

ICPESK 2018
International Congress of Physical Education, Sports and
Kinotherapy. Education and Sports Science in the 21st
Century, Edition dedicated to the 95th anniversary of UNEFS

KINETIC REHABILITATION FOR ADULTS WITH
GONARTHROSIS

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Abstract

The main goal of this study is to investigate the beneficial effects of the rehabilitation through medical gymnastics for adults with gonarthrosis. Research methods: pedagogical observation, investigation, tests for muscular and articular assessment, statistical-mathematical method and graphical representation of the data. The study was conducted in the specialised gym of the “Sf. Luca” Chronic Disease Hospital of Bucharest, from December 2016 to May 2017, with a group of 10 male and female subjects of 49-67 years old, hospitalised for the treatment of gonarthrosis. Control tests used: height (cm), weight (kg), glycaemia (g/l), blood pressure (mmHg), muscular strength and mobility of knee joint. Medical gymnastics, including exercises of warm-up, mobility and coordination, balance, posture, breathing and non-competitive sport elements, was used for kinetic rehabilitation. The study results confirm the improvement of the condition of patients submitted to an early rehabilitation plan, phased and individualised depending on their diagnosis and particularities, focusing on the morphofunctional and mental aspects. The rehabilitation treatment must be continued at home, workplace or in special spaces, under the supervision of the kinesiotherapist, in order to prevent the possible relapses of the disease and to maintain and improve the functional progress reached during the sessions made in the hospital.

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Keywords: Gonarthrosis, assessment, medical gymnastics, rehabilitation, adults..



1. Introduction

Gonarthrosis is the most common articular disease of the knee. It is also called “the disease that immobilises the knee”, because of the pain felt in the joint, the walking with a limp and the obvious swelling of the knee. Its frequency is due to the genetic heritage, life-long excessive strain of the joint, injuries or rheumatism of the affected joint or neighbouring joints (Slăvilă, 2016a).

Gonarthrosis does not affect young people, but people over 40 years old. In the last years, there are an increasing number of persons who seek the help of the doctor, taking into consideration that the elderly are more and more active and prefer efficient treatments instead of classical and conservative ones (Sbenghe, 1981).

Kinesiotherapy is included in the means of medical rehabilitation of motor disabilities. This is a therapeutic method largely used in the phase immediately after the injury and continued with the phase of spontaneous recovery; it is a valuable auxiliary before and after surgery in the phase of sequelae (Stroescu, 1979; Sbenghe, 1987; Crețu, 2003).

Medical gymnastics is mainly intended to initiate and improve the remaining motricity or the rehabilitation during the complex process of physical, mental, professional and social readaptation of the individual; it has a very important role in the rehabilitation of motor disabilities during all evolutionary stages of the disease (Nicolescu, 2010; Potop, 2014).

2. Problem Statement

From a mechanical point of view, the knee, also called the “intermediate joint of the lower limb”, has a great ability in the full extension, and thus it can support the large pressure exerted by the human body. The knee also has high mobility and, starting from a certain degree of flexion, ensures the optimum orientation and movement of the leg related to the unevenness of the ground. The skeleton of the knee includes the lower end of the femur bone, the upper extremities of the tibia and fibula and also the knee cap/patella – a specific bone of this zone (Baciu, 1977; Gavrilesu, 2010).

Knee joint is the largest mobile segment that links the thigh to the shank and has numerous implications in pathology. Some authors consider it a condylar joint or a trochlea joint, which has only one level of movement freedom and allows the flexion and extension, ensuring the anterior and posterior movement of the lower limb (Potop, 2011; Timnea & Baican, 2017).

Gonarthrosis or arthrosis is one of the oldest diseases worldwide; it is characteristic of the vertebrates and can affect them everywhere. It is responsible for the alteration of life quality in all its aspects, because it generates pains and mobility limitation (Constantin, 1997; Slăvilă, 2016b).

