INPLASY PROTOCOL

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None.

Curative efficacy of surgical procedures for older patients with femoral neck fracture: a network meta-analysis and systematic review

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Review question / Objective: **Femoral neck fractures have a higher incidence in middle-aged and older people with poor prognosis, inducing serious social problems. Common treatment methods include total hip arthroplasty, bipolar hemiarthroplasty, double-screw fixation, multiple-screw fixation, and dynamic hip system. We searched through four electronic databases, including PubMed, Web of Science, Cochrane Library, and EMbase databases, for Randomized controlled trials and cohort studies regarding femoral head fractures, bone screw, and hip prosthesis published up to February 11, 2020.**

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 27 November 2020 and was last updated on 27 November 2020 (registration number INPLASY2020110123).

INTRODUCTION

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controlled trials and cohort studies regarding femoral head fractures, bone screw, and hip prosthesis published up to February 11, 2020.

Condition being studied: Increasing concern has been focused on improving patient postoperative survival rate and quality of life after femoral neck fractures. Numerous meta-analyses and systematic reviews have reported pairwise comparisons between THA and HA, between internal fixation and HA, and between types of internal fixations. However, few scholars have made a network meta-analysis on multiple influencing factors of femoral neck fracture. We conducted a network meta-analysis of all relevant random evidence and considered several prognostic indicators such as Harris hip score (HHS), complication rate, one-year mortality rate, reoperation rate, intraoperative blood loss, and operation duration. We also fully discussed and ranked the existing treatment methods for femoral neck fractures, including THA, BHA, double-screw internal fixation, multiple-screw internal fixation, and DHS. Therefore, this study presents comprehensive recommendations for the clinical treatment of femoral head fractures.

METHODS

Search strategy: We searched four databases, including PubMed, Embase, Web of Science, and Cochrane Library, for relevant articles published through February 11, 2020 using the search terms "femoral head fracture," "bone screw," "bone nail," and "bone plate," "hip prosthesis," "THA," and "hip replacement." Additionally, all included articles were independently assessed by three researchers by reading the full text. Any disagreement was resolved by the fourth researcher.

Participant or population: The inclusion criteria were as follows: (1) middle-aged and elderly patients with femoral neck fractures of Garden types I to IV; (2) at least one of five surgical methods described (THA, BHA, double-screw internal fixation, multiple-screw internal fixation, DHS); (3) at least one of six outcome indicators described (HHS score, complications, mortality within one year, reoperations, intraoperative blood loss, and duration of surgery); (4) randomized controlled trials or cohort studies; (5) written in the English language. The exclusion criteria were as follows: (1) basic studies about biomechanics and autopsy; (2) femoral neck fracture in children (age < 18 years); (3) patients with femoral neck fractures who were suffering from specific primary diseases; (4) non-surgical interventions; (4) valid data could not be extracted or converted; (5) case-control, paired analysis, conference abstracts, systematic reviews, and meta-analysis studies.

Intervention: This is a network meta-analysis. The intervention measures mainly is total hip arthroplasty.

Comparator: This is a network meta-analysis. The intervention measures mainly are bipolar hemiarthroplasty, double-screw fixation, multiple-screw fixation, and dynamic hip system.

Study designs to be included: Randomized controlled trials and cohort studies.

Eligibility criteria: This study was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement.

Information sources: We searched four databases, including PubMed, Embase, Web of Science, and Cochrane Library, for relevant articles published through February 11, 2020 using the search terms "femoral head fracture," "bone screw," "bone nail," and "bone plate," "hip prosthesis," "THA," and "hip replacement." Additionally, all included articles were independently assessed by three researchers by reading the full text. Any disagreement was resolved by the fourth researcher.

Main outcome(s): This study included the prognostic indicators of patients with

femoral head fractures as outcome measures. 1、HHS HHS is a widely used method to evaluate hip joint function. In this study, HHS was used to assess the arthroplasty effect in four aspects: pain, function, deformity, and mobility. HHS scores within six months and more than one year after surgery were collected. 2、Surgical complications Postoperative complications associated with femoral neck fractures commonly include fixation failure, nonunion, osteonecrosis, infection, and nerve paralysis. 3、Reoperation Because of artificial joint wear, screw dislocation, or serious complications, reoperation may be required in some patients with femoral neck fractures. 4、Mortality The mortality was calculated by counting the number of deaths within 12 months after surgery. 5、Blood loss Intraoperative blood loss (mL) was statistically counted. 5、Operation time Operation time (min) was statistically counted. Additionally, related factors such as surgical approach, prosthesis model, and demographic data were recorded for further discussion.

Additional outcome(s): Additionally, related factors such as surgical approach, prosthesis model, and demographic data were recorded for further discussion.

Data management: Three researchers independently extracted data from all the included studies according to a standard data extraction format. Any disagreement was resolved by discussion with another researcher. In some cases, the standard deviation (SD) was not available. Attempts were made to contact corresponding authors in such cases, but no response was available. Thus, for these cases, we estimated the range or median, or used the method described in the Cochrane Intervention Manual Systematic Evaluation Manual to convert data and estimate the SD from the confidence interval (CI).

Quality assessment / Risk of bias analysis: For the comparison of therapeutic efficacy, binary data and continuous data were expressed as odds ratio (OR) or weighted mean difference (MD), with a 95% CI. Heterogeneity was defined as the variability of research results. The significance level was set at P = 0.1. Where there was heterogeneity, a random-effects model was used; otherwise, a fixed-effects model was used. Additionally, we used inconsistency factors to test the consistency of the closed loop and used the node-splitting method to evaluate the local inconsistency.

Strategy of data synthesis: For the comparison of therapeutic efficacy, binary data and continuous data were expressed as odds ratio (OR) or weighted mean difference (MD), with a 95% CI. Heterogeneity was defined as the variability of research results. The significance level was set at P = 0.1. Where there was heterogeneity, a random-effects model was used; otherwise, a fixed-effects model was used. Additionally, we used inconsistency factors to test the consistency of the closed loop and used the node-splitting method to evaluate the local inconsistency. In the Results section, the ranking probability of each intervention was expressed through a cumulative probability ranking graph, where the surface under the cumulative ranking curve (SUCRA) value was an index to summarize the cumulative ranking probability corresponding to the area under the curve of the probability graph, which is between 0 and 1. Higher values indicate greater therapeutic efficacy. All intervention measures were ranked based on the SUCRA value or the area under the curve, and the intervention measures were ranked. The 95% CI estimates and hypothesis test results of each variable are listed in the forest plots.

Subgroup analysis: In the main results HHS scores were divided into three subgroups for analysis：HHS score within six months after surgery, HHS score within one year after surgery, and HHS score over one year after surgery.

Sensibility analysis: Heterogeneity was defined as the variability of research results. The significance level was set at

P=0.1. Where there was heterogeneity, a random-effects model was used.

Language: English.

Country(ies) involved: China.

Keywords: Femoral neck fracture; Hip hemiarthroplasty; Total hip arthroplasty; Internal Fixation; Elderly; Meta-Analysis.

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