Total hip arthroplasty versus hemiarthroplasty for displaced femoral neck fractures: meta-analysis of randomized trials

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CRD summary
This review concluded that total hip arthroplasty, for patients with displaced femoral neck fractures, had lower reoperation rates and higher function scores than hemiarthroplasty, but with an increased risk of dislocations. The review was generally well conducted and, in spite of some limitations in the evidence, the authors' conclusions are likely to be reliable.

Authors' objectives
To compare the reoperation rates, mortality, complications and function outcomes, of total hip arthroplasty, with those of hemiarthroplasty, in patients with displaced femoral neck fractures.

Searching
PubMed, EMBASE, CBM, and Cochrane Central Register of Controlled Trials (CENTRAL) were searched, without language restriction, for studies published between January 1980 and June 2011; search terms were reported. The reference lists of identified studies and relevant reviews were searched.

Study selection
Randomised controlled trials (RCTs) that compared total hip arthroplasty with hemiarthroplasty, for displaced femoral neck fractures, were eligible for the review. Trials had to report at least one of the following: reoperation for any cause, one-year mortality, hip function (measured by the Harris Hip Score), local infections, general perioperative complications, and dislocations.

Most of the included trials used cemented total hip arthroplasty; uncemented fixation was also used. Hemiarthroplasty used either cemented or uncemented fixation, and unipolar or bipolar prostheses. No further trial characteristics were reported. The trials were published between 1986 and 2011, with most of them published from 2008 onwards.

The authors did not state how many reviewers selected studies for the review.

Assessment of study quality
Trials were assessed for quality using the Jadad scale; criteria included randomisation, blinding and description of withdrawals and dropouts. Trials were considered of high quality if they fulfilled three or more criteria. They were assessed for risk of bias, using the Cochrane risk of bias tool; criteria included randomisation method, concealment of allocation, blinding to intervention and outcome, addressing incomplete data, selective reporting, and other bias.

Two reviewers assessed trials for quality and risk of bias, with discrepancies resolved by consensus between all three reviewers.

Data extraction
Data were extracted on efficacy and safety (general complications, local infections, and dislocations) to enable the calculation of relative risks and weighted mean differences, with 95% confidence intervals.

At least two reviewers extracted the data, with discrepancies resolved by consensus between all three reviewers.

Methods of synthesis
The effect estimates were pooled in meta-analyses, using either a fixed-effect model (Mantel-Haenszel) or, where there was evidence of significant statistical heterogeneity, a random-effects model (DerSimonian and Laird). Heterogeneity was assessed using $\chi^2$, with a probability of less than 0.1 being considered significant, and $I^2$.

Sensitivity analyses were undertaken, using sequential omission of individual trials. Meta-regression was used to explore the possible sources of heterogeneity. Publication bias was assessed by inspection of the funnel plots and using Egger's
Results of the review
Twelve RCTs, with 1,320 participants (range 40 to 252) were included in the review. Nine trials were assessed as high quality. Most trials addressed incomplete data, eight had adequate sequence generation, seven were free of selective reporting, six had adequate allocation concealment and were free of other bias, five had blinded outcome assessment, and three had single or double blinding to the intervention. Follow-up ranged from 24 to 156 months.

Efficacy: Compared with hemiarthroplasty, total hip arthroplasty had a significantly lower risk of reoperation (RR 0.53, 95% CI 0.34 to 0.84; I²=17%; 10 RCTs) and significantly improved hip function both at one-year follow-up (WMD 3.81 points, 95% CI 0.87 to 6.74; I²=73%; five RCTs) and at three-to-four years of follow-up (WMD 10.07 points, 95% CI 6.92 to 13.21; I²=85%; five RCTs). Sensitivity analyses did not markedly change the results. Heterogeneity in the analyses of hip function, appeared to be partly explained by cemented or uncemented status and by surgery indications.

There was no evidence of a significant difference in mortality between groups (I²=0; eight RCTs). With the omission of one trial, in the sensitivity analyses, the summary estimate changed, indicating that the results were not stable.

Complications: Compared with hemiarthroplasty, total hip arthroplasty had a significantly higher risk of dislocations (RR 1.99, 95% CI 1.26 to 3.15; I²=5%; 10 RCTs), but there was no evidence of a significant difference in the local infection rates (I²=0; six RCTs) and general complications (I²=24%; nine RCTs). The sensitivity analyses did not markedly change the findings.

There was no evidence of publication bias by inspection of the funnel plots for reoperation rates and mortality nor by Egger's test.

Authors' conclusions
With total hip arthroplasty for patients with displaced femoral neck fractures, compared with hemiarthroplasty, the risk of dislocations was increased, but the reoperation rate was lower and the function scores were higher.

CRD commentary
This review addressed a clear research question, supported by appropriate inclusion criteria. Relevant sources were searched, without language restriction, for published trials. No search for unpublished trials was reported, but publication bias was assessed by inspection of funnel plots and using Egger's test, with no evidence of bias found. Appropriate methods were used to assess the trial quality and risk of bias, and for data extraction, but it was unclear if these were used for study selection, so reviewer error and bias cannot be ruled out.

The Jadad scale assessment suggested that most trials were of high quality, but the criteria in this scale were limited. The risk of bias assessment indicated that only half of the trials had adequate allocation concealment and few were blinded, but a lack of reporting may have influenced the results of this assessment. The authors acknowledged that there was variation in the eligibility criteria for participants in the trials, and they noted that the outcomes of cemented and uncemented, as well as unipolar and bipolar procedures, for hemiarthroplasty differed. The synthesis of the trials, in meta-analyses, the assessment of heterogeneity, and the sensitivity analyses were appropriate, but the choice of model should have been specified prior to the heterogeneity assessment. Where heterogeneity was identified, meta-regression was undertaken to explore its sources, but there were few trials.

The review was generally well conducted and, in spite of some limitations in the evidence, the authors' conclusions are likely to be reliable.

Implications of the review for practice and research
Practice: The authors stated that, due to the higher risk of dislocation, total hip arthroplasty might be more suitable for patients who were less likely to be at risk of dislocation.

Research: The authors stated that a meta-analysis of individual patient data was needed to confirm these findings. Future research should compare total hip arthroplasty and hemiarthroplasty according to cemented or uncemented status, and according to unipolar or bipolar prostheses for hemiarthroplasty independently. Trials should have large
samples, report more patient outcomes, and assess long-term outcomes.

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