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Knee Adduction Moment for Improvement of Knee Osteoarthritis

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Abstract

Background: Conservative treatment strategies for knee osteoarthritis include exercise therapy. Exercise therapy is thought to reduce knee adduction. A systematic review examined the effects of exercise therapy on knee adduction and other physical parameters in patients with knee osteoarthritis.

Method: The study was conducted in the following electronic databases:

MEDLINE, Google Scholar, Cochrane Central, EMBASE, OpenGrey. Study participants with knee osteoarthritis undergoing structural exercise therapy were entered into a randomized controlled trial. For each study, we performed an independent analysis to extract data and analyze the risk of bias. We calculated the mean difference and 95% confidence interval for each outcome.

Result: In his three studies of 233 participants, there was no significant difference in knee adduction moment between intervention and control groups. Two of his studies observed improvements in physical function after exercise therapy, one of which showed a significant reduction in pain. All three studies favored the intervention group in terms of strength and torque.

Interpretation: Changes in knee adduction time were not associated with the therapeutic effect of exercise therapy. Exercise therapy for knee osteoarthritis may not be effective unless temporary adduction is performed. Dynamic joint loading may result from altered neuromuscular control after exercise therapy.

Keywords: Neuromuscular; Arthrosis; Knee; Adduction.

Abbreviations

Exercise therapy (ET); knee; knee osteoarthritis (KOA); knee adduction moment (KAM) (KAM); adduction

Introduction

The most common clinical symptoms include pain, stiffness, and decreased physical ability, leading to disability and activity limitations. The role of biomechanical variables in the development and progression of KOA has recently been investigated [1]. KAM is more commonly used as a surrogate for medial tibiofemoral contact force when a person suffers from KOA, reflecting the relative distribution of force across the joint. KAM varied significantly between participants, despite being closely related to tibiofemoral medial contact force. Currently, there is no association between structural disease and pain severity [2, 3]. Several factors may explain the pain relief and improved function seen in KOA patients participating in exercise programs, including strengthening of the quadriceps, hip abductors and adductors, and neuromuscular strength. Exercise programs such as strength training are designed to reduce stress on the knee joint [4]. On the other hand, strengthening the hip muscles corrects imbalances in the pelvic area. As the contralateral pelvis sinks and the center of gravity move away from the supporting leg, CAM may increase. Regardless of the specific ET technique, the main task is to restore correct biomechanics of the lower extremity. A reduction in CAM may be one reason for less pain and disability. Although exercise training has visible clinical benefits, it is unclear whether it affects CAM. As a first step, we wanted to determine whether the clinical benefits of exercise therapy were associated with changes in her CAM in her KOA patient [5]. Only studies that measured pain scores and physical function were able to confirm the effects of ET on CAM in KOA patients, as there were very few studies assessing the desired outcome, and qualitative ET in relation to

these aspects could not be confirmed. analysis was performed.

Material and Method

Protocol

Systematic reviews will be reported using the recommended reporting methods for systematic reviews and meta-analyses, in accordance with the PRISMA standards and The Cochrane Collaboration.

Data Sources and Search Technology

We surveyed EMBASE, MEDLINE, and Cochrane CENTRAL from inception to November 2020. The search was extended to include systematic review and citation surveillance methods to find potentially eligible works [6]. Gray literature was discovered using Google Scholar and OpenGrey, specialized databases of technical and research reports, conference papers, and official publications.

Eligibility

Randomized controlled trials (RCTs) were included when assessing physical function, pain, muscle strength, and CAM in KOA patients independently of other outcomes [7]. If an illness or injury is causing the pain, exercise may be recommended to reduce symptoms [8]. Physical training is defined as any type of exercise, regardless of intensity, volume, or type of exercise (e.g., exercises that improve motor control and muscle strength, such as high-impact and low-impact strengthening exercises). Of his three results above, one study tested only his one exercise session, and his other study tested multimodal therapy (foot braces, manual therapy, exercise therapy, etc.). used [9]. Study selection and data extraction.

