Portal Venous Gas Detected on Computed Tomography in Emergency Situations: Surgery Is Still Necessary

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Abstract

Background: Portal venous gas (PVG) has been reported to be associated with lethal surgical diagnosis. Recent studies tend to confirm the clinical significance of gas in the portal vein; however, some patients are managed without surgical treatment. The aim of this study was to assess both the diagnoses and the treatment of patients with PVG in an emergency surgical setting.

Materials and methods: We performed a retrospective chart review of 15 patients with PVG in the emergency setting detected by computed tomography (CT) between July 1999 and July 2004. Characteristics assessed included age, sex, clinical presentation, first CT diagnosis of both PVG and the underlying pathology, American Society of Anesthesiologists (ASA) score, surgical findings, final clinical diagnosis, duration of hospitalization, and evolution of the illness/mortality. All patients were examined one month after operation.

Results: This series of 5 women and 10 men ranged in age from 38 to 90 years at the time they underwent emergency surgical treatment. The mean preoperative ASA score was 4.20. Computed tomography diagnosed the underlying pathology in all cases: bowel obstruction (4 cases), bowel necrosis (9 cases), and diffuse peritonitis (2 cases). The mean length of hospital stay was 12.4 days. The mortality rate was 46.6% (7 patients).

Conclusions: A wide range of pathologies can generate PVG. Computed tomography can detect both the presence of gas and the underlying pathology. In emergency situations, all the diagnosed causal pathologies required a surgical procedure without delay. We report that the prognosis was related to the pathology itself and was not influenced by the presence of PVG.

The association of portal venous gas (PVG) and high mortality was first documented by Wolfe and Evans more than 45 years ago. Three main mechanisms for the production of PVG have been identified:

A disruption of gastrointestinal mucosa that allows intraluminal gas to pass into the mesenteric venous system. This mechanism is most commonly associated with bowel ischemia or obstruction.
An increase in luminal gas pressure, secondary in bowel obstruction or endoscopic gastrointestinal exams permits passage of luminal gas into the portal venous system.

Bacterial contamination of the portal venous system with a production of gas directly in the mesenteric system. This has been described to occur with many pathologic processes of the digestive tract, including diverticulitis, perforated gastric ulcer, and pancreatitis.

With advances in computed tomography, its sensitivity for the detection of PVG and its underlying pathology has improved significantly. This diagnostic capability has enabled earlier surgical intervention and thus improved the ultimate prognosis correlated with PVG. Because of low incidence of this radiological finding, only small case series are available for review. Most of the publications are case reports or reviews of the literature. Recent reviews suggest an improved prognosis even in patients treated without surgery.

The aim of the present study was to assess the different underlying pathologies encountered in emergency situations, and to evaluate how prognosis was affected by the presence of PVG.

**PATIENTS AND METHODS**

This continuous, retrospective study included all patients admitted in our emergency surgical center between July 1999 and July 2004, for whom portal venous gas, including mesenteric venous gas, had been detected by CT scan.

As the basis for the study, we obtained the medical records of 15 patients. All CT scans were performed with a helical CT scanner (SR 7000, Philips or Somatom Plus 4, Siemens). In all patients, CT examinations were performed according to a CT protocol that included images obtained during the portal vein dominant phase at 60–70 s after injection of a bolus of contrast material. All patients received 3 cc/kg of iomeprol (laboratoires Altana Pharma, France) injected intravenously at a rate of 3 ml/s with a power injector (Medrad, Pittsburgh, PA).

Portal vein gas appeared as tubular areas of decreased attenuation in the liver. The radiographic criteria used to diagnose PVG were as usual: branching areas of low attenuation, caused by the accumulation of gas, extending to within 2 cm of the liver capsule (Fig. 1a, 1b). Intrahepatic portal vein gas was differentiated from air in the biliary tree (pneumobilia) in which the air is located centrally. Portal venous gas can also occur in the mesenteric veins (Fig. 2) or in the prehepatic portal vein (Fig. 3). The underlying pathology of portal venous gas was also investigated in the same CT exam.

Two experienced radiologists reviewed all CT images in order to confirm the original diagnosis of PVG. Characteristics assessed included age, sex, clinical presentation, initial CT diagnosis of both the PVG and the underlying pathology, ASA score, surgical findings, final clinical diagnosis, duration of hospitalization and evolution of the illness, and mortality.

All surviving patients returned to the initial surgeon 4 weeks after surgery for clinical reassessment including physical examination. Subsequent follow-up was determined by the nature of the underlying cause (e.g., cancer, bowel necrosis).

**RESULTS**

**Demographic Data**

The study group included 5 women and 10 men ranging in age from 38 to 90 years (mean age: 63.9 years).