

# INPLASY PROTOCOL

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**Review Stage at time of this submission:** Formal screening of search results against eligibility criteria.

**Conflicts of interest:**  
None.

## INTRODUCTION

**Review question / Objective:** 1. For patients with avascular necrosis of the femoral head, is hip resurfacing arthroplasty a safer procedure than Total Hip Arthroplasty? 2. For patients with avascular necrosis of femoral head, is hip resurfacing more cost-effective than total hip arthroplasty? 3. Is

revision surgery for patients with avascular necrosis of the femoral head more successful following resurfacing than total hip arthroplasty?

**Rationale:** Patients with avascular necrosis of the femoral head are those young and active between 20 to 50 years of age, hip resurfacing arthroplasty is able to provide

## A systematic review and meta-analysis to compare the survivorship of total hip arthroplasty and hip resurfacing for avascular necrosis

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**Review question / Objective:** 1. For patients with avascular necrosis of the femoral head, is hip resurfacing arthroplasty a safer procedure than Total Hip Arthroplasty? 2. For patients with avascular necrosis of femoral head, is hip resurfacing more cost-effective than total hip arthroplasty? 3. Is revision surgery for patients with avascular necrosis of the femoral head more successful following resurfacing than total hip arthroplasty?

**Rationale:** Patients with avascular necrosis of the femoral head are those young and active between 20 to 50 years of age, hip resurfacing arthroplasty is able to provide higher post-operative functional outcome and lower mortality rate than conventional total hip arthroplasty.

**INPLASY registration number:** This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 28 April 2020 and was last updated on 28 April 2020 (registration number INPLASY202040200).

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**Condition being studied:** There are no known drugs available to cure avascular necrosis of femoral head (AVN). Commonly, the condition presents late, when significant collapse has occurred, and arthroplasty is the common treatment. The procedure of total hip arthroplasty (THA) is well established as a safe and effective intervention, but a large scale matched cohort study from American College of Surgeon's database indicated AVN patients had significantly higher medical complication rate than osteoarthritis (OA) patients. The Australian Joint Registry and UK Joint Registry also reported that much higher mortality rates of total hip arthroplasty to that of hip resurfacing 15 years postoperatively. Hip resurfacing arthroplasty (HRA) is a conservative alternative to THA, for AVN patients. This kind of surgery will not remove the necrotic lesion only. Hip resurfacing is not only less invasive and causes fewer postoperative complications than THA, but also provides patients with better postoperative functional outcomes. However, hip resurfacing remains controversial for two reasons. Firstly, the release of metal ions from some devices, which have now been withdrawn. Secondly, a hip resurfacing can be revised to a THA very easily, while revision of a THA can be very demanding, so comparison based upon revision rates alone may be misleading.

## METHODS

**Search strategy:** #1. Search ((((((Femur Head Necroses[mh]) OR (Femur Head Necroses) OR (Head Necrosis, Femur) OR (Necrosis, Femur Head) OR (Aseptic Necrosis of Femur Head) OR (Necrosis, Aseptic, of Femur Head) OR (Ischemic Necrosis Of Femoral Head) OR (Femoral Head, Avascular Necrosis Of) OR (Avascular Necrosis Of Femoral Head, Primary) OR (Avascular Necrosis of Femur Head) OR (Necrosis, Avascular, of Femur Head) #2. Search ((((((Arthroplasties, Replacement, Hip[mh]) OR (Arthroplasty,

