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Comparison of arthroscopic reduction and percutaneous fixation and open reduction and internal fixation for tibial plateau fractures

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ABSTRACT

Purpose: To conduct a meta-analysis with randomized controlled trials (RCTs) published in full text to demonstrate database to show the associations of perioperative, postoperative outcomes of arthroscopic reduction and percutaneous fixation(ARPF) and open reduction and internal fixation(ORIF) for tibial plateau fractures to provide the predictive diagnosis for clinic.

Methods: Literature search was performed in PubMed, Embase, Web of Science and Cochrane Library for information from the earliest date of data collection to June 2017. RCTs comparing the benefits and risks of ARPF with those of ORIF in tibial plateau fractures were included. Statistical heterogeneity was quantitatively evaluated by X^2 test with the significance set $P < 0.10$ or $I^2 > 50\%$.

Results: Seven RCTs consisting of 571 patients were included.(288 ARPF patients; 283 ORIF patients;). Pooled results showed that ORIF was related to a greater increase in operative time, incision length, hospital stay, perioperative complications, and full weight bearing compared with ARPF. The results showed that ARPF was related to a greater increase in ROM Rasmussen Scores compared with ORIF (WMD = 10.38; 95% CI, 8.31, 12.45; $P < 0.10$).

Conclusion: This meta-analysis showed that arthroscopic reduction and percutaneous fixation for tibial plateau fractures, compared with open reduction and internal fixation, could demonstrate an decreased risk of perioperative and postoperative complications and improve clinical outcome in operative time, incision length, hospital stay, perioperative complications, full weight bearing and Rasmussen Scores.

Introduction

Tibial plateau fracture belongs to the fractures of proximal tibial articular. It was consist of thin cortical bone around a large number of cancellous and susceptible to pressure load and shear stress, fracture can have different degrees of compression, collapse and displacement in articular surface. If fracture can not treated effectively, it will affect the alignment, stability and movement of the knee joint [1,9]. The purpose of treatment including the restoration of joint shape, axial alignment, joint stability and joint function activities. Recovery of joint stability and early functional exercise can avoid or delay the occurrence of osteoarthritis [5].

Restoration of joint anatomy cannot be accomplished with conservative management. The traditional open reduction and internal fixation in the treatment of tibial plateau fracture can recovery articular surface continuity and strong fixation, but the preoperative injury condition and combined with soft tissue articular structural damage assessment are insufficient, and the long surgical incision, more injury, damage the surrounding structures and joint soft tissue; also have a higher incidence of soft tissue necrosis, infection, joint stiffness, internal fixation failure and other complications in postoperation [6,11].

Arthroscopy is being used to treat more complex joint pathology. The main advantages are improved visualization and decreased patient morbidity. Furthermore, it has the advantages of sufficient exposure, small trauma, definite injury in joints, accurate joint alignment and quick recovery of postoperative function. Arthroscopic reduction for tibial plateau fractures with rigid percutaneous internal fixation achieves the surgical goals while diminishing the complications associated with extensive surgical dissection or long-term immobilization [3,8]. Additionally, ARPF allows the orthopaedic surgeon to assess and treat concomitant knee pathology at the same time. Also using arthroscopy to evaluate tibial plateau fractures does not obviate any other available method of treatment [10,7]. However, there are few comparative studies on arthroscopic reduction and percutaneous fixation and conventional open reduction and internal fixation. Consequently, it is necessary to make a more comprehensive and

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latest meta-analysis which consists of all RCTs to determine the effectiveness of ARPF in tibial plateau fractures.

The hypothesis proposed by us is that ARPF, compared with ORIF in tibial plateau fractures, has a superior effect on the incidence of complications and the clinical outcome. The aim of this study is to determine the effectiveness of ARPF, on the incidence of complications and the clinical outcome in RCTs.

Methods

Literature and search strategy

Two different reviewers independently searched the following electronic databases: PubMed, Embase, Web of Science, and the Cochrane Libraryfor information from databases inception to June 2017. The following related terms were searched: tibial plateau fractures, arthroscopy, open reduction and internal fixation, RCTs, meta-analysis. Searching strategy was constructed by combining the above terms with "AND" or "OR". No restrictions were imposed on the language of studies. We had also screened reference lists of retrieved articles, so that relevant studies were not missed.Two different reviewers independently assessed the retrieved articles to determine whether they met the inclusion criteria. In case of disagreements, a third reviewer was involved in the discussion until a consensus was reached. All RCTs comparing arthroscopy assisted percutaneous internal fixation and open reduction and internal fixation were eligible. Exclusion criteria included: (1) quasi-randomized clinical trials,non-randomized trials, retrospective studies, cohort studies and case–control studies, animal studies, cadaver studies, single case reports, comments, letters, editorials, protocols, guidelines, publications based on surgical registries, and review papers; (2) other intervention instead of arthroscopy assisted percutaneous internal fixation.

