

Tuberculous Empyema in Children

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ABSTRACT We present a case of tuberculous empyema in a 14 month old girl. The diagnosis was primarily based on the history of the course of disease and a highly-suspected contagious person. On physical examination, she was undernourished with enlargement of the lymph nodes prominently at the lateral of the neck. Aspiration of pleural fluid showed pus. Other findings were high blood sedimentation rate and a positive Mantoux test. The evidence of *Mycobacterium tuberculosis* from the pus culture confirmed the diagnosis. Before the diagnosis of pulmonary tuberculosis was established, cefuroxime was administered as the antibiotic of choice for eradicating any susceptible bacteria. Specific anti-tuberculosis therapy was then administered. In addition, water sealed drainage was performed in order to expand the lungs. However, this approach was insufficient due to abundant production of pus, therefore, surgical drainage was done with a good result. In order to avoid any further complications in the treatment of tuberculous empyema such as bronchopleural fistulas or drug resistancy, this child still requires a long-time follow up after discharged from hospital. [Paediatr Indones 1999; 39: 330-336]

Introduction

Empyema thoracis is commonly defined as collected pus inside pleural cavities.¹ In most cases, empyema thoracis is caused by a complication of bacterial pneumonia.² Tuberculous empyema is one type of empyema thoracis caused by a rupture of a caseous focus node into the pleural cavities. The occurrence of tuberculous empyema

should also be suspected when treatment for pleural empyema was not responsive, or when pus from tuberculous lungs spillover into pleural cavities.³

Prolonged monetary crises in Indonesia have brought about a lack of affording nutritious food for most people. Therefore, cases of undernourishment have increased. This condition may result in a disturbance of immune function, thereby increasing the risk of contracting *Mycobacterium tuberculosis* infection. In addition to that, the cost of treatment for this type of infection has also become too expensive and making difficulties in the eradication of this infectious agent. Accordingly the number of contagious persons is prone to increase. The aim of this report is to discuss a case of tuberculous empyema and to review a recent standard management of empyema thoracis.

Report of the Case

A girl of 14 months was admitted to the Emergency Pediatric Unit of RSCM. Her chief complaint was dyspnea since 7 days before admission. Eight months prior to admission, the girl has also been suffering from a low-grade fever. She has a lack of appetite and a productive cough since she was 8 months old. She had a gradually elevated temperature and dyspnea which were progressively became worse until the day of admission. A neighbour, who usually took care of the patient since she was a newly born baby until she was 4 months old, was suspected of suffering from contagious tuberculosis.

The patient is an only child. Her father is a Javanese, aging 32 years old, and graduated from junior high school. The occupation of her father is a coolie with daily salary of Rp. 15.000. Her mother is a housewife of 22 years old and had a formal education up to only an elementary school level. The mother had a normal pregnancy and delivery of this child. The birth weight was unknown and the delivery was done by a traditional midwife. Her basic immunization was not completed. She only had Polio I & II. History of physical development was delayed because of prolonged illnesses and nutritional history was also inadequate.

On admission, the patient was alert, weak, pale and malnourished. The pulse rate was normal, respiration rate was 68 times/minute, the temperature was 38.3°C (centigrade) and the blood pressure was normal. Her weight was 6 kg and her height was 72 cm. The head circumference was normal. The color of her hair was brownie-black, and difficult to pull out. The conjunctivae were anemic, and several lymph nodes were palpable on the anterior region of the left side of the neck. There were lymphadenopathy which were multiple, painless and adhere one to each other. Chest examination revealed that the right thorax had limited movement during inspiration and expiration. On palpation, her trachea shifted to the left side, and the intercostal spaces of the right thorax were wider than the left one. On percussion, the right thorax was dull at its lower part i.e. below the fourth (4th) intercostal space. Furthermore, on

auscultation it was revealed that the breath sound was decreased on the affected side. The examination on the abdomen also revealed that the tip of the liver was palpable at one-third the distance between the arch of the rib to the umbilicus. Extremities showed hypertrophy, hypotonic and less subcutaneous fat.

