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Minimally Invasive Approach In The Treatment Of Lung Abscess: A Case Report

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ABSTRACT

Background : Lung abscess is characterized by a localized collection of pus or necrotic tissue in the lung parenchyma, which develops into a cavity. Early diagnosis and appropriate management are essential to prevent further complications. Minimally invasive procedures can be performed on lesions larger than 6cm in diameter. **Case Report :** A 63-year-old man came with a chief complaint of progressive shortness of breath and coughing up blood. The cough had been present for 1 month, accompanied by night sweats, and weight loss. The patient's general condition appeared thin. Physical examination showed decreased fremitus and dull percussion in the left hemithorax. Laboratory results showed leukocytosis with increased neutrophils. Chest radiography showed *air-fluid level* in the inferior zone and the left parahilar cavity with infiltration suggest a suspected lung abscess. Based on the findings obtained, the patient underwent percutaneous drainage guided by ultrasound (*U S -guided drainage)* using a 14-gauge *abbocath needle* as a therapeutic procedure. The procedure was performed twice, evacuating 400 cc and 250 cc of purulent fluid. Thoracic radiology evaluation showed resolution of the lung abscess, along with significant clinical improvement in the patient. The patient received metronidazole antibiotic therapy combined with ceftriaxone. The patient underwent treatment for 5 days, before finally being allowed to go home. **Discussion:** In cases of lung abscess, if conservative therapy using antibiotics does not provide adequate improvement, then invasive intervention such as open surgical procedures is needed. Minimally invasive approaches such as ultrasound-guided percutaneous drainage are an alternative option in areas with limited resources and no *computed tomography* (CT) facilities. This approach is considered to provide shorter hospitalization and faster recovery. In this case, the percutaneous drainage procedure in cases of lung abscess showed good clinical improvement in the patient. **Conclusion:** Lung abscess is a serious condition that requires rapid diagnosis and intervention. Ultrasonography-guided percutaneous drainage has been shown to be effective as a therapeutic modality in treating lung abscess . Operator reliability in operating ultrasonography can reduce the risk of complications that may occur.

Keywords: Lung abscess, US-guided drainage

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INTRODUCTION

Advances in imaging modalities, particularly computed tomography (CT) and magnetic resonance imaging (MRI), have significantly improved the ability to detect and characterize lesions in the lung parenchyma such as tumors, cysts, and inflammatory processes. These imaging techniques provide detailed anatomical information and can help assess the extent of the lesion, its relationship to surrounding structures, potential for invasion, and distinguish between benign and malignant lesions in tumors. Hospitals that do not yet have these facilities can rely on deep *X-ray* and ultrasonography imaging as diagnostic and therapeutic procedures for patients with lung abscess.

Lung abscess is characterized by a collection of pus or necrotic tissue localized in the lung parenchyma, which develops into a cavity. The most common etiology of primary lung abscess is due to anaerobic bacteria, while nonspecific etiology of lung abscess is due to gram-negative, gram-positive and microaerophilic *streptococcus bacteria.* The incidence of lung abscess in the era before antibiotics was discovered was very high, and was comparable to the mortality rate that occurred. Although the incidence of lung abscess has decreased in this antibiotic era, lung abscess is still a source of morbidity and mortality that must be treated immediately and appropriately (Sperling, 2024).

The clinical manifestations of lung abscess are similar to other lung infections, namely cough, purulent sputum production, pleuritic chest pain, fever, and hemoptysis. In anaerobic infections, clinical symptoms can worsen over a long period of time or even be asymptomatic, while infections caused by aerobic germs are usually more acute. The history of the disease must be reviewed such as when the symptoms began, risk factors, predisposing factors, comorbidities, and previous lung infections. The gold standard for diagnosing lung abscess is using CT examination in determining the right choice of therapy for patients.

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Standardized conservative management of lung abscess uses antibiotic therapy, with a success rate of 95%. Antibiotic therapy is the first line of conservative management. Invasive therapy can be an option if the patient does not respond to antibiotics or the abscess is larger than 6 cm in diameter. Health facilities that do not have CT facilities can use ultrasound as a guide for percutaneous abscess drainage. We report a case of lung abscess in a type D hospital that does not have CT facilities performing percutaneous drainage using *ultrasound-guided.*

CASE REPORT

A 63-year-old man came with a chief complaint of progressive shortness of breath and coughing up blood since 4 days before admission to the hospital. Complaints of coughing up phlegm often recurred since 1 month. Complaints of fever, night sweats and weight loss were denied. There was no history of previous lung disease, family history of suffering from similar complaints was denied. The patient works as a farmer, the patient does not smoke and drink alcohol.

