

Possibilities of using combined kinesiotherapy in patients with coxarthrosis

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Abstract

Introduction: Osteoarthritis is the most common disease of the musculoskeletal system. Coxarthrosis accounts for over 40% of all osteoarthritis. Physical exercises are an important component of the rehabilitation treatment of patients with coxarthrosis. The use of combined kinesiotherapy in the conservative treatment of coxarthrosis is pathogenetically justified because combined kinesiotherapy on an inclined plane contributes to the unloading of hip joints and the lumbar region of the spine, which has an impact on pathologically changed biomechanical relationships in the joint and prevents the development and progression of pathological changes on the part of the lumbar region of the spine, which are usually inherent in coxarthrosis and are biomechanically related to it. **Patients and Methods:** The study involved 68 patients with coxarthrosis who met the inclusion criteria from May 2018 to May 2020, followed by a 3-month follow-up. All patients were divided into two groups depending on the type of treatment and rehabilitation complex (TRC). 32 patients of the first group (control group) received TRK №1, which included complex treatment using standard physiotherapy exercises. The second group included 36 patients who received a complex of combined kinesiotherapy (TRK №2). The study's results were analyzed by assessing the intensity of the pain syndrome and the quality of life according to the algofunctional Lequesne index, the WOMAC index, and the EuroQol-5D-3L questionnaire. The effectiveness of treatment was assessed after 1 and 3 months of using TRK. Data were collected and analyzed using common methods in MS Excel 2010 and Statistica software environments. Descriptive statistics were presented as frequencies and proportions (%) or mean ± standard deviation. The difference was considered significant if the achieved level of significance (p) was below 0.05. **Results:** Analysis of the results of the study showed significant advantages of using combined kinesiotherapy in the complex treatment of patients with coxarthrosis in comparison to standard kinesiotherapy. Including combined kinesiotherapy in the complex rehabilitation treatment of patients with coxarthrosis significantly improved the quality of life according to the EuroQol-5D-3L scale and contributed to a decrease in the intensity of the pain syndrome (by 34.4% according to VAS, the Lequesne algofunctional index - by 2 times, the WOMAC index - by 36,4 %) (p<0.05). Using combined kinesiotherapy helped to improve the functional activity of the joints and increase the adaptive capabilities of the body in the long-term follow-up period. **Conclusions:** The use of combined kinesiotherapy in the complex rehabilitation treatment of patients with coxarthrosis significantly increases the effectiveness of treatment.

Keywords: osteoarthritis, kinesiotherapy, rehabilitation, quality of life.

Introduction

Musculoskeletal disorders continue to hold a leading position in the category of temporary disability and causes of disability and mortality among the adult population. In addition, the pathology of the musculoskeletal system is also associated with deteriorating mental health and reduced functionality of people of working age (Östlind et al.,2021; Veronese et al.,2016; Haluzynskyi et al.,2020; Wallace et al.,2017). Osteoarthritis is the most prevalent disease in this group and is one of the ten most disabling diseases of the modern world (Veronese et al.,2016; Turkiewicz et al.,2019) According to the ACR (American College of Rheumatology) in 2019, osteoarthritis was diagnosed in about 302 million people. In addition, osteoarthritis is a disease that continues to spread, so, according to ACR estimates, by 2025 this disease will affect about 350 million people (Soroka,2020).

The results of a study by Veronese N. and co-authors indicate an association between osteoarthritis with an increased risk of mortality (Veronese et al.,2016). Among patients with osteoarthritis, the overall mortality rate is 50% and the cardiovascular mortality rate is 71% higher than in the general population. (Tereshchenko, 2021). In 2018, the US Food and Drug Administration (FDA) recognized osteoarthritis as a serious, life-threatening disease in which patient monitoring and initiation of treatment are necessary for the early stages of its development (Golovach et al.,2021).

