumulative review of the literature. *Arch Surg* 2001; 136:1410-4.
5. Rha SE, Ha HK, Lee SH, et al. CT and MR imaging findings of bowel ischemia from various primary causes. *Radiographics* 2000; 20:29-42.
6. St Peter SD, Abbas MA, Kelly KA. The spectrum of pneumatosis intestinalis. *Arch Surg* 2003; 138:68-75.
7. Faberman RS, Mayo-Smith WW. Outcome of 17 patients with portal venous gas detected by CT. *Am J Roentgenol* 1997; 169:1535-8.
8. Oldenburg WA, Lau LL, Rodenberg TJ, Edmonds HJ, Burger CD. Acute mesenteric ischemia: a clinical review. *Arch Intern Med* 2004; 164:1054-62.

SMA is pleased to announce the relaunch of the SMA Forum

**For
members
only**

Topics include:

- Managed Healthcare
- Medical Cases
- Infectious Diseases
- Hot Topics of the Day
- Ethics & Professionalism
- Continuing Medical Education
- SMA Publications: SMA News, SMJ, Sensory
- SMA Perks and Activities
- Medical Manpower

To register, please visit <http://smaforum.org>. Once your registration is approved, you can access the forum, view the postings, and post your comments. Be assured that the forum is secure.

**Sign on now and be plugged into the community!
Have your voice heard!**