

Hybrid Techniques: The Best of Internal and External Fixation

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HOSPITAL
FOR
SPECIAL
SURGERY



External Fixation

- Gradual lengthening
- Gradual deformity correction
- Staged treatment for infection
- Pin tract infections
- Soft-tissue tethering from pins
- Long duration psychologically difficult

Hybrid Techniques

- Utilize the best of external fixation and internal fixation.
- External Fixation for distraction
- Substitute internal fixation for consolidation
- Decrease time in frame
- Protects against refracture

Techniques

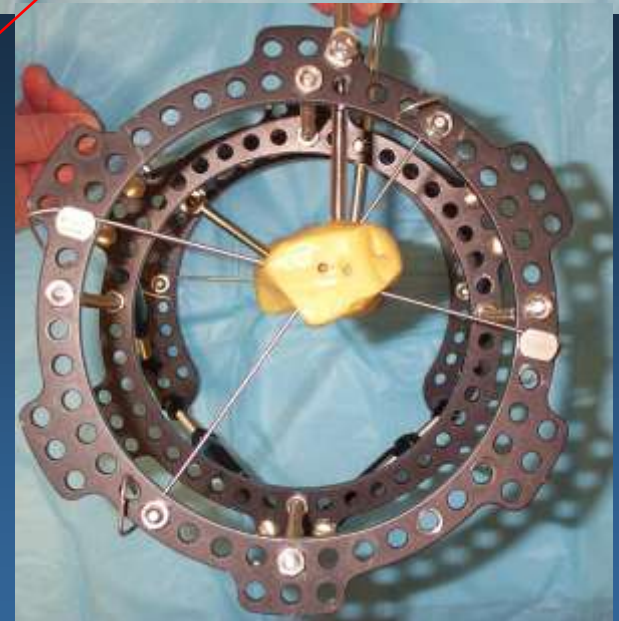
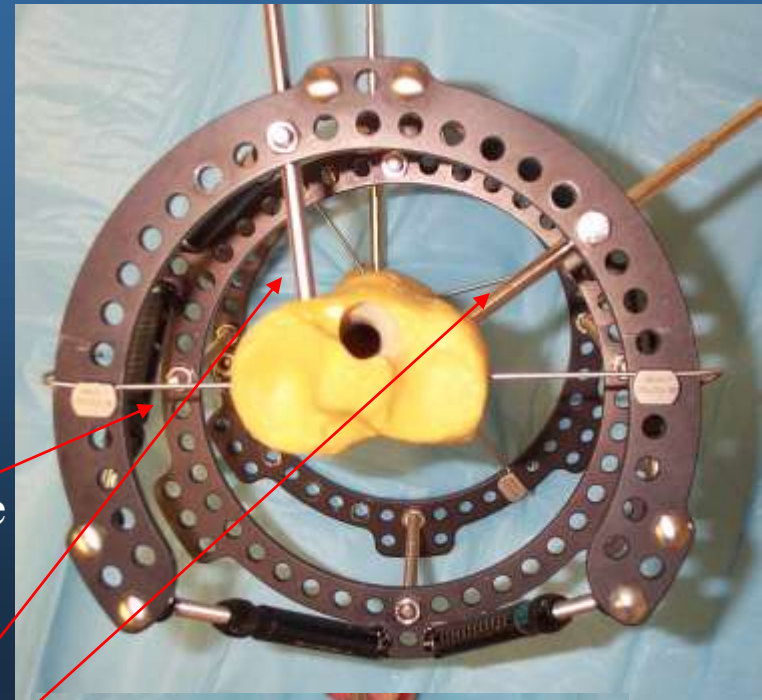
- Lengthening over a nail (LON)
- Reconstruction around an existing IM nail
- Lengthening and then nailing (LATN)
- Lengthening and then plating (LAP)
- Bone transport over a nail

Lengthening and Then Nailing LATN

Technique



Pin placement
To avoid contact
With future
IM nail:
Posterior transverse
Wire
Anteromedial pin
11:00
Anterolateral pin
2:00





After residual deformity correction





**Custom LATN
Targeting Device**

Matched comparison

- LATN versus traditional lengthening with Ilizarov method
- Patients matched
 - Age
 - Etiology
 - Amount of lengthening

RESULTS

	LATN	CLASSIC
Follow-up (mo)	40 (8-74)	41 (12-88)
Time in frame (weeks)	12 (3-27)	29 (14-55)
ED to frame removal (days)	9.6 (0-35)	130 (45-278)
EFI (mos/ cm)	0.5 (0.3-1.1)	1.9 (1-4)
BHI (mos/cm)	0.8 (0.4-1.3)	1.9 (1-4)

