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Application of kinesiotherapy and electrothermotherapy in the treatment of elderly with knee osteoarthrosis: a comparative study

Aplicação da cinesioterapia e eletrotermoterapia no tratamento de idosas com osteoartrose de joelho: estudo comparativo

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Abstract

Introduction: Among the treatment modalities in this disease , the surgical and conservative means stand out through therapy resources such as electro-thermotherapy and kinetic therapy. The general objective of this study was to evaluate the effects from two protocols of physical therapy in elder women with knee osteoarthritis. **Methods**: An experimental clinical trial type study consisting of pre and post tests was performed, in which 30 female patients were selected, all between 61 and 80 years old, diagnosed with primary knee OA, treated at the Center for Comprehensive Health Care for the Elder (CAISI – Centro de Atenção Integral à Saúde do Idoso). They were divided into 2 groups of 15 persons for each type of treatment: Group

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I was treated with kinetic therapy, and group II was treated with electro-thermotherapy. Patients from both groups underwent 36 physical therapy sessions during 12 weeks. For data collection, protocol sheets with socio-demographic data, Body Mass Index (BMI) at kg/m2, visual analogue scale (VAS) and measurement of motion range (ADM) were used. For statistics analysis, the Mann-Whitney, Wilcoxon and Chi-square's non--parametric tests were used. Student's parametric tests were also applied as independent samples. **Results**: The tests performed in both groups contributed to the reduction in the level of pain. There were differences in group I and II on the increase of ADM, except in bending the left knee in group II. **Conclusion**: It was concluded that both treatment modalities showed effective therapeutic responses, but these benefits were even higher in OA treatment by kinetic therapy**.**

Keywords: Osteoarthritis. Aged. Therapeutics.

Resumo

Introdução*: Dentre as modalidades de tratamento na Osteoartrose, destacam-se a forma cirúrgica e conservadora através dos recursos fisioterapêuticos como a eletrotermoterapia e a cinesioterapia.* ***Objetivo****: Verificar os efeitos de dois protocolos terapêuticos em mulheres idosas com Osteoartrose de joelho.* ***Métodos:*** *Realizou-se um estudo do tipo ensaio clínico não controlado com delineamento pré-teste e pós-teste, onde foram selecionadas para a pesquisa 30 pacientes do sexo feminino, com idade entre 61 a 80 anos, com diagnóstico de Osteoartrose de joelho primária, atendidas em um Centro de Referência Integral à Saúde do Idoso (CAISI), que foram divididas em 2 grupos de 15 pessoas para cada modalidade de terapias: o grupo I foi tratado com a cinesioterapia, e o grupo II foi tratado com eletrotermoterapia. Pacientes de ambos os grupos realizaram 36 atendimentos fisioterapêuticos durante 12 semanas. Para a coleta dos dados foi utilizada ficha protocolo contendo dados sócio-demográficos, índice de massa corporal (IMC), escala visual analógica (EVA) e medida da amplitude do movimento (ADM). Para análise estatística, foram utilizados os testes não paramétricos de Mann-Whitney e Wilcoxon, o teste paramétrico t de Student para amostras independentes e para verificar as associações o teste qui-quadrado.* ***Resultados****: Os tratamentos realizados nos dois grupos contribuíram para a redução do nível de dor. Houveram diferenças nos grupo I e II quanto ao aumento da ADM, exceto na flexão do joelho esquerdo no grupo II.* ***Conclusões****: Conclui-se que ambas as modalidades de terapias demonstraram respostas terapêuticas pela redução da dor e melhora da ADM, porém o grupo que foi tratado pela cinesioterapia obteve uma melhora mais acentuada.*

Palavras-chave*: Osteoartrite. Idoso. Terapêutica.*

Introduction

The World Health Organization (WHO) emphasizes that Osteoarthritis (OA) would be the fourth most important cause of disability among women, and the eighth among men. It is estimated that 10% of the global population aged over 60 years suffer from the symptoms of this degenerative disease that is inherent to the aging process that affects organs, tissues and organic systems (1, 2).

