

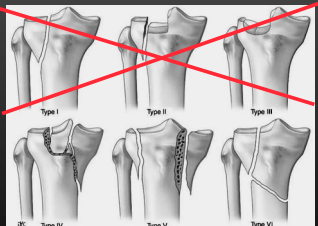
# External Fixation

## Tibial Plateau Fractures

Ph.Beaufils, Ph Boisrenoult,  
Centre Hospitalier Versailles

- External Fixation is not only indicated in
- Open fractures
  - Salvage procedures :
    - Acute ischemia
    - Crush syndrome
    - ....

External Fixation is an alternative for unstable proximal tibial fractures or metaphyseal-diaphyseal fractures



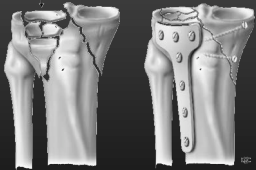

### Internal fixation

**Advantages :**

- Stable fixation ?
- Reco of the articular surface
- Easy Wound care
- Bone Healing specially with less invasive techniques

**Risk**

- Infection
- Long leg axis ?



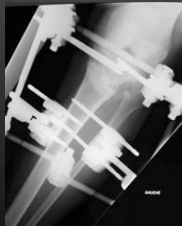
### External Fixation

**Advantages**

- Stable fixation
- Intra op and Post Op (++) control of the long leg axis
- Low rate of infection

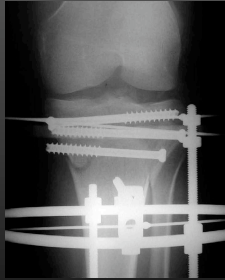
**Risks –Disadvantages**

- Non Union ?
- Wound Care



### Combined Procedures

- Internal fixation to control the articular surface
- External Fixation to
  - Stabilize the epiphysis
  - Fix the metaphyseo-diaphyseal junction

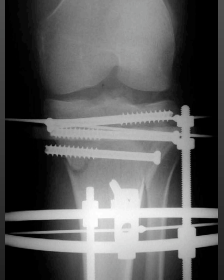


### Biomechanics

*Ali Clin Biomech 2003*

#### Duocondylar fracture model (sawbone)

- 5 different fixations (no locking plate)
- The best fixation :
  - Dual plate : 4218N
  - Two ring Hybrid fixator : 4184N



### Biomechanics


*Ali 2006 – cadaver study*

#### Dual plate versus external fixator-bicondylar fracture

“However, BMD in the dual-plating group influenced the failure load significantly ( $p=0.03$ ), whereas in the external fixation group this was less evident ( $p=0.100$ )”

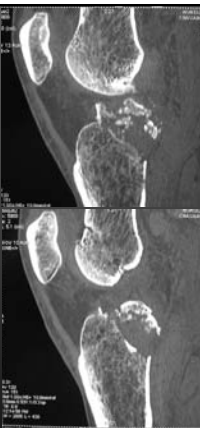
### Biomechanics

- Which configuration would be the best ?
  - Roberts
  - J Orthop Trauma 2003
- « box hybrid » (additional ring group distal to the fracture)
- + 6mm anterior proximal half pin



### Technique

- Pre Op CT scan, specially to assess :
  - articular congruency
  - comminution
  - posterior fragments which must be fixed +++



### If articular congruency is not OK If skin coverage is OK

1. mini approach
2. Elevation of the epiphyseal fragment
3. fixation with a clamp
4. Less invasive epiphyseal internal fixation with screws

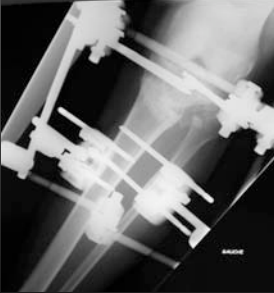


*Hall JBJS 2009*

- Type of epiphyseal external fixation depends on aspect of epiphysis
- Large, solid fragments

↓

Conventional threaded pins



- Type of epiphyseal external fixation depends on aspect of epiphysis
- Comminutive fragments


↓

Tensioned wires pins  
Ilizarof or Hybrid  
Fixator (Tenxor)



If the fracture is severely unstable

- Extend the frame to the distal femur to immobilize the knee and stabilize the construct



Rehab program

- No weight bearing
- Delayed removal of the frame to avoid secondary « plastic » deformity ; at least 5-6 months (Zhuo 2008)

**Results**

Internal Fixation vs Hybrid Fixation  
*Zhuo 2008 : no differences*

*Can Orthop Trauma Society JBJS 2006*

- Same functional results
- External fixation : less complications, less iterative surgery
- « substantial residual limb specific and general health deficits »

**Results**

Internal Fixation vs Hybrid Fixation  
*Mahaeva Archiv Orthop Trauma 2008*

Literature review : 5 papers (1 contolled, multicenter trial)

- “it demonstrated a marginal non-significant benefit of hybrid external fixation over internal fixation”

### Indications of external fixation

- Skin damage
- Unstable fractures (comminution of the metaphyseo-diaphyseal junction)
- Consider complementary mini invasive internal fixation