Navigated cup implantation in hip arthroplasty: a meta-analysis
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CRD summary
This review compared navigated total hip arthroplasty (THA) with conventional THA. The authors concluded that navigated THA reduced the risk of positioning the cup outside of the safe zone. Uncertainties regarding study quality, small sample sizes of included studies and methodological problems with the review mean caution is warranted when interpreting the authors’ conclusions.

Authors’ objectives
To evaluate the effectiveness of navigated total hip arthroplasty (THA) compared with conventional THA.

Searching
MEDLINE, EMBASE, SciSearch, CINAHL and Cochrane Central Register of Controlled Trials (CENTRAL) were searched from January 1976 to August 2007. Search terms were reported. No language restrictions were imposed. Handsearching of four orthopedic journals was undertaken. Reference lists of relevant articles were searched.

Study selection
Cohort studies, randomised controlled trials (RCTs) and quasi-randomised controlled trials of navigated THA compared with conventional THA were eligible for inclusion, regardless of the underlying disease, condition or navigation system. Studies that scored lower than II on the Oxford Centre for Evidence-Based Medicine checklist were excluded.

The included trials compared conventional THA with OrthoPilot, VectorVision or SurgiGATE-navigated THA in adult patients. Mean age (by treatment arm) ranged from 54 to 65 years. The type of cup implanted was Press-fit for most studies and uncemented metal-backed cup in one study. Primary osteoarthritis was the reason for hip replacement in 87% of patients.

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

Assessment of study quality
Study validity was assessed using five criteria: a clear hypothesis; sample size calculation; randomisation procedure; intention-to-treat analysis; and CONSORT flow diagram.

Three reviewers independently assessed the validity of the included studies.

Data extraction
Data were extracted on the inclination and anteversion of the hip joint and used to calculate weighted means and weighted mean differences (WMD). The relative risk (RR) of cup placement outside of Lewinnek’s safe zone was calculated.

The authors did not state how many reviewers performed the data extraction.

Methods of synthesis
WMDs and RRs together with 95% CIs were pooled using a random-effects meta-analysis. Heterogeneity was assessed using the $\chi^2$ statistic. Publication bias assessment was attempted using funnel plots.

Results of the review
Five trials (n=400) were included in the review; two were considered to be only partially randomised or non randomised. Overall study quality was rated as being moderate: only one study provided a sample size calculation and none provided intention-to-treat analysis. Assessment of publication bias was deemed inappropriate due to the small
number of included studies. Significant statistical heterogeneity was present in the analyses of anteversion and inclination, but not in the analysis of the safe zone.

There was no statistically significant difference between conventional THA and navigated THA in terms of inclination (five studies) or anteversion (four studies). Navigated THA was significantly better at optimizing the cup position in the safe zone (RR 0.21, 95% CI 0.13 to 0.32) compared with conventional THA (five studies).

**Authors' conclusions**
Navigated THA reduced the risk of positioning the cup outside of the safe zone and was a reliable tool for optimisation of cup positioning in THA.

**CRD commentary**
Inclusion criteria for the review were broadly defined. Several relevant sources were searched. No language restrictions were imposed and several non-English language articles were included, which minimised language bias. Restriction to published literature may have caused relevant unpublished trials to be missed; measurement for publication bias was not possible because of the limited number of included trials. Suitable methods were used to minimise the risk of reviewer bias during quality assessment; the authors did not report on whether such methods were used for study selection and data extraction. Validity assessment was undertaken using a limited five-point checklist, which may not have given a true reflection of study quality. Trials were combined using meta-analysis and study heterogeneity was explored; there was evidence of outlier trials in two of the analyses which the authors did not appear to acknowledge.

Given uncertainties on study quality, small sample sizes of included studies and methodological problems with the review, caution is warranted when interpreting the authors’ conclusions.

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

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

**Research**: The authors stated that future trials must adhere to methodological standards such as proper random assignment and intention-to-treat analyses, and aim for a thorough comparison of radiographic and functional results, complication and survival rates, quality of life and extra costs and cost utility.

**Funding**
Not stated.

**Bibliographic details**

**PubMedID**
19916685

**DOI**
10.3109/17453670903350073

**Original Paper URL**

**Other URL**
http://ukpmc.ac.uk/abstract/MED/19916685

**Indexing Status**
Subject indexing assigned by NLM
MeSH
Acetabulum /surgery; Arthroplasty, Replacement, Hip /adverse effects /instrumentation /methods; Hip Prosthesis; Humans; Reproducibility of Results; Surgery, Computer-Assisted; Treatment Outcome

AccessionNumber
12010000254

Date bibliographic record published
17/02/2010

Date abstract record published
22/09/2010

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.