ORIGINAL ARTICLE

Effects of geotherapy and phytotherapy associated with kinesiotherapy in the knee osteoarthritis: randomized double blind study

Katleen Arthur[1], Ligia Carla do Nascimento[1], Delize Alves da Silva Figueiredo[2], Lucas Barbosa de Souza[2], Fábio Marcon Alfieri[3]

ABSTRACT

Geotherapy is the therapeutic use of clay materials which are defined as natural earths that have different minerals in their composition. **Objective:** This work aimed to compare the pain, mobility, weight-bearing, and functional impairment in individuals with Knee Osteoarthritis who had undergone two types of physiotherapy treatments: the first group associated Geotherapy with Kinesiotherapy (GGK) and second group associated Geotherapy and Phytotherapy with Kinesiotherapy (GGFK). **Method:** This study was a randomized double-blind clinical trial, which was attended by 25 individuals of both sexes aged over 43 years; they underwent 10 sessions lasting 45 minutes each. The individuals performed the assessments to check for pain by using a visual analogue scale (VAS); to assess functional mobility, the test *Timed Up and Go* (TUG) test; to assess disability and symptoms, the Lequesne Algofunctional questionnaire; and finally the Nintendo Wii Fit®, to measure weight-bearing between members. **Results:** The results showed that only the GGFK had improved functional mobility. Both groups improved the intensity of pain and symptoms after the intervention and that improvement in GGFK was superior for symptoms in relation to GGK. Both groups showed a reduction in the intensity of pain and symptoms after the intervention, and the GGFK improvement was greater than the GGK for symptoms of Osteoarthritis (OA). Neither group showed any improvement in weight-bearing. **Conclusion:** It was concluded that geotherapy and phytotherapy associated with kinesiotherapy can be beneficial in reducing the pain and functional impairment associated with knee OA.

Keywords: clay, exercise therapy, osteoarthritis, knee, phytotherapy

[1] Student in the Physical Therapy course at the *Centro Universitário Adventista de São Paulo - UNASP* (Adventist University Center of São Paulo - UNASP)
[2] Physical therapist graduated from the Adventist University Center of São Paulo - UNASP
[3] Physical therapist, Professor in the Physical Therapy course at the Adventist University Center of São Paulo - UNASP

Mailing address:
UNASP - Centro Universitário Adventista de São Paulo
Fábio Marcon Alfieri
Estrada de Itapecerica, 5859
CEP 05828-001
São Paulo - SP
E-mail: fabio.alfieri@unasp.edu.br

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INTRODUCTION

Osteoarthritis (AO) of the knee is a chronic rheumatic disease of an inflammatory and degenerative nature that afflicts the cartilage and periarticular structures, leading to alterations in the joint structure.[1,2] In Brazil, osteoarthritis effects approximately 16.2% of the population, and it is responsible for 30 to 40% of all the ambulatory consultations in rheumatology.[3] Its incidence increases with age and it is the disease that causes the most pain and physical disability in elderly patients, in addition to being the cause for work disabilities in around 15% of the adult population in the world.[4] The term most internationally known for this disease is osteoarthritis, which can also be called: arthritis, arthrosis, osteoarthrosis, degenerative arthropathy, and when the knee joint is affected it is called gonarthrosis.[5]

The symptoms associated with osteoarthritis are: pain, joint rigidity, crepitations, deformities, and functional losses.[6] The pain can make the individual restrict his or her regular practice of physical activity, which causes weakening and muscular hypotrophy, diminishing one's physical conditioning, and thus leading to exacerbation of the pain.[7] It is known that knee osteoarthritis leads to progressive functional disability, which makes kinesiotherapy essential in its treatment, for it helps the individual to improve and recover his movement and physical function.[5] It is a disease that carries one of the highest treatment costs for health systems in the world.[5] Currently, health issues demand low cost medical models that can assure the practices of health promotion and recovery.[8]

