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The impact of pulmonary rehabilitation on the parameters of spirometric examination and six-minute walk test of patients with respiratory dysfunctions (chronic obstructive pulmonary disease or asthma) aged 50-70 years hospitalized at the Pulmonary Rehabilitation Ward in the Pulmonary-Cardiological Specialistic Hospital in Torzym

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Key words: pulmonary rehabilitation, chronic obstructive pulmonary disease, bronchial asthma, 6-minute walk test, spirometric exercise test.

Abstract

Spiroergometric exercise test and a six-minute march test are methods for assessing the exercise capacity. They are used to determine diagnostic and prognostic information, treatment and its effectiveness. The article presents the main parameters evaluated during the tests. The examined disease entities were presented and described, and conclusions from the research were drawn.

Introduction

Bronchial asthma and chronic obstructive pulmonary disease (COPD) are the most common respiratory diseases in the world. [1,2] Bronchial asthma and chronic obstructive pulmonary disease (COPD) are the most common respiratory diseases in the world. At the base of both bronchial asthma and COPD lies an inflammatory process. In both of these diseases we observe a reduced airflow rate through the airways. Most of the data, however, suggest that they are separate disease entities with a different etiology, pathophysiology and course. Bronchial bronchial asthma develops at a younger age and is associated with the presence of variable but largely reversible airflow limitation and it is associated with excessive airway reactivity. This obstruction is caused by many factors, including inflammation mediators, edema and respiratory remodeling. [3] COPD, on the other hand, is a disease that is constantly progressing and lung function deteriorates. It develops primarily in adults smoking cigarettes. Chronic restriction of airflow through the airways can in this case be caused by both small airways disease (obstructive bronchiolitis) and can also develop as a result of the destruction of the pulmonary parenchyma or emphysema. Pathophysiological changes that characterize COPD include: gas exchange disorder, excessive mucus secretion and airway obstruction, resulting in the occurrence of air traps, dyspnoea and dynamic pulmonary distension. Unfortunately, despite the use of treatment, these disorders do not subside completely. [4,5] Physiotherapy plays a very important role in the treatment of patients with respiratory diseases. Appropriately used exercises with pharmacotherapy and oxygen therapy affect the increase of oxygen supply, which improves the tolerance of effort. [6] Rehabilitation programs should be run by a multidisciplinary team - nurses working with patients with respiratory diseases, physiotherapists, pulmonologists, and dieticians. These programs may be conducted in a hospital, outpatient or at home, however, educational sessions and exercises are usually conducted in groups of several or a dozen or so. [7] Before starting the rehabilitation program and after its completion, the patient should be thoroughly examined in order to individually assess the results of the therapy and determine the directions of further treatment. [8]

Methods

The study involved 18 patients aged 50-70 with two disease entities (nine patients with bronchial asthma, 9 patients with chronic obstructive pulmonary disease) who were hospitalized in the pulmonary rehabilitation ward in Torzym. The time of the patient's stay in the ward was 21 days.

The Evaluation of Physical Efficiency:

Two research methods were used to assess the physical efficiency of the patients: spiroergometric exercise test and a six-minute walk test. The tests were carried out on patients twice: at the beginning and at the end of rehabilitation.

Spiroergometrical exercise test (cardiopulmonary exercise test – CPET)

This test is the most reliable method used to assess physical performance in order to obtain prognostic information necessary for planning treatment and assessing its effectiveness. Thanks to this widely used diagnostic method, detailed parameters are obtained allowing for accurate clinical assessment of the patient's condition. Spiroergometric exercise test, carried out on a treadmill or a cycloergometer, is a combination of a classic exercise test and measurement of gases in the respiratory air, which gives the opportunity to accurately assess the body's response to physical effort and physical performance. Physical capacity is the ability to perform hard or prolonged physical work without rapidly increasing fatigue and deeper changes in the internal environment of the body, which determine its development, and the ability to quickly withdraw any disturbances of homeostasis after exercise. Physical efficiency can also be described as a good toleration of fatigue changes after high intensity exercise. [9]

Six Minutes Walk Test

The most popular simple exercise test is a 6-minute walk test. [10] At present, 6MWT is a commonly used test for indicative assessment of physical performance and due to its nature it is much easier to associate it with daily activity than any other exercise test. [11] The 6-minute walk test should be performed on a flat and straight corridor with a hard surface and a length of 30 m. The distance achieved in shorter corridors may be shorter due to the need to perform more relapses. This test consists in determining the length of the distance traveled by the patient within six minutes. This parameter reflects the level of exercise tolerance or otherwise the physical and respiratory capacity of the patient. [12]

Rehabilitation Programme:

The 21-day rehabilitation program included 5 group activities during the day such as:
-> morning gymnastics - overall exercise with intertwined breathing plus a 400-meter walk around the building (15 minutes),

-> breathing exercises (30 minutes),

-> walking training - it takes place outdoors, unless weather conditions do not allow it, then we train in the building walking along the corridor. You can attach instruments such as nordic walking poles

for training. (Thirty minutes)

-> relaxation training (30 minutes)

-> cycloergometers and treadmills - interval training with alternating load and rest periods (30 minutes)

Classes were held before and after noon. In addition, at the doctor's request, chest massage was performed twice a week and daily drainage and chest patting. Each patient, for three weeks, was supposed to take 4 exhalations every hour to a tube immersed in water, the water resists giving us breathing exercises with resistance. In addition, every patient underwent education in the field of respiratory tracts and chest springing and effective cough.

