

The role of the balneo-physical-kinetic treatment on the ligamentous stability in osteoarthritis of the knee

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Abstract

Osteoarthritis of the knee is one of the disabling conditions with a major impact on the quality of life of the patients. Existing therapies focus on reducing pain and disability caused by the disease. The existence of scores that evaluate the different aspects of patients quality of life are often used in monitoring the treatment and its results.

The study is performed on a batch of 21 patients, between June 2017 and June 2018. They performed a complex rehabilitation program being evaluated every six months by applying the WOMAC questionnaire and performing specific maneuvers.

The study has shown that by performing complex rehabilitation treatments the patients ability to perform some actions as well as their quality of life is improved and the effect following repeated treatments every six months is maintained during two treatments successive treatment.

Key words: *knee osteoarthritis, Womac scale, rehabilitation.*

Introduction

Osteoarthritis of the knee is a disabling condition with a slow progressive evolution, which has the effect of decreasing the stability, occurrence and maintenance of pain in the lower limbs which result in a significant decrease in the mobility and functioning capacity of the affected patients.

The prevalence of osteoarthritis is constantly increasing, the main reason being the aging of the population, a condition that is classically associated with old age (1). Worldwide, osteoarthritis of the knee is an important cause of morbidity. In general the diagnostic and treatment guides (2) focus on methods that reduce the pain and disability caused by the disease, and less on curative treatment methods.

Osteoarthritis being a degenerative condition manifests mainly in the lower limbs, osteoarthritis of the knee having the highest incidence (3, 4).

Assessing the quality of life of patients in order to identify the points that can be improved in the light of the evaluation of how they can perform their daily activities and the level of pain felt is an important area of research. Identification of therapeutic methods that can improve the quality of life of patients having an essential role (5). Patients with osteoarthritis of the knee have a severe impairment of quality of life, which is significantly lower

compared to the existence of other chronic pathologies (6).

In this study we evaluated how the WOMAC score as well as specific tests of the stability of the knee evolve after the complex treatment performed every six months.

Material and method

21 patients admitted to the Section II of the Balnear Sanatorium and Rehabilitation Techirghiol, between June 2017 - June 2018, patients diagnosed with Osteoarthritis of the knee, without contraindications to the balnear treatment. They performed a complex rehabilitation program, consisting of: individual kinetotherapy specific for osteoarthritis, hydrotherapy in the pool with saltwater from Lake Techirghiol, short wave electrotherapy, dyadinamic current, laser therapy, ultrasonotherapy, magnetotherapy. The duration of the treatment was 10 days, which was performed daily.

Patients diagnosed clinically and imagistic with osteoarthritis of the knee participated in the study. The criteria for inclusion in the study included the classification of the disorders in the field of osteoarthritis of the knee according to EULAR, patients without trauma or surgery at the level of the knees and who consented to participate in the study.

Exclusion criteria included: presence of heart failure or angina at minimal effort, patients with silent coronary ischemia, myocardial infarction or coronary bypass 3 months before first admission, uncontrolled systolic blood pressure, unbalanced diabetes, severe COPD blood clotting disorders.

We have analyzed the evolution of the WOMAC Index. Also in order to evaluate how the stability of the knee is influenced by the complex balnear treatment we performed the test of the anterior drawer, the test of the posterior drawer, the posterolateral Hughston test and the posteromedial Hughston test.

The WOMAC score consists of a questionnaire comprising 24 questions completed by the patient following the initial training. The maximum score that can be obtained is 96 points. It investigates three major aspects, namely pain (5 questions), mobility (2 questions) and functionality (17 questions). The score obtained for each item is between 0 points (no pain or limitation) and 4 points (severe pain or limitation). Intermediate scores are 1 point - pain or mild limitation, 2 points pain or moderate limitation, respectively 3 points for pain or severe limitation. In interpreting the results, a score between 0 and 14 points is considered excellent, between 15 and 28 points, good, between 29 and 38 points acceptable and a score greater than 38 points indicates an unsatisfactory level (7).

The patients were evaluated at three times, respectively the initial moment, of the first hospitalization, their evolution at the next hospitalization, at an interval of 6 months from the initial moment, respectively their evolution until the next hospitalization, which took place 12 months from the moment first admission.

We compared in the case of the WOMAC scale the results obtained using the Friedman's Two-Way ANOVA (Two-Way Analysis of Variance by Ranks) test. For the other assessments, Cochran's Q test.

