

**Krzysztof Mroczek<sup>1,2</sup>, Tomasz Derewiecki<sup>1,2,3</sup>, Joanna Mroczek<sup>4</sup>**

<sup>1</sup>Zamość Rehabilitation Department, College of Management and Public Administration, Zamość

<sup>1</sup>Zamojska Klinika Rehabilitacji; Wyższa Szkoła Zarządzania i Administracji, Zamość

<sup>2</sup>Department of Physiotherapy, College of Management and Public Administration, Zamość

<sup>2</sup>Katedra Fizjoterapii, Wyższa Szkoła Zarządzania i Administracji, Zamość

<sup>3</sup>Division of Rehabilitation and Physiotherapy, Department of Rehabilitation, Physiotherapy and Balneotherapy, Medical University of Lublin

<sup>3</sup>Zakład Rehabilitacji i Fizjoterapii Katedry Rehabilitacji, Fizjoterapii i Balneoterapii, Wydział Pielęgniarstwa i Nauk o Zdrowiu Uniwersytetu Medycznego w Lublinie

<sup>4</sup>Master Degrees, College of Management and Public Administration, Zamość

<sup>4</sup>Studia magisterskie, Wyższa Szkoła Zarządzania i Administracji w Zamościu

## **Using of physiotherapeutical measures in the treatment of bronchial asthma**

### **Wykorzystanie środków fizjoterapeutycznych w leczeniu astmy oskrzelowej**

#### **Summary**

The bronchial asthma is a chronic inflammation of a respiratory system, involving many cells and substances released by them. A chronic inflammation causes a hyperactivity of the bronchi, leading subsequently to recurrent attacks of dyspnoea, wheezing breath, coughing and tightness in breast, appearing especially at night or at dawn. Such attacks are usually accompanied by a flooding bronchial obturation with a diversified intensity, often subsiding spontaneously or because of a treatment.

The aim of the present paper is introducing of mechanisms causing bronchial asthma and current trends of rehabilitation proceedings.

Conclusions: The rehabilitation methods in patients suffering from bronchial asthma should be individually selected, considering the advance of an illness, occurring of co-existing diseases and complications. In order to obtaining the maximum level of recovery, a complete rehabilitation program should be worked up and applied. Full rehabilitation proceedings cause a significant improvement of the patients' life comfort.

**Key words:** bronchial asthma, rehabilitation, physiotherapy

#### **Streszczenie**

Astma oskrzelowa jest przewlekłą chorobą zapalną dróg oddechowych, w której uczestniczy wiele komórek i substancji przez nie uwalnianych. Przewlekłe zapalenie jest przyczyną nadreaktywności oskrzeli, prowadzącej do nawracających epizodów świszczącego oddechu, duszności, ściskania w klatce piersiowej i kaszlu, występujących szczególnie w nocy lub nad ranem. Epizodom tym zwykle towarzyszy rozlana obturacja oskrzeli o zmiennym nasileniu, często ustępująca samistnie lub pod wpływem leczenia.

Celem pracy jest przedstawienie mechanizmów powstania astmy oskrzelowej oraz aktualnych trendów postępowania rehabilitacyjnego.

Wnioski: Podejście rehabilitacyjne u chorych na astmę oskrzelową powinno być

dobrane indywidualnie. Powinno ono uwzględniać stopień zaawansowania choroby, występowanie chorób współistniejących oraz występowanie powikłań. W celu osiągnięcia maksymalnej poprawy stanu zdrowia pacjenta należy opracować i zastosować kompleksowy program rehabilitacji. Pełne postępowanie rehabilitacyjne daje znaczną poprawę jakości życia chorych.