Among all forms of osteoarthritis, more than 40% are coxarthrosis, which ranks first in terms of temporary and permanent disability and second after gonarthrosis in terms of incidence (Afanasiev et al.,2020). The proportion of people with disabilities due to coxarthrosis of various origins is, according to various authors, from

20 to 30%, which has the character of chronic and progressive disease (Roy et al.,2017). Although the prevalence of diseases in the musculoskeletal system increases with age, they also affect a large number of young people, during the years of greatest labor and social activity. According to the literature, in recent years there has been a "rejuvenation" of the pathology of the hip joint, and at a young age is determined by the increase in severe forms (Golovach et al.,2021; Afanasiev et al.,2020). Diagnosis of musculoskeletal disorders among young people is often difficult due to higher tolerance to pain than older people have, which leads to the beginning of treatment, not in the early stages of the disease, but later. Therefore, osteoarthritis at a young age is a common disease and is usually asymptomatic.

Pain syndrome, impaired support function, and limited motor activity leads to loss of ability to work or to limiting it, complicates self-care, and reduces the quality of life of patients. The main goals of osteoarthritis therapy are reduction of pain, improvement of joint function, prevention of functional insufficiency, improvement of quality of life, and prevention or reduction of adverse effects of pharmacotherapy (Veronese et al.,2016; Roy et al.,2017).

Modern directions of development of rehabilitation technologies to prevent disability due to degenerative-dystrophic joint diseases include methods of physical rehabilitation, including the usage of various methods of kinesiotherapy, to improve the quality of life of this group of patients, their social status, and economic status (Östlind et al.,2021; Cieza et al.,2020; Nguyen et al.,2016). Exercises used in comprehensive physical rehabilitation programs are the most important "tools" of rehabilitation treatment and are aimed at improving joint function, increasing muscle endurance, developing skills of balance and posture, increasing physical activity and efficiency of the patient (Östlind et al.,2021; Nguyen et al.,2016; Yegudina et al.,2020). The use of kinesiotherapy in the early stages of the disease helps to reduce significant functional disorders, maintain mobility in the joints, and increase the ability of tendons and muscles to reduce the load on the joint during movement (Roy et al.,2017; Nguyen et al.,2016; Yegudina et al.,2020; Nevedomska et al.,2018).

A special place among the methods of physical therapy for coxarthrosis is occupied by the methods of kinesiotherapy, which contribute to the unloading of the hip joint. Axial and mechanical load on the affected hip joint is one of the main factors in increasing the pain syndrome in patients with coxarthrosis, therefore patients' commitment to physical activity decreases, and patients, limit the physical load on the joint. Muscles lose strength and mass, which further contributes to the progression of pathological changes in the joint. But the conditions for ensuring the functional activity of the hip joints, namely, hip movements, are also the normal tone of the muscles adjacent to the joint (Voloshyna et al.,2020; Babov et al.,2012). Therefore, an important factor in the treatment of coxarthrosis is the maximum unloading of the hip joint, which creates conditions not only for reducing the axial load on the joint but also conditions for improving the metabolism of cartilage tissue (Nevedomska et al.,2018).

In addition, a violation of the biomechanics of walking, which occurs with coxarthrosis, leads to the development of pathology from the lumbar spine. Performing exercises on an inclined plane during combined kinesiotherapy contributes to the functional unloading of both the hip joint and the lumbar spine, reduces pain associated with muscle dysfunction and mechanical stress, and allows you to perform exercises effectively to improve the functional state of the hip joint and prevent muscle atrophy. Combined kinesiotherapy in the complex conservative treatment of patients with coxarthrosis prevents the development and progression of pathological changes in the lumbar spine that accompany coxarthrosis and are biomechanically associated with it (Babov et al.,2012).

Prospects for new research lie in the theoretical substantiation and improvement of methodological approaches to kinesiotherapy in the treatment of coxarthrosis, in consideration of the pathogenetic and biomechanical features of the disease.

The aim of the study. Improving the effectiveness of rehabilitation therapy for patients with osteoarthritis of the hip joints by using in the complex treatment combined kinesiotherapy on an inclined plane.

Material & Methods

This was a comparative study with a sequential sample. The study involved 68 patients with coxarthrosis who met the inclusion criteria, from May 2018 to May 2020, followed by a 3-month follow-up.