Results

Following the analysis of the medico-social data of the patients included in this study, it turned out that the average age of the patients is 59.95 years, with the standard deviation of 9.57 years. The minimum age was 36 years and the maximum age was 73 years.

In terms of age at the onset of the disease, this was on average, 52.9 years, the standard deviation of 9.04 years. The minimum age of onset of the disease was 33 years and the maximum age was 66 years.

Demographic characteristics such as sex, country of origin and educational level are found in table 1, together with the medial characteristics related to the distribution of patients according to the body mass index, the number of criteria met for the diagnosis of osteoarthritis of the knee and the smoking habit.

Table 1. Medio-social characteristics of the patients

		Number	Procent
Sex	Male	5	23,8
	Female	16	76,2
Enviroment	Urban	13	61,9
	Rural	8	38,1
Level of Education	First classes	3	14,3
	Gimnasyum	6	28,6
	Highschool	1	4,8
	Profesional school	3	14,3
	Post highschool	4	19
	University	3	14,3
	Not specified	1	4,8
Body mass index	Normal	6	28,6
	Overweight	6	28,6
	Obesity	9	42,9
Number of criteria required for diagnosis	3	2	9,5
	4	9	42,9
	5	5	23,8
	6	5	23,8
Smoke	Yes	9	42,9
	No	12	57,1

WOMAC score

Following the application of the WOMAC questionnaire the scores were obtained at the time of the three assessments located at a distance of six months. A descriptive statistical analysis of the obtained results is performed in table 2. It can be observed that, as a result of the treatments applied, the overall WOMAC score improved falling from average values of 59.19 points to average values of

47.95 points (a decrease of 18.98%). It is also noted that the variability of the results also decreased, the standard deviation being lower and also the median decreased significantly from 61 points to 48 points (Table 2).

Table 2 Statistic analyze of the Womac Score

	WOMAC Initial	WOMAC 6 months	WOMAC 12 months
N	21	21	21
Mean	59.19	50.38	47.95
Std. Deviation	21.085	13.607	13.036
Median	61.00	51.00	48.00
Minimum	30	28	28
Maximum	93	70	67

From the point of view of the category in which the patients were classified according to the result of the WOMAC score, we found an improvement of it so if initially there was no patient that allowed to fit in a good result this has changed since the second evaluation following the first treatment cure (Figure 1).

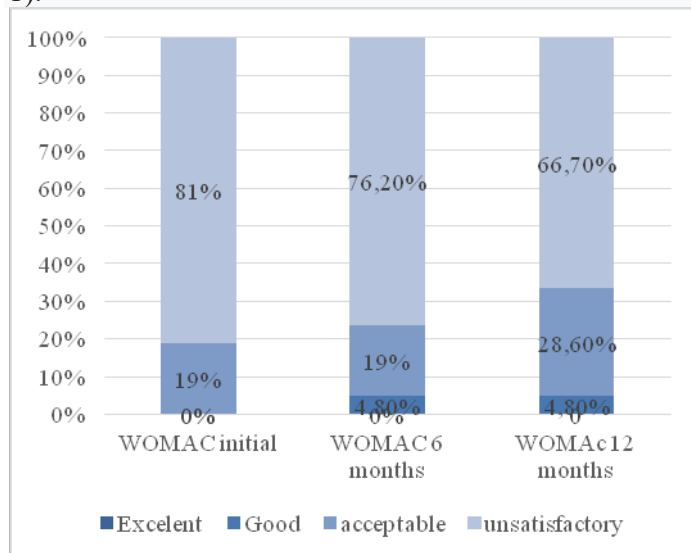
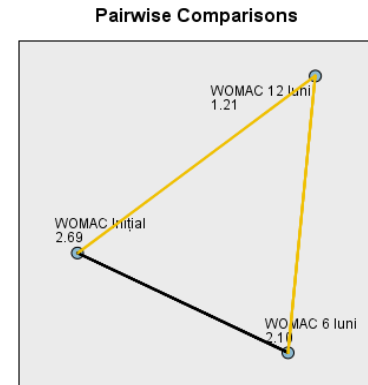


Figure 1. The distribution of the patients in Womac score

Following the application of the statistical test to the Friedman test, the result obtained is statistically significant (statistical test = 25,273, df = 2, p <0.001). Thus it can be concluded that the differences observed in the results of the WOMAC

questionnaire are statistically significant. Further analyzing the statistical significance of the differences between the three groups we found that statistically significant differences are between the initial score and the one at 12 months, respectively the score at six months and the one at 12 months. There are no statistically significant differences between the scores obtained at baseline and 6 months reassessment (Figure 2).