Arthrosis is defined as a chronic, degenerative, painful and deforming articular disease anatomically characterised by initial destructive alterations of the articular cartilage, formation of osteophytes and eventual synovial inflammatory responses. The disease consists of degeneration, a kind of aging of the articular system. The cartilaginous surfaces, bone masses, ligaments and synovia are more or less damaged and fulfil their task insufficiently.

Gonarthrosis can be divided into two forms: primitive and secondary.

All articular deformations will cause arthrosis, regardless of their origin. Also, the less severe injury can generate arthrosis. A simple sprain poorly treated can maintain a swelling of a cartilaginous zone, which will facilitate degeneration of the peripheral tissues.

Gonarthrosis is diagnosed by an orthopaedist following up a clinical examination focused on the painful knee. The mobility, oedema, sensibility and walking shall be checked up. The X-rays will prove the “grinding” of the articular cartilage (diminution of the articular space height) and the appearance of the osteophytes (bone spurs).

The treatment of gonarthrosis involves: the necessary measures taken for reducing the articular stress; avoidance of the aggressive sports and overstress; control of body weight; balneophysiotherapy and kinesiotherapy; administration of painkillers, corticosteroids and sterile viscoelastic solutions administered into knee joint (Slăvilă, 2016a).

3. Research Questions

In order to conduct our research, we have proposed the following questions:

- Does the synthesis of the information taken from specialised literature and personal experience improve the methods of kinetic intervention on the patients with gonarthrosis?
- Is the rehabilitation program established depending on other diseases or objectives of the patients?
- Is the beneficial role of kinesiotherapy proven (pain relief, recovery of knee articular stability and mobility)?
- Are the patients influenced positively during the programs of kinesiotherapy?
- Does the kinesiotherapy relieve the articular pains and increase the mobility of knee joint?

4. Purpose of the Study

The main goal of this study is to investigate the beneficial effects of the rehabilitation through medical gymnastics for adults with gonarthrosis.

5. Research Methods

Research methods: pedagogical observation, investigation, method of tests for muscular and articular assessment, statistical-mathematical method and graphical representation of the data. The study was conducted in the specialised gym of the “Sf. Luca” Chronic Disease Hospital of Bucharest, from December 2016 to May 2017, with a group of 10 male and female subjects from the urban environment, with different professions, aged 49 to 67 years, hospitalised for the treatment of gonarthrosis. Control tests used: height (cm), weight (kg), glycaemia (g/l), blood pressure (mmHg), muscular strength and mobility of knee joint. A program with medical gymnastics means including warm-up exercises, mobility and coordination exercises, balance exercises, posture exercises, breathing gymnastics and, if possible, non-competitive sport elements was applied for kinetic rehabilitation.

6. Findings

Gonarthrosis is most frequently defined as the change involving damage of the articular cartilage of the knee joint, emergence of abnormal knee tissue, reactive changes in synovial membrane and pathological synovial fluid. The review of the specialised literature on gonarthrosis reveals: the existence of several studies supporting the systemic therapy of the arthrosis by means of the sterile viscoelastic solutions (Stănescu, 2009); the efficacy of individual physical therapy during the medical treatment for gonarthrosis in the working population engaged in physical labour; comparison between the state of pain and mobility before and after the treatment (Kasumovic et al., 2013); rehabilitation of knee mobility using hydrokinesiotherapy in patients with gonarthrosis (Burcea, Georgescu, Armean, & Burlibaşa, 2014); main causes of the gonarthrosis and of other forms of arthrosis; when and how they can be treated; conservative treatment and knee arthroplasty (Stănescu, 2018); the impact of dynamic platform exercises on knee joint muscle strength in patients with gonarthrosis treated with microfracture method (Klupiński, Krochmalski, & Woldańska-Okońska, 2017) etc.

This study monitored a group of 10 male and female subjects from the urban environment, with different professions, aged from 49 to 67 years, hospitalised for the treatment of gonarthrosis.

