Patellar tendon or four-strand hamstring: a systematic review of autografts for anterior cruciate ligament reconstruction

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CRD summary
This review compared bone-patellar tendon-bone and four-strand hamstring autografts for anterior cruciate ligament reconstruction. The authors concluded that, overall, there were few differences between the procedures. Although the authors' conclusion appears to follow from the results presented, the lack of a quality assessment of the included studies makes it difficult to adequately assess the strength of the evidence.

Authors' objectives
To compare bone-patellar tendon-bone (BPTB) and four-strand hamstring (4SHS) autografts for anterior cruciate ligament (ACL) reconstruction.

Searching
MEDLINE (from 1966), EMBASE (from 1980) and the Cochrane Library were searched; the search terms were not reported. Potentially relevant references were obtained and reference lists in these reports were also screened.

Study selection
Study designs of evaluations included in the review
Prospective randomised controlled trials (RCTs) and quasi-randomised trials that allocated treatments using factors not related to ACL reconstruction, with a minimum of 2 years follow-up, were eligible for inclusion. Comparative trials with a historical control group were excluded.

Specific interventions included in the review
Studies that compared central third BPTB with 4SHS autografts inserted using an arthroscopically assisted technique were eligible for inclusion. All studies used a central third patellar tendon graft with bone blocks for BPTB. Participants undergoing 4SHS received either a doubled semitendinosus and gracilis graft or a quadrupled semitendinosus graft. All but one of the included studies used consistent surgical procedures, but different types of femoral and tibial fixation were used (details were reported). Post-operative rehabilitation varied considerably amongst the studies (details were reported).

Participants included in the review
Inclusion criteria for the participants were not specifically stated, but it was clear that studies of patients undergoing ACL were eligible for inclusion. Where reported, the mean age of the participants in the included studies ranged from 22 to 32 years and the time from injury to surgery ranged from 3 to 42 months. The majority of the participants were male.

Outcomes assessed in the review
The review assessed extension loss, flexion loss, Lachman testing, pivot shift testing, arthrometer testing, return to sports, clinical knee scores, isokinetic muscle testing, patellofemoral joint pain, graft ruptures and other complications. The included studies used different definitions for extension loss (less than 3 degrees loss considered as no loss and 1 degree loss considered to be loss). They also applied different forces during arthrometer testing and used different scoring systems for clinical knee scores.

How were decisions on the relevance of primary studies made?
The authors did not state how the studies were selected for the review, or how many reviewers performed the selection. [A: Two authors independently selected the studies and there were no disagreements.]
Assessment of study quality
The authors did not state that they assessed validity.

Data extraction
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction. [A: One author extracted the data. For each study, odds ratios (ORs) with 95% confidence interval (CIs) for dichotomous data and weighted mean differences (WMD) with 95% CIs for continuous data were either extracted or calculated (it was not clear which applied).]

Methods of synthesis
How were the studies combined?
The studies were grouped according to outcome and combined in a narrative.

Where studies were statistically homogeneous (P<0.010), data were pooled using a fixed-effect meta-analysis. Pooled ORs and 95% CIs were calculated for dichotomous data, while pooled WMDs with 95% CIs calculated for continuous data.

How were differences between studies investigated?
Statistical heterogeneity was assessed using the Cochran Q test. Where significant heterogeneity was found, attempts were made to determine the sources.

Results of the review
Six comparative trials were included (475 followed up for 2 years). Of these, three were RCTs (n=273) and three were quasi-randomised studies (n=202). In total, 235 patients received a BPTB graft and 240 received a 4SHS graft.

Extension loss was statistically significantly more common after BPTB than after 4SHS; the OR (based on 4 studies) was 0.48 (95% CI: 0.29, 0.82, P=0.007).

Patellofemoral pain was more common after BPTB, but the increase was not statistically significant; the OR (based on 5 studies) was 0.61 (95% CI: 0.35, 1.08, P=0.09).

Peak hamstring torque was significantly lower after 4SHS; the WMD (based on 2 studies) was -6.82 (95% CI: -11.84, -1.79, P=0.008).

There was a non-statistically significant trend towards an increase in the proportion of patients with a pivot shift test greater than 1 after 4SHS; the OR (based on 3 studies) was 2.25 (95% CI: 0.81, 6.29, P=0.12).

There were no significant differences between BPTB and 4SHS in Lachmans testing, return to the same level of sport, clinical knee scores, graft ruptures or other complications (details were reported).

Authors' conclusions
There were advantages and disadvantages with BPTB and 4SHS but, overall, there were few differences between procedures.

CRD commentary
The review addressed a clear question that was defined in terms of the intervention, outcomes and study design. Three relevant databases were searched, but no attempts to minimise publication or language bias were specifically reported. The methods used to select studies and extract the data were not described in the report of the review, but subsequent communication from the authors has indicated that methods were used to minimise reviewer errors and bias in the selection of studies. However, the lack of duplication in the data extraction might have led to reviewer errors and bias in that area. Quasi-randomised trials and RCTs were included but, since study validity was not assessed, the results from
these studies and any synthesis may not be reliable. The studies were appropriately grouped by outcome. Although the authors’ conclusions appear to follow from the results presented, the lack of a quality assessment of the included studies makes it difficult to comment on the strength of the evidence underpinning the conclusions.

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

Practice: The authors stated that in view of the few differences found between BPTB and 4SHS, knee surgeons should be skilled in both procedures.

Research: The authors did not specifically state any implications for further research. However, they did state that the standardisation of outcome measures would facilitate meta-analysis and that a large multicentre RCT of BPTB verses 4SHS has yet to be performed.

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