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Scientific and pathogenetic substantiation of approaches to the physical rehabilitation of children with recurrent bronchitis infected with coronavirus (Covid-19)

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Annotation. The aim of our study was the pathogenetic and scientific substantiation of the use of kinesiohydrotherapy (CGT) by the method of monitoring the function of external respiration at the stage of rehabilitation of children with recurrent bronchial obstruction (RBO). A study of children aged 1 to 6 years of Uzbek ethnicity with recurrent bronchitis occurring with bronchial obstruction syndrome was conducted. A comparative analysis of spirometry indicators in children with RBD before and after CGT in the experimental group and in the control, group showed the effectiveness of the method of complex rehabilitation with the inclusion of CGT with special breathing exercises on land and in the pool. Effective use of CGT reduces the activity of the inflammatory process in the bronchi due to good training of the muscles smooth of the bronchi and chest muscles.

Keywords: rehabilitation, bronchitis, kinesiohydrotherapy, children

Introduction

To date, to optimize the rehabilitation of children with bronchopulmonary pathology (BLP). The emergence of COVID-19 has posed challenges for pediatricians in healthcare related to early diagnosis and provision of rehabilitation care to patients. In recent years, the study of the clinical features of bronchopulmonary diseases infected with coronavirus (covid-19) has continued. An urgent problem is the development of new means of its prevention and therapy. The recommendations presented in various documents of the Ministry of Health are largely based on materials on the diagnosis, prevention and treatment of COVID-19, published by experts from WHO and the European Centers for Disease Control. The world has accumulated a lot of experience in studying severe acute respiratory syndromes caused by coronaviruses. They provoked such diseases as atypical pneumonia (caused by the SARS- CoV strain), Middle East respiratory syndrome - acute respiratory infections, turning into relapses of bronchial obstruction, viral pneumonia with respiratory and less often renal failure (caused by the MERS- CoV strain) and others.

The Republic of Uzbekistan has developed and introduced new forms of organizing medical care for the population - a hospital at home, day hospitals in a family clinic and private medical centers. At the same time, in medical institutions (HCIs), in particular in SPs, they adhere to the orders of the Ministry of Health of the Republic of Uzbekistan No. 420 dated November 2, 2015 “On measures to improve the provision of medical services to children in an outpatient clinic” and the decree of the President of the Republic of Uzbekistan dated June 20 2017 No. PP-3071 "On measures for the further development of specialized medical care for the population of the Republic of Uzbekistan for 2017 - 2021", No. PP-2650 dated November 2, 2016 "On measures to further improve the system of maternal and child health care in Uzbekistan for 2016- 2020 years” [10,11]. The high level of bronchopulmonary diseases (BLD) in children, the complexity of the pathogenesis

and the severity of the consequences of recurrent bronchitis necessitate the development of measures for its early diagnosis, prediction of consequences, effective treatment, as well as the introduction of research results into practical medicine [2,4].

The basis of rehabilitation treatment for recurrent bronchial obstruction (RBO) infected with coronavirus (covid-19) is to ensure good bronchial patency and its functional activity. The system of measures aimed at recovery and compensation of functions impaired as a result of the disease is a medical rehabilitation for the prevention of complications, chronic course and recurrence of the disease, returning it to an active life in society. According to the WHO, rehabilitation measures are necessary to restore the functional ability of the respiratory organs to ensure the physical working capacity of the body. The main tasks of the rehabilitation of children with BLS diseases include: treatment of inflammation; restoration of bronchial patency; improvement of respiratory function; increased activity of muscles and neurohumoral mechanisms of the respiratory organs [3,6].

The implementation of the basic principles of rehabilitation measures for bronchopulmonary diseases (BLD) in children ensures the effectiveness of the recovery of patients after illness. At the same time, the main principles of rehabilitation measures include: phasing, timely start, application of the necessary methods, individual approach, active participation of parents and the patient, and continuity in the rehabilitation treatments carried out. The timely start of rehabilitation measures in children with RBO is necessary to prevent complications in the form of a persistent course and a possible transition to BA. Early onset contributes to a favorable course and outcome of the disease, is the prevention of the transformation of RBO into AD and the development of disability. It should be noted that in severe conditions, severe intoxication, respiratory and heart failure, it is necessary to limit rehabilitation measures [9,12].

