



# **Femoral Fractures**

## ***How To Avoid Malreduction ?***

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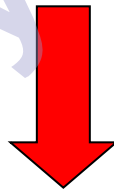
***Çankaya Hospital***  
***Dept. Orthopedics and Traumatology***  
***Ankara, TURKEY***

***AO Masters Course***  
***Prague, 2013***



# Femoral Fractures

- **Intertrochanteric fractures**
  - Sliding hip screw
  - Cephalomedullary nail
- **Subtrochanteric fractures**
  - Antegrade nail
  - Bridge plate
- **Diaphysial fractures**
  - Antegrade nail
  - Retrograde nail
  - Bridge plate ?
- **Distal femoral fractures**
  - Bridge plate
  - Retrograde nail



**Biological fixation**



# Biological Fixation

- **Closed indirect reduction**
- **Minimally invasive open techniques**

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# Intertrochanteric Fractures

- **Proximal fragment**

- Hip abductors → varus
- Short rotators → external rotation

- **Distal fragment**

- Adductors → external rotation and shortening

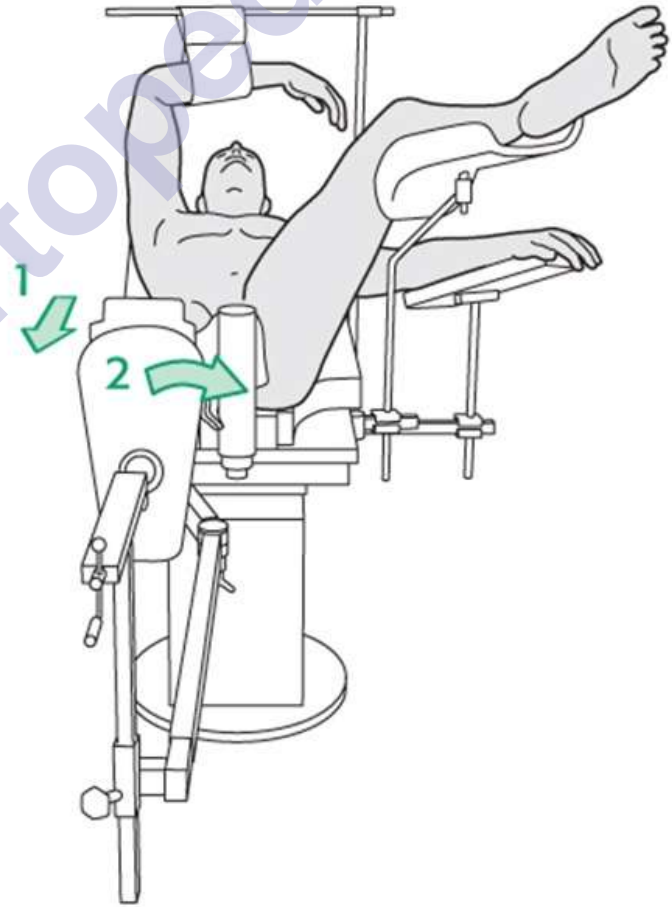
- **Posteromedial comminution**

- Posterior sag !



# Stable Fractures

- Fracture table
- Supine
- Usually by internal rotation
- Abduction for varus



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# IM Nail

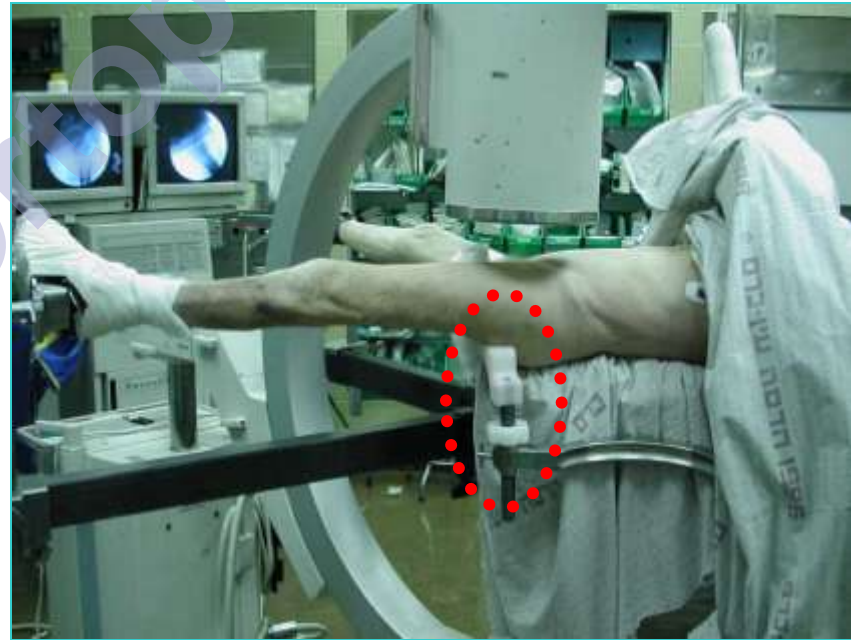
- **Leg adducted**
- **Chest shifted 10-15° off midline**
- **Varus malalignment**
  - ↑ traction
  - Percutaneous pins as joystick