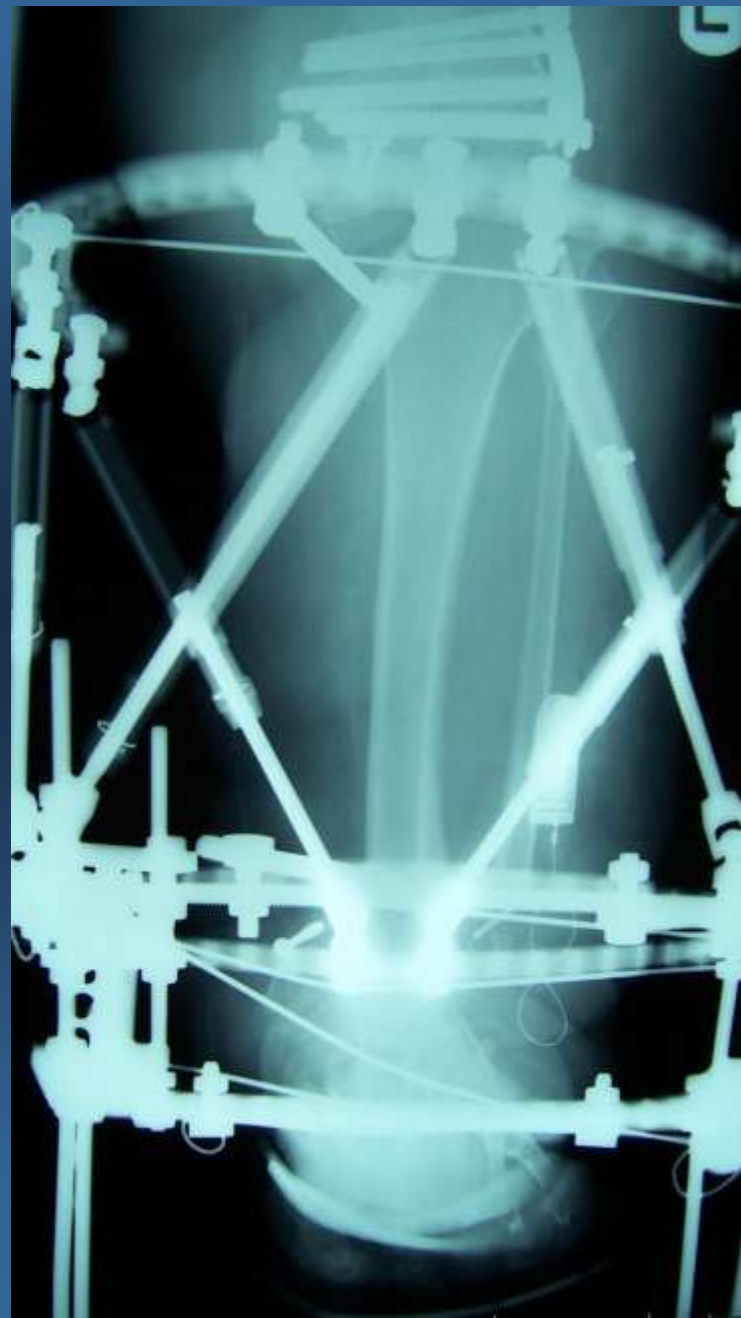
60 y/o woman, failed pilon fx, osteomyelitis, bone defect

