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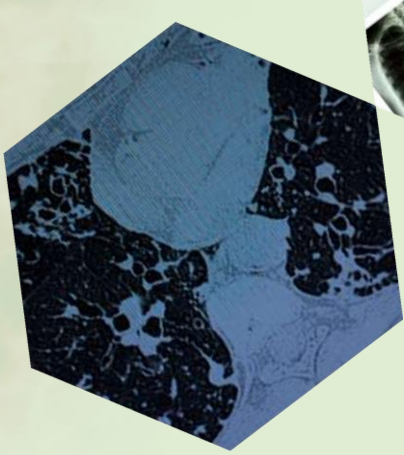
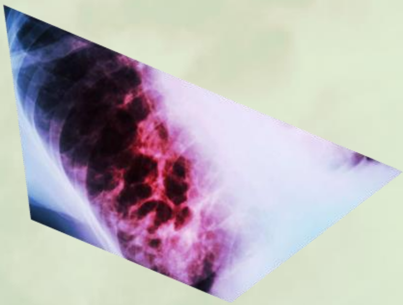
BRONCHIECTASIS
IN CHILDREN



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BRONCHIECTASIS IN CHILDREN

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The monograph presents the modern treatment of bronchiectasis in children. ExperBRONCHIECTASISn endobronchial application of ozone and laser radiation in purulent endobronchitis. The etiology, pathogenesis, clinical picture, design, OSI,s and morphological changes of the lung in bronchiectasis in children are described in detail. The method of conservative and surgical treatment of bronchiectasis developed by bauthorsorsrsandd and performed in a large contingent of patients and presented by extensive clinical material is highlighted.

The monograph is intended for pediatric surgeons, pediatricians, clinical residents, and students of medical institutes.

Reviewers:

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Introduction

The literature of recent years shows an abundance of works on the diagnosis and surgical treatment of bronchiectasis (BED) in children. On the one hand, this reflects the intensity of scientific research in this area, but on the other hand, it indicates that the proposed multilateral diagnostic and treatment programs for this pathology are still far from being resolved. The effectiveness of surgical treatment of PEB is beyond doubt, however, several intractable problems associated with bronchopulmonary complications in the postoperative period remain to date. The most common and malignant causcausessuch complications areiselectasis, pneumonia, fistula of the bronchus stump, and pleasantries, which are the result of endobronchitis undertreated in the preoperative period, especially its hypersecretory forms. In the complex of applied measures for the treatment of chronic purulent endobronchitis, various methods are used: antibiotics, antiseptics, endobronchial lavage, etc.

Suppurative lung diseases in children occur against the background of inhibition of the body's activity. In this regard, it is of great interest to use the radiation energy of low-energy lasers and ozone in the treatment of this category of sick children. A review of the literature shows that low-energy laser therapy is widely used in the treatment of bronchopulmonary pathology, in particular: endobronchial, intravascular, endothoracic, and external laser irradiation.

Many diseases are based on pathological conditions caused by tissue hypoxia and infection. In this regard, over the past few years, ozone-oxygen therapy has found worthy application among many other methods of treatment. The high oxidizing power of ozone manifests itself in the form of bactericidal, virucidal, and fungicidal properties.

Recent studies have established that ozone therapy is a new non-drug method of treatment. The high oxidizing power of ozone manifests itself in the form of bactericidal, virucidal, and fungicidal properties. In the available literature, we have come across a small number of works devoted to the use of ozone in thoracic surgery in general, especially its endobronchial use; there are no data on the degree of permissible ozone ratio in therapeutic mixtures for children.

However, there are no works devoted to the analysis of the effectiveness of the combined endobronchial application of laser and ozone in the available literature. There is only scattered and conflicting information about each of these methods, but there is no detailed description of them in a comprehensive version. A high percentage (10-43%) of postoperative complications and persistent mortality, especially in childhood, indicate the relevance of the problem and the need for further search for adequate methods of preoperative preparation in this category of patients.

According to the research results, the high efficiency of endobronchial ozone-laser therapy in the treatment of experimental purulent endobronchitis has been proven. The high efficiency of ozone-laser therapy in the treatment of endobronchitis in BEB in children was determined as a modern non-drug method of preoperative preparation. The study of the immediate and long-term results of surgical treatment of BEB in children showed that the use of ozone-laser therapy allows you to perform surgical interventions in the stage of remission of the disease, respectively, reducing the number of postoperative complications from 39.5% to 22.4%, and lethality from 9.3% to 3.5%. Endobronchial laser therapy in the treatment of endobronchitis in BEB in children is effective when using an apparatus of the ALT type "Sogdiana" with a wavelength of 0.67 μm, at a dose of 4.87 J/cm2. It is advisable to perform endobronchial ozone therapy with a bubbling physiological solution of ozone with an oxygen mixture (with a concentration of 5 mg/l using the OTRI-01 device). The combined use of ozone and laser in the complex treatment of BEB in children can reduce the time of preoperative preparation and reduce the number of postoperative complications since the impact of two physical methods (ozone + laser) accelerates the regression of inflammatory changes in the bronchial wall. The implemented diagnostic complex and the use of ozone + laser therapy in the (preoperative period) BEB in children allows you to establish a diagnosis of the disease, outline a treatment strategy and tactics of surgical intervention

CHAPTER I

MODERN ASPECTS OF DIAGNOSTICS AND TREATMENT OF BRONCHIECTASIS DISEASE IN CHILDREN

(Literature review)

Overview of bronchiectasis

Until the last century, “bronchiectasis disease” (BED) was referred to in the literature as chronic pneumonia (CP). Currently, the most stable alternative terms for CP are “bronchiectasis”, “bronchiectasis”, “chronic bronchitis”, “bronchitis deformans”, and “pneumosclerosis”. CP occurs with a frequency of 0.45 - 0.9 per 1000 children and is detected in 50-70% of children with chronic non-specific lung diseases. The interest in bronchiectasis is explained by the fact that the incidence increases annually throughout the world, and disability and mortality from this pathology are growing [1, 13, 46, 99].

BEB is a disease based on localized suppurative processes, irreversibly multiple, pathological, and functionally defective expansions of the bronchial walls, in which chronic inflammation develops, as a rule, with purulent exudation into their lumen and sclerotic changes in the peribronchial tissues [4, 20].

The development of bronchiectasis (BE) is a polyetiological process. It may be based on a genetically determined inferiority of the bronchial wall, and the impact of various pathological processes on the developing lung in the embryonic period in the period of postnatal development. BE is most often the result of acute pneumonia suffered in childhood. According to the literature, in more than 2/3 of patients, the disease begins before the age of 18, in 1/2 - younger than 5 years, and in 1/3 of them - in the first year of life. This is due because lungs in the first years of a child's life have not yet completed their development. In the development of EB in children, the features of the anatomical structure of the bronchial tree are also important, since the drainage function of the left bronchus is worse than the right one, and therefore the process is more common on the left. Another reason for the development of BE may be foreign bodies in the respiratory tract. It has been experimentally proven that even a short stay of foreign bodies in the bronchi can lead to the occurrence of BE [9, 24, 38, 99].

Primary tuberculosis plays a certain role in the occurrence of BEB, in which impaired ventilation of the lung is associated with compression of the bronchial wall by the lymph nodes, and subsequently with sclerosis of the peribronchial tissue [15, 126, 127]. The reasons for the development of BE, so far, cannot be considered definitively installed. Any lung disease leading to BE goes through the stage of chronic endobronchitis (CE) [16, 35, 38, 103].

According to modern concepts, two factors play the most important role in their occurrence - impaired bronchial patency and infection. Violation of bronchial patency and inflammation of the bronchi is trigger mechanisms for the I formation of BE. The primary inflammation is accompanied by ba bronchial obstruction, which exacerbates inflammation [19, 20]. The purulent process of the bronchi, affecting its wall, leads to degeneration of the cartilaginous plate, smooth muscle, and neurovascular elements of the bronchi, their replacement with scistisue and expansion of the lumen [26, 120, 123]. As a result, the bronchi lose their normal elasticity, and, under the influence of the so-called “bronchodilating forces” (increased endobronchial pressure when coughing, stretching the bronchi with accumulated secretions, etc.), they gradually expand and become functionally inferior. Simultaneously with the change in the walls of the bronchus, there is a change in the lung parenchyma with partial or complete atelectasis due to a violation of the activity of the surfactant, the lipoprotein complex, which causes the surface tension of the alveolar membrane to be maintained at a certain level. Therefore, with CE, the phenomena of pneumosclerosis of varying degrees develop.

Bacteriological examination of purulent contents or bronchial lavage in CE in most patients reveals a mixed flora. Especially often - in 41% of cases - Clebciella is found 2 times less often - pseudomonas and staphylococcus aureus 4 times less often than Haemophilus influenza ca, even more rarely proteus and staphylococcus, as well as acid-resistant bacteria. According to [10, 18], microflora was detected in 50.5%, staphylococcus was the most common - in 60%. When sowing tissue of regional lymph nodes taken from 25 patients from the root of the affected parts of the lungs during surgery, microflora was not detected, while in sputum, and throat swabs in these patients, microorganisms were not sown from bronchial secretions. In 24.6% of patients, the microbial landscape of the bronchial tree turned out to be polymorphic. Pneumococcus (33.3%), staphylococcus (20%), streptococcus (17.7%), gram-negative flora - 11.1% were often sown, and yeast-like fungi were isolated in 17.7%. According to Danilin A.B. 2011 [15], five or more component associations of microorganisms were seeded from bronchial lavage [128, 129, 131]. The predominant pathogen was pneumococcus. The total microbial count in bronchial lavage was 106-105 colony-forming units (CFU) [63, 78, 82, 90, 111]. The isolated flora in most cases was sensitive to gentamicin [7, 8, 18, 30, 84].

Thus, it should be noted that almost all infections of the bronchopulmonary zone have a polymicrobial aerobic-anaerobic character. It can be concluded that Pseudomonas aeruginosa, and staphylococcus aureus, which ultimately generate the development of BEB, are the most common causative agent of respiratory system infection. The system of local protection of the respiratory system is also important in the appearance and progression of BE. It consists of factors of nonspecific and specific immunity. Local immunity of the mucous membranes of the respiratory tract is only relatively isolated and does not depend on general immunity.

There are several links to local lung protection: 1) mucociliary link, 2) humoral link, 3and) cellular link.

Violations in one or more links of the local defense system can be composed of pathogenetic or predisposing factors in the development of bronchopulmonary pathology, and determine the course, nature of the complication, and prognosis of the disease.

Full mucociliary clearance is provided by a combination of the movement of the cilia of the ciliated epithelium of the bronchi and the changing viscosity of the mucus covering them.

1. The efficiency of mucociliary clearance also depends on the rheological properties of the bronchial secretion, which is a complex mixture of products of epithelial cells of the respiratory tract and tissue transudate - surfactant [32, 92]. So the violation of tracheobronchial clearance due to damage to the ciliated epithelium and changes in the state of aggregation of the secretion is an attributive link in the pathogenesis of BEB of the lungs in children.

2. Among the factors of the humoral link of local immunity, immunoglobulins are of great importance. The main role in the processes of protection of the tracheobronchial tree belongs to secretory immunoglobulin A (SIgA) Korotaeva N.V., Nastausheva T.L., Ippolitova L.I. 2017 [25]. At the same time, the authors cannot rule out a secondary impairment of SIgA synthesis, as a result of actively current purulent endobronchitis. It has been established that a significant decrease in SIgA during long-term bronchial inflammation is due to the absence of cells in the bronchial epithelium capable of synthesizing the secretory component [2, 7, 21, 130].

3. One of the features of local immunity of the bronchial mucosa during suppurative processes is the predominance of neutrophils, and this does not always indicate their high phagocytic function. Pizzutto S.J., Grimwood K., Bauert P. 2004 [120]. In BEB, the motor and phagocytic activity of neutrophils is inhibited [40, 48, 93, 101].

The chronic course of the inflammatory process in the lungs is facilitated by a decrease in the number of alveolar macrophages and a decrease in their phagocytic activity. Alveolar macrophages phagocytize corpuscular particles from the air and blood, carry out erythrophagocytosis, and affect tumor cells infected with the virus. They produce interferon, lysozyme, glycosidase, and complements,participatingipate in the exchange of surfactant and lipids. These functions are important for cleaning the respiratory tract, antiviral, antimicrobial, and antitumor protection of lung immunological responses, and regulation of inflammation [87, 118, 124].

Together with alveolar macrophages and neutrophils, lymphocytes take part in counteracting violations of the physiological conditions of the bronchi and alveoli [14, 55].

Thus, a violation of tracheobronchial clearance due to damage to the ciliated epithelium and changes in the aggregate state of the secretion is an attributive link in the pathogenesis of pulmonary EBV. alveolar macrophages, neutrophilic granulocytes, lymphocytes, and their associated humoral factors protect the respiratory sections of the lungs from pathogenic factors.

The state of the body's immune system in chronic suppurative lung diseases (COPD) is the subject of many works. Infection of the lower respiratory tract in children can be one of the important manifestations of insufficiency of the immune system. Features of the course of the inflammatory process and its prognosis depend on the state of specific and nonspecific immunity. [3, 61, 125, 133].

Analysis of the results of immunological studies shows that the development of both acute and chronic suppuration in the lungs is accompanied by a decrease in the absolute and relative number of T-lymphocytes in the peripheral blood. According to Yakovlev S.V., 2012 [59] in children with CP against the background of congenital malformations of the bronchopulmonary system, the decrease in T-lymphocytes was the most pronounced D'Urso A., Forte A., Gallinaro LS, 2002 [76].

According to Sinha S., and Gureria R. 2004 [128], in children with CP, there is a change in the ratio of T-helpers and T-suppressors against the background of a decrease in the number of T-lymphocytes.

Research by Omarov K.A. et al. 2002 [39] showed that in patients with BE the inhibition of the functional properties of T-lymphocytes occurs. With the transition of inflammatory changes to suppuration or abscess formation, T-cell deficiency is aggravated. An increase in the level of B-lymphocytes in patients with chronic pneumonia can be combined with their dysfunction.

Literature data concerning changes in the phagocytic activity of neutrophils during suppurative processes in the lungs are contradictory. Transient acquired disorders of humoral immunity are observed in 30% of children with chronic inflammatory bronchopulmonary diseases Polosukhin V. V. 2009 [41]. At the same time, the results of the study of the immune status of patients with BE showed a significant decrease in the level of IgA against the background of an increase in the content of IgG in the blood serum. According to Shoikhet Ya.N. (and others) 2006 [56], in children with CP, the level of IgA does not differ significantly from the norm, and the amount of IgG is increased. Other authors also pointed to an increase in the level of IgG in CP in children. The level of IgM is also subject to significant fluctuations [86, 95, 133].

The analysis of literary sources allows us to conclude that patients with COPD have impaired systemic immunity. The most frequently observed decrease in the relative and absolute number of T-lymphocytes, dysfunction of B-lymphocytes, impaired phagocytic activity of neutrophils, and dysgammaglobulinemia [133].

The generally accepted division of BE according to the etiological basis has no practical significance, since it is impossible to reliably determine the cause of their occurrence in most cases. EB is usually divided into primary (“idiopathic”) and secondary, which are a complication of any disease transferred by the patient - chronic bronchitis, chronic pneumonia, tuberculosis, the foreign body of the bronchi, etc. Much more important is the division of BE into atelectatic, arising in atelectatic lung tissue or accompanied by the development of fibroatelectasis, and non-atelectatic, in which areas of emphysema and pneumosclerosis alternate in the surrounding lung tissue. Atelectatic BE, as a rule, is limited to one or two lobes of the lungs, more often the lower (sometimes together with lingual segments) or middle. Non-atelectatic EBs are less localized and may occur simultaneously in different parts of one or both lungs. According to the form of bronchial expansion, cylindrical, saccular, cy,stic and mixed EBs are distinguished. In atelectatic areas of the lung, saccular EBs are more common, and in non-atelectatic EBs, they are more often cylindrical or mixed. Cystic forms are more common in congenital BE.

Diagnosis of BEB in children

Based on the history and physical examination, the diagnosis of BE and its localization can only be approximated. A characteristic cough and profuse wheezing of various sizes, localized in the lower parts of the lung, can only suspect the presence of BE. The clinical picture of BE depends on the volume and severity of inflammatory diseases. The disease is often accompanied by a cough with light, and then gray or purulent sputum, especially in the morning, and moderate fever [85, 61, 68, 73]. Cough with purulent sputum persists even in light intervals, and with an exacerbation of the process, its intensity increases sharply. Sputum acquires an unpleasant odor, becomes two-layer (when settling), pain in the chest Bloch KE, Weder W, Boehler A. 2002 [69]. Such clinical manifestations as fetid purulent sputum, purulent intoxication, and cardiopulmonary insufficiency, which were considered classic, are now rare in children. Children lag in development, often get sick, get tired quickly, and landnanoticeablybly paler than their healthy peers. With extensive bilateral BE, changes in the nail phalanges and nails (symptomptom of "drum sticks and watch glasses"), characteristic of hypoxia and chronic intoxication, can be observed [83, 98, 104].

When roentgenoscopy and on survey pictures, only atelectatic areas of the lung are quite clearly revealed, as well as changes in the lung pattern and foci of pneumosclerosis. Tracheobronchoscopy (TBS) plays an important role in the diagnosis of BE [108, 109]. It allows you to visually assess the state of the tracheobronchial tree, perform sanitation and restore bronchial patency [29, 33, 88, 90].

In addition to visual assessment of the state of the tracheobronchial tree, during the treatment of HBS, diagnostic bronchoalveolar lavage (BAL) can be performed. This research method has opened up fundamentally new opportunities for morphological, biochemical, and immunological assessments of compensatory-adaptive reactions in human lungs in normal and pathological conditions. Figuratively speaking, BAL is a window into the lungs, which makes it possible to determine the nature and severity of endobronchitis (and sometimes to determine the cause of bronchiectasis, for example, with a previously undiagnosed foreign body [91, 106, 117, 121, 124, 130]. BAL allows you to control the functional activity of polymorphonuclear leukocytes and alveolar macrophages in the bronchoalveolar space of patients with BE during the use of endoscopic methods of treatment [115, 122, 134].

To verify the diagnosis, it is necessary to perform tracheobronchography (TBG), which in recent years has been successfully replaced by computed tomography (CT) and nuclear magnetic resonance imaging (NMR) of the lungs. Also, in the diagnosis, functional research methods are used, such as spirography, and spirometry, which for low assessing the degree of obstruction in the bronchial tree [54, 77, 114, 116]. The final diagnosis of BEB is established after a morphological study of biopsy specimens in the postoperative period Kurtukov V.A. 2007 [32].

An analysis of the literature demonstrates the advantages of one method or another, but there are clear signs of discrepancy in assessing the diagnostic value of the methods. There are only attempts to combine such simple methods as a total assessment of LII, AIR, radiological methods, tracheobronchoscopy (TBS), tracheobronchography (TBG), studies of bronchoalveolar lavage fluid (BALF), neutrophil cytosis index (INC), bacteriological studies of lavage fluid, studies of anti-infective resistance of the organism (AIR) and leukocyte intoxication index (LII). The introduction of such a complex examination of children with BE during the preoperative period should determine the optimal preoperative preparation.

Treatment of bronchiectasis

The advances in thoracic surgery in recent years have made it possible to significantly improve the immediate and long-term results of the treatment of PEB. The methods of complex therapy for patients with BEB have been developed and summarized in sufficient detail. Nevertheless, despite the well-known advances in pediatric surgery over the past three decades, the problem of treating various forms of CE in BE remains relevant [35, 45, 65, 69].

The main cause of exacerbation of the bronchopulmonary process and subsequent early or late complications of BEB in etiology in children is localized or widespread chronic purulent endobronchitis, which is difficult to treat. Particularly big problems arise in the treatment of reactive ascending endobronchitis in patients with BE, in which bronchial obstruction syndrome is the leading cause of respiratory failure. In the clinic of pulmonary surgery, with uncontrolled purulent endobronchitis, the risk of postoperative complications, such as atelectasis, pneumonia, and the formation of a fistula of the stump of the resected bronchus, is significantly increased. That is why the main goal of the preoperative preparation of the patient is the effective sanitation of the tracheobronchial tree, aimed at eliminating reactive endobronchitis and suppressing purulent inflammation, localized in the area of irreversible changes in the bronchopulmonary tissue to be resected Danilin A.V. 2011 [15].

Conservative treatment of chronic bronchopulmonary pathology remains one of the serious and urgent problems of pediatrics. The task of therapeutic measures in this pathology is to restore or replace the drainage function of the bronchi and suppress the activity of microflora [28, 49, 51, 58, 64, 79].

Since mechanical sanitation of the bronchi does not ensure their sterility, it is proposed to combine it with intratracheal and especially endobronchial administration of antibiotics Avdeev S.N. [6]. With this method, high concentrations of the drug are achieved in the focus of chronic pulmonary inflammation, which persists for 3-6 days, while the level of antibiotics in the blood serum and unaffected areas of the lung remains low. To prolong the effect and better penetration into the lung tissue, ultrasonic cavitation of the antibiotic solution L.I. Dvoretsky is used. 2011 [17].

New methods have been developed for the treatment of inflammatory lung diseases, which consist of the combined use of drugs introduced into the body by various methods and galvanic current directed to the chest in the projection of the lesion. The combined use of drugs and galvanic current is known as interstitial electrophoresis. The method is based on the principle of electroelimination of drugs from vessels into tissues under the influence of a direct current electric field. The application of the method is especially effective in patients with COPD in case of pronounced activity of the inflammatory process in the bronchi and lung parenchyma. The disadvantage of the method is poor penetration into areas of pneumosclerosis O'Donnell D. E. (et al.) 2008 [116]. It is well tolerated by patients and has practically no contraindications for the inhalation method of administering medicinal substances. It is advisable to use it in patients with impaired respiratory and circulatory functions when other methods of sanitation of the bronchopulmonary system are not indicated due to the severity of the condition Otgun I., Karnak I. 2004 [117]. Especially effective is the use of finely dispersed (0.5-5 μm) aerosols of a medicinal solution formed by ultrasonic inhalers O'Donnell D. E. (et al.) 2008 [116]. At the same time, the aerosol method has several significant disadvantages: the need to use expensive equipment and high the allergenic properties of the antibiotic aerosol. In addition, local exposure to antibiotic aerosol is limited due to impaired ventilation of the affected area, as well as the deposition of most particles in the upper respiratory tract.

A method has been developed for filling bronchiectasis with the polymerizing composition "KL-3" to stop aeration and stop endobronchitis Avdeev S.N. 2011, Balasanyants G.S. 2010, [5, 8], which was based on the operation of bronchial extirpation and sealing of the pancreatic ducts to external secretion with polymerizable composites [71, 105, 112].

The impossibility of stopping purulent endobronchitis in the bronchial tree often determines the need for endobronchial treatment methods with various drugs (antibiotics, antiseptics, herbal medicine) [81, 52, 53, 135]. Aerosol inhalation of antibiotics, including endobronchial administration, cannot replace parenteral administration due to the inability to create a sufficiently stable concentration of the drug in the blood. The effect of aerosols on inflammation in the lungs is insignificant, due to poor ventilation of the affected areas. The sensitizing effect of antibiotic aerosols on the patient and staff is also important [106]. According to several authors, lymphotropic administration of various antibiotics is used in the treatment of BE [56, 107].

According to several authors, in 10–53% of cases, traditional methods of general and local treatment of purulent tracheobronchitis in children do not give the desired effect [72].

Thus, a significant proportion of unsatisfactory results in the treatment of endobronchial inflammation in BE in children using traditional methods of sanitation of the tracheobronchial tree is associated with the transition of inflammation to neighboring, healthy areas. The increased risk of bronchial failure and other complications during resection and the risk of transition from the zone of irreversibly and destructively altered segments of the bronchial wall to healthy areas of the lung requires the development of effective preventive measures [44, 47, 108, 122].

New perspectives in medicine have arisen due to the use of non-drug methods of treatment, with the discovery of the biological phenomenon of the impact of low-intensity laser radiation and ozone on the human body in pathological conditions. It has been established that the photon energy of a low-intensity laser and the action of ozone has anti-inflammatory, anti-allergic, immunoprotective, and stimulating effects. Novikov V.N. 2005 [37].

Suppurative lung diseases in children occur against the background of suppression of the body's immune state. In this regard, it is of great interest to use the radiation energy of low-energy lasers and ozone in the treatment of this category of sick children.

The use of semiconductor red and infrared lasers in surgery deserves attention. According to some authors [28, 42, 87], semiconductor lasers have several very significant advantages over other laser devices used for medical purposes: the output power of the radiation of the specified equipment can be changed and modulated over a wide range without the use of complex optical-mechanical devices;

• semiconductor lasers have a high efficiency close to theoretically calculated (the efficiency of semiconductor lasers based on gallium arsenide, depending on the pumping method, is from 30 to 100%, gas helium-neon lasers - from 1 to 20%, CO_2 lasers - from 10 to 30%) ;

• significant divergence of the radiation beam of semiconductor lasers makes it possible to irradiate a large surface of an object without the use of special defocusing optics;

• device for laser therapy based on semiconductor lasers can be structurally combined with endoscopic, ultrasonic, magnetic, thermographic equipment, and other types.

• the operation of injection semiconductor lasers at low electrical voltages provides a higher degree of safety when they are used in comparison with gas lasers, where the voltage in the electrical circuit reaches the order of thousands of volts;

In studies by a group of authors, it was found that 2-fold irradiation of the skin with a gallium arsenide laser "Uzor" with a wavelength of 0.99 μm and a pulse frequency of 80 Hz has a positive effect on microcirculation in the dermis and subcutaneous connective tissue. In this case, blood flow is accelerated, additional capillaries are opened, transcapillary exchange between blood and tissue is improved, and exchange in cellular elements is increased. The data obtained made it possible to propose the use of this type of laser for the prevention and treatment of suppuration of wounds and the pleural cavity, and to include infrared laser therapy in the complex of preoperative preparation [66, 67, 80].

Studies by some scientists have revealed the advantage of infrared coherent radiation in the treatment and prevention of wound infection compared to red laser radiation. In the process of developing a treatment technique, a favorable synergy was established for the combined or sequential use of laser radiation of different frequency ranges, modes, and exposure powers [74,75,76].

Vitkovsky Yu.A. 2008 [11] studied the rosette-forming function of peripheral blood lymphocytes of donors after it's in vitro irradiation with a gallium arsenide laser. The results obtained revealed a stimulating effect of semiconductor laser radiation on the expression of E-receptors on T-cells, which indirectly indicates an increase in their functional potential. The authors conclude that the stimulating effect of radiation from the Uzor semiconductor laser based on gallium arsenide is achieved at significantly lower levels of energy introduced into a biological object compared to continuous radiation from a helium-neon laser.

Several works by Horani A., Brody S.L., and Ferkand of T. 2014 [94] summarized the results of electron microscopic and radioautography examination of the bronchi and bronchoalveolar lavage in chronic inflammation under endobronchial exposure to a helium-neon laser. It has been established that the main characteristic of low-intensity laser radiation (LILI) obtained is hyperplastic transformation with heterotopy of the bronchial epithelium and correlative restructuring of the underlying tissue.

According to [36] several researchers, such a restructuring of the metaplastic bronchial epithelium with a change in its differentiation and restoration of the natural morphological phenotype under conditions of a continuing pathological process in the lungs is a unique phenomenon. In the process of endobronchial laser therapy in bronchoalveolar washings, the number of neutrophils decreased and the percentage of macrophages increased. Ultrastructural analysis of BALF neutrophils showed that as a result of laser exposure, a large number of phagocytic cells appear, while the number of degenerating forms of neutrophils decreases.

Polosukhin V. V. 2006 [41], irradiating the bronchial mucosa through a bronchoscope with monochromatic infrared radiation of a gallium arsenide laser, observed positive dynamics in patients with diseases such as acute and chronic abscesses, bronchiectasis, chronic purulent bronchitis. At the same time, normalization of temperature, a decrease in the amount of sputum, regeneration of the ciliary apparatus of the bronchial epithelium, activation of the rate of mucociliary transport, and a decrease in ESR was noted.

Astamar H., Suzuki K. 2001 [65] carried out a comparative evaluation of the effectiveness of endobronchial irradiation with a helium-neon laser in children with chronic pneumonia at a dose of 3 mW/cm2 and 15 mW/cm2 with an exposure of 2 minutes. It was found that a dose of 15 mW/cm2 led to a rapid disappearance of inflammatory changes, and a stable remission was achieved especially in patients with the moderate activity of endobronchitis.

The use of LILI with a wavelength of 0.63-0.68 μm endobronchial in the preoperative period allows for opping endobronchitis, reducing the frequency of postoperative complications, animprovesng the results of treatment of bronchiectasis in children. The immunosuppressive effect of LILI radiation in the experiment is reported. The mechanisms of the stimulating effects of LILI on tissues are still not entirely clear. Shmelev E.I. 2012 [58].

Some studies have established that LILI has a universal, stimulating, or suppressive effect. Wherein the nature of the latter is determined by the dose of laser irradiation Polivanov G.E. 2008 [44].

At the same time, several authors argue that in different patients the same doses of laser energy can cause opposite clinical results. Moreover, it has been experimentally proven that the radiation of a helium-neon laser causes ultrastructural damage to various cellular and tissue structures, comparable to the effects caused by other types of lasers.

A review of the literature shows that low-energy laser therapy is widely used in the treatment of bronchopulmonary pathology.

There are ambiguous views regarding the effect of LILI on the state of local and general immunity in children with COPD. Our work is an attempt to study in-depth the influence of LILI on the course of the studied pathological conditions.

Many diseases are based on pathological conditions caused by tissue hypoxia and infection. In this regard, over the past few years, ozone-oxygen therapy has found worthy application among many other methods of treatment. According to its chemical structure, ozone is an allotropic modification of oxygen. The high oxidizing power of ozone manifests itself in the form of bactericidal, virucidal, and fungicidal properties [22, 23, 89].

Recent studies have established that ozone therapy is a new non-drug method of treatment. The features of ozone were described for the first time [23, 62, 70, 97] in the course of research on air elimination.

Since the late fifties of the twentieth century, works have appeared that testify to the successful use of ozone in the treatment of several chronic diseases, such as chronic colitis, and post-traumatic arachnoiditis Agusti A. (et al.) 2003 [61]. To prevent hypoxic events in cardiac patients during surgery with cardiopulmonary bypass, extracorporeal treatment of blood and cardioplegic solutions treated with an ozone-oxygen mixture was used Eren S., Eren M N. 2003 [77]. Clinically confirmed data on the successful use of an ozone-oxygen mixture and ozonized solutions used for treating the abdominal cavity and performing peritoneal dialysis in patients with diffuse purulent peritonitis [22, 27, 113, 119, 132]. Intravenous administration of ozonized solutions not only contributes to the elimination of hypoxic phenomena but also has a detoxifying effect [34].

Contraindications to ozone therapy, according to several authors, are acute myocardial infarction, hyperthyroidism, a tendency to convulsions, an allergy to ozone, thrombocytopenia, and, bleeding from organs Vendrem M. 2010 [10].

When studying the duration of the preservation of the antibacterial activity of ozonized solutions, it was noted that distilled water has the shortest period of bactericidal action, which is several minutes. The saline solution and 5% glucose solution Ahmad I. 2003 retain their antibacterial activity for a longer time up to 24 hours [34,60].

Intravenous infusions of 100-150 ml of ozonized saline solution with a concentration of 50-100 mg/ml, used in 50 patients with sepsis, showed that the growth of the pathogenic flora of staphylococci, Proteus, Escherichia coli is completely suppressed when exposed to an ozonized solution with a concentration of 10 mg/ml. l [34, 41]. In the available literature, we have come across a small number of works devoted to the use of ozone in thoracic surgery in general, especially its endobronchial use; there are no data on the degree of permissible ozone ratio in therapeutic mixtures for children.

