Case Reports

An Unusual Presentation of Spontaneous Pneumoperitoneum Secondary to the Rupture of a Gas-Containing Pyogenic Liver Abscess: Report of a Case

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Abstract: We describe a rare case of spontaneous pneumoperitoneum secondary to the rupture of a gas-containing pyogenic liver abscess in a 59-year-old man. The patient was diagnosed as having a hollow viscus perforation based on a sudden onset of acute abdominal pain along with radiological evidence of bilateral subphrenic free air (pneumoperitoneum), and underwent an emergency laparotomy. Contrary to expectations, the surgery revealed no perforations of the hollow viscus, but instead a ruptured liver abscess at the dome of the right hepatic lobe was identified associated with suppurative peritonitis. To the best of our knowledge, such a case of spontaneous pneumoperitoneum secondary to the rupture of a gas-containing liver abscess is extremely rare.

Key Words: gas-containing pyogenic liver abscess, acute abdomen, spontaneous pneumoperitoneum

Introduction

Pyogenic liver abscess occasionally contains gas originating from the fermentation of gas-producing bacteria, such as Klebsiella or Escherichia coli, which can form gases using glucose in the anaerobic environment associated with tissue ischemia and hyperglycemia. We herein describe an unusual case of spontaneous pneumoperitoneum secondary to the rupture of a gas-containing liver abscess in a patient, who was misdiagnosed as having a hollow viscus perforation based on the acute onset of symptoms and radiological evidence indicating pneumoperitoneum. Surgery, however, revealed no hollow viscus perforation, but instead a ruptured pyogenic liver abscess at the dome of the right hepatic lobe. To the best of our knowledge, such a case of spontaneous pneumoperitoneum resulting from the rupture of a gas-containing pyogenic liver abscess is extremely rare.

Case Report

A 59-year-old male was transferred to the emergency room of our hospital with complaints of an acute exacerbation of right upper quadrant pain, shivering, chills, and a fever of about 10 days' duration. The patient had been diagnosed as having uncontrolled diabetes mellitus, but had never consulted a practitioner to receive medication in spite of suffering from long-standing pyrexia. The patient had no history of any previous overseas travel or residence. In the emergency room, his abdomen was rigid, displaying muscle guarding and rebound tenderness, while normal bowel sounds had decreased. The physical examination disclosed suppurative peritonitis which warranted the classification of his condition as serious. His white blood cell count was 13,100/mm$^3$ and the blood sugar level was 382 mg/dl. A plain abdominal radiogram disclosed free air in both subphrenic spaces (Fig. 1). Under the tentative diagnosis of a perforation of a peptic ulcer, which is one of the most frequent causes of pneumoperitoneum, an emergency laparotomy was performed. At surgery, about 300 ml of dark purulent ascites was aspirated but gave off no foul smell which would have suggested an anaerobic bacterial infection. A large amount of purulent plaque was observed scattered throughout the entire abdominal cavity. Severe suppurative peritonitis was apparent. An exploration of the abdominal cavity revealed no perforations in the alimentary tract, but disclosed a ruptured liver abscess at the dome of the right hepatic lobe. The necrotic masses and purulent materials were removed as much as possible, while the peritoneal cavity was thoroughly irrigated with a large quantity of physiological saline, and, in addition, small sections of liver tissue around...
the ruptured liver abscess were obtained for a histological examination. Drainage tubes were placed into both the right subphrenic region near the ruptured abscess cavity and the rectovesical pouch.

A bacterial culture on the ascites subsequently yielded no anaerobic bacteria, however, *K. pneumoniae* was observed which was more sensitive to carumonam, aztreonam, cefotaxime, cefoperazone, ciprofloxacin, and flomoxef. A postoperative histological examination of tissue sections revealed liver necrosis containing colonies of Gram-negative bacilli and air vacuoles (Fig. 2). Computed tomography (CT) performed 10 days after operation (Fig. 3A) demonstrated an air-containing cavity in the same portion of the right hepatic lobe. A follow-up CT scan (Fig. 3B) also disclosed evidence of liver regeneration and no residual abscesses around the liver. Although the patient’s postoperative course was complicated by the long-standing low grade fever, which might have been due to the residual intra-abdominal abscess, he was successfully treated by conservative therapy. His condition gradually improved, and he was discharged on the 73rd postoperative day. He has since manifested no signs of liver abscess and has been free of any symptoms for 11 months.

**Discussion**

According to a review by Morioka et al., only 27 cases of a gas-containing pyogenic liver abscess have been reported since 1973 in Japan. In addition, to the best of our knowledge, only six cases of a ruptured pyogenic liver abscess have been reported. A ruptured gas-containing abscess resulting in spontaneous pneumoperitoneum, however, has rarely been reported. Twenty-one of the above 27 patients had diabetes mellitus, which is thought to lower the host defense mechanism and increase the opportunity of bacterial infection. In most cases, bacterial cultures grew either *K. pneumoniae* or *E. coli*, which both have the ability to form gas using glucose.

Although the majority of spontaneous pneumoperitoneum encountered in ordinary clinical practice are the result of a peptic ulcer perforation and require prompt surgical intervention, we must keep in mind the fact that other causes can also mimic a perforation of the gastrointestinal tract and this phenomenon may lead to misdiagnosis. Gantt et al. classified the causes of non-surgical pneumoperitoneum as intra-thoracic, abdominal, gynecologic, and iatrogenic. Some authors have also reviewed other causes of spontaneous pneumoperitoneum requiring no immediate surgical intervention, and have recommended, whenever possible, the avoidance of unnecessary surgery. To avoid misdiagnosing the origin of pneumoperitoneum, we recommend that physicians should pay attention to such other causes when a patient with intra-abdominal free air is encountered.

For the preoperative diagnosis of a gas-containing liver abscess, CT is normally very useful and effective for demonstrating the internal structure of the liver. A plain abdominal radiogram can also provide useful diagnostic clues if it is carefully interpreted as described by Hayashi et al. In our case, an unusual gaseous shadow within the liver on the plain abdominal