

**PHYSICAL THERAPY FOR CHRONIC LATERAL ELBOW TENDOPATHY  
(TENNIS ELBOW)**

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**Purpose:** to evaluate the effectiveness of inclusion of exercises for scapula stabilizers in physical therapy (PhT) of patients with chronic lateral tendopathy of the elbow joint (CLTEJ).

**Material and methods:** a three-month research involved 32 patients who were divided into two groups – the main (MG) – 17 people and the control (CG) – 15. MG of patients performed an PhT program consisting of: patient training, exercises for the shoulder blade and forearm (elbow/wrist), deep soft tissue massage in conjunction with Mill's manipulation, phonophoresis with hydrocortisone. CG of patients had the same program, but without exercise for scapula stabilizers. Evaluation of results according to the criteria - determination of the intensity of pain syndrome (visual analog scale -VAS); measurement of muscle strength of the forearm and hands (dynamometry); test questionnaire of the functional state of the upper limb - Disability of the Arm, Shoulder and Hand Outcome Measure (DASH).

**Results:** the authors identified the features of the use of FT for the rehabilitation of patients with CLTEJ with exercises for scapular stabilizers in combination with deep soft tissue massage and Mill' manipulation.

**Conclusions:** This used rehabilitation complex had an advantage over the PhT only with special exercises for the forearm, as evidenced by reliable positive changes in VAS and the DASH scale ( $p < 0,005$  and  $p < 0,001$  respectively) in the short-trained performance assessment period.

**Keywords:** lateral elbow tendopathy, physical therapy.

## **Introduction**

Treatment for lateral tendonitis of the elbow joint (LTEJ) is common in the medical practice of many specialists: orthopedic traumatologists, neurologists, rheumatologists, surgeons, family physicians, physicians of physical and rehabilitation medicine, physical therapists, etc. [1, 2]. Today there are many thoughts even about the name of this pathology. The terms "tennis elbow", "lateral elbow tendopathy", "lateral epicondylitis", "enthesopathy" and others are found in the medical literature. So, Stasinopoulos D, Johnson MI., 2006 [21] believe that the terms "lateral epicondylitis", "lateral epicondylosis", "tennis elbow" do not fully reflect the pathophysiological, anatomical and etiological factors. They, like a number of other researchers [8; 11] note that the term "lateral tendopathy of the elbow joint" is more appropriate. LTEJ therapy is versatile and includes many methods, both conservative and operational [4; 9; 13]. Modern research has not yet proven the benefits of a specific approach to the treatment of LTEJ and this is difficult for clinicians [25]. Epidemiological data show that the prevalence of LTEJ is 5 - 10%, mainly middle-aged people - from 30 to 60 years old - without gender difference [25].

Due to the prevalence of right-handers in human nature, LTEJ most often affects the right hand of patients who are engaged in manual monotonous labor or sports exercises. Among patients with this pathology, tennis players (mostly amateurs), pianists, artists, locksmiths, carpenters, blacksmiths, masseurs and many others are most often encountered. In the mechanism of the disease, there is necessarily a long-term receipt of microtraumas of the tendons of the forearm, elbow

joint or a powerful long-term effect on the body of industrial harmful factors, such as phenol, mercury, acid fumes, ionizing radiation [19; 22].

Patients often complain of pain or burning sensation in the lateral epicondyle of the humerus, which extends down the forearm and sometimes to the shoulder segment. This pain is usually triggered or exacerbated by a variety of activities, including resisting wrist extension, such as grasping objects or twisting towels. In addition, patients often complain of weakness in grasping and difficulty in flexing. Usually, normal elbow movement persists even in severe cases [1]. The degree of pain often ranges from mild to severe and intermittent to persistent, seriously affecting patients' quality of daily life. In about 80% of cases, LTLS symptoms improve within a year, often after the trauma factor stops acting, but at the end of 20% it becomes chronic [24]. Clinical, instrumental and laboratory methods are used to establish the diagnosis. [1; 3; 15].

Analysis of modern scientific literature shows that complex therapy of LTEJ does not have a sufficient evidence base to confirm or refute its effectiveness. All this determined the need for further study of the effect of PhT programs in patients with LTEJ [2, 13; 15; 21].

**Purpose of the study** was to evaluate the effectiveness of the inclusion of exercises for scapula stabilizers in PT in patients with chronic LTEJ.

### **Material and methods of research**

The study involved patients who were undergoing rehabilitation treatment at the Fortis medical health center (clinical base of the KhDAFK) with a diagnosis of chronic LTEJ at the stage of unstable remission. The study was conducted during 2019-2020 with the participation of 32 patients with their informed consent (mean age  $39,4 \pm 0,5$ ). Men -21, women - 11.

The criteria for the inclusion of patients in the research: the presence of symptoms for more than 3 months; the absence of severe somatic pathology; absence of pathology of the shoulder and wrist joints.

Exclusion criteria for patients from the research: significant pain syndrome; previous surgical interventions on the joint; rheumatoid arthritis; instability of the

shoulder or elbow joint; a history of elbow fracture; high degree extensor tendon ruptures (more than 50%); cervical radiculopathy.

Patients were stratified by sex and age, then randomly (according to tables of random numbers) were divided into two groups - the main (MG) and the control (CG). The MG included 17 patients (11 men and 6 women); in the CG - 15 patients (10 men and 5 women).

LTEJ treatment usually has five therapeutic goals: control of elbow pain, maintaining mobility of the affected limb, improving grip strength and endurance, restoring normal function of the affected limb, and preventing further deterioration. [16].

Patients of both groups received one group session on LTEJ prevention (patient education) [4], 13 individual sessions with a physical therapist (exercise, recommendations for home exercises), 6 manual interventions (deep soft tissue massage in combination with Mill' manipulation [17]), 8 procedures of apparatus physiotherapy (phonophoresis with hydrocortisone [5]). The duration of the physical therapist session was 45 minutes. Patients with CG after warm-up and general physical training (15 min) performed special exercises only for the forearm (30 min). In the main part of the session, MG patients performed special exercises for the stabilizers of the scapula and forearm with the same structure of the session. The set of special exercises for the forearm/hand included isometric, eccentric and stretching exercises, exercises with an elastic band, dumbbells, an elastic roll for twisting.

The program is designed for 3 months, classes were conducted first in a medical wellness center, and then home exercises with keeping a diary were recommended. Clinical evaluation was carried out by independent experts of the intervention and after 3 months to establish the short-term effect of treatment.

A number of criteria were selected to evaluate the results of the research. The intensity of pain syndrome, which is the leading clinical manifestation of LTEJ, was determined using a visual analog scale (VAS). The scale is the generally accepted worldwide standard for the definition of pain and has a gradation in cm (or mm) from 0 to 10, where 0 equals no pain and 10 equals maximum pain intensity. The strength

of the muscles of the forearm and hand was measured according to the method of hand dynamometry (using a medical electronic hand dynamometer MEHD-120) [6].

According to modern approaches in PhT, along with the violation of structure and function, it is necessary to assess the activity and participation of patients. The test questionnaire of the functional state of the upper limb (Disability of the Arm, Shoulder and Hand Outcome Measure - DASH) was used to assess the dynamics of the activity of daily life. The main section of the questionnaire contains 30 items-questions related to the functional state of the limb over the last week. At the same time, 21 questions determine the severity of performing various physical actions through limiting the function of the hand and shoulder; 6 - concern the expressiveness of some symptoms and 3 - social-role functions. Each item has 5 answer options, which are evaluated in points from 1 to 5. The sum of points for all items is listed on a 100-point scale. Thus, DASH scores an upper limb disability from 0 - no disability to 100 - significant disability. An excellent result is considered to be up to 25 points, from 26 to 50 - good, from 51 to 75 - satisfactory and from 76 to 100 points - unsatisfactory [7; 14].

Statistical analysis was performed using the SPSS program to calculate descriptive statistics, all data are presented as the average and its error. Differences between the baseline and post-intervention indicators were calculated using a paired t-test, between the comparison groups - using a t-test for independent samples, the significance level was considered significant at  $p < 0.05$ . When comparing gender, age, VAS, DASH and relative hand dynamometry, no statistical difference was found between MG and CG patients (Table 1).

### **Results of the research**

The duration of the disease was  $3.4 \pm 0.9$  years on average. Each of the patients during the course of the disease underwent 3 to 4 courses of conservative treatment by different methods with unstable remission of the disease. The following factors were named by the patients as the cause of the disease: professional workload on the hand (locksmiths, masons, musicians, programmers), sports (tennis), hobbies (fishing).

Table 1

**Indicators of comparison group patients before physical therapy**

Indicators	MG, M±m (n=17)	CG, M±m (n=15)	p
Gender Men / women	11/6	10/5	-
Age (years)	38,5±2,4	38,9±2,8	>0,05
VAS (cm)	5,20±0,47	5,15±0,45	>0,05
Dynamometry (kg)	14,3±1,6	13,8±1,5	>0,05
DASH (points)	64,5±6,5	64,0±6,4	>0,05

Upon completion of the PhT program, patients of both groups underwent a second examination in order to assess the effectiveness of the proposed measures.

After three months of PhT, there was a decrease in pain on the VAS scale in both groups ( $p < 0,05$ ), and a significant difference was found between the comparison groups ( $p < 0,005$ ) (Table 2).

Table 2

**Dynamics of indicators of pain syndrome in patients of MG and CG according to the VAS scale (cm)**

Indicators	MG (n=17)		CG (n=15)		p between groups
	before PT	after PT	before PT	after PT	
VAS (cm)	5,20±0,47	2,45±0,19	5,15±0,45	3,35±0,24	<0,005
p in dynamics in groups	<0,05		<0,05		

The results of the assessment of wrist dynamometry showed a significant recovery of muscle strength for patients with MG and CG without a significant difference between the groups ( $p > 0,05$ ) (Table 3).

Table 3

**Dynamics of indicators of the relative strength of the muscles of the forearm and hand in patients of MG and CG (kg)**

Indicators	MG (n=17)		CG (n=15)		p between groups
	before PT	after PT	before PT	after PT	
Dynamometry (%)	14,3±1,6	17,9±1,9	13,8±1,5	18,4±1,9	>0,05
p in dynamics in groups	<0,05		<0,05		

The dynamics of everyday life activity according to the analysis of the results of the DASH questionnaire showed that the patients of both groups significantly

improved the indicators of the functional state of the upper limb ( $p < 0,05$ ,  $p < 0,001$ ), but the DASH indicators in patients in MG are significantly better than in patients in the CG ( $p < 0.001$ ) (Table 4).

*Table 4*

**Dynamics of indicators of the functional state of the upper limb, DASH**

Indicators	MG (n=17)		CG (n=15)		p between groups
	before PT	after PT	before PT	after PT	
DASH (points)	64,5±6,5	34,0±6,4	64,0±6,4	49,0±6,4	<0,001
p in dynamics in groups	<0,001		<0,05		

**Conclusions / Discussion**

Study results show that patient education, forearm (elbow/wrist) exercises, deep soft tissue massage combined with Mill manipulation, phonophoresis with hydrocortisone, and home exercise diary can significantly ease pain, improve activity in daily life, and strengthen strength. indicators of the forearm and hand. Incorporating scapula stabilizer exercises, altered muscle-fascial chain function, improved activity, and reduced pain complaints at 3 months based on significant differences in VAS and DASH scores. According to the meta-analysis [10], the results of measuring the hand strength with LTEJ are on average 17 kg, which was higher than the baseline values obtained in the study and corresponded to the results of the CG and MG patients after the implementation of the PhT program. That is, the functional capabilities of the muscles of the hand and forearm of patients with LTEJ to PhT were low, which could contribute to the chronicity of the disease.

The DASH scale had low scores both at the beginning and after the PhT program. When compared with the indicators of other studies of LTEJ patients [26], it was found that the scale scores were almost two times lower, which may indicate a more severe impact of the pathology on the condition of Ukrainian patients. The study and assessment of the sensation of pain behind VAS generally coincided with the assessments of other studies of LTEJ [18] and also had a positive trend over three months of the program. Various physical exercises are recommended for the treatment of LTEJ. Recently, eccentric exercise has gradually become the first line of

conservative treatment for LTEJ. Clinical trials have shown that they are highly effective in treating LTEJ when compared to a combination of several traditional exercise [23].

According to Day J. M. et al. (2019), scapula muscle training can be an important element for solving rehabilitation problems in patients with LTEJ [12]. Sethi K., Noohu M. M. (2018) also investigated the influence of the scapular muscles and the position of the scapula on the activity of the short radial extensor of the hand and the common extensor of the fingers in persons with chronic LTEJ. That is, in the opinion of many scientists, strengthening of the scapula muscles should be used in conjunction with apparatus physiotherapy in persons with chronic LTEJ to reduce pain, strengthen the compression force without pain, and improve functional results and activity [20]. The obtained results of the PhT program confirm the effectiveness of the inclusion of exercises for the stabilizers of the scapula to reduce pain, improve the functional state of the upper limb in the absence of a significant effect on the strength of the muscles of the forearm and hand.

Chiropractic and Mill' manipulation have some advantages over other treatments LTEJ [17] that were used in the current study, and found positive in the combined treatment effect. Researchers prove that corticosteroid injections are better than NSAIDs in improving patient outcomes within four weeks, with no long-term effect after 12 months [26], so phonophoresis with hydrocortisone may have an effect when used in a PhT program, which has been implemented found positive short-term effectiveness.

Patient education for LTEJ is a necessary part of restorative treatment. Without proper understanding by the patient of the factors damaging his condition, in all likelihood, recurrence or exacerbation of symptoms. Changing activity and avoiding fatigue are important parts of any treatment protocol. Turning the palm upward while lifting and avoiding the lowering exercise can transfer force from the lateral epicondyle to the medial epicondyle and help relieve pain [16].

The inclusion of exercises for the stabilizers of the scapula significantly ( $p < 0.05$ ) improves the recovery process in the short-term period of LTEJ therapy, in



general, the rehabilitation program as part of physical exercises, deep massage of soft tissues in combination with Mill's manipulation, phonophoresis with hydrocortisone, as well as keeping a diary of performance home exercise is effective. The results obtained have an effect in a fairly short time interval and require a longer verification.

**Prospects for further research** include the continuation of studies to determine the long-term effects (up to 12 months).

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