We observed 68 patients aged 36 to 57 years with osteoarthritis of the hip joints. Among them, there were 51 men (75.0%), and 17 women (25.0%). Lesions of one joint were observed in 42 (61.8%) patients, bilateral lesions, respectively, in 26 (38.2%) cases. Usually, coxarthrosis was secondary, post-traumatic, or dysplastic.

Most patients were diagnosed with stage I osteoarthritis (42) (61.8%), stage II was diagnosed among 23 (33.8%) patients, the rest had stage III manifestations, and patients with stage IV osteoarthritis were not in the observation groups.

Inclusion criteria: patient consent, adult patients younger than 65 years, coxarthrosis stage I-III in remission, the patient's ability to exercise.

Exclusion criteria: severe comorbid conditions in the stage of decompensation (type 2 diabetes, hypertension, chronic heart failure, chronic kidney disease and other), coxarthrosis stage IV, coxarthrosis in the stage exacerbate, intra-articular injections

All patients signed a written Informed Voluntary Patient Consent for participation in the clinical trial.

The study was approved by the Ethics and Academic Integrity Commission at Odessa National Medical University/ The algorithm of complex examination of patients included: general clinical, orthopedic, neurological, X-ray examination (MRI, CT), assessment of the quality of life by algofunctional index Lequesne, WOMAC, and the visual analog scale of pain (VAS), Coefficient of saturation of symptoms (CS) and EuroQol-5D-3L Questionnaire. Evaluation of the effectiveness of treatment was performed after the use of the treatment and rehabilitation complex (TRC) (Table 1).

Table 1: Clinical characteristics of patients

	Group I (n = 32)	Group II (n = 36)
Age, years	49.5±1.57	52.3±1.64
Men, n(%)	24(75.0)	27(75.0)
Women, n(%)	8(25.0)	9(25.0)
Unilateral coxarthrosis, n(%)	20(62.5)	22(61.1)
Bilateral coxarthrosis, n(%)	12(37.5)	14(38.9)
Radiological stage I, n(%)	20(62.5)	22(61.1)
Radiological stage II, n(%)	11(34.4)	12(33.3)
Radiological stage III, n(%)	1(3.1)	2(5.6)
VAS, (M ± σ)	6.8±0.2	6.4±0.2
Lequesne index, (M ± σ)	7.6±0.2	7.7±0.2
WOMAC, (M ± σ)	53.1±2.2	56.2±2.2
EuroQol-5D-3L, (M ± σ)	9.9±0.2	10.0±0.2

The orthopedic examination included determination of the range of active and passive movements in the hip joints, algometric assessment (severity of pain on palpation, active and passive movements), and signs of inflammation, disfiguration, and deformity of the joints.

X-ray examination was performed according to generally accepted methods (using a single system of tests) for all patients at the beginning of treatment. A review radiograph was performed. To clarify the diagnosis, if necessary, performed a CT scan or MRI.

The stage of osteoarthritis was determined according to the radiological classification D. Kellgren - Laurence: 0 - no stage of change; Stage I (minor changes) – in significant narrowing of the joint space, the beginning of the formation of osteophytes; Stage II (minimal changes) - a slight narrowing of the joint space, small osteophytes; Stage III (moderate changes) - moderate narrowing of the joint space, multiple osteophytes, minor subchondral sclerosis, moderate deformation of the joint surfaces; Stage IV (pronounced changes) - a sharp narrowing of the joint space, multiple osteophytes, severe subchondral sclerosis, severe deformation of the joint surfaces (Smijan, 2011). Evaluation of the intensity of the pain syndrome according to VAS, in points, allowed to determine the severity of the pain syndrome (0 points - no pain, 10 points - the most severe pain).

In order to determine the severity of osteoarthritis of the hip joint, we used the Lequesne algofunctional index, which is an open questionnaire for self-completion of patients (if this is not possible, then with the assistance of outside help). The questionnaire has three sections: the characteristics of the pain syndrome or discomfort, the maximum distance when walking without pain, and functional activity. The maximum amount of points for each section is 8 points, the total - is 24 points, and the minimum - is 0 points. The assessment is based on the sum of points: 1-4 - mild, mild osteoarthritis, 5-7 - moderate, moderate, 8-10 - severe, severe, 11-13 - severe, very severe, 14 or more - severe, extremely severe osteoarthritis (Lequesne, 1997).

