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Shortterm Outcome Air Plombage Thoracoplasty of Empyema Thoracis at Pulmonary Tuberculosis

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Abstract
Pulmonary tuberculosis (pulmonary TB) is a type of infectious disease caused by the bacterium Mycobacterium tuberculosis. A male patient aged 40 years, came to the hospital with complaints of shortness of breath, severe shortness of breath for 1 week before coming to the hospital, the patient had a history of having WSD installed, on palpation the left vocal fremitus was stronger than the right, percussion was found to be dim in the basal area. lung, hyperresonance in the medial-apex area pulmo dextra and sonor on pulmo sinistra, decreased vesicular auscultation in the right lung, chest X-ray found pleural effusion. The patient was treated with air surge therapy. After surgery and evaluated for 4 days in the hospital and repeated follow-up on patients where the results of the examination did not find recurrent effusions.

Keyword: Tuberculosis; Thorax; Empyema;

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Introduction

Pulmonary tuberculosis (pulmonary TB) is a type of infectious disease caused by the bacterium Mycobacterium tuberculosis. this disease is one of the diseases that can be treated, pulmonary TB still remains a major global health problem (Bostock et al., 2018)

Pulmonary TB is one of the top 10 causes of death in the world. According to the Global TB Report, around 10 million people with pulmonary TB were found in 2019 every year in the world, of which 90% were found in adults, namely 5.4 million men and 3.2 million women (van Roozendaal et al., 2018). Indonesia is one of the countries that has the largest burden of pulmonary TB among 5 countries in Asia, namely India, Indonesia, China, the Philippines and Pakistan (Madhi et al., 2019)

One effective way to reduce the number of patients with pulmonary TB is to increase patient compliance with treatment. Complications that arise include coughing up blood, pneumothorax, lung damage, and pleural effusion. The clinical presentation of this tuberculous pleural effusion can be mild, moderate, or severe. Pleural effusion secondary to infection may develop into an empyema. In one study, the incidence of pleural effusion, an early stage of empyema due to tuberculosis infection, was approximately 31% (Liese et al., 2019)

In India, the documented incidence of empyema due to tuberculosis was 38.7%, compared with 61.3% for non-tuberculous empyema. According to the etiology, 68.9% of empyema caused by a specific infectious process occurred, and only 19.6% of non-specific infections occurred. Empyema can form a fistula that connects the pleural cavity with the bronchi, which is called a bronchopleural fistula (Makdisi & Makdisi, 2018)

4% of thoracic empyemas present as foreskin empyema. Of all cases of empyema, 86.7% worsened after surgical treatment, 10% improved with peeling, and 3.3% improved with fistula closure surgery (Feller-Kopman & Light, 2018)

Thoracoplasty surgery has also been further developed especially as a technique to achieve cure of TB with empyema. This thoracoplasty is performed primarily as a solution for chronic empyema (Yang et al., 2017)

Case Report

Male patient aged 40 years, came to the hospital on February 22, 2022 with complaints of shortness of breath, severe shortness of breath for 1 week before coming to the hospital, the patient had been feeling short of breath since 2 months ago. tightness does not sound wheezing, and is not affected by weather, dust, activity and food. Complaints of shortness of breath are not influenced by activity, and the patient's position during sleep. Previously, the patient had complaints of cough, greenish-yellow phlegm since 2 months ago, right chest pain, fever, night sweats, decreased appetite, weight loss of 10 kg in the last 2 months.