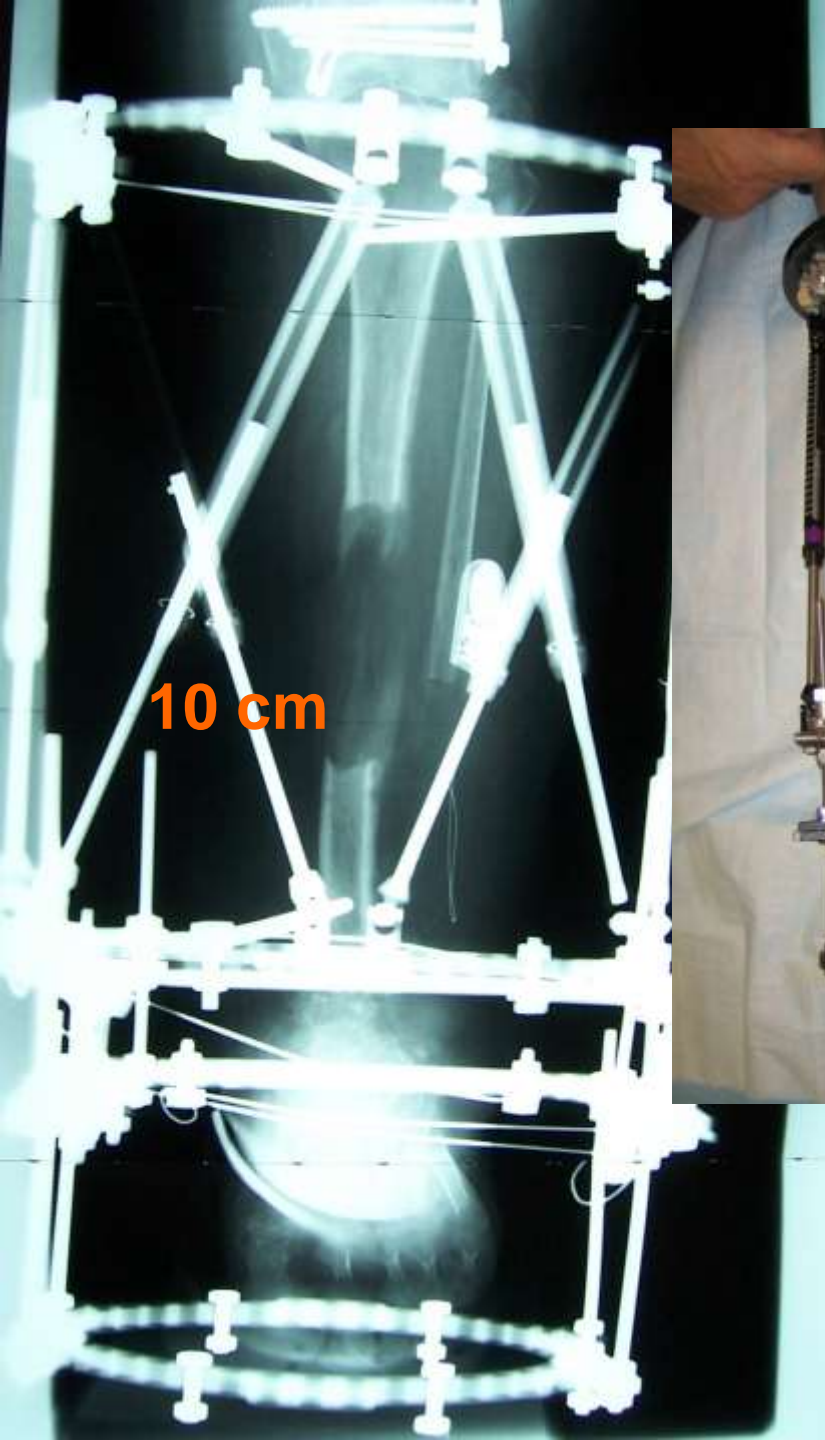


**Bone defect + LLD
= 13 cm**



Ankle fusion, gradual shortening, IV antibiotics, planned staged LATN





10 cm





10 cm

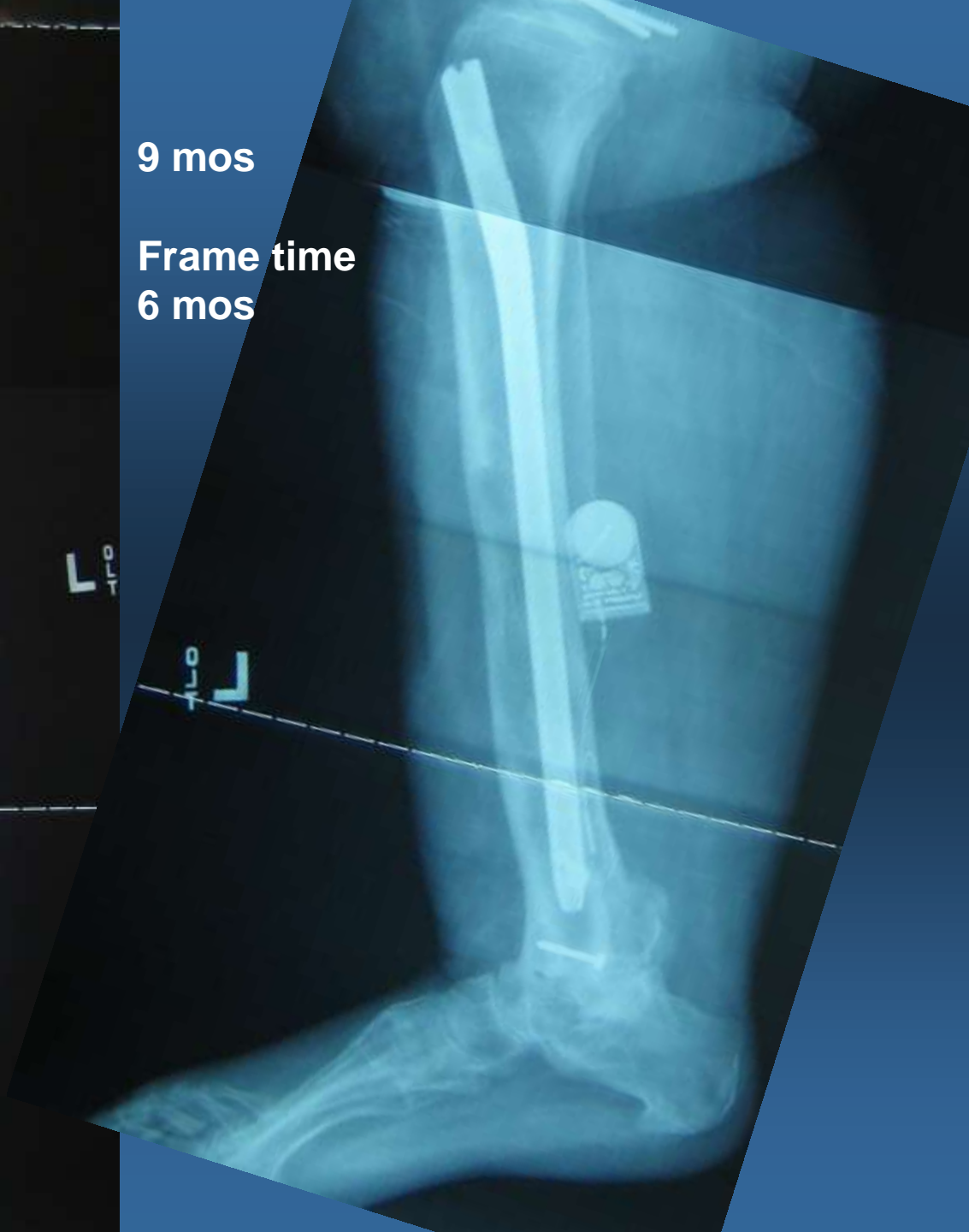






9 mos

Frame time
6 mos

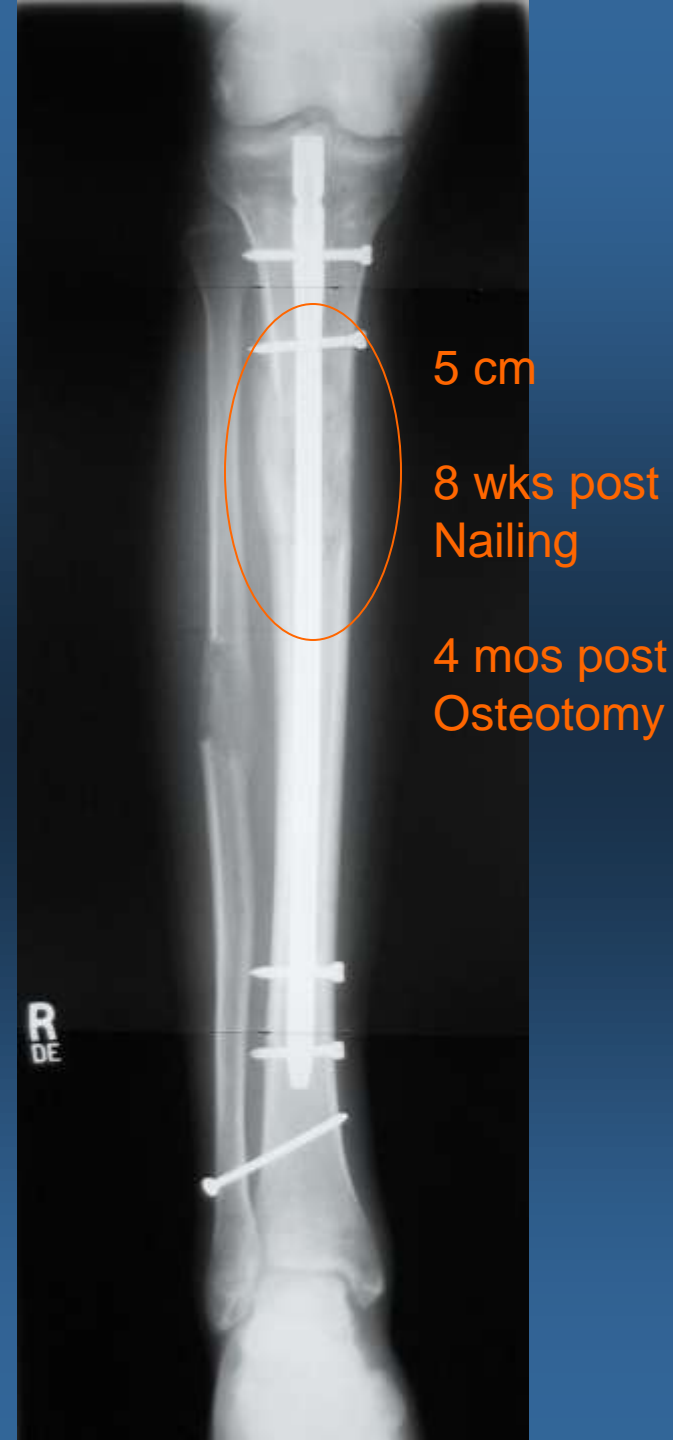


Discussion

- LATN seems to be effective and safe
- Compared to classic method, time in frame is significantly less
- Bone Healing is hastened
- Protects against refracture
- No nonunions

Discussion

- Further study of LATN is warranted
 - Increased biomechanical stability of nail construct
 - Longer and wider nail
 - Biology of regenerate reaming