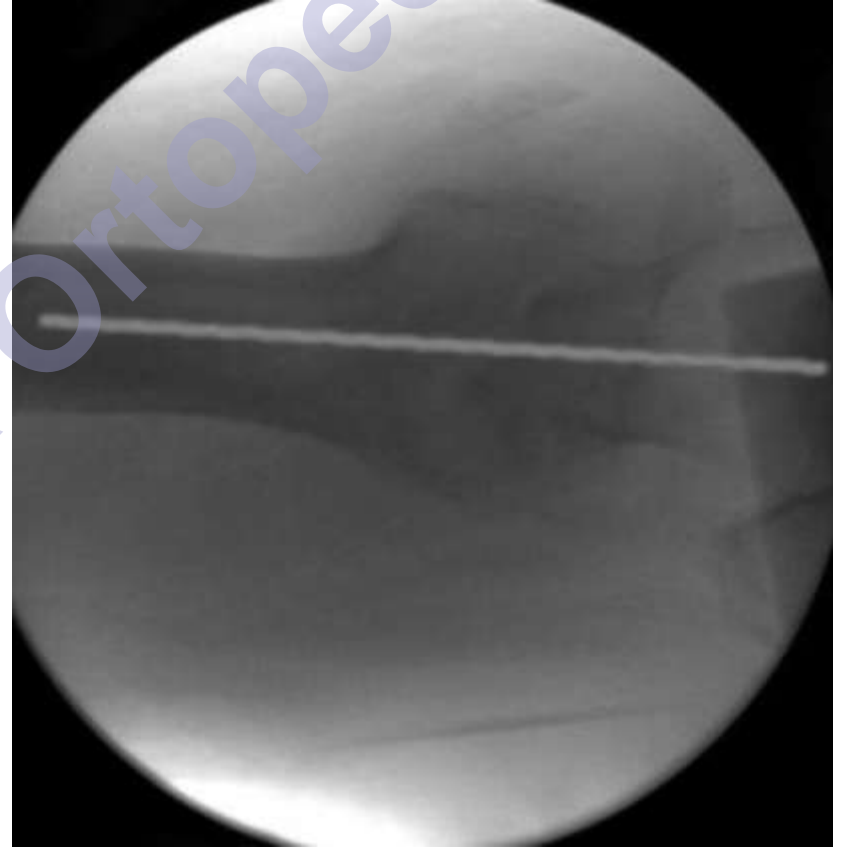
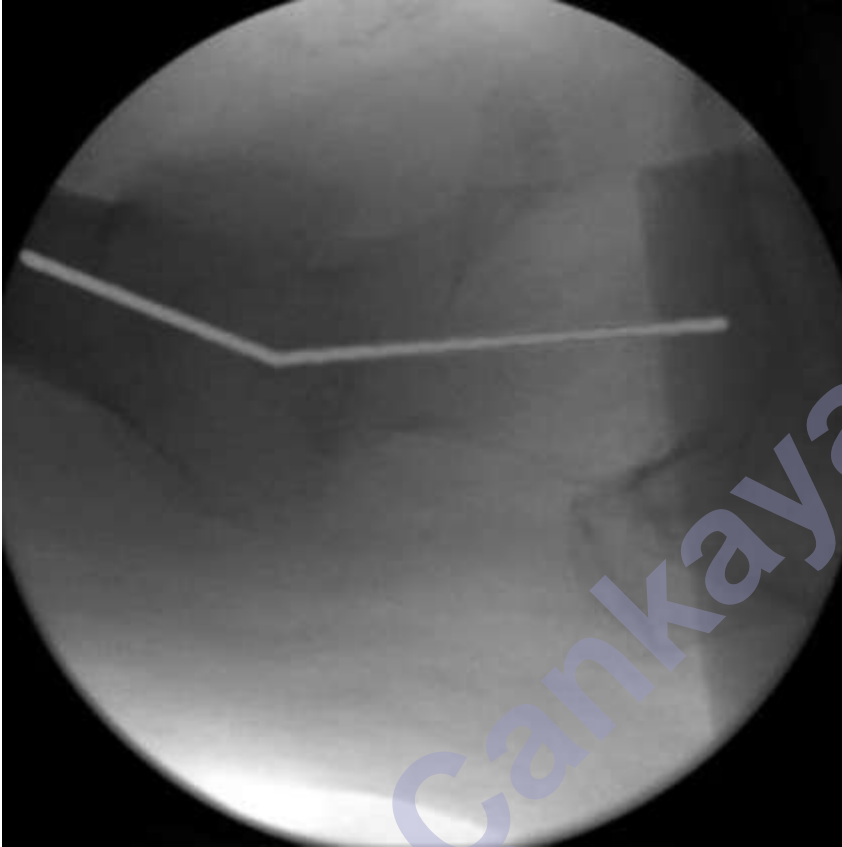
# Posterior Sag

- **External rotation – elevation**
- **Supports**
  - Crutch
  - Platform attachments
- **Open reduction**
  - Overlapping between fragments
- **Lateral decubitus position ?**





# Posterior Sag



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# Varus Malreduction

- **↑ load on proximal femur**
- **↑ moment arm on implant**
- **↑ risk of implant failure**

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# IM Nail

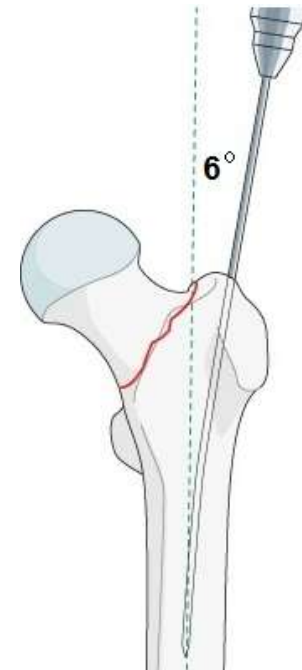
- **Nail does not help reduction**
- **Fracture must be reduced before nailing**
- **Correct entry point**

