Composite Fixation Of Fracture Distal Tibia

Thesis

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By

Mohamed abd El Moneim Hussein Ali

MBBchMsc Orthopedics
Cairo University

Under supervision of

Prof. Dr. Mohamed Kaddah

Prof Of Orthopedic Surgery, Faculty Of Medicine ,Cairo University

Prof. Dr. Ahmed Mahmoud

Prof Of Orthopedic Surgery ,Faculty Of Medicine,

Cairo University

Dr.Abdallah Mohamed

Lecturer Of Orthopedic Surgery,Faculty Of Medicine ,Cairo University

Faculty of Medicine,
Cairo University
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Abstract

The patients with the external fixator lost slightly more motion in each direction than did the patients with internal fixation***.***
We found a higher rate of delayed union with external fixation, located primarily at the diaphyseal-metaphyseal junction. Whether this finding represents selection of fracture patterns that extend up into the diaphysis for that treatment method,or a true effect of stabilization method is unclear. Could be that fractures with shortening and marked comminution into the diaphysis are subjected to over distraction, causing delayed or non-union in that area. circular external fixator can eliminate
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Introduction

Plafond or Pilon fractures of the tibia result from axial forces that can range from low to high energy and produce a spectrum of articular and metaphyseal injuries. These can be challenging to manage, especially when associated with significant soft tissue injury. Although a variety of options are available to treat these fractures, timing of the definitive surgery is crucial with respect to the condition of the soft tissues. Despite the advances made to date in managing these fractures, new developments in the field continue to lead to better outcomes.

The treatment of plafond fractures has evolved over the last century. Conservative management gave way to surgical intervention when implants became available, but poor outcomes led to a return to cast immobilization or limited internal fixation of the fibula only. However, outcomes after nonoperative treatment continue to be poor.

Open reduction and internal fixation with plates and screws is associated with a high rate of complications including wound breakdown, superficial or deep infection including osteomyelitis and occasionally amputation.

External fixation with or without open reduction and limited internal fixation has therefore gained popularity.

Anatomic reduction of the articular surface of the ankle mortise as a stable functional unit, stabilization of the articular surface to the tibial shaft with the appropriate alignment and length, and early return to functional activities are regarded as the main goals of the treatment of tibial plafond fractures. Successful results can be achieved when these principles are followed for treating low-energy tibial plafond fractures. By contrast, anatomic restoration of the articular surface and large exposure of the soft tissue for internal fixation may lead to an increased rate of complications in high-energy pilon fractures.

Therefore, the standard treatment, especially for high-energy tibial plafond fractures, is still controversial.

In recent years, various types of external fixators have been proposed with a minimally invasive operation. Many different types of external fixators, including hybrid, articulated, unilateral, and circular external fixators, have been used for this purpose. Although these techniques have reduced the early complications related to soft tissues and bone to an acceptable level, it is still claimed that they cannot provide efficient fixation and anatomic reduction.

AIM OF WORK

We aim to study and evaluate results of fixing distal tibial (pilon)fractures by open reduction internal fixation(composite fixation and minimally invasive) and external fixation , we follow our patients regarding function and radiology in order to know which is the best accordingly.

Anatomy

Anatomy Of Ankle Joint

1- ANKLE JOINT OSTEOLOGY

The ankle joint is a complex three-bone joint. It consists of the distal tibial articular surface referred to as the "plafond" which includes the posterior malleolus and articulates with the body of the talus; the medial malleolus; and the lateral malleolus. The joint is considered as saddle-shaped, with a larger circumference of the talar dome laterally than medially. The dome itself is wider anteriorly than posteriorly, and as the ankle dorsiflexes, the fibula rotates externally through the tibiofibular syndesmosis, to accommodate this widened anterior surface of the talar dome **(Marsh and Saltzman, 2001).**

(1) THE LOWER END OF THE TIBIA:

The distal end of the tibia, slightly expanded, has anterior, medial, posterior, lateral and distal surfaces (plafond). It projects infero-medially as the medial malleolus.

The distal end of the tibia, when compared to proximal end, is laterally rotated (tibial torsion), the torsion begins in utero and progress throughout childhood and adolescence to skeletal maturity. Tibial torsion is about 30 degree in Caucasian and Oriental populations, but is significantly greater in Africans ***(Williams, 1995).***

The relatively thick-walled cortical bone of the tibial diaphysis flares distally at the transition of the diaphysis to metaphysis. The cortex is much thinner here and the metaphysis is filled with trabecular bone ***(Borrelli et al., 2002).***

Its anterior surface is covered by the extensor tendons above and a rough surface below for attachment of the anterior ligament of the ankle joint. Its smooth anterior surface bulges beyond the distal surface, separated from it by a narrow groove, continuing the shaft's lateral surface. The medial surface, smooth and continuous above and below with the medial surfaces of shaft and malleolus, is subcutaneous and visible. The posterior surface is crossed near its medial end by a nearly vertical, but slightly oblique groove, usually conspicuous, extending to the posterior surface of the malleolus; in which the tendon of the tibialis posterior lies as it passes to the sole of the foot; elsewhere it is smooth and continuous with the shaft's posterior surface.

The lateral surface has the triangular fibular notch, bounded by ligaments to the fibula; it’s anterior and posterior edges project and converge proximally to interosseous border. The floor of the notch is roughened proximally by a substantial interosseous ligament, but it is smooth distally and sometimes covered by articular cartilage.