The increase in the proportion of "small forms" in the structure of bronchiectasis is accompanied by a change in surgical tactics towards the predominance of volume-limited lung resections. Operations of choice in patients with "small forms" of bronchiectasis should be considered lobectomy, lobectomy with resection of the lingular segment, lobectomy, and anmentalal resections have been developed and implemented in surgical practice options for shutting down the bronchus. Its extirpation in the presence of saccular bronchiectasis or proximal resection of the bronchus with suturing of the central and peripheral ends in cylindrical bronchiectasis with moderate inflammation in the bronchial tree was proposed. Balasanyants G.S. 2010 [8, 51].

The timing of the surgical intervention is of no small importance for the quality of surgical treatment. Partial lung resection performed in early childhood leads to good functional regeneration of the lung tissue. According to the authors Maksumov D.T., Tulaev N.A. [31, 37] the optimal age for surgical correction of primary bronchopulmonary suppurations is 3-6 years, with congenital malformations - 3-4 years. Surgical treatment [89, 94, 96, 100, 102], performed at a later date against the background of a widespread suppuration, is accompanied by an increased risk of early postoperative complications and the risk of suppuration recurrence.

Thus, a wide range of diagnostic methods for recognizing EBV in children still has limited capabilities for a full assessment of the stage of the disease and provides insufficient information for adequate preoperative preparation.

The therapeutic possibilities of bronchial lavage have not been studied enough, the literature review allows us to conclude that patients with BE have impaired systemic immunity. However, the abundance of literature in this area does not provide an exhaustive answer to many questions related to the restoration of the immune status after a complex effect on the pathological process, including the use of endobronchial methods of ozone therapy and laser therapy. Moreover, in the literature, there is ambiguous information about the effect of a certain dose of laser energy to obtain the desired result.

Insufficient information is presented on the effectiveness of endobronchial laser therapy in children with BE, endobronchial ozonation, and their combination during preoperative preparation.

CHAPTER II

CLINICAL MATERIAL AND RESEARCH METHODS

Characteristics of the experimental material.

The experiments were carried out on 88 guinea pigs weighing from 140 to 180 grams at the age of 1.5-2 months. Modeling of endobronchitis was carried out according to the method of Sultanov A.T. (1989). Staphylococcus aureus, isolated from patients with purulent endobronchitis, was grown on oblique agar. Animals after anesthesia with ether anesthesia were slowly instilled into the nasal passages with 0.4-0.6 ml of a microbial suspension of Staphylococcus aureus by diluting a one-day agar culture in saline with parallel chest massage. Concentration - 4-5 billion microbial cells in 1 ml of solution.

After waking up, the animals were subjected to cooling in ice baths at a temperature of –0 + 40C, until they stopped free swimming and fine shivering appeared. These symptoms usually precede stiffness. Then the guinea pigs were placed in a dry cage at a temperature of +18+200C. Within 0.5-3 days, the animals developed staphylococcal bronchopneumonia. Signs of the developed disease were decreased mobility, cyanosis of the nose and ears, sneezing with the release of mucous secretion from the nose, fever, the appearance of moist rales, ruffled hair, refusal to eat, and irritability. During the modeling of experimental purulent endobronchitis, 7 animals died. The causes of death were an overdose of ether anesthesia - 1, hypothermia -and 4, water aspiration -2.

To clarify and confirm experimental purulent endobronchitis, guinea pigs were slaughtered for 3 days (2 animals), 4 days (4 animals), 5 days (1 animal) by the method of instantaneous decapitation and subjected to the morphological examination of the lung tissue, bronchi of the second, third order. Two guinea pigs were euthanized to obtain normal lavage fluid endobronchial cytogram data. It was revealed that the three-day modeling was the optimal experimental option, the histological description corresponds to this particular period.

72 guinea pigs with experimental purulent endobronchitis were divided into 4 main groups:

1. Control group (endobronchial administration of physiological saline) - 18 animals,

2. Group of endobronchial ozone therapy -18 animals,

3. Group of endobronchial laser therapy - 18 animals,

4. Group of combined endobronchial use of ozone and laser-18 animals.

The control group of animals was administered physiological saline endobronchial. After preliminary cleaning of the hair from the cervical region of guinea pigs in compliance with asepsis and antiseptics under ether anesthesia, a skin incision up to 1.5 cm long was made. No aspiration was noted during the ministration of the saline solution, as coughing and sneezing occurred in animals with endotracheal administration of saline. After that, the needle was removed, and the wound was sutured tightly. The treatment was carried out on the 3rd, 6th, and, 9th day of experimental endobronchitis modeling. Then the animals were slaughtered on the 4th, and 7th, 10th day of modeling, that is, on the next day after treatment, and the material was taken for the above-mentioned analyses. In the control group, one animal died on the 6th day and one on the 9th day of the experiment. In the first case, the cause of death was respiratory failure, and in the second, the progression of the disease with the development of an irreversible process.

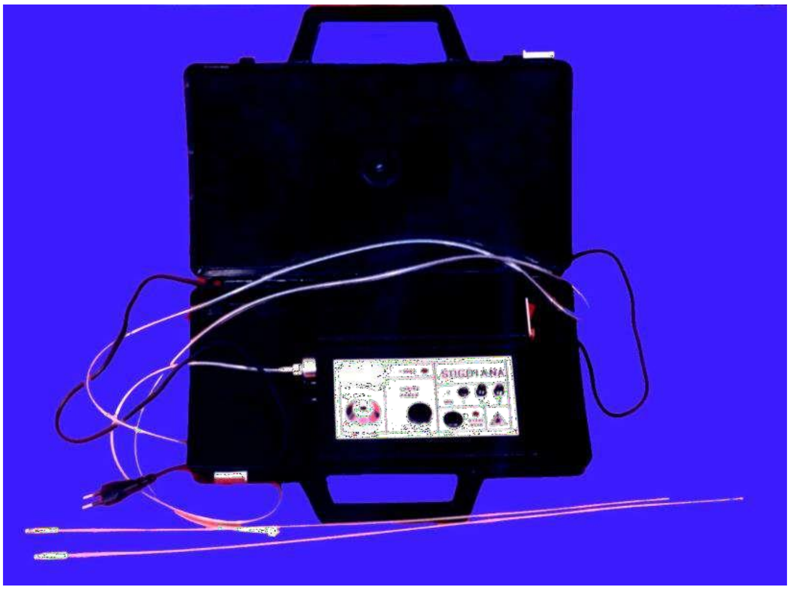
In the group of endobronchial ozone therapy, the animals received the same treatment as in the control group, but instead of saline, ozonized saline was administered endobronchial.

Rice. 2.1. Apparatus Ozonator OTRI-01.

To prepare an ozonized saline solution with a volume of 400 ml and an ozone concentration of 5 mg/l in it, it is necessary to bubble a saline solution of 0.9% sodium chloride with an ozone-oxygen mixture through a divider in a glass container for 10 minutes [89] using the OTRI Ozonator -01" (Russia) (Fig. 2.1.)

Slaughter and sampling of material for research were carried out at the same time as in the control group.

In the endobronchial laser therapy group, access was carried out in the same way as in the previous groups. A special monofilament light guide was passed through the hole in the trachea, and the bronchial tree was irradiated for 1 min. To carry out endobronchial irradiation, we used a low-intensity gallium arsenide-based semiconductor laser with the ALT apparatus “Sogdiana” (Uzbekistan) of continuous operation in the red range with a wavelength of 0.67 μm, at a dose of 4.87 J/cm2. It consists of a power supply, a gallium arsenide laser emitter, and a focusing lens. The focusing lens with adjusting elements is located in the input unit fixed at the output of the laser emitter. (Fig.2.2.).



Rice. 2.2. Apparatus "Sogdiana" for endobronchial laser therapy.

The laser light was transmitted to the irradiated object using an optical telescope connected to a cable-type monofilament quartz-polymer with a core diameter of 400 μm. At the end of the telescope, the maximum radiation power was 12 mW. The distance from the end of the light guide to the object of irradiation is 10 mm. In this case, the diameter of the light spot is 4 mm with a halo of –2 cm2. The power density of the light flux under these conditions is 7.9 mW / cm2, and the energy of the light flux is 0.6 J. (Table 2.1.)

Table 2.1.

Technical characteristics of the Apparatus "Sogdiana"

№	Specifications	Options
1.	Radiation wavelength,	0.67 μm
2.	Output radiation power, at the end	5-15mW
3.	The nature of the radiation	continuous
4.	Power consumed from the network, no more	10 VA

5.	Mains supply voltage, V	220±10%
6.	Apparatus dimensions. mm	180x18048
7.	In a case, mm	340x190x56

The power density of the luminous flux was measured by this formula:

H=P/S

The radiation energy was calculated by the formula:

E (Dj) = P (мВт) •T(s)

The dose of laser radiation, in this case, was determined by the formula:

W (Dj/sm^2) = H (Vт/sm2) •T (s)

The terms of slaughter and taking of material are the same as in the previous groups.

In the group of combined use of endobronchial ozone therapy and laser therapy, the treatment was carried out in the same way as in the previous groups, with endobronchial laser therapy being performed first, and then the introduction of ozonized saline. The timing of slaughter is the same as for other groups.

Research Methods

Cytological examination of bronchoalveolar lavage fluid (cytosis x109/l, neutrophilic leukocytes, alveolar macrophages, lymphocytes).

The lavage fluid was examined after each slaughter of animals by washing the bronchial tree with sterile saline 0.9%, heated to 370C, then subjected to cytological analysis: diluted with saline 1:20 and counted cell elements in 25 large squares of the Goryaev chamber. The ratio of alveolar macrophages (AM), neutrophilic leukocytes (NL), and lymphocytes (L) was studied in smears from a bronchoalveolar lavage centrifuge, stained according to Romanovsky–Giemsa, based on a count of 500 cells. Also, for comparison, the BALF of a healthy lung was studied in two animals.

Morphological studies (light-optical and electron microscopy)

Samples of bronchi and lungs were subjected to light-optical and electron microscopic examination within 3 and 5 days after reproduction of the model of bronchopneumonia in guinea pigs and 1, 2, and 3-fold endobronchial exposure to ozone, red range LILI and their combined use. This corresponded to 4, 7, and 10 days of reproduction of experimental bronchopneumonia.

For transmission electron microscopy (TEM), the material was fixed in a 2.5% solution of glutaraldehyde in 0.1 M phosphate buffer (pH 7.2) in a 1% solution of osmium tetroxide, and after dehydration and impregnation, was poured into a mixture of upon and Araldite. Semithin and ultrathin sections (PTS and UTS) were made on a Reichert-Jung ultramicrotome (Reichert, Austria) and stained, respectively, with methylene blue and basic fuchsin, or with uranyl acetate and lead citrate (Karupu V.Ya., 1986). Ultrathin sections were examined using an H-600 electron microscope (Hitachi, Japan).

For scanning electron microscopy (SEM), the samples after dehydration were dried by the critical point method in an HCP-2 apparatus (Hitachi, Japan) and ion-coated with gold in an IB-3 sprayer (Eiko, Japan). The preparations were studied using an S-405 electron microscope (Hitachi, Japan).

Characterization of clinical material

The basis of the work was the analysis of the diagnosis and treatment of 104 children with bronchiectasis who were hospitalized in

2 clinics of the Samarkand State Medical University in the Department of Thoracic Surgery (Chief Physician - Doctor of Medical Sciences Zh.A. Shamsiev)

Table 2.2 shows the distribution of patients by sex and age.

Table 2.2

Distribution of patients depending on gender and age in children with bronchiectasis

Age (years)	Gender (%)		Total
	Boys	Girls	
Up to 3 years	2 (1,9 %)	3 (2,9 %)	5 (4,81 %)

3-7 years	8 (7,7 %)	14 (13,5 %)	22 (21,2 %)
7-12 years old	23 (22,1 %)	20 (19,2 %)	43(41,3 %)
12-16 years old	18 (17,3 %)	16 (15,4 %)	34(32,7 %)
Total	51 (49,0%)	53 (51,0 %)	104 (100,0)

There were 51 boys (49.0%), girls - 53 (51.0%). Children over 7 years old predominated, mostly 7-12 years old (41.3%), and there was approximately the same number of boys and girls.

Taking into account the influence of the place of residence on the development of pulmonary pathology, and environmental factors, we divided the patients into urban and rural residents.

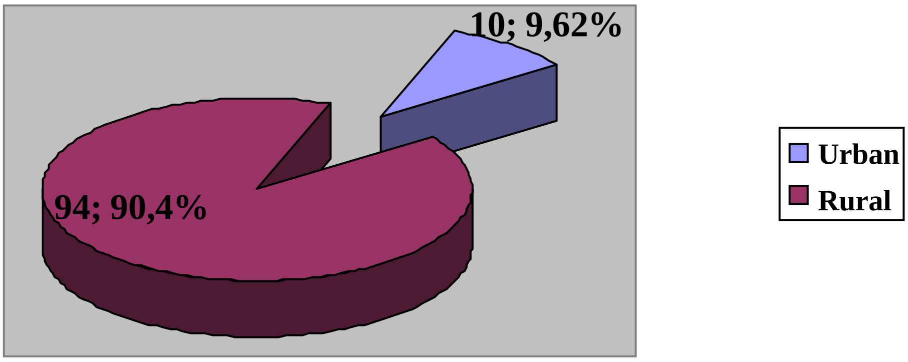


Fig 2.3. Distribution of patients by place of residence

As can be seen from the data presented in Fig. 2.3., among the sick rural residents, there are much more. On the one hand, this circumstance testifies to the difference in the social status of the contingent. On the other hand, in our opinion, the late appeal for medical care in the early stages of the disease among the rural population is of significant importance here.

According to the nature of endobronchial preparation in the preoperative period, the patients were divided into two groups. Group I - control group (CG) 45 (43.3%) patients - children who received generally accepted traditional treatment in the preoperative period, including broncholavage with antiseptic solutions, antibiotics, mucolytic drugs (trypsin, chymotrypsin, etc.) Group II patients - main group (MG) 59 (59.7%) children who were divided into 3 subgroups:

I subgroup 22 patients in the preoperative period during diagnostic and therapeutic bronchoscopy who received endobronchial ozone therapy. After taking the necessary portions of swabs for diagnostic purposes, the prepared ozonized solution was injected into the lumen of the bronchus (the method for preparing ozone is described above), and it was immediately aspirated. The procedure was repeated 5–6 times until clean washing water appeared.

II subgroup 19 children received endobronchial laser therapy. During one session, an optical telescope was inserted through the tube of the Friedel bronchoscope with a special nozzle, and irradiation was carried out in 5-7 positions for 1 min per mucosa, which made it possible to influence almost the entire mucosa, starting from the trachea and up to the bronchi 3-4 orders inclusive. The areas of interlobar spurs, bronchial orifices, and the pre-resected area were irradiated with particular care during the operation. (Table 2.3.)

Table 2.3.

Localization of points of influence, power, the wavelength of radiation, exposuand re, doses.

Endobronchial	Power mW	Radiation wavelength, µm	Exposure min.	Dose J/cm2
The affected area of the lung	12	0,67	2,0	1,2
The mouth of the bronchus is preliminarily resected	12	0,67	1,0	0,6
Wash zone	12	0,67	by - 1.0	by -0,6

III subgroup 18 patients underwent a combination of endobronchial ozone therapy and endobronchial laser therapy according to the above method. Each patient underwent two to four sessions.

Methods of laboratory research

Examination methods included: general blood tests, urine tests, biochemical tests, blood type, and Rh factor. Blood tests were also carried out for markers for hepatitis B, HIV infection, and syphilis.

To assess the functional state of the liver, pancreas, and kidneys, patients underwent biochemical studies and at the same paying paid attention to the levels of bilirubin, total protein, the sugar activity of transaminases, amylase, etc.

In terms of preoperative preparation, all patients underwent electrocardiography (ECG). The study of cardiac activity (ECG) was carried out on the device MOD-029 multichannel electrocardiograph (Russia). These ECGs were taken into account in the preoperative preparation. With pathological changes, corrective therapy was carried out, the effectiveness of which was evaluated by repeating this study.

The main studies were the following.

X-ray research methods

X-ray studies were carried out on the device EDR 750B (Hungary) according to the standard generally accepted method.

Endoscopic research methods Endoscopy was performed on all patients.

Tracheobronchoscopy (TBS) and Tracheobronchography (TBG) we used in all 104 patients, both for diagnosis and endoscopic treatment. The study was carried out under general anesthesia and was performed using a Friedel rigid pediatric bronchoscope (Germany, Storz). After aspiration of the secret from the tracheobronchial tree, the condition was visually assessed from the severity of the inflammatory process of the bronchial mucosa. Allocated patients with catarrhal, catarrhal-purulent and purulentendob, bronchitis; depending on the prevalence of pathology - common (diffuse) and local. To clarify the volume and nature of changes in the bronchial tree, patients underwent TBG. TBG was performed under the control of an EDR 750B X-ray unit with the introduction of the Visotrast-B contrast agent, sulfide, and a ssulfideter-soluble preparation Geodon). The studyGeodonried out in direct and lateral projection.

Examination of bronchoalveolar lavage fluid (BALF).

Bronchoalveolar lavage fluid was studied in 67 patients in the following sequence. After intubation of the trachea with a bronchoscope, examination of the trachea and bronchi, in the presence of a secr it was aspirated. Then obturation of the segmental or subsegmental bronchus of the studied area was performed. Through the lumen of the obturation catheter, a sterile saline solution of 0.9% sodium chloride, heated to 370C in a volume of 10-20 ml, was injected in portions, depending on the child's age and weight. The number of servings is on average 4 - 5 ml. According to indications, bronchial lavage was performed in other segments of the affected lung. To determine probable changes in the intact lung, BAL was previously performed (in the case of unilateral processes) in the same segment. The lavage fluid was collected in a sterile trap after the catheter was pulled up; the amount of aspirated fluid reached 40–60% of the injected fluid.

For cytological analysis, 5–6 portions of washings were collected. After thorough mixing, the aspirated fluid was subjected to cytological analysis: it was diluted with physiological saline 1:20, and cell elements were counted in 25 large squares of the Goryaev chamber. The ratio of alveolar macrophages (AM), neutrophilic leukocytes (NL,) and lymphocytes (L) was studied in smears from a bronchoalveolar lavage centrifuge, stained according to Romanovsky–Giemsa, based on a count of 500 cells. Also, for comparison, the BALF of a healthy lung of children operated on for urolithiasis, from whom lavage fluid was taken through an endotracheal tube, was studied.

The neutrophil cytosis index (INC) was studied in 67 children according to the formula: (Lischke 1998) [79]

$$INC = \frac{C(\cdot 10^{9}/_{л})NL(\%)}{100}, \text{ where (2.1)}$$

C- general cytosis

NL - neutrophilic leukocytes in bronchoalveolar lavage fluid.

Normally, in children, ICI is 0.06±0.01 (n=20).

Bacteriological research methods.

Bacteriological analysis of BALF content was studied in 97 using a quantitative method. Bronchial contents and their dilutions were obtained during tracheobronchoscopy under conditions that ensured the absence of contamination by the microflora of the oral cavity. After isolation of microflora, their sensitivity to antibacterial drugs was determined. Sowing was carried out on blood agar, Endo medium for enterobacter, IA, and vitelline-salt agar medium for staphylococci. The level of seeding was determined as follows.

1 - very poor growth of bacteria only in liquid media, no growth on solid media;

2 - a small amount - on a dense medium, growth up to 10 colonies;

3- moderate amount - growth from 11 to 100 colonies on a dense medium;

4 - a large number - growth on a dense medium of more than 100 colonies.

It has been proven that a contamination level of 105 CFU (colony forming units) is critical. Exceeding this level indicates a greater likelihood of developing a purulent infection and the possibility of a generalization of the process. With contamination of less than 105 CFU, the tissues heal without suppuration.

The study of indicators of anti-infective resistance of the body (AIR) and leukocyte intoxication index (LII).

In 62 children the indicators of AIR were studied, and LII was studied in all 104 patients. In addition, in 45 practically healthy children, the indicators of LII and the AIR system, which served as the norm, were studied.

Immunological studies were carried out by the isolation of lymphocytes according to the method of Boym (1968). 2-3 ml of blood was poured into test tubes containing heparin (25 units per 1 ml) and diluted 1:2 with Hanks' solution. To isolate lymphocytes, a verografin-hypac gradient was used: 12 parts of 9% ficoll and 5 parts of 34% verografin were mixed so that the density of the solution was 1.077 g/ml. The diluted blood was carefully layered along the walls of the tube on the surface with 3 ml of ficoll-verografin, centrifuged at room temperature for 30 min. at 15000 pm. The resulting layer of lymphocytes (white narrow ring in interphase) was collected and washed three times (30 minutes each) in a solution of medium 199 at 800-1000 rpm. The number of lymphocytes was counted and the concentration of the suspension was adjusted to 2 million cells per 1 ml. Viability was determined by trypan blue staining.

The number of T-lymphocytes was estimated by the E-rosette method according to Jondal et al (1972). The content of T-lymphocytes was determined in the reaction of spontaneous rosette formation with ram erythrocytes (E-ROC). The principle was to attach ram erythrocytes to the surface of T-lymphocytes. At the same time, a rosette was formed, consisting of a centrally located lymphocyte with sheep erythrocytes attached to it from all sides. Simultaneously with the isolation of lymphocytes, a suspension of ram erythrocytes was prepared: ram erythrocytes stored in a preservative at a temperature of 40C were washed several times with a physiological raster and a suspension was prepared in medium 199 at a concentration of 100 million in 1 ml. Prepared suspensions of sheep erythrocytes and lymphocytes (0.1 ml each) were mixed in a test tube and centrifuged for 5 minutes. at 800 rpm, then placed in a refrigerator and kept for 30 minutes at a temperature of 40C, cold glutaraldehyde was added to a final concentration of 0.6%. Smears were made from the cell sediment, which was stained according to Romanovsky-Giemsa. T-lymphocytes were counted in a stained smear, noting rosette-forming ones among them, i.e. not connected 3 or more erythrocytes.

The number of T-lymphocytes was expressed as a percentage of the total number of lymphocytes (relative index) and the number of T-lymphocytes contained in 1 μl of blood (absolute index). Calculations were performed according to the formula:

The number of T-lymphocytes in 1 μl of blood was (2.2)

A - the number of leukocytes in 1 μl of blood

B – the percentage of lymphocytes in the blood

B – the percentage of rosette-forming T-lymphocytes in the blood

Determination of immunoregulatory subpopulations of T-lymphocytes; T-suppressors and T-helpers were carried out by loading tests with theophylline The number of theophylline-sensitive T-suppressors was determined by the formula

$Ts = T - ROKtotal - Trx$, where (2.3)

T- ROCK total - the total content of rosette-forming lymphocytes,

Try - the number of theophylline-resistant T-helpers (the number of T-ROKs remaining after exposure to theophylline).

B-lymphocytes were determined by the method of spontaneous rosette formation with mouse erythrocytes (EM-ROK).

The phagocytic activity of neutrophils was studied by the method of V.N. Berman and K.M. Slavskoy.[15] The percentage of phagocytes (PF), and the absolute number of phagocytes (AP) were determined with cultures of Escherichia coli. Serum immunoglobulins of the main classes A, M, and G were determined by the method of radial immunodiffusion according to V. Manchini et al [158].

The leukocyte index of intoxication (LII) is calculated according to the method proposed by Ya.Ya.Kalf-Kalif:

$$LII = \frac{(С + 2П + 3Ю + 4Ми) \cdot (Пл + 1)}{(М + Ли) \cdot (Э + 1)}$$, where (2.4)

C-segmented neutrophils;

P-stab;

Yu-young;

Mi-myelocytes;

Pl-plasma cells;

M-monocytes;
Li-lymphocytes;
E-eosinophils.
All indicators are entered as a percentage, except plasma cells and eosinophils, which are taken in absolute quantities.

The absolute number of eosinophils is calculated by the formula:

Labs.col.=(L•E,%)/(100%), where (2.5)

L-leukocytes; E-eosinophils.

Normal LII in children is 1.1±0.04 (n=45).

Histo-morphological studies of biopsy materials were carried out in 46 patients operated on for BEB, and the study of smears-imprints from the mucous membrane of the bronchial tree was carried out in 54 children. Materials of imprint smears were taken from the mouths of the bronchi of the affected lobe after fixation with Leyman's solution, staining was carried out according to Ramanovsky-Giemsa.

Morphological studies were carried out in the laboratory of path morphology of the RSCS. acad. V.Vakhidov under the guidance of Professor Baibekov I.M. that temperature does not cause negative taxis in motile cell inflammation and does not deprive them of their adhesive ability. The morphological study of the surgical material was carried out by comparing the histological results in children of the control and main groups operated on for bronchiectasis. The material research material means of lung tissue removed during surgery, ranging in volume from 1-2 segments to a lobe of the lung. When taking material for histological examination, samples were taken directly from the lesion (fragments of bronchiectasis), areas adjacent to the lesion, and fragments from visually unchanged areas. Material for morphological examination was taken during and after the operation. Fixation was carried out in a 10% neutral formalin solution. Paraffin sections were prepared on sled misled and stained with hematoxylin-eosin, the structure and of the stroma bronchi and the condition of the alveoli of blood vessels were studied.

The effectiveness of treatment with the use of new methods in the preoperative period compared with the traditional method and the direct effectiveness of lung resections were evaluated by us based on clinical, radiological, functional, and laboratory data by the time of discharge from the clinic.

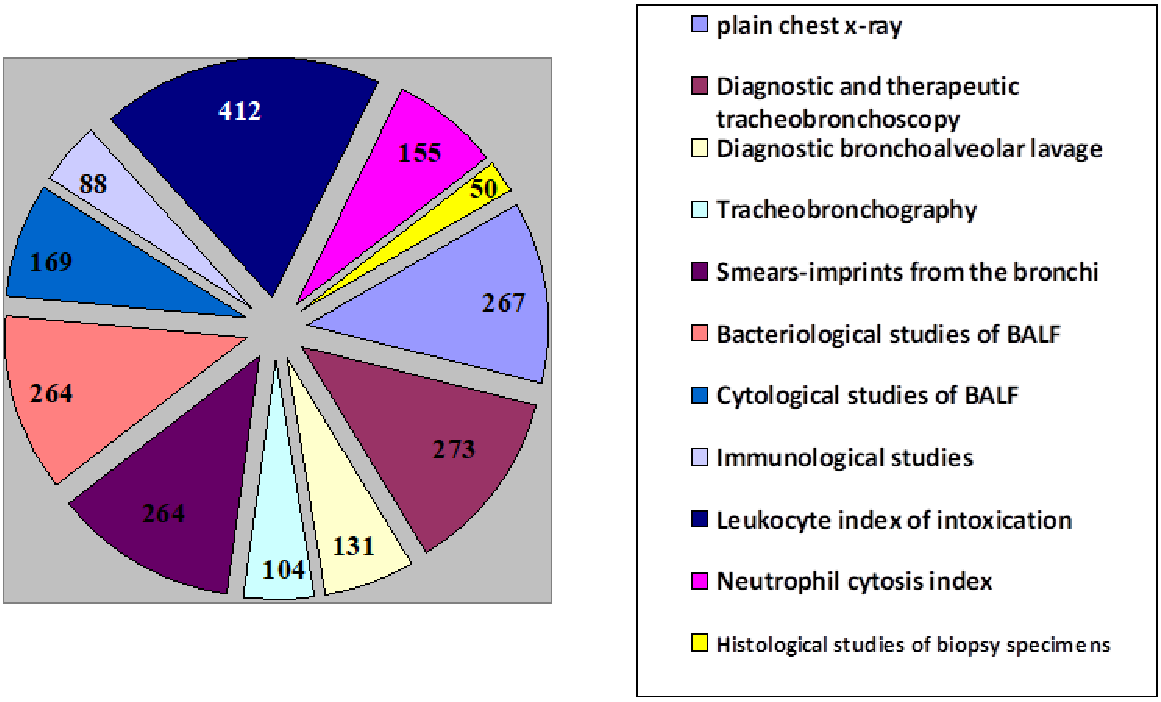
A good clinical effect was considered - a complete cure for the underlying disease, the absence of any complaints, radiographically - complete expansion of the remaining part of the lung or, single pleural sutures, laboratory absence of endogenous intoxication.

Satisfactory was recognized - the cure of the underlying disease, the presence of complications such as postoperative pneumonia, the presence of complaints, x-ray areas of gross pneumofibrosis, pleural fusion, and limited physical activity.

Unsatisfactory was considered - the presence of persistent complaints of coughing with sputum production, the presence in the postoperative period of such complications as bronchial fistula, pleural empyema, etc., disability and physical activity subsequently leading to disability, complications resulting in subsequent repeated surgical interventions.

The volume and types of special research methods are given in Figure

Rise 2.4.



Statistical processing of the material was carried out on a Pentium 4, 2400 MHz computer with 4096 MB of RAM. Logical operators were used: if, and, or, not; the calculation of the mean, the standard error was carried out using the method of descriptive statistics, to calculate the significance of differences in the study ground ps, a two-sample t-test with the same variances was used.

CHAPTER III

RESULTS OF TREATMENT OF EXPERIMENTAL PURULENT ENDOBRONCHITIS.

Using the proposed method, we have obtained a model of purulent endobronchitis in guinea pigs.

Endobronchial cytogram of experimental endobronchitis.

In experimental animals, lavage of the bronchial tree was performed with a further cytological examination.

Tables 3.1 and 3.2. reflect the results of the analysis of endobronchial lavage in all groups of the experiment.

Table 3.1

Endobronchial cytogram in healthy and untreated animals of the experimental group

Healthy				
Neutrophilic leukocytes %		**Lymphocytes %**	**Alveolar macrophages %**	**Cytosis x 109/l**
n	2	2	2	2
M	5,50	6,0	88,50	0,40
m	0,20	0,20	0,70	0,10
Untreated 3 days after the experiment				
n	2	2	2	2
M	90,50	7,50	2,0	21,40
m	0,80	0,10	0,10	0,60

According to table 3.1.1. on the third day of the experiment, when purulent bronchitis develops in guinea pigs, cytosis, that is, the number of cells in the broncho-important fluid increases sharply from 0.4□0.10 x109/l to 21.4□0.60 x109/l. ($P<0.001$). Mostly in the analyzed fluid, there are neutrophilic leukocytes, the content of which increases from 5.5□2.0% to 90.5□0.8% ($P<0.001$). To a lesser extent, the number of lymphocytes is added - from 6.0□2.0% to 7.5□1.0%

(P<0.5). Indicative is a significant decrease in alveolar macrophages from 88.5□0.7% to 2.0□0.1% (P<0.001), which indicates a significant decrease in ventilation and blood supply to the alveoli and the development of structural disorders of the alveoli. Table 3.1.2. In the control group, with endobronchial administration of saline, cytosis on the 4th day decreases to 9.2□0.4 x109/l, on the 7th day of the experiment to 6.4□0.2 x109/l and the 10th day to 1.8□0 .06 x109/l (P<0.001). The number of neutrophils in the control group also decreases from 82.8□1.8% on the 4th day of the experiment, to 71.6□1.5% on the 7th day and to 60.4□1.2% on the 10th day (P<0.005). At the same time, the number of lymphocytes increases as a response of the immune system to stress. Their number, which is 7.3□0.1% on the 4th day of the experiment, increases to 16.2□0.25% by the 7th day, and up to 20.8□0.45% by the 10th day (P<0.001), ashing the bronchoalveolar tree with saline to a certain extent clears the alveolar zone from mucus and detritus. In this regard, the ventilation of the alveoli and the blood supply to this zone improve This is reflected in the increase in the number of alveolar macrophages from 9.8□0.43% on the fourth day of the experiment to 12.2□0.2% and up to 19.4□0.2% on day 10 (P<0.001).