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# Entry Point

- At or medial to the tip
- Lateral → varus



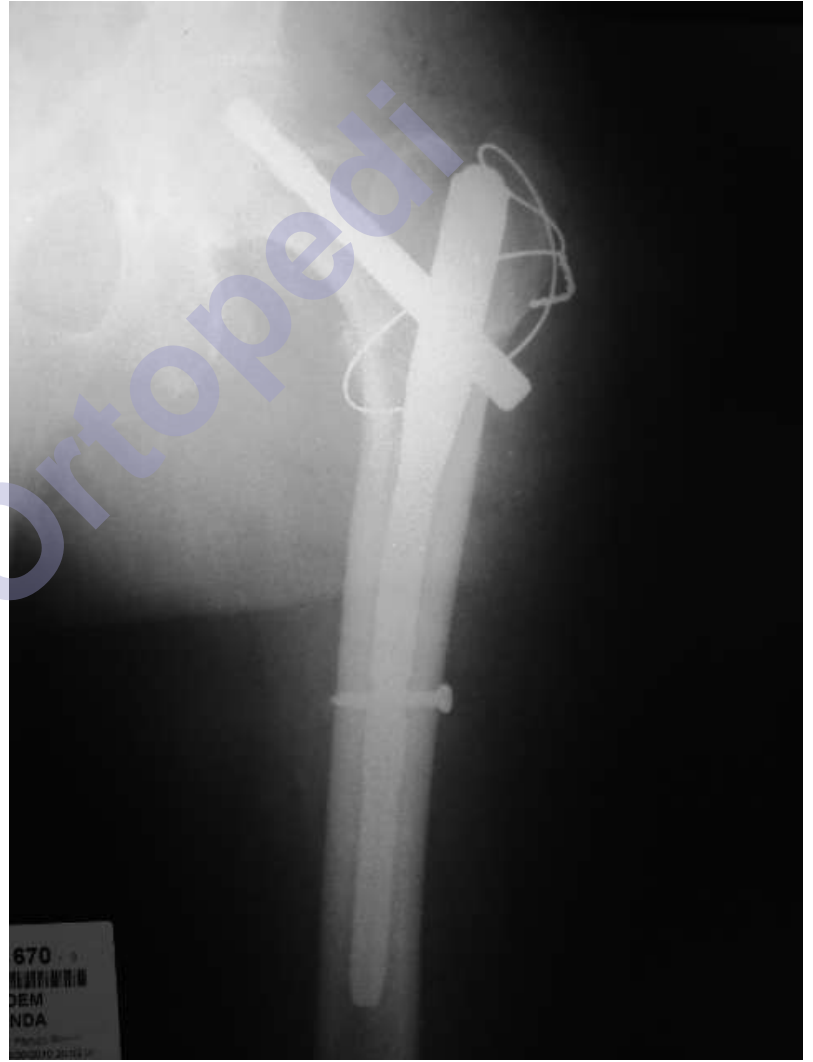
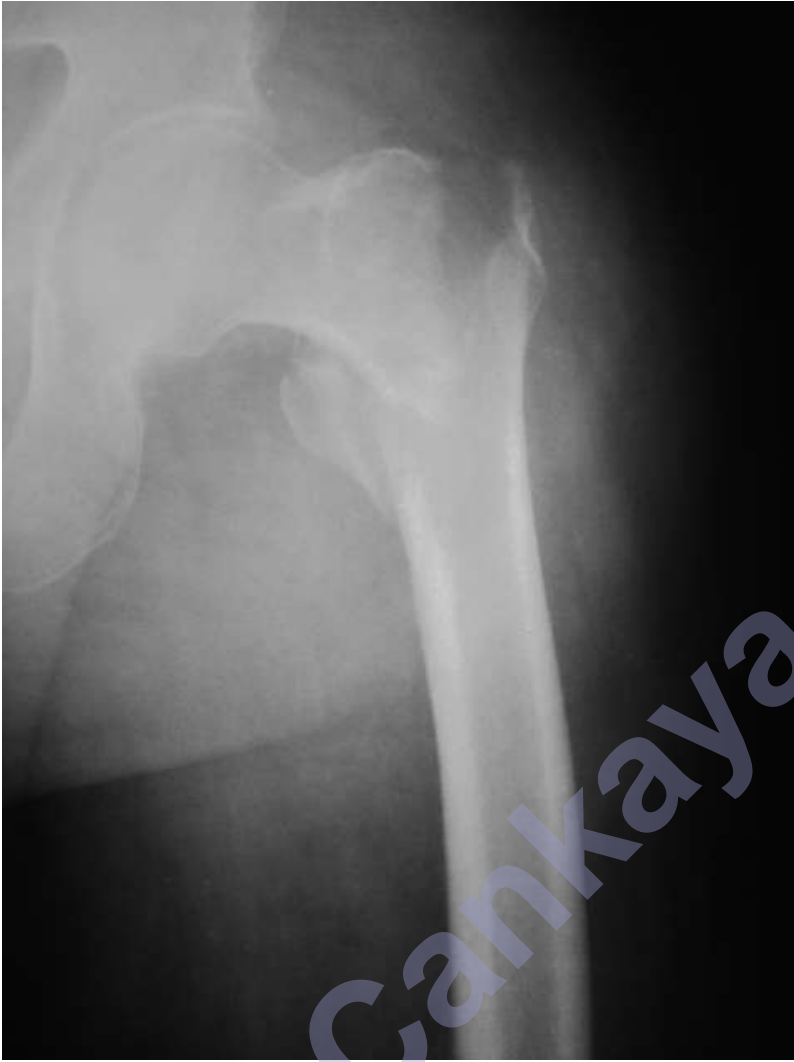
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# Proximal Reaming

- **Displaced trochanteric fragment !!**
- **Do not ream through fracture line**
  - Fracture gap
  - Varus malalignment

