THE REVERSE OBLIQUITY FRACTURE: TREATMENT AND SALVAGE OF FAILURES

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DISCLOSURES

- ROYALTIES BIOMET, DEPUY
- CONSULTANT, DEPUY, SYNTHES, AND BIOMET
- STOCK OWNERSHIP, INSTITUTE FOR BETTER BONE HEALTH, ORTHOPEDIATRICS

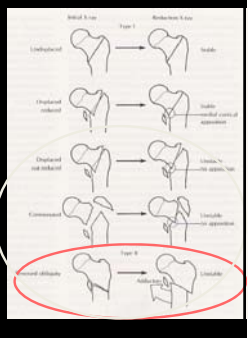
OBJECTIVES

- DISCUSS STABILITY CONSIDERATIONS IN INTERTROCHANTERIC FRACTURES
- REVERSE OBLIQUITY
- IMPLANT SELECTION, REDUCTION TIPS
- MANAGEMENT OF FIXATION FAILURES

Evans Classification (JBJS1949, 1951)

Based on pre and post reduction stability, i.e., the ability to convert a fx into a stable reduction

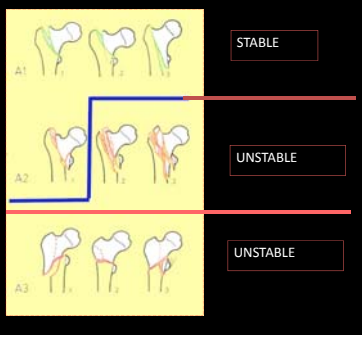
- Type I
  - Stable fx
  - Unstable fx
  - Unstable fx can be converted to stable reduction if medial cortical opposition obtained
- ***Type II***
  - ***Reverse obliquity fx***
  - Inherently unstable due to the abductors' pull on proximal fragment and adductor pull on distal fragment



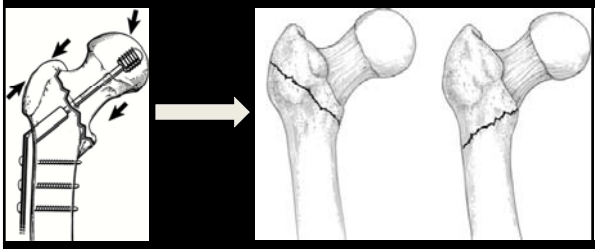
Fracture Stability

- Cortical contact prevents fx displacement
- ***Stable IT***
  - Cortical contact without comminution medially or posteriorly
- Unstable IT
  - Medial or posterior comminution
  - Reverse obliquity fx
  - Subtrochanteric extension

Stability Matters



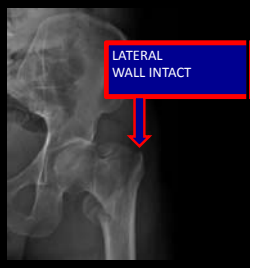
Fracture Pattern & Common Theme of Instability - Geometry



As the LATERAL fracture line moves DISTALLY → INSTABILITY

Does instability matter?

- What is instability?
  - PM cortical loss
  - 3-4 part fracture



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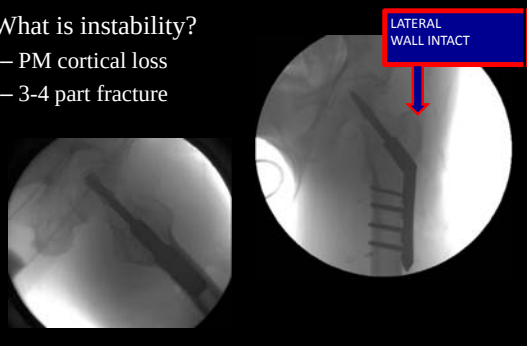
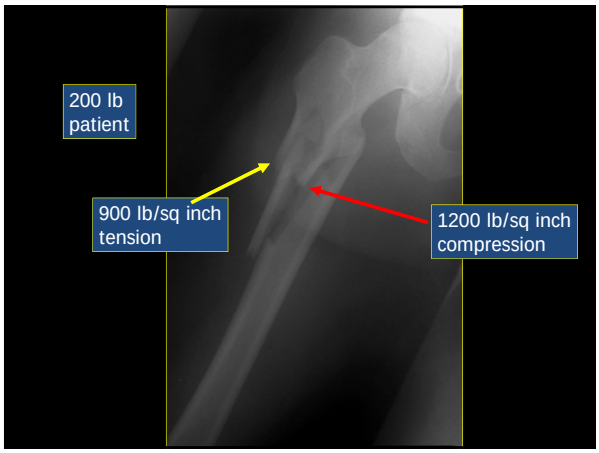




