



CURRENT TREATMENT OF ACUTE BACTERIAL DESTRUCTIVE PNEUMONIA IN CHILDREN

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Article history:	Abstract:
Received: October 1 st 2022 Accepted: November 1 st 2022 Published: December 6 th 2022	The paper presents data on the examination and treatment of 243 patients with acute destructive pneumonia. Based on this, an immunological rapid method for determining the type of pathogens of acute destructive pneumonia was developed based on the registration of antigen-binding lymphocytes (ASL) in the blood of patients that selectively react with bacterial antigens, which has significant advantages over traditional bacteriological research. A differentiated method of drainage treatment of severe pleural complications of acute destructive pneumonia in children was tested, which allows obtaining a more pronounced clinical effect compared to traditional treatment.

Keywords: acute destructive pneumonia, rapid immunological method, antigen-binding lymphocytes, intrapulmonary administration of antibiotics, differentiated method of drainage treatment.

RELEVANCE

Acute destructive pneumonia (ADP) remains a serious disease in young children [3,9,13]. In Uzbekistan, it is a common cause of child mortality (2.12). In the last decade, Staphylococcus has been gradually displaced from the etiological agents due to a wide range of gram-negative flora [1,5,14]. Treatment of patients with ADP is carried out in a comprehensive manner using surgical and medical methods aimed at sanitizing the focus, stopping the intoxication syndrome and activating the anti-infective resistance of the body [8, 10, 13].

To date, the issue of early detection of pathogens of ADP in the first hours of admission to the hospital has not been resolved, which does not allow for immediate and targeted effective antibacterial treatment [4,6,7,15]. It is known that the pathogenesis of ADP is associated with a decrease in the body's immunoreactivity, so an in-depth study of the immune system and the choice of the most effective immune correctors is necessary [14, 16]. There is a growing need to develop and implement more gentle and effective methods of drainage treatment of ADP in childhood.

Despite advances in the development of surgical and medical treatment methods, they need to be further improved.

MATERIALS AND METHODS

This work is based on the data from the examination and treatment of 176 patients with acute destructive

pneumonia. We also examined 40 practically healthy children of the same age, whose immunological status indicators served as a control. When studying the clinical and radiological picture of the disease, we identified several clinical groups in each specific case. The majority of patients were children with exudative pleurisy (31.3%) and pyopneumothorax (31.8%). The incidence of pleural complications was significantly higher in children under 3 years of age – 78.4%. The main contingent of patients were children of the first three years of life, including 30.7% - under the age of one year, from one year to three years made up the majority (47.7%) of the observed patients. Among the children we examined, there were slightly more boys (54.3%) than girls (45.7%). It should be noted that in 83.7% of patients, acute destructive pneumonia occurred against the background of various concomitant diseases and complications, which were mainly observed in children in the first three years of life. In infancy, frequent comorbidities were anaemia (90.3%), rickets (47.3%), hypotrophy (30.2%), exudative diathesis (8.9%), etc. It is important to emphasize that 94% of children had a history of acute viral infection and pneumonia.

Clinical and radiological, laboratory and immunological research methods were used to solve the tasks set by us.

Immunological studies were conducted as follows: isolation of lymphocytes by the Heim method Воуим(1974). Detection of T-lymphocytes by E-rosette formation (Jondaletal.; 135). Determination of T-



suppressors and T-helpers. They are performed by repeated tests with theophylline (K. A. Lebedev and Ponyakina 1990). Determination of antigen-binding lymphocytes (F. Y. Gharib et al., 1988). The phagocytic activity of neutrophils was studied by the method of V. M. Berman and K. M. Slavsky (1958).

Statistical analysis of the results was carried out using standard methods with the calculation of the arithmetic mean (M), its error (m), mean square deviation, and Student confidence criterion (L). To conduct rational antibiotic therapy, we have developed a new approach that includes rapid registration of pathogens based on the definition of ASL. To determine the aetiology of ADP, bacteriological and immunological examinations of patients were performed.

RESULTS AND THEIR DISCUSSIONS. Topi study the etiological structure of ADP obtained with bac. We used two indicators: the frequency of detection of the pathogen from the number of all examined and from the number of positive results after sowing. Staphylococcus was most frequently seeded – in 49 cases out of 152 studies, which accounted for 32.2%. This figure increases to 62% of the positive samples (79). In second place is *Pseudomonas aeruginosa*-9.8% and 18%, respectively. Associations of bacteria were noted, most often Staphylococcus with *Pseudomonas aeruginosa* and *Escherichia coli*.

