

Intrahepatic Air: Pneumobilia vs. Portal Venous Gas

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Citation

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Abstract

The finding of intrahepatic air on computed tomography scan is a potentially ominous radiographic sign that is usually attributed to either pneumobilia or portal venous gas. In this article, we present a case of each of the aforementioned conditions. Pneumobilia is typically visualized as a large confluence of air located within the central portion of the liver and is most commonly seen in patients following procedures involving the biliary tract. Management may be either surgical or non-operative, depending on the etiology and clinical presentation. Portal venous gas manifests as small air densities in the periphery of the liver located predominantly in the left lobe. This entity is most commonly caused by mesenteric ischemia and carries a mortality rate of 75-90%. Treatment entails emergent laparotomy with possible resection of the affected segment of bowel. In the absence of findings of bowel ischemia, portal venous gas may be managed non-operative. Early diagnosis and treatment is based on correlation of the clinical presentation and a high index of suspicion on radiographic evaluation. CT findings of intrahepatic air should be carefully evaluated to determine an appropriate course of clinical management.

INTRODUCTION

The finding of intrahepatic air on computed tomography scan is a potentially ominous discovery that presents a diagnostic challenge for physicians and surgeons alike. Pneumobilia and portal venous gas are the two entities typically involved. Pneumobilia generally manifests as air centrally located within the liver and is most commonly seen in patients following surgery or procedures involving the biliary tract. Portal venous gas is a comparatively alarming finding typically located in the peripheral regions of the liver. It is most commonly caused by mesenteric ischemia and is associated with a mortality rate of 75-90%^[1]. We herein present a case of each of the aforementioned conditions.

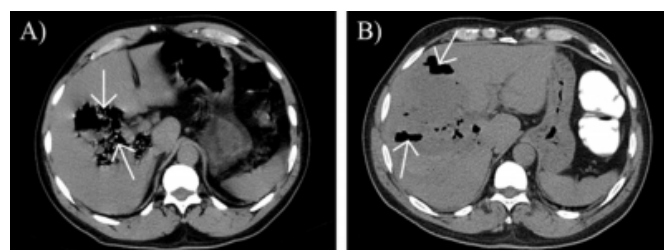
CASE REPORT: PNEUMOBILIA ATTRIBUTED TO BILIARY-ENTERIC FISTULA

A 54-year-old male with a past medical history of diabetes mellitus presented with a three-day history of right upper quadrant abdominal pain, nausea with two episodes of vomiting, fever, and chills. He was admitted to our hospital with a diagnosis of cholecystitis with intent to rule out cholangitis. The patient had no surgical history. Vitals on admission revealed a mild tachycardia. Physical examination was significant for signs of dehydration and tenderness in the right upper quadrant without guarding or rebound. Laboratory analysis revealed the presence of a leukopenia

with a bandemia (23%), as well as elevated liver function tests. The patient also had elevated blood urea nitrogen and creatinine levels suggestive of pre-renal azotemia. All other laboratory data were within normal limits. A CT scan of the abdomen and pelvis revealed a large pocket of air in the central region of the liver (Figure 1). The patient was placed on appropriate antibiotics. He was noted to be clinically improving and signed-out against medical advice on the third day of hospitalization.

Figure 1. A) Collection of air within central biliary tree measuring 10 cm in diameter. B) Repeat CT scan two days after initial presentation displaying peripheral redistribution of gas.

Figure 1



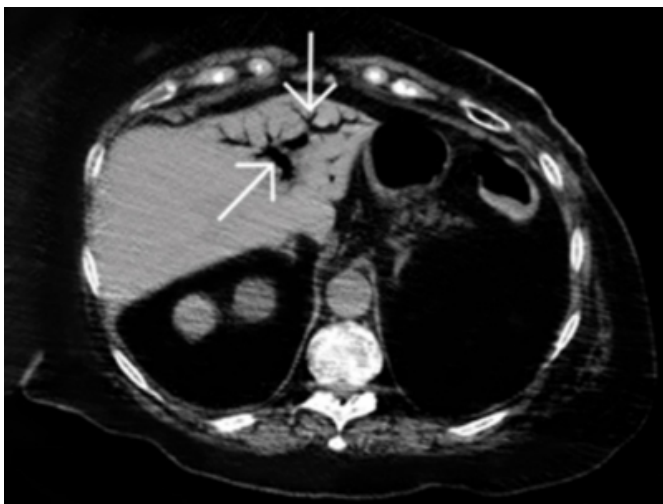
CASE REPORT: PORTAL VENOUS GAS DUE TO MESENTERIC ISCHEMIA

An 86-year-old female was brought to our hospital with altered mental status and hypoglycemia. She complained of

