Intertrochanteric Femur Fractures

Alan Afsari, MD

March 2014

Topics

- epidemiology
- anatomy
- classification
- mechanism of injury
- patient assessment
- treatment
- rehabilitation
- complications

Epidemiology

- 341k people visited EDs with hip fractures
- 90% were > 60y
- trochanteric : cervical – 2:1
- appox 227k trochanteric fxs per year; ~200k in elderly patients

Hip Fractures in the United States: 2008 Nationwide Emergency Department Sample

SUNNY H. KIM,[1] JOHN P. MEEHAN,[2] THOMAS BLUMENFELD,[1] AND ROBERT M. SZABO[1]

Arthritis Care & Research
Vol. 64, No. 5, May 2012, pp 751–757

Epidemiology

- 20% mortality w/in 1 y (most w/in 6 m)

The Effect of Hip Fracture on Mortality, Hospitalization, and Functional Status: A Prospective Study

American Journal of Public Health
March 1997, Vol. 87, No. 3

Fredric D. Wolinsky, PhD, John F. Fitzgerald, MD, MBA, and Timothy E. Stump, MA

- $8.6 billion spent on hip fxs in 1995 (of $13.7 billion spent on all osteoporotic fxs

Medical Expenditures for the Treatment of Osteoporotic Fractures in the United States in 1995: Report from the National Osteoporosis Foundation

JOURNAL OF BONE AND MINERAL RESEARCH
Volume 12, Number 1, 1997

NANCY FOX RAY,[1] JULIEN K. CHAN,[1] MAE THAMER,[1] and L. JOSEPH MELTON, III[2]

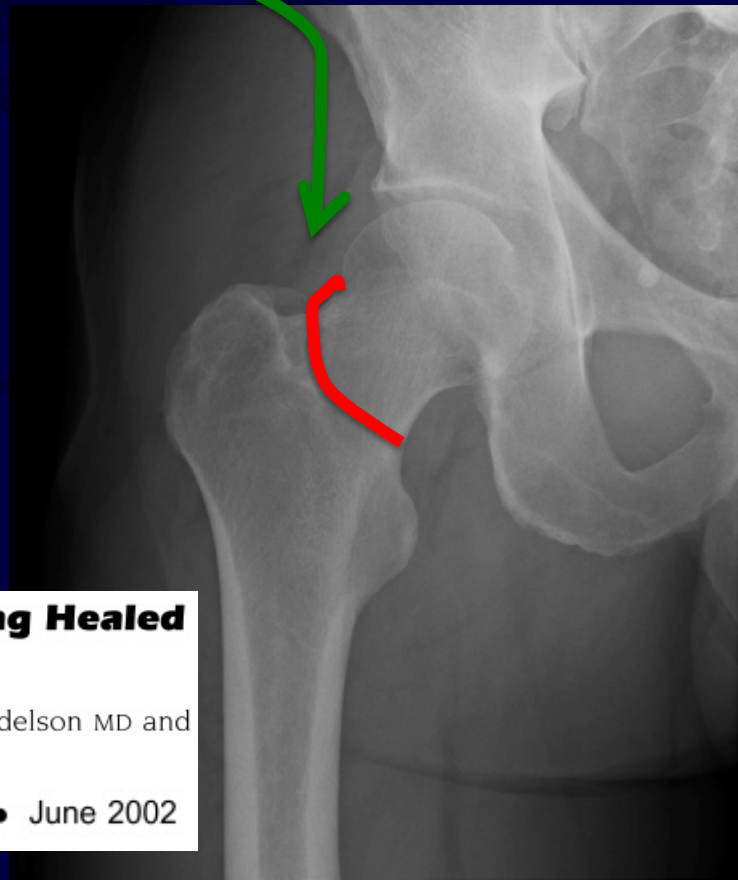
Anatomy

- osseous anatomy is straightforward
- the soft tissue anatomy is more nuanced

Anatomy

- the deep branch of the medial femoral circumflex vessel

- generally fractures are lateral and inferior to the vessel and blood flow is not compromised
- basicervical fractures potentially are at risk



Avascular Necrosis and Related Complications Following Healed Osteoporotic Intertrochanteric Fractures

