REVISTA BRASILEIRA DE REUMATOLOGIA

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SOCIEDADE BRASILEIRA DE REUMATOLOGIA

Original article

Evaluation of postural control and quality of life in elderly women with knee osteoarthritis

Júlia Guimarães Reis[a,*], *Matheus Machado Gomes*[a], *Thamires Máximo Neves*[a], *Marina Petrella*[a], *Renê Donizeti Ribeiro de Oliveira*[b], *Daniela Cristina Carvalho de Abreu*[a]

[a]*Department of Biomechanics, Faculdade de Medicina de Ribeirão Preto, Universidade de São Paulo, Ribeirão Preto, SP, Brazil*
[b]*Department of Clinical Medicine, Faculdade de Medicina de Ribeirão Preto, Universidade de São Paulo, Ribeirão Preto, SP, Brazil*

ARTICLE INFO

Article history:
Received on 8 May 2013
Accepted on 12 November 2013

Keywords:
Osteoarthritis
Knee
Elderly
Quality of Life

ABSTRACT

Objective: To assess the balance in dynamic tasks and in the quality of life in elderly women with and without knee osteoarthritis.
Methods: Elderly women were divided into Group 1 (n = 12), consisting of participants with bilateral knee osteoarthritis (Kellgreen-Lawrence grade 1 and 2), and Group 2 (n = 12), consisting of controls. A force plate (EMG System do Brazil) was used to assess postural sway in dynamic tasks, whereas the quality of life was assessed by using the WHOQOL-Bref questionnaire.
Results: Student's t-test showed no statistical difference during sitting down and standing up from the chair ($p > 0.05$). However, stair ascent revealed difference in displacement speed ($p < 0.05$), whereas stair descent showed differences in both displacement speed and amplitude ($p < 0.05$). In the questionnaire, Group 1 showed values lower than those in the control group regarding physical domain ($p < 0.05$).
Conclusion: Elderly women with knee osteoarthritis seemed to have more difficulty on stair descent task and had perception of worst physical domain. These findings were observed in OA group, even in the early stages of the disease, which shows the importance of even earlier interventions.

* *Corresponding author.*
E-mail: juliagreis@yahoo.com.br (J.G. Reis).

0482-5004/$ - see front matter.
http://dx.doi.org/10.1016/j.rbre.2013.11.001

Avaliação do controle postural e da qualidade de vida em idosas com osteoartrite de joelho

Palavras-chave:
Osteoartrite
Joelho
Idosos
Qualidade de vida

RESUMO

Objetivo: Avaliar o equilíbrio em tarefas dinâmicas e a qualidade de vida em idosas com e sem osteoartrite no joelho.

Métodos: As idosas foram divididas em: Grupo 1 (n = 12), consistindo de idosas com osteoartrite bilateral no joelho (Grau Kellgreen-Lawrence 1 e 2); e Grupo 2 (n = 12), consistindo de controles. Foi empregada uma plataforma de força (EMG System do Brasil) para avaliar a oscilação postural em tarefas dinâmicas; já a qualidade de vida foi avaliada mediante a aplicação do questionário WHOQOL-Bref.

Resultados: O teste t de Student não demonstrou diferença estatística durante as ações de ficar de pé e sentar em uma cadeira ($p > 0,05$). Contudo, a tarefa de subir escadas revelou diferença na velocidade de deslocamento ($p < 0,05$), enquanto a tarefa de descer escadas demonstrou diferenças tanto na velocidade como na amplitude do deslocamento ($p < 0,05$). No questionário, o Grupo 1 demonstrou valores mais baixos do que os obtidos no Grupo de controle, no que diz respeito ao domínio físico ($p < 0,05$).

Conclusão: Aparentemente, idosas com osteoartrite no joelho tiveram mais dificuldade na tarefa de descer escadas e pior percepção de domínio físico. Esses achados foram observados no grupo com OA, mesmo nos estágios iniciais da doença, o que demonstra a importância de intervenções ainda mais precoces.

