**Article Full Title**

Continuous passive motion as an adjunct to active exercises in early rehabilitation following total knee arthroplasty – a randomized controlled trial

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**Paper Abstract**

Purpose. Continuous passive motion is frequently used post-operatively to increase knee range of motion after total knee arthroplasty in spite of little conclusive evidence. The aim of this study was to examine whether continuous passive motion (CPM) as an adjunct to active exercises had any short time effects (after one week and three months) on pain, range of motion, timed walking and stair climbing. Method. A randomized controlled trial was conducted. A total of 63 patients undergoing primary TKA were randomly assigned into an experimental group receiving CPM and active exercises and a control group receiving active exercises only. Outcomes were assessed by goniometer, visual analogue scale (VAS), timed ‘Up and Go’ test (TUG), timed 40 m walking distance and timed stair climbing. Results. There were no statistical differences between the treatment groups for any outcome measures either at one week or after three months. For the whole group, a significant and 50% reduction in pain score was found after three months (p &lt; 0.01 ). Compared with before surgery, a significantly impaired knee flexion range of motion (p &lt; 0.01 ) and a significantly decreased number of patients able to climb stairs were found after three months (p &lt; 0.01). Conclusion. CPM was not found to have an additional short-time effect compared with active physiotherapy. After three months considerable pain relief was obtained for the whole group, the patients preoperative ROM was not restored and the number of patients able to climb stairs had decreased.

**NIH Risk of Bias Tool**

Quality Assessment of Controlled Intervention Studies

**Was the study described as randomized, a randomized trial, a randomized clinical trial, or an RCT**

Yes

**Was the method of randomization adequate (i.e., use of randomly generated assignment)?**

Yes

**Was the treatment allocation concealed (so that assignments could not be predicted)?**

Yes

**Were study participants and providers blinded to treatment group assignment?**

Yes

**Were the people assessing the outcomes blinded to the participants' group assignments?**

Yes

**Were the groups similar at baseline on important characteristics that could affect outcomes (e.g., demographics, risk factors, co-morbid conditions)?**

Yes

**Was the overall drop-out rate from the study at endpoint 20% or lower of the number allocated to treatment?**

Yes

**Was the differential drop-out rate (between treatment groups) at endpoint 15 percentage points or lower?**

Yes

**Was there high adherence to the intervention protocols for each treatment group?**

Yes

**Were other interventions avoided or similar in the groups (e.g., similar background treatments)?**

Yes

**Were outcomes assessed using valid and reliable measures, implemented consistently across all study participants?**

Yes

**Did the authors report that the sample size was sufficiently large to be able to detect a difference in the main outcome between groups with at least 80% power?**

Yes

**Were outcomes reported or subgroups analyzed prespecified (i.e., identified before analyses were conducted)?**

Yes

**Were all randomized participants analyzed in the group to which they were originally assigned, i.e., did they use an intention-to-treat analysis?**

Yes

**Were the included studies listed along with important characteristics and results of each study?**

Yes

**Key Finding #1**

The focus of treatment was on improving mobility for which ROM was the primary outcome variable measured in the study.

**Key Finding #2**

All patients in the study followed an exercise programme with a local physiotherapist following discharge from the hospital, however, the outpatient treatment was not standardized.

**Key Finding #3**

Both groups had a statistically significant (p &lt; 0.01) reduction in pain intensity after 3 months than at baseline (before surgery).

**Key Finding #4**

Continuous passive motion (CPM) does not seem to provide an additional effect of clinical relevance above active physiotherapy exercises on knee ROM.

**Please provide your summary of the paper**

This RCT investigated the effects of continuous passive motion (CPM) as an addition to active exercises in early rehabilitation following a total knee arthroplasty (TKA). The experimental group received CPM and active exercises while the control group only received active exercises. The short term effects were evaluated at 1 week and 3 months to measure pain, range of motion (ROM), timed walking, and stair climbing. The outcome measures utilized were reliable and consisted of a visual analogue scale (VAS), goniometer, timed ‘Up and Go’ test (TUG), timed 40m walking distance, and timed stair climbing.

The findings of this study showed no additional benefit of CPM on short-term effects of pain, knee ROM, or walking ability compared with active exercises alone for patients in the postoperative period following a TKA. All patients did not recover their baseline ROM within 3 months post-surgery; and there were more patients unable to climb stairs compared to the baseline of patients able to climb stairs 3 months post-surgery. Both groups had a statistically significant reduction in pain intensity after 3 months than at baseline. Furthermore, there was no association found between ROM and walking ability for either group.

With regards to the limitations of this study, the authors note good external validity, however, they did not incorporate a standardized out-patient treatment which could have been of benefit for better implication in clinical practice and future studies. Overall, these findings reveal the underlying need for more research on functional recovery post-op a TKA.

**Please provide your clinical interpretation of this paper. Include how this study may impact clinical practice and how the results can be implemented.**

I believe the study provided strong evidence on the lack of additional benefit that continuous passive motion (CPM) has above active exercises alone for patients post-op TKA. The study has adequate external validity, it acknowledged it's weaknesses (e.g. ceiling effect regarding TUG outcome measure), and indicated other factors (strength, balance, motivation, and level of anxiety) which could have influenced some of the findings. Specifics were given with regards to the administration of CPM and types of active exercises which gives clinicians the ability to replicate these techniques in clinical practice. I am curious if incorporating a standard out-patient treatment would have changed patient outcomes. Overall, I think the results of this study are vital to note and have the ground to prompt further research in considering a new approach to treatment and functional recovery following a TKA.