a four-day history of diarrhea and decreased appetite. Her past medical history was significant for hypertension, myocardial infarction, diabetes mellitus, chronic kidney disease, mild dementia, hypothyroidism, breast carcinoma (treated 5 years earlier), and a recent fracture of the left humerus (within one week of current admission). The patient had no significant surgical history. Physical examination was unremarkable. Laboratory analysis revealed a non-anion gap metabolic acidosis. Twenty-four hours after admission, the patient's abdomen became distended and vaguely tender without guarding or peritoneal signs. Repeat laboratory analysis revealed a normal white blood cell count with a bandemia (27%) as well as a persistent non-anion gap acidosis. CT scan of the abdomen displayed portal venous gas within the left lobe of the liver and a small amount of air in the right hepatic lobe (Figure 2). No free intraperitoneal air was observed, but pneumatosis intestinalis was noted in the distal ileum and ascending colon. The patient was taken to the operating room for exploratory laparotomy during which we performed right hemicolectomy and distal small bowel resection due to patches of necrosis. Postoperatively, the patient remained on ventilator support and was transferred to the intensive care unit. She subsequently developed pneumonia followed by multiple organ failure and expired.

Figure 2

Figure 2. Portal venous gas with air predominantly located within the left hepatic lobe



DISCUSSION

On computed tomography, pneumobilia is typically visualized as a large confluence of air located within the central portion of the liver. The classic description emphasizes the central distribution of gas with branching air

densities at the level of the porta hepatis^[2]. However, later in the clinical course the air spreads from the common hepatic duct through the branches of the biliary tree resulting in a peripheral redistribution. Iatrogenic causes of pneumobilia include biliary-enteric anastomosis, biliary sphincterotomy, biliary stenting, endoscopic retrograde cholangiopancreatography, and upper gastrointestinal endoscopy. The most common non-iatrogenic etiology is spontaneous biliary-enteric fistula, usually due to recurrent bouts of acute cholecystitis or peptic ulcer disease. Other causes of pneumobilia include an incompetent sphincter of Oddi, emphysematous cholecystitis, and trauma^[3,4,5]. Management may be either surgical or non-operative, depending on the etiology and clinical presentation.

Portal venous gas manifests on CT as small, tubular air densities in the peripheral regions of the liver, predominantly in the left hepatic lobe. Due to the centrifugal flow of blood in the portal venous system, air bubbles appear to extend within 2 cm of the liver capsule^[1,6]. The most common cause of portal vein gas is mesenteric ischemia, followed by bowel dilatation (iatrogenic or non-iatrogenic), gastrointestinal tract inflammation, trauma, and cancer^[1,6,7]. Mesenteric ischemia is associated with a mortality rate of 75-90%^[1] and may be due to a variety of processes including thromboembolic vascular disease, non-occlusive hypoperfusion, and intestinal obstruction. Additional CT manifestations associated with this condition include pneumatosis intestinalis, bowel dilatation, thickening of the bowel wall, and mesenteric edema^[1]. Treatment entails emergent laparotomy with possible resection of the affected segment of bowel. In the absence of CT findings associated with bowel ischemia, portal venous gas due to trauma or iatrogenic causes may be treated conservatively.

When intrahepatic air is discovered on CT, the first distinction must be made between pneumobilia and portal venous gas. Both entities may be attributed to either benign or life-threatening conditions. Patients with intrahepatic air may present with similar complaints of acute abdominal pain and laboratory values that reveal elevated liver function tests. However, pneumobilia can be managed non-operatively whereas portal venous gas often requires operative management. Early diagnosis and treatment of the latter condition is based on correlation of the clinical presentation and a high index of suspicion on radiographic evaluation. CT findings should be carefully evaluated to determine an appropriate course of clinical management.

References

1. Sebastia C, Quiroga S, Espin E, et al. Portomesenteric vein gas: pathologic mechanisms, CT findings, and prognosis. *Radiographics* 2000;20:1213-1224.
2. Lewandowski BJ, Withers C, Winsberg F. The air-filled left hepatic duct as an aid to the radiographic diagnosis of pneumobilia. *Radiology* 1984;153:329-332.
3. Nyidob J, Smith EB. Pneumobilia — current concepts. Report of fourteen cases with biliary-enteric fistulae. *J Natl Med Assoc* 1976;68:177-181.
4. Braiteh F, Ramsey W. Transient pneumobilia following upper gastrointestinal endoscopy. *Am J Gastroenterology* 2005;100:2364-5.
5. Sherman SC, Tran H. Pneumobilia — benign or life threatening. *J Emerg Med* 2006;30:147-53.
6. Hussain A, Mahmood H, El-Hasani S. Portal vein gas in emergency surgery. *World J Emerg Surg* 2008;3:21.
7. Faberman RS, Mayo-Smith WW. Outcome of 17 patients with portal venous gas detected by CT. *AJR* 1997;169:1535-1538.

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