

Lung Abscess Remains a Life-Threatening Condition in Pediatrics – A Case Report

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ABSTRACT

Pulmonary abscess or lung abscess is a lung infection which destroys the lung parenchyma leading to cavitations and central necrosis in localised areas formed by thick-walled purulent material. It can be primary or secondary. Lung abscesses can occur at any age, but it seems that paediatric pulmonary abscess morbidity is lower than in adults. We present the case of a one year and 5-month-old male child admitted to our clinic for fever, loss of appetite and an overall altered general status. Laboratory tests revealed elevated inflammatory biomarkers, leukocytosis with neutrophilia, anaemia, thrombocytosis, low serum iron concentration and increased lactate dehydrogenase level. Despite wide-spectrum antibiotic therapy, the patient's progress remained poor after seven days of treatment and a CT scan established the diagnosis of a large lung abscess. Despite changing the antibiotic therapy, surgical intervention was eventually needed. There was a slow but steady improvement and eventually, the patient was discharged after approximately five weeks.

Keywords: lung abscess, child, sepsis

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INTRODUCTION

Lower respiratory tract infections are a leading cause of death for approximately 3.9 million people per year worldwide, and of these, 1.8 million deaths occur in children under the age of five years [1]. Pulmonary abscess is an infectious condition which destroys the lung parenchyma leading to cavitations and central necrosis in localised areas, formed by thick-walled purulent material, and can be primary or secondary [2]. Primary lung abscesses develop in previously healthy children without any known underlying conditions, being usually solitary, while secondary ones occur in children with underlying or predisposing disorders and these can be multiple [2]. Most frequently, lung abscess is a local complication of pneumonia. The clinical manifestations of lung abscess in children include a cough, fever, tachypnea, dyspnea, chest pain, vomiting, sputum pro-

duction, weight loss and haemoptysis. The diagnosis is usually established by chest radiography or a CT scan in selected cases, the later being able to indicate the location, size and anatomic characteristics of a lesion [2].

The aetiology of lung abscess can be bacterial including (a) aerobic *Streptococcus spp.*, *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, or very rarely *Mycoplasma pneumoniae*, (b) anaerobic such as *Bacteroides spp.*, *Fusobacterium spp.*, and *Peptostreptococcus spp.* or (c) fungal in immunocompromised patients [2]. Though lung abscess can occur at any age, it seems that paediatric pulmonary abscess morbidity is lower than in adults. Nevertheless, there are only a few reported studies regarding the prevalence and clinical outcome of this condition in children [3,4]. However the development of antimicrobial therapy over the last decades has improved the outcome of lung abscess, the

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data from 1969 to 2005 reported mortality rates, ranging from 2% to 38.2% [5].

The treatment of lung abscess can be conservative or surgical, with most physicians preferring conservative treatment as the treatment of choice. Conservative treatment involves parenteral antibiotics for two to three weeks, followed by a course of oral antibiotics for four to six weeks, concurrently with vital function support [2]. In severe cases, where there is little or no improvement after seven to ten days of therapy, surgical intervention is the appropriate therapeutic option [2].

■ CASE REPORT

Medical history and presenting concerns

The case is presented of a one year and 5-month-old male child admitted to Paediatric Clinic 1, Tg. Mureş, with fever, loss of appetite and altered general status. Neither the family nor his personal history revealed any pathological elements. The onset of the disease occurred approximately ten days before admission, with a raised temperature of 39°C in spite of the administration of antipyretics. Therefore, the mother consulted a paediatrician who recommended antibiotic treatment (Cefuroxime suspension 125 mg/5 ml; 5 ml 2 times/day). No improvement in the child's condition resulted and he was admitted to the territorial hospital where thoracic radiography revealed a massive right pneumonia with pleural effusion. The child was transferred to the Paediatrics Clinic 1 Tg. Mureş, Romania, for further investigations and treatment.

