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MOTOR ACTIVITY IN PATIENTS WITH SUPRATENTORIAL UNILATERAL STROKE

Danche Vasileva, Nikolai Izov, Ivan Maznev, Daniela Lubenova, Kristin Grigorova-Petrova

Abstract

The aim of the study is to evaluate the effect of the specialized kinesitherapy methodology (SKTM) on motor activity in patients with supratentorial unilateral stroke in the chronic period (SUSChP).

Material and Methods

The study was conducted with 67 patients with SUSChP (56 patients are included in the experimental group – 32 men and 24 women, with the duration of the disease 7.8 ± 2.0 months, and 11 patients in the control group – 9 men and 2 women, with the duration of the disease 7.3 ± 1.5 months).

To evaluate the changes, the motor capabilities are tracked with a modified Chedoke-McMaster test, and muscle tone with a modified Ashworth scale for upper and lower extremities that are relevant metric to evaluate the motor activity of the patients. The experimental group was conducted with a specialized 10-day KT treatment, which later continued to perform as an adapted exercise program at home for a period of 1 month. Control patients are following a conventional 10-day KT.

Results

After applying SKTM, the highest tendency towards improvement of motor activity is established in the 1st month for upper and lower extremities, with a level of significance during treatment $p < 0.001$.

Conclusion

The applied SKTM to the experimental group, later continued as adapted exercise program at home, which significantly improves the motor activity of patients with supratentorial unilateral stroke in the chronic period compared with the usual kinesitherapeutic methodology applied in the control group.

Keywords: Kinesitherapy, Motor activity, Motor capabilities, Stroke, Chronic period

Introduction

Motor activity is an essential part of complex therapy in patients suffering from stroke. It has been shown that physically active people have a lower risk of stroke and fatal outcome than those with low physical activity. This dependence is due to the positive effect of physical activity on body weight, blood pressure, serum cholesterol, and glucose tolerance. Physical activity performed during leisure time (3–4 times/week, on average 40 min) (Eckel et al., 2013; Kernan et al., 2013) have a favorable short-term effect in patients with mild stroke (Katsiki et al., 2011; Willey et al., 2011; Li, Siegrist, 2012). Modern neurorehabilitation and kinesitherapy (KT) have principal differences in acute, suboptimal (up to the 6th month of the accident) and chronic (after 6 months) restoration phase. While its application during the first 6 weeks after the stroke stimulates and supports the spontaneous recovery of motor disorders, its role in the chronic period is not the actual recovery of the motor deficit, but the use of compensatory behavioral strategies to overcome it, which is associated with a bishhemistic reorganization. Unintentional brain cells are trained to perform certain functions (Titianova et al., 2008; Peppen et al., 2004). The recovery potential is increased by combining KT and pharmacotherapy (Krakauer, 2006; Dobkin, 2010; Bersano et al., 2010). Newer concepts offer intensive therapy with motor-related tasks that involve more functional skills. As a prognostic mark, the degree of damage to the corticospinal pathway is considered. Patient's relatives are trained to assist and support the day-to-day activities of the patient (Titianova, 2007; Lubenova, Titianova, 2012). It is known that after the KT, the patients are more independent, their mood improved and their activity level increased. There is a number of evidence that KT could be effective in motor control, but systemic comparisons of effectiveness across different types of treatment programs are limited (Duncan, 1997; Gordon et al., 2004; O'Sillivan, 2001). It has

been shown that nearly 14% of stroke survivors achieve almost complete recovery of motor skills, between 25% –50% need support for daily activities, and other patients have permanent disability. Abnormal mobility is common in stroke survivors, especially in the elderly (Roth, Harvey, 2000).

Purpose

To investigate the early (10th) and the late (1st month) effect of the application of the specialized KT method in patients with chronic hemiparesis, in comparison with the control group, which is the usual KT, on the motor activity.

Material and methods

The study was conducted in 67 patients with supratentorial unilateral stroke in the chronic period (56 patients in the experimental group (EG) – 32 males and 24 women with a disease duration of 7.8 ± 2.0 months and 11 patients in the control group (CG) – 9 men and 2 women with disease duration 7.3 ± 1.5 months). The clinical characteristics of the contingent are presented in Table 1. A modified Chedoke-Mc-Master scale was used to determine the gravity of the phase that the 4th and 5th stage patients had a moderate degree of involvement, and the 6th and 7th stages had a slight degree of involvement (Cowland et al., 1993; Wade, 1992). On this basis, the patients were divided into two subgroups (moderate and mild).

