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# APPLICATION OF PHYSICAL THERAPY FOR MENISCAL INJURY

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**Abstract.** The meniscus is an important part of the knee joint. The crescent-shaped soft tissue structure plays a major role in providing significant stability, cushioning, and lubrication of the joint.

In general, meniscus damage is one of the most common knee joint injuries, the relevance of which is significantly increasing in the conditions of modern military operations.

Meniscus surgery is a common surgical intervention aimed at restoring the function of the knee joint after injury. However, the operation itself is not the end of treatment. The effectiveness of the postoperative recovery period is determined by the complexity and structure of the physical therapy program aimed at gradually restoring the patient's functional capacity.

**The purpose of the work** is to create and conduct a rehabilitation program in patients after mine-blast injuries to restore the full range of motion in the knee joint, strengthen the muscles that support the knee, and facilitate a return to daily activities and thereby improve the patient's quality of life.

The physical therapy program is usually divided into several stages, each with its own goals and exercises:

1. Early postoperative period (1-2 weeks). Reduction of pain and swelling: application of cold, compression bandage. Restoration of basic range of motion: passive and active-assisted movements of knee flexion and extension within the pain-free range. Muscle activation: light isometric exercises for the quadriceps and hamstrings. Crutching: learning how to use crutches correctly to reduce the load on the operated leg.

2. The next stage of recovery was 3-6 weeks. Further increase in range of motion: Active exercises for knee flexion and extension. Beginning of muscle strengthening: light resistance exercises such as straight leg raises, short squats, standing calf raises. Improving balance and proprioception: exercises on unstable surfaces, standing on one leg (with support). Gradual increase in load: transition to walking without crutches or with one crutch.

3. Late recovery stage from 6 weeks and more. Full restoration of the range of motion: achieving full amplitude of knee flexion and extension. Intensive muscle strengthening: exercises with progressive resistance, use of simulators. Improving coordination and agility: more complex exercises for balance and proprioception. Functional exercises: imitation of movements necessary for daily activities, work or sports (climbing stairs, jumping, running).

**Conclusions.** Early use of physical rehabilitation tools and methods in the recovery of patients with traumatic knee joint injury after arthroscopic meniscectomy restores the amplitude of knee joint movements and prevents complications.

Correct implementation of an individual rehabilitation program and professional actions of a multidisciplinary team are an important component in the rehabilitation treatment of a patient with a traumatic knee meniscus injury.

**Keywords**: physical therapy, meniscus injury, rehabilitation program, mine-explosive injuries with meniscus damage, international classification of functioning, rehabilitation.

**Introduction.** The meniscus is an important part of the knee joint. This crescent-shaped soft tissue structure plays a major role in providing significant stability, cushioning, and lubrication to the joint.

The meniscus consists of two cartilage plates (medial and lateral) that help stabilize the knee joint, ensuring its smooth functioning [1, 2].

Meniscal injuries are one of the most common injuries to the knee joint. Their incidence can vary depending on age, gender, and level of physical activity. Meniscal injuries are injuries to the cartilage tissue located in the knee joint that acts as a shock absorber between the femur and

tibia and affects the stability and functionality of the knee joint. Today, it is common for military personnel with lower limb injuries to also have injuries to the knee joint with the meniscus [3].

In general, the problem of meniscus injuries remains one of the most urgent in modern medicine, especially in the context of the increase in cases of combat trauma. Meniscus surgery is a common surgical intervention aimed at restoring the function of the knee joint after injury. However, surgery itself is not the end of treatment. A carefully planned and implemented physical therapy program plays a key role in returning to a full life [3, 4]. The rehabilitation program usually includes exercises to strengthen the muscles, improve mobility, and restore normal knee function. The duration of the rehabilitation period can vary from several weeks to several months, depending on the complexity of the operation and the individual characteristics of the patient [5, 6].

