

Intertrochanteric Fractures Treatment Options and Outcomes

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***AO Trauma Advanced Course
Krakow, 2014***

Learning Outcomes

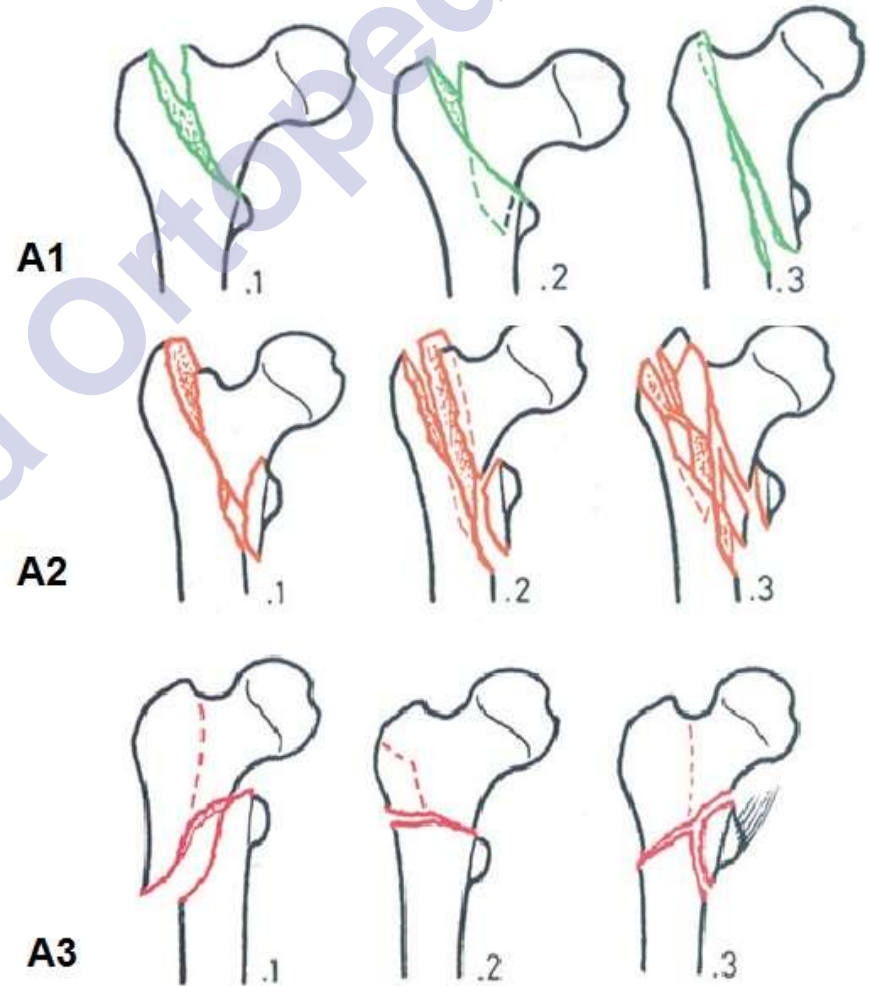
- **Assess different injury patterns**
- **Define unstable fractures**
- **Compare treatment options**
- **Identify factors associated with good outcome**

AO Classification 31-A

- **31-A1**
simple

- **32-A2**
multifragmentary

- **32-A3**
intertrochanteric
-reverse oblique-

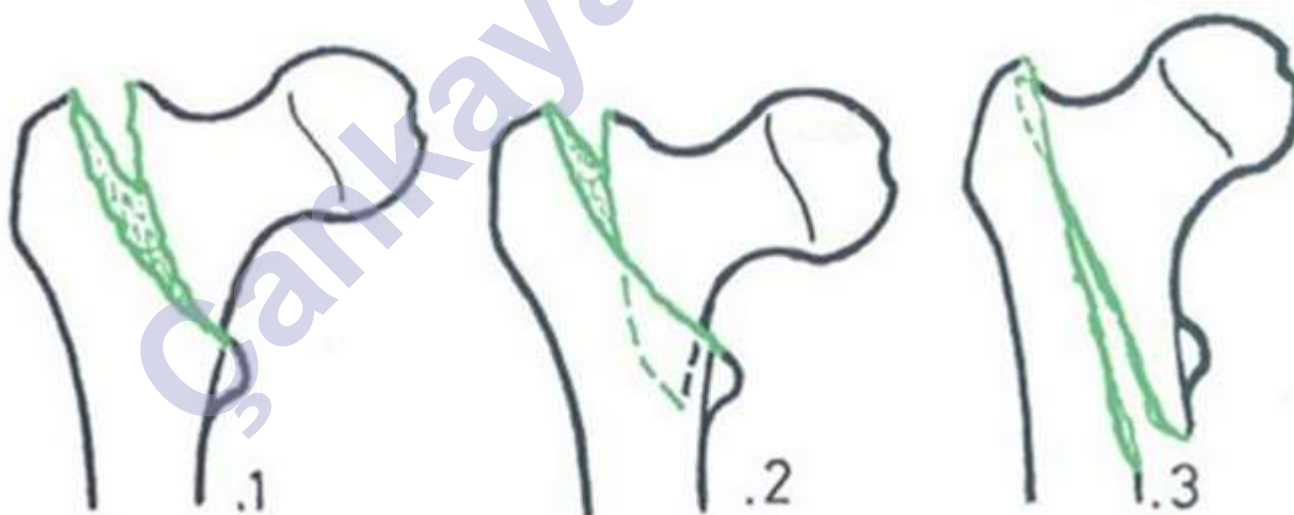


AO 31-A1

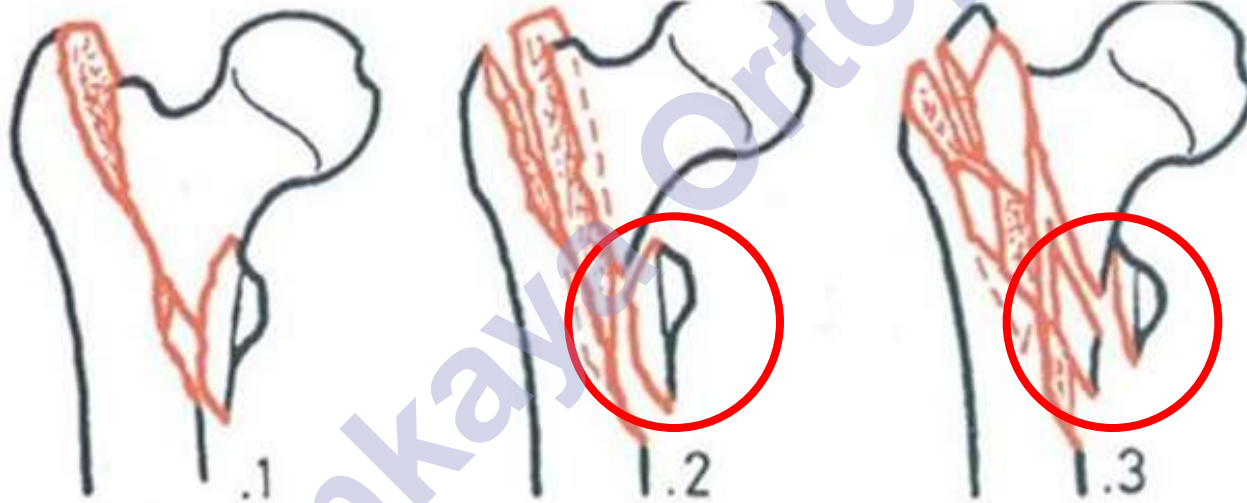
- Typically considered as “stable”