The patient has a history of having WSD installed in December 2021 for 10 days because the complaints experienced are the same as now. The results obtained were a thick greenish white liquid of about 500 ml on the first day of WSD installation. The patient had previously been diagnosed with pulmonary TB based on the results of the

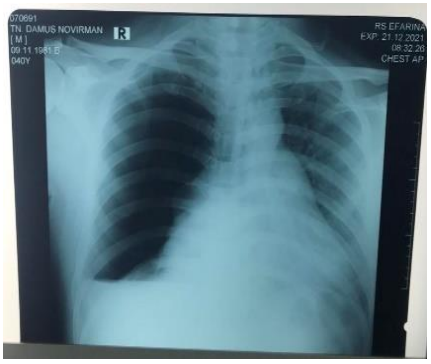
sputum examination, the patient received treatment for pulmonary TB in December 2021. However, the patient only took anti-tuberculosis drugs for 3 days, and the treatment was stopped by the patient because the patient said that while taking anti-tuberculosis drugs the body looks yellow and the joints are painful. Past history of uncontrolled diabetes mellitus. The patient also has a habit of smoking 3 packs per day, with a job as a security for a plantation company.

Physical examination of the patient on February 22, 2022 General complaints appear to be moderately ill, with awareness of Compos Mentis, Blood pressure 140/80 mmHg, Pulse 80 x/i, Breathing 25 x/i, SpO_2 99% with room air, TB 165 cm, BB 69 Kg, BMI 25.3% (overweight). The head is within normal limits, the eyes are anemic conjunctiva, the sclera is not icteric, the teeth are not found with dental caries. Examination of the neck JVP 5-2 cmH2O, the trachea is located in the middle, enlarged lymph nodes (-). Physical examination of the BJ I-II regular heart, murmurs and gallops were absent. Examination of the thoracic region, inspection in static conditions looks symmetrical, dynamic state is asymmetrical, palpation found vocal fremitus left stronger than right, percussion was found to be dim at lung bases, hyperresonance in the medial-apex area of pulmo dextra and sonor on left pulmo, vesicular auscultation decreased in the right lung, crackles (-) and wheezing (-). Abdomen is supple and epigastric tenderness (-), liver and spleen are not palpable, extremities are not palpable, edematous and not cyanotic, acral warm.

Laboratory examination on February 08, 2022, where Hb 9.9 g/dl, leukocytes 6.66 g/dl, hematocrit 30.2%, platelets 343,000, MCV 86.8fL, MCH 2.4%, MCHC 32.8%, D-Dimer 3.34, CRP 90.1, urea 19, GDS 103, Cr 0.8, albumin 2.6. Laboratory examination on February 14, 2022, where Hb 11 g/dl, leukocytes 6.2 g/dl, hematocrit 34.7%, platelets 454,000, MCV 85.9fL, MCH 27.2%, MCHC 31.7%, D-Dimer 2.15, GDS 86, Ur 36, Cr 0.8, albumin 2.7. Laboratory examination on February 08, 2022, where Hb 10.4 g/dl, leukocytes 10 g/dl, hematocrit 31.6%, thrombosis 412,000, MCV 85.4fL, MCH 28.1%, MCHC 32.9%, CRP 47.6, GDS 159, Ur 11, Cr 11, albumin 3.

Examination on December 22, 2021, showed the impression of a right pleural effusion. Chest X-ray examination December 21, 2021 (Figure 2) showed a right pleural effusion

Figure 2.
Chest X-ray December 21, 2021



Results of previous chest X-rays at different hospitals on February 03 2022 and February 05 2022 which showed Pleural Effusion

Figure 3.
Thorax photo February 03, 2022

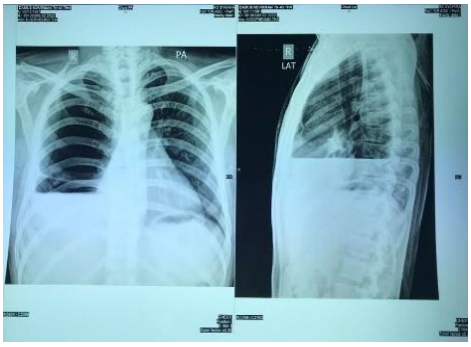
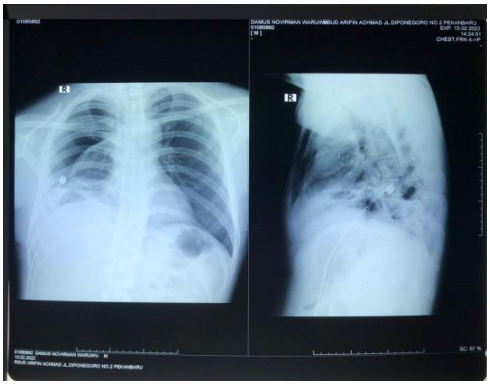


