Bulletin of the *Transilvania* University of Braşov
Series IX: Sciences of Human Kinetics • Vol. 19(68) No. 1 – 2026
https://doi.org/10.31926/but.shk.2026.19.68.1.11

THE ROLE OF PHYSIOTHERAPY IN THE FUNCTIONAL RECOVERY OF PATIENTS WITH GONARTROSIS

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Abstract: *Gonarthrosis is one of the most common degenerative diseases of the knee joint, characterized by pain, limited mobility and impaired joint function. Medical rehabilitation, especially through physiotherapy, plays an important role in the conservative management of this pathology. The aim of the study is to highlight the effectiveness of physiotherapy programs in alleviating symptoms and improving joint function in patients with gonarthrosis. The recovery program includes joint mobilization exercises, muscle toning and functional reeducation. The constant application of these programs contributes to reducing pain, increasing joint mobility and improving the quality of life of patients. The results obtained highlight the importance of physiotherapy as an essential therapeutic method in the functional recovery of patients with gonarthrosis.*

Key words: *gonarthrosis, physiotherapy, functional recovery, joint mobility, joint pain.*

1. Introduction

Gonarthrosis, also known as knee osteoarthritis, is a chronic degenerative condition characterized by joint pain, stiffness, muscle weakness, and limited joint function, significantly affecting daily activities and quality of life of patients [26].

Knee osteoarthritis, also known as degenerative joint disease (DJD), is mainly characterized by the gradual degeneration of the joint, resulting from continuous mechanical stress and the progressive breakdown of articular cartilage [23].

This condition is one of the primary causes of disability worldwide, predominantly affecting older adults. Its prevalence continues to rise, largely because of population aging and the growing incidence of obesity [15].

In the conservative management of gonarthrosis, non-pharmacological interventions, exercise-based therapies are essential elements of the treatment strategy, with the goals of alleviating pain, enhancing muscular strength, and improving joint mobility [17].

Physical therapy plays a significant role in functional recovery. Contemporary physiotherapy aims to reduce prolonged

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pathological processes while emphasizing the preservation and restoration of functions impaired by the disease. In addition to its therapeutic benefits, physiotherapy also has a preventive function, contributing to the reeducation of local biomechanics, as well as to muscle strengthening and relaxation through postural training and comprehensive kinetic reeducation [21].

Pain, functional limitations, and balance impairment can be improved through structured therapeutic exercise programs, including strength, aerobics, and neuromotor exercises [15].

A systematic review of the literature suggests that combined physical therapies, including muscle strengthening exercises, flexibility exercises, and proprioceptive training, can help improve symptoms and function in patients with knee osteoarthritis [26].

Good physical condition is figured out by the body's ability to recover the major functions highlighted by the respiratory and cardiac rhythms [22].

However, although evidence supports the inclusion of therapeutic exercises in recovery programs for gonarthrosis, the variable methodological quality of the studies and the lack of standardized protocols highlight the need for further research to improve therapeutic interventions [15].

In this context, the present study aims to highlight the role of physiotherapy in the functional recovery of patients with gonarthrosis and the impact of therapeutic exercise programs on symptomatology and joint function.

1.2. Symptomatology

Gonarthrosis is a degenerative joint disease that is clinically manifested by a complex picture of symptoms that affect both the comfort and function of the knee joint. The most common symptom is joint pain, described by patients as a dull ache that worsens with exertion and improves at rest, characteristic of mechanical pain associated with wear of the articular cartilage and repetitive mechanical stress on the knee. In the early stages, the pain may occur only during physical activities and after periods of overexertion, and as the disease progresses it may become persistent and present even at rest [24].

Another important symptom is joint stiffness, which occurs especially after periods of inactivity, such as in the morning or after prolonged sitting, and which usually improves after a few minutes of movement [11].

This can limit the patient's ability to perform basic movements, such as knee flexion and extension.

1.3. Risk factors

Gonarthrosis is a complex, multifactorial condition whose onset and progression are influenced by an interplay of biological, mechanical, and lifestyle-related factors.

- **Age**

The risk of gonarthrosis increases with age, due to the natural wear of articular cartilage, decreased elasticity and slow regeneration of joint tissues [10].