A common screening checklist was used for each study based on the eligibility criteria. Studies whose title or abstract did not meet the requirements were disqualified [10]. The reviewers discussed disagreements regarding eligibility. Authors were contacted by email to seek clarification for studies in which there was insufficient information to assess eligibility criteria. Due to insufficient information after this contact, the patient was excluded from the study. The review team decided to exclude publications reporting results from the same population when multiple publications reported the same results [11]. The authors were contacted by her twice by email when data were needed for synthesis or assessment of study quality. Estimation of missing data was performed whenever possible. Studies were rejected if data were insufficient.

Evaluate the level of evidence and the risk of bias

To assess the risk of bias, we used the Cochrane Collaboration method to assess the risk of bias. Overall, three types of bias were assessed in the included studies.

High, low and unclear biases. Funnel charts are not suitable in this case due to the small number of studies investigated [12]. Evidence is defined as the consistency of results across high-quality studies. Those of moderate quality are consistent results from multiple low-quality studies. Evidence for limited quality is the consistency of results across studies of poor quality. and none (no research evidence available) [13]. According to our team of experts, high-quality research will only be considered if each of the five elements are present. Studies were rated as low quality when other biases were present. As a result, the “obscure” classification was classified as harmful and the evidence was downgraded [14].

Outcome measure

Kinematic and kinetic analyzes are used to create KAM, and body weight is used as a normalization factor. The studies included in this review were conducted with subjects walking barefoot and at their own pace. In this study, the WOMAC pain subscale was used to assess pain and the physical function subscale was used to assess physical function. Although there were considerable differences in the numerical scales used in the studies of physical function and pain subscales, data were reported in raw form because there was no summary and no need for modification [15]. data analysis

Biomechanical differences between the training sessions included in the study prevented data pooling due to clinical heterogeneity [16–19]. Therefore, the results were qualitatively analyzed by the authors using the original scale.

Results

Research description

From October to November 2020, manual and automated searches yielded 1917 records. A Google Scholar search for gray literature returned 1850 citations, while OpenGrey yielded no citations. These two databases do not contain related articles, except for duplicates already included in the list [20]. 1803 Register title and abstract checked, 1770 Register rejected. The remaining 33 full-text evaluations were performed, as shown in Figure 1. 233 patients were included in the qualitative analysis. Age ranged from She was 60.8 years to She was 67.2 years in all other studies, except studies involving women only. Mean BMI was between 28.5 and 34.2. Two studies used her Kellgren-Lawrence classification and the third used her modified Outterbridge classification.

Training protocols varied during the included trials. Over a 12-week treatment period, patients used ankle cuff weights and rubber bands five times a week to exercise the hip adductor and abductor muscles [21]. To meet the study objectives, patients were encouraged to exercise at home and seven visits to a physical therapy clinic for guidance and measurement of exercise history.