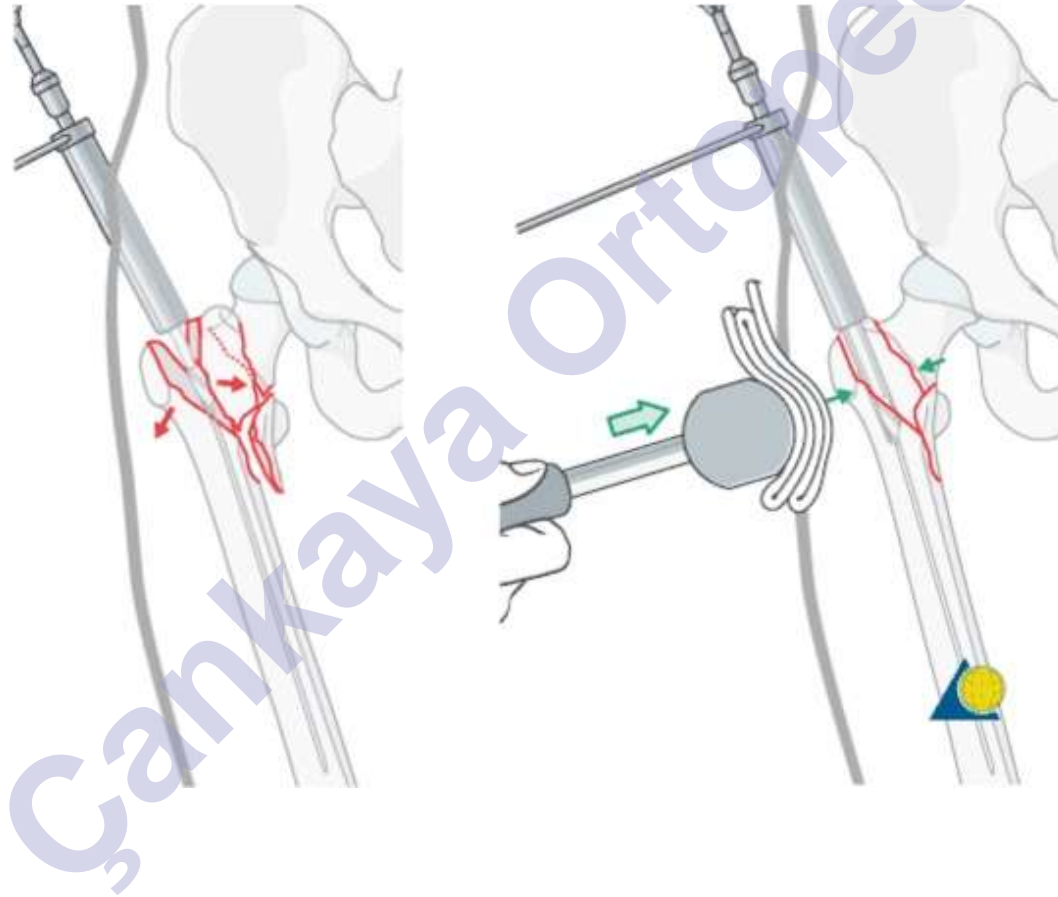
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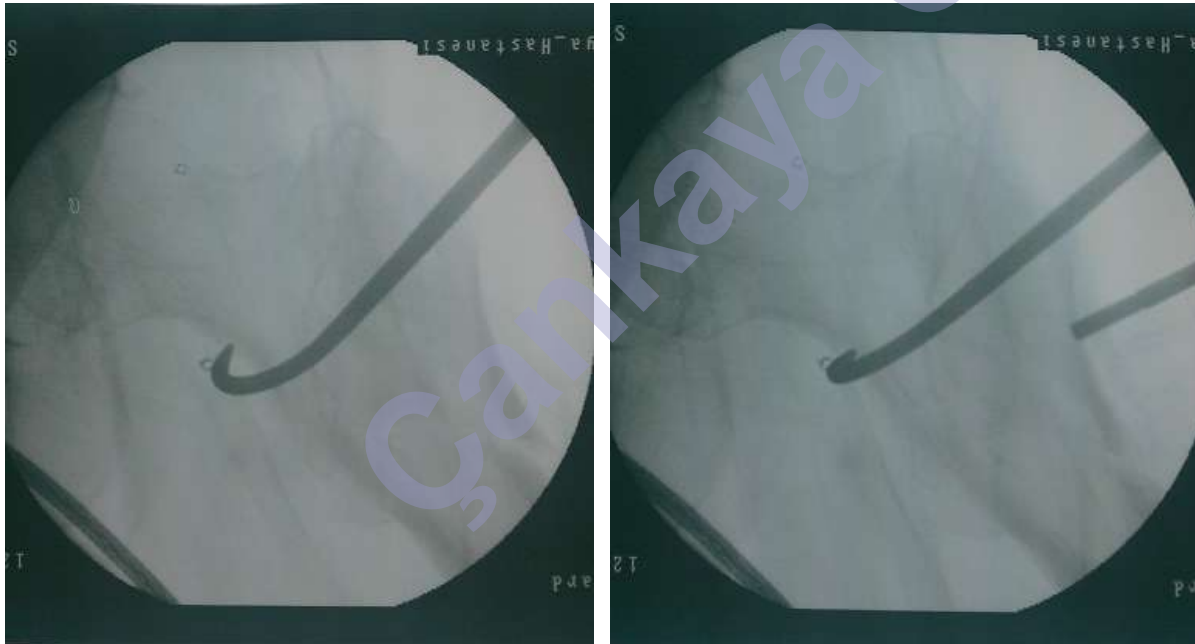
# Reduction Tools