No posteromedial comminution

Intact lateral buttress



AO 31-A2

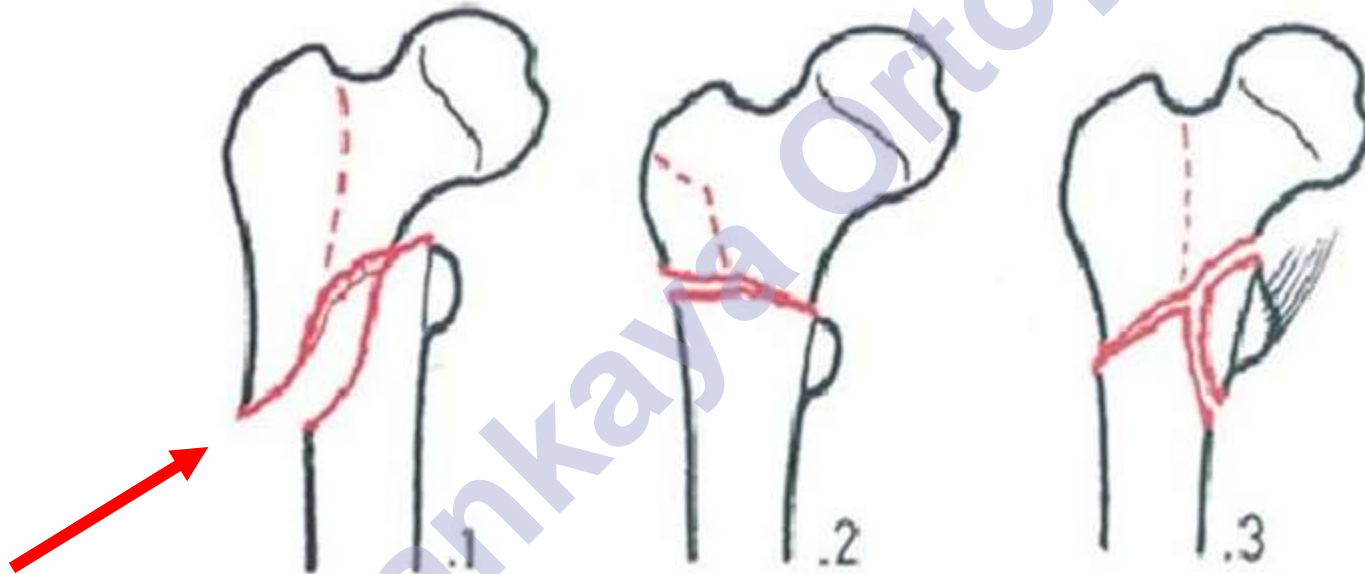


Stable

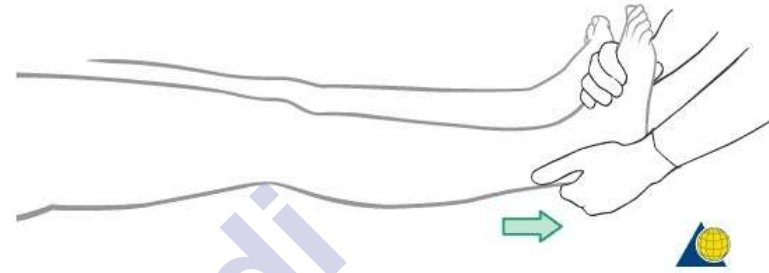
Unstable

AO 31-A3

- Unstable by nature



Traction X-ray



Role of Surgeon

- **Restore mobility and function**
- **Decrease morbidity and mortality**
- **Minimize surgical complications**

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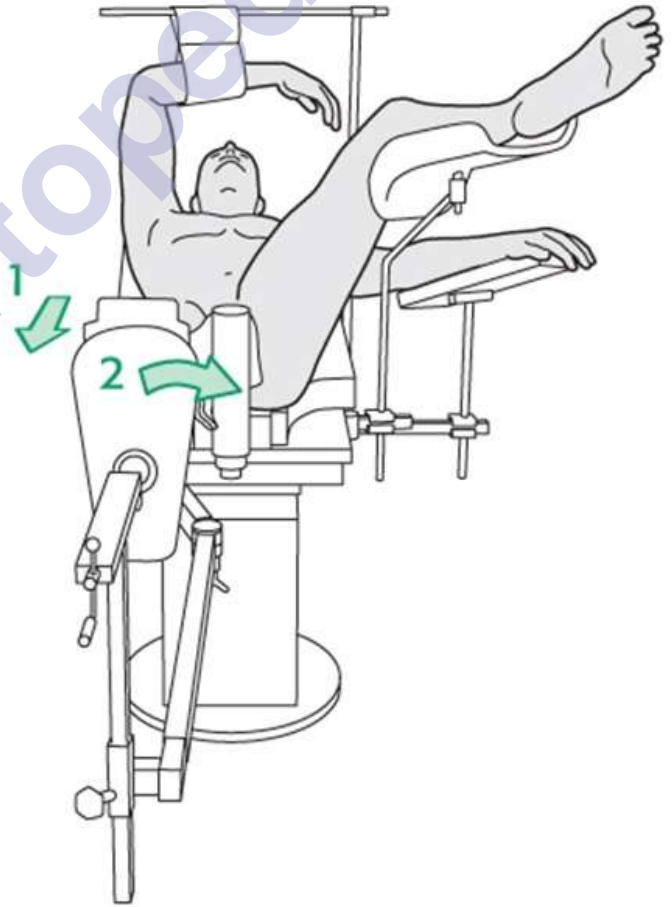
Good Reduction

- Restores hip biomechanics
- Reduces stress on the implant
- Leads to rapid and complete healing

