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Perforated Liver Abscess in Makkah, Saudi Arabia: A Case Report

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Abstract

Pyogenic liver abscess (PLA) is a significant cause of hospitalization and potentially fatal conditions in low-income nations. Most pyogenic abscesses are polymicrobial and make up about 80% of all liver abscesses in the developed world. One major complication that might negatively affect a patient's life is the rupture of a pyogenic liver abscess (PLA). In this case, we report a rare case presented by pneumoperitoneum due to a ruptured pyogenic liver abscess in an undiagnosed type 1 DM caused by Klebsiella pneumoniae. A 25-year-old Yamni male patient, not known to have any medical illness and surgical free, came to the emergency department complaining of right-sided abdominal pain for 10 days.The result of a computed tomography (CT) scan revealed a ruptured hepatic abscess in segment VI of the liver (11×10×10 cm) with gas formation, marked free fluid in the abdomen, and pneumoperitoneum. The patient underwent an exploratory laparotomy. Klebsiella pneumoniae was demonstrated by blood culture and fluid culture. His postoperative course was complicated by diabetic ketoacidosis, hypoglycemia-induced seizures, and multiple ICU admissions. Despite these challenges, with surgical intervention, antibiotic therapy, drainage procedures, and diabetes management, the patient made a significant recovery. Three months post-surgery, he remains stable and under regular outpatient follow-up. The majority of acute abdominal pain cases accompanied by pneumoperitoneum are caused by a perforated hollow viscus. But it's also necessary to consider alternative possibilities, such as the gas-forming bacteria rupturing the liver abscess.

Keywords: *Pyogenic liver abscess, Klebsiella pneumoniae, pneumoperitoneum, ruptured liver abscess, DM.*

Background

Pyogenic liver abscess (PLA) is a significant cause of hospitalization and potentially fatal conditions in low-income nations. Most pyogenic abscesses are polymicrobial and make up about 80% of all liver abscesses in the developed world. (1) One major complication that might negatively affect a patient's life is the rupture of a pyogenic liver abscess (PLA) (2). A gas-containing PLA's rupture typically occurs with pneumoperitoneum and can resemble a hollow viscous perforation (3,4). According to a previous studies, liver abscesses were once thought to be a high morbidity condition that required open surgical drainage and had fatality rates ranging from 9% to 80%. It was consistently lethal if left untreated (5, 6, 7). A significant paradigm shift in treating pyogenic hepatic abscesses has occurred within the past 25 years, and mortality rates have decreased to 5–30%.

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This condition can now be managed using less intrusive methods due to developments in diagnostic and interventional radiology during the past three decades. Currently, percutaneous drainage procedures are the cornerstone of treatment when combined with targeted antimicrobial therapy. Nonetheless, a tiny percentage of patients do not react well to minimally invasive management techniques; it is crucial to identify these patients as soon as possible, as open surgery is the only effective treatment for them. A number of the documented complications include recurrent liver abscesses, endophthalmitis, bacteremia, rupture, septic shock, severe respiratory and renal failure, and various metastatic infections (8). Despite proper evaluation and therapy, morbidity and death rates are still high; consequently, early detection and prediction of complications can save lives (8, 9). However, more research is needed to clarify the general conditions and traits of perforated liver abscess in this nation, where many medical settings still lack adequate resources. This is the first case report in Makkah, Saudi Arabia. In this case, we report a rare case presented by pneumoperitoneum due to a ruptured pyogenic liver abscess in an undiagnosed type 1 DM caused by Klebsiella pneumoniae.

Case presentation

A 25-year-old Yamani male patient, not known to have any medical illness and surgical free, came to the emergency department complaining of right-sided abdominal pain for 10 days. The history was unclear because the patient was anxious, but mainly he complained of abdominal pain for 10 days. He described this pain in the right upper quadrant, which started gradually, did not radiate, was on and off, and was progressive over time. There were no reliving or aggravating factors. He described that pain was associated with obistation for 7 days. He was nauseated but denied any history of vomiting or change in bowel habit. He also reported decreases in appetite, loss of weight, and fatigue. According to his complaint, the fatigue lasted one month, and in the last ten days, he started complaining of abdominal pain. He denied subjective fever, night sweats, or eating from outside. There was no family history of bowel disease or malignancy. He had no sick contact and no traveling history. There was no previous similar complaint or alternative bowel habits.