# Open Reduction

- **Limetted access to fragments**
- **Prefer percutaneous techniques**

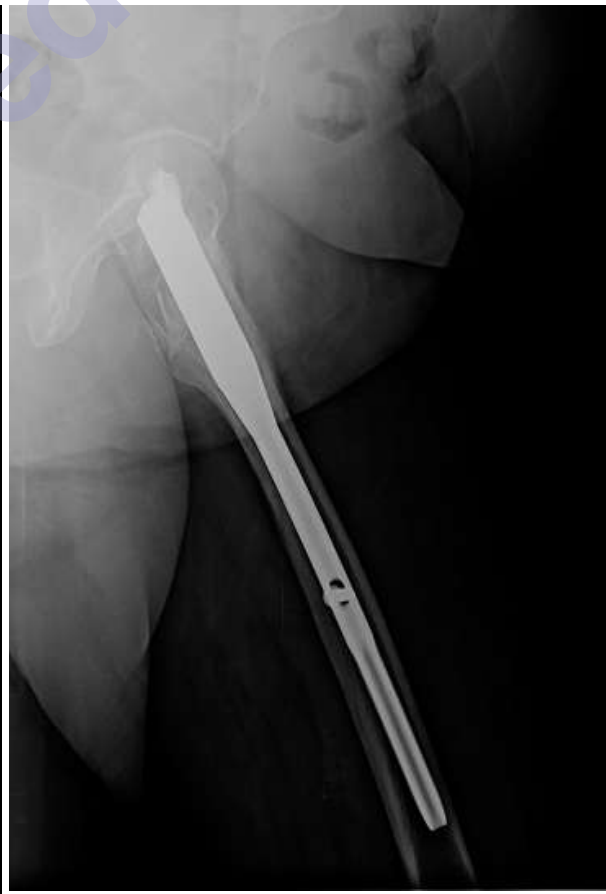




# Reduction Tools



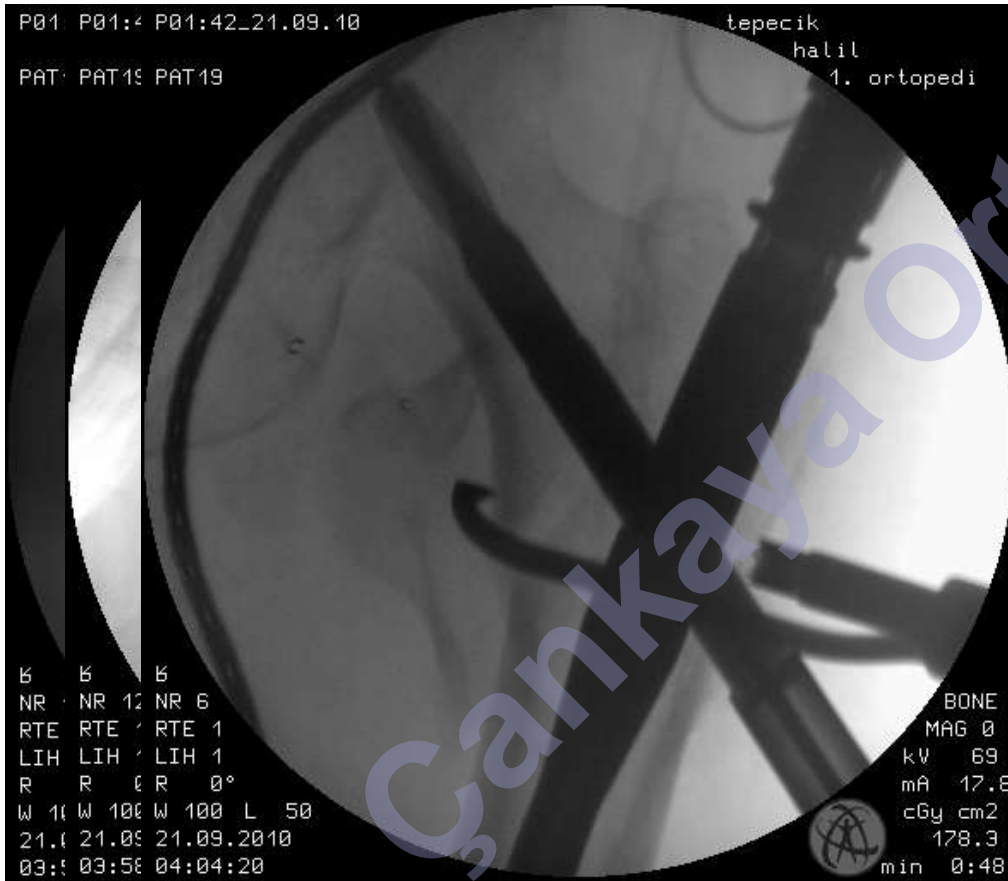




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# Reduction Tools





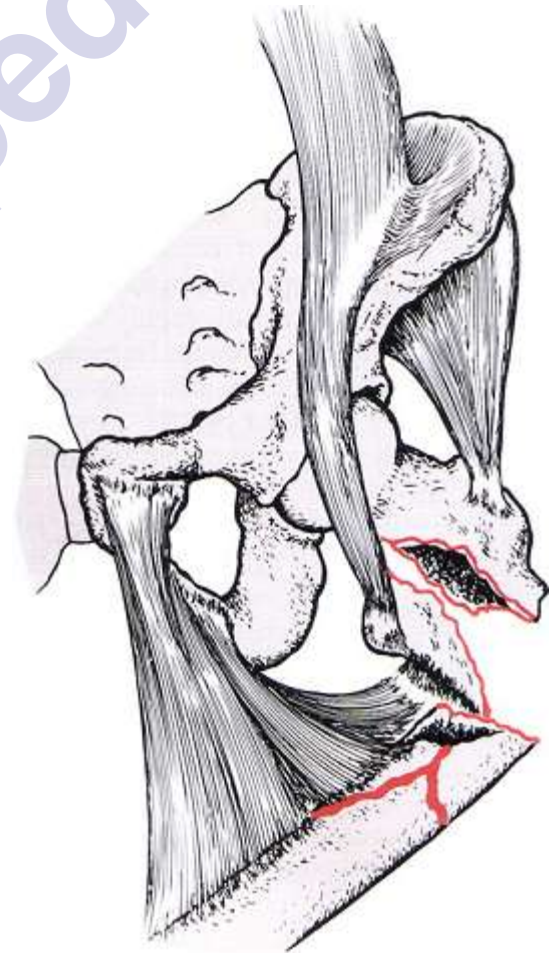
# Subtrochanteric Fractures

- **Proximal fragment**

- Iliopsoas → flexion
- Hip abductors → varus
- Ext. rotators → ext. rotation

- **Distal fragment**

- Adductors → adduction  
shortening





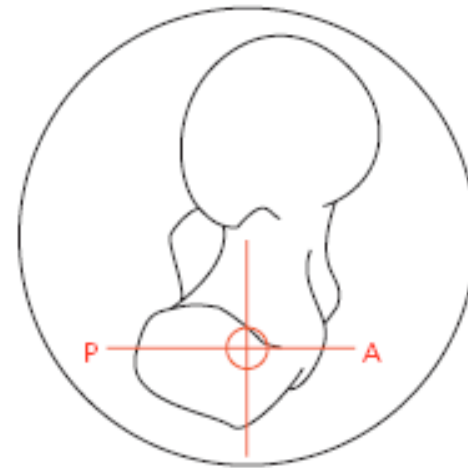
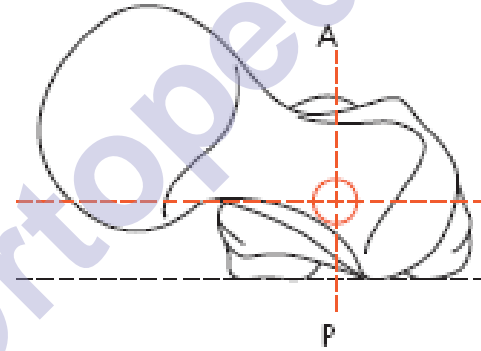
# Subtrochanteric Fractures