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Patient Positioning

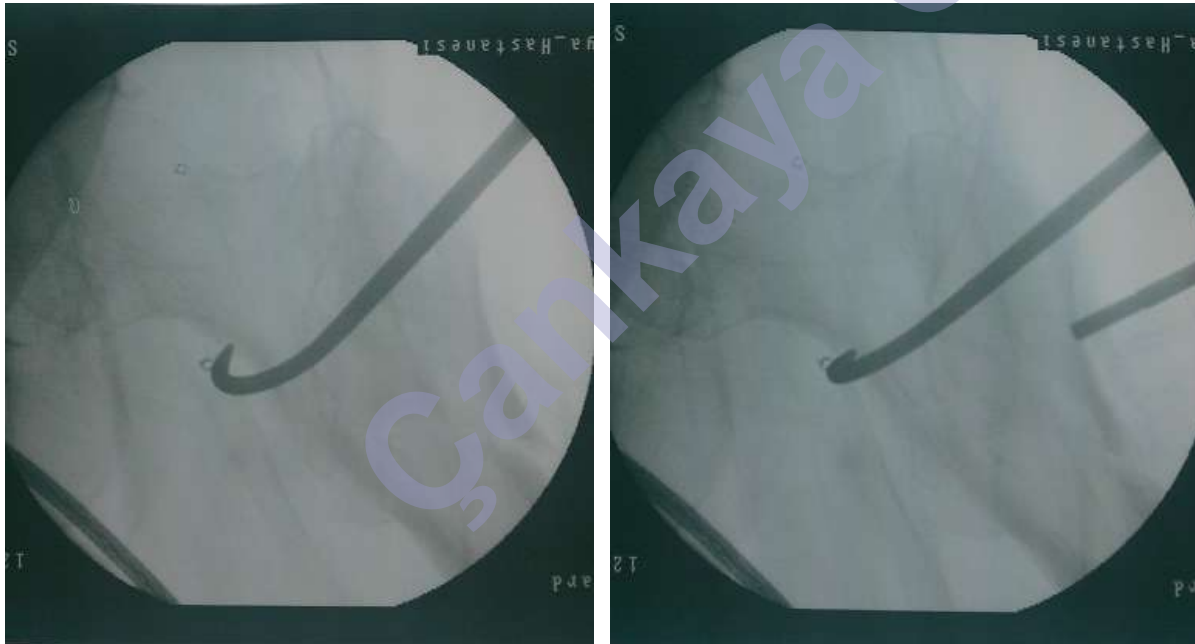
- Fracture table
- Supine
- Indirect reduction
- Usually by internal rotation





Open Reduction

- Limb access to fragments
- Prefer percutaneous techniques



Varus Malreduction

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

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Stable Fractures A1 & A2.1

Sliding Hip Screw

- Gold standard
- Frequently used
- Low cost
- Easy technique



Sliding Hip Screw

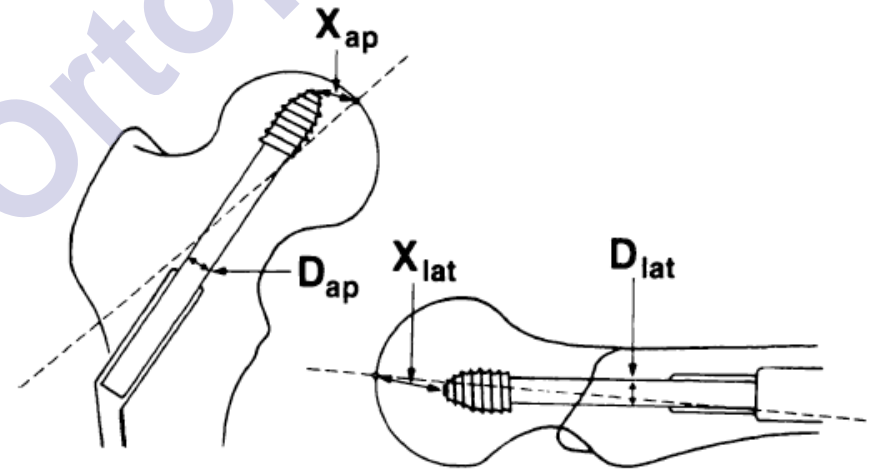
- **Accurate reduction**
- **Precise implant placement**
- **Deep and central positioning of lag screw**

