External Fixation

Tibial Plateau Fractures

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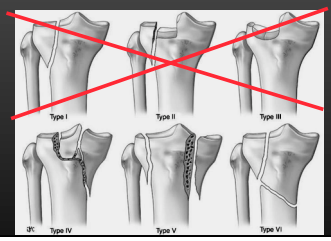
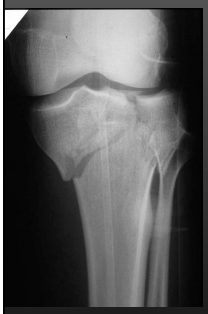
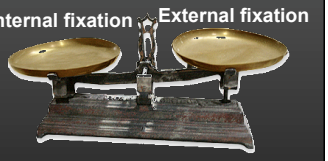
External Fixation is not only indicated in

- Open fractures
- Salvage procedures :
  - Acute ischemia
  - Crush syndrome
  - ....

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







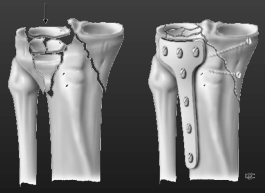
Internal fixation

Advantages :

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

Risk

- Infection
- Long leg axis ?



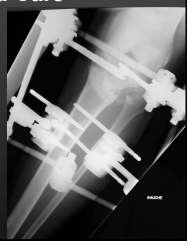
External Fixation

Advantages

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

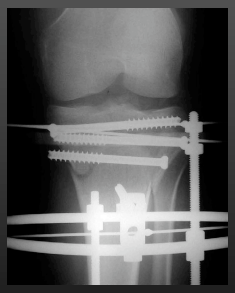
Risks –Disadvantages

- Non Union ?
- Wound Care



Combined Procedures

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

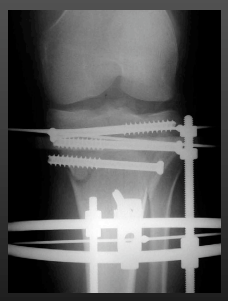


Biomechanics

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

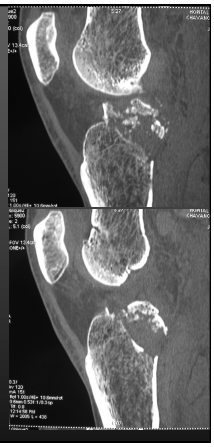
"However, BMD in the dual-plating group influenced the failure load significantly (p=0.03), whereas in the external fixation group this was less evident (p=0.100)"

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

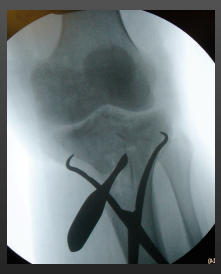
Technique

- 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

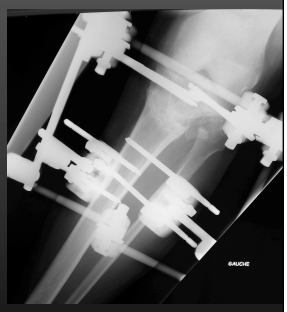


Hall JBJS 2009

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

⇩

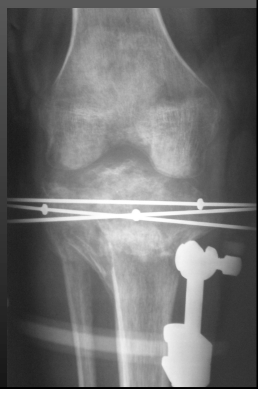
Conventional threaded pins



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

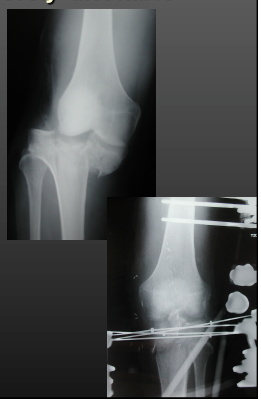
⇩

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

Mahaheva 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