HA and THA for treating a primary intracapsular fracture

# Hemiarthroplasty and total hip arthroplasty for treating primary intracapsular fracture of the hip: a systematic review and cost-effectiveness analysis

C Carroll,[1]* M Stevenson,[1] A Scope,[1] P Evans[1] and S Buckley[2]

[1]School of Health and Related Research (ScHARR), University of Sheffield, Sheffield, UK
[2]Consultant Orthopaedic Surgeon and Honorary Senior Lecturer, University of Sheffield, Sheffield, UK

*Corresponding author

## *Executive summary*

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# Executive summary

## Background

Hip fracture is a common problem in people aged ≥ 60 years. The annual rate of hip fracture in women in the UK has been reported to be exponentially distributed and to be 20 per 10,000, 38 per 10,000 and 73 per 10,000 at 65, 70 and 75 years of age, respectively. Only 5% of fractures occur in men and women under the age of 60 years. Owing to increasingly ageing populations, the absolute number of hip fractures is expected to rise. Half of all hip fractures are displaced intracapsular fractures, i.e. unstable fractures in which the blood supply to the femoral head may be impaired, affecting the rate of fracture healing. The treatment for displaced intracapsular fractures is currently determined by the mobility and functional demands of the patient. There is no consensus regarding the optimal treatment for individuals who are cognitively intact and have high pre-fracture mobility or function: the two options are hemiarthroplasty (HA) or total hip arthroplasty (THA).

The principal outcomes associated with hip arthroplasty are dislocation, revision rates and quality of life. THA is particularly associated with higher rates of dislocation, whereas HA is particularly associated with pain, infection, loosening of the joint and acetabular erosion. Postoperative complications such as loosening and acetabular erosion can necessitate revision surgery. Revision rates may therefore be higher for HA than for THA.

## Objectives

The purpose of this report is to assess the clinical effectiveness and cost-effectiveness evidence of THA compared with HA in patients with displaced intracapsular fracture who are cognitively intact and have high pre-fracture mobility or function.

## Methods

A systematic review of the evidence for the clinical effectiveness and cost-effectiveness of THA compared with HA was performed. The primary outcomes of interest were dislocation, revision and reoperation rates. An information specialist made a systematic search of 11 databases of published and unpublished literature from their inception to December 2010. There was no restriction by language, date or study design. Two reviewers screened all titles and abstracts of the citations retrieved by the search to identify both clinical effectiveness and cost-effectiveness studies that satisfied the inclusion criteria, and extracted relevant data from all included studies. The references of all included studies were also checked for further relevant citations. Additionally, exploratory modelling was conducted using the differential costs and quality of life associated with THA compared with HA that were reported in a direct head-to-head randomised controlled trial (RCT) with 2-year follow-up.

## Results

A single literature search was conducted for both clinical effectiveness and cost-effectiveness reviews and identified 532 unique citations. Fourteen citations satisfied the inclusion criteria

for the clinical effectiveness review. This represented eight separate trials with 972 participants. Meta-analysis of the six trials found a near significant increased risk of dislocation within 1 year for THA compared with HA [relative risk (RR) 3.98, 95% confidence interval (CI) 0.98 to 16.12, $p = 0.05$], but meta-analysis of seven trials found a statistically significant increased risk of dislocation for patients treated with THA (RR 2.40, 95% CI 1.41 to 2.76, $p = 0.01$) for all follow-up periods up to 13 years. Meta-analysis of five trials found a statistically non-significant 59% reduced risk of revision within 1 year for THA compared with HA (RR 0.41, 95% CI 0.16 to 1.03, $p = 0.06$), but meta-analysis of seven trials found a statistically significant 69% reduced risk of revision for patients treated with THA compared with HA (RR 0.31, 95% CI 0.17 to 0.59, $p = 0.0003$) for all follow-up periods up to 13 years.

Meta-analyses of the five and seven trials, respectively, found a statistically non-significant increased risk of any surgery (reduction of dislocations, revisions and all other surgical interventions) both within 1 year and for all follow-up periods for THA compared with HA ($p = 0.46$ and 0.75, respectively). Meta-analyses of five and seven trials, respectively, found a statistically non-significant 9% reduced risk of mortality within 1 year, and a non-significant 4% increased risk of mortality for all follow-up periods, for THA compared with HA ($p = 0.60$ and 0.81, respectively).

