Distal Femur Fractures ORIF

Trauma 101
2019

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University of Cincinnati

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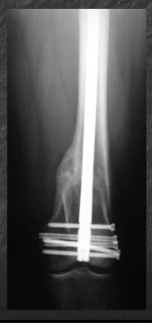
ORIF Distal Femur

- Technique focused
- Not IMN vs plate



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ORIF Distal Femur

Anatomy

- Main deforming forces
  - Pull of gastrocs and quads
  - Extension deformity
  - Rotation of condyles

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ORIF Distal Femur

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  - Pull of gastrocs and quads
  - Extension deformity
  - Rotation of condyles
- Alignment: 7-11° valgus
  - 95° implants

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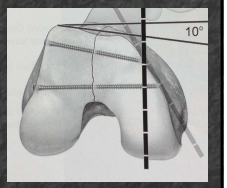
ORIF Distal Femur

Anatomy

- Main deforming forces
  - Pull of gastrocs and quads
  - Extension deformity
  - Rotation of condyles
- Alignment: 7-11° valgus
  - 95° implants
- Trapezoidal shape



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Goals

- Avoid varus
  - Aiming for 5-10° anatomic valgus
- Anatomic reduction of joint
- Stable fixation to allow early ROM

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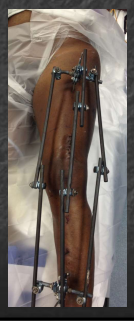
Initial Treatment To Ex Fix or Not

- Allows for elective scheduling
- CT with reduction
- Mobilize while waiting
- Use as reduction aid in surgery
- Not necessary every case
  - Soft tissue more forgiving vs prox tibia



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Evaluation

- CT in all DF fxs
- Preferably after ex fix

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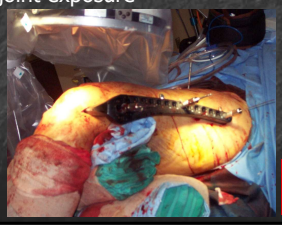
Position

- Supine on Jackson
  - Allows visualization of hip
  - Standard cases, joint exposure
  - Triangle
- Lateral
  - Periprosthetic
  - Pure SC
  - Nonunion



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Approach

- Lateral
  - SC or simple split
  - Extend to Gerdy's for more exposure

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Approach

- Lateral parapatellar
  - More joint exposure
  - Hoffa fxs

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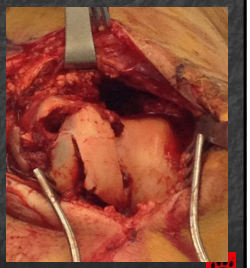
Approach

- Lateral parapatellar
  - More joint exposure
  - Hoffa fxs
- Can allow shortening to relax quads



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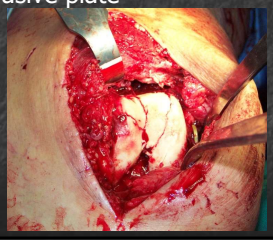
Approach

- Medial parapatellar option
- Lateral min invasive plate



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Approach

- Medial parapatellar option
- Lateral min invasive plate

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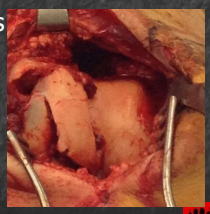
ORIF Distal Femur

- Articular reduction first
- Pointed tenaculum clamps
- Hoffa first then IC fx
- K-wires
- 3.5mm or smaller screws
  - Lag and countersink



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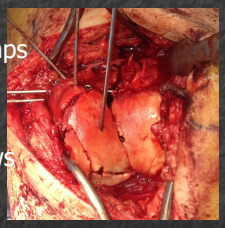

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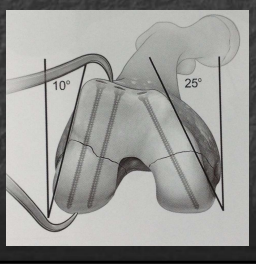
ORIF Distal Femur

- Remember the shape of the femur



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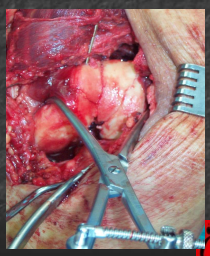
ORIF Distal Femur