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Tip-apex Distance

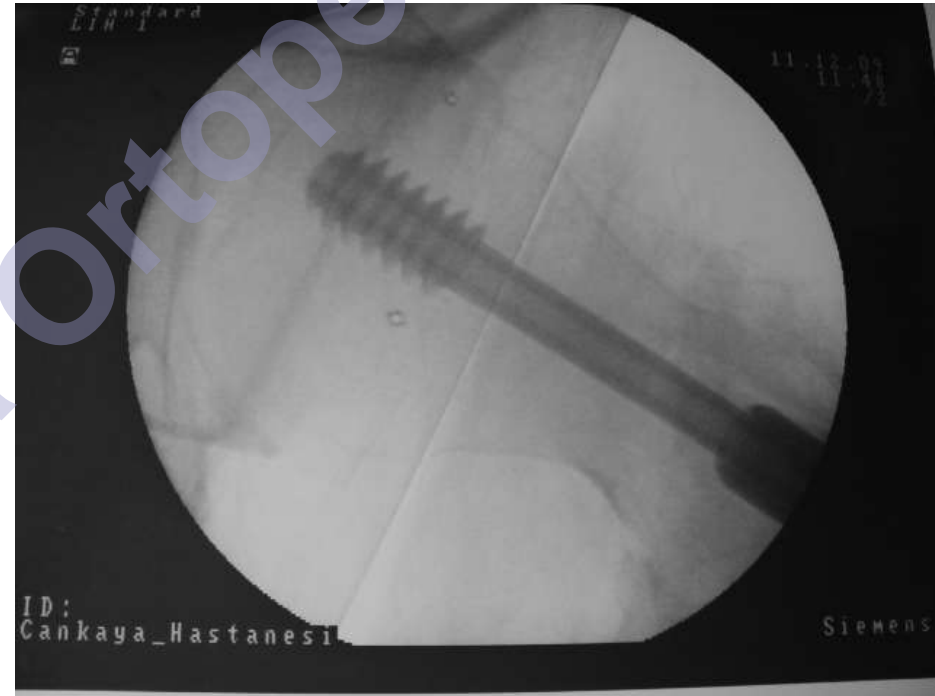
Baumgaertner et al, JBJS Am, 1995

$\leq 25 \text{ mm} \rightarrow$ no cut-outs

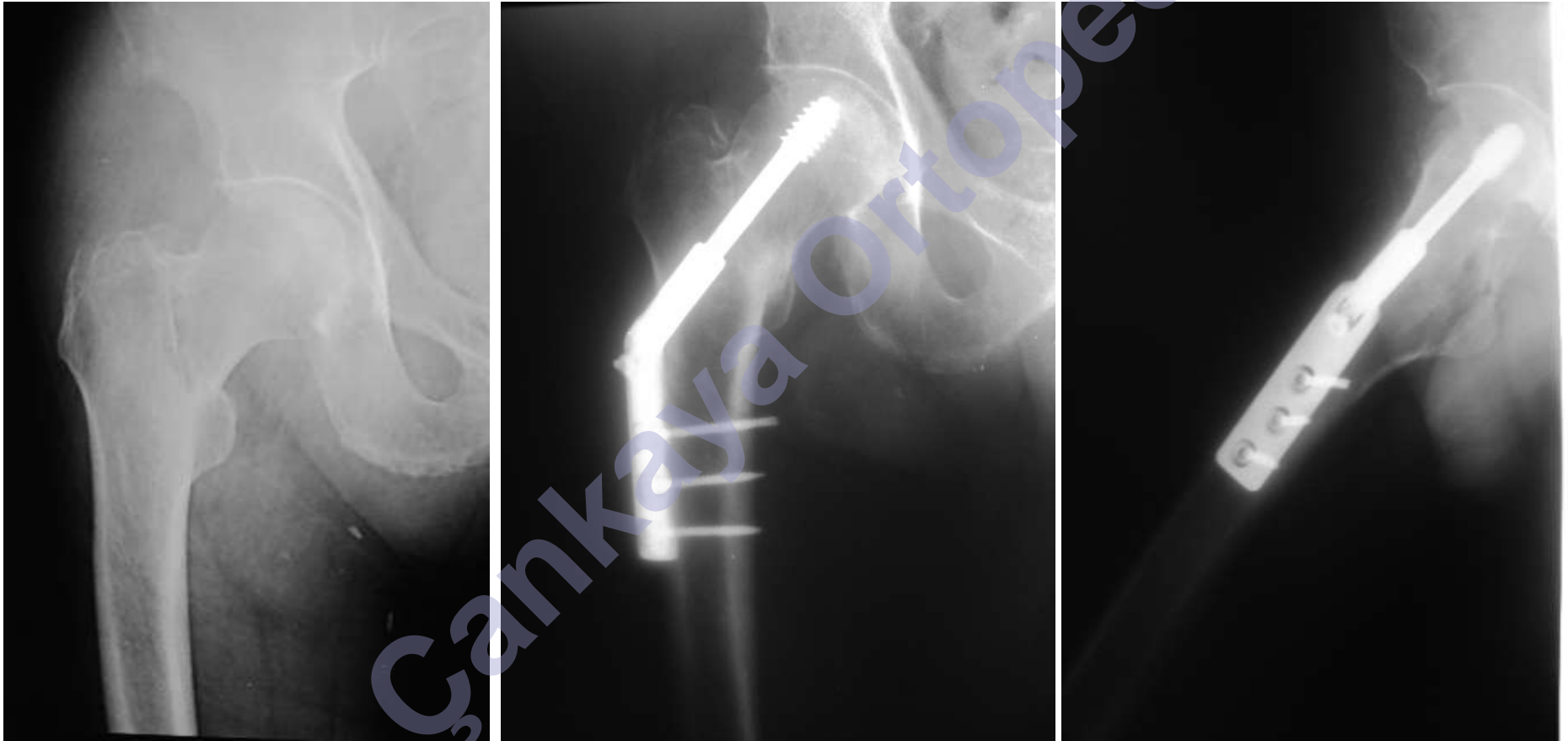


$$TAD = \left(X_{ap} \times \frac{D_{true}}{D_{ap}} \right) + \left(X_{lat} \times \frac{D_{true}}{D_{lat}} \right)$$

Tip-apex Distance



Stable Fractures A1 & A2.1



Unstable Fractures A2.2 & A2.3

- **Sliding hip screw**
- **Intramedullary nail (PFN, Gamma nail, IMHS, etc..)**

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Sliding Hip Screw

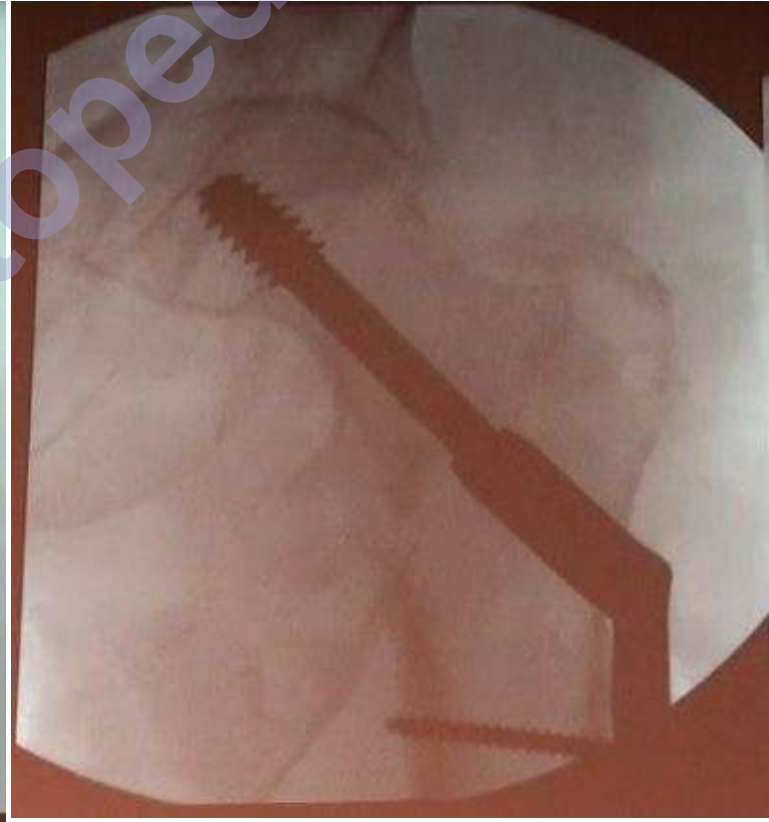
- **Historically used for both stable and unstable fractures**
- **Designed to impact**
- **Maintenance of normal anatomy is sacrificed to prevent cut-out**



A-2.2 & A-2.3 Fractures

- **Posteromedial comminution**
- **Thin lateral buttress**
- **High risk of intraoperative or postoperative lateral wall fracture**
- **Malunion → shortening, abd. weakness**