**Research rationale.** The inpatient stage of treatment and rehabilitation for meniscus damage is aimed at ensuring proper restoration of joint functions. An important component of this stage is constant clinical observation of the patient and periodic monitoring of the condition of the damaged joint in order to timely identify possible complications and eliminate them. The maximum level of recovery can be achieved only under the conditions of a multidisciplinary approach and consistency in the provision of rehabilitation care [7].

The purpose of the work is to create an effective physical therapy program for patients after mine-explosive injuries of the lower limb with an emphasis on restoring knee joint mobility, stabilizing the musculoskeletal system and restoring functional independence.

**Materials and methods.** We examined and rehabilitated 6 servicemen who, after a mine-explosive injury, received damage to the meniscus in the knee joint. All patients underwent arthroscopic meniscectomy, and in the postoperative period underwent a rehabilitation course at the Lysetsk Hospital. Patients were hospitalized for 6-10 days after surgery. The patients were aged from 34 to 46 years.

The first stage of the work involved a systematic review of literature sources to determine the main causes and types of meniscus injuries, as well as an analysis of existing rehabilitation methods after surgical intervention on the knee joint.

During the analysis of the literature, special attention was paid to physical rehabilitation in military personnel. Pain was assessed using a visual analog scale (VAS), which allowed the physical therapist to track the dynamics and evaluate the effectiveness of the rehabilitation intervention [8, 9, 10].

Patient examination is one of the key stages of physical rehabilitation, as it is the foundation for the work of a physical therapist. This provides an opportunity to obtain objective data on the patient's condition and to find out what functions are currently lost.

Goniometry is used to measure movements (flexion and extension) in the knee joint.

Muscle strength testing using the MMT method is simple in technical terms and does not require significant time. One of the main methods for quantifying muscle strength in this study was the Lovett scale, which is characterized by high clinical informativeness [11].

According to the recommendations of the World Health Organization and regulatory documents of the Ukrainian healthcare system, the rehabilitation process should be carried out on the basis of the International Classification of Functioning (ICF). It is used to assess the structures and functions of the body, the patient's activity and participation in society. The ICF allows you to formulate a rehabilitation diagnosis, determine the goal and objectives of rehabilitation, develop an individual plan and assess the effectiveness of the intervention [12, 13].

Rehabilitation diagnosis is described using ICF codes that cover four levels of impairment: structures, functions, activities and participation, and environmental factors.

ICF core codes for impairment of function related to meniscus injury: b7100 - Mobility of one joint (knee); b7603 - Support functions of the leg; b28015 - Pain in the knee joint.

ICF core codes for body structures related to calcaneal fracture:

s7501 - Structures of the knee joint; s75010 - Bones of the knee joint (femur, tibia); s75011 - Menisci; s75012 - Ligaments of the knee (anterior/posterior cruciate, lateral).

ICF core codes for activity and participation in individuals with calcaneal fracture: d4500 - Walking short distances; d4501 - walking long distances; d4502 - walking on different surfaces; d4552 - running; d4600 - moving around the house.

ICF codes related to injuries of the meniscus of the knee joint and fractures of the calcaneo-tibial joint are given in table 1.

**Results and Discussion.** All patients had knee pain, swelling, and limited range of motion after surgery. The muscles around the knee weakened, affecting stability and function of the entire lower extremity.

The rehabilitation program was designed to address these issues and ensure optimal recovery. Its main goals included:

Reducing pain and swelling. Specific techniques and exercises help control pain and reduce postoperative swelling.

Restoring full range of motion. Progressive knee extension and flexion exercises help restore full range of motion.

Strengthening muscles. Exercises are designed to restore strength in the quadriceps, hamstrings, calf muscles, and other muscles that support the knee joint.

Improving knee stability. Strengthening the muscles and restoring proprioception (the sense of the body's position in space) contribute to the stability of the knee joint and prevent re-injury.

