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Case Report

Recurrent pneumonia in malnourished children

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ABSTRACT

Recurrent pneumonia was defined as two episodes of pneumonia per year or three episodes of pneumonia at any time of life. The causes of recurrent pneumonia are multifactorial. Additional diagnostic should be considered because most cases are associated with an underlying illness. We reported a case recurrent pneumonia of a 3 months old malnourished male patient. Chest radiograph show infiltrate in both lung with history hospitalized for pneumonia one month before admission. Recurrent pneumonia occurs in 7.7-9% of children with community-acquired pneumonia. Several related conditions such as malnutrition, anatomic defect, immunodeficiency and other underlying illness can cause recurrent pneumonia.

Keywords: Recurrent pneumonia, Malnutrition

INTRODUCTION

Recurrent pneumonia was defined as two episodes of pneumonia per year or three episodes of pneumonia at any time of life. Recurrent pneumonia occurs in 7.7-9% of children with community-acquired pneumonia.[1] There are additional diagnostic considerations because most cases are associated with an underlying illness. Only few cases of recurrent pneumonia remain unclear cause by multifactorial.

CASE REPORT

A 3 months old male patient was brought to emergency room by his family complained shortness of breath since one day before admitted to the hospital. Shortness of breath had been described as heavy breathing with chest wall retraction. Beside shortness of breath, patient also had cough since two days before admitted to the hospital. The patient also had breath sound like inspiratory stridor present since birth and history of one episode of pneumonia one month before admitted to the hospital.

The patient was the third child from two siblings, born by cesarean section with an indication of mother with locus menorus resisten (LMR) 2 times, aterm, immediately cried, birth weight 2800 gram. The patient's mother had a history of intrauterine fetal death when she was pregnant with her second child at 9 months of gestation. There was tobacco exposure from patient's father.

On physical examination the patient appeared weak, the consciousness was compos mentis, heart rate 114 times per minutes, respiratory frequency 28 times per minutes, temperature 36.6 °C and oxygen saturation 91% on room air. General physical examination showed subcostal chest wall retraction accompanied by rhonchi sounds in both lung fields. The extremities were warm. Body weight was 3.3 kg and length 56 cm.

Complete blood tests showed haemoglobin slightly decreased (10.8 g/dl), normal MCV (91.2 fl), normal (MCH 28.4 pg), leucocyte was normal (8.04×103 /µl), and thrombocyte in normal range (424×103 /µl). The random blood sugar level was normal (97 mg/dl). The

examination of FT4 (9.49 mmol/l) and TSH (0.084 IU/ml) were decrease.

Chest radiograph showed infiltrate in both lungs (Figure 1). The patient's blood culture result was negative, on the other hand sputum culture found organism *Serratia marcescens*. Evaluation for HIV and Mantoux test for tuberculosis demonstrated negative result.

Figure 1: Chest radiograph showed infiltrate in both lungs.

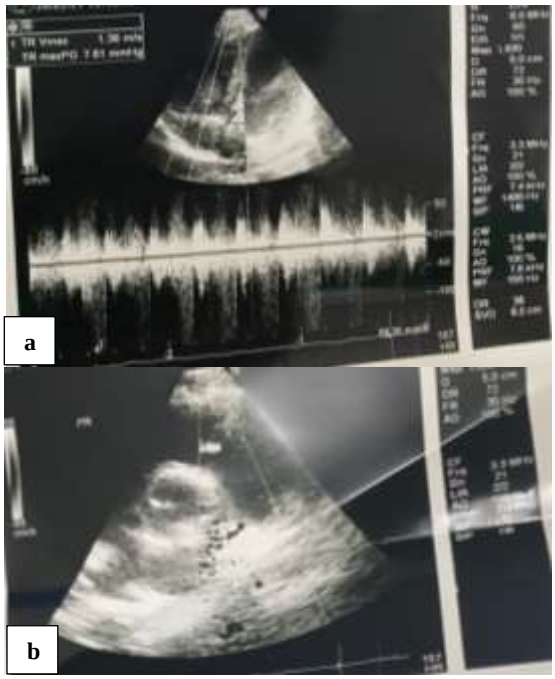

Figure 2 (a and b): Echocardiography showed mild tricuspid regurgitation and mild pulmonal regurgitation.