**Słowa kluczowe:** astma oskrzelowa, rehabilitacja, fizjoterapia

### **Introduction**

In the course of years the definition of asthma has been changed. Its final version was fixed in 2002. According to it, bronchial asthma is a chronic inflammatory disease of respiratory ducts, involving many cells and stuffs released by them. A chronic inflammation causes hyperactivity of the bronchi, leading subsequently to recurrent attacks of dyspnoea, wheezing breath, coughing and tightness in breast, appearing especially at night or at dawn. Such attacks are usually accompanied by a flooding bronchial obturation with a diversified intensity, often subsiding spontaneously or because of a treatment (Bateman et al. 2008; Bodzenta-Łukaszczyk, Kowal 2007; Busse et al. 1999; Busse, Lemanske 2001; Doniec, Tomalak 2006; Kowalski, Kubsik 2010; Kuś, Rowińska-Zakrzewska 2003).

Bronchial asthma causes lowering of the patients' comfort of living, depending on advance of disease. In the first, mildest stage some living functions are disturbed, but the patient remains independent, whereas in the fourth, the most severe stage the patients become unable to work or education, moreover, they can't do without an assistance of other persons (Emeryk, Trojanowska 2009).

The contemporary medical science can significantly increase the comfort of living in patients affected with asthma. Rehabilitation plays an important role in the healing process, the sooner began – the better. Used should be all accessible means, as pharmacological, kinesiotherapeutic and physiotherapeutic ones, including also a healing massage. Important are also: prophylaxis, psychological rehabilitation and education of patients and their families (Czupryna et al. 2004).

Nowadays in Poland about 8.6% of children and 5.4% of adults suffer from bronchial asthma. Additional research results indicate, that in recent several years the incidence rate of this disease is permanently increasing. Noteworthy is, that 25% of Poles suffer from different kinds of allergy (Borowicz et al. 2009).

The aim of the present paper is introduction of bronchial asthma development and current trends of rehabilitation methods. Assumed was also, that introduced should be a complete rehabilitation cycle and its influence upon the patients' comfort of living. Bronchial asthma, etiology, pathogenesis, symptoms, diagnostics, prognosis.

The research results show, that exist many factors influencing the occurrence of bronchial asthma. Directly bound with its incidence rate are the following factors:

1. Genetics – the research confirmed, that asthma depends on many genes. In the human genom localized were several regions containing genes responsible for asthma, atopia, hyperactivity of bronchi and intensifying of IgE production.
2. Atopia – the state of excessive standby to IgE production, when exposed to antigens.

3. Hyperactivity of bronchi – readiness of bronchi to react with a cramp to several physical, chemical and pharmacological stimuli. It depends on gravity of the disease and occurs in 80% of patients, whereas during the attack – in 98-100% of patients.
4. Sex - asthma occurs twice more often in boys than in girls (Bernacka-Parzych et al. 2011; Bjamason et al. 2000; Bręborowicz et al. 2007; Ober 2005; Stelmach et al. 2002).  
Occur also many factors triggering off the symptoms. Such factors are as follows:
  1. Influence of the environment – climate factors, environmental pollution
  2. Inhaled allergens – house dust, mites, plant pollen, animal epidermis, molds.
  3. Nutritional allergens – especially significant in children.
  4. Psychogenic factor – fear of danger.
  5. Viral, bacterial and mycotic (very rare in Poland) infections.
  6. Exogenic (Uranium, glue, organic solvent) or endogenic (digestive reflux) toxic factors.
  7. Drugs – all drugs may trigger off asthmatic attacks, even aspirin (Bernacka-Parzych et al. 2011; Bjamason et al. 2000; Bręborowicz et al. 2007; Ober 2005; Stelmach et al. 2002).

The major pathological phenomenon in asthma are the following ones: bronchial muscles' cramp, swelling, intensified permeability of blood vessels, intensified mucus excretion and appearing of inflammatory intumescences. Inflammatory changes subsequently lead to thickening of bronchial walls, swelling and hypertrophy of muscle layer. Finally it results in an irreversible sclerosis of bronchial walls in an advanced stage of asthma. All those processes, however, may be noticed in early stages of the illness, resulting in narrowing of inside diameter of the bronchi (Kuś, Rowińska-Zakrzewska 2003).

