Survival and clinical function of cemented and uncemented prostheses in total knee replacement: a meta-analysis

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CRD summary
This review compared survival and clinical outcomes of cemented and uncemented techniques in primary total knee replacement and concluded that there was improved survival for cemented implants. Given the presence of publication bias, uncertain study quality and conclusions based on pooling of two study types, the authors' conclusions should be interpreted with caution.

Authors' objectives
To compare survival and clinical outcomes of cemented and uncemented techniques in primary total knee replacement.

Searching
PubMed, EMBASE, Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials (CENTRAL) and Clinicaltrials.gov were searched without publication or language restrictions from inception to June 2008; search terms were reported. Archives of orthopaedic meetings were searched and included American Academy of Orthopaedic Surgeons, Knee Society, Canadian Orthopaedic Association and British Orthopaedic Association; search dates ranged from 2001 to 2008. Reference lists of included studies were screened for additional studies.

Study selection
Eligible studies comprised randomised controlled trials (RCTs) or observational studies that compared fully cemented and fully uncemented fixation in patients who underwent primary total knee replacement. Outcomes included survival of implant free of aseptic loosening and joint function as measured by Knee Society score. Mean age of participants was 63 years (range 16 to 97). Proportion of males was 0 to 50%. The proportion diagnosed with osteoarthritis ranged from 48% to 100% and the proportion with rheumatoid arthritis from 0 to 50%. Studies reported other complications, most commonly patellar subluxation and dislocation, infections and sepsis, subsequent patellar resurfacing and loosening or failure of the patellar component.

Two reviewers independently selected studies for inclusion in the review.

Assessment of study quality
Study quality of RCTs was assessed using a previously published 21-point scale. Observational studies were assessed using an 11-point scale based on the following criteria: well-defined eligibility criteria; comparison of demographic data; description of sample size calculations; reporting of outcome measures; blinded outcome assessment; limited loss to follow-up; and appropriate statistical analysis.

Two reviewers independently assessed study quality; disagreements were resolved through consensus.

Data extraction
Two reviewers independently extracted survival data to calculate odds ratios (OR) with means and standard deviations extracted for the Knee Society score.

Methods of synthesis
Data were pooled using a random-effect model with dichotomous outcomes combined to calculate pooled odds ratios (Mantel-Haenszel method) and continuous outcomes to calculate mean differences or standardised mean differences (SMDs), all with 95% confidence intervals (CIs). Heterogeneity was assessed using Hedges and Olkin methods (p<0.1) and the I² statistic. Publication bias was assessed through funnel plot analysis. Sensitivity analysis explored the impact of type of study.
Results of the review
A total of 15 studies was included in the review (n=3,560): five RCTs (n=780, 348 uncemented and 432 cemented) and 10 observational studies (n=2,780, 1,153 uncemented and 1,627 cemented). Follow-up ranged from two to 11 years. There was evidence of publication bias.

There was significantly improved survival of the implant for the cemented fixation compared to uncemented fixation (OR 4.2, 95% CI 2.7 to 6.5; 15 studies); no evidence of heterogeneity. There was no significant difference for Knee Society score between fixation methods (WMD 0.005, 95% CI -0.26 to 0.26; nine studies); significant heterogeneity was present.

Sensitivity analysis using only RCTs showed no differences between the groups for odds of aseptic loosening (OR 1.9, 95% CI 0.55 to 6.40; five studies); there was no evidence of heterogeneity.

Additional complications included patellar subluxation and dislocation (4.3% to 11.8%; four studies), infections and sepsis (0.9% to 2.9%; six studies), subsequent patellar resurfacing (1.1% to 1.2%; two studies) and loosening or failure of the patellar component (5.6% to 39.1%; two studies).

Authors' conclusions
There was improved survival of cemented compared to uncemented implants, with no statistically significant difference in the mean Knee Society score between groups for all pooled data.

CRD commentary
The review question and inclusion criteria were clear. A thorough search of databases was undertaken. No language or publication status restrictions were placed on the search, which reduced potential for language and publication biases. Publication bias was assessed and there was some evidence for its presence from the funnel plot. All stages of the review process were conducted in duplicate, which reduced potential for error and bias. Appropriate criteria were used to assess quality of included studies, but the results were not reported and so study quality was unclear. Appropriate methods were employed for the meta-analysis. Suitable methods were undertaken to assess statistical heterogeneity. Pooling both types of studies might not have been appropriate in light of differences in results for the combined result and the RCT-only result. Generally this was a well-conducted review, but given the likely presence of publication bias, uncertain quality of included studies and conclusions that were based on the pooling of both study types, the authors' conclusions should be interpreted with caution.

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

Research: The authors stated that randomised trials that examining the best fixation method for total knee replacement in a young population were required; such studies should be of sufficient power and utilise validated outcome measures.

Funding
None.

Bibliographic details

PubMedID
19567852

DOI
10.1302/0301-620X.91B7.21702
Original Paper URL
http://www.jbjs.org.uk/cgi/content/abstract/91-B/7/889

Indexing Status
Subject indexing assigned by NLM

MeSH
Aged; Aged, 80 and over; Arthroplasty, Replacement, Knee /methods; Cementation /statistics & numerical data; Equipment Failure Analysis; Female; Humans; Knee Joint /physiopathology /surgery; Male; Middle Aged; Odds Ratio; Prosthesis Failure; Randomized Controlled Trials as Topic; Range of Motion, Articular /physiology; Treatment Outcome

AccessionNumber
12009107312

Date bibliographic record published
18/11/2009

Date abstract record published
02/06/2010

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.