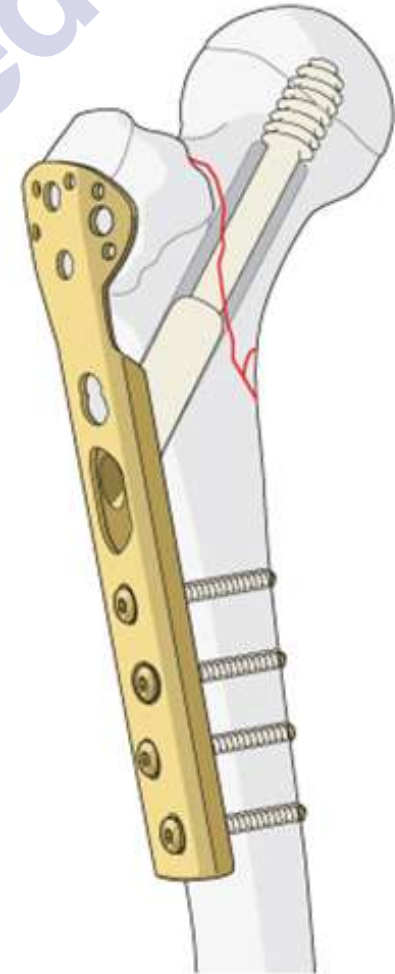




Trochanteric Stabilization Plate

- **Modification of SHS**
- **Provides proximal buttress**
- **Prevents lateralization of trochanter**
- **Resist medialization of shaft**

Bong et al, J Trauma,2004



Intramedullary Nails



Gamma nail
Stryker



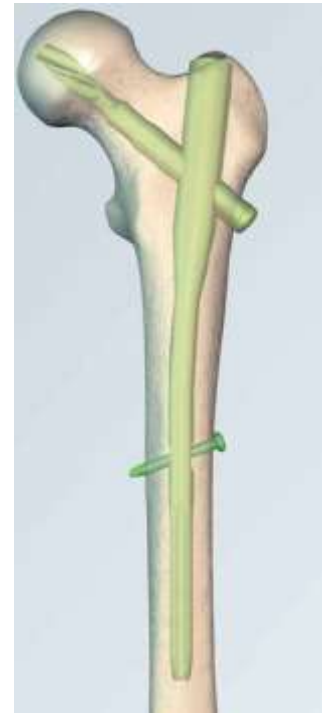
Intertan
Smith&Nephew



Veronail
Orthofix



PFN
Synthes



PFN-A
Synthes

Intramedullary Nails

Theoretical advantages

- Smaller incisions
- Less blood loss
- Less muscle stripping
- Better functional outcome



Intramedullary Nails

Mechanical advantages

- Shorter lever arm
- ↑ resistance at bending forces
- Limits fracture collapse
 - Acts as a strut that obstructs sliding





IM Nail vs SHS

No difference by means of

- **Complications**
- **Fracture healing**
- **Reoperations**
- **Mortality**

Adams et al, J Orthop Trauma, 2001

Saudan et al, Injury, 2002

Harrington et al, Injury, 2002

A-yassasri et al, Injury, 2002

Audige et al, Int Orthop, 2003

Crawford et al, Injury, 2006

Strauss et al, J Trauma, 2006

IM Nail vs SHS

Intramedullary nails

- Shorter surgical time
- Less blood loss
- Faster return to preop ambulation

Nuber et al, Unfallchirurg, 2003

Utrilla et al, J Orthop Trauma, 2005

Pajarinen et al, JBJS Br, 2005

Gamma and Other Cephalocondylic IM Nails vs Extramedullary Implants for Extracapsular Hip Fractures

Parker MJ, Handoll HH

Cochrane Database of Systemic Reviews, 2005

Cochrane Database of Systemic Reviews, 2005

- **24 PRCT comparing IM nails and SHS for intertrochanteric fractures**
- **No differences between the techniques in terms of mortality, infection or medical complications**
- **IM nails were associated with a higher risk of intra and postoperative femoral fracture**

Cochrane Database of Systemic Reviews, 2005

- **Does not include full length nails**
- **Does not include more recent changes in nail design**
- **Studies do not differentiate stable and unstable fractures**
- **No data on functional outcomes and malunion**

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Gamma Nails Revisited: Gamma Nails Versus Compression Hip Screws in the Management of Intertrochanteric Fractures of the Hip: A Meta-Analysis

Mohit Bhandari, MD, Emil Schemitsch, MD,† Anders Jönsson, MD, PHD,‡
Michael Zlowodzki, MD,‡ and George J. Haidukewych, MD§*

J Orthop Trauma - Volume 23, No 6, July 2009

Gamma vs SHS

- **25 randomized comparative studies 1991-2005**
- **4.5 increase risk of femoral fracture in short IM nails**
- **Recent studies show no difference between IM nails and SHS in regard to femoral fracture**
- **Recent nail design changes have reduced the risk of femoral fracture**

Bahandri et al, 2009

A Comparison of the Long Gamma Nail with the Sliding Hip Screw for the Treatment of AO/OTA 31-A2 Fractures of the Proximal Part of the Femur

A Prospective Randomized Trial

By Tristan M. Barton, MBChB, MSc, Robert Gleeson, FRCS(Orth), Claire Topliss, FRCS(Orth), Rosemary Greenwood, MSc, William J. Harries, FRCS(Orth), and Timothy J.S. Chesser, FRCS(Orth)

