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Clinical Case Seminar

A5 (1-6)

An unusual evolution of pneumonia in a child

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Abstract

Pleural empyema represents a severe complication of community acquired pneumonia with an incidence of 0.6% among hospitalized children.

Clinical manifestations of picture may be different in infants and young children and it should always be suspected in a child with pneumonia without significant clinical improvement after 48 hours of antibiotic treatment.

The most common microorganism associated with empyema is Streptococcus pneumoniae, especially in children under 5 years of age.

Chest radiograph is the gold standard for diagnosis but chest ultrasonography, and in some cases chest-CT, may be necessary to study features and evolution of the pleural fluid in order to guide therapeutic choices.

In most cases small pleural empyema responds to antibiotics alone. However in severe and extensive cases, drainage and invasive treatments, like video-assisted thoracic surgery (VATS) and thoracotomy, became necessary.

Due to the early start of antibiotic therapy, blood and pleural fluid cultures may result negative; in these cases only the use of molecular techniques, like polymerase chain reaction in biological fluids, may determine the etiology of the infection.

Here we report the case of previously healthy 8-years-old boy with an important and severe pleural empyema as a complication of S. Pneumoniae pneumonia, that did not respond to antibiotic therapy and thoracocentesis and for which decortication has been necessary. In our patient only molecular analysis on pleuric fluid has allowed us to define the etiology of the process.

KEYWORDS: Pleural empyema, Streptococcus pneumonia, Real-time PCR

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Introduction

Parapneumonic effusion and pleural empyema (PPE/PE) are the most common complications of community acquired pneumonia in children. S. pneumoniae remains the most common etiologic agent, exceeding 60% of cases in some studies (1).

The use of molecular techniques, like polymerase chain reaction (PCR), for detection of the bacterial DNA, improves the efficacy of pathogen identification in pleural fluid from children with empyema (1).

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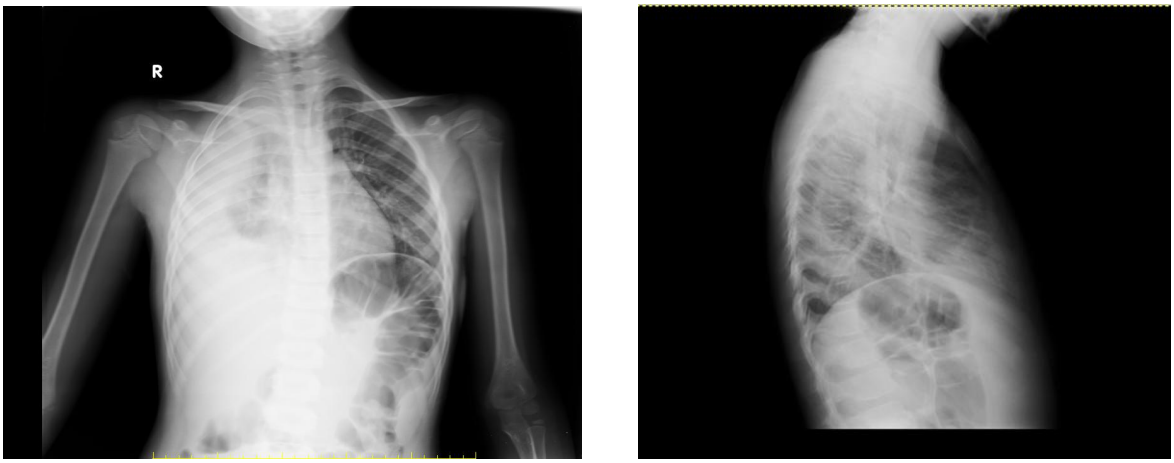
Case Report

A previously healthy eight-year-old male was admitted to our department with an eight-day history of cough, high fever, asthenia and anorexia, non responding to three days antibiotic treatment with amoxicillin low-dosage, prescribed by the pediatrician.

On admission, child presented bad general conditions, fever, tachypnoea with chest pain and low oxygen saturation (92-93%); his physical examination showed crackles and decreased breath sounds on the right lung. Chest x-ray revealed a complete opacification of the right hemithorax, suggesting a large pleural effusion (fig.1).