Results

In the six-minute marching tests, the average of the initial distance covered in patients suffering from asthma was 525 m and it was comparable to the average initial distance traveled by patients with COPD, which was 521 m. The mean of the final distance covered by patients with bronchial asthma was 636m and it was much higher than the mean of the final distance covered by patients with COPD, which was only 582m.

Both patients with COPD and asthma improved the results of their initial march tests.

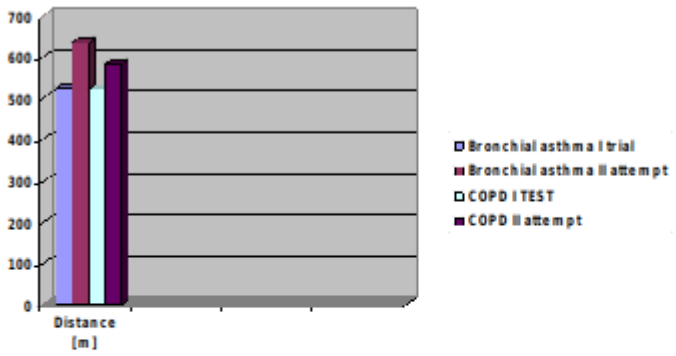

Chart 1: Results of the initial and final tests of patients marching

In the spiroergometric exercise test, the duration of the exercise is increased. The patient was

switched off when he reached 100% max heart rate.

The maximum time of effort in both disease entities in the final exercise tests was much longer than in the initial trials.

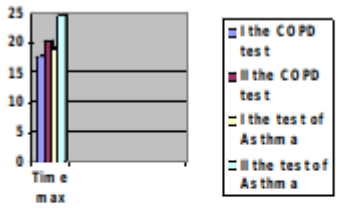

Chart 2: The maximum duration of the effort.

In the final results, the oxygen consumption per kg body weight at the top of the effort in both bronchial asthma and COPD increased significantly compared to the initial exercise tests.

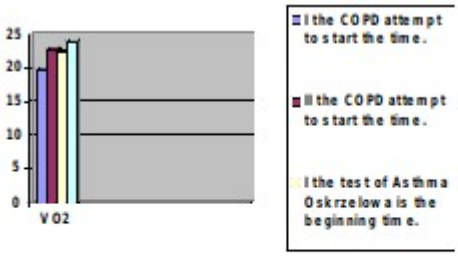

Chart 3: VO2 / kg at the peak of max effort

Ventilation volume also significantly increased in final trials compared to the initial trials in both disease entities.

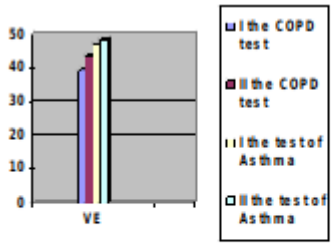

Chart 4: VE

Discussion

In recent years, there has been a steady increase in interest in the use of respiratory rehabilitation in connection with the widespread use of pulmonary diseases such as bronchial asthma or chronic obstructive pulmonary disease.

Previously published studies confirm the legitimacy of using physical activity among the studied population of people. In studies by Rożek et al. On the efficacy of short-term physiotherapy, an increase in the intensity of life of the lungs in the study group, an increase in walking distance during the 6-minute test and an increase in pO2 and SaO2 were observed. [13] Similar conclusions were published by Singh et al. On improving exercise tolerance, reducing dyspnoea and general fatigue in patients undergoing 4-week respiratory rehabilitation. [14] Ries showed significant differences in the effectiveness of the therapy program used during the 6-year follow-up of patients treated for COPD. The study group subjected to 8-week respiratory rehabilitation presented significantly better results of exercise tolerance, physical endurance and maximum oxygen uptake as compared to the use of health education in the second group of patients. [15] The beneficial effect of the six-month rehabilitation program on exercise capacity in the 6-minute test was also noted in their studies by Troosters et al. The researchers observed a significant increase in distance traveled by patients during walking and increased strength of peripheral muscles, improved physical fitness and quality of life. [16] One of the team of researchers also assessed the effect of the intensity of respiratory training on the benefits derived by the patient. It is believed that along with the increase in intensity of training, the functioning of the patient's respiratory system is also improved. However, studies by Normandin et al. Indicate similar benefits for the patient related to both the low and high intensity exercise program. It should be emphasized that patients have experienced a reduction in dyspnoea, functional improvement of the lungs and general condition

after rehabilitation. Another important aspect of respiratory rehabilitation is its duration. [17] This study proves that even relatively short (4-week) training periods can bring beneficial effects of respiratory rehabilitation in chronic obstructive pulmonary disease. [18]

Conclusion

As results from the research, pulmonary rehabilitation has a huge impact on both the result of the spiroergometrical exercise test and the result of a six-minute march test. Pulmonary rehabilitation increases the respiratory capacity of patients, improves their lung ventilation, strengthens respiratory muscles, increases exercise capacity and reduces exercise dyspnoea.

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