Laboratory examination results were anemia, leukocytosis and the differential count showed that the segment were predominantly increased. Blood gas analysis revealed respiratory alkalosis with hypoxemia. Chest-X ray revealed enlarged lymph nodes in the hilus area and fluid or pleural effusion in the right lung.

The patient was diagnosed having pleural effusion, malnutrition, Fe deficiency anemia, and lymphadenopathy most probably due to pulmonary tuberculosis. Thoracocentesis was then planned.

The result of thoracocentesis demonstrated that the aspirated fluid was pus, its color and consistency were whitish, mucopurulent, and with bad odor. Rivalta test was positive. The number of cells were 1618 cells/ μ l with 95% of segment and 5% of lymphocytes. Based on the fluid characteristics, the empyema thoracis was determined. The water sealed drainage was performed.

Other laboratory findings obtained were as follows: blood sedimentation rate 110 mm in the first hour and 140 mm in the second hour, the liver function test was normal, the blood smear showed hypochromic red cells. Moreover, Mantoux test showed a positive reaction with 12 mm in diameter. A culture test on pus showed positive for *Mycobacterium tuberculosis* which is sensitive to all antituberculosis drugs tested. Culture for pyogenic bacteria was negative.

The patient was treated with antibiotic Cefuroxime three times 200 mg orally per day (according to literature, most empyema thoracis of children 1-5 years old is caused by *Haemophilus influenza* which is sensitive to cephalosporin). Antituberculosis drugs such as INH, Rifampicin and pyrazinamide were also administered. Corticosteroid was also administered, packed red cells were transfused and nutritious fluids were given at 8x100 ml. Two weeks after WSD, the production of pus was still active.

Discussion

This is the first case reported from the Pediatric Department Dr. Cipto Mangunkusumo General Hospital in the last ten years. This case is supported by most literatures stating that empyema TB is a very rare case.^{1,4} From a study of 43 empyema thoracic cases in USA, it was found that only one was caused by *Mycobacterium tuberculosis*.⁴ Generally, the main etiology of empyema thoracis in children is pyogenic bacteria. Those bacteria are *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella species*, and *Pseudomonas species*. Empyema thoracis is usually developed as a complication of severe bronchopneumonia.² From 1990 to 1997, there were 14 cases of empyema

thoracis treated in the Pediatric Department, and mostly as a complication of Broncho pneumonia.

Mycobacterium tuberculosis as the etiology of empyema thoracis in the patient was directly suspected because of the history of longstanding fever, chronic cough, loss of appetite and loss of weight. The Mantoux test was also positive, notwithstanding that most empyema thoracis have a basis of pyogenic bacterial infections. The child was treated as tuberculosis. Microbiological examinations for *Mycobacterium tuberculosis* was performed.

A strongly-suspected source of infection is one one of the fairly member who looked after the patient since she was newborn till four month old. The ventilation of their house was poor (they used to stay in one room with only one small window). This living condition made spreading of the disease a lot easier. Efforts in finding the contagious person have been made by consulting both of the child parents to the Department of Internal Medicine. Chest x-ray examination of the parents revealed that they had no signs of tuberculosis. It is stated in most literatures that young children usually get infected horizontally from close contact with active TB who are usually a member of the close neighbour or child-caring person.⁵

The incubation period of tuberculosis is 2 - 10 weeks. In approximately 5-10% of all infected persons, control of the growing organism is inadequate, and the disease occurs within 1 year of infection.^{6,7} *Mycobacterium tuberculosis* infection in this patient may happen in her early months of life.⁶ During which, her immune system may not function effectively to control the *Mycobacterium* and so the disease developed. Susceptibility to tuberculosis may increase during the first 2 years of someone's life because her or his immune system has not function effectively.^{6,8} Her young age and the malnourish condition caused the patient's susceptibility for this infection.⁸

