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Influence of health-normalizing walking regimens on the state of the respiratory system of students with chronic bronchitis

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Purpose: *to determine the influence of the types of walking on the state of the respiratory system of students with chronic bronchitis in the period of convalescence.*

Material & Methods: *73 students were studied at the age of 17–20 years, MG1 (n=25) and MG2 (n=21) were engaged in the developed program, but MG1 students additionally applied the types of walking and running at various health-normalizing regimes, CG (n=27) did not have bronchopulmonary pathology and were engaged in physical culture according to the program of the university. All students underwent spirometric studies, hypoxic tests.*

Results: *at the end of the course of physical rehabilitation of students of MG1, spirometric indicators were statistically significantly improved and reached the level of CG indices. MG2 students observed improvement in all parameters, but they did not receive any statistical significance.*

Conclusion: *it is proved that the inclusion in the program of physical rehabilitation during the convalescence period of varieties of walking and running on various health-normalizing regimes promotes the complete restoration of the lost functions of the respiratory system.*

Keywords: *chronic bronchitis, students, physical rehabilitation, a variety of walking.*

Introduction

Diseases of the respiratory organs remain the most common on all continents among different strata of the population, regardless of sex and age [6; 9]. Most acute diseases of the respiratory tract and lungs are caused by viruses, bacteria, parasitic fungi. Inflammatory processes in the respiratory system can be caused not only by the penetration of pathogens of the infection, but also by the impact on the body of other unfavorable factors: the influence of the environment, the state of other organs and systems [1; 2].

Chronic bronchitis is a disease with a predominant airway damage, which is associated with inflammation or prolonged irritation of the bronchial mucosa by various agents, characterized by a progressive recurrent course [7; 8]. The progressive course of chronic bronchitis leads to pulmonary and cardiac failure, therefore, rational treatment of this disease has an important socio-economic significance. However, in recent years, the number of scientific studies devoted to the rehabilitation of patients with chronic bronchitis, especially young people, has significantly decreased. Substantiated recommendations for physical rehabilitation for patients with chronic bronchitis are almost absent today, and support signs of the formation of restorative medical complexes have not been determined. All of the above identified the relevance of this study and allowed to formulate the purpose and objectives of the work.

Relationship of research with scientific programs, plans, themes. The work was carried out in accordance with the priority thematic area No. 76.35 "Medical and Biological Substantiation for Conducting Recovery Measures and Assigning Physical Rehabilitation to Persons of Different Age of Fitness". Number of state registration – 0116U004081.

Purpose of the study: on the basis of the study of the function of external respiration, to establish the influence of the types of walking on the state of the respiratory system of students with chronic bronchitis in the period of convalescence.

Material and Methods of the research

The examination and physical rehabilitation of students with chronic bronchitis were conducted on the basis of the University Clinic of Kharkov National Medical University. We observed 73 students aged 17–20 years who were divided into three groups. The MG1 included 25 students who subsequently underwent a course of physical rehabilitation according to the developed program with additional application of the types of walking and running at various health-normalizing regimes, in MG2 21 students were assigned, engaged in the developed program of physical rehabilitation, the CG consisted of 27 students who did not have bronchopulmonary pathology and were engaged in physical culture according to the program of the university. The course of treatment was 21 days.

The study protocol included conducting a study of the function of external respiration (FER) on the spirographic complex "Spirokom-Pro", with an assessment of the following parameters: respiratory rate (RR), respiratory volume (RV), minute respiration volume (MRV) , the forced vital capacity of the lungs (FVC), the forced expiratory volume in the first second (FEV1), the peak space velocity (PSV), the maximum space velocity at the time of expiration of 25%, 50%, 75% of the forced vital capacity of the lungs (MSV25, MSV50, MSV75), maximum ventilation of the lungs (MVL). All students were subjected to hypoxic tests of Stange and Genci.

The statistical processing of the received digital data was carried out using a package of data processing programs for general purpose Statistica for Windows version 6,0. To deter-

mine the statistical significance of the differences, Student's t-test was used. For all the analyzes performed, the differences were considered reliable at a significance level of $p<0,05$, where the minimum probability of differences was 95%.

Results of the research and their discussion

According to anthropometric indices, the groups of subjects were homogeneous by sex, age, height-weight (Table 1).

Table 1

Anthropometric indices of students of both groups, patients with chronic bronchitis and students of the control group

No.	Indices	MG1 (n=25) Me±m	MG2 (n=20) Me±m	CG (n=27) Me±m
1.	Height, cm	172,52±3,79	172,46±3,97	173,38±3,46
2.	Weight, kg	71,06±3,52	70,72±3,29	71,38±3,84
3.	BMI, kg cm^{-2}	23,75±0,41	23,85±0,61	23,74±0,41
4.	CE, cm	5,07±0,11	5,08±0,11	5,36±0,14

When examining students of both groups with chronic bronchitis, there were complaints of weakness, increased fatigue, periodic dyspnoea with physical exertion, a cough with transparent sputum.