Sliding Hip Screw

- Time proven
- Technically simple
- Most surgeons comfortable
- Cheap
- Quick

Sliding Hip Screw Insertion

Central position
Within 1 cm of subchondral bone
T.A.D. < 25 mm (AP + Lateral)

Tip-Apex-Distance

DOESN'T

COUNTER

INSTABILITY

Based on

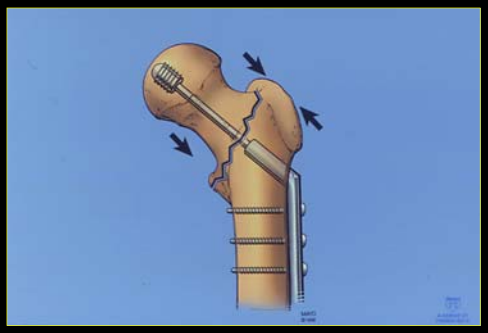
GEOMETRY

Reverse Obliquity Fractures of the Intertrochanteric Region of the Femur

JBJS-Am 2001

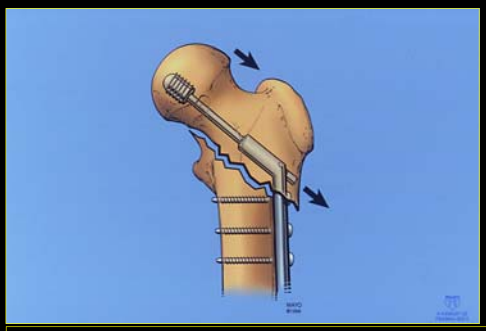
By George J. Haidukewych, MD, T. Andrew Israel, MD, and Daniel J. Berry, MD

- Reverse Obliquity
  - Fracture in Lateral Cortex
  - Loss of Lateral Buttress
  - Loss of Resistance to Medial Shaft Displacement

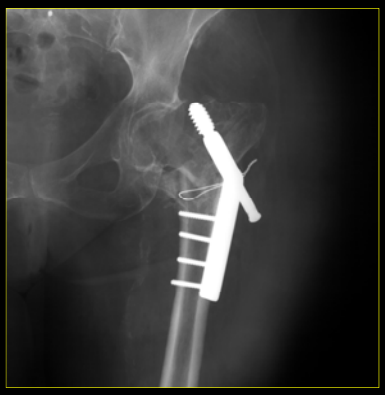


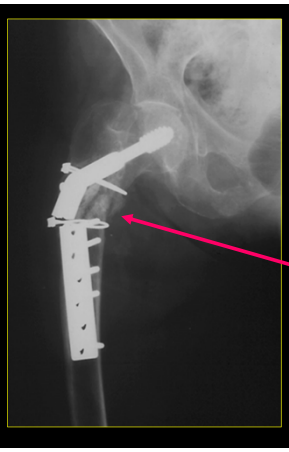
Special Fractures

- Reverse Obliquity
  - Fracture in Lateral Cortex
  - Different treatment
  - Resist Medial Shaft Displacement



56% FAILURE RATE Haidukewych et al JBJS 2001





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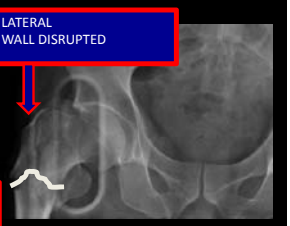
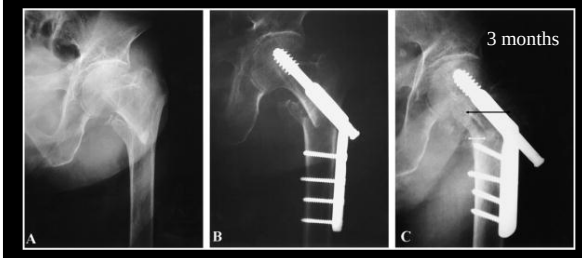