The patient's general condition appeared thin, blood pressure 110/70 mmHg, pulse rate 110x/minute, respiratory rate 30x/minute, oxygen saturation 98% and axillary body temperature 37 ° C. Physical examination showed decreased fremitus and dull percussion in the left hemithorax. Laboratory results showed leukocytosis with increased neutrophils. Chest radiography showed *air-fluid level* in the inferior zone and the left parahilar cavity with infiltration suggest a suspected lung abscess. Thoracic ultrasonography was performed In patients for diagnostic procedures, an irregular round cavity was obtained with irregular hypoechoic and hyperechoic lesion edges. In the central area, an anechoic image was seen with a size of 5.4 x 6.4 cm.

Based on the findings obtained, the patient underwent an ultrasound-guided percutaneous drainage procedure (US - guided). drainage *)* to mark and determine the location of catheter installation, followed by aseptic action and local anesthesia using lidocaine before aspiration and thoracentesis using a 14 G needle. Then a 14F

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trocar was installed and the abscess was removed, after which 5-15 ml of normal saline fluid was given to clean until the purulent fluid turned clear. The procedure was performed twice, evacuating 400 cc and 250 cc of purulent fluid. The results of the abscess fluid culture showed a *streptococcus pseudoporcinus bacterial infection* that was still sensitive to cephalosporin antibiotics, so that antibiotic therapy with ceftriaxone and metronidazole continued. Thoracic radiology evaluation showed resolution of the lung abscess, along with significant clinical improvement in the patient . The patient underwent treatment for 5 days, before finally being allowed to go home.



Figure 1. Chest *X-ray* before US-guided drainage procedure



Figure 2. Chest *X-ray* 2 days after *US-guided drainage procedure*

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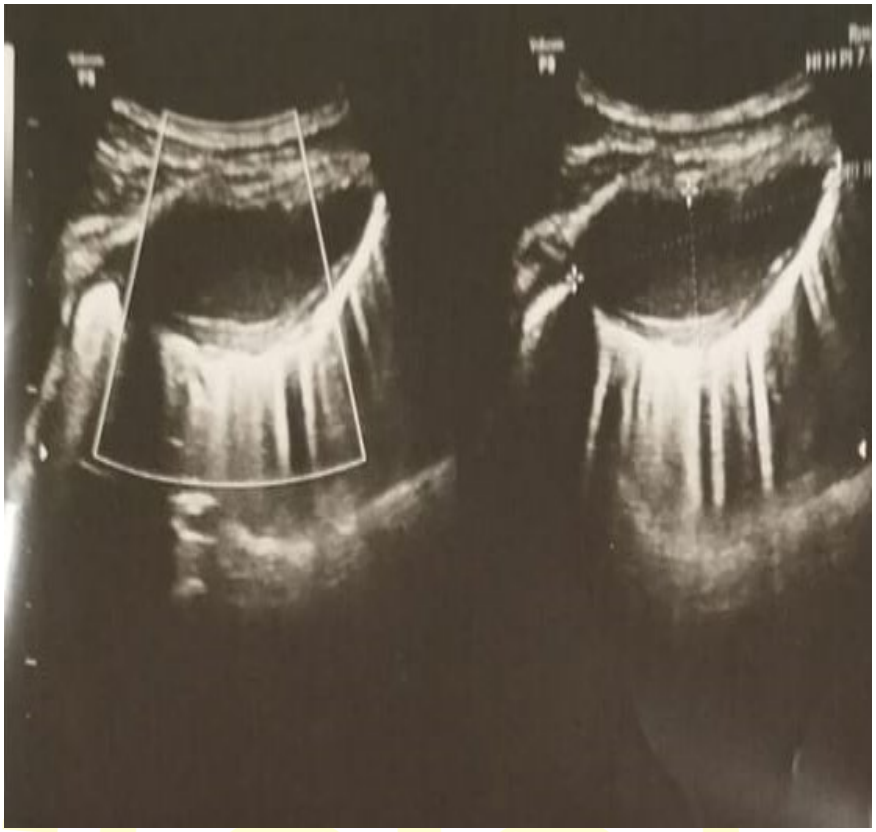


Figure 3. Thoracic USG shows an abscess in the left lung.