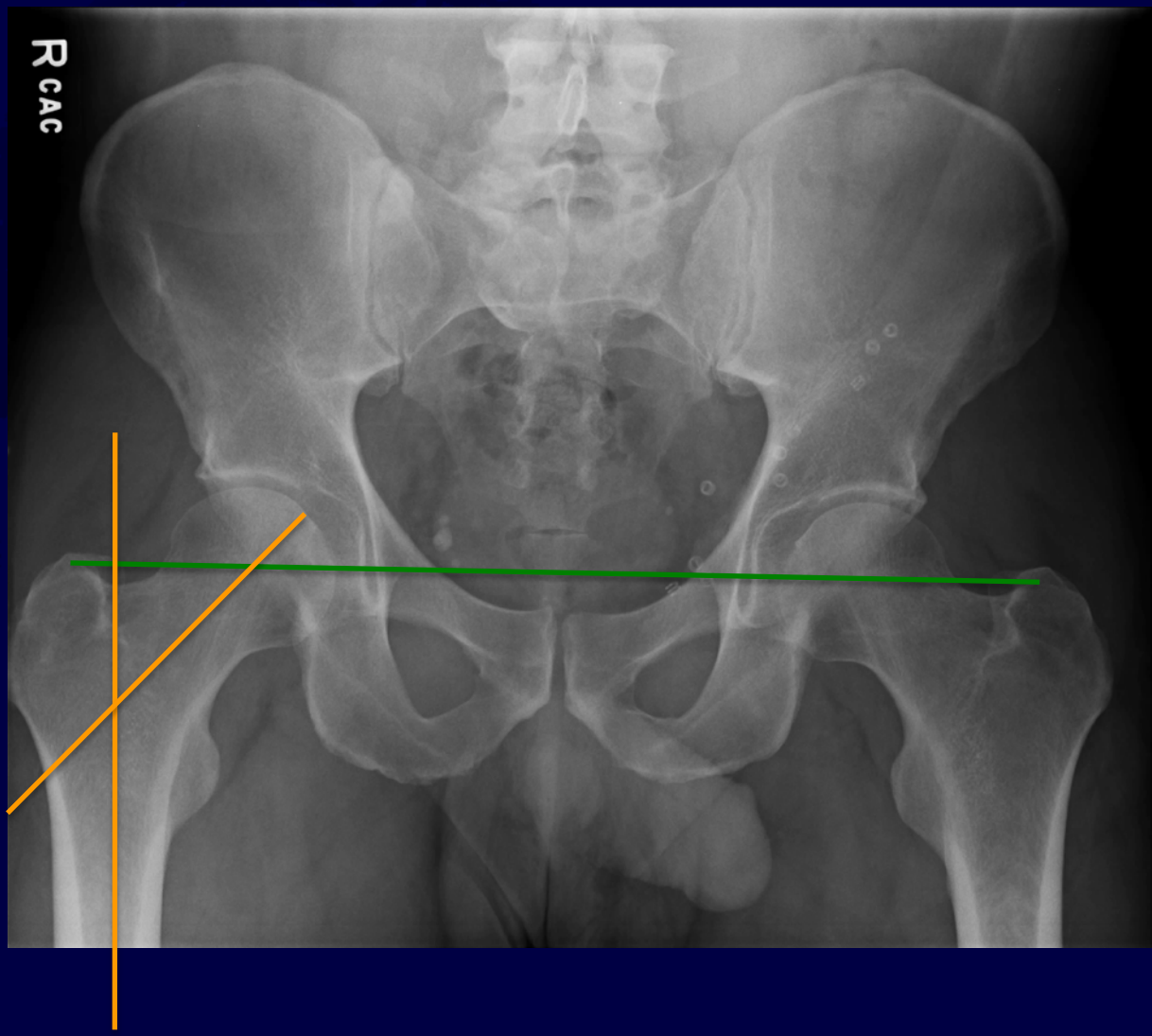
Yoav Mattan MD, Alice Dimant MD, Rami Mosheiff MD, Amos Peyser MD, Steven Mendelson MD and Meir Liebergall MD

Department of Orthopedic Surgery, Hadassah University Hospital, Jerusalem, Israel
Affiliated to Hebrew University Medical School, Jerusalem, Israel