- **Gender**

Epidemiological studies show that women are more susceptible to gonarthrosis, especially after menopause, which suggests a role of hormonal imbalance, especially decreased estrogen, on the integrity of cartilage and periarticular structures [27].

- **Mechanical overload**

Activities that involve frequent knee flexion, weightlifting, intense running, or high-impact sports are associated with a higher risk of joint damage.

- **Overweight and obesity**

Obesity is considered one of the most significant modifiable risk factors, and reducing body weight can substantially decrease the likelihood of disease progression. [7].

- **Joint trauma and surgical history**

Knee injuries, such as meniscus tears, ligament injuries, or intra-articular fractures, increase the risk of post-traumatic osteoarthritis.

- **Genetic factors**

Gonarthrosis has a hereditary part. Genetic studies suggest that certain genetic polymorphisms related to metabolism and inflammatory response increase individual susceptibility to the disease [30].

- **Metabolic and systemic factors**

Diseases such as diabetes mellitus, dyslipidemias or metabolic syndrome can contribute to chronic inflammation and degradation of articular cartilage, favoring the development of gonarthrosis [18].

2. Materials and Method

The diagnosis of knee osteoarthritis is based on a combination of clinical evaluation, imaging, and standardized criteria, designed to confirm articular cartilage damage and exclude other conditions that may cause pain and limit knee function.

- **Clinical evaluation**

The clinical examination is the first step and involves:

A detailed history of pain, stiffness, history of trauma or strenuous physical activity.

Physical examination of the knee to detect swelling, crepitus, limited range of motion, and joint instability [14].

Functional assessment through standardized tests, such as the Timed Up and Go (TUG) or the 6-Minute Walk Test (6MWT), to assess mobility and exercise capacity [19].

- **Medical imaging**

Plain radiography is the primary method for confirming osteoarthritis and assessing the degree of joint damage. The Kellgren-Lawrence classification is the most used radiological staging system [12].

Magnetic resonance imaging (MRI) is shown in cases with persistent symptoms but normal radiography, for detailed evaluation of cartilage, menisci, and periarticular structures [14].

Joint ultrasound can be used to detect effusion, synovitis, and incipient osteophyte changes [31].

- **International diagnostic criteria**

The American College of Rheumatology (ACR) proposes clinical-radiological criteria for diagnosis, which include knee pain, limitation of function, radiological signs of osteoarthritis, and exclusion of other inflammatory conditions [1].

- **Further investigations**

Laboratory tests are generally not necessary for diagnosis but may be indicated to exclude inflammatory arthritis or other secondary causes of joint pain [31].

The diagnosis of knee osteoarthritis combines clinical assessment, imaging, and standardized criteria to determine the extent of joint damage and guide the treatment plan.

Treatment of knee osteoarthritis aims

to reduce pain, improve mobility, prevent progression, and improve the patient's quality of life. Interventions can be non-pharmacological, pharmacological, and surgical, often combined in an individualized plan.

2.1. Non-pharmacological treatment

This is the first step in the management of knee osteoarthritis and includes:

- Physiotherapy and therapeutic exercises

Physical exercises adapted to the patient reduce pain, improve periarticular muscle strength, and increase knee stability [8].

Programs include quadriceps strengthening exercises, low-impact aerobic exercises (walking, cycling), and proprioceptive exercises for balance and coordination [5, 8,].

- Weight control

Weight loss in overweight patients significantly reduces mechanical stress on the knee and can slow the progression of the disease [7].

Heating and joint protection

The use of orthopedic devices (knee braces, canes) can reduce pain and prevent overuse of the joint [14].
Patient education

Information about the disease, adaptation of daily activities and avoidance of overuse are essential for long-term success [31].

2.2. Pharmacological treatment

- Analgesics and anti-inflammatories

Paracetamol and NSAIDs are used to relieve moderate pain [14].

- Intra-articular injections

Hyaluronic acid or corticosteroids to reduce pain and inflammation in moderate to severe cases [31].
Nutritional supplements

Glucosamine and chondroitin are sometimes used as adjunctive therapy, although evidence of their effectiveness is limited [5].

2.3. Surgical treatment

Indicated in cases with severe pain, functional limitation, and failure of conservative therapies.

