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COMPLICATED PNEUMOCOCCAL PNEUMONIA IN A CHILD

Solieva Mavlyuda Adiljanovna

Assistant of the department of pediatrics and neonatology of the faculty, ASMI

Abstract. The article presents a clinical case of pneumococcal pneumonia in a child complicated by a destructive process and septicemia. In addition to massive antibacterial therapy, successful treatment required the use of immunopreparations, extracorporeal detoxification methods and thoracoscopy with drainage of the pleural cavity. The effectiveness of the therapy was confirmed by a study of the dynamics of intoxication syndrome markers.

Keywords: pneumonia, pneumococcus, thoracoscopy, plasmapheresis.

INTRODUCTION

Pneumococcal diseases are a pressing problem in practical healthcare due to the leading role of Streptococcus pneumoniae in the structure of respiratory tract infections [1]. About 1.6 million people die from pneumococcal infections annually, including 0.7–1 million children under 5 years of age, mainly living in developing countries [4]. However, even in developed countries, the mortality rate for invasive pneumococcal infection reaches 60% [1]. Another problem associated with pneumococcal infections is the growing resistance of pathogens to antibiotics (penicillin, third-generation cephalosporins, macrolides, tetracyclines, quinolones, and rifampicin) [1, 3, 4].

MATERIALS AND METHODS

Despite the fact that pneumococcus is the most common causative agent of lobar pneumonia in children [2], the treatment of this disease remains complex, the course is severe, and the outcome is unpredictable, as confirmed by the following clinical case. Patient N., 8 years old, was admitted to the anesthesiology and intensive care department (AIT) of the city multidisciplinary children's hospital with complaints of a hacking cough, groaning breathing, vomiting, back pain, abdominal pain, and an increase in temperature to febrile numbers.

RESULTS AND DISCUSSION

It is known from the anamnesis that the girl, a Canadian citizen, had previously received a full range of pneumococcal vaccinations. From the first day of her stay in the department, the child received combination antibacterial therapy: meropenem with vancomycin, followed by a change to levofloxacin and sulbactomax, then to linezolid with amikacin. In addition, immunotherapy with intravenous immunoglobulin, infusion therapy in detoxification mode were carried out, nitrates, anticoagulants and antiplatelet agents were prescribed. Sanitary fibrobronchoscopy, puncture and drainage of the pleural cavity according to Bulau (puncture - purulent-hemorrhagic discharge) with the introduction of enzyme preparations into the pleural cavity were performed. On the 1st and 2nd days of the child's stay in the intensive care unit, discrete plasmapheresis (DPP) was performed using the sedimentation method with an exfusion volume of 0.8 of the circulating plasma volume. Despite the therapy, the desired positive dynamics were not observed, in particular, shortness of breath up to 70 respiratory movements per 1 minute, an increase in body temperature, and intoxication indices corresponded to a severe condition persisted.

The severity of the degree of intoxication was assessed based on the results of calculating the leukocyte intoxication index using the Kalf-Kalif formula (LII), the nuclear index of G.D. Dashtayants (NI), the leukocyte shift index according to A.Ya. Lyubimova (ISL), and the SM1/SM2

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ratio. The following data were obtained: upon admission of the child, the intoxication syndrome corresponded to moderate, on the second day of stay in the intensive care unit - severe.

Due to the ineffectiveness of conservative therapy, a conclusion was made about the need for surgical sanitation of the infection site. On the eighth day of stay in the department, thoracoscopy was performed on the right, fibrinous plaque of armor density was found on the middle and lower lobes of the lung, which was partially removed; drainage of the pleural cavity was performed in the 5th intercostal space along lin. axillaris anterior and in the 7th along lin. axillaris posterior. Already on the next day, some positive dynamics were noted in the laboratory (intoxication indices corresponded to a moderate condition). On the ninth day, the third session of DPF was performed, after which obvious positive dynamics were observed both in the laboratory and clinically due to regression of dyspnea, improved well-being, and a decrease in body temperature.

Repeat pleural culture: no microbial growth; repeat blood culture: blood is sterile. Chest X-ray: positive dynamics of the pneumonic process, right-sided fibrothorax. On the 18th day, the child was transferred to the surgical department for further treatment and rehabilitation. Chest X-ray on the 52nd day: right-sided fibrothorax persists. The presence of fibrothorax was also confirmed by chest computed tomography, the conclusion of which was fibroatelectasis of segments S1, 2 of the upper lobe on the right; fibrosis, pleural adhesions on the right.

Streptococcus pneumoniae is the most common bacterial cause of CAP in children and significant clinical improvement is expected in the first 24–48 h after starting empirical treatment with a β-lactam. Failure to respond may indicate that the causative organism is not sensitive to initial therapy; Staphylococcus aureus, and in particular the toxin-producing Panton-Valentine leukocidin (PVL) strain, or atypical organisms, such as Mycoplasma pneumoniae or Fusobacterium necrophorum, may cause severe or persistent symptoms. Equally, monotherapy with macrolides may also lead to treatment failure due to emergence of resistant strains of S. pneumoniae and therefore first-line treatment of severe CAP in our centre is always with both a β-lactam (usually intravenous co-amoxiclav) and a macrolide (usually oral azithromycin); it has been demonstrated that this regimen reduces mortality in adults hospitalised patients with CAP.

The BTS states that oxygen saturation <92% in air in older children is a cardinal sign of severe CAP; only a small number of these children will develop respiratory failure or septic shock and require mechanical ventilation on a paediatric intensive care unit (PICU) and, even then, survival in previously healthy children is excellent in developed countries. Mortality figures in England and Wales (UK) in 2021 estimate that only 0.01% of deaths in children aged ≥14 years were attributable to pneumonia. The total number of deaths caused by pneumonia across all age groups in 2021 was 25 696, reflecting the fact that there are co-existing morbidities in the adult population, while most cases in children are secondary to infection in a previously healthy lung.

Severe sepsis is defined as a systemic inflammatory response in the presence of infection with end-organ dysfunction. Septic shock occurs when there is cardiovascular dysfunction, which usually necessitates admission to a PICU for intravenous inotropic support. The incidence of this in children presenting with CAP is unclear but from our experience, even in children who present with empyema or necrotising pneumonia, it is very low. A large adult study suggests that severe sepsis is a common feature in CAP (48% of hospitalised patients) with 4.5% of patients developing septic shock.

The recent Berlin Consensus defines acute respiratory distress syndrome (ARDS) as severe hypoxaemia refractory to supplemental oxygen therapy that usually occurs within 72 h of an acute inflammatory lung injury that increases vascular permeability and decreases lung compliance. ARDS

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can be categorised as mild, moderate or severe and bilateral radiographic opacities are typically present. Pneumonia and septic shock can both lead to ARDS and these children will typically require conventional mechanical or high-frequency oscillation ventilation, both of which can accentuate the systemic inflammatory response by the mechanisms summarised in. Published mortality rates from ARDS vary from 10% to 90% with most deaths secondary to the underlying cause of acute lung injury (sepsis, trauma or burns) rather than primary respiratory failure; our experience is that this is an extremely rare occurrence secondary to CAP.

CONCLUSION

This clinical case allows us to conclude that in complicated destructive pneumonia of pneumococcal etiology, in addition to combined antibacterial therapy, taking into account the de-escalation principle, it is possible to perform surgical interventions in combination with extracorporeal detoxification methods.

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