



Original Article

Comparative analysis of quadriceps and hamstrings strength in knee osteoarthritis before and after total knee arthroplasty: a cross-sectional study[☆]

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ABSTRACT

Objective: Compare the maximal isokinetic muscle strength of knee extensor and flexor muscles between patients with knee osteoarthritis and patients submitted to total knee arthroplasty.

Methods: Volunteers were divided into five groups ($n=20$): Control; Ahlbäck I and II; Ahlbäck IV; six months after total knee arthroplasty; 12 months after total knee arthroplasty. An isokinetic knee strength evaluation was conducted for the quadriceps and hamstrings at 60°/s.

Results: Significant differences in the peak torque of the quadriceps and hamstrings were found among the groups ($p < 0.001$). The Ahlbäck IV, six-month, and 12-month postoperative groups demonstrated lower values when compared to the Control and Ahlbäck I and II groups. When percentage values were compared to the Control group, mean differences ranged from 7% to 41%.

Conclusion: Patients with healthy knees or early stage osteoarthritis have higher quadriceps and hamstrings strengths than those with a more advanced stage of the disease, even after knee replacement. These findings suggest that the traditional rehabilitation programs do not recover strength to levels observed in individuals without knee osteoarthritis.

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Análise comparativa da força do quadríceps e dos isquiotibiais na osteoartrite do joelho antes e após a artroplastia total do joelho: um estudo transversal

R E S U M O

Palavras-chave:

Força muscular

Artroplastia do joelho

Osteoartrite

Objetivo: Comparar a força muscular isocinética máxima dos músculos extensores e flexores do joelho entre pacientes com osteoartrite do joelho e pacientes submetidos à artroplastia total do joelho.

Métodos: Os voluntários foram divididos em cinco grupos (n = 20): Controle, Ahlbäck I e II; Ahlbäck IV; seis meses após artroplastia total do joelho; 12 meses após artroplastia total do joelho. O teste de força voluntária isocinética máxima foi feito para mensuração da força do quadríceps e isquiotibiais a 60/s.

Resultados: Foram achadas diferenças significativas entre o pico de torque do quadríceps e dos isquiotibiais (p < 0,001). Os grupos Ahlbäck IV, seis meses e 12 meses após cirurgia mostraram valores mais baixos quando comparados com os grupos controle e Ahlbäck I e II. Quando os valores percentuais foram comparados com o grupo Controle, as diferenças médias variaram de 7% a 41%.

Conclusão: Os pacientes com joelhos saudáveis ou osteoartrite em estágio inicial apresentaram maior força no quadríceps e nos isquiotibiais do que pacientes em estágio mais avançado da doença, mesmo após a ATJ. Esses achados sugerem que os programas tradicionais de reabilitação não recuperam a força nos níveis observados em indivíduos sem osteoartrite do joelho.

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Introduction

Knee osteoarthritis (OA) is the most common orthopedic disorder among the pathologies of this joint.¹ OA clinical management is age-related; this condition has a major impact on function and independence, including limitations in locomotion and domestic tasks.²⁻⁴ Recent research associates the functional decline in OA with muscle weakness, particularly in the quadriceps and hamstrings.^{5,6}

In addition to physical exercise, pharmacological treatment and lifestyle changes are suggested as a conservative treatment for OA.⁷ As the disease progresses, with the reduced effect of the therapeutic interventions and the high impairment of the patient's functionality a total knee arthroplasty (TKA) is often considered as the best treatment option.⁸ Despite the fact that TKA decreases pain levels in patients with OA, the quadriceps and hamstring muscle strength deficits persist after surgery.⁹⁻¹¹

Although the causes of quadriceps and hamstring weakness are unknown, the main causes appear to be disuse atrophy and activation deficits.¹² Thus it has been observed that the main focus of attention regarding muscle strength deficit in OA and TKA is directed to quadriceps strength.^{13,14} In turn, the interpretation of the importance of hamstrings in OA and TKA has not increased, despite the fact that, together with the quadriceps, the hamstrings provide the structural and functional stability of this joint.¹⁴ Understanding the magnitude of muscle strength in OA and TKA can help identify disease-modifying triggers and refine rehabilitation procedures to improve patients' quality of life. Therefore, this study

is aimed at comparing the maximal isokinetic muscle strength of the knee extensor and flexor muscles between patients with knee OA and those undergoing TKA, and to analyze the percentage alteration rate and the ratio of maximal isokinetic muscle strength between the knee extensors and flexors. The authors' hypothesis was that the 12-month post-TKA group would present higher values of muscle strength than the other groups.

Material and methods

The sample consisted of patients attended to at the outpatient clinic of the Specialized Knee Surgery Care Center (Centro de Atenção Especializada em Cirurgia do Joelho [CAECJ]) of the National Institute of Traumatology and Orthopedics Jamil Haddad (Instituto Nacional de Traumatologia e Ortopedia Jamil Haddad [Into]). Tables 1-5 describe the inclusion and exclusion criteria used for patient selection, as well as the composition of the following experimental groups (n = 20 in each): (1) asymptomatic individuals (control); (2) radiological diagnosis of OA - Ahlbäck grades I and II (OA-1/2); (3)

Table 1 – Inclusion and exclusion criteria – Control group.

Inclusion	Exclusion
	With a medical record of muscular injuries in the lower limbs and articular injuries in the knees.

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