High tibial osteotomy compared with unicompartmental arthroplasty for the treatment of medial compartment osteoarthritis: a meta-analysis

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CRD summary
The authors found that good or excellent outcomes for isolated medial compartment knee osteoarthritis were more likely with unicompartmental knee arthroplasty (UKA) than high tibial osteotomy. There was a trend for lower risk of aseptic loosening with UKA. These conclusions should be regarded cautiously, due to the small size, questionable quality and observational nature of most of the included studies.

Authors’ objectives
To compare the clinical effectiveness of high tibial osteotomy and unicompartmental knee arthroplasty (UKA) for treatment of isolated medial compartment osteoarthritis of the knee.

Searching
MEDLINE (from 1966), PubMed and EMBASE (from 1980) were searched to March 2008. Search terms were reported. Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials (CENTRAL), ClinicalTrials.gov, archives of orthopaedic meetings and references of eligible studies were searched. The search was not limited by publication status.

Study selection
Randomised controlled trials (RCTs) or observational studies that compared high tibial osteotomy and medial UKA for isolated medial compartment osteoarthritis were eligible for inclusion, provided they reported as outcomes the rate of good or excellent results (primary outcome), implant survivorship and/or postoperative gait velocity. Using the Knee Society Scoring System, good or excellent results were defined as a score of at least 70. Survivorship was defined as freedom from surgical revision.

The mean age of participants in the included studies ranged from 55 to 71 years. Males comprised 21% to 86% of participants. A wide variety of implants were used in the UKA group, while for high tibial osteotomy most studies used a lateral closing wedge technique. Good or excellent results were in most cases defined by subjective study-specific measures rather than Knee Society Scoring System. Implant survivorship was reported in the review in terms of no aseptic loosening. Some studies commented on surgical complications. Mean duration of follow-up ranged from 0.5 to 7.8 years; however, it was stated that mean follow-up for the primary review outcome was at least two years in all cases.

Two authors independently selected the studies for inclusion.

Assessment of study quality
The quality of RCT design was assessed using a 21-point scale; criteria used were not reported. Observational studies were assessed using an 11-point scale to evaluate the clarity of eligibility criteria and the quality of outcomes measures and statistical analysis. The extent of losses to follow up was also considered.

The assessment was conducted independently by two reviewers, with disagreements resolved by consensus.

Data extraction
For each study, odds ratios (ORs) were calculated for event rates in the two groups (for binary data) and standard mean differences between the groups (for continuous data), with 95% confidence intervals (CIs). Two reviewers extracted the data. Additional data were obtained from one of the primary study authors.

Methods of synthesis
Studies were combined using the Mantel-Haenszel fixed-effect model to calculate pooled odds ratios and weighted
mean differences (WMDs), with 95% CIs. A cumulative meta-analysis was also conducted, which added studies by date order. Heterogeneity was assessed using the $X^2$ test ($p<0.01$ suggested statistical heterogeneity) and $I^2$ statistic (values over 50% suggested moderate heterogeneity and over 75% suggested high heterogeneity). Publication bias for all outcomes was assessed using funnel plots.

Results of the review
Six studies were included in the review (n=362): one RCT (n=60) and five observational studies (n=302). The RCT reported computer-generated randomisation, but described neither allocation concealment nor blinded assessment. Few studies reported sample size calculation. Follow-up was excellent (94%) in all studies.

A good or excellent outcome was significantly more likely in the UKA group (OR 2.03, 95% CI 1.16 to 3.6; six studies). Cumulative meta-analysis showed the cumulative odds ratio stabilising at around 2.00 after addition of the fifth and sixth studies. There was a non-statistically significant trend that favoured UKA for the outcome of survival from aseptic loosening (OR 2.14, 95% CI 0.93 to 4.93; five studies). There was no statistically significant difference between the groups in gait velocity (WMD 0.39 m/second, 95% CI -0.12 to 0.90; two studies). No significant statistical heterogeneity was detected for any outcome ($I^2$ range 0% to 36%). There was no evidence of publication bias.

Four studies reported surgical complications. The most commonly reported were wound complications and peroneal nerve palsy.

Authors’ conclusions
For isolated medial compartment knee osteoarthritis, good or excellent outcomes were more likely with UKA than with high tibial osteotomy and a trend for lower risk of aseptic loosening with UKA.

CRD commentary
The objectives and inclusion criteria of the review were clear. Relevant sources were searched for both published and unpublished studies. It was unclear whether the search was restricted by language. Steps were taken to minimise the risk of reviewer bias and error by having more than one reviewer undertake study selection, validity assessment and data extraction, but the criteria used for assessment of RCT validity were not systematically reported. Appropriate statistical techniques were used to combine the studies and assess statistical heterogeneity and publication bias. Clinical and methodological differences between the studies were considered a priori as potential sources of heterogeneity. The authors pointed out methodological weaknesses in the primary studies, such as subjective outcomes measures and potential confounding. Their conclusions should be regarded cautiously, due to the small amount of evidence available and the questionable quality of the included studies, only one of which was randomised.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.

Research: The authors stated that well-designed RCTs were required to compare high tibial osteotomy and UKA for isolated medial compartment osteoarthritis of the knee, with validated and blindly assessed general and disease-specific outcomes. Studies should take into account potential performance bias from different level of surgical expertise.

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