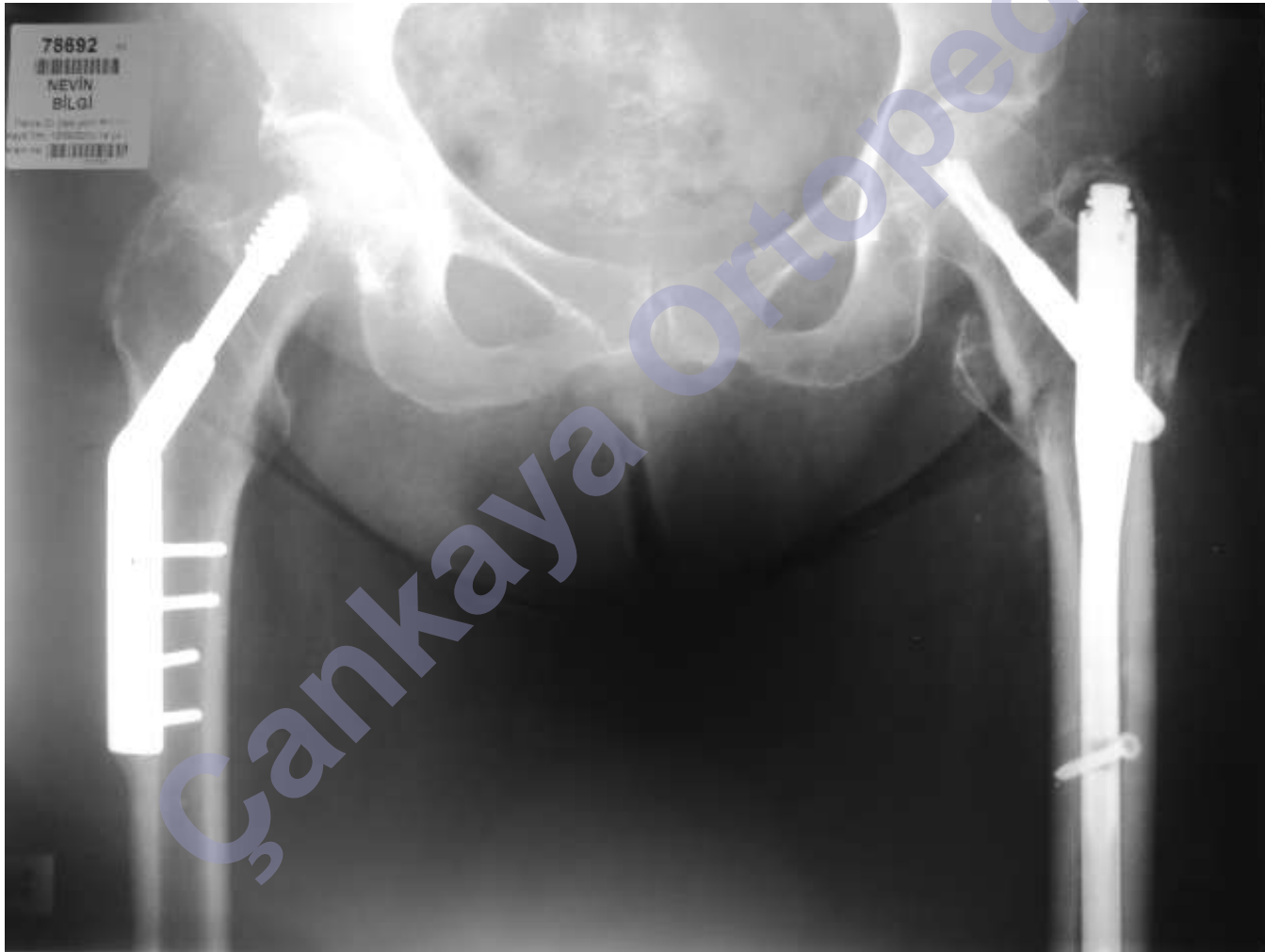
JBJS Am - Volume 92, No 4, 2010

- **No significant difference between reoperation rates**
- **Tip-apex distance correlate with implant cut-out rate**
- **No significant difference between groups in terms of any secondary outcome measures**

Unstable Fractures A2.2 & A2.3



Trend to IM Nailing?



Technical Difficulties

- Risk of gluteus medius injury
- Difficulties of proximal fragment reduction
- Intraoperative femoral fracture

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Reduction

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

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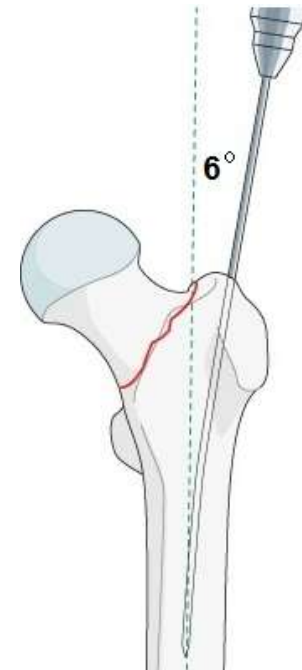
Patient Positioning

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



Entry Point

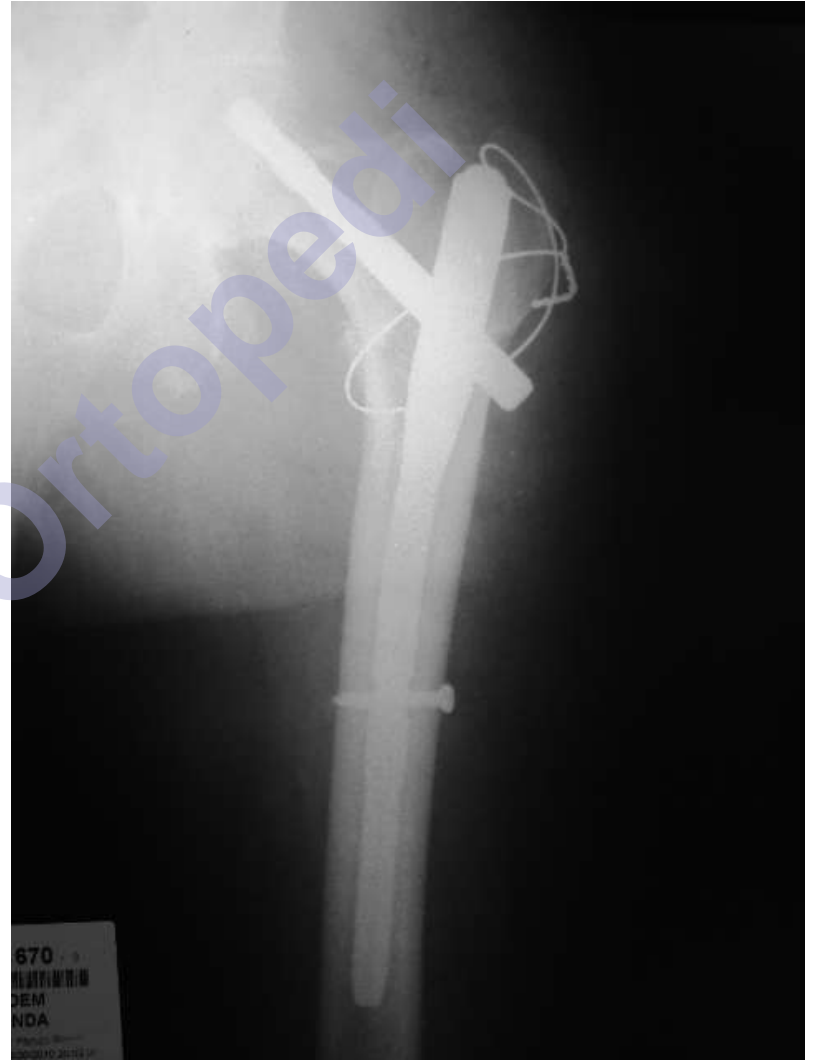
- At or medial to the tip
- Lateral → varus
- Check both AP and lateral views