The basic symptom of asthma is an exhalation dyspnoea. Its attacks may have different intensity, in chronic patients also during the remission periods. They can be triggered off by the presence of an allergen, physical effort, cold air or taking an anti-inflammatory drug. The dyspnoea is preceded by a dry cough, later replaced by the main symptom. Patients are sweating, willingly sit down, whereas their breathing frequency exceeds 20 per minute. They automatically start extra respiratory muscles, the exhalation phase is prolonged, audible are wheezing, humming and rustling sounds. Finally the dyspnoea attack ends with spitting of a dense, sticky and transparent saliva. The attacks reaching 30-60 min., despite drugs application, are called severe asthmatic states (Busse, Lemanske 1997; Gdalevich et al. 2001; Kuś, Rowińska-Zakrzewska 2003). In patients suffering from severe asthmatic states deepening are the clinical symptoms, fund In the initial stage, as anxiety, profuse sweating, fear of death, blue lips, end of the nose and ears. Occur concentration problems, a patient gets sleepy, hardly answers the questions asked, loses orientation and gets physically exhausted. The breath gets gradually more shallow, humming and rustling stop. The patients' pulse values exceed 140-160 beats per minute, whereas their blood pressure decreases (Busse, Lemanske 1997; Gdalevich et al. 2001; Kuś, Rowińska-Zakrzewska 2003). In the case of chronic asthma the patient's rib cage often stands in an inhalation position. In asthmatic children often occurs broadening the rib cage in its front-back dimension. Humming and rustling are clearly audible in the beginning of an attack, whereas the deeper becomes dyspnoea – the quieter are the sounds, Sometimes they stop being audible at all, what indicates a dangerous symptom, because it witnesses lack of ventilation, caused by a strong bronchial cramp (Kuś, Rowińska-Zakrzewska 2003).

In diagnostics of bronchial asthma we use a medical history, physical examination (auscultation of lungs), watching the patient's figure in order to find potential anomalies, as well as measuring of his/her chest circumference during the inhalation and exhalation, spirometrical test and measuring of top exhalation flow using peakflowmeter. If necessary, diagnostic procedures may be widened by additional examinations, as skin tests, X-raying of the rib cage, bronchoscopy, measuring of concentration of carbon dioxide and oxygen in circuit blood (Akerman et al. 2003; Baldacci et al. 2001; Bridge et al. 2005; Boros et al. 2006; Burge et al. 2010; Martinez, Stein 2000).

The prognosis may be different and uncertain, varying from subsiding of the illness to its transition into a severe state. It depends on the age of appearing the first symptoms, gravity of the illness' course and frequency of asthmatic states.. By prognosing, one must consider occurring complications and co-existing illnesses. To those complications may belong respiratory or coronary insufficiency, as well as a pulmonary heart. In general, asthma is hard to get rid of, but one can live with it until an old age (Kuś, Rowińska-Zakrzewska 2003).

#### **The clinical forms of bronchial asthma**

Grade 1. An episodic, light form of asthma. Within the last 3 months such symptoms, as coughing, dyspnoea and a wheezing breath, occur less often than once a week. Night attacks appear less often than twice a month and may be caused by an effort or exposing to the allergen. Between exacerbation periods no other symptoms occur. The values of FEV<sub>1</sub> and top exhalation flow don't decrease under 80% of the norm, whereas the variability of the other indicator doesn't exceed 20%. In such conditions the patient is able to manage with the attack, using relaxant drugs. Possible is elimination of allergens and fulfilling normal living functions (Kuś, Rowińska-Zakrzewska 2003).

Grade 2. Chronic, mild (moderately severe) asthma. The disease symptoms appear at least once a week, but not every day whereas the night attacks – more often than twice a month. The value of top exhalatory flow exceeds 80% of a norm, whereas its daily variability oscillates from 20 to 30%. Attacks occurring in that group of patients require a medical aid. The patients may become periodically unable to work or study (Kuś, Rowińska-Zakrzewska 2003).

Grade 3. Chronic, moderately severe asthma. The disease symptoms appear every Day, whereas the night attacks more often than once a week. The value of top exhalatory flow varies from 60 to 80%, whereas its daily variability doesn't exceed 20-30%. Patients may suffer from life-threatening attacks and partial insufficiency to work and study.