The most frequent manifestation of tuberculosis is pulmonary tuberculosis, and pleural effusion is one main complication of it, which usually happens, in the first 6 months of infection. Pleural fluid is normally present between the parietal and the visceral pleura. This thin layer of fluid acts as a lubricant and allows the visceral pleura covering the lung to slide along the parietal pleura lining the thoracic cavity during respiratory movements. There are various pathogenesis of pleural effusion. Pleural effusion as I have mentioned above, were due to 2 processes:^{6,8,9}

The pleural effusion is caused by delayed hypersensitivity of the host. This process occurs due to the sensitization of T lymphocyte *Mycobacterium tuberculosis* entered the pleural cavity and caused inflammation reactions

A pleural effusion which was caused by both processes can be treated with an adequate therapy at the site of inflammation. The medicines will be absorbed without difficulties. However, occasionally, a large amount of *Mycobacterium tuberculosis* may present in the pleura making the fluid purulent, especially when the fluid was from a rupture of the caseous nodes into the pleural cavity. This thick fluid is called as

empyema tuberculosis.^{8,9}

Process of empyema consist of 3 stadium e.i: exudative, fibrinopurulent and organization. The characteristic of exudative phase is sterile pleural fluid which happened due to inflammation which caused the incresement of permeability. The characteristic of fibrinopurulent phase is an accumulation of pleural fluid inside the pleural cavity with consist of many polimorphnuclear leucocyte, bacteria and debris. Futhermore organization stadium is characterized by fibroblast in the exudat fluid, therefore there is a membrane which is not elactic and is called pleural peel.¹⁰

The possibility of pathogenesis pleural effusion in this case are.

The pleural effusion was caused by a complication of pneumonia bacterialis which have not been treated adequately, so that the stadium was continued to fibrinopurulent. It was supported with an laboratory examination that revealed the increasing of polimorphnuclear in the peripheral blood. Futhermore analysis of the fluid (pus) revealed segment predominantly.¹⁰

Thick fluid in pleural effusion (pus) was caused by a rupture of a caseous nodes into the pleural cavity. This was supported by a positive culture for Mycobacterium tuberculosis from the pus.^{8,9} Polymorphonuclear predominantly in the blood, could happen in early phase of tuberculosis.¹¹

In this case, both of process could happend together. Although the culture for pyogenic bacteria did not reveal a positive result.

The clinical manifestation in the tuberculous empyema was chronic. The symptom were: low grade fever, fatigue, the decreasement of body weight, chest pain and coughing.^{9,10} Those clinical manifestation were also happended in this case. Undernutrition status and enlargement of several lym-p-nodes which were fixed one each other at the anterior of the left side of the neck, also supposed the diagnosis of tuberculosis. In this case, based on physical and radiologic examination, pleural effusion was suspected.

The management of this case was same as the algorithm. The thick pus in a large volume were as a pointing thing that the WSD should be performed immediatelly. The principle management of empyema thoracis are antibiotic and drainage of the pus, so that the complication such as empyema necessitatis (a pus spillover to the skin because the ruptering of parietal pleural), bronchopleural fistula, or sepsis can be prevented.

Evaluation of WSD should be done in 2 weeks. If there is no resolution, the aggressive prosedures such as an open drainage and decortication should be considered. Controversies on both procedures still happened among the surgeons.¹² Decortications as a procedure choice still have to be proved. Complication of decortication should be considered so that children with empyema tb heal compeletely. Respons to therapy in tuberculous empyema is slow. The pleura in empyema tb tend to become fibrotic and calcified. This condition make tuberculostatic fail to infiltrate the pleural cavity and

make the treatment difficult. Poor penetration of drugs (anti tuberculosis drug) into the empyema due to the surrounding calcification and fibrosis meant that organisms were exposed to subtherapeutic concentration of some or all of the drugs, allowing emergence of resistant bacteria.¹³⁻¹⁵

The treatment of tuberculosis need a long time period, and the child grows and develop all the time. Therefore corporation with the parents is important in order to get an optimal growth and development.

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