73 - THE RELATION BETWEEN THE MUSCULAR STRENGTH OF PATIENTS WITH OSTEOARTHRITIS AND THE DEGREE OF JOINT DETERIORATION

MAVIE AMARAL NATALIO; RUDNEI PALHANO
UNIVERSITY OF THE STATE OF SANTA CATARINA (UDESC), FLORIANÓPOLIS, SC, BRAZIL
mavie_fisio@yahoo.com.br

INTRODUCTION

The osteoarthritis is a degenerative illness that provokes a significant joint deterioration and a great loss in the quality of life, being responsible for around 15 % of the incompetence laborativa of the adult population of mundo.[1] It is a common condition that affects million persons annually and, according to data of the Ministry of Health, it occupies the third place in the list of the insureds of the Soial welfare, corresponding to 65 % of the causes of incompetence that receive sickness benefit, being only surpassed by the mental diseases and cardiovasculares.[2]

Approximately 35 % of the cases of osteoarthritis involve the knee joint in elderly individuals and most of the people above fifty years of age. In the osteoarthritis (OA) of knee it's observed a important decrease of muscular strength in flexors and extensors of knee, this decrease can bring a progressive functional incompetence, once these are muscles considered primary motor of many functional activities.[3] Being the strength of the flexors and extensors of the knee and the capacity of work of these essential muscles and in the realization of activities as walking, going up and down the stairs and standing up of a chair, it is probable that the performance of these individuals is compromised, which might culminate in the restriction of their participation in the sociedade[3]. In this situation if the individual falls, with the reduction of the mineral bone density, there is a bigger probability of fractures, alterations in the energetic metabolism and in aerobic capacity, as well as, in the reduction of the strength of the trunk's muscles, hip and ankle on account of lack of use.[4,5,6]

Considering what was exposed, and the osteoarthritis being a chronic disease, degenerative and having a significant predominance in the general population, this research aims at the analysis maximum concentric and eccentric torque of flexors and extensors of knee relating it with the degree of joint compromising.

METHODOLOGY

This inquiry is characterized as exploratory descriptive because it tries to define parameters on muscular strength of flexors and extensors of the knee in individuals with osteoarthritis and to associate with the degree of joint compromising.

The sample was constituted by 12 subjects, being seven (7) participants females and five (5) males, with average of age of 61,08 3,82 years. All the participants were volunteers and they were recruited from the register of the Clinic of Prevention and Rehabilitation of the Centre of Health Sciences and Sports (CEFID) of the University of the State of Santa Catarina (UDESC), where they were carrying out Physiotherapist treatment or were waiting in the waiting list. The subjects were selected through straight approach and for presenting the following criteria of inclusion: suffer of osteoarthritis of knee (confirmed by the criteria of the American College of Reumatologia), age superior to 55 years, having radiographic examination of the knee and cognitive capacity for the understanding and the realization of the tests, absence of injuries and / or orthopedic or neurological surgeries in the last two years. It was asked the individuals of the sample the maintenance of their daily activities and not to alterate of the level of physical activity during the day of the isokinetic evaluation.

Instrumentation and Proceedings

After the approval of this study for the Committee of Ethics and Research of UDESC, the participants received written and oral information on the study and signed the term of permission. The data collection was carried out in the Laboratory of Biomechanics of the UDESC. The instrument used in the data collection was the isokinetic dynamometer Kintec-Communicator (Kin-Com), model AP/MP, developed by the Chattanooga Group, Inc. which determined the maximum peak of torque, concentric and eccentric, of the flexors and extensors knee muscles of both inferior members. In the protocol of evaluation the individuals executed five maximum repetitions of concentric and eccentric flexing / extension in chain opened in the speed of 60 °/s, having a period of rest of 2 minutes between the tests. The peak of torque is a variable widely used in the evaluation of the muscular strength and, for traditional isokicnetic definitions is used speed equal or inferiors to 60 °/s. However, low speeds are not functional and they can cause stress in the articulation, pain and reflexive inhibition, what would influence negatively in teste.[7]

Evaluation of the Muscular Torque and Joint Compromising

The participants carried out, before the isokinetic test, inferior members stretches of the with the help of one of the examiners. Next, they were positioned seated in the dynamometer with back to 78 ° of inclination, with trunk, pelvis and thigh stabilized by belts.

