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## **The impact of pulmonary rehabilitation on the parameters of spirometric examination and quality of life of a patient with bronchial asthma hospitalized at the Pulmonary Rehabilitation Ward in the Pulmonary-Cardiological Specialistic Hospital in Torzym - a case report**

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### **Abstract**

The study assessed the influence of pulmonary rehabilitation on the parameters of spirometric examination and the quality of life of a patient with bronchial asthma staying in a pulmonary rehabilitation ward. The aim of the study was to assess the efficiency of the respiratory system performed on a particular patient during the 3-week stationary pulmonary rehabilitation. The results of six-minute walking test and spirometric stress test parameters showed significant changes after a

three-week pulmonary rehabilitation.

Key words: pulmonary rehabilitation; quality of life; bronchial asthma

## **Introduction**

From a technical point of view, our breathing apparatus is a masterful achievement. Respiratory organs represent in themselves an ideally equipped system that consists of the airways, lungs, respiratory muscles and breathing aids, and a breath center located in the brain. Only harmonious cooperation of the above-mentioned structures guarantees optimal breathing. [1]

Pulmonary rehabilitation covers a multidirectional range of services provided to people with lung diseases and their families, usually by a multidisciplinary team whose aim is to achieve and maintain the highest possible level of independence and efficiency of functioning in the environment. This definition was developed by the National Institute of Health in the USA. Rehabilitation is effective while there is close cooperation and agreement between the patient and members of a multidisciplinary rehabilitation team. The rehabilitation program should be selected individually to the needs of the patient and verified during the treatment process. [2]

One of the most common chronic diseases is bronchial asthma. In recent years, there has been a significant increase in asthma. Currently, over 30% of people suffer from it. Bronchial asthma significantly affects the quality of life of patients, significantly affecting their family life and their professional and social activity. The treatments in the field of comprehensive physiotherapy have a beneficial effect both on the change of the patient's attitude and increase the scope of everyday activities and self-care, and positively affect his professional and social activity. [3,4]

Bronchial asthma is a disease of the airways, characterized by increased reactivity of the trachea and bronchi to various stimuli. Physiologically, it manifests itself with generalized narrowing of the airways, which may resign spontaneously or under the influence of treatment. Clinical images of asthma are characterized by paroxysmal dyspnea, cough and audible wheezing. [5]

## **Case report**

A 58-year-old female patient suffering from bronchial asthma was referred by a physician from a pulmonology clinic and admitted to the pulmonary rehabilitation department. In an asthma exacerbation interview, he has an average of 3 times a year. On the day of admission, the patient was examined by the head of the ward and it was recommended that the physiotherapist performed a six-minute march test by the physiotherapist and the following day a spirometric effort test.

The 6 Minute Walk Test consists of a free walk at a convenient rate, so that it passes as long as possible within 6 minutes. [6]

The test was carried out on a 30 meter long corridor. The test is usually carried out on a 30 meter long corridor. At the beginning of the examination, the patient is assessed for the measurement of blood pressure, pulse and saturation (measured with a pulse oximeter). The patient must be informed that he can rest during the examination, if he needs it. After 6 minutes, the measurement of the distance that has been defeated and exercise dyspnoea (according to the Borg scale) is determined and then the measurement of the arterial pressure, pulse and saturation again. [7].

The patient was tested on a 30 meter long corridor.

The result of the initial and final march test was as follows.

**Table 1:** A 6-minute walk test.

6 Minute Walk Test		23.11.2018	12.12.2018
Total distance [m]		540	630
Number of rest breaks		-	-
Number of rest breaks		-	-
Borg's scale		11	12
RR [mm Hg]	I	127/87	133/79
	II	139/78	115/74
HR [1/s]	I	81	72
	II	92	96
SpO2 [%]		97/96	98/96
Symptoms		-	-
Comments		-	-

Spiroergometry is a non-invasive stress test that allows comprehensive assessment of response to cardiovascular and respiratory effort. The physical fitness of the examined person is assessed by this test, and in the case of disability it also includes the type of disorders (eg respiratory or circulatory) responsible for its occurrence. In practice, it boils down to the exercise test (on the treadmill or cyclometer with monitoring of blood pressure and ECG), enriched with the measurement of ventilation and resilience of respiratory gases. [8,9]

The patient was tested on a treadmill.

The result of the initial and final stress test spirometry.

**Table 2:** Spirometric effort test.

Spirometric effort test	24.11.2018	11.12.2018
Max Mets	6.8 (7.4) METs (92%)	8.0 (7.4) METs (108%)
Max heart rate	138 (147) / min ( 94%)	147 (147) / min (100%)
VO2 [l / min] at max. Load	1,67	1,81
VO2 / kg [ml / kg / min] at max. Load	25,6	27,8
VCO2 [l / min] at max. Load	1,58	1,77
RER	0,95	0,98
Comments	The test was terminated due to fatigue without reaching the 100% heart rate limitThe test was stopped when the 100% heart rate limit was reached	The test was stopped when the 100% heart rate limit was reached

The doctor also recommended a modification of the breath consisting in giving the patient a 50 cm tube and instruction on how to perform the exercises. Place the bottle on the table in front of you and then immerse the tube in water. We gather air with our nose and mouth and blow air into the water as long as possible. During training, resistance from water requires the involvement of additional chest muscles, which improves their fitness.