As mentioned above, on the third day of the experiment, the second group of animals was irrigated with an ozonized saline solution to the bronchoalveolar tree. The next day, there was a decrease in cytosis, which was 8.3□0.4 x109/l, by day 7 it dropped to 2.1□0.08 x109/l, and on day 10 - to 0.8□0.03 x109 /l (P<0.001). This indicates that a decrease in the content of tissue elements is observed in the lumen of the alveoli. At the same time, the very next day after ozone therapy, the number of neutrophils, compared with the control group, decreases to 40.2□1.35% (P<0.001), after the second session treatment - up to 20.2□1.01%, and on the 10th day, after the third session of endobronchial ozone therapy - up to 7.1□0.3% (P<0.001). There is also a decrease in the content of lymphocytes. Indicative is a significant increase in the number of alveolar macrophages. After the first session of endobronchial ozone therapy, their content is 36.3□1.5%, after the second session, on the 7th day, - 56.1□2.8%, and the 10th day - 75.2□3.2% (P <0.001). An analysis of the dynamics of these indicators after ozone therapy indicates an increase in the body's resistance to the inflammatory process, as well as an effective cleansing of the lumen of the alveolar zone, restoring the functioning of the alveoli.

In the group of animals with endobronchial laser therapy, the level of cytosis after the first session, on the 4th day of the experiment, was 10.8±0.52 x109/l, on the 7th day, after the second 10 days of the experiment - 1.1□0.05 x109/l (P<0.001), but does not yet reach the indicators of healthy animals. This indicator is somewhat worse than in the group of endobronchial ozone therapy. The same changes occur in the number of neutrophils. On the 4th day of the experiment, their number is 51.1□2.46%, on the 7th day - 26.1□1.6%, and on the 10th day - 10.2□0.35%(P<0.001). The number of lymphocytes not only does not decrease, but is slightly increased on the 7th day of the experiment, tends to decrease on the 10th day, but continues to remain at high numbers. The impact of the laser creates a response in the body in the immune system.

The dynamics of the number of alveolar macrophages are observed to a lesser extent than in the ozone therapy group, but statistically significantly higher than in the control group.

The results of the combined use of endobronchial ozone therapy and laser therapy are indicative. On the 4th day of the experiment, after the first session of therapy, cytosis was 7.2□0.32 x109/l, on the 7th day - 2.1□0.09 x109/l, after the third session, on the 10th day of the experiment - 0.5 □0.02 x109/l (P<0.001), that is, actually normalized. The same picture was noted in the dynamics of neutrophils (P<0.001). The level of alveolar macrophages after the third session of combined therapy reached 75.9□1.8%, i.e. slightly less than normal.

Thus, the analysis of the results of the study of broncho-important fluid in the experiment shows a clear advantage of the combined endobronchial ozone and laser therapy in the treatment of purulent endobronchitis. In our opinion, these results can be applied in clinical practice as a preoperative preparation for PEB to fully treat existing purulent endobronchitis.

Pathomorphosis of experimental endobronchitis under the influence of ozone and laser therapy.

Light-optical studies of the bronchi and lungs showed that on the 3rd day after the reproduction of the endobronchitis model, significant inflammatory changes take place.

The mucous membrane of the bronchi of various calibers is infiltrated with polymorphic cellular elements. There is an increase in mucus secretion and migration of cells from the epithelial lining into the lumen of the bronchi.

Desquamation of epithelial cells of the epithelial lining of the bronchi is also noted. All layers of the bronchial wall are edematous with moderate infiltration (Fig. 3.1). In the bronchi of the 1st and 2nd order, the phenomena of desquamation and migration of connective tissue cells into the lumen of the bronchi are more pronounced. In areas of desquamation during experimental endobronchitis, accumulations of lymphoid tissue are noted and formations are formed that resemble lymphoid follicles with an admixture of polymorphonuclear neutrophilic leukocytes. This is accompanied by an increase in the secretion of mucus from goblet cells and their devastation (Fig. 3.2.).

Rice. 3.1. Edema and infiltration of the bronchial wall and peribronchial zone. 3 days of experimental endobronchitis. G-E 10 x 20.

Fig.3.2. Edema and infiltration of the bronchial wall and the formation of lymphoid accumulations. 3 days of experimental endobronchitis. G-E 10 x 20.

Scanning electron microscopy (SEM) showed significant changes in the bronchi in experimental endobronchitis.

The intercellular gaps of the epithelial lining are expanded. Among the epitheliocytes, mucus-forming cells with a domed surface dominate. Apical parts of prismatic cells bear single cilia. On the surface of the epithelial lining, strands of mucus and accumulations of various migrating blood cells and connective tissue cells of the stroma are detected. These are erythrocytes and lymphocytes and phagocytes (Fig. 3.3). Lymphocytes have numerous processes on their surface.

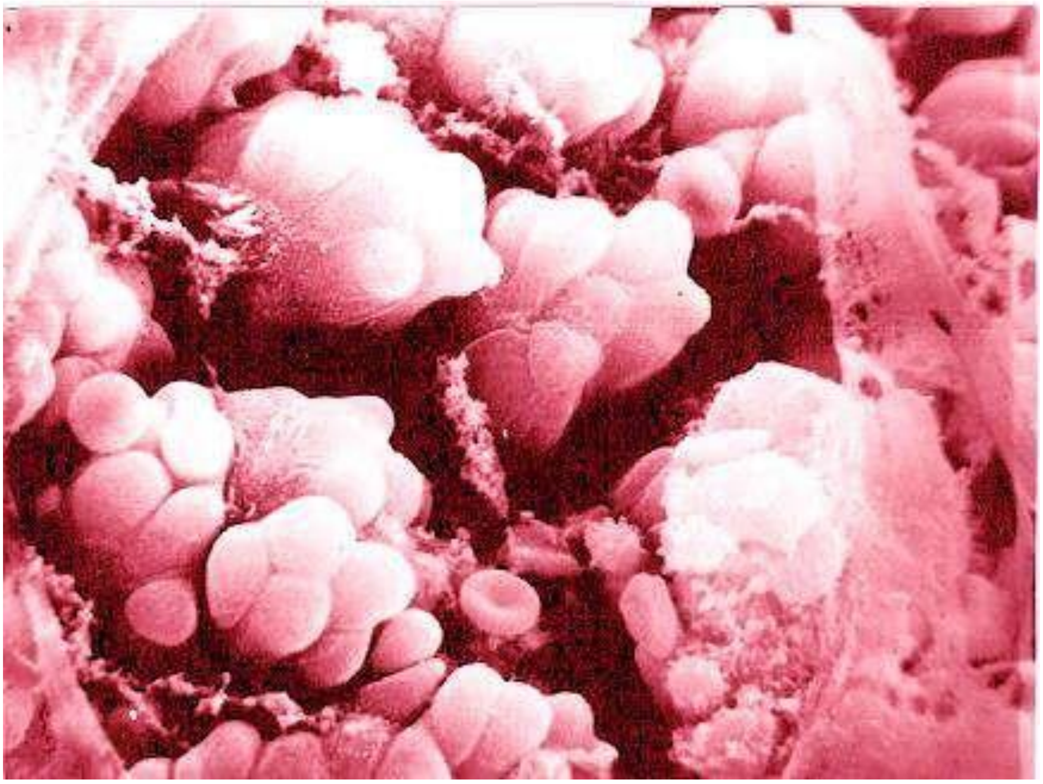


Fig.3.3. Cells and strands of mucus on the surface of the epithelial lining Day 3 of experimental endobronchitis. SAM x 1000.

Transmission electron microscopy (TEM) showed that phagocytosis of microorganisms takes place in neutrophilic leukocytes migrating into the epithelial lining and bronchial lumen. On the surface of neutrophils, single outgrowths and invaginations of the plasma membrane are determined, indicating moderate manifestations of phagocytosis. At the same time, vacuolization, accumulation of glycogen, reduction of profiles of the granular endoplasmic reticulum, and free ribosomes are noted in the cytoplasm of neutrophilic polymorphonuclear leukocytes. Phagocytosed microorganisms are freely located in the cytoplasm of neutrophilic leukocytes, without being exposed to visible ultrastructural changes indicating their lysis **(Fig. 3.4).**

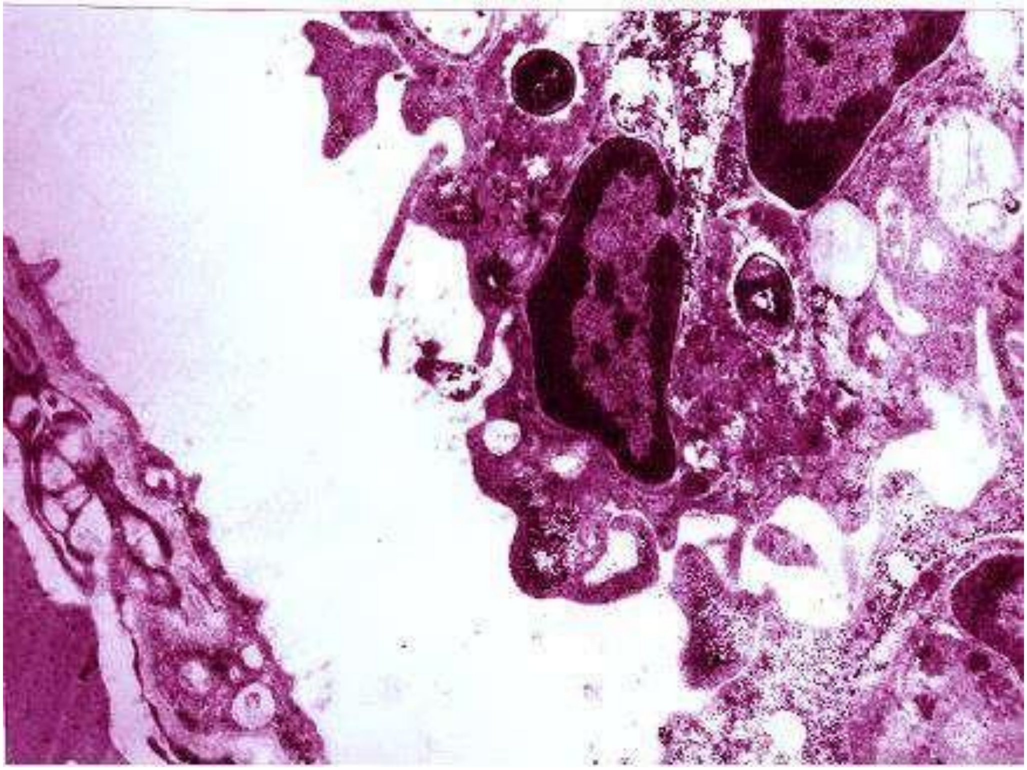


Fig.3.4. Microorganisms (MO) in PYAL.3 days of experimental endobronchitis. TEM x 7500.

Along with pronounced changes in the bronchi of various calibers, the conducted studies revealed significant changes in the alveoli of the lungs. In the alveoli adjacent to the bronchi of 2-3 calibers, atelectasis is noted with infiltration of all the walls of the bronchi and septa of the alveoli. Only single alveoli retain their airiness (Fig. 3.5).

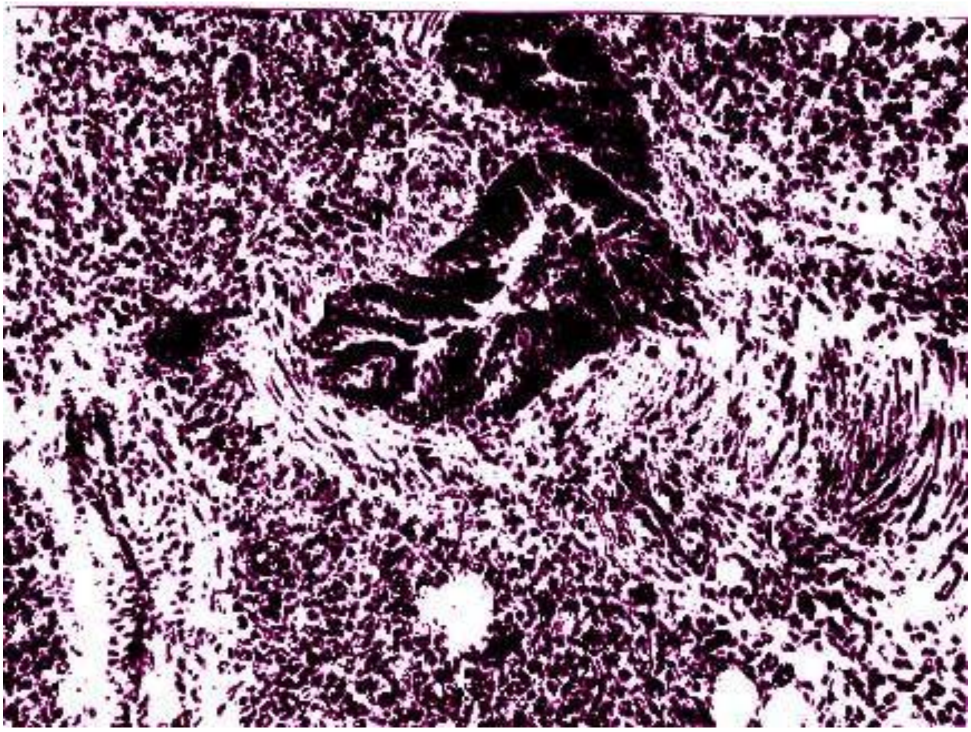


Fig.3.5. Edema and infiltration of the bronchial wall, alveolar atelectasis.

3 days of experimental endobronchitis. G-E 10 x 20

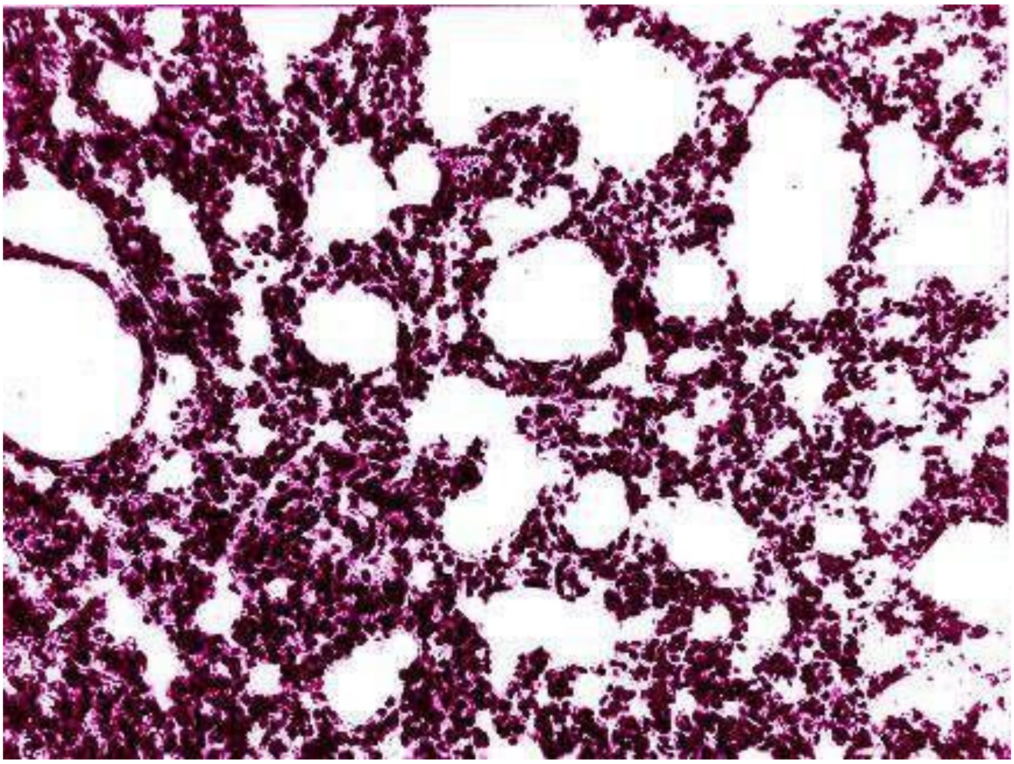


Fig.3.6. Edema and infiltration of septa, alveolar atelectasis. Day 3 of experimental endobronchitis G-E 10 x 20.

In other parts of the lung tissue, the number of alveoli that retained their airiness is greater. However, in these areas, there is a pronounced infiltration of the interalveolar septa with polymorphic cellular elements with hemorrhages (Fig. 3.6).

In the control group on the 3rd day of the experiment, physiological saline was injected into the bronchial tree. Control studies were carried out on the 4th day of the experiment.

SEM shows significant infiltration of the interalveolar septa and collapse of most of the alveoli. In the septa and the lumen of the alveoli, a variety of cellular elements are determined, including lymphocytes and erythrocytes (Fig. 3.7).

Fig.3.7. Edema and infiltration of septa, cells, and mucus in the lumen of the alveoli. 3 days of experimental endobronchitis. SAM x 200.

Light-optical studies of the control group showed some morphological changes in the bronchial mucosa. These changes consisted of desquamation of the epithelial layer of the mucous membrane and the accumulation in the lumen of the bronchi of a significant size conglomerate of desquamated cells, lymphocytes, and neutrophilic polymorphonuclear leukocytes and mucus. Mucus-producing cells of the epithelial lining are devastated, and their cytoplasm collapsed (**Fig. 3.8).**

All the walls of the bronchi and the area around them are significantly infiltrated with polymorphic-cellular elements with a predominance of lymphocytes and a significant number of polymorphic-nuclear leukocytes.

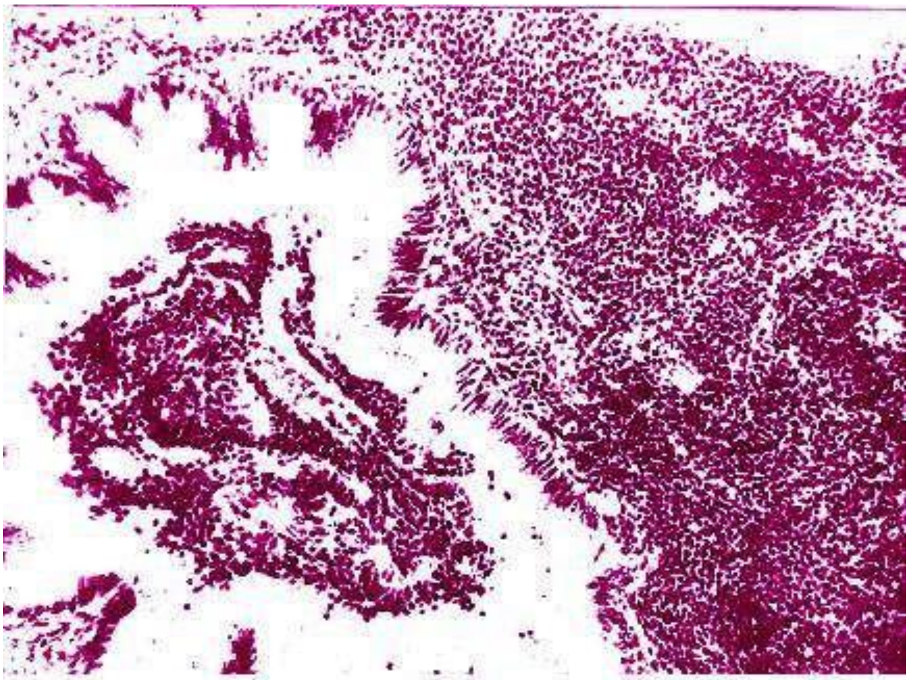


Fig.3.8. Severe edema and infiltration of the bronchial wall and peribronchial zone, desquamation of the epithelium. And 4 days of experimental endobronchitis. G-E 10 x 20.

Around the bronchi 2-3 orders and bronchioles, the alveoli are completely atelectatic. The walls of the bronchioles are edematous. In the lumen of larger bronchi, accumulations of mucus, desquamated epithelial cells, and migrated connective tissue cells, mainly lymphocytes, are determined **(Fig. 3.9).**

SEM showed a significant accumulation of mucus and a variety of cells, both epithelial and connective tissue in the lumen of non-atelectatic alveoli.

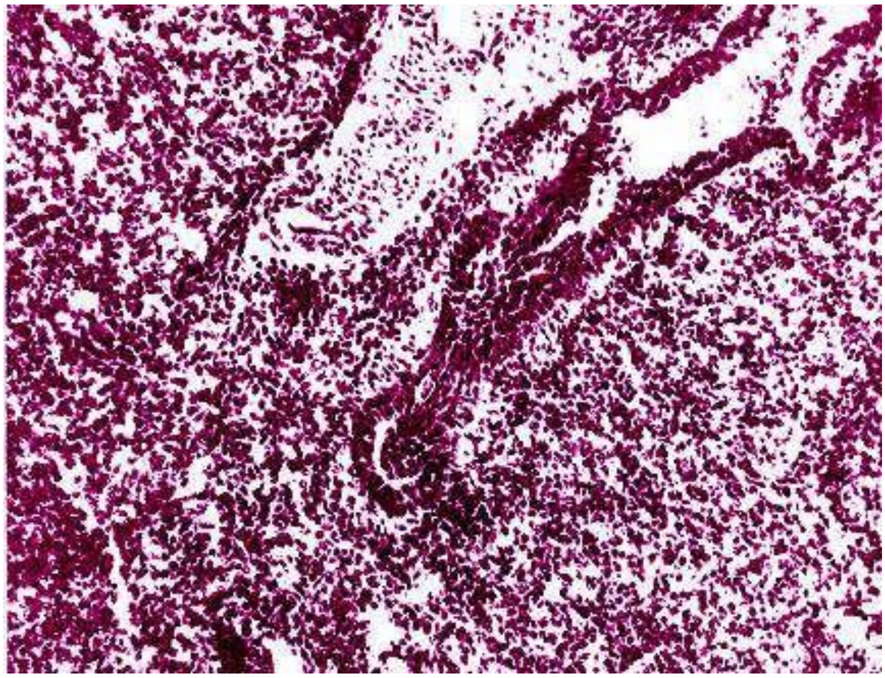


Fig.3.9. Severe edema and infiltration of the bronchial wall and peribronchial zone, alveolar atelectasis. G-E 10 x 20.

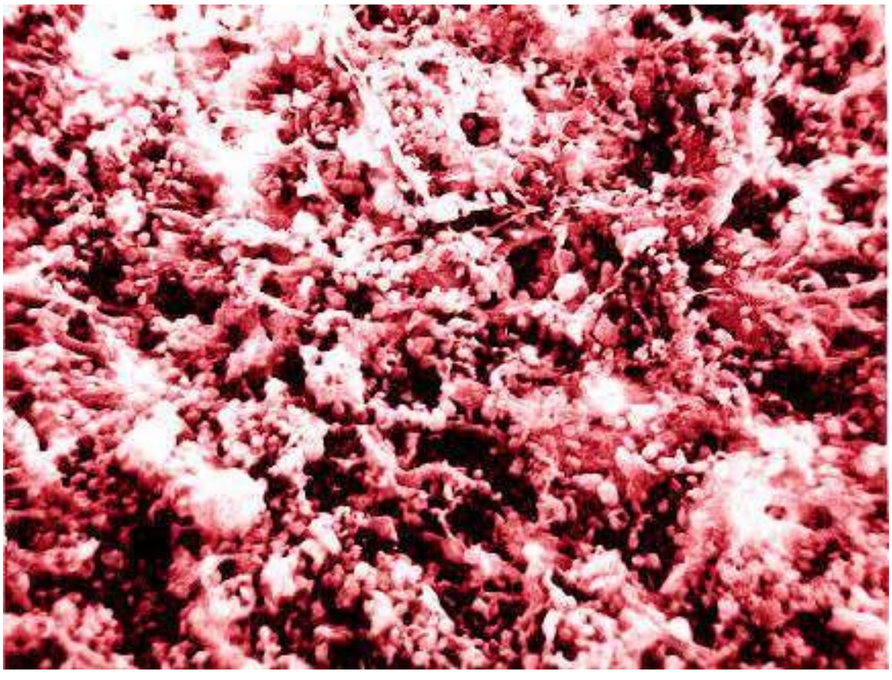


Fig.3.10. Edema and infiltration of the septa, a large number of cells, and mucus in the lumen of the alveoli. 7 days of experimental endobronchitis. SAM x 200.

Particularly massive accumulations of cells were noted around the bronchioles. Among the cells in the lumen of the alveoli, erythrocytes dominated, and alveolar macrophages were also found. At the same time, some of the alveoli retained their airiness, although migrating erythrocytes and connective tissue cells were determined in their lumen (Fig. 3.10).

Thus, the revealed changes in experimental endobronchitis allow us to assert the presence of catarrhal-purulent bronchitis.

Significant changes take place on the 4th day after the simulation of the process. On days 7–10, changes indicate the presence of a severe form of purulent endobronchitis.

The ozone treatment carried out already after one session (3 days after the modeling of endobronchitis) has a beneficial effect on the morphological picture of the bronchi and lungs.

Light-optical studies of the bronchi and lungs 1 day after a single exposure to ozone (4 days after the endobronchitis model) showed a significant decrease in the manifestations of peribronchial inflammation. Although rejection masses of epithelial cells with an admixture of connective tissue cells and mucus continue to be determined in the lumen of the bronchi, inflammatory manifestations in the epithelial lining were significantly reduced. Slight edema remained in the submucosal layer and areas of mild infiltration (**Fig. 3.11**).

SEM showed restoration of the airiness of most of the alveoli and a decrease in the number of migrating connective tissue cells into the lumen of the alveoli. Free erythrocytes are not determined **(Fig. 3.12).**

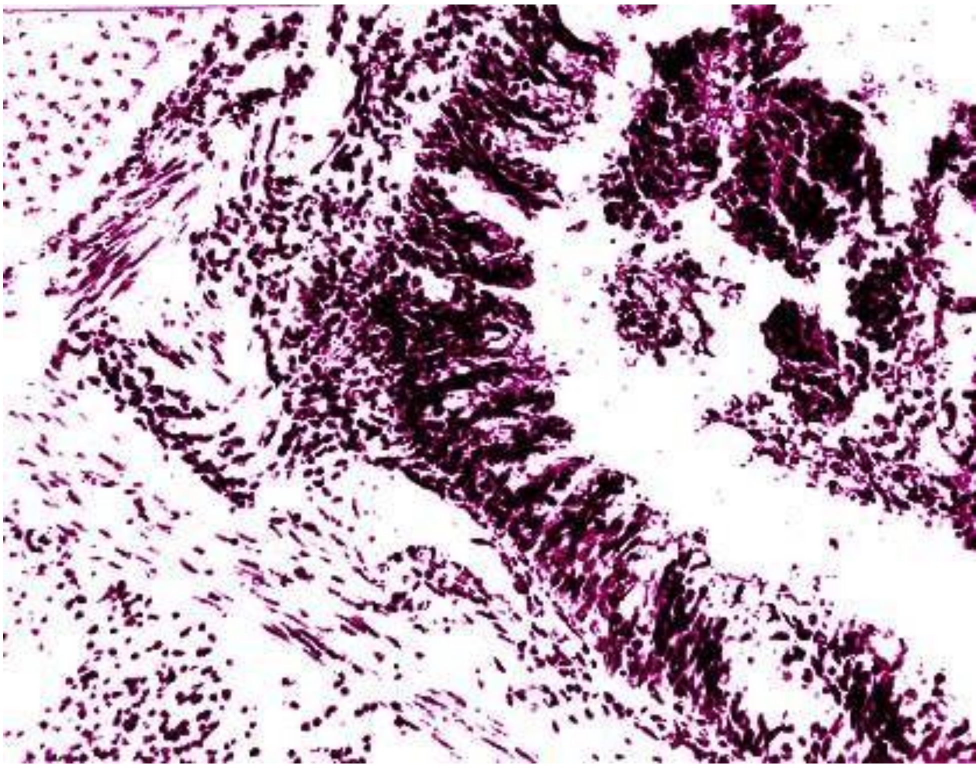


Fig.3.11. Reduced manifestations of edema and infiltration of the bronchial wall. 1-fold exposure to ozone. G - E 10 x 20.

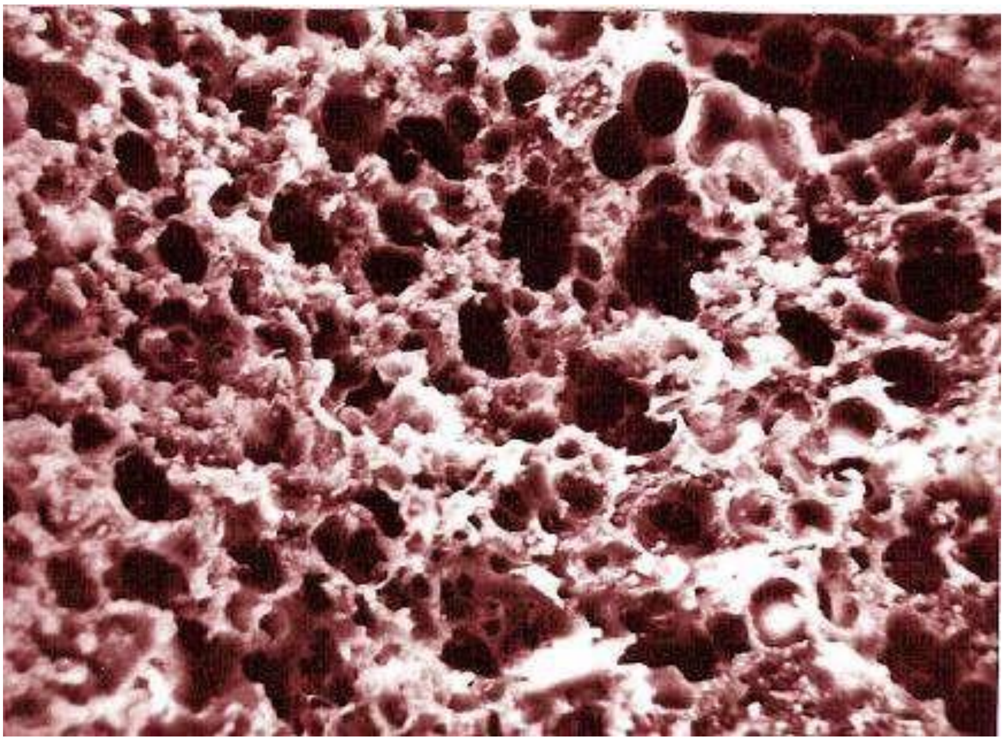


Fig.3.12. Reduced manifestations of edema and cell migration into the alveoli. 1-fold exposure to ozone. SAM x 300**.**

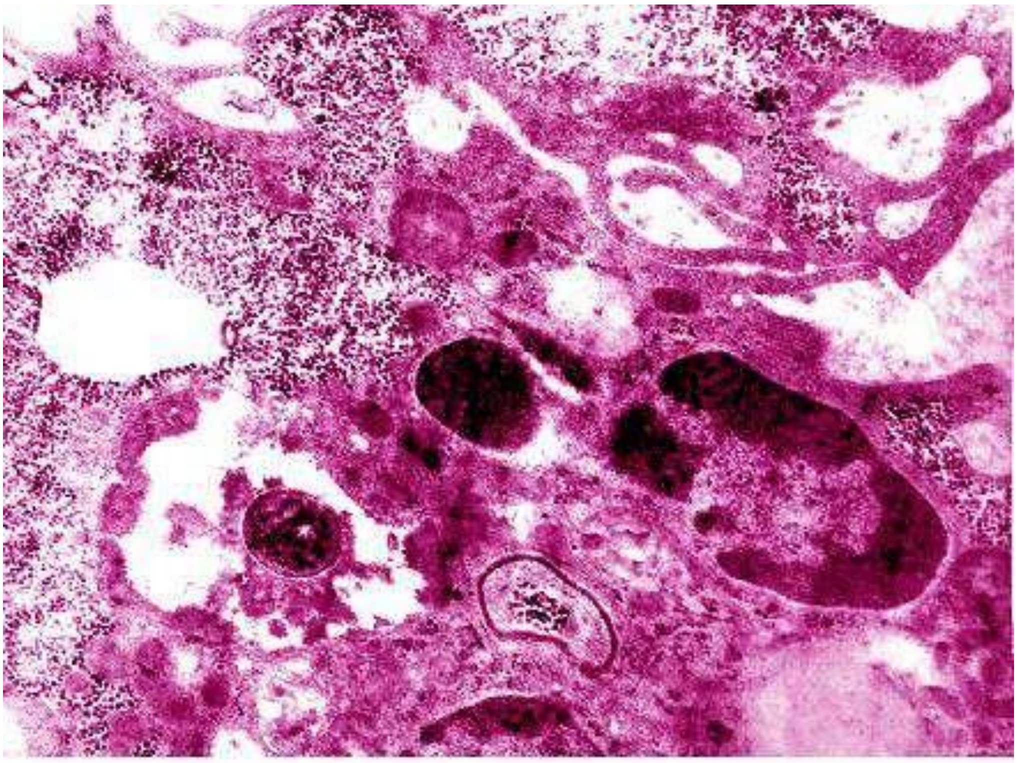


Fig.3.13. Lysis of microbes (MO) in PMN. 1-fold exposure to ozone. TEM x 7500.