Table 1. Clinical characteristics of the contingent at the start of the study

Parameters	Patients	Moderate degree	Mild degree
Experimental group	n=56	n=33	n=23
Age	63.2±8.8	63.9±7.1	62.3±10.9
Sex(men / women)	32/24	22/11	10/13
Limitation periods (months)	7.8±2.0	8.3±2.2	7.2±1.5
Localization (left / right)	26/30	16/17	10/13
Control group	n=11	n=5	n=6
Age	63.3±6.0	63.6±5.3	63.1±7.1
Sex (men / women)	9/2	5/0	4/2
Limitation periods (months)	7.3±1.5	7.6±1.8	7.0±1.2
Localization (left / right)	5/6	2/3	3/3

$\bar{X}$±SD – *mean and standard deviation EG – the experimental group, KG – control group. The significance of the intra-group changes is defined by the binominal test. Intergroup significance of sex and localization is determined by U-criteria of Mann Whitney for independent samples, while for age and limitation period, a Student t-test for independent samples is attached.*

To evaluate the changes, the motion capabilities were tracked through a modified Chedoke-McMaster test and muscle tone through Ashworth's modified upper and lower limb scales, which are current informative indicators for motor performance assessment. Patients from the EG were treated with a specialized 10-day KT, which was later performed as an adapted home exercise program for a period of 1 month. It is based on the basic principles of modern neurorehabilitation: to be individual, intensive and specifically oriented – tailored and focused on the individual needs of the patient; To realize the active involvement of the patient and his / her family during prolonged administration so as to ensure care that is tailored for the patient's needs throughout his life to achieve recovery and influence of late complications of the disease (Vasileva, Lubenova, 2014). A 10-day standard KT method with a 30 min duration was applied to CG patients using traditional approaches to central motor neuron damage as outlined in the „Medical Standard on Physical and Rehabilitative Medicine" (Lubenova, Titianova, 2015). The two KT methods used are different in their duration of treatment, structure and included postural movements, walking, active upper limb movements and transfers).

Statistics

A set of statistical programs were used to quantify the received data. The Wilcoxon test was used to compare non-parametric parameters during treatment, and the Mann-Whitney U-criterion was used to determine the significance of differences between the groups. The Paired Samples Test is applied to compare parametric parameters.

Results

Comparison of patients in two groups did not show

significant differences in age, gender, localization and disease duration. The evaluation was performed before KT, on the 10th day and 1st month after the start of treatment. The results of the traceability indicators of the changes in motor activity in patients with chronic ischemic stroke from the EG and CG as well as the significance of changes in the course of treatment are presented in Table 2. The differences between the obtained and the baseline values as well as the significance of the changes between the two groups are presented in Fig. 1 and Fig. 2.

Table 2. Prospective comparative assessment of motor activity in the EG and CG

Parameters	Groups EG (n=56) CG (n=11)	At the beginning $\bar{X}$±SD	10th day $\bar{X}$±SD	1st month $\bar{X}$±SD
Chedoke-McMaster - Upper limb (stage)	EG	4.2±0.7	5.2±0.7 ***	5.7±0.4 ***
	CG	4.4±0.7	5.20.7± *	4.70.9±
	P	0.390	0.884	0.000
Chedoke-McMaster – Lower limb (stage)	EG	4.8±0.6	5.7±0.5 ***	6.0±0.3 ***
	CG	4.90.7±	5.80.6± *	5.40.9±
	P	0.693	0.600	0.001
Ashworth – Upper limb (points)	EG	1.6±0.6	0.8±0.7 ***	0.4±0.5 ***
	CG	1.4±0.5	0.9±0.6 *	1.20.5±
	P	0.419	0.972	0.000
Ashworth – Lower limb (points)	EG	1.1±0.6	0.5±0.6 ***	0.1±0.3***
	CG	1.2±0.3	0.60.6± *	0.9±0.5
	P	0.912	0.925	0.000

*$\bar{X}$±SD – mean and standard deviation, *** p <0.001, * p <0.05 – significant change compared to baseline in the course of treatment assessed by Wilcoxon Test; P <0.001 – significance of the change between the two groups measured by U-criteria of Mann-Whitney Test.*

It was found that at the beginning of the treatment both groups had decreased motor activity. There are no significant differences in the baseline data between two groups. Compared with the baseline data in the experimental group, there is a significant improvement in the upper limb capabilities, as evidenced by the Chedoke-McMaster test. Similar are the changes in the lower limb. In absolute terms, the positive change was most pronounced on the 1st month, with a level of significance p <0.001. The effect on motor restoration of the limbs is sustained and is maintained until the first month of follow-up in the EG. It means that patients are restored to the possibility of coordinated movements near normal. Unusual patterns of movement can occur only in fast and complex action. Control patients have significant improvement in motor activity that was observed on day 10, then the values decreased. Compared to the baseline, no change was observed in the 1st month.