Clinical findings

The clinical examination on admission showed an altered general status, ringed face, pallor, cryptic and hyperaemic tonsils, hyperaemic pharynx, respiratory distress, abdominal breathing, vesicular murmur absent on the right lung, peripheral oxygen saturation 94%, heart rate 134 beats/minute. The patient weighed 10 kilogrammes, and his height was 95 centimetres.

Diagnostic focus and assessment

The laboratory tests performed on the day of admission revealed a severe inflammatory syndrome with increased inflammatory biomarkers. C-reactive protein (CRP) 299 mg/L, erythrocyte sedimentation rate (ESR) 130 mm/h; leukocytosis (Leu 24 550/ μ L) with neutrophilia (Neu 16 680/ μ L), thrombocytosis (Plt 883/ μ L),

anemia (Hb 7.3 g/dL, Htc 23.2%, MEV 66.9fL, MEH 21 pg), low serum iron (3.21 μ mol/l), and an increased level of lactate dehydrogenase (LDH 398 U/L).

A blood smear indicated 1% myelocyte, 3% non-segmented cells, 69% segmented cells, 11% monocytes, 16% lymphocytes with hypochromic, microcytic red blood cells, increased number of platelets, hyper granulated and hyper segmented polymorphonuclear cells.

A blood culture was negative. A chest X-ray showed a massive right pneumonia with pleural effusions. (Fig. 1)

Therapeutic focus and assessment

Based on the clinical, laboratory and radiological findings a diagnosis was made of staphylococcal pleural-pneumonia. Antibiotic treatment with meropenem (200 mg 3 times a daily for 7 days) and vancomycin (100 mg 4 times daily for 7 days) together with oxygen by mask during the first three days of admission, electrolytes (sodium chloride and potassium chloride) and glucose solutions by vein during the first week of admission depending on the oral intake and symptomatic treatment (antipyretics – paracetamol 125 mg/dose up to 600 mg/day, inhaled bronchodilator therapy with salbutamol sulphate 5mg/ml 0,5 ml up to 1 ml/dose). We initiated the treatment with antipyretics followed by inhaled bronchodilator therapy with salbutamol and rehydration therapy. At the same time we administrated the above mentioned antibiotherapy.

Unfortunately, after one week of the above mentioned antibiotic treatment, the fever persisted, and the patient developed bilateral lower limbs oedema. Subsequent laboratory tests showed approximately the same level of inflammatory biomarkers (CRP 291 mg/L, ESR 120 mm/h), decreasing level of Hb (6.1 g/dL), and low level of albumin and total proteins (Alb 2.14 g/dL, TP 5.05 g/dL) as previously recorded. A chest X-ray showed a massive fluid cavity with air inclusions in the upper and middle right lobes associated with right pleural effusion compressing the mediastinum. (Fig. 2)

A thoracic CT established the diagnosis of a massive lung abscess, partially evacuated, with a cranial-caudal diameter of approximately 74 mm, and secluded pleural effusion. The paediatric surgeon refused surgical treatment based on the patient's relatively good general status without signs of respiratory distress. An infectious diseases specialist recommended the following antibiotic regimen: meropenem 200 mg 3 times daily, metronidazole 60 mg 3 times daily, amikacin 75 mg 2 times daily, and levofloxacin 50 mg 2 times daily for

