

## Clinical and laboratory studies the effect of chronic pneumonia on the state of the upper respiratory tract in children

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**Objective:** to investigate the state of the upper respiratory tract (URT) in children suffering from nonspecific chronic pneumonia without clinical and medical history of the presence of associated chronic inflammatory processes on the part of the nasopharynx, and based on the results obtained, assess the nature of the effect of the chronic bronchopulmonary process on the condition URT.

**Material and methods.** 45 children from 5 to 16 years old with chronic nonspecific pneumonia were examined. We studied the endoscopic picture of the nasal cavity and bronchi, the motor activity of the ciliated epithelium of the nasal cavity, the pH of the nasal secretion, and the concentration of secretory immunoglobulins A and G class in the nasal secretion. The treatment consisted of sanitation bronchoscopy and the appointment of medications and physiotherapeutic agents in relation to the pathology of the bronchopulmonary apparatus.

**Results.** Our studies and their interpretation showed that chronic pneumonia has an adverse effect on the state of the URT. This effect is realized through the reflex effect of the pathological process of the bronchopulmonary system on the initial section of the respiratory system. As a result of pathological reflection in the nasal cavity, paranasal sinuses, vasomotor and secretory disorders occur, which are clinically manifested in the form of edematous, stagnant phenomena, as well as increased secretion, a change in the color of the mucous membrane of the nasal cavity and a violation of a number of indicators of its functional state.

**Conclusion.** Children with chronic nonspecific pneumonia registered at the pulmonary clinic should also be observed by URT specialists in order to timely detect the transition of the subclinical stage of the disease to the clinical and adequate treatment with the pulmonologist.

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According to the literature of different years of both our country and foreign countries, the relationship of diseases of the upper respiratory tract (URT) and internal organs and body systems can be traced mainly along the line of influence of

diseases of the URT on the condition of internal organs [1, 2, 8-10]. At the same time, the question of the influence of various chronic diseases on the occurrence, course, and treatment features of pathological processes of the nasopharynx and

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oropharynx is addressed in a few works [3, 5, 11].

Various clinical and experimental studies have established that the mucous membrane of the URT, in particular the nasal cavity, is a powerful reflexogenic zone and the site of the occurrence of both physiological and pathophysiological reflexes that affect the function of internal organs and systems organism [4, 11, 12]. Along with this, in the literature there is information about the reflex influences of the reverse nature. It is known, for example, that irritation of the sciatic nerve trunks by faradic current causes a narrowing of the blood vessels of the nasal cavity [13]. In human experiments, a change in the temperature of the nasal mucosa in response to temperature effects in the region of the upper and lower extremities is shown [7]. Reflex changes from the mucous membrane of the URT under the influence of thermal procedures in the limb region have been empirically used by clinicians for a long time as a therapeutic measure for diseases of the URT.

The discussion of feedback is of undoubted practical and theoretical importance, since it can contribute to the resolution of many, not yet studied, issues of the pathogenesis of associated respiratory tract diseases and an adequate interpretation of the clinical manifestations of diseases of the URT occurring in the presence of chronic bronchopulmonary process and pathogenetically substantiated complex therapy of concomitant disease.

**Purpose:** to study the state of the upper respiratory tract in children suffering from chronic non-specific pneumonia without clinical and anamnestic information about the presence of associated chronic inflammatory processes from the URT, and based on the results obtained, evaluate the character the influence of the chronic bronchopulmonary process on the state of the upper segment of the respiratory tract.

#### **Material and methods**

To study this issue, 45 children with chronic pneumonia who were hospitalized in the pulmonology department of the Republican Children's Clinical Hospital in Makhachkala were taken under observation.

The age of the examined was from 5 to 16 years. During heredity examination and a history of patients, there were no signs indicating the presence of foci of chronic infection and other diseases of the URT. For this category of patients were characterized by: moderate swelling of the nasal concha, increased humidity of the nasal cavity and discoloration of the nasal mucosa. According to the anamnesis, patients from this group were exposed to such diagnoses as "chronic catarrhal rhinitis", "vasomotor rhinopathy", "chronic rhinosinusitis", etc. They received nasal decongestants, physiotherapy for the nose, endonasal electrophoresis, etc. From their own words (and the words of their parents), nasal breathing improved, the excess nasal discharge stopped only during the treatment period. The complex of therapeutic measures provided for conducting medical bronchoscopy from 2 to 8 times, which consisted of aspirating the pathological secretion, washing the bronchi with a warm physiological solution, followed by the introduction of a mixture of chymotrypsin and antibiotic according to the sensitivity of microflora isolated from sputum, the appointment of aerosols with proteolytic enzymes and alkaline inhalations. In addition, children received multivitamins, massage and ultra high frequency therapy on the chest area. No treatment was prescribed for patients with ear, nose and throat diseases.