TEM made it possible to establish that single microorganisms are found in neutrophilic polymorphonuclear leukocytes from the lumen of the bronchi and the epithelial lining, but they are surrounded in the cytoplasm of neutrophils by a zone of enlightenment and their ultrastructure indicates that they undergo lysis. The cytoplasm of polymorphonuclear neutrophils contains significant accumulations of glycogen and free polysomes (Fig. 3.13).

The ultrastructure of neutrophilic polymorphonuclear leukocytes and the lysis of microbes in them indicates a high level of their specific function in terms of phagocytosis.

Light-optical studies of bronchi and lungs 1 day after double exposure to ozone (7 days of experimental endobronchitis) revealed a significant decrease in previously identified changes caused by catarrhal-purulent endobronchitis.

Fig.3.14. A significant reduction in the manifestations of edema and infiltration of the bronchial wall. 2-fold exposure to ozone. G - E 10 x 20.

There is a restoration of the structure of the epithelial lining of the bronchi, and a reduction in the manifestations of inflammation and edema in all layers of the bronchial wall. Separate small accumulations of connective tissue cells are noted only among the cartilaginous plates of the bronchi **(Fig. 3.14).**

In more remote periods (10 days of experimental endobronchitis and 3-fold exposure to ozone), the structure of the bronchial wall practically does not differ from that in intact animals (**Fig. 3.15**).

The epithelial lining is restored. In the lumen, cells are not detected, both desquamated epithelial and migrated connective tissue.

Small single infiltrative accumulations of connective tissue cells are found in the bronchi of the 2nd order. During this period of observation, the airiness of the pulmonary alveoli is fully restored. In their lumen, migrating cells of the connective tissue, epitheliocytes and erythrocytes are not determined. In septa, pathological accumulations of connective tissue cells are also not determined.

Fig.3.15. Normalization of the structure of the bronchus. 3-fold exposure to ozone. G - E 10 x 20.

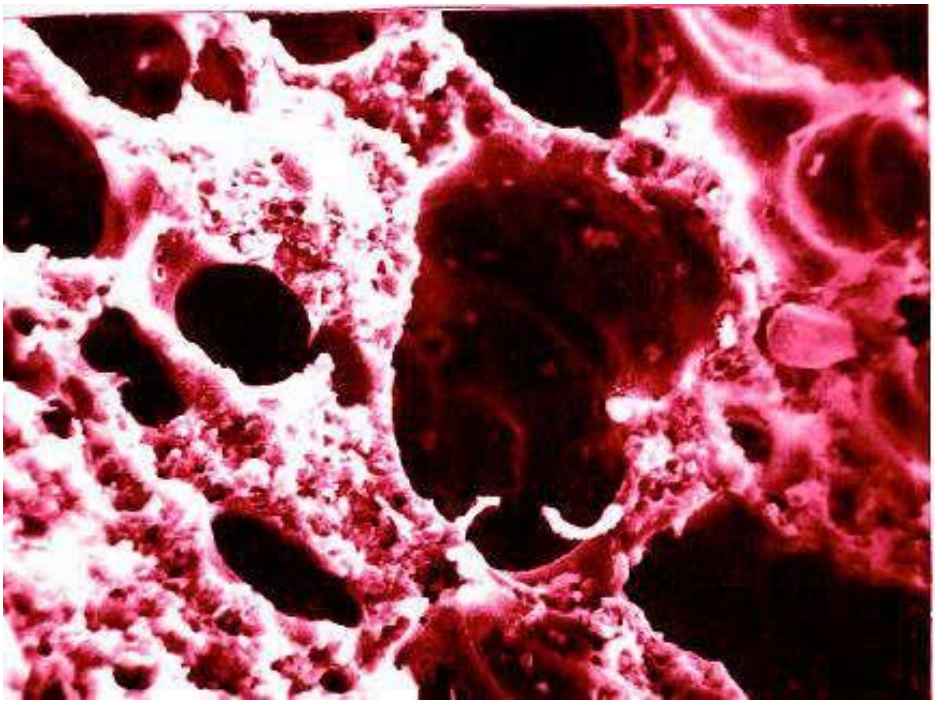


Fig.3.16. Normalization of the alveoli. 3-fold exposure to ozone. SAM x 600.

SEM also showed that during this period the restoration of the airiness of the alveoli takes place. Their lumens are free from any migrated cells or other inclusions. They are wide, and Kohn's pores are defined in them. In the interalveolar septa, characteristic diverse connective tissue cells and capillaries are located (Fig. 3.16).

Light-optical studies conducted after laser therapy have shown that even a single session leads to a decrease in inflammatory changes in the bronchi. The phenomena of desquamation of the epithelium are reduced. To a greater extent than with ozone therapy, the mucus-forming cells of the bronchi are restored. However, in some cases, significant accumulations of polymorphic cells infiltrating the submucosa and, in part, the epithelial lining of the mucous membrane continue to be determined in the bronchial wall **(Fig. 3.17).**

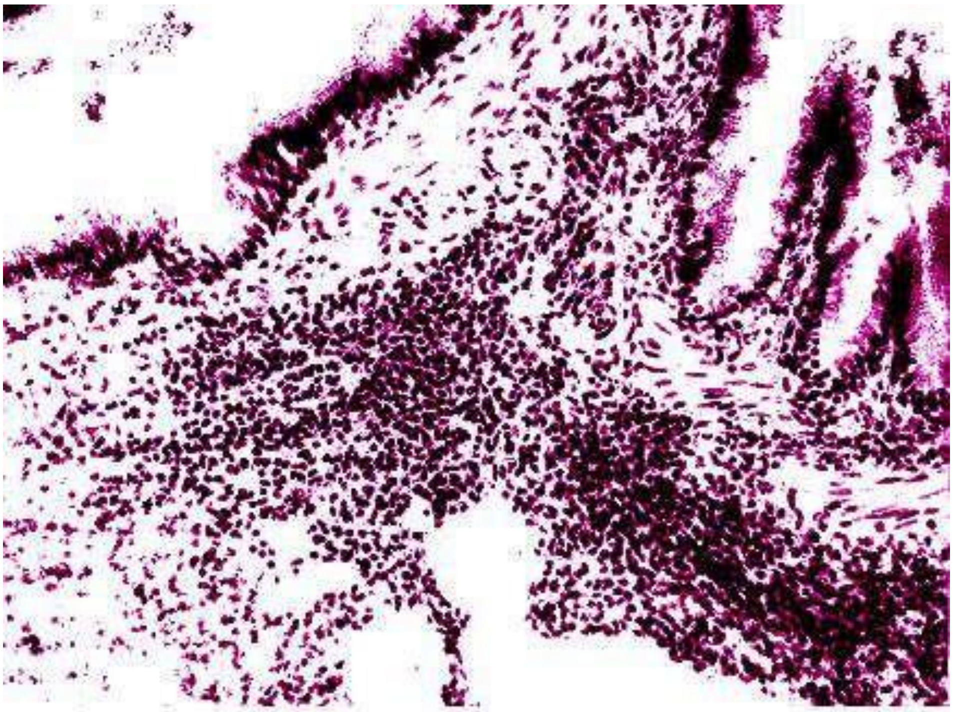


Fig.3.17. Site of infiltration of the bronchus wall. Normalization of the epithelial lining. 1-fold laser exposure. G - E 10 x 20.

Mild desquamation of epithelial lining cells into the bronchial lumen takes place even after double exposure to the laser. However, inflammatory changes in the walls of the bronchi after double laser therapy are significantly reduced, and an MD edema of their walls remains.

TEM during this observation period after laser therapy showed that phagocytosed microbes are found in neutrophilic leukocytes in the bronchial lumen and epithelial lining. Their ultrastructure, in contrast to that after exposure to ozone, is less indicative of intense lysis. However, the cytoplasm of neutrophils contains a large number of glycogen granules. A large number of pseudopodia indicates their activation of phagocytosis. (**fig.3.18).**

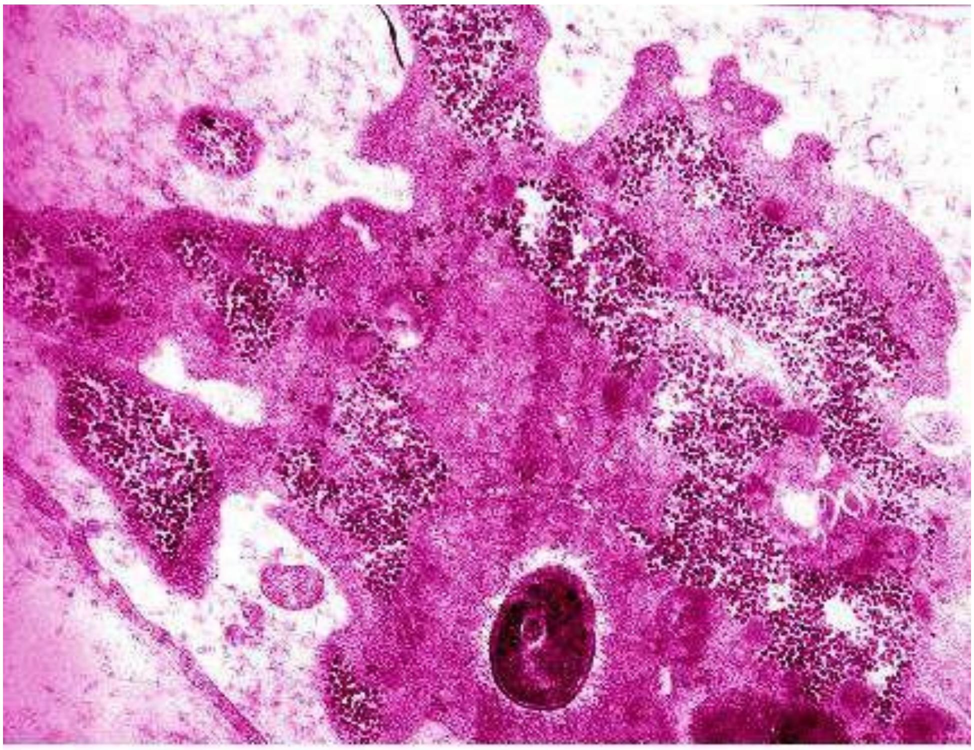


Fig.3.18. Phagocytosis and moderate lysis of microorganisms in PMN.

2-fold laser exposure. TEM x 7500.

A three-time session of laser therapy does not lead to a complete reduction of inflammatory changes in the bronchial wall. They continued to detect small infiltrates. The lumens of lymphatic microvessels were significantly enlarged.

However, the bronchial lumen is free from desquamated and migrated cells and mucus.

The structure of the alveoli and their airiness is fully restored. In interalveolar septa, pathological accumulations of connective tissue cells and manifestations of interstitium edema are not determined. **(fig.3.19).**

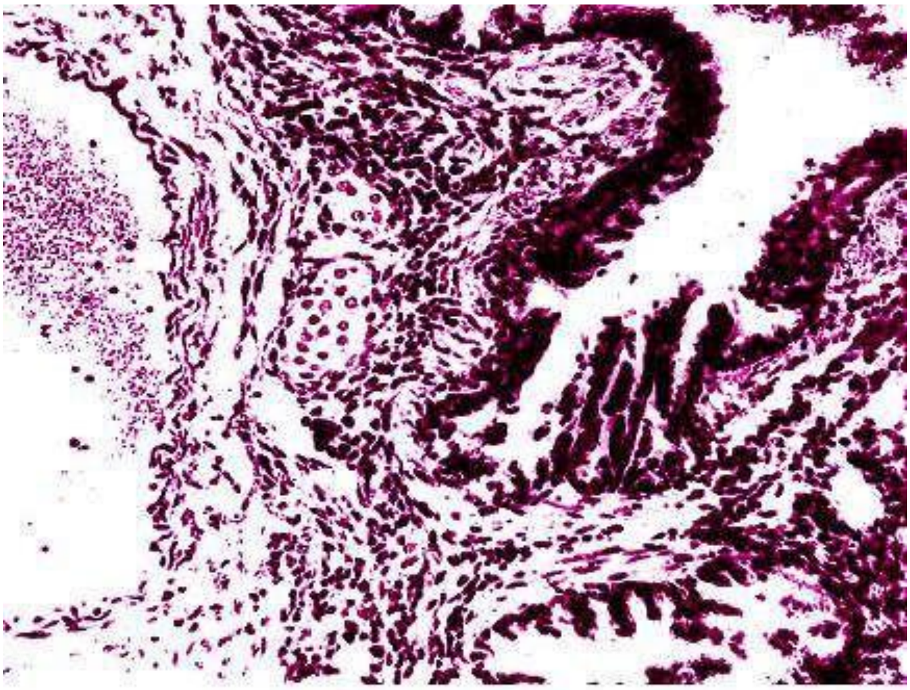


Fig.3.19. Normalization of the epithelial lining of the bronchus wall, and expansion of the lymphatic capillary. 3-fold laser exposure. G - E. 10 x 20.

SEM also revealed the restoration of the structure of the alveoli after three laser exposures.

The alveoli are free from migrated and connective tissue cells, erythrocytes, and desquamated alveolates. In the interalveolar septa, connective tissue cells characteristic of the interalveolar septa are determined. Occasionally, erythrocytes are found **(Fig. 3.20).**

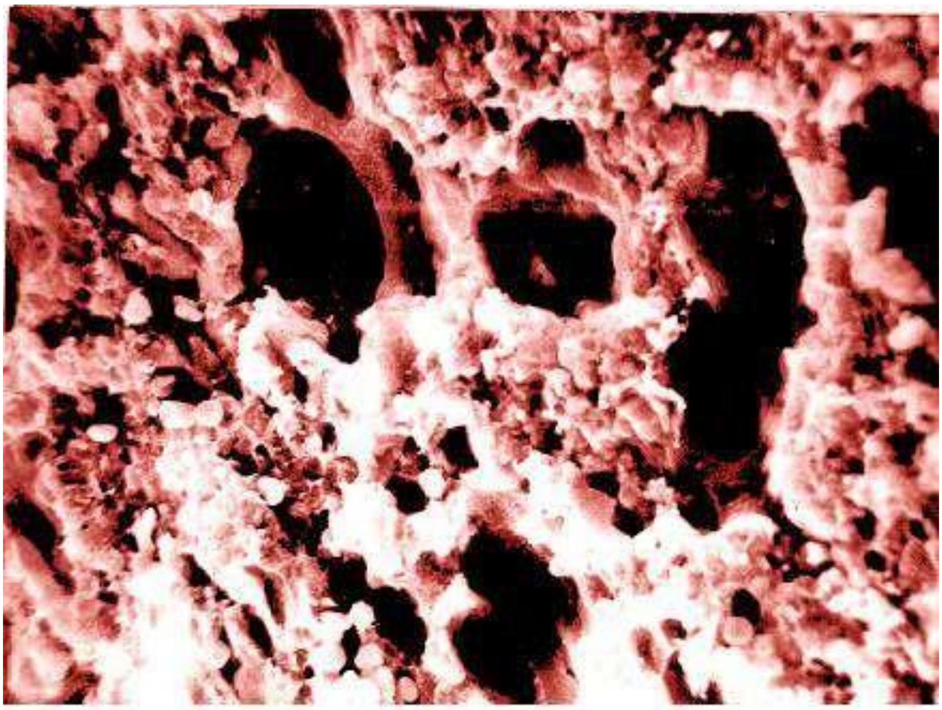


Fig.3.20. Normalization of the alveoli. 3-fold laser exposure. SAM x 600.

Light microscopy of the bronchi and lungs after combined exposure to ozone and laser indicates the most favorable result of complex therapy.

Already a single exposure led to a reduction in inflammatory changes and restoration of the epithelial lining of the bronchi. However, in the lumen of the bronchi, there were small single accumulations of desquamated and migrated cells and a small amount of mucus **(Fig. 3.21).**

TEM of neutrophilic polymorphonuclear leukocytes (PMNs) from the bronchial lumen and epithelial lining revealed ultrastructural signs of their functional and phagocytic activity.

Phagocytosed microorganisms are enclosed in phagosomes surrounded by a membrane with a zone of enlightenment. They were subjected to pronounced lysis. In the cytoplasm, along with glycogen grains, there were profiles of a granular endoplasmic reticulum.

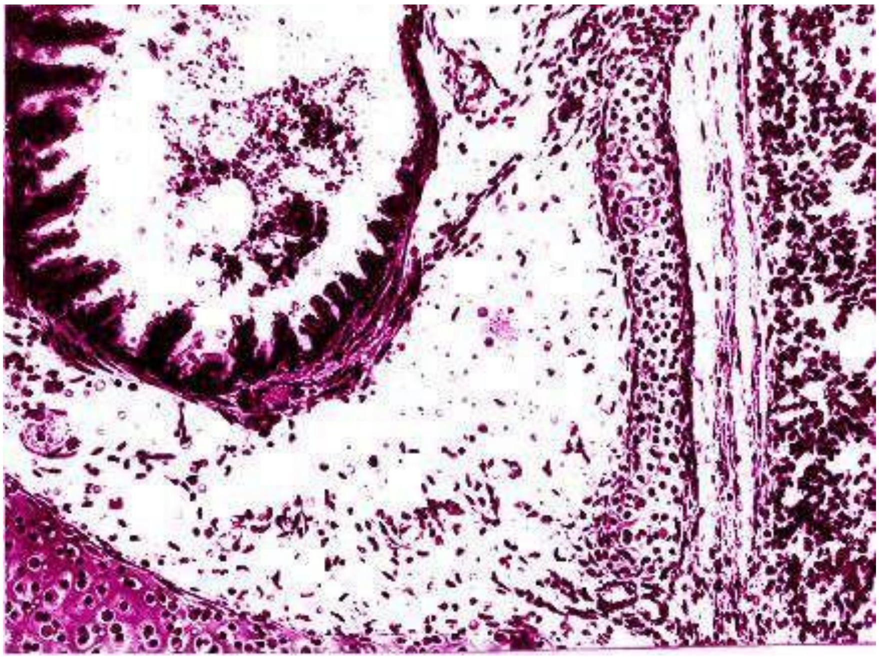


Fig.3.21. Reduction of the structure of the bronchial wall, moderate manifestations of desquamation. 1-fold complex exposure to ozone and laser. G - E. 10 x 20.

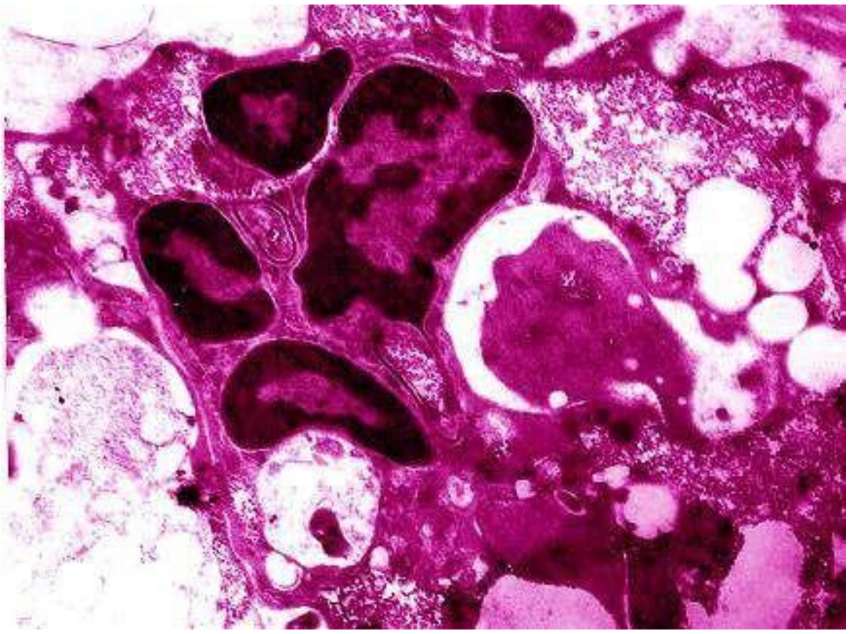


Fig.3.22. Phagocytosis and pronounced lysis of microorganisms in PMN. 1-fold complex exposure to ozone and laser. TEM x 7500.

The plasma membrane formed numerous pseudopodia. In nuclei with typical segmentation, heterochromatin dominated, located along the periphery of the nucleus, contouring the nuclear pores **(Fig. 3.22).**

This indicates a high level of differentiation and functional activity of neutrophilic PMNs detected in the bronchial lumen after complex exposure.

SEM showed the restoration of the structure of the alveoli after a single complex (ozone + laser) exposure.

The lumen of the alveoli is airy. They do not detect migrated connective tissue cells, erythrocytes, and desquamatedalveolatess. Just as in the observations described above, cells of the connective tissue and fibers are located in the septa **(Fig. 3.23).**

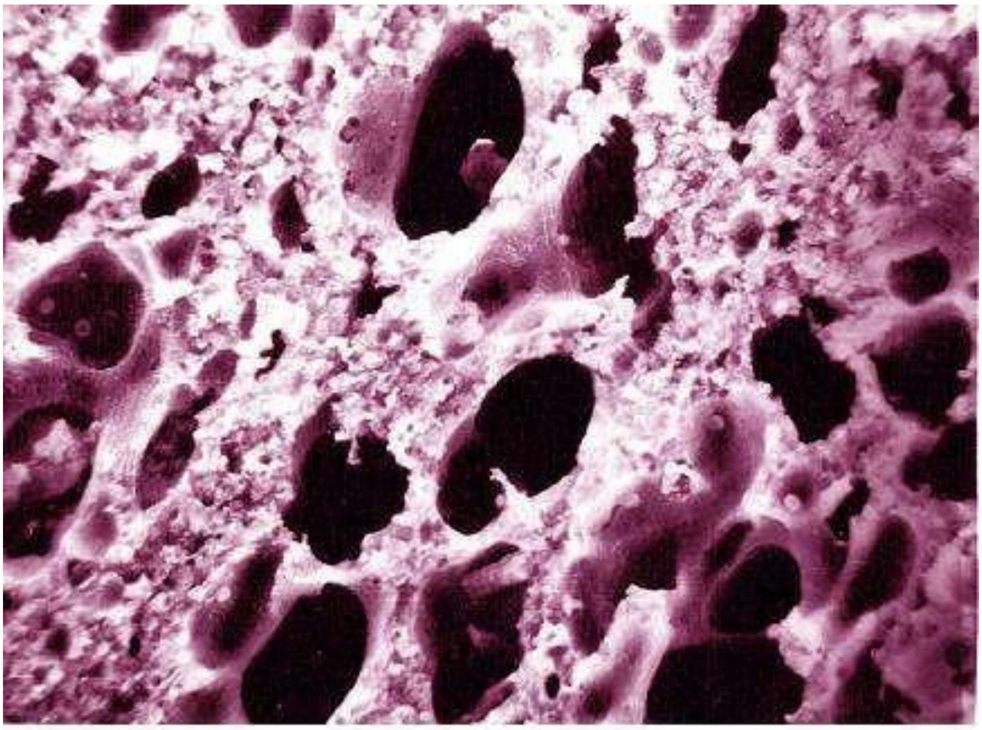


Fig.3.23. Normalization of the alveoli. 1-fold complex endobronchial exposure to ozone and laser. SAM x 600.

Double complex exposure (7 days after infection of animals) leads to a complete restoration of the structure of the walls of the bronchi. Only a small amount of mucus and single desquamated cells are found in their lumen. The presence of a large number of small microvessels with “juicy” endothelium in the wall of the bronchi is characteristic. As a rule, these microvessels are located in groups. The nature of the location of these microvessels may indicate the intensification of the processes of neovasculogenesis. **(Fig.3.24).**

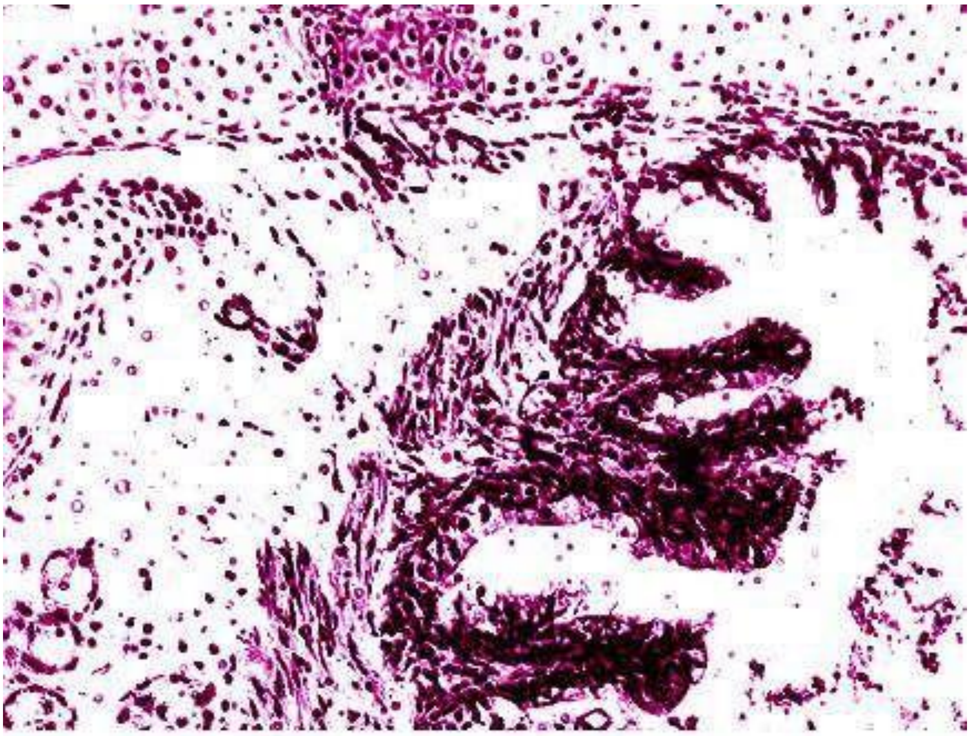


Fig.3.24. Normalization of the structure of the bronchial wall and neovasculogenesis. 2-fold complex exposure to ozone and laser. G - E. 10 x 20.

Three-time complex exposure (10 days after modeling endobronchitis) leads to complete normalization of the bronchial wall structure, and restoration of their epithelial lining.

During these terms, described above, the processes of neovasculogenesis are expressed to a greater extent. Microvessels with "succulent" endothelium are adjacent directly to the basement membrane of the epithelial lining **(Fig. 3.25).**

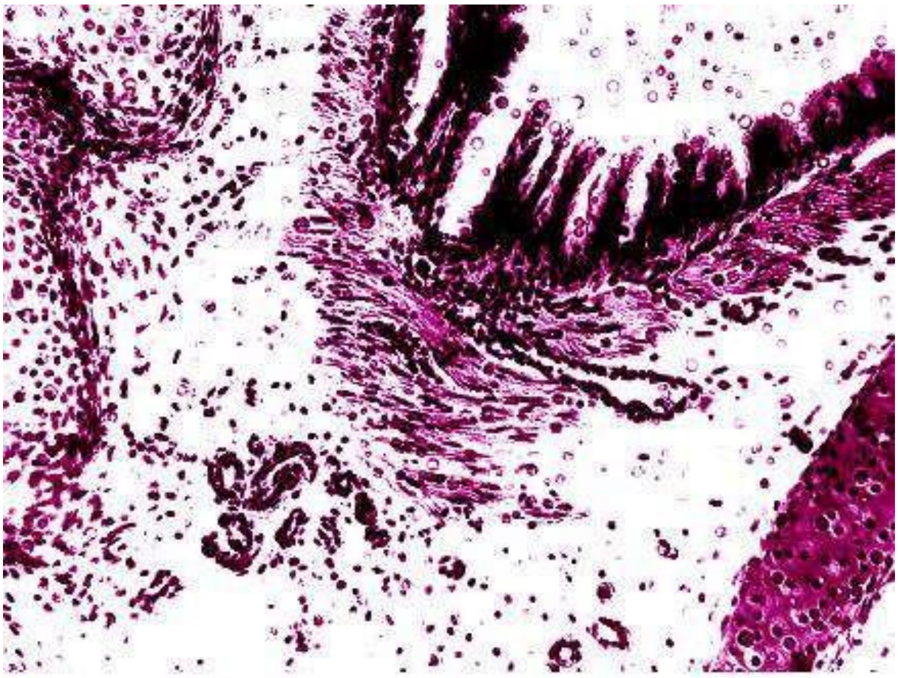


Fig.3.25. Normalization of the structure of the bronchial wall, manifestations of neovasculogenesis. 3-fold complex exposure to ozone and laser. G - E. 10 x 20.

A triple complex effect leads to complete normalization of the alveoli. All alveoli regain their airiness. They are separated by thin septa with a large number of microvessels in them and a small number of connective tissue cells and fibers.

Bronchioles in the respiratory part of the lungs, as well as bronchi of the 2nd-3rd order, also fully restore their inherent structure after a complex three-fold exposure.

SEM performed after a three-fold complex exposure also confirms the restoration of the three-dimensional organization of the alveoli. They are airy, in their lumen, there are only single erythrocytes and other migrated cells and desquamatedalveolatess. Kohn's pores are well expressed **(Fig. 3.26).**

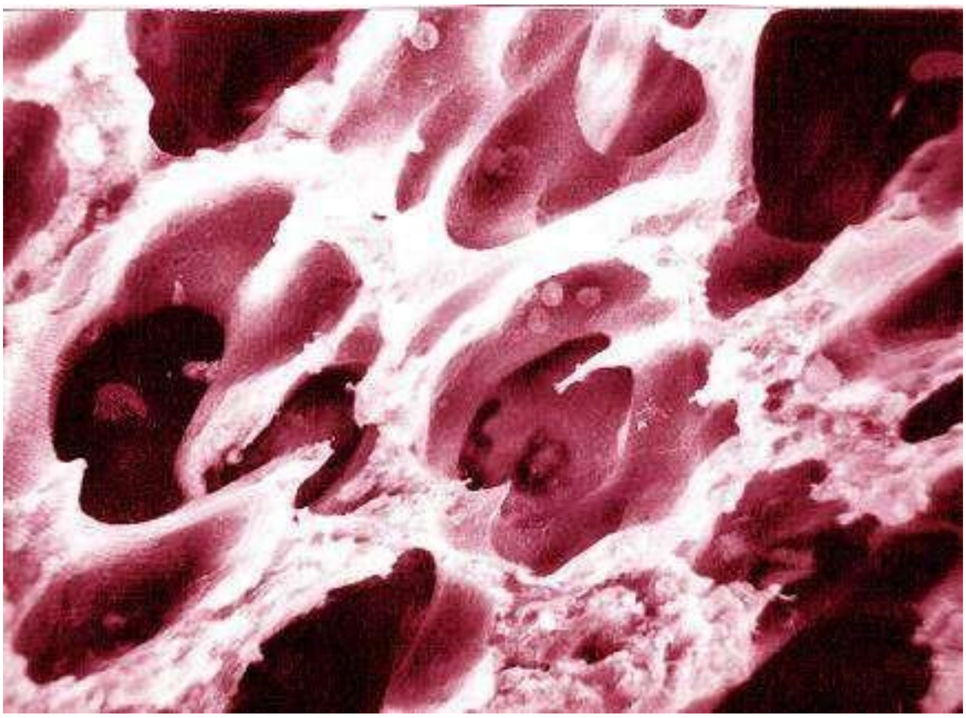


Fig.3.26. Complete normalization of the alveoli. 3-fold complex exposure to ozone and laser. SAM x 600.

