65 Tibial plafond fractures

Introduction

Plafond fractures are infrequent injuries, accounting for 7-10% of all tibial fractures. Most fractures are secondary to high-energy trauma that result in significant bone and soft tissue damage. Plafond fractures are also known as "pilon" fracture, or "explosion fracture."

Anatomy

The distal portion of the tibia is known as the plafond, which, along with the medial and lateral malleoli, forms the mortise to articulate with the talar dome. The plafond is concave in the anteroposterior plane and convex in the lateral plane. It is wider in the anterior plane to provide stability, especially while weight-bearing. Ligaments providing support about the distal tibia include the tibiofibular ligament (anterior, posterior, and transverse portion), the interosseous ligament, and the strong deltoid ligament (divided into superficial and deep portion).

Classification

The amount of soft tissue damage should be graded according to the Tscherne classification:

- Grade 0 - Minimal soft tissue damage, indirect injury to limb (torsion), simple fracture pattern
- Grade 1 - Superficial abrasion or contusion, mild fracture pattern
- Grade 2 - Deep abrasion with skin or muscle contusion, severe fracture pattern, direct trauma to limb
- Grade 3 - Extensive skin contusion or crush injury, severe damage to underlying muscle, subcutaneous avulsion, compartment syndrome

Ruedi and Allgower Classification
• Type A: Little or no articular displacement
• Type B: Displacement of the articular surface, without comminution
• Type C: Intra-articular displacement occurs with marked comminution and/or impaction

Osteosynthesefragen/Association for the Study of Internal Fixation and AOOrthopaedic Trauma Association Classification

• Type A: Distal tibial metaphyseal injuries without intra-articular extension
  • A1: Simple
  • A2: Comminuted
  • A3: Severely comminuted
• Type B: Partial articular fractures
  • B1: Pure split
  • B2: Split with depression
  • B3: Depression with multiple fragments
• Type C: Fracture involves the entire joint surface
  • C1: Simple split in the articular surface and the metaphysis
  • C2: Articular split that is simple with a metaphysis split that is multifragmentary
  • C3: Fracture with multiple fragments of the articular surface and the metaphysis

65.4 Clinical Presentation

Clinical features of pain, swelling, deformity, and crepitus about the ankle, along with the inability to bear weight, are the cardinal signs and symptoms. Vascular examination should include posterior tibial and dorsalis pedis pulses and capillary refill. Neurologic examination should assess sensation and ability to move the toes. An assessment for compartment syndrome should be done.

Multi-view radiographs and CT imaging are the diagnostic tools of choice. Often there is significant soft tissue injury with a tibial plafond fracture. Fractures of the foot, tibial shaft, or fibula should be evaluated. The knee joint should also be evaluated for soft tissue damage or bony disruption.

65.5 Imaging

Radiographs including the foot, ankle, tibia, and knee should be obtained. Traction radiographic views in both the anteroposterior and lateral planes, as well as contralateral ankle radiographs, can be of great benefit. CT scans are particularly important and are necessary in most cases.

65.6 Treatment

Goals of treatment are

• Reestablishment of articular congruity
• Stable fixation of the metaphysis to the diaphysis in acceptable alignment
• Prevention of complications
• Rapid return to function

Acute ankle-spanning external fixation followed by delayed reconstruction of the tibial plafond with plating or limited internal fixation combined with external fixation is the primary treatment option in cases of extensive soft tissue injury. Long-leg cast may be an acceptable treatment in patients with isolated, nondisplaced fractures. Acute open reduction with internal fixation (ORIF) should be limited to low-energy fracture patterns with minimal soft tissue injury or swelling. IM nailing with internal fixation is indicated in the event of tibial diaphyseal fractures with nondisplaced split through the plafond. Supplemental fixation of the split should be considered. For pain and soft tissue considerations, early motion should be delayed 7-10 days following treatment. In all intra-articular fractures, weight-bearing is prohibited in the first 8 weeks.

65.7 Complications

The most common complication is post-traumatic osteoarthritis. Axial load injuries cause cartilage damage and often cause poor results despite good anatomic radiographic joint reconstruction. Compartment syndrome can be a catastrophic result if missed on physical examination. Rates for secondary ankle arthrodesis after attempted ORIF of type 3 fractures approaches 30%. Pin track infections in the open reduction group may occur. Wound healing problem and infection are a concern, particular in high-energy injuries with extensive soft tissue injury.

65.8 Red Flags and Controversies

The type of external fixation device and the need for concomitant fixation of the fibula are the major sources of debate. Hybrid external fixation systems or articulated frames are the main devices used for fixation.

65.9 Outcomes

Satisfactory long-term outcomes are expected in approximately 70% of high-energy fractures. Good-to-excellent results have been reported in nearly 80% of low-energy fractures.