Portal-venous gas unrelated to mesenteric ischemia

Abstract The aim of this study was to report on 8 patients with all different non-ischemic etiologies for portal-venous gas and to discuss this rare entity and its potentially misleading CT findings in context with a review of the literature. The CT examinations of eight patients who presented with intrahepatic portal-venous gas, unrelated to bowel ischemia or infarction, were reviewed and compared with their medical records with special emphasis on the pathogenesis and clinical impact of portal-venous gas caused by non-ischemic conditions. The etiologies for portal-venous gas included: abdominal trauma (n=1); large gastric cancer (n=1); prior gastroscopic biopsy (n=1); prior hemicolectomy (n=1); graft-vs-host reaction (n=1); large paracolic abscess (n=1); mesenteric recurrence of ovarian cancer superinfected with clostridium septicum (n=1); and sepsis with Pseudomonas aeruginosa (n=1). The clinical outcome of all patients was determined by their underlying disease and not negatively influenced by the presence of portal-venous gas. Although the presence of portal-venous gas usually raises the suspicion of bowel ischemia and/or intestinal necrosis, this CT finding may be related to a variety of non-ischemic etiologies and pathogeneses as well. The knowledge about these conditions may help to avoid misinterpretation of CT findings, inappropriate clinical uncertainty and unnecessary surgery in certain cases.

Keywords Computed tomography · Portal-venous gas · Portal-venous air · Intrahepatic gas

Introduction

The presence of portal-venous gas on plain radiographs was described for the first time more than 40 years ago, and in the late 1970s and 1980s this “ominous finding” was attributed to a mortality rate of 75–90% [1, 2, 3, 4]. Over the past two decades, CT has become the most important imaging modality for the detection of portal-venous gas, and by using CT even small amounts of portal-venous gas may be diagnosed with high accuracy. It is generally accepted that bowel ischemia or bowel infarction are the most common causes for portal-venous gas, and that this constellation is associated with a bad prognosis and a high mortality rate [5, 6]; however, portal-venous gas may occur in certain non-ischemic conditions as well, where it is not automatically associated with an unfavorable outcome [7, 8, 9]. Therefore, the presence of portal-venous gas may falsely raise the suspicion of bowel ischemia and bowel infarction and result in unnecessary surgery if the true cause for this impressive CT finding is missed. Numerous articles on non-ischemic portal venous gas, consisting mainly of case reports, have appeared in the literature in past years, showing that this entity is still of great clinical interest and relevance. We add eight patients to the literature with all different non-ischemic etiologies for portal-venous gas and discuss the pathogeneses and the clinical impact of non-ischemic portal-venous gas by reviewing the literature.
Materials and methods

Between February 1992 and December 1999, eight consecutive patients presented with the CT diagnosis of portal-venous gas that was not caused by bowel ischemia or infarction. These eight patients were identified by a search in our computer database (IDX-RAD) using the following key words: portal gas/air; hepatic gas/air; and portal-venous gas/air or porto-mesenteric gas/air. This allowed us to identify also 16 patients (observed between February 1992 and March 2000) in whom the presence of portal-venous gas was clearly attributable to bowel ischemia, bowel infarction or bowel necrosis due to:

1. Occlusion of the mesenteric arteries or veins
2. Complicated bowel obstruction with incarceration and/or strangulation
3. Overdistension
4. Non-occlusive bowel ischemia, but these 16 patients were excluded from our study

Our study population consisted of six male patients and two female patients. Their age ranged from 42 to 100 years with a mean age of 67.25 years. All patients were examined using a Somatom or a Somatom Plus 4 CT scanner (Siemens, Erlangen, Germany). Three patients underwent contrast-enhanced CT and 5 patients underwent unenhanced CT only. The CT examinations were read by two radiologists with special interest in abdominal imaging. The presence of portal-venous gas was confirmed independently by both readers. Finally, all clinical records of these patients were reviewed using the computerized medical information system (BICS). Special emphasis was given to analyze the etiology and the pathogenesis of portal-venous gas in the clinical setting of each patient and the impact of this CT finding on the clinical course.

Results

In five patients intrahepatic portal-venous gas was found in the left liver lobe, in one patient it was found in the right liver lobe and in two patients it was found in both liver lobes. In three patients portal-venous gas consisted of small and focal intrahepatic gaseous inclusions, whereas in five patients it was more pronounced and visible as continuous collections of gas in the intrahepatic branches of the portal vein.

Case 1

A 53-year-old man presented with intrahepatic portal-venous gas and some tiny gaseous inclusions in the gastrocolic ligament and around the descending duodenum following blunt abdominal trauma (Fig. 1). Although there was no free intraperitoneal gas, the patient underwent immediate explorative laparotomy in order to exclude more severe gastrointestinal injury and recovered well after only a small paraduodenal hematoma was found intraoperatively.

Case 2

A 76-year-old man presented with intrahepatic portal-venous gas secondary to a large ulcerating gastric cancer, although no endoscopy or surgery was performed prior to the CT examination (Fig. 2). Abdominal CT showed pronounced circumferential gastric wall thickening and peritoneal carcinomatosis, and the patient underwent gastric resection and chemotherapy later during his clinical course.

Case 3

A 60-year-old man with portal-venous gas had undergone gastroscopy and antrum biopsy for chronic gastritis 1 day prior to his CT examination. Abdominal CT showed no reason for portal-venous gas and the patient, who was therefore treated conservatively, recovered well.