 - Autogenous bone graft, closed
 - Stimulate release of growth factors ???



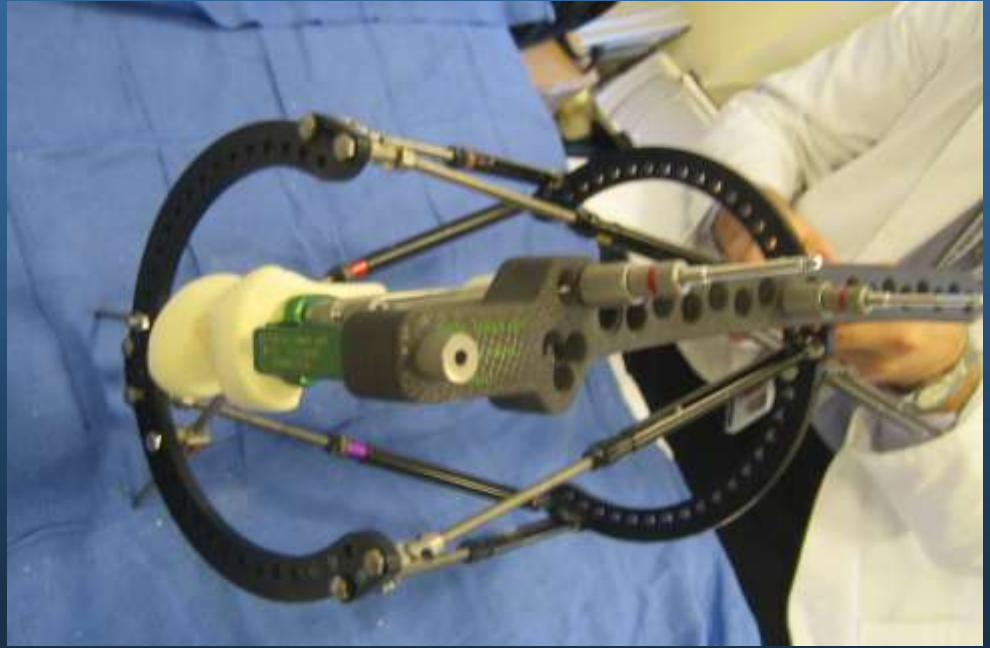
Lengthening and Then Plating

LAP

Goals

- Decrease time in frame
- Prevent refracture of regenerate
- Correct periarticular deformity
- Osteotomy distal femur or proximal tibia









Methods

- 13 patients, 15 bone segments
- Femur (6); tibia (9)
- Etiology
 - Congenital (4)
 - Malunion (4)
 - Bone defect/ transport (4)
 - Polio (1)
 - Growth arrest (2)

Results

- Lengthening: 3 cm (0.5- 5.3)
- time in frame: 2.6 months (1.7-5)
- EFI: 1.0 (0.5-2.4)
- FWB/healing: 9.5 weeks (4.7-14)
- No deep infections



