

**THE CONTRIBUTION OF PHYSIOTHERAPY IN THE RECOVERY OF
THE POST-TRAUMATIC KNEE AND ITS INFLUENCE ON THE
RESUMPTION OF DAILY ACTIVITY**

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Abstract

The current processes of automation and robotization have indisputably left their mark on the methods of facilitating any human activities, including the recovery of the knee joint after post-traumatic sequelae. We support, however, the usefulness of a physical therapy program that takes into account the anatomical-functional individuality of each patient, their socio-professional status, as well as their age and their level of tolerance to physical effort during physical therapy sessions.

Regarding post-traumatic knee recovery and early reintegration of patients into everyday-life, a 4-week study was conducted on a sample of 20 subjects, of which 11 female patients and 9 male patients, aged between 21 and 69 years old. This study sought to achieve effects such as: pain relief, increased range of motion, increased muscle strength and, last but not least, reaching a comfortable level of quality of life through the effective selection of kineto-therapeutic techniques, as well as, massotherapy and electrotherapy.

As a result of this study, it was demonstrated that using the methods mentioned above we met the proposed objectives, with patients obtaining considerable improvements for the measured parameters.

Introduction

According to T. Sbenghe, regarding the sliding surface, "the knee is the largest joint of the body, being at the same time the most complicated from the point of view of intra-articular structures". Being positioned medially at the level of the upper limb, it "participates in its function both in ensuring statics, the moment of support while walking, and in ensuring the dynamics of walking by lifting the leg and orienting it according to the undulations of the ground at the moment of swinging". [1], [2].

The knee consists of the tibio-femoral, femoro-patellar and proximal tibio-fibular joints - participating only in the movements of the ankle, being, however, included by some authors in the knee joint due to its positioning. Regarding the tibio-femoral joint, the articular surfaces are represented by the femoral condyles

and the tibial plateau, being a condylar-type joint. The articular surfaces are represented by the posterior articular surface of the patella and the femoral condyle. The means of joining the two joints are represented by the joint capsule that adheres to the two menisci (lateral and medial), as well as by a series of ligaments. The knee musculature is represented by the knee flexors (semitendinosus, semimembranosus, biceps femoris, gastrocnemius - accessory muscles) and the knee extensors; (quadriceps, vastus lateralis, vastus medialis, rectus anterior, vastus intermedius). [3].

Although it is a complex joint, the (main) movements that can be performed in the transverse plane are flexion and extension respectively, accompanied by secondary, passive movements of external and internal rotation, imposed by the existing inequalities between the two condyles and the shape of the articular surfaces of the femoral condyles.

Being one of the joints that supports a large part of the body's weight, any disturbances of a biomechanical nature at its level can have serious repercussions on locomotion. [4]

Regardless of the type of trauma, its sequelae can be manifested by one or more of the following signs: joint swelling, limitation of mobility, instability, decreased muscle strength, and incoordination. Symptomatically, pain and joint swelling also occur, a fact that justifies assisted physical-therapy, which aims to restore motor control of the knee, restore muscle strength and joint mobility, and last but not least, reduce pain. [5], [6].

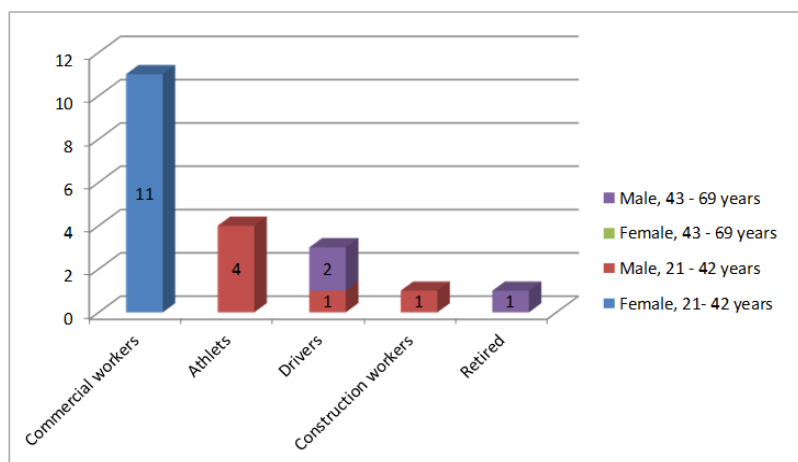
Although we are in the century of automation and robotization of human processes, where the appearance of prostheses, orthoses or other facilitative medical devices never cease to amaze with their evolution, we campaign for the integrity and long-term functionality of the knee joint, as these devices cannot completely replace physiological motor quality, they can lead to overuse, and finally to other possible injuries of the lower limb. Indisputably, these technologies play a major role post-traumatic in maintaining the quality of life as close as possible to the normal one, but all these devices can also have a limiting psychological impact as they involve acceptance and identification.

