# Summary

The treatment of high energy plateau and plafond fractures has hunted orthopaedic surgeon for many years. Treatment protocols have shifted over the years from non operative management to formal open reduction and internal fixation to limited internal fixation, to limited internal fixation, and external fixation and even spanning external fixation. ( ***Borrelli and Catalano 1999***).

The llizarov circular fixator is method of treatment of these high energy factures when extensive dissection and internal fixation are hazardous or contraindicated due to trauma to soft tissues, deficiency of bone stock and bony comminution (***MC Donald et al, 1996., morandi et al, 1997; Watson and Caufal 1998, Marsh, 1999***).

Its advantages over other methods is the circular fixation apparatus facilitated a better over all reduction than was possible with closed reduction alone or with traction treatment methods (Murphy et al 1991). The circular fixation frame allows excellent stabilization of the fracture for early amulation of the patient reducing the length of hospital stay (***Murphy et al 1991***).

It's indication in treatment of tibial plateau fractures are proximal tibial periarticular fractures with shaft dissociation (***Schatzker type V and VI, AO classification type A and type C fractures*** ).

Compromised soft tissue envelope associated with a type B fracture .

Low energy fractures with soft tissue injury are indications for using Ilizarov.

In proximal tibial periarticular fractures with ispsilateral distal femur fractures.(***Hutson J.J 2002***)

Its indications in tibial plafond fracture are compromised soft tissue envelope, Moderate to severe fracturing of the joint and metaphysis ,

Proximal extension of the fracture to the midshaft, Comminution of the fibula lateral malleolus , Metaphyseal shaft junction bone loss, Type B plafond fractures with greater than 50% joint comminution***( Hutson J.J Zych G.A 2000***)

**There are three construction methods** used in the treatment of fractures. **The most basic** is using the llizarov fixator as a neutralization frame. The external fixator is applied to maintain axial alignment, rotation, and control force transmission across the fracture site. This function is similar to using a neutralization plate across an oblique or spiral fracture that has been realigned with interfragmentary screws. The external fixator is applied after axial alignment has been corrected by manual reduction, internal fixation, or percutaneous fixation. The system is usually used in low energy periarticular fractures with limited large fragments at the joint surface, (**AO Classification CI & C2 fractures**).

The fragments are realigned with limited screws and small fixation plates. These fractures are often associated with shaft extension fractures with minimal to moderate displacement (low energy soft tissue injury ). To avoid plating these injuries, a neutralization frame is applied spanning the fracture. This allows the concept of limited internal fixation to succeed. The only requirement of the limited internal fixation is that the fracture fragments are maintained in a reduced position during healing. The limited internal fixation is that the fracture fragments are maintain axial alignment and resist the deforming forces of weight transmission across the fracture zone. This is the function of the neutralization frame. The strategy of reconstruction can be applied to low energy tibial plateau, pilon.

An advantage of the Ilizarov system is that neutralization frames can be used to compress the fracture site because the threaded rods are parallel.

**The second strategy** of reduction is using universal hinge connections between fixation blocks for reduction of the fractures. This method is considered the most practical method of reduction by orthopaedists and is used widely in fracture care.

The technique is accomplished by applying fixation blocks to the proximal and distal segments of the fracture. The fracture is reduced by manipulation of the fracture followed by tightening of the universal hinge mechanisms.

Traction on the extremity and application of the fixation blocks in orthogonal alignment facilitates the reduction and limits the zigzag alignment of the external fixator. These universal hinge mechanisms have an “all or none” control of alignment of the frame. To correct alignment in one axis requires loosening all axis of alignment .

This strategy of reduction has had wide usage and success and can be considered for moderate tomidenergy fractures of the tibia. This method of fixation is also used well in pilon fractures as joint spanning fixators with limited internal fixation of the plafond.

After reduction of the fracture, the universal hinge systems function as neutralization frames. The Spatial frame (Smith Nephew) also functions as a universal hinge mechanism. The independent linkages must all be loosened to manipulate fixation blocks proximal and distal to the fracture and provides more precise correction of alignment compared with manual manipulation of fixation blocks. (***Hutson J.J 2002***)

**The third strategy** of reduction is using the Ilizarov fixator as an external scaffold and manipulating the fracture using reduction techniques that combine distraction, lengthening compression, rotation,

translation, and angular correction . The system utilizes the placement of wires and pins as pivot points and axis of rotation that can be mainipulated by lever arms to obtain reduction. This, combined with the manipulation of wires and pins on the rings which allow positioning through the entire $360^{o}$ arc of a circle, produces an effective and adaptable system that can be used for high energy fractures of the tibia.

The technique can be unifocal or multifocal. Segmental fractures can be reduced systematically, bone loss can be reconstructed, and severely comminuted periarticular fractures can be reconstructed and stabilized. The external scaffold system is the most difficult technique to master and requires an understanding of biomechanics, Ilizarov reduction techniques, and an ability to preoperatively plan the sequence of reduction. The Ilizarov fixator system is the only external fixation system that has the adaptability to use the external scaffold technique, which separates it from other external fixation systems into a unique category.
The technique of reduction will vary depending on the location of the fracture.