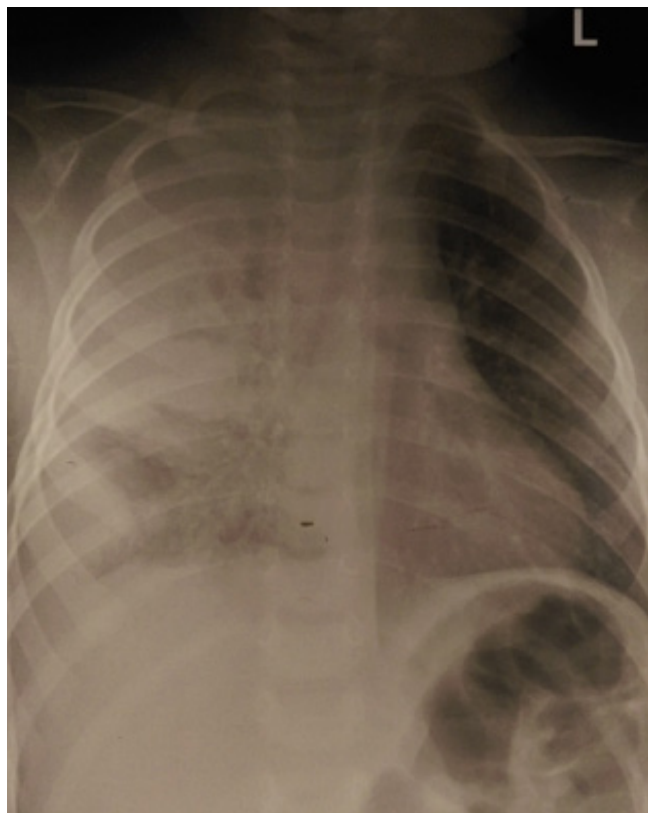


Fig. 1. Radiological aspect of the right lung on the day of admission

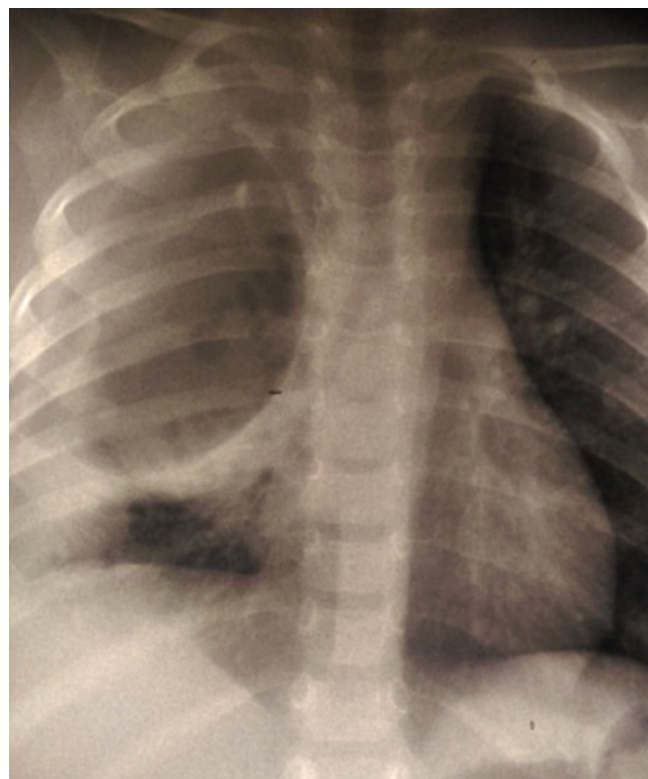


Fig. 2. Radiological aspect of the lung abscess

one week. Human albumin 10 g per day for three days, blood transfusion 100 ml once, and immunoglobulin 5 g a day for five days parenterally, were also administered, resulting in a favourable clinical evolution after three days of treatment.

Laboratory tests were repeated one week after the commencement of the new antibiotic regimen and showed that the inflammatory biomarkers remained elevated. A second CT was taken which revealed right fluid-pneumothorax compressing the mediastinum and causing the collapse of the right superior lobe, and an air cavity of approximately 49 mm diameter with a fluid content of approximately 19 mm axial diameter.

The patient was transferred to the Paediatric Surgery and Orthopedic Clinic Tg Mureş where a right pleurostomy was carried out. Afterwards, he was admitted to the Paediatric Intensive Care Unit for three days. A bronchoscopy indicated an atelectasis of the superior right lobe due to purulent secretions. The amount of drained purulent secretions was approximately 40-50 ml per day. A culture from the drained fluid, as well as a specific bacteriological culture, were both negative for Koch bacillus. Treatment was continued with meropenem 200 mg 3 times daily and levofloxacin 50 mg 2 times daily for another three weeks to cover both Gram positive and negative bacteria and anaerobic bacteria.