Grade 4. Chronic, severe asthma. The dyspnoea stays permanently, night attacks are frequent despite the treatment. The physical fitness of the patient is limited. The value of top exhalatory flow doesn't exceed 60% of a norm, whereas its daily variability exceeds 30%. Despite an intensive medical treatment spirometrical indicators of patients decrease, appearing are severe side symptoms and constant recurrences of asthmatic states. Patients are no more able to work or study (Kuś, Rowińska-Zakrzewska 2003).

### **Preventive measures**

Prevention should begin from education of patients and their families. A patient should be informed about the essence and course of the illness, course of the healing process and a correct behavior during the dyspnoea attack. Education allows reducing fear in patients, like in model schools in Sweden and Norway, where asthma-affected patients are encouraged to keep special charts, filled with information about frequency of attacks, the length of their lasting and what was the trigger (Custovic, Wijk 2005; Rosławski, Woźniewski 2001). For proper preventive measures important is identification of environmental factors triggering off the attacks or intensifying inflammatory processes in bronchi, as house dust, animal allergens, molds or plant pollen (Custovic, Wijk 2005).

The primary prophylaxis is aimed at prevention of appearing of the disease. It embraces avoiding of allergens, breast-feeding of newborn babies, baby milk formulas modifications and avoiding the air pollution. Significant is identification of persons with an increased risk factors (allergy, skin irritations) and their monitoring. Recently desensibilization was gradually introduced. As far, as allergy for plant pollen is concerned, it included injection of allergen solution before the pollination season. In the cases of allergy for house dust – desensibilizing injections should be given all the year round (Peat 1999; Brożek et al. 2003).

The secondary prophylaxis is applied in patients affected with a confirmed bronchial asthma. Its task is to stop or slow the Progress of the illness, prevent the dyspnoea attacks and appearing complications. It includes avoiding of allergens, stopping of smoking, getting rid of house pets, moving to another region and applying preventive shots (against flu, pneumonia and others) (Peat 1999; Brożek et al. 2003).

### **Pharmacological treatment**

Drugs applied in bronchial asthma may be divided into two groups:

1. Emergency drugs – applied when needed, in a case of exhalation dyspnoea attack, in order to diastole smooth bronchial muscles.
2. Controlling drugs – applied permanently, in order to stop inflammatory process in bronchial mucous membrane, reducing hyperactivity, prevent exacerbations and lowering demand for emergency drugs (Ashrafian, Violaris 2007; Bodzenta-Łukaszczyk, Kowal 2007; Bręborowicz et al. 2007; Dargie et al. 2004; Kim et al. 2007; Kuś, Rowińska-Zakrzewska 2003).

### **Kinesiotherapy**

Of the highest importance among kinesiotherapeutic methods in asthma treatment are breathing exercises, learning of effective coughing and some exercises improving general fitness. Their aim is maintaining the correct ventilation of lungs, rib cage and diaphragm mobility, enhancing effective coughing. The aims of breathing exercises are: regaining of correct breathing mechanisms, convincing the patient of possibilities of breaking the attack by involving diaphragm breathing, eliminating of uncoordinated breathing movements. The exercises should be preceded by applying of diastolic drugs and should not exceed 5 repetitions, because excessive efforts are contraindicated for the patients. Applied also should be a classic massage of rib cage, back and inter-rib muscles, using stroking, rubbing and vibration techniques (Rosławski, Skolimowski 2003; Rosławski, Woźniewski 2001).

Very important is learning of effective coughing, in order to remove discharge lying heavy in the bronchi. To tear it out, the patient should deeply inhale through the nose, and exhale air through the mouth with short, coughing intervals, causing quick changes of air pressure in bronchi and a subsequent vibration in bronchial walls, moving the discharge to the outside (Rosławski, Woźniewski 2001).

