International Platform of Registered Systematic Review and Meta-analysis Protocols

INPLASY

Surgical Outcomes and Complications of Anterolateral Versus Posterior Approaches for Distal-Third Humeral Shaft Fractures: A Systematic Review and Meta-Analysis

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ADMINISTRATIVE INFORMATION

Support - No financial support was received for this systematic review.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 7 May 2026 and was last updated on 7 May 2026.

INTRODUCTION

Review question / Objective This systematic review and meta-analysis aims to compare the clinical outcomes and complications of anterolateral versus posterior approaches for adult distal-third humeral shaft fractures. Using the PICOS framework, the population includes adult patients with distal-third humeral shaft fractures; the intervention is the anterolateral approach; the comparator is the posterior approach; the outcomes include operative time, intraoperative blood loss, fracture union time, elbow range of motion, Mayo Elbow Performance Score, postoperative infection, nonunion, iatrogenic radial nerve injury, and recovery from radial nerve injury; and the included study designs are randomized controlled trials and cohort studies.

Rationale Distal-third humeral shaft fractures are extra-articular fractures that are commonly treated surgically. Both anterolateral and posterior approaches are widely used for open reduction and plate fixation. The anterolateral approach may reduce the need for radial nerve dissection, whereas the posterior approach provides direct exposure of the distal humerus and facilitates plate placement. However, there is no clear consensus regarding the optimal surgical approach, particularly in terms of functional outcomes and radial nerve-related complications. Therefore, a systematic review and meta-analysis is needed to compare the efficacy and safety of these two approaches.

Condition being studied The condition being studied is distal-third humeral shaft fracture in adult patients. This refers to an extra-articular fracture occurring in the distal one-third of the humeral shaft. These fractures may require surgical fixation because conservative treatment can be associated with nonunion, malunion, prolonged immobilization, and functional impairment. Open reduction and plate fixation through either an anterolateral or posterior approach is commonly used in clinical practice. The main clinical

concerns include fracture union, elbow function, infection, nonunion, and radial nerve injury.

METHODS

Participant or population Adult patients aged 18 years or older with distal-third humeral shaft fractures will be included. The target population includes patients with extra-articular fractures of the distal one-third of the humeral shaft treated surgically with plate fixation. Studies involving pathological fractures, pediatric patients, or fractures not involving the distal-third humeral shaft will be excluded.

Intervention The intervention of interest is surgical treatment using the anterolateral approach. This may include anterior or anterolateral exposure for open reduction and plate fixation of distal-third humeral shaft fractures.

Comparator The comparator is surgical treatment using the posterior approach. This may include posterior plating techniques, including triceps-splitting or triceps-sparing posterior approaches, for fixation of distal-third humeral shaft fractures.

Study designs to be included Randomized controlled trials and cohort studies comparing anterolateral and posterior approaches for distal-third humeral shaft fractures will be included. Retrospective and prospective comparative studies will be eligible.

Eligibility criteria Studies will be included if they meet the following criteria: adult patients aged 18 years or older; diagnosis of distal-third humeral shaft fracture; comparison between anterolateral and posterior surgical approaches; available data for at least one predefined outcome; randomized controlled trial or cohort study design; and a minimum follow-up duration of 12 months. Studies will be excluded if they involve pathological fractures, non-target fracture types, non-target surgical comparisons, non-comparative designs, case reports, letters, reviews, conference abstracts, or if valid outcome data cannot be obtained or converted.

Information sources The information sources will include PubMed, Embase, Web of Science, and the Cochrane Library. The reference lists of included studies and relevant systematic reviews will also be manually screened to identify additional eligible studies. If necessary, study authors may be contacted to obtain missing or unclear data.

Main outcome(s) The main outcomes will include iatrogenic radial nerve injury and postoperative recovery from radial nerve injury. Radial nerve injury will be analyzed as a dichotomous outcome using risk ratios with 95% confidence intervals. Recovery from radial nerve injury will also be analyzed as a dichotomous outcome using risk ratios with 95% confidence intervals. Outcomes will be assessed at the final follow-up reported in each included study.

Quality assessment / Risk of bias analysis The risk of bias of included non-randomized comparative studies will be assessed using the ROBINS-I tool. Two reviewers will independently evaluate each study across seven domains: bias due to confounding, selection of participants, classification of interventions, deviations from intended interventions, missing data, measurement of outcomes, and selection of the reported result. Each study will be judged as having low, moderate, serious, critical risk of bias, or no information. Disagreements will be resolved by consensus or by consultation with a third reviewer.

Strategy of data synthesis Meta-analysis will be performed using R software. Continuous outcomes will be pooled as mean differences with 95% confidence intervals, and dichotomous outcomes will be pooled as risk ratios with 95% confidence intervals. Random-effects models will be used as the primary analytical approach because clinical and methodological heterogeneity are expected across studies. Fixed-effect or common-effect models may also be calculated for comparison. Statistical heterogeneity will be assessed using the I^2 statistic and τ^2. A two-sided P value of less than 0.05 will be considered statistically significant. Publication bias will not be formally assessed if fewer than 10 studies are available for each outcome.

Subgroup analysis Subgroup analysis will be considered if sufficient data are available. Potential subgroup analyses may include fracture type, open versus closed fracture, type of posterior approach, implant type, and study design. However, if the number of included studies is limited, subgroup analysis will not be performed to avoid unreliable or underpowered results.

Sensitivity analysis Sensitivity analyses will be performed when sufficient studies are available. Leave-one-out sensitivity analysis will be conducted by sequentially omitting one study at a time to assess the robustness of pooled estimates and to explore potential sources of heterogeneity. The stability of the results will be evaluated by

examining changes in effect size, confidence intervals, statistical significance, and heterogeneity estimates.

Country(ies) involved China.

Keywords distal-third humeral shaft fracture; anterolateral approach; posterior approach; radial nerve injury; meta-analysis.

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