Many types of treatments for knee osteoarthritis are used: medication, surgery, and physical therapy.[8] Various forms of physical therapy treatments are used for knee osteoarthritis: therapeutic exercises, thermotherapy, cryotherapy, hydrotherapy, acupuncture, electrotherapy, ultrasound, galvanic current, and laser.[4,9] Phytotherapy and geotherapy (clay therapy) have stood out, being used in many diseases.[8,10] Geotherapy is the therapeutic use of clays, which are defined as earthy natural materials that have in their composition different types of minerals: magnesium and aluminum lamellar silicates, quartz, feldspar, carbonate minerals, metallic oxides, and calcium.[10] Ancient physicians like Hippocrates, Avicenna, Plinius, and Galen, already used therapeutic clays to treat individuals afflicted by rheumatism.[11] Brazilian dolomite, a much-used type of clay also known and commercially registered as Gran-White (GW), is made up of 27 minerals, especially calcium and magnesium.[12] When mixed with hot water and in contact with the skin, dolomite creates perspiration, eliminating substances such as urea, sodium, chlorine, and potassium, activating a metabolic exchange.[13]

Phytotherapy is the application of plants and other natural substances that have curative components in the treatment of diseases. The interest in the use of medicinal plants for rheumatic diseases has increased in the scientific community, mainly relating to the use of *Uncaria*, which includes some 60 species.[14] The *Uncaria Guianensis*, popularly known as Cat's Claw, is a medicinal plant native of tropical South America that has been frequently used in treatments of chronic inflammations, including arthritis.[15]

OBJECTIVE

This study seeks to compare the pain, mobility, the bearing of weight, and functional losses in individuals with knee osteoarthritis submitted to two types of physical therapy treatments: geotherapy combined with kinesiotherapy, or geotherapy and phytotherapy combined with kinesiotherapy.

METHOD

The present study was approved by the Committee on Ethics in Research from the Adventist University Center of São Paulo. All the volunteers who participated in this research signed a Free and Informed Consent form.

This is a prospective clinical test, randomized and double blind, in which 44 individuals of both genders were evaluated. This study was made at the *Policlínica Universitária da UNASP* (UNASP Policlinic University), in São Paulo.

Individuals were excluded from this study who had a total or partial prosthesis in one or both knees or hips, uncontrolled cardiopathies and hypertension, rheumatoid arthritis, and neurological diseases that affect locomotion. Also, those who missed treatment two or more times were excluded from this study.

The treatment was made twice a week, totaling 10 sessions at the from UNASP Policlinic University. The participants were randomized into two groups through a simple drawing for their treatment.

The geotherapy + kinesiotherapy group (GK) received therapy with a powdered dolomite poultice (300 g per individual), mixed with hot water, and applied to the knees for 25 minutes.

The geotherapy + phytotherapy + kinesiotherapy group (GPK) received therapy with a powdered dolomite poultice (330 g per individual), mixed with *Uncaria Guianensis* tea (sachets of *Uncaria Guianensis* were made using its leaves and stems put in an infusion in the proportion of 150 g to 500 ml of water), with application and duration similar to the first group. The application of the dolomite poultice in both groups was made hot so as to create perspiration.

The groups also received a kinesiotherapy program that consisted of stretching exercises for the flexor and extensor hip and knee muscles, plantar flexors, and their strengthening in a closed kinetic chain, totaling 10 minutes. To finish each session, there was a 10-minute walking circuit on mats, hula hoops, stairs, and cones to deviate from, thus working their coordination and proprioception.

The volunteers were initially asked data such as age, weight, and height, and then afterwards were evaluated for pain, functional mobility, symptoms, disability, and bearing of weight.

To evaluate the body mass index (BMI), the weight in kilograms was divided by the square of the height in meters. The BMI values, according to the World Health Organization, are classified into: BMI < 20 kg/m^2 (low weight); BMI of 20 to 24.99 kg/m^2 (normal); BMI of 25 to 29.99 kg/m^2 (overweight), and BMI ≥ 30 kg/m^2 (obese).[16]

The Visual Analogue Scale (VAS) was used to evaluate the pain. This test consists of a straight 10 centimeter line, on which the individual makes a mark, indicating the place that best identifies his pain: close to the beginning of the line means absence of pain, and close to the end of the line means intolerable pain.[17]

To measure functional mobility, the Timed Up and Go (TUG) test was used. This test consists of measuring in seconds the time spent by the individual to get up from a chair, to walk three meters, and to go back and sit down in the chair again. The test was repeated three times by the participant, and the shortest time was the one selected.[18]

The symptoms and physical disability were evaluated by the Lequesne Algofunctional Index. The index is composed of 11 questions, with six about pain and discomfort (one of these especially for the knee and another for the hip), one about the maximum

distance to walk, and four different questions for the hip or knee on daily life activities. The scores vary from 0 to 24 (from little impairment to extremely serious). In this study only the knee questions were used.[19]

