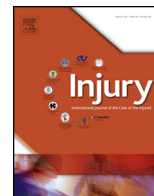




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Review

# Characteristics of postoperative weight bearing and management protocols for tibial plateau fractures: Findings from a scoping review

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ABSTRACT

**Objective:** To identify and describe the characteristics of existing practices for postoperative weight bearing and management of tibial plateau fractures (TPFs), identify gaps in the literature, and inform the design of future research.

**Methods:** Seven electronic databases and clinical trial registers were searched from inception until November 17th 2016. Studies were included if they reported on the surgical management of TPFs, had a mean follow-up time of  $\geq 1$  year and provided data on postoperative management protocols. Data were extracted and synthesized according to study demographics, patient characteristics and postoperative management (weight bearing regimes, immobilisation devices, exercises and complications).

**Results:** 124 studies were included involving 5156 patients with TPFs. The mean age across studies was 45.1 years (range 20.8–72; 60% male), with a mean follow-up of 34.9 months (range 12–264). The most frequent fracture types were AO/OTA classification 41-B3 (29.5%) and C3 (25%). The most commonly reported non-weight bearing time after surgery was 4–6 weeks (39% of studies), with a further 4–6 weeks of partial weight bearing (51% of studies), resulting in 9–12 weeks before full weight bearing status was recommended (55% of studies). Loading recommendations for initial weight bearing were most commonly toe-touch/ $< 10$  kg (28%), 10 kg–20 kg (33%) and progressive (39%). Time to full weight bearing was positively correlated with the proportion of fractures of AO/OTA type C ( $r = 0.465$ ,  $p = 0.029$ ) and Schatzker type IV–VI ( $r = 0.614$ ,  $p < 0.001$ ). Similar rates of rigid (47%) and hinged braces were reported (58%), most frequently for 3–6 weeks (43% of studies). Complication rates averaged 2% of patients (range 0–26%) for abnormal varus/valgus and 1% (range 0–22%) for non-union or delayed union.

**Conclusions:** Postoperative rehabilitation for TPFs most commonly involves significant non-weight bearing time before full weight bearing is recommended at 9–12 weeks. Partial weight bearing protocols and brace use were varied. Type of rehabilitation may be an important factor influencing recovery, with future high quality prospective studies required to determine the impact of different protocols on clinical and radiological outcomes.

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**Introduction**

Tibial plateau fractures (TPFs) are one of the most complex and common intra-articular fractures the trauma surgeon faces, representing approximately 1% of all fractures in adults [1–3]. TPFs are often associated with a poor prognosis due to associated factors such as cartilage destruction and soft-tissue envelope damage, as well as complications including compartment syndrome, post-surgery infection, knee instability or stiffness and post-traumatic osteoarthritis [4–7]. As such, they not only pose surgical challenges [8,9], but can also result in a substantial negative impact on health-related quality of life and functional independence. In addition, there is commonly a significant socio-economic impact due to time taken off work and impaired functional integrity of the knee [10–13].

Early postoperative mobilisation may limit complications, including knee joint stiffness, muscle and bone atrophy, synovial adhesions and capsular contractions [14–16]. However, there is no consensus about rehabilitation practices as immobilisation and protection from weight bearing varies widely. There are differences of opinion as to whether range of motion exercises should be passive, active assisted or active in nature [17]. While some authors recommended passive exercises immediately postoperatively [18–20], after the second postoperative day [21] or once wounds were sealed and dry [22], others never employ continuous passive motion regimes for their patients [23].

Moreover, for postoperative weight bearing, practices vary widely from immediate weight bearing as tolerated [24], weight bearing up to 20 kg for 6 weeks, followed by progression to full weight bearing [25], or avoidance of full weight bearing of up to 12 weeks [26]. Partial weight bearing may also be prescribed on an individual basis [27], or when union observed on plain film is significant [28,29].

While commencing weight bearing too early may increase the risk of loss of fracture position and subsequent malunion [30], there are potential benefits from optimising weight bearing after surgery. These include limiting physical deconditioning, reducing length of hospital stay, accelerating functional improvement and return to work. In addition, a recent study showed that early weight bearing after tibial plateau fractures was not associated with loss of reduction and patient reported outcomes at one year [31]. However, to date, there has been no comprehensive review of the characteristics of postoperative management protocols for TPFs, with a subsequent lack of clarity regarding current practices.

Identifying and analysing the variability of data relating to postoperative management protocols for TPFs will assist in providing up-to-date data on clinical practices, as well as informing intervention design for future research.

The literature on the surgical management and postoperative management protocols for TPFs is extensive and diverse. In these situations, scoping reviews have been recommended to map the existing evidence and literature to collate information on a broader topic [32]. This is in contrast to systematic reviews which have a specific and targeted question with narrow criteria and parameters. Scoping reviews are broader in nature and identify parameters and gaps within the literature. As this review included many different types of studies and the inherent diversity in information regarding postoperative management protocols for TPFs, a scoping review was chosen. The purpose of this review was to identify all relevant studies that have reported upon postoperative management and rehabilitation for TPFs in order to comprehensively map the characteristics of the practices.

**Methods**

*Design and search strategy*

The PICO (Population, Intervention, Comparison and Outcome) framework was used to develop the search strategy for this review, with the protocol published in the Joanna Briggs Institute Database of Systematic Reviews and Implementation Reports [33]. The electronic databases Medline (via OvidSP), EMBASE (via OvidSP), CINAHL (via EBSCOhost), Cochrane Database, Scopus, Physiotherapy Evidence Database (PEDro) and Joanna Briggs Institute (JBI) Library were searched from inception to November 17th 2016. The Medical Subject Headings (MeSH) were used for keywords where available. Trial protocol registers and unpublished studies were also searched via clinicaltrial.gov, the International Clinical Trials Registry Platform, the UK Clinical Trials Gateway, Open Grey (Europe) and New York Academy of Medicine (US), Mednar, Trove and ProQuest. Search terms and keywords included the following: “tibial plateau” OR tibial plateau fractures” OR “proximal tibial fractures” OR “knee fractures” AND “rehabilitation” OR “exercise” OR “joint loading” OR “weight bearing” OR “physical therapy” OR “knee function”. Each database was searched by two independent researchers to ensure reproducibility; with agreement required on the number of search hits achieved in each database before study screening was initiated.

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