Bracing after ACL reconstruction: a systematic review
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CRD summary
This review assessed whether the use of braces improves the outcome of anterior cruciate ligament (ACL) reconstruction. The authors concluded that there was no evidence to support the routine use of functional or rehabilitative bracing in a patient with a reconstructive ACL. Given the differences between the poor-quality studies, the conclusions should be treated with caution.

Authors' objectives
To assess whether the use of braces during rehabilitation improves the outcome of anterior cruciate ligament reconstruction.

Searching
PubMed (1966 to 2005), EMBASE (1980 to 2005) and the Cochrane Controlled Trials Register were searched for studies published in English; the search terms were reported. The bibliographies of identified studies were checked and appropriate journals published during the previous 6 months were handsearched.

Study selection
Study designs of evaluations included in the review
Randomised clinical trials (RCTs) were eligible for the review. Where reported, the duration of follow-up ranged from 4 months to 2 years in the included studies.

Specific interventions included in the review
Studies eligible for inclusion included bracing as part of ACL reconstruction rehabilitation. Where reported, the reconstruction method was generally bone-tendon-bone, with the exception of one study in which Jones PT was used. Control treatments included no brace, plaster, cylinder cast, neoprene sleeve and different types of braces.

Participants included in the review
Studies of patients who had undergone ACL reconstruction were eligible for inclusion.

Outcomes assessed in the review
Inclusion criteria were not specified for the outcomes. The outcomes assessed across the included studies were range of motion (ROM), KT 1000, isokinetic testing, Lysholm score, Tegner activity scale, laxity, International Knee Documentation Committee 1991 score, Cincinnati, thigh computed tomography scan, pain visual analogue scale, three functional tests, swelling, early complications, heel height difference, Swiss Orthopaedic Society (OAK) score, Cybex 6000, thigh atrophy, muscle biopsy, one-legged hop and one-legged ROM. The studies assessed multiple outcomes.

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
Study quality was appraised through the Consolidated Standards of Reporting Trials (CONSORT) Statement for RCTs. The factors considered were form of randomisation, loss to follow-up, drop-outs, outcome parameters measured and how measured, blinding, use of an independent examiner, selection bias, performance bias, detection bias and attrition bias. Two reviewers assessed validity, but it was not reported if this process was performed independently or not.

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

Methods of synthesis
How were the studies combined?
Individual studies were described in the text.

How were differences between studies investigated?
Differences between the studies were discussed in the text and details of all but one study were tabulated.

**Results of the review**
Twelve studies (n=554) were included in the review (11 were tabulated).

All studies reported in the review demonstrated substantial weaknesses in the RCT and heterogeneous outcome measures. Potential selection bias and/or observer bias were present in all studies and only one described power calculations to determine study size, thus all the remaining studies have the potential for type II errors. Most studies did not report details of randomisation methods and reported methods included birth year, consecutive allocation and alternating groups. Three studies described the use of independent examiners and three undertook blinding.

Four of the 6 studies that compared brace with no brace reported no differences between treatment groups at intervals between 4 months and 2 years. One of the other studies reported an increased Cincinnati score and thigh atrophy at 3 months in the brace group, while in the other study the no brace group had increased Tegner score at 6 months and decreased swelling at 2 weeks.

A study comparing a Protonics brace versus a rehabilitation brace reported that 80% strength was achieved 3.3 weeks earlier in the Protonics group.

One study reported that a brace decreased strength by Biodex at 24 months compared with plaster.

One study reported that a brace locked in full extension was better in extension at 4 and 8 weeks than a brace locked from 0 to 90 degrees.

One study reported that the 6- and 12-weeks ROM and 24-week one-legged hop were improved in the neoprene sleeve group compared with a hinged brace group. One study that compared a cylinder cast with a cast brace reported no data. The study that was not presented in the tables appeared to report no difference between a hinged knee lock brace and a knee immobiliser.

**Authors’ conclusions**
The studies included in the review are not of sufficient quality from which to draw reliable conclusions about the use of bracing after ACL reconstruction. There was no evidence to support the routine use of functional or rehabilitative bracing in patients with a reconstructive ACL. None of the studies demonstrated clinically improved ROM, decreasing pain, improved graft stability, or decreased complication and re-injuries. The use of braces is not supported by currently available evidence.

**CRD commentary**
The review question and inclusion criteria were clearly reported with respect to the study design, participants and interventions; inclusion criteria were not defined for the outcomes and this raises the possibility of selective reporting of the results. Several databases were searched, but the restriction to studies reported in English might have led to language bias. Validity was assessed using specified criteria. The quality appraisal was undertaken by both authors, but it was not clear whether this was done independently and whether the study selection and data extraction processes were undertaken similarly, thus the potential for error and bias cannot be assessed. Details of the participants were lacking, so it is not clear how representative the samples are. The studies were described individually rather than the evidence being synthesised, although it should be acknowledged that summarising studies with such diverse outcomes can be problematic. The clinical heterogeneity of the included studies was considerable, and the fact that all the included studies had potential biases requires the results of the review to be treated with caution.

**Implications of the review for practice and research**
The authors did not state any implications for practice or further research.
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