DISCUSSION

Clinical symptoms that appear in this case are coughing up phlegm, fever and weakness, this is in accordance with research (sperling, 2024) the most common symptoms of lung abscess are productive cough as much as 79%, fever 57% and weakness 61%, with incidence in men more than women. Symptoms can last one to two weeks. If symptoms have been more than 2 weeks, the symptoms get worse. If the infection spreads to the pleura, the patient will feel symptoms of pleuritic chest pain. Infection of the blood vessels in the bronchi will cause symptoms of coughing up blood or hemoptysis.

The mechanism of lung abscess begins with the entry of oropharyngeal secretions or germ droplets into the lower respiratory tract. Poor body defense mechanisms against pathogens are the initial gateway for the entry of agents that

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cause lung abscesses. Lipoproteins of the causative pathogen will stimulate inflammatory mediators such as chemokines and cytokines to stimulate neutrophils and monocytes to enter the site of infection, causing increased levels of tissue factor (FJ) and plasminogen activator inhibitor (PAI-1). This process will activate coagulation, inhibit fibrinolysis so that fibrin deposits occur and cavities or cavities form in the lung parenchyma. Cavity formation usually takes about 1-2 weeks. Lung abscesses then form after the inflammatory process with the production of necrotic tissue that fills the lung parenchymal cavity. In this case, the patient had complained of a long cough for 1 month. (Audina, 2024)

Radiological examination is a supporting examination that plays a very important role in the diagnosis of lung abscess. CT examination is still *the gold standard* for establishing the diagnosis of lesions in the lungs. Differential diagnosis that can be distinguished from lung abscess with other diseases that have similar morphology to lung abscess on chest radiography, CT plays an important role in determining the differential diagnosis and can distinguish between air, fluid, abscess or tumor mass in the lung parenchyma. In addition, CT can provide important additional information such as location, lesion size, outer boundaries, wall thickness, and contents of the lesion cavity that are not visible on chest radiography. However, in hospitals that do not have these facilities, chest radiography and ultrasonography are often used to establish the diagnosis of lung abscess (Isus, 2021).

Management of lung abscess is divided into 2 options, pharmacological therapy and non-pharmacological therapy. The main choice of lung abscess therapy is the administration of antibiotics, as many as 95% of patients respond to antimicrobial treatment. The main antibiotic therapy of choice is clindamycin, which has been shown to be superior to the penicillin group. Administration of Metronidazole antibiotics should be combined with other antibiotics such as ceftriaxone, because metronidazole only covers anaerobic organisms without affecting microaerophilic streptococcus organisms which are often the cause of primary lung abscesses. According to (Hadid, 2023) As many as 37% of abscesses

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still require invasive procedures or surgical management, although conservative medical management using systemic antibiotics is improving.

Clinical symptoms usually begin to improve within the first 4 days after antibiotic administration. If the patient does not show clinical or radiological improvement during the first 7-14 days after starting antibiotic therapy, an invasive procedure needs to be considered for drainage. A minimally invasive approach is an option if the abscess lesion is more than 6 cm in diameter. *US-guided drainage* is very helpful in minimally invasive techniques in the thoracic region. with results comparable to CT, but with shorter procedure times and fewer complications. (Chiang, 2023) reported that the length *of stay* (LOS) in the hospital in patients who underwent percutaneous drainage had a shorter duration of stay in the hospital compared to patients who underwent conservative treatment using antibiotics. In this case, the patient only received treatment for 5 days and there was already improvement both clinically and radiologically.

Research conducted by (Hadid, 2024) shows that percutaneous drainage is a safe procedure compared to surgical procedures. Significant abscess resolution is also an advantage of percutaneous drainage procedures. Patients who receive percutaneous drainage procedures also experience rapid improvement in their condition compared to surgical or conservative procedures. Research reports on the comparison of complications of percutaneous drainage procedures with endoscopic drainage procedures, percutaneous drainage procedures have complications of 19% can occur pneumothorax, hemothorax and bronchopleural fistula. *US-guided procedures Drainage* is highly dependent on the operator's skill in identifying the type of lesion, location, and complications during the drainage procedure. The condition of patients with obesity and pulmonary edema complicates the *US-guided drainage procedure* (Fantin, 2024).

CONCLUSION

A minimally invasive approach with US-guided can be an option for lung abscess management in limited health facilities. Abscess lesions with a diameter of

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more than 6 cm or lesions that do not improve with antibiotic administration are indications for percutaneous drainage. This procedure has a good level of effectiveness in increasing abscess resolution and shortening the duration of hospitalization. The reliability of the operator in operating ultrasonography can reduce the risk of complications that may occur.

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