A standardized questionnaire (questionnaire) EuroQol-5D-3L, which meets the requirements of evidence-based medicine and provides information on the self-assessment of health and well-being of the patient, was used to assess the quality of life related to health. The questionnaire contains 15 questions, which assessed the overall index of quality of life and quality of life by 4 factors: physical (mobility, self-care); social (domestic activity); pain, and psychological (anxiety, depression). The first part of the questionnaire was used, in which the patient independently assesses his condition in five settings: mobility (mobility), self-care, normal daily activities, pain and discomfort, anxiety, and depression. For each category of questions, the patient can provide one answer from three options: 1 - no problem, 2 - there is a problem, 3 - a significant problem. The total number of points was calculated (EuroQol Research Foundation, 2018; Janssen et al., 2019).

The effectiveness of treatment was also assessed using the WOMAC (Western Ontario and McMaster Universities Osteoarthritis Index), which is a questionnaire for self-completion of patients, and has 24 questions: the severity of pain (5 questions), stiffness (2 questions), and functional capacity (17 questions). The patient chooses the answers that describe his condition the best on a five-point scale: no problems (0 points), mild (1 point), moderate changes (2 points), severe disorders (3 points), and very severe disorders (4 points). The result

is determined by the total sum of points: excellent - (0 - 14) points, good - (15 –28) points, satisfactory - (29 - 38) points, and unsatisfactory - more than 38 points (Collins et al., 2021).

CS was determined by the ratio of the actual number of patients who experienced symptoms: joint pain, at rest, during movement, at night, on palpation, restricted movement, fatigue in the lower extremities, reducing the walking distance to the number of examined patients in each clinical group.

Evaluation of the effectiveness of treatment by the patient in the remote period (1 and 3 months after the application of the TRC was performed on a scale of "significant improvement", "improvement", "good", "satisfactory", and "unsatisfactory" results. Data were collected and analyzed using common methods in MS Excel 2010 and Statistica software environments. Descriptive statistics were presented as frequencies and proportions (%) or mean \pm standard deviation. The difference was considered significant if the achieved level of significance (p) was below 0.05. All patients were divided into two groups, depending on the type of TRC. Patients of the first group (32 (47.1%)) received TRK №1, which included a comprehensive treatment (orthopedic regimen, massage) using standard therapeutic physical training (a set of training exercises in a sitting or lying position, aimed at strengthening muscles of the lower extremities, improving the functional activity of the joints). 36 (52.9%) patients of the second group received a complex of combined kinesiotherapy (a set of strengthening exercises and exercises for the hip joints) on an inclined plane, in the conditions of unloading the joints and spine, selected individually (as well as the angle of the simulator), depending on the stage of the disease, the severity of pathological disorders, comorbidities, level of physical fitness and the results of functional testing of patients.

Massage (classical and segmental reflexology) was aimed at normalizing tone, increasing the contractility of weakened muscles, improving blood and lymph circulation, trophic and regenerative processes, correcting associated neurological manifestations, and normalization of the patient's emotional state. The course consisted of 10 procedures daily or every other day.

Results

The analysis of the research results showed the advantages of using combined kinesiotherapy in the complex treatment of patients with coxarthrosis.

Thus, according to clinical indicators, after 1 month of TRC №2, CS in patients of the second clinical group decreased by 3.5 times, while in patients of the first group, the improvement of this indicator was only 1.2 times ($p < 0.05$). The improvement in CS with combination kinesiotherapy was due to a reduction in the number of patients with joint pain at rest, at night, during movements, and patients with fatigue in the legs and limited movement in the hip joint.