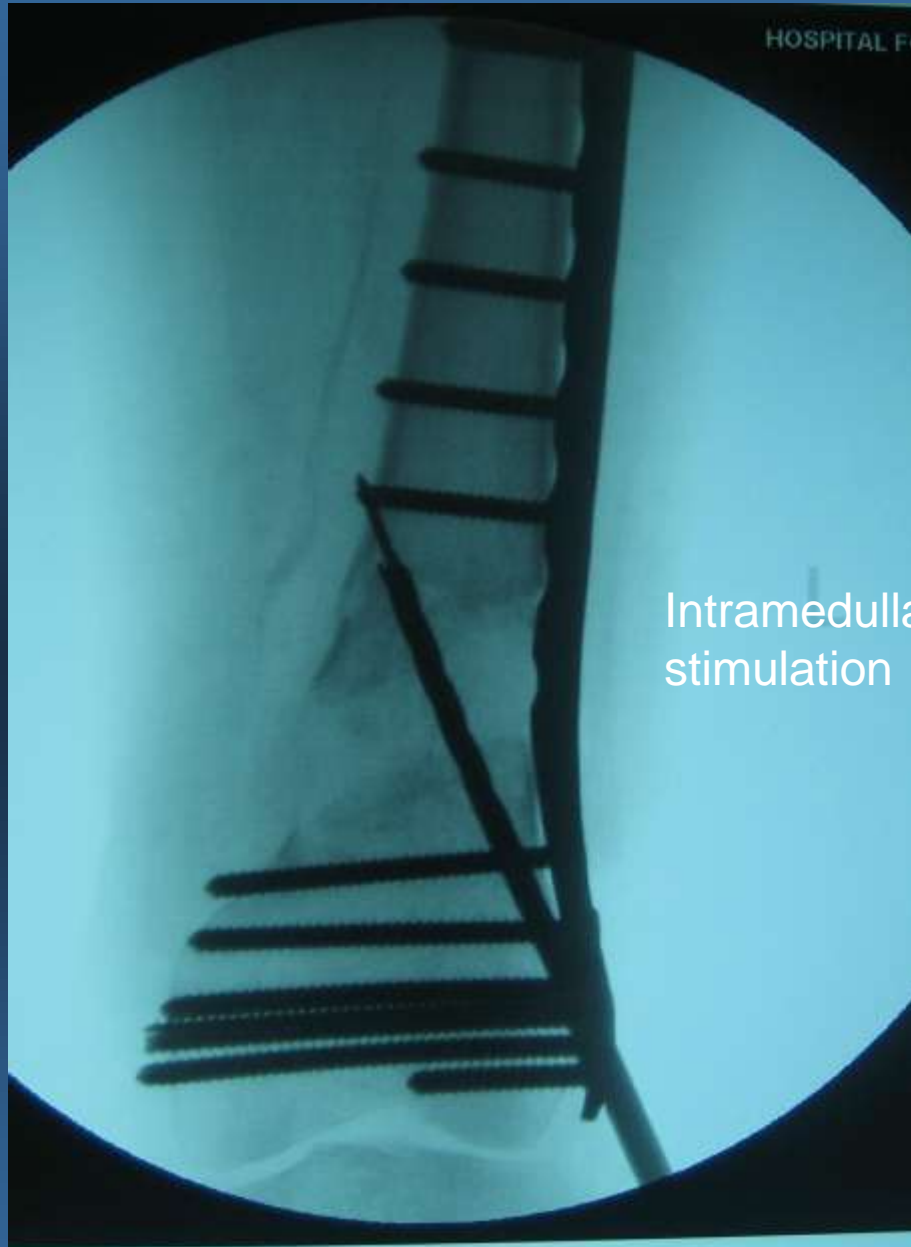
Polio
LLD
Flexion deformity
Weak quads

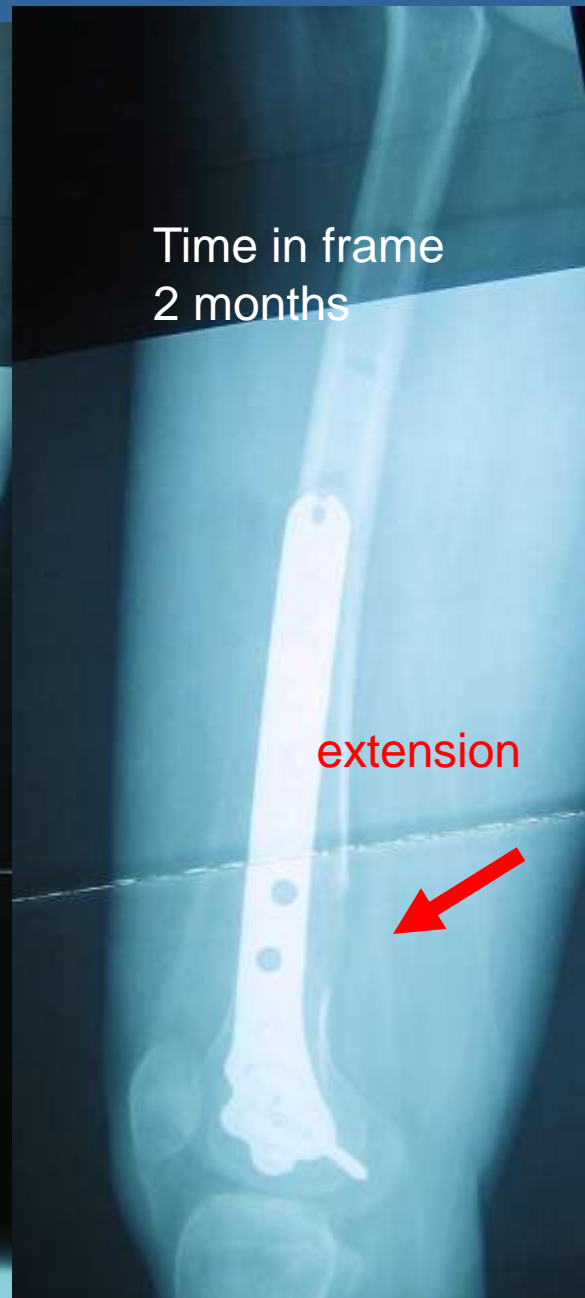


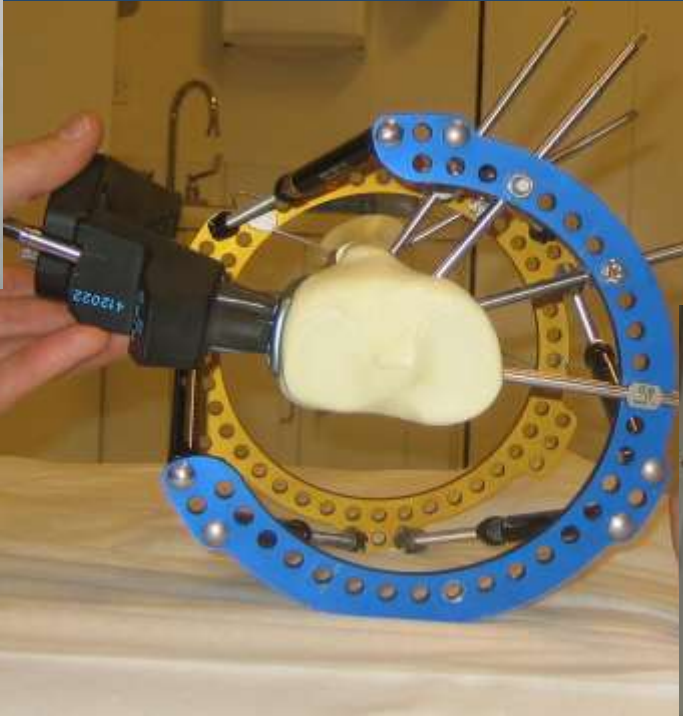