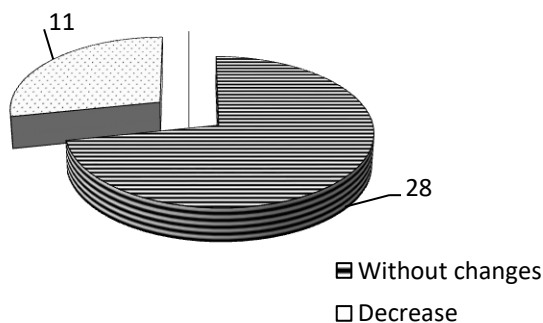
#### **Discussion**

First of all, the results of bronchoscopic debridement were analyzed. At the end of bronchial lavage, out of 39 patients in whom, during the initial examination, a bluish tint of the nasal mucosa was revealed, it decreased only in 11.

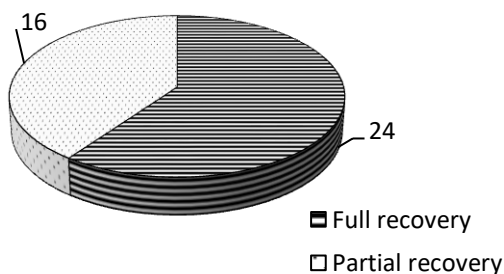
Reduction of edema of the lower nasal concha could be seen already after 2-3 bronchoscopic debridements. With bilateral widespread morphological changes in the bronchopulmonary system and diffuse endobronchitis with a significant amount of discharge, the reduction of the nasal concha to the usual size was delayed until the end of the course of treatment.

In parallel with the positive dynamics of the state of the lower nasal concha during the rehabilitation of the bronchi, a decrease

in the amount of discharge in the nose was noted. Two patients who failed to achieve complete rehabilitation of the bronchial tree had swelling of the shells and increased mucous secretion. By the end of the course of bronchoscopic debridement of 40 patients with impaired pneumatization of the maxillary sinuses, airiness fully recovered in 24 and partially in 16 patients.

