

Pyogenic and fungal liver abscess with pneumonia due to abdominal trauma in pediatric: A rare case report

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ABSTRACT

Liver abscess is an infection characterized by the presence of pus in the hepatic parenchyma due to necrosis caused by bacteria, fungi, or parasites. The prevalence of liver abscesses in children remains a significant issue in developing countries. We report a unique case of pediatric liver abscess, in which the primary etiology is suspected to be a blunt abdominal trauma that occurred a month prior. A 14-year-old boy presented with fever, shortness of breath, cough, and persistent right upper abdominal pain that had not improved despite a week of hospitalization. Diagnostic investigations revealed pneumonia, empyema, and a right lobe liver abscess. The patient's condition progressed to sepsis with a sequential organ failure assessment score of 7, necessitating intensive care for several days.

Key words: Abdominal trauma, Emphyema, Fungal, Liver abscess, Pediatric, Pneumonia, Pyogenic


Liver abscess is an infection characterized by the presence of pus in the hepatic parenchyma, caused by bacterial or parasitic necrosis, and may be either infectious or sterile in nature [1,2]. There are two common types of liver abscesses: Pyogenic liver abscess, which is typically polymicrobial and often caused by organisms such as *Escherichia coli*, *Klebsiella*, *Streptococcus*, *Staphylococcus*, and anaerobes; and amebic liver abscess caused by *Entamoeba histolytica*, as well as abscesses due to tuberculosis or fungi [3,4]. Factors that may worsen the prognosis of liver abscesses include advanced age, immunosuppression, comorbidities (e.g., cirrhosis and malignancy), and complications such as acute kidney injury or shock [5]. A significant number of liver abscesses are reported to be pyogenic. In the United States, the reported annual incidence is 3.6 cases/100,000 people. However, in Taiwan, it is 17.6/100,000 people. Men dominate pyogenic liver abscess sufferers, but it currently affects older people more [6,7]. Pleuropulmonary involvement is the most common complication of liver abscess, usually resulting from direct extension of the abscess. Patients with liver abscesses are susceptible to secondary infections originating from the primary site via venous circulation, which may rapidly

progress from mild respiratory symptoms to respiratory failure and septic shock. Hematogenous spread may occur through the portal system, hepatic veins, and the inferior vena cava [6,7]. Liver abscesses remain a significant issue in infectious disease children, especially in developing countries [8].

CASE PRESENTATION

A 14-year-old boy was admitted to the emergency department of Dr. Soegiri Regional Hospital, Lamongan, presenting with fever, shortness of breath, cough, and right upper abdominal pain. He had previously been hospitalized for a week with the same complaints but showed no clinical improvement. The patient had a history of blunt abdominal trauma from a physical assault 1 month prior. He was also known to be an active smoker and to consume alcohol. Through heteroanamnesis, it was revealed that his father, siblings, and grandmother had been diagnosed with hepatitis.

The general status of the examination revealed a weakened overall condition, with stable vital signs and icterus. Other findings presented leukocytosis, hyperbilirubinemia, hypoalbuminemia, and a tendency toward hypoglycemia. A chest X-ray showed pneumonia and right-sided pleural effusion (Fig. 1). Thoracentesis yielded purulent fluid mixed with blood. Abdominal ultrasonography revealed abscesses in segments VII

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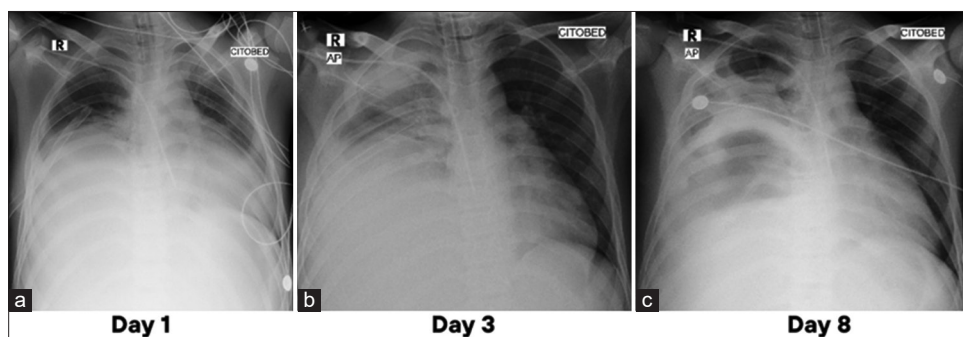


Figure 1: Evaluation of pulmonary infection progression through chest X-ray imaging. (a) Infiltrates observed in the right and left perihilar regions (pneumonia) with bilateral pleural effusion; (b) Postoperative chest X-ray after the first surgery showing right hemithorax infiltrates and organized right pleural effusion; (c) Follow-up chest X-ray after the second surgery revealing persistent organized right pleural effusion

and VIII of the right hepatic lobe, along with signs of cholecystitis (Fig. 2). The patient received broad-spectrum antibiotics, hepatoprotective agents, steroids, and bronchodilators in the emergency department. Subsequently, a diagnostic laparoscopy was performed, revealing suppurative inflammation of the hepatic tissue (Fig. 3). This was followed by liver biopsy through laparotomy, placement of water-seal drainage (WSD), and insertion of a central venous line. Histopathological examination of the liver tissue revealed extensive necrosis and inflammation. Postoperatively, the patient was transferred to the intensive care unit (ICU) for further management.