The centre of the axle of rotation of the dynamometer was aligned to a lateral epicondyle of the femur and the arm of lever fixed above the lateral malleolus. The possible mistakes induced in the torque by the strength of the gravity were corrected based on the weight of the inferior member leaving in as horizontal and static as possible. During the acquisition of the data the participants received verbal incentive to carry out the maximum contraction.

The degree of severity of the OA was obtained through the analysis of the radiological examination by a radiologist physician who followed the radiological graduation of Kellgren-Lawrence, officially adopted by the World-wide Organization of Health, which classifies the affected joint in absentee (degree 0), questionable reduction of the joint space and possible osteophyte formation (degree I), presence of osteophytes and doubtful reduction of the joint space (degree II), reduction of the joint space, osteophytes, certain degree of sclerosis and eventual bone deformity (degree 3), many osteophytes, when the joint space, shows clear sclerosis subchondral and bone deformities (degree 4) marked reduction of the space.[8,9,10,11,12]

Statistical Analysis

The data referring to the muscular torque of the isokinetic dynamometer were managed through the software Excel 7.0 ® obtaining only the maximum torque of each repetition and exported to a statistical packet for analyses. In order meet the aims at the present study, initially was carried out the descriptive statistic (average and the standard deviation) next it was used in the inferencial statistics, through which we applied tests of hypotheses and tests of association, with signification p 0,05.

RESULTS AND DISCUSSION

Out of the twelve subject participants eight (8) presented right domination and four (4) left domination. As for the degree of the joint compromising of the knee was noticed, through the clinical diagnosis and radiographies, out of twelve subjects, six (6) presented unilateral OA and bilateral six (6). The unilateral form demonstrated proportional distribution between inferior right and left member.

The relation between the maximum torque and the degree of OA was carried out with the intention to verify the inverse proportion of these two characteristics, i.e. the bigger the degree of OA the smaller the maximum torque of the flexors and extensors of the knee. The figures 1 and 2 make a list of the average of the concentric and eccentric torques of flexors and extensors of the IRM.

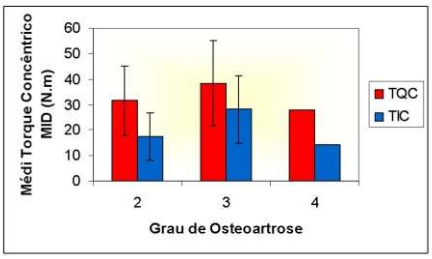

Figure 1: Average of concentric torque of the inferior right member (IRM) in relation with the degree of osteoarthritis (OA): TQC - concentric torque of quadriceps; TIC - concentric torque of hamstrings.

The hypothesis of reverse proportion was not confirmed, perhaps it can be related with the small size of the sample and present a big variability (HP> 25 %). Meantime, we make a list of the degrees 2 and 3 of osteoarthritis in the IRM notice that the torque of flexors and extensors, concentric and eccentrically, it is more elevated in the bigger degree of compromising. However if we compare the degrees 2 and 4 or 3 and 4, separately, we observe that with the raising of joint compromising, in people with OA, occurs a diminution of the maximum torque.

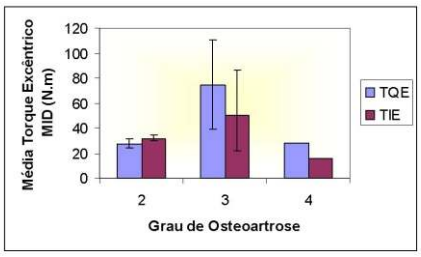

Figure 2: Average of eccentric torque of the inferior right member (MID) in relation with the degree of osteoarthritis (OA): TQE - eccentric torque of quadriceps; TIE - eccentric torque of hamstrings eccentric.

This observation proceeds also after we analyzed the average of the maximum torque in MIE (figures 3 and 4).

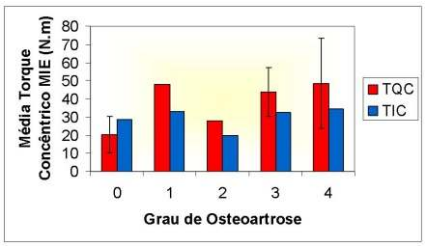

Figure 3: Average of concentric torque of the inferior left member (MIE) in relation with the degree of osteoarthritis (OA).