OA is a chronic degenerative rheumatic disease, multifactorial, of unknown etiology. It is the most common form of compromising the diarthrodial joints that affect elderly with cartilage changes resulting from age and, especially, by wear of the joints present at this this stage of life (1). Among the rheumatic diseases, it is the most usual, affecting nearly one fifth of the world's population, around 50% of seniors over 60 and 80% of the population over 75 years (3, 4).

Osteoarthritis affects 16.2% of the brazilian population, representing about 30% to 40% of appointments specialized in osteomuscular articular system (5). In Brazil, this disease is responsible for 7.5% of all leaves of absences and it is the fourth cause to determine retirement, with 6.2% (6).

However, its incidence in aging is higher among women, due to changes in their hormone levels and mechanical alterations found in knee joint (7).

The most common places affected by the disease are the joints of the hands, feet, knees, hips, cervical and lumbar spine. The knee is highlighted for supporting great impacts, which compromises the quality of life, especially the elderly, may lead to functional disability (8, 9).

It is noteworthy that the functional disability arising from degenerative diseases, including OA, lead to high costs to public health in Brazil, as a consequence of reduced capacity of human beings to develop labor activities and the increased risk of morbidity and mortality (10).

Recent breakthroughs in the treatment of osteoarthrosis have allowed better conditions in the evolutive course of the disease, favoring a better prognosis of patients (11, 12). Among the types of treatments most commonly used by the physiotherapist in physical therapy procedures of osteoarthrosis, it is highlighted the conservative manner, through the use of techniques of kinesiotherapy, electrotherapy, mechanotherapy, thermotherapy and hydrotherapy. These techniques are employed as an intervention measure, whose induced effects enhance joint mobility and muscle strength, optimizing the quality of life of patients (13, 14).

It is still controversial the effectiveness of several treatment modalities in degenerative diseases such as OA, especially when studied in women, due to hormonal differences and associated factors in this population. Thus, the present study aimed to verify the effectiveness of two physical therapy protocols with knee OA in elderly women.

Methods

This study is a uncontrolled clinical essay, conducted at the Centro de Atenção Integral à Saúde do Idoso (CAISI) in São Luís, Maranhão, in 2009, with a convenience sample. Initially, 60 patients were recruited. Of these, 50 fulfilled the inclusion criteria of the study, but, at the end, 30 patients agreed to participate. This study was conducted after the approval of the Research Ethics Committee (CEP) of the University Hospital of the Federal University of Maranhão (Process No 004975 / 2008-70). All patients who agreed to participate signed the informed consent.

The study included patients over the age of 60, female, lack of regular exercise for at least four months, absence of any treatment for at least 6 months, and medical referral with clinical diagnosis of OA accompanied by examination of radiological image. The exclusion criteria were patients with cognitive impairment, who presented hypersensitivity to thermal and physical means applied in the treatment, previous knee surgery, exclusive locomotion by wheel chairs or knee prosthesis.

The patients were allocated randomly into two physiotherapy groups (Group I - Kinesiotherapy and Group II - electrothermotherapy).

The intervention was simply-blinded, featured conducted by a team of three professionals. The professional responsible for assessing the pre- and post-treatment of the study had no information of the data that were archived and not manipulated, besides not participating of the intervention and not knowing groups of both treatment modalities avoiding possible bias in research.

All professionals were qualified and had extensive clinical experience with the research instruments.

The clinical and radiographic diagnosis was obtained from the American College of Rheumatology (15) criteria, based on the main complaint of women during the investigation.

It was applied a standardized questionnaire through an evaluation protocol of the clinic services composed of a full investigation about the clinical manifestations present in OA and other complaints, besides socioeconomic information.