The patient was diagnosed with pneumonia, right-sided empyema, liver abscess, and sepsis, with a sequential organ failure assessment score of 7. In the ICU, he was placed on ventilatory support, with sedation and analgesia administered for ventilator management. Antibiotic therapy included meropenem, quinolones, and metronidazole. On the 2nd day, additional therapy included furosemide, fentanyl, ondansetron, ranitidine, multivitamins, and a hepatospecific diet. Within 48 h, the patient developed acute kidney injury and type 2 respiratory failure with respiratory acidosis (serum creatinine 4.13 mg/dL, PF ratio 214 mmHg), indicating progression to respiratory, renal, and hepatic failure. Multi-organ dysfunction syndrome was suspected. Sputum culture revealed Gram-positive bacteria and yeast cells, leading to the addition of fluconazole and a revised diagnosis of pulmonary mycosis. On day 3, oxygenation showed some improvement.

By the 7th day, however, the PF ratio remained at 206 mmHg, indicating no significant improvement in respiratory function. Drainage output remained high (2,760 mL of pus), prompting a second laparotomy and WSD revision. Intraoperatively, a right hemidiaphragm rupture was discovered, with liver abscess extending into the right thoracic cavity, likely due to increased intrahepatic pressure from excessive pus accumulation.

Over 12 days in the ICU, the patient's albumin levels progressively declined despite albumin transfusions, showing only transient and insufficient increases. Hemoglobin levels also dropped significantly, reaching a nadir of 4.2 mg/dL. The patient received three packed red cell transfusions totaling 800 cc. Following the second surgery, the patient's respiratory condition deteriorated into type 1 respiratory failure due to acute respiratory

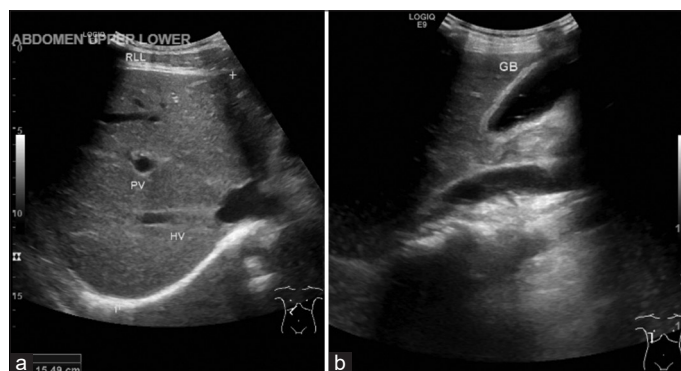


Figure 2: Abdominal ultrasound findings. (a) Abscess measuring approximately 12.49×11.9×17.19 cm located in segments VII and VIII of the right hepatic lobe; (b) Cholecystitis characterized by thickening and irregularity of the gallbladder wall

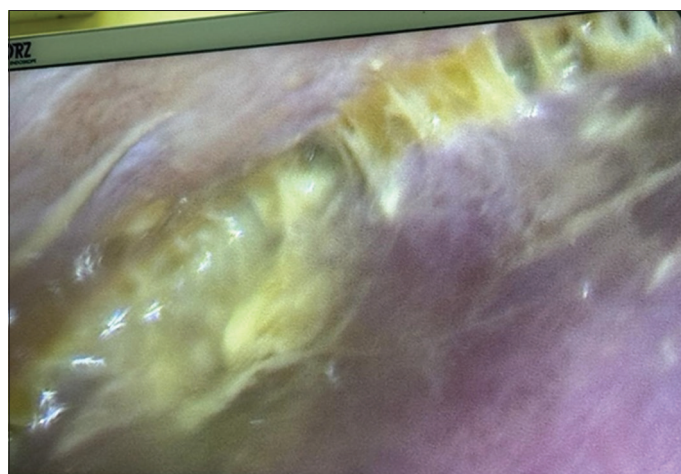


Figure 3: Initial laparoscopy findings. Suppurative inflammation of the hepatic tissue was found

distress syndrome and type 2 failure, accompanied by circulatory collapse requiring vasopressor support. These deteriorations were paralleled by further reductions in hemoglobin and albumin levels, while pus production remained unchanged. The patient's condition continued to worsen, ultimately resulting in death.

