

Minimally Invasive Interventional Procedures for Pulmonary-Pleural Forms of Bacterial Lung Destruction in Children

Uglonov I.M.¹, Ollabergenov O.T.²

¹Tashkent Pediatric Medical Institute,

²Tashkent, Republic of Uzbekistan

E mail: ildamjon@gmail.com

SUMMARY

The results of treatment of 91 patients aged 1 to 17 years with pulmonary-pleural form of bacterial destruction of the lungs were analyzed. The effectiveness of programmed bronchoscopy and short-term occlusion of the bronchi in the complex treatment of pulmonary-pleural forms of bacterial destruction of the lungs in children was evaluated.

A comparative assessment of the immediate and long-term results of treatment showed a high clinical efficiency of sanitation bronchoscopy with short-term occlusion of the bronchi in the treatment of pulmonary-pleural forms of bacterial destruction of the lungs, which indicates the prospects for their widespread use, since they have high resolution and low invasiveness, and prevent the development of formidable complications. and prevent the transition of the disease to a chronic form with the development of empyema.

Abstract:

Bacterial destruction of the lungs is a severe form of purulent-septic respiratory diseases in children.

The severity of this pathology is due to the presence of a combined manifestation of respiratory, cardiac and other organ failure against the background of a pronounced intoxication syndrome and progressive changes in the bronchopulmonary system, manifested by formidable pulmonary-pleural complications that pose a threat to the child's life. Many researchers note that despite the improvement in the quality of diagnostics and the development of new methods for treating bacterial destruction of the lungs, the complications encountered continue to represent a serious medical problem in the children's contingent of patients[1, 5, 6, 7, 9, 14, 18, 19].

Analysis of the literature data indicates that the proportion of pulmonary-pleural forms of bacterial destruction of the lungs is about 26.5-60.0% in the structure of purulent-inflammatory diseases of the lungs and pleura in children, and has no significant tendency to decrease. Complex etiopathogenetic aspects of bacterial destruction of the lungs, a variety of clinical symptoms manifested by varying degrees of differentiable pathological syndromes, the development of frequent pulmonary-pleural forms of the disease due to late diagnosis, leads to a high percentage of predictable complications and an increase in unsatisfactory treatment results[2, 3, 11, 12, 13, 16, 17, 22].

The reasons for the unsatisfactory results of treatment of pulmonary-pleural forms of bacterial destruction are the inadequacy of the chosen tactics, as well as the unreasonableness in the choice of the method and method of early endoscopic or minimally invasive intervention, which leads to the forced implementation of wide traditional thoracotomies. In

this regard, controversial and sometimes contradictory questions remain in the sequence of performing one or another method of treatment based on the principles from simple to complex: conservative pathogenetic therapy, minimally invasive puncture-draining and endoscopic interventions, as well as video-thoracoscopic surgical operations. The widespread introduction of modern medical technologies into the clinical practice of pediatric thoracic surgery made it possible to choose effective methods of treating many inflammatory diseases of the bronchopulmonary system at the early stages of their development, which in turn made it possible to prevent the development of severe pulmonary-pleural complications.[4, 8, 10, 15, 19, 20, 21, 22].

The above data clearly indicate the high urgency of the problem of diagnosis and treatment of pulmonary-pleural forms of bacterial destruction of the lungs in children.

Keywords: children, bacterial destruction of the lungs, programmed sanitation bronchoscopy with short-term bronchial occlusion.

PURPOSE

Evaluation of the effectiveness of programmed bronchoscopy and short-term bronchial occlusion in the complex treatment of pulmonary-pleural forms of bacterial destruction of the lungs in children.

MATERIAL AND METHODS

This study is based on the results of examination and treatment of 91 patients with pulmonary-pleural form of bacterial destruction of the lungs, aged 1 to 17 years, who were undergoing inpatient examination and treatment at the clinic of the Tashkent Pediatric Medical Institute for the period from 2015 to 2020.