Options: total or partial knee arthroplasty, osteotomy, or limited arthroscopies to correct associated lesions [14].

2.4. The role of physiotherapy

Physiotherapy is considered an essential component in the management of gonarthrosis, both in non-pharmacological and post-surgical treatment, contributing to:

- Reducing pain and stiffness;
- Increasing muscle strength;
- Improving range of motion;
- Increasing the patient's functional independence [5,8].

Immediate postoperative period (0–2 weeks)

- Early mobilization: Patients are encouraged to mobilize their knees and begin walking with crutches to prevent stiffness and deep vein thrombosis [28].
- Isometric contraction exercises of the quadriceps and calf: Helps keep muscle tone and prevent atrophy [2].
- Pain and inflammation control: Analgesics and sometimes cryotherapy is used to reduce edema.

Intermediate Period (2–6 weeks)

- Increasing ROM: Active-passive flexion and extension exercises are essential to prevent contractures and ease independent walking [2]. Gait training: Initially with partial support, then progressing to independent walking.
- Balance and proprioception exercises: Prevent instability and reduce the risk of falls [29].

Advanced Recovery Period (6–12 weeks)

- Muscular strength and stability: Progressive resistance exercises and functional training help restore periarticular muscle strength and motor control [6].
- Progress monitoring: Pain, range of motion, and function are assessed using standardized tools such as WOMAC and VAS [2].

Long-term rehabilitation (beyond 3 months)

- Maintaining strength and mobility: Ongoing exercise, including low-impact aerobics activities, keeps best knee function.
- Relapses prevention: Patient education on avoiding overuse and keeping a healthy body weight.
- Professional supervision: Physical therapy can be tailored to meet individual functional needs and prevent long-term postoperative complications [29].

2.5. Recovery objectives

Medical rehabilitation in gonarthrosis has as its main goal improving joint function, reducing pain and increasing the quality of life of patients. Recovery interventions focus on well-defined therapeutic aims, which contribute to maintaining or restoring knee functionality [3].

- **Pain reduction**

One of the main aims of recovery is to reduce joint pain, which is the dominant symptom of gonarthrosis. Through therapeutic exercises, physiotherapy techniques and patient education, pressure on the joint can be reduced and exercise tolerance can be improved [14].

- **Increasing the amplitude of motion**

Limited knee mobility is often found in patients with gonarthrosis. Active and passive mobilization exercises aim to keep or increase range of motion, thus preventing joint stiffness and contractures [9].

- **Improving muscle strength**

Muscle strengthening exercise programs contribute to stabilizing the joint and reducing mechanical load on the articular cartilage [20].

- **Improving stability and neuromuscular control**

Balance and proprioception exercises are important for restoring neuromuscular control and preventing falls. They contribute to improving movement coordination and increasing safety during daily activities [25].

- **Increase functional capacity**

Rehabilitation also aims to improve the patient's ability to perform daily activities such as walking, climbing stairs, or getting out of a chair. Progressive exercise programs and functional training can increase the patient's level of

independence [3].

- **Improve quality of life**

Physiotherapy interventions have proved positive effects on the mobility, psychological state, and social participation of patients with gonarthrosis [25].

2.6 Indication

Compliance with therapeutic recommendations and maintaining an active lifestyle are essential to maintain the results achieved during recovery and to prevent the recurrence of symptoms [3].

After completing the medical rehabilitation program, patients are recommended to:

1. Maintain regular physical activity, through low-impact exercises on the joints, such as walking, swimming or cycling, which help maintain mobility and muscle strength.
2. Continue muscle strengthening exercises, especially for the quadriceps muscles and the lower limb muscle chain, to stabilize the knee joint.
3. Maintain an optimal body weight, as excess weight increases pressure on the knee joint and accelerates the progression of gonarthrosis.
4. Adopt an active lifestyle, avoiding sedentary lifestyles, but maintaining a balance between activity and rest periods.
5. Correct use of joint protection techniques, such as avoiding prolonged positions in knee flexion and using appropriate footwear with good cushioning.
6. Periodic medical monitoring, to assess the evolution of the disease and adapt therapeutic recommendations when necessary [14].