The implementation of the principle of complexity in medical rehabilitation (MR) of children with RBO and AD implies the widest possible use of all possible and necessary methods of drug and physical rehabilitation. At the same time, methods of psychological rehabilitation should also be used in order to develop the patient's motivation for rehabilitation. The methods of physical rehabilitation include: kinesiotherapy, occupational therapy and manual therapy, massage, apparatus physiotherapy, reflexology, balneotherapy and others. The principle of individualization of the rehabilitation of children with RBO and AD consists in drawing up an individual rehabilitation program that takes into account the characteristics of the medical history, the course and severity of the patient, age, gender, their functional capabilities, family and social status, the composition of specialists and the methods and means used.

In this regard, in order to diagnose the severity of RBO, much attention in clinical practice is paid to assessing the functional state of the respiratory organs. Pulmonary function disorders (RF) detected by spirography and peak flow measurements are a reliable method for diagnosing SBO, chronic obstructive pulmonary diseases (S.E. Tsyplenkova, Yu.L. Mizernitsky, 2015). Determining the function of external respiration (RF) is well standardized, highly reproducible, but requires good technical training and correct performance of respiratory maneuvers, which is limited by the age of the examined children [1,8].

Rehabilitation of children with RBO begins from the first days of the disease and continues during the period of recovery of the child. After discharge from the hospital, patients continue rehabilitation activities during the period of remission of the disease. The principle of stages in the MR of children includes: a specialized hospital; family city polyclinic; rehabilitation centers; sanatorium treatment [7,9,12]. In the system of rehabilitation treatment of patients with RBO and BA, individual tasks are set and, accordingly, the necessary drugs and methods of physical rehabilitation are selected for them.

Kinesohydrotherapy (KHT) is an effective non-drug method of treating a number of BLDs using breathing exercises and therapeutic swimming. Effective use of KGT reduces the activity of the inflammatory process in the bronchi due to the good fitness of the smooth muscles of the bronchi and chest muscles. In this case, it is necessary to carry out KGT in combination with the necessary medical rehabilitation and physiotherapy. The effectiveness of KGT through regular classes of a semi-annual or annual program must be carried out under the control of physical activity indicators. The results of studies in determining the effectiveness of kinesiotherapy in children with BA showed an improvement in clinical dynamics, an improvement in respiratory function, a decrease in the frequency and duration of exacerbations [5,9]. It should be noted that it is necessary to further improve the system of rehabilitation measures, taking into account local natural healing factors in the climatic zone of Central Asia.

The aim of our study was the pathogenetic and scientific substantiation of the use of kinesiohydrotherapy by the method of controlling the function of external respiration at the stage of rehabilitation of children with recurrent bronchial obstruction.

MATERIALS AND METHODS OF RESEARCH A study of 72 children aged 1 to 6 years of Uzbek ethnicity with recurrent bronchitis occurring with bronchial obstruction syndrome (BOR) was conducted. The control group included 45 practically healthy children of the same age and population without bronchopulmonary pathology and allergic history.

The main first group consisted of children with a diagnosis of recurrent bronchitis (J40.0), occurring with bronchial obstruction syndrome 3 or more times during the year. The diagnosis was made on the basis of clinical and anamnestic data, laboratory and instrumental research methods, incl. spirography with a provocative test. The analysis of the clinical course, premorbid background, obstetric-somatic history and the influence of exogenous factors was carried out using the questionnaires developed by us. The patients were diagnosed according to the working classification of the main clinical forms of bronchopulmonary diseases in children (2010) and ICD-10.

A comparative analysis of the functional characteristics between the groups of children with RBO and the control group in terms of spirometric indicators was carried out. The analysis of clinical and functional parameters in the examined patients was carried out by spirometry using a computer spirograph type Neurosoft Spirospector (Russia) and Spirolab (Italy) on the 1st - 2nd day of hospital stay from 5-6 years of age. The technique of spirometry according to the standard method. Statistical analysis was carried out on a personal computer using the Excel software package, using Microsoft Excel Version 7.0 application programs for mathematical and statistical analysis.

Research results

Upon admission to the hospital during the period of exacerbation on the 2nd day, spirometric parameters were studied in patients. The main indicators obtained by spirometry were measurements: 1. lung capacity (VC); 2. forced vital capacity (FVC); 3. FEV1-volume of forced exhalation in 1 second; 4. spirometry indicators, including flows measured at different levels of FVC (MOS25, MOS50, MOS75, SOS25-75); 5. maximum lung ventilation (MVL); 6. peak expiratory flow (PEV). In an experimental study, spirometry was performed initially on days 1-2 of hospital stay, after 6 months and 1 year. During spirometry, the degree of BO of the respiratory tract and the type of ventilation disorders were determined. A bronchodilation test was performed according to the standard method to establish the reversibility of BO and to determine the potential

effect of bronchodilator therapy. An increase in FEV1 equal to or greater than 12-15% predicted is a positive test of bronchodilation and is documented as reversible.

