

# Effect of spa physiotherapy on the range of motion and muscle strength in women with gonarthrosis

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Lizis P. Effect of spa physiotherapy on the range of motion and muscle strength in women with gonarthrosis. *Ann Agric Environ Med.* 2013; 20(4): 784–786.

## Abstract

**Introduction:** Degeneration arthritis is a chronic disease of undetermined progressiveness and unknown pathogenesis. It can affect one or more joints. It reveals itself most frequently between 40 – 60 years of age, and affects the lives of professionally active individuals. The aim of the presented study was to assess the impact of a 21-day stay at a rehabilitation facility on the range of motion and muscle strength of the knee in women with gonarthrosis.

**Materials and Methods:** The study group consisted of 30 women aged 50–74 years diagnosed with degeneration of the knee joint. The average age of the study group was  $65.9 \pm 7.2$  years. Patients remained in the 21-day rehabilitation facility of Rehabilitational Hospital No. 21 in Busko Zdrój SP ZOZ, Poland. We measured with the help of protractor in SFTR range the motion bending and straightening of the knee with an accuracy of 1°. The Lovett strength test was assessed of the ischio-tibial muscles, quadriceps, sartorius – acting on the knee joint of the patient. The study was carried out on the first and the last day of the stay in the rehabilitation facility.

**Results:** There was improvement in the range of flexion and strength of muscles acting on the knee joint of the afflicted women.

**Conclusion:** The study showed that 21-day rehabilitation holiday improved the range and strength of the muscles acting on the knee joint of the afflicted women. This proved that comprehensive rehabilitation improves the function of the knee joint with gonarthrosis, prevents disease progression and is an alternative to drug therapy.

## Key words

gonarthrosis, muscle strength, rehabilitation, range of motion

## INTRODUCTION

To date, arthritis is a chronic, progressive disease of unknown pathogenesis which can affect one or more joints. It reveals itself most frequently between 40 – 60 years of age, affects individuals who are active in their life and profession. Significant performance reduction occurs in as many as 10–20% of patients. About 15% of the population aged 35–70 suffer from knee osteoarthritis – gonarthrosis. Particularly painful is the movement of descending stairs. The movement of bending and straightening the knee may be accompanied by palpable or even audible crackling. As the disease progresses it reaches the axis of the limb disorder (knee varus or valgus), instability of the knee – a result of the destruction of collateral ligaments, muscles surrounding the disappearance – mainly the quadriceps, and the emergence of a popliteal fossa cyst with fluid – so-called Baker's cysts [1, 2, 3, 4, 5]. The rehabilitation of people with osteoarthritis of the knee is an important part of the healing process and is a supplement to medical treatment. The comprehensive rehabilitation of the patient determines the level of regenerative efficiency and the further course of the disease.

**Objective.** The aim of this study was to assess the impact of a 21-day stay at a rehabilitation facility on the range of motion and muscle strength of the knee in women with gonarthrosis.

## MATERIALS AND METHOD

The study, conducted from November 2010 – January 2011, involved a group of 30 women aged 50–74 years with diagnosed unilateral x-ray of the knee joint degeneration. The period of disability of the women was not less than 5 years. The average age of the study group was  $65.9 \pm 7.2$  years. The patients remained in the 21-day rehabilitation facility in Rehabilitational Hospital No. 21 in Busko Zdroj SP ZOZ, Poland. The patients performed 10 procedures of local cryotherapy liquid nitrogen vapour, and 10 treatments of iontophoresis with the drug Olfen-Gel (Diclofenac); the energy density was  $0.05 \text{ mA/cm}^2$ , duration of treatment – 10 minutes. Free active exercises, self-service exercises, active exercises in relieving the resistance were also used daily.

We measured with the help of protractor in SFTR the range of motion bending and straightening of the knee with an accuracy of 1°. The Lovett strength test was assessed towards the ischio-tibial muscles, quadriceps, sartorius – acting on the knee joint ill [6]. The study was conducted on the first and last day of the stay in the rehabilitation facility. All patients were informed about the harmlessness of the research, familiarized with the purpose and the way it was to be performed. All the patients agreed to participate in the study.

In order to analyze the data, the basic measure of descriptive statistics were applied: the mean arithmetic ( $\bar{x}$ ), standard deviation (SD), and coefficient of variation (V). To evaluate the statistical significance of differences in the range of motion and strength before and after the rehabilitation, one-way analysis of variance ANOVA was applied, and in

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Received: 18 December 2012; accepted: 28 February 2013



various combinations, the value of the function F Snedecor. Statistical significant of differences in functional parameters was assessed on the level  $p \leq 0.05$  and  $p \leq 0.01$  [7]. The calculations were performed at the Department of Computer Science of the Holy Cross Cancer Centre in Kielce, Poland, using MedCalc software – version 11.4.3.0, licensed to Holy Cross Cancer Centre.

