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SYSTEMATIC REVIEW

Effective exercise intervention period for improving body function or activity in patients with knee osteoarthritis undergoing total knee arthroplasty: a systematic review and meta-analysis

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KEYWORDS
Total knee arthroplasty;
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Abstract
Background: Various systematic reviews and/or meta-analyses examining the effects of pre- or postoperative exercise on body function or activity in patients undergoing total knee arthroplasty (TKA) have been published. However, the interventional period needed to at least improve outcomes is unknown.
Objective: The aim of this systematic review and meta-analysis was to investigate the exercise intervention period needed to effectively improve body function or activity before and after TKA in patients with knee osteoarthritis (OA).
Methods: Studies published until July 2017 were included in the review. The Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach was applied to each meta-analysis to determine the quality of the evidence.
Results: Twenty-seven randomized controlled trials were identified. A meta-analysis indicated that exercises performed for 8 weeks after discharge in addition to standard postoperative intervention effectively improved body function as assessed using pain level; physical function, and stiffness on the Western Ontario and McMaster Universities Arthritis Index; extension strength; active knee flexion range of motion; timed up and go test; and gait speed.
Conclusion: Overall, we found low- to moderate-quality evidence that an 8-week exercise period was needed after discharge to improve body function and activity in patients with knee OA undergoing TKA.

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Introduction

Total knee arthroplasty (TKA) is usually performed in patients with severe knee osteoarthritis (OA).[1] Interventions using exercise are often performed before and/or after TKA. Various systematic reviews[2] and/or meta-analyses[3–5] examining the effects of pre- or postoperative exercise on body function or activity in patients undergoing TKA were published. For example, Wallis and Taylor[3] and Gill and McBurney[4] reported that preoperative exercise is ineffective for pain control[3] and assessed physical function[3] using the Western Ontario and McMaster Universities Arthritis Index (WOMAC), knee extension strength,[4] and gait speed[4] after TKA. Minns Lowe et al.[5] examined the effects of postoperative exercise in patients undergoing TKA and found no significant effect on walking or quality of life (QOL), although knee joint range of motion (ROM) significantly improved compared to that observed in the control group. Finally, Artz et al.[6] reported that interventions including physical therapy and exercise result in short-term improvements in physical function.

However, knowledge is lacking on the effective exercise intervention period for improving outcomes. Since rehabilitation time before and after surgery affects medical cost, it is meaningful to clarify the required intervention period to improve outcomes. Furthermore, in previous systematic reviews and/or meta-analyses, the following research limitations were observed. Wallis and Taylor[3] did not examine whether additional early exercise effectively improves body function and activity.[3] The systematic review by Gill and McBurney[4] included non-randomized controlled trials (RCTs); thus, the findings provided in this review are not indicative of high-quality evidence. Gill and McBurney[4] and Minns Lowe et al.[5] used data other than the mean value and standard deviation of the primary study for the meta-analysis. Artz et al.[6] conducted the meta-analysis based on the difference in the intervention contents after discharge only. Therefore, the aim of this systematic review was to investigate the exercise intervention period needed to effectively improve body function or activity before and after TKA in patients with knee OA.

Methods

Q5 The study design was a systematic review with a meta-analysis statistical approach.

Eligibility criteria

The studies were eligible if: (1) the research design was an RCT; (2) the participants were undergoing TKA for knee OA; (3) preoperative exercise intervention or postoperative exercise intervention was performed; (4) the researchers assessed the participants' body function and/or activity using parameters such as pain, strength, ROM, QOL, balance, and gait speed; and (5) the paper was published in English. Eligibility criteria for the control group were not set. Regarding the selection of each article, the choice of the two researchers were independent. According to the international classification of function, disability, and health proposed by the World Health Organization,[8] we defined body function as physiological functions of body systems (including psychological functions) and activity as the execution of a task or action by an individual.

Information sources

We used the following search terms to search all trial registers and databases: ''arthroplasty, replacement, knee,'' ''osteoarthritis, knee,'' ''exercise,'' and ''exercise therapy.'' The search strategy consisted of a combination of free text words and medical subject heading terms. The search strategy is shown in Table 1. All studies published until July 2017 were included in the search. The terms ''population'' and ''intervention'' were combined with the word ''AND'' as an operator. Population was defined as participants with OA of the knee on a waiting list for TKA or who had undergone TKA. This RCT intended to achieve the most valid information regarding intervention effectiveness. For each concept, synonyms and Medical Subject Headings terms were combined with the ''OR'' operator.

Search

The PubMed, Cochrane Central Register of Controlled Trials, Physiotherapy Evidence Database (PEDro), and Cumulative Index to Nursing & Allied Health databases were searched.

Study selection

Two reviewers independently screened the titles and abstracts using the predetermined eligibility criteria. Disagreements were resolved by discussion. Full-text copies of articles that were not definitively excluded based on the title and/or abstract were retrieved, and the criteria were reapplied. Uncertain cases were discussed by the reviewers to achieve a consensus.

Data collection process

Predesigned spreadsheets were used to extract data regarding the participants, interventions, outcome measurements, and results.

Data items

The database search was supplemented by a manual search of the reference lists of past systematic reviews.

Risk of bias in individual studies

Two researchers independently applied a validated scale (PEDro) to rate the methodological quality and statistical reporting of each trial.[9] The 11 items are based upon the Delphi list.[10] Each item is scored ''yes'' or ''no'' with a maximum score of 10 as one criterion is not scored. The PEDro score has demonstrated moderate inter-rater reliability (intraclass correlation coefficient = 0.68 [95% confidence interval (CI), 0.57–0.76]) for clinical trials.[11] A trial with a

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