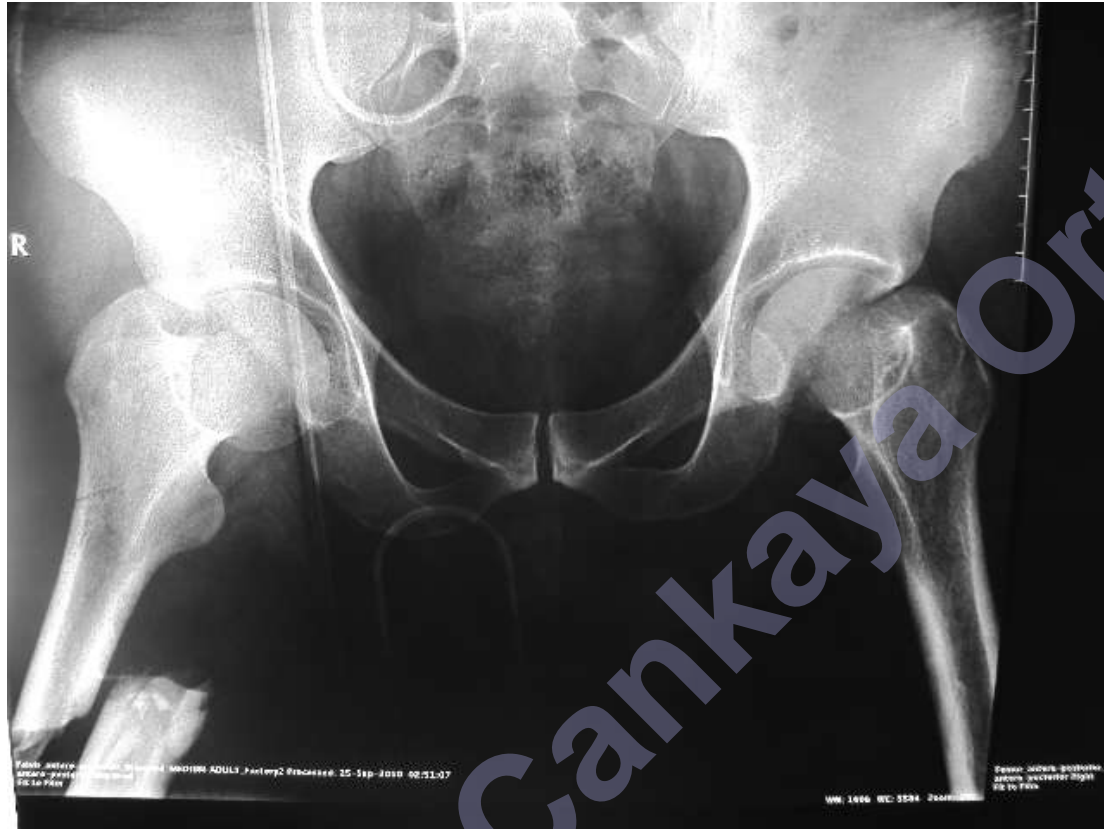
# Entry Point

- **Piriformis entry**
- **Trochanteric entry**
  - Just medial to tip
  - 1/3 ant – 2/3 post
- **Nail does not help reduction**
- **Lateral entry → varus**





# Varus Malreduction





# Flexion Deformity





# Reduction Tools

- **Bumps**
  - Buttock → ext. rotation
  - Distal fragment → flexion
- **Mallet**
- **Bone hook**
- **Ball spike pusher**
- **Shanz screw**
- **Colinear clamps**

***Till the end of reaming !!!***







# IM Reducer





# Blocking Screw

- **Flexion**

- Posterior
- Lateral → medial

- **Varus**

- Medial
- Anterior → posterior



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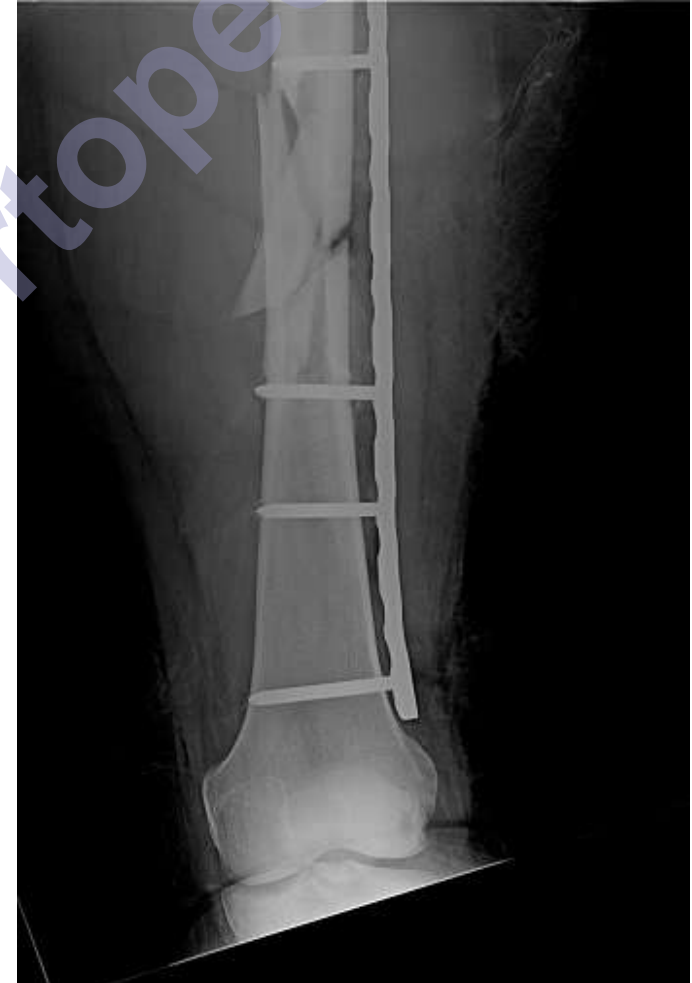
# Open Reduction