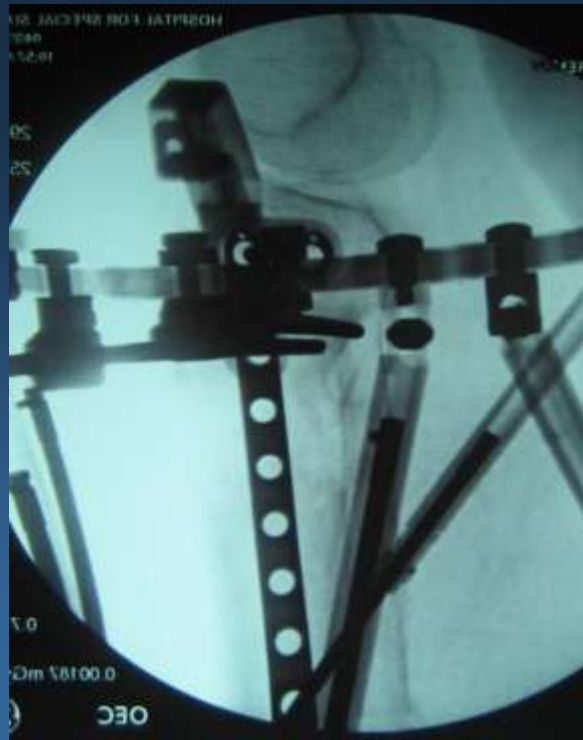


MONITOR OEC #3

#3









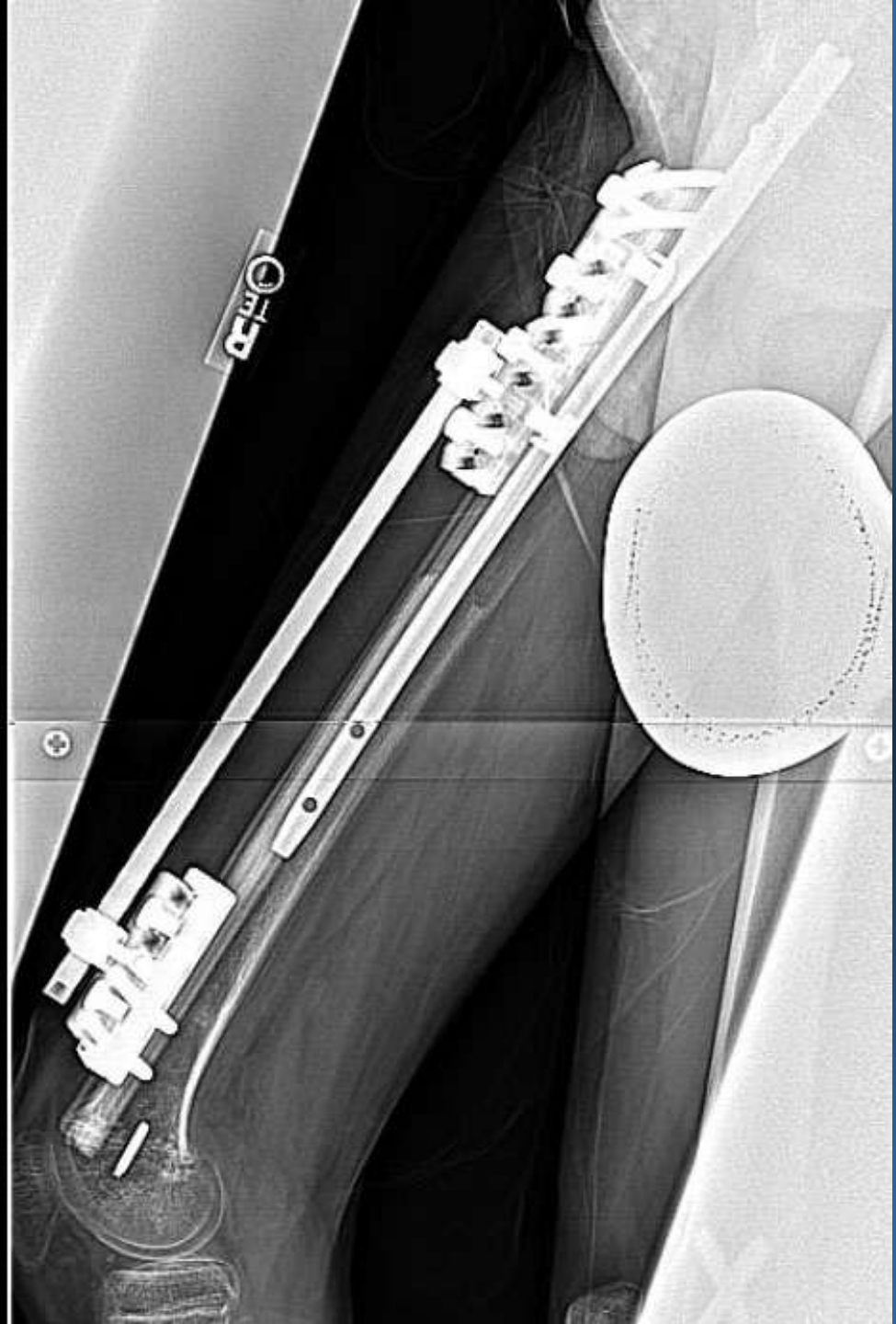
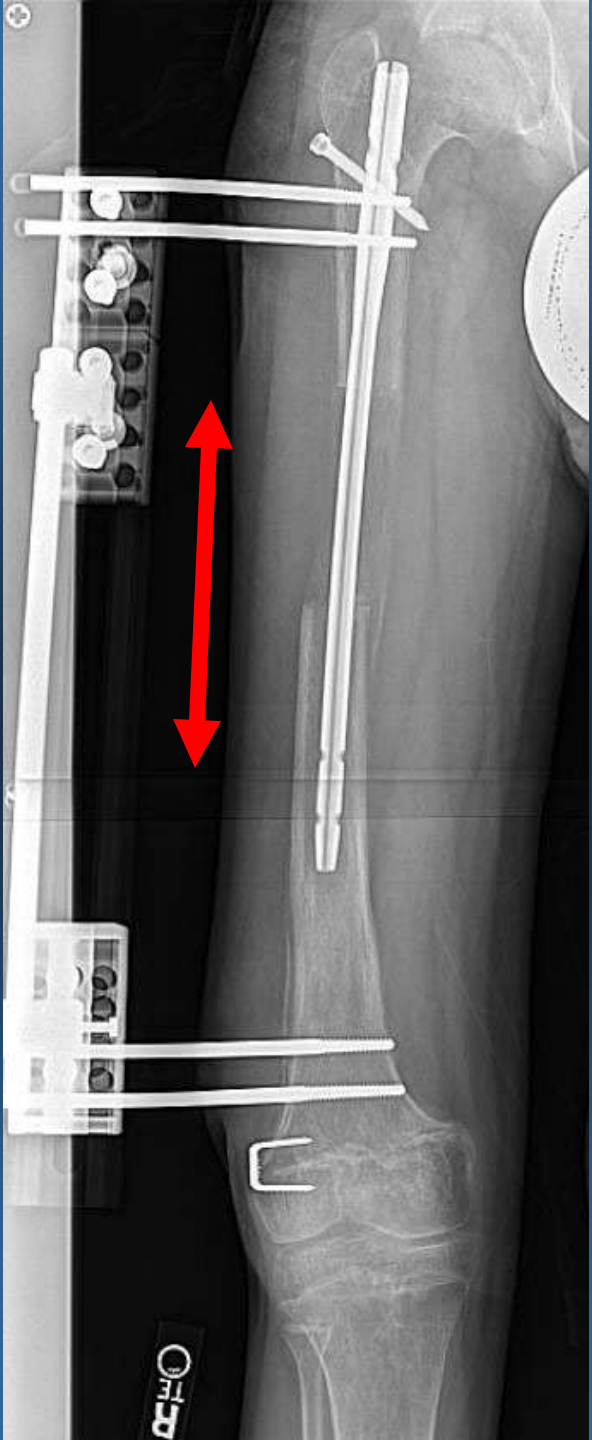