The presence of knee pain and range of motion before and after treatment was assessed. Some additional clinical data such as blood pressure, heart rate, symptomatic knee and joint deformities were also obtained.

It was used as a parameter a visual scale analogic for the assessment of the perception of pain related to the last 24 hours (16). The measurement of the range of motion for flexion and extension of the knees was conducted through a universal goniometer (brand Carci, SP, Brazil) consisting of a complete circle (360 degrees) or half circle (180°), with two arms (one mobile and one fixed) being measured by passive goniometer.

During the measurement of knee flexion the patient was positioned in supine with knees and hips flexed. The fixed arm was positioned parallel to the longitudinal axis of the femur toward the greater trochanter, on the surface of the thigh. The other rod was parallel to the longitudinal axis of the fibula on the side surface and aiming at the lateral malleolus.

When measuring the knee extension the patient should be positioned in the supine position, and this measure corresponds to the return of knee flexion, therefore, with the patient's knee extended and hip in neutral position. The fixed arm of the goniometer was positioned laterally along the longitudinal axis of the femur towards the greater trochanter. The mobile arm was positioned parallel to the side of the fibula toward the lateral malleolus.

The measurements of weight and height were assessed, and the body mass index (BMI) was calculated using the formula: weight (kg) / height (m)2. BMI classification used the cutoff points recommended by the WHO (17).

Physiotherapy Intervention

In group 1 (GI), it has been developed the kinesiotherapy, through passive stretching of ischio-crural, fascia lata tensor and surae triceps (three sets of 30 seconds). Patellar mobilizations, talocrural pump, osteokinematic movements and arthrokinematic (traction and compression), besides isotonic exercises that consisted of flexing the free active knee and hip flexion with extension of the free active knee (three sets of 12-15 repetitions), in addition to a 10-minute session on an exercise bike at the end of each treatment. These treatments were conducted in three alternate weekly sessions, lasting an average of 30 to 40 minutes.

Group II has used the electrothermotherapy, through the electrical nerve neurostimulation (TENS) using the Neurodyn II apparatus (Ibramed, São Paulo, Brazil), with one output channel. The acupuncture mode was used in this technique - T = 150μs, F = 4 Hz with fixed pulse amplitude throughout the period of physiotherapy intervention. For 30 minutes the gel electrodes were positioned in the anterior portion of the affected knee.

The treatment using the ultrasound model sonopulse Compact 1 MHz (Ibramed, São Paulo, Brazil) with continuous frequency, intensity 1 MHz dose 0.8 W / cm2, employed to the anterior portion of the knee ranging from 3 to 5 minutes was still conducted. The application depended on the size of the knee area due to edema presented in patients. They achieved three alternate weekly sessions, lasting an average of 30 to 40 minutes. It is justified, this dosimetry as a reference standard since these parameters are most often used in physical therapy, mainly in soft tissue injuries and painful episodes.

After treatment, the patients were advised to continue the treatment, according to their clinical and functional prognostic in CAISI or in their homes.

Statistical Analysis

The data were analyzed with SPSS for Windows 17.0 (2009). A descriptive analysis with the presentation of means and simple frequencies was conducted. In comparisons of ordinal variables (pain and BMI), it was employed the chi-square test and the Mann Whitney test. It was employed for numerical variables of knee extension (right and left) and knee flexion (right and left), the Shapiro-Wilk normality test. As all variables both before and after the intervention presented normal distribution, the parametric Student t test for independent samples was employed in order to assess the difference between treatments (kinetotherapy and electrothermotherapy). After these analyses, within each treatment was employed the Student t test for paired samples, adopting the significance level of 5% for all comparisons.

Results

The sample consisted of elderly patients, 40% (12) were widows, 36.7% (11) married and 23.4% (7) were single or separated. The mean age was 68.1 ± 6.35 years (61-80 years). Regarding socioeconomic conditions, more than half (53.3%) had an income of two minimum wages. It was observed that 72.6% of elderly were overweight or obese.