Material-method

The study was carried out for 4 weeks, on a sample of 20 subjects selected on the basis of clinical and paraclinical manifestations, of which 11 were female patients and 9 were male patients, the ages being between 21 and 69 years (Table 1), coming from various socio-professional backgrounds, such as : retired patients - (1), athletes -(4), commercial workers -(11), drivers -(3) and construction workers - (1) (Chart 1). The activity took place at the ”Ștefan cel Mare” University of Suceava.

Tabel 1. Distribution of patients by age groups and sex

Age Groups	Male	Female	Total
21 – 42 years	6	4	10
43 – 69 years	3	7	10
Total	9	11	Sum Total 20 Patients



Graph 1. Distribution of patients by socio-professional groups, age and sex

The patients included in this study were selected based on the clinical diagnosis, clinical and paraclinical manifestations, diagnosis highlighted and objectified by functional somatic evaluations consisting of the VAS scale. In view of the fact that the patients presented themselves at the recovery clinic in an acute, painful condition, we decided to use the WOMAC questionnaire, knee flexion assessment, joint range assessment and manual muscle strength testing. [7].

The selection of eligible cases for this study was based on certain criteria (for excluding from the group patients with presumed post-traumatic conditions of the knee joint such as sprain, dislocation or meniscus injuries) these criteria consisted of:

- Kinetic therapy contraindications: painful ischemic heart disease, unstable angina pectoris.
- Electrotherapy contraindications: osteosynthesis materials, pregnancy, neoplasia, TB, diseases in acute stage, inflammatory diseases in acute stage.
- Knee pain of a different nature (gonarthrosis, arthritis, periarticular infections). [8].

The parameters measured during the initial evaluations of the subjects included in the study consisted of the VAS scale, where values between VAS 7 and VAS 9 were recorded, the WOMAC questionnaire identified increased values regarding the alteration of the functional index, namely WOMAC 4, muscle

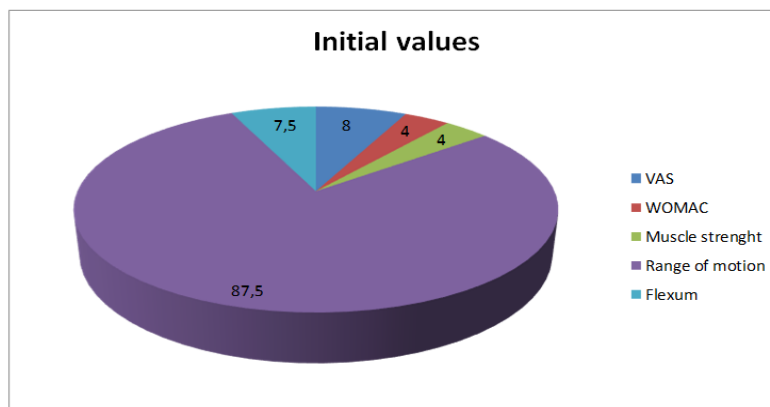
strength was recorded with an average of F4, the articular amplitude with 87.5°, and the degree of flexion of the knee was on average at the value of 7.5°. (Chart 2).

As observations in the process of measurement and evaluation of the targeted parameters, the decrease of the muscle strength of the affected limb compared to the healthy one, low joint amplitude, presence of genu flexum, increased pain parameter, and pain during movements were discovered. We believe that after analyzing these data, the patients' quality of life does not ensure the degree of comfort necessary for daily activities.

To establish the objectives, we took into account the anatomically functional individuality of each patient, their professional activity, age and their level of tolerance to the effort made during the physical therapy sessions.

Therefore, the objectives of the kinetic program, based on therapeutic physical exercise, include:

- relief of pain, inflammation for reintegration into daily life (restoration of ADLs);
- increasing the range of motion and preventing the loss of articular cartilage integrity;
- correcting the incorrect postures adopted by the patient, caused by anti-algesic attitudes, reducing the degree of static disorder and combating knee flexion;
- restoring muscle control promoting stability;
- maintaining the mioarthrokinetic apparatus within normal parameters for the adjacent joints and the opposite limb;
- in order to avoid side effects, the patient will be informed about a series of rules related to prophylactic hygiene;
- regaining joint stability by toning the muscles;
- decrease in intra-articular pressure;
- preventing the occurrence of cardio-respiratory disorders;
- preventing the decompensation of the sportsmen's qualities and motor skills;
- achieving a comfortable level of quality of life.