LATERAL WALL DISRUPTION

Converts potentially STABLE fx to

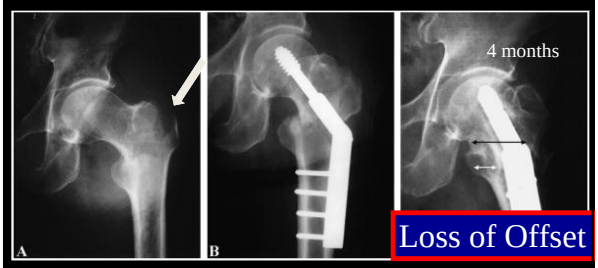
REVERSE OBLIQUITY

Lateral Wall



Im G-I, Shin Y-W, Song YJ, MD: **Potentially** unstable intertrochanteric fractures. JOT 2005

Lateral Wall



Im G-I, Shin Y-W, Song YJ, MD: **Potentially** unstable intertrochanteric fractures. JOT 2005

Lateral Wall

Parameters	Group I	Group II	*P* Value
Age (yrs, mean ± SD)	81 ± 4.3	72 ± 15	0.01*
Gender	M: 2, F: 7	M: 21, F: 36	0.70
AO/OTA classification		I: 10	0.33
		II: 8	
		III: 19	
		IV: 10	
		V: 6	
		VI: 4	
Poor quality of reduction	2/9	4/57	0.53
Iatrogenic comminution of lateral cortex occurring intraoperatively	6/9	1/57	0.13
Postoperative comminution of lateral cortex	3/9	0/57	0.0001*
			0.002

*$P < 0.05$

- Age
- Iatrogenic Comminution
- Post-op Comminution

Im G-I, Shin Y-W, Song YJ, MD: **Potentially** unstable intertrochanteric fractures. JOT 2005

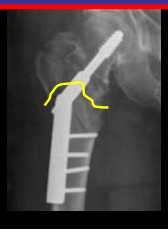
Integrity of the Lateral Femoral Wall in Intertrochanteric Hip Fractures: An Important Predictor of a Reoperation

JBJS-Am 2007

By Henrik Palm, MD, Steffen Jacobsen, MD, Stig Sonne-Holm, MD, DMSc, and Peter Gebuhr, MD, on behalf of the Hip Fracture Study Group

Lateral Wall Intact

Lateral Wall Disrupted



FAILURE !!!

Integrity of the Lateral Femoral Wall in Intertrochanteric Hip Fractures: An Important Predictor of a Reoperation

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	Fractured Lateral Femoral Wall*	Intact Lateral Femoral Wall*	P Value†
No. of patients	46 (100)	168 (100)	
Age (yr)	82 (71-91)	83 (77-89)	0.876
Female gender	35 (76)	118 (70)	0.436
Prefracture NMS of 0-5†	25 (54)	91 (54)	0.983
ASA score of 3 or 4§	23 (50)	100 (60)	0.247
AO/OTA classification			<0.001
31-A1	1 (2)	83 (50)	
31-A2.1	2 (4)	17 (10)	
31-A2.2 or A2.3	31 (68)	68 (40)	
31-A3			
Reoperation within 6 mo	10 (22)	5 (3)	<0.001

> 7x Re-operation Rate !!!

■ TRAUMA

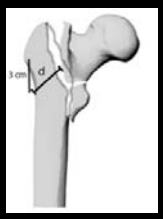
Lateral femoral wall thickness

A RELIABLE PREDICTOR OF POST-OPERATIVE LATERAL WALL FRACTURE IN INTERTROCHANTERIC FRACTURES

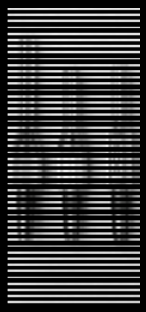
Bone Joint J 2013;95-B:1134–8.