Also, recent studies show that individualized exercise programs have a positive impact on the quality of life of

2.7. Contraindication

To prevent worsening of symptoms or structural damage to the joint, patients should avoid:

1.High-impact physical activities on the knee, such as intense running, jumping, or contact sports;
2.Lifting or carrying heavy weights, which increase pressure on the knee joint.
3.Repetitive deep knee flexion movements, such as prolonged squatting or kneeling.
4.Prolonged sedentary lifestyle, as lack of movement can lead to joint stiffness and muscle weakness.
5.Overuse of the joint, without adequate recovery periods or without adapting activities to the patient's functional level [25].

3. Results and Discussions

The analysis of data from the specialized literature highlights that rehabilitation programs based on physiotherapy contribute significantly to the improvement of symptoms and joint function in patients with gonarthrosis. Therapeutic interventions that include joint mobilization exercises, muscle strengthening and proprioceptive training reduce pain and increase the amplitude of movement in the knee joint.

patients, contributing to increasing functional autonomy and reducing limitations in daily activities [4].

During the recovery process, quadriceps and periarticular muscle strengthening exercises have demonstrated increased efficiency in stabilizing the knee joint and reducing mechanical stress on the articular cartilage. In addition, the inclusion of stretching exercises and joint mobilization techniques contributes to maintaining flexibility and preventing joint stiffness, a common issue in patients with gonarthrosis [13].

Research results also highlight the important role of patient education in the management of gonarthrosis.

Patients who were trained in adopting an active lifestyle, controlling body weight and correctly performing therapeutic exercises showed a more favorable clinical evolution compared to those who only followed drug treatment [16].

In this context, physiotherapy is not only a method of functional recovery, but also an effective strategy for long-term management of the disease.

The discussion of the results suggests that the integration of physiotherapy programs into the multidisciplinary treatment of gonarthrosis is essential for optimizing joint function and slowing down the progression of the disease. In addition, the therapeutic approach must be adapted to the individual characteristics of the patient, considering the stage of the disease, the level of physical activity and associated comorbidities.

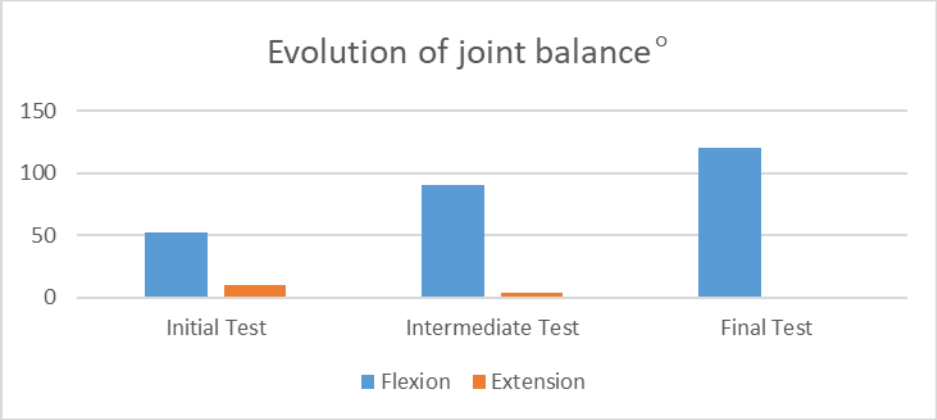

Fig. 1. *Evolution of joint balance °*

Evolution of joint balance ° Table 1

Movement	Initial test	Intermediate test	Final test
Flexion	52 °	90 °	120 °
Extension	10 °	4 °	0 °

The analysis of the results highlights a significant improvement in the amplitude of the knee flexion movement during the recovery program. At the initial assessment, the patient had a significant limitation of flexion, which was 52°,

indicating a significant functional restriction. Following the physiotherapy intervention, an increase in flexion up to 90° was observed at the intermediate testing, which suggests an improvement in joint mobility.

At the end of the recovery program, knee flexion reached the value of 120°, approaching the functional limits necessary for carrying out daily activities. Regarding extension, it remained constant at 0° throughout all assessments, indicating the absence of an extension deficit.

The results obtained highlight the effectiveness of the physiotherapy program in improving joint mobility and restoring knee function in the patient with gonarthrosis.