In the periods of remission the patient should perform exercises regaining general fitness and corrective, to remove posture faults, especially in children. Exercises should be of moderate intensity, because excessive efforts may trigger off a dyspnoea attack and discourage a patient to further movements. Physical exercises should be planned between dyspnoea attacks, when patients are breathing correctly, in a warm room with air saturated with water vapour, for example, with a wet towel placed on a radiator. In the case of dyspnoea, the exercises should be stopped immediately (Rosławski, Skolimowski 2003; Rosławski, Woźniewski 2001).

The exercises should provide short-lasting efforts, alternated with breaks. They should be preceded with applying diastolic drugs. It must be emphasized, however, that patients shouldn't avoid physical activity at all (Rosławski, Skolimowski 2003; Rosławski, Woźniewski 2001).

### **Postural drainage**

Drainage postures use gravity forces for removing discharge lying heavy in border sections of bronchi, making it move to the windpipe. It is called a passive drainage, what should be supported with different massage techniques, correct breathing and expectorating. It may be also preceded by inhalations. The best times to apply the postural drainage are in the morning (before breakfast) and in the evening (before supper or 2 hours after it). The patient is changing postures every 20-30 seconds (Rosławski, Woźniewski 2001).

### **Inhalations**

Drugs are often applied by the means of inhalations. This way are mostly applied diastolic drugs, enhancing discharge expectorating, antibiotics and measures preventing inflammations and swelling of bronchial mucous membrane. Used are many inhalation devices, from the simple pocket inhalators to complicated nebulizers, using compressed air or ultrasounds. In health resorts used are mineral waters, especially brines and alcalic ones. As a kind of inhalation acknowledged can be also say in a salty cave (Doniec, Tomalak 2006; Rosławski, Woźniewski 2001; Straburzyńska-Lupa et al. 2008b).

### **Physiotherapy**

The infra-red radiation (IR) is often used In rehabilitation of patients with bronchial asthma. Their biological influence on tissues consists in their thermal effects. It reduces the tension of respiratory muscles, intensifies the metabolism and improves blood supply in irradiated tissues. The infra-red treatments are also applied as an introduction to breathing exercises. Irradiated may be breast or space between shoulder blades. We apply a sufficient filter according to a doctor's disposition or state of a patient. In a medical literature one may find remarks about applying of ultra-violet radiation in rehabilitation of patients affected with bronchial asthma. (Kasprzak, Mańkowska 2008; Rosławski, Woźniewski 2001; Straburzyńska-Lupa et al. 2008a).

Application of sauna causes acceleration of breathing and increasing of lungs' volume. Before the treatment patient's body should be thoroughly washed and dried out. The patient enters the sauna chamber two or three times, but the total time of staying there can't exceed 30 minutes. After every entering the chamber, with staying there for 5-10 minutes, the patient should cool down for no less than 5-10 min, either going out to dive in cold air, or pouring cold water over himself. The patient should be accompanied by another person, what increases his security (Staraburzyńska-Lupa et al. 2008a).

Full hot baths, in water with the temperature of 38 degrees, belong to hydrotherapy. Such treatments last about 20-30 minutes and allowed is cooling the patient's head with a cold compress. Hot baths cause better blood supply of the airways. Applied are also brine hot baths, conducted every second day, lasting about 15-20 minutes. We begin from a lower concentration of a brine, increasing it gradually. Brine baths, like hot baths, improve the blood supply of airways and the general resistance of the organism (Straburzyńska-Lupa et al. 2008a).

Ionoforesis may also be useful in asthmatic patients treatment. Applied are solutions of iodine (softening effect) and calcium (anti-inflammatory and anti-allergenic effect). We specify two methods of conducting those treatments. In the classic method embraced are side parts of rib cage. The other one is Wermel's method, in which used is an active electrode, made from foil, with a surface of 400 square centimeters. It is placed between the shoulder blades, whereas two passive electrodes are placed on calves. The treatment lasts 20 minutes, with the amperage varying between 10 and 20 mA (Kim et al. 2007; Straburzyńska-Lupa et al. 2008b).