- Clamp across IC fx at Blumensaats



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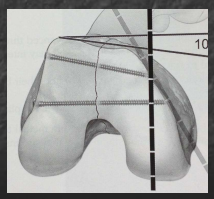
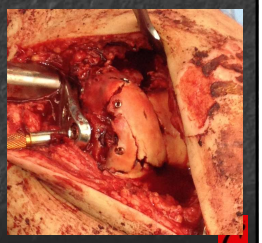
ORIF Distal Femur

- IC screws anterior and distal to plate





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ORIF Distal Femur

- IC screws anterior and distal to plate

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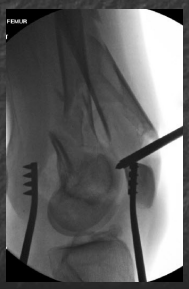
ORIF Distal Femur

- Condyles to the shaft
- Extension deformity
- Use ex fix to help, flex knee



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ORIF Distal Femur

- Condyles to the shaft
- Extension deformity
- Use ex fix to help, flex knee
- Joysticks, Schantz pin

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ORIF Distal Femur Sagittal Plane

- Simpler fxs direct reduction
- Lag or small plates
- Alignment and length
- Read off lateral cortex

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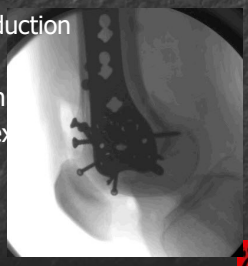
ORIF Distal Femur Sagittal Plane

- Simpler fxs direct reduction
- Lag or small plates
- Alignment and length
- Read off lateral cortex
- Match plate and DF contour



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ORIF Distal Femur Coronal Plane

- Hardest for me to get correct
- C-arm limited view
- Implants with 95° alignment wire
- ? accuracy of C-arm image and position of wire
- Flex in wire, can help

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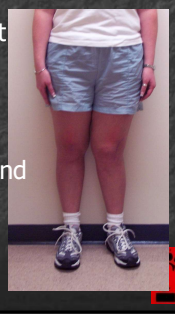

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ORIF Distal Femur Coronal Plane

- Techniques to use
- Alignment wire

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ORIF Distal Femur Coronal Plane

- Techniques to use
- Alignment wire
- Intraop plain xray
  - Metaphyseal comminution
- Check mech axis with bovie

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ORIF Distal Femur Plate Application

- Locking plate, polyaxial
- Fix distal and prox with wires
- Cortical screws in shaft
  - Still allows adjustment of alignment of joint

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ORIF Distal Femur Plate Application

- Locking plate, polyaxial
- Fix distal and prox with wires
- Cortical screws in shaft
  - Still allows adjustment of alignment of joint
  - Whirlybird
- Clamp plate to bone

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ORIF Distal Femur Plate Application

- Locking screw distally
- Final check of alignment, length, rotation

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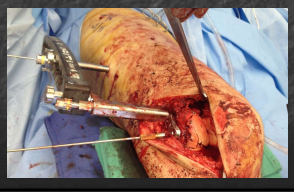
ORIF Distal Femur Plate Application

- Locking screw distally
- Final check of alignment, length, rotation



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ORIF Distal Femur Plate Application

- Check mechanical axis with bovie

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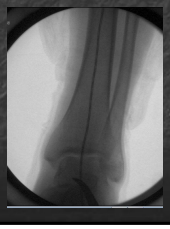
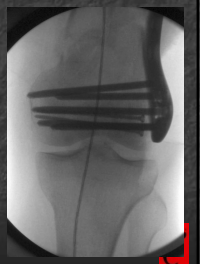
ORIF Distal Femur Plate Application

- Check mechanical axis with bovie





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ORIF Distal Femur
Internal Ex Fix

- Highly comminuted metaphyseal, leave medial side untouched

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ORIF Distal Femur
Internal Ex Fix

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ORIF Distal Femur
Internal Ex Fix

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ORIF Distal Femur
Internal Ex Fix

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Implant stiffness

- Implants/constructs with high stiffness associated with increased failures

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Implant stiffness

- Stiffness modulated by:
- Increased plate length (>8 holes, Ricci et al)
- Increased working length
- Spread between shaft screws
- Nonlocking screws in shaft
- Far cortical locking

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Summary

- Remember the trapezoidal shape
- Alignment, alignment, alignment
- Intraop xrays
- Simple fxs, direct reduction
- Comminuted fxs, indirect

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Life is short, Have some fun

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THANK YOU!!!

