PHYSICAL THERAPY OF PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASES: SIGNIFICANCE, MEANS AND PRINCIPLES

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Author's Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript preparation.

Abstract

Physical rehabilitation, along with the pharmaceutical treatment, is one of the main components of the recovery and the maintenance of health of the patients with chronic obstructive pulmonary disease (COPD). The treatment and rehabilitation results of the physical therapy largely depend on the proper use of its means, requiring the knowledge of its principles. The aim of the study was to establish the means and principles of the physical therapy in COPD, the use of which allows achieving the optimal rehabilitation result.

The objective – to establish the means and principles of the physical therapy in COPD, the use of which allows achieving the optimal rehabilitation result.

Methods. Literature sources for the last 10 years, selected from the electronic databases of the Vernadsky National Library of Ukraine, Russian Scientific Electronic Library eLIBRARY.RU, Web of Science, PubMed, PEDro.

Results. The existing principles of rehabilitation of pulmonologic patients, including those with the COPD were analyzed. The list of physical rehabilitation principles in COPD was formed: a common understanding of the pathogenesis and the clinical disease, influential mechanisms, the medical rehabilitation help effects of physical therapy means; the development and the implementation of an individualized physical therapy program taking into account the peculiarities of the disease of each patient; an early application of physical therapy means; phasing, continuity and sequence of the physical therapy; a complexity, composed and combined application of the physical therapy; an availability of the physical therapy in any conditions of its implementation; an integration of the physical therapy means into the multidisciplinary rehabilitation help; the knowledge of rehabilitation needs, encouragement and active participation of the patient; the focusing of the physical therapy means at the realization of self-care capabilities, a retrieval to a productive labour activity of the patient; involving family or close relatives of the patient to the performing of his or her physical therapy program.

Conclusions. The principles of the rehabilitation of pulmonologic patients mentioned above are presented. The list of physical rehabilitation principles in COPD is suggested.

Key words: physical therapy, rehabilitation, chronic obstructive pulmonary disease, means, principles.

Introduction

The chronic obstructive pulmonary disease (COPD) is a common disease of the respiratory system, which appears to be a significant health problem for the population of all countries around the globe [6, 10]. Today, a rehabilitation along with a medical treatment is the most effective component in the recovery and health maintenance of such patients [10, 35, 26]. One of the components of pulmonary rehabilitation is a physical therapy with its numerous means (physical exercises, mechanotherapy, occupational therapy, therapeutic massage, etc.) [2, 31, 35].

The therapeutic and rehabilitation results of the physical therapy largely depend on the proper use of its means, determined by the ability to set a specific goal, to build a physiotherapeutic program following its principles with the consequent proper performing of the program by a patient. The above mentioned requires from the physical therapist profound knowledge of the pathogenic characteristics of the COPD, the functionality of physical therapy means and the principles of their application in general and in different clinical conditions.

The objective – to establish the means and principles of the physical therapy in COPD, the use

of which allows achieving the optimal rehabilitation result.

Methods

Literature sources, selected from the electronic databases of the Vernadsky National Library of Ukraine, Russian Scientific Electronic Library eLIBRARY.RU, Web of Science, PubMed, PEDro embracing the period of last 10 years serve as materials of the current research.

Results and discussion

The reasoning for the use of physical therapy in COPD. The necessity of the physical therapy in COPD is determined by the possibilities of its means to influence over all components of the patient's health. The depth and the manifestation of a morphofunctional lesion of the bronchopulmonary system and the influence of a local organ dysfunction on the body as a whole determine the medical condition of a person with COPD. The Global Initiative for Chronic Obstructive Lung Disease (hereinafter GOLD) identifies the main pathophysiological manifestations of the disease that require correction by various means: airflow limitation and "air traps", hyperinflation, disruption of gas exchange, mucus hypersecretion and pulmonary hypertension. The chronic inflammatory process in the bronchopulmonary system makes patient suffer; such condition is characterized by persistent symptoms (cough, increased sputum production, shortness of breath, attacks of expiratory dyspnea, etc.) that prevent a patient from living a normal life [6, 10, 24, 26, 37 and others].

