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Case Report

Antibiotic of choice in patients with pyogenic liver abscess

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ABSTRACT

Pyogenic liver abscess is a dangerous, life-threatening disease with a high mortality rate that requires accurate diagnosis and treatment. The most common symptoms are upper abdominal pain, hepatomegaly, high fever, nausea, and vomiting. A pyogenic liver abscess occurs due to infection from anaerobic bacteria to aerobic bacteria. In the United States, the reported annual incidence is 3.6 cases per 100,000 people, but in Taiwan, it is 17.6 per 100,000 people. Men dominate pyogenic liver abscess sufferers but currently it affects older people more, with the most cases aged 50 to 60 years. Empiric antibiotics should be initiated immediately upon suspicion of a pyogenic liver abscess tailored to kill all possible bacteria: Gram-negative cocci, gram-positive cocci, and anaerobes. Antibiotic regimens include amoxicillin-clavulanic acid, third-generation cephalosporins combined with aminoglycosides, or piperacillin/tazobactam. Fluoroquinolones or carbapenems may be used in cases of penicillin allergy or antibiotic resistance. In this case, The patient complained of fever since 1 week ago. Complaints accompanied by middle and right upper abdominal pain (VAS 2-3). On abdominal examination, the abdomen was enlarged in the upper right region, supple, bowel sounds 3x/minute, liver palpable 3 fingers below the right archus costae, abdominal tenderness in the upper right region (Vas 1-2) and no ascites or splenomegaly. On ultrasound examination and CT-Scan of the liver, the size appears enlarged and had a flat surface. Because of this phenomenon, researchers want to review information on administering antibiotics in patients with pyogenic liver abscess.

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INTRODUCTION

Liver abscess is a form of liver infection characterized by pus covered by fibrous tissue in the liver parenchyma. This condition is one of the life-threatening liver infections, especially if not treated properly. The three most common forms of liver abscess are pyogenic liver abscess (associated with bacterial infection), amebic (associated with protozoan infection of the Entamoeba species), and fungal (related to fungal infection) (Mahendra & Prasetyo, 2021) Pyogenic liver abscess is a dangerous, life-threatening disease with a high mortality rate that requires accurate diagnosis and treatment. The most common symptoms are upper abdominal pain, hepatomegaly, high fever, nausea, and vomiting. These symptoms vary depending on the abscess size, the patient's general condition, underlying disease, and complications (Annisya et al., 2020).

A pyogenic liver abscess occurs due to infection from anaerobic bacteria to aerobic bacteria. These bacteria include *Klebsiella pneumoniae*, Bacteriodes, microaerophilic and anaerobic Streptococci, Enterobacteriaceae, Fusobacterium, *Staphylococcus milleri*, aspergillus, *Eikenella corrodens*, *Proteus vulgaris*, *Staphylococcus aureus*, *Yersinia enterolitica*, *Salmonella typhi*, *Candida albicans*, brucella, *E. coli*, *Enterobacter aerogenes*, *Actinomyces*, and anaerobic bacterial species are the organisms most often found to cause pyogenic liver abscesses (Giangiuli et al., 2019). The pathophysiology of pyogenic liver abscesses can be divided by the route of infection but is most commonly through biliary infection (50 to 60%). The incidence of biliary tract infection leading to liver abscess has increased over the past century as the population ages and biliary tract disease becomes more common. Common causes of biliary abscess include malignant obstruction, bile duct puncture, choledocholithiasis, primary sclerosing cholangitis, Caroli disease, and (rarely) obstruction by parasites such as *Ascaris lumbricoides* (Roediger & Lisker-Melman, 2020).

Pyogenic liver abscess is a rare infectious disease, in the United States the reported annual incidence is 3.6 cases per 100,000 people. But in Taiwan it is 17.6 per 100,000 people. Men dominate pyogenic liver abscess sufferers but currently it affects older people more, with the most cases aged 50 to 60 years (Salim et al., 2023). Pyogenic liver abscesses can be treated conservatively with antibiotics alone, but abscesses larger than 5 cm - 10 cm must be accompanied by percutaneous needle aspiration (PNA) or larger than 10 cm using percutaneous catheter drainage (PCD) (He et al., 2020). The antibiotics that can be used are 3rd generation cephalosporin antibiotics combined with metronidazole. These two are the most common combination drugs for treating liver abscess patients (Parawira et al., 2019). Because of this phenomenon, researchers want to review information on administering antibiotics in patients with pyogenic liver abscesses.