To evaluate the bearing of weight on the lower limbs, the Nintendo Wii Balance Board® postural evaluation system was used. The evaluator asked the patient to remove his shoes and to stand on a balance platform (the Nintendo Wii Balance Board®). The software used was that of the Wii Fit Plus® game. The patient remained with his feet apart, one on each side of the platform, static and relaxed, looking at a television set at his eye level two meters away. The game was started and, once the Nintendo Wii® had measured the bearing of weight between the right and left lower limbs, the test was concluded.[20]

These tests were applied before and after the treatment by an evaluator who did not know which intervention group the volunteer belonged to. Neither the researchers who made the intervention nor the volunteers knew which individuals were using phytotherapy in their treatment.

Data analysis

The data analysis was made using the Graph Pad Instat statistical package. The data is presented in average ± standard deviation. The comparisons between the groups before the intervention were made with the unpaired *t* test. The comparisons within each group after the interventions were also made with the unpaired t test. The comparison of the intervention effect between the groups was made with the t test for unpaired data. In all cases, the established descriptive level α was 5% ($\alpha < 0.05$).

RESULTS

Forty-four (44) individuals diagnosed with symptomatic knee osteoarthritis were evaluated. From the study, 6 individuals were excluded, and 13 abandoned treatment during the study, leaving thus 25 patients who participated in the intervention programs. The patients who left and did not have their data analyzed among the intervention groups were statistically younger (averaging 50.6 years) and with a statistically higher BMI (32.3 Kg/m^2) ($p = 0.02$) in relation to the volunteers who concluded the study. In relation to the other evaluations, only the TUG of these volunteers who did not participate in the study had a statistically lower value ($p = 0.03$). The remaining evaluations had similar values.

The 25 individuals who continued to the end of the work were divided randomly by simple drawing into two groups: GK (n = 12), with 3 males and 9 females, and GPK (n = 13) with 3 males and 10 females. The average for age, body mass, and distribution as to the gender of the participants was similar between the two groups as observed in Table 1. As for the clinical evaluations, both groups showed similar basal values.

After the intervention it was possible to detect that both the geotherapy + kinesiotherapy group (GK) and the geotherapy + phytotherapy = kinesiotherapy group (GPK) obtained significant results in the VAS and in the Lequesne Algofunctional test.

In the Timed Up and Go test, only the GPK group reached a statistically significant value. In the comparison between the groups x time, the GPK group obtained better results in the reduction of symptoms associated with knee osteoarthritis according to the Lequesne index. Neither group showed alterations as to the distribution of body weight, as shown in Table 2.

DISCUSSION

The results of this study showed that both techniques with natural therapeutic resources associated with kinesiotherapy were significantly efficient at reducing pain and symptoms associated with knee osteoarthritis.

The GK group as well as the GPK group obtained results in reducing the pain and symptoms related to knee osteoarthritis. Matsudo et al. report that the pain associated with osteoarthritis is the main cause of restriction of physical activity in the elderly,[7] and according to Sanchez et al.[5] and Greve et al.[21] it can alter the reflex muscular activity, leading to hypotrophy and muscle weakness.

As a way to recover from these alterations, one of the proposals for the treatments was the use of therapeutic exercise or kinesiotherapy. There is evidence in the literature that therapeutic exercise decreases joint pain and, in addition, improves motor function. Kinesiotherapy can also diminish the need for arthroplasty and intra-joint knee medication.[22-25]

Besides diminishing pain, it is also important to increase the muscular strength of lower limbs, for it helps to stabilize the joint and influences the quality of gait directly.[26] Creating treatment proposals that work these two questions is essential in the control and treatment of osteoarthritis of the knee.[2] The results obtained in the Lequesne index indicate that such benefits were reached in the GK group as well as in the GPK group.[19]

Both groups combined therapeutic exercises with the application of dolomite in knees afflicted by osteoarthritis. It is constituted mainly by Calcium and Magnesium, two important components in the maintenance of osseous health.[27,28] For this reason, it is

Table 1. General characteristics of the sample (average and standard deviation) of the geotherapy + kinesiotherapy group (GK) and of the geotherapy + phytotherapy + kinesiotherapy group (GPK)

	GK	GPK	*p*
N	12	13	-
Males/Females	3/9	3/10	-
Age (years)	58.6 ± 9.5	63.9 ± 6.7	0.11
BMI (Kg/m^2)	24.7 ± 5.7	28.8 ± 7.9	0.15