IMAJ • Vol 4 • June 2002

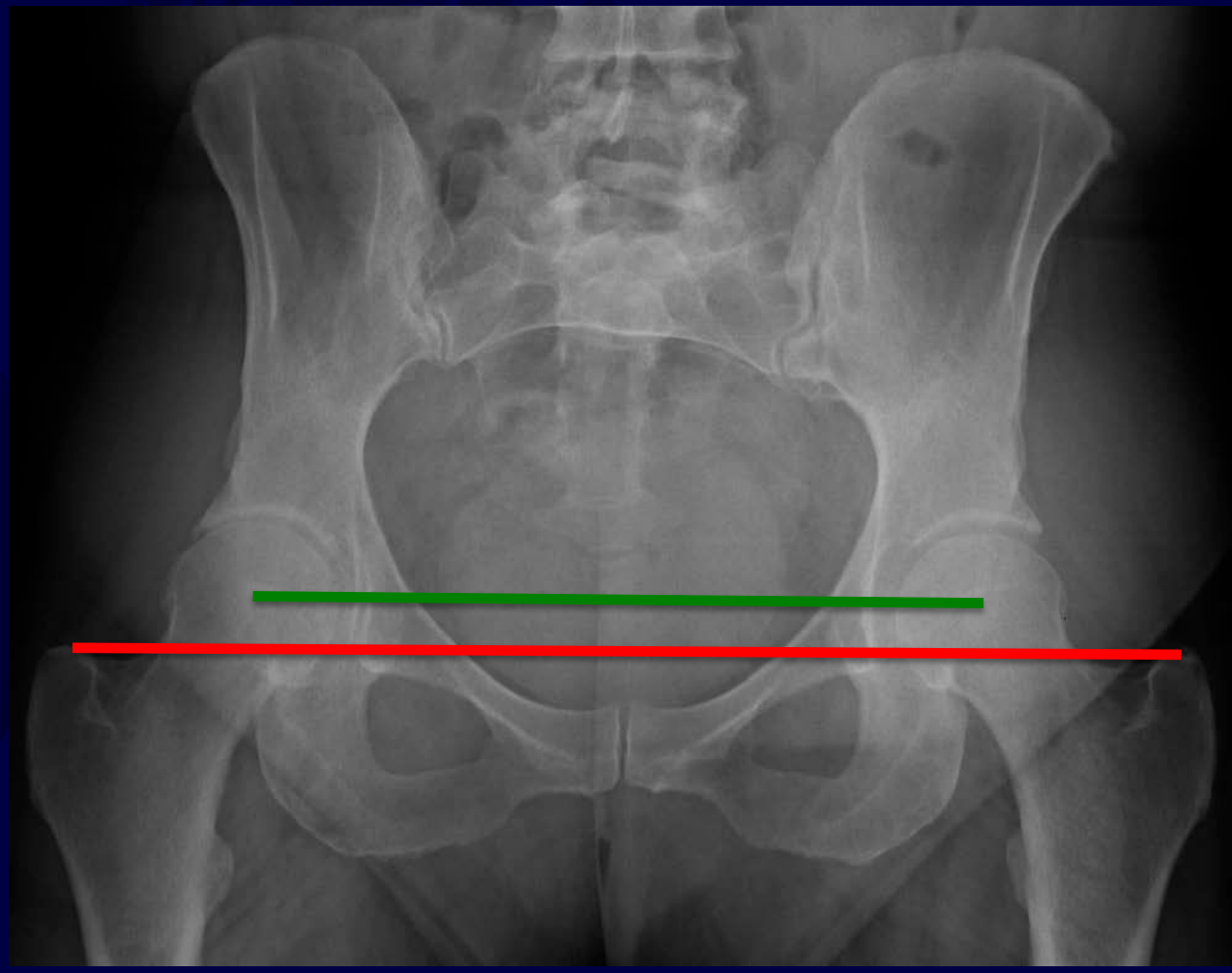
Anatomy

- note neck-shaft angle
- note the ‘height’ of the greater trochanter relative to the center of the femoral head
- the reduction should aim to recreate the patient’s normal anatomy



