# ETIOPATHOGENESIS OF BRONCHOPULMONARY DYSPLASIA

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The development of BPD is facilitated by many factors: immaturity of lung tissue, deficiency of surfactant, exposure to oxygen in high concentrations during mechanical ventilation. High oxygen concentrations have a damaging effect on both the structural and functional state of lung cells. Molecules of reactive oxygen radicals and peroxide compounds that destroy surfactant have an aggressive damaging effect. The damaging effect is associated not only with exposure to reactive oxygen radicals, but also with a decrease in the activity of antioxidant activity, a pronounced decrease in protective functions from the effects of peroxide agents in very premature babies. Barotrauma of the lungs plays a major role in the formation of BPD.

The damaging effect of hardware ventilation, deficiency of surfactant, reduction of extensibility of alveoli requires the creation of increased pressure in the respiratory tract to ensure their ventilation. mechanical ventilation in premature infants leads to the development of interstitial emphysema and rupture of the terminal bronchioles. The combined effects of high oxygen concentration and positive exhalation pressure, as well as barotrauma during long-term mechanical ventilation, play a major role in the development of the disease.

With the advent of pressure-controlled ventilators, with the beginning of the use of surfactant, therapy of the functioning ductus arteriosus, limitation of fluid load, careful use of high concentrations of oxygen in the respiratory mixture, improvement of parenteral and enteral nutrition methods, the survival rate of premature infants with severe forms of RDS, with extremely low body weight increased and changes occurred during the course of the BPD[92].

Due to the improvement of respiratory therapy and nursing techniques, the widespread introduction of surfactant replacement therapy, the survival rate of deeply premature babies increased and cases of the development of BPD began to be recorded everywhere in infants who did not need high oxygen concentrations,

long-term oxygen therapy, mechanical ventilation and did not have RDS[93]. This served as the basis for the allocation of a new BLD. The degree of respiratory disorders and the severity of RDS in children with new BPD is less or they do not have RDS, the average airway pressure and the percentage of oxygen in the inhaled mixture are lower, and radiographic changes are minimal. Children with new BPD have a positive effect on the administration of exogenous surfactants, which is manifested in a rapid improvement in respiratory function[94].

[92] The national program to optimize feeding children first year of life in the Russian Federation. – Moscow, 2010. – 86 p.
[93] *Ovsyannikov D.Yu., Bolibok A.M., Daniel M.* Abu-Modern approaches to prevention and treatment of bronchopulmonary dysplasia // Vestnik sovremennoj klinicheskoj mediciny. – 2016. – Vol. 2. – P.29-35.
[94] Sakhipova Gulnara Adyevna (2016). Bronchopulmonary dysplasia in children. Baikal Medical Journal, 145 (6), 5-9.

Clinical picture of bronchopulmonary dysplasia

Unlike children with classic BPD who require multi-day ventilators with high oxygen content, patients with new BPD often have minimal oxygen demand in the first days and weeks of life[95]. Only after a few days or weeks do these children begin to experience progressive deterioration of lung function, which is characterized by an increase in the need for ventilation and oxygen, and signs of ongoing respiratory failure. Consequently, a feature of the clinical picture of the new BPD is also the late, delayed development of oxygen dependence.

The initial manifestations of the disease are closely related to the clinical picture of RDS. With uncomplicated RDS, improvement usually occurs on the 3-4th day of life. The first sign of the possible formation of a BPD is the prolonged course of the RDS[96].

The clinical picture of BPD is represented by the symptoms of chronic respiratory failure in premature newborns, dependent on high concentrations of oxygen in inhaled air and mechanical ventilation for a more or less long time. With a mild course, it is impossible to reduce oxygen concentration and soften ventilator parameters for 1-2 weeks, lengthening the recovery period after respiratory failure; in severe – against the background of mechanical ventilation, hypoxemia, hypercapnia are preserved, «it is not possible to remove a child's » from mechanical ventilation for several months. Reintubations are a risk factor for severe disease. The clinical picture of the new form of BPD is characterized by long-term oxygen dependence and, at the same time, a relatively rare occurrence of BOS. For children with BPD, «air leakage syndromes » (pneumothorax, pneumomediastinum, interstitial emphysema) are typical; attacks of apnea with bradycardia, acquired infectious processes in the lungs (pneumonia, bronchitis), hypotrophy such as hypostatura and other deficiency conditions (premature rickets, anemia)[97].

The treatment and prevention of bronchopulmonary dysplasia BPD is difficult to treat, so special attention should be paid to its prevention. Manual ventilation of the lungs at birth, even after several deep breaths, leads to serious damage to the lung, causes the development of neutrophil infiltration, reduces the effect of subsequent surfactant therapy and predisposes to subsequent volumotrauma in mechanical ventilation. The tactic of early initiation of continuous positive airway pressure (CRAP — Continuous Positive Airway Pressure) and selective administration of surfactant may be more effective than routine preventive administration of surfactant in children at risk of developing BPD; Also in the CPR group, a lower incidence of death or BPD was noted.