Table 01. Results of subjects' anthropometric and functional tests

No.	Initials	Age (years)	Height (m)	Weight (kg)	Glycaemia (mg/dl)	Blood pressure (mmHg)	
						Systole	Diastole
1.	D.E.	63	1.53	76	115	138	54
2.	V.A.	65	1.64	60	110	123	74
3.	L.C.	58	1.69	80	114	161	58
4.	A.A.	58	1.55	84	110	130	50
5.	V.B.	55	1.74	77	105	208	64
6.	E.D.	53	1.57	52	100	148	71
7.	G.H.	56	1.58	66	110	110	54
8.	E.S.	67	1.80	95	130	149	52
9.	M.M.*	55	1.61	68	190	188	64
10.	R.N.	49	1.52	72	115	93	57
X		57.9	1.62	73.00	119.9	144.8	59.8
Me		1.77	0.03	3.89	8.17	10.95	2.57
S		5.61	0.09	12.31	25.84	34.62	8.14
Cv%		9.68	5.78	16.86	21.55	23.91	13.63

Note: X - arithmetic mean, Me - mean error, S - standard deviation, Cv - coefficient of variation, diabetes mellitus - values: normal = 73-110 mg/dl; latent diabetes > 111-126 mg/dl; clear diabetes > 126 mg/dl; MM* - insulin dependent (4 shots of insulin/day)

Table 01 shows the results of the functional and anthropometric tests of the subjects. The mean calculated for the group of subjects included in this research has the following values: age - 57.9 years, weight - 73 kg and height - 1.62 cm, which highlights a slight tendency towards obesity in the studied group, with no major statistical importance, but with a representative clinical significance in the process of functional, mental and social readaptation of the patients with gonarthrosis, hospitalised for rehabilitation. The rehabilitation sessions took into account the blood sugar level and the blood pressure of the patients, as factors that influenced the capacity for effort during physical exercises and the number of exercises/session.

The values of glycaemia in the whole group of subjects have a mean of 43.0 mg/dl, with a mean error of 8.17 and a poor homogeneity (25.84%). The blood sugar values of the patients under study indicate a stage of latent diabetes (Figure 01), with a mean of glycaemia values of 119.9 mg/dl. The group of patients includes subjects who keep a diet and who are under insulin treatment. The blood pressure of the subjects has a mean of the systolic blood pressure of 144.8 mmHg and the diastolic one of 59.8 mmHg, with a mean error of 10.95 for the systole and 2.57 for the diastole, indicating a moderate homogeneity of the systolic blood pressure values and a poor homogeneity of the diastolic ones.

Given the age of the subjects of this study, the values of blood pressure and glycaemia are clinically significant for each individual who participated in the research. The study has revealed that blood pressure values, along with glycaemia values, have a decisive influence on the kinesiotherapy program and the progress made by each patient from one session to another. Therefore, besides the specific kinesiotherapy treatment, the patients received a proper medication during their hospitalisation, which contributed to their successful rehabilitation.

Table 02 presents the data on the quality of the affected joint and also the functional progress made after going through the kinesiology program of muscular and articular rehabilitation.

Table 02. Results of subjects' anthropometric and functional tests

No.	Initials	Muscle strength (points)		Flexion range of motion (degrees)		Flexion functional progress (degrees)
		Initial	Final	Initial	Final	
1.	D.E.	2	4	95	115	20
2.	V.A.	2	3	90	120	30
3.	L.C.	3	5	85	125	40
4.	A.A.	3	4	95	110	15
5.	V.B.	2	3	110	120	10
6.	E.D.	3	5	85	115	30
7.	G.H.	2	3	75	100	25
8.	E.S.	3	4	90	115	25
9.	M.M.	2	4	100	125	20
10.	R.N.	3	4	80	110	30
X		2.60	3.90	90.5	115.5	24.5
Me		0.22	0.23	3.20	2.41	2.73
S		0.69	0.74	10,12	7.62	8.64
Cv%		26.89	18.91	11.18	6.59	35.28
t; P		9.061; <0.001		9.303; <0.001		