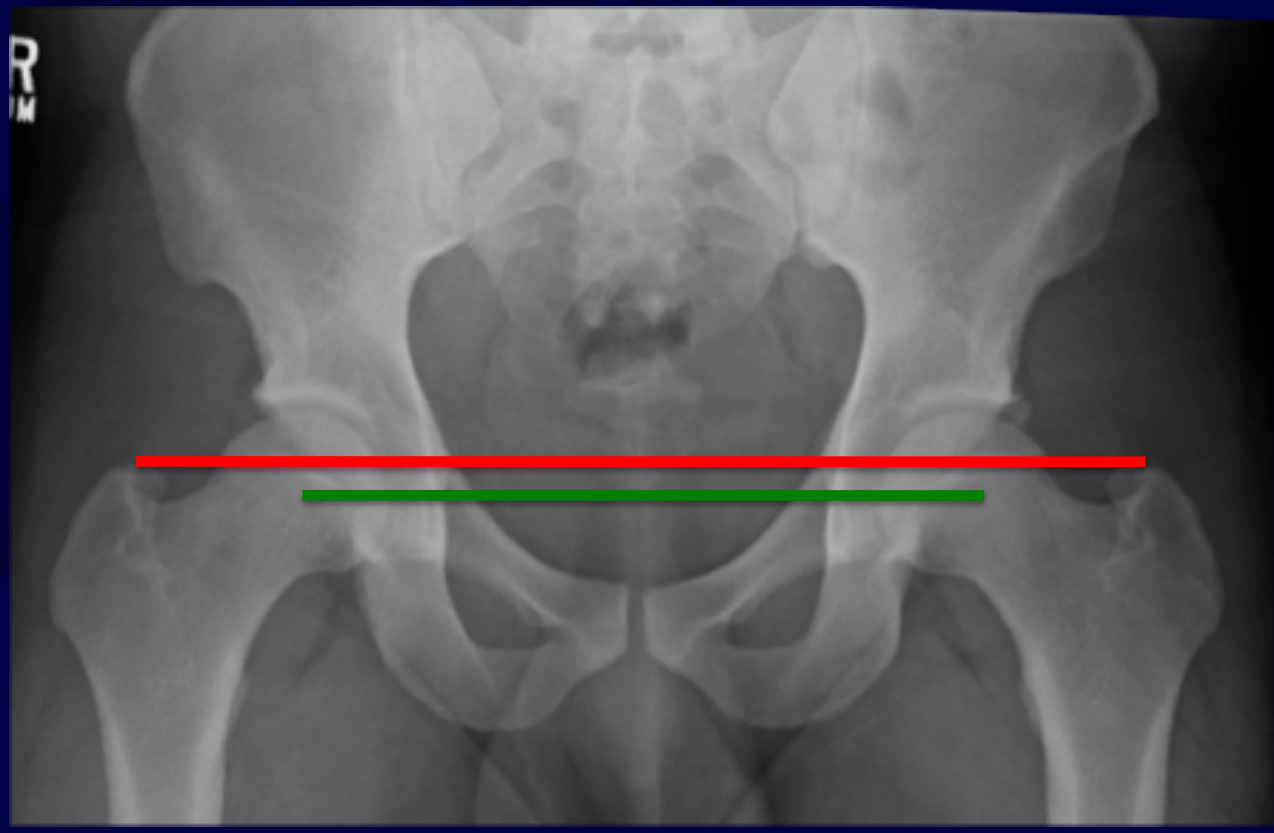
Anatomy

- when the centers are higher the trochs = valgus



Anatomy

- when the centers are lower than the trochs = varus



Classification – AO/OTA

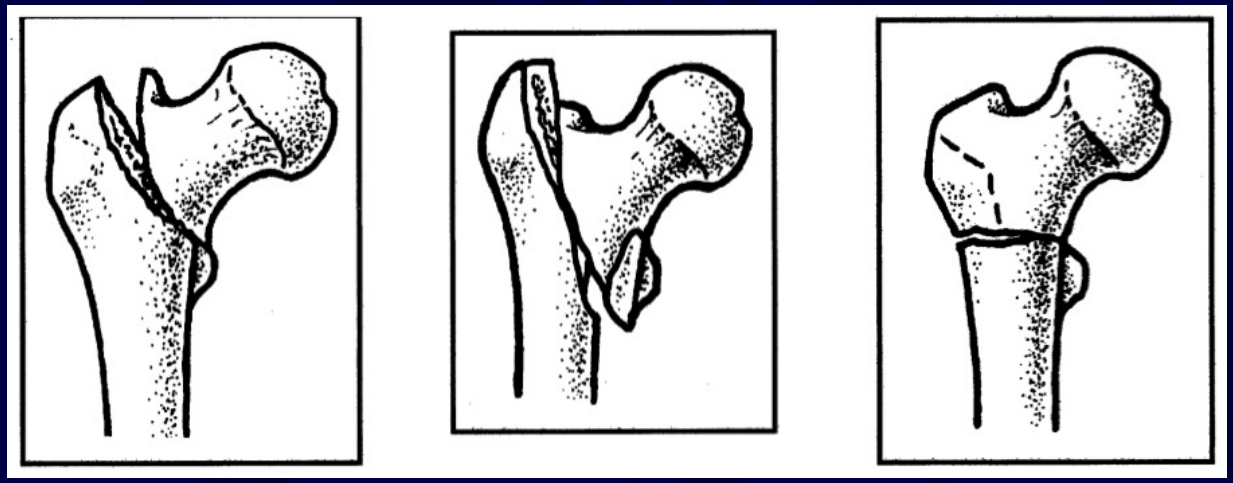
Fracture and Dislocation Classification Compendium - 2007