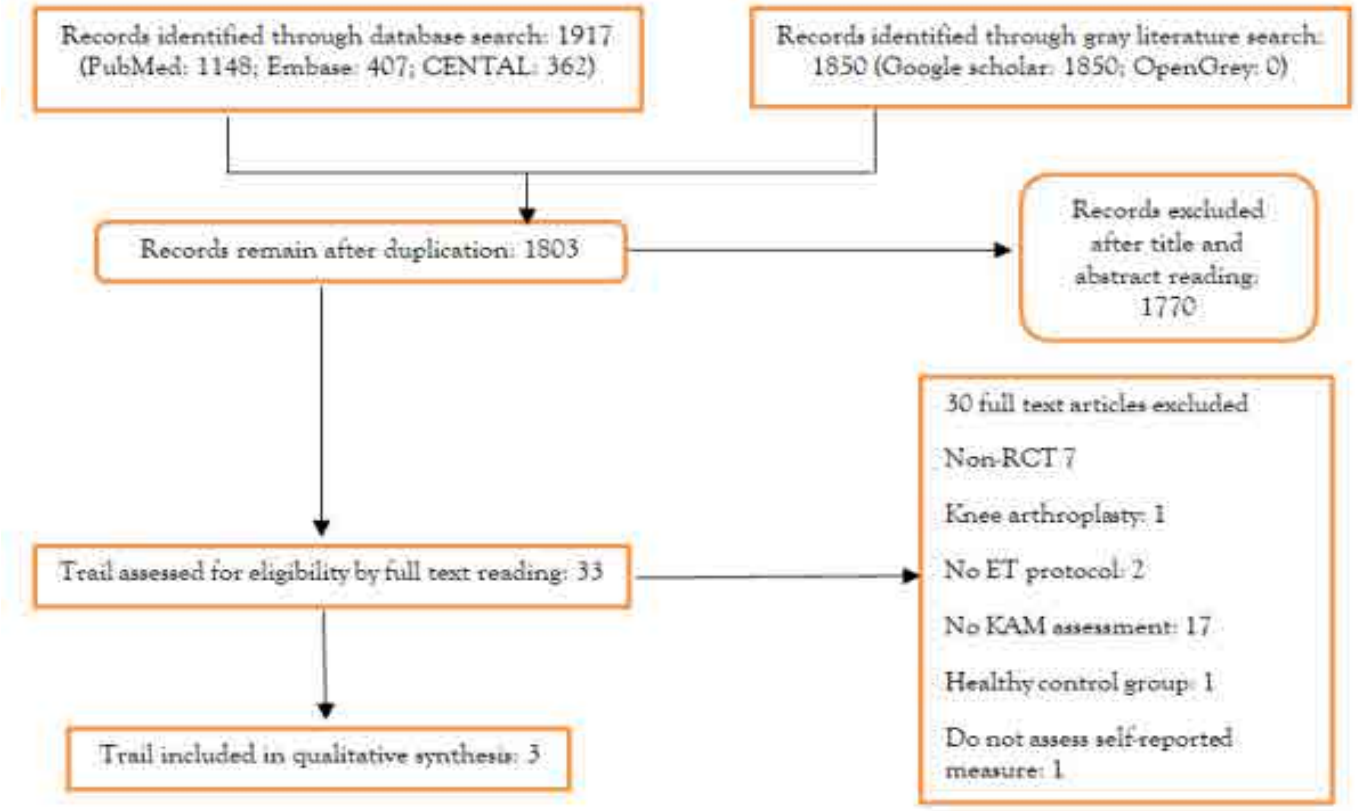

Figure 1: The PRISMA inclusion procedure flow chart.

The exercise program focused on knee extension, hip adduction, hip abduction, leg press, and ankle flexion strengthening by an exercise physiologist. As a control group, study participants received no ET intervention and were advised not to receive additional treatment [22].

Intervention effect

Exercise effect on KAM:

CAM did not differ between the fortified and control groups during the 12-week study, with 95% confidence intervals (CI) ranging from 0.039 to 0.335 Nm/BW × HT % = 0.146. CAM increased by 4.6 percent in the enhanced group compared to the control group. No statistically significant difference was found between the enhanced exercise group and the simulated exercise group in KAM [22]. Effects of Exercise on Physical Function and Pain:

Study participants' pain and physical performance improved after six months, with no significant differences between groups. Strengthening participants showed significant pain relief compared to controls in the neutrally aligned group.

Effect of training on strength:

The study found that people who underwent a hip strengthening program had significantly higher hip torque and knee extension torque compared to patients in the control group. Similar results were seen in the strength group of our study compared to patients in the sham exercise group in terms of knee extension strength, knee flexion, plantar flexion, hip adduction and hip abduction. In this study, both aligned and vicious individuals who participated in the strengthening program experienced significant improvements in quadriceps muscle strength compared to controls. Bias and Evidence Evaluation

In general, the interventions in these studies did not lead to blindness in the therapists or patients. ET has positive effects on pain, physical function and muscle strength. As a percentage, however, ET does not significantly affect her KAM, as shown in Figure 2.