Introduction

The aging process causes changes in several organ systems, which may result in alterations in people's lifestyle and in their quality of life as well. Together with these alterations, some chronic-degenerative joint diseases like osteoarthritis (OA) can manifest themselves in elderly individuals.1 OA is one of the most common musculoskeletal complaints worldwide.2 According to the World Health Organisation (WHO), this is the fourth leading cause of disability among women.[3]

Individuals with OA are more likely to have pain, decrease in range of movement (ROM), decline in muscle function[4] and balance, thus resulting in functional limitation and decreased capacity to perform activities of daily living.[5-7]

About 18% of elderly have difficulty performing one or more activities of daily living, mainly those requiring muscle force, mobility and balance such as standing up and sitting down from a chair, stair ascent and descent.[7,8] Limitations in these tasks can lead to both loss of functional capacity and reduction in quality of life.[4,9]

Based on the muscle-joint dysfunctions individuals with knee OA have, one can question whether the early stages of this disease interferes with postural control during performance activities of daily living and people's quality of life, since there are very few studies on this theme.[10-12]

Therefore, the objectives of the present study were to evaluate the balance in dynamic tasks as well as the quality of life regarding physical, social, psychological, environmental and global domains in elderly individuals with and without knee OA.

Methods

The subjects, all female, taking part in the study were divided into two groups: Group 1 (n = 12), consisting of elderly individuals with bilateral knee OA and mean ± SD age of 67.25 ± 4.65 years, mean weight of 72.09 ± 10.13kg and mean height of 1.54 ± 0.06m; and Group 2 (n = 12), consisting of elderly individuals without OA (controls) whose mean age, mean weight, and mean height were, respectively, 65.58 ± 4.23years, 64.51 ± 8.59kg, and 1.55 ± 0.05m.

Group 1 had knee OA Kellgreen-Lawrence (K/L) grade 1 and 2[13] diagnosed by a rheumatologist in accordance with the American College of Rheumatology criteria.[14] X-ray radiographs involved antero-posterior and lateral aspects. The Western Ontario and MacMaster Universities Osteoarthritis Index (WOMAC) was used to measure pain, with Group 1 having mean score of 0.77 (value ranging from 0 to 1, that is, no pain to little pain).[15]

Group 2 was not submitted to X-ray examination for ethical reasons, with the controls exhibiting no symptom in lower limbs that could characterize OA. Those individuals, in both groups, having neurological diseases, vestibulopathies, neuropathies, history of fracture and lesions in lower limbs in the last 6 months or other complications that could affect their balance were excluded from study.

The volunteers were recruited from the Outpatient Rheumatology Center of the Ribeirão Preto School of Medicine (CSE-FMRP-USP) as well as from the community. The study was approved by the ethics research committee (protocol number 291), with all the volunteers signing a free informed consent before participating in the study.

To evaluate postural sway in dynamic situations (standing up and sitting down from a chair, stair ascent and descent), a force platform (EMG System do Brasil) was used to quantify both antero-posterior (AP) displacement amplitude and speed of the center of pressure (CoP). Data were analyzed by using Matlab software.

During the tasks of standing up and sitting down, elderly women were asked to stand up from the chair with their arms crossed over the chest and remain in standing position for 30 seconds, looking at a marker positioned at 1.5 m from the chair and then sitting down again. The subjects were initially positioned on the chair with knees and hips flexed at 90 degrees.

With regard to task on stairs, the subjects were instructed to go up and go down 3 steps, each one measuring 17.8 cm height, 80 cm width, and 30.5 cm depth, using one foot at once. The platform was placed on the first step of the stairs. All the tasks were repeated three times.[16]

The Brazilian version of the validated WHOQOL-Bref questionnaire, which is the condensed version of the World Health Organisation Quality of Life Instrument 100 (WHOQOL-100), was used to assess the quality of life. This instrument consists of 26 questions, where 24 encompass four domains of quality of life (physical capacity, psychological well-being, social relations, and environmental in which the subject is inserted), whereas two questions (questions 1 and 2) are on global quality of life.[17] Each question has answers ranging from 1 to 5.

The final scores of each domain are those regarding the mean scores of each question multiplied by 4, thus resulting in final scores within a scale ranging from 4 to 20 that is proportional to that from WHOQOL-100 instrument (scale from 0 to 100). Questions 3, 4 and 26 were re-coded as (1 = 5), (2 = 4), (3 = 3), (4 = 2), (5 = 1), and the higher the score the better the quality of life.

By using the Shapiro-Wilks normality and the Levene's variance homogeneity tests, it was observed that the mean values of the subjects had normality and variance homogeneity. As a result, the Student's t test for independent samples was employed for comparison between Groups 1 and 2. Analyses were performed by using the SPSS software (SPSS for Windows, Version 16.0, SPSS Inc.) The alpha value was set at 0.05.

