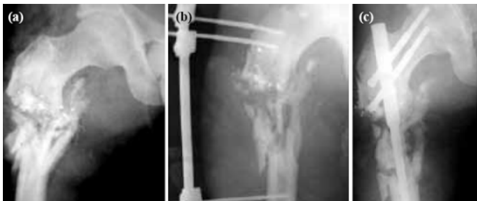


Role and Technique for Spanning External Fixation

Jeff Anglen, MD

WHEN TO DELAY FIXATION with spanning external fixation

- Severe Soft tissue injury
 - swelling
 - blisters
 - open wounds
 - compartment syndrome
- Shock and multi-system trauma
 - "Damage Control"
- Other
 - ? Most pilons
 - Knee dislocation
 - Severe elbow trauma



High velocity GSW to femur treated initially with ex fix, followed by delayed nailing

Dar GN, Turkish journal of trauma 15(6): 553-60, 2009









Damage Control

- Applied early during resuscitation
- Most studies involve femur fracture
- Risk-adapted approach
- What criteria?

[illegible]

The Borderline Patient

- (ISS) >20 with additional thoracic trauma AIS >2.
- abd/pelvic trauma and haemorrhagic shock (initial systolic BP <90 mmHg).
- ISS >40
- CXR or CT evidence of bilateral pulmonary contusion.
- Initial mean pulmonary arterial pressure >24 mmHg.
- Pulmonary artery pressure ↑ during IM nailing >6 mmHg.

Damage Control

- ? Chest trauma: pulmonary contusion
- ?Moderate or Severe TBI: GCS 3-13
 - Flierl MA et al. JOT 24(2):107-114



Ex fix in Damage control

Controversial
Inconclusive evidence

EXTERNAL FIXATION – Orthopaedic Advantages

- Maintains length and alignment
- Partial reduction of fracture via ligamentotaxis
- Stabilizes soft tissues and allows wound access



EXTERNAL FIXATION

Can be applied quickly

- Minimal blood loss
- ED application possible
- Flouro not necessary

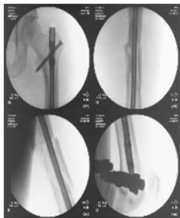
Preserves Fixation Options



EXTERNAL FIXATION

- Femoral fractures stabilized 5-7 days
- Conversion to IM nail
- Minimal orthopaedic complications

Scalea J Trauma 2000
Nowotarski JBJS 2000

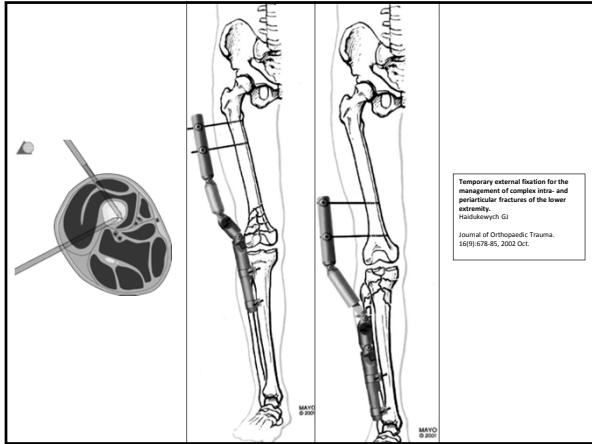


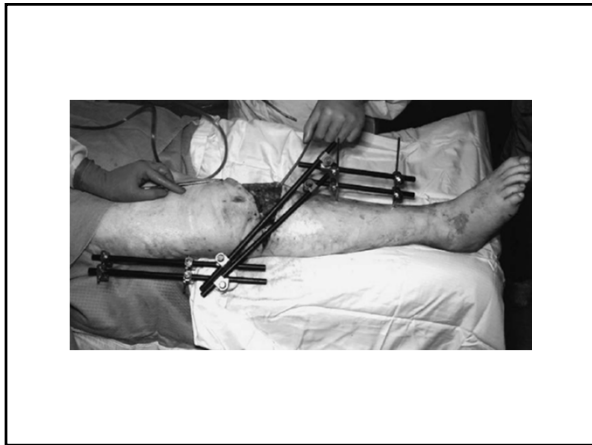
Principles

- Place pins as far from injury as possible
- Consider incision locations for definitive fixation
- Restore length and alignment
- Minimize pin number – don't cluster
 - Goal is not to maximize stability
- Place clamps away from necessary Xrays
- CT and planning films after ex fix

Spanning the knee

- Anterior pins allow sitting and wheelchair mobility
- Use drill guides and careful soft tissue technique through Quadriceps
- Gentle traction over a knee bump avoids hyperextension
- Make sure connection clamp is not over fracture site







Temporizing External Fixation of the Lower Extremity: A Survey of the Orthopaedic Trauma Association Membership

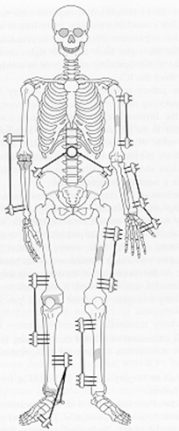
Cory Collinge, MD; Jason Kennedy, MD; Andrew Schmidt, MD

Orthopedics
April 2010 • Volume 33 • Issue 4
DOI:

Table 3
Survey Items With a High Rate of Agreement Among Orthopaedic Trauma Association Members


Survey Item	Rating Average
A CT scan of complex periarticular injuries should be obtained for preoperative planning	4.8
A CT scan should be obtained after external closed reduction and fixator application	4.6
Soft tissue protection should be used when drilling and applying pins	4.4
It is important to restore length with closed reduction	4.3
Femoral pins should be placed proximally for distal femur fractures and distally for proximal tibia fractures	4.3
Tibial pins should be placed proximally for distal femur fractures and distally for proximal tibia fractures	4.3
Avoid placing pin sites where they will later overlap plate placement	4.3
A delta frame configuration is preferred for tibial plafond and ankle fractures	4.0

Abbreviations: CT, computed tomography.