LAP

- Can be effective for decreasing time in frame and preventing refracture
- Effective for correcting periarticular deformity
- Opportunity to stimulate regenerate in OR with drilling and injection (Harvest)
- Promising technique

Lengthening over a Nail LON

- Paley (JBJS 1997) compared to classic femoral lengthening
- Decrease time in frame
- Quicker rehab and knee ROM recovery
- Protects against refracture





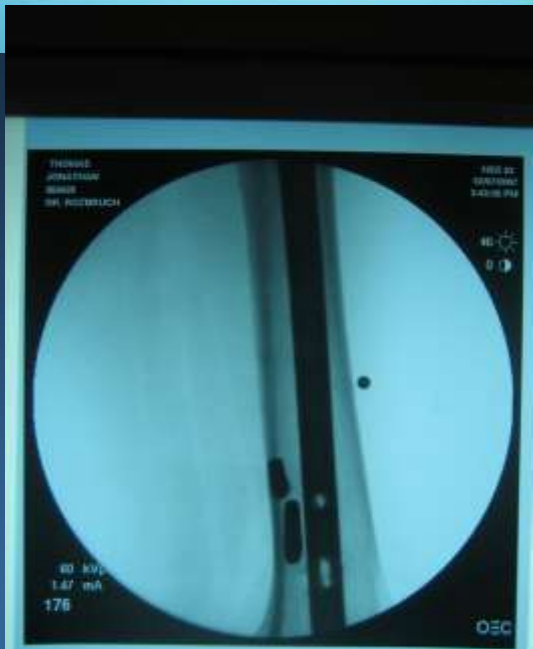
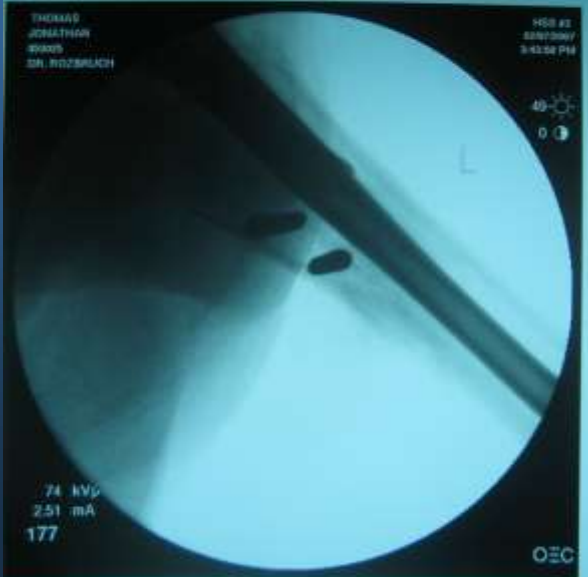
In frame
3 mos