## RESULTS

There was no patient limit in straightening of the knee before the 21-day stay in the rehabilitation facility, and thereafter there was no decrease in the range of the motion in the affected joint straightening for the women. Consequently, there were no differences in straightening patient range of the motion of the knee between the consecutive test dates. The knee bending of the patients was limited before the rehabilitation, but after the rehabilitation the range of the motion improved. It was found that the extent of the bending motion of the knee increased after the 21 days of gonarthrosis rehabilitation, and the difference between the range of bending motion between the start and the end of the examination was statistically significant at  $p \leq 0.01$ , where  $F=9.299$  (Tab. 1).

**Table 1.** Flexion, strength of muscles of the knee and Snedecor F values in the women studied.

Feature	Variables	$\bar{x} \pm SD$		V	F	p
Flexion	Before rehabilitation	98.0	17.7	18.0		
	After rehabilitation	110.0	12.3	11.1	9.299	0.003**
Ischio-tibial	Before rehabilitation	3.5	0.4	11.2		
	After rehabilitation	4.0	0.4	11.5	23.438	0.000**
Quadriceps	Before rehabilitation	3.8	0.3	7.9		
	After rehabilitation	4.2	0.3	7.9	26.667	0.000**
Sartorius	Before rehabilitation	3.5	0.4	11.5		
	After rehabilitation	4.0	0.4	11.3	23.438	0.000**

Statistically significant on the level:  $p \leq 0.01$ \*\*

The presented study shows that the 21-day rehabilitation holiday improves the strength of muscles acting on the knee joint with gonarthrosis. The difference of the muscles' strength of ischio-tibial, quadriceps and sartorius in the 6 level Lovett scale were significant between the successive tests, and were on the level of  $p \leq 0.01$  –  $F=23.438$ ;  $26.667$ ;  $23.438$  (Tab. 1).

## DISCUSSION

Gonarthrosis of the knee is chronic and progressive if left untreated, and leads to a deterioration of physical function and quality of life. In the professional literature can be found publications about the use of various physical procedures in the treatment of knee osteoarthritis. Bolach and Trzonkowski [8] compared the efficacy of 10 treatments with local cryotherapy treatments supported by kinesitherapy physical attributes (magnetic field, ultrasound, laser biostimulation, iontophoresis, current DD) in women with gonarthrosis. It turned out that the local cryotherapy effectively reduced pain, increased mobility and strength of the knee joint muscles

acting on the joint better than physiotherapy treatments supported by physical attributes. Gachewicz et al [9], Szczepańska et al. [10] investigated the analgesic efficacy of 10 local cryotherapy treatments and their effect on the degenerate mobility of the knee in women. The study showed a reduction in pain and improvement in mobility degenerated knees in women. Jezierski [11, 12] tried the effect of cryotherapy on the walking endurance and strength of muscles acting on the knee joint in men and women with gonarthrosis. It turned out that cryostimulation improves gait, muscle strength and reduces pain. Lukowicz et al. [13] compared the efficacy of cryotherapy and pulsed shortwave diathermy kinesitherapy associated with the treatment of gonarthrosis. It turned out that both cryotherapy and diathermy short-pulse improves knee function, but cryotherapy more effectively increases the range of motion in the joint than the short-wave diathermy. Eggs and Zagrobelny [14] evaluated the impact of 15 local cryotherapy treatments for pain and mobility of the knee in men and women with gonarthrosis. They reduced pain and improved mobility of the knee after a series of treatments by cryotherapy.

The impact of exercises on muscle strength, range of motion of the knee and the patient's fitness to travel have also been studied. It was found that long-term rehabilitation – more than four weeks – increased muscle strength, ranged the motion, reduced the stiffness of the joint and improved the efficiency of transportation, which improved the quality of life of patients suffering from degeneration of the knee joint [15, 16, 17, 18, 19, 20, 21].

The presented study confirms the results shown by other authors: the 21-day rehabilitation holiday significantly improved the range of motion of the affected knee bending gonarthrosis, and counteracted the reduction in the scope of joint straightening of the afflicted women. Also, muscle strength ischio-tibial, quadriceps and sartorius increased in the women after the improvement. Therefore, it appears that the test characteristics are associated with each other, are dependent on each other, and have an impact on the efficiency of the patient's knee joint static and dynamic conditions. Thus, with the increase in muscle strength, mobility improves of the knee joint with gonarthrosis.

This proves that comprehensive rehabilitation and patient education improves the function of the knee joint with gonarthrosis, prevents disease progression, and is an alternative to drug therapy. Nevertheless, further studies are needed to assess the effects of distant healing rehabilitation periods in women with knee gonarthrosis. Comparative studies should also be carried out of therapeutic effects obtained by various methods of therapy; physiotherapy determines which methods are the most effective in achieving and maintaining the optimum for as long as possible in the physical functioning of people with knee gonarthrosis.

## CONCLUSION

Comparative studies and the results led to the following conclusions:

1. the range of bending of the affected knee gonarthrosis significantly improved in the women;
2. there was a significant improvement in muscle strength of the ischio-tibial, quadriceps and sartorius of the women after the rehabilitation;



3. comprehensive rehabilitation improves the functions of the affected knee gonarthrosis, prevents disease progression, and is an alternative to drug therapy.

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