International Platform of Registered Systematic Review and Meta-analysis Protocols

INPLASY

INPLASY2024100111

doi: 10.37766/inplasy2024.10.0111

Received: 26 October 2024

Published: 26 October 2024

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Effectiveness and Priority of Irradiation and Six NSAIDs in Prevention Heterotopic Ossification After Total Hip Arthroplasty: A Comprehensive Meta-analysis of Randomized Controlled Studies

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ADMINISTRATIVE INFORMATION

Support - The National Natural Science Foundation of China (82060405 and 82360436); Lanzhou Science and Technology Plan Program (2021-RC-102); Natural Science Foundation of Gansu Province (23JRRA1500); Cuiying Scientific and Technological Innovation Program of Lanzhou University Second Hospital (CY2021-MS-A07, CY2022-MS-A19).

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

Conflicts of interest - None declared.

INPLASY registration number: INPLASY2024100111

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 26 October 2024 and was last updated on 26 October 2024.

INTRODUCTION

Review question / Objective Review Question: What is the efficacy and priority of irradiation and six NSAIDs in preventing the development of heterotopic ossification after total hip arthroplasty?
Objective: To systematically evaluate and summarize the available evidence on the effectiveness and priority of irradiation and six NSAIDs in reducing the incidence and severity of heterotopic ossification (HO) after total hip arthroplasty. Additionally, the objective is to assess the safety profile of irradiation and six NSAIDs use for this purpose, including gastrointestinal side effects.

Condition being studied Heterotopic ossification (HO) is a common complication after total hip replacement. Currently, some network meta-analyses on drugs have been published, but there is a lack of in-depth efficacy evaluation and comparison of drug efficacy and complications with Irradiation radiation.

METHODS

Participant or population Adult patients preparing total hip arthroplasty.

Intervention Irradiation, celecoxib, naproxen, diclofenac, etoricoxib, indomethacin or ibuprofen are employed to prevent heterotopic ossification.

Comparator Patients who received placebo or no treatment, and those who received another of the above interventions.

Study designs to be included Randomized controlled trials.

Eligibility criteria 1. Adult patients preparing total hip arthroplasty; 2. Clinical outcomes included the incidence of heterotopic ossification (HO).

Information sources Electronic databases, contact with authors and trial registers.

Main outcome(s) Incidence of heterotopic ossification (HO) post-operatively, as measured by radiological assessment (e.g., Brooker classification).

Additional outcome(s) Gastrointestinal side effects.

Quality assessment / Risk of bias analysis Cochrane risk-of-bias tool for randomized trials.

Strategy of data synthesis Statistical analyses of individual interventions were performed with Review Manager 5.4 (Cochrane Collaboration, Oxford, UK) and STATA 16.0 (StataCorp LP, College Station, Texas). Odds ratio (OR) with 95% confidence interval (CI) were used to compare binary variables. The weighted mean difference (WMD) and 95% CI were calculated for continuous outcomes. Based on the method described by Wan et al, the medians and interquartile ranges of continuous data were converted to means and standard deviations. For all meta-analyses the Cochrane Qpvalue and I2 statistic were applied to check heterogeneity. When p value 50%, there was asignificant heterogeneity, a random-effect model was used to merge the results. Otherwise, a fixed-effect model was used. A p value less than 0.05 was considered statistically significant. We performed egger's test to assess publication bias (only for outcomes including ten or more studies).
Network meta-analysis concerning multiple treatments was performed with a random-effect model within a Bayesian framework. The pooled estimates of the relative risk (RR) and 95% credible intervals (CrIs) were used to evaluate the four outcomes (overall incidence of HO; incidence of Brooker I and II HO; incidence of Brooker III and IV HO; and the incidence of gastrointestinal side effects.). All of the outcomes were calculated by the R (V.4.4.1) GEMTC package. Furthermore, we examined comparisons made with direct and indirect evidence. The P value was greater than 0.05, which indicated that there was little consistency between the studies. We also sorted the nine different strategies (Irradiation, celecoxib, naproxen, diclofenac, etoricoxib, indomethacin, ibuprofen, placebo and control)by rank probabilities. The rank probabilities were assessed for each strategy by the surface under the cumulative ranking curve (SUCRA). Alower SUCRA value indicates a better rank for the intervention. The publication bias of this network meta-analysis was assessed by Deek's funnel plot asymmetry test. P values less than 0.05 were considered to be statistically significant for differences between studies.

Subgroup analysis We do not plan to do a subgroup analysis, which can be adjusted on a case-by-case basis.

Sensitivity analysis This involves re-analyzing the data under varying assumptions or conditions to assess how changes in these factors impact the overall findings. By systematically altering variables such as study inclusion criteria, exclusion of low-quality studies, changing analytical models (e.g., from fixed-effects to random-effects), or adjusting for potential biases, we can determine the sensitivity of the results to these modifications. If the conclusions remain consistent across various sensitivity analyses, it suggests a higher level of confidence in the robustness of the meta-analysis. Conversely, substantial variations in results may indicate instability and require further investigation.

Country(ies) involved China.

Keywords Heterotopic Ossification; Irradiation; NSAIDs; Meta-Analysis.

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