The muscular dysfunction plays the most significant role in limiting the daily activity of patients with COPD being one of the manifestations of systemic effects. A series of foreign works demonstrate a stable correlation between the increase in the levels of IL-6, IL-1β and the decrease in the skeletal muscle mass index in COPD patients, as well as the increase in the level of circulating cytokines, that leads to the increase of systemic inflammation and muscle depletion [9, 11, 23]. The peripheral muscle dysfunction may also be associated with a sedentary lifestyle, an oxidative stress, a disruption of gas exchange, a corticosteroid therapy and a decrease in the mass of the muscle [24, 26, 37, 40].

Musculoskeletal dysfunction presents in functional (decrease in strength and muscle endurance, change in the activity of enzyme systems) and in structural (atrophy, ratio distortion of myofibrils) changes that contribute to a decrease in physical activity in everyday life, greatly worsening the course of the disease. Thus, the imbalance in the respiratory muscles increases a shortness of breath and leads to a rupture of afferent and efferent bonds, which, in their turn, play an important role in regulating the function of the lungs [16]. The loss of weight in patients with COPD, which mainly includes the loss of muscle mass, is an important prognostic factor of COPD. It is shown that the weakness and atrophy of the quadriceps of the thigh lead to poor prognostication – an increase in mortality rate in COPD [14].

Thus, physical activity intolerance that occurs due to these locally-organ and systemic factors, is one of the main reasons that limit daily activities of patients with COPD and their quality of life. This contributes to the use of physical therapy in addition to obligatory protocol medicamentous therapy.

Physical therapy is necessary for solving the problems that cannot be eliminated by medicamentous therapy – a decrease of physical activity tolerance, a physical deconditioning, muscle mass and weight loss, and for improving the physical and emotional state of COPD patients, ensuring the patient's continued liability to behavior aimed at healthcare and, correspondingly, disease symptoms' improvement [6, 10, 14, 15, 24, 26, 35, 37 etc.].

Physical therapy in COPD possess its own characteristics, which are described in detail in main rehabilitation techniques [6, 10, 28, 35, 38] and numerical review articles [14, 15, 24, 26, 37 etc.]. It should be aimed at:

- reduction of the skeletal muscle dysfunction effects;
- developing the correct breathing pattern;
- eliminating the pressure of the respiratory muscles, their training to increase strength and endurance;
- increasing the mobility of the chest and the diaphragm;
- prevention of expiratory airway collapse;
- improvement of the drainage function of bronchi and bronchial patency.

The significance of the beneficial effects of physical activity on the body of COPD patients is

presented in Petersen AMW et al. (2008) [30]. The authors have shown that physical exercises have not only anti-inflammatory effects, but also reduce the accelerated decomposition of protein throughout the body by 10%.

Experts confirmed the following results of the pulmonary physiotherapy of patients with respiratory diseases [35]:

- weakening of the respiratory dysfunction (such as shortness of breath or fatigue);
- increasing of the labour activity productiveness;
- increasing the awareness of lung diseases and promotion of the health monitoring needs;
- improving the ability to cope with the tasks of everyday life;
- improving the quality of life due to the improvement of health;
- elimination of psychosocial symptoms (for example, repeated attacks of anxiety and depression, increasing of autonomy);
- elimination of the hospitalization need and medical care;
- in case of some patients – returning to normal work.

Also the positive effects of pulmonary rehabilitation in COPD with a different level of evidence were established [5, 6]:

- the ability to exercise improves (level of evidence A);
- the perception of shortness of breath reduces (level of evidence A);
- the quality of life which depends on the health condition betters (level of evidence A);
- the number and duration of hospitalizations decreases (level of evidence A);
- anxiety and depression associated with COPD reduce (level of evidence A);
- training activity aimed at developing strength and endurance of the upper group of muscles improves the function of hands (level of evidence B);
- the achieved positive effects remain after the training for a long time (level of evidence B).
- improves a survival rate (level of evidence B);
- the training of the respiratory muscles brings positive results, especially if combined with general physical training (level of evidence C);
- the recovery after hospitalization improves in terms of the disease recurrence (level of evidence A).
- increases the effectiveness of long-term bronchodilators (level of evidence B).