On examination: the general appearance of patient was conscious, oriented, sleepy and his body build was thin, BMI: 14. He wasn't jaundiced or cyanosed. The body temperature was 37°C. The heart rate was 120 beats per 1 minute, the respiratory rate was 20, and the blood pressure was 138/78 mm Hg. The abdominal examination showed tenderness in the right upper quadrant. Otherwise, the abdomen was soft and lax without guarding or rigidity. Murphy's sign was negative.

The patient's laboratory results showed a white blood cell (WBC) count of 5.2, red blood cell (RBC) count of 5.14, hemoglobin (HGB) level of 12.2 g/dL, and a platelet count of 223 x 10^9/L. Liver function tests revealed an elevated alkaline phosphatase level of 624 U/L, aspartate aminotransferase (AST) at 66 U/L, and alanine aminotransferase (ALT) at 42 U/L. Coagulation studies showed an international normalized ratio (INR) of 1.49, prothrombin time (PT) of 17.7 seconds, and partial thromboplastin time (PTT) of 33.4 seconds. Additionally, creatine kinase (CKI) was 21 U/L, and lactate dehydrogenase (LDH) was 193.97 U/L. Hemoglobin A1c level was 10.9.

On a plain abdominal x-ray, free air under the diaphragm was demonstrated as a free fluid level **(Figure 1)**. So, an urgent abdominal computed tomography (CT) scan with contrast was done on 13 July. The results showed that there is evidence of ill-defined collection with gas formation in segment VI of the liver, measuring about 11 x 10 x 10 cm, with evidence of marked free fluid within the abdominal cavity and pneumoperitoneum, previous findings suggestive of rupture of a hepatic abscess. The rest of the abdominal organs appear within normal limits. There is evidence of right pleural effusion with right basal collapse consolidation; otherwise, it is an unremarkable study **(Figure 2)(figure 3).**

The patient was admitted under general surgery as a case of suspected perforated liver abscess and was scheduled for an exploratory laparotomy. The patient was taken to the operating room for an exploratory laparotomy on 13 July.Under general anesthesia, the patient was positioned supine, and standard preparation and draping were performed. Upon opening the laparotomy wound, approximately 6 liters of pus were evacuated. A cavity measuring around 15 cm in depth and 10 cm in width was identified in segment 6 of the liver. The mesentery appeared nodular, and the surrounding tissue was notably fragile. Wound swabs were collected, and the pus was sectioned for analysis. Irrigation was performed, and a drain was placed. The right colic peritoneum was opened to access the subhepatic area. A liver biopsy was taken, and a thorough examination of the bowel was conducted, revealing no perforation. Additionally, biopsies were obtained from the mesentery and omentum. The appendix was found to be small and firm, necessitating an appendectomy. Drains were placed in the sub-hepatic, pelvic, and left colic regions. The wound was closed using prolonged sutures and Vicryl, while the skin was approximated with clips. A sterile dressing was applied, and the patient was transferred to the recovery room. Post-operative HB was 9.5.

Multiple cultures were sent for the patient, which revealed a contaminated sample for the pleural fluid culture and sensitivity. Urine culture grew Klebsiella pneumoniae ESBL, while the aerobic peripheral blood culture also identified Klebsiella pneumoniae. Fluid culture and wound swab both showed the presence of Klebsiella pneumoniae. Sputum culture revealed Klebsiella pneumoniae ESBL. Culture and sensitivity of the abdominal drain grew Pseudomonas fluorescens.

The patient was extubated post-operatively and shifted to a high-independence room on the floor. But unfortunately, the patient developed hypotension and was shifted to the ICU from the surgical ward. He received 3 liters of fluid in the operating room and 1 liter in the ward. One unit of PRBCs was requested to be transfused. On the second postoperative day, the patient experienced a decreased level of consciousness with a Glasgow Coma Scale (GCS) score of 8/15 and became agitated. Arterial blood gas analysis revealed metabolic acidosis with ketone in blood (DKA), leading to elective intubation and connection to a mechanical ventilator, and consultation for Endocrine was made as undiagnosed DM. The patient was extubated on July 17, 2023, with a room air oxygen saturation of 95%.