Proximal Reaming

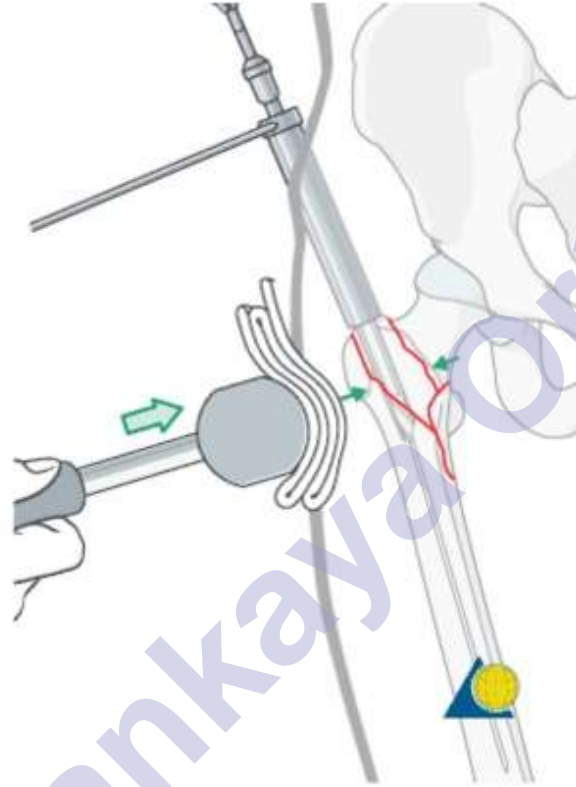
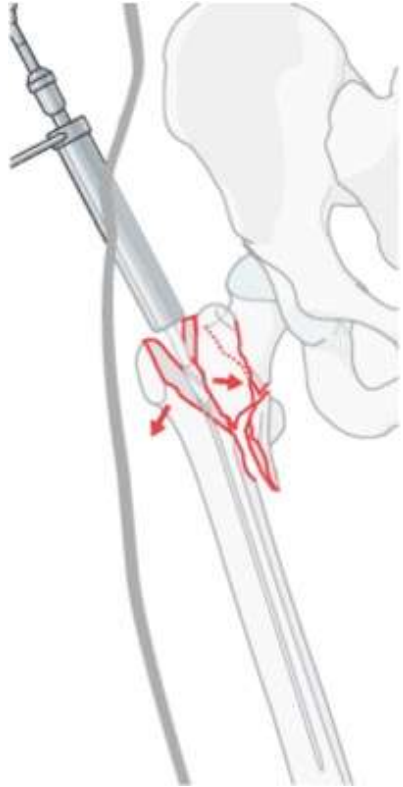
- **Ream slowly**
- **Ream to the recommended depth**
- **Do not ream through fracture line**
 - Fracture gap
 - Varus malalignment

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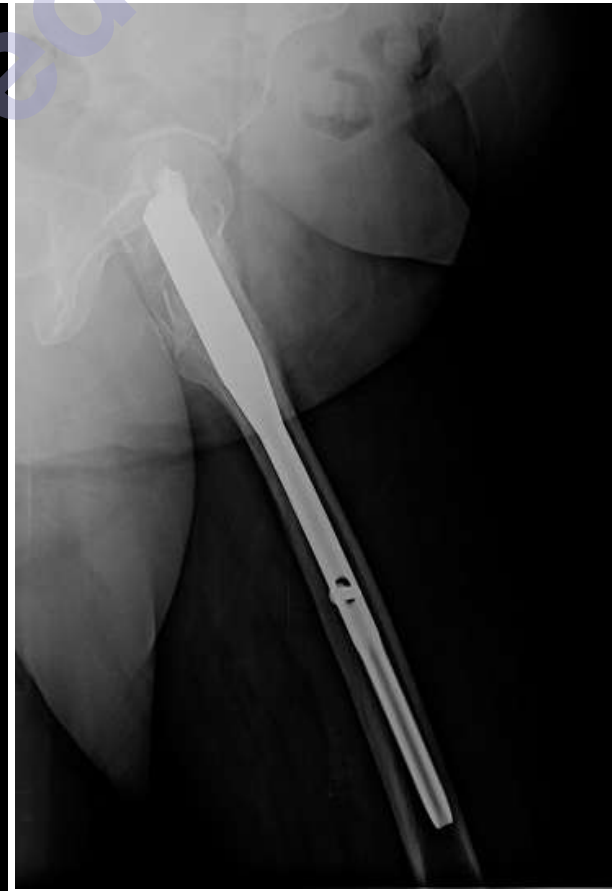
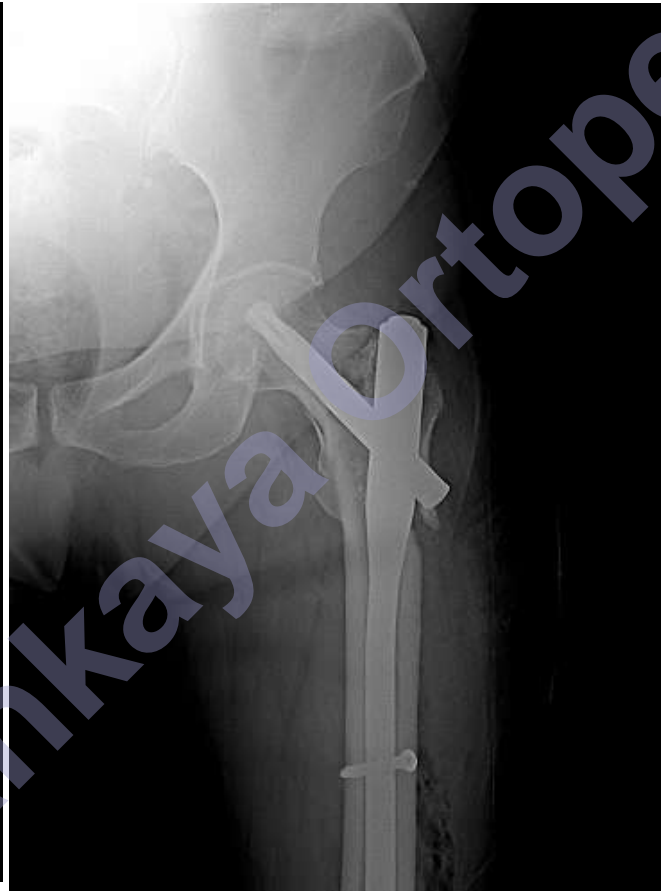
Reduction Tools