Hip Replacement) OR (Hip Prosthesis Implantation) OR (Hip Prosthesis Implantations) OR (Implantation, Hip Prosthesis) OR (Implantations, Hip Prosthesis) OR (Prosthesis Implantation, Hip) OR (Prosthesis Implantations, Hip) OR (Hip Replacement Arthroplasty) OR (Replacement Arthroplasties, Hip) OR (Replacement Arthroplasty, Hip) OR (Arthroplasties, Hip Replacement) OR (Hip Replacement Arthroplasties) OR (Hip Replacement, Total) OR (Replacement, Total Hip) OR (Hip Replacements, Total) OR (Replacements, Total Hip) OR (Total Hip Replacements) OR (Total Hip Replacement) #3. Search ((((((Estimate, Kaplan-Meier[mh]) OR Kaplan-Meier Test) OR Kaplan Meier Test) OR Test, Kaplan-Meier) OR Product-Limit Method) OR Method, Product-Limit) OR Methods, Product-Limit) OR Product Limit Method) OR Product-Limit Methods) OR Kaplan-Meier Analysis) OR Analysis, Kaplan-Meier) OR Kaplan Meier Analysis) OR Curves, Kaplan-Meier Survival) OR Kaplan Meier Survival Curves) OR Survival Curves, Kaplan-Meier) #4. Search ((((((Follow Up Studies[mh]) OR (Follow-Up Study) OR (Studies, Follow-Up) OR (Study, Follow-Up) OR (Followup Studies) OR (Followup Study) OR (Studies, Followup) OR (Study, Followup) #5. Search #3 or #4 #6. Search #1 and #2 and #5.

**Participant or population:** People with AVN; any age, any gender and any severity of AVN. Population not restricted to the UK.

**Intervention:** People who have been admitted to hospital with AVN, who have received total hip arthroplasty or hip resurfacing.

**Comparator:** 1. Total hip arthroplasty for AVN patients with hip resurfacing for AVN patients. 2. Hip resurfacing for AVN patients and for osteoarthritis.

**Study designs to be included:** Including RCTs and observational/cohort studies.

**Eligibility criteria:** 1. Survival rates came without 95% confidence interval. 2. All surgeries done after the year of 1990. 3. Reliable design implants.

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**Information sources:** PUBMED/MEDLINE; COCHRANE LIBRARY DATABASE; EMBASE; Reference checking and hand searching of these database. Contacting experts in relevant fields in DOH/BTS/NICE Identifying possible data from conferences attended.

**Main outcome(s):** Findings will suggest that a ladder of surgical interventions should be advocated, from femoral head preserving surgery, to hip resurfacing arthroplasty, with total hip arthroplasty kept for revision and those with severe disease.

**Data management:** Data extraction form in Word document Endnote to be used to keep track of references Reviewer number 1 (ZZ) will review first, followed by reviewer number 2 (HZ), which will be done independently. If necessary reviewer number 3 will review if there are any disparities between the two initial reviews.

**Quality assessment / Risk of bias analysis:**  
1. Protocol will define the method of literature critique/ appraisal use, and will use PRISMA tool for relevant content and methodology used in the each of the papers to be reviewed. 2. Use STATA built-in bias analysis.

**Strategy of data synthesis:** Narrative synthesis will be done alongside any meta-analysis and will be carried out using a framework which consists of four elements; 1. Developing a theory of how the intervention works, why and for whom 2. Developing a preliminary synthesis of findings of included studies 3. Exploring relationships within and between studies 4. Assessing the robustness of the synthesis

**Subgroup analysis:** Each group will be subgrouped by the post-operative follow-up years.

**Sensibility analysis:** Use the STATA built-in sensibility analysis and PRISMA tool.

**Language:** English only.

**Country(ies) involved:** China, UK.

**Keywords:** Avascular necrosis of femoral head, hip resurfacing, total hip arthroplasty, mortality rate, revision rate.

**Contributions of each author:**

Author 1 - Zexin Zheng - Author 1 define search strategy, manage literatures, do statistical analysis, draft the manuscript.

Author 2 - Hongyan Zhao - Author 2 define search strategy, manage literatures, do statistical analysis, draft the manuscript.

Author 3 - Justin Cobb - Author 3 supervises the review method and statistical method, revises manuscript.

Author 4 - Richard Abel - Author 4 supervises the review method and statistical method, revises manuscript.