Joint pain during VAS movements at the beginning of rehabilitation treatment was (6.8 ± 0.2) points in the first group and (6.4 ± 0.2) points in the second group. During the month of observation, there was a slight decrease in the intensity of the pain syndrome - (4.1 ± 0.2) points for VAS), including palpation, among patients receiving standard kinesiotherapy, and a more pronounced improvement (2.2 ± 0.2) VAS scores) and stabilization of patients in the second observation group, where combined kinesiotherapy was used ($p < 0.05$).

The arthrological status was assessed using the Lequesne algofunctional index. The severity of coxarthrosis was assessed in both groups. Before the use of TRC, pathological changes of moderate severity were determined among the patients. There were changes in all categories of the questionnaire, patients noted the presence of pain and a decrease in motor and daily activity (Table 2). Evaluation of the results of the use of TRC in patients with coxarthrosis according to the Lequesne index revealed the advantages of using combined kinesiotherapy and improving the condition of patients. Evaluation by the Lequesne index testified to mild pathological changes in patients of the second group. In the first section of the questionnaire (characteristics of pain or discomfort), the decrease in night pains, and pain when walking and sitting was determined to a greater extent; in the second group of indicators, the maximum distance of pain-free walking increased, and the indicators of the functional activity of patients improved. In patients of the first group, the severity of coxarthrosis remained moderate, despite the improvement in the questionnaire in all categories. Significant improvements in patients of the first group were in the category of functional activity (Table 2).

Table 2: Dynamics of the Lequesne index in patients with coxarthrosis

Groups of indicators	Group I (n = 32)		Group II (n = 36)	
	before TRC	after TRC	before TRC	after TRC

Characteristics of pain or discomfort, (M ± σ)	2.6±0.2	1.9±0.1	2.8±0.2	1.2±0.1
Maximum distance when walking without pain, (M ± σ)	1.8±0.2	1.6±0.1	1.8±0.2	0.8±0.2
Functional activity, (M ± σ)	3.2±0.2	1.9±0.2	3.1±0.2	1.8±0.2
Total points, (M ± σ)	7.6±0.2	5.4±0.2	7.7±0.2	3.8±0.2*

Note. * - $p \leq 0,005$, in comparison with indicators after TRC of patients of the first group

As the study showed, according to the results of EuroQol-5D-3L, before the use of TRC, all patients experienced health problems, and the majority - were in all categories of the questionnaire. When assessing the quality of life on the EuroQol-5D-3L scale of the first part of the questionnaire, in the mobility category, all 100% experienced difficulties with movement. In the self-service category, in addition to certain problems, a small number of patients had significant problems. Problems were least identified in the category of daily activities. Patients in both groups in this category had no significant problems, most patients had only some problems. Pain or discomfort was noted in patients in both groups, with most patients experiencing moderate pain. In the anxiety/depression category, the distribution of patients was as follows: the majority of patients had a moderate feeling of anxiety or depression, a minority (14.6 %) of patients had a significant psycho-emotional problem, and 38.2% of patients had no problems (Table 3).

Table 3: Dynamics of quality of life EuroQol-5D-3L in patients with coxarthrosis

Categories / evaluation	Group I (n = 32)		Group II (n = 36)	
	before TRC	after TRC	before TRC	after TRC
Mobility, n (%)	-	8(25.0)	-	19(52.8)
1 - no problem	32(100.0)	24(75.0)	36 (100.0)	17(47.2)
2 - there is a problem	-	-	-	-
3 - a significant problem	-	-	-	-
Average score, (M ± σ)	2.0±0.13	1.8±0.11	2,0±0,16	1.5±0.12
Self-care, n (%)	-	9 (28.1)	-	21(58.3)
1 - no problem	30(93.75)	23(71.9)	34(94.4)	15(41.7)
2 - there is a problem	2(6.25)	-	2(5.6)	-
3 - a significant problem	-	-	-	-
Average score, (M ± σ)	2.06±0.14	1.7±0.11	2.06±0.18	1.4±0.12
Normal daily activities, n (%)	12(37.5)	16(50.0)	11(30.6)	30(83.3)
1 - no problem	20(62.5)	16(50.0)	25(69.4)	6(16.7)
2 - there is a problem	-	-	-	-
3 - a significant problem	-	-	-	-
Average score, (M ± σ)	1.6±0.12	1.5±0.12	1.7±0.13	1.2±0.11*
Pain/discomfort, n (%)	-	8(25.0)	-	21(58.3)
1 - no problem	22(68.75)	20(62.5)	24(66.7)	15(41.7)
2 - there is a problem	10(31.25)	4(12.5)	12(33.3)	-
3 - a significant problem	-	-	-	-
Average score, (M ± σ)	2.3±0.18	1.9±0.14	2.3±0.2	1.4±0.13
Anxiety/depression, n (%)	6(18.75)	24(75.0)	7(19.4)	24(66.7)
1 - no problem	24(75.0)	8(25.0)	26(72.3)	12(33.3)
2 - there is a problem	2(6.25)	-	3(8.3)	-
3 - a significant problem	-	-	-	-
Average score, (M ± σ)	1.9±0.13	1.3±0.11	1.9±0.11	0.7±0.12*