In primary analysis, the background indicators of the function of external respiration in students MG1 and MG2 statistically significant differed from the indices of the CG students, namely, the RR in the MG1 was 1,26 times and in the MG2 1,14 times higher than in the CG students; The rate in MG1 was 1,33 times and in MG2 was reduced by 1,37 times than for the students of the CG; MVL was also reduced by 1,07 times in groups MG1 and MG2. The students from MG1 and MG1 were 1,12 times less than in the CG students; FVC was also reduced in individuals MG1 and MG2 by 1,12 and 1,13 times, respectively ($p<0,05$).

Analysis was carried out by calculating the actual values and comparing them with the calculated values due to age, sex, height and weight (Table).

Resistance to hypoxia and hypercapnia due to data from the Stange and Genci assays was statistically significant in MG1 and MG2 patients compared to those of the CG students ($p<0,05$).

To restore the functional state of the respiratory system of the examined patient population, we developed a physical rehabilitation program [3], which was made taking into account two stages of the reconvalescence period, clinical and biological recovery, since even after normalization of human health, objective indicators of the function of the respiratory system and other systems the body does not yet reach the values of healthy individuals.

At the first stage, MG1 and MG2 students were prescribed exercise therapy, muscle massage of the trunk, shoulder girdle, upper limbs; physiotherapy: UHF was on duty with salix on the bridge of the nose and chest; internally vitamins B, C, E; Eleutherococcus (to stimulate the resistance of the body). Students of both groups practiced curative gymnastics 3 times a week, performed general strengthening and general development exercises in relation to respiratory exercises 4:1.

MG1 students were additionally used in various types of walking at various health-normalizing regimes with a combination of permutations of hand movements. It is established that muscle contraction during physical work or during physical exercises activates breathing. With muscular work, the nervous mechanisms of breathing regulation provide adequate ventilation and constancy of the CO_2 tension in the arterial blood. When the gymnastic exercises are performed, the movements of the hands, coinciding with the phases of breathing, become a conditioned stimulus of the respiratory system, conducive to the formation of a conditioned reflex of the respiratory system. The cerebral cortex during muscular activity renders not only the starting, but also correcting the action, since it during the whole work provides the appropriate pulmonary ventilation, the rate and rhythm of breathing [4; 5; 10].

At the second stage, MG1 students performed morning hygienic gymnastics in the morning, accelerated walking in the evening for 20 minutes; slow running – 30 minutes; acceler-

Table 2

Indicators of external respiration function in students of different levels of fitness, patients with chronic bronchitis in the period of convalescence

№ i/o	Indicators	MG1 (n=25) Me±m	MG2 (n=20) Me±m	CG2 (n=27) Me±m
1.	RR, for min	16,99±2,22*	15,42±2,38+	13,48±0,49
2.	RV, l	0,70±0,04	0,71±0,04	0,84±0,03
3.	MRV, l	9,99±0,44*	9,70±0,42+	13,33±0,40
4.	FER,л·min^{-1}	110,00±1,85*	109,93±1,75+	118,29±1,31
5.	VC, l	4,69±0,11*	4,69±0,12+	5,26±0,24
6.	FVC, l	4,20±0,09*	4,15±0,09+	4,72±0,14
7.	FEV1, l·s^{-1}	4,06±0,07	4,06±0,06	3,98±0,26
8.	PSV, l·s^{-1}	8,04±0,11	7,90±0,39	8,34±0,08
9.	MSV_{25}, l·s^{-1}	7,35±0,64	7,31±0,13	7,56±0,11
10.	MSV_{50}, l·s^{-1}	4,91±0,11	4,98±0,12	5,08±0,12
11.	MSV_{75}, l·s^{-1}	2,45±0,08	2,39±0,07	2,41±0,05
12.	test of Stange, s	55,00±0,75*	55,51±0,78+	69,97±0,47
13.	test of Genci, s	39,01±0,48*	39,27±0,58+	48,96±0,48

Remark. ** – statistical significance between the groups MG1 and CG is reliable; + – statistical significance between the MG2 and CG groups is significant (p<0,05)*

ated walking – 10 min. MG2 students continued to perform the motor tasks of the first stage, gradually completely replacing them with motor programs, which included special, basic and simulation exercises with increasing load to the level of normal training.

After the application of the comprehensive physical rehabilitation program proposed by us to MG1, the spirometric parameters were statistically significantly improved and reached the level of CG indices. The students of MG2 observed an improvement in all parameters, but they did not receive statistical significance (Figure 1).