The relation between the maximum torque and the degree of OA of MIE did not demonstrate statistically significant difference (p> 0,05). In the degree MIE 4, of bigger compromising, presents average of TQC, TQE, TIC more elevated in comparison to the inferior degrees. The relation of reverse proportion is confirmed when we make a list of the degrees 1 and 2, when one can verify the reduction of the torques according to the degree of compromising increases.

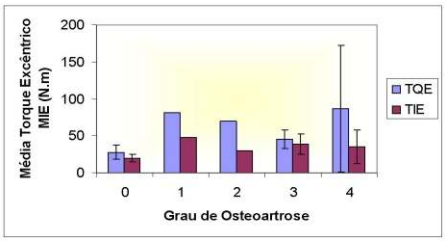

Figure 4: It imagines 4: Average of eccentric torque of the inferior left member (MIE) in relation with the degree of osteoarthritis (OA).

Chart 1 described the results when the maximum peak of torque and the degree of OA of the MID was compared and of hamstring MIE of the subjects of the research.

Table 1: Statistical values of the relation between the maximum peak of absolute torque and the degree of osteoarthritis (OA) of the inferior right member (MID) and of the inferior left member (MIE).

Torque	MID		MIE	
	Chi-square	p*	Chi-square	p*
TQC	1,889	0,957	5,038	0,283
TQE	3,822	0,148	5,467	0,243
TIC	2,600	0,273	1,689	0,793
TIE	2,756	0,252	5,162	0,271

*p 0,05

Taking in consideration that of twelve participants, six present unilateral OA it is interesting to compare the torques between the members with and without OA. In this way, it is expected that the not attacked member presents the maximum torque bigger than the member with OA. This affirmation, in the other hand, is only valid regarding the TIC that presented reduction in the member without OA, the way it was elucidated in figure 5.

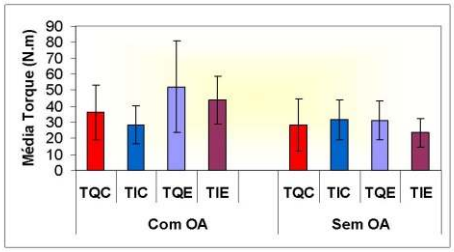

Figure 5: Relation of the average of the maximum torque between the IIMM with and without OA.

When we apply the test U of Mann-Whitney (table 2) we find statistically significant difference only in the variability of the maximum eccentric torque of hamstrings.

Table 2: Comparison between the maximum torque of members with and without OA.

	COM OA	SEM OA		
	Média		t.	p*
TQC	36,16	28,33	0,724	0,469
TQE	52,16	31,00	1,604	0,109
TIC	28,5	31,50	0,401	0,688
TIE	43,66	23,50	2,330	0,020

*p 0,05

Farias et al. (2005) found significant differences between the peak of maximum torque in elderly symptomatic and non-symptomatic. The torque of the extensors and of the flexors of knee of the most attacked member of the bearers of OA presents equal to 90,11 and 45,44 watts, respectively, while in the healthy elderly non-symptomatic the values are equal to 142,71 and 64,04 watts.

McAlindon and collaborators (1993) *apud* Gür, Çakin (2003) evaluated the influences of the severity of the osteoarthritis proved by the X-ray, of the strength of quadriceps, of the aging, of the knee pain complaints and of the functional capacity in bearers of knee OA, and checked that the strength, the pain and the age are more important determiners than the degree of OA in the functional damage of old bearers of this disease. In this study the proposed tests presented correlations with the values of the pain.

In comparison the maximum torque of the dominant member with non dominant before a training of strength in healthy elderly of both genders, age 68,95 0,9 years, Carvalho and collaborators (2004) pointed out values equal to 139,1 and 90,9 Nm for dominant concentric torque of quadriceps of men and women, respectively, and 127,9 and 82,8 Nm in the member not dominant.

The values of the concentric torque of the flexors of knee in the same study correspond to 63,8 and 46,4 Nm in the dominant member and 66,1 and 46,4 Nm in the non dominant member. Another study carried out with 47 elderly women non-symptomatics, with average of age of 69,11 3,64 years, Arantes et al. (2003) connected the peak of torque with the physical mass and obtained values equal to 114,03 35,21% for extensors of knee and 66,82 19,35% for flexors of knee.

