What is the evidence for total knee arthroplasty in young patients? A systematic review of the literature

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CRD summary
This review found that total knee replacement (arthroplasty) provided clinical and functional improvements with a moderate increase in second-decade implant failures. The analyses were based on retrospective studies where the data are subject to a number of potential biases. This means that the results should be interpreted with some caution and the reliability of the authors’ conclusions is unclear.

Authors' objectives
To evaluate the effectiveness of total knee arthroplasty in young patients (under 55 years).

Searching
PubMed, CINAHL, OVID, EMBASE and the Cochrane Library were searched for relevant published studies in English from 1950 to November 2009; some search terms were reported. The Journal of Bone and Joint Surgery, The Journal of Arthroplasty, and Clinical Orthopaedics and Related Research were handsearched from February 2009 to November 2009. Reference lists of the identified studies were checked to identify additional references.

Study selection
Studies of total knee arthroplasty that reported clinical and radiographic results of total knee arthroplasty in patients younger than 55 years with osteoarthritis, rheumatoid arthritis, or post-traumatic arthritis were eligible for inclusion. Studies were required to have a minimum follow-up of two years.

Included patients had osteoarthritis, rheumatoid arthritis, juvenile rheumatoid arthritis and post-traumatic arthritis. A few patients had ankylosing spondylitis, osteonecrosis, haemophilia and other unspecified diagnoses. The mean age of the patients ranged from 29 to 53 years. The outcomes most commonly reported were Knee Society (KS) clinical and functional scores, and adverse events. The outcomes of radiographic assessments for radiolucency were also reported.

Two reviewers independently performed the study selection.

Assessment of study quality
Two reviewers independently evaluated the methodological quality of the included studies using criteria developed by the Strengthening the Reporting of Observational studies in Epidemiology (STROBE) statement for various quality items including recruitment of subjects, information provided on interventions, outcome assessments, potential sources of bias, follow-up, analyses and validity. The potential for selection and reporting biases in each study which may affect the quality of the reporting were evaluated. Any disagreements between the reviewers were resolved by consensus.

Data extraction
Data were extracted on the outcomes as reported. Mean post-operative Knee Society clinical and functional scores and mean improvement, with 95% confidence intervals (CIs), were calculated for each study.

Methods of synthesis
Cochran Q-statistics were calculated to assess statistical heterogeneity across the results of the studies. The authors stated that the Cochran's Q-statistics showed substantial heterogeneity across the studies. The studies were reported to be heterogeneous in diagnoses, activity levels and surgical techniques used during the arthroplasties. The heterogeneity observed precluded statistical combining of the data in a meta-analysis, although some mean scores and 95% confidence intervals were calculated for clinical and functional improvements. The results were summarised in a narrative synthesis.

Results of the review
Thirteen studies (n=671 patients with 908 total knee arthroplasties) were included in the review. The studies were all retrospective case series, although one study included some prospectively collected cases. Losses to follow-up were from 0 to 27%. The mean individual study follow-ups were from five to 18 years. The individual patient follow-ups were from two to 25.7 years.

The mean postoperative Knee Society clinical score was 90.9 points (95% CI 88.3 to 95 points; 13 studies), which showed improvements by a mean 47 points (range 31 to 56 points). The postoperative mean Knee Society functional score was 81.6 points (95% CI 70.2 to 89.8 points; six studies) with a mean improvement of 37 points (range 15 to 41 points). Fifty revision surgeries (5.5%) were performed across the studies with a range of revisions across studies from 3.4% to 18.6% at two to 25.7 years. Mean follow-up ranged between five years and 20 years (but the authors stated that long-term follow-up did not occur for most patients in the studies), with 36 patients (31.5%) having documented follow-up of more than 10 years post-surgery.

Component survivorship was reported or estimated in 10 studies. Survivorship was between 90.6 and 99% for the first six to 10 years post-surgery, and between 85 and 95% for the studies that projected at or beyond 15 years post-surgery.

The most commonly reported complications were revisions for patellar component failure, instability and infection. Global radiolucency, aseptic loosening, pain, and osteolysis were also reported. Non-progressive radiolucencies were reported in between 3.8% and 30% of cases (mean 14.5%), most commonly located in the patella and the tibia.

Authors’ conclusions
Total knee arthroplasty provided clinical and functional improvements, with a moderate increase in second-decade implant failures, in younger patients (under 55 years).

CRD commentary
The review addressed a clear question. Criteria were stipulated for the inclusion of studies in the review. Appropriate databases were searched to identify studies, but the restriction of the review to published studies in English language meant there was some risk of publication and language biases. Steps were taken to minimise errors and biases at most stages of the review process.

The authors’ decision to combine the results of Knee Society scores may not have been justified given the heterogeneity in diagnosis, activity levels and surgical techniques used in the studies. The results should be interpreted with some caution as the analyses were based on retrospective case series in which the data were subject to a number of potential biases.

These biases and the risk that some studies may have been missed means that the results of the review should be interpreted with some caution and that the reliability of the authors’ conclusions is unclear.

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

Research: The authors stated that future research should determine optimum knee arthroplasty design considerations, fixation levels, and the effect of activity levels on the durability of total knee arthroplasties on younger and active patients. They also stated that improvements were required in the study designs and the reporting of results.

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