Similar are the results of tracking the muscle tone in the upper and lower limbs, according to the Ashworth scale before and after the KT in the EG. An improvement is noted between mild and missing spasticity. The effect of reducing the spontaneously increased muscle tone of the affected limbs is sustained and is maintained until the first month of follow-up.

In the CG, the decrease in muscle tone was observed on day 10.

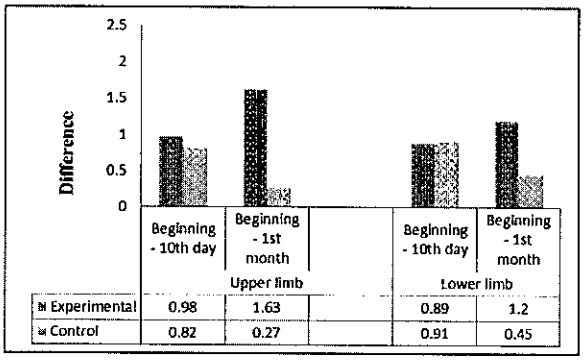

Figure 1. *Changes in motor recovery presented as the difference between the results obtained and the baseline values in the two study groups, *** P <0.001 – Significant change between the two groups during treatment, assessed by the U-criteria of the Mann-Whitney Test.*

Similar changes in muscle tone are seen when compared between the two groups (Fig. 2). The effect of specialized kinesitherapy methodology (SKTM) is significantly better than standard KT at the 1 month of treatment (Fig. 2).

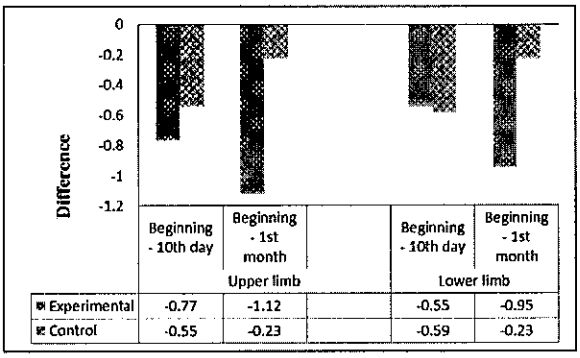

Figure 2. *Changes in muscle tone, presented as difference between results and baseline values in the two groups studied, *** P <0.001 – Significant change between the two groups during the course of treatment as assessed by the Mann-Whitney U-Criterion Test*

Discussion

The lasting positive effect in the EG may be related to various mechanisms where the applied targeted movements affect the functional capabilities of patients with chronic stroke in a chronic period. These basically include: functional upper and lower limb movements, body and pelvic control that normalize the control of the body's intact and affected parts, and the motor response sequence. It is essential to include walking instruction in the methodology, which leads to: normalizing the control of the lower limbs and facilitating the movement (Vasileva et al., 2015; Vasileva et al., 2015; Vasileva et al., 2017; Lubenova et al., 2008). The improvement on the 10th day of onset treatment in the two groups is probably due to the fact that the methodologies used are moderate in intensity and are tailored to the patient's individual abilities.

Beneficial effect in patients in the EG remains significant in the one month follow-up, which necessitates the need for a sustained KT use of at least 4 weeks and appropriate individual training. Training in new methods, with the necessary length of time, changes the brain and creates a new motor stereotype (Lubenova, Titianova, 2015). Improved locomotor activity on the 10th day in a hospital setting under the control of a therapist is maintained in the middle of life, which has been linked to the positive influence of the surrounding and psychosocial factors relevant to the performance of motor tasks. Apparently these home-based factors are beneficial and provide an opportunity to generalize acquired skills (Dijoseph, 1982; Iwarsson, Isacsson, 1997). Grigorova-Petrova K., (2014) confirms that the duration is essential for the recovery of patients with stroke in an acute period with a 4-week KT program. There is a significant improvement in everyday activities evaluated throughout the Barthel Index to moderate dependence on day-to-day activities of the 1st month following the incident. The author demonstrates the positive effect of the applied KT in an acute period after ischemic stroke and the need for continuation of the KT to achieving patient independence in everyday life, which has been reported for most follow-up activities of the FIM test in this study (Grigorova-Petrova, 2014). Differences in mild and moderate changes can be explained by the fact that functional recovery involves more than the restitution of body functions. In particular, recent studies exploring human kinematics show that improving fine movements and gait is largely based on the use of compensatory motion strategies to help patients learn to cope with the existing neurological deficit (Kwakkel et al., 2004). The use of specialized KT has a beneficial effect on the functional mobility of patients with stroke in a chronic period. The effect is positive and continues until the end of the intervention period in the EG (Indredavik et al., 1998; O'Sullivan, 2007; Pollock et al., 2014).