Comparing these values with obtained in the present study a significant difference can be observed, once the values quoted by the literature concern patients apparently healthy and without pain complaint involving the knee joint. Akima et al. (2001) concluded that the percentage of the decline per decade in the torque of extension of knee in men and women was 12 % and 8 %, respectively, and in the torque of flexing of knees it was 11 % and 8 % respectively.

CONCLUSION

From the results obtained with this research it is concluded that the hypothesis of reverse proportion between the joint compromising for this sample is not true and this can be related to the sample size and the big variability between the values of torque. In the relation between the maximum torque and the degree of unilateral joint compromising, the obtained values of TQC, TQE and TIE are bigger in the attacked member.

The knowledge of the values of maximum torque are clinically relevant, once it will conduct the rehabilitation making it more effective, besides favoring the institution that works with the prevention of this illness that is attacking more and more young individuals. However the results of this research cannot be considered conclusive suggesting the application of this method of study in bigger samples so that the results are more trustworthy and that correspond to Brazilian reality.

Key words: Osteoarthritis. Knee. Torque. Biomechanics.

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Rua: Almirante Lamego, 830, apto 1002.
CEP: 88015-600. Florianópolis (SC). Brasil.
Fone: (048) 9925-6949.
E-mail: mavie_fisio@yahoo.com.br

THE RELATION BETWEEN THE MUSCULAR STRENGTH OF PATIENTS WITH OSTEOARTHRITIS AND THE DEGREE OF JOINT DETERIORATION

ABSTRACT

Introduction: Patients with osteoarthritis of the knee present muscular weakness especially in extensors and flexors, in other words, muscles that are considered primary motors of many functional activities. Objectives: In this work was valued the concentric and eccentric torque of flexors and extensors of the knee of patients with osteoarthritis of the knee and related with the degree of the joint deterioration. Methodology: The sample was constituted of 12 subjects, 7 women and 5 men, with average age of 61,08 ±3,82 years old. The maximum torque was obtained through the isokinetic dynamometer (Kin-Com) in the angular speed of 60 °/s, the degree of the joint deterioration was obtained through the analysis of the radiographic examination by a radiologist who followed the radiological graduation of Kellgren-Lawrence. Results: Comparing, separately, the degrees of the joint deterioration 2 and 4 or 3 and 4 in the inferior right member and the degrees 1 and 2 in the left one, we could notice that with the raise of the joint deterioration in patients with osteoarthritis takes place a reduction on the average of the maximum torque, however this relation does not demonstrate statistically significant difference. In the relation between the maximum torque and the degree of the joint deterioration unilateral, the obtained values of TQC, TQE and TIE are bigger in the stricken member. Conclusions: The results of this research show reduction of strength in patients with osteoarthritis, however they cannot be considered conclusive for it being a small sample and with a high variability, further investigations are needed.

KEY WORDS: Osteoarthritis. Knee. Torque. Biomechanics.

RELATION ENTRE LA FORCE MUSCULAIRE DE PORTEURS DE OSTEOARTRITE ET LE DEGRÉ DE COMPROMISSION ARTICULER

RÉSUMÉ

Introduction: Les porteurs de osteoartrite de genou présentent de la faiblesse musculaire surtout dans extensores et flexores, c'est-à-dire, muscles qui sont considérés des moteurs primaires de beaucoup d'activités fonctionnelles. Objectifs: Dans ce travail nous évaluons le force concentrique et excentrique de flexores et extensores de genou dans des porteurs de osteoartrite de genou et rapportons avec le degré de compromission articuler. Méthodologie: L'échantillon a été constitué par 12 sujets, 7 femmes et 5 hommes, avec moyenne d'âge de 61.08 ±3,82 années. Le force maximum a été obtenu à travers le

dynamomètre isocinético (Kin-Com) dans la vitesse angulaire de 60°/s, le degré de compromission articuler a été obtenu à travers l'analyse de l'examen radiographique par un médical radiologue qui a suivi la graduation radiologique de Kellgren-Lawrence. Résultats: En comparant, séparément, les degrés de compromission articuler les 2 et 4 ou 3 et 4 dans les membres inférieurs droits et degrés 1 et 2 dans le gauche, nous nous représentons qu'avec l'augmentation de la compromission articuler des porteurs se produit diminution dans la moyenne du force maximum, néanmoins cette relation ne démontre pas différence statistiquement significative. Dans la relation entre le force maximum et le degré de compromission articuler unilatéral, les valeurs obtenues de TQC, TQE et TIE sont plus grandes dans le membre attaqué. Conclusions: Les résultats de cette recherche dénotent réduction de force dans des porteurs de osteoartrite, néanmoins ils ne peuvent pas être considérés concluants s'agir d'un échantillon petit et avec d'une élevée variabilité, ayant besoin ainsi de futures recherches.