As for the knee OA characteristics, 56.7% (17) of the patients had right knee as the predominant side, 36.7% (11) had the left knee as predominant, and 6.7% (2) diagnosed with bilateral predominance.

When comparing the two therapeutic modalities (GI and GII) it was observed that there was a reduction in the pain level ($p < 0.0001$) of patients before and after the intervention. The medians of BMI in group I was 29.31 kg / m^2 before and 28.70 kg / m^2 after treatment. For group II 29.68 kg / m^2 and 29.50 kg / m^2 before and after treatment. For BMI values there was no difference (Table 1).

When comparing the average amplitude of the bilateral movement of the knees, it was verified that only the variable right knee extension difference was found ($p = 0.040$) between the GI and GII therapies (Table 2).

In the group submitted to kinesiotherapy (GI), there was difference in the amplitudes means of right knee extension movements ($p = 0.009$), left knee extension ($p = 0.012$), right knee flexion ($p = 0.001$) and left knee flexion ($p = 0.001$) when compared the pre and post-treatment values (Table 3). Similarly, it was observed in the group submitted to electrothermotherapy (GII) differences in amplitudes means of right knee extension movements ($p = 0.004$), left knee extension ($p = 0.012$) and right knee flexion ($p = 0.003$). There was no difference in the amplitude of the left knee flexion movements ($p = 0.051$) in relation to pre and post-treatment values (Table 4).

Table 1 - Comparison of ordinal variables BMI and Pain before and after treatment of kinesiotherapy and electrothermotherapy São Luís, MA, 2009

Variable	Before (n)	%	After (n)	%	x^2	p
			BMI			
Eutrophy	5	16.7	9	30.0	2.32	0.3621
Overweight	11	36.6	7	23.3		
Obesity	14	46.7	14	46.7		
Total	30	100.0	30	100.0		
			Pain level			
0 to 2	1	3.3	7	23.3	25.323	<0.0001*
3 to 5	7	23.3	20	66.7		
6 to 8	11	36.7	2	6.7		
9 to 10	11	36.7	1	3.3		
Total	30	100.0	30	100.0		

Note: *p<0.05

Table 2 - Comparison of range of motion values in bilateral movements of extension and flexion of the knee before and after the treatment with methods Kinesiotherapy (GI) and Electrothermoterapy (GII) in 30 elderly women. São Luís, MA, 2009

Variables		Group							
		Kinesiotherapy			Electrothermoterapy				
		n	Mean	SD	n	Mean	SD	t	p
Before	Age	15	69,13	6,32	15	67,07	6,43	0,888	0,382
	Right Knee Extension	15	-9.13º	11.61	15º	-7.13º	7.95	-0.551	0.586
	Left Knee Extension	15	-8.07º	12.35	15º	-5.87º	7.36	-0.593	0.558
	Right Knee Flexion	15	77.67º	25.68	15º	90.07º	23.97	-1.367	0.182
	Left Knee Extension	15	85.87º	20.26	15º	92.47º	25.36	-0.788	0.438
After	Right Knee Extension	15	-2.47º	3.33	15º	-0.47º	1.36	-2.151	0.040*
	Left Knee Extension	15	-0.93º	3.39	15º	-0.8º	1.52	-0.139	0.890
	Right Knee Flexion	15	104.67º	11.23	15º	105.53º	15.83	-0.173	0.864
	Left Knee Extension	15	104.87º	16.17	15º	104.07º	18.37	0.127	0.900

Note: *p<0.05

Table 3 - Range of Motion values of the knee movements before and after the treatment of GI (kinesiotherapy) of Elderly Women, São Luís, MA, 2009