Conclusion

The presented data clearly underline the different tendency of the changes in the all patients and the significant early and late effects of SKTM in patients with supratentorial unilateral stroke in the chronic period. In the EG, a significant improvement was observed on the 1st month post-initiation of kinesitherapy, with a p <0.001 level of significance during treatment, whereas in the controls the observed positive effect on day 10 decreased and patients regained baseline. The applied short-term kinesitherapy has no long-lasting effect.

Literature

Bersano, A., Ballabio, E., Lanfranconi, S., Corti, S., Locatelly, F., Baron, P., Bresolin, N., Parati, E., Candelise, L. (2010), Clinical studies in stem cells transplantation for stroke: a review, *Curr Vase Pharmacol*, Vol. 8, pp. 29–34.

Cowland, C., Stratford, P., Ward, M. (1993), Measuring physical impairment and disability with the Chedoke-McMaster Stroke Assessment, *Stroke*, Vol. 24 No. 1, pp. 58–63.

Dijoseph, L. (1982), Indipendence through activity: mind, body and environment interaction in therapy, *Am J Occup Ther*, Vol. 36, pp. 740–744.

Dobkin, B. (2010), What matters in cellular transplantation for spinal cord injury: the cells, the rehabilitation or the best mix?, *Neurorehabil Neural Repair*, Vol. 24, pp. 7–9.

Duncan, P. (1997), Synthesis of intervention trials to im-

prove motor recovery following stroke, *Top Stroke Rehabil*, Vol. 3, pp. 1–20.

Eckel, R., Jakicic, J., Ard, J., Miller, N., Hubbard, V., Nonas, C., de Jesus, J., Sacks, F., Lee, I., Smith, S., Lichtenstein, A., Svetkey, L., Loria, C, Wadden, T., Millen, B, Yanovski, S. (2013), AHA/ACC Guideline on Lifestyle Management to Reduce Cardiovascular Risk. In Press. *Circulation*. 2013;00:000–000 DOI: 10.1161/01.cir.0000437740.48606.d1

Gordon, N., Gulanick, M., Costa, F., Fletcher, G., Franklin, B., Roth, E., Shephard, T. (2004), Physical Activity and Exercise Recommendations for Stroke Survivors: An AHA Scientific Statement From the Council on Clinical Cardiology, Subcommittee on Exercise, Cardiac Rehabilitation, and Prevention, *Stroke*, Vol. 35, pp. 1230–1240.

Grigorova-Petrova, K., Lubenova, D., Dimitrova, A., Baldaranov, D., Lozeva, J. (2014), Feasibility of Early Physical Therapy Program In-Hospital Patients with Acute Ischemic Stroke, *Macedonian Journal of Medical Sciences*, Vol 7 No.3, pp. 452–455.

Indredavik, B., Bakke, F., Slordahl, S. (1998), Stroke unit treatment improves quality of life: a randomized controlled trial, *Stroke*, Vol. 315, pp. 895–899.

Iwarsson, S., Isacsson, A. (1997), On scaling methodology and environmental influences in disability assessments: the cumulative structure of personal and instrumental ADL among older adults in a Swedish rural district, *Can J Occup Ther*, Vol. 64, pp. 240–251.

Katsiki, N., Ntaios, G., Vemmos, K. (2011), Stroke, obesity and gender: a review of the literature, *Maturitas*, Vol. 69, pp. 239–243.

Kernan, W., Inzucchi, S., Sawan, C., Macko, R., Furie, K. (2013), Obesity: a stubbornly obvious target for stroke prevention, *Stroke*, Vol. 44, pp. 278–286.

Krakauer, J. (2006), Motor learning: its relevance to stroke recovery and neurorehabilitation, *Curr Opin Neurol*, Vol. 19, No. 1, pp. 84–90.

Kwakkel, G., Kollen, B., Lindeman, E. (2004) Understanding the pattern of functional recovery after stroke: facts and theories, *Restor Neurol Neurosci*, Vol. 22, pp. 281–299.

Li, J., Siegrist, J. (2012), Physical activity and risk of cardiovascular disease: a meta-analysis of prospective cohort studies, *Int J Environ Res Public Health*, Vol. 9, pp. 391–407.