Note. * - $p \leq 0,005$, in comparison with indicators after TRC of patients of the first group

After the use of TRC in patients of both groups, there was an improvement in the quality of life according to the EuroQol-5D-3L scale. In the "mobility" category, more than half of the patients (52.8%) after using TRC №2 did not experience difficulties in moving and noted an increase in walking distance, a reduction in rest stops, and an increase in movement speed. In the first group (TRC №1), only 25.0% of patients had no problems, the rest continued to experience difficulty in movement.

There were no significant changes in the categories of self-service and daily activities in patients of both groups. In patients of the second group, the indicators in the categories "pain/discomfort" and "anxiety/depression" significantly improved. After TRC №2, more than half of the patients (58.3% and 66.7%, respectively) did not experience pain and discomfort, as well as anxiety and depression. In patients of the first group (TRC №1), improvement was in 28.1% and 37.5% of patients, respectively, while the majority of patients retained pain syndrome and a state of anxiety and depression (Table 3).

The results of the data analysis of the EuroQol-5D-3L questionnaire indicate the presence of differences in the health status of patients of the first and second groups after TRC. The use of combined kinesiotherapy in patients of the second group led to an improvement in the quality of life in all indicators of the questionnaire.

Articular status was also assessed using the WOMAC index. Prior to the use of TRC in the categories "pain syndrome" and "limitation of mobility (stiffness)", patients in both groups noted significant changes. Also, patients had difficulty performing daily activities. Evaluation of the effectiveness of TRC according to the WOMAC index revealed a regression of pain syndrome, morning stiffness, and an improvement in functional activity in patients of both groups.

However, the questionnaire indicators were significantly better in patients of the second group, who used combined kinesiotherapy. The WOMAC index when using TRC №2 was 19.6% better compared to the results after TRC №1 (Fig. 1). Significant improvement was noted in the group of indicators "pain syndrome" and "functional activity". Patients noted an increase in the walking distance on a flat surface, and an improvement in the functional state when descending and climbing stairs while sitting and during household activities. In patients of the first group, difficulties in daily activities, a moderate manifestation of pain syndrome, persisted.

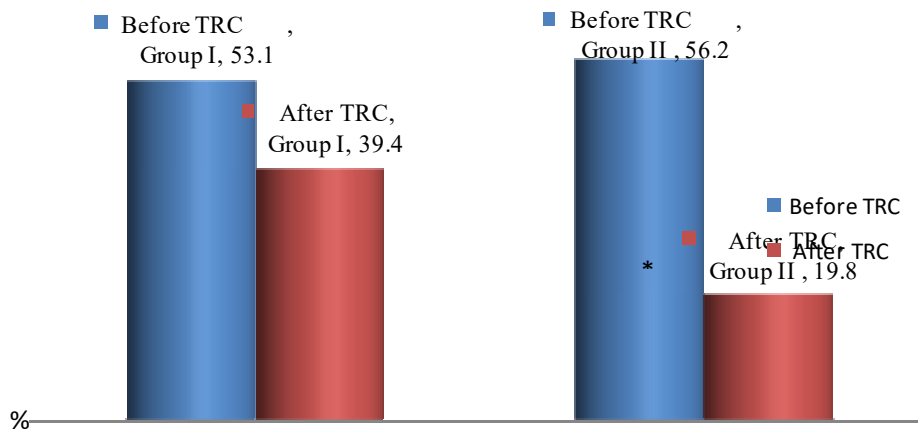


Figure 1: Dynamics of the effectiveness of treatment of ailments with coxarthrosis behind the WOMAC nursery