In such a way, numerous studies have proved the effectiveness of pulmonary rehabilitation in COPD, the main component of which is a physical therapy.

Components and means of the physical therapy in COPD, the mechanism of physical exercises. According to the recommendations of the American Association of Cardiovascular and Pulmonary Rehabilution (AACVPR), the main components of pulmonary rehabilitation are [35]:

- assessment of the patient's medical condition;
- training and preparation of the patient;
- physical exercises;
- psychosocial effects;
- encouraging of a long-term participation in the rehab program.

The above specified components of pulmonary rehabilitation can be supplemented by other means of physical therapy, such as: massage, training with breathing simulators, dance-movement therapy, autogenic training, physiotherapy (application of natural and preformed physical factors), reflexotherapy, mechanotherapy, non-invasive mechanical ventilation, oxygen therapy; as well as ergotherapy, nutritional support and manual therapy [1, 2, 6, 7, 10, 31, 22, 35, 36, etc.].

Physical exercises have the basic and the most accessible physical influence on a human body. Speaking about physical exercises, all kinds of physical influences on the body of a patient, or any form of physical therapy, which have effect on the body movement during their implementation, should be meant. The mechanism of action of physical exercises is based on the application of the most important biological function of a person – the function of motion. Nowadays, the authors from the post-Soviet countries believe that COPD physical exercises contribute to:

- the increase in the mobility of the chest and diaphragm;
- the eliminating the pressure of the respiratory muscles, increasing their strength and endurance;
- the improving coordination of breathing and movement and formation of mechanisms of proper breathing;
- the prevention of expiratory airway collapse;

• the improvement of drainage function of bronchi and bronchial patency;

• the increase in lung compliance;

• the reduction of pulmonary congestion [1, 13, 18, 24, 26, 37, 41, etc.].

The principles of physical therapy for respiratory diseases and COPD. Before setting out the principles of physical therapy, it is important to understand the goals of the pulmonary rehabilitation. These goals are mentioned in the AACVPR recommendations [35]:

• integration of preventive measures and actions aimed at encouraging long-term extension of occupations in the patient's treatment plan;

• development and implementation of an individualized program of therapeutic influence;

• improving the quality of life of the patient and his relatives;

• the establishment of control or relaxation, as far as possible, of the symptoms and pathophysiological complications of respiratory diseases;

• increase in strength, endurance and physical activity;

• abatement of the psychological manifestations of a disease, such as anxiety or depression;

• stimulating the patient's desire to follow the program of treatment and rehabilitation for a long time;

• preparation, motivation and rehabilitation of the patient in order to maximize the realization of his self-care capabilities;

• preparation, motivation and involving family or close relatives of the patient to the performing of his or her physical therapy program;

• eliminating the society economic costs allocated for the pulmonary diseases by the decrudescence, reducing the number of hospitalizations, as well as the duration of staying in the hospital, appeals for emergency care and shortening of the recovery period;

• making a patient return back to productive work or active aging, depending on the age and abilities;

• medical staff training with constant updating of the information on pulmonary disease and pulmonary rehabilitation;

• informing the health system staff about the importance of early detection of pulmonary diseases by screening (for example, using spirometry);

• dissemination of information on the harm of smoking, nicotine addiction and passive smoking, as well as the suggested methods of therapy, among the population.

The principles of physical therapy should ensure the achievement of these goals. In the post-Soviet countries, the principles of physical therapy in pulmonary patients were formed in the 80's and 90's of the last century by the work of A. N. Cocosov (1981, 1987), V. G. Bokshi (1991), L. M. Klyachkin (1992) [8, 17, 18, 19]. The authors emphasize the need to adhere principle approaches in the implementation of pulmonary patients' rehabilitation, namely:

1) the succession between the stages of rehabilitation;

2) a common understanding of the pathogenesis and the clinical disease of non-specific diseases of the lungs;

3) taking into account the pathogenetic features of the course of the disease in each particular case while forming an individual rehabilitation complex;

4) obligatory quantitative assessment of the main functions of the cardiopulmonary system;

5) current, stage and cyclical evaluation of the effectiveness of the rehabilitation measures carried out, etc.

