Ruptured liver abscess presenting as pneumoperitoneum caused by *Klebsiella pneumoniae*: a case report

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**Abstract**

**Background:** Spontaneous gas-forming pyogenic liver abscess (GFPLA) is a rare complication with a high fatality rate in spite of aggressive management. Clinical spectrum of GFPLA can mimic hollow viscus perforation as it usually accompanied by pneumoperitoneum and peritonitis. Up to now, GFPLA has not been well studied in Vietnam.

**Case presentation:** We reported here a case with pneumoperitoneum caused by ruptured liver abscess in a 41-year-old man with a history of treated duodenal ulcer and uncontrolled type II diabetes mellitus. He had an epigastric pain associated with a high fever. Patient was diagnosed peritonitis and pneumoperitoneum presumed to be secondary to perforation of a hollow viscus and subjected to emergency laparotomy. We did not find any gastrointestinal perforation. Surprisingly, we detected a 4 cm x 4 cm pus-containing abscess in the left liver lobe of the liver. The abscess was ruptured. Pus was running into abdominal cavity through one hole. The abscess and abdominal cavities were cleaned up and abscess and abdominal drainages were performed. *K. pneumoniae* was isolated from culture of the abscess. The histopathological examination of the abscess did not yield any evidence of malignancy. Blood glucose levels were controlled. Antibiotic therapy was used according to antibiogram. A reassessment chest X-ray showed no air-fluid level or subdiaphragmatic air by the hospital day 14. Patient eventually made a full recovery and was discharged home 23 days after the operation.

**Conclusions:** Ruptured GFPLA is a life-threatening complication. It is usually accompanied by peritonitis and pneumoperitoneum and can imitate hollow viscous perforation. In these cases, CT scan should be performed whenever it is possible to make a correct diagnosis. When the abscess has small size, partial hepatectomy might not be necessary and could be replaced by a careful cleaning and drainage of the abscess. Patient could show a good postoperative recovery following an appropriate antibiotic therapy.

**Keywords:** Pneumoperitoneum, Ruptured liver abscess, *Klebsiella pneumoniae*, Case report

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Background
Pyogenic liver abscess (PLA) is an important cause of hospitalization and life threatening disease in low-middle income countries [6, 18]. Spontaneous gas-forming pyogenic liver abscess (GFPLA) is a rare complication with a high fatality rate in spite of aggressive management [3]. Clinical spectrum of GFPLA can mimic hollow viscus perforation as it usually accompanied by pneumoperitoneum and peritonitis [7]. Previous studies showed that *E. coli* and *K. pneumoniae* are the most common pathogens isolated in pyogenic liver abscess [10].

GFPLA is uncommon in western countries but often reported in Asian countries such as Taiwan and South Korea [5, 10]. Recently, ruptured liver abscess has received attention of clinicians and researchers in Vietnam [4, 17]. However, further studies are required in order to elucidate the general states and characteristics of GFPLA in this country where there is still a high percentage of low resource medical settings. Here, we reported a case of pneumoperitoneum due to ruptured pyogenic liver abscess caused by *Klebsiella pneumoniae*.

Case presentation
We present a case of a 41-years-old man living in a rural area with a history of treated duodenal ulcer and uncontrolled type II diabetes mellitus. Five days before the hospital admission, this patient had an epigastric pain associated with a high fever (up to 39.5 °C). Four hours before the hospitalization, his epigastric pain was seriously and dramatically increased. A physical examination on admission to the emergency department revealed high temperature of 39 °C and generalized rigidity of the abdominal wall, suggesting a peritonitis. His heart rate was 109 beats/min and his blood pressure were 120/80 mmHg. There was not a clear clinical anemia or jaundice. His white blood cell count was 19.1 × 10⁹/L and the percentage of neutrophils was 85.3%. Other laboratory results were as follows: serum pro-calcitonin level, 17.73 ng/ml; serum glucose level, 14.7 mmol/L; serum bilirubin level, 37.6 mmol/L; serum aspartate aminotransferase level, 51 U/L and serum alanine aminotransferase level, 87 U/L.

Both of the chest and abdominal X-ray showed bilateral subdiaphragmatic air, indicating pneumoperitoneum (Fig. 1). Consistently, ultrasound scan of the abdomen was conducted and detected free intraperitoneal air and fluid. It was hard to evaluate liver tissue due to the presence of intraperitoneal air and no hypoechoic foci was detected in the liver by this method. Unfortunately, computed tomography (CT) of the abdomen was not available by the time of the admission.

Patient was diagnosed peritonitis and pneumoperitoneum presumed to be secondary to perforation of a hollow viscus and treated for septic shock with intravenous fluid and broad-spectrum antibiotic. He was subjected to emergency laparotomy. Based on his previously reported duodenal ulcer history, we carefully checked and did not find any gastrointestinal perforation. Surprisingly, we detected a 4 cm × 4 cm pus-containing abscess in the left liver lobe of the liver. The abscess was ruptured. Pus was running into abdominal cavity through one hole. At the end of the operation, 80 ml of turbid pus was drained from the subphrenic and subhepatic spaces. We carefully checked and did not find any underlying disease of the biliary tract. We concluded that the pneumoperitoneum resulted from spontaneous rupture of the hepatic abscess in the left liver. We placed abdominal drains in the abscess cavity and the subhepatic area. *K. pneumoniae* was isolated from culture of the abscess. The histopathological examination of the abscess did not yield any evidence of malignancy. Blood glucose levels were controlled. Antibiotic therapy was used according to

Fig. 1 Gas under both domes of diaphragm on radiograph. Routine preoperative X-ray taken on admission showed free gas under both domes of diaphragm (arrows)
anti-biogram (piperacillin and tazobactam). A re-assess-
ment chest X-ray showed no air-fluid level or subdi-
aphragmatic air by the hospital day 14. The patient eventually
made a full recovery without any complication and was
discharged home 23 days after the operation.

