ACL reconstruction: a meta-analysis of functional scores
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CRD summary
This review concluded that there was no difference between bone-patellar tendon-bone and hamstring grafts with respect to function after anterior cruciate ligament reconstruction. Despite the considerable procedural strengths of the review, the authors’ conclusions may be unreliable because of the clinical variability of the included studies.

Authors' objectives
To compare bone-patellar tendon-bone (PT) grafts and hamstring (HS) grafts with respect to function of the knee after reconstruction of the anterior cruciate ligament (ACL).

Searching
MEDLINE, WebSPIRS, Science Citation Index, Current Contents and the Cochrane CENTRAL Register were searched to March 14, 2005; the search terms were reported. The searches were later updated to March 15, 2006, and EMBASE was searched from 1996 at the update. To find other relevant studies, references of published trials were checked. Trial authors, orthopaedic journals and relevant organisations were sent a list of selected studies and asked for information regarding other published or unpublished studies. No restrictions were placed on language or status of publication.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) and quasi-randomised trials (QRTs; trials that used non-random allocation by alternation, date of birth, or day of surgery) were eligible for inclusion providing that the treatment groups were formed at the same time and the mean follow-up was at least 2 years. The mean follow-up period among the included studies ranged from 24 to 102 months.

Specific interventions included in the review
Studies eligible for inclusion compared PT and HS grafts without augmentation for reconstruction of the ACL. HS grafts varied with respect to the number of strands (two to five). Several methods for femoral and tibial fixation were reported for both PT and HS groups. Reported aspects of the procedures included reconditioning the graft, cycling, securing under tension, and flexion degree of the knee when fixing the graft. All trials used arthroscopy. Post-operative rehabilitation varied across the trials, but was similar for each group within trials.

Participants included in the review
Studies of patients who underwent ACL reconstruction were eligible for inclusion. When reported, the mean age of the included patients ranged from 20 to 32 years. In all but two studies the majority of the patients were male for both treatment groups.

Outcomes assessed in the review
Studies eligible for inclusion reported at least one primary functional outcome: final overall International Knee Documentation Committee (IKDC) score and/or return to pre-injury activity level. The IKDC score, which was recorded as class A (normal), B (nearly normal), C (abnormal) or D (severely abnormal), is based on a multidimensional scale comprising four categories: subjective assessment, symptoms, range of motion and ligament examination. The category score was determined by the lowest item rating, whilst the overall score was determined by the lowest category rating. In the review, two outcome variables for function as measured by the IKDC scale were considered: final IKDC class A versus the remaining classes, and final IKDC class A or B versus class C or D. Return to pre-injury activity level was treated as a binary variable (yes, no).

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**
The authors assessed study validity using a 5-point quality scale. One point was awarded when randomisation was described and appropriate, the withdrawal or drop-out rate was less than 20%, cointerventions were comparable, assessment was independent, or an intention-to-treat analysis was reported. A total quality score of no more than 2 indicated a poor study, 3 or 4 a fair study, and 5 a good study.

**Data extraction**
Two reviewers independently extracted the data using standardised forms. Any discrepancies were resolved by discussion, sometimes involving two other reviewers. When necessary, authors of retrieved studies were contacted for unpublished data or for clarification regarding possible patient overlap.

For individual trials, the number of patients in each IKDC class and the numbers of patients who did or did not return to pre-injury activity level were extracted for each treatment group. Relative risks (RRs) and corresponding confidence intervals (CIs) were computed for each dichotomised outcome. In addition, the overall percentages for each outcome per treatment group were computed.

**Methods of synthesis**

How were the studies combined?
The studies were combined in a meta-analysis using a random-effects model to estimate pooled RRs and 95% CIs.

How were differences between studies investigated?
Statistical heterogeneity of the treatment effects was assessed using the Cochran test statistic (p<=0.10 indicating significance). Studies with the greatest influence on a statistically significant chi-squared value were further investigated with respect to study features.

The total quality score, randomisation status, number of strands in the HS graft and length of follow-up were extracted to assess the impact of study features on treatment effects. These variables were dichotomised for interaction analyses. In additionally, the RR for an IKDC class A score was estimated for subgroups based on the dichotomised variables.

**Results of the review**
Fourteen trials (n=1,263) from 21 reports were included in this review: 7 RCTs (n=605) and 7 QRTs (n=658). When reports used overlapping data from the same trial, the report with the longest follow-up period was used.

Six trials were rated as poor and eight as fair. The drop-out rate for all trials was less than 20%. None of the trials reported an intention-to-treat analysis. The results for the other quality variables were mixed.

The ACL reconstructions involved 649 PT grafts and 614 HS grafts. Thirty-three per cent of the HS group and 41% of the PT group returned to normal (class A), as measured by the IKDC scale. This difference was not statistically significant; neither were statistically significant differences found between PT and HS grafts with respect to the number of patients with a final overall IKDC class A or B score (80% versus 78%, respectively), nor for the number who returned to pre-injury activity level (76% versus 67%).

The Cochran test for statistical heterogeneity of the treatment effects was significant (p<0.06) for the final overall IKDC class A or B score. Three influential trials were identified, but an investigation as to why the trials were influential was not conclusive. Statistical heterogeneity was non significant for the final overall IKDC class A score and for return to pre-injury activity level.

The impact of type of graft on the number of patients with a final overall IKDC class A score did not depend on selected study feature variables (quality, randomisation status, number of strands, length of follow-up), as all of the interaction tests were statistically non significant.
Authors' conclusions
There was no difference in the final overall IKDC score or the number of patients who returned to full activity after ACL reconstruction involving a PT or HS graft.

The authors discussed the limitations of the conservatively scored IKDC scale for measurement of function. Possible floor and ceiling effects could limit the range of obtained scores, making it difficult to find statistically significant differences. A new instrument using a 0- to 100-point scale could be more sensitive to differences in function after ACL reconstruction.

CRD commentary
This review addressed a well-defined research question in terms of the population, interventions, outcomes and trial designs. A thorough search of relevant databases was conducted, unpublished studies were sought, and the search terms were reported. Attempts to avoid language and publication biases were made by the inclusion of relevant papers regardless of language or publication status. Study validity was assessed and the data were extracted independently, which might also have helped reduce error and bias. However, efforts to control selection bias were not reported.

The clinical heterogeneity of the included studies seems considerable and may mean that the pooling of studies in a meta-analysis was ill advised. As a consequence of dichotomising variables for selected study features, the interaction tests may have been too crude to find statistically significant effects.

Despite the considerable procedural strengths of this review, the authors' conclusions may be unreliable given the clinical heterogeneity of the included studies.

Implications of the review for practice and research
Practice: The authors stated that patients should be told of their chances for full recovery after ACL reconstruction.

Research: The authors stated that innovative evaluation methods sensitive to the needs, expectations and preferences of patients should be designed.

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