CASE REPORT

The patient came to the emergency room at Cilandak Marine Hospital on April 2 with complaints of fever since 1 week ago. Fever appears to come and go, is felt to increase at night, and temperature ranges from 38°C. Fever increases slowly. Complaints accompanied by middle and right upper abdominal pain (VAS 2-3). Abdominal pain does not improve with bending forward. Enlarged stomach denied. Liquid defecation or difficult defecation denied. Changes in the consistency or color of bowel movements are denied. There was no nausea, vomiting, lack of appetite and weight loss. The patient had gone to the private practice of a midwife. It was said to be typhoid, so he

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was given antibiotics ciprofloxacin 2x500 mg; when he came to the hospital, he had been on antibiotics for the 4th day, but the complaints had not improved. The patient denied having previously experienced liver disease, hypertension, diabetes, and heart disease.

Physical examination showed that the patient's general condition appeared mildly ill, with vital signs: pulse 101x/minute; respiratory rate 19x/minute; temperature; 36.9 °C; blood pressure 100/60 mmHg; and oxygen saturation of 99%. In generalist status, the eye conjunctiva is found to be non-anemic, and the sclera anicteric. On examination the heart and lungs were found to be within normal limits. On abdominal examination, the abdomen was enlarged in the upper right region, supple, bowel sounds 3x/minute, liver palpable 3 fingers below the right archus costae, abdominal tenderness in the upper right region (VAS 1-2) and no ascites or splenomegaly.

In the patient's laboratory examination, it was found:

There were no abnormalities in the chest X-ray examination. On ultrasound examination of the liver, the size appears enlarged, the surface is flat, the texture of the parenchyma was homogeneous, rough, the capsule was not thickened. There was an inhomogeneous hypoechoic mass with internal echo in it, with relatively firm boundaries measuring 10 x 9.7 x 11.3 cm in the right liver lobe. On color Doppler examination, vascularization appears at the edges. The portal vein was not dilated, and the hepatic vein was not dilated. There was no visible fluid collection around it, suggesting hepatomegaly with liver abscess.

Table 1. Patient's laboratory examination result

Parameter	Result	Reference range	Unit
Hematology			
Hemoglobin	12.1	13.0 - 17.0	g/dL
Hematocrit	35	40.0 – 50.0	%
Eritrocyte	4.2	4.50 – 5.50	10^6/µL
Leukocyte	22.6	5 – 10	10^3/µL
Thrombocyte	186	150 - 400	10^3/µL
Differential Leukocyte Count			
Basophils	0	0 - 1	%
Eosinophils	2	2 – 4	%
Neutrophils Stab	1	3 – 5	%
Neutrophils Segmen	87	50 – 70	%
Lymphocyte	5	25 – 4	%
Monocyte	5	2 – 6	%
Blood Chemistry			

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Random Blood Glucose	120	<200	mg/dL
Total Bilirubin	6.54	0.3-1.2	mg/dL
Direct Bilirubin	4.29	<0.3	mg/dL
Indirect Bilirubin	2.25	<0.9	mg/dL
Ureum	54	20-50	mg/dL
Creatinin	1.24	0.8-11	mg/dL
Albumin	2.85	3.4-4.8	mg/dL
Globulin	2.87	2.6-3.4	mg/dL
Total Protein	5.56	6-8	g/dL
Triglycerides	187	<175	
Total Cholesterol	136	<200	
HDL	6	33-35	
LDL	93	<130	
SGOT	98	<50	
SGPT	139	<50	
Serology			
Widal	Negative	Negative	
Others Check			
CT	5	2-6	
BT	3	1-3	
PT	28.7	24-43	
APTT	15.2	10-11.5	