**Discussion and conclusions**

Pyogenic liver abcess (PLA) is a common infectious dis-
ease worldwide relating to a mortality rate ranging be-
tWEEN 15 and 19% [15, 18]. Gas-forming pyogenic liver
abcess (GFPLA) remains one of the most dangerous
complication with a high fatality rate in spite of aggressive
management [10]. *Klebsiella pneumoniae* is considered to
surpass *Escherichia coli* (E. coli) to become the major
pathogen of pyogenic liver abscesses, especially in GFPLA
and in patients with diabetic mellitus (DM) [9, 10]. Here,
we reported a case of *Klebsiella pneumoniae*-induced gas-
forming pyogenic liver abcess with uncontrolled DM
history.

**CT-Scan plays a key role in the diagnosis of gas-
forming pyogenic liver abcess** [4, 12]. Unfortunately,
there is a fact that access to advanced imaging systems
like CT is still limited in developing countries. In our
case, CT was not available by the time of hospital admis-
sion of the patient. But this was not the unique reason
for the inaccurate preoperative diagnosis as pneumoperi-
toneum presumed to be secondary to perforation of a
hollow viscus. Indeed, there are several other causes such as:
history of duodenal ulcer, the relatively small
size of this liver abcess, and the deficiency of ultrasound
scan in case of ruptured liver abcess. By presenting this
case of GFPLA, we aimed to highlight the importance of
careful examination by the surgeons when abdominal
peritonitis and pneumoperitoneum were present without
any perforation of a hollow viscus. This case also implied
that CT scan should be performed wherever it is pos-
sible to make an early and correct diagnosis of GFPLA
which in turn, help to decrease the operative time and
improve patient outcomes.

Several studies have reported the cases of successful
non-surgical treatment of ruptured pyogenic liver ab-
cess [11, 13]. In these cases, patients with ruptured liver
abcess associated with septic shock and high glycemic
level can be successfully treated with percutaneous
ultrasound-guided drainage associated with IV broad
spectrum antibiotics without surgical intervention. How-
ever, these cases had prolonged hospital stay (40–52
days). According to a study of Shiba H., in case of rup-
tured liver abscess associated with peritonitis and sepsis,
drain abscess should not be performed. Instead of that,
they cut the part of liver which contained abscess and
cleaned the abdominal cavity. Their patient recovered
well after surgery without any complication and dis-
charged at the postoperative day 30 [16]. In our case,
partial hepatectomy was not conducted to remove the
abcess. Alternatively, we firstly performed cleaning of
the abcess cavity and removed all the pus inside, in par-
allel with cleaning of the abdominal cavity. After that,
one of the abdominal drainages was directly put inside
the abcess. Our patient presented a good recovery with-
out any complication and he was discharged at the 23rd
postoperative day. We suggest that this method might
be useful for treating ruptured PLA with a single and
relatively small size abscess.

In our case, emergency laparotomy was chosen as the
first choice following the diagnosis of a secondary peri-
tonitis in order to carry out a careful abdominal lavage.
This method also allowed the surgeons to perform
cleaning of the abcess cavity and contributed to the
successful treatment without partial hepatectomy. Lapar-
oscopy lavage is an alternative option in the treatment of
purulent peritonitis but it is associated with a signifi-
cantly higher rate of reoperations and a higher rate of
intra-abdominal abscess [1]. Furthermore, laparoscopic
surgery and training is not widely available in the devel-
oping countries. Therefore, we suggest that laparotomy
might be suitable to combine with the treatment of rup-
ture liver abscess using abdominal drainages.

Finally, *K. pneumoniae* PLA is predominantly seen in
Southeast Asia but only few cases have been reported in
Vietnam [2, 4]. Strikingly, current researches showed
that *K. pneumoniae* infection is becoming an emerging
public health problem in Vietnam due to its carabapenem-resistance [8, 14]. Therefore, further investi-
gations are required to clarify the clinical and paraclin-
cal characteristics of *K. pneumoniae* PLA in Vietnam.

In conclusion, ruptured gas-containing PLA is a life-
threatening complication. It is usually accompanied by
peritonitis and pneumoperitoneum and can imitate hol-
low viscous perforation. In these cases, CT scan should
be performed whenever it is possible to make a correct
diagnosis. When the abcess has small size, partial hepa-
tectomy might not be necessary and could be replaced
by a careful cleaning and drainage of the abcess in asso-
ciation with an appropriate antibiotic therapy.

**Abbreviations**

CT: Computed tomography; GFPLA: Gas-forming pyogenic liver abcess;
IV: Intravenous; PLA: Pyogenic liver abcess

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**Authors’ contributions**

TPV and TADD: Management of the case and preparing the manuscript.
SVN: Management of the case and critical appraisal and review of the
manuscript.
DHH: Management of the case and critical appraisal and review of the
manuscript.

of the manuscript. Interpretation of X-rays. All authors read and approved the final manuscript.

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Availability of data and materials
All data generated or analyzed during this study are included in this published article.

Ethics approval and consent to participate
Ethics approval of this study was given by the Research Ethics Committees of Haiphong University of Medicine and Pharmacy. Authors have agreed to submit it in its current form for consideration for publication in the Journal.

Consent for publication
Written informed consent for publication of their clinical details and clinical images was obtained from the patient.

Competing interests
The authors declare that there is no conflict of interest regarding the publication of this article.

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