In the acute period, patients received traditional medical treatment and physiotherapy (UHF, drug electrophoresis, inhalations) in the hospital. The study contingent of children with RBO were divided into 3 groups, of which the 1st experimental group (EG) consisted of 42 patients with RBO and the 2nd group of comparison (CG) of 30 children with RBO who received standard recommendations at discharge and the 3rd group was practically healthy. control (CG) of 45 children of the same age. When discharged from the hospital, children from the EG were given recommendations for complex rehabilitation with CHT (Appendix No. 3 Instruction on CHT) during the next year. At discharge, a group of children with RBO were given recommendations for medical and physical rehabilitation measures using the KGT method. The kinesihydrotherapy KGT program included the above-mentioned program (see chapter 6.2). Upon discharge, the parents of the EG and GS were notified of the arrival of children in 6 and 12 months for spirometry and clinical and anamnestic examination. Comprehensive rehabilitation of children with RB includes dispensary observation, medication recommendations and physiotherapy.

The method for determining the effectiveness of CHT in RBO children in rehabilitation was the study of the respiratory function initially on the 2nd day of hospital stay (1 study) and after 6 (2 study) and 12 months (3 study). During spirometry analyzed following main indicators: FEV1; FZhEL; Index Tiffno - the ratio of FEV1 / FVC; PSV; MOS25, MOS50 and MOS75; MVL-maximum lung ventilation.

Initially, in the period of exacerbation, children with RBO showed signs of impaired respiratory function (EPF), which is characteristic of RBO (Figure 1).

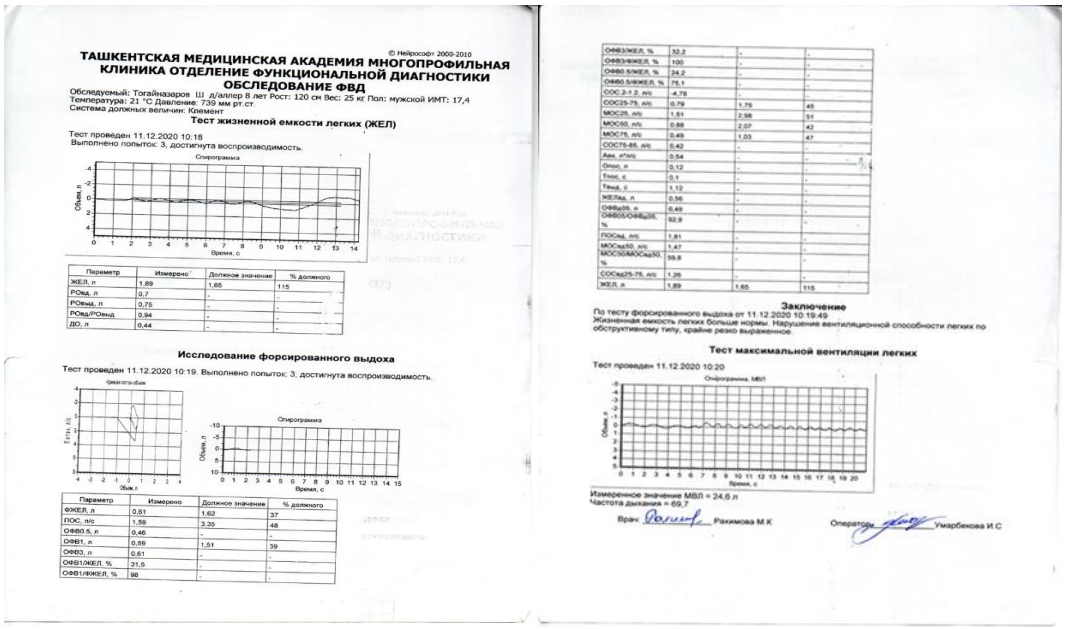

Fig. 1 Results of spirography of a patient with recurrent bronchial obstruction

It was manifested by a decrease in: respiratory function indicators - forced expiratory volume in 1 s (decrease in FEV1 below 80% of the due value), maximum expiratory flow and maximum volumetric velocities, FEV1/FVC. At the same time, moderate violations of MOS50 and MOS25 were established in more than 80% of patients, MVL - in 40%, FVC - in 1/3 of patients, PSV - in 1/4 patients, IT, respectively, 14.7% and 16.7%, MOS75 - respectively, in 17.6% and 20.0% of the subjects.

