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

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Objectives
- Goals of “Early” Fracture Stabilization
- Fixation Timing Factors
- Advantages of Spanning External Fixators
- Case Examples

Spectrum of Injury

Osseous injury is an imperfect mirror of the soft tissue injury.
High Energy Periarticular Frxs

**Osseous Injury**
- Static
- Easily assessed
- Easily Quantified

**Soft Tissue Injury**
- Dynamic
- Accumulative
- Difficult to assess

Complications and Prognosis
Both are significantly altered by treatment

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Goals of Fracture Fixation

- Stabilize fractures w minimal complications
- Provisional & definitive fixations - same goal
- Definitive fixation & ETC - harmful
- Spanning external fix offers numerous advantages for complex periarticular fractures & patients in extremis

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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

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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

- **Pin Size** – 5 mm
- **Rod Size**
  - 11 mm – for knee
  - 8 mm for ankle
- **Parallel Bars**

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
High-Energy Tibial Plateau

Compartment Syndrome
Fasciotomy & Surgical Approach

Knee in External Fixator

CT Evaluation

Axial image  Sagittal 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
- Pain management
- Little added dissection
- Soft tissue management
- Additional imaging – CT/MRI

Spanning Ex Fix

- Integral part of resuscitation
- Initial step in fracture management
- Soft tissue management – swelling, open injuries & compartment syndrome
- Preop planning & transfer

Key Points

- Pins away from fracture
- Parallel bars construct
- L/A/R
- Plan ahead with definitive fixation
  - Incision
  - Limited articular reduction
THANK YOU