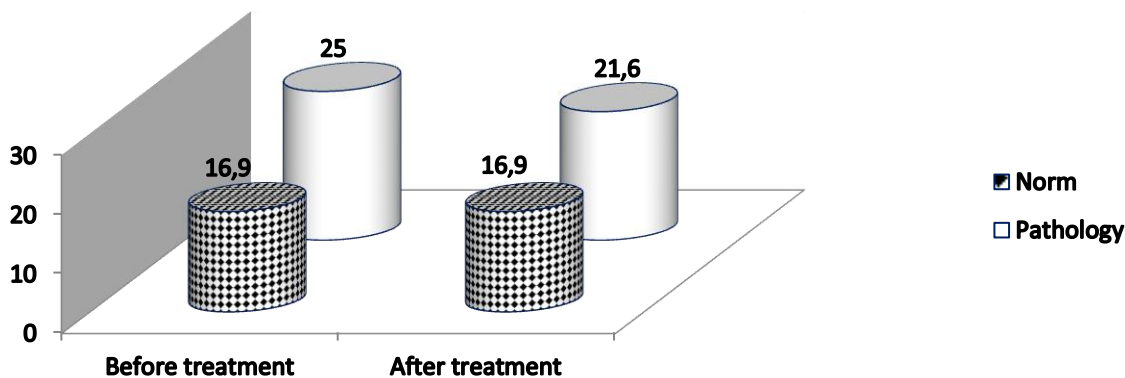


**Figure 1.** Cyanotic shade of the nasal mucosa after treatment.



**Figure 2.** Restoration of pneumatization of the maxillary sinuses after bronchoscopic rehabilitation.

Based on clinical observations based on an analysis of the results of bronchoscopic sanitation of the lower respiratory tract, we came to the conclusion that the revealed radiological changes in the maxillary sinuses, as well as increased secretion and swelling of the nasal mucosa, a change in its color is due to the adverse effect of the chronic bronchopulmonary process on the state of the URT, possibly of a reflex nature. For a more complete understanding of the effect of chronic pneumonia on the state of the initial section of the respiratory tract, laboratory studies were conducted aimed at identifying the functional activity of the nasal mucosa: the motor activity of the ciliated epithelium of the nose was determined using a 3% protorgol solution, the value of hydrogen indicator (pH) of nasal secretion using universal indicator paper, a cytological picture in prints from the mucous membrane of the lower nasal concha, and taught concentration level secretory Ig A and G class in nasal secretion. The average indices of motor activity of the ciliated epithelium of the nose during the initial examination in only 6 out of 45 patients were equal to the control values ( $16.9 \pm 1.2$  min), and in the rest, the time of moving the indicator solution from the anterior end of the lower nasal the shells to the nasopharynx were  $25.0 \pm 0.9$  min. By the end of the course of treatment, this indicator decreased to  $21.6 \pm 0.8$  min.



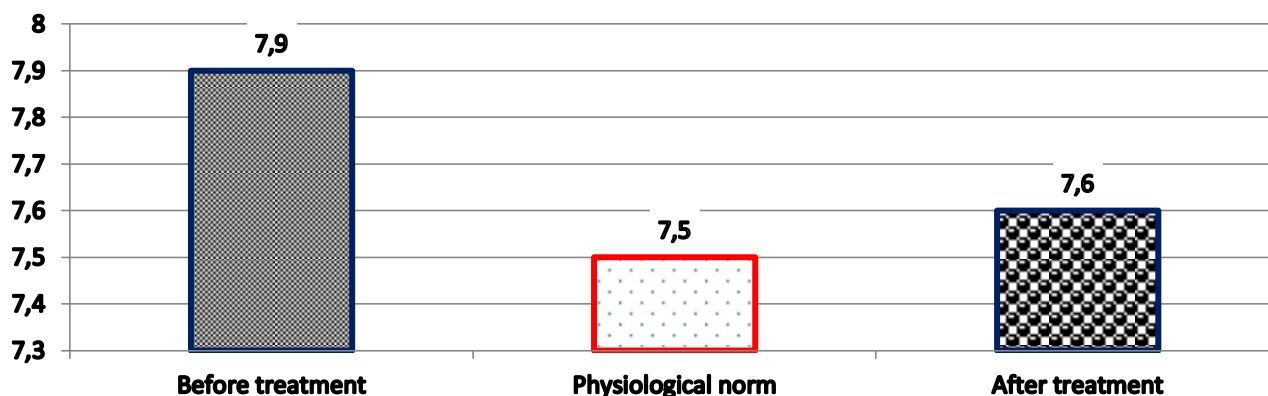
**Figure 3.** Motor activity of the ciliated epithelium of the nasal cavity, min.

The pH values of nasal secretion during the initial examination were  $7.9 \pm 0.07$  min

(physiological norm  $7.5 \pm 0.05$  min). Repeated examination at the end of treatment

showed a decrease in pH by an average of 0.3, i.e. the transition of the alkaline reac-

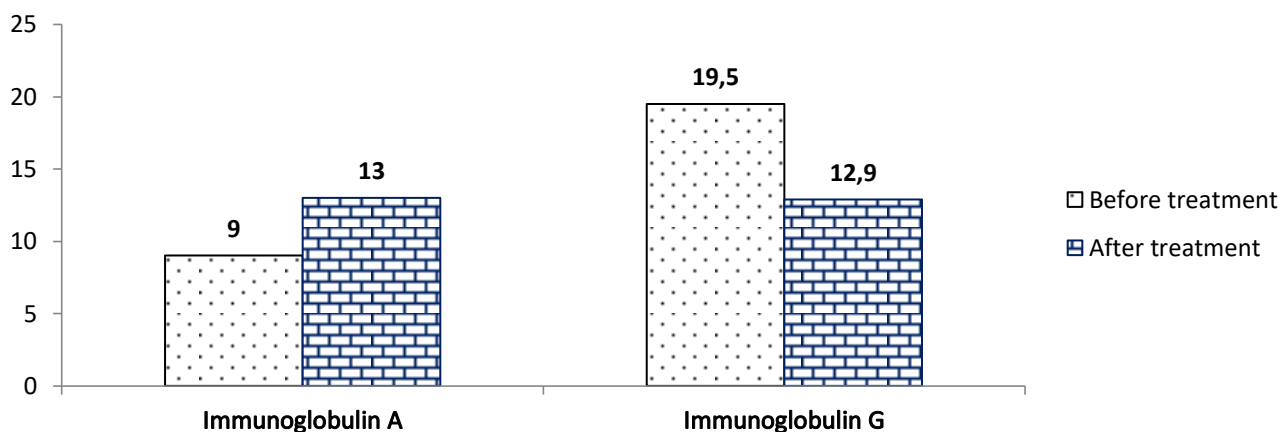
tion to neutral, optimal.



