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# Diagnosis of Empyema as a Complication of Liver Abscess in Peripheral Area

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**ABSTRACT**

Right pleural empyema is one of the rare complications in liver abscess. This condition is life-threatening as it causes breathing difficulties and requires immediate life-saving. This case report aims to diagnose and manage empyema in a male patient with a liver abscess in a limited diagnostic setting. Methods: According to medical records, a 44-year-old man came to the emergency room (ER) of Umbu Rara Meha General Hospital with complaints of shortness of breath that had been getting worse for two months, accompanied by a cough with phlegm for one week, fever, and weight loss. The patient also complained of pain in the right upper abdomen for the last four months. History of pulmonary tuberculosis, diabetes mellitus, or hypertension was denied. The patient is not a smoker. On physical examination, there was an increase in the frequency of breathing and a decrease in the vesicular sounds on the right side. Right thorax X-ray examination revealed massive right pleural effusion without pulmonary infiltrates. Abdominal ultrasound showed a liver abscess. Emergency pleural puncture was performed in the ER, and 1600 cc of purulent pleural fluid was removed, followed by Water Sealed Draignase (WSD) installation. The patient was given intravenous broad-spectrum antibiotics and treated for 12 days. **Conclusion:** Empyema can be a rare but life-threatening complication of liver abscess. Medical action must be taken immediately in the ER to save the patient. Delaying pus drainage can increase morbidity and mortality rates.

**KEYWORDS:** empyema, liver abscess, WSD

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## BACKGROUND

Pleural empyema, also known as Pyothorax or purulent pleurisy, is a condition with pus in the pleural space.1 According to Vianna, empyema is a pleural effusion with positive bacterial culture or leukocyte count greater than 15,000/mm$^3$ and protein level above 3.0 g/dL.[2] Empyema generally occurs after infection of the lung parenchyma, such as in cases of pulmonary tuberculosis, bronchiectasis, lung abscess, or pneumonia.2 Empyema can also be caused by trauma, surgery, malignancy, vascular disorders, immunodeficiency diseases, and infection in adjacent sites hematogenous or transdiaphragmatical, such as in the oropharynx, esophagus, mediastinum, or subdiaphragmatic tissues such as in cases of liver abscess.[2,3,12]

Liver abscess are classified into 2 groups based on the causative germ, namely amboebic liver abscess (ALA) and pyogenic liver abscess (PLA). In developing countries, 75% of liver abscesses are caused by PLA, but ALA is the most significant cause worldwide.[4] Entamoeba hystolitica is the cause of ALA, while Staphylococcus is the most common cause of PLA. PLA is usually a combination of aerobic and anaerobic bacterial infections.[4]

The spread of infection from hepatic abscess is most commonly through transdiaphragmatic, hematogenous, inhalation of E. histolytica, direct trauma, and 15% of these mechanisms are unknown.[4]

The incidence of liver abscess varies in several countries. In the United States, there are 32,000 cases of hepatic abscess per year, with morbidity and mortality rates of around 20%-30%. Despite aggressive management, mortality rates still range from 6% to 14%.[4] Male incidence is higher than female.[5] Age also affects the progression of

hepatic abscess, with 40-60 years of age having a worse prognosis.[6,7]

Epidemiologically, the incidence of empyema increases in children and adults.[12] Empyema in liver abscess has very high disease progression. Mortality rates range from 5 to 30 percent with incidence varying based on comorbid conditions. 20-30% of patients with empyema, antibiotics and chest tube drainage still fail to control infection. The mortality Rate will also increase to 40% in immunocompromised conditions. There is no exact data on empyema cases in Indonesia.[2]

Liver abscess is a potentially life-threatening condition, with overall mortality rates reaching up to 30%.[8] Pleural empyema is a rare severe complication of liver abscess.[6,8] Empyema is associated with increased morbidity and mortality. Immediate intervention is essential in the management of empyema.[6]

## METODOLOGY

A 44-year-old man came to the emergency room of Umbu Rara Meha Hospital with complaints of shortness of breath that had been getting worse for the last 2 months, accompanied by a cough with yellow phlegm for one week. Other complaints included right chest pain, fever and weight loss in the last 1 month. In the last 4 months, the patient often felt pain in the right upper abdomen. The patient is not a smoker. The patient has no previous history of diabetes, hypertension, and tuberculosis. The patient has received Ambroxol and Paracetamol, but the complaints have not improved.

