Pneumoperitoneum Resulting from A Ruptured Pyogenic Liver Abscess: A Case Report

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Pneumoperitoneum represents the perforation of intraperitoneal hollow organs in most cases. Pneumoperitoneum resulting from a ruptured pyogenic liver abscess is rare. Open drainage followed by antibiotics is recommended for a ruptured pyogenic liver abscess with generalized peritonitis. Herein, we reported a case of pneumoperitoneum resulting from a ruptured pyogenic liver abscess successfully treated by open drainage in a 62-year-old female with diabetes.

Key words: pneumoperitoneum, ruptured, pyogenic live abscess

Introduction

Pneumoperitoneum referred to the presence of free air within the peritoneal cavity but outside the viscera, representing the perforation of intraperitoneal hollow organs in 85% to 90% of cases\(^1,2\). Therefore, surgical intervention is needed for most of the cases of pneumoperitoneum. Other causes of pneumoperitoneum include cardiopulmonary resuscitation (CPR), mechanical ventilatory support, previous open abdominal surgery with retained postoperative air, peritoneal dialysis, endoscopic gastrointestinal procedure, gynecologic manipulation, and so on. All of the above-mentioned cases were referred to nonsurgical pneumoperitoneum\(^3\). Moreover, other reported unusually causes included a ruptured splenic abscess, ovarian abscess, and liver abscess. Herein, we reported a rare case of pneumoperitoneum resulting from a ruptured pyogenic liver abscess.

Case Report

A 62-year-old female presented to our emergency department with epigastric pain for 3 days. There was associated chill, but no fever. She had a history of diabetes mellitus and appendectomy. On examination, she was afebrile with temperature of 36.4°C. Blood pressure was 83/42 mmHg. Pulse rate was 103 bpm. Respiratory rate was 20/min. Abdominal examination revealed generalized tenderness, especially in the epigastrium. Besides, severe rebound tenderness and guarding was noted over the epigastrium. Blood examination revealed white blood count 4700/mm\(^3\) (bands 0.02%, neutrophils 77%, lymphocyte 13%), hemoglobin 12.0 g/dl, and platelet count 358 × 10\(^9\)/l, glucose 461 mg/dl, C-reactive protein (CRP) 196 mg/l, sodium 134 mEq/l, potassium 3.6 mEq/l, blood urea nitrogen 27 mg/dl, creatinine 1.0 mg/dl, aspartate aminotransferase (AST) 26 IU/l, alanine
aminotransferase (ALT) 23 IU/l, amylase 25 IU/l, and lipase 61 IU/l. Upon the arrival, the chest x-ray showed no free intraperitoneal air (Fig. 1A). Perforated peptic ulcer with peritonitis was suspected though no free air was noted in the initial chest-X-ray. Four hours later, the second chest x-ray showed free right subphrenic air, so-called pneumoperitoneum, after 300 ml of air was inflated into the stomach through a nasogastric tube (Fig. 1B). Abdominal computed tomography (CT) revealed pneumoperitoneum, ascites, and a slightly lower density lesion at segment 5 (S5) of the liver (Fig. 2). Therefore, a liver (S5) abscess was suspected. Because perforated peptic ulcer with pneumoperitoneum, generalized peritonitis, and secondary liver abscess were suspected, we performed an emergent laparotomy. At laparotomy, 600 ml of turbid pus was noted in the peritoneal cavity. The stomach, small intestines, colon, and gallbladder were normal, without any evidence of perforation. The adhesion between the omentum and liver was noted and lysed. Then, a ruptured liver abscess, about 2 × 2 cm, was noted at S5 with purulent material covering it, and we drained it. A rubber drain tube was placed in subhepatic area. Klebsiella pneumoniae was isolated from the ruptured liver abscess. Two days after the operation, oral intake was started after the flatus passage. Infection of operation wound was noted on the 4th day postoperatively, and the wound was opened for drainage. The patient was discharged on the 13th day after the operation wound was improved. The patient has been free of any signs of liver abscess for more than 7 years.

**Discussion**

Pneumoperitoneum usually results from the perforation of intraperitoneal hollow organs, which had been thought surgical emergency in 85% to 90% of cases\(^1\)-\(^2\). Therefore, about 10% of pneumoperitoneums are caused by nonsurgical reasons, in which surgical intervention is usually not required. The reported causes of nonsurgical pneumoperitoneum include thoracic causes (chronic obstructive pulmonary disease,

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**Fig. 1** Chest X-ray. (A) Upon her arrival to our emergency department, no free air was noted on the chest X-ray. (B) Four hours later, pneumoperitoneum was suspected at the right subphrenic region (white arrow)
pneumothorax), abdominal causes (connective tissue disease, subclinical or sealed perforated viscus), gynaecological causes (pelvic inflammatory diseases, recent vaginal examination) and iatrogenic causes (previous open abdominal surgery with retained postoperative air, peritoneal dialysis, CPR, endoscopic gastrointestinal procedure\(^\text{(3)}\)). Pneumoperitoneum resulting form a ruptured pyogenic liver abscess is rare.