Orthopaedic Trauma Association Classification, Database and Outcomes Committee

J.L. Marsh, MD, Theddy F. Slongo, MD,† Julie Agel, NA, ATC,‡ J. Scott Broderick, MD,§ William Creevey, MD,|| Thomas A. DeCoster, MD,¶ Laura Prokuski, MD,# Michael S. Sirkin, MD,** Bruce Ziran, MD,†† Brad Henley, MD,‡ Laurent Audigé, DVM, PhD‡‡*

J Orthop Trauma • Volume 21, Number 10 Supplement, November/December 2007

- 31-A – proximal femur, trochanteric segment



1 2 3

- the standard classification system
- not great for communication
- (too) many subtypes

Classification - Stability

- stability *may* drive choice of implant
- stable fractures may be treated with a sliding hip screw
- unstable fractures *may* do better with intramedullary fixation

Classification - Stability

- features of instability
  - medial or posteromedial comminution
  - large lesser trochanter fragment
  - incompetent ‘lateral wall’
  - transverse fracture above the lesser
  - reverse obliquity
  - extension to the subtrochanteric region

Mechanism of Injury

- geriatric fractures most commonly occur from a ground level fall ➔ osteoporosis

- younger patients typically have a high energy mechanism
  - motorcycle
  - auto
  - fall from height

Assessing the Patient

- geriatric patient
  - in addition to full assessment for other injuries
  - prior functional level
  - living arrangements
  - comorbidities
  - prior treatment for osteoporosis?
- young patients
  - ATLS

Assessing the Patient

- shortened & externally rotated limb
- neuro exam
- vascular exam
- imaging

Assessing the Patient

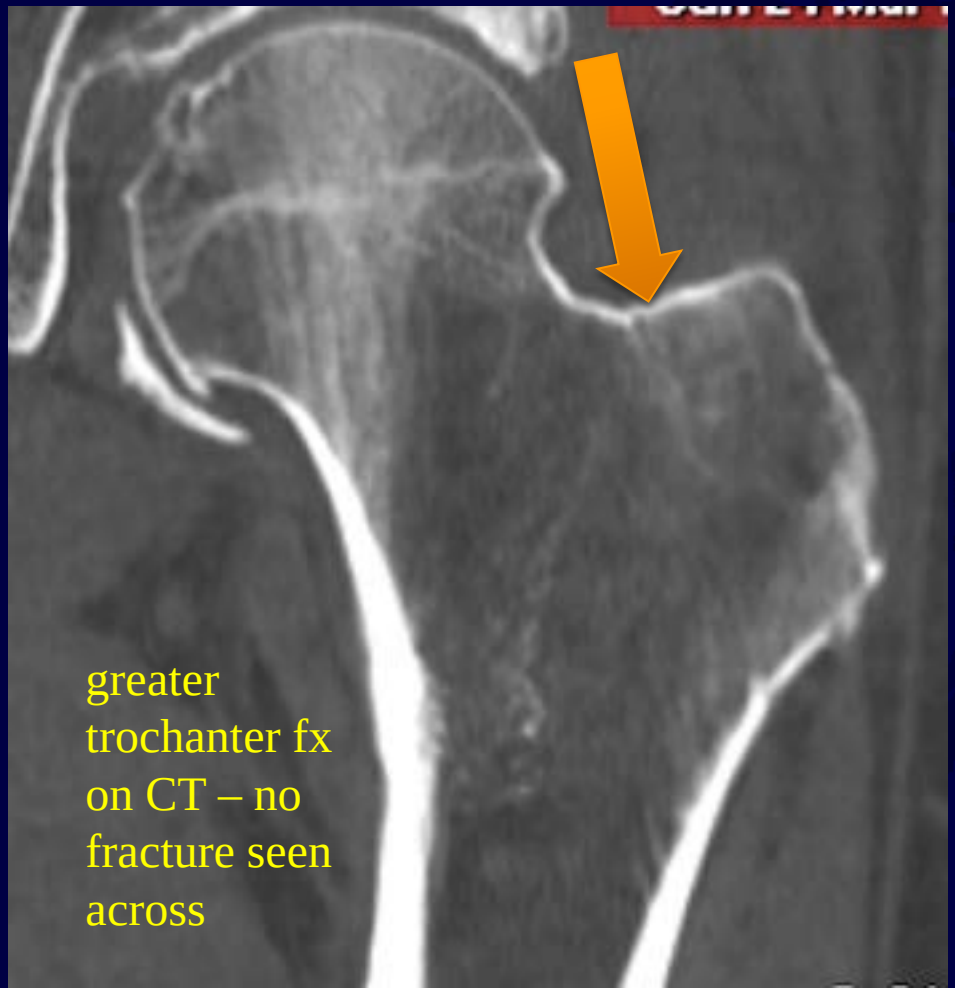
- imaging
  - pelvis AP
  - hip 2v
  - femur 2v – deformities? other implants? (you need to assess the whole femur