On physical examination, vital signs found blood pressure 106/67 mmHg, pulse 108x/minutes, respiratory rate 32x/minutes, SpO2 79% on room air, temperature 37.7oC. Pulmonary examination revealed decreased chest motion and vesicular sounds on the right side. No additional breath sounds of rhonki and wheezing were found. There was tenderness in the right upper abdomen with a slightly enlarged palpable liver. Laboratory examination results of leukocytosis 22,950, elevated AST 104 IU/L and ALT 89 IU/L, albumin 3.2 g/dL and blood protein 6.5 g/dL and HIV negative. XPert Mtb/Rif result: MTb not detected.

Due to a lack of facilities, a CT scan and culture could not be done. A stool examination did not reveal an amoeba. The initial thorax X-ray in the ER showed a right massive pleural effusion with homogeneous opacity in the right hemithorax.

**Figure 1: Initial thorax X-ray in the ER, before pleura puncture. There was homogeneous opacity in the right hemitorax**

A pleural puncture was performed immediately in the ER. Pleural fluid of as much as 1600 ml purulent color was obtained. The analysis results of the pleural fluid are as follows:

**Table 1:**

| Examination | Results of Pleural Fluid Analysis |
|---|---|
| **Color** | Purulen |
| **Cell Count** | 69.998 cells/Ul |
| **Diff. coun** | MN 2%, PMN 98% |
| **Glukosa** | 42 mg/dL |
| **Total Protein** | 3,16 g/dL |
| **BTA** | Negatif |
| **Gram** | Bacteria -, Leukocytes +2, fungi negative, epithelium negative |

Abdominal ultrasound examination showed enlarged size hepar, obtuse angle, and a hypoechoic lesion with firm boundaries and irregular edges in the right lobe measuring 6x4 cm, which on CDUS appears to have vascular enhancement at the edges. There was also free fluid in the right pleural cavum. Conclusion of abdominal ultrasound: hepatic abscess and right pleural effusion. An abdominal CT scan was not performed on this patient due to limited hospital facilities.

Furthermore, this patient was placed on a WSD for 7 days, with a total amount of fluid released of 7,200 mL. The patient was also given broad-spectrum antibiotics cefriaxone combined with intravenous metronidazole for 12 days and followed by oral antibiotics at discharge. In this patient, only conservative measures were taken for the liver abscess because its size was not too large and the patient's clinical condition improved.

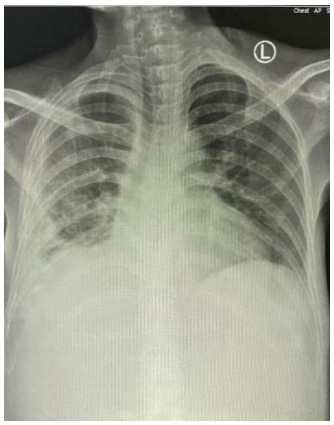

**Figure 2: Thorax X-ray results on day 6 after WSD insertion. Opacity in the right lung is reduced. There is improvement compared to the first thorax X-ray.**

The patient was outpatient at the hospital 1 week later, clinically the patient improved. Abdominal ultrasound was performed to evaluate the hepatic abscess, and it was found that the size of the abscess had decreased by 3x 2 cm. Metronidazole antibiotics were continued for up to 4 weeks.

## RESULT AND DISCUSSION

In this case, the diagnosis of empyema as a complication of liver abscess was based on history, physical examination and supporting examination. From the history, there were complaints of shortness of breath, heavy breathing, weight loss, fever, and upper right abdominal pain that had been felt since 4 months earlier. Physical examination revealed fever, increased respiratory frequency, right upper quadrant tenderness, and hepatomegaly. Laboratory examination revealed leukocytosis and elevated liver function tests. Pleural fluid analysis examination found purulent fluid, PMN dominant, leukocytes, high protein and low sugar. Thorax X-ray examination showed a massive right pleural effusion. Ultrasound results showed a liver abscess in the right lobe with a size of 6x4 cm.