On the seventh postoperative day, the patient was transferred to the surgical ward. He showed significant improvement and was doing well. The patient was conscious, alert, and oriented. His vital signs were stable, with a blood pressure of 114/72 mmHg, a pulse rate of 60 beats per minute, a temperature of 37°C, and an oxygen saturation of 92%. On the abdominal examination,

the abdomen was soft and lax with no tenderness. The surgical dressing was clean. Drain outputs were recorded as follows: the subhepatic drain produced 200 ml/24 hours of hemoserous fluid, the pelvic drain yielded 75 ml/24 hours of bile, and the left colic drain collected 300 ml/24 hours of serous fluid.

On July 25, the patient underwent a post-ERCP procedure, during which a plastic stent was placed in the hepatic duct. The ERCP report showed a Normal Ampula with normal CBD and no filling defect. Biliary leakage was seen at the intrahepatic level during the cholangiogram.

After three days, the patient suddenly experienced a decreased level of consciousness with a Glasgow Coma Scale (GCS) score of 5/15 and was found to have a random blood sugar (RBS) level of 39 mg/dL. He was immediately shifted to the ICU, and a Rapid Response Team (RRT) was activated due to the low GCS. The patient was hypoglycemic and developed tonic-clonic seizures, leading to intubation. The seizures were suspected to be induced by hypoglycemia.

On July 29, 2023, the patient was shifted to the surgical ward after signing a refusal form to remain in the ICU. On August 14, 2023, the drain was placed with the help of interventional radiology (IR), followed by a contrast-enhanced CT scan of the abdomen on August 21, 2023. A contrast-enhanced CT scan of the abdomen was performed and compared to a previous study done on August 3, 2023. The findings revealed the insertion of a pigtail drain into the previous hepatic abscess through the right lateral upper abdomen. The interval removal of the common bile duct (CBD) stent was also noted. The right lobe hepatic abscess was still present. Still, it showed a decrease in size, now measuring approximately 4.13 x 6.82 x 6.6 cm, compared to the previous dimensions of 7.22 x 8.4 x 8.7 cm (transverse, anteroposterior, craniocaudal). Additionally, there was a re-demonstration of the anterior abdominal wall surgical wound collection without significant changes. No free air was observed in the abdomen or pelvis, and the rest of the study remained unchanged.

On August 22, 2024, the patient was discharged with the following medications: amoxicillin-clavulanic acid, regular routine insulin aspart (NovoRapid pen), regular routine insulin glargine (international units, subcutaneous), lornoxicam as needed, and paracetamol. Three months after surgery, the patient's condition has significantly improved, and his overall status is satisfactory. He is now able to carry out his daily activities independently. The patient continues regular follow-up at the general surgery outpatient department, with the latest visit on September 18, 2025. Currently, he reports no abdominal pain but experiences occasional nausea without vomiting. There is no history of diarrhea. On examination, the surgical wound was found to be completely healed, and the drain had been removed one week prior.

Discussion

Pyogenic liver abscesses (PLAs) are potentially fatal abdominal disorders that need to be diagnosed and treated right away. Incidence rates in the US and Europe range from 1 to 15 per 100,000 person-years. There is a lack of structured epidemiological data for European nations (10). According to earlier research, Taiwan's yearly incidence of pyogenic liver abscess for all age groups grew gradually from 10.83 per 100,000 in 2000 to 15.45 per 100,000 person-years in 2011. Male patients, those over 50, and those with lower family incomes were more likely to

develop a pyogenic liver abscess. () A different study conducted in Germany revealed roughly seven PLA cases for every 100,000 people. 65% of patients were male, and the average age at diagnosis was 66 (10). In Asian nations, the prevalence of PLAs has steadily increased, ranging from 12 to 18 cases per 100,000 people (12).

