

DYNAMICS OF KNEE JOINT FUNCTIONALITY AFTER ARTHROSCOPY IN THE RECOVERY PERIOD WITH THE USE OF PHYSICAL THERAPY MEANS

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Abstract. The article considers the dynamics of the knee joint functionality after arthroscopy in the recovery period using physical therapy means. The duration of the physical therapy course aimed at restoring the knee joint functionality after arthroscopy in the recovery period was 3 months. The following were used: therapeutic gymnastics, mechanotherapy, sessions with training devices, hydrokinesitherapy, massage, physiotherapy (cryotherapy, magnet therapy), proprioceptive gymnastics, kinesio taping of the knee joint. The total amount of rehabilitation sessions was 3-5 times a week with a duration of 60-90 minutes. The dynamics of the damaged knee joint functionality after arthroscopy is reflected in reliable improvements of the studied indices: the range of motion in the knee joint according to the goniometry data increased by 38.7% in flexion and by 126.2% in extension; the strength of the quadriceps femoris muscle of the thigh of the operated lower limb increased (according to the dynamometry data) by 77.2%; the functional state of the knee joint according to the Lysholm scale improved by 46.8%; the intensity of the pain syndrome according to the visual analogue scale decreased by 76.1%. The presented results reflect the positive changes in the knee joint functionality after arthroscopy in the recovery period with the use of physical therapy means.

Keywords: functionality, knee joint, meniscus, arthroscopy, physical therapy means.

Introduction. Tear of the knee joint's medial meniscus is one of the most common injuries of the musculoskeletal system among patients of young and middle age. According to the epidemiological data, medial meniscus tear incidence ranges from 12 to 14 cases per 100 000 population per year, with the highest peak incidence in the 18-30 age group [1].

In Russia, according to the Federal Register of Knee Injuries and Diseases, in 2022 more than 120 000 cases of meniscus tear, 70% of which were attributed to medial meniscus, were registered. The highest incidence is found among professional athletes and people leading an active lifestyle [2].

Along with the improvement of arthroscopic methods of meniscus tears treatment, the problem of the knee joint function restoration after arthroscopy remains relevant. In 30-40% of operated patients, signs of posttraumatic osteoarthritis develop in the long-term period, which leads to persistent limitation of physical activity and worsened quality of life [3]. The effectiveness of rehabilitation after arthroscopic meniscus surgery is largely determined by the quality and timeliness of rehabilitation treatment [4, 5], reflecting the relevance of the presented study.

Objective of the study: to estimate the dynamics of the knee joint functionality after arthroscopy among patients aged 18-25 years in the recovery period with the use of physical therapy means.

Methods and organization. The study involved 18-25-year-old patients (n=12) during the recovery period after arthroscopy with the "medial meniscus tear". There were 8 males and 4 females among the test subject, the average age – 21.5 ± 2.4 years.

Inclusion criteria: age – 18 to 25 years; medial meniscus tear, confirmed by the MRI scan; prescription of injury – not longer than 3 months; condition after arthroscopy at 3-4 weeks; absence of other knee joint injuries (ligaments, cartilage); informed consent for participation in the study.

Exclusion criteria: age younger than 18 and older than 25 years; prescription of injury – more than 3 months; condition after arthroscopy at less than 3 and more than 4 weeks; presence of concomitant knee injuries; severe somatic diseases; refusal to participate in the study.

The knee joint functionality was estimated with the data from goniometry (°), dynamometry of the quadriceps femoris muscle of the operated lower limb (kg), the Lysholm scale

points), the visual analogue scale (VAS, cm).

The statistical data processing was carried out with Statistica 13. The study's results were processed with the following statistical methods:

1) descriptive statistics (calculation of the arithmetic mean ($\bar{X}$), standard deviation (σ));

2) checking the normality of distribution with the Shapiro-Wilk Test;

3) assessment of reliability of differences between dependent samples with the Wilcoxon signed-rank test.

The critical level of significance in testing statistical hypotheses was assumed to be 0.05.

Results and discussion. For improving the knee joint functionality of 18-25-year-old patients after arthroscopy, we applied the physical therapy (PT) means; the course lasted for 3 months. We used the following forms:

therapeutic gymnastics (5 to 3 times a week for 15-60 minutes depending on a period), mechanotherapy on the Artromot, Kinetec devices, bicycle ergometer and elliptical trainer (5 to 3 times a week for 15-60 minutes), hydrokinesitherapy (3 times a week for 30-45 minutes), massage (every day to 3 times a week for 15-25 minutes), physiotherapy (cryotherapy 3-4 times a week for 10-15 minutes, magnet therapy every day for 10-15 minutes), proprioceptive gymnastics (3 times a week for 15-20 minutes), kinesio taping of the knee joint (applications once every 5 days). The total volume of rehabilitation sessions was 3-5 times a week, lasting 60-90 minutes.

Improvement of the knee joint functionality after arthroscopy in the recovery period is represented by reliable positive dynamics of the studied parameters (table).

Table

Changes in the knee joint functionality after arthroscopy in the recovery period with the use of physical therapy means, $\bar{X} \pm \sigma$

Stage	Goniometry, °		Dynamometry, kg	Lysholm scale, points	Visual analogue scale, mm
	Flexion	Extension			
Initial	92.5±8.4	4.2±2.6	18.4±4.2	62.4±6.8	52.4±9.6
Final	128.3±6.2	9.5±1.4	32.6±3.8	91.6±4.5	12.5±5.1
P≤	0.05	0.05	0.05	0.05	0.05

At the initial stage of the study, the goniometry data revealed restriction of the knee joint amplitude of the operated limb: the flexion angle was 92.5±8.4°, which is 32.7% lower than the physiological standard (135-140°); the extension angle was 4.2±2.6° with the standard of 0-5° overextension. Such limitation of the knee joint mobility may be due to the persisting postoperative edema, pain syndrome and protective muscle spasm. At the final stage of the study, there was a significant improvement in the amplitude of the knee joint movement: the flexion angle increased by 38.7% to 128.3±6.2°, approaching the physiological standard.

Weakness of the thigh muscles, the quadriceps femoris muscle in particular, is a typical consequence of immobilization and reduced physical activity after injury and surgeries on the knee joint. Recovery of strength and endurance of the joint's stabilizing muscles is one of the key tasks of physical therapy, identifying its functional outcome. According to

the dynamometry data, the values of the quadriceps femoris muscle strength amounted to 18.4±4.2 kg, which is significantly lower than the standard. At the final stage of the study, there was a significant increase in strength by 77.2%, up to 32.6±3.8 kg, approaching the age standard.

The Lysholm scale is implemented to assess the functional state of the knee joint, allowing quantitative characterization of the degree of impairment of its function, as well as the changes in knee joint recovery after injuries and surgeries. The Lysholm scale allows estimating the following parameters: limping, use of additional support when walking, pain, instability, edema, etc.

At the initial stage of the study, the Lysholm scale values of 62.4±6.8 points corresponded to the unsatisfactory functional state of the knee joint. At the final stage, the index changed by 46.8%, reaching 91.6±4.5 points, corresponding to a good functional state of the knee joint.

Pain syndrome is the leading clinical sign of

medial meniscus tear and the main factor limiting the patient's functional capabilities. Pain control and associated reflex disorders is one of the primary objectives of rehabilitation after arthroscopic meniscus surgeries. The initial level of pain syndrome according to the visual analogue scale was 52.4 ± 9.6 mm, corresponding to moderate pain intensity. After the physical therapy course, the pain syndrome significantly decreased to 12.5 ± 5.1 mm, corresponding to minimal pain sensations of the operated limb.

Conclusion. Significant improvements in the goniometry of the knee joint and dynamometry of the quadriceps femoris muscle of the operated limb, the functional state of the knee joint assessed by the Lysholm scale, the decrease in the pain syndrome intensity according to the visual analogue scale clearly reflect the positive changes of the knee joint functionality after arthroscopy in 18-25 year olds in the recovery period with the use of physical therapy means.

Conflict of interest. The authors declare no conflict of interest.

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