- **Mini-open**
  - Bone calmps
- **Cerclage cables**
  - Long oblique-spiral fractures
  - Percutaneous passer





# Diaphyseal Fractures





# Reduction

- **Closed**
- **Mini-open**
- **Nail helps reduction !**

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# Comminuted Fractures

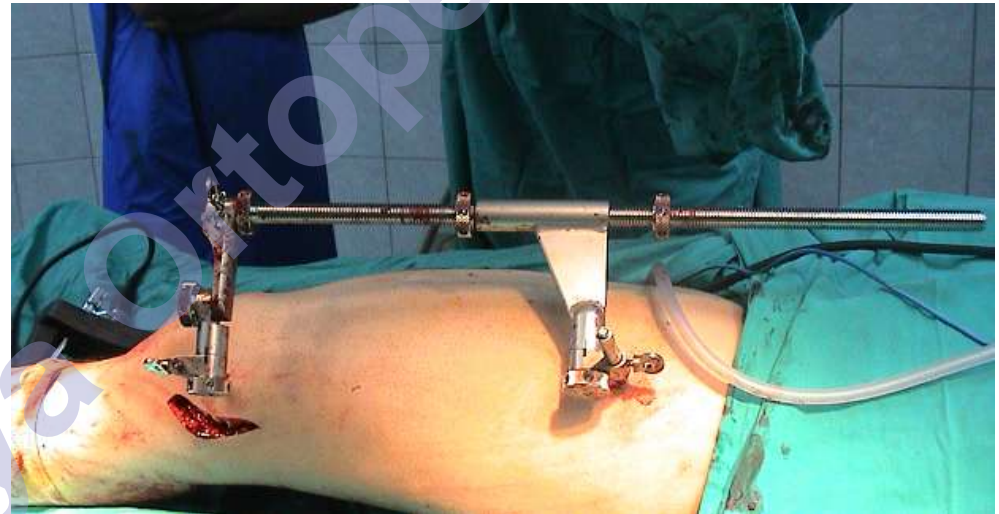
- Shortening
- Rotational deformity





# Comminuted Fractures

- **Traction table**
- **Femoral distractor**
  - IM nail
  - Bridge plate
- **Bridge plate**
  - Cortical screws help reduction





# Rotational Deformity

## Lesser trochanter sign



**Uninjured**



**Ext. rotation**



**Int. rotation**

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# Rotational Deformity

## Hip rotation test

- Uninjured extremity
- 90° flex. of hip and knee
- Pre-op evaluation
- Sterile draping of both sides