A hepatic abscess is typically characterized by fever, jaundice, and pain in the right upper quadrant. Some people, on the other hand, experience vague symptoms like fatigue, anorexia, vomiting, malaise, and weight loss. There could be a delay in diagnosis because of these more modest symptoms. For the symptoms, according to a previous study done at Louisiana State University Medical Center in Shreveport, fever and pain were the most typical presenting symptoms (13). Another case report about 41 patients diagnosed with peritonitis and pneumoperitoneum presented with epigastric pain associated with a high fever (14). Another case report on a 40-year-old man who arrived at the emergency room with fever and abdominal pain in the right upper quadrant. This is similar to our case presentation (4).

Pneumoperitoneum is an uncommon manifestation of a liver abscess, and liver abscesses are rarely the cause of this diagnosis. The most common explanation for air in the peritoneum is a perforation in the gastrointestinal tract. Other gynecologic, urologic, or intra-abdominal conditions are less frequent causes (15,16). PLA is a common infectious condition that spreads across the abdomen and is brought on by various bacteria. In Asia, K. pneumoniae is the most common pathogen for PLA, whereas Streptococci and E. coli are the most common in North America (17). According to this study, the percentage of K. pneumoniae in PLA patients' blood cultures or pus increased annually to 81.8% in the most recent two years (18,19). In a prior study conducted in China, E. coli and K. pneumoniae were found to be the leading causes of PLAs. Therefore, empirical antibiotic therapy should be applied to both bacterial species before collecting the findings of the bacterial culture. Ampicillin resistance is innate in K. pneumoniae (20).

Pyogenic hepatic abscess complications typically arise from rupture or direct extension into a nearby viscera (21). A rare cause of pneumoperitoneum is rupture of a liver abscess caused by a gas-forming bacterium. In Southeast Asia, particularly Taiwan, gas-forming pyogenic liver abscess (GFPLA), often called emphysematous, is most common (11). Up to 30% of all pyogenic liver abscesses have this condition, and its death rate is higher than that of non-GFPLA (30.3% vs. 9%). Another concern is the high complication rate linked to GFPLA, which has been reported to reach up to 90% in certain studies (22, 24).

These complications include Bacteremia, septic shock, acute kidney injury (AKI), respiratory failure, abscess rupture, recurring abscesses, and infections that spread to the eyes, lungs, and muscular tissue (24,25). The association between glycemic control and the risk of liver abscess is notably stronger in individuals younger than 65 years compared to those older than 65. Improved glycemic control and weight reduction may help lower the risk of pyogenic liver abscess, an emerging infectious disease. Additionally, overweight and obese individuals have been found to have a higher risk of developing liver abscesses compared to those with a normal weight. A previous study revealed that within the diabetic population, the incidence rate of liver abscess was significantly higher in individuals with poor glycemic control (75.7 per 100,000) than in those with reasonable glycemic control (55.7 per 100,000). Regarding BMI, the lowest

incidence rates were observed in the normal weight and underweight groups (14.2 and 11.0 per 100,000, respectively).

Furthermore, liver-abscess-free survival was poorest among diabetic patients with inadequate glycemic control. Age- and sex-adjusted Cox regression analysis confirmed that diabetes is associated with an increased risk of liver abscess, with the risk being even higher among diabetic individuals with poor glycemic control compared to those with reasonable control (26). In a previous study, diabetes mellitus (DM) remained the most common comorbidity among patients with pyogenic liver abscesses (PLAs), accounting for approximately 37% of cases, with no significant changes observed in recent years. Similarly, data from Korea reported a prevalence of diabetes at 37.24% and malignancy at 26.5% among PLA patients (27). Metastatic infections were identified in 1.74% of cases, with endophthalmitis being the most frequent. Another study focusing on patients with ruptured liver abscesses revealed that 60.9% had diabetes mellitus, while 65.2% of the cases were classified as cryptogenic (2).

The management of GFPLA involves using suitable antibiotics, adequate drainage to enhance tissue perfusion and support gas removal, and proper blood sugar control. While surgical exploration and drainage were traditionally the standard approach, recent decades have seen a significant transition toward image-guided percutaneous transhepatic drainage as the preferred method. According to a study that examined 22 cases of emphysematous liver abscess, 19 patients had percutaneous transhepatic abscess drainage, and one patient had surgery (28). Drainage is especially advised when an abscess is massive and more than 5 cm in diameter. Surgery needs to be considered in situations of rupture and peritonitis (29, 30).