Each node shows the sample average rank.

Sample1-Sample2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj.Sig.
WOMAC 12 luni-WOMAC 6 luni	.881	.309	2.855	.004	.013
WOMAC 12 luni-WOMAC Initial	1.476	.309	4.783	.000	.000
WOMAC 6 luni-WOMAC Initial	.595	.309	1.929	.054	.161

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is .05. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Figure 2. The post hoc analyze of the groups

Next we evaluated how the three major components of the WOMAC questionnaire namely the assessment of pain, mobility and functionality evolve following the application of complex rehabilitation treatments.

Pain component

The component of the WOMAC questionnaire that assesses pain comprises a set of 5 questions, thus, the maximum score that can be obtained for this section score corresponding to a very high degree of severity is 20 points.

Table 3 shows the descriptive analysis for this component. It can be observed that both the average and the median values decrease significantly (percentage decreases of the average of 14.36% after 6 months, respectively 25.93% after 12 months).

The differences observed are statistically significant (statistical test = 27,028, df = 2, p <0.001), p <0.001. Regarding the differences between the groups, we

found that the decreases are significant ($P = 0.013$ vs 6 months, respectively $p < 0.001$ versus 12 months). Between the 6-month and 12-month assessments, the differences are not statistically significant ($p = 0.161$).

Table 3. The descriptive analyze of the pain

	WOMAC Pain initial	WOMAC Pain 6 months	WOMAC Pain 12 months
N	21	21	21
Mean	13.57	11.62	10.05
Std. Deviation	4.319	3.598	3.398
Median	15.00	11.00	10.00
Minimum	7	6	5
Maximum	20	18	16

The mobility component

The mobility component is evaluated in the WOMAC questionnaire by two questions, thus, the maximum possible result is 8 points. The average obtained at the initial evaluation was 5.24 points and at the subsequent evaluations 4.67 and 4.19 points respectively. Thus, significant decreases are observed, as a percentage, compared to the initial moment of 10.9% and 20% respectively (Table 4).

The differences observed are statistically significant (statistical test = 13.955, $df = 2$, $p = 0.001$). The comparison analysis between the groups identified that the statistically significant difference is only between the initial and the 12 months assessment ($p = 0.021$), in the case of the other combinations (initially vs 6 months respectively 6 months versus 12 months), the differences are statistically insignificant ($p = 0.628$, respectively $p = 0.428$).

Table 4. The descriptive analyze of the mobility

Report			
	WOMAC Mobility initial	WOMAC - Mobility 6 months	WOMAC - Mobility 12 months
N	21	21	21
Mean	5.24	4.67	4.19
Std. Deviation	1.947	1.317	1.167
Median	6.00	4.00	4.00
Minimum	2	2	2

Maximum	8	6	6
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Functionality component

The functionality component comprises the largest number of investigated items, 17. As with the other components, the functionality has improved, with decreases of the average score of 15.4% after the first six months, respectively 16.34% after 12 months from the first treatment cure. The differences are statistically significant (statistical test = 21.194, $df = 2$, $p < 0.001$). Table 5 shows the results of the descriptive statistical analysis for the functionality component.

Table 5. The descriptive analyze of the functionality

Report			
	WOMAC Functionality initial	WOMAC Functionality 6 months	WOMAC Functionality 12 months
N	21	21	21
Mean	40.76	34.48	34.10
Std. Deviation	14.889	9.320	9.746
Median	41.00	37.00	35.00
Minimum	22	19	18
Maximum	65	47	50

The differences between the groups are statistically significant between the initial evaluation and the six-month evaluation ($p < 0.04$), respectively the initial evaluation and the 12-month evaluation ($p < 0.001$). Between the six-month and the 12-month evaluation, the differences are statistically insignificant ($p = 0.228$).

Posterior drawer test

As a result of the evaluation of the patients through the posterior drawer test we found that their proportion does not change during the study the number of patients with a positive result being the same at the time of each evaluation (Table 6).

Table 6. The result of the patients evaluation.

