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ORIGINAL ARTICLE

Association between ischiotibial muscle flexibility, functional capacity and pain in patients with knee osteoarthritis

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Abstract
Objective: To determine the association between flexibility of the ischiotibial muscles, function and pain in patients with knee osteoarthritis (OA).
Methods: A total of 33 patients of both genders with an age greater than or equal to 40 years, clinically diagnosed with osteoarthritis in one or both knees with radiographic evidence of the disease, were recruited and evaluated. Participants underwent the WOMAC questionnaire, along with measurements of flexibility using a Lafayette flexometer and the Back Saver Sit and Reach test. The correlation between the WOMAC questionnaire and its three components (pain, stiffness and functional limitation) was recorded. Total flexibility was obtained from the mean measurement of both knees.
Results: A statistically significant correlation between the global WOMAC score and flexibility was found (−0.38, $p = 0.02$). When the components were analyzed separately, a statistically significant correlation between total flexibility and functional limitation (−0.40, $p = 0.01$) was evident; however, this was not so with the components of pain and stiffness.
Conclusions: Greater ischiotibial flexibility reduces pain, stiffness, and significant functional limitation in patients with knee OA. These results show that it is important to prescribe flexibility exercises during physical therapy in these patients.

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Introduction

Osteoarthritis (OA) affects 60% of men and 70% of women over the age of 70. The prevalence of OA has been increasing, and it is now one of the 10 leading causes of total disability in Mexico.[1,2] The most affected joints are the knee and hip.[3]

The prevalence of knee OA has been estimated to affect from 4 to 30% in adults depending on gender, age, and physical activity.[4,5] About 85% of the population over the age of 60 has radiographic evidence of OA.[6] This high predilection for the knee is mainly due to joint loading, which makes it susceptible to wear and tear under pressure.[7]

The clinical manifestations of the disease include pain, decreased range of motion, quadriceps muscle weakness, and impaired proprioception.[8] Multiple studies report a condition beyond the cartilage that affects muscles, tendons, ligaments, synovial capsule, and bone.[9]

Knee OA pain affects approximately 10–30% of adults, and of these, 25% are severely disabled owing to difficulty in performing the activities of daily living due to muscle spasms or weakness.[10–13]

There is a clear association between decreased range of motion – secondary to decreased flexibility, weakness, and muscle spasms – and disability.[13]

Exercise and physical therapy have an important role in the treatment of knee OA, with the main objectives being to reduce pain and inflammation, increase muscle strength, and finally, maintain or improve range of motion.[14,15]

Enhancement of range of motion, especially knee extension, has been associated with improvement in pain and muscle function.[16,17] Despite this, it is not always considered a priority to work on flexibility.

Onigbinde (2013) found a difference by comparing measures of flexibility between subjects with knee osteoarthritis and same-age subjects chosen as controls, concluding that ischiotibial flexibility was significantly lower in the affected subjects. It is unknown whether this decrease in ischiotibial flexibility in people with knee osteoarthritis has an impact on patients' performance of activities of daily living.

Material and methods

This was a cross-sectional, observational correlation study. We recruited participants who were attending consultation and/or physical therapy at a sports medicine and rehabilitation outpatient clinic. We included patients of both genders with an age greater than or equal to 40 years, who were clinically diagnosed with osteoarthritis in one or both knees with radiographic evidence of the disease (recent or under one-year-old weightbearing anteroposterior knee radiographs).

We excluded patients with lumbar pathologies, or who were diagnosed with a neurological disorder and/or with incomplete knee extension (>15° flexion) that may alter the flexibility test due to pain or impossibility of making an adequate lumbar flexion. Patients with poor technique when performing the flexibility test or who did not complete the questionnaires were eliminated. A sample of 30 patients was calculated using a simple correlation formula with a $z\alpha$ value of 1.96 and a significance level of 95% for a two-tailed test, and a $z\beta$ value of 0.84 with a power of 80% with a minimum expected correlation of 0.5.

A Lafayette flexometer was built according to the specifications in the Fitnessgram® /Activitygram® test administration manual,[18] using a 46 cm tape gradiated from −23 to 23 cm, with 0 set parallel to the face of the box where the patient's foot was located.

The general questionnaire recorded data, such as age, sex, the Kellgren and Lawrence system for ostheoarthrosis classification, knee or knees affected, time since diagnosis, dominant leg, treatment received, and flexibility measures. The Spanish version of the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) v. 3.1 was used to assess pain, stiffness, and physical function.

The study was approved by the Research Ethics Committee of our institution. Patient consent was obtained after verbally explaining and showing the procedure. The general questionnaire and the WOMAC were applied prior to the BSSR test. In case of doubt or difficulty understanding the text, help was provided. Afterwards, the BSSR test was applied to obtain flexibility measurements.[19] The subjects sat on a hard surface, shoeless, with the box in front and their foot flat against it. Patients were asked to flex the knee that was not going to be measured and place the sole of that foot on the floor in line with the other knee or just below. We verified that the hip of the unmeasured knee was flexed at 90° and that the measured knee was at 0° or less than 15° of flexion. With their back and arms straight, and with hands overlapping, they were asked to inhale and exhale, then reach forward with their fingertips. The distance was measured and the process was repeated 3 times for each knee. Results were recorded by the physician. At the end of the test, patients were asked for a second signature, validating their participation and agreement to use their results for the purposes of this research.

We used the statistical program SPSS version 20 (SPSS Inc., Armonk, NY) to conduct data analysis.

Pearson's correlation was used to determine the relationship between mean flexibility and the WOMAC index results.

Results

A total of 33 patients were included in this study. Of these, 20 were women and 13 were men. The median age was 63 years, with a dispersion (IQR) of 57–69 years (Table 1). Using the Kellgren–Lawrence classification, 48.5% of the subjects were grade 2; 69.7% of the patients were receiving physical therapy at the time of the study. Both knees were affected in most patients (66.7%), and 90.9% were right leg dominant. The mean flexibility measure was -5.7 ± 7.7 cm.

A statistically significant correlation between the global WOMAC score (−0.38, 95%CI: −0.68; −0.08, $p = 0.02$) and measuring flexibility was found (Table 2).

When the components were analyzed separately, a statistically significant correlation (−0.40, 95%CI: −0.7; −0.08, $p = 0.01$) was found between total flexibility and functional limitation; however, there was no correlation between pain and stiffness.

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