Assessing the Patient

- imaging
  - ct – atypical patterns?
  - mri – searching for an occult fx

Assessing the Patient

- imaging
  - w/u hip pain after trauma



greater trochanter fx on CT – no fracture seen across

pt unable to mobilize - MRI was ordered - fluid consistent with occult fx

Assessing the Patient

- imaging
  - mri – searching for an occult fx
  - a negative ct does *not* rule out an occult fx in geriatric patients

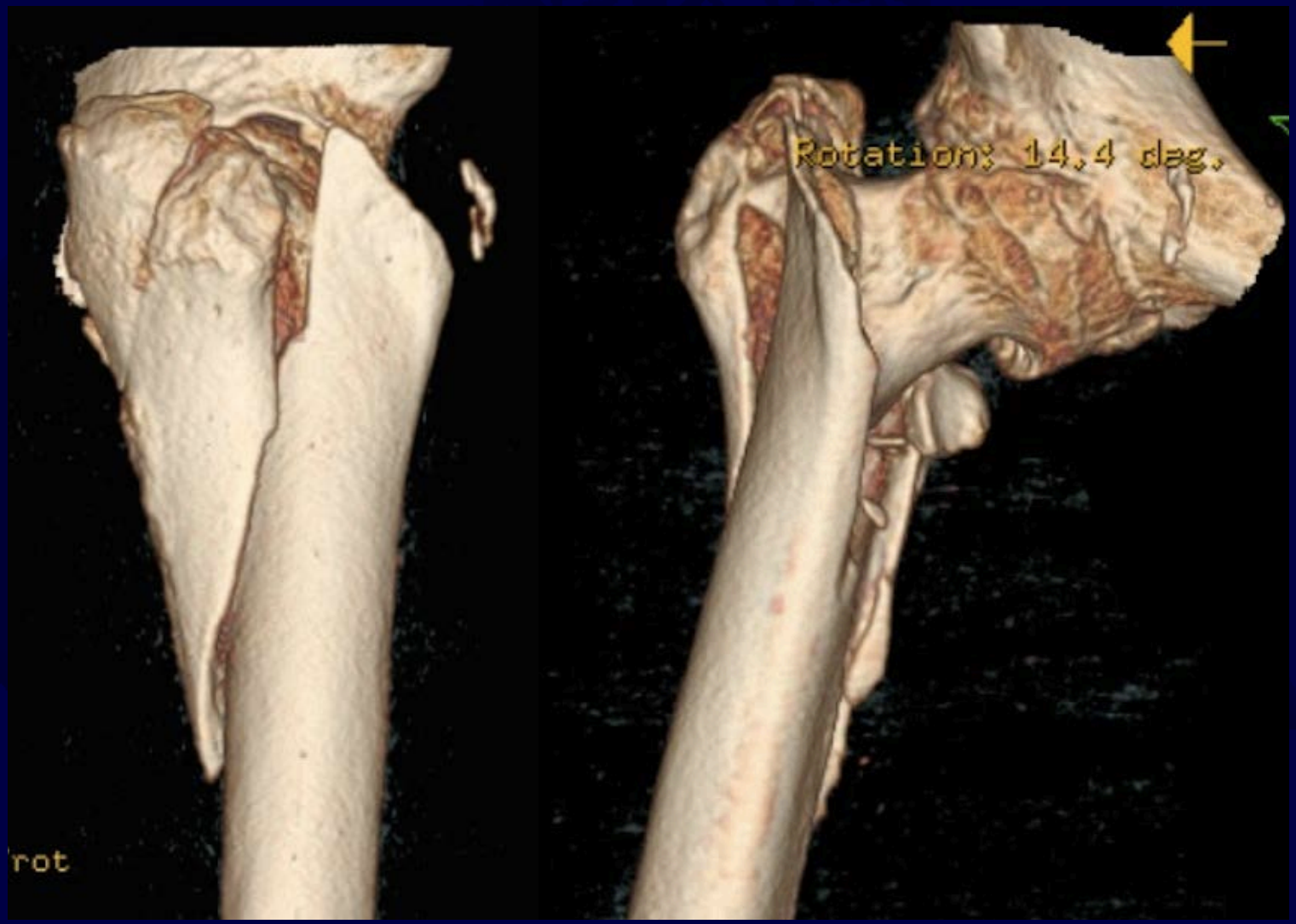
Diagnosis of Occult Fractures about the Hip