The conducted morphological studies have shown that the selected model of endobronchitis in guinea pigs causes pronounced lesions of the bronchi and alveoli on the 3rd day of reproduction, indicating the development of endobronchitis, which, by the nature of the changes, can be attributed to a purulent process.

The severity of the pathological process is indicated both by the death of some animals in the control group and by the corresponding morphological picture of the bronchi and lungs.

Treatment with ozone led to a reduction in morphological changes in the bronchi and alveoli after a single exposure.

The decrease in inflammatory changes in all layers of the bronchial wall was accompanied by a decrease in epitheliocyte desquamation and migration of connective tissue cells. Phagocytosis and lysis of microorganisms intensified in neutrophilic PMNs.

Threefold lavage of the bronchial tree with ozonized saline led to the normalization of the structure of the bronchi and lungs.

LILI of the red range also had an effect after a single exposure. It was expressed in a decrease in inflammatory and destructive changes in the bronchi and alveoli.

Laser therapy had a pronounced effect on the processes of normalization of mucus-forming cells and microcirculation. However, the processes of phagocytosis of lysis of microorganisms by neutrophilic polymorphonuclear leukocytes were less pronounced than after ozone therapy.

After three exposures, despite the overall positive effect and restoration of the structure of the bronchi and alveoli, residual manifestations of the inflammatory reaction were determined in some areas.

The most pronounced positive effect was noted with the complex use of ozone and laser therapy.

One session of complex exposure led to a significant reduction in inflammatory changes, reduced the manifestations of epithelial desquamation, and normalized mucus secretion.

The ultrastructure of neutrophilic polymorphonuclear leukocytes indicated the intensification of the processes of phagocytosis and lysis of phagocytized microorganisms. The complex effect led to pronounced manifestations of neovasculogenesis.

After 3 sessions, a complete restoration of the structure of the bronchi and lungs was noted.

Conducted experimental - morphological studies give reason to believe that ozone therapy is an effective treatment for purulent endobronchitis. It can be used both as an anti-pyogenic and as an anti-inflammatory agent.

Laser therapy, is also anti-inflammatory a means that has a stimulating effect on microcirculation, mucus-forming cells, in terms of efficiency to some extent inferior to the effects of ozone. In the treatment of purulent endobronchitis, laser therapy can be used as an alternative remedy.

Our observations have shown that the maximum anti-inflammatory and antipyogenic effect is manifested in the complex use of ozone and laser therapy.

Thus, the results of the cytological studies of endobronchial lavage fluid and morphological studies using light microscopy, transmission and scanning electron microscopy suggest that the use of ozone, and the laser is an effective tool in the treatment of experimental endobronchitis, and their combined use (ozone + laser) enhance impact, potentiating the positive properties of each of them.

The complex use of ozone and laser therapy can be recommended for clinical use in the treatment of purulent endobronchitis, which occurs with suppurative lung diseases.

CHAPTER IV.

DIAGNOSTICS OF BRONCHIECTASIS DISEASE IN CHILDREN.

Clinical symptoms

The study of anamnestic data and the causes that led to the development of the disease in the observed patients made it possible to note that the onset of the disease was usually associated with catarrhal factors. Repeated respiratory diseases in the form of influenza, pneumonia, tracheobronchitis with the obstructive syndrome, or diseases of the ENT organs were always noted, which, before admission to the hospital, and therefore patients repeatedly received inpatient and outpatient treatment, also 9 (8.7%) were treated in anti-tuberculosis dispensaries. The duration of illness in children is shown in Table 4.1.

Table 4.1

Medical history

Medical history	КГ	%	ОГ	%	Σ	%
From birth	13	28,9	10	16,95	23	22,1
From early childhood	13	28,9	25	42,37	38	36,5
Last one or two years	12	26,7	15	25,42	27	26
last three to eight years	7	15,6	9	15,25	16	15,4
Σ	45	100	59	100	104	100

Based on the anamnesis, it was possible to find out that in 23 (22.1%) cases the disease was congenital (in CG -13 (28.9%) and 10 (16.95% in MG, respectively). Among acquired bronchiectasis, 65 (62,5%) children whose cause of BE was undertreated acute lung disease and their chronicityWhenen collecting an anamnesis, it was found that short-term periods of remission, as a result of the termination of active treatment, were soon replaced by periods of regular exacerbations of bronchopulmonary diseases. The second important etiological factor is late recognition in the primary health care system of acute and subacute lung diseases and the-chronicity city. The third factor is, in our opinion, late access to medical care due to the extremely low level of educational work among the rural population (Table 4.2).

Table 4.2.

Etiology of acquired bronchiectasis

Etiology of acquired bronchiectasis	**KG**		**OG**		**Total**	
	Abc.	**%**	**Abc.**	**%**	**Abc.**	**%**
Primary acute diseases and their chronicity	24	53,3	41	69,5	65	62,5
Transferred pleurisy	4	8,9	2	3,4	6	5,8
Foreign rear airways	2	4,4	5	8,5	7	6,7
Thermal burn of the upper respiratory tract	1	2,2	0	0	1	0,96
Abscess	1	2,2	1	1,7	2	1,9

As can be seen from the table, foreign bodies as the cause of the development of PEB were noted in 7 (6.73%) cases. Among the foreign bodies were identified: peas, peanuts, and sunflower seeds, which, as a rule, are not contrasted during plain fluoroscopy and radiography. In addition, beads were found among foreign bodies, and in one case, a fragment of polyethylene material. These foreign bodies were in the lumen of the bronchi from three to nine months. In 6 (5.8%) cases, the cause of the development of the disease was pleurisy against the background of acute destructive pneumonia.

In one case, the etiological factor of bronchiectasis was a thermal burn of the bronchi when high-temperature steam entered their lumen. In 2 (1.92%) cases, the cause of bronchiectasis was a lung abscess.

Of 104 patients, 1 exacerbation of the disease during the year was observed in 29 (27.9%) and 75 (72.1%), exacerbation of the disease was noted 2-3 times a year in the form of acute pneumonia and bronchitis, in some cases masking acute respiratory infections diseases.

Upon admission, the general condition of the patients was assessed as moderate in the CG in 34 (75.6%) children and, accordingly, in 48 (81.7%) in the MG, as severe in 11 (24.4%) in the CG, and - 11 (18.6%) children in the MG. The severity of the condition was also explained by the period of exacerbation or the addition of SARS.

26 (57.8%) patients in the CG and 34 (57.6%) in the MG were admitted for treatment in remission, 19 (42.2%) and 25 (42.4%), respectively, were admitted in the acute stage.

An objective examination revealed that 66 (63.5%) children had a symptom of “drumsticks”, indicating chronic hypoxia of the body, in 24 (23.1%) patients this symptom was less pronounced, and in 14 (13.5%) %) was absent. In patients with a mild symptom of "drumsticks" or the absence of this symptom, as a rule, a short duration of the disease was noted, the cause of the disease was more often foreign bodies of the respiratory tract, cylindrical bronchiectasis was noted in the form of the lesion in these patients.

Examination of the chest revealed a cylindrical shape in 78 (75.0%) cases, a barrel-shaped one in 5 (4.8%) cases, a keeled shape in 5 (4.8%) cases, and a normothermic shape in 16 (15.4%) cases. The main symptom at admission in all children was a cough of a different nature, with the release of purulent (especially during the period of exacerbation) or mucopurulent sputum, mainly sputum was noted in the morning. In 21 (20.1%) cases, shortness of breath was noted, which was associated with an exacerbation of the disease or the addition of acute respiratory viral infections. In 2 (1.92%) cases, hemoptysis was observed (Table 4.3).

Table 4.3.

Complaints of patients with BEB

Complaints	KG	%	OG	%	Σ	%
Cough with sputum odor, with a periodic increase in body t.	23	51,1	36	61,0	59	56,7
General weakness, shortness of breath.	21	46,7	22	37,3	43	41,4
Hemoptysis.	1	2,2	1	1,7	2	1,9
Σ	45	100	59	100	104	100

Auscultation most often revealed localized conductive rales, as well as weakening of breathing over the affected area and various wet rales associated with the presence of exudate in the lumen of the bronchioles.

The pathological general somatic background was observed in 51 patients (58.6%). In 39 (44.8%) of them, a weight deficit from 10 to 30% was detected. Anemia of varying severity was observed in 62 children (71.2%). Chronic tonsillitis was observed in 18 (20.6%) patients, and chronic sinusitis - in 4 (4.6%). Together with the detected lag in physical development, 35 patients (40.2%) had hyperleukocytosis 9.0x109/l - 15x109/l, lymphocytopenia from 19x109/l to 10x109/l, hypercoagulability, hypoproteinemia, ESR acceleration from 20 to 60 mm /hour. Urolithiasis occurred in one child ld, epilepsy - in one.

Instrumental and laboratory research methods.

The ECG was used as a routine study. However, the ECG analysis revealed several specific changes characteristic of BEB. Sinus tachycardia was detected in

58 (60.6%) cases, and dystrophic changes in the myocardium were observed in 22 (21.2%) patients. These changes were diffuse in every second patient. Slowing of the conduction of the His bundle system was noted in 9 (8.7%) patients. Due to intrapulmonary pathology and increased resistance in the pulmonary vascular system, overload of the right parts of the heart occurred in 10 (9.6%) children. The severity of ECG changes was proportional to the duration of the disease, the prevalence of pathology, and the severity of morphological changes in the lung tissue.

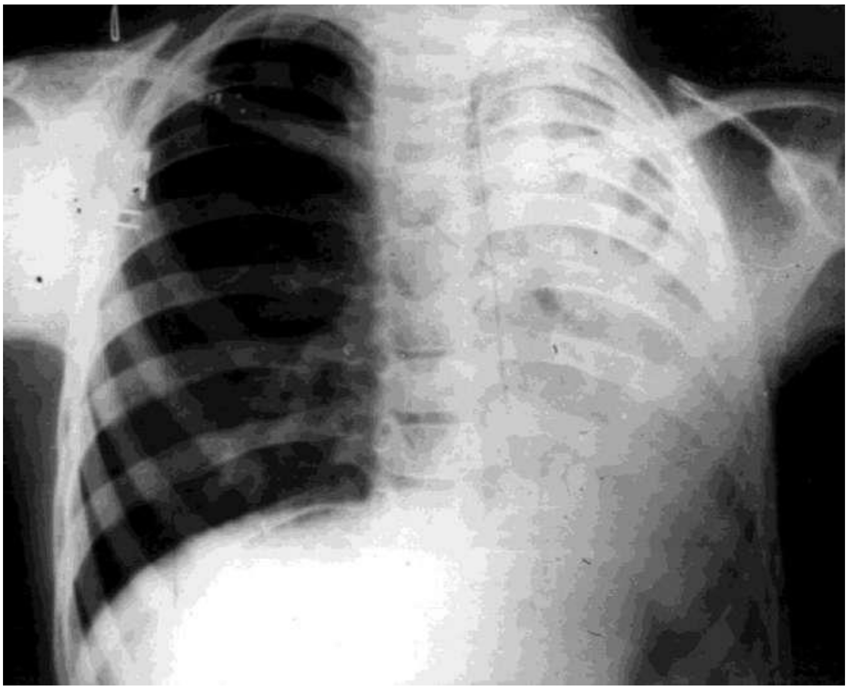
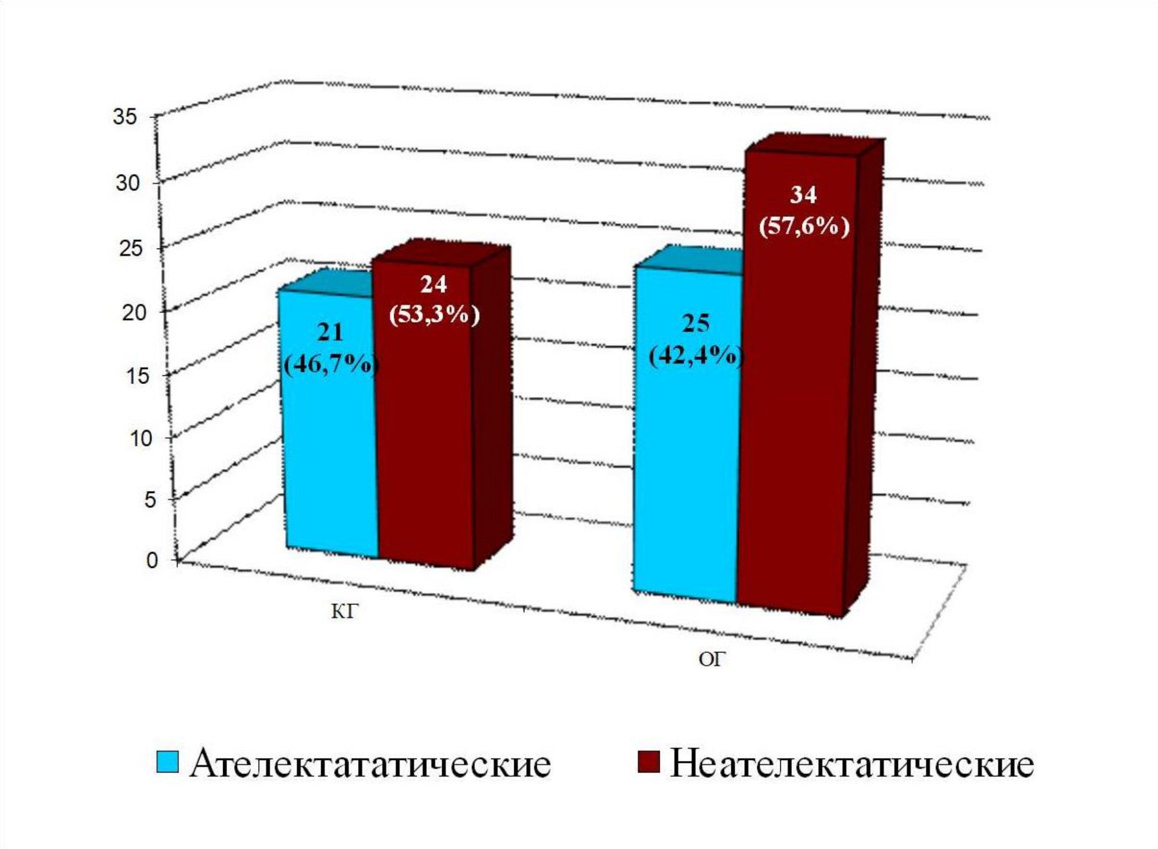


Fig 4.1. Atelectasis of the lung on the background of bronchiectasis with mediastinal shift to the diseased side.

X-ray methods of research in BEB are highly informative. Thus, in 46 cases, plain radiography and fluoroscopy revealed mediastinal displacement against the background of existing atelectasis of the affected side, and in 14 cases, cellularity of the pulmonary pattern was detected. On fig. 4.1. the picture of BEB with mediastinal displacement is shown



Rice. 4.2. Characteristics of bronchiectasis. (Ателектататические - Atelectatic , non-atelectatic, неателектатические - non-atelectatic)

The atelectatic form of bronchiectasis was found in 46 (44.2%) children. X-ray was determined by the mediastinal shift to the pathological side and the deformation of the lung pattern. The atelectatic form of BEB was mainly congenital or developed at a very early age after birth and is associated with defects in the formation of cellular and tissue structures. As for the emphysematous form, it developed in the later stages of the child's development and was associated to a greater extent with the nature of the acquired lung pathology. This type of bronchiectasis was noted by us in 58 (55.8%) patients **(Fig. 4.2**.).

Experience has shown that in a certain percentage of cases, X-ray examination does not reveal the emphysematous nature of bronchiectasis. This form is often found only during surgery, after thoracotomy. This circumstance is another justification for the need to improve the preoperative diagnosis of PEB.

One of the main instrumental methods for studying BEB is tracheobronchoscopy.

The results of a visual assessment of the condition of the bronchial tree are presented in Table 4.4. The criteria for the pathological picture were evaluated according to the classification of Klimanskaya E.V., 1972.

Table 4.4.

The nature of endobronchial pathology.

Character endobronchial pathology		**KG**		**ОГ**						**TOTAL**	
				I-subgroup.		**II-subgroup.**		**III-subgroup.**			
		Abc.	%	Abc.	%	Abc.	%	Abc	%	Abc	%
Type endobronchitis	catarrhal	-	-	-	-	-	-	-	-	-	-
	Catarrhal	7	15,6	3	13,6	3	15,8	3	16,7	16	15,4
	purulent	38	84,4	19	86,4	16	84,2	15	83,3	88	84,6
Prevalence	Purulent	16	35,6	10	45,5	5	26,3	8	44,4	39	37,5
	Diffuse	29	64,4	12	54,5	14	73,7	10	55,6	65	62,5
The nature of the lesion	Unilateral	26	57,8	18	81,8	7	36,8	12	66,7	63	60,6
	Double-sided	19	42,2	4	18,2	12	63,2	6	33,3	41	39,4

As can be seen from the table of 104 patients: catarrhal-purulent bronchitis was detected in 16 children (15.4%), and purulent - in 88 (84.6%). In 65 (62.5%) patients, a diffuse process was noted that went beyond the zone of organic changes in the bronchus, and the local nature of the lesion was noted in 39 (37.5%) sick children.

At the beginning of the examination and treatment, a unilateral lesion was diagnosed in 63 (60.6%) patients and a bilateral lesion in 41 (39.4%) patients. At the same time, it should be noted, as will be shown in subsequent chapters, that even with a unilateral lesion, non-compliance with all the rules for the sanitation of the bronchial tree and inadequate treatment contribute not only to the progression of the process on the side of the lesion, but also to the transition to the contralateral side. Naturally, this leads to further complications, and unsatisfactory results.

Bronchography revealed the following types of bronchiectasis (Table 4.5).

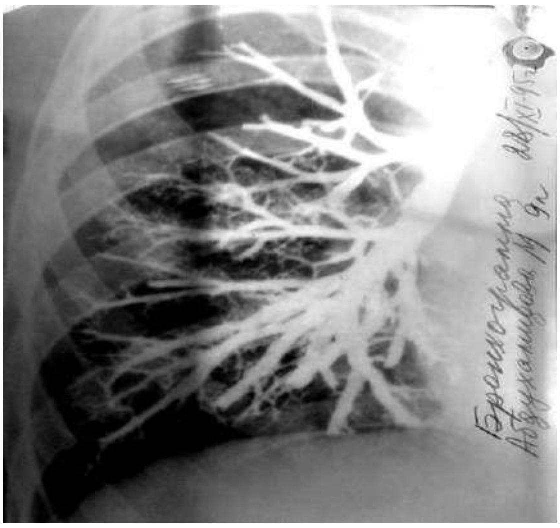
Table 4.5

The form of bronchiectasis in the examined patients

Form of bronchiectasis	**Control group**		**Main group**		**TOTAL**	
	abc	%	abc	%	abc	%
Cylindrical	14	31,1	13	22	27	26
Saccular	19	42,2	36	61	55	52,9
Cystic	10	22,2	6	10,2	16	15,4
Mixed	2	4,4	4	6,78	6	5,77

It was noted that the cylindrical form of bronchiectasis in 27 (26.0%) cases proceeds more favorably, and does not lead to significant complications, with regard to saccular (55 (52.9%) cases) and cystic (16 (15.4%)) forms, they are accompanied by a much larger number of postoperative complications, less responsive to ongoing treatment.

In Figures 4.3.; 4.4.; 4.5.; 4.6.; 4.7. various forms of bronchiectasis observed in the examined patients are presented.



Rice. 4.3. The cylindrical form of bronchiectasis of the lower lobe of the right lung.

Fig 4.4. Saccular form of bronchiectasis of the lower lobe with deformation of the bronchi of the upper lobe, condition after removal of the foreign body.

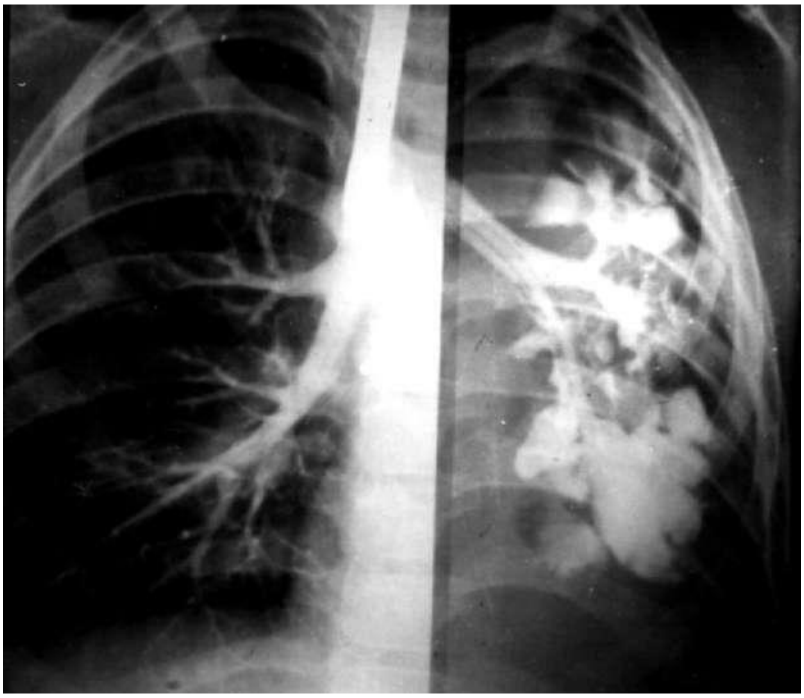
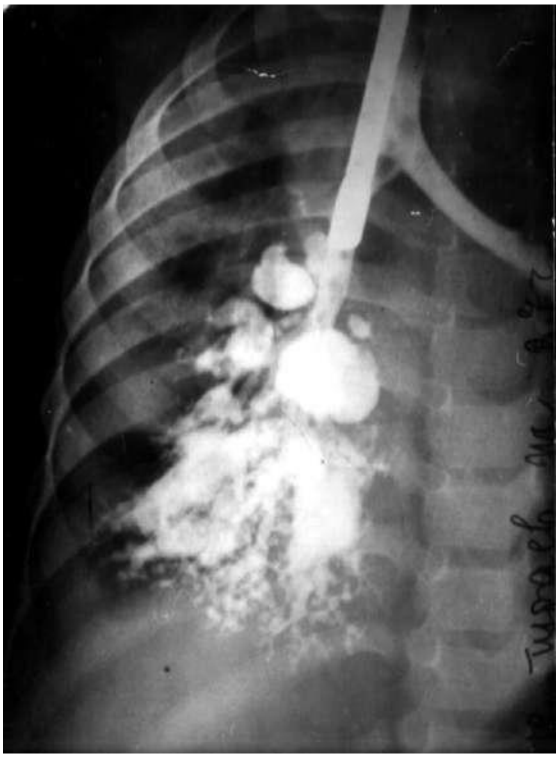


Figure 4.5. Cystic bronchiectasis of the left lung.



Right

Left

Fig 4.6.; 4.7. Bilateral bronchiectasis (mixed form).

This group of patients has a higher mortality rate. Of the 104 examined patients, one had previously undergone pneumonectomy at another institution for the cystic form of BEB of the left lung. After the examination, it was established that this child had a long bronchus stump, as a result of which persistent purulent endobronchitis continued, which required preoperative preparation and reamputation of the bronchus stump.

The second of these patients had also previously been operated on in another institution for the saccular form of BEB, and a left lower lobe lobectomy was performed. Subsequently, a recurrence of BEB occurred in the remaining part of the lung, which required a second operation. In this case, the development of pronounced purulent endobronchitis against the background of saccular forms of bronchiectasis was also noted upon admission to us, and careful preoperative preparation was carried out.

As can be seen from figure 4.8. left-sided localization of the process was found in 72 (69.2%), right-sided - in 17 (16.3%), bilateral bronchiectasis lesion was noted in 8 (7.7%) cases, and in 7 (6.7%) patients in the contralateral lung was marked with deforming bronchitis.

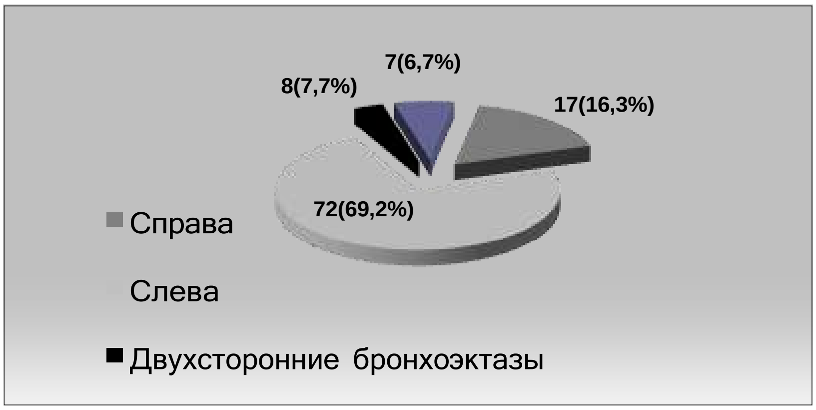


Fig 4.8. The nature of the X-ray bronchographic picture, taking into account changes in the contralateral lung.

The aggravation of the inflammatory process is associated primarily with late negotiability and late-onset therapeutic measures. The natural outcome of delayed treatment is the development of chronic complications, which include bronchiectasis.

Bronchial swabs were taken from 20 patients who underwent surgery for urolithiasis under intubation anesthesia to obtain normal cytology of broncho-important fluid. The cytological examination of the washouts was taken as the normal values of the cytograms. For diagnostic purposes and as a treatment, BALF was performed in 67 patients with PEB. The nature of changes in cytograms in children with BE is shown in the table.

Table 4.6.

Endobronchial cytogram for bronchiectasis in children at the first bronchoscopy, i.e. before treatment (M+m)

Cellular elements	**Norm (n-20)**	**KG (n-8)**	**OG**			**∑**
			I-subgroup. (n-22)	**II-subgroup. (n-19)**	**III-subgroup. (n-18)**	
Cytosis x 10^9/л	0,7±0,06	22,6±0,4	20,8±1,1	22,1±1,2	23,2±0,9	22,0±0,6
NL %	8,5±1,0	90,8±0,7	90,6±0,7	91,4±1,6	89,4±1,7	90,5±0,7
AM %	87,7±1,5	3,8±0,2	3,1±0,3	4,2±1,4	2,6±0,9	3,3±0,5
L %	3,9±0,7	5,5±0,2	6,0±0,6	5,6±0,8	8,0±1,1	6,4±0,4

In the analysis of broncho-important fluid at the beginning of the examination, it was found that 76.0% of patients showed signs of activation of the pathological process. If the normal total cytosis was 0.7□0.06 x 109/l, then in the examined patients it was up to 22.0□0.6 x 109/l. The level of neutrophilic leukocytes (NL) increased from 8.5□ 1.0% to 90.5□ 0.7% (P<0.001). At the same time, the number of lymphocytes (L) increased from 3.9□ 0.7% to 6.4□0.4%. In some cases, with a local segmental pathological process, the number of macrophages and neutrophils in the analysis of broncho-important fluid from unaffected areas did not differ significantly from normal values. This indicates the development of symbiosis of microorganisms and the system of microorganisms - the mechanisms of protection of the macroorganism are in a state of dynamic equilibrium. Endobronchial spread of pathogenic microflora from pathological areas into the lumen of intact bronchi and alveoli leads to an overload of alveolar macrophages. This further significantly reduces the functional activity of macrophage protection, activates the neutrophilic phase of inflammation, and also involves specific immunity factors in the pathological process. With long-term BEB, endobronchitis and metaplasia of the epithelium of the affected area disrupt bronchial clearance, and stead lowering lower the level of macrophage protection. This is accompanied by activation of the intrabronchial microflora, an increase in tissue detritus, and an increase in the reaction level of the neutrophilic system. In intact areas of the lungs, dysfunction of local pulmonary protection occurs, which contributes to the further formation of a nonspecific reaction of neutrophils. Pyknosis of the nuclei, karyolysis of epithelial cells (Fig. 4.9.), many segmented leukocytes, fand fibrin,and cells with signs of degeneration (Fig. 4.10.) were revealed in the broncho-important fluid.

For demonstration, a cytogram of broncho-important fluid from healthy bronchi is shown (Fig. 4.11).

As is known, alveolar macrophages, like other tissue macrophages, are of bone marrow origin and their source is monocytic cells. The maturation of these macrophages and their adaptation to aerobic conditions occurs in the interstitium. Subsequently, macrophages migrate to the alveolar spaces.