Variable		n	Mean	SD	Standard error	t	p
Right Knee Extension	Before	15	-9.13º	11.61	2.99	-3.005	0.009 *
	After	15	-2.47º	3.33	0.86		
Left Knee Extension	Before	15	-8.07º	12.35	3.19	-2.899	0.012 *
	After	15	-0.93º	3.39	0.87		
Right Knee Flexion	Before	15	77.67º	25.68	6.63	-3.988	0.001 *
	After	15	104.67º	11.23	2.90		
Left Knee Flexion	Before	15	85.87º	20.26	5.23	-4.472	0.001 *
	After	15	104.87º	16.17	4.18		

Note: *p<0.05

Table 4 - Range of Motion values of the knee movements before and after the treatment of GII (electrothermotherapy) of Elderly Women, São Luís, MA, 2009

Variable		n	Mean	SD	Standard Error	t	p
Right Knee Extension	Before	15	-7.13º	7.945	2.051	-3.417	0.004*
	After	15	-0.47º	1.356	0.35		
Left Knee Extension	Before	15	-5.87º	7.357	1.900	-2.905	0.012 *
	After	15	-0.8º	1.521	0.393		
Right Knee Flexion	Before	15	90.07º	23.975	6.190	-3.545	0.003 *
	After	15	105.53º	15.833	4.088		
Left Knee Flexion	Before	15	92.47º	25.357	6.547	-2.132	0.051
	After	15	104.07º	18.371	4.743		

Note: *p<0.05

Discussion

This study was mainly focused on comparing two therapeutic protocols (Kinesiotherapy and electrothermotherapy) conservatives in the treatment of OA in elderly women, in order to observe differences in the benefits of both therapies at the pain level, ADM and BMI values of the investigated patients. Fransen (18) reports the need of investigations related to the treatment of OA, as the pain level, ADM and BMI influence these approaches. The answers to these therapies continue deserving attention by the scientific community, since the evidence on physical rehabilitation are often without evidence.

After the initial investigation, the patients were assessed regarding full medical history as proposed by Cipriano (19). The medical history was obtained in the pretreatment phase and constitutes one of the most important steps of the clinical assessment protocol.

The mean age of patients was 68.1 years (± 6.35). The World Health Organization estimates that 25% of those over 65 suffer from pain and disability associated with OA (20). Advanced age and female gender are risk factors for OA (21). Due to the greater prevalence of this disease in women, this study chose to study only female patients.

The median BMI was high in both groups (GI and GII), showing that this is a sample where the majority (72.6%) are women overweight most likely due to physical inactivity and consequent reduction of energy expenditure. There was no significant difference when compared the BMI values before and after physical therapy. It is possible that the time of treatment and the exercises performed in two therapies have not been sufficient to promote weight reduction and response in the decrease of BMI among women in this study. Some studies have been conducted with obese women with knee OA, showing that overweight is one of the main risk factors for knee OA (22-24). Chacur's study (23) with obese women over 40 years has observed that the severity of OA is positively associated with overweight assessed by BMI, indicating that weight control should be part of knee OA prevention in women.

Pain is among the leading causes of physical disability in patients with OA and its improvement constitutes a major goal of therapies (25). Rodrigues (26), in a study with 45 patients with knee osteoarthrosis accompanied by an average time of 246 ± 99 days, showed that the treatment with kinesiotherapy contributed to the reduction of pain between the pretreatment phase and medical release. Morgan et al. (27) verified that the use of TENS helped in reducing the pain and strengthen knee muscles. In a study conducted by Mascarin (28), using EVA to measure pain, 60 patients were evaluated, divided into 3 groups of 20 patients with different techniques of kinesiotherapy, TENS and Ultrasound. It was observed that, at the end of the treatment, the mean pain decreased in the 3 groups and was homogeneous. This study agrees with these results, due to the observation of the significant decrease in the pain level of patients submitted to kinesiotherapy and electro-thermotherapy.

