Minimally invasive total hip arthroplasty: a systematic review

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CRD summary

The authors concluded that mini and standard incision appeared to have similar outcomes in total hip arthroplasty. The review had some methodological problems, but the authors' conclusions were suitably cautious and appear appropriate.

Authors' objectives

To compare intraoperative and postoperative outcomes from randomised or quasi-randomised trials of mini incision versus standard incision total hip arthroplasty.

Searching

MEDLINE, EMBASE, CBM and The Cochrane Library databases and Google Scholar were searched between 1994 and September 2008 for articles in any language. Search terms were reported. The related articles feature of PubMed was used. References of articles obtained in full were searched.

Study selection

Randomised controlled trials (RCTs) and quasi-RCTs of mini incision versus standard incision in patients who underwent total hip arthroplasty were eligible for inclusion. Studies had to report the outcomes: operative outcomes, including blood loss and operative time; length of hospital stay; functional outcomes, including Harris Hip Score (HHS); adverse events, including postoperative complications; and radiographic outcomes including cup inclination, cup antversion, angulation of the stem, acetabular outlier, femoral outlier and grade of cement mantle. Studies were excluded if they did not report the outcomes of interest for both techniques, if it was not possible to extrapolate or calculate the necessary data from the published results or if the studies contained previously published data.

The included trials studied patients with osteoarthritis, rheumatoid arthritis, post-traumatic arthritis, hip dysplasia, osteonecrosis and femoral neck fracture. Total hip arthroplasty was predominantly conducted unilaterally. Mini incision was conducted using various procedures and cut lengths that ranged from anterior 3.6cm to posterior 10cm. Standard incision was conducted posterolaterally with cut lengths ranging from 12cm to 25cm.

The authors did not state how many authors undertook the selection process.

Assessment of study quality

Quality assessment was undertaken using the five-point Jadad scale of blinding, randomisation and loss of patients. Studies that scored at least 3 points were considered to be high quality.

The authors did not state how many reviewers undertook the quality assessment.

Data extraction

Two authors independently extracted data on prespecified outcomes and used it to calculate odds ratios (OR) or weighted mean differences (WMD), together with 95% confidence intervals (CIs). Authors of the included trials were contacted for missing data.

Methods of synthesis

Pooled ORs and WMDs, together with 95% CIs, were calculated using a random-effects meta-analysis. Data were handled as dichotomous for analysis purposes. Statistical heterogeneity was assessed using the $I^2$ statistic. Subgroup analysis was undertaken based on quality, follow-up of at least 12 months and whether the approach was posterior or posterolateral.

Results of the review

Twelve trials were included in the review (n=1,205 hips): nine RCTs and three quasi-RCTs. Sample sizes of included
trials ranged from 30 to 219 patients. Length of follow-up ranged from 11 weeks to five years. Quality assessment indicated variable quality of the included studies (range 1 to 5 out of 5); seven trials scored less than 3. The main quality problems were lack of double blinding and lack of an adequate description of blinding and/or randomisation method.

**Perioperative outcomes:** There was no difference between mini and standard incision in terms of operative time (nine trials, n=875 patients, I²=91%), postoperative complications (12 trials, n=1,205 patients, I²=0%) or HHS (five trials, n=513 patients, I²=90%). There was a significant decrease in intra-operative blood loss with mini compared with standard incision (WMD -79.75, 95% CI -125.45 to -34.04; I²=92%; nine trials, 875 patients) and a significant decrease in the length of hospital stay (WMD -3.59, 95% CI -5.69 to -1.50, I²=97%; four trials, 330 patients).

**Radiographic outcomes:** There was no difference between mini and standard incision in terms of cup inclination (five trials, n=569 patients; I²=47%), stem angle (three trials, n=419 patients, I²=67%), acetabular outlier (four trials, n=504 patients, I²=0%), femoral outlier (four trials, n=599 patients, I²=0%) or grade of cement mantle (two trials, n=279 patients, I²=0%). There was a significant increase in cup anteverversion with mini compared with standard incision (WMD 2.90, 95% CI 1.05 to 4.74, I²=63%; four trials, 350 patients).

**Subgroups:**

Inclusion of only studies that scored at least 3 on the Jadad scale did not significantly alter the results of the analyses; mini incision still had significantly less blood loss than standard incision (WMD -86.85, 95% CI -59.89 to -13.81, I²=91%; four trials, 459 patients).

Inclusion of only studies with a posterior approach slightly altered the results of the analysis; mini incision still had significantly less blood loss than standard incision (WMD -45.75, 95% CI -65.07 to -26.43, I²=48%; five trials, 543 patients) and mini incision also had a significantly less operative time compared with standard incision (WMD -4.73, 95% CI -7.37 to -2.09, I²=26%; five trials, 543 patients).

Inclusion of only studies with at least 12 months follow-up showed no difference between mini and standard incision in terms of postoperative complications (six trials; n=644 patients; I² 0%).

**Authors' conclusions**

Mini incision appeared to have similar outcomes to standard incision for total hip arthroplasty.

**CRD commentary**

Inclusion criteria for the review were clearly defined. Several relevant data sources were searched without language restrictions. The search was limited to published studies, which could have introduced bias into the analysis; publication bias was not assessed. The authors did not state how many reviewers performed study selection and quality assessment, which may have been due to poor reporting or could indicate the possibility of bias in the review. Data extraction was performed in duplicate, which should have minimised chances of error and bias in the analysis. A random-effects meta-analysis was undertaken, which appeared appropriate. Statistical heterogeneity was explored. The quality of the included studies was not optimal, but the authors acknowledged this and their interpretation of the review results was suitably cautious. Overall, the review had some methodological problems, but the authors’ conclusions were tempered by the quality of the data and appear appropriate.

**Implications of the review for practice and research**

**Practice:** The authors did not state any implications for practice.

**Research:** The authors stated that high quality RCTs with intermediate and long term follow-up were needed.

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