# Surgical Treatment of Tibial Plafond Fractures

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**KEYWORDS**

• Tibial plafond fractures • Pilon fractures • Internal fixation • External fixation
• Surgery • Reconstruction

**KEY POINTS**

- Rotational distal tibial plafond fractures are usually associated with low-energy injuries.
- High-energy axial load injuries can result in tibial pilon fractures with severe intra-articular impaction, comminution of the metaphysis, and poor soft tissue envelope.
- Understanding the mechanism of injury, fracture pattern, and soft tissue injury is paramount to the patient's overall successful outcome.
- Open pilon fractures are surgically addressed in staged procedures with a thorough understanding of the role of free tissue transfer for major soft tissue defects.

## INITIAL CARE PLAN

Ultimate success to the management of tibial plafond fractures stems from a logical systematic approach that is predicated on the overall assessment of the patient, fracture pattern, and associated soft tissue injury. Addressing the associated soft tissue injuries encountered with the tibia plafond fractures is paramount to the overall patient's successful outcome. Crushing injuries, open wounds, fracture blisters, and/or compartment syndrome are typically associated with the high-energy tibial plafond fractures. The surgical plan will need to be formulated early on at the initial presentation to determine whether a single or multiple staged procedures are required to achieve the definitive fracture reduction.

Tibial plafond fractures are often present among polytrauma patients with several body injuries. Although life-threatening trauma is a priority, the lower extremity needs

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to be assessed to determine if early care is required for stabilization in a temporary and expedited fashion. Fractures with severe instability, open fractures, and fractures associated with compartment syndrome may need to be addressed in an expedited manner and if the patient's general condition permits. Open wounds should be meticulously debrided and irrigated to prevent septic complications; fasciotomies should be performed for the compartment syndrome, and unstable fractures may need to be stabilized with spanning external fixators. Closed fractures that are stable may be managed with an early application of well-padded splints and until a definitive surgical treatment plan can be performed. A simple bar to clamp external fixators is most commonly used in these types of injuries because they provide reliable temporary fracture stabilization in an expedited manner until the definitive surgical treatment is performed.

## STEPWISE APPROACH

Single-staged procedures are reserved for low-energy rotational tibial plafond fractures without soft tissue compromise and relatively healthy individuals. These fractures are typically associated with little impaction of the articular surface and involve large fracture fragments that make reduction feasible through a limited approach and/or percutaneous plating (**Fig. 1**). Typically, the fibular fractures encountered along with the rotational tibial plafond fractures are fixated first, while the tibia can be fixated by means of a limited open reduction and internal fixation (ORIF), percutaneous plating, or standard ORIF of the tibia.[1] High-energy axial loading tibial plafond fractures are definitively fixated once the soft tissue envelope permits.[2]

Understanding the fracture pattern and forces that led to failure of the tibia are paramount in formulating a surgical approach. The AO/OTA (Arbeitsgemeinschaft für Osteosynthesefragen/Orthopaedic Trauma Association) classification system simplifies tibial plafond fractures into 3 broad categories with 3 subdivisions. Type A is extra-articular and is further divided into: A1: pure distal tibia metaphyseal fracture; A2: distal tibia metaphyseal wedge; and A3: complex distal tibia metaphyseal complex. Type B fracture is partially articular and is further divided into: B1: pure lateral split; B2: medial split with joint depression; and B3: posterior split with multiple fragmentary joint depression. Last, type C fractures are completely articular and are divided into: C1: articular fracture simple with metaphyseal fracture simple; C2: articular fracture simple with metaphyseal multifragmentary fracture; and C3: articular fracture multifragmentary with metaphyseal multifragmentary fracture.[3]

An associated tibia deformity with a varus or valgus component will alter the surgical approach and/or surgical construct to stabilize the tibia plafond. For example, a varus failure of the tibia is best treated with a medial buttress plate once the articular segment is secured (**Fig. 2**). On the other hand, a valgus failure of the tibia is better treated with an anterior-lateral plate. These basic principles of fixation will aid in neutralizing the major deforming forces that occur at the metaphyseal-diaphyseal junction and may prevent the incidence of hardware failure, malunion, and/or nonunion.

Preoperative planning is an essential part of the treatment of tibial plafond fractures. Careful evaluation of the preoperative radiographs will need to be compared and correlated with computed tomographic (CT) images to identify the individual fracture fragments that are amenable to reduction and those that need to be manipulated to gain access to areas of comminution. In many cases of high-energy and/or open tibia plafond fractures, the application of a spanning external fixator may need to be