Thus, traditional methods of bacteriological study of the lesion focus due to the low frequency of registration of pathogens and the duration of the study do not allow us to start targeted, timely antibacterial therapy. In addition, it is often impossible to obtain material for the tank in the future seeding from the focus of the pathological process (inflammatory infiltrate, pneumothorax, bullae, fibrinous pleurisy). All this prompted us to search for alternative approaches to determining the aetiology of the causative agent of ADP, which are not related to obtaining material from the lesion site and traditional cultivation of bacteria.

For the first time, we detected antigen-binding lymphocytes (ASL) reacting with bacterial antigens of the corresponding pathogen in the blood of patients with ADP. Based on this, a new opportunity has appeared – to determine the causative agent of the disease within 2-3 hours.

The method developed by F. Y. Gharib et al. in 1983 was used to determine ASL.. in 1983 y. The principle of the method is as follows: bacterial antigens prepared from pathogens of purulent diseases that, according to bacterial studies, are the cause of purulent-inflammatory destruction in ADP

(staphylococci, streptococci, *Pseudomonas aeruginosa*, proteus, *Escherichia coli*, bifidum bacteria and others) are added to the lymphocytes of patients isolated from the blood. To visualize the reactions of ASL interaction with antigens, we loaded them on red blood cells. As a result of this interaction, "rosettes" are formed, which are centrally located lymphocytes (ASL) to which test red blood cells have joined. The "rosettes" are clearly visible under a microscope; counting them makes it possible to determine the number of ASL reacting with the control antigen. As a result, it was important to compare the data for determining the causative agent of the disease by two methods: ASL and bacteriological seeding.

For this purpose, both methods are presented with parallel results: it is clearly noticeable that a significant reaction to the causative agent of the disease as a whole was noted in 87% of cases, but the etiological structure remained undeciphered only in 13% of cases. Under the same conditions, the percentage of negative values increases. The sowing rate was 48%, which is almost 4 times more compared to the ASL. The value of determining ASL increases, even more, when determining the etiological structure in patients, when obtaining material for bac. research is not possible. These include lobar infiltrates, bullae, pneumothorax, and serous-fibrinous pleurisy. Such patients in the examined group were 1/4 of them.

ASL determination has several advantages over the traditional method of bacteriological seeding of material obtained from the destruction site:

- 1) The detection rate of the causative agent of the disease increases by up to 87% compared to the bac.by seeding-52%;
- 2) The possibility of detecting the causative agent of the disease in clinical forms of ADP, when it is not possible to obtain material for bac.studies from the focus (inflammatory infiltrate, bullae, pneumothorax and serous-fibrinous pleurisy);
- 3) Speed of analysis: ASL method - within 2-3 hours, comparison with the traditional method of obtaining the results of BAC.sowing - after 2 days.
- 4) 2 times higher frequency of detection of associations, microorganisms compared to bacteriological research. When using the ak.research – 5.2%, according to the ASL method-10%;
- 5) The use of the ASL method makes it possible to reduce the frequency of negative studies in the detection of pathogens to 13%, while this indicator was at BAC.in the study, 48%, which differs 3.7 times, and in serous-fibrinous pleurisy, it reached 90%. Rapid identification of the causative agent of ADP disease allows you to select an antibiotic that is



sensitive to this type of bacterium and immediately start the antibacterial treatment of patients with ADP. This approach formed the basis for our early targeted antibiotic therapy for children with ADP. It consists of two stages:

I Stage I - determination of the type of pathogen based on the registration of ASL with the corresponding antigen in the blood of patients;

II Stage II – the correct choice of an antibiotic, taking into account the following requirements:

A) high sensitivity of the identified type of pathogen to antibiotics to ensure a bactericidal effect;

B) selective diffusion of antibiotics into the lung tissue, pleural cavity and bronchial secretions.

Analyzing the literature data on the spectrum of bacterial sensitivity to antibiotics, we have compiled a table that is the main one for choosing an antibacterial agent in the treatment of ADP.

For example, Staphylococcus usually exhibits high sensitivity to oxyacetylene, methicillin, monomycin, kanamycin, gentamicin, and lincomycin. Pseudomonas aeruginosa-to carbenicillin, gentamicin, polymyxin, erythromycin and tetracycline. Among these antibiotics, those that meet the conditions for selective accumulation in the lungs should be used. As our observations have shown, by applying a new approach to early targeted antibiotic therapy based on determining the type of pathogen, it is possible to select the right antibiotic for the treatment of patients with sufficient confidence. This method is of particular value in the treatment of lobar infiltrates. With this disease, it is not possible to take material for the bac.researches. Therefore, the only way to determine the pathogen is ASL.

