Gait analysis of patients following total knee replacement: a systematic review
McClelland J A, Webster K E, Feller J A

CRD summary
This well-conducted review assessed the gait of patients who had previously undergone total knee replacement (TKR) in comparison with healthy controls. The authors concluded that TKR patients have less knee motion and less flexion during swing than the controls. These conclusions are likely to be reliable.

Authors' objectives
To assess the results of gait analysis in patients following total knee replacement (TKR).

Searching
MEDLINE, EMBASE, CINAHL, Current Contents, PEDro and the Cochrane Library were searched to September 2006; the search terms were reported. Only studies published in English were included. The references of included studies were screened and citations cross-checked.

Study selection
Studies of patients who had undergone TKR at least 6 months previously were eligible for inclusion provided the indication for surgery was osteoarthritis of the knee in at least 75% of the study participants. The included studies used a very wide range of prostheses. The time elapsed since surgery varied from 1 to 2 years to a mean of 98 months. Patients with both bilateral and unilateral TKR were included in the studies. A control group of healthy participants was required for studies to be included. Eligible studies were required to report the outcome of knee biomechanics with reference to speed, stride length or cadence, and the included studies reported a wide range of such outcomes. Electromyographic data were also included in the review. No inclusion criteria were stated for study design; all of the included studies appeared to be non-randomised.

Abstracts of study reports were screened and full papers of potentially relevant studies assessed. Two reviewers performed the selection process and any disagreements were resolved through discussion with a third reviewer.

Assessment of study quality
Validity was assessed using the checklist of Downs and Black, modified for application only to non-randomised studies. Two reviewers carried out the assessment and any disagreements were resolved through discussion with a third reviewer.

Data extraction
Data on the outcome of knee biomechanics were extracted for both patients and healthy controls. Effect sizes were calculated. Two reviewers extracted the data into a standardised form and any disagreements were resolved through discussion with a third reviewer.

Methods of synthesis
The studies were combined in a narrative, with illustrative forest plots presented. The studies were grouped on the basis of the outcomes reported.

Results of the review
Eleven studies involving at least 259 knees (some studies reported patient numbers, so there is some uncertainty) were included in the review.

The quality of the included studies was mixed, with no study reporting a representative study population, and all except one providing an adequate description of the patient group and a planned analysis. All of the studies used appropriate statistics.

Walking speed: although methods of measurement varied, in 8 of the 11 trials patients walked at a significantly slower
speed than control groups.

Kinematic data: all studies showed that patients walked with less total range of knee motion and a reduced range of flexion during the loading phase of gait, and all except one found patients had less knee flexion during the swing phase of gait compared with healthy controls.

Kinetic data: 5 studies assessed the presence of a biphasic sagittal knee movement pattern. They found that approximately 80% of the control participants employed this pattern compared with between 20% and 36% of TKR patients. A range of other measures including maximum magnitudes of flexion and extension were assessed, but the authors were unable to fully assess the results.

**Authors' conclusions**

Patients who have undergone TKR walk with less total knee motion and less knee flexion during swing than healthy controls.

**CRD commentary**

The review question and the inclusion criteria were stated clearly. The authors searched a number of relevant databases, but the search was limited to studies reported in English and there was no mention of unpublished studies being sought. Both of these restrictions may have increased the possibility that some relevant studies were not included in the review. The authors used appropriate measures to minimise bias and error in the study selection, validity assessment and data extraction processes. The validity assessment used appropriate criteria. Given the level of clinical heterogeneity between the included studies, the decision to employ a narrative synthesis appears sensible. This was a well-conducted review and the conclusions are likely to be reliable, although they are based on non-randomised 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 research is required to establish the clinical significance of their findings.

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