Cemented versus uncemented fixation in total hip replacement: a systematic review and meta-analysis of randomized controlled trials

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CRD summary
The review concluded that cemented total hip replacement was similar to uncemented total hip replacement for revision rate, mortality and complication rate; better short-term outcomes for improved pain scores were found for cemented fixation. The authors’ conclusions may be overstated given the limitations of the evidence presented.

Authors’ objectives
To assess the effectiveness of cemented versus uncemented fixation in total hip replacement.

Searching
Eight databases were searched including MEDLINE, EMBASE and The Cochrane Library. Grey literature was searched for using two databases and relevant abstract bands. Unpublished studies were located using online trial registers. Reference lists of retrieved articles were examined. Experts in the field and manufacturers of implants were contacted to identify further studies. No language restrictions were applied.

Study selection
Randomised controlled trials (RCTs) that evaluated implantation of primary cemented total hip replacements compared to primary uncemented total hip replacement in adults (aged 18 years or older) were eligible for inclusion. The primary outcome was failure of the primary procedure, measured objectively by the revision rate due to aseptic loosening of either the cup or the stem. Several secondary outcomes were of interest including radiological signs of loosening or osteolysis, mortality, complications and pain scores. Studies that included arthroplasty for trauma or tumour cases were excluded.

Included studies compared cemented and uncemented sockets, femoral stems or both. Implant characteristics varied between studies. More than half of the participants were female. The mean age of participants was 60.5 years. Studies were conducted in Sweden, Norway, UK, Canada and Australia.

Initial screening for inclusion was conducted by one reviewer. Two reviewers independently screening studies for inclusion. Disagreements were resolved by consensus.

Assessment of study quality
The authors did not state that they formally assessed study quality but some limitations in the included studies were reported.

Data extraction
Data were extracted to enable calculation of relative risks for categorical variables and mean differences for continuous variables. Corresponding 95% confidence intervals were calculated. Data extraction was cross-checked by two authors.

Methods of synthesis
Pooled relative risks and mean differences, together with 95% confidence intervals, were calculated using a random-effects model (providing data from at least three RCTs were available). Statistical heterogeneity was assessed using the I² statistic; significant heterogeneity was predefined at I²>50%. Publication bias was assessed using a funnel plot.

Subgroup analyses were conducted for revision rate, pain and Harris Hip Functional Score separately for RCTs with short-term follow-up (<5 years) and those with long term follow-up (>5 years).

Results of the review
Nine RCTs (930 total hip replacements in 778 participants, range 37 to 162 participants) were included in the review. Only one study documented adequate randomisation techniques, concealment of allocation and discussed reasons for exclusion or non-participation. The average postoperative follow-up was 4.3 years (range 2 to 8 years).
Patients with cemented total hip replacements had a slightly higher but statistically non significant overall revision rate than uncemented total hip replacements (RR 1.44, 95% CI 0.88 to 2.35; six RCTs). Subgroup analysis found similar results for RCTs that reported long-term results but findings were unreported for short-term follow-up. There was no evidence of significant heterogeneity.

There were statistically significant improvements in pain scores in favour of cemented fixation compared with uncemented fixation (MD 1.13, 95% CI 0.03 to 2.23; seven RCTs). Statistical heterogeneity was high ($I^2=93\%$). Subgroup analyses reported similar results for studies with short-term follow-up (four RCTs) but results for long-term follow-up (three RCTs) were no longer statistically significant. Statistical heterogeneity remained high.

There were no statistically significant differences between groups for Harris Hip Functional Score (seven RCTs), radiological osteolysis (five RCTs), mortality (five RCTs) or complications (four RCTs). Statistical heterogeneity was high for analyses of Harris Hip Score ($I^2=90\%$) and for radiological osteolysis ($I^2=85\%$).

**Authors' conclusions**
Cemented total hip replacement was similar to uncemented total hip replacement for revision rate, mortality and complication rate. It appeared that better short-term outcomes for improved pain scores can be obtained from cemented fixation; this was still unclear for the long-term clinical and functional outcomes.

**CRD commentary**
The review question was clear with adequately reported inclusion criteria. Several relevant sources were searched without language restrictions and efforts were made to locate unpublished data. Appropriate methods to reduce reviewer error and bias were reported for selection of studies and extraction of data. Study quality was not formally assessed but the authors reported some detail in the discussion. It appeared that the included RCTs were generally of low quality. Most studies had small sample sizes.

Methods of analysis appeared appropriate. Although the results for pain were statistically significant it was unclear which scale was used and whether the results were also clinically significant. Only a few studies were included in subgroup analyses and their sample sizes were generally small. There was evidence of substantial heterogeneity for some outcomes. Potential sources of heterogeneity were explored.

The authors' conclusions may be overstated given the limitations of the evidence presented.

**Implications of the review for practice and research**
**Practice:** The authors did not report any implications for practice.

**Research:** The authors stated that further research using improved methodology and longer follow-up was necessary to better define specific subgroups of patients in whom the benefits of cemented and uncemented implant fixation can be clearly demonstrated. The authors emphasised the need for more uniform standards in the selection of control groups in future trials.

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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.