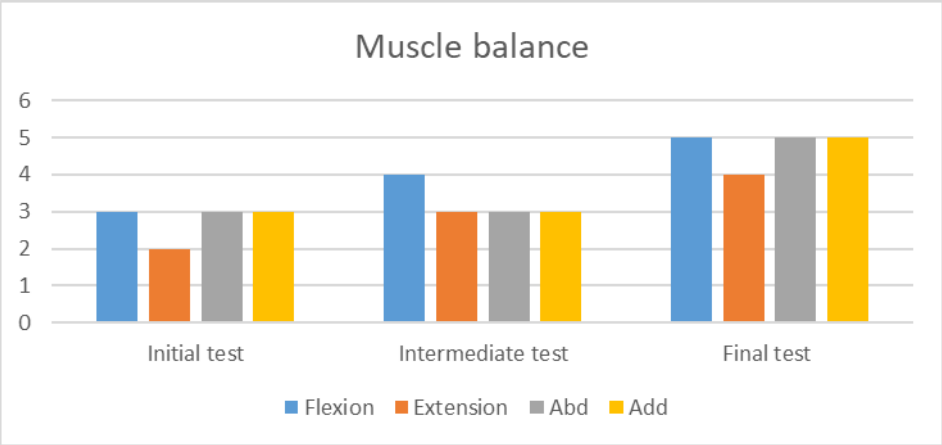

Fig. 2. *Muscle balance for knee level*

Muscle balance for knee level Table 2

Muscles	Initial test	Intermediate test	Final test
Flexion	F3	F4	F5
Extension	F2	F3	F4
Abd	F3	F3	F5
Add	F3	F3	F5

The results obtained show a progressive increase in muscle strength during the recovery program. At the initial evaluation, low muscle strength values were observed, especially at the level of flexors, abductors and adductors, where F2 values were recorded, indicating the possibility of performing movements only in conditions of eliminating gravity.

Following the application of the physiotherapy program, at the intermediate testing an improvement in muscle strength was observed, with most muscle groups reaching F3–F4 values, indicating the ability to perform

movements against gravity and, partially, against moderate resistance.

At the final evaluation, the flexors, extensors and adductors reached the F5 value, corresponding to normal muscle strength, while the abductors recorded the F4 value, indicating good muscle strength, but slightly below the maximum level. These results suggest the effectiveness of the recovery program in restoring muscle strength and improving knee joint stability.

4. Conclusions

The evaluation of the outcomes obtained after implementing the rehabilitation program emphasizes the crucial role of physiotherapy in alleviating symptoms and enhancing joint function in patients diagnosed with gonarthrosis.

The therapeutic exercise program contributed to the progressive increase in the amplitude of joint movements, especially knee flexion, which indicates a significant improvement in the mobility and functionality of the joint.

Another important aspect observed during the recovery program was the increase in muscle strength of the muscle groups involved in stabilizing the knee joint.

Strengthening the quadriceps and periarticular muscles contributes to reducing mechanical stress on the joint and increasing its stability.

These results are consistent with data from the specialized literature, which highlights the fact that muscle strengthening exercises represent one of the most effective methods of conservative treatment in gonarthrosis.

Also, the reduction in pain intensity observed during the recovery program confirms the effectiveness of physiotherapy interventions in the management of gonarthrosis symptoms.

By relieving pain and increasing joint mobility, patients can more easily resume daily activities, which contributes to improving quality of life.

The results of the study emphasize the importance of individualizing the recovery program, depending on the stage of the disease, the functional level of the patient and any comorbidities.

Applying a progressive exercise program, which includes joint mobilizations, muscle strengthening exercises, stretching exercises and proprioceptive training, can lead to significant functional results.

In accordance with current recommendations in the specialized literature, physiotherapy is a fundamental component of the non-pharmacological treatment of gonarthrosis.

Its integration into a complex medical recovery program contributes not only to the improvement of symptoms, but also to slowing the progression of the disease and maintaining the functional independence of the patient.

In conclusion, the results obtained confirm that rehabilitation programs based on physiotherapy have a significant positive impact on joint mobility, muscle strength and pain level in patients with gonarthrosis, contributing to improving joint function and quality of life.

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