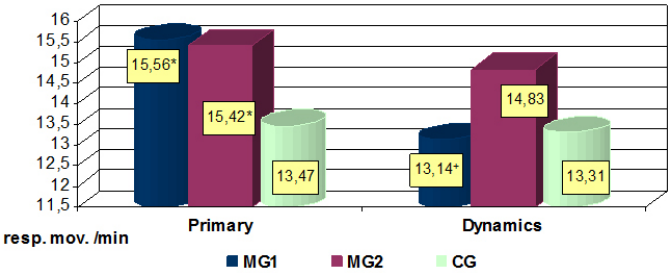

Figure 1. Dynamics of the BH indicator of students of MG1 (n=25), MG2 (n=21) and CG (n=27)
Remark: * Statistical significance of the primary examination is reliable; + Statistical significance of dynamics in the OG1 group is reliable (p<0,05)

Figure 2 shows the dynamics progress of the MRV indicator of student MG1 (n=25), MG2 (n=21) and CG (n=27).

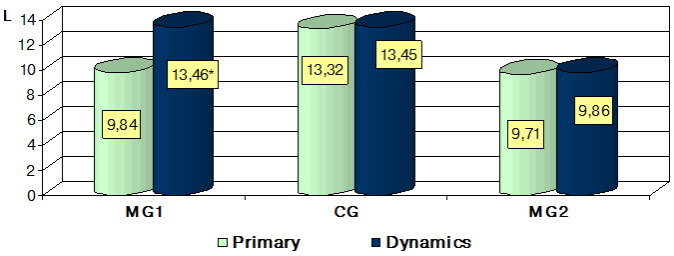

Figure 2. Dynamics of minute respiratory volume in students MG1 (n=25), MG2 (n=21) and CG (n=27)
Remark: statistical significance of the dynamics in the group MG1 (p<0,05)

After the application of the comprehensive physical rehabilitation program for MG1 students, statistically significant increased VC and received the level of the VC indicator among the CG students, MG2 students showed a tendency to increase, but did not receive statistical significance (Figure 3). A similar dynamics was observed with high-speed indicators that reflect the state of obstructive changes: MG1 students statistically significantly increased the FVC (t=5,37; p <0,05), PSV (t=2,43; p <0,05).

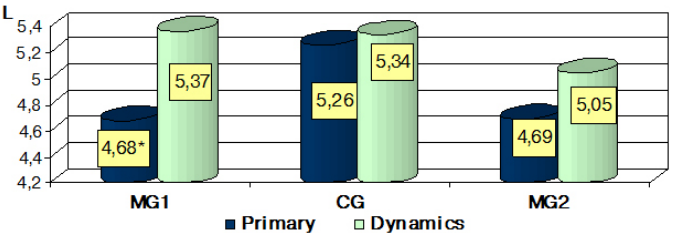

Figure 3. Dynamics of the indicator of the vital capacity of the lungs in students MG1 (n=25), MG2 (n=21) and CG (n=27)
Remark: statistical significance of the dynamics in the group MG1 (p<0,05)

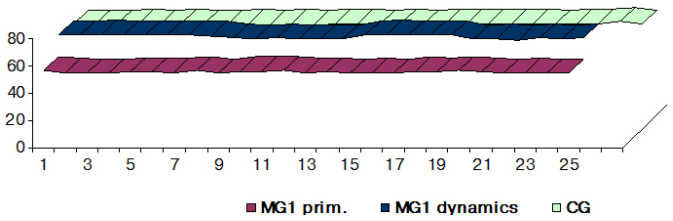

Figure 4. Dynamics of the Stange test score for students MG1 (n=25) and CG (n=27)

Resistance to the phenomena of hypoxia and hypercapnia, according to the Stange and Gench samples, statistically significantly increased in individuals MG1 and MG2 compared with the primary indicators (t=7,12; p<0,05 and t=2,04; p <0,05 in accordance) (Figure 4).

Thus, at the end of the course of physical rehabilitation of students of MG1, the spirometric parameters were statistically significantly improved and reached the level of CG values. MG2 students observed an improvement in all parameters, but they did not receive any statistical significance.

Conclusions

A special feature of the physical rehabilitation of students with chronic bronchitis is not only the early onset, but also the appointment from the first days of the period of convalescence next to medical gymnastics, physiotherapy and massage of the forms of walking and running at various health-normalizing regimes with a combination of permutations of hand movements. After the application of the proposed comprehensive physical rehabilitation program for MG1 students, the impaired functions of the respiratory system reached the level of healthy individuals.

Prospects for further studies are related to the assessment of the dynamics of the adaptive potential in students with chronic bronchitis after the application of a comprehensive program of physical rehabilitation during the reconvalescence period.

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