Note: Table 01, t - Student's parametric test

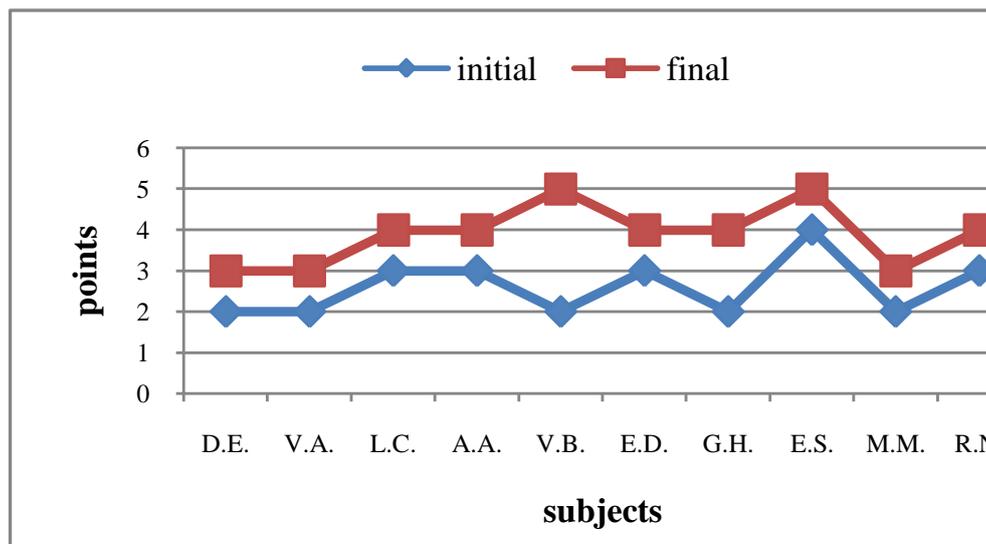


Figure 01. Values of muscle strength development in the quadriceps

The analysis of the results of muscle strength development in the quadriceps for the studied subjects, as shown in Table 02, and the graphical representation in Figure 01 highlight an arithmetical mean of 2.60 units in initial testing of the muscle strength calculated for a mean error of 0.22, at a standard deviation of 0.69 and a coefficient of variation of 26.89%. The improvement of muscle strength by 1.3 units in final testing (value of 3.90 calculated for standard deviation of 0.74 and a coefficient of variance of 18.91%) was possible thanks to the fulfilment of the kinesiotherapeutic program depending on the clinical particularities specific to each subject of this study. The comparison of the means of the tests reveals significant differences calculated for a threshold of variation $p < 0.001$, which confirms the efficiency of the rehabilitation program in the group under research.

Figure 02 shows the level of mobility development in knee joint. The results of knee articular testing in the studied group highlights a mean of knee flexion of 90.5 degrees, and this value increases up to 115.5 degrees in final testing. The recording of these values indicates functional progress of 24.5 degrees in the knee joint flexion range of motion. The comparisons of the means between tests calculated for a variation threshold of $p < 0.001$ prove the efficiency of using the kinesiology rehabilitation program in all stages of the disease for the progressive and individual improvement of the knee's remaining motricity, in the case of the studied subjects. According to the data of the Centers for Disease Control and Prevention (2010) regarding the Reference values for normal joint range of motion in people aged 45 to 69 years, the normal value of knee flexion for females is 137.9 (131.6-139.1) and for males 132.9 (131.6-134.2), while the knee extension in females is 1.2 (0.7-1.7) and in males 0.5 (0.1-0.9). The active practice of exercises created for this purpose and their organized execution in the kinesiotherapy room, taking into consideration the specifics of the disease and the real possibilities of the patients who participated in this study, led to the diminution of the dominant symptom of gonarthrosis by increasing the ability to initiate gestures or movements with direct finality at the level of the affected limb, in the shortest possible time.