The patient was assigned on the basis of an interview, a 6-minute march test and spirometric effort test to the appropriate exercise group, in which she had 5 group classes every day with a master's degree in physiotherapy, such as morning gymnastics, breathing exercises, cycloergometer cycling exercises and treadmill exercises, walking training and relaxation training. Classes were held before and after the southern one. In addition, she used chest massage twice a week and daily with drainage and patting.

Morning gymnastics is based on a morning start, usually 10-15 minutes. As soon as the weather allows it to be carried out in the open air.

Breathing exercises play a very important role in the rehabilitation of patients with bronchial asthma. Exercises should start with a deep inhalation through the nose, then we will have to breathe in at least twice as long with the exhalation of the mouth. The number of repetitions of each exercise in the series should not exceed 5. The exercises can be performed in the form of blowing or

whistling. In addition, active exercises of upper limbs can be combined with the breath. In the training of respiratory muscles, the involvement of individual muscles is very important. In patients with bronchial asthma, the chest tends to have an inspiratory position, which is why it is also very important to teach patients to breathe in the lower part of the chest. In addition, we can practice breathing exercises by resisting both the upper respiratory tract and the diaphragm using additional props. In the breathing exercises, students learn how to cough effectively. This is one of the techniques favoring the evacuation of bronchial tree secretion.

General improvement exercises are mainly based on stretching the chest. The intensity of the effort is adjusted to the appropriate training group. The series of exercises should last relatively short here, and we break interludes between them. When the dyspnea appears, we stop the exercise. [10,11,12,13,14]

Exercises that increase aerobic endurance can be exercised on a treadmill or on a cycloergometer, so that you can precisely dose training loads and have an accurate supervision of the patient. You can use the form of interval and continuous training.

The simplest and most natural form of exercise, which does not require special preparation and equipment, is walking training in the field without equipment or with ski poles so-called. Nordic walking.

Relaxation training consists in a comfortable positioning in a sitting or lying position. During the training, the patient performs the instructor's instructions consisting in the tension and relaxation of individual muscles and the visualization of breathing the whole body. It is also another technique to facilitate the evacuation of secretions. the fact is that the patient tries to breathe more and more increased volumes of air, and at the end performs a quick exhale with simultaneous expectoration of the secretion. [15,16]

The massage is performed in bronchial asthma only in the interictal period and is distinguished by its two types. The first method is a segmental massage, after which the frequency of seizures and their severity are reduced or even completely stopped. the second way is classical massage, during which the breathing muscles relax. mainly the chest and ridge, shoulder, neck and neck are developed. [17,18,19,20]

Positional drainage requires knowledge of the topography of the bronchial segments, which determines the patient's positioning positions, thus releasing the evacuation of the secretion, which is vibrated by tapping the chest with his hand. This leads to easier expectoration of secretions, reduction of inflammatory processes and most importantly to improve lung ventilation.[21,22]

## **Discussion**

It should be remembered that bronchial asthma is accompanied by a series of systemic allergic, inflammatory, psychosocial, and musculoskeletal disorders. These changes may contribute to the reduction of exercise capacity or deterioration of overall health, which in effect may lead to occupational disability in adults. [23]

Bronchial asthma is a very chronic disease requiring very frequent pharmacological treatment, including steroid therapy, for many years this disease has been of interest to researchers who are looking for other methods to support the healing process. MLJBuurs with his colleagues searching for complementary methods of treatment has analyzed 21 articles, which show that breathing exercises that improve respiratory muscles and breathing techniques that help in cleaning the airways can improve the quality of life, cardiovascular fitness, reduce the symptoms of the disease as well as the amount of medicines taken. [25]

Mike Thomas and Anne Burton admit that the achievement of the second half of the twentieth century was a significant advance in both the pharmacological treatment and organization of care for a patient with asthma. However, it turned out that it is still a chronic disease significantly affecting the quality of life of patients. Therefore, we started looking for complementary, non-pharmacological methods of treatment that would minimize the negative impact of the disease on patients' lives. The authors reviewed a number of publications that confirm that breathing exercises in patients with bronchial asthma: reduce symptoms, improve the quality of life and may affect the reduction of medication. Therefore, they should become a standard supplementary treatment for asthma. [25]

The team headed by Ewa Szelingą presented the results of a study of 27 patients with diagnosed bronchial asthma, who were subjected to 15-day respiratory rehabilitation. Final examinations in all patients in this group showed improvement in lung function parameters. [26]

Rudkowski Ryszard and his colleagues in the work devoted to respiratory rehabilitation referred to the American Thoracic Society (ATS) and European Respiratory Society (ERS), which in the therapy of chronic lung diseases which is also bronchial asthma recommend respiratory rehabilitation, which should be characterized by an individual approach to the patient and in a special way should be treated his education. [6]

## **Summation**

Both on the Six-minutes Walk Test and the spirometric effort test, we can confirm that comprehensive pulmonary rehabilitation is effective and has a huge impact on both tests and is therefore indicated in the treatment of bronchial asthma. The education of the patient is an

extremely important element of rehabilitation.