Of the total number of patients (91 cases) with pulmonary-pleural form of BDL, pyothorax was detected in 28 (21.2%) cases, pyopneumothorax in 30 (22.7%) cases, exudative pleurisy in 29 (22%) patients, fibrothorax in 4 (3.1%) patients. A severe course of the process was diagnosed in 60 (65.9%) children under the age of 7 years. To establish the nature, localization and prevalence of the pathological process in the lungs and pleural cavity, all patients underwent a standard set of studies: plain chest X-ray, ultrasound methods for examining the lungs and pleural cavity, multispiral computed tomography, which allowed specifying the form of the lesion and making a clinical diagnosis, which contributed to determination of treatment tactics in a surgical hospital.

On a mandatory basis, the patients underwent general clinical, laboratory and bacteriological studies.

RESULTS

The clinical picture of pulmonary-pleural forms of bacterial destruction of the lungs was manifested by a severe course, which in most cases was accompanied by severe impairment

of lung function with signs of respiratory disorders due to the presence of air and effusion in the pleural cavity, which required urgent surgical care.

Depending on the volume and nature of the effusion in the pleural cavity, the patients underwent puncture and drainage interventions, and after removal from a severe septic condition and stabilization of the child's body, the patients underwent sanitation bronchoscopy to reduce perifocal inflammation and edema of the bronchial mucosa. Diagnostic and therapeutic puncture of the pleural cavity was performed in all patients, it was performed according to the standard technique under local anesthesia, the puncture point was the V-VII intercostal space along the mid-axillary line, the resulting fluid from the pleural cavity was sent to the bacteriological laboratory.

In case of ineffectiveness of puncture treatment, drainage of the pleural cavity was carried out with connection to an underwater system of passive or active aspiration of pleural contents according to Bulau; this technique was performed in 83 (91.2%) patients. The pleural cavity was washed daily with a solution of decasan (in an equal percentage dilution with saline), as well as the introduction of antibiotics, depending on the sensitivity to the isolated microflora. These interventions were effective in 19 (22.9%) cases in patients who underwent drainage interventions. However, in 64 (77.1%) patients with exudative pleurisy, pyothorax, pyopneumothorax and fibrothorax, only puncture-draining interventions were insufficient, since a significant progression of the purulent-inflammatory process in the lungs and pleural cavity in these patients contributed to the weakening of compensatory and adaptive capabilities. The child's body and the development of severe respiratory disorders with hypoventilation and atelectasis of the lung, the formation of bronchopleural fistulas. This contingent of patients underwent sanitation bronchoscopy (38 patients) and programmed sanitation bronchoscopy (26 observations) with endobronchial administration of 5% metronidazole solution in an amount of 10-15 ml with an exposure of 30 to 90 seconds, followed by its aspiration. The number of sanitizations averaged up to 2-4 procedures, the daily interval between manipulations depended on the positive dynamics.

Programmed sanitation bronchoscopy contributed to the dilution and aspiration of bronchial secretions, reducing the infiltration of surrounding tissues.