MOST CLÉ: Osteoartrite. Genou. Force. Biomécanique.

RELACIÓN ENTRE LA FUERZA MUSCULAR DE PORTADORES DE OSTEOART Y EL GRADO DE COMPROMISO ARTICULAR RESUMEN

RESUMÉN

Introducción: Los portadores de osteoart de rodilla presentan de la debilidad muscular sobre todo en extensores y flexores, c'est-à-, músculos que se consideran motores primarios mucho de d'activités funcionales. Objetivos: En este trabajo evaluamos el fuerza concéntrico y excéntrico de flexores y extensores de rodilla en portadores de osteoart de rodilla e informamos con el grado de compromiso articular. Metodología: L'échantillon ha estado constituido por 12 individuos, 7 mujeres y 5 hombres, con media d'âge de 61.08 ±3,82 años. La fuerza máxima se obtuvo a través del dinamómetro isocinético (Kin-Com) en la velocidad angular de 60°/s, el grado de compromiso se obtuvo articular a través de l'ana de l'examen radiográfico por un médico radiólogo que siguió la graduación radiológica de Kellgren-Lawrence. Resultados: En comparando, separadamente, los grados de compromiso articular los 2 y 4 ó 3 y 4 en los miembros inferiores derechos y grados 1 y 2 en la izquierda, nos representamos qu'avec l'augmentation del compromiso articular portadores nos producimos disminución en la media de la fuerza máxima, sin embargo esta relación no demuestra diferencia estadísticamente significativa. En la relación entre el fuerza máximo y el grado de compromiso articular unilateral, los valores obtenidos de TQC, TQE y TIE son mayor en el miembro atacado. Conclusiones: Los resultados de esta investigación indican reducción de fuerza en portadores de osteoart, sin embargo no pueden considerar les concluyentes s'agir d'un pequeña muestra y con d' elevada variabilidad, necesitando así futuras investigaciones.

PALABRA CLAVE: Osteoart. Rodilla. Fuerza. Biomecánica.

RELAÇÃO ENTRE A FORÇA MUSCULAR DE PORTADORES DE OSTEOARTROSE E O GRAU DE COMPROMETIMENTO ARTICULAR

RESUMO

Introdução: Os portadores de osteoartrose de joelho apresentam fraqueza muscular especialmente em extensores e flexores, ou seja, músculos que são considerados motores primários de muitas atividades funcionais. Objetivos: Neste trabalho avaliamos o torque concêntrico e excêntrico de flexores e extensores de joelho em portadores de osteoartrose de joelho e relacionamos com o grau de comprometimento articular. Metodologia: A amostra foi constituída por 12 sujeitos, 7 mulheres e 5 homens, com média de idade de 61,08 ±3,82 anos. O torque máximo foi obtido através do dinamômetro isocinético (Kin-Com) na velocidade angular de 60°/s, o grau de comprometimento articular foi obtido através da análise do exame radiográfico por um médico radiologista que seguiu a graduação radiológica de Kellgren-Lawrence. Resultados: Comparando, separadamente, os graus de comprometimento articular 2 e 4 ou 3 e 4 no membro inferior direito e os graus 1 e 2 no esquerdo, visualizamos que com o aumento do comprometimento articular dos portadores ocorre diminuição na média do torque máximo, porém esta relação não demonstra diferença estatisticamente significativa. Na relação entre o torque máximo e o grau de comprometimento articular unilateral, os valores obtidos de TQC, TQE e TIE são maiores no membro acometido. Conclusões: Os resultados desta pesquisa denotam redução de força em portadores de osteoartrose, porém não podem ser considerados conclusivos por se tratar de uma amostra pequena e com elevada variabilidade, necessitando assim de futuras investigações.

PALAVRAS CHAVE: Osteoartrite. Joelho. Força. Biomecânica.