Outcomes of total and unicompartmental knee arthroplasty for secondary and spontaneous osteonecrosis of the knee

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CRD summary
This review assessed total knee arthroplasty for secondary osteonecrosis and total and unicompartmental arthroplasty for spontaneous necrosis. The authors concluded that outcomes for all procedures had improved with time, and that total arthroplasty is associated with better outcomes than unicompartmental arthroplasty after spontaneous necrosis. Problems with review methodology, including synthesis, and reporting mean that the conclusion is unlikely to be reliable.

Authors' objectives
To assess the outcomes for patients who have undergone total knee arthroplasty (TKA) for secondary osteonecrosis, or total or unicompartmental knee arthroplasty for spontaneous osteonecrosis of the knee.

Searching
PubMed was searched from 1982 to October 2005; the search terms were reported. The references of included studies were also checked.

Study selection
The inclusion criteria for study design were not stated. All of the included studies were cohort studies. Studies of TKA for secondary osteonecrosis (defined as tricompartmental or bicompartamental arthroplasty), and total or unicompartmental knee arthroplasty for spontaneous osteonecrosis of the knee, were eligible for inclusion. The included studies used both cemented and uncemented procedures. Studies that had a cohort composed of fewer than 90% primary TKAs and unicompartmental knee arthroplasties were excluded from the review. The included studies had follow-up ranging from 2.5 to 10 years. In the included studies, patients treated for secondary osteonecrosis had mean ages ranging from 23 to 55 years, while those treated for spontaneous osteonecrosis had mean ages ranging from 44 to 74.9 years. Eligible studies reported outcome measures including the number of revisions (defined as replacement of any component, knee fusion, or amputation) and global outcome scores, i.e. the Knee Society score (KSS) or Hospital for Special Surgery score (HSS). Radiographic outcomes were also reported.

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 did not state that they assessed validity.

Data extraction
Global outcome scores (KSS or HSS), revision rates and radiographic outcomes were extracted. The objective and functional components of the KSS were combined to produce an average score. Two categories of outcome ('poor' and 'good') were created. A poor outcome was defined as one where the knee required revision or had ominous radiographic signs, or poor outcome scores were reported by the authors, or it scored less than 60 points on any global outcome score. A good outcome was defined as one where the knee required no revision and had no ominous radiographic signs (progressive, probable or definite loosening), and had good or excellent clinical outcome scores reported by authors, or scored 70 or more on the HSS or averaged KSS, or 80 or more on the knee component of the KSS.

The data were extracted into a spreadsheet, but the authors did not state how many reviewers performed the data extraction or how any discrepancies were resolved.

Methods of synthesis
Global outcome variables were averaged for subgroups based on disease type (spontaneous versus secondary
osteonecrosis) and type of surgical intervention (total versus unicompartmental arthroplasty). The average was weighted for the number of knees included in the analysis and 95% confidence intervals (CIs) were calculated for the weighted means. For part of the synthesis, the KSS and HSS were regarded as equivalent and combined. For the categorisation of outcomes as good or poor, and for revision rates, CIs were not calculated but variance was indicated by the range of cohort results. A comparison of post-operative KSS scores on the basis of surgery date (pre- versus post-1985) was also undertaken.

**Results of the review**
Fifteen studies with 20 cohorts were included in the review. Three studies had a prospective design and 12 a retrospective design. Eight cohorts (150 knees) assessed TKA for secondary osteonecrosis, 7 cohorts (148 knees) assessed TKA for spontaneous osteonecrosis and 5 cohorts (64 knees) assessed unicompartmental arthroplasty for spontaneous osteonecrosis.

**TKA for secondary osteonecrosis:** the weighted mean post-operative global knee score was 82 points (95% CI: 81, 83) compared with a pre-operative value of 39 (95% CI: 38, 40). The mean percentage of knees with an outcome rated as good was 74% (range: 55 to 100); the percentage was 23% (range: 0 to 45) for an outcome rated as poor. The mean revision rate was 20% (range: 0 to 36).

**TKA for spontaneous osteonecrosis:** the weighted mean post-operative global knee score was 85 points (95% CI: 84, 86) compared with a pre-operative value of 57 (95% CI: 56, 58). The mean percentage of knees with an outcome rated as good was 92% (range: 67 to 100); the percentage was 6% (range: 0 to 33) for an outcome rated as poor. The mean revision rate was 3% (range: 0 to 33).

**Unicompartmental knee arthroplasty for spontaneous osteonecrosis:** the weighted mean post-operative global knee score was 82 points (95% CI: 79, 85) compared with a pre-operative value of 46 (95% CI: 45, 47). The mean percentage of knees with an outcome rated as good was 90% (range: 50 to 100); the percentage was 16% (range: 0 to 50) for an outcome rated as poor. The mean revision rate was 13% (range: 0 to 50%).

Comparisons between pre- and post-1985 operations uniformly favoured the latter period (full details were provided in the paper).

**Authors' conclusions**
TKA for secondary osteonecrosis or total or unicompartmental knee arthroplasty for spontaneous osteonecrosis of the knee were all associated with improved outcomes in cohorts with more recent operative dates. Outcomes after TKA appeared better than after unicompartmental knee arthroplasty for spontaneous osteonecrosis and TKA for secondary osteonecrosis. However, issues concerning the quality of the included data mean that this conclusion should be regarded with caution.

**CRD commentary**
The review question was clear, as were the inclusion criteria with the exception of study design. The authors searched only one electronic database and did not report any attempts to locate unpublished studies. These factors increase the likelihood that some relevant studies were not included in the review. The authors did not report using methods designed to minimise bias and error in the selection of studies for the review or in the extraction of data. They also did not perform a validity assessment. It appears that the included studies also had methodological limitations. The use of simple averages to combine study outcomes was inappropriate and it is not clear how weighted averages were calculated for global outcomes in the absence of a formal statistical synthesis. As a result of these issues with the methodology and reporting of the review, the conclusions cannot be considered reliable; the authors' caution therefore appears justified.

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

Research: The authors stated that further studies, which should report global knee function scores using a primary score, preferably the KSS, should be undertaken. Ultimately, a further evidence synthesis with formal statistical pooling would be desirable.
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