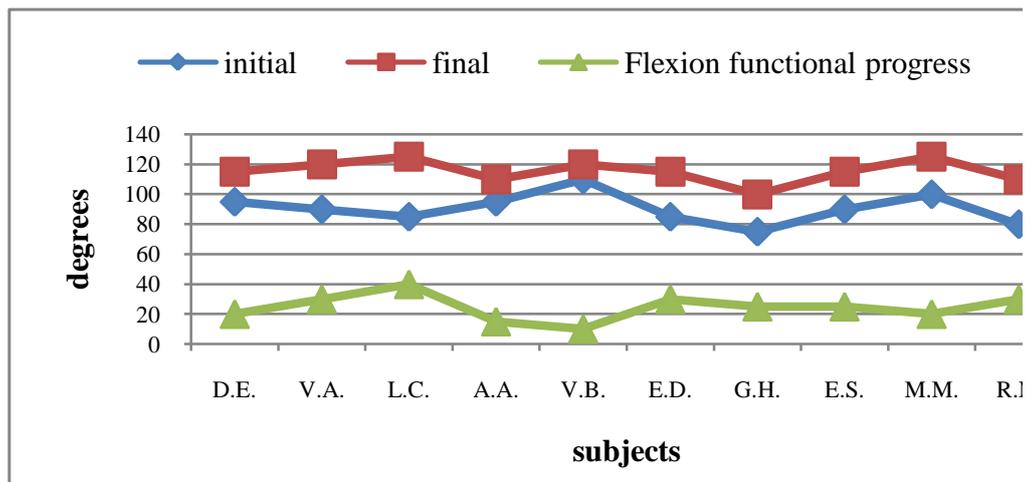


Figure 02. Level of development of knee joint mobility

The kinesiotherapeutic programs personalised for each patient participating in this study were based on the physical, mental, professional and social rehabilitation of the individual as soon as possible. These programs have an active contribution, even after the sessions made with the specialised staff of the hospital, to the rehabilitation of the motor disability caused by gonarthrosis, regardless of the disease stage before rehabilitation.

The rehabilitation program focused on the function or segments of the injured limb and took into account the progressive complexity of exercises performed under the supervision of the kinesiotherapist, meant to ensure gestures or movements with direct finality, depending on the specifics of the disease, age, physical capacity, medical history record etc.

The beneficial effects of kinesiotherapy recorded during our research on gonarthrosis are explained by highly efficient rehabilitation means and methods selected and adapted to each and every patient. The created commands and programs were clearly transmitted and easy for everyone to understand.

7. Conclusion

This research has proven that the progress in the development of knee motricity and mobility is directly proportional to the improvement of patient's physical possibilities and confirms the efficiency of the gonarthrosis rehabilitation program used in the case of the group under study.

The functional progress of the affected joint is due to the correlation between the kinesiotherapeutic program of rehabilitation after gonarthrosis and the real possibilities of the patient. This correlation shortens the reintegration of patients into socio-professional life by fighting efficiently against the main symptoms of gonarthrosis.

Our study certifies the improvement of patients' condition following the implementation of an early rehabilitation plan, sequenced and individualised according to the diagnosis and particularities of the patient, focusing on their morphofunctional and mental particularities.

The rehabilitation treatment must be carried on at home, workplace or in special facilities, under the supervision of the kinesiotherapist, in order to prevent the possible relapses of the disease and to

maintain and improve, as the case may be, the functional progress reached during the sessions performed in the hospital.

Acknowledgments

This paper is part of the research plan for 2017-2018 of the Faculty of Physical Education and Sport of the Ecological University of Bucharest. In charge with the project: Professor Vladimir Potop, PhD. The authors of this paper express their gratitude to the senior professor CFM, Doctor Mircea Slăvilă, department head in “St. Luca” Chronic Disease Hospital of Bucharest, for his collaboration and support for carrying out this study.

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