The efficacy of continuous passive motion after anterior cruciate ligament reconstruction: a systematic review

Smith T O, Davies L

CRD summary
This review assessed the use of continuous passive motion (CPM) compared with no CPM following anterior cruciate ligament reconstruction. The authors concluded that the benefits of CPM were unclear and CPM could not be supported. The conclusion of this reasonably well-conducted review is an accurate reflection of the evidence base, and is likely to be reliable.

Authors' objectives
To assess the efficacy of continuous passive motion (CPM) following anterior cruciate ligament (ACL) reconstruction.

Searching
AMED, British Nursing Index, CINAHL, EMBASE, MEDLINE, PubMed, PEDro and the Cochrane Library were searched from inception to November 2006; the search terms were reported. Five relevant journals were handsearched from 1986 (1994 in one case) to November 2006. The references of papers ordered as full texts were checked. Only studies published in full and in English were eligible for inclusion in the review.

Study selection
Studies that compared the effect of using a CPM machine at any point in rehabilitation with not using CPM following ACL reconstruction surgery were eligible for inclusion. The duration of CPM in the included studies ranged from 1 day to 4 weeks. Comparison groups received a range of interventions including hinge braces, active exercise with passive extension and active flexion, isometric exercises, and weight-bearing exercise. The intervention groups generally received the same treatment but with the addition of CPM. Studies that assessed either hamstring or patellar-tendon graft surgeries were eligible for inclusion, as were both open or arthroscopic reconstructions. All but one of the included studies assessed patients with patellar-tendon graft reconstructions. The mean age of the patients was 25.9 years. Eligible studies could enrol both male and female patients of any age. No inclusion criteria were reported for the outcomes. The outcomes reported in the included studies included joint laxity, range of movement, pain scores and analgesia requirements, functional measures, swelling, joint position sense, patient satisfaction, complications, radiological changes, ecchymoses, blood drainage, muscle atrophy and hospital stay. The included studies were randomised controlled trials (RCTs) or controlled clinical trials (CCTs).

Two independent reviewers assessed papers for inclusion in the review, and any differences were resolved through discussion and consensus.

Assessment of study quality
Validity was assessed using the PEDro scoring system and the studies were given a total score of between 0 and 11.

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Data extraction
Data on the direction of overall effects and their statistical significance were extracted.

The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction.

Methods of synthesis
The studies were combined in a narrative for each outcome. Any differences between the studies were discussed in the text and were further apparent from the evidence tables.

**Results of the review**

Eight studies (465, 505 knees) were included in the review: 7 RCTs and one CCT.

Pedro scores for validity ranged from 1 to 4 out of a possible 11, indicating poor-quality evidence.

Joint laxity (2 studies): both studies found no statistically significant differences in joint laxity between the CPM and non-CPM groups.

Range of movement (6 studies): 5 studies found no statistically significant differences between CPM and non-CPM groups; the sixth found significantly greater active and passive knee flexion in the CPM patients (p<0.05).

Pain (5 studies): 3 studies found no statistically significant differences between groups on any pain or analgesia outcome; the remaining 2 studies found no differences in perceived pain between the groups, but reported significantly lower analgesia use in the CPM group in the immediate post-operative periods (p-values not reported).

Swelling (4 studies): 2 studies reported no statistically significant differences between the groups, one found less swelling in the non-CPM group at 6 weeks, and the final study reported more swelling in the non-CPM group in the first 3 post-operative days (p-values not reported).

Joint position sense (1 study): this study found joint position sense on the seventh post-operative day was significantly better in the active movement group compared to the CPM group (p<0.0001).

Complications (3 studies): 2 studies reported no statistically significant differences between study groups in the incidence of complications. The third study reported that three CPM patients re-ruptured compared with no non-CPM patients.

Blood drainage (3 studies): 2 studies reported no statistically significant differences in blood loss over the first 24-hour post-operative period, while a third reported significantly less blood loss in the non-CPM group compared with the CPM group over the same period (p<0.001).

Duration of hospital stay (2 studies): one study reported no differences in hospital stay between the groups, while the other found a small (0.52 days) but significant difference favouring the non-CPM group (p<0.0001).

Functional scores, patient satisfaction, radiological changes, ecchymoses and muscle atrophy were each assessed by one study and no statistically significant differences between the groups were reported.

**Authors’ conclusions**

It is unclear whether post-operative CPM has any benefit for patients who have undergone ACL reconstruction.

**CRD commentary**

The review question and the inclusion criteria, except for outcomes, were clear. The authors searched a number of relevant databases and other sources. However, the decision to limit the review to full-text English language publications may have increased the possibility that some relevant studies were not included in the review. The authors reported using methods designed to minimise reviewer bias and error in the selection of studies for the review and the assessment of validity, but not for the extraction of data. The validity assessment used appropriate criteria. As there was some clinical heterogeneity it was probably appropriate to conduct a narrative synthesis. The authors’ conclusions accurately reflect the evidence of the review and are likely to be reliable.

**Implications of the review for practice and research**

Practice: The authors stated that further research is required. Specifically: to assess the impact of different CPM
protocols; to compare functional outcomes and quality of life for CPM versus non-CPM; and to assess CPM with hamstring tendon grafts.

**Funding**
Not stated.

**Bibliographic details**

**Indexing Status**
Subject indexing assigned by CRD

**MeSH**
Humans; Joint Instability; Knee Injuries /rehabilitation; Ligaments, Articular; Movement; Postoperative Period

**AccessionNumber**
12008009197

**Date bibliographic record published**
09/08/2008

**Date abstract record published**
01/12/2008

**Record Status**
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.