Graph 2. Valori rezultate din evaluarea inițială a pacienților

Electrotherapeutic intervention was carried out through low-frequency currents with predominantly stimulating action on excitable substrates (nerve and muscle tissue), medium-frequency currents (sinusoidal alternating currents) and high-frequency currents, which have a series of characteristics that distinguish them from other types of currents: very high frequency, production of targeted inductive phenomena, production of caloric energy, etc. [9].

The following forms of low-frequency current were applied: Transcutaneous electrical nerve stimulation (TENS) to combat painful conditions, applied within a 20-minute interval. Trabert current was applied for the analgesic and hyperemetic effect, within a 20-minute interval. From the medium frequency current, the interference current was applied for the following effects: excitomotor (on the striated muscles), decontracting, vasculotropic, analgesic (by reducing the painful excitability), and excitomotor action on the smooth muscles, in a 20-minute interval.

Physiotherapy applied through:

- akinetic techniques, i.e. corrective posture;
- kinetic techniques: isometric contraction and muscle relaxation from static kinetic techniques, and from dynamic kinetic techniques through voluntary active movement with and without resistance;
- through proprioceptive neuromuscular facilitation techniques. From here, only part of the techniques for promoting mobility (rhythmic initiation and rhythmic stabilization) and part of the techniques for promoting stability (alternating isometry) were selected;
- therapeutic physical exercise was also used, prescribed to promote muscle strength and increase normal muscle tone. [10], [11], [12].

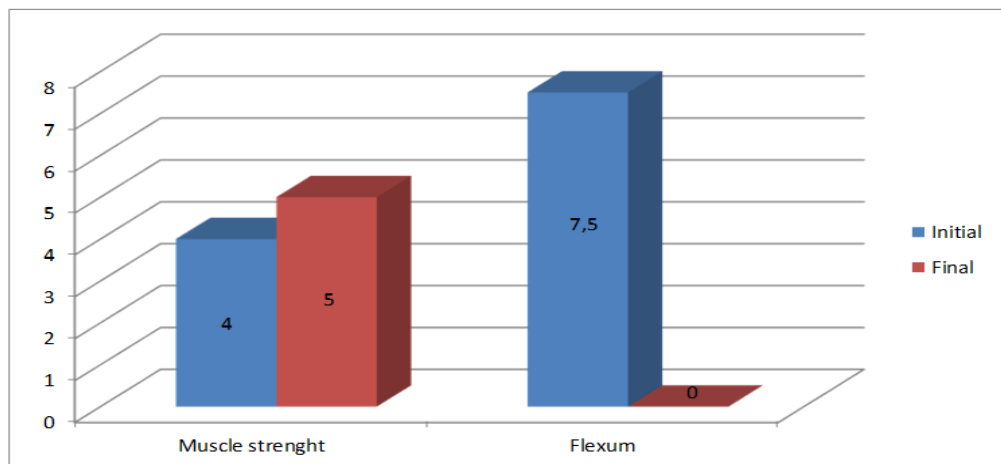
Massotherapy intervened by smoothing, facilitating blood circulation, kneading and friction to improve muscle elasticity, respectively improving pain sensitivity. [13], [14].

Results

After carrying out the recovery program, the same methods of testing and evaluating patients were applied to identify the progress of the treatment, thus, the data obtained were transposed graphically to be interpreted. After comparing the data using the mean, median and standard deviation, we chose to transpose in the paper only the average values obtained from the individual values recorded.

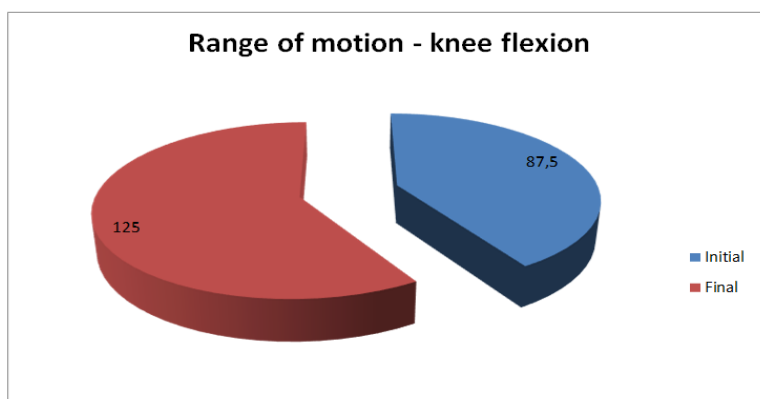
Graph 3 shows the initial and final values for muscle strength and degree of flexion for comparison and highlights that a physical therapy program developed (taking into account the particularities and daily needs of patients) has an important role in increasing muscle strength and improving knee flexion. This mentioned, physical therapy cannot be eliminated from the recuperative protocols of traumatic

knee conditions, and if applied early can reduce the time of specialized medical assistance and decreases the patient's time of dependence in performing ADLs.