Independent subgroup analyses also indicate that study quality, the surgical approach taken (lateral or posterior), the use of cement and the use of unipolar or bipolar prostheses in HA are not statistically significant confounding variables affecting any of these outcomes, when comparing the data on THA and HA reported for the RCTs identified for this review.

Five studies reported Harris Hip Score (HHS). Two studies reported a statistically significant ($p < 0.05$) difference after 1 or 2 years in favour of THA, and the three other studies reported the average HHS for study survivors at all follow-up points to be higher (i.e. better) for individuals receiving THA than for those receiving HA. The three remaining studies also reported hip scores using different scales: two studies reported statistically significant differences in favour of THA compared with HA, one after 2 years and one after 3 years, and the third reported that individuals receiving THA reported less pain and better ambulation than those receiving HA. The only statistically significant differences between groups for peri- and postoperative adverse events or complications reported by any study were higher numbers of patients receiving blood transfusion for THA than for HA in one study and higher percentages of patients experiencing acetabular erosion or loosening for HA than for THA in two studies.

Three papers were found that reported the cost-effectiveness of THA compared with HA, although they performed only a cost–utility analysis. An additional paper reported the usage of resources and patient utility recorded in an RCT. The conclusion from the cost–utility analyses was that THA was more cost-effective than HA with an expected 1.53 quality-adjusted life-years (QALYs) being provided at a cost of US$3000. The cost per QALY ratio of US$1960 would be viewed as extremely cost-effective using standard UK cost-effectiveness thresholds. A further estimate of the cost-effectiveness of THA compared with HA was also calculated by the authors of this report using data from a published trial which had a follow-up period of 2 years. Even when the utility benefits are constrained to this 2-year horizon, the cost per QALY is < £25,000. When the time horizon is extrapolated to more realistic values, the cost per QALY decreases, reaching a value < £10,000 with a horizon of only 5 years. This value would be seen as cost-effective under current cost-effectiveness thresholds. Furthermore, longer-term consequences, such as the likely reduced rates of revision associated with THA compared with HA, have not been incorporated in the model. Therefore, the results presented are likely to be unfavourable to THA and the cost-effectiveness of THA is likely to be better than reported.

## Discussion

This review conducted a comprehensive and sensitive search for relevant evidence and identified eight RCTs, as well as three ongoing studies. The evidence from the eight relevant RCTs identified indicates that the risk of dislocation is significantly increased for those patients treated with THA than for those with HA, and that the risk of revision is significantly reduced for those treated with THA compared with HA. Patients treated with THA are also more likely to report better function and mobility and less pain than those treated with HA. There are no significant differences in terms of other effectiveness or safety outcomes.

Exploratory modelling was undertaken that showed that THA is likely to be cost-effective compared with HA even when the limitations of the data and methodology are considered. The exploratory model did not consider future revisions or dislocations or differential mortality rates; however, these omissions are expected to strengthen the conclusion that THA is more cost-effective than HA.

## Conclusions

Meta-analysis of eight RCTs indicates that THA is more effective than HA in terms of rates of revision, and also more effective in terms of function, pain and mobility, but less effective than HA in terms of rates of dislocation. THA appears to be more cost-effective than HA. It is likely that THA will be associated with increased costs in the initial 2-year period, but the longer-term costs, due to potentially lower revision rates associated with THA, have not been estimated. The capacity and experience of surgeons to perform THA have not been explored and these would need to be addressed at local level were THA to become recommended for active, elderly patients in whom THA is not contraindicated.

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## Publication

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The research reported in this issue of the journal was commissioned by the HTA programme as project number 09/108/02. The contractual start date was in September 2010. The draft report began editorial review in March 2011 and was accepted for publication in May 2011. As the funder, by devising a commissioning brief, the HTA programme specified the research question and study design. The authors have been wholly responsible for all data collection, analysis and interpretation, and for writing up their work. The HTA editors and publisher have tried to ensure the accuracy of the authors' report and would like to thank the referees for their constructive comments on the draft document. However, they do not accept liability for damages or losses arising from material published in this report.

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