Quick temporary ex fix

Anglen JO, Aleto T
Transarticular external fixation of the knee and ankle
J Ortho Trauma 12(6):431-4, 1998



Spanning the ankle

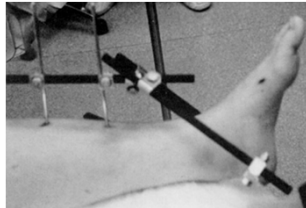
- Tibia – calcaneus
- Articulated fixator with pins in talus/ calc
- Don't forget the forefoot!
 - Equinus in ankle, or in midfoot
 - Pins in metatarsals
 - Foot plate



"Transfixion" centrally threaded pin in the calcaneus

Two anterior-posterior tibial half pins

"A frame" or delta frame



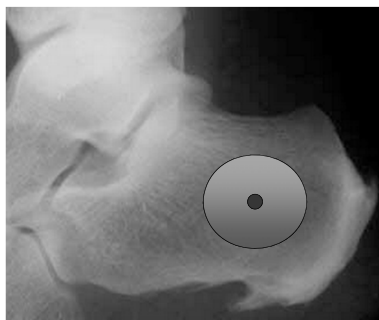


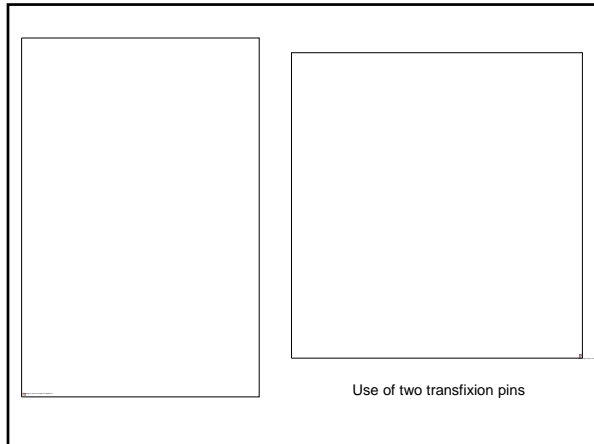
Elevation above the heart – Use of foot pumps

Pre-drill 3.5 mm

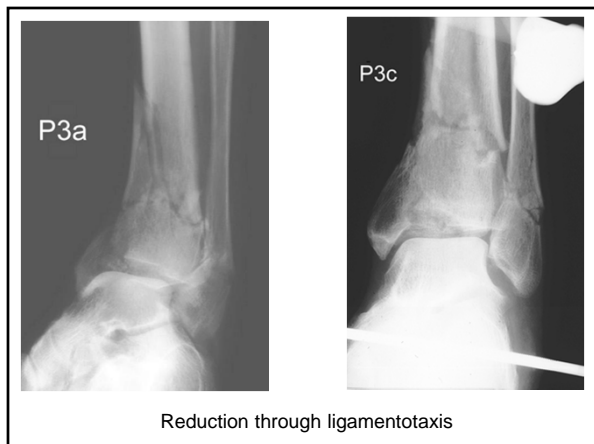
Use drill guides

Place centrally threaded pin under power









Subsequent procedures

- Temporary fixators can be safely prepped into the field using Alcohol, Iodine prep scrub and Iodine spray

Watson JT, Occhietti MJ, Moed BR, et al. Perioperative external fixator management during secondary surgical procedures. Presented at: 15th Annual Meeting of the Orthopedic Trauma Association; 1999; Charlotte, North Carolina.

Can External Fixators Be Sterilized for Surgery? **(yes)**
 A Prospective Cohort Study in Orthopaedic Trauma Patients
 David Hardeksi, Greg Gaski, Richard Venezia, Jason Nascone, Marcus Sciadini, , Robert O'Toole
 Department of Orthopaedic Surgery, University of Maryland School of Medicine
 OTA Poster 2012

Conversion to internal fixation

- Overlap of plates with pin sites does not seem to increase risk of infection

Laible C, JOT 2012, 26:92-97

- Infection rate after conversion to IM nail, goes up if delayed >28 days

Bhandari M et al JOT 2005, 19:140-144

- If pin site infections, consider a "pin holiday" prior to nailing

Compartment Syndrome

- Temporary ex fix for Medial tibial plateau fx dislocation may contribute to development of compartment syndrome

– Monitor carefully

– Leave foot out

Stark E et al. JOT 2009 23:502-506

- Transient elevation of pressures seen after application of ex fix and restoration of length

Egol KA et al. JOT 2008 22:680-685

DVT

- Protocol of early joint spanning ex fix and LMWH resulted in DVT rates similar to historical controls

Sems SA et al. J Trauma 2009 66(4):1164-9

Thank You



I've had a wonderful evening.

Unfortunately, this wasn't it. *Groucho*