Graph 3. Values recorded in the initial and final assessment for muscle strength and degree of knee flexion.

Graph 4 highlights the importance of both physical therapy and electrotherapy in regaining joint range. Since some patients complained of pain during the execution of knee flexion, yet did not feel a joint blockage, we consider that the limitation of joint mobility could also be of an algic nature, thus, the analgic currents applied before the kinetic program have the role of facilitating the exercise physical therapy and thus, improving the functional capacity of the lower limb.



Graph 4. Initial and final values recorded for knee joint mobility.

Graph 5 highlights the importance of physiotherapy in combating pain and improving the functional capacity of patients with post-traumatic knees, which also leads to an improvement in the quality of life. Thus, we affirm that the physiotherapeutic and electrotherapeutic programs drawn up according to the daily requirements of the patients and their biological particularities, contribute to a large extent to the early reintegration of the patients into social as well as professional activity, where it applies.

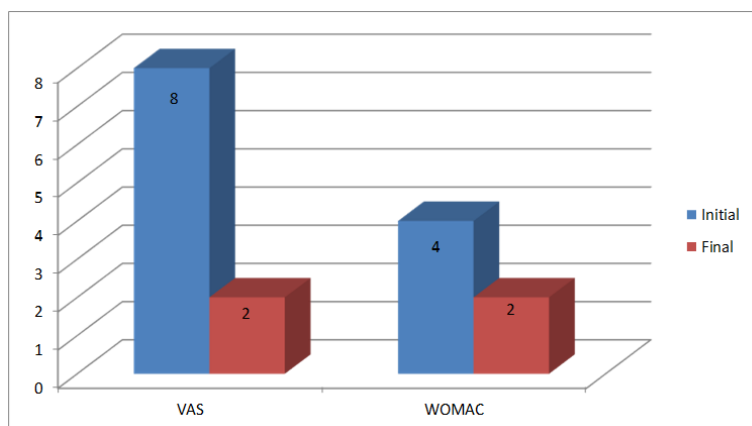


Chart 5. VAS scale and WOMAC questionnaire, initial and final values.

Following the graphical method of interpreting the results, (that highlights their statistical significance), we conclude that the patients have achieved important progress in terms of both functional capacity and trophic health functions, and the improvement of the quality of life is based on the approach to the particularities of each individual patient and their needs in their daily performance.

Discussions

We believe that the importance of the individualization of the recovery program cannot be contested, thus, the objectives have been adapted to the particularities of each individual patient and to the way of daily life that they reported in their anamnesis. The aim of this study was to facilitate social/professional reinsertion as early as possible and to help the patient return to the normal way of life before the trauma they had suffered.

After the final evaluations applied to the patients, improved values were found for all measured parameters. For the pain parameter, much lower values were recorded compared to the initial evaluation, joint amplitude and muscle strength improved considerably, the degree of genu flexum decreased, and the results obtained through the WOMAC questionnaire are lower than the initial results.

Conclusions

Physiotherapy applied early to patients with trauma to the knee, determines the fight against the adoption of vicious positions, adopted antalgic gaits, thus combats the occurrence of joint deviations.

Through the physiokinetic program based on physical exercise, both rest deconditioning and cardio-respiratory disorders that can occur in the case of prolonged immobilization are combated.

The kinetic program recommended at home reduces the risk of relapses, helps to maintain normal parameters of the musculo-ligamentous apparatus of both the traumatized joint and the adjacent joints.

Physical therapy, fully involving the patient in the treatment, has a primary role in restoring ADLs and reintegrating him into everyday life by increasing the patient's self-confidence following the progress achieved both in the physical therapy room and at home.

The study highlights the essential role of physiotherapy in combating pain, in restoring joint mobility, muscle tone and muscle trophicity at the level of the knee joint, also having an anti-inflammatory effect. By restoring muscle control and joint stability, physiotherapy contributes to achieving a comfortable level of quality of life.

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