**Figure 4.** pH values of nasal secretions.

In fingerprint preparations, we also took into account the number of leukocytes, the degree of microbial contamination and phagocytosis. A large number of leukocytes and significant microbial seeding in the preparations was observed in the vast majority of patients. There were degenerative forms of leukocytes and eosinophils in single fields of vision. Repeated study of cytograms, conducted at the end of treatment, revealed a tendency to a decrease in inflammatory phenomena in the mucous membrane of the nasal cavity (decrease in leukocyte migration and microflora contam-

ination). An increase in the phagocytic reaction was detected, which indicated the activation of local defense mechanisms. Determination of the content of secretory immunoglobulin A class showed that after treatment there was a tendency to an unreliable increase in its level ( $13 \pm 2.4$  mg%) compared with the initial values ( $9.0 \pm 3.2$  mg%). As for class G immunoglobulin, the average values of its content before treatment are significantly higher ( $19.5 \pm 2.2$  mg%) than after treatment ( $12.9 \pm 3.4$  mg%).



**Figure 5.** The content of secretory immunoglobulins in the mucous membrane of the nasal cavity, mg%.

As is known, Ig A in the secretion of the nasal cavity is a dimer of serum Ig A and secretory fragment (Sc), which are produced in the mucous membranes, and Ig G class enters the surface of the mucous

membrane from the blood serum. An increase in the concentration of immunoglobulin G in nasal secretion, according to the researchers [4, 11], indicates a violation of the permeability of the vascular walls of

inflammatory genesis. In the examined patients, as a result of therapeutic measures, the permeability of the vascular walls improved, and therefore the concentration of Ig G decreased.

### Discussion

Interpretation of clinical and laboratory studies indicates that chronic pneumonia has an adverse effect on the state of the URT. This effect is carried out, it can be supposed, through the reflex effect of the pathological process of the bronchopulmonary system on the initial part of the respiratory system, and, as a result, in the nasal cavity, paranasal grooves vasomotor and secretory disorders occur, which are clinically manifested in the form of edematous congestion, as well as increased secretion and discoloration of the nasal mucosa. The adverse effect of chronic pneumonia on the state of the URT was manifested not only by morphological changes in the mucous membrane of the nasal cavity, but also by a violation of a number of indicators of its functional state. The revealed morphological and functional shifts from the side of the nasal cavity in patients with chronic pneumonia, in whom the signs of chronic inflammation of the URT were not anamnestically or clinically determined, should be assessed as the initial (subclinical) forms of chronic infection URT.

Studies performed earlier in our clinic [6] indicate that, before the formation of chronic pneumonia, foci of chronic infection of the upper respiratory tract were detected in 47.2%. Almost simultaneously, chronic inflammatory processes in both parts of the respiratory tract formed in 28.2%, and in 24.4% of chronic pneumonia preceded infection foci of the upper airway. Therefore,

taking into account the above clinical and functional data, indicating the adverse effects of chronic pneumonia on the state of the URT, we can assume that in most patients (in 28.2% and 24.4%) The chronic nonspecific inflammatory process of the bronchopulmonary system also takes part in the formation of pathological processes of the nasopharynx.

### Conclusions

1. Children with chronic nonspecific pneumonia in the upper respiratory tract develop morphofunctional disorders, which can be regarded as subclinical forms of foci of chronic infection.
2. Therapeutic measures aimed at the rehabilitation of the bronchial tree contribute to the normalization of the morphological and functional activity of the mucous membrane of the upper segment of the respiratory system.
3. In order to prevent the development of diseases of the upper respiratory tract, and if they are present, and treatment, children with chronic pneumonia registered in the dispensary with pulmonologists should also observe otorhinolaryngologists.

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