The pleurostomy was suppressed after two weeks, and the patient was discharged soon after.

■ DISCUSSION

Lung abscess in children is very rare, accounting for approximately 0.7 per 100 000 admissions per year [6] with a continuing decrease in their incidence due to major pharmacological developments. Most cases of paediatric lung abscess arise due to a complication of bacterial pneumonia [7]. There are, however, other predisposing factors that can lead to this condition in children such as immunodeficiency syndromes or immunosuppression states due to viral infections, severe systemic disorders and neurological conditions which can lead to aspiration lung disease [8].

Even though in the present case the lung abscess was the result of pneumonia, no predisposing factors or underlying conditions were identified that could have led to this condition. One of the most severe and common complications of lung abscess is sepsis, a critical condition with a wide spectrum of aetiologies, but which usually carries a good prognosis in children [9,10].

The most common aetiological agents of lung abscess in paediatric patients are Gram-positive cocci including *Staphylococcus aureus* and *Streptococcus pneumoniae* and anaerobic bacteria. In immunocompromised or aspiration patients, several Gram-negative bacteria have been identified, such as *Pseudomonas aeruginosa* and *Klebsiella pneumoniae* [3]. Nevertheless, other rare aetiologies can be encountered such as that identified by Ruffini et al., (2014) who showed that a *Mycoplasma pneumoniae* infection might predispose to severe infections caused by typical respiratory pathogens [11].

Though we did not identify the precise aetiology in our case, it was most likely that the condition was caused by Gram-positive cocci, probably *Staphylococcus aureus*.

The diagnosis of lung abscess is usually established radiologically, but in certain cases, it can be difficult to differentiate between empyema and a lung abscess, based solely on a chest radiography. In such cases, it is necessary to perform a CT scan to confirm a diagnosis [12].

The first step in the management of a lung abscess is by parenteral antibiotics together with physiotherapy to facilitate postural drainage [13]. In most cases, due to the difficulties in establishing the aetiology in paediatric patients, antibiotic therapy is administered empirically [14].

Surgical drainage or percutaneous drainage should be limited to those cases which are refractory to medical therapy or who develop complications like bronchopleural fistula [15].

Our case was refractory to medical therapy and developed a right fluid-pneumothorax compressing the mediastinum and collapse of the right superior lobe. It, therefore, required surgical drainage. The consensus opinion is that in cases of children under the age of seven years, lung abscess does not respond readily to medical therapy and does not drain spontaneously [13], and it follows that up to 21% of patients diagnosed with lung abscess, who do not respond to antibiotics, are likely to need surgical or percutaneous drainage [16]. Even though lung abscesses in paediatric patients are rare conditions, our case proves that they can develop despite the early administration of wide-spectrum antibiotics in children without any predisposing factors or underlying conditions, probably due to the bacterial strain involved and its pathogenicity.

■ CONCLUSIONS

Lung abscess infrequently occurs in paediatric patients and is commonly a complication of bacterial pneumonia. Despite the fact that we initiated wide-spectrum antibiotics and vital functional support from the first day of admission, our patient developed a massive lung abscess with multiple complications eventually requiring surgical drainage. The eventual outcome and prognosis for the patient were favourable.

■ CONFLICT OF INTEREST

None to declare.

■ ABBREVIATIONS

Alb – albumin, CRP – C-reactive protein, ESR – erythrocyte sedimentation rate, Hb – haemoglobin, Htc – hematocrit, MEH – medium erythrocyte haemoglobin, MEV – medium erythrocyte volume, LDH – lactate dehydrogenase, Leu – leukocytes, Neu – neutrophils, Plt – platelets, TP – total proteins

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