Echocardiography examination showed result of mild tricuspid regurgitation and mild pulmonal regurgitation. Systolic function left ventricle found normal with ejection fraction 64% and normal systolic function of right ventricle. There was not found patent ductus arteriosus, atrial septal defect or ventricular septal defect (Figure 2).

Initial treatment was oxygen with flow rate of 1-2 liters per minutes through nasal cannula and was given 10 drops per minutes KAEN 3B infusion. The next treatments given include antibiotics cefotaxim (150-200 mg/kgBW/day divided q6-8 h) 200 mg every 8 hours and gentamicin (5-7.5 mg/kgBW/once a day) 20 mg every 24 hours intravenously; methylprednisolone IV (0.5-1 mg/kg/times) 3 mg every 8 hours and nebulization bronchodilators every 8 hours.

Figure 3: Chest CT scan showed in the posterior segment of the inferior lobe of the left lung.

On the 6th day of treatment, the patient had shown clinical improvement so oxygen was stopped, but during observation the patient had desaturation showed oxygen saturation 91% on room air. The patient given oxygen 4 liters per minutes through mask. Cefotaxime antibiotics were stopped and changed to cefoperazone sulbactam according to sputum culture results. The patient also received nutritional therapy in the form of high-calorie milk, but the patient's ability to drink was still lacking.

We also performed chest computerized tomography scan to evaluate and search underlying illness. CT scan showed infiltrate in the posterior segment of the inferior lobe of the left lung. Trachea and main bronchus right and left appear paten. No anomaly were seen on CT scan (Figure 3).

DISCUSSION

Recurrent pneumonia was defined as two episodes of pneumonia per year or three episodes of pneumonia at any time of life. The most common underlying causes of recurrent pneumonia included aspiration syndrome, recurrent wheezing and congenital heart disease.[1] In this case, the patient had no history of that condition and many studies have shown recurrent pneumonia can be multifactorial in cause.

Echocardiography examination was conducted to evaluate whether there were congenital heart

abnormalities that potentially caused the recurrent pneumonia. Echocardiography examination showed result of mild tricuspid regurgitation (TR) and mild pulmonal regurgitation (PR). TR could occurred in 65-85% of population, thus the mild TR found in normal tricuspid valve was deemed as normal variation.[2] Mild or physiologic pulmonary valve regurgitation can often be found in a normal heart without a pathologic condition or pulmonary hypertension. Pathologic pulmonary valve regurgitation was usually caused by dilation of either the pulmonary valve annulus or the pulmonary artery, secondary to pulmonary hypertension, idiopathic pulmonary artery dilation or connective tissue disease.[3]

The patient also had breath sound like inspiratory stridor present since birth. That condition may be present in most patients with tracheomalacia (TM) and tracheobronchomalacia (TBM). Tracheomalacia referred to an excessive increase in compliance of the trachea, such that the airway was more susceptible to dynamic and/or static collapse. The mainstem bronchi may also be affected, which was referred to as tracheobronchomalacia. Less commonly, the mainstem bronchi and/or their distal divisions at the lobar or segmental level were affected alone, which was known as bronchomalacia (BM). There was no definitive standardized guideline for diagnosis and evaluation of TM/TBM. For the most accurate diagnosis of TM/TBM, direct visualization was achieved through flexible and rigid endoscopy including laryngoscopy, tracheoscopy and bronchoscopy. The diagnosis should be suspected by a clinical history of signs and symptoms that would be suggestive of TM/TBM including barky cough, noisy breathing, recurrent pneumonia, prolonged pulmonary infection, feeding difficulties with dyspnea, cough and aspiration. The extensive airway collapse can lead to ineffective cough and reduced clearance of secretions. As a result, patients with TM/TBM were at increased risk of frequent upper respiratory infections, prolonged recovery from an upper respiratory infection and recurrent or persistent pneumonia.[4]

Atopy can defective innate immune response of epithelial cells interleukin 13-dependant reduced mucociliary clearance. Children with immune deficiency tended to gain weight and grow poorly.[5] In this case, the family history of allergic, asthma, allergic rhinitis and dermatitis were denied. The patient doesn't have cow's milk related symptom such as rash of the skin, urtikaria, vomiting, regurgitation or wheezing; but patient had history of constipation and diarrhea.