BMI: body mass index

Table 2. Results (average and standard deviation and value of p) of the different clinical evaluations between the groups: geotherapy and kinesiotherapy (GK), or geotherapy along with phytotherapy and kinesiotherapy (GPK), before and after the treatment program

	GK			GPK			*p*
	Before	After	*p*	Before	After	*p*	Group x Time
TUG (s)	16.3 ± 7.7	12.11 ± 3	0.08	13.8 ± 2.8	11.4 ± 1.4	0.003	0.43
VAS (cm)	7.7 ± 1.9	4.3 ± 2.2	0.003	7.6 ± 1.6	3.4 ± 2.6	< 0.0001	0.47
Lequesne	11.3 ± 2.2	8.4 ± 3.5	0.01	12.3 ± 3.6	6.0 ± 3.9	0.001	0.03
Difference in weight bearing (%)	14 ± 11.3	9.2 ± 5.6	0.08	9.8 ± 10.7	7.2 ± 7.3	0.52	0.66

TUG: *Timed up and Go*; s: seconds; VAS: visual analogue scale; cm: centimeters

probable that its use helped to attenuate the osteoarthritic symptoms.

In this study, *U. Guianensis* was used by one of the groups (GPK). It was applied topically, but other studies use cat's claw orally, through the ingestion of pills and also its extract.[8,15,29]

As osteoarthritis has a chronic inflammatory character, some mediators may be increased and participating actively in the destruction of cartilage and other periarticular structures.[30-34] For this reason it was decided to use *U. Guianensis* in one of the groups, for it has the capacity to inhibit the molecular effects of TNF-a (tumor necrosis factor-a) and of NF-kB (nuclear factor NF-kappaB). It is an efficient eliminator of free radicals such as DPPH (l-diphenyl-2-picrilhydrazyl), and also shows discreet inhibiting effects on cyclooxigenase-1 and on cyclooxigenase-2 (Cox-1 and Cox-2).[8,35-40] Thus, it is possible to say that its use is effective in treating the physiopathological mechanism of knee osteoarthritis. This may have contributed to the GPK group obtaining more satisfactory results than the GK group in relation to reduction of symptoms seen in the Lequesne index.

Mobility, a factor evaluated in this study, was improved only in the GPK group, corroborating the findings of the Lequesne index. Although the GPK did not improve statistically, clinically it may have been important, for the time before the treatment was more than 14 seconds, which is a strong indicator for the risk of falling. However, after treatment, time was reduced to 12.1 ± 3.0 seconds, and could, in that way, have reduced the patients' risk of falling. Nevertheless, neither of the groups reached a value of ≤ 10 seconds, interpreted as normal.[41,42] This nondecrease shows how much osteoarthritis can interfere with the functional mobility of individuals afflicted by this disease.

Although the GK group improved the weight bearing of the limbs, the results relative to this evaluation made through the Wii Fit® were not statistically significant. Maybe this result is related to the BMI, which was higher in the phytotherapy group. Vasconcelos et al.[43] mention that overweight patients with knee osteoarthritis tend to have more difficulty in performing activities that demand moving and carrying weight on the afflicted joints.

The results of this study were favorable to the use of natural resources such as clay and phytotherapy combined with kinesiotherapy, however, it is believed that other studies with larger samples should be made to better understand the effects of each one of these resources, especially the use of *U. guianeneses*. Experimental laboratory studies are desirable to confirm the benefits of clay as well as of *U. guianeneses*. It is also noteworthy that if all the volunteers evaluated initially in the study had participated in the interventions as well as in the final evaluations, the results would probably have been different, for the group that left was younger and with greater functional mobility, however, with a higher body mass index than the group that participated in all the stages of the study.

New studies that compare these resources to other traditional studies may also provide new ways to choose more efficient and economical resources for the treatment of osteoarthritis.

CONCLUSION

The results of this study indicate that individuals with knee osteoarthritis submitted to geotherapy treatment combined with phytotherapy and kinesiotherapy or geotherapy combined only with kinesiotherapy can see a reduction of pain and improvement of functionality. However, the group that used phytotherapy obtained better results than the group without phytotherapy. The group that used phytotherapy showed improvement in functional mobility, but this improvement was not any greater than the other group. Neither group showed any significant improvement as to carrying weight on foot.

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