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Lightning Tips
Distal Femur

JW

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- Trend for IMN fixation of DF fx, including articular fxs
- I wanted to review the selection of DF nails.
- Dr Beltran has done this already
- JOT 2015

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Management of Distal Femur Fractures With Modern Plates and Nails: State of the Art

Michael J. Beltran, MD, Joshua L. Gary, MD,† and Cory A. Collinge, MD‡*

JOT 2015;29:165-172

Nail System	Manufacturer	Distal Screw Options	Fixed Angle Screws?	Distance from Nail Tip to Prox Screw	Radius of Curvature	Driving End Diameter*
RAFN	Depuy-Synthes	3: All transverse: may use spiral blade in distal hole.	Yes- Distal only w/ end cap	65mm	1.5m	12mm
T2 Supracondylar Nail (SCN)	Stryker	4 Screws: 2 Transverse. 2 Oblique: may use 2 condyle bolts/nuts	Yes- Distal screw only w/ end cap	32mm	2.0m	12mm
Meta-Nail	Smith and Nephew	3 Screws: 1 Transverse and 2 Oblique	Yes- Distal screw only w/ end cap	40mm	2.0m	12mm
Phoenix	Biomet	4: 2 Transverse. 2 Oblique	Yes- all 4 screws w/o end cap	38mm	1.8m	12mm
Natural Nail	Zimmer	4: 2 Transverse. 2 Oblique	Yes- Distal screw only w/ end cap	48mm	1.27m	13mm

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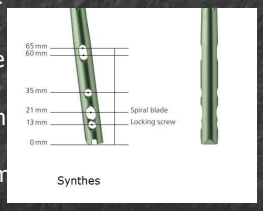
Depuy Synthes R/AFN

- 3 screws, all transverse
- Spiral blade option
- Distal screw fixed angle with end cap
- Most distal 13 mm from end
- Most proximal 60-65mm



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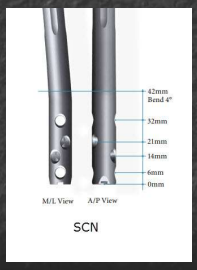
Stryker SCN

- 4 screws, 2 transverse and 2 oblique
- Fixed angle: distal screw with end cap
- Most distal screw 6mm from end
- Proximal 32mm from end



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Stryker SCN

- 4 screws, 2 transverse and 2 oblique
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- Proximal 32mm from end

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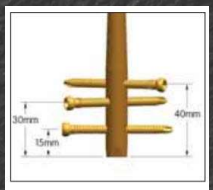
Smith & Nephew MetaNail

- 3 screws, 1 transverse, 2 oblique
- Fixed angle: all 3 with threaded internal bushing
- Most distal screw 15mm from end
- Proximal screw 40mm



Driving End of Nail
S&N MetaNail

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Smith & Nephew MetaNail

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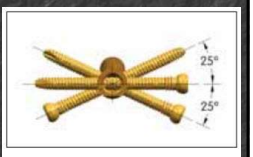
- Most distal screw 15mm from end
- Proximal screw 40mm



Top View of Nail
S&N MetaNail

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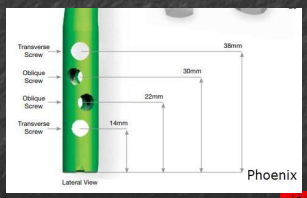
Biomet Phoenix

- 4 screws, 2 transverse 2 oblique
- All 4 fixed angle without end cap
- Most distal screw 16mm from end
- Proximal 38mm



Phoenix

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Biomet Phoenix

- 4 screws, 2 transverse 2 oblique
- All 4 fixed angle without end cap
- Most distal screw 16mm from end
- Proximal 38mm

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Zimmer Natural

- 4 screws, 2 transverse, 2 oblique
- Fixed angle: distal screw only with end cap
- Distal screw 12mm from end of nail
- Proximal 48mm

56

Zimmer Natural

- 4 screws, 2 transverse, 2 oblique
- Fixed angle: distal screw only with end cap
- Distal screw 12mm from end of nail
- Proximal 48mm
- Unique locking into post femoral condyles

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