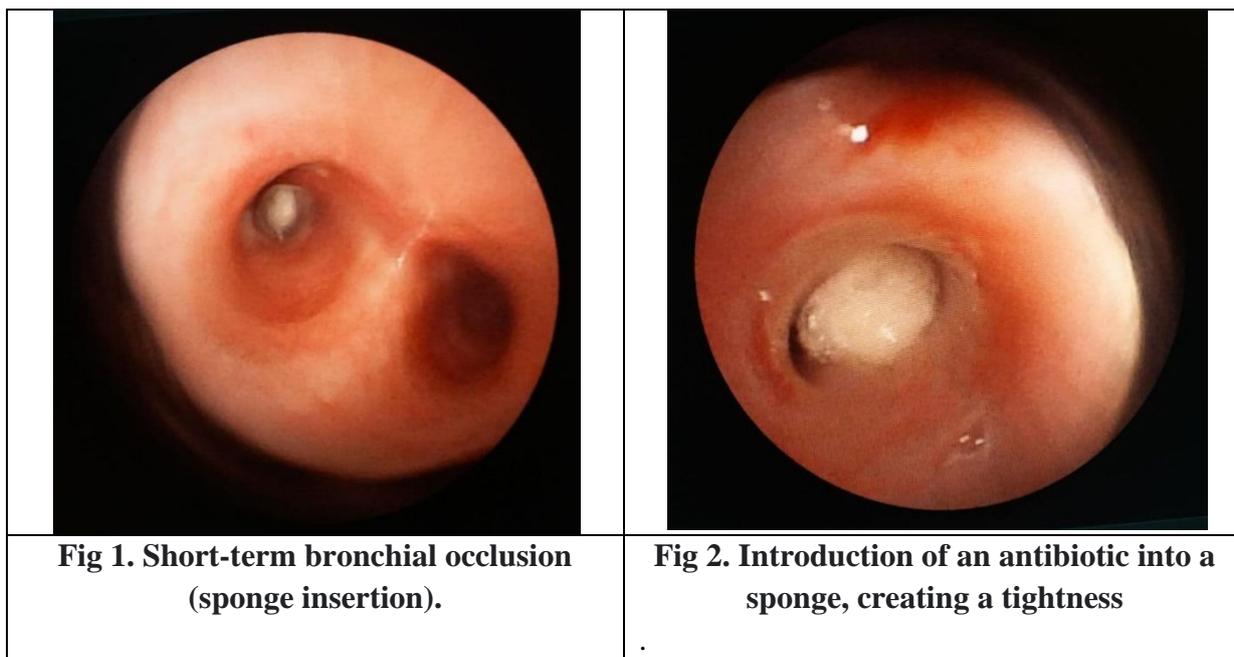
Thanks to sanitation and programmed bronchoscopy in 52 (62.6%) cases, we managed to stop the development and spread of the pyoinflammatory process, which in turn made it possible to prevent morphofunctional changes and deformation of bronchial structures.

In 12 (14.4%) patients, despite the complex treatment carried out, as well as the performance of puncture-draining interventions with programmed sanitation bronchoscopy, the formation of a persistent bronchopleural fistula with a wide base was noted, which did not allow their self-closure.

The presence of a bronchopleural fistula in these patients contributed to the violation of the sealing of the bronchopulmonary structures and prevented the expansion of the collapsed parts of the lung, in connection with which it was decided to conduct a short-term occlusion of the segmental or lobar bronchi.

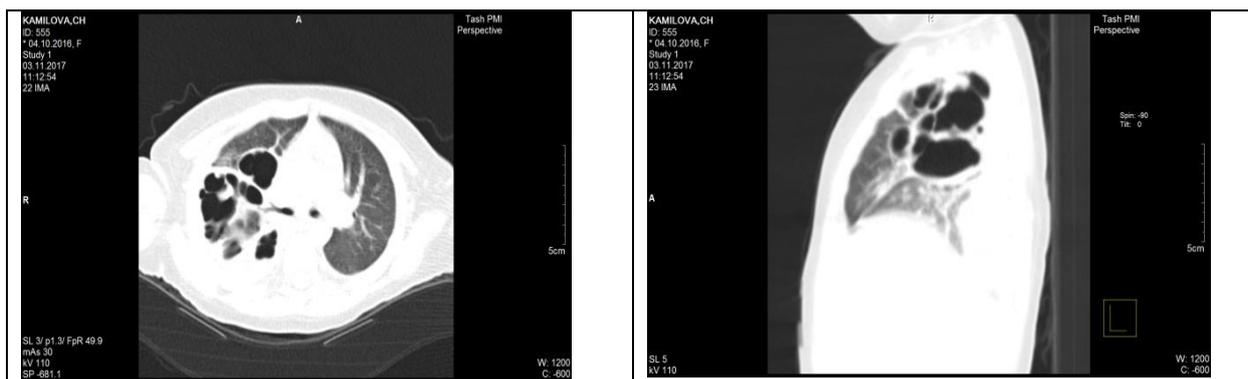
Short-term bronchial occlusion was performed under general intravenous anesthesia (Sibazone and Ketamine) using short-acting muscle relaxants (Ditilin).

