

# INPLASY PROTOCOL

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**Conflicts of interest:**  
None.

## Closed reduction Percutaneous Screw Fixation and open reduction plate internal fixation for displaced intra-articular calcaneal fractures: A meta-analysis of randomized controlled trial

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**Review question / Objective:** Whether Closed reduction Percutaneous Screw Fixation is superior to open reduction plate fixation for displaced intra-articular calcaneal fracture? The aim of this meta-analysis of randomized controlled trials is to evaluate the therapeutic effectiveness of these two Operational Methods for displaced intra-articular calcaneal fracture.

**Condition being studied:** Calcaneal fracture is the most common foot injury that contributes to 60 % of the tarsal bone fracture and 2 % of the body fractures. Approximately 75% of calcaneal fracture are displaced intra-articular fractures (DIACFs). The management of displaced intra-articular calcaneal fractures is controversial. The most common approach has been to manage the fracture with standard ORIF through an extensile lateral approach. However, this approach has been complicated by soft tissue complications, wound infection, dehiscence, necrosis, and injury to the sural nerve. Percutaneous treatment has well protected soft tissue. Closed reduction and percutaneous screw fixation technique was mainly recommended for Sanders Type III fractures and good results have been reported.

**INPLASY registration number:** This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 21 January 2021 and was last updated on 21 January 2021 (registration number INPLASY202110081).

### INTRODUCTION

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Fixation is superior to open reduction plate fixation for displaced intra-articular calcaneal fracture? The aim of this meta-analysis of randomized controlled trials is

to evaluate the therapeutic effectiveness of these two Operational Methods for displaced intra-articular calcaneal fracture.

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## METHODS

**Participant or population:** Inclusion criteria: a. Displaced intra-articular calcaneal fractures (DIACFs) displaced >2 mm including Sanders Type II-III. b. Operative treatment possible within 7 days of injury. Some patients with significant swelling could wait for surgery until 2 weeks. c. Closed fracture d. age of 18-60 years; e. Patients must undergo either closed reduction with percutaneous screw fixation or open reduction with plate internal fixation Exclusion criteria: a. Patients with known local or systemic infection. b. Medical contraindication (severe vascular or neurologic injury, diabetes). c. patients who could not accept the treatment plan designated using a random number table. d. patients with previous history of calcaneal fracture; e. patients who were followed up for <12 months.

**Intervention:** Closed reduction Percutaneous Screw Fixation for displaced intra-articular calcaneal fractures.

**Comparator:** Open reduction plate internal fixation for displaced intra-articular calcaneal fractures

**Study designs to be included:** All RCTs (Randomized controlled study) involving percutaneous screw fixation and ORIF (Open reduction and internal fixation) for displaced intra-articular calcaneal fractures.

**Eligibility criteria:** a. Displaced intra-articular calcaneal fractures (DIACFs) displaced >2 mm including Sanders Type II-III. b. Operative treatment possible within 7 days of injury. Some patients with significant swelling could wait for surgery until 2 weeks. c. Closed fracture d. age of 18-60 years; e. Patients must undergo either closed reduction with percutaneous screw fixation or open reduction with plate internal fixation.

**Information sources:** We will search, with no time and language restrictions, the following databases: PubMed (MEDLINE), the Cochrane Central Register of Controlled Trials (CENTRAL), Embase, CBM and CNKI. The search string will be built as follows: (calcaneal fracture OR calcaneus fracture OR calcaneum fracture OR calcanea fracture) AND (screw OR percutaneous screw OR cannulated screw OR cannulated cancellous screw) AND (plate OR calcaneal plate OR calcaneal locking plate). The electronic database search will be supplemented by a manual search of the the library the reference lists of included articles. If necessary, we will contact the author himself for original information.

**Main outcome(s):** Improvement in Width of the calcaneus, Improvement in height of the calcaneus, improvement of Bohler's angle, improvement of Gissane's angle, American Orthopedic Foot and Ankle Society score (AOFAS) 、Mary land score(MFS), Excellent and good AOFAS ratings, Excellent and good MFS ratings, Rate of complications.

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**Additional outcome(s):** Time from trauma to operation, Duration of surgery, Intraoperative blood loss, Duration of hospital stay, VAS score.

**Quality assessment / Risk of bias analysis:**  
a. The Jadad scale was used to evaluate study quality b. Make Risk of bias graph and Risk of bias summary using Review Man5.3

**Strategy of data synthesis:** If the data is continuous, Outcomes will be reported as the standard mean difference (SMD) with the 95% confidence interval (CI). If the data was dichotomous, Outcomes will be reported as the OR (Odds ratio) OR RR (Relative risk) with the 95% confidence interval (CI). If the heterogeneity of the study was large, random effects model could be used. If there is little heterogeneity in the study, a fixed-effect model is used.

**Subgroup analysis:** When the heterogeneity of outcomes was large, subgroup analysis could be performed according to the study plan, study quality, race, publication date and other factors.

**Sensibility analysis:** Sensitivity analysis can be performed by changing the inclusion criteria, effect size (OR,RR,RD) and the statistical model (FE OR RE) of the data if the heterogeneity of the study is large. Meanwhile, Elimination of single study is also a common method for sensitivity analysis.

**Country(ies) involved:** China, Turkey, India, Spain.

**Keywords:** Closed reduction, Percutaneous Screw Fixation, open reduction, plate internal fixation, displaced intra-articular calcaneal fractures, meta-analysis.

**Contributions of each author:**

Author 1 - Yi Qin - The first author completed the literature search and the writing of the draft.

Author 2 - Zhihong Liang - The second author and the first author jointly completed the study quality assessment

(according to the Cochrane Manual of Systematic Evaluation of Interventions, Version 5.3).

Author 3 - Jian Li - In case of disagreement, the third author served as the reviewer to reach a final consensus through discussion.