Applied is also a short-wave diathermia (DKF) for overheating of tissues. Used is a condensator method, consisting In placing of one stiff electrode between the shoulder blades, whereas the rather one placed is near to the breastbone. The heat dose depends on individual feelings of a patient. One treatment lasts usually 10-15 minutes (Kasprzak, Mańkowska 2008; Low et al. 2009).

Seldom occur cases of applying ultrasonic devices, applied for sides of the chest and The part of the spine. The doses reach 0,3-0,5 W/cm<sup>2</sup>, each treatment lasts 10 minutes. Its task is to relieve a too high tension of respiratory muscles (Kasprzak, Mańkowska 2008).

### **Rehabilitation in health resorts**

The strongest healing effect In health resorts is mainly created by natural factors. The most effective is a change of climate and balneological treatment, using minor stimuli. The most suitable climate for treatment of asthmatic patients are the following spas: Wieliczka, Czerniawa, Iwonicz Zdrój, Muszyna, Piwniczna, Rymanów Zdrój, Ustroń, Wysowa. Used are natural mineral waters or brines. Recommended is also mountain trekking, but only for pleasure (Rosławski, Woźniewski 2001; Staraburzyńska-Lupa et al. 2008b).

### **Psychological rehabilitation**

Psychological rehabilitation can be useful In all branches of the medicine, because intensity of illness symptoms is influenced by psychogenic factors. Many authors recommend relaxation as an introduction to breathing exercises. From the conducted research results a close relationship between the gravity of illness and the intensity of fear, depression and aggression. On the other hand, helpful is an active attitude towards

the disease, avoiding of factors irritating the mucous membrane, immediate giving up smoking, maintaining a good family atmosphere and an autogenic training or other forms of psychotherapy (Rosławski, Woźniewski 2001).

### **Measures in case of a dyspnoea attack**

In case of a dyspnoea attack a bronchi widening drug should be applied. The patient should be calmed down and persuaded to take a posture loosening the muscles. The patient should be seated on a chair with the face to its backrest, with forearms leaned on it and head resting on them, turned to the side. In those postures hindered is lifting of shoulders, thus one can avoid involving auxiliary respiratory muscles. A patient should be taught of those postures in the periods between attacks, Recommended is also massage of chest and shoulder girdle, whereas the patient should pronounce any given words with the mouth closed, while breathing calmly and passively (Rosławski, Woźniewski 2001).

### **Discussion**

Bronchial asthma makes a serious problem in current medicine, as well as in physiotherapy, often underestimated. IN current literature one can hardly find remarks on physiotherapeutic methods used in regaining fitness in asthmatic patients.

Using physiotherapeutic methods in rehabilitation of bronchial asthma affected patients brings measurable benefits. Applying of kinesiotherapy enables regaining correct breathing mechanisms, convincing patients about possibilities of stopping the attack through involving diaphragm breathing, eliminating of uncoordinated respiratory movements, removing of mucus lying heavy in bronchi and correcting of posture defects caused by the illness. Using of physiotherapy results in relieving excessively tensed respiratory muscles, pain and inflammation stopping and improving of blood supply of airways. Applying of a healing massage helps removing the discharge lying heavy in the bronchi, improves the flexibility of skin, reduces the excessive tension of respiratory muscles.

Physiotherapeutic methods, because of measurable benefits of their using, should be involved in standard therapy of bronchial asthma affected patients.

### **Conclusions**

1. Rehabilitation measures in asthmatic patient should be individually selected, just as pharmacological treatment. It should concern advance of the illness, occurrence of side diseases and complications.
2. In order to achieve maximum recovery, a complete rehabilitation program should be elaborated.
3. Measures in case of dyspnoea attack should be based not only on applying drugs widening bronchi, but also on correct postures relieving the muscles and correct breathing technique.
4. In a complete therapeutic process important is conducting of psychological rehabilitation and a social support for the patient. It can significantly influence the patient`s recovery.
5. Full rehabilitation measures result in a significant improvement of health and living comfort of asthma affected patients.



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