Figure 1: Chest x-ray at admission



Laboratory studies showed increased white blood cell count (34,810 mmc, 85% neutrophils) and a markedly elevated C-reactive protein (CRP) (22.8 mg/dl, normal values 0.1-0.5).

After the initial evaluation, empiric intravenous antibiotic treatment (ceftriaxone 80mg/kg/die) and oral betamethasone (0.1 mg/kg/day) were started; oxygen-therapy with nasal cannula (1.5-2 L/m) was introduced too.

After 72 hours from admission blood cultures remained negative and ultrasound showed on the right lung “particulate pleural effusion (D. max 40 mm) with, multiple consolidations areas and atelectasis..”.

Because of persistent fever and worsening of the respiratory picture, a thoracentesis, with placement of a chest tube was performed; the puncture allowed to withdraw 600 cc of purulent effusion that was submitted for both aerobic and anaerobic cultures, which were negative.

Treatment with ceftriaxone was suspended and replaced by meropenem (90 mg/Kg/day) and Vancomycin (40mg/kg/day); because of a borderline sierology for Mycoplasma pneumoniae (IgA 16) a therapy with clarithromycin (15mg/Kg/day) was started too.

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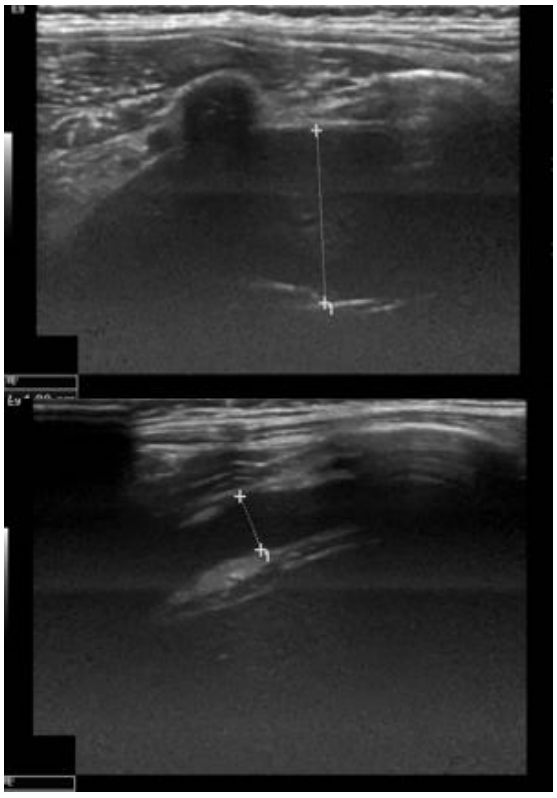
Fig. 2 Ultrasound images of pleural effusion