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Reduction Tools

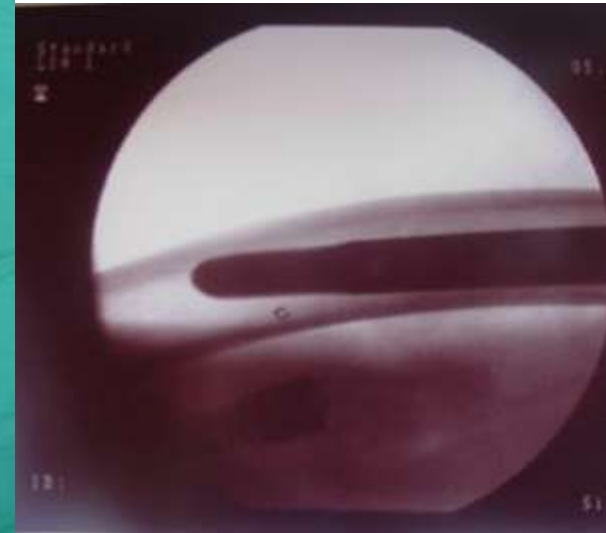


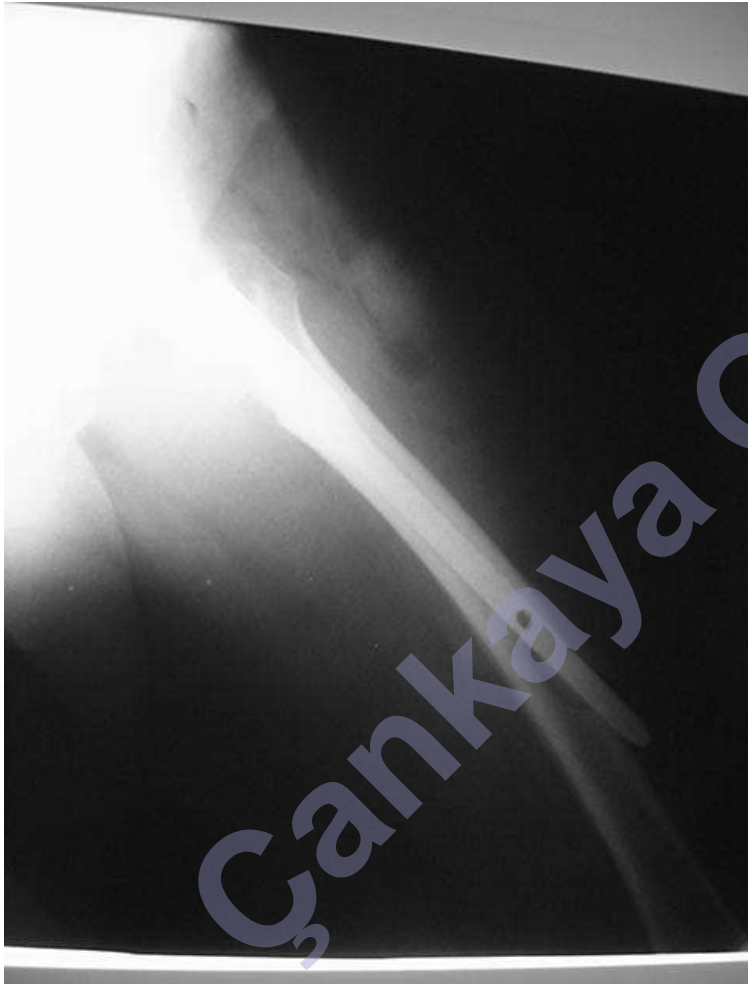


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Femoral Fracture

- **Intraoperative**
 - Nail design
 - Bad reduction
 - Narrow canal
 - Increased femoral bowing
- **Postoperative**
 - Nail design





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Helical Blade

- **Biomechanically increased resistance to failure**
Strauss et al, Injury, 2006
- **No enough clinical studies**



Cement Augmentation



Implant Failure

- **Cut-out from femoral head**
- **Z-effect in two screw designs**
- **Similar rates as SHS (~ 3%)**
- **Tip-apex distance ≤ 25 mm**



Tip-apex Distance



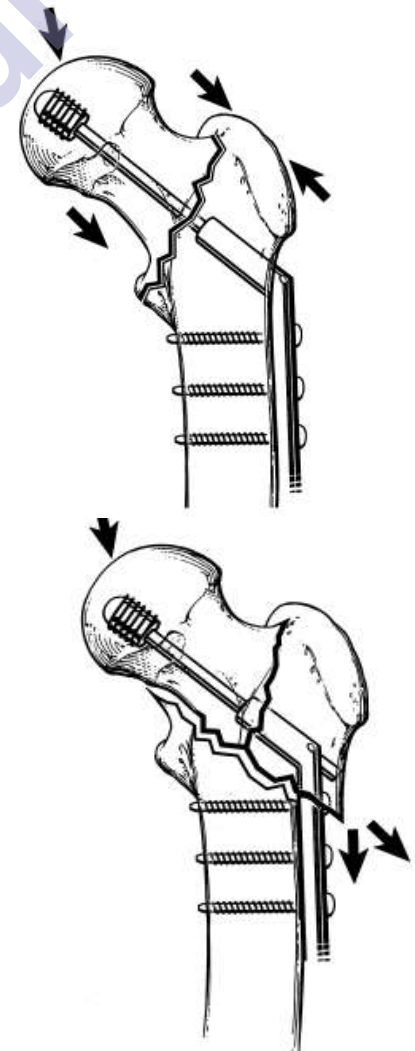


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05/09/2013 12:45:47 512

Unstable Fractures A3

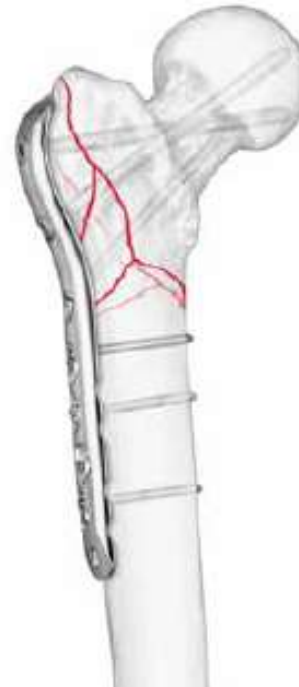
- No lateral wall integrity
- Axial loading → medial displacement
- SHS must be avoided
- Fixed angled device or IM nail

Haidukewych et al, JBJS Am, 2001 fig. 5



Fixed Angled Devices

- 95° blade plate
- Dynamic condylar screw (DCS)
- Proximal femur locking plate



Unstable Pertrochanteric Femoral Fractures

Philip J. Kregor, MD, William T. Obremskey, MD, MPH,* Hans J. Kreder, MD, MPH,† and
Marc F. Swiontkowski, MD‡*

J Orthop Trauma • Volume 19, Number 1, January 2005

- **Unacceptable failure rates with SHS**
- **Failure rate is less likely with 95° angled plate**
- **Lower reoperation rate with IM nails**
 - Abductor function ?
 - Functional outcomes ?

Unstable Fractures A3



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Take home messages

- **Assessing the fracture pattern is crucial**
- **Stable A1 fractures**
 - SHS is gold standard
- **Unstable A2 fractures**
 - Clinical evidence → SHS = IM nail
 - Lateral wall integrity is important
- **Unstable A3 fractures**
 - IM nails are superior
 - Fixed angled plates

Take home messages

- **Accurate fracture reduction**
- **Precise insertion of implant**
- **Good surgical technique**
- **Early tolerated weight wearing**

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