Lubenova, D., Dimitrova, A., Ganchev, D. (2008), Characteristics of kinesitherapy in patients with agnosia after ischemic stroke in the undetermined hemisphere, *Kinesitherapy*, Vol. 1, pp. 12–20.

Lubenova, D., Titianova, E. (2012), Principles of modern neurorehabilitation, *Neurosonology and cerebral hemodynamics*, Vol. 8, No. 1, pp. 45–55.

Lubenova, D., Titianova, E. (2015), Neurorehabilitation, in Titianova, E. (Ed.), *Neural Diseases Textbook – General Neurology*. University Publishing House „St Kliment Ohridski", Sofia, pp. 249–259.

O'Sillivan, S. (2001), Strategies to improve motor control and motor learning, in O'Sillivan, S., Schmitz, T. (Ed.), *Physical rehabilitation: assessment and treatment*. 4-th Ed, Philadelphia, Davis Company, pp. 363–368.

O'Sullivan, S. (2007), Stroke, in O'Sullivan S., Schmitz T. (Ed.), *Physical rehabilitation*. Philadelphia, Davis Company, pp. 704–768.

Peppen, R., Kwakkel, G., Harmeling-van der Wel, B., Kollen, B., Hobbelen, J., Buurke, J., et al. (2004), KNGF Clinical Practice Guideline for physical therapy in patients with stroke. Review of the evidence, *Nederlands Tijdschrift voor Fysiotherapie*, Vol. 114, No. 5 (Suppl).

Pollock, A., Baer, G., Campbell, P., Choo, P., Forster, A., Morris, J., Pomeroy, V., Langhorne, P. (2014), Physical rehabilitation approaches for the recovery of function and mobility following stroke, *Cochrane Database of Systematic Reviews*, 4–001920.

Roth, E., Harvey, R. (2000), Rehabilitation of stroke syndromes. In: Braddom R, ed. *Physical Medicine and Rehabilitation*. 2nd ed. Philadelphia, Pa: WB Saunders, pp. 1117–1163.

Titianova, E. (2007), Reorganization of motor control after unilateral stroke, *Neurosonography and cerebral hemodynamics*, Vol. 3, No. 1, pp. 42–47.

Titianova, E., Velcheva, I., Stamenov, B., Hristova, E., Karakaneva, S., Staikov, I., Grozdinski, L., Petrov, I. (2008), Algorithm for ultrasound diagnostics and therapeutic behavior in carotid pathology. Kontsensus of the Bulgarian Association of Neurosonology and cerebral hemodynamics, *Neurosonology and cerebral hemodynamics*, Vol. 4 No. 2, pp. 12–134.

Vasileva, D., Izov, N., Maznev, I., Lubenova, D., Mihova, M., Markovski, V., Nistor Cseppento, C. (2017), Changes in Kinetic Parameters of Gait in Patients with Supratentorial Unilateral Stroke in Chronic Period, *Open Access Macedonian Journal of Medical Sciences*, Vol. 5, No. 2, pp. 201–206.

Vasileva, D., Lubenova, D., Mihova, M., Dimitrova, A., Grigorova Pertova, K. (2015), Influence of kinesitherapy on balance reactions in patients with ischemic stroke in the chronic period, *Open Access Macedonian Journal of Medical Sciences*, Vol.3, No. 4, pp. 601–606.

Vasileva, D., Lubenova, D., Mihova, M., Dimitrova, A., Grigorova Pertova, K. (2015), Influence of kinesitherapy on gait in patients with ischemic stroke in the chronic period, *Open Access Macedonian Journal of Medical Sciences*, Vol.3, No. 4, pp. 619–623.

Vasileva, D., Lubenova, D. (2014), Adapted program for independent home rehabilitation in patients with chronic stroke. *Sports and Science*, Vol.58, No. 3, 61–72.

Wade, D. (1992), *Measurement in neurological rehabilitation*. University Press, Oxford.

Willey, J., Moon, Y., Paik, M., Yoshita, M., Decarli, C., Sacco, R., Elkind, M., Wright, C. (2011), Lower prevalence of silent brain infarcts in the physically active: the Northern Manhattan Study, *Neurology*, Vol. 76, pp. 2112–2118.

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PHYSIOTHERAPY IN PATIENTS W ITH CHRONIC RESPIRATORY FAILURE IN CLINICAL STAGE

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ABSTRACT

AIM: To evaluate the effect of physiotherapeutic (PT) methodology including inspiratory training device on functional status in patients with acute exacerbation of chronic obstructive pulmonary disease (COPD) and chronic respiratory failure (CRF) in clinical stage.

