Patient outcomes following unicompartmental or bicompartamental knee arthroplasty: a meta-analysis

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Authors' objectives
To summarise the literature describing patient outcomes following unicompartmental and bicompartamental knee arthroplasty.

Searching
MEDLARS was searched from 1966 to 1992 for articles published in the English language only. Reference lists of retrieved articles were examined, and those containing the MeSH terms 'amputation', 'animal', 'bone neoplasm' and 'case report' were excluded.

Study selection
Study designs of evaluations included in the review
Prospective and historical cohort studies consisting of at least 10 patients and reporting post-operative patient outcomes were included.

Specific interventions included in the review
Unicompartmental and bicompartamental knee arthroplasty.

Participants included in the review
Patients receiving unicompartmental or bicompartamental knee arthroplasty were included.

Outcomes assessed in the review
Pain, function, and range of motion (summarised in a global knee rating scale), rates of complications, and rates of revisions of surgery were assessed.

How were decisions on the relevance of primary studies made?
A multistaged assessment was performed by two reviewers.

Assessment of study quality
All included articles were subjected to a blinded qualitative assessment. Quality issues addressed included study design, method of patient outcome assessment and description of the sample population, including referral patterns and comorbidity. The quality of the papers was assessed by one reviewer who was blinded to each study's author, journal, date of publication, results and conclusions.

Data extraction
The following data were recorded: mean pre-operative and post-operative global knee rating scale (GKRS) scores, percentage of patients rated as having a good or excellent outcome, complications relating directly to the prosthesis.

Methods of synthesis
How were the studies combined?
The data were summarised across the studies within prosthetic groups by calculating means and ranges for each of the abstracted variables. Reported means were weighted by the number of enrolled patients. T-tests were used to examine for significant differences in means between groups.

How were differences between studies investigated?
The Pearson correlation coefficient was used to determine if study characteristics were significantly correlated with outcomes.

Results of the review

Unicompartmental knee arthroplasty: 46 studies reported data from 51 patient cohorts (13 prospective, 34 historical, 4 no details) involving a total of 2,391 participants. Bicompartmental knee arthroplasty: 18 studies reported data from 20 patient cohorts (12 prospective and 8 historical) involving a total of 884 participants.

Evaluations of unicompartmental knee arthroplasty: 80% (range: 34-100%) of patients reported a good or excellent outcome after a mean follow-up period of 4.6 years. Of 10 studies reporting post-operative pain as a specific outcome measure, 63% of patients reported no post-operative pain, 28% reported mild pain, 6% reported moderate pain and 2% reported severe pain. The number of deaths per year during the follow-up period was 2.1% (range: 0-5.6%) in 28 studies reporting mortality.

For evaluations of bicompartmental knee arthroplasty: 73% (range: 33-100%) of patients reported a good or excellent outcome after a mean follow-up period of 3.6 years. Of 3 studies reporting post-operative pain as a specific outcome measure, 66% of patients reported no post-operative pain, 16% reported mild pain, 12% reported moderate pain and 6% reported severe pain. The number of deaths per year during the follow-up period was 1.7% (range: 0-3.9%) in 12 studies reporting mortality.

Revision of surgery:

The overall rate of revision was similar for unicompartmental (9.2%, range: 0-39%) and bicompartmental (7.2%, range: 0-44%) prostheses. However, there were significantly more septic failure revisions for bicompartmental than unicompartmental prostheses (2.1% versus 0.4% respectively, p<0.01).

Comparability of unicompartmental and bicompartmental studies:

There were statistically-significant differences for the following study characteristics: mean follow-up period, 4.6 versus 3.6 years respectively, (p<0.05); mean age of patients, 66.5 versus 61.4 years (p<0.01); percentage of women included in the study, 67 versus 79% (p<0.01); percentage of patients with osteoarthritis, 75 versus 31% (p<0.01); and percentage of patients with rheumatoid arthritis, 20 versus 66% (p<0.01).

Sensitivity analyses:

Among unicompartmental studies, the mean post-operative GKRS scores were systematically higher among studies published more recently and those that enrolled patients with higher mean pre-operative GKRS scores. Also, outcomes were systematically poorer among studies with greater numbers of enrolled women.

Among bicompartmental studies, the mean post-operative GKRS scores were systematically higher among studies with greater numbers of enrolled women and those with greater numbers of patients with rheumatoid arthritis.

Authors' conclusions

Although bicompartmental studies reported lower mean post-operative GKRS scores, these studies tended to enrol patients with worse pre-operative knee rating scores. Recent improvements in patient outcomes following unicompartmental knee arthroplasty appear to be due to changes in patient selection criteria. Patient outcomes appear to be worse for bicompartmental arthroplasties than for other prosthetic designs. However, patients enrolled in these studies had more poorly functioning knees before surgery and actually had greater absolute improvements in GKRS scores.

CRD commentary

It would not be possible to replicate the search strategy from this paper as keywords were not supplied. In addition, since only English language studies were included and there was no attempt to locate unpublished literature, study
identification may have been biased. Quality assessment of studies was carried out by one reviewer, with no mention of independent checking. A multistaged assessment of study relevance was performed by two of the study investigators, but it is not stated whether this was done independently. The meaning of the outcomes ‘good’ and ‘excellent’ is not explained. Due to inconsistencies between the text and tables, it is unclear exactly how many studies were included. There are few details concerning the design of included studies.

Implications of the review for practice and research
The authors stated that rigorous, well designed research is needed to help physicians and patients understand how individual patient characteristics and treatment goals should influence the choice of surgery for knee arthritis.

Funding
Agency for Health Care Policy and Research, grant number 06432; National Institute on Aging, grant number KO8 AG00538-01.

Bibliographic details

PubMedID
7798094

Other publications of related interest

Indexing Status
Subject indexing assigned by NLM

MeSH
Aged; Female; Follow-Up Studies; Humans; Knee Prosthesis /statistics & numerical data; Male; Middle Aged; Osteoarthritis /epidemiology /surgery; Patient Selection; Postoperative Complications /epidemiology; Prognosis; Prosthesis Design; Prosthesis Failure; Reoperation /statistics & numerical data; Time Factors; Treatment Outcome

AccessionNumber
11995000771

Date bibliographic record published
30/06/1997

Date abstract record published
30/06/1997

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.