The results of observations in children with RBO on the 2nd day of illness showed the initial data of respiratory function were below the expected values from the norm. All examined PEF was initially below the norm and of varying severity., which in 36.8% of children this indicator was more than 80% of the proper values, in 23.6% - more than 70%, in 17% - more than 60%, and in 2% of cases - less than 60%. These results indicate that in patients with RB in the acute stage, there are moderate, and in some patients, pronounced manifestations of obstruction in medium and large caliber bronchi. It is caused by swelling of the bronchial mucosa, mucus hypersecretion, impaired rheological properties of bronchial secretions and desquamation of bronchial epithelial cells. It was found that in 54.2% (42) of the children, the respiratory function was within the normal range, mild violations of the ventilation capacity of the obstructive type were observed in 23.6% (18) of the patients, in 15.7% (12) - moderate violations, in 5 ,2% (4) - significant violations.

We analyzed the results of a study of children in the experimental group (EG) with RBO 6 and 12 months after the treatment and rehabilitation measures, including effective CHT. During the recovery period, against the background of CHT, there was a positive clinical dynamic - a decrease in cough, its productive nature, the disappearance of dyspnea during exercise, a decrease in the number of wheezing over the lung fields were recorded in parallel with an improvement in respiratory function (Table 1).

Table 1 presents the average values of spirometric indicators from the proper values before and after CHT in children with RB with SBO. After a 1-year rehabilitation course, a significant positive effect was revealed in both the experimental and control groups. As can be seen from Table 6, in children with RBO after 6 months of rehabilitation, there is a gradual recovery of respiratory function, while the indicators of FEV1 (68.1 ± 4.1%), IT (70.2 + 3.2%) and POS (68.7 ± 2.4%) did not yet correspond to official values. During complex differentiated rehabilitation, annual KGT in 76.5±4.6% children with RB spirometry indicators approached the proper values. The results after the annual program of CHT in children with RBO only in 3.9% of cases remained moderate violations of the respiratory function of the obstructive type, in 19.7% - mild violations, in the remaining 76.3% of patients with RBO, the ventilation capacity of the lungs and bronchial patency was determined in within the age range.

Table 1

Comparative analysis of spirometric parameters in children with recurrent bronchial obstruction before and after CHT, %

Spirometry indicators	Initial (n= 85)	In 6 months	After 1 year
	M± m	M±m	M±m
VC	76.4 ± 4.2	82.5 ± 1.4	98.7 ± 3.4*
FZhEL	51.4 ± 2.8	76.8 ± 3.0*	82.3 ± 5.4*
FEV1	52.3 ± 2.3	68.1 ± 4.1*	76.1 ± 4.3*
FEV1/VC	64.5 ± 5.1	70.2 ± 3.2*	89.4 ± 3.7*
pic	54.2 ± 2.1	68.7 ± 2.4	74.1 ± 1.6*

MOS25	53.5 ± 2.4	70.2 ± 3.0*	79.4 ± 4.3*
MOS50	58.1 ± 2.8	75.2 ± 2.5*	81.7 ± 3.2*
MOS75	65.9 ± 5.2	78.4 ± 4.3	80.2 ± 4.1*

Note: * $p<0.05$ - significant differences in indicators in relation to the original

As can be seen from the table, in RBO children after 6 months of rehabilitation, there is a gradual recovery of respiratory function. In the control group of children, spirometry indicators showed a statistical increase in the number of patients with standard FVC values from 57.3% to 76.2% ($p<0.001$), FEV1 from 58% to 78.4% ($p<0.001$), POS from 48, 8% to 75.6% ($p<0.001$), MOC75 from 61.2% to 80.3% ($p<0.001$) and MVL from an average of 23.6L to 42.1L ($p<0.05$). In the CG of patients with RBO, it was noted that after 6 months of rehabilitation, the FVC, FEV1, FEV1/VC ratio increased slightly.

Conclusions

Comparative analysis of spirometric indicators in children with RD before and after CHT in the EG and in the control group showed the effectiveness of the method of complex rehabilitation with the inclusion of CHT with special breathing exercises on land and in the pool. In some patients of both groups, changes in POS did not have a stable trend, which can be explained by violations of the regularity of training. Spirometry showed that for children with RBO, the largest number of cases belonged to the obstructive type of ventilation disorders.

Thus, the use in rehabilitation therapy of a complex of necessary medical rehabilitation and physical training in the form of therapeutic water procedures and respiratory exercises, i.e. Kinesohydrotherapy (KHT) is an effective technique in the rehabilitation of children with recurrent bronchial obstruction. A correct analysis of the results of the measures taken makes it possible to assess the significance of the rehabilitation methods used, their application in the future, the need to improve and introduce modern rehabilitation technologies in outpatient settings.

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