**Table 1**

**ICF codes associated with supratalar ankle injuries**

| ICF | | |
|---|---|---|
| **Functions** | **b28015** | **Lower extremity pain** |
| | **b7100** | **Mobility of a single joint (knee)** |
| | **b7301** | **Muscle strength of the lower extremity** |
| | **b7400** | **Endurance of individual muscles (thigh muscles)** |
| | **b7602** | **Control of knee joint movements** |
| | **b28015** | **Knee joint pain** |
| **Structures** | **s7501** | **Structures of the knee joint** |
| | **s75010** | **Knee bones (femur, tibia)** |
| | **s75011** | **Menisocapsular apparatus** |
| | **s75012** | **Knee ligaments** |
| **Activities/ Participation** | **d4500** | **Walking short distance** |
| | **d4501** | **Walking long distance** |
| | **d4552** | **Running** |
| | **d4502** | **Walking on different surfaces** |
| | **d4600** | **Moving around the house** |

Return to daily activities. Physical therapy is designed to gradually prepare the patient to return to their usual level of activity.

Physical therapy is an indispensable component of the recovery process after meniscus surgery. Thanks to correctly selected exercises and hard work, the patient can achieve full restoration of knee joint function, return to an active lifestyle and avoid possible complications.

The main stages of physical therapy after meniscus surgery:

The physical therapy program is usually divided into several stages, each of which has its own goals and exercises:

1. Early postoperative period (1-2 weeks). Reduction of pain and swelling: application of cold, compression bandage. Restoring basic range of motion: passive and active-assisted knee flexion and extension within a pain-free range. Muscle activation: light isometric exercises for the quadriceps and hamstrings. Crutching: learning how to use crutches correctly to reduce the load on the operated leg.

2. The next phase of recovery was 3-6 weeks. Further increase in range of motion: Active knee flexion and extension exercises. Beginning of muscle strengthening: light resistance exercises such as straight leg raises, short squats, standing calf raises. Improving balance and proprioception: exercises on unstable surfaces, standing on one leg (with support). Gradual increase in load: transition to walking without crutches or with one crutch.

3. Late recovery phase of 6 weeks or more. Full range of motion: achieving full range of knee flexion and extension. Intensive muscle strengthening: progressive resistance exercises, use of weight machines. Coordination and agility improvement: more complex balance and proprioception exercises. Functional exercises: simulating movements required for daily activities, work, or sports (stair climbing, jumping, running).

Exercises that were included in the physical therapy program:

- straight leg raises: strengthening the quadriceps muscle of the thigh.

- short squats: strengthening the thigh and gluteal muscles.

- standing or lying leg curls: strengthening the muscles of the back of the thigh.

- toe raises: strengthening the calf muscles.

- exercise bike: restoring movement and strengthening the muscles without significant load on the joint.

- exercises on a balance board or cushion: improving proprioception and stability.

- lateral steps with an elastic band: strengthening the muscles that abduct the thigh.

An important aspect of the physical therapy program was an individual approach, regularity and perseverance, communication with the patient and in the team.

This stage is based on the full restoration of the knee joint. Balance exercises on a Bosu board, neurocognitive training, proprioceptive board exercises, hamstring-supported leg curls in the form of a heel, followed by Scandinavian leg curls with patient-tolerable variations, and lateral walking with squats using a gray resistance belt were performed in 3 sets of 30 repetitions, single-leg squats in 1 set of 30 repetitions, as well as retraining in running, jumping, twisting, and turning. We also add the use of mechanotherapy to kinesitherapy.

**Conclusions.** Early use of physical rehabilitation tools and methods in the recovery of patients with traumatic knee joint damage after arthroscopic meniscectomy restores the amplitude of knee joint movements and prevents complications.

Proper implementation of an individual rehabilitation program and professional actions of a multidisciplinary team are an important component in the rehabilitation treatment of a patient with a knee meniscus injury.