DISCUSSION

There is a notable difference in the prevalence of liver abscesses in children between developed and developing countries.

For instance, in the United States, the incidence is reported at approximately 25/100,000 children, whereas a 23-year study in Belgium (1996–2019) reported only 24 cases in children under 16 years old. In contrast, developing countries show significantly higher rates: India reports approximately 79/100,000 children, and Côte d'Ivoire reports up to 400/100,000 children [8,9]. Indonesia, as a developing country, lacks definitive epidemiological data; thus, this case report is noteworthy as it presents a pediatric patient with a rapidly progressive disease course at age 14.

A study on pediatric liver abscesses reported that 47% of 53 patients had underlying diseases, such as hepatobiliary disorders, hemato-oncologic conditions, or diabetes mellitus, all of which are known risk factors in the progression of the disease [10]. However, several articles have also identified abdominal trauma as a relevant risk factor, whether penetrating or blunt. Blunt trauma may lead to hematoma formation, predisposing the area to bacterial colonization and subsequent abscess development. Penetrating trauma, such as stab wounds, may allow direct bacterial entry into the hepatic parenchyma [8,10]. Hepatic necrosis and bile leakage following hepatic trauma can also promote bacterial growth. The right lobe of the liver is the most common site for abscesses, likely due to the blood flow pattern of the right portal vein, which continues from the main portal vein, whereas the left portal vein takes a more horizontal course [11]. In this case, the patient had no apparent underlying disease but had a history of blunt trauma to the right side of the abdomen, liver abscesses in segments VII and VIII, cholecystitis, and a history of alcohol consumption.

In general, the clinical manifestations of a liver abscess include right upper quadrant pain, fever, malaise, nausea, vomiting, dyspnea, and weight loss. Jaundice may occur, but is observed in only 8–21% of cases. Symptoms such as cough or pleuritic chest pain are common when the abscess involves liver segments VII or VIII [2,12]. This matches the presentation in our case, in which the patient experienced fever, shortness of breath, right upper abdominal pain, cough, and jaundice. Physical examination may reveal hepatomegaly and diminished breath sounds, particularly over the right hemithorax with associated rhonchi [2]. However, hepatomegaly is not always present in children; one study found it in only 9 of 24 pediatric liver abscess cases (37.5%) [9]. The differential diagnosis of this case is the presence of biliary obstruction, such as choledocholithiasis, cholelithiasis, or cholangitis.

Several laboratory and radiological examinations are essential for diagnosing liver abscess and identifying the causative pathogens. Laboratory findings may include anemia, leukocytosis, elevated bilirubin, alkaline phosphatase, and transaminase levels, prolonged prothrombin time, and hypoalbuminemia. These findings were mostly present in our patient, although prothrombin time was not assessed. Blood culture and abscess aspirate culture are essential for pathogen identification, and serological testing may be necessary in cases of suspected amebic liver abscess. In a study by Yeh *et al.* (2020), *Klebsiella pneumoniae* and *E. coli* were the most common pathogens in pediatric pyogenic liver

abscess. Another study from Belgium reported one case of fungal infection (*Gymnosoma clavatum*) among seven positive blood cultures [9]. Fungal liver abscess is rare. In this case, only sputum samples were examined. Gram staining showed gram-positive bacilli, while culture revealed the presence of yeast cells. This makes the case noteworthy, as both bacterial and fungal pathogens were identified.

The pharmacological treatment of liver abscess depends on the causative microorganism. For pyogenic liver abscess, different antibiotics may be selected based on the suspected pathogens. For gram-positive cocci and some sensitive gram-negative organisms, cephalosporins such as cefoperazone are effective. *Bacteroides fragilis* infections may be treated with clindamycin or chloramphenicol. Aminoglycosides may be used for resistant gram-negative bacteria. These antibiotics are often used in combination therapy [2]. Antifungal therapy includes amphotericin B, fluconazole, or flucytosine [13].

In addition to medical therapy, surgical drainage is an important intervention. Drainage methods include percutaneous or open surgical drainage. Percutaneous drainage is typically indicated for abscesses larger than 7 cm (due to rupture risk), superficial abscesses, or those without perforation signs. Open surgery is considered when conservative treatment and aspiration fail, or in cases of secondary septicemia due to amebic liver abscess. Laparoscopy is highly recommended to assess for possible intraperitoneal rupture [2]. If percutaneous drainage and antibiotics fail (particularly in cases with multiloculated abscesses, peritoneal rupture, or thick pus), an open laparotomy is required [11].

CONCLUSION

This case represents a rare primary risk factor of pediatric liver abscess in a developing country, a history of blunt abdominal trauma, which may have led to hematoma formation that predisposed the patient to bacterial colonization and abscess formation. Liver abscess can be a life-threatening condition, particularly when rupture occurs in the peritoneal or thoracic cavities.

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