METHODS: 20 patients with exacerbation of COPD in clinical stage divided into experimental group (EG) and control (CG) were examined. One week in-hospital physical therapy sessions were conducted. All patients were applied the same PT methodology, but in the EG in addition was included individual inspiratory training device without resistance of inhaled air. For the purpose of the study are double-tracked and evaluated the following tests and measures: breathing rate at rest, saturation and two apneic tests.

RESULTS: After completion of the PT sessions there is an increase in saturation, in the strength of intercostal muscles and diaphragm according the tests for inspiratory and expiratory apnea and decrease in the respiratory rate at rest in both groups, but in the EG the results were better in mean values.

CONCLUSIONS: The use of inspiratory training device without resistance in patients with COPD and CRF in a period of exacerbation in clinical stage leads to significant positive effect on studied parameters.

Key words: COPD; inspiratory training device; physiotherapy

Introduction

Chronic obstructive pulmonary disease (COPD), is a group of respiratory diseases, including pulmonary emphysema and chronic obstructive bronchitis, which almost always present together in varying degrees of manifestation with progressive development of chronic respiratory failure (CRF).

COPD is considered to be a major global epidemic, as one in ten adults over 40 years most likely has COPD. Almost 3 milion people worldwide have died from COPD annually. According to the World Health Organization, COPD is the sixth leading cause of death in the world. The prediction is that by 2020 COPD is going to be the third leading cause of death worldwide after the heart attack and stroke (Kostov, 2004).

Pulmonary rehabilitation is integrated into the overall approach of treating patients and it is individually aimed at reducing the burden of respiratory complaints, optimizing the functional status, keeping patients in a stable condition, preventing the complications of other organs and systems, and reducing the economic expenses and the need for health care. Moreover, it is the most effective therapeutic strategy for reducing breathlessness, improving the physical endurance, and improving the quality of life compared to the standard and self- medication treatment (Kostov, 2004; Karaneshev, 1991).

The physiotherapy is the most important part of a complex pulmonary rehabilitation. It positively affects patients with COPD and CRF at all stages of the disease (Berry et al., 1999), and the long-term effect of a PT course of treatment is undoubtedly proven (Foglio et al., 1999; Griffiths et al., 2000; Young et al., 1999). One of the most common causes of pro-

gressive worsening of pulmonary function and the progressive development of a chronic respiratory failure is Chronic Obstructive Pulmonary Disease.

Chronic respiratory failure is a disease state in which the exchange of oxygen and carbon dioxide between the atmosphere and the blood in the lungs is impaired, and the normal oxygen content (hypoxemia), and later the carbon dioxide in the arterial blood (hypercapnia), can not be supported. CRF occurs in a number of acute and chronic diseases of the cardiorespiratory system, blood diseases, some diseases of the central nervous system and others. The most progressive chronic bronchopulmonary diseases cause respiratory failure, which is often accompanied by a cardiovascular failure and neuropsychiatric syndrome. Depending on the nature of the underlying disease process, respiratory failure occurs acutely or chronically. Chronic pulmonary failure develops progressively over most chronic diffuse bronchopulmonary diseases, most commonly due to the chronic bronchitis, bronchial asthma, and pulmonary emphysema. All other diffuse diseases of the lungs and thorax could also cause respiratory failure (Dimitrova, 2009).

Targeted respiratory rehabilitation is recommended for all patients, especially if they have reduced physical tolerance, dyspnea on exertion, fatigue, and/or impaired daily motor activity. The early administration of PT in COPD patients has demonstrated clinically significant improvements in the quality of life and health status (Dimitrova, 2013).

Weakness of the respiratory muscles in the majority of COPD patients, even in the early stages of the diseases, is observed and it leads to the appearance of hypercapnia, dyspnea, night oxygen desaturation, and reduced functional walking options. It is proven that during physical exercises, diaphragm work increases in COPD patients as compared to healthy individuals, and causes quicker respiratory muscle fatigue and shortness of breath.

Inspiratory muscle training (IMT), in addition to the selected physiotherapeutic methodology, is suitable for use in a number of respiratory illnesses, but studies on its influence on the functional status of patients with COPD at the clinical stage are quite controversial. Some researchers conclude that IMT increases the muscle strength and endurance of the respiratory muscles and reduces the dyspnea. Other authors believe that adding of IMT to the general training program does not significantly improve the physical capacity and quality of life of the patients. The exact characteristics of the patients with COPD, which require the inclusion of IMT with devices as part of the therapeutic exercises in PT sessions, have not yet been established (Gosselink, 2011).

This study aimed to research the effect of the use of an inspiratory training device without resistance on the functional status of patients with CRF due to exacerbation of COPD.