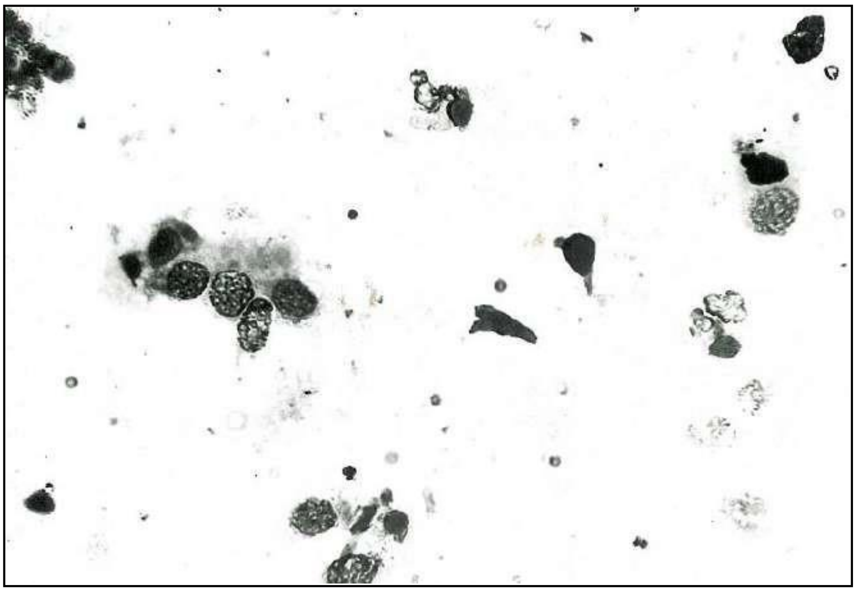
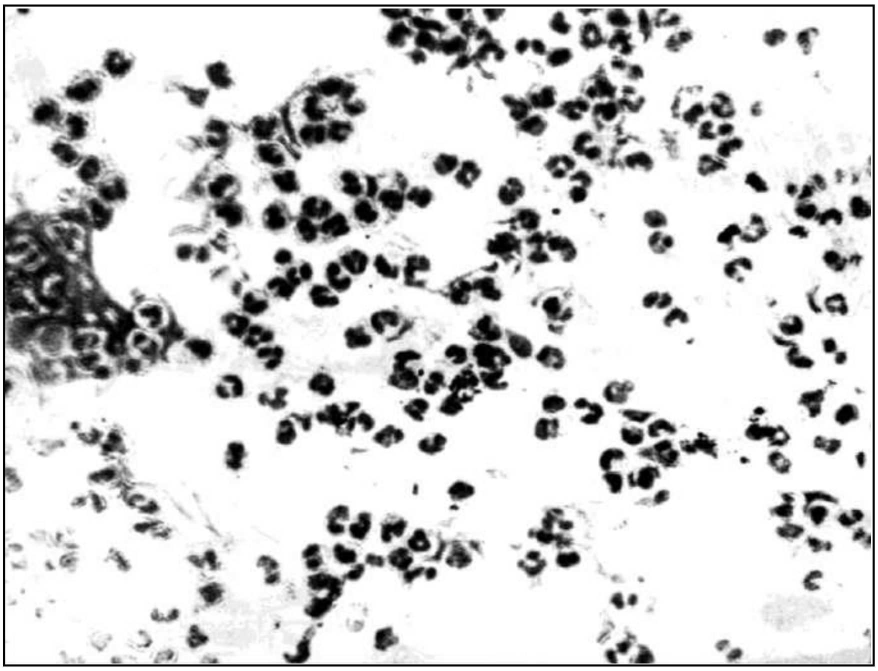
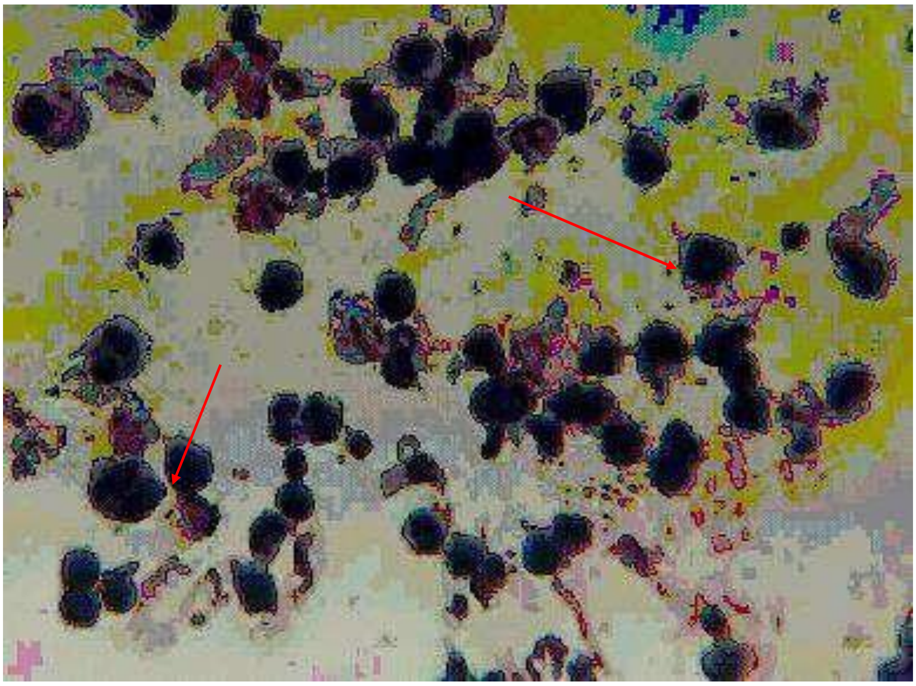


Fig.4.9. Pycnosis of nuclei, karyolysis of epithelial cells. Coloring according to Romanovsky-Giemsa. Increase x400.



Rice. 4.10. Segmented neutrophils, fibrin, and cells with signs of degeneration. Alveolar macrophages are absent. Coloring according to Romanovsky-Giemsa. Increase x400.



Rice. 4.11. Normal BALF cytogram. Clusters of alveolar macrophages are visible. Painting according to Romanovsky-Giemsa.Uv.x400.

For the transformation of monocytes into pulmonary macrophages with their further differentiation, a prerequisite is the presence of alveolar tissue, which has a sufficient level of blood supply and aeration for normal functioning. Based on this, it follows that the degree of reduction in the content of alveolar macrophages is directly dependent on the degree of violation of the respiratory structures.

In the examined patients, the content of AM decreased from 87.7±1.5% to 3.3±0.5% (P<0.001). In 9 (13.4%) cases, alveolar macrophages were completely absent in the broncho-important fluid.

The INC indicator (Table 4.7) is an integral indicator of changes in the activity of the bronchopulmonary suppurative process. Normally, this indicator is 0.06±0.01; at the first sanitation, the level of INC in all the studied groups was significantly increased (P < 0.001).

Table 4.7.

Indicators of the index of neutrophilic cytosis in children. (M±m).

Parameter	**Norm (n-20)**	**KG (n-8)**	**OG**		
			I-subgroup. (n-22)	**II-subgroup. (n-19)**	**III-subgroup. (n-18)**
INC %	0,06±0,01	20,5±0,4*	18,8±1,0*	16,2±2,3*	20,9±1,0*

Note: where * - P < 0.001, the significance of differences compared to the norm.

Evaluation of the dynamics of cytological parameters of the affected lung, the sanitation of which is one of the main tasks of preoperative preparation, makes it possible to judge the degree of intoxication and the patient's readiness for pulmonary surgery and predict the possibility of postoperative complications. Thus, the persistent absence of alveolar macrophages in the broncho-important fluid reliably indicates the fact of a sharp inhibition of local ventilation and gas exchange as a result of organic changes in the alveolar tissue.

In a bacteriological study of 97 washes of broncho-important fluid, the following types of microorganisms were sown: staphylococci 18 (18.6%), Pseudomonas aeruginosa 14 (14.4%), Escherichia coli 9 (9.3%). Associations of microbes were noted in 6 (6.2%) cases. Proteus 1 (1.03%) and yeast fungi 1 (1.03%) were sown less frequently. In 48.5% of cases, the microflora was not sown. This is since several microflora species require special media and incubation conditions. Although we have not identified viruses, the literature indicates that viral etiology is of no small importance in the development of chronic pathological processes in the lungs.

Table 4.8.

The nature of the microflora in the broncho-important fluid.

Type of microflora	KG (n-39)		ОГ						TOTAL	
			I-subgroup.		II-subgroup.		III-subgroup.			
	abc	%	abc	%	авс.	%	abc.	%	abc.	%
E. coli	6	15,4	1	4,5	2	10,5	-	-	9	9,3
St. aureus	6	15,4	5	22,7	4	21,1	3	17,6	18	18,6
Ps. aureginosus	4	10,3	5	22,7	2	10,5	3	17,6	14	14,4
Prot. vulgaris	1	2,6	-	-	-	-	-	-	1	1,03
Candida	1	2,6	-	-	-	-	-	-	1	1,03
St.epidermat	-	-	-	-	1	5,6	-	-	1	1,03
Flora associations	4	10,3	1	4,5	-	-	1	5,9	6	6,2
No growth	17	43,6	10	45,5	10	52,6	10	58,8	47	48,5

In 15 patients admitted during an exacerbation of the process, colony-forming units (CFU) were noted in x106, and in the remaining patients with a chronic course of the disease, CFU were 104 and 105.

Detection of yeast fungi in the broncho-important fluid is due to the fact that these patients received antibiotic therapy in anamnesis, which sometimes led to the development of fungal pneumonia, up to fungal sepsis.

The registration of Pseudomonas aeruginosa is due to the fact that these patients were treated for a long time in various hospitals, and they may have developed a nosocomial infection.

Analysis of table 4.9. shows that the vast majority of microorganisms are sensitive to drugs such as derived, cephalosporins. However, the use of these drugs should only be indicated in the absence of sensitivity to other drugs or when there is sensitivity only to these drugs. This circumstance encourages clinicians to search for new non-drug methods of treating infection.

Table 4.9.

Sensitivity of microflora to antibiotics in the examined children (%)

Antibiotics	**Staphylo-coccus**	**Blue-purulent stick**	**Coli**	**Microbial association**
Penicillin	41,4	-	30,8	-
Gentamicin	75,0	-	90,9	30,8
Streptomycin	64,3	2,1	34,8	40,1
Tetracycline	42,7	-	48,8	80,2
Tarivid	75,0	100	73,0	99,3
Kanamycin	71,2	28,3	34,8	48,1
Lincomycin	81,2	70,8	6,0	50,9
Oxacillin	79,4	-	68,9	78,3
Polymyxin	64,1	100	89,8	100
Cefazolin	80,2	96,2	88,1	94,3
Claforan	82,1	91,4	91,2	92,4

To identify the severity of endogenous intoxication, LII was determined.

If normally this indicator was 1.09±0.04, then in the examined children upon admission of LII it ranges from 1.9± 0.2 to 22.0±0.2 (P < 0.001), that is, almost twice as high as normal values.

Table 4.10.

Indicators of LII in the studied groups. (M±m).

Parameter	Norm	KG	OG		
			I-subgroup.	II-subgroup.	III-subgroup.
LII	1,09±0.04	2,0±0,2*	1,9±0,2*	1,9±0,2*	2,0±0,3*

Note: where * - P< 0.001, the significance of differences compared to the norm.

From the data given in the table, we can conclude that, with all the simplicity of determining this indicator, its value is very high, since this method is highly sensitive and reliable in diagnosing the severity of bronchial pathology and the degree of development of intoxication.

The state of AIR in children with BE (n-62), the comparison group consisted of 45 healthy children aged 3 to 15 years. The nature of AIR on admission in children with BE is shown in Table 4.2.8.

It can be seen from the indicators that the total content of leukocytes increases from 6.33x109±0.36 to 8.9x109±0.2 (P<0.001). At the same time, it is clear from the data in the table that such indicators of immunity as T-lymphocytes have a statistically significant tendency to decrease.

If normally they correspond to 58.09±2.54%, then in the studied group of patients the content of T-lymphocytes decreases to 49.1±1.1%. (P < 0.001).

Analysis of subpopulations of T-lymphocytes also indicates a decrease in their level. This is especially true for the content of T-helpers.

Table 4.11.

The state of AIR in children with BE. (M±m).

Indicators	Norm (n=45)	Study Groups (n=62)
Leukocytes	$6{,}33x10^9$±0,36	8,9±0,23*
Lymphocytes, %	36,16±2,48	34,6±1,33
T-lymphocytes, %	58,13±1,1	49,1±1,1*
B-lymphocytes, %	12,3±0,52	12,5±0,5
T-helpers, %	46,09±1,09	39,42±1,3*
T-suppressors, %	8,2±0,45	6,7±0,4**
THEN, %	26,82±3,24	38,6±1,34
En-ROK	48,51±2,5	42,5±0,9
CEC	1,3±0,05	1,8±0,6
Phagocytosis, %	58,44±1,17	50,4±1,23*
IgA	1,18±0,07	1,9±0,08*
IgM	1,01±0,05	1,6±0,6*
IgG	9,03±0,21	10±0,03*

Note: where * - P < 0.001, ** - P < 0.01, the significance of differences compared to the norm.

Their number decreases from 46.0.9 □1.09% to 39.42 □1.3% (P<0.001). The content of T-suppressors decreases to a lesser extent, from 8.18 □0.37% to 6.7□0.4% (P<0.01).

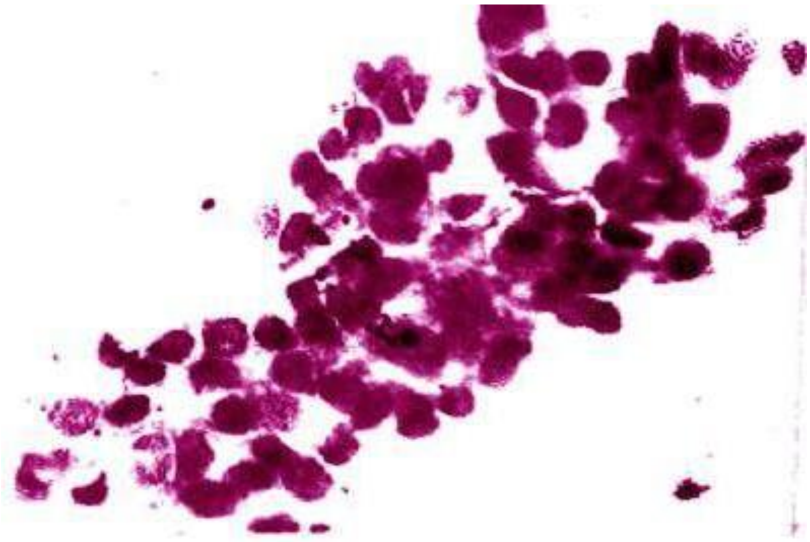
The phagocytic activity of neutrophils is one of the main indicators of the body's resistance factors. It was evaluated by two indicators: the relative content of cells capable of phagocytosis and their absolute content in 1 ml of blood. We found that in practically healthy children, the blood contains an average of 58.44±1.17% of phagocytic neutrophils relative to the total number of neutrophil cells. With BE, this indicator decreased to 50.4 ± 1.23% (P<0.001).

With BEB, the content of Ig A increased from 1.18□0.07 to 1.9±0.08 (P<0.001). The same picture is observed in the analysis of the dynamics of Ig M in the norm of 1.01±0.05. with BE, this indicator increases to 1.6±0.06 (P<0.001). The content of IgG was slightly increased by 10 ± 0.03 in children with BEB, however, the increase in the indicator was to a lesser extent than Ig M, and even more so - Ig A. It is obvious that immunoglobulins G are bound by immune complexes, as a result of which their content in the blood remains close to normal. An increase in the content of the CEC to 1.8±0.6 was noted in BE with statistical (P<0.001) significance compared to 9.03±0.21 with the healthy group.

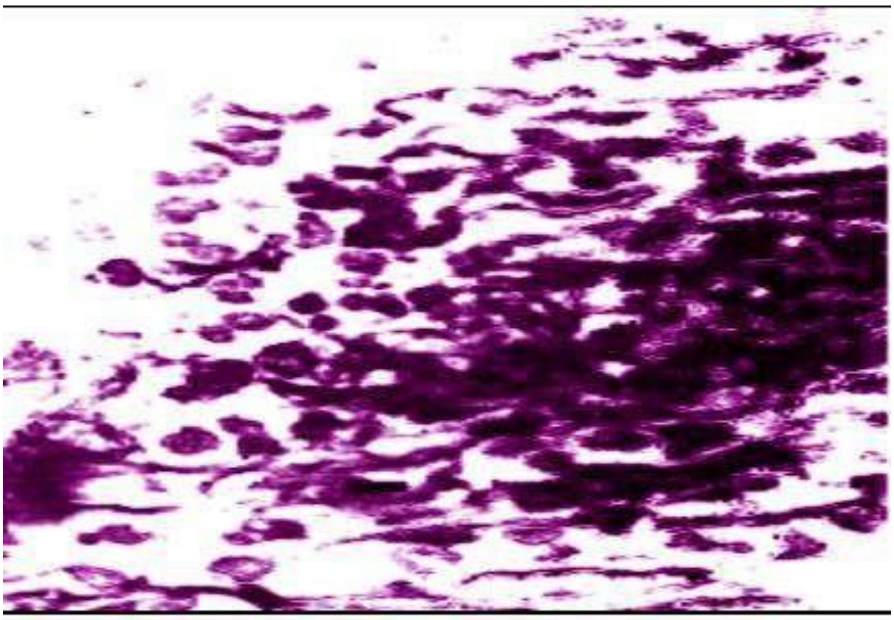
An analysis of changes in the AIR system allows us to conclude that, in general, there is a tendency to increase the humoral reactions of the immune system to the development of BEB, which is associated with the development of a specific immune response to antigens that arise during pathological processes.

When assessing the functioning of the immune system in children with bronchiectasis, we state that the nature and degree of impaired immunity in the child's body can be attributed to secondary immunodeficiency. This circumstance requires the use of immunocorrective drugs to restore the immune system, which is impaired in the body during BE.

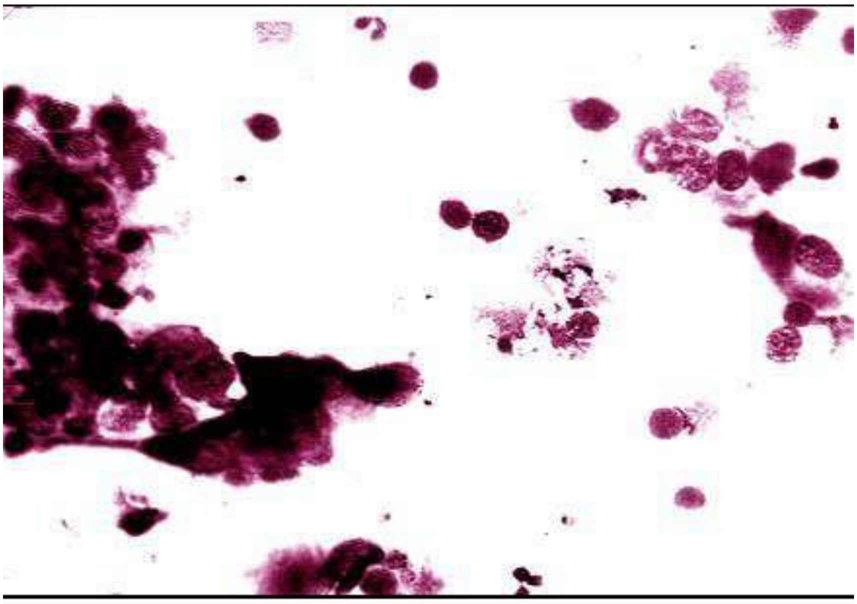
Morphological studies showed the presence of a cylindrical, cubic epithelium (Fig. 4.12.). Layers of epithelial cells were found, consisting of mucous cubic cells (Fig. 4.13.), neutrophils, and degenerating cells (Fig. 4.14.).



Rice. 4.12. Cylindrical and cuboidal epithelium in a smear-imprint in the control group of patients. Coloring according to Romanovsky-Giemsa. Increase x400.



Rice. 4.13. The epithelial layer of the bronchus, consists of cubic cells. Control group. Coloring according to Romanovsky-Giemsa. Increase x400.



Rice. 4.14. Neutrophils degenerating cells in a smear imprint. Control group. Coloring according to Romanovsky-Giemsa. Increase x400.

Thus, based on the above morphological studies, it was stated that in the case of pulmonary BEB, chronic inflammation of the bronchial tree is noted in the form of purulent endobronchitis, cylindrical and saccular bronchiectasias, which are, admittedly, the source of most complications.

With PEB, there is endobronchitis and metaplasia of the epithelium in the area of inflammation, and insufficiency of the macrophage link of the pulmonary protection. Along with this, the activity of the microflora is activated, which entailsa non-specific reaction of neutrophils, as well as the mechanisms of specific lymphocytic protection. All these factors lead to the activation of microflora, decompensation of the system of neutrophilic granulocytes. Then a new level of non-specific and specific lymphocytic protection is formed, leading to a dynamic balance between microorganisms and the mechanisms of protection of the macroorganism. With this unstable balance, an endobronchial transition of inflammation from the zone of pathology to healthy areas occurs. In the future, dysfunction of the already weak link in the protective systems of the lung develops, as well as a violation of bronchial drainage. The result of everything is the development of a chronic purulent process with the development of bronchial deformity, and later - bronchiectasis. Therefore, as the leading specialists of pulmonary surgery emphasize, among the pathogenetic multi-link mechanism of the development of BEB, the main place is occupied by such factors as impaired bronchial clearance, aggression of microflora, increased tissue detritus, pathological reaction of the neutrophilic system, a critical decrease in macrophage protection and the transition of inflammation to healthy areas by endobronchial through

Algorithm of preoperative preparation and established forms of the lesion.

Preoperative preparation algorithm, including the following activities (Fig. 4.15.).

As it follows from the proposed algorithm of preoperative preparation, it should be aimed at correcting many impaired functions in PEB, stimulating the body's immunological status, and substituting therapy.

The results presented in the chapter indicate that a full-fledged diagnosis of the development of pathophysiological processes in children with BE cannot be based only on a clinical examination or single laboratory and instrumental studies. Each of the described methods of instrumental diagnostics has its advantages. However, there are also disadvantages of either method. Preference given to one or another method, as well as ignoring other existing methods, is fraught with errors in a full-fledged diagnosis. The result of this may be complications of the treatment, up to an increase in the number of lethality inthis complex disease. Instrumental diagnostic methods that supplement the analysis of clinical data should be fully combined with studies of the bacterial spectrum, analysis of smears-imprints. The importance of the analysis of bronchoalveolar fluid is especially emphasized, since the absence of alveolar macrophages indicates deep pathophysiological changes in the bronchial tree and the lung tissue itself. Analysis of bacterial culture from bronchoalveolar fluid and smears-prints made it possible to accurately identify the type of microflora, sensitivity, and the degree of development of cytological changes inthe bronchi. The study of AIR, LII and INC provides information on the state of immunity and the degree of endogenous intoxication of the body. Only in thiscase, it is possible to determine the optimal method and timing of surgical intervention, to identify the scope of operations for BEB in children.

CHAPTER V

RESULTS OF COMPLEX TREATMENT OF BRONCHIECTASIS DISEASE IN CHILDREN USING OZONE AND LILI.

Traditional treatment meant endobronchial lavage with the use of antibiotics, depending on the sensitivity of the microflora, various antiseptics (furatsilin, dioxide) and proteolytic enzymes (trypsin, chymotrypsin) were also used for this purpose.

The total number of traditional bronchoscopic sanitation, sessions of endobronchial ozone therapy, laser therapy and their combined use is presented in Table 5.1.

Table 5.1

The frequency of bronchoscopic sanitation in the study groups

Researched groups		**Frequency**			
		1-2 times		**2-3 times or more**	
		abc.	%	abc.	%
KG (n-45)		17	37,8	28	62,2
OG	ОГ 1 (n-22)	6	27,3	16	72,7
	ОГ 2 (n-19)	3	15,8	16	84,2
	ОГ 3 (n-18)	1	5,6	17	94,4
TOTAL		27	25,96	77	74,04

As can be seen from the table, the frequency of bronchological treatment in the CG received 1-2 sessions in 17 (37%) patients, 2-3 sessions and more in 28 (62.2%) children.

The frequency of bronchological treatment depended on the course of purulent endobronchitis. No side effects or complications were noted during bronchological manipulation.

Table 5.2

Analysis of the results of bronchoscopy in the studied groups of children.

Character endobronchial pathology		KG (n-45)		OГ					
				OG 1 (n-22)		OG 2 (n-19)		OG 3 (n-18)	
		Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Type endobronchial	Catarrhal	-	12(26,7%)	-	8 (36,4%)	-	3 (15,8%)	-	11(61,1%)
	Catarrhal	7 (15,6%)	23(51,1%)	3 (13,6%)	11(50,0%)	3 (15,8%)	16(84,2%)	3 (16,7%)	6 (33,3%)
	Purulent	38(84,4%)	10(22,2%)	19(86,4%)	3(13,6%)	16(84,2%)	-	15(83,3%)	1 (5,6%)
Distribution innocence	Purulent	16(35,6%)	31(68,9%)	10(45,5%)	17(77,3%)	5 (26,3%)	12(63,2%)	8 (44,4%)	16(88,9%)
	Local	29(64,4%)	14(31,1%)	12(54,5%)	5(22,7%)	14(73,7%)	7 (36,8%)	10(55,6%)	2 (11,1%)
Character defeat	Diffuse	26(57,8%)	35(77,8%)	18(81,8%)	22(100%)	7 (36,8%)	16(84,2%)	12(66,7%)	16(88,9%)
	Unilateral	19(42,2%)	10(22,2%)	4 (18,2%)	-	12(63,2%)	3 (15,8%)	6 (33,3%)	2 (11,1%)

In the course of treatment, the course of purulent endobronchitis was assessed in dynamics both visually and according to laboratory studies of BALF analyses.

As can be seen from the presented table 5.2., in the majority of patients in each group, after the bronchological treatment, there was a transition from purulent to catarrhal endobronchitis. This trend is especially noticeable in OG 3 up to 61.1%, and in CG only 26.7%. In terms of the prevalence of the process, the initially diffuse nature of the lesion tended to transform into a localized form also more in the OG, especially in OG 3, and amounted to 88.9%, while in the CG this figure reached only 68.9%. The same is true for the defeat of the bronchi of one or both lungs in the OG, the percentage of transition from bilateral to unilateral bronchitis is also higher and reaches a maximum of 100% in OG 1.

Thus, the transition from purulent to catarrhal endobronchitis, from diffuse to localized and from bilateral to unilateral, is characteristic of OH and is most pronounced in OH 3, which can later serve as a guarantee of successful surgical treatment of these patients.

Next, we studied the nature of BALF in the study groups before treatment, after 1 session and 2-3 sessions of treatment (table 5.3).

From the data in the table it is clear that in all groups before treatment there is a high percentage of neutrophils and a decrease in the number of lymphocytes. The content of alveolar macrophages, the main indicator of damage to the bronchoalveolar zone, was sharply reduced. Significantly increased cytosis. The latter indicator demonstrates how full the lumen of the bronchioles is with detritus worsens the ventilation function of the respiratory tract. After treatment, there is a decrease in the content of neutrophils, especially in the subgroup of the combined use of ozone and laser. However, in quantitative terms, this decrease is still far from the norm, which is explained by the short duration of treatment and the presence of an irreversible chronic process. In a chronic inflammatory process, it is difficult to expect the complete elimination of pathological agents that increase the neutrophilic response of the body. At the same time, there is a significant improvement in the dynamics of alveolar macrophages and cytosis. Particularly attractive are the data of the third subgroup.

In the analyzed endobronchial washings, the number of neutrophilic leukocytes decreased from 89.4□1.7% to 80.3□2.1%, alveolar macrophages increased from 2.6□0.9% to 9.9□0.3%. Cytosis decreased from 23.2□0.9x109/l to 1.9□0.07x109/l, i.e. it approached the norm. Unchanged neutrophils and macrophages appear, phagocytizing destroyed leukocytes. The degree of destruction of neutrophils decreases. The content of detritus is significantly reduced, which reflects the indicators of cytosis. Along with this, in one patient of the first group, two patients of the second group and two from the third group, after receiving preoperative treatment in BALF, alveolar macrophages were absent. This indicates gross destructive changes in the bronchoalveolar zone, requiring the removal of the affected areas.

A similar picture is noted in the analysis of the index of neutrophilic cytosis table 5.4.

As can be seen from the table, in all groups there is a significant decrease in this indicator before and after the completion of treatment, i.e. before the operation. In the dynamics after treatment, this trend is especially noticeable in patients with OH 3 - 1.3□0.1 compared with the control group 7.5□0.3. There is also a decrease in indicators after endobronchial treatment of BEB in all groups about CG ($p<0.001$). But this figure still does not reach the normal level, which we associate with a chronic process.

Table 5.3

Endobronchial cytogram in BE in children depending on the type of treatment in the preoperative period.

Researched groups			Cytosis x 10^9/л	NL %	AM %	L %
Норма (n-20)			**0,7±0,06**	**8,5±1,0**	**87,7±1,5**	**3,9±0,7**
KG (n-8)		Before treatment	22,6±0,4	90,8±0,7	3,8±0,2	5,5±0,2
		After 1 treatment	11,4±0,2	89,0±0,2	3,8±0,1	7,3±0,16
		After 2-3 treatments	8,5±0,3 p<0,001	88,7±0,1 p<0,01	5,0±0,2 p<0,001	6,4±0,12 p<0,001
OG	**OG 1 (n-22)**	Before treatment	20,8±1,1	90,6±0,7	3,1±0,3	6,0±0,6
		After 1 treatment	9,5±0,6 p_1<0,05	85,8±1,6 p_1<0,01	7,1±1,2	6,9±0,6
		After 2-3 treatments	22,1±0,7 p<0,001 p_1<0,001	91,4±3,5 p<0,05	4,2±3,6 p<0,01	5,6±1,7
	OG 2 (n-19)	Before treatment	22,1±1,2	91,4±1,6	4,2±1,4	5,6±0,8
		After 1 treatment	12,9±1,4 p_1<0,01 p_2<0,01	86,8±1,7	6,9±1,1	6,1±0,6
		After 2-3 treatments	7,8±1,3 p<0,001 p_2<0,01	85,5±2,2 p<0,05	8,6±2,1 p<0,05 p_1<0,05	5,2±0,6
	OG 3 (n-18)	Before treatment	23,2±0,9	89,4±1,7	2,6±0,9	8,0±1,1
		After 1 treatment	9,2±0,3 p_1<0,001 p_3<0,01	82,4±1,7 p_1<0,01 p_3<0,05	10,1±0,2 p_1<0,001 p_2<0,01 $_3$<0,005	8,6±2,1 p_2<0,05 p_3<0,05
		After 2-3 treatments	1,9±0,07 p<0,001 p_1<0,001 p_2<0,01 p_3<0,001	80,3±2,1 p<0,001 p_1<0,005 p_3<0,05	9,9±0,3 p_1<0,001	9,7±1,2 p_1<0,05 p_3<0,005

Note:

p - reliability of differences before and after 2-3 times treatment

p1 - reliability of differences about CG
p2 - reliability of differences in relation to OG 1
p3 - reliability of differences in relation to OG 2

Table 5.4

Indicators of the index of neutrophilic cytosis in children.

Study Groups		Before treatment	After 1st treatment	After 2nd-3rd treatment
KG (n-8)		20,5±0,4	10,1±0,4	7,5±0,3 $p<0,001$
OG	**OG 1 (n-22)**	18,8±1,0	7,5±0,7 $p_1<0,05$	1,9±0,5 $p<0,001$ $p_1<0,001$
	OG 2 (n-19)	16,2±2,3	9,3±1,7 $p_2<0,05$	5,2±1,4 $p<0,001$ $p_2 < 0,01$
	OG 3 (n-18)	20,9±1,0	7,6±0,3 $p_1<0,001$ $p_3<0,01$	1,3±0,1 $p<0,001$ $p_1<0,001$ $p_2<0,01$ $p_3<0,001$
Norm (n-20)		**0,06±0,01**		

Note:
p - reliability of differences before and after 2-3 times treatment

p1 - reliability of differences in relation to CG

p2 - reliability of differences in relation to OG 1

p3 - reliability of differences in relation to OG 2

Thus, the analysis of BALF cytograms and the neutrophilic cytosis index demonstrates clear advantages of the combined use of endobronchial ozone and laser therapy in the process of preparing patients with EBV for surgery. The use of this method contributes to improving the quality of diagnosis, and preoperative preparation, and ultimately, to the predicted favorable postoperative course and reduces the complications of surgical treatment of PEB.

The bacterial flora of the broncho-important fluid was studied. At the same time, not only the species composition of the microflora was studied, but also the degree of contamination of each of the bacterial species, that is, colony-forming units (CFU) were counted. The research results are shown in Table 5.5. The presented table shows that in all the studied groups, Staphylococcus aureus and Pseudomonas aeruginosa predominate. The initial CFU for them amounted to 105 - 106 for each type of bacteria. In the control group, after treatment, a decrease in the species composition of the microflora was noted, and the number of patients with sterile cultures increased significantly. So, out of 29 examined after treatment, in 24 (82.9%) cases no microflora was found in the crops, and in 5 children staphylococcus aureus, Pseudomonas aerugi,nosa and Escherichia coli were sown. However, the CFU of each type of microflora decreased to 102–103. In the group of endobronchial ozone therapy, the landscape of microflora is approximately the same as in the control group. However, after ozone therapy, out of 22 patients, 16 (84.2%) microflora was not sown. Staphylococcus was found in one patient, and in one patient, in whom Pseudomonas aeruginosa was not initially sown, it appeared in the crops after treatment. It is associated with nosocomial infection. In this group, the CFU decreased to 102. In the endobronchial laser therapy group, the microbial landscape is more heterogeneous. In addition to individual types of microbes, there were also their associations. After laser therapy, microbes were not sown in 88.9% of patients. Bacteria such as Pseudomonas aeruginosa, and associations of Pseudomonas aeruginosa and Escherichia coli were sown. CFU dropped to 102-103.