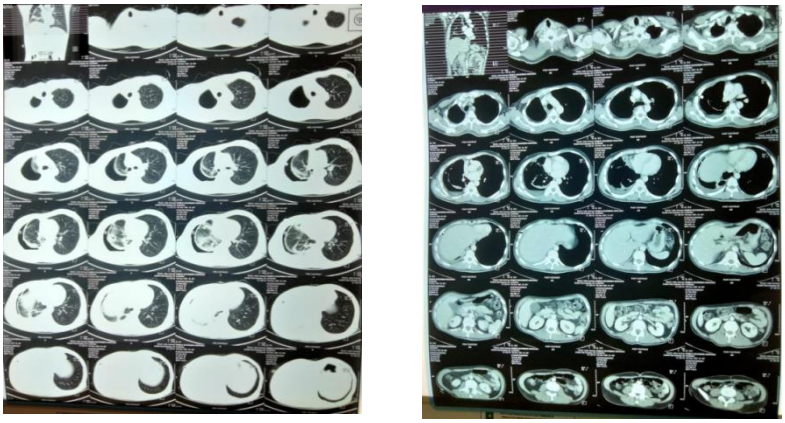
Figure 4.
Thorax photo dated February 07, 2022



Analysis of pleural fluid on February 8, 2022 was found macroscopically with a volume of 65 ml, cloudy and green in color. Microscopically, the number of cells was 96.938/mL, PMN cells were 88%, MN cells were 12%. Chemical analysis of pleural protein >5.6 g/dl, glucose 9 g/dl, LDH >13,500, positive rival. Exudate Effect. Microbiological examination dated 08/02/2022 BTA sputum I-II was negative, Genexpert sputum found MTB detected medium, and rifampin not resistant. The results of pleural fluid culture on February 8, 2022 found *Staphylococcus hominis spp,*cefoxitin screen (+), the impression of normal flora. Pleural fluid cytology February 08 2022 did not find malignant tumor cells, pleura suppurativa which supports a specific process of tuberculosis.

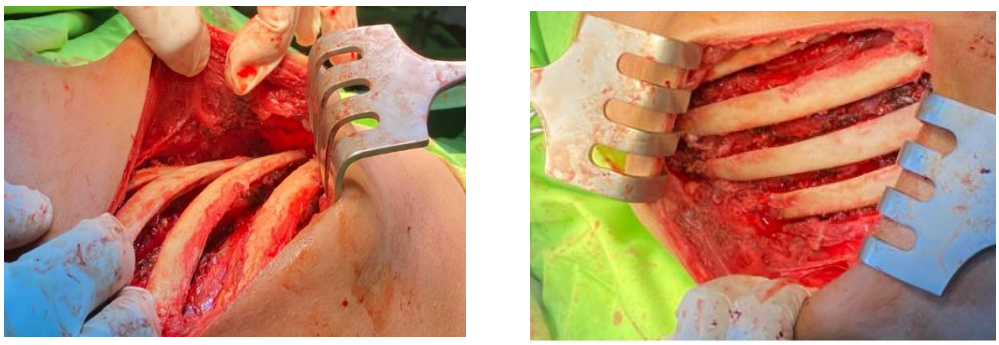
The following is a chest CT scan with contrast on February 23, 2022 which shows a right hydropneumothorax with thick right visceral pleura with a suspected long specific process.

Figure 5.
Thorax CT scan with contrast on February 23, 2022.