Material and methods

Twenty patients with exacerbation of COPD and CRF in the St. Anna University Hospital – Sofia, were examined. The study covers the period from the hospitalization of patients and administration of physiotherapy to their discharge from the pulmonary disease clinic (an average of 7 days). The contingent was divided into two groups – control (CG) and experimental (EG) (Table 1). The EG consisted of 10 patients selected according to their desire to perform an inspiratory training with an individual Coach2 Incentive Spirometer without resistance, in addition to the individual PT procedures. The CG included 10 patients who were treated with the same PT methodology as the EG but without an inspiratory training device. The patients were in the second stage of COPD according to GOLD (Global Initiave for Chronic Obstructive Pulmonary Disease, 2014) with a mean disease duration over 10 years.

For the purposes of the study, the following indicators were tracked and evaluated: respiratory rate at rest (number of inspirations/min.), oxygen saturation at rest (%), inspiratory and expiratory apnea tests (sec.).

The PT complex comprised the following administered to patients in both groups: nasal, thoracic and diaphragmatic breathing; rhythmic exercises for distal muscle groups; resistance exercises against upper limbs; specific breathing techniques; relaxing massage of the intercostal muscles; active exercises including slopes and curves; exercise to stimulate expectoration and coughing, and dosed walking.

The patients from the EG performed an inspirational muscle training with an individual Feedback Device Coach 2 Incentive Spirometer without inspi-

ratory resistance. All patients in the experimental group, after the initial tests, were given inspiratory exercise devices and precise and clear instructions, in order to allow them to practice 3–4 times a day for self-training. According to the norm, depending on the height, gender and age of the patients, the maximum amount of air was set to be inhaled slowly and gradually. The inspiration itself was through the mouthpiece which is linked to the section that shows how steady the breathing is, and in turn is related to the section indicating the amount of inhaled air. Each series consisted of 3–4 inspirations and after each inhalation a rest of 30 sec. was made. The inhalation time duration must be at least 3 sec. 3–4 series of inspirations were performed throughout the duration of the whole day. The use of this device, provided with a scale allowing visual control of the velocity and volume of the breathed air, stimulated a slow and deep inhalation. The aim was to improve the strength and endurance of the inspiratory muscles.

In the clinical stage of treatment, the load was determined by the patient's current status. The functional capabilities of patients and their clinical conditions were taken into consideration, and the load was optimal and distributed twice a day.

Student's t-criterion was used to determine the change significance for each group in the course of treatment, and the significance of the changes between the two groups.

Results and discussion

The general characteristic of the surveyed contingent is presented on table 1.

Table 1. Common characteristic of the contingent

Parameter \ Group		EG	CG
Mean age		59,5 ± 8,9	67,8 ± 3,8
41–50 years		0	1
51–60 years		2	4
61–70 years		6	5
71–80 years		2	0
Gender	male	4	5
	female	6	5
Smoking status		5	2

EG – experimental group; CG – control group

The results of monitored saturation, respiratory frequency at rest, and functional breathing tests, objectively reflect the changes in the cardiorespiratory system in both groups of patients, and are presented on table 2.

Table 2. Changes of the respiratory parameters and the saturation (mean value and standard deviation) in the experimental and control groups before and after treatment

Parameter	Group	mean value ± SD	mean value ± SD	Difference (X_2–X_1)
Respiratory rate at rest (number of breaths/min)	EG	23.5 ± 2.6	20.8 ± 1.8**	- 2.7
	CG	24.0 ± 0.8	21.4 ± 0.5***	- 2.6
	P	**0.605**	**0.350**	
Saturation at rest (%)	EG	91.6 ± 6.0	94.5 ± 5.8**	2.9
	CG	81.9 ± 7.1	77.39 ± 8.60**	5,1
	P	**0.010**	**0.010**	
Inspiratory apnea (sec)	EG	18.4 ± 6.2	21.5 ± 5.4***	3.1
	CG	19.0 ± 1.9	20.9 ± 1.8***	1.9
	P	**0.788**	**0.761**	
Expiratory apnea (sec)	EG	15.9 ± 4.7	18.9 ± 3.6***	3.0
	CG	16.0 ± 1.4	77.39±8.60***	2.1
	P	**0.944**	**0.579**	

EG-experimental group; CG-control group; X_1- mean values before treatment; X_2 – mean values after treatment; SD – standard deviation; p-*significant difference between the EG and CG (Student t-test)* *** $p<0.001$, ** $p < 0.01$

The two apneic tests reflect the condition of the cardiorespiratory system. There are no fixed norms for the parameters of inspiratory and expiratory apnea in elderly people.