Posterior drawer test

Evaluation	Negative		Positive	
	Number	Procent	Number	Procent
Initial	11	52,4%	10	47,6%
6 months	11	52,4%	10	47,6%
12 months	11	52,4%	10	47,6%

Anterior drawer test

Following the evaluation of the patients by means of the test of the anterior drawer we found that at the beginning about 62% of the patients had a positive result. In the subsequent evaluations the percentage of those with positive values decreased significantly reaching 42.9% in the case of the evaluation performed six months after the first treatment course respectively 33.3% when evaluating after two treatment courses respectively the evaluation of 12 months (Table 7).

Cochran's Q test result is statistically significant (statistical test = 8, df = 2, p = 0.018).

Table 7. The result of the patients evaluation. Anterior drawer test

Evaluation	Negative		Positive	
	Number	Percent	Number	Percent
Initial	8	38,1%	13	61,9%
6 months	12	57,1%	9	42,9%
12 months	14	66,7%	7	33,3%

In order to identify the way the patients evolved, we performed the intergroup comparison. Thus, we found that statistically significant differences exist only between the initial moment and the time of completion of the study (p = 0.016), between the initial and 6-month evaluation, respectively the 6-month and the 12-month evaluation, the differences being statistically insignificant (p = 0.192, respectively p = 1).

The posterolateral Hughston test

For the posterolateral Hughston test, although the results indicate an improvement (Table 8), the differences observed are statistically insignificant (statistical test = 2.8, df = 2, p = 0.247).

Table 8. The result of the patients evaluation. The posterolateral Hughston test

Evaluation	Negative		Positive	
	Number	Percent	Number	Percent
Initial	14	66,7%	7	33,3%
6 months	16	76,2%	5	23,8%
12 months	17	81%	4	19%

Hughston posteromedial test

Regarding the Hughston posteromedial test, there is a significant improvement, with a significant

decrease in the proportion of positive tests, from 33.3% to 9.5% (Table 9).

The result obtained is statistically significant (statistical test = 7.6, df = 2, p = 0.022). The comparison between the groups identified the fact that statistically significant difference only the proportion of patients with positive test at the beginning of the respective study at the time of its completion, p = 0.19. In the case of comparing the proportion of patients with positive results between the other assessments, the results are statistically insignificant, p = 0.301 between the initial and the six-month evaluation, respectively p = 0.82 between the six-month and the 12-month evaluation.

Table 9. The result of the patients evaluation. The posteromedial Hughston test

Evaluation	Negative		Positive	
	Number	Percent	Number	Percent
Initial	14	66,7%	7	33,3%
6 months	17	81%	4	19%
12 months	19	90,5%	2	9,5%

Discussions

According to the obtained results we found that there is an improvement of the symptomatology following the application of the complex treatment methods specific to the medical rehabilitation in the patients in this study. Thus, we found the overall improvement of the WOMAC score, as well as the improvement observed on each of its main components, namely pain, mobility and functionality. Following a systematic review conducted in 2018 (8) that evaluated the effectiveness of recovery therapies in the management of osteoarthritis of the knee, the authors concluded that there is evidence of WOMAC score improvement. In the present study, compared to the studies included in the review, the therapeutic methods used involved besides mud baths in Techirghiol Lake, saltwater hydrotherapy and kinetotherapy, electrotherapy, sonotherapy, laser therapy and magnetotherapy. The improvement observed, in general, appeared after the first therapeutic cure, subsequent improvements, after the second cure being significantly lower, the changes being insignificant. However, this can be considered as a positive aspect, representing practically a slowing down of the clinical progression of the

condition, with the maintenance of mobility and functionality.

Regarding the posterior drawer test, no influence of the treatment was observed. The posterolateral Hughston test also showed no statistically significant changes in the proportion of patients with a positive outcome.

For the evaluation of the previous drawer, the result is statistically significant, with a significant reduction in the percentage of patients with a positive result.

The Hughston posteromedial test shows a significant improvement, with a significant decrease in the proportion of patients with a positive outcome.

Conclusions

The study has shown that, by performing complex rehabilitation treatments, the patients ability to perform some actions, as well as their quality of life is improved and the effect following repeated treatments every six months is maintained during two treatments successive treatment.

Conflict of interest

There is no conflict of interest for any of the authors regarding this paper.

Informed consent

An informed consent was obtained from the patients included in this study.

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