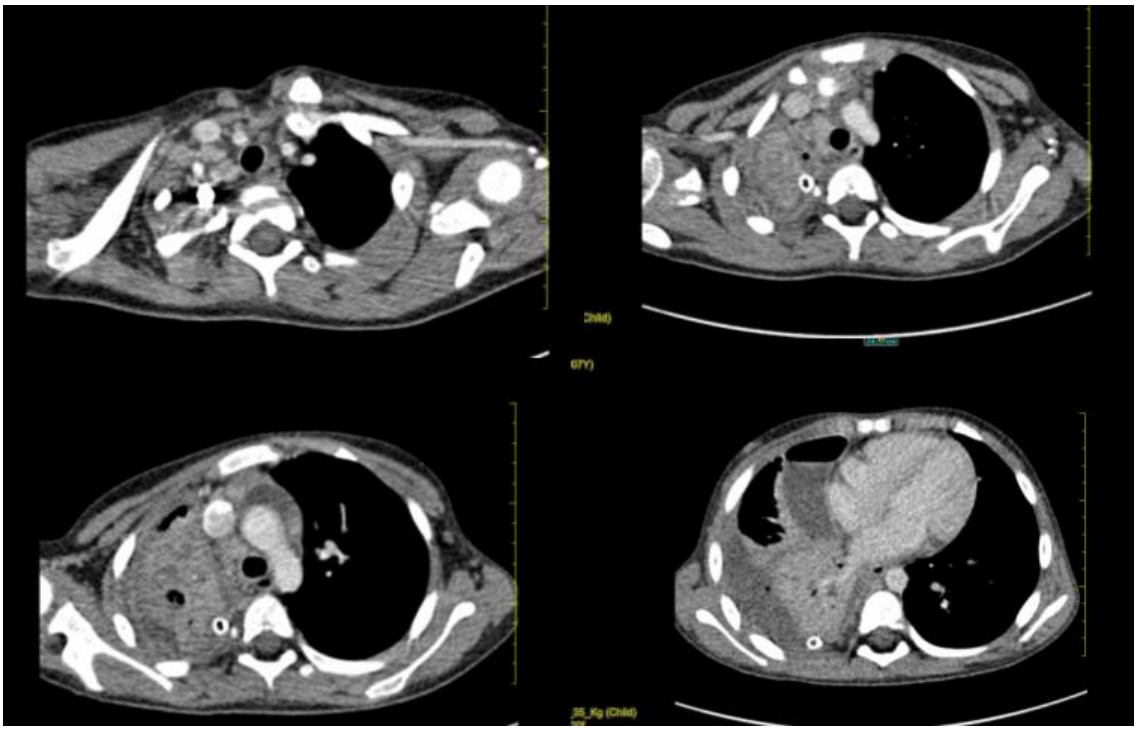


In the following days patient presented a slight clinical improvement with reduction of tachypnea and oxygen demand and improvement of inflammatory markers (white blood cells count 11.110, with 69% neutrophils, CRP 4.9 mg/dl).

Ultrasound and computer tomography (CT) with intravenous contrast medium administration (after collecting other 500cc of purulent pleural effusion in the drainage system) showed persistent lung consolidations, extended loculated pleural effusion and a parietal and visceral pleural inflammatory thickening (Fig.2).Because of these radiological findings, surgery drainage of the purulent effusion was performed along with placement of second chest tube; for the severity of the case the initial VATS was converted to decortication.

Cultures of pleural fluid obtained during the VATS procedure were negative, as well as quantiferon gold.

Fig. 3: Axial contrast-enhanced CT scans



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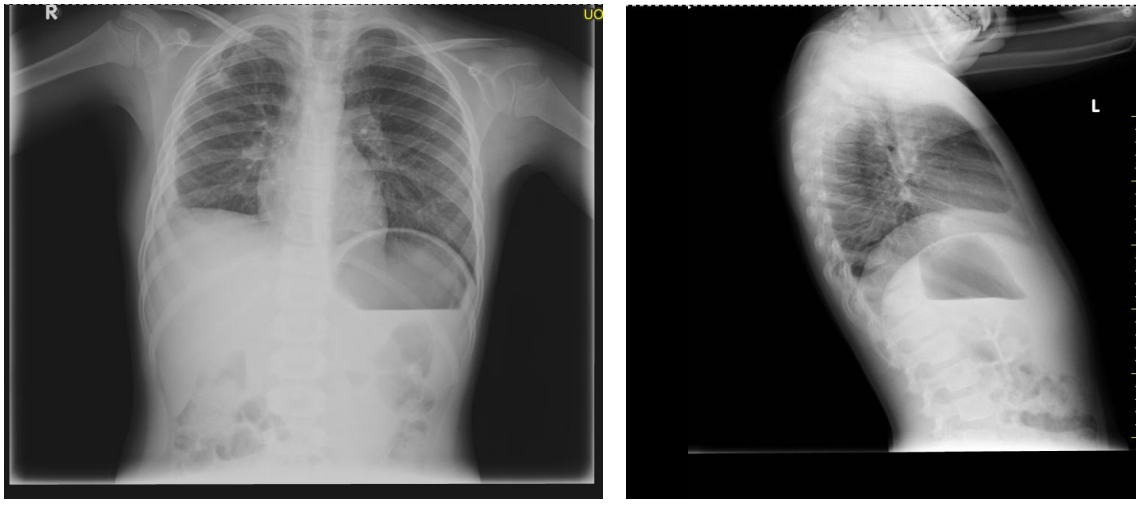
In order to find the etiologic agent, a pleural fluid sample was sent to the Meyer Hospital for detection of bacterial DNA (Streptococcus pneumoniae, Neisseria meningitidis and Haemophilus influentiae) by use of PCR; research resulted positive for Streptococcus pneumoniae.