In this case, the surgical treatment chosen was thoracoplasty (air plombage), in which the 3,4,5,6 and 7 intercostal muscles were lowered into the visceral pleura. This patient cannot be treated for muscle congestion because this patient does not have sufficient muscle mass in the 3,4,5,6 and 7 intercostal muscles so that the distance between the latissimus dorsi muscle and the intercostalis muscle is filled with free air, which serves to fill the space between the visceral pleura and the intercostal pleura. lungs. Where the patient's BMI index is 17.5 (Underweight).

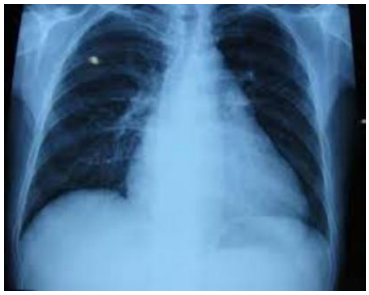
Figure 6.
Operative Airplombage Therapy



Outcome assessment indicators in patients were assessed from ventilator time, surgical wound, length of stay and recurrence of effusion. In patients the value of the ventilator time for 6 hours where the patient was intubated during surgery and after surgery using 6 L/i oxygen, signs of surgical wound infection were not found, and in patients treated after surgery for 4 days, drug therapy was given. for patients at home, given metronidazole 3x500 mg, paracetamol 3x500 mg, the patient was consulted to a pulmonary specialist to be given an Anti-Tuberculosis Drug regimen and after the patient went home and was followed up to the cardiovascular thoracic surgery poly where the patient was examined for vital signs, namely blood pressure 120/70 mmHg, pulse 87x/i, respiratory rate 21x/i, physical examination was carried out by percussion of the thoracic region with sonor voice, stem fremitus was within normal limits, so the results of this

patient's evaluation did not find any signs of effusion again and an examination was performed. Chest X-ray was found within normal limits. From the outcome of the operation, air plombage therapy in these patients with recurrent thoracic empyema was said to be successful.

Figure 7.
Photo of Thorax Re-Found No Signs of Effusion Returning



Case Discussion

Thoracic empyema is a condition where there is fluid in the pleural cavity in the form of pus, thick, and purulent (Ohara et al., 2018). Pleural effusion occurs because the balance between the production and expenditure of pleural fluid is disturbed (Kelly et al., 2018)

The clinical course of parapneumonic effusion is divided into two major parts, namely based on infection by aerobic bacteria or anaerobic bacteria. Patients with aerobic bacterial infection have the same clinical symptoms as pneumonia due to aerobic bacteria without effusion (Semenkovich et al., 2018). Initial clinical manifestations are acute fever with chest pain, increased sputum production and leukocytosis. While the anaerobic bacterial infection will show subacute clinical symptoms (Touray et al., 2018). Clinical symptoms will begin to be felt after >7 days since the first time you get symptoms such as unproductive cough, subfebrile fever, bad breath, leukocytosis and anemia (Höfken et al., 2018)

In this case the patient complained of shortness of breath, severe shortness of breath for 1 week Before coming to the hospital, the patient had been feeling short of breath since 2 months ago (Moffett et al., 2011). Previously, the patient had complaints of cough, greenish-yellow phlegm since 2 months ago, right chest pain, fever, night sweats, decreased appetite, weight loss of 10 kg in the last 2 months (Davies et al., 2010). This patient had clinical symptoms of previously clinically confirmed pulmonary TB and now has complications of empyema. Microbiological examination dated 08/02/2022 Genexpert sputum found MTB detected medium (Menzies et al., 2011)

The etiology of empyema occurs due to specific infectious processes and nonspecific infections. The patient's microbiological findings revealed tuberculous empyema, one of the complications of pulmonary tuberculosis. Several factors can cause a pleural effusion (Colice et al., 2000). Factors that contribute to pleural effusion include increased hydrostatic pressure, decreased intrapleural pressure, and increased pleural permeability. Fluid in the pleural cavity has two properties, exudate and exudate