Kinesiotherapy is the use of movement caused by muscle activity for therapeutic purposes (5). The kinesiotherapy goals in patients with OA should be the reduction of disability and pain, increase of ADM and flexibility (20). This investigation has observed significant difference in the means of range of motion before and after the treatment of the group submitted to kinesiotherapy. In a comparative study by Silva et al. (29), kinesiotherapy proved to be better than cryotherapy and short waves in the increase of range of motion of passive flexion and flexibility of the knee affected by osteoarthrosis.

In the work conducted by Arden & Nevitt (30), it was demonstrated the effectiveness of therapeutic exercise programs whereas studying 201 female patients with hip and knee OA, with a mean age of 68 years, in which the participants received orientations and necessary medications. The patients were divided into 2 groups of therapeutic exercises and 1 control, treated for 12 weeks. After the treatment, the patients with knee and hip OA, belonging to the group of therapeutic exercise, had improved range of motion and functional capacity.

Moreira & Carvalho (31) claim that the limitation of movement in the knee joint is a significant cause of osteoarthrosis, but the treatment conducted with kinesiotherapy produces physiological effects such as the preservation of articular cartilage through its best hydration in addition to better joint mobility.

Among the modalities of thermoelectrotherapy, TENS and ultrasound were used in patients of group II of this study. TENS has been used as one of the modalities of physical therapy most used in pain relief for OA. A study shows that TENS reduces pain and improves knee functionality (27). There are still controversies regarding the use of methods using deep

heat in affected joints, although a review study, that brought together studies using deep heat as a form of physical therapy for OA, indicate that there seems to be a positive balance in favor of the analgesic effects, mainly produced by ultrasound and the diathermy by short waves (32).

In a meta-analysis (33), of studies with randomized controlled essays to assess the achievement of the ultrasound in the pain of OA patients by visual analogue scale, were observed, in general, pain reduction. Nevertheless, the heterogeneity present in the definition of the groups made it difficult to analyze the results because of parameters such as mode, frequency and intensity that were not well defined, explaining the inconsistency between groups.

The patients in this study showed improvement represented by the significant increase in the amplitude of the knee and pain reduction after treatment with thermoelectrotherapy, demonstrating the effectiveness of ultrasound as a therapeutic modality in OA.

Therefore, the results of this study corroborate other studies that indicate kinesiotherapy and therapies heat-based as a low-cost and safe treatment, with significant effects in reducing the pain and improving range of motion of patients studied (34, 35).

Among the limitations of this study it can be highlighted the convenience sample which has been used, exposing the results of the effect by chance, it is possible that some of the observed results are due to characteristics of the group rather than the treatment.

The short period of treatment, the sample size, the lack of control over the use of medications and the lack of a control group are other limitations that may be mentioned. However, the study allowed the use of two therapeutic approaches in women with knee OA, and it was possible to observe beneficial effects of both therapies in the disease.

It is necessary to conduct new studies with therapeutic approach related to OA for validation of effective protocols in controlling this disease, since the casuistry and the functional classification are some limitations of this study that can be elucidated in further studies.

Conclusion

Comparing the treatment groups, it was observed a significant decrease in the pain level after the intervention. It is justified, the responsiveness in reducing pain presented in both treatment groups possibly for the primary classification of OA where these characteristics are not decisive in the clinical aspects in this stage of the disease.

Regarding the BMI, no significant changes were observed before and after the interventions, most likely, due to time and goals of their respective treatment modalities, or even, according to overweight characteristics, manifest themselves more frequently in women especially the elderly. Both therapeutic techniques promoted increased range of functional motion of the knee. However, in relation to the left knee flexion, the electrothermotherapy showed no significant difference. It is noteworthy that the therapeutic techniques approached in this study reflected positively on ADM due to staging in painful episodes, as well as improved flexibility through the techniques of stretching and joint mobilizations that allowed improvements in the release of joint movements. Therefore, these results indicate that both treatments were effective in improving patients with OA. However, it is suggested that future research use control groups with other conservative therapeutic possibilities, as well as comparison between sexes, since this study has investigated a specific population.