Currently, the National authorities of Russia in Society of Physical and Rehabilitation Medicine outline the basic principles of medical rehabilitation [31]:

• active participation of the patient;

• staging;

• succession;

• continuity

• complexity.

In Ukraine, Sokrut V. M. and Yabluchansky M. I. (2015) add to the basic principles of medical rehabilitation the following [36]:

• early implementation of rehabilitation measures;

• complexity of application of the necessary means;

• individualization of rehabilitation program;

• staging of rehabilitation;

• continuity and consistency throughout all stages of rehabilitation;

• combination of general and special action;

• social orientation of rehabilitation measures;

• use of methods to control the adequacy of exercises and the effectiveness of rehabilitation.

According to Abramov V. and his coauthors (2014), the main principles of the rehabilitation are [1]:

• early implementation;
• complexity;
• individualization;
• staging;
• continuity and portability;
• social orientation;
• control of the adequacy and the effectiveness of the rehabilitation.

Other local authors [25] suggest similar principles of the physical rehabilitation:

• early implementation;
• accessibility and individualization of physical activity;
• complexity;
• continuity;
• rehabilitation in a group;
• making a patient or a disabled person return back to active work.

The literature sources also contain the principles of the use of the physical exercises [31]:

1) the principle of active patient's participation in physical training;

2) the principle of individuality of physical activity;

3) the principle of the regularity of physical exercises;

4) the principle of adequacy of physical activity;

5) the principle of gradual and consistent increase of physical activity.

Thus, for now, all the scientific and methodological conditions of wide usage of physical therapy means for improving the health status of patients with COPD have been compiled. These conditions are described in the relevant international and national recommendations.

It is possible to present the systematized principles of physical therapy in COPD as a single list, namely:

• a common understanding of the pathogenesis and the clinical disease, mechanisms of influence, therapeutic and rehabilitation effects of the physical therapy;
• the development and implementation of an individualized program of physical therapy taking into account specific features of the course of the disease of a particular patient;
• early implementation of the physical therapy;
• staging, continuity and sequence of the physical therapy;
• complexity, combined and portable application of the physical therapy;
• availability of the physical therapy in any conditions of its implementation;
• integration of the physical therapy means into multidisciplinary rehabilitation assistance;
• knowledge of rehabilitation needs, encouragement and active participation of a person with COPD;
• the focus of the physical therapy measures at the realization of self-care capabilities, the return to the productive labor activity of the patient;
• involving family or close relatives of the patient to the performing of physical therapy program.

Applying these recommendations to each COPD patient it is possible to create an individual program of physical therapy aimed at reducing the manifestations of the disease, increasing physical activity, developing physical and emotional participation of a patient in everyday life and improving the quality of his or her life.

Conclusions

Presently, all the scientific and methodological conditions have been compiled, the principles of application of physical therapy in COPD have been formed. Among them, it is possible to distinguish the following: a common understanding of the pathogenesis and the clinical disease, mechanisms of influence, therapeutic and rehabilitation effects of the physical therapy; the development and implementation of an individualized program of physical therapy taking into account specific features of the course of the disease of a particular patient; early implementation of the physical therapy; staging, continuity and sequence of the physical therapy; complexity, combined and portable application of the physical therapy; availability of the physical therapy in any conditions of its implementation; integration of the physical therapy means into multidisciplinary rehabilitation as-sistance; knowledge of rehabilitation needs,

encouragement and active participation of a person with COPD; the focus of the physical therapy measures at the realization of self-care capabilities, the return to the productive labor activity of the patient; involving family or close relatives of the patient to the performing of physical therapy program.

Conflict of interest

The author claims that there is no conflict of interest.

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Received: 23.02.02.2019;
Accepted: 09.03.03.2019; Published: 29.03.2019.