Note. * - $p \leq 0,005$, in comparison with indicators after TRC of patients of the first group

Long-term treatment results were evaluated 1 and 3 months after the use of TRC on the scale of evaluation of the effectiveness of treatment by the patient. Thus, "significant improvement" and "improvement" after 1 month of comprehensive treatment were noted by more than half of patients in the second group, and only 21.9% of patients in the first group, and after 3 months, such results had, respectively, 75.0% of patients in the second group and 31.3% of patients in the first group.

No effect in 1 month after the use of TRC №1 was noted by 46.9% of patients in the first group, and after 3 months of therapy - 37.5% of patients, while in the second group only 11.1% (one month) and 2.8% (after 3 months) noted the results of treatment as satisfactory, there was no unsatisfactory assessment (Table 4).

Table 4: Evaluation of the effectiveness of treatment by the patient in 1 and 3 months after the use of TRC in patients with coxarthrosis.

Indicator	Group I (n = 32)		Group II (n = 36)	
	1 month	3 months	1 month	3 months
Significant improvement, n(%)	2(6.3)	3(9.4)	8(22.2)	14(38.9)
Improvements, n(%)	5(15.6)	7(21.9)	12(33.3)	13(36.1)
OK, n(%)	10(31.3)	10(31.3)	12(33.3)	8(22.2)
Satisfactory, n(%)	13(40.6)	11(34.4)	4(11.1)	1(2.8)
Unsatisfactory, n(%)	2(6.3)	1(3.1)	-	-

Improvement and stabilization of the condition after 3 months of follow-up were noted by almost all patients in the second group of follow-up (97.2%), while in the first group - 62.5% of patients.

Thus, the use of combined kinesiotherapy in the treatment of patients with coxarthrosis makes it possible to effectively control the manifestations of pain due to the impact on all pathogenetic links of its formation, to maintain the functional activity of joints, including in the remote observation period.

Discussion

The present study was conducted to evaluate the effectiveness of combined kinesiotherapy (in comparison with standard kinesiotherapy) in the complex treatment of 68 patients with coxarthrosis. Using of kinesiotherapy in the complex treatment among patients with osteoarthritis of the hip joints increases the effectiveness of therapy and improves the functional state of the joints and the quality of life of patients.

The statement about the effectiveness of various options for kinesiotherapy in the conservative treatment of patients with coxarthrosis is confirmed by numerous studies. As a result of these studies, it was found that dosed physical activity (kinesiotherapy) causes adaptive reactions aimed at restoring disturbed body functions, including adaptation and self-regulation. At the same time, depending on the degree of pathological disorders, the main compensatory-adaptive processes are activated (Nguyen et al.,2016; [Nevedomska et al.,2018](#); Gay et al.,2016). The most widely studied standard types of kinesiotherapy.

A review study by Moseng T., et al. showed that adherence to exercise is an important factor influencing the outcome of osteoarthritis. According to the authors, international treatment guidelines recommend patient education, exercise, and weight control as the main first-line treatment options for reducing pain and improving physical function among people with hip and knee osteoarthritis (Moseng et al.,2019).

The importance of physical activity and its impact on quality of life was also demonstrated in the Healing Physical Activity (HEPA) study in patients with osteoarthritis. As the authors note, lack of physical activity is a factor in exacerbating symptoms and worsening overall health in patients with osteoarthritis of the hip (Ernstgård et al.,2019).

A descriptive review of evidence and international guidelines on the effectiveness of exercise and strength training in osteoarthritis by Nguyen C. et al. strongly suggests that exercise therapy is widely recommended in the treatment of hip osteoarthritis (Nguyen et al., 2016).