References

1. Bjordal JM, Johnson MI, Lopes-Martins RA, Bogen B, Chow R, Ljunggren AE. Short-term efficacy of physical interventions in osteoarthritic knee pain. A systematic review and meta-analysis of randomised placebo-controlled trials. BMC Musculoskelet Disord. 2007; 8:51.

2. Marx FC, Oliveira LM, Bellini CG, Ribeiro MCC. Tradução e validação cultural do questionário algo funcional de Lesquene para osteoartrose de joelhos e quadris para língua portuguesa. Rev Bras Reumatol. 2006; 46 (4): 253-60.

3. Zacaron KAM, Dias JMD, Abreu NS, Dias RC. Nível de atividade física, dor e edema e suas relações com a disfunção muscular do joelho de idosos com osteoartrite. Rev Bras Fisioter. 2006; 10(3): 279-84.

4. Barduzzi GO, Rocha Júnior PR, de Souza Neto JC, Aveiro MC. Capacidade funcional de idosos com osteoartrite submetidos a fisioterapia aquática e terrestre. Fisioter Mov. 2013, 26(2): 349-60.

5. Paula BL, Soares MB, Lima GEG. A eficácia da associação da cinesioterapia e da crioterapia nos pacientes portadores de osteoartrite de joelho utilizando o questionário Algo-Funcional de Lequesne. R Bras Ci e Mov. 2009; 17(4): 18-26.

6. Chahade WH, Giorgi RDN, Pastor EMH. Como diagnosticar e tratar osteoartrose. RBM Rev. Bras. Med. 2001; 58(5): 304 - 14.

7. Dias JMD, Arantes PMM, Alencar MA, Faria JC, Machala CC, Camargos FFO et al. Relação isquiotibiais/quadríceps em mulheres idosas utilizando o dinamômetro isocinético. Rev Bras Fisioter. 2004; 8(2): 111 - 5.

8. Muhlen CA. Osteoartrose: como diagnosticar e tratar. Rev Bras Med. 2000; 57(3): 150-5.

9. Camargos FFO, Lana DM, Dias RC, Dias JMD. Estudo da propriocepção e desempenho funcional em idosos com osteoartrite de joelhos. Rev Bras Fisioter, 2004; 8(13): 13 - 9.

10. Mascarenhas CHM, Campos SL, Azevedo LM, Reis Junior NM. Avaliação funcional de idosas com osteoartrite de joelho submetidas a tratamento fisioterapêutico. RBSP. 2010; 34(2): 254 - 66.

11. Kellgren JH. Osteoarthritis in patients and populations. Br Med J 1961; 2 (5243): 1-6.

12. Cooper C. The epidemiology of osteoarthritis. In: Klipel J, Dieppe P. Rheumatology. New York: CV Mosby; 1994. p. 1-4.

13. Fitzgerald GK, Oatis C. Role of physical therapy in management of knee osteoarthritis. Curr Opin Rheumatol, 2004; 16(2): 143 - 7.

14. Brosseau L, Wells GA, Tugwell P, Egan M, Wilson KG, Dubouloz CJ. Ottawa Panel Evidence-Based Clinical Practice Guidelines for Therapeutic Exercises and Manual Therapy in the Management of Osteoarthritis. Phys Ther. 2005; 85(9):907 - 71.

15. Hinton R, Moody RL, Davis AW, Thomas SF. Osteoarthritis: diagnosis and therapeutic considerations. Am Fam Physician. 2002; 65(5): 841 - 8.

16. Scott J, Huskisson EC. Graphic representation of pain. Pain. 1976; 2 (2): 175-184.

17. Comité Expertos de la OMS sobre el Estado Físico. El estado físico: uso e interpretación de la antropometría. Genebra 1995 .

18. Fransen M, McConnell S, Bell M. Therapeutic exercise for people with osteoarthritis of the hip or knee: a systematic review. J Rheumatol. 2002; 29(8):1737-45.