Figure 1. Chest X-ray result of the patient

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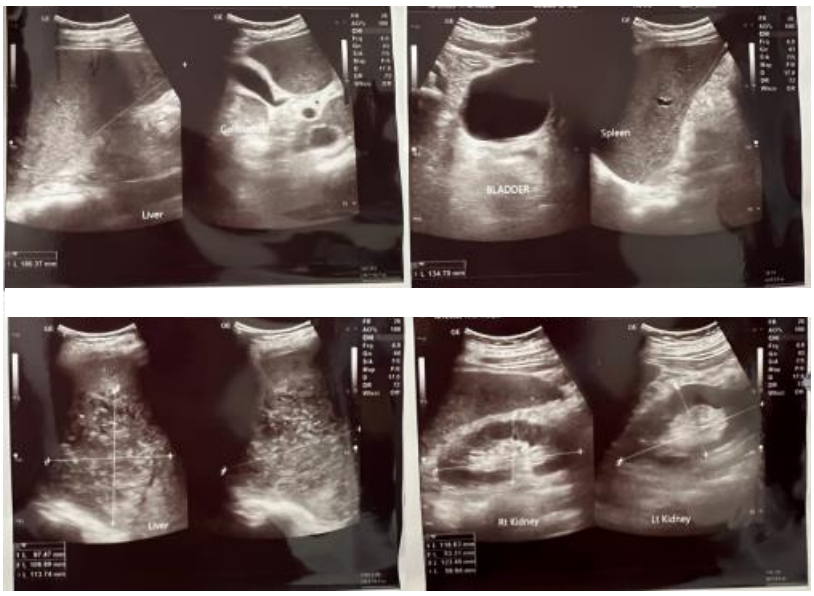

Figure 2. Ultrasonography result of the patient.

On the CT scan, it was found that the liver appeared enlarged and had a flat surface. The portal vein was not dilated. The hepatic veins were not dilated. The inferior vena cava was not dilated. The intrahepatic bile ducts were not dilated. There was a hypodense mass with irregular edges measuring 11.7 x 10.5 x 11.8 cm in segments 7 and 8 of the right lobe of the liver, which in the Arterial Phase: provided minimal enhancement at the edges, Venous Phase: provided minimal enhancement at the edges, wash out: did not provide enhancement. In the right posterior thorax, a hypodense lesion was seen, accompanied by consolidation with an air bronchogram. Hepatomegaly was accompanied by liver abscess in segments 7 and 8 of the right lobe, right pleural effusion in the lower posterior thorax accompanied by subsegmental atelectasis.

When a patient is diagnosed with a pyogenic liver abscess, the patient receives the following treatment: pro abscess drainage surgery (laparoscopy), intravenous fluid drip ringer lactate 20 drops per minute, injection lansoprazole 2x30 mg, injection ondansetron 3x4 mg, injection metronidazole 3x500 mg, injection meropenem 3x1 g, oral paracetamol 3x500 mg, drip paracetamol 1 g if temperature >38.5 °c.

On April 6, 1 day after abscess drainage, the patient complained of pain in the post-op wound and felt tight. The patient appeared moderately ill with vital signs: blood pressure 145/80 mmHg; pulse 82x/minute; RR 20x/minute; oxygen saturation 99% room air; temperature 36.8 °C. On general examination of the eyes, the sclera was icteric, the abdomen was found to be flat and supple, bowel sounds +, hepatomegaly 3 fingers below the archus costae. The patient receives the following treatment: intravenous fluid drip ringer lactate 28 drops per minute, injection lansoprazole 2x30 mg, injection ondansetron 3x4 mg, injection metronidazole 3x500 mg, injection meropenem 3x1 g, injection ketorolac 3x30 mg.

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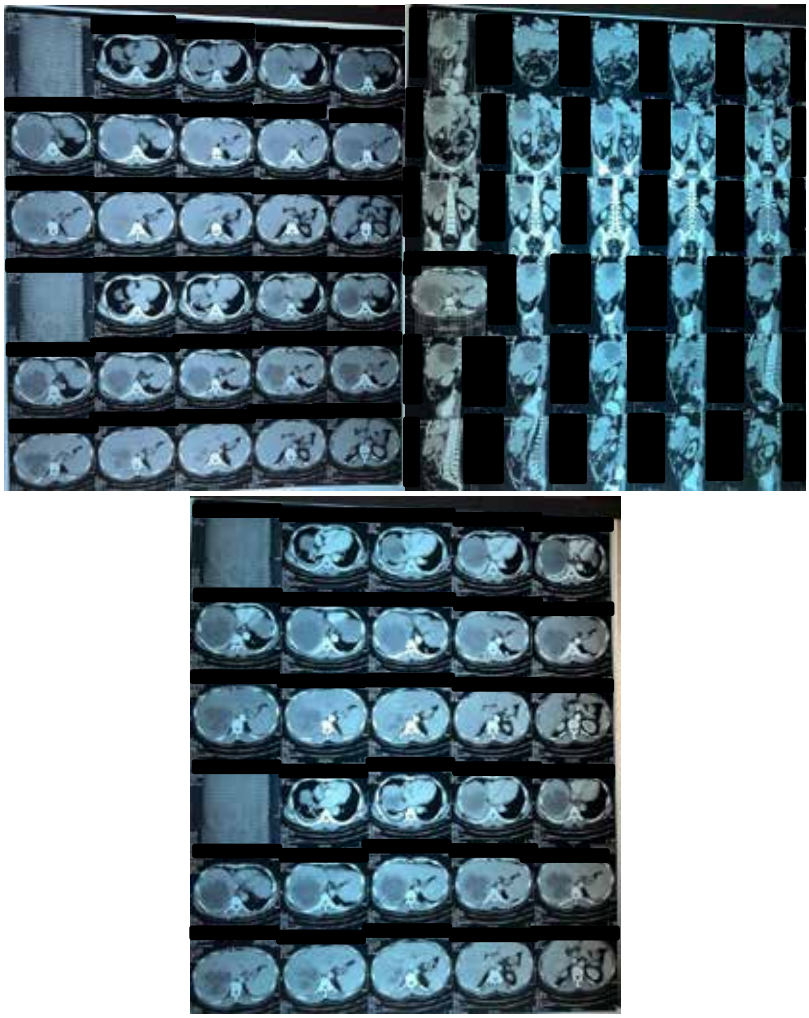