Results

Fig. 1a and 1b show, respectively, amplitude and speed of the CoP displacement in antero-posterior (AP) direction of subjects from both groups during the tasks of standing up and sitting down. Student's t-test showed no difference in the variables between both groups ($p > 0.05$). This means that women with OA exhibited a balance similar to that of controls performing such activities.

Fig. 2a and 2b show, respectively, amplitude and Fig. 2b of the CoP displacement in antero-posterior (AP) direction of subjects during stair ascent and descent task. During stair ascent the Student's t test revealed difference for displacement speed ($p < 0.05$), whereas displacement amplitude was found to be similar between both groups ($p > 0.05$). On the other hand, differences were found in both displacement speed and amplitude during stair descent task ($p < 0.05$). Women with OA showed higher speed and greater amplitude of CoP displacement compared to controls.

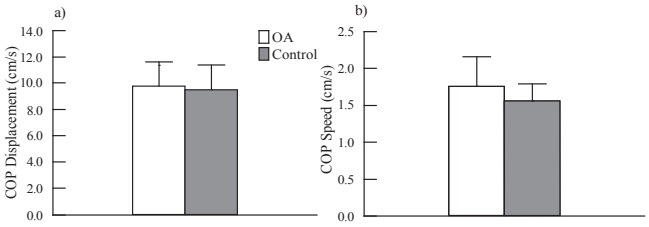

Fig. 1 – Values of both amplitude (a) and speed (b) of the CoP displacement in antero-posterior (AP) direction from both groups during standing up and sitting down task.

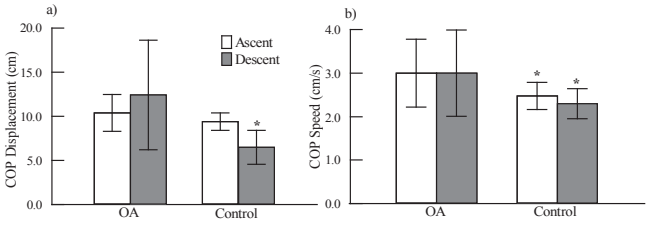

Fig. 2 – Values of both amplitude (a) and speed (b) of the CoP displacement in antero-posterior (AP) direction from both groups during stair ascent and descent task.

Table 1 lists the results for questions 1 and 2 as well as for the four domains of WHOQOL-Bref instrument regarding both groups. Women with OA had lower scores for physical domain compared to controls.

Discussion

During the activities in which there are postural changes (dynamic tasks), it is needed to control the movement of center of pressure in relation to the support base. The balance control is crucial for performing daily life activities involving maintenance of static posture as well as complex dynamic movements.[6] Subjects suffering from knee OA have joint and muscle changes, most frequently associated with local pain that can, in turn, impair the ability to perform dynamic tasks and consequently interfere with the quality of life.

Table 1 – Values (mean ± SD) obtained in the Questionnaire WHOQOL-bref of Osteoarthritis (OA) and control group

	Groups		*p* value
	OA	Control	
Question 1	14.5 ± 4.1	16.0 ± 4.2	0.41
Question 2	13.1 ± 4.0	16.3 ± 3.6	0.06
Physical Domain	13.2 ± 2.6	17.2 ± 1.6	0.001*
Psychological Domain	15.0 ± 3.2	14.4 ± 2.2	0.62
Social Domain	16.2 ± 3.0	17.0 ± 1.4	0.44
Environmental Domain	14.4 ± 1.3	15.2 ± 2.9	0.44

* Significant T Test

The present study evaluated the balance in elderly individuals with and without knee OA during functional tasks such as standing up and sitting down from a chair and stair ascent and descent. Additionally, quality of life was also evaluated in both groups.

According to Hinman[18] (2002), because several daily activities require balance, understanding the impact of knee OA on the postural sway can help clarify the poor mechanisms in this population in addition to allowing a more effective treatment to be established. It is important to use tests that reflect the dynamism of motion tasks during evaluation of the balance.[19]

It was expected that the subjects with knee OA exhibited changes in their balance while performing the experimental tasks because of pain, muscular, proprioceptive and ROM alterations, resulting from such a disease. However, the degree of OA can influence differently in the individuals' physical capacity.