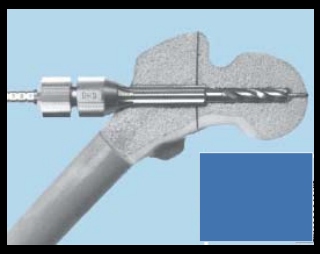
C-E. Hsu,
C-M. Shih,
C-C. Wang,
K-C. Huang

- 208 patients
- T.A.D. ~18mm
- Failures / Re-operation Rates
- d < 20.5mm → No SHS



Weapon of Mass Destruction

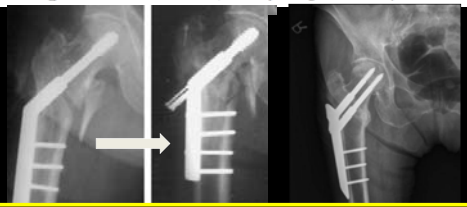




Perioperative Lateral Trochanteric Wall Fractures: Sliding Hip Screw versus Percutaneous Compression Plate for Intertrochanteric Hip Fractures

(J Orthop Trauma 2011;25:191–195)

Joshua Langford, MD,* Gita Pillai, MD,† Anthony D. Ugliailoro, MD,‡ and Edward Yang, MD†



Smaller Screw Holes → Less Risk Iatrogenic Lateral Wall Instability

Simplified Evans	Group 1 (PCCP)	Group 2 (SHS)	P
Two-part	0/36 (0%)	3/43 (7%)	>0.01
Three-part	1/73 (1.4%)	10/43 (23%)	<0.01*
Four-part	1/32 (3.1%)	7/14 (50%)	<0.01*

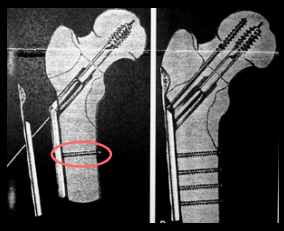
Significance of excess sliding (DEFORMITY)

- Jacobs (1980)
  - 15.7 mm sliding in unstable IT's treated with DHS
- Rha (1993)
  - Excessive sliding major cause of fixation failure
- Steinberg (1988)
  - incidence of fixation failure was increased when sliding length > 15mm
- Baixauli (1999)
  - pts with sliding >15mm had more pain

Another option:

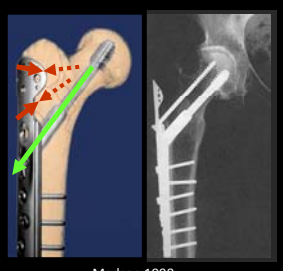
TSP / Regazzoni side plate

- Trochanteric Stabilization Plate
  - –Buttress against the greater trochanter providing a mechanical hindrance against the distal fracture fragment



TSP

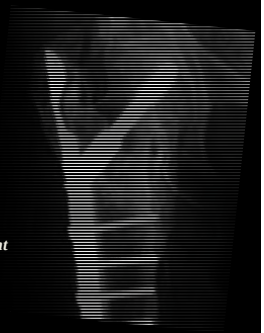
- 170 unstable IT fx's
- Compared : DHS
  DHS/TSP
  Gamma Nail
- **Significant secondary (>20mm) fracture displacement at 6 mos f/u**
  - DHS – 34%
  - Gamma 18%
  - DHS/TSP – 9%



Madsen 1998

TSP

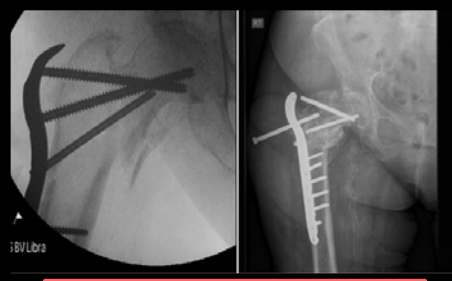
- Babst (1998) – 46 unstable IT fractures with DHS/TSP
  - ***–Limited fracture impaction in 90%***
  - –DHS+TSP vs DHS alone
    Avg OR time 119 min vs 77 min
- Bong (2004) - biomechanically compared TSP w/ IMHS
  - ***–Similar resistance to medial displacement***