With a combination of endobronchial ozone therapy and laser therapy at the beginning of treatment, the microbial landscape consisted of staphylococcus, Pseudomonas aeruginosa and Escherichia coli and their associations. After the treatment, the number of patients in whom staphylococcus and Pseudomonas aeruginosa were sown decreased by half, and the remaining types of microflora microorganisms disappeared. In 92.3% of cases, the microflora was not sown

Table 5.5

The results of bacteriological control of BALF before and after (initial and last session) various types of treatment for endobronchitis in children.

Type of microflora	Control Group n (%)		Основная группа n (%)					
			I-subgroup		II-subgroup		III-subgroup	
	before	after	before	after	before	after	before	after
E. Colli	6 (15,4)	2 (11,1)*	1(4,5)	-	2 (10,5)	-	-	-
St. Aureus	6 (15,4)	1 (5,6)	5 (22,7)	1 (5,3)*	4 (21,1)**	1 (5,6)*	3 (17,6)	-
Ps. Aureginosus	4 (10,3)**	3(16,7)	5(22,7)	2(10,5)	2 (10,5)	-	3 (17,6)	1(7,7)*
Prot. Vulgaris	1 (2,6)		-	-	-	-	-	-
Candida	1 (2,6)	3(16,7)	-	-	-	-	-	-
St.epidermaticus		-		-	1 (5,3)		-	-
Mixed flora	4 (10,3)**	-	1(4,5)	-	-	1 (5,6)	1 (5,9)	-
No growth	17 (43,6)	9 (50,0)	10(45,5)	16 (84,2)	10 (52,6)	16 (88,9)	10(58,8)	12 (92,3)
Total	39 (100)	18 (100)	22 (100)	19 (100)	19 (100)	18(100)	17(100)	13(100)

Note: where **- CFU amounted to 105 - 106, where *- CFU amounted to 102 – 103

Analysis of the BALF microflora shows that endobronchial ozone therapy has a more significant effect on the elimination of the microbial factor than endobronchial laser therapy and traditional treatment. The combination of endobronchial ozone and laser therapy seems to be the most optimal in the fight against the microbial factor during the preoperative preparation of this contingent. It was shown above that the level of contamination equal to 105 CFU is critical. Exceeding this level indicates a greater likelihood of developing a purulent infection and the possibility of a generalization of the process. With contamination of less than 105 CFU, the tissues heal without suppuration. A two or threefold decrease in CFU after treatment in our patients indicates that a normal healing process without suppurative complications is expected in the postoperative period. Microscopic examination of smears-imprints taken from the bronchial mucosa located near the focus of bronchiectasis in the lungs. The study of imprint smears is a more reliable method for determining the morphofunctional status of the bronchial mucosa in the vicinity of a bronchiectasis lesion of the bronchial tree. These studies were conducted in all endobronchial treatment groups.

After traditional treatment, smears-imprints reveal remaining elements of destruction in the form of groups of neutrophils, detrital mass, and macrophages. After ozone therapy, a decrease in the number of cellular structures is observed, however, in comparison with the traditional method of treatment, only a slight improvement was noted. In some cases, hyaline structures near the bronchial epithelium are visualized in bronchial smears, after laser therapy, groups of proliferating epithelium are visible **(Fig. 5.1)**

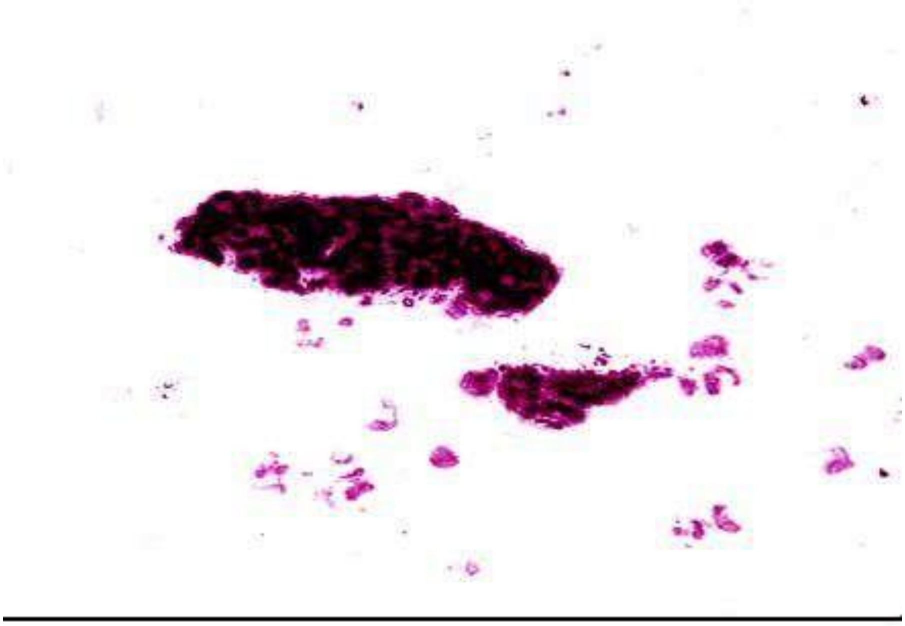


Fig.5.1 Smear-imprint from the bronchus after endobronchial laser therapy. Groups of proliferating epithelium. Increase x400.

In addition, fibroblasts are detected in smears-imprints (Fig. 5.2)

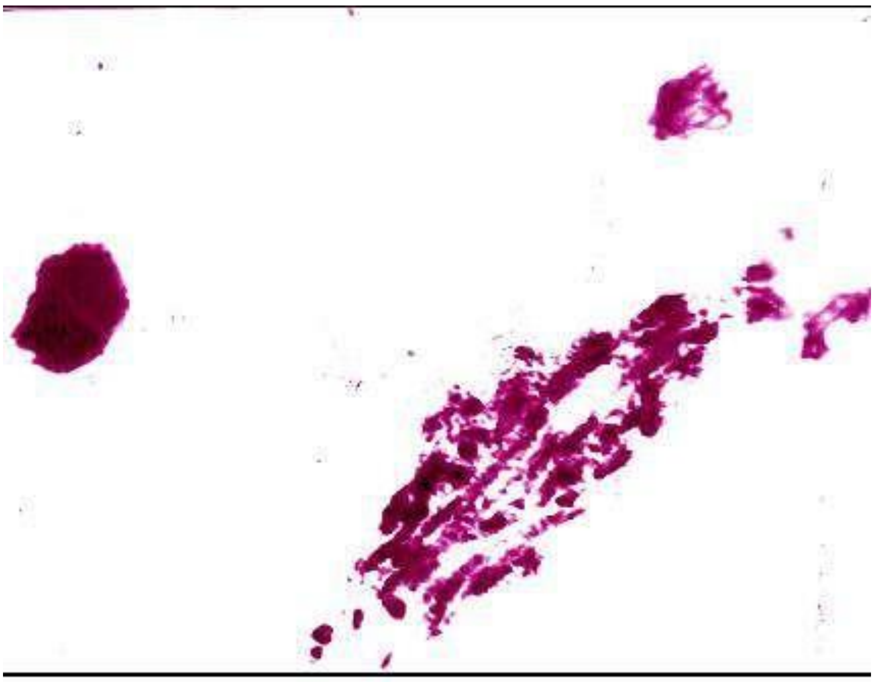


Fig.5.2 Imprint smear after endobronchial laser therapy. Proliferating epithelium and fibroblasts. Increase x400.

This indicates an acceleration of the proliferative processes of the bronchial mucosa.

A cytological study of imprint smears after combined treatment with ozone with laser therapy showed a significant decrease in inflammation elements (neutrophils, plasma cells, macrophages) in the field of view, where there are layers, strands of cuboidal, goblet cells, proliferating epithelium, lymphocytes, which is a morphological criterion for the remission of the inflammatory process in lungs.

In smears-imprints, a prismatic, cubic epithelium is visible with a decrease in the number of neutrophilic macrophages (Fig. 5.3), layers of the above cells, with monomorphic intensely stained nuclei, which is typical for cellular structures with proliferation phenomena.

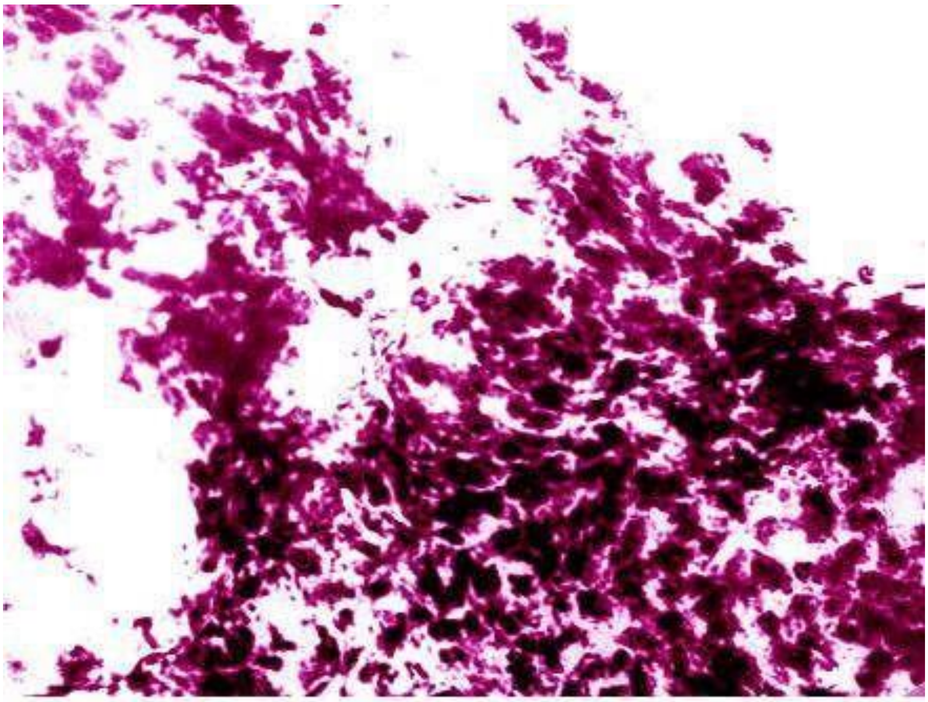


Fig.5.3. A smear imprint after combined ozone and laser therapy. Multiple cylindrical and cubic cells. Increase x400.

Thus, a cytological study of smears of impressions from the bronchial mucosa showed the presence of many elements of inflammation (neutrophils, macrophages, degenerating cells) during traditional sanitation of the bronchial tree,a decrease in their number during ozone therapy, and the virtual disappearance from the field of view during laser therapy, especially in the combination of ozone and laser therapy.

Based on the above morphological data, it was established that chronic inflammation of the bronchial tree is noted in BE. The applied methods of treatment, such as traditional drug sanitation, are not as effective as ozone therapy, or laser therapy, especially the combination of laser and ozone therapy for preoperative preparation of patients with BE.

Table 5.6

LII indicators in the studied groups (M±m)

Study Groups		**Upon admission**	**In the middle of treatment**	**Before surgery**
KG (n-45)		2,0±0,2	1,6±0,08	1,6±0,09 $p<0,01$
OG	ОГ 1 (n-22)	1,9±0,2	1,4±0,1 $p_1<0,1$	1,2±0,1 $p<0,001$ $p_1<0,005$
	ОГ 2 (n-19)	1,9±0,2	1,5±0,1	1,4±0,4 $p< 0,05$
	ОГ 3 (n-18)	2,0±0,3	1,3±0,09 $p_1<0,05$	1,1±0,09 $p<0,01$ $p_1<0,005$ $p_3<0,05$
Norm (n-45) 1,09±0,04				

Note:
p – the significance of differences before and after 2-3 treatments in the group itself
p1 – the significance of differences in the control group.
p2 – the significance of differences in the I-subgroup.
p3 - reliability of differences in the II-subgroup.

In the study of the leukocyte index of intoxication, the following results were obtained (table 5.6)

From the above data, it can be seen that in all groups the initial indicators significantly exceed the norm. So, if normally LII is 1.09±0.04, in the CG with traditional treatment it was 2.0±0.2, in the ozone therapy group - 1.9±0.2, in the laser therapy group - 1.9 ± 0.2 a in the combined treatment group - 2.0 ± 0.3. After the treatment, the LII index decreased in different groups in different ways, however, there was a significant improvement in the index in all groups ($p<0.01$). The normalization of this indicator indicates the effectiveness of preoperative preparation and an increase in the body's defenses before surgery.

After a comprehensive diagnosis, determination of the volume and nature of the lesion, and preoperative preparation, 99 patients were operated on, the remaining 5 patients were not indicated for surgery due to a bilateral widespread lesion exceeding more than 15 segments in total. The following table 5.7 reflects the volume and nature of operations performed in children with BE.

From the table above, it can be seen that the left-sided lesion occurs more often than the right-sided one. This is obviously due to the anatomical features in which the drainage function of the left bronchus is usually, due to its departure from the trachea at an angle worse than the right bronchus, which has an almost direct continuation of the trachea. In the control group, as can be seen from the data in the table, 41 operations were performed. The discrepancy between the number of operations and the number of patients in the control group - 43 patients - is due to the fact that two patients in this group underwent primary surgery in other institutions.

For one of them, as a second operation, we performed reamputation of the long bronchus stump after primary pulmonectomy, and for the second - pulmonectomy on the left after the primary operation, lobectomy of the lower lobe on the left, due to recurrence of bronchiectasis of the upper lobe of the lung.

Table 5.7

Volume and nature of operations in children with bronchiectasis

Type of operation	**KG**		**OG**						**Σ**	**%**
			OG 1		**OG 2**		**OG 3**			
	I Operation	**II Operation**	**I operation**	**II Operation**	**I operation**	**II Operation**	**I operation**	**II Operation**		
Pulmonectomy on the left	12	1	4	-	-	-	4	-	21	20,8
Pulmonectomy on the right	1	-	1	-	3	-	1	1	7	6,93
Lobectomy n/a left	16	-	9	1	7	-	8	-	41	40,6
Lobectomy n/a right	3	-	2	-	2	-	1	-	8	7,92
Lobectomy s/d on the right	1	-	1	-	-	-	-	-	2	1,98
Bilobectomy s/d + n/d on the right	-	-	2	-	3	-	-	-	5	4,95
Segmentectomy on the left	5	-	-	-	1	-	1	-	7	6,93
Segmentectomy on the right	1	-	-	-	-	-	-	-	1	0,99
Lobectomy of the lower lobe	2	-	1	-	1	-	3	-	7	6,93
+segmentectomy on the left	-	-	1	-	-	-	-	-	1	0,99
Bilobectomy s/d + n/d and segmentectomy i/d on the right	-	1	-	-	-	-	-	-	1	0,99
TOTAL operations	41	2	21	1	17	-	18	1	101	100
Number of operated patients	43		21		17		18		99	

In the OG, 56 patients underwent 58 operations, this is due to the fact that in the I-subgroup and the II-subgroup, two patients underwent surgery in two stages in patients with a bilateral form of damage to the BEB of the lower lobes. One patient from subgroup II refused surgery on the second lung at the insistence of relatives.

All operations ended with drainage of the pleural cavity (PVC tubes) with passive aspiration according to Bulau. The terms of drainage tube removal after surgery averaged 9.6 ± 2.6 days in the CG, 5.8 ± 0.5 days for me - subgroup, 6.8 ± 0.6 for subgroup II, 5.3 for III - subgroup ±0.3 days.

After operations, the following early postoperative complications were observed (Table 5.8).

A smooth course of the postoperative period in the CG was observed in 26 (60.5%) patients, in the MG in 45 (77.6%) sick children. Among the complications of the postoperative period, as can be seen from the table, pleural empyema was most often noted, in the CG it occurred in 8 (18.6%) children and the MG - in 3 (5.17%) sick children. Bronchial fistula with pleural empyema was observed in the control group in 4 (9.3%) children, in the main group - in 2 (3.4%) patients.

Table 5.8.

Early postoperative complications

Complication	Control group. n-43		Main group (general)n -58		Complication by subgroups of the main group					
					I – subgroup. n-22		II – subgroup. n-17		III – subgroup. n-19	
	авс	%	авс	%	авс	%	авс	%	авс	%
Postoperative pneumonia	3	7,0	6	10,3	3	13,6	2	11,8	1	5,3
Foreign body of bronchus stump	1	2,3	-	-	-	-	-	-	1	0,99
Empyema	8	18,6	3	5,17	2	9,09	-	-	1	5,3
Bronchial fistula with pleural	4	9,3	2	3,4	-	-	1	5,9	1	5,3

empyema										
Hemothorax (pleural bleeding)	1	2,3	2	3,4	1	4,5	-	-	1	5,3
TOTAL	17	39,5	13	22,4	6	27,3	3	17,6	4	21,1

Note: n is the number of operations in this group, % ratio to the number of operations in this group or subgroup.

The above complications were mainly observed starting from the second week of the postoperative period, all of them were eliminated by the use of minor thoracic surgery (drainage of the pleural cavity) in 8 (18.6%) patients in the CG and 4 (7.14%) children in the CG. OG. In 2 (4.65%) cases, CG patients had a bronchial fistula, which was eliminated by endobronchial bronchus occlusion. In 1 (2.3%) patient in the CG and in 2 (3.4%) patients in the MG in the postoperative period, intrapleural bleeding from pleural adhesions was noted, which was eliminated by thoracotomy and bleeding arrest. In 1 (2.3%) case in the CG, a foreign body of the stump of the resected bronchus (Lavan thread) was noted, which was removed bronchoscopically. Postoperative pneumonia was present in 3 (7.0%) children in the CG and (10.3%) patients in the MG. Treatment of postoperative pneumonia was carried out according to the generally accepted method: antibiotic therapy, the use of sulfa drugs in combination with inhalations of proteolytic enzymes or alkaline solutions, in two cases bronchoscopic sanitation was performed. The cause of the overwhelming number of complications in the postoperative period, in our opinion, is endobronchitis in the remaining segments of the operated lung, which was confirmed by endoscopic examination. Most often, endobronchitis occurred in the CG, in the MG, endobronchitis was observed much less frequently and was of a milder nature.

Treatment results are presented in Table 5.9.

Table 5.9

Immediate clinical effectiveness of operations

Results treatment	KG n-43		OG (Command) n-58		Complication by subgroups of the main group					
					I – subgroup. n-22		II – subgroup. n-17		III – subgroup. n-19	
	abc	%	abc	%	abc	%	abc	%	abc	%
	28	65,1	46	82,1	17	81,4	14	82,3	15	83,2
Good ones	3	7,0	6	10,7	3	13,8	2	11,8	1	5,6
	8	18,6	2	3,6	1	4,8	1	5,9	-	-
Satisfy	4	9,3	2	3,6	-	-	-	-	2	11,2
body	43	100	56	100	21	100	17	100	18	100

Note; n- number of operations in this group, % ratio to the number of operations in this group or subgroup.

Table 5.9 shows that a good result was obtained in the CG in 28 (65.1%) children and in 46 (82.1%) patients in the MG. Mortality in the CG was observed in 4 (9.3%) cases and in 2 (3.6%) in the MG.

The analysis of the stay of patients in the hospital in the compared subgroups of patients was carried out, the results of which are shown in Table 5.10.

Table 5.10

Total number of bed days and number of bed days after surgery

Study Groups		Total bunk days	Bed days after surgery
KG (n-39)		51,8±4,1	29,3±3,5
OG	OΓ 1 (n-21)	36,5±3,6	19,2±1,8
	OΓ 2 (n-17)	34,0±3,1	20,1±2,2
	OΓ 3 (n-16)	30,9±2,1	15,3±1,6

Table 5.10 clearly proves that the duration of inpatient treatment in the CG was 51.8±4.1 days, while in the MG subgroups it was significantly lower and amounted to 36.5±3.6 in OG 1 and 34.0 in OG 3 ±3.1 and in MG 3 only 30.9±2.1 days.

In the uncomplicated course of the postoperative period, patients with OH, as a rule, were discharged from the department on the 10-15th day after the operation (after pulmonectomy - on the 20-24th day).

The next stage of the study was to study the state of the anti-infection resistance system (AIR) in sick children who underwent surgery for bronchiectasis. The study of AIR was carried out at admission and at discharge of the patient. The results of the study are presented in Table 5.11, the data show that almost all indicators of AIR at admission are worse than at discharge, although numerically these changes are not so significant, but still in groups where ozone therapy, laser therapy and their combined use were used. these indicators return to normal faster.

An analysis of the causes of death was carried out depending on the surgical intervention performed. Table 5.12 shows that deaths were mainly observed after pulmonectomy: 2 (4.7%) patients in the CG and 2 (3.45%) in the MG. In 1 (2.33%) case, death occurred in the patient after removal of the basal segment on the left and in 1 (2.33%) case after lower lobectomy on the right.

Thus, the indicators of the AIR system change little in the short term. This is explained by the fact that it takes quite a long time to restore such a complex system of the body as the system of specific protection, immunity.

Table 5.11

Indicators of the AIR system in children with bronchiectasis at admission and at discharge in the study groups

Indicators	KG		OG					
			OG 1		OG 2		OG 3	
	upon enrolment (n-8)	before extract (n-8)	before extract (n-21)	before extract (n-19)	upon enrolment (n-15)	before extract (n-15)	upon enrolment (n-18)	before extract (n-18)
Leukocytes	7,1±0,6	7,6±0,7	7,1±0,4	8,1±0,6	6,6±0,3	6,8±0,5	7,0±0,4	6,8±0,3
Lymphocytes, %	35,5±4,9	31,0±2,1	34,5±2,2	34,1±2,3	32,7±2,3	32,1±2,9	35,8±2,5	34,2±2,5
T-lymphocytes, %	50,6±3,3	44,5±2,9	50,0±2,3	48,5±2,2	46,2±1,9	52,6±2,7	49,6±1,5	46,7±2,1
B-lymphocytes, %	11,5±1,2	8,6±0,5*	11,6±0,7	11,8±0,8	12,7±1,0	13,1±1,4*	13,8±0,9	13,2±1,0
T-helpers, %	43,1±5,9	34,5±1,9	39,7±2,8	36,9±1,7	37,9±1,6	40,1±1,9	38,6±0,7	35,8±1,5
T-suppressors, %	9,0±1,6	5,7±0,9	7,4±0,9	6,7±0,6	6,1±05	9,0±0,7**	8,8±0,7	7,9±0,8
THEN, %	37,9±4,4	41,1±4,1	36,4±2,7	39,9±3,0	44,1±1,6	37,3±2,8*	36,7±2,1	41,2±2,7
En-ROK	44,9±3,0	36,4±3,2*	42,7±1,6	42,6±2,1	39,6±1,6	44,5±2,1*	43,5±1,3	41,0±1,6
CEC	1,6±0,05	2,0±0,3	1,7±0,08	1,9±0,1	2,1±0,1	2,0±0,1	1,7±0,1	1,6±0,09
Phagocytosis, %	60,1±4,9	56,0±3,6	57,3±2,4	57,2±2,4	50,7±1,4	55,8±2,6	55,0±1,8	53,8±1,7
Phagocytosis, abs.	2,4±0,3	2,9±0,6	2,5±0,2	2,7±0,3	2,3±0,2	2,6±0,4	1,9±0,1	2,2±0,2
IgA	2,3±0,1	1,9±0,1**	2,0±0,1	1,8±0,1	1,8±0,2	1,7±0,2	1,6±0,1	1,8±0,1
IgM	1,7±0,1	1,3±0,1*	1,7±0,1	1,3±0,09*	1,4±0,09	1,4±0,09	1,5±0,09	1,5±0,08
IgG	8,8±1,1	9,9±0,5	10,2±0,6	11,0±0,4	9,5±0,4	10,2±0,4	10,7±0,3	10,4±0,2

*Note: significance of differences between the data at admission and before discharge in this group. * -p<0.05, ** - p<0.01*

Cause of death	KG (n-43)	OG (n-58)	Age	The volume of the operation	number of beds days после операции

Cause of death of the study groups, age, volume of operation and bed days after the operation period

	авс	%	авс	%			
ODN, OSSN	1	2,33	-	-	2 years 9 months.	Segmentectomy on the left	1
Pleural bleeding. DIC syndrome. Pleural empyema. Sepsis. ODN, OSSN	1	2,33	-	-	11 years 11 months .	Lower lobectomy	10
Pleural empyema. Generalization of the infection. Sepsis. ODN. OSSN.	1	2,33	-	-	8 years 11 months .	on right	88
Acute adrenal insufficiency, ARF, OSHF	1	2,33	-	-	6 years 7 months .	Pulmonectomy on the left	2
Acute pleural bleeding. DIC syndrome. Posthemorrhagic shock	-	-	1	1,72	13 years 9 months .	Pulmonectomy on the right	2
Bronchial fistula, Esophageal fistula Pleural empyema. Sepsis. ODN. OSSN	-	-	1	1,72	8 years 9 months .	Pulmonectomy on the left	14
TOTAL	4	9,3	2	3,45			

Chapter Conclusion.

The study of BALF showed that with BE there is a pronounced inflammation of the bronchial wall with widespread inflammatory-destructive changes in neighboring areas of the lung. The use of ozone and a laser in combination can reduce their drainage function, localize the pathological process and qualitatively prepare the lungs for radical removal of lung tissue areas where there are gross irreversible morphological changes. The study of the index of neutrophilic cytosis shows the clear advantages of using endobronchial ozone and laser. Analysis of the BALF microflora shows that endobronchial ozone therapy has a more significant effect on the elimination of the microbial factor than endobronchial laser therapy and traditional treatment. The combined use of ozone - and laser therapy seems to be the most optimal in the fight against the microbial factor in the preoperative period in BE. A cytological study of BALF and smears of impressions from the bronchial mucosa showed the presence of many elements of inflammation (neutrophils, macrophages, degenerating cells) with traditional sanitation of the bronchial tree, a decrease in the number with ozone therapy, a virtual disappearance from the field of view with laser therapy, and especially in combination with ozone and laser. The study of AIR in patients with BE showed that on admission they are worse than on discharge, however, the use of ozone and laser leads to a more rapid improvement.

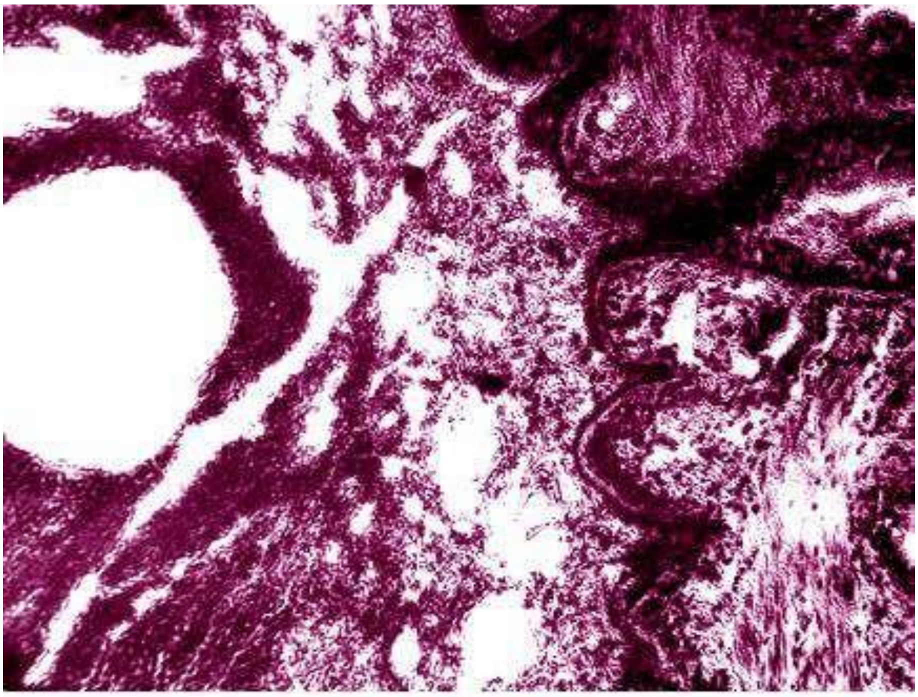
CHAPTER VI

MORPHOLOGICAL STUDIES OF REMOVED MARGIN PREPARATIONS OF PATIENTS WITH BRONCHIOECTATIC DISEASE.

As is known from the literature and from our own research, morphologically, BEB is a metaplasia of the cylindrical bronchial epithelium into a stratified squamous epithelium with desquamation of the ciliated epithelium, sometimes with atrophy or complete absence of the epithelium. Also, with BEB, there is an overgrowth of coarse fibrous connective tissue, atrophy of the peribronchial vessels, atrophy of the muscle layer, etc.

The purpose of the morphological study was to study changes in the bronchi and lung parenchyma in the resected zone of the lung and the border zones of the transition of bronchiectasis to intact areas.

Despite the traditional sanation in the bronchi, pronounced changes persist in BE. In some areas, the epithelial lining of the bronchi is desquamated. For a considerable extent, detachment of the epithelium from the basement membrane is noted. The basement membrane in such areas is significantly thickened. Next to the denuded areas are zones of metaplastic hyperchromic epithelium (Fig. 6.1.). In the lumen, mucus, desquamated epitheliocytes and connective tissue cells with a predominance of neutrophilic leukocytes are determined. In the submucosal layer, along with the phenomena of edema and polymorphic cell infiltration, areas of hemorrhages are noted. Muscular plate of uneven thickness. In some places, it is almost not defined, while in others it is significantly thickened (Fig. 6.2).



Rice. 6.1. Exposed areas of the mucosa, swelling and infiltration of the bronchial wall, accumulations of mucus and desquamated cells in the lumen of the bronchi. Traditional treatment. Mr. 10x10.

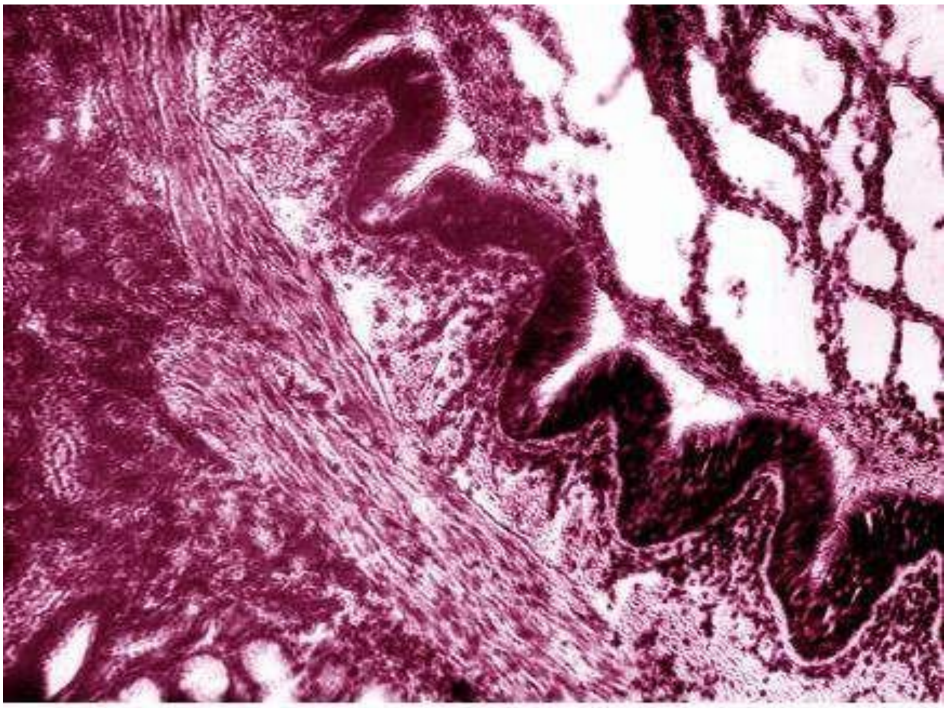


Fig.6.2. Edema and infiltration of the bronchial wall, thickening of the muscle layer, accumulation of lymphoid cells. G-E 10x20.

In the wall of the dilated bronchi, in its submucosa, there are extensive accumulations of lymphoid tissue, forming structures resembling lymphoid follicles (Fig. 6.3).