Ethical approval for our study was given by Tianjin First Center Hospital and all patients signed informed consent.

Data extraction and quality assessment

Two different reviewers independently performed data extraction and methodological quality assessment. All discrepancies encountered were solved eventually through discussion. Data extracted from the included studies consisted of authors, publication date, study design, number of patients, gender proportion, age, Schatzker type of tibial plateau, surgical approach, follow-up duration and outcome data in both arthroscopy assisted percutaneous internal fixation and open reduction and internal fixation groups. The outcome measures comprised of Operation Time, Hospital Stay, Incision Length, Full Weight Bearing, perioperative complications, Rasmussen Scores. The methodological quality of study was evaluated in six domains, including sequence generation, allocation concealment, participants' blinding, assessors' blinding, incomplete data, selective reporting and other bias. Each included study could be considered as unclear, low risk or high risk of bias for each domain on the ground of Cochrane Handbook 5.1.0.

Statistical analysis

Statistical analyses were performed by two different authors using the procedure Review Manager Software (Rev-Man5.3, Cochrane Collaboration). For dichotomous outcomes, odds ratio

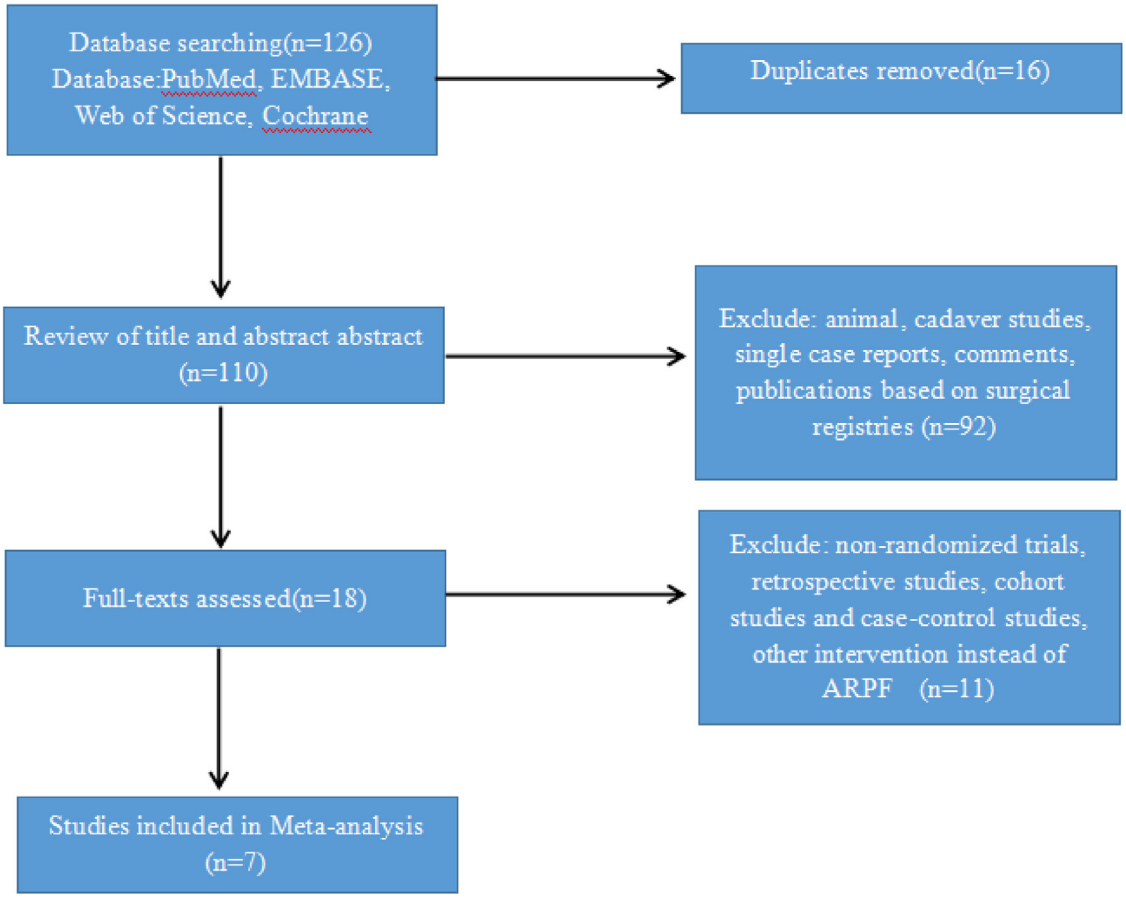

Fig. 1. Flow chart illustrating the literature search (ARPF arthroscopic reduction and percutaneous fixation, ORIF open reduction and internal fixation).

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