Short-Term Follow-Up of Pertrochanteric Fractures Treated Using the Proximal Femoral Locking Plate

(J Orthop Trauma 2014;28:283–287)

Benjamin Johnson, MBBS, Jonathan Stevenson, MBBS, Ramsey Chamma, MBBS, Amit Patel, MBBS, Shin-Jae Rhee, MBBS, Caroline Lever, MBBS, Ian Starks, FRCS, MBBS, and Phillip J. Roberts, MA



41% COMPLICATIONS!!!

Mechanical Failure After Locking Plate Fixation of Unstable Intertrochanteric Femur Fractures

(J Orthop Trauma 2013;27:22–28)

Philipp N. Streubel, MD, Michael J. Moustoukas, MD, and William T. Obremskey, MD, MPH

RIGID

No ability for compression

HUGE Moment Arm

37% FAILURE !!!

Proximal femoral nails compared with reverse distal femoral locking plates in intertrochanteric fractures with a compromised lateral wall; a randomised controlled trial

Rehan Ul Haq · Vikrant Manhas · Amite Pankaj · Amit Srivastava · Ish Kumar Dhammi · Anil Kumar Jain

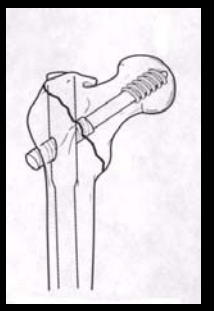
International Orthopaedics (SICOT) (2014) 38:1443–1449

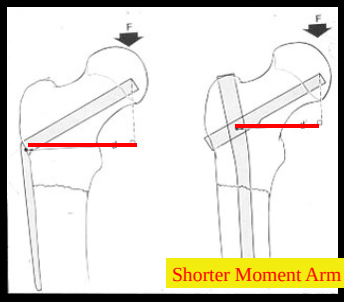
	Nail	Locking plate
OR time (min)	64	80
Blood Loss (mL)	316	441
Fluoroscopy (sec)	22.75	35.68
Harris Hip Score	81.53	68.43
SF-12 (physical / mental)	41.83 / 57.52	31.18 / 53.74
Failures	1/20	6/20

IMN

Intramedullary Devices

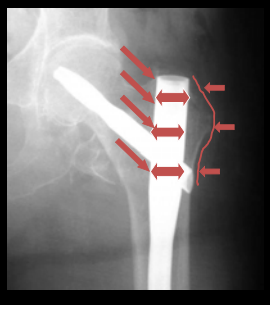
1. Increased rigidity
2. More efficient load transfer.
3. Greater mechanical strength.
4. Shorter moment arm decreases strain on implant





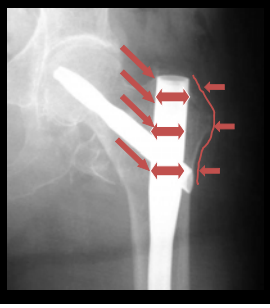
Mechanical Advantage

- IM Buttress
  - Not dependent on lateral cortex
  - Get *appropriate* compression
    - SLIDE BLOCKED BY NAIL
    - No significant loss of offset



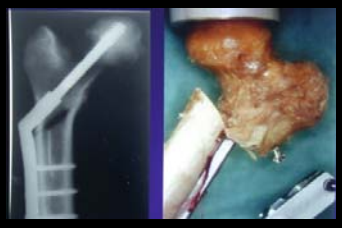
Lateral wall "Blow out"

- IM Buttress
  - Not dependent on lateral cortex
  - Screw has less excursion
  - Nail supports Intertrochanteric zone



Reverse Obliquity Fracture

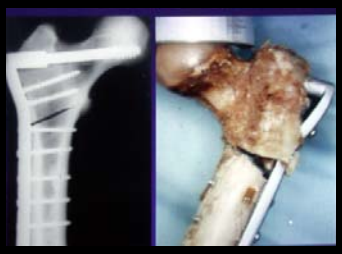
(Kuzyk PR, Schemitsch EH, et al: JOT 2009)