Exploratory bronchoscopy made it possible to determine the localization of the bronchial fistula, a sterile dry sponge (manufactured by Merocel) was inserted into the lumen of the bronchus (Fig. 1), after which an antibiotic solution was injected into the sponge itself, the sponge increased in size, tightly closing the lumen of the bronchus, thereby creating reliable sealing (fig. 2).

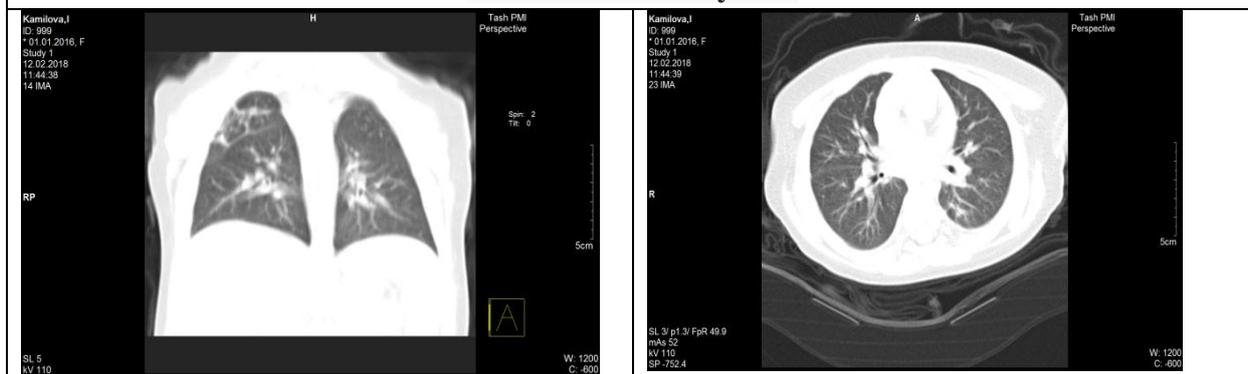


After a short-term occlusion of the bronchi, the cessation of bronchial discharge into the pleural cavity and a decrease in the phenomena of respiratory failure were noted, due to the sealing of the bronchial tree. Straightening of the collapsed areas of the lung with the restoration of their aeration was noted 2-3 days after occlusion, which served as an indication for removing the drainage tube from the pleural cavity. Complex conservative treatment with plasma transfusion and physiotherapeutic procedures was carried out until the general condition of patients improved, the main indicators of respiration and blood circulation stabilized, as well as a destructive process in the lung and pleural cavity, regression of purulent inflammation, and a decrease in the severity of intoxication.

The effectiveness of short-term bronchial occlusion was assessed by the dynamics of the clinical course of the disease, data from X-ray studies and multislice computed tomography (Fig. 3-4). The time of finding the occlusal plug averaged 7 to 15 days.



**Figure: 3. MSCT. BDL. Pulmonary pleural form. Pyopneumothorax on the right.
Patient: K.Ch. - 4 years.**



**Figure: 4. MSCT - after programmed bronchoscopy and bronchial occlusion.
Patient: K.Ch. - 4 years.**

In 77 (92.7%) cases, puncture and drainage interventions in combination with sanitation bronchoscopy and short-term occlusion of the bronchi allowed a positive resolution of pulmonary-pleural complications of bacterial destruction of the lungs. However, in 6 (7.2%) patients with pyopneumothorax and fibrothorax, despite the treatment, the destructive process led to the development of an acute form of pleural empyema, in connection with which the patient underwent video-thoracoscopic sanitation of the pleural cavity.

CONCLUSION

Thus, a comparative assessment of the immediate and long-term results of treatment of pulmonary-pleural forms of bacterial destruction of the lungs showed the advantage of performing minimally invasive interventions. The clinical effectiveness of sanitation bronchoscopy with short-term occlusion of the bronchi indicates the prospects for their widespread use, since they have a high resolution and low invasiveness in the complex treatment of pulmonary-pleural forms of bacterial destruction of the lungs. Early implementation of minimally invasive interventions for the pulmonary-pleural form of bacterial destruction of the lungs contributes to the prevention of formidable complications and the transition of the disease into a chronic form with the development of empyema.

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