High Energy Injuries around the Knee: Ext Fix and Soft-Tissue Managment

T. Toan Le MD
Dep. of Orthopaedics - UC
Trauma Update 101
Clearwater FL 2016

Outline

- Goals of "Early" Fracture Stabilization
- Fixation Timing Factors
- Advantages of Spanning External Fixators
- Case Examples

Spectrum of Injury

Osseous injury is an imperfect
the *soft tissue injury*

Tibial Metaphyseal Fractures

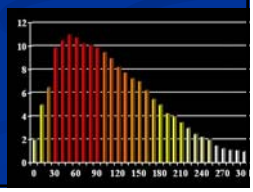
Osseous Injury
- Static
- Easily assessed
- Easily Quantified

Soft Tissue Injury
- Dynamic
- Accumulative
- Difficult to assess

Complications and Prognosis
Both are significantly altered by treatment

Soft Tissue Response to Injury

- **Inflammatory Phase**
  Platelets, Neutrophils and Macrophages
  - *Release cytokines*
  - *Worsening tissue hypoxia*
  - *Perpetuates inflammatory response*
  - *Progressive acidosis*
  - *Vicious cycle of progressive tissue injury*



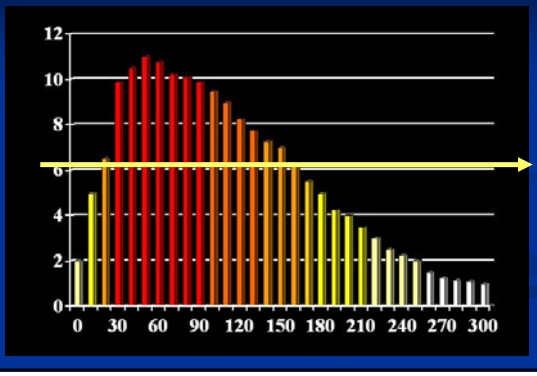
Goals of Fracture Fixation

- Stabilize fractures & minimize complications
- Both provisional & definitive fixation accomplish the same goal in acute setting
- Definitive fixation does not have to be the initial procedure
- Spanning external fix offers numerous advantages for *complex periarticular fractures & patients in extremis*

Importance of Early Fracture Stabilization

- Integral part of resuscitation process
- Mobilization – nursing care
- Pulmonary function
- Pain management
- Soft-tissue management
- Improves patient survival & outcome

Soft Tissue Injury



When to use it?

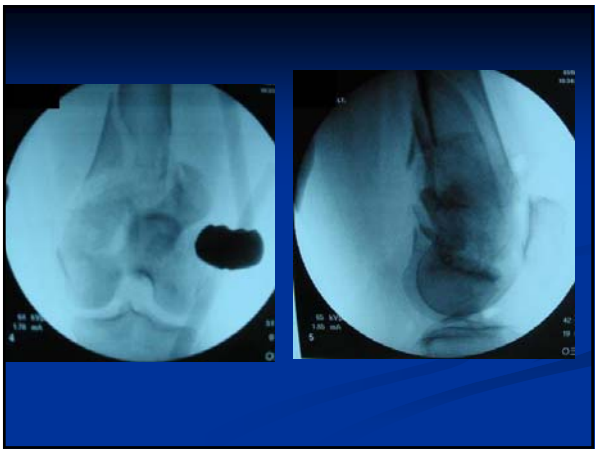
- Complex periarticular injuries
- Soft-tissue injuries – Grade 3B or swelling & compartment syndrome
- Speed is an issue – vascular injury or patient in extremis
- Logistics of definitive fixation are suboptimal

Biomechanics of External Fixation

Biomechanics of External Fixation

- Pin Size – 5 mm
  - {Radius}^{4}
  - Most significant factor in frame stability
- Rod Size
  - 11 mm – for knee
  - 8 mm for ankle

Open Comminuted Distal Femur Fx

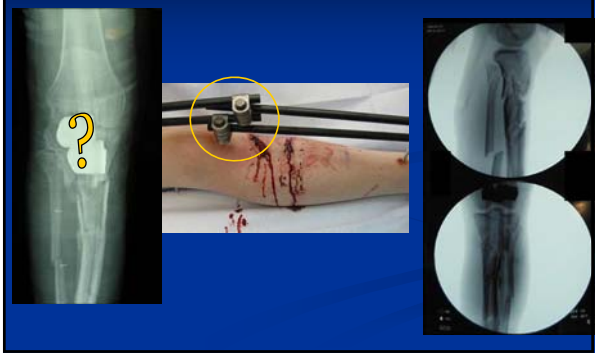


Incision for ID & Pins Placement

- Be cognizant of future incision & placement of definitive implant
- ***Maximize pins spread while avoid zone of injury***
- Predrill pins

Keep pins out of supra-patellar pouch

Do not obstruct X-Rays with clamps

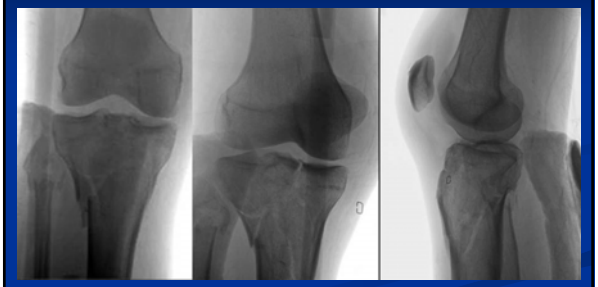


High-Energy Tibial Plateau

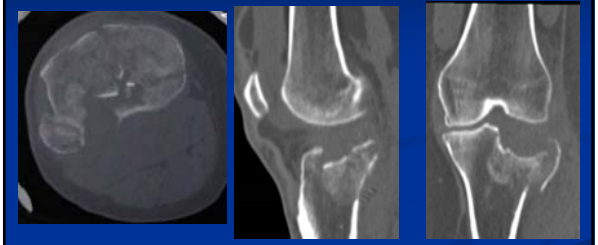
Compartment Syndrome

Fasciotomy & Surgical Approach

Knee in External Fixator



CT Evaluation



Axial image Sagital image Coronal image

High Energy Tibial Plateau

Provisional Stabilization

Haidukewych and Collinge, OTA & AAOS, 2002

- High energy injuries (A2/A3, C2/C3)
- 80 fractures: distal femur (10), tibial plateau (24), and pilon (46) fractures
- Treated with:
  - Wound care PRN
  - Urgent spanning ext. fixation
  - Delayed ORIF

Provisional Stabilization

Haidukewych and Collinge, OTA & AAOS, 2002

- Average time from Ex Fix to ORIF: 9 days
- Complications
  - 4% infections (3 deep)
  - 1% amputation
  - 0% late flaps

"Temp" ex fix/delayed ORIF is safe for use in complex injuries of the lower extremity

Advantages of Spanning Ex Fix

- Portable traction splint
- Prevents further damage
- Little added dissection
- Soft tissue management
- Easy to monitor wounds
- Additional imaging – CT/MRI
- Expeditious & versatile

Spanning Ext Fix

- Integral part of resuscitation
- Initial step in fracture management
- Important for soft tissue management – compartment syndrome & open injuries
- Resuscitation & preop planning