Figure 3. CT-Scan result of the patient.

The patient had no complaints on April 10, 5 days after abscess drainage. The patient appeared moderately ill with vital signs: blood pressure 110/70 mmHg; pulse 80x/minute; RR 20x/minute; oxygen saturation 99% room air; temperature 36.5 °C. On general examination of the eyes, the sclera was icteric, the abdomen was flat, supple, bowel sounds +, hepatomegaly 3 fingers below the archus costae. Patients receive the following outpatient treatment: aff drain, oral baquinor 2x500 mg, oral trichodazol 3x500 mg, oral vip albumin 3x1.

DISCUSSION

Liver abscess is a form of infection in the liver, which is characterized by the presence of pus covered by fibrous tissue in the liver parenchyma. This condition is a life-threatening liver infection, especially if not treated properly. The three most common forms of liver abscess are pyogenic liver abscess (related to bacterial infection), amebic (related to infection with the protozoan Entamoeba species), and fungal (related to fungal infection) (Mahendra & Prasetyo, 2021).

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Pyogenic liver abscess is a dangerous, life-threatening disease with a high mortality rate that requires accurate diagnosis and treatment. The most common symptoms are upper abdominal pain, hepatomegaly, high fever, nausea, and vomiting. These symptoms vary depending on the size of the abscess, the patient's general condition, the presence of underlying disease, and complications (Annisya et al., 2020). Patients usually present with complaints of fever and right upper quadrant pain. Fever, which sometimes leads to chills, and also weakness are symptoms that appear before other symptoms in 80-88% of sufferers. Pain in the right upper quadrant (RUQ) occurs in 33-70% of sufferers. Pain in RUQ is influenced by the size of the lesion from the abscess but usually occurs in abscesses larger than 5 cm. Patients who experience abscesses in segments VII or VIII may also experience pleuritic pain and coughing (Ali et al., 2018). In this case, the patient complained of fever 1 week ago. Fever appears to come and go, is felt to increase at night, and temperature ranges from 38^{o}C. Fever increases slowly. Complaints accompanied by middle and right upper abdominal pain (VAS 2-3). Abdominal pain does not improve with bending forward. The pain experienced by the patient may be due to an abscess in the liver that is larger than 5 cm. The symptoms experienced by the patient are in accordance with the discussion above.

On laboratory examination of the pyogenic liver abscess, you will find a complete blood count shift to the left, increased sedimentation rate, anemia, and impaired liver function (increased SGOT, SGPT, bilirubin, serum bilirubin, and alkaline phosphatase. The gold standard for diagnosis is to use culture (Ali et al., 2018). In this patient, the results of a shift to the left complete blood test were the same as the explanation above, which was followed by an increase in total bilirubin, direct bilirubin, indirect bilirubin, SGOT, and SGPT; this is in accordance with the explanation above.

On radiological examination, a pyogenic liver abscess will be found: pleural effusion, collapsed lung, and lifting of the right diaphragm. An abdominal photo examination will reveal hepatomegaly, obstructive ileus, free air above the liver, and an air-fluid level in the liver. On a CT scan, a microabscess can appear as a low-density mass with dull borders if the abscess is more than 10 mm in size. On examination using contrast, an image of a mass with increased edges, in the form of a thick capsule, will be formed. The middle part of the abscess appears hypodense, and many fine septa give a net-like impression (Ali et al., 2018; Mazza et al., 2017). In this patient, the patient's CT scan results showed that the liver appeared enlarged and had a flat surface. There was a hypodense mass with irregular edges measuring 11.7 x 10.5 x 11.8 cm, which in the Arterial Phase: provided minimal enhancement at the edges, Venous Phase: provided minimal enhancement at the edges. The mass is in segments 7 and 8 of the right lobe of the liver.

