A meta-analysis of patellar replacement in total knee arthroplasty

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CRD summary
This review compared patellar resurfacing with nonresurfacing during total knee arthroplasty. The authors concluded that although resurfacing appeared superior, it was difficult to draw firm conclusions given the many differences between the studies. Overall, this was a well-conducted review and the authors’ cautious conclusions appear appropriate.

Authors’ objectives
To compare patellar resurfacing with nonresurfacing during total knee arthroplasty (TKA).

Searching
MEDLINE and the Cochrane CENTRAL Register were searched from 1966 to August 2003 using the reported search terms. The reference lists of published trials were screened and a French database of theses was searched. Experts were contacted for details of additional and unpublished studies. No language restrictions were applied.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) with at least 10 patients per treatment group, a follow-up of at least 1 year, and adequate follow-up (80% or more patients) were eligible for inclusion. The authors included one quasi-RCT. The duration of follow-up in the included studies ranged from 12 to 79.2 months.

Specific interventions included in the review
Studies that compared patellar resurfacing with nonresurfacing during TKA were eligible for inclusion. The studies could use any type of prosthesis. In the review, preparation of the patella with removal of osteophytes, perforation of eburnated bone, and preparation or removal of cartilage were considered as nonresurfacing. The included studies used ten different types of prostheses, and used different forms of preparation of the nonresurfaced patella (where reported), different rates of lateral retinacular release (up to 93.5% of knees in one study) and different designs of patellar component (details were reported).

Participants included in the review
Studies of patients of any age who required a TKA were eligible for inclusion, regardless of the aetiology of the disease. Some studies only included patients with osteoarthritis, one only included patients with rheumatoid arthritis, and some included patients with either type of arthritis.

Outcomes assessed in the review
Studies that assessed any outcome were eligible. The review assessed the most frequently reported outcome measures: reoperation for patellofemoral failure, anterior knee pain, International Knee Society (IKS) knee and function scores, patient satisfaction, and Hospital for Special Surgery scores. The review also assessed pain during stair climbing. Some studies included bilateral procedures but the outcomes were generally knee-specific.

How were decisions on the relevance of primary studies made?
Two reviewers independently selected studies and resolved any disagreements on inclusion through recourse to a third author, if required.

Assessment of study quality
The studies were assessed using a checklist of the following items: eligibility criteria specified; random allocation to treatment; allocation concealment; baseline similarity of the treatment groups; explicit description of all interventions; cointerventions comparable or avoided; blinding of the patients and outcome assessors; relevant outcome measures.
assessed; adverse effects described; withdrawals described and rate acceptable; outcomes assessed at 1 and at least 5 years; comparable timing of the outcome assessment for all groups; sample size of each group reported; analysis based on intention-to-treat; and point estimates and measures of variability reported for the primary outcome measures. Studies were considered to be of a high quality if they were randomised with clear allocation concealment and with blind assessment of the outcomes.

Two reviewers 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. For each study, the numbers of events of interest were extracted for each treatment group and the relative risk (RR) with 95% confidence interval (CI) was calculated.

**Methods of synthesis**
How were the studies combined?
Clinically comparable studies were combined using fixed-effect and random-effects meta-analyses. Pooled RR and pooled weighted mean differences (WMD) with 95% CIs were calculated.

How were differences between studies investigated?
Statistical heterogeneity was assessed, but no details of the methods used were reported. The results from the random-effects meta-analysis were preferred when statistically significant heterogeneity was detected, to allow potential sources of heterogeneity to be investigated. One meta-analysis was repeated after excluding an outlier; others were repeated with the inclusion of only high-quality studies and with the inclusion of only studies of patients with osteoarthritis. Other potential causes of differences between studies were discussed in the review.

**Results of the review**
Eleven RCTs and one quasi-RCT were included (1,490 knees).

In terms of study quality, 6 studies reported the randomisation method, six reported a blind outcome assessment, and three clearly reported intention-to-treat analysis.

Resurfacing was associated with a statistically significant reduction in the risk of reoperation compared with nonresurfacing; 2.3% versus 6.5% (RR 0.43, 95% CI: 0.27, 0.71, P=0.0008). The reduction in reoperation with resurfacing remained statistically significant when the meta-analysis was limited to the 3 highest quality studies (RR 0.45, 95% CI: 0.24, 0.82, P=0.01) and patients with osteoarthritis (RR 0.48, 95% CI: 0.27, 0.86, P=0.01). No statistically significant heterogeneity was detected.

Resurfacing was associated with a statistically significant reduction in the risk of significant anterior knee pain compared with nonresurfacing; 7.6% versus 22.3% (RR 0.39, 95% CI: 0.20, 0.75, P=0.005), based on 7 studies. There was no statistically significant difference between treatments in anterior knee pain when the meta-analysis was limited to the 3 high-quality studies. Statistically significant heterogeneity was detected for both meta-analyses (P=0.01 and P=0.004).

There was no statistically significant difference between resurfacing and nonresurfacing in the IKS knee score; the WMD was 1.12 (95% CI: -2.13, 4.37), based on 4 studies. Statistically significant heterogeneity was detected (P=0.005). Following the exclusion of an outlier, which removed the significant heterogeneity, the meta-analysis showed a statistically significant effect in favour of resurfacing (WMD 2.67, 95% CI: 1.26, 4.08, P=0.0002). There was no statistically significant difference between resurfacing and nonresurfacing in the IKS function score (based on 3 studies), but statistically significant heterogeneity was detected (P=0.07).

Resurfacing was associated with a statistically significant reduction in the risk of significant pain during stair climbing compared with nonresurfacing; 12.7% versus 26.4% (RR 0.43, 95% CI: 0.22, 0.83, P=0.01), based on 2 studies.
There was no statistically significant difference between resurfacing and nonresurfacing in patient satisfaction (RR 0.71, 95% CI: 0.42, 1.19; based on 4 studies). No statistically significant heterogeneity was detected.

**Authors’ conclusions**
Although patellar resurfacing appeared to be superior to nonresurfacing in total knee replacement, it was difficult to draw firm conclusions given the many potential confounding factors.

**CRD commentary**
The review addressed a clear question that was defined in terms of the participants, intervention and study design. Relevant sources were searched and attempts were made to reduce the possibility of publication and language bias. Methods were used to minimise reviewer errors and bias in the study selection and validity assessment processes, but it was unclear whether similar steps were taken in the data extraction. The validity of the included studies was assessed using specified criteria and the results of the assessment were reported.

Adequate details of each included study were given. There were differences between the studies but the meta-analysis allowed potential sources of heterogeneity to be explored and discussed. Overall, this was a well-conducted review and the authors’ cautious conclusion appears appropriate in view of the differences between the studies.

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

Research: The authors stated that further high-quality studies are required to provide surgeons with material on which to make evidence-based decisions. They also stated that studies should have longer durations of follow-up and should consider survival outcomes that take patients lost to follow-up and differences in follow-up into consideration.

**Bibliographic details**

**PubMedID**
15738822

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Activities of Daily Living; Arthroplasty, Replacement, Knee /adverse effects /methods; Humans; Outcome and Process Assessment (Health Care); Pain /etiology; Patella /surgery; Patient Satisfaction; Reoperation; Risk; Treatment Outcome

**AccessionNumber**
12005009493

**Date bibliographic record published**
31/12/2006

**Date abstract record published**
31/12/2006

**Record Status**
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on
the reliability of the review and the conclusions drawn.