# Distal Femur Fractures

- **Extension**
  - Gastrocnemius
- **Shortening**
  - Quadriceps
  - Hamstring





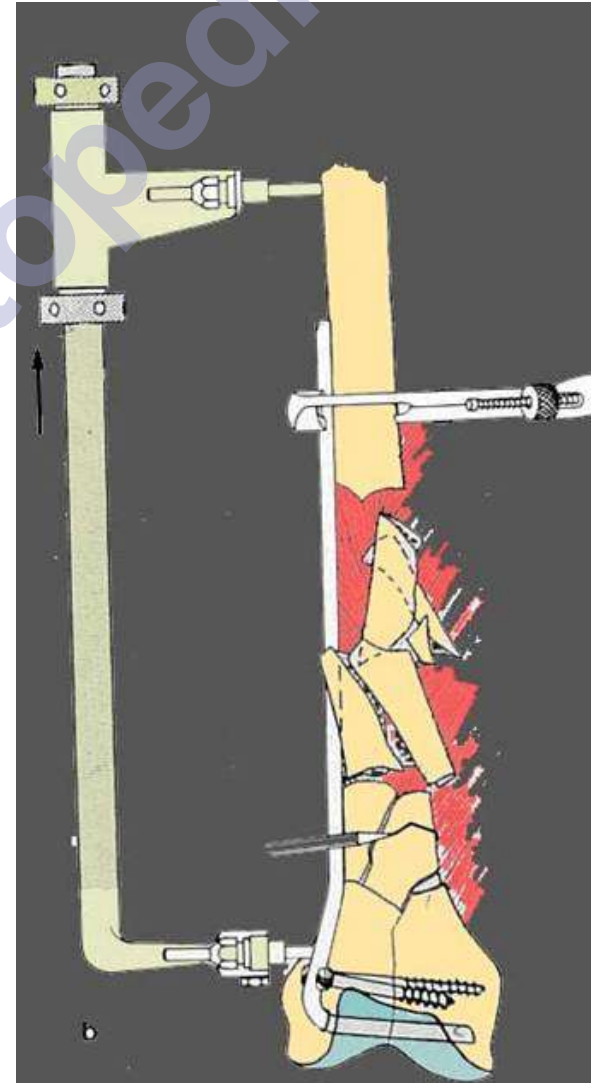
# Biological Fixation





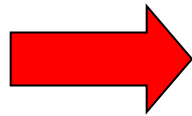
# Blade plate / DCS

Indirect reduction using plate





# Entry Point



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# Entry Point



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# Locked Plates

- Knee and hip flexion
- Bumps





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# Schanz Screw





# Schanz Screw





# Sagittal Reduction Control

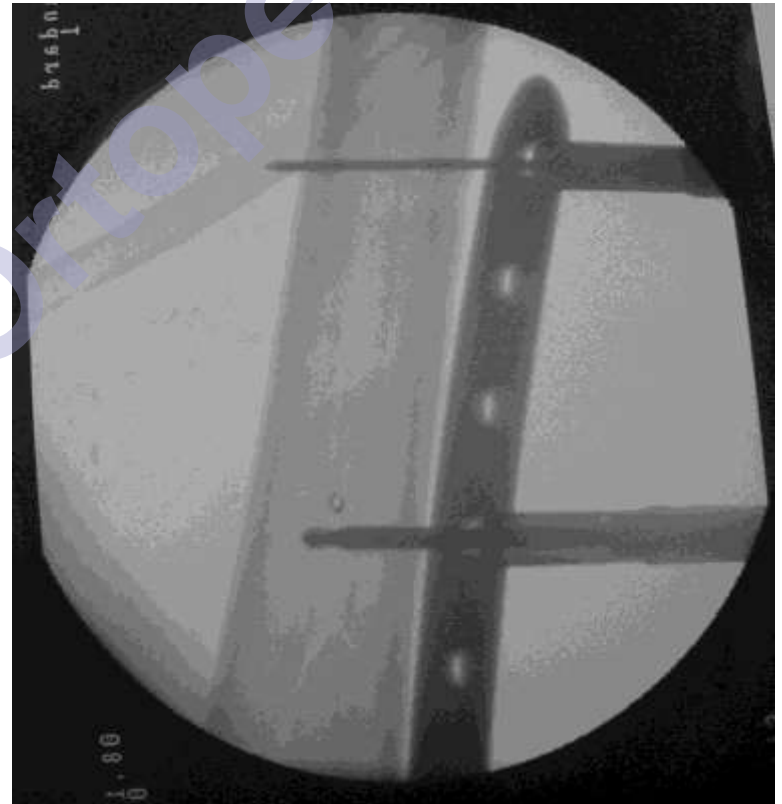
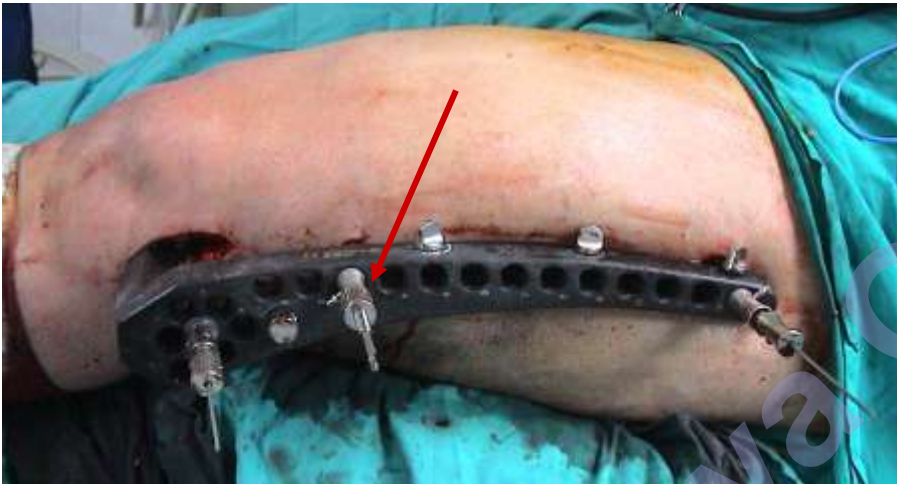
- **Lateral view**
- **AP view**
  - Notch depth



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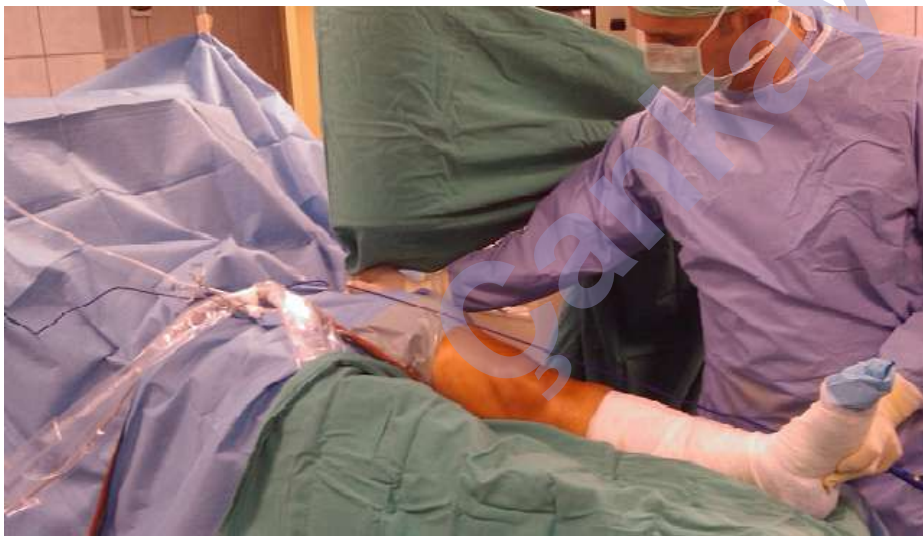
# Coronal Deformity



***“Whirlybird” approximation device***



# Coronal Reduction Control





# Femoral Distractor





# Blocking Screw

- **Hyperextension**
  - Anterior
  - Lateral → medial
- **Varus**
  - Medial
  - Anterior → posterior
- **Valgus**
  - Lateral
  - Anterior → posterior





# Femoral Fractures

- **Understanding of deforming muscle forces**
- **Surgeon must be familiar with**
  - Indirect reduction techniques
  - Minimally invasive direct reduction techniques
  - Reduction control methods
- **Good surgical technique**
  - Correct entry point
- **Proximal and distal fractures → IM nail does not help reduction**
- **Blocking screws**





# Malreduction

- **Must be recognized during surgery**
- **If happens → must be corrected within 2 weeks**

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