The current primary treatment is antibiotics combined with drainage and, if necessary, treatment of the underlying cause. Treatment is considered effective if the temperature, white blood cell count, and C-reactive protein levels return to normal and the pain disappears. Laboratory values and signs of inflammation should return to normal within a few days after starting antibiotics and drainage. Visual resolution of the abscess occurs later than clinical resolution. Follow-up photos are recommended. Ultrasound is the modality of choice for most surveillance imaging due to its sensitivity and lack of radiation. However, CT scans allow assessment of potential malignancy once the abscess has resolved (Lardière-Deguelte et al., 2015).

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Empiric antibiotics should be initiated as soon as a pyogenic liver abscess is suspected and after initial blood cultures. Antibiotics should be tailored to kill all possible bacteria: Gram-negative cocci, gram-positive cocci, and anaerobes. Empiric antibiotic regimens may include amoxicillin-clavulanic acid, a third-generation cephalosporin combined with an aminoglycoside, or piperacillin/tazobactam. In cases of penicillin allergy or antibiotic resistance, fluoroquinolones or carbapenems may be used. Metronidazole should be added if the selected antibiotic regimen does not provide an anaerobic bactericidal effect. Anaerobic bacteria are difficult to culture and therefore must be included in all treatment regimens. Antibiotic regimen limitations are based on culture and sensitivity data obtained from aspiration specimens (Waghmare et al., 2017). The duration of antibiotic use varies, with most recommending a 2 to 6-week course of treatment. The recommended antibiotic treatment is intravenous injection for approximately two weeks before switching to oral antibiotics during the treatment period.

In this patient who was first diagnosed, he was given therapy with meropenem (carbapenem) 3x1 g in combination with metronidazole 3x500 mg. Then 1 day after abscess drainage, the patient was given meropenem (carbapenem) therapy 3x1 g in combination with metronidazole 3x500 mg. and on 5 days after abscess drainage the patient was given therapy with baquinor (ciprofloxacin) 2x500 mg in combination with trichodazole (metronidazole) 3x500 mg. Therapy for these patients is in accordance with the regimen recommended by several existing studies, and this option was chosen to avoid if the patient is allergic to penicillin or cephalosporins.

According to research conducted by Khim et all (2019) and Meister et all (2022). The current primary treatment is antibiotics combined with drainage and, if necessary, treatment of the underlying cause. Treatment is considered effective if the temperature, white blood cell count, and C-reactive protein levels return to normal and the pain disappears. Laboratory values and signs of inflammation should return to normal within a few days after starting antibiotics and drainage. The antibiotics of choice that can be used are a combination of piperacillin/tazobactam, third-generation cephalosporins combined with aminoglycosides, amoxicillin-clavulanic acid, or fluoroquinolones or carbapenems may be used if the patient has antibiotic resistance or is allergic to penicillin class antibiotics. It can even reach a 70% success rate if accompanied by drainage (Khim et al., 2019; Meister et al., 2022).

Table 2. Antibiotics regimen for pyogenic liver abscess.

Antibiotics Regimen for Pyogenic Liver Abcess
• Amoxicillin-Clavulanic acid + Metronidazole • Cephalosporin generation 3 + Metronidazole • Piperacillin or Tazobaktam If the patient has an allergy to penicillin or cephalosporin can be given • Fluoquinolone + Metronidazole ± Aminoglycoside • Carbapenem +Metronidazole

Source: Akhondi & Sabih, 2019.

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CONCLUSION

Pyogenic liver abscess is a dangerous, life-threatening disease with a high mortality rate that requires accurate diagnosis and treatment. Empiric antibiotics should be initiated immediately upon suspicion of a pyogenic liver abscess tailored to kill all possible bacteria: Gram-negative cocci, gram-positive cocci, and anaerobes. Antibiotic regimens include amoxicillin-clavulanic acid, third-generation cephalosporins combined with aminoglycosides, or piperacillin/tazobactam. Fluoroquinolones or carbapenems may be used in cases of penicillin allergy or antibiotic resistance.

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