

## The Tibial Pilon Fractures: Are there Problems?

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French radiologist Destot primarily used the nomenclature of Tibial Pilon fractures (TPF) to describe distal tibia metaphyseal fractures [1]. The TPF represent a difficult problem in orthopedic surgical practice because the reduction of these fractures is complex both in the choice of “how” for surgery, both in the choice of “when” (operative timing) for surgery. Their frequency is relatively low, about 1% of all lower limb fractures, with higher incidence in the 3<sup>rd</sup> and 5<sup>th</sup> decade [2]. These fractures may be caused by falls, road accidents or sport injuries. TPF may be produced by two different dynamics: shear-stress injuries, which separate bone fragments, and compression injuries, which compress and impact bony matter. The mechanism is the implosion of the tibial plafond caused by axial compression between the talus and the distal tibial articular surface, with or without horizontal torsion [3]. It is often associated with significant degloving of the soft tissue surrounding the bone, while the skin, capsule and ligaments are partly spared.

The aim of operative treatment is to anatomically reduce the fracture fragments to restore the congruity of the joint surface and promote bony union with minimal disruption of the soft tissue envelope [4]. So the TPF are always complex. Its complexity is related to the number of bone fragments, the decomposition of the bone fragments and the lesion of the neighboring soft tissues.

Muller's AO classification is the more complete and universally accepted system: it characterizes Type A (not articular), type B (partially articular) and type C (completely articular) fractures. TPF can also be classified by Ruedi and Allgower classification that includes three type of fracture depending on the displacement of articular surface, metaphyseal and injury extent of fractures [5]. The treatment of this type of fractures is a very timely topic, since there is no real consensus on the unique methods of treatment, which must take into account not only the stabilization of bone but also soft tissue which frequently leads to complications. Non operative management, such as cast immobilization, is reserved only for nondisplaced articular fractures, patients who have surgical contraindications because of medical co-morbidities, or patients with low demand such as those who are nonambulatory. Surgical treatments are varied and different: minimally invasive osteosynthesis (MIO), open reduction and internal fixation (ORIF), minimally invasive plate osteosynthesis (MIPO), external fixation (EF), external fixator combined with limited invasive internal fixation (LIFEFF), ilizarov treatment. Operative fixation of TPF has presented a significant challenge to the orthopaedic surgeon as the extensive soft tissue damage associated with such injuries makes surgical intervention hazardous.

Advantages of minimally invasive osteosynthesis of pilon fractures compared to conventional open reduction and osteosynthesis, include protection of the soft tissue and no further disturbances of circulation-ideal prerequisites for undisturbed bone healing. Ruedi and Allgower [5] believed that anatomical restoration of the articular surface was fundamental surgical point. They considered essential: the restoration of the length and axis of fibula or tibia, the reconstruction of the distal end of the tibia, the filling of the defect resulting from impaction, using cancellous autografts, the support of the medial side of the tibia by plating to prevent a late varus deformity. White et al. say that provided surgery is performed expeditiously by experienced orthopedic trauma surgeons, most tibial pilon fractures can be stabilized

by primary ORIF within a safe and effective operative window with relatively low rates of wound complications, a high quality of reduction, and functional outcomes that compare favorably with the published results for all other reported surgical treatments of these severe injuries [6]. A retrospective study by Watson et al. has shown that there is a significantly higher complication rate with the use of open plating techniques in AO type C fractures of the distal tibia, and this is probably related to the amount of dissection and stripping of soft tissues needed to achieve reduction and plate fixation [7].

Davidovitch et al. describe that both ORIF and EF appear to be comparable for treatment of TPF fractures with regard to final range of ankle motion, development of arthritis and hind foot scores [8]. Kiene et al. propose combined treatment using lag screws with external fixation as a practical treatment option for those fractures for which lag screws combined with a locking plate are not feasible or when there is a high risk of wound-healing deficits due to severe soft tissue damage [9]. Wang et al. show that in the treatment of closed tibial plafond fractures; both two-staged ORIF and LIFEFF offer similar results [10]. Patients undergo LIFEFF carry significantly greater radiation exposure and higher superficial soft tissue infection rate (usually occurs on pin tract and does not affect the final outcomes). Vidyadhara and Rao had 76% of excellent results using Ilizarov treatment [11]. One of the most frequent procedures is a two-stage surgery: the initial closed reduction of the fracture via primary placement of an ankle joint-spanning external fixator, if possible in conjunction with open reduction and internal fixation of the fractured fibula followed by a secondary procedure after soft tissue recovery by open reduction and internal fixation of the tibial plafond [12].

The TPF have so much space in the world scientific literature. Numerous articles describe good results using all the techniques and each technique is always considered better than the other to avoid complications and to restore the anatomical conditions. Certainly the TPF are not easy to manage; in fact, all authors consider these fractures as complex in their resolution.

The articular fracture would require a perfect surgical reconstruction, but these clashes with pathological anatomical and technical problems. The outcomes are questionable and they have a curious contradiction: almost never functional results have a direct correlation with the radiographic check. The complications may be present in any surgical treatment used and tend to be severe.

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There is an algorithm that can be used in the choice of the surgical technique?

The classifications used, only tend to emphasize the type of fracture, the displacement of the fragments, the dynamics of trauma, but do not take into account the quality of the skin affected by trauma. A fracture is not exposed there may be a skin suffering as an open fracture. The quality of the skin damage is important in the timeliness of a surgical choice. An algorithm that takes into account the bone injury and soft tissue injury is essential and difficult preparation to take a correct decision. Complications in fact are often linked to a surgical incorrect choice for a not right detection of soft tissue damage. An algorithm that takes into account the bone injury and soft tissue injury is essential and difficult preparation to take a correct decision. Complications in fact are often linked to a surgical incorrect choice for a not right detection of soft tissue damage. The choice between internal and external fixator can be taken based on the type of damage in general. Each technique has advantages and disadvantages, so the choice for one or the other leads to a better quality of clinical and radiographic outcome. It is important to perform appropriate surgeries for open TPF; according to a new fracture classification, different damage to skin and tissue and time interval after injury and the nature of the pilon fracture has caused evolution of treatment methods and its historically high rate of complication and poor outcome continue to direct the choice of treatment. Attention to the delicate soft tissue envelope surrounding the ankle and recognition of the severity of the initial injury is crucial to ensure a satisfactory outcome and to minimize complications. Can you create a new classification? Can you create a correlation between the type of fracture, the quality of the skin lesion and surgical treatment? The answer must be given by the surgeons of the ankle.

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