DHS – Infinite ability to slide

Reverse Obliquity Fracture

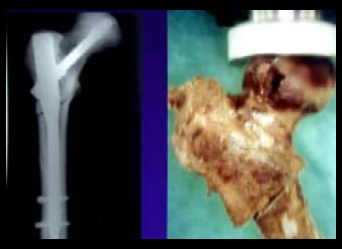
(Kuzyk PR, Schemitsch EH, et al: JOT 2009)



DCS: Some Slide, Some Rotational Instability

Reverse Obliquity Fracture

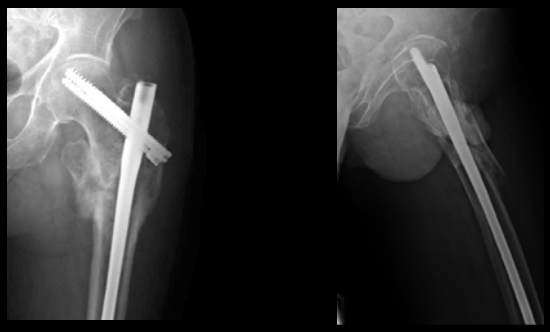
(Kuzyk PR, Schemitsch EH, et al: JOT 2009)



IMHS: Prevents Slide and Rotation

LATERAL WALL INCOMPETENT

OFF-SET MAINTAINED – SUCCESS!!!

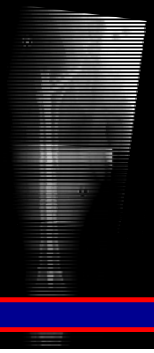


IT fx treatment

- ***Most important to understand radiographic picture***
- Is it an IT fx?
  - 2-4 part
- Is it a reverse obliquity?
- Is there subtrochanteric extension?
- Lateral wall blow-out
  - Real or Potential

MY PREFERENCE

- ***Most important to understand radiographic picture***
- IMN if:
  - Reverse Obliquity
  - Subtrochanteric extension
  - Lateral Wall blow-out
  - Thin Lateral Wall
  - If unsure of stability

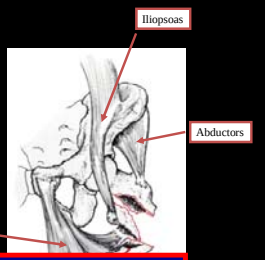


ANY QUESTION OF CURRENT OR POTENTIAL INSTABILITY!!!

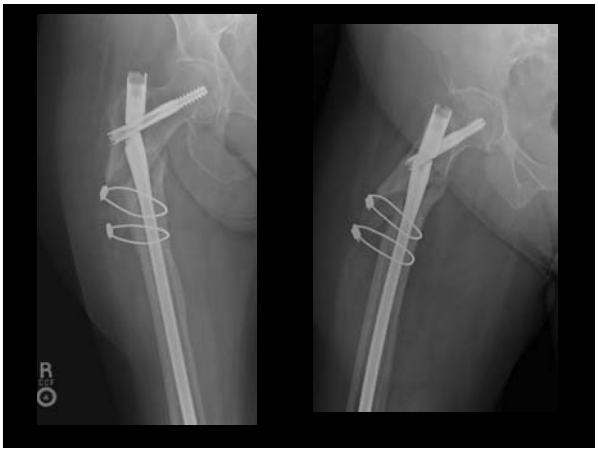
REDUCTION TIPS AND TRICKS

Deforming Forces – R.O. & S.T.