The distal surface “plafond”, articulating with the talus, is wider in front, concave sagittally and transversely it is slightly convex. Medially it continues into the malleolar articullar surface. This articullar surface may extend into the groove, separating it from the shaft's anterior surface. Such extension, medial or lateral or both, are squatting facets, articulating with reciprocal talar facets in extreme dorsiflexion. These features have been used in racial evaluation ***(Williams, 1995).***

Medial malleolus. The medial malleolus, short and thick, has a smooth lateral surface with a crescentic facet articulating with the medial talar surface. Its anterior aspect is rough and its posterior continues the groove on the shaft’s posterior surface. The distal border is pointed anteriorly, but it is posteriorly depressed ***(Williams, 1995).***

(2) THE LOWER END OF THE FIBULA:

The distal end or lateral malleolus projects distally and posteriorly. Its lateral aspect is subcutaneous; its posterior aspect has a broad groove with a prominent lateral border. Its anterior aspect is rough, round and continuous with the tibial inferior border. The medial surface has a triangular articular facet, vertically convex, its apex distal; it articulates with the lateral talar surface. Behind the facet is a rough malleolar fossa ***(Williams, 1995).***

The lower end of the fibula is a complex bony structure, giving rise to multiple ligaments and housing the lateral articular surface of the ankle. The distal fibula has two major surfaces, lateral and medial. The interosseous ligament attaches where the lateral surface twists and becomes the posterior border of the lateral malleolus. The lateral malleolus forms the lateral prominence of the ankle and extends distally ½ inch beyond medial malleolus. The posterior surface has a groove in which the peroneal tendons lie.

The lateral malleolus is encased in strong ligamentous attachments anteriorly, posteriorly, inferiorly, and superiorly. Anteriorly, these ligamentous attachments include the anterior tibiofibular ligament and the main and secondary bands of the anterior talofibular ligament. Inferiorly, the main attachment is through the stout calcaneofibular ligament. Posteriorly, the fibula is firmly connected to the talus and tibia through the posterior talofibular ligament, the superficial and deep components of the posterior tibiofibular ligament. Superiorly, the fibula is held in continuity to the tibia by the tibiofibular interosseous ligaments ***(Marsh and Saltzman, 2001).***

(3) THE TALUS:

The talus is almost entirely covered by articular cartilage, with no musculotendinous attachments. The superior surface is convex from front to back, and it is slightly concave from side to side. The dome of the talus is trapezoidal, with its anterior surface wider than its posterior surface. This shape confers increased ankle stability with dorsiflexion. The medial and lateral articular facets of the talus are contiguous with the superior articular surface. The talar dome bone is, on average, denser than tibial plafond bone, and generally it is not injured in ankle fractures. Because the lateral border is larger than the medial border, and the anterior border is longer than the posterior, this surface was described by Inman as a section of a frustrum of a cone, with a medial apex. This is partially responsible for the ankle joint variable axis of rotation (**Fig. 1**). ***(Marsh and Saltzman, 2001).***

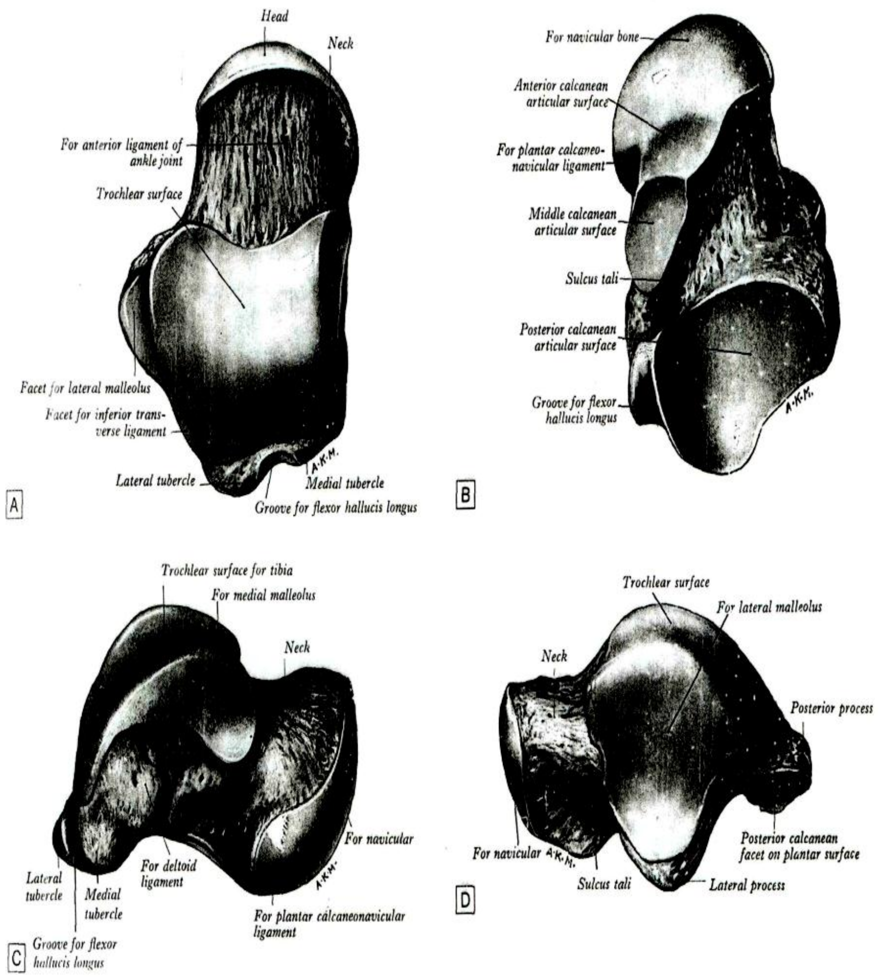

Figure (1): The left talus: A. Dorsal (superior) aspect; B. Planter (inferior) aspect; C. Medial aspect; D. Lateral aspect. ***(Williams, 1995).***