## Reference

1. Schutt K: *Terapia Oddechowa*. Interspar, MA-GRO, Warszawa, 1998.
2. Paprocka-Borowicz M, Demczyszak I, Kuciel-Lewandowska J: *Fizjoterapia w chorobach układu oddechowego*. Górnicki Wydawnictwo Medyczne, Wrocław, 2009.
3. Droszcz W: *Choroby płuc. Diagnostyka i terapia*. Wydawnictwo Elsevier Urban&Partner, Wrocław, 2000.
4. Balińska-Miśkiewicz W: *Diagnostyka i leczenie astmy oskrzelowej u osób dorosłych*. *Terapia i Leki*, 2009, 65(11):793-803.
5. Frauci AS, Braunwald E, Isselbacher KJ, Wilson JD, Martin JB, Kasper DL, Hauser SL, Longo DL: *Interna Harrisona*. Wydawnictwo Czelej Sp. z o.o., Lublin, 2001.
6. Kasprzak W: *Fizjoterapia Kliniczna*. Wydawnictwo Lekarskie PZWL, Warszawa, 2011.
7. American Thoracic Society Statement: Guidelines for the Six-Minute Walk Test. *Am J Respir Crit Care Med.*, 2002, 166:111-117.
8. Karlman Wasserman et al. "Principles of Exercise Testing and Interpretation: Including Pathophysiology and Clinical Applications." Philadelphia [etc.] : Lippincott Williams & Wilkins, cop. 2005
9. Prognostic value and diagnostic potential of cardiopulmonary exercise testing in patients with chronic heart failure. *Eur J Heart Fail.* 2008 Feb;10(2):112-8.
10. Rutkowska J., Rudkowski K., Rutkowski R., Siergiejko Z. *Wybrane zagadnienia rehabilitacji oddechowej*. *Fizjoterapia Polska*. 2009;9, 21-30
11. Kulus M., Osipiuk S., Zawadzka – Krajewska A. Funkcja mięśni oddechowych w astmie. Zmiany w postawie ciała u dzieci chorych na astmę. *Alergologia Polska*. 2014. 1:112-118.
12. Klusiewicz A. *Trening mięśni oddechowych a zdolność wysiłkowa zawodników*. *Sport wyczynowy*. 2007. 7-9: 511-513
13. Edre L. *Physical exercise and bronchial asthma*. *Orv Hetil.* 2016 Jun 26. 157 (26):1019-27.
14. Westergren T., Fegran L., Nilsen T., Haraldstad K., Kittang OB., Berntsen S. *Active play exercise intervention in children with asthma: a Pilot Study*. *BMJ Open*. 2016 Jan. 5. 6(1).
15. Yang ZY., Zhong HB., Mao C., Yuan JQ., Huang YF., Wu XY., Gao YM., Tang JL. *Yoga for asthma*. *Sao Paulo Med J.* 2016 Jul - AUG. 134 (4): 368
16. Pattabhi Jois Śri. *Joga Mala*. Virya 2001.
17. Zborowski A. *Masaż klasyczny*. Firma Wydawnicza - Handlowa AZ. Kraków 2008
18. Prochowicz Z. *Podstawy masażu leczniczego*. Wyd. PZWL. Warszawa. 2015.

19. Zborowski A. *Masaż segmentarny*. Firma Wydawniczo - Handlowa AZ. Kraków 2007.
20. Zborowski A. *Masaż w wybranych jednostkach chorobowych II*. Wydawnictwo AZ. Kraków 2002.
21. Rąglewska P., Cywińska - Wasilewska G., Barinow-Wojewódzki A. *Wpływ ćwiczeń leczniczych na czynność wentylacyjną u osób z chorobami obturacyjnymi*. Post Rehabil.2005.II.48.
22. Kadziółka W., Lis A., Bal-Bocheńska M., i wsp. *Rola Fizjoterapii w przygotowaniu pacjentów z ograniczonymi wartościami spirometrycznymi do planowanych zabiegów resekcyjnych miążu płucnego*. Prz. Med. Uniw. Rzesz.2006. 5 ( 3): 213
23. Słonka K., Szczegielniak J., Zaryczański J. *Ocena postawy ciała u dzieci z astmą oskrzelową*. Fizjoterapia Polska vol. 5 Nr 2. 2005. 192
24. Bruurs MLJ., van der Giessen L J., Moed H. *The effectiveness of physiotherapy in patients with asthma: A systematic review of the literature*. Respiratory Medicine. 2013. 107: 483-494.
25. Thomas M., Bruton A. *Breathing exercises for asthma*. *Breathe*. 2014. 10 (4) : 313-322.
26. Szeliga E., Bal - Bocheńska M., Zniewska A., Magoń G., *Wpływ procesu rehabilitacji na efektywność leczenia chorych z astmą oskrzelową*. Young Sport Science of Ukraine. 2011. 3: 311-318.