Ventilating can be avoided using the INSURE (Intubate – Surfactant – Extubate to CPAP) technique. In RCT, it has been shown that the use of this technique reduces the need for mechanical ventilation and the frequency of subsequent development of BPD. More full-term newborns may often undergo extubation with conversion to CPAP or

[95] *Panchenko A.S., Gaimolenko I.N., Tikhonenko O.A., Ignatieva A.B.* Bronchopulmonary dysplasia: causes of forming and morphology of pulmonary tissue // Sibirskij Medicinskij Zurnal (Irkutsk). – 2013. – Vol. 117. №2. – P.61-64.
[96] *Pavlinova E.B.* Bronchopulmonary dysplasia: state of the art // Omskij Nauchnyj Vestnik. – 2011. – №4. – P.20-22.
[97] *Allen J., Zwerdling R., Ehrenkranz R., et al.* American Thoracic Society. Statement on the care of the child with chronic lung disease of infancy and childhood // Am. J. Respir. Crit. Care Med. – 2003. – Vol. 168. – P.356-396.

intermittent positive pressure nasal ventilation (NIPPV) immediately after surfactant administration[98].

**MAIN PART**

A comparative analysis of the use of two intermittent positive pressure (NIPPV) and continuous positive pressure (NCPAP) nasal ventilator regimens in preterm infants after extubation, which included 8 studies that compared extubation patterns in NIPPV and NCPAP in 1,316 neonates, demonstrated a statistically and clinically significant reduction in the risk of extubation failure and reintubation rates. However, there was no statistically significant decrease in the incidence of mortality and the formation of PDD against the background of the use of NIPPV[99].

Caffeine therapy should be part of standard care for very premature babies. The Caffeine for Apnea of Prematurity study examined the long-term effects of neonatal caffeine therapy. Randomization of 2,006 children weighing less than 1,250 g at birth for caffeine or placebo therapy in the first 10 days of life or longer until a decision is made that there is no need for therapy. The use of caffeine led to faster extubation (29.1 and 30 weeks of postconceptual gestational age, respectively), and a reduction in oxygen dependence (33.6 and 35.1 weeks of postconceptual gestational age). Caffeine significantly reduced BPD frequency (36.3 vs 46.9%). In addition, early (in the first 10 days of life) caffeine administration significantly reduced the incidence of PDA, which requires medication or surgical treatment, as well as the number of children with an unfavorable neurological outcome by the 18-21st month of life. Caffeine therapy is believed to be part of standard therapy for deeply premature infants with RDS, as it promotes successful extubation and reduces the incidence of BPD.

In the pathogenesis of BPD, persistent inflammation of the respiratory tract is of great importance, therefore the main means of pathogenetic therapy of the disease are glucocorticosteroids, of which dexamethasone is the most widely used. The prescription of systemic steroids in these patients is conditionally divided into early (up to 7 days of life) and later (after 7 days of life). Prescribing dexamethasone due to its anti-inflammatory effects to very low and extremely low weight premature infants on mechanical ventilation leads to improved gas exchange in the lungs, reduces the need for high FiO2 and ventilation duration, BPD frequency. The higher the risk of BPD, the more likely it is that the benefits of corticosteroids will outweigh the risks. Indications for the administration of dexamethasone: (1) long-term dependence on mechanical ventilation (more than 7 days); (2) unsuccessful attempts at extubation; (3) FiO2 › 35-50%; (4) need for high peak inspiratory pressure in mechanical ventilation; (5) mean airway pressure MAP › 7-10 cm of water; (6) radiographic data indicating a decrease in lung tissue transparency.

Considering the data obtained on the benefit/harm ratio from the use of this therapy and the currently limited evidence base, it seems reasonable to maintain later (after 7 days of life) the start of corticosteroid therapy in those newborns who have difficulty stopping mechanical ventilation, using minimal doses drugs and duration of therapy.

[98] *Tatochenko V.K.* Vaccination of preterm and LBW infants. // Pediatricheskaja farmakologija. – 2013. – Vol. 10. №4. – P.30-36.
[99] Verder H., Robertson B., Greisen G., et al. Surfactant therapy and nasal continuous positive airway pressure for newborns with respiratory distress syndrome. Danish-Swedish Multicenter Study Group // N Engl J Med. – 1994. – Vol. 331. – P.1051-1055.

The use of inhaled corticosteroids in children with developing or formed BPD reduces the incidence of the disease, leads to a decrease in the incidence of symptoms, or improves outcomes. Evidence has been obtained that long-term administration of budesonide in the form of a suspension as anti-inflammatory control (basic) therapy to children with BPD leads to the elimination of tachypnea and shortness of breath at rest, a decrease in the frequency of exacerbations of BPD and hospitalizations in connection with them, reduces the severity of symptoms of respiratory failure, modifies the course of the disease in the direction of reducing severity, and also reduces the level of proteolysis enzymes, active in the first half of life in children with BPD.