The incidence of pyogenic liver abscess was rare, with the annual incidence rate of 2.3/100,000 in Canada\(^\text{(4)}\) and 1.0/100,000 in Denmark\(^\text{(5)}\). The pyogenic liver abscess was usually caused by underlying hepatobiliary disease, and was associated with high mortality rate previously\(^\text{(6)}\). Escherichia coli was reported as the major pathogen\(^\text{(7)}\). Recently, the primary liver pyogenic abscess without underlying hepatobiliary disease is noted more and more common, and Klebsiella pneumoniae is reported as the major pathogen\(^\text{(8,9)}\) in Taiwan. They also noted diabetes as the major predisposing factor of liver abscess. Morioka et al.\(^\text{(10)}\) reviewed the literature and reported 27 cases of gas-containing pyogenic liver abscess in Japan. Twenty-one of the 27 cases had diabetes mellitus. Tsai FC et al.\(^\text{(11)}\) reported that the incidence of pyogenic liver abscess increased steadily from 11.15/100,000 population in 1996 to 17.59/100,000 in 2004 in Taiwan. The death due to pyogenic liver abscess decreased over time, with mortality rate of 10.9% during 1996-2004 in Taiwan\(^\text{(11)}\). However, the reported mortality rate was 25%-50%\(^\text{(5,12)}\) in the earlier literatures and about 10% in more recent reports\(^\text{(4,5)}\). They also noted the association of diabetes, malignancy, renal disease, and pneumonia with a higher risk of this disease\(^\text{(11)}\). Our patient was a diabetes patient. Moreover, renal disease, malignancy, pneumonia, and heart disease were noted correlated with higher death rates. In their study, Klebsiella pneumoniae was the major pathogen and was thought to be associated with the high incidence of pyogenic liver abscess\(^\text{(11)}\). Klebsiella pneumoniae was also isolated from the ruptured liver abscess in our case.

The treatment of pyogenic liver abscess has been changed in the past decades. Open surgical drainage had been the treatment of choice\(^\text{(13)}\) before the era of antibiotics. After the era of antibiotics, systemic empirical antibiotics should be administered early. However, Bamberger MD\(^\text{(14)}\) reported only 61% response rate and a longer median treatment duration (42 days) if the pyogenic liver abscesses were treated with antibiotics alone. With the advancement of high-solution imaging
tools, including the ultrasonography and computed tomography (CT), percutaneous aspiration or drainage with antibiotics was promoted as the main treatment modality. Mc Fadzean et al(15) first reported successful treatment of pyogenic liver abscess with closed aspiration and antibiotics in 1953. Avoidance of surgical procedures and general anesthesia, increased response rate of antibiotics treatment, shorter hospital stay, fewer complications, and better acceptance were reported the advance of percutaneous aspiration or drainage(16-18). Therefore, altra sonography- or CT-guided percutaneous drainage is advocated as the main therapy when the medical treatment with antibiotics alone fails. When percutaneous drainage fails or there is concurrent intraabdominal pathology, large and multiloculated abscess, or ruptured abscess, surgical intervention is required. Surgical interventions include open drainage, laparoscopic drainage, and liver resection. Laparoscopic drainage has the advantage of effective drainage, thorough peritoneal lavage, and detection of associated hepatobiliary pathology(19). Liver resection is advocated in the pyogenic abscesses associated with intrahepatic calculi and suspicious tumors(20).

Pneumoperitoneum resulting from a ruptured pyogenic liver abscess is rare. Only few cases were reported in the literature. Matsuyama(21) reported a case of pneumoperitoneum resulting from a ruptured liver abscess with an unusual gas shallow, which was overlooked on admission, in the right upper quadrant of the abdomen. Uikasa(22) reported a similar case. Chou FF(23) reported that gas-forming pyogenic liver abscess accounted for 10 to 20% of pyogenic liver abscess. The incidence of rupture of pyogenic liver abscess was reported 7.1-15.1%(24). Chou FF(23,24) also reported the mortality rate of ruptured pyogenic liver abscess as high as 42.8%. The most common organism accounting to the gas-forming pyogenic liver abscess was Klebsiella pneumoniae, as in our case. Abdominal CT is very useful in the diagnosis of pyogenic liver abscess with high sensitivity of 98%(25). Abdominal CT can also revealed pneumoperitoneum. In our case, liver abscess and pneumoperitoneum were suspected in the abdominal CT. Because the pneumoperitoneum was noted after 300ml of air was inflated into the stomach through a nasogastric tube, we suspected perforated peptic ulcer with generalized peritonitis. The liver abscess noted in the abdominal CT was suspected secondary to the perforated peptic ulcer. We performed an emergent laparotomy. Open drainage and peritoneal lavage were performed after we excluded the presence of a hallow organ perforation and any hepatobiliary disease.

In summary, though pneumoperitoneum resulting from a ruptured liver abscess is rare, we must keep it in mind. The mortality rate is high, so early diagnosis is very important. Abdominal CT is a very sensitive diagnosis modality. Diabetes is reported as a major predisposing factor of liver abscess. The treatment for a ruptured pyogenic liver abscess is surgical drainage or laparoscopic drainage followed by appropriate antibiotics. Careful examination of the entire bowel is necessary to exclude the presence of the bowel perforation during the surgery.

References

化膿性肝膿瘍破裂引起的腹腔積氣：病例報告

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腹腔積氣在大多數的病例中是因為腹腔內中空器官破裂所引起的。化膿性肝膿瘍破裂引起的腹腔積氣是罕見的。對於化膿性肝膿瘍破裂引起的腹膜炎所建議的治療是開腹式引流併用抗生素。我們報告一個62歲糖尿病婦女，罹患化膿性肝膿瘍破裂引起腹腔積氣及腹膜炎，以開腹式引流併用抗生素成功治癒的病例。

關鍵詞：腹腔積氣，破裂，化膿性肝膿瘍