One stage bilateral total hip arthroplasty, is it safe? A meta-analysis
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CRD summary
The review found no difference in major complications between one- and two-stage bilateral total hip arthroplasty and concluded that one-stage bilateral total hip arthroplasty may be a safe procedure. The limited data set and questionable pooling of studies mean that the reliability of the authors conclusion should be considered with caution.

Authors' objectives
To compare the safety of one-stage total hip arthroplasty with two-stage surgery in patients with bilateral disease.

Searching
PubMed, EMBASE and Cochrane Database of Systematic Reviews were searched from 1970 to 2009. There were no language restrictions. Search terms were reported. Reference lists of retrieved publications were checked manually for additional articles. Conference abstracts were excluded.

Study selection
Randomised clinical trials and comparative prospective trials that compared complication rates of one-stage bilateral total hip arthroplasty to two stage bilateral or unilateral total hip arthroplasty were eligible for inclusion. All types of cemented and non-cemented total hip prothesis designs were eligible. Complications were defined as occurrences related to the surgical procedure, which included preoperative, implant-related and general complications. Primary outcomes included major events (mortality, cardiovascular complications, embolism, infection of the implant requiring surgery, intraoperative fractures and dislocation or instability requiring revision) and minor events (all other complications).

Most studies compared one-stage bilateral with two-stage unilateral total hip arthroplasty; two studies used two-stage bilateral total hip arthroplasty. Follow-up ranged from 1.5 to 12 months.

Two reviewers independently selected studies for inclusion. Disagreements were resolved by discussion or arbitration with a third reviewer.

Assessment of study quality
Two reviewers independently assessed the quality of the included studies using criteria recommended by the Cochrane Collaboration Back Review Group for selection bias (three criteria), performance bias (four criteria), attrition bias (two criteria) and detection bias (two criteria). A score of 6 out of a possible 11 was considered to be of adequate quality. Disagreements were resolved by consensus.

Data extraction
Data were extracted to enable calculate mean differences for continuous outcomes and odds ratios (ORs) for dichotomous outcomes, each with their associated 95% confidence intervals (CIs). For continuous data, when only a range was reported standard deviations were calculated using the method described by Walter et al. Authors of the included studies were contacted if additional data was required.

One reviewer extracted data using a pre-piloted extraction form that was checked by a second reviewer.

Methods of synthesis
Studies were pooled in a meta-analysis. A fixed-effect model was used to calculate summary odds ratios and weighted mean differences (WMDs). Statistical heterogeneity was assessed using $X^2$ and $I^2$.

Results of the review
Five studies were included in the data analyses (796 participants): one randomised controlled trial and four prospective non-randomised comparative studies. One study was considered to be of adequate methodological quality. Quality scores ranged from 1 to 7.
No statistically significant differences were found between one-stage total hip arthroplasty and two-stage surgery in numbers of major complications reported (OR 0.72, 95% CI 0.45 to 1.15, I²=0%). Significantly fewer minor complications (OR 0.50, 95% CI 0.32 to 0.78, I²=35%) and blood transfusions (WMD -0.47, 95% CI -0.74 to -0.20, I²=68%) were reported in two-stage total hip arthroplasty compared with one-stage bilateral total hip arthroplasty. Significantly more average blood loss (WMD 121.72 cubic centimetres, 95% CI 51.57 to 191.88, I²=95%) and more time in hospital (WMD 3.32 days, 95% CI 2.96 to 3.68, I²=92%) were reported for two-stage bilateral total hip arthroplasty.

Authors' conclusions
No difference was found in major complications between one- and two-stage bilateral total hip arthroplasty. One-stage bilateral total hip arthroplasty may be a safe procedure.

CRD commentary
The review question was clearly stated and supported by defined inclusion criteria. Three databases were searched. There were no language restrictions. There was no attempt to locate unpublished articles, which increased the chances of publication bias. Methods used to select studies, extract data and assess study quality were likely to reduce the possibility of reviewer error or bias. Study quality was assessed and it appeared that relevant criteria were used, but the authors did not report full details.

The overall quality of the included studies was low. Few study details and patient characteristics were provided. Studies of mixed design were included in the meta-analyses (not recommended). There was evidence of substantial statistical heterogeneity in some analyses, which suggested that pooling these studies may not have been appropriate.

Limitations of the included data (a few small studies of generally poor quality) and questionable pooling of studies mean that the reliability of the authors conclusion should be considered with caution.

Implications of the review for practice and research
Practice: The authors stated that potential complications such as blood loss, transfusions and hospital stay should be considered in the decision making if a one-stage bilateral total hip arthroplasty was considered preferable to a two-stage surgical procedure.

Research: The authors stated that future research should focus on long-term follow-up of patients using well-defined and validated functional outcomes (such as patient-derived quality of life and recording of complications) and determination of candidates for bilateral total hip arthroplasty. Cost analyses were highlighted as a focus for future research.

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