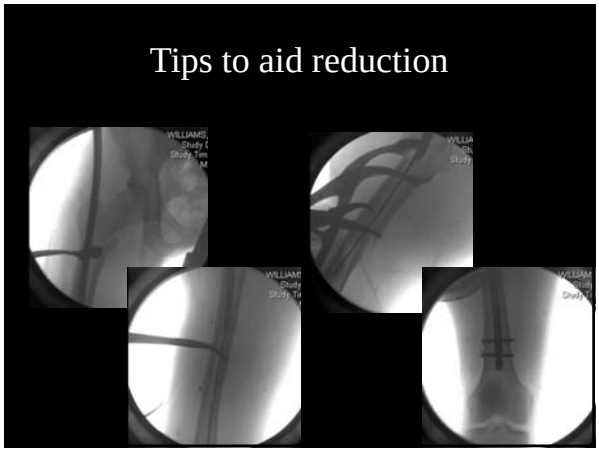
- Proximal Fragment
  - Abduction
  - ± Flexion / ER
- Distal Fragment
  - Adduction and Flexion



AP fluoro on Fx Table:
"Over-the-top";
Accommodate for ER of proximal fragment

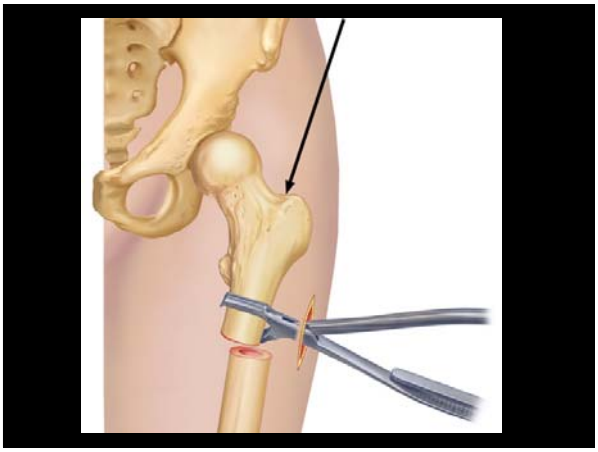


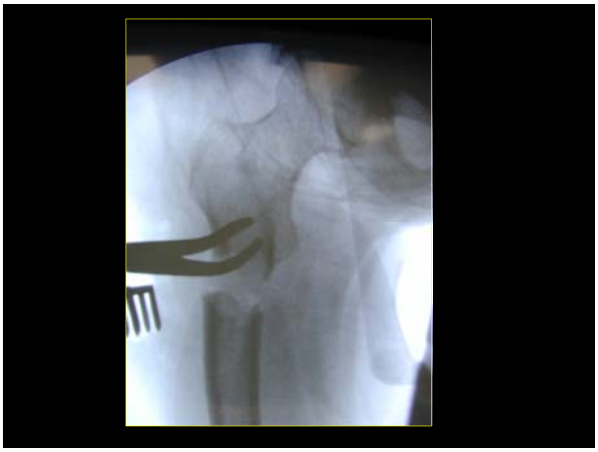
Tips to aid reduction



Clamp-Assisted Reduction of High Subtrochanteric Fractures of the Femur

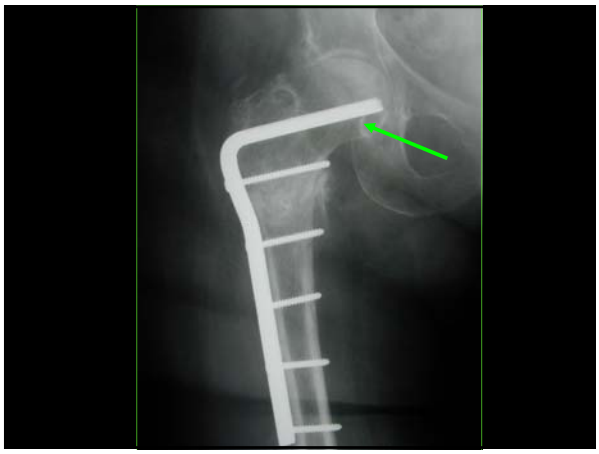
Alan Afsari, Frank Liporace, Eric Lindvall, Anthony Infante, Jr., Henry C. Sagi and George J. Haidukewych
J Bone Joint Surg Am. 2009;91:1913-1918. doi:10.2106/JBJS.H.01563