VOL. 75-A, NO. 3, MARCH 1993

MAGNETIC RESONANCE IMAGING COMPARED WITH BONE-SCANNING*

BY PETER FOLEY RIZZO, M.D.†, ELAINE S. GOULD, M.D.‡, JOHN P. LYDEN, M.D.§, NEW YORK, AND STANLEY E. ASNIS, M.D.¶, MANHASSET, NEW YORK

Assessing the Patient

- 

Associated Injuries

- geriatric patients
  - look for other osteoporotic fractures
    - shoulder
    - wrist
    - vertebral compression
  - beware of head injuries in patients on anticoagulants
- w/u & treat osteoporosis

Associated Injuries

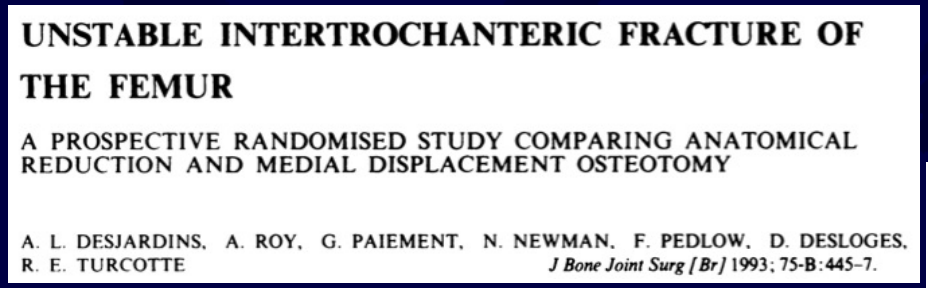
- young patients – ATLS
  - like any other high energy trauma
  - full secondary surveys on initial evaluation and after surgical intervention – look for other injuries

Treatment

- closed
  - infrequently used – even in nonambulators
  - reduction and fixation is palliative for pain, hygiene

Treatment

- open
  - reduction and stabilization versus arthroplasty (primarily ➔ severe DJD)
  - anatomic reduction favored over displacment osteotomies (ie. dimon-hughston)