**Conflict of interest.** Authors declare their absence conflict interests The prospects for further research are to practically determine the impact of the developed physical therapy program on the indicators of the functioning of the pelvic floor muscles in women who have undergone

cesarean section.

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**Author contributions:** V.I. Neonica a) conception and design; c) provision of materials for the study; d) collection and synthesis of data; e) analysis and interpretation of results; f) writing of the manuscript; I.K. Churpiy b) administrative support; M.V. Zelinska g) editing of the manuscript.

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## ЗАСТОСУВАННЯ ФІЗИЧНОЇ ТЕРАПІЇ ПРИ ПОШКОДЖЕННІ МЕНІСКА

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**Резюме.** Меніск є важливою частиною колінного суглоба. Серпоподібна структура м'яких тканин відіграє основну роль у забезпеченні значної стабільності, амортизації та змащування суглоба.

Загалом, пошкодження меніска належить до найчастіших травм колінного суглоба, актуальність яких істотно зростає в умовах сучасних воєнних дій.

Операція на меніску є поширеним хірургічним втручанням, спрямованим на відновлення функції колінного суглоба після травми. Однак, сама по собі операція не є завершенням лікування. Ефективність відновлення післяопераційного періоду визначається комплексністю та структурованістю програми фізичної терапії, спрямованої на поступове відновлення функціональної спроможності пацієнта.

**Мета роботи** – створення і проведення реабілітаційної програми у пацієнтів після мінно-вибухових травм для відновлення повного обсягу рухів у колінному суглобі, зміцнення м'язів, що підтримують коліно, та сприяння поверненню до повсякденної діяльності і тим самим покращення якості життя пацієнта.

Програма фізичної терапії зазвичай поділяється на кілька етапів, кожен з яких має свої цілі та вправи:

1. Ранній післяопераційний період (1-2 тижні). Зменшення болю та набряку: застосування холоду, накладання компресійної пов'язки. Відновлення базового діапазону рухів: пасивні та активно-допоміжні рухи на згинання та розгинання коліна в межах безболісної амплітуди. Активізація м'язів: легкі ізометричні вправи для чотириголового м'яза стегна та м'язів задньої поверхні стегна. Пересування за допомогою милиць: навчання правильному використанню милиць для зменшення навантаження на прооперовану ногу.

2. Наступний етап відновлення складав 3-6 тижнів. Подальше збільшення діапазону рухів: Активні вправи на згинання та розгинання коліна. Початок зміцнення м'язів: вправи з невеликим опором, такі як підйоми прямої ноги, короткі присідання, згинання гомілки стоячи. Покращення балансу та пропріоцепції: вправи на нестійких поверхнях, стояння на одній нозі (з підтримкою). Поступове збільшення навантаження: перехід до ходьби без милиць або з однією милицею.

3. Пізній етап відновлення від 6 тижнів і більше. Повне відновлення обсягу рухів: досягнення повної амплітуди згинання та розгинання коліна. Інтенсивне зміцнення м'язів: вправи з прогресуючим опором, використання тренажерів. Покращення координації та спритності: більш складні вправи на баланс та пропріоцепцію. Функціональні вправи: імітація рухів, необхідних для повсякденної діяльності, роботи або спорту (підйоми по сходах, стрибки, біг).

**Висновки.** Раннє застосування засобів і методів фізичної реабілітації у відновленні пацієнтів із травматичним пошкодженням колінного суглоба, після артроскопічної меніскектомії відновлює амплітуду рухів колінного суглоба та запобігає уникненню ускладнень.

Правильне виконання індивідуальної програми реабілітації та професійні дії мультидисциплінарної команди є важливим складовим у відновному лікуванні пацієнта із травмою пошкодження меніска колінного суглоба.

**Ключові слова:** фізична терапія, травма меніска, реабілітаційна програма, мінно-вибухові травми з пошкодженням меніска, міжнародна класифікація функціонування, реабілітація.

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