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Review Article

External fixation and ligamentotaxy in tibial pilon fractures

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Article Info

Received: November 05, 2026
Accepted: November 16, 2026
Published: November 19, 2026

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Citation: Horacio T Sáez, Horacio T Neyra., (2026). "External fixation and ligamentotaxy in tibial pilon fractures". Clinical Research and Clinical Case Reports, 7(1); DOI: 10.61148/2836-2667/CRCCR/102.

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Abstract:
Soft tissue trauma in tibial pilon fractures predisposes patients to wound healing complications and infections. External fixation with ligamentotaxy before open reduction and internal fixation appears to be a solution. The purpose of this study was to demonstrate the value of initial external fixation with ligamentotaxy in the treatment of tibial pilon fractures. References were identified by searching PubMed, Google Scholar, and Elsevier for publications published between 2010 and 2025 in English using the terms: "tibial pilon fractures," "distal tibial fractures," and "distal tibial metaphyseal-articular fractures." Tibial pilon fractures can involve a wide spectrum of soft tissue injuries and compromise. External fixation preserves the soft tissue envelope with minimal damage and allows for fracture stabilization, early weight-bearing, and mobilization, thus promoting bone healing.

Keywords: Tibial pilon, blisters, external fixation, ligamentotaxy

Introduction

Tibial pilon fractures, which account for approximately 1% of all lower extremity fractures and up to 10% of tibial fractures, are complex and difficult to treat. They typically occur as a result of high-energy axial loading of the talus onto the tibial articular surface.[1,2]

The tibial pilon, considered as an anatomical unit, has thin skin, poor vascularization, and lacks muscle attachments. Soft tissue trauma, often manifested by blister formation, is associated with these high-energy injuries and predisposes patients to wound healing complications and infections.[3]

Due to the fragility of soft tissues and the consequent risk of wound complications, common in tibial pilon fractures, the staged approach, which includes external fixation with ligamentotaxy before open reduction with internal fixation, has become the standard treatment for high-energy tibial pilon fractures.[4,5]

The purpose of this study was to demonstrate the value of initial external fixation with ligamentotaxy in the treatment of tibial pilon fractures in adults in emergency situations.

Search strategy and selection criteria

References were identified by searching PubMed, Google Scholar, and Elsevier for publications between 2010 and 2025 in English using the terms: "tibial pilon fractures," "distal tibial fractures," and "metaphyseal-articular fractures of the distal tibia." Articles freely accessible or through the Clinical Key and Hinari services were also reviewed. Articles older than ten years but relevant to the topic were included.

Development

Tibial pilon fractures can involve a wide spectrum of soft tissue injuries and involvement.[6] With significant soft tissue trauma, a tear of the dermoepidermal junction can occur at the time of injury, leading to the formation of a potential space. Frequent blistering in tibial pilon fractures presents a challenge for orthopedic surgeons. These blisters appear in areas without a secure subcutaneous tissue cover, develop between 8 and 72 hours after the initial injury, and, depending on their location, can interfere with surgical approaches to the distal tibial end.[7]

The main goals of treatment for tibial pilon fractures are maintenance of length, recreation of articular surfaces, and restoration of limb alignment. Open reduction provides the safest way to achieve fracture reduction and restore joint congruity. External fixation preserves the soft tissue envelope with minimal damage and allows for fracture stabilization, early weight-bearing, and mobilization, promoting bone healing.[8] External fixation, as damage control, is implemented to allow for soft tissue recovery while providing initial fracture stabilization.[3] Urgent ligamentotaxy allows the surgeon to achieve better length and alignment of the tibia, talus, and hindfoot, and create an optimal environment for soft tissue rest.[9]

While early fixation can reduce the occurrence of soft tissue injuries, such as fracture blisters, their presence is associated with worse outcomes and complications, including infection and wound dehiscence.[10,11] Current guidelines favor a staged approach with initial external fixation to provide stabilization and limit soft tissue damage, followed by staged internal osteosynthesis once the soft tissues permit.[12,13]

Conclusions

Due to the considerable delay in being able to perform definitive fixation, as a consequence of potential soft tissue injuries in tibial pilon fractures, these patients benefit from staged treatment by initial external fixation with ligamentotaxy, before definitive treatment with internal fixation.

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