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## **EXPERIENCE OF APPLICATION OF HYDROKINETIC THERAPY FOR RESTORING THE SKILL OF INDEPENDENT WALKING AFTER THE ENDOPROSTHESIS REPLACEMENT OF JOINTS OF LOWER EXTREMITIES**

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**Key words:** hydrokinetic therapy, hip joint, knee joint, stereotype of walking, rehabilitation.

**Annotation.** The analysis of the effect of exercises in conditions of specially equipped swimming pool on the effectiveness of physical exercises after the total endoprosthesis replacement of large joints of lower extremities was conducted in this study. Forty patients went through rehabilitation after the joint replacement surgery in the medical center "Preodoleniye" for 3 years, positive results in the formation of optimal stereotype of walking at various stages of recovery were achieved. Hydrokinetic therapy, being included into the individual rehabilitation program, has shown its effectiveness at all stages of treatment in such criteria as range of motion, reducing of pain syndrome, muscle strength, confidence in walking without support and the process of forming normal stereotype of walking. Data of observation allows to assess the significance of complex rehabilitation after the total joint replacement using physical exercises in conditions of gravity unloading.

**Introduction.** To this day, the tendency of rehabilitation of patients after the replacement of large joints could be considered as very significant and it has the prospect of developing new methods. Rehabilitation events aimed at the recovery of social, physical and professional status of patients play the most important role. Due to the high incidence of trauma, diseases, degenerative changes in knee and hip joints, the functional abnormality of joints, which serves as a reason for a temporary or full loss of performance capability, turns rehabilitation after the total endoprosthesis replacement into the significant issue of healthcare.

The rate of diseases related to degenerative changes in hip and knee joints, their traumatization and deterioration, according to WHO, would irreversibly increase due to the change of the rhythm of life and the increase of its expectancy. Among the increase of pathologies of the musculoskeletal system the ratio of given trauma could increase up to 80%. In 2005, the number of people of 55 years old and

older was 580 million around the world; in 2025, this number would be higher than one billion. Since 1994, the total endoprosthesis replacement of hip and knee joints was a choice for most patients with the given pathology, leading to the dysfunction of the area and the everyday sensation of pain and discomfort. In most cases, the given method has optimistic prospects for long-term recovery of the quality of life. Similar situation appears in choosing the treatment method for knee joint [2, 8]. The most important component of quality recovery is a balanced, methodologically based program of rehabilitation at all stages after surgical intervention.

The purpose of this study is to examine the effect of exercises in conditions of specially equipped swimming pool on the effectiveness of physical exercises after the total endoprosthesis replacement of large joints of lower extremities.

**Methods and organization.** Forty people (18 women and 22 men) went through rehabilitation after the total replacement of knee (15 patients) and hip (25 patients) joints in the medical center for disabled “Preodolenie” since 2017 to 2020. The age of patients was 45-78 years, the rehabilitation period in in-patient facility was 14 days long. All patients gave their voluntary consent to participate in the study. The 10-meter walk test (Finch), questionnaire of value judgments of the state of health [9], questionnaire of anxiety level during walking without support [9], Barthel scale of activities of daily living were used as criteria for the evaluation.

Results of the study were processed using methods of mathematical statistics.

**Results and discussion.** The program of recovery after the total replacement of large joints of extremities includes a number of subsequent events, which solve the main tasks to an accomplished standard.

Clinical characteristics of the effectiveness, as well as the choice of tools, are adjusted depending on progress of set motor tasks. The recovery period consists of the number of objective methods and tests, defining physiological indicators of the problem area (pain syndrome, volume and strength of engaged muscles, amplitude of movement, support reaction of the operative extremity), and also the choice of rehabilitation tools (mechanical joint working out, therapeutic exercises, physiotherapy, training sessions in gym) and the mode of performance of procedures (passive, passive-active, active) [5].

During the period of active recovery with the increase in physical loads and the formation of normal parameters of walking, the evaluation of quality of performed movement and its significance in everyday activity is the most important. When forming the program of correction of normal walking using the specially equipped swimming pool, the number of methods, which allow to lead the patient to independent walking in the most effective and fast way, is used.

The most frequently used methods are:

- Correction of walking without additional support with the help and control of the coordinator of therapeutic exercises in the pool at the mean depth depending on the height of patient;
- Balance therapy with the use of non-stable platform at the mean depth;
- Performance of the set of exercises aimed at the increase of amplitude of movement of lower extremities.

Given methods were recommended as the effective measures of recovery of normal walking pattern, allowing to significantly improve the quality of life in terms of overall health, recovery of performance capability and independent walking in space. The suggested indicators could be considered as the main ones in order to determine the quality of accomplished task of rehabilitation after the total replacement of large joints of extremities.

Using the means of hydrokinetic therapy in recovery after the endoprosthesis replacement of knee and hip joint is the new experience in solving similar motor tasks. Inclusion of specialized sessions in the pool into the general program of rehabilitation showed results comparable with those, which are published in various sources dedicated to all main indicators [1, 2, 3].

The most effective and quality form of rehabilitation at the given stage was the program of recovery of optimal stereotype of walking without additional support using the methods of hydrokinetic therapy.

The specially equipped swimming pool creates conditions of optimal safety and release of stress related to the risk of falling. Water lowers the axial load on torso support structures and creates soft resistance by the density of environment, which could be already considered as a physical exercise. The individually selected set of movements with diving depth measurements, moving through various obstacles, turbulent oscillations created by movement allow to diversify the training process and make motor tasks harder, making the impact stronger. Performing of specialized exercises in conditions of the specially equipped swimming pool has a positive effect on recovery of locomotor functions; gravity unloading and density of water environment allow to perform exercises in the initial position (standing without an additional support). Given indicators have a positive effect on solution of the main motor task, which is faced by patients after the total replacement of knee or hip joint.

Results obtained after the pedagogical experiment are presented in tables 1, 2.

Results of the 10-meter walking test showed that after the session of developed method of hydrorehabilitation, the number of patients, who passed the test with 70% was increased. That is, before discharge from the in-patient facility

all patients managed to form the skill of independent walking. Moreover, the speed of passing each segment was increased by 3,9%. The time of passing did not have a statistical difference  $P>0,05$ , but the number of patients, who passed the test was at 100% ( $P<0,05$ ).

Table 1

Results of 10-meter walking test before and after the experiment

Testing	Number of patients who went through the test	Distance crossing time, sec
Before	12 (30%)	13,54±2
After	40 (100%)	13,01±1
P	$P<0,05$	$P>0,05$

The questionnaire before the experiment has shown that most of patients assessed the quality of their walking as “unsatisfactory” – 25, 13 patients – as “satisfactory”, “2” – as “good”. After the experiment 30 patients assessed their walking as “good”, 5 – as “great” and 5 – as “satisfactory”, the average group indicator was increased by 40%.

Table 2

Results of the study of value judgments of the state of walking and anxiety of patients after total replacement of joints of lower extremities before and after the experiment

Indicators	Before	After	P
Value judgements of walking, points	2,425 ±0,598	4±0,506	$<0,01$
Assessment of anxiety during independent walking, points	2,17 ±0,627	3,7±0,648	$<0,01$

The anxiety indicator was decreased by 41% after going through the course of hydrorehabilitation. Most of the group (20 patients) showed confidence in their walking, 4 patients could rate their walking for the highest score, 16 patients still needed support.

Barthel index of activities of daily living was 76,875±5,063 points before the experiment, which indicates the level of moderate dependency during independent walking. Main difficulties are dressing up, going to bathroom, independent walking without support, going upstairs. After the experiment, the result was 93,125±3,257 points, which indicates the level of mild everyday dependency during independent walking. Most of the group (34 patients (89,5%)) got 95 points, only dressing up remained difficult for them. Other 6 patients experienced some difficulties while dressing up, going upstairs and independent bathing.

As an addition to aforementioned results, it should be noted that all patients without exception, who went through rehabilitation after the endoprosthesis replacement, noted an increasing confidence in independent walking after sessions in the pool. Most of the group managed to make first steps without additional support in the pool because of hydrokinetic therapy sessions, using minimal conditions for the risk of falling and gravity unloading.

**Conclusion.** Sessions in water aimed at recovery of the skill of independent walking are recommended for inclusion into the complex rehabilitation program of patients after the endoprosthesis replacement of large joints of lower extremities. Sessions with hydrokinetic therapy managed to improve such indicators as speed and quality of independent walking, to improve indicators of activities of daily living.

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