Meta-analysis of navigation vs conventional total knee arthroplasty
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CRD summary
This review concluded that navigated total knee arthroscopy provided significant improvement in prosthesis alignment, compared with conventional arthroscopy. The review was generally well conducted, but there was potential bias in the evidence and substantial variation, meaning that the conclusions should be considered to be tentative.

Authors' objectives
To compare the mechanical alignment of navigated versus conventional total knee arthroplasty.

Searching
PubMed, EMBASE, The Cochrane Library and major medical and publisher databases were searched, without language restriction, from 1986 to November 2009 for relevant studies; search terms were reported. The reference lists of recent meta-analyses were searched.

Study selection
Prospective randomised controlled trials (RCTs) with more than four patients per treatment group were eligible for the review if they compared navigation versus convention total knee arthroplasty and reported limb alignment as an outcome. The primary outcome of interest was alignment on full-limb-length radiographs of patients standing in full extension. Functional outcomes were assessed using various scales. In the included trials, the average age of participants was 69 years. Most trials were undertaken in Europe and were performed for primary osteoarthritis.

Two reviewers independently selected trials for the review, and agreement between reviewers was assessed.

Assessment of study quality
The quality of trials was assessed, using the Detsky Quality Assessment Scale, for randomisation, outcome measures, eligibility criteria and reasons for exclusion, interventions, and statistical issues. There was a maximum of 20 points for these items, with an additional question on power calculations for trials that did not find a significant effect. Trials that scored more than 15 were considered to be of high quality.

Two reviewers independently assessed trials for quality, and between-reviewer agreement was evaluated.

Data extraction
Data were extracted on the degree of deviance from 180° to enable calculation of relative risks, with corresponding 95% confidence intervals for deviations of more than 2° or more than 3°, on the mechanical axis and femoral and tibial component alignment.

Data were extracted by one reviewer and independently reviewed by a second reviewer for accuracy.

Methods of synthesis
Trial data were combined in meta-analyses and summary effect relative risks, with corresponding 95% confidence intervals, were calculated using a DerSimonian and Laird random-effects model. Heterogeneity was quantified using I². Publication bias was assessed, but the methods were not reported.

Results of the review
Twenty-three RCTs (n=2,541 patients; range 30 to 467) were included in the review. Seven had scores over 16 and were regarded as high quality, but few reported allocation concealment or intention-to-treat analysis. Nine trials had sample size calculations. The mean duration of follow-up was 7.5 months.

Mechanical axis: Compared with conventional arthroplasty, navigation arthroplasty was associated with a significantly reduced risk of deviation in the coronal plane greater than 2° (RR 0.54, 95% CI 0.42 to 0.69; I²=58%; 13 RCTs) and deviation in the coronal plane greater than 3° (RR 0.37, 95% CI 0.24 to 0.58; I²=85%; 20 RCTs).
Femoral component alignment: Compared with conventional arthroplasty, navigation arthroplasty was associated with a significantly reduced risk of femoral component deviation in the coronal plane greater than 2° (RR 0.58, 95% CI 0.40 to 0.84; eight RCTs) and deviation greater than 3° (RR 0.49, 95% CI 0.31 to 0.78; 14 RCTs). Compared with control, navigation arthroscopy was associated with significantly reduced risk of femoral component sagittal alignment greater than 2° (RR 0.38, 95% CI 0.17 to 0.86; five RCTs) and greater than 3° (RR 0.46, 95% CI 0.26 to 0.82; six RCTs). There was no evidence of significant differences between groups in the effects on transepicondylar alignment exceeding 3°.

Tibial component alignment: Compared with conventional arthroplasty, navigation arthroplasty was associated with a significantly reduced risk of tibial component deviation in the coronal plane greater than 2° (RR 0.48, 95% CI 0.28 to 0.82; eight RCTs) and deviation greater than 3° (RR 0.42, 95% CI 0.24 to 0.76; 14 RCTs). There was no evidence of significant differences between groups in the effects on tibial component deviation in the sagittal plane exceeding either 2° or 3°.

No functional outcome findings were reported. The authors stated that there was no clear indication of publication bias.

Authors’ conclusions
Navigated total knee arthroscopy provided significant improvement in prosthesis alignment.

CRD commentary
The review addressed a clear research question, supported by appropriate inclusion criteria. A range of relevant resources were searched without language restriction. Appropriate methods were used to select trials, extract data and assess trial quality, minimising the chance of reviewer error or bias. Details of the participants and interventions in the included trials were not provided, making it difficult to assess the applicability of the findings. A few of the included trials were considered to be of high quality, so potential bias influencing the results cannot be ruled out.

The synthesis of the trial data in meta-analysis and the assessment of heterogeneity were appropriate. Where heterogeneity was reported, it appears to have been substantial and the authors noted that the variation between trials was not explained by their quality, time of publication and size. They also stated that the assessment of functional outcomes was not possible because of lack of data. Discrepancies were found between the authors’ presentation of the results as significant or not significant in some instances.

The review was generally well conducted, but there was potential bias in the evidence and substantial variation, meaning that the conclusions should be considered to be tentative.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.
Research: The authors did not state any implications for research, but they noted that larger studies could confirm their findings. They also noted that there was a lack of studies assessing functional outcomes.

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