Tobacco smoke exposure was one of the risk factor recurrent pneumonia by mechanism neonatal low lung volume, impaired toll-like receptor-mediated immune response, suppressed phagocytic activity of neutrophils and monocytes/macrophage cells secondary to reduced production of oxygen radicals, increased bacterial adherence and impaired lung function.[5]

In this case we found *S. marcescens* on sputum culture. Isolate was found to be resistant with ampicillin but sensitive to ceftriaxone, cefoperazone sulbactam and gentamicin. *S. marcescens* was an opportunistic, gram negative, nosocomial pathogen which belonged to family, *Enterobacteriaceae*. Although *S. marcescens* was considered to be an innocuous, non-pathogenic organism, over the last few decades, they have become an opportunist pathogen causing nosocomial infections. Reports have shown rare cases of *S. marcescens* was the primary cause of pneumonia in children. It may come from the soil, result of unhygienic habits, as the patient belonged to a low socio-economic status group.[6]

In this case, patient had severe malnutrition (Z score <-3 SD on body weight for length). Study concluded that severe malnutrition had a significant the risk of death from pneumonia by up to four times greater than normal nutritional status. Nutrition can affect the development of the immune system of the human body and the emergence of diseases. The body in severe malnutrition had fewer immunity mediator cells, weaker complement system and less IgA secretion making its humoral immunity become more vulnerable. There was a disruption of epithelial regeneration in the respiratory tract. The thymus gland and tonsils became atrophic, so the number of t-lymphocytes decreased gradually. The mechanism of cellular immunity deficiency will make the infectious process easier.[7]

Poor nutrition was one of the factors that increased the risk of pneumonia incidence. Caggiano et al on 2017 in Tanzania found malnourished children required more antibiotic treatment ($p<0.05$). Malnutrition and young age were still dangerous factors affecting child mortality, 73% of children with pneumonia who died were malnourished.[8]

The length of stay patient was related to the severity of disease, the presence of underlying diseases and disorders related to the immune system. Aryani et al study on 2014 in Surabaya found that the longest length of stay was less than 10 days, a total of 17 patients (58.62%) followed by 10-20 days as many as 11 patients (37.93%) and 1 patient (3.45%) were hospitalized for more than 32 days. Patients who were hospitalized for more than 32 days were patients aged 3 months with a diagnosis of bronchopneumonia, malnutrition and congenital hypothyroidism.[9]

Hormones and hypothalamic neuropeptides played a role in the regulation of respiration and in bronchopulmonary morphology. Hypothyroid can reduced inspiratory and expiratory muscle tone demonstrated by the measurement of muscle pressure during maximal inspiration and expiration was correlated with the severity of hypothyroidism. On the other hand, patients with hyperthyroidism can experience effort and rest dyspnea. In the context of associated cardiac disorders, these clinical manifestations can be more frequent and more

severe. High thyroid hormone levels induced hyperventilation and an increase of ventilatory response to hypoxia and hypercapnia, particularly through an increase of the central ventilatory drive.[10] A variety of endocrine abnormalities have been reported in protein energy malnutrition. Alteration in thyroid hormone status in severe acute malnutrition was an adaption of thyroid to low energy and protein reserve and perhaps a defense mechanism against excessive metabolic stimulation and energy consumption in such children.[11]

Cefoperazone sulbactam (25-60 mg/kgBW/dose every q6-12h) 200 mg every 8 hours was given to the patient according to sputum culture results to the antibiotic sensitivity. The patient's condition improved and could be discharge after being treated for 34 days. Nutritional therapy still continued with periodic control as an outpatient.

CONCLUSION

We have presented a case recurrent pneumonia of a 3 months old malnourished male patient. Chest radiograph show infiltrate in both lung with history hospitalized for pneumonia one month before admission. Several related conditions such as malnutrition, anatomic defect, immunodeficiency, and other underlying illness can cause recurrent pneumonia. On the other hand pneumonia can be risk factor for malnutrition also increase risk mortality and morbidity of underlying illness.

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