Lengthening
Over an
Existing
IMN

LLD 3 cm



HSS #3

THOMAS
JONATHAN
959025
DR. ROZBRUCH

HSS #3
02/07/2007
3:56:56 PM

44
2

65 kVp
1.85 mA
182

OEC

THOMAS
JONATHAN
959025
DR. ROZBRUCH

HSS #3
02/07/2007
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45
0

65 kVp
1.85 mA
179

OEC





2.5
mo

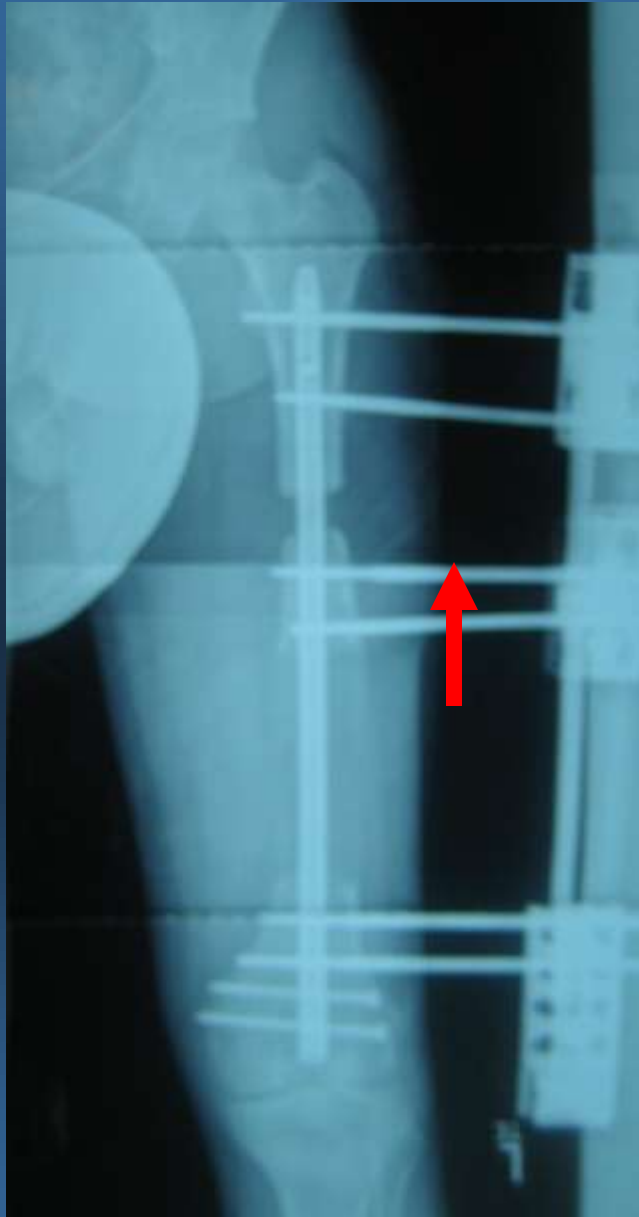


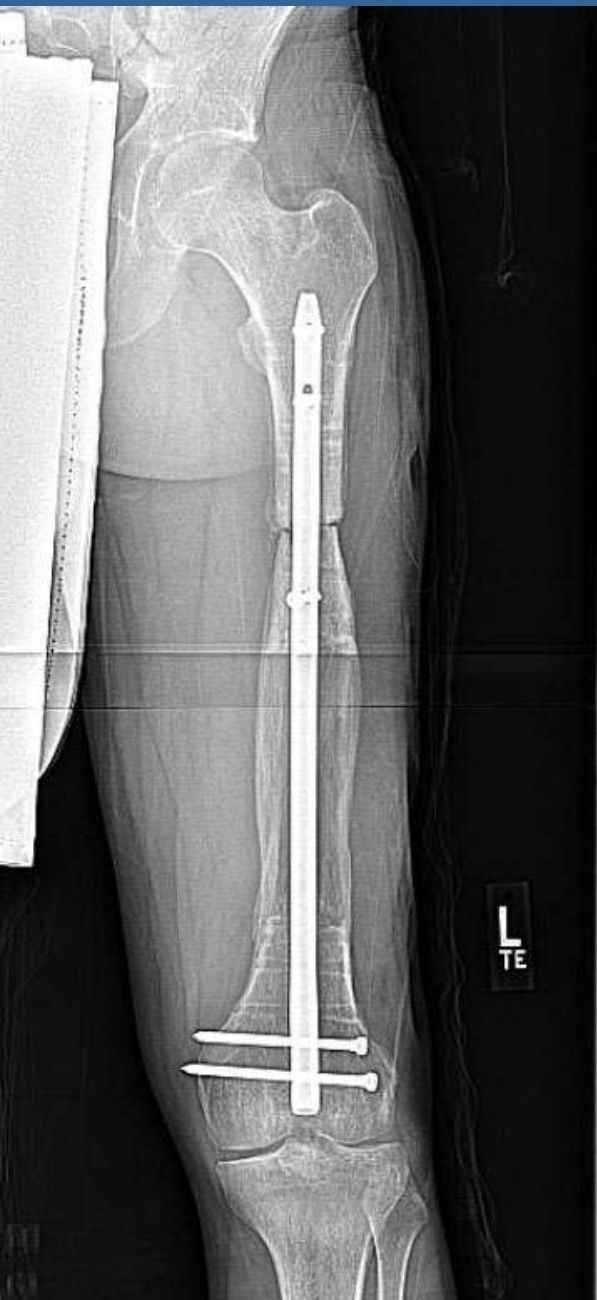
Reconstruction of the Femur with Osteotomy Around an Existing Intramedullary Nail

- Presented at LLRS 2007, Chicago
- 6 patients
- 2.5 cm lengthening
- Frame time 35 days
- EFI: .49 mo/cm
- BHI: 1.13 mo/cm
- No deep infections, refractures

Bone Transport Over a Nail







Time in frame 4 months

Summary of Hybrid techniques

- Combine best of internal and external fixation
- Use ex fix for gradual distraction
- Use internal fixation to stabilize during consolidation
- Decrease frame time
- Protect against refracture
- Technical details about frame application
- Concern over deep infections

Thank You



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