(Vaudaux & Waldvogel, 1980). The two characteristics have different pathogenesis, namely pleural effusion due to differences in intrapleural pressure and pleural effusion due to increased pleural permeability (Ampofo & Byington, 2007)

In this case, pleural fluid analysis on February 8, 2022 was found macroscopically with a volume of 65 ml, cloudy and colored green. Microscopically, the number of cells was 96.938/mL, PMN cells were 88%, MN cells were 12%. Chemical analysis of pleural protein >5.6 g/dl, glucose 9 g/dl, LDH >13,500, positive rival. Exudate Effect. According to Haffner et al., exudate has several criteria, including: protein content > 3 g/L; pH > 7.30; glucose < 60 mg/dL (Rahman et al., 2011). Under normal pleural conditions, glucose diffuses freely in the pleura. Pleural fluid glucose values are proportional to serum glucose. Increased consumption of glucose in empyema fluid in infectious diseases with increased metabolic activity. In examining the number of cells in this case where PMN cells are dominant, this indicates an acute process (Porcel, 2018)

In this case, he has a history of previous disease, namely uncontrolled diabetes mellitus. Chronic hyperglycemic state caused by diabetes can cause impaired lung function through glycosylation and glycosylation mechanisms of amino acids and fats. Hyperglycemia interferes with autophagy to kill microbes (polymorphs and monocytes) in white blood cells. Disruption of this intracellular process occurs due to activation of the polyol pathway. The criteria for insulin-dependent diabetes are immune system disorders, such as complement deficiency, and T helper lymphopenia also plays a role. Hyperglycemia interferes with various functions of neutrophils and monocytes (macrophages), thereby interfering with the process of phagocytosis and intracellular microorganisms (Redden et al., 2017). It causes immune deficiency, interferes with cell-mediated immune activity, and has the greatest impact on PMN, monocyte, and lymphocyte abnormalities. The state of hyperglycemia disrupts the phagocytic system of macrophages, causing specific and nonspecific infectious processes. The metabolic effect of infection is a factor in high blood sugar levels due to the gluconeogenesis process (Bandaru et al., 2018)

In this case, physical examination and radiological examination showed that there was an effusion in the pleural cavity, and pleural effusion analysis showed a characteristic exudate impression, and cloudy and green effusion in the pleural space. under the microscope (Balfour-Lynn et al., 2005). Thoracic ultrasound examination revealed the presence of pleural fluid. In this case patients often experience recurrence so that surgery is needed. Surgery is performed if antibiotic therapy and drainage fail (Shen et al., 2017)

Clinical manifestations of fever, chest pain and tightness will occur if there is a lot of effusion fluid. Persistent fever after diagnosis of pneumonia should be suspected of an empyema. Examination of pH and biochemical markers is an additional check to determine the diagnosis and prognosis. Lights classifies pleural fluid as exudative or exudative according to their characteristics: pleural fluid/serum protein > 0.5, pleural fluid LDH/serum LDH > 0.6, pleural fluid LDH more than 200 IU or serum within 2/3 of the upper limit of normal (7) According to the criteria of Heffner et al., several parameters

of pleural fluid analysis as a standard exudate include: protein content > 3 g/L; pH > 7.30; glucose < 60 mg/dL (Shen et al., 2017)

Under normal pleural conditions, glucose diffuses freely in the pleura. Pleural fluid glucose values are proportional to serum glucose. Consumption of glucose in empyema fluid increases in infectious conditions with increased metabolic activity. In this case, a low pleural fluid glucose value (32 mg/dL) is one of the hallmarks of fluid exudate caused by an infectious process. The parameter of pleural effusion analysis was the predominant PMN leukocyte count, which indicated the presence of an acute process. Nonspecific process infections had higher leukocyte, granulocyte and CRP values (Vaudaux & Waldvogel, 1980). Adenosine deaminase (ADA) is one of the biomarkers to determine the etiology of pleural effusion. ADA is an enzyme involved in purine metabolism, which catalyzes the conversion of adenosine to inosine and deoxyadenosine to dideoxyinosine. This enzyme plays an important role in the differentiation of lymphoid cells. Several etiologies of ADA values in pleural effusion (Rahman et al., 2011)

Posteroanterior or anteroposterior and lateral chest radiographs show parenchymal infiltrates or consolidation (Porcel, 2018). A lateral decubitus chest X-ray can be used to see the presence of fluid. Computed Tomography (CT scan) can be used to differentiate the abscess cavity from fluid or intrapulmonary abscess (Bandaru et al., 2018)

CT scan and thoracic ultrasonography (USG) can be performed. Thoracic ultrasound examination can help in all cases of suspected empyema, pleural fluid and evidence of a loculated pleural effusion, helping to determine the location of thoracentesis or drain. Thoracic CT scan examination is useful for distinguishing parenchymal abnormalities from the pleura, evaluating parenchymal abnormalities, determining loculation, evaluating the pleural surface and assisting in determining therapy. Pleural biopsy and pleural fluid culture should be performed to confirm the diagnosis of empyema due to tuberculosis, mycobacterial culture is usually positive, so a pleural biopsy is not necessary (Balfour-Lynn et al., 2005)

Empyema is managed by draining the empyema from the pleural space. Empyema that has undergone tissue processing requires surgical stripping via VATS or thoracotomy. Radical surgery is one of the recommended treatments and is performed in all patients with empyema and sepsis after antibiotic therapy and failure of drainage (Shen et al., 2017)

Drainage is indicated in empyema, large loculated pleural effusion, empyema with pH less than 7.20, glucose deficiency than 60 mg/dl, or the presence of bacteria on staining or culture. Surgical options include tube thoracostomy, decortication and video-assisted thoracoscopic surgery (VATS). Mini thoracotomy is a debridement procedure performed through a small incision similar to VATS, but the tube thoracostomy is a surgical procedure, which leaves a small linear scar along the rib line (Redden et al., 2017)

Most patients with parapneumonic effusions and empyema can be cured with antibiotics and thoracocentesis or tube-thoracostomy, without the need for major surgery. If this requires major surgery, the first option is pulmonary decortication, which removes space by re-expanding the lung, functional restoration of the collapsed lung, and no

significant long-term sequelae. Performing this procedure using a minimally invasive approach makes it preferable by reducing postoperative morbidity and pain and by improving aesthetic aspects. Decortication performed via *video-assisted thoracic surgery* (VATS) is now the first choice for the majority of patients with empyema requiring major surgery (Porcel, 2018)

However, lung decortication (open or VATS) requires two main conditions to be successful. First, there must be a plane of cleavage that allows for decoration of the lungs; if these areas are absent or not clearly identified, the procedure becomes difficult or even impossible because of the bleeding and air leaks that occur during surgery (Redden et al., 2017). Second, the underlying lung parenchyma must have the ability to re-expand and completely obliterate the pleural space (Bandaru et al., 2018). If these two conditions are not met, lung decortication becomes a dangerous and very risky procedure and thoracoplasty is an option that should be considered (Balfour-Lynn et al., 2005)

In pulmonary empyema, if a bronchopleural fistula is found, the principle of management of a bronchopleural fistula is to close the fistula so that there is no space between the pleural cavity and the bronchi. If the bronchopleural fistula is small and less than 0.8 mm in diameter, the bronchopleural fistula can close spontaneously with conservative treatment alone. Spontaneous closure is more common after lobectomy, segmentectomy, and pneumonectomy. Several surgical approaches to treating bronchopleural fistulas are fistula repair, in addition to obtaining muscle flaps or air actuation to treat or close the bronchopleural fistula (Shen et al., 2017)

Conclusion

Patients with empyema due to pulmonary tuberculosis, where thoracoplasty (air plumbago) was performed on these patients to prevent recurrent effusions. The result of therapy in this patient was that there was no recurrence of effusion in this patient.

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