The choice of antibiotics allows you to immediately start antibiotic therapy by injection into the lesion. We used intrapulmonary administration of antibiotics in the infiltrate zone in 31 children. We chose the antibiotic after determining the causative agent of the disease by the ASL method, i.e. we performed early targeted antibiotic therapy. In the case of lobar infiltrate, the use of intrapulmonary administration of antibiotics, i.e. early targeted antibiotic therapy in a complex of therapeutic measures, made it possible to achieve recovery in 93.5% of patients (29 patients). 2 patients (5%) had a pneumothorax.

Thus, intrapulmonary administration of antibiotics allows you to create a high concentration of them in the area of inflammation, prevent the development of severe pleural complications, and in some cases contribute to the abortive course of the pathological process. In general, the method of intrapulmonary administration of antibiotics used according to

indications, is a very effective preventive measure, preventing the development of purulent pleural complications.

The main goal of drainage treatment is to remove air and fluid from the pleural cavity and straighten the lung to prevent it from collapsing again. Thoracocentesis with drainage of the pleural cavity npwas performed in 72 patients. In this study, patients were divided into two groups according to the method of drainage treatment, in order to determine the comparative effectiveness of new and traditional approaches to drainage treatment.

Traditional drainage, including trocar drainage, is usually introduced urgently, without taking into account the localization of the lesion; as a rule, along the VI-VII intercostal space, mid-axillary line, and the differentiation approach provided for the introduction of trocar drainage at the level of the lesion, taking into account its localization.

Patients who underwent thoracocentesis with pleural drainage using trocar drainage according to the traditional method made I up group I (17 children). Pyopneumothorax and pneumothorax were observed in 15 patients (88%). Pyothorax in 2 patients (12%). When treated with trocar drainage, the condition of patients improved faster and the lung expanded, which was observed in 6 patients (35%). However, in 9 children (53%), a favourable clinical course was not accompanied by lung expansion. They showed a gradual, slow spreading of it. In 7 patients, the lung expanded slowly, after 2-3 weeks. Overall, the use of trocar drainage allowed recovery in 16 patients (94%). 1 patient (5%) from this group died. The duration of hospital stay was 34.1 ± 0.8 bed-days. The thoracocentesis opening on the chest wall healed in 27.2 ± 1.1 days after drainage removal.

Больным IIIIn group II patients - 55 children-we used the method of differentiated drainage of the pleural cavity. Pyopneumothorax was detected in 48 children (87%), and pyothorax in 7 children (13%).

When treated in a differentiated way, a rapid improvement in the condition with the expansion of the lung in the first hours and days was observed in 47 patients (87%), in 6 patients (11%) after a few days, only in 1 child (2%) the lung expanded in the late stages of treatment, after the second drainage was applied to 1-2 intercostal spaces above the places of introduction to the first drainage.

The duration of hospital stay was 25.2 ± 0.5 bed-days. Thoracocentric wound on the chest wall healed in 18.2 ± 6 days. 2 children (3.6%) died out of 55 patients in this group. The cause of adverse events here cannot be attributed to the use of this method (in all the



deceased, the lung remained straightened out before death). In all cases, there was progressive septicemia.

CONCLUSIONS: 1. A new rapid immunological method for determining the type of pathogens of acute destructive pneumonia, based on the registration in the blood of patients with antigen-binding lymphocytes (ASL) that selectively react with bacterial antigens, has been developed, which has significant advantages over traditional bacteriological research.

2. A method for conducting early targeted antibiotic therapy for various forms of acute destructive pneumonia, based on the rapid immunological method for determining the causative agent of the disease and the optimal choice of an antibiotic, has been developed.

3. A new approach to the treatment of inflammatory lung infiltrates was developed, based on the early detection of the causative agent of the disease by immunological method, the optimal choice of an antibiotic administered through the cutaneous-intrapulmonary lesion, which prevented the transition of the disease to the purulent – destructive stage in 93% of patients.

4. A new differentiated method of drainage treatment of severe pleural complications of acute destructive pneumonia in children was tested and introduced into clinical practice, which allows for obtaining a more pronounced clinical effect compared to traditional treatment.

5. In patients with acute destructive pneumonia, a secondary immunodeficiency condition was revealed, characterized by a significant decrease in the blood content of T-lymphocytes, T-suppressors, T-helpers, phagocytes and an increase in the concentration of immunoglobulins M, G and circulating immune complexes, which raises the question of the need for immune correction.

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