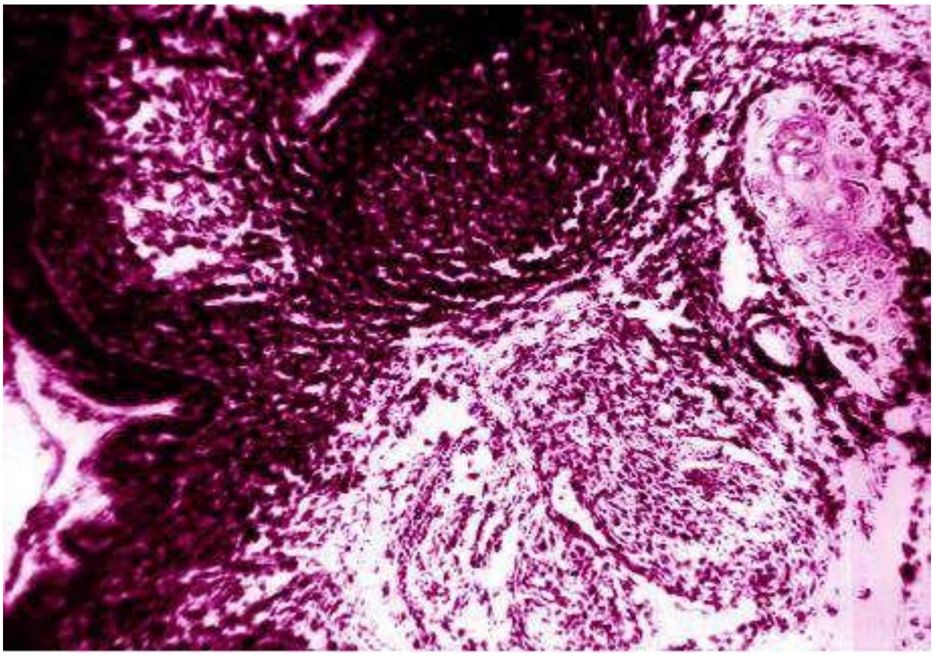


Fig.6.3. Formation of follicles with centers of reproduction of the bronchial wall. Traditional treatment. G-E 10x20.

In these follicles, reproduction centers are clearly distinguished, where quite numerous mitoses occur.

For bronchiectasis is characterized by hypertrophy and hyperplasia of the bronchial mucous glands, which are located mainly in the submucosa. Epithelial cells of the bronchial glands are characterized by eosinophilic cytoplasm due to the content of a significant amount of mucinoid secretion (Fig. 6.4.).

Cartilaginous plates are well developed in bronchiectasis intrapulmonary bronchi. They are thickened and contain a fairly large number of isogenic groups of cartilage cells. However, the latter are small. Often, cartilage plates are separated from the submucosa by a thick layer of loose connective tissue, with pronounced edema.

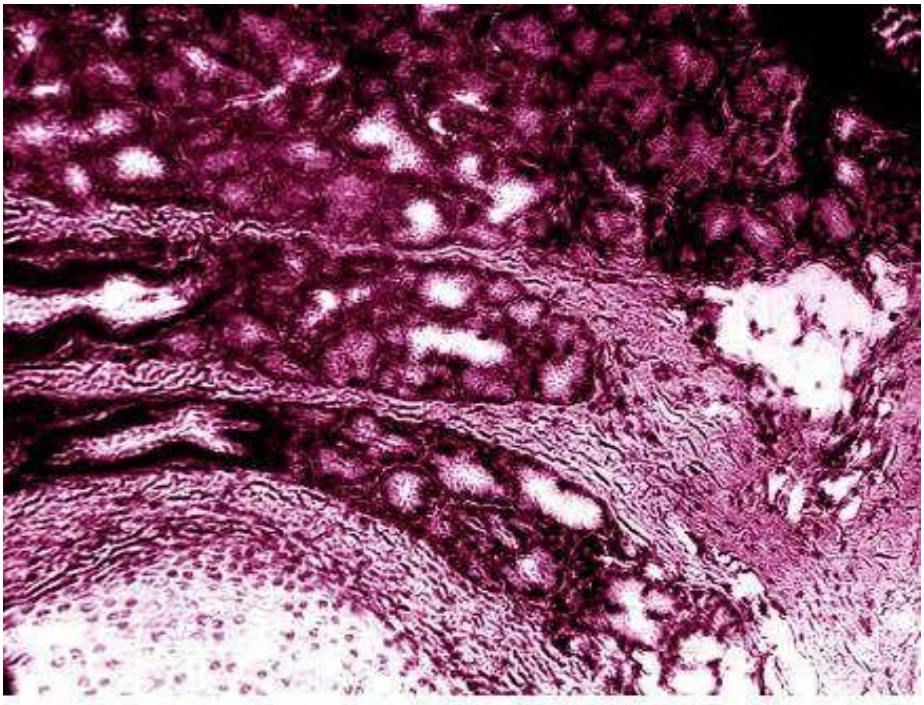


Fig.6.5. Hyperplasia of the bronchial glands. Traditional treatment. G-E.10x10.

However, in contrast to the submucosa, no accumulation of infiltrate cells is noted in this connective tissue.

Bronchiectasis is accompanied by severe disorders of the pulmonary alveoli. The lumens of most of the alveoli near the atelectatic area of the bronchus are filled with homogeneous eosinophilic content. Often with an admixture of alveolar macrophages and other cells. There are also atelectatic alveoli. The interalveolar septa are somewhat thickened. They contain a variety of cellular elements of connective tissue, more often eosinophils and mast cells (Fig. 6.6).

Vessels of various calibers also undergo significant changes near the atelectatic sections of the bronchi. The walls of most vessels, mainly muscular arteries, are thickened and hyalinized in some areas. Often, areas of hemorrhage are noted around the vessels. Around the vessels, in addition to areas of hemorrhage, there is a pronounced round cell infiltration, up to the formation of follicle-like structures. Such clusters of round cells are more common around vessels with hyalinized walls.

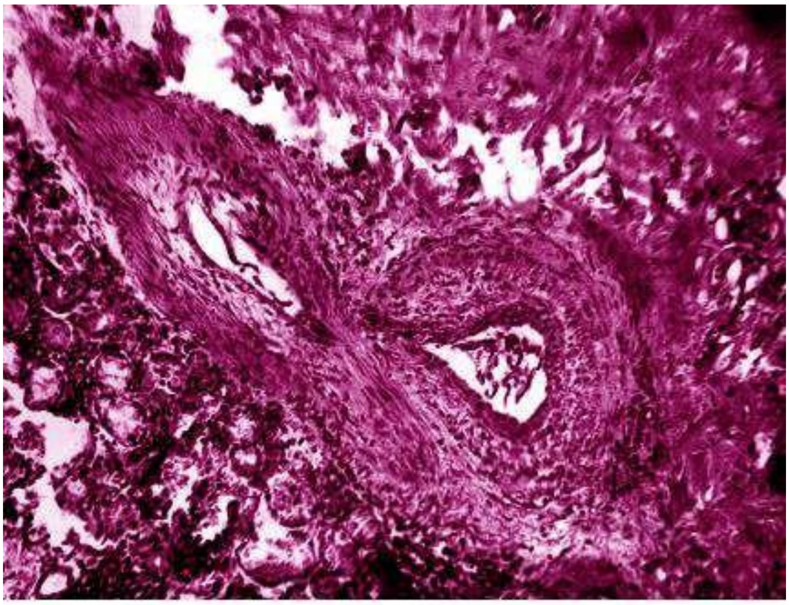


Fig.6.6. Thickening of the vessel wall. Traditional treatment.G-E.10x10 Laser therapy carried out in the preoperative period, as our observations show, leads to a significant reduction in the manifestations of inflammatory changes.

To a lesser extent, destructive changes in the mucous membrane, especially the epithelial lining of the bronchi, are expressed. There are no phenomena of desquamation and detachment of the epithelial lining from the basement membrane. In the wall of the bronchi, manifestations of an inflammatory nature are significantly reduced - edema, infiltration, hemorrhages (Fig. 6.7).

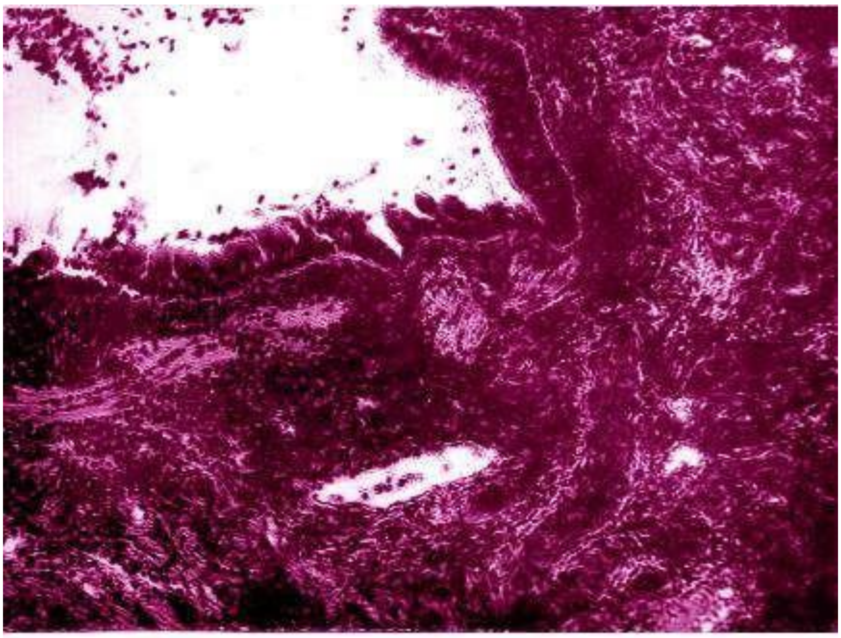


Fig.6.7. Reduced edema and infiltration of the bronchial wall. Preservation of the integrity of the epithelial lining. Laser therapy. G-E. 10x10

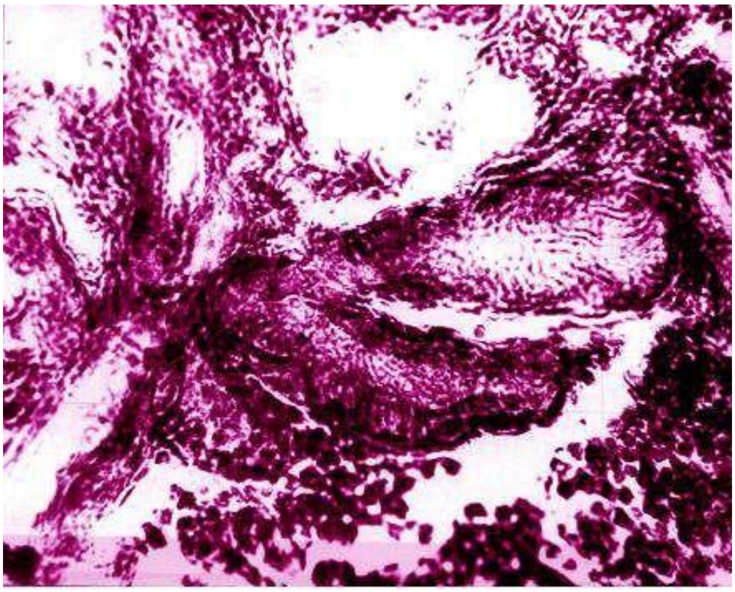


Fig.6.8. Lack of edema of the connective tissue base of the mucosa. bronchial glands. Laser therapy. G-E. 10x40

Between the connective tissue base of the mucous membrane and the cartilaginous plates, there are no manifestations of edema. Cartilage cells in isogenic groups become somewhat larger, and the isogenic groups themselves become smaller.

The phenomena of hyperplasia of the bronchial glands are also less pronounced (**Fig. 6.8**.).

In the lung parenchyma, there is also a decrease in the manifestation of edema of the alveoli and polymorphic cell infiltration of the interalveolar septa. In the lumen of the alveoli, eosinophilic transudate is not detected, only a small number of desquamated cells are found. However, part of the alveoli is in a state of atelectasis.

Ozone therapy also causes positive changes in the morphological status of the bronchi and lung parenchyma.

The epithelial lining of the bronchi is preserved throughout. In the own connective tissue layer of the mucosa, the manifestations of inflammation - edema and infiltration - are reduced, but to a lesser extent than after laser therapy (Fig. 6.9).

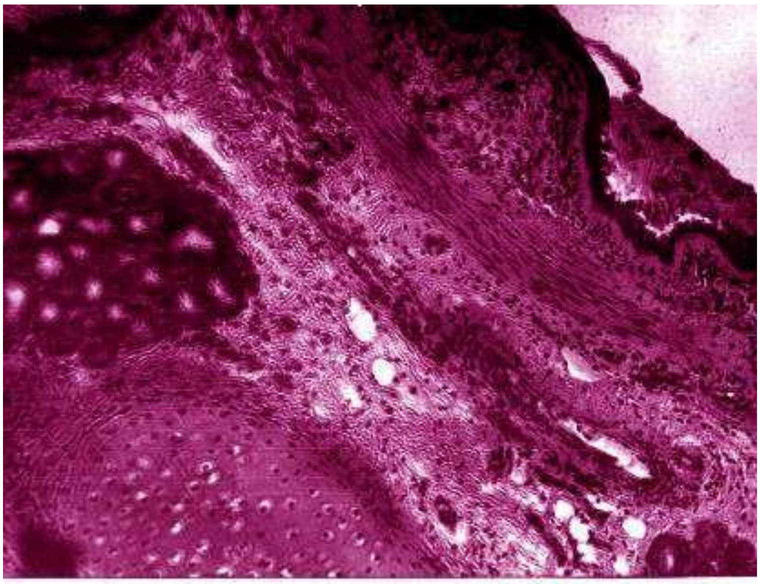
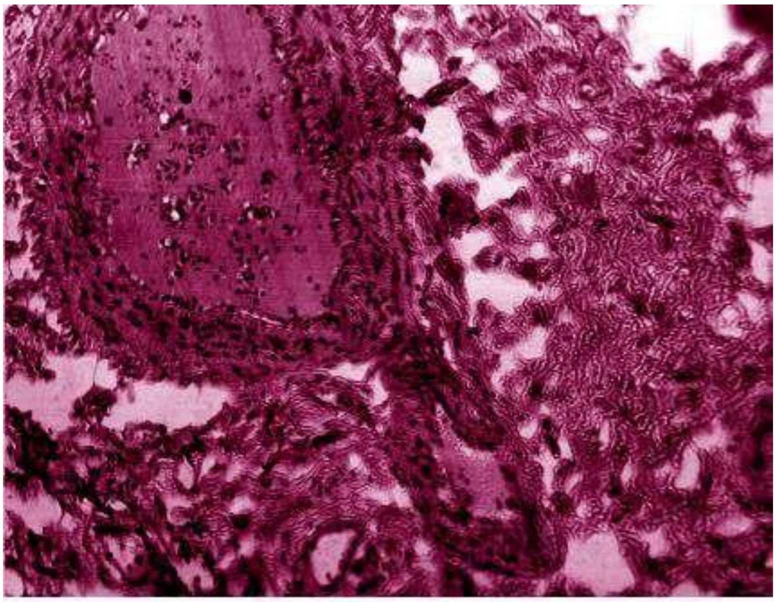


Fig.6.9. Preservation of the epithelial lining intact, reduction of edema and inflammation of the bronchial wall. Ozone therapy. G-E. 10x10

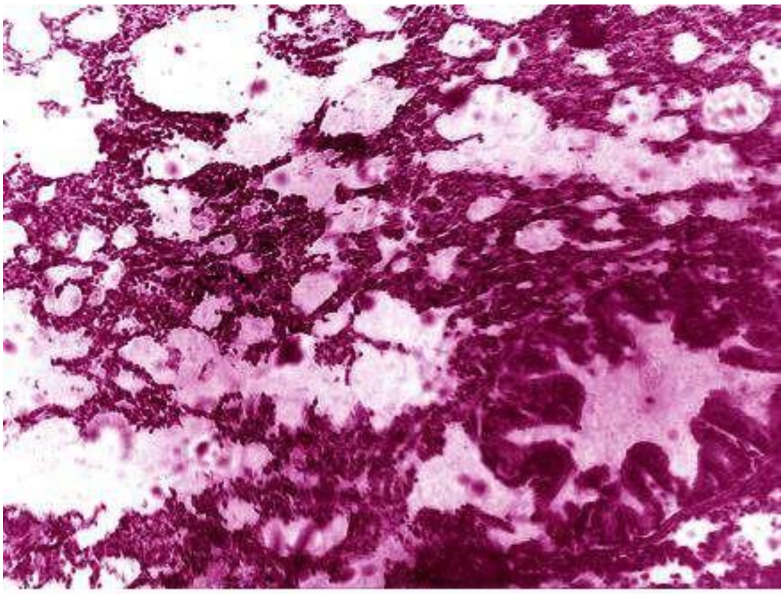
In the muscle layer, there is a thickening of the muscle fibers, the vessels are collapsed. On the part of the bronchial glands, the manifestations of hyperplasia are largely preserved. The cartilaginous plates are rather thick with numerous small isogenic groups. In the alveoli, there are no manifestations of edema and infiltration of the interalveolar septa.

The thickness of the vessel walls decreases. Rarely, there are manifestations of hyalinosis of the walls (Fig. 6.10.).



Rice. 6.10. The absence of edema and alveoli and inflamed changes in the alveolar septa, a decrease in the thickness of the walls of blood vessels, the absence of their hyalinosis. Ozone therapy. G-E.10x10

However, most of the vessels with stasis. In the lumen, a homogeneous eosinophilic content with white blood cells - mainly neutrophils - is determined. To the greatest extent, the reduction of changes in the walls of ectatic bronchi takes place after the use of complex treatment using laser irradiation and ozone therapy in preoperative preparation (Fig. 6.11.).



Rice. 6.11. Reduction of the epithelial lining of the ectasic bronchus, absence of inflammation and edema of the bronchus wall of the second order, complex treatment with ozone + laser therapy. G-E. 10x10

The epithelial lining of the bronchi without violating the integrity in the lumen is practically not determined by mucus, deflated cells and migrated cells of the connective tissue. In the own connective tissue layer, the accumulation of infiltrate cells is insignificant, as well as the manifestations of edema in all layers of the bronchial wall. There are no accumulations of lymphoid tissue in the form of lymphoid follicles. The phenomena of hyperplasia of the bronchial glands are insignificant. The interalveolar septa are thin, the capillaries in them are thin-walled. The structure of microvessels of various calibers is also little different from that in the norm. Their walls are without signs of hyalinosis. There are no signs of inflammation around the vessels, accumulations of round cell elements and perivascular edema are not determined.

Thus, ozone therapy carried out in the preoperative period, as observations show, leads to a significant reduction in the manifestations of inflammatory changes. Laser therapy also causes positive changes in the morphological status of the bronchi and lung parenchyma. To the greatest extent, the reduction of changes in the walls of ectatic bronchi takes place after the use of complex treatment using laser irradiation and ozone therapy in preoperative preparation. Traditional sanation in the bronchi with BEB preserved pronounced morphological changes.

CHAPTER 7

LONG-TERM RESULTS OF SURGICAL TREATMENT OF BRONCHIOECTATIC DISEASE IN CHILDREN

The final stage of our study was the comparative study of long-term results in the control and main groups. Long-term results in terms of 6 months to 10 years were studied by us in 71 (68.3%) of 104 patients. In the CG in 30 (66.7%) and 41 (69.5%) children in the MG. All patients were hospitalized to the clinic, where they underwent a complete clinical, laboratory, X-ray and, according to indications, bronchological examination.

When taking anamnesis, 7 (23.3%) patients in the CG and 8 (19.5%) patients in the MG complained of coughing with sputum production, periodic fever, shortness of breath and general weakness. Three patients with CG had a history of hemoptysis. Of the examined children, 23 (76.7%) children in the CG and 34 (85.5%) children did not complain. The frequency of exacerbations once a year in the CG was noted in 6 (20.0%) patients and in 7 (17.1%) cases in the MG. 2-3 times a year in 4 (13.3%) and 3 (7.3%), respectively, in the CG and MG. In 4 (13.3%) children from the CG, exacerbation of chronic bronchitis was noted at admission, in the CG in 3 (7.3%) patients. On objective examination, 2 (6.7%) patients in the CG and 7 (17.1%) patients in the MG had grade 1 spinal scoliosis. The main part of the patients were patients who underwent pulmonectomy. All patients underwent an X-ray examination, in which 5 (16.7%) CG and 4 (9.8%) patients of the MG showed signs of an inflammatory process in the lung parenchyma and in the peribronchial zone.

Bronchological examination (HBS and TBH) was performed in 18 (60.0%) patients in CG and in 27 (65.9%) patients in MG. At the same time, catarrhal endobronchitis was detected in 11 (61.1%) patients in the CG and in 17 (63.0%) in the MG. Catarrhal-purulent nature of endobronchitis was observed in 4 (22.2%) children from the CG and in 9 (33.3%) children from the CG, purulent nature of endobronchitis was observed in 3 (16.7%) children from the) of the OG patient.

A bronchographic study revealed the following changes in the bronchial tree (Table 7.1.).

Table 7.1.

The nature of bronchograms in patients in the long-term period

Diagnosis of BEB	KG		OG		TOTAL	
	Abc.	%	Abc.	%	Abc.	%
Recurrence of BEB v.d. left	1	3,3	-	-	1	1,4
Recurrence of EBV v.d. on right	-	-	1	2,4	1	1,4
Recurrence of BEB III-segment on the left	2	6,7			2	2,8
Recurrence of BEB III-segment	1	3,3	-	-	1	1,4
left, chronic osteomyelitis	1	3,3	2	4,8	3	4,2
VI ribs, chronic empyema.	3	10,0	4	9,8	7	9,9
Deforming bronchitis	1	3,3	1	2,4	2	2,8
III-segment on the left	21	70,0	33	80,5	54	76,1
Exacerbation of chronic bronchitis	30	100,0	41	100,0	71	100,0

Table 7.1 clearly proves the benefits of using ozone and LILI in patients with EBV, which is reflected in the almost 4 times lower frequency of EBV relapses in patients with OH.

In connection with the recurrence of BEB in the CG, in one case (previously a lobectomy was performed), a lung resection was performed according to the type of pulmonectomy. In the second case, decortication of the lung and segmentectomy due to recurrence of bronchiectasis in the segment adjacent to the former affected area. In the two remaining cases, the operation was postponed due to the temporary refusal of the parents of the children from the operation.

In the OG, one patient (primary operation - lower bilobectomy + segmentectomy of the III-segment) underwent pulmonectomy-type lung resection.

Conservative treatment of other patients with deforming bronchitis, long stump syndrome included antibiotic therapy, therapeutic broncholation with the use of ozone and LILI, alkaline inhalations, physiotherapy, treatment of broncho-obstructive syndrome.

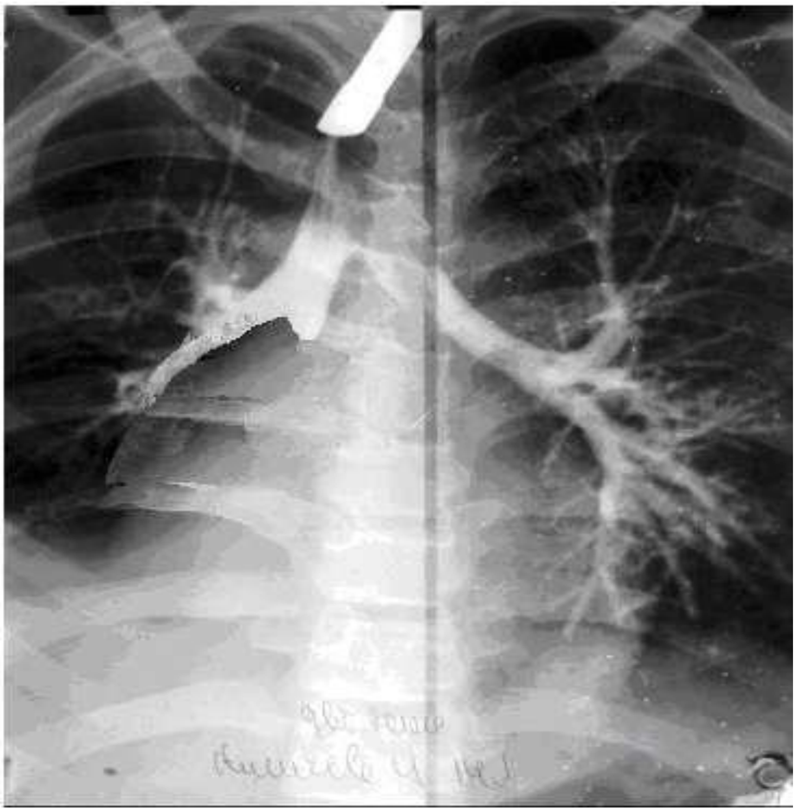
Summarizing the analysis of long-term results, we summarized the following results:

A good result was obtained in 23 (76.7%) CGs and in 34 (85.5%) OGs. The criteria for a good result were the absence of complaints, the absence of clinical and roentgenbronchological changes in the child during the examination.

A satisfactory result was obtained in 3 (10.0%) CG and 4 (10.0%) children in the MG. The criteria for a satisfactory result were periodically exacerbations of endobronchitis, against the deformations of the bronchial tree noted on bronchograms.

As an example, we give the following observation of patient U., 13 years old, 10 months old, case history No. 1426, was admitted to the clinic of the Scientific Center for Pediatric Surgery on March 22, 1998 with complaints of coughing with sputum production, periodic fever, general weakness, decreased appetite, chest pain and chest deformity. From the anamnesis: the third child in the family, sick from early childhood. The disease is associated with frequent colds of the respiratory tract, for which he was repeatedly treated on an outpatient and inpatient basis, while a temporary effect was noted from the therapy. Upon admission, the general condition of the patient is moderate; skin is pale; over the lungs auscultatory - on the right, weakening of breathing, a lot of wet rales of various sizes; on the left - hard breathing, single wire wheezing; respiratory rate - 24 per minute; The heart sounds are muffled, the heart rate is 98 beats per minute, A/D 100/70 mm. rt. Art.; the tongue is moist, the abdomen is soft, painless on palpation, the liver and spleen are not enlarged. Stool and diuresis are normal. On *objective examination, the chest is barrel-shaped, the Symptom of "drum sticks and watch glasses" is positive. After the treatment (endobronchial application of LILI was used for the purpose of preoperative preparation). Bilateral bronchography revealed a saccular form of bronchiectasis of the lower, middle lobe of the right lung.*

In a planned manner on 23/03-98, an operation was performed: Thoracotomy on the right, bilobectomy of the lower, middle lobe of the right lung. The p / o period proceeded smoothly, the wound healed by primary intention, on the 20th day after the operation, the child was discharged home.



Rice. 7.1. Bilateral bronchography of patient U., 13 l

2 years after the operation, a control examination of the case history No. 745/82 was performed. Complaints at admission does not show, the general condition is satisfactory. Bronchological examination revealed catarrhal endobronchitis, laboratory parameters of BALF without pathological abnormalities. On bilateral *bronchography: the bronchial tree on both sides without features. On the right there is a small stump (Fig. 7.1).*

An unsatisfactory result was noted in 4 (13.3%) children from the CG and in 2 (5.0%) children from the MG. The criteria for an unsatisfactory result were the recurrence of bronchiectasis, repeated surgical interventions.

Thus, the results of a comparative analysis of the complex treatment of EB patients who were treated in the traditional way, with the use of LILI, ozone and their combined use indicate that the indicators of broncho-important fluid, bacteriological spectrum, analysis of smears-imprints, LII, INC, morphological data are better in groups patients who used laser or LILI compared to the traditional treatment group, however, the use of ozone therapy alone, although it reduces the influence of the bacterial factor, does not eliminate other pathological factors. Laser therapy does not significantly affect microorganisms, but to a greater extent restores microcirculation, the functioning of the glands, which reduces hypersecretory syndrome. The combination of the use of endobronchial ozone therapy and laser therapy allows the most optimal and in the shortest possible time to prepare the patient for surgery for BAE. An analysis of the early postoperative period confirms a significant reduction in such immediate postoperative complications as atelectasis, bacterial infection up to pleural empyema, pneumonia, bronchial fistulas, and also contributes to the smooth course of the rehabilitation process.

CONCLUSION

In recent years, a large number of works have been published on the diagnosis and surgical treatment of bronchiectasis in children. On the one hand, this reflects the intensity of scientific research in this area, but on the other hand, it indicates that multilateral diagnostic and treatment programs for this pathology are still far from being resolved. To date, a number of intractable problems associated with bronchopulmonary complications in the postoperative period remain.

The most common and malignant cause of postoperative complications such as atelectasis, pneumonia, fistula of the bronchus stump, pleurisy, is endobronchitis, not treated in the preoperative period, especially its hypersecretory forms. A number of authors directly indicate that, setting the task of improving the compensatory capabilities of the diseased organ itself - the lungs, they pursue two goals - reducing the activity of concomitant bronchitis and relieving inflammation in the lung parenchyma surrounding the lesion.

Despite the numerous works in this direction, the principles of preoperative preparation in the bottom category of patients are still insufficiently developed. In the complex of applied measures for the treatment of chronic endobronchitis, many different antibiotics, antiseptics, endobronchial lavage are used. However, there are no works devoted to the analysis of the effectiveness of endobronchial combined use of laser and ozone in the available literature. There is only scattered and conflicting information about each of these methods, but there is no detailed description of them in a comprehensive version. The result of this is a high percentage (10-53%) of postoperative complications and persistent high mortality, especially in childhood. The foregoing indicates the high relevance of the problem associated with adequate preoperative preparation in these categories of patients.

Conducted experimental - morphological studies give reason to believe that ozone therapy is an effective treatment for purulent endobronchitis. It can be used as both an anti-pyogenic and an anti-inflammatory agent.

Laser therapy, being also anti-inflammatory

a means that has a stimulating effect on microcirculation, mucus-forming cells, in terms of efficiency to some extent inferior to the effects of ozone. In the treatment of purulent endobronchitis, laser therapy can be used as an alternative remedy.

Observations have shown that the maximum anti-inflammatory and antipyogenic effect is manifested with the complex use of ozone and laser therapy.

The results of the cytological studies of BALF and morphological studies using light microscopy, transmission and scanning electron microscopy suggest that the use of ozone, laser is an effective tool in the treatment of experimental endobronchitis, and their combined use (ozone + laser) enhances the effect, potentiating the positive properties each of them.

The complex use of ozone and laser therapy can be recommended for clinical use in the treatment of purulent endobronchitis, which occurs with suppurative lung diseases.

Thus, a cytological study of smears of impressions from the bronchial mucosa revealed many elements of inflammation (neutrophils, macrophages, degenerating cells) during traditional sanitation of the bronchial tree, a decrease in their number during ozone therapy, and a virtual disappearance from the field of view during laser therapy, especially in combination with ozone and laser therapy.

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LIST OF ABBREVIATIONS

AIR - anti-infective resistance

AM - alveolar macrophages

BALF - bronchoalveolar lavage fluid

BAL - bronchoalveolar lavage

BEB - bronchiectasis

H-E - hematoxylin eosin

INC - index of neutrophilic cytosis

CG - control group

CFU - colony forming units

LII - leukocyte index of intoxication

L - lymphocytes

LILI - low intensity laser radiation

NL - neutrophilic leukocytes

OG - main group

OG1-main 1 subgroup

OG2 - main 2 subgroup

OG3 - main 3 subgroup

PMN - polymorphonuclear leukocytes

SEM - scanning electron microscopy

TBG - tracheobronchography

TBS - tracheobronchoscopy

TEM - transmission electron microscopy

CE - chronic endobronchitis

CEC - circulating immune complexes

EC - endobronchial cytogram

Ig - immunoglobulin