Theoretically, fever, right upper abdominal pain and malaise are three typical symptoms of liver abscess, but fever is the most common.[9] Shortness of breath, heavy breathing, and chest pain are symptoms that appear when there are complications in the form of empyema.[6] Laboratory examination showed elevated leukocytes, AST, ALT, and CRP.7 Abdominal ultrasound was performed in all patients with suspected liver abscess with a sensitivity of 85%. CT scans have sensitivity close to 100% but are more expensive.[4] A hypoechoic picture with increased vascularity around it characterizes ultrasound of a liver abscess.[7,9]

Empyema is a rare complication in cases of liver abscess. The spread of infection from a liver abscess is most commonly through transdiaphragmatic, hematogenous, inhalation of E. histolytica, direct trauma, and 15% of these mechanisms are unknown.[4,6] The spread of infection through hepatopleural or transdiaphragmatic fistula can be seen on abdominal CT scan with contrast.[6] In this case, the fistula was challenging to find because only abdominal ultrasound was performed without abdominal CT scan due to limited diagnostic facilities.

The management in this patient was aimed at restoring normal respiration function and lung development function by administering oxygen, antibiotics and drainage of pus from the pleural cavum by installing a Water Sealed Draignase (WSD) and management for liver abscesses. Surgical action is performed if the drainage action fails. Surgical action can be open thoracotomy or using VATS.[2]

Antibiotic selection should be done according to the culture results of the liver abscess and empyema. Most aerobic bacteria that cause empyema are S. aureus and S. pneumoniae, while the most common anaerobic bacteria are Bacteroides sp.[12] In Asia, Klebsiella pneumonie is the most common pathogenic bacteria causing liver abscesses, followed by Streptococcus sp and E.Coli.[9] Some case reports have negative culture results.[8] Even if the culture results are negative, antibiotics should still be given. The culture of abscess fluid usually gives positive results compared to blood culture.[4] In this case, culture was not performed due to limited hospital facilities. Antibiotics should be given immediately to reduce the complications of septicemia and systemic complications.[11]

Recommended antibiotic regimens are third or fourth-generation cephalosforin intravenous ceftriaxone (2 grams daily) plus metronidazole (500 mg every 8 hours), or piperacillin and tazobactam (4. 5 grams every 6 hours) plus metronidazole, or intravenous ampicillin (2 grams IV every 6 hours) plus gentamicin (5-7 mg/kg/day) plus metronidazole, or intravenous carbapenem (imipenem-cilastatin or meropenem) plus metronidazole. If MRSA bacteria are suspected, vancomycin should be added to the regimen. Intravenous antibiotics are given for 2-3 weeks, followed by oral antibiotics for 4-8 weeks.[5,9] But in other journals, there is no specific guidance on how long antibiotics should be given.[4] Metronidazole must be given in combination to treat possible concurrent infections with amobiasis, where according to data, 80% of liver abscess infections are a combination of aerobic and anaerobic microorganism infections.[4] Culture of anaerobic bacteria is difficult to do. The results are usually negative.[6] In this case, empirical antibiotics Ceftriaxone plus metronidazole were given intravenous for 12 days followed by oral antibiotic for 4 weeks.

WSD is usually removed after less than 350 mL/day of pleural fluid production. Before removal, an evaluation thorax X-ray should be performed.[5] In this case, pleural fluid production was reduced on the 6th day with a total amount of fluid released of 7200 mL. On the seventh day, an evaluation thorax X-ray and laboratory examination were performed. There was improvement in the thorax X-ray (figure 2) and laboratory. There was no more empyema and leukocytes were within normal limits. Then the WSD was removed and the

patient was discharged on the 12th day of treatment in good condition; fever and shortness of breath disappeared.

Recommendations for managing liver abscess are broad-spectrum antibiotics and drainage of the abscess if the abscess is >5 cm.[4,9] Aspiration of the abscess can be done using ultrasound guiding.[9] In this case, liver abscess was not treated surgically because the patient's condition improved with the administration of antibiotics. Surgical intervention is the last resort. Surgery or drainage of the abscess is performed if the size of the abscess is more than 5 cm or if there are complications of peritonitis and abscess rupture.[9]

## CONCLUSION AND SUGGESTION

Pleural empyema is a rare complication of liver abscess but has a poor prognosis. Empyema should be suspected in patients with complaints of shortness of breath, decreased oxygen saturation, decreased chest movement and breath sounds on one side. Speed, accuracy of diagnosis and early management are critical to reduce mortality. We report a case of empyema complicated by liver abscess and its management in a limited setting. Pleural puncture, immediate WSD placement for pus drainage, and administration of broad-spectrum antibiotics reduced mortality in this patient.
If you have adequate facilities, establish the diagnosis of empyema on liver abscess can be done according to gold standards.

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