Antibiotic treatment with meropenem and vancomycin was discontinued after 8 days of intervention and replaced with ceftriaxone until discharge.

During hospitalization, laboratory and functional monitoring was performed and respiratory physiotherapy was started. The patient was resigned after 15 days from surgery in improved general conditions.

Control Chest x-ray (two weeks after discharge) showed "modest, mobile volume pleural effusion, lifting of right hemidiaphragm with decreased volume of the lung; thickening and irregularities in the top of right paracostal pleura" (fig.4).

Figure 4: Chest x-ray two weeks after discharge



Discussion.

PE is a significant complication of pneumonia that occurs in 0.6% of all childhood pneumonias and his incidence is on the rise (2). PPE and PE are more common in boys than girls and are more frequently encountered in infants and young children (3).

Empyema is an active disease state that advances through three stages:

- Exudative phase: consists of an increase in fluid and inflammatory cells in the pleural space;

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- Fibropurulent phase*:* characterized by large amounts of white cells and fibrin deposition in the pleural space resulting in the formulation of loculations;
- Organization phase: fibroblasts infiltrate the pleural cavity, and the thin intrapleural membranes are reorganized to become thick and non-elastic (the 'peel').

Because of the presence of loculations and fibrinous adhesions debridement and decortication become necessary, like in our patient (2,3).

The most common organism associated with empyema is Streptococcus pneumoniae (particularly in children younger than 5 years of age), follows by S. pyogenes, Haemophilus influenza, Mycoplasma pneumoniae, and other streptococcal species. Legionella pneumophila and primary viral pneumonia may also be associated with PPE (3,5).

Our child presented typical symptoms of older pediatric patients, like fever, cough, tachypnea, chest pain, diminished breath sounds, abdominal pain to palpation and dullness to percussion on the affected side.

Instead, children younger than 1 year of age, often present with ambiguous symptoms like fever, decreased activity and anorexia. In those already diagnosed with pneumonia, lack of improvement after 48 hours of antibiotic treatment may underline the presence of an effusion (3-5).

Frontal and lateral chest radiographs are a mainstay of diagnosis but ultrasonography allowed us to get information about volumes of pleural fluid and viscosity. CT will, however, provide the most information, displaying fluid, loculation, and thickening of the pleural membranes (2,6).

Lung ultrasound has become more popular, both in neonatal and in pediatric age groups, because of its possibility to be utilised at the bedside, without risk of irradiation along with simple and immediate interpretations of the images (7).

A blood cultures or thoracentesis may be drawn to confirm the causative agent although different studies assert our experience: blood cultures are only positive in about 10% of cases and the yield from pleural cultures is also often very low due to the fact that most children have already started antibiotic therapy (2).

Several studies have suggested the use of molecular assays, such as nucleic acid amplification, to determine the etiology of PE, with higher sensitivity; the use of PCR significantly increased the definition of pneumococcus as the causative microorganism from 71% to 75% (1,4,8).

Indeed in our experience, only molecular analysis on pleuric fluid has allowed us to define the etiology of the infectious process.

The treatment for empyema in children remains controversial.

Many small PE will respond to antibiotics alone; however, effusions which are enlarging and/or

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compromising respiratory function need drainage or invasive treatment modalities like fibrinolytics, VATS, and thoracotomy (2,3).

Study have shown that primary operative therapy, like thoracotomy or VATS, may be associated with lower mortality rate, repeat intervention rate, length of stay, time with tube thoracostomy, and time of antibiotic therapy, compared with nonoperative treatment (2,3).

Our case underlines the importance of clinical examination in order to confirm the etiology and the diagnosis also when first laboratory findings seem not confirm diagnostic suspicion.

Conflicts of Interest: There is no potential conflict of interest, and the authors have nothing to disclose. This work was not supported by any grant.

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