Inhaled bronchodilators include β2agonists (salbutamol), anticholinergics (ipratropium bromide), or a combination thereof. Unlike healthy children, children with BPD have hypertrophied bronchial smooth muscles. This is associated with the positive effect of administering bronchodilators to patients with this disease[100]. Research results indicate that inhaled bronchodilators have a positive effect if used in children with symptoms of bronchial obstruction[101]. A domestic study of the effectiveness of inhaled bronchodilators in newborns with BPD showed a positive effect after inhalation administration (through an intubation tube against a background of mechanical ventilation or through a nebulizer) of salbutamol and the combined drug beroduala (phenoterol + ipratropium bromide).

Parenteral nutrition (nutrient-subsidized nutrition) and early initiation of enteral nutrition are important for children with very low body weight and extremely low body weight. When conducting parenteral nutrition, adapted amino acids should be used; along with the fat emulsion, it is advisable to administer combined multivitamin preparations, especially if complete parenteral nutrition is delayed for more than one week. If it is necessary to artificially feed premature babies with BPD, it is advisable to use only specialized mixtures for premature babies (with a high protein content, providing high calorie content in small volumes)[102].

The course and prognosis of BPD depends on the prevalence and severity of the lung lesion. In typical cases, severe BPD is severe, with frequent complications and exacerbations, pneumonia and broncho-obstructive syndromes are characteristic. Children with BPD have a tendency to frequent respiratory diseases with a risk of developing bronchospasm, and airway hyperreactivity persists for several years. Normalization of clinical and functional indicators of the lungs occurs only by the 7-10th year of life.

## CONCLUSION

The outpatient stage of observation is one of the important stages of treatment and observation of patients with BPD. Dynamic outpatient observation by a pediatrician and pulmonologist in outpatient settings is indicated at least 2-3 times a year. Children over 3 years of age, with a history of BPD, are observed by a pulmonologist in the event of the formation of a chronic bronchopulmonary process in the outcome of BPD. At the outpatient

[100] Davydov I.V., Namazov-Baranova L.S., Yatsyk G.V. Prevention strategies at the stages of formation and course of bronchopulmonary dysplasia // Pediatricheskaja farmakologija. – 2014. – Vol. 11. №2. – P.34-40.
[101] Sandri F., Plavka R., Ancora G., et al. CURPAP Study Group: Prophylactic or early selective surfactant combined with nCPAP in very preterm infants // Pediatrics. – 2010. – Vol. 125. – P.e1402-e1409
[102] The national program to optimize feeding children first year of life in the Russian Federation. – Moscow, 2010. – 86 p.

stage of monitoring children with BPD, mandatory control of mass growth gains, psychomotor development, treatment of concomitant pathology, prevention of respiratory syncytial viral infection (immunization with palivizumab), vaccination in accordance with the National Calendar is carried out.

## REFERENCES:

**1.** Bronchopulmonary dysplasia: Guidelines / Ed. N.N. Volodin. – Moscow: Medical University, 2010. – 56 p.

**2.** Davydov I.V., Yatsyk G.V., Lukina O.F., et al. Experience with inhaled steroids in children with bronchopulmonary dysplasia in the first six months of life // Pediatricheskaja farmakologija. – 2008. – №6. – P.42-44.

**3.** Ilyina S.V., Namazova-Baranova L.S., Baranov A.A. Vaccination for All: tough answers to difficult questions: a guide for physicians. – Moscow: Pediatr, 2016. – 204 p.

**4.** The national program to optimize feeding children first year of life in the Russian Federation. – Moscow, 2010. – 86 p.

**5.** Ovsyannikov D.Yu., Bolibok A.M., Daniel M. Abu-Modern approaches to prevention and treatment of bronchopulmonary dysplasia // Vestnik sovremennoj klinicheskoj mediciny. – 2016. – Vol. 2. – P.29-35.

**6.** Sakhipova Gulnara Adyevna (2016). Bronchopulmonary dysplasia in children. Baikal Medical Journal, 145 (6), 5-9.

**7.** Pavlinova E.B. Bronchopulmonary dysplasia: state of the art // Omskij Nauchnyj Vestnik. – 2011. – №4. – P.20-22.

**8.** Panchenko A.S., Gaimolenko I.N., Tikhonenko O.A., Ignatieva A.B. Bronchopulmonary dysplasia: causes of forming and morphology of pulmonary tissue // Sibirskij Medicinskij Zurnal (Irkutsk). – 2013. – Vol. 117. №2. – P.61-64.

**9.** Tatochenko V.K. Vaccination of preterm and LBW infants. // Pediatricheskaja farmakologija. – 2013. – Vol. 10. №4. – P.30-36.

**10.** Allen J., Zwerdling R., Ehrenkranz R., et al. American Thoracic Society. Statement on the care of the child with chronic lung disease of infancy and childhood // Am. J. Respir. Crit. Care Med. – 2003. – Vol. 168. – P.356-396.