For an intact hepatic abscess, parenteral antibiotics combined with image-guided needle aspiration and drainage are the preferred course of treatment. Surgery is necessary for an abscess that has ruptured to drain the abscess and clean the contaminated abdominal cavity (2). According to the multivariate analysis's findings, PLA patient fatality was associated with diabetes, cancer, younger age, female sex, and chronic renal disease (27). Previous studies showed that biliary illness and advanced age were negative prognostic factors, and that the fatality rate for cases of unruptured hepatic abscess ranged from 7.1% to 15.5%. A ruptured liver abscess is thought to be the cause of death for 43.5% of persons (2,31).

Mortality rates in patients with GFPLA are notably high, ranging from 30% to 40%, which is over three times higher than the mortality rate seen in typical PLA cases. Factors associated with an increased risk of death include elevated creatinine levels and high blood sugar levels (8).

Conclusion

The majority of acute abdominal pain cases accompanied by pneumoperitoneum are caused by a perforated hollow viscus. However, alternative possibilities, such as gas-forming bacteria rupturing the liver abscess, must also be considered. A CT scan or other further imaging may aid in the diagnosis and, in certain situations, prevent the necessity for a laparotomy. Antibiotics, exploratory laparotomy, drain insertion, and supportive treatments were all used to manage our patient successfully.

Figure1.

Abdomen x-ray
Note. Abdominal x-ray showed Free fluid level.

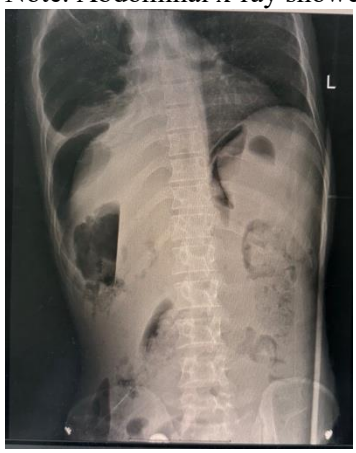


Figure 2.
CT scan of abdomen, axial view.

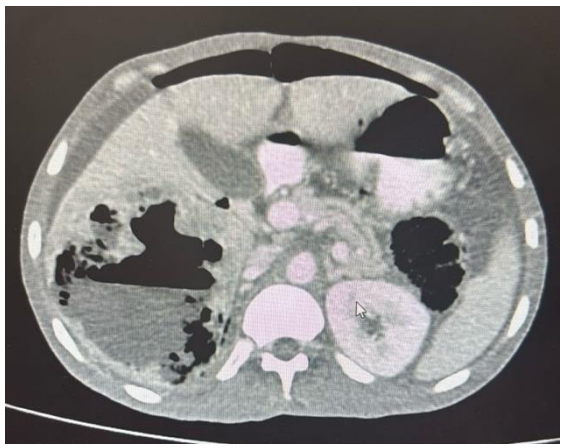
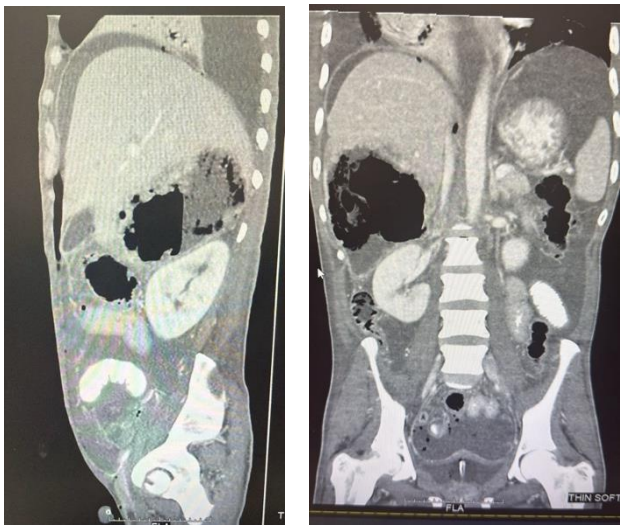


Figure 3.

CT scan of abdomen, sagittal and coronal view.



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