As it is known, the expiratory apnea test provides indirect information about the left atrial and left ventricular functional conditions, and the inspiratory apnea test provides indirect information about

the right heart half. The inspiration increases intrathoracic pressure, which prevents blood movement from the right ventricle to the lungs. In healthy middle-aged individuals, the breathing retention time after inspiration usually is an average of 40–50 sec., and the breathing retention time after expiration is 30 sec. on average. An inspiratory test under 15 sec. and expiratory test under 10 sec. is considered to be a sign of impaired cardiac and pulmonary function (Slŭnchev, Toteva, 1975; Slŭnchev at al., 1986).

The results of the two apneic tests from the patients in the EG, before the applied PT, were on average 18.4 sec. for the inspiratory apnea and on average of 15.9 sec. for expiratory apnea. This indicates worsening cardiac function, specifically in the right ventricle and right atrium. The results for the CG at the beggining of the study were slightly higher than results in the EG. Regarding the inspiratory apnea, an average score of 19 sec. was recorded, and an average of 16 sec. was recorded in the expiratory apnea. (Table 2). At the end of the study an improvement in both groups was observed, and in the experimental group the two apneic samples were improved on average by 3 sec., and apneic samples in the CG were improved on average by 2 sec. The results at the end of the study showed a statistically significant increase in time for both inspiration and expiration ($p < 0.01$).

Oxygen blood saturation at rest is relatively constant, and it is difficult to influence. Changes at the end of the study were insignificant and unreliable. Against the background of stable oxygen saturation, an increase in breathing hold time was observed, which had a direct relationship to the haemodynamics and breathing. We take these small but unidirectional in dynamics results as a consequence of purposefully applied physiotherapy.

The respiratory rate at rest, measured at the beginning and the end of the study, showed significant reductions in both groups, and it was important to take into account that the mean values (20.8 ± 1.8) in the experimental group were close to the norm (16–20 inspirations/min).

The application of a respiratory training device is an appropriate addition to the PT complex to improve the functional condition of the patients, because it gives positive results, it is safe, easy, and convenient to use, and it does not require continuous control by a physiotherapist.

Conclusion

In conclusion, the present study shows that the use of a non-resistance inducer device in COPD patients at the clinical stage is appropriate and has a positive effect on oxygen saturation, respiratory muscular strength, and respiratory rate at rest.

Reference

Berry, M., Rejeski, W., Adair, N., et al. (1999), Exercise rehabilitation and chronic obstructive pulmonary disease stage, Am J Respir Crit Care Med, Vol.160, pp. 1248–53

Dimitrova, A. (2013), Geriatrichna dikhatelna rekhabilitatsiya, Betaprint – Petrovi i Sie, Sofiya

Dimitrova, A. (2009), Pulmonalna rekhabilitatsiya pri khronichna dikhatelna nedostatŭchnost i khronichna obstruktivna belodrobna bolest, In Spiro, Vol. 2, pp. 24–29

Foglio, K., Bianchi, L., Bruletti, G., et al. (1999), Long-term effectiveness of pulmonary rehabilitation in patients with chronic airway obstruction, Eur Respir J, Vol.13, pp. 125–132

Global Initiave for Chronic Obstructive Pulmonary Disease (GOLD), (2014), Global strategy for the diagnosis, management and prevention of chronic obstructive pulmonary disease

Gosselink, R. (2011), Controlled breathing and dyspnea in patients with chronic obstructive pulmonary disease, J Rehabil Res Dev, Vol.40, pp. 25–34

Griffiths, T., Burr, M., Campbell, I., et al. (2000), Results at 1 year of outpatient multidisciplinary pulmonary rehabilitation: a randomised controlled trial, Lancet, Vol. 355, pp. 362–368

Karaneshev, G. (1991), Obshta teoriya i metodika na lechebnata fizkultura, Meditsina i fizkultura, Sofiya

Kostov, K. (2004), KHOBB. Ima li takava bolest?, Monografiya, Ankos, Sofiya

10. Slŭnchev, P., Bonev, L., Bankov, S. (1986), Rŭkovodstvo po kineziterapiya., ÍÍ izdanie, Meditsina i fizkultura, Sofiya

Slŭnchev, P., Toteva, M. (1975), Rŭkovodstvo za prakticheski uprazhneniya po meditsinski nadzor, Meditsina i fizkultura, Sofiya

Young, P., Dewse, M., Fergusson, W., et al. (1999), Improvements in outcomes for chronic obstructive pulmonary disease (COPD) attributable to a hospital – based respiratory rehabil-itation programme, Aust N Z J Med, Vol. 29, pp. 59–65

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