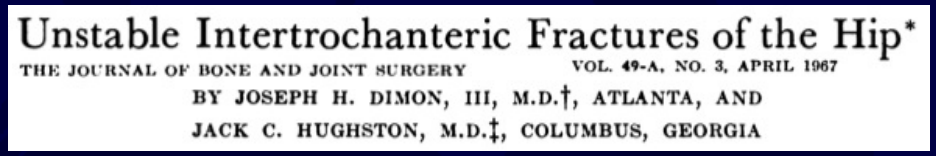


UNSTABLE INTERTROCHANTERIC FRACTURE OF THE FEMUR

A PROSPECTIVE RANDOMISED STUDY COMPARING ANATOMICAL REDUCTION AND MEDIAL DISPLACEMENT OSTEOTOMY

A. L. DESJARDINS, A. ROY, G. PAIEMENT, N. NEWMAN, F. PEDLOW, D. DESLOGES, R. E. TURCOTTE

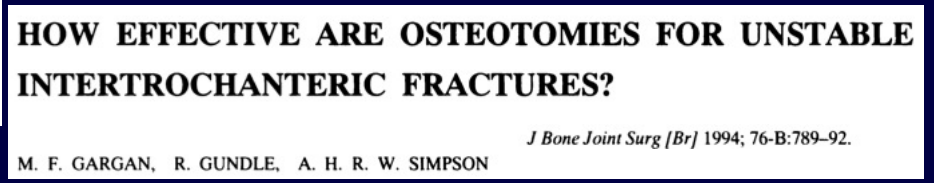
J Bone Joint Surg [Br] 1993; 75-B:445–7.



Unstable Intertrochanteric Fractures of the Hip*

THE JOURNAL OF BONE AND JOINT SURGERY VOL. 49-A, NO. 3, APRIL 1967

BY JOSEPH H. DIMON, III, M.D.†, ATLANTA, AND JACK C. HUGHSTON, M.D.‡, COLUMBUS, GEORGIA



HOW EFFECTIVE ARE OSTEOTOMIES FOR UNSTABLE INTERTROCHANTERIC FRACTURES?

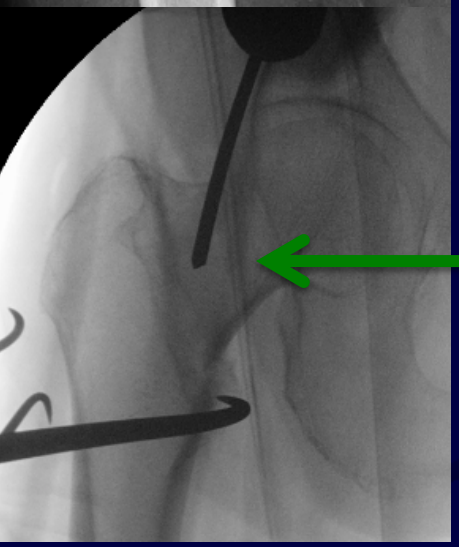
J Bone Joint Surg [Br] 1994; 76-B:789–92.

M. F. GARGAN, R. GUNDLE, A. H. R. W. SIMPSON

Treatment

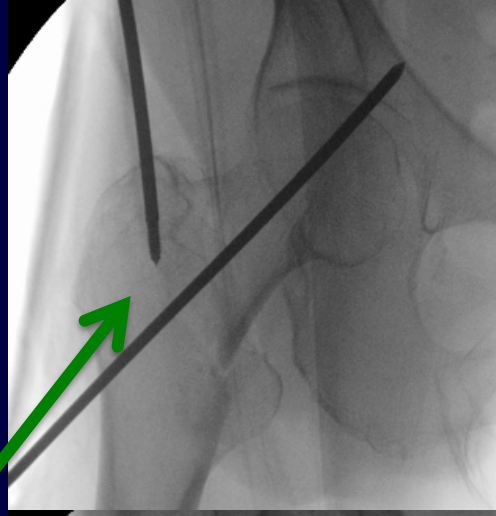
- open (continued)
  - choice of implant is controversial
    - sliding hip screw (shs)
    - intramedullary nail (imn)

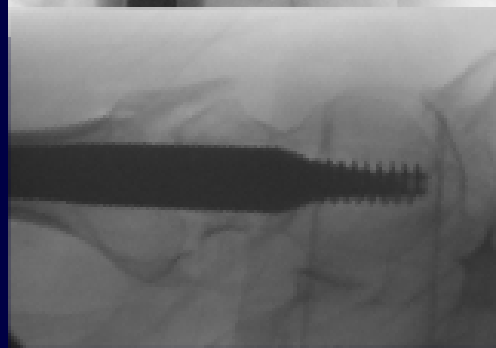
Treatment



whatever implant is chosen…

- anatomic reduction ***prior*** to fixation**
  - implant won't reduce the fracture
- