TREATMENT

Historical

AO/ASIF: anatomic reconstruction + ORIF

Emphasis on an anatomic reconstruction and absolute stability

Soft-tissue and osseous vascularity were sometimes sacrificed

With these techniques, soft-tissue complications 50%

New biological Fixation

Temporary external fixation and delayed joint reconstruction

Hybrid fixation: Reduction is focused on restoring overall length and alignment rather than reducing individual fracture

Timing of Surgery

Open fractures, acute compartment syndromes, and arterial occlusions necessitate immediate surgical intervention

Most tibial plateau fractures require a careful evaluation and, often, delayed definitive fracture fixation.

High-energy tibial plateau fractures frequently have massive swelling and soft-tissue injury: EF. The stability provided by EF allows faster resolution of soft-tissue swelling than do splints or other forms of temporary immobilization

Preoperative Planning

When ORIF is chosen as the definitive treatment:

(1) Whether reduction will be open or closed,

(2) Which indirect reduction methods will be used?

(3) Which incision will be used?

(4) Whether a separate incision needed for fixation of the medial condyle

(5) Which type of plate will be used?

(6) Whether bone graft will be necessary.

When external fixation is chosen as temporary management, planning is important.

External Fixation

Bridging

A standard frame for this purpose consists of two 5-mm half-pins in the distal femur and two in the distal tibia, connected with two bars.

Femur: Anterior or anterolateral and should avoid the suprapatellar pouch

Tibia: The distal tibial pins should be placed distal to any anticipated ORIF incisions over the shin

Hybrid

These fixators are used in place of plates as definitive treatment. Thin-wire ring fixators, such as hybrid Ilizarov fixators, are useful for this application, but monolateral and half-pin fixators also may be used. Excellent results have been noted with hybrid external fixation, whose mechanical construct is similar in strength to that of dual plating.

Technique

Tensioned wires: avoid passing through the patellar or hamstring tendons.
Olive wires (wires with an oval nut attached) are used to increase the stability
Wires or pins: 14 mm below the articular surface

An appropriately sized ring is then affixed to the construct and the wires tensioned.

An additional half-pin can be placed anterior to posterior and fixed to the ring

External fixators typically remain in place for 2 to 4 months

Fracture healing: which is judged on radiographs, by the ability to bear weight, and occasionally by stress fluoroscopic examinations.

Weight bearing begins once callus is visible on radiographs.

Dynamization of the frame assists in maturing callus.

ORIF

Incisions

The skin should be soft, blisters should be epithelialized, and skin wrinkles should be present.

A midline anterior approach uses the same incision as a traditional total knee arthroplasty, facilitating later salvage arthroplasty.

It permits simultaneous exposure to both plateaus but involves extensive soft-tissue dissection, which can result in considerable devascularization of fracture fragments, thus delaying fracture healing and increasing the potential for infection and nonunion.

When a midline incision is chosen, it is imperative that only one side of the proximal tibia be exposed. This can be accomplished with a lateral or medial anterior parapatellar approach, depending on the condyle involved.

Concern for the vascularity of the proximal tibia has led to a trend toward more direct surgical approaches. Lateral or anterolateral incisions, with separate limited medial or posteromedial incisions, as necessary, provide excellent exposure for the reduction and fixation of most complex tibial plateau fractures. Because the lateral surface of the tibia has better soft tissue for coverage, the lateral approach often is preferable. A laterally based approach is especially useful in the application of "minimally invasive" plates that can be applied submuscularly through this incision, with screws placed percutaneously into the tibial shaft.

In the lateral approach, a straight or hockey stick incision is made anterolaterally from just proximal to the joint line to just lateral to the tibial tubercle.

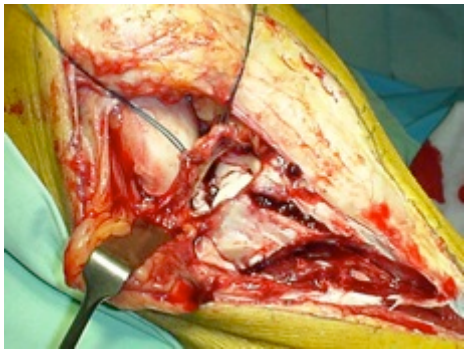
The incision is extended down through the iliotibial band proximally and the fascia of the anterior compartment distally.

The tibialis anterior muscle is elevated supraperiosteally off the proximal tibia to the level of the capsule.

The coronary ligament is incised, allowing proximal retraction of the lateral meniscus with a holding suture when direct joint visualization is necessary.

Positioning

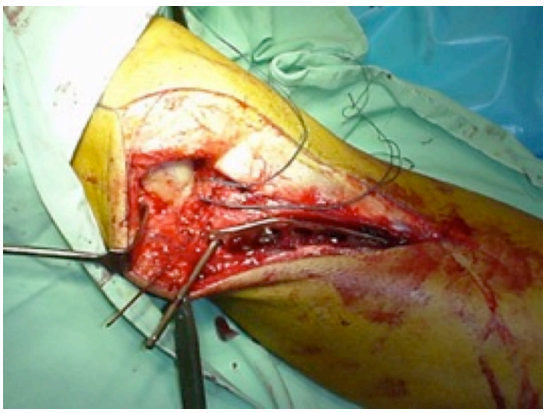
Lift the meniscus



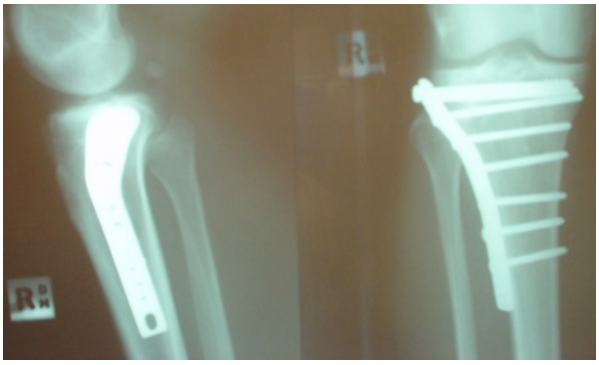
Open split and elevate depressed fragment

Plating Options

A plate is applied through an interval created between the medial head of the gastrocnemius and the pes anserinus tendons. This plate is applied as a buttress or antiglide plate and is most effectively positioned at the lower portion of the condyle, where typically a spike keys into the metaphysis



Menisci is repaired



Locking screw-plate implants are anatomically contoured plates with screws that lock into the plate at a fixed angle. These plates have numerous advantages. Because their stability does not depend on friction generated between the plate and the bone, they cause less compression of the periosteum and soft tissue.

Additionally, by functioning as modular fixed-angle devices, they provide stability to the plateau adjacent to the plate as well as to the plateau opposite the plate. The fixed-angle construct allows the medial condyle to be buttressed from the lateral side and may provide enough stability to forego a separate medial plate in bicondylar fractures.

In fact, no statistically significant difference was found between the biomechanical stiffness of a single laterally based fixed-angle plate and a dual plate in a bicondylar fracture model.

However, when locking screws are used, there is no freedom to place the screws in the optimal location based on fracture pattern; the screw direction is determined by the direction of the threads in the plate. Because of this, a lateral locking plate will not always provide adequate stabilization of bicondylar fractures. When the medial condyle is small, comminuted, or osteoporotic, or when the condyle has a coronal split, it is usually prudent to place an additional plate supporting the medial condyle.

Locking plate techniques call for placement of the implant through a lateral incision. Because locked screws do not generate a lag force across articular fracture lines, percutaneous or open techniques with screw or Kirschner wire fixation typically provide supplemental fixation at the joint line. The plate provides support to the joint line and allows healing of the metaphysis and diaphysis. An option for some implants is to use nonlocking screws in the locking plate when a lag effect is desired.

Early results of locking plates show decreased infection rates and the successful utilization of a single plate for most bicondylar fractures. Even so, an additional strategically placed, medially based plate may be