19. Cipriano JS. Manual fotográfico de testes ortopédicos e neurológicos. 3. ed. São Paulo: Manole; 1999.

20. Bennell KL, Hinman RS. A review of the clinical evidence for exercise in osteoarthritis of the hip and knee. J Sci Med Sport. 2011; 14(1): 4-9.

21. Nicklas BJ, Ambrosius W, Messier S, Miller GD, Penninx BW, Loeser RF, et al. Diet-induced weight loss, exercise, an cronic inflammation in older, obese adults: a randomized controlled clinical trial. Am J Clin Nutr, 2004; 79(4): 544 - 51.

22. Vasconcelos KSS, Dias JMD, Dias RC. Relação entre a intensidade de dor e capacidade funcional em indivíduos obesos com osteoartrite de joelho. Rev Bras Fisioter. 2006; 10(2): 213 - 8.

23. Chacur EP, Silva LO, Luz GCP, Kaminice FD, Silva PL, Cheik NC, et al. Obesidade e sua correlação com a osteoartrite de joelho em mulheres. Fisioter Mov. 2008; 21(2):93 - 8.

24. Vasconcelos KSS, Dias JMD, Dias RC. Impacto do grau de obesidade nos sintomas e na capacidade funcional de mulheres com osteoartrite de joelhos. Fisioter Pesq. 2008; 15(2): 125-30.

25. Wibelinger LM, Batista JS, Vidmar MF, Kayser B, Pasqualotti A, Schneider RH. Effects of conventional physiotherapy and wii therapy on pain and functional capacity of elderly women with knee osteoarthritis. Rev Dor. São Paulo. 2013; 14(3): 196-9.

26. Rodrigues RC, Pontin JCB, Falcon SM, Chamlian TR. Avaliação do perfil, satisfação e efetividade do tratamento fisioterapêutico em grupo nos pacientes com osteoartrite de joelho. Acta Fisiatr. 2013; 20(3): 124 - 8.

27. Morgan CR, Santos FS. Estudo da estimulação elétrica nervosa transcutânea (TENS) nível sensório para efeito de analgesia em pacientes com osteoartrose de joelho. Fisioter Mov. 2011; 24(4):637-46.

28. Mascarin NC. Uma abordagem fisioterapêutica no tratamento da osteoartrite de joelho [Dissertação]. Campinas: Universidade Estadual de Campinas; 2008.

29. Silva ALP, Imoto DM, Croci AT. Estudo comparativo entre a aplicação de crioterapia, cinesioterapia e ondas curtas no tratamento da osteoartrite de joelho. Acta Ortop Bras. 2007; 15(4): 204 - 9.

30. Arden N, Nevitt MC. Osteoarthritis: epidemiology. Best Pract Res Clin Rheumatol, 2006; 20(1): 3-25.

31. Moreira C, Carvalho MAP. Noções práticas de reumatologia. Belo Horizonte: Health; 1996.

32. Assunção MLAC, Ramos AAT, Lima BA. Termoterapia profunda como tratamento fisioterapêutico na osteoartrite. Rev Ciênc Méd. 2010; 19(1-6):73 - 9.

33. Loyola-Sánchez A, Richardson J, MacIntyre NJ. Efficacy of ultrasound therapy for the management of knee osteoarthritis: a systematic review with meta-analysis. Osteoarthritis Cartilage. 2010; 18(9): 1117 - 26.

34. Chaves ACM, Marques BD, Alves CGC. Intervenção da fisioterapêutica na osteoartrite do joelho: um relato de caso. R Eletr Ci 2011; 4(2): 79-90.

35. Dadalto TV, Souza CP, Silva EB. Eletroestimulação neuromuscular, exercícios contrarresistência, força muscular, dor e função motora em pacientes com osteoartrite primária de joelho. Fisioter Mov. 2013; 26(4): 777-89.

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