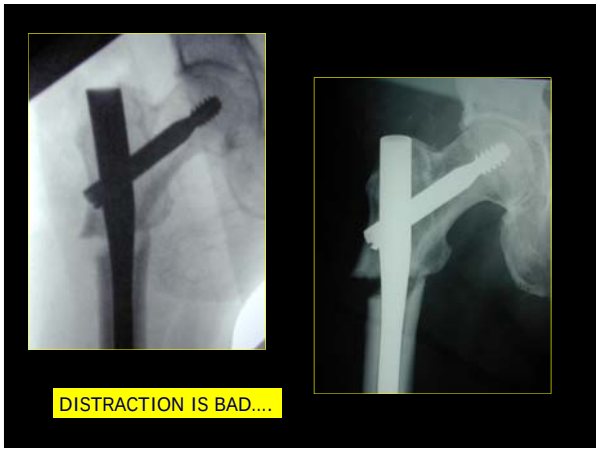


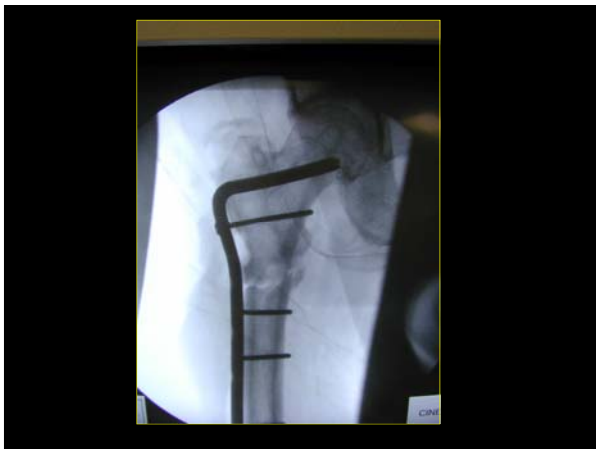


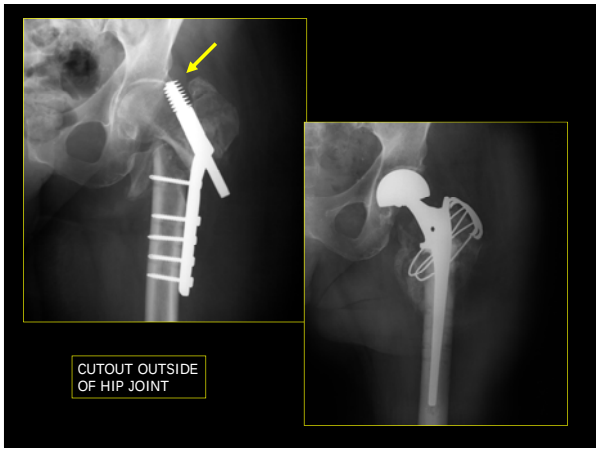

PT

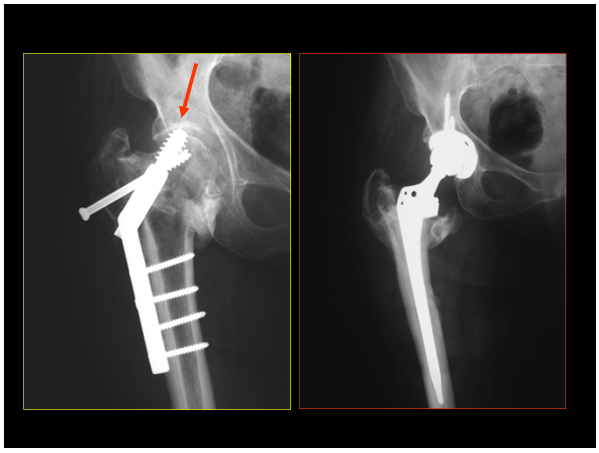
SALVAGE OF FAILED FIXATION




DISTRACTION IS BAD....




CUTOUT OUTSIDE
OF HIP JOINT



CONCLUSIONS

- RECOGNIZE INSTABILITY PATTERNS
- DON'T CREATE A REVERSE OBLIQUITY FRACTURE BY BLOWING OUT A THIN LATERAL WALL
- USE NAILS, IMPLANT THEM ACCURATELY

THANK YOU