The results of this study showed no difference in the speed, and amplitude of CoP displacement was found between the groups in this study for the tasks of standing up and sitting down, probably because the subjects with OA were in the initial stages of the disease. It is also possible that the task of standing up and sitting down was not difficult enough to affect the postural control of subjects with OA (K/L grade 1 and 2).

Alencar *et al.*[10] (2007) have evaluated the shift in the center of gravity in faller and non-faller individuals with knee OA by using the stand-up test and no difference in the displacement speed was observed. It is important to keep the control of the center of gravity while performing a movement in order to avoid excessive forward or backward displacement.

With regard to stair ascent and descent tasks, it was observed significant differences in AP displacement amplitude of CoP during stair descent only, and AP displacement speed of CoP during stair ascent and descent task. The results of the present study showed that individuals with OA had alterations in postural control during stair ascent and descent, although such changes were greater in the latter task probably.

For some authors, the ability to walk stairs may require much effort by elderly subjects whose motor function is impaired due to the presence of diseases like osteoarthritis.[20,21] In the present study, despite the presence of little or no pain it was possible to observe changes in postural control at Group 1.

Other studies have reported that the decrease in muscle strength over time can impair the capacity to reduce CoP sway during stair descent, with elderly individuals having more difficulty in keeping their balance while descending stairs rather than ascending stairs.[16,22] In fact, this finding is corroborated by our results. On the other hand, Mian *et al.*[23] (2007) observed no difference in the AP displacement between healthy young and elderly men during the task of stair ascent and descent.

Quality of Life

The evaluation of the functional capacity plays an important role in understanding the effects of OA on physical deficit and disability in elderly individuals.[24] For Moskowitz[12] (2009), it is important to evaluate the quality of life of individuals suffering from OA as this information helps determine adequate interventions as well as their efficacy. An increasingly used approach is the use of questionnaires containing questions on the individual's perception on his or her health.[25]

The present study has used the WHOQOL-Bref instrument to assess the perception on the global quality of life of individuals with and without knee OA regarding physical, psychological, social and environmental domains. It was observed a difference in perception physical domain only, which involves questions such as: How much does your pain (physical) prevent you from doing what you need to do? How much medical treatment do you need to function in your daily life? Do you have enough energy for your daily tasks? How well do you move? How well do you sleep? How well are you performing your daily activities? How well are you performing at your job?

Subjects with knee OA had lower scores than that of controls, thus demonstrating that even the early stages of OA have negatively influenced the perception of them on quality of life. Alves and Bassitt[26] (2013) reported that worse functional capacity was associated with lower quality of life scores after correlation between WOMAC and WHOQOL-OLD in elderly women with knee OA.

Alexandre *et al.*[27] (2008) observed a negative correlation between functionality domain assessed by questionnaire WOMAC and functional capacity, physical aspect, pain and general health assessed by SF-36. They suggest that elderly with knee OA that have more difficulty in performing activities of daily living (ADL) also have worse perception of important domains of quality of life. The present study corroborates these findings since subjects with OA had alterations in the postural control during stair descent and also worse perception of physical domain in the WHOQOL-OLD.

The decline in physical performance has become an increasing major public health problem because of the higher number of elderly people.[28] Together, pain and functional disability often account for a significant reduction in the quality of life.[27]

The present study may have some limitations regarding small sample size and lack to evaluate variables reflecting the questions addressed in the WHOQOL-Bref instrument, such as time spent for performing the tasks and quality of gait.

Although consisting of a small sample size, the present study evaluated balance and quality of life in women with initial stages of OA and some significant differences were observed between groups. Elderly women with knee OA may have had more difficulty in stair descent task as they exhibited more AP displacement and speed CoP, which is a risky situation for them. Furthermore, subjects with knee OA showed a lower score in physical domain than that of controls, confirming that the physical changes possibly caused by OA were perceived by them.

Conclusion

Therefore, the worst postural control during stair descent stairs and lower scores in the physical domain were observed in OA group, even in the early stages of the disease, which

shows the importance of interventions ever earlier to maintain or improve balance in dynamic tasks and physical capacity, since functional deficits due to knee OA could negatively affect the quality of life. It is expected that the improvement of physical aspects, provided by physiotherapy treatment, reflects positively on their quality of life. Further studies with a larger sample should be conducted to confirm these results.

Conflicts of interest

The authors declare no conflicts of interest.

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