Discussion

Current systematic studies show that ET significantly reduces pain, enhances exercise performance and increases muscle strength, but has minimal effects on CAM. Therefore, the clinical efficacy of different exercise regimens did not lead to changes in CAM in KOA patients. ET has been shown to have excellent clinical efficacy in several rigorous systematic studies and clinical guidelines. However, this is the first systematic evaluation to show that dynamic CAM is unchanged despite therapeutic

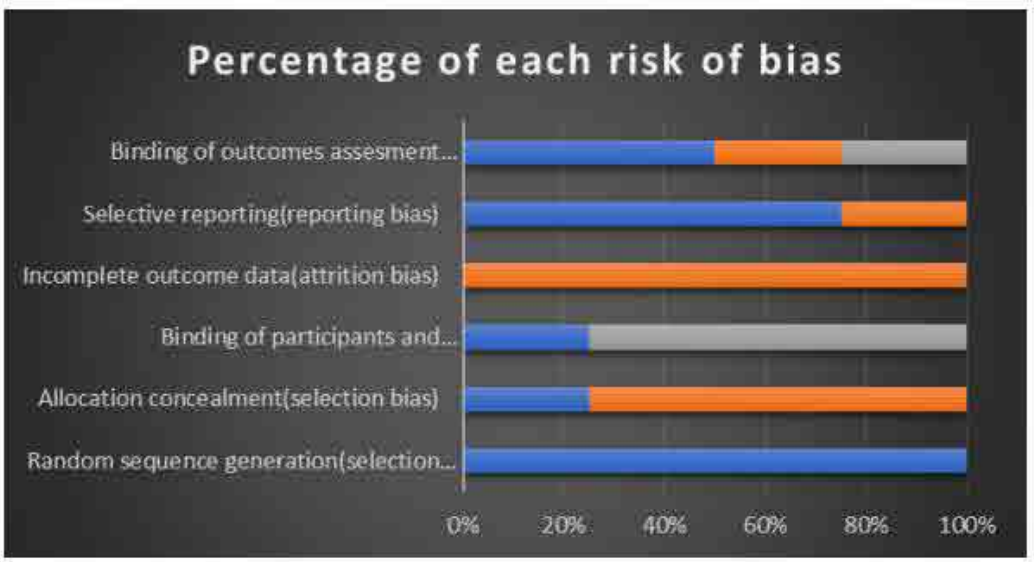

Figure 2: Percentage of each risk of bias item judged by review authors for all included studies.

improvement with ET. As only a small number of studies were considered in this review, conclusions should be interpreted with caution. On the one hand, the findings of this study are supported by those that did not meet the inclusion criteria. After 8 weeks of hip abductor strengthening, pain and strength improved, but CAM did not change significantly. The data consistently show that the biomechanical principles underlying training effects from CAM reduction are not valid in the literature. In contrast, KAM balance is justified by its ability to induce moments of abduction through quadriceps contraction.

Conclusion

His 16-week weight loss program over a year yielded excellent clinical response despite increased joint loading but did not improve structural markers of disease onset. Future studies should investigate other mechanisms that explain the therapeutic success of ET. Moreover, some of the studies we have included may affect the generalizability of our results. Pooling of data was not possible due to clinical variability in ET therapy. The available evidence may be limited because randomized controlled trials do not have control groups. To test the effect of ET on dynamic knee loading, rather than considering the entire KOA population, some specific type of biomechanical change (e.g., increased trunk inclination or contralateral less pelvic dimples) was needed. Researchers will be better able to control possible biases in future studies. In some of the included studies, the lack of selective reporting bias and blinding of outcome assessors compromised the quality of the evidence. ET did not lower her CAM but did improve her physical function and pain. Apart from reducing dynamic joint loading, there may be other mechanisms by which ET influences her KOA.

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