Health Quality Ontario evaluated the effectiveness of a neuromuscular exercise program for patients with hip osteoarthritis in their review of the clinical and economic literature. Compared to usual, the neuromuscular exercise program showed statistically significant short-term improvements in pain and physical function, statistically significant long-term improvements in activities of daily living and quality of life, and sustained long-term improvements in physical function (Health Quality Ontario, 2018).

In a multicenter, non-randomized, controlled study by German scientists, the effectiveness of an 11-week hip and knee training session was evaluated. The exercises included mobilization, muscle strengthening, and postural control training. Scientists provide data on the benefits of exercise therapy in terms of pain reduction and physical functioning (Krauss et al., 2016).

Our assumptions that kinesiotherapy in conditions of unloading the joint and spine (combined kinesiotherapy) is effective in the treatment of patients with coxarthrosis were confirmed in scientific studies in which the reduction of the axial load was achieved in various ways.

The combined approach to kinesiotherapy comprises a combination of special physical exercises for the hip joints and conditions for unloading the lumbar spine and hip joints on an inclined plane (Voloshyna et al., 2020). This type of combined kinesiotherapy promotes decompression, improves the functional activity of the joints, and increases the effectiveness of rehabilitation. The principle of reducing the axial load when using kinesiotherapy in patients with coxarthrosis allows for avoiding the occurrence of pain and increases the patients' adherence to physical activity (Voloshyna et al., 2020).

Conditions for unloading the hip joint can be obtained by performing physical exercises in the aquatic environment. A group of Polish scientists evaluated the effectiveness of physical exercises in water in patients with coxarthrosis. Analysis of the results of their work showed that the rehabilitation program, including water gymnastics, significantly reduced pain in patients with coxarthrosis, contributed to an increase in range of motion and muscle strength, and reduced the use of drugs (Łyp et al., 2016).

One of the options for unloading the hip joint in coxarthrosis is the kinesiotherapy program proposed by Romanian scientists. This program includes stretching exercises, unpacking the hip joint using hanging traction, hydrokinesiotherapy. The results of the study showed that the use of such approaches of kinesiotherapy significantly reduces the progression of coxarthrosis. Special exercises according to the author's method help to strengthen muscles, ligaments, and tendons, functionally improve cardiovascular, respiratory, endocrine, and nervous systems, activation of the self-regulation and recovery system (Moldovan et al., 2019).

The results of this study showed the advantages of combined kinesiotherapy compared with standard kinesiotherapy in patients with coxarthrosis. However, the present study has limitations due to the lack of sufficient information on the use of combined kinesiotherapy in patients with coxarthrosis. In addition, the study is limited by long-term follow-up data and statistical power. The issues of the effectiveness of combined kinesiotherapy in patients with coxarthrosis in the long-term follow-up period remain open and require further study. It is necessary to continue qualitative research in this direction.

Conclusion

1. Dosed exercise on an inclined plane in the mode of unloading the joints helps to reduce hyperpression of motor segments (including the spine), more effective recovery of the patient's functionality, and improve the volume of active movements in the hip joints.
2. The use of combined kinesiotherapy in the complex rehabilitation treatment of patients with coxarthrosis helps to improve motor-visceral regulation, activates regenerative-reparative processes, stimulates occupational hypertrophy, and development of a strong muscular corset, and helps to eliminate pathological conditioned reflexes.
3. The inclusion of combined kinesiotherapy in the complex rehabilitation treatment of patients with coxarthrosis probably improves the quality of life of patients (according to the scale EuroQol-5D-3L) and helps to increase the body's adaptability. Thus, according to VAS, the reduction in the manifestations of the pain syndrome occurred by 34.4 %, the algofunctional Lequesne index - by 2 times, and the WOMAC index - by 36.4% ($p < 0.05$).
4. In the long-term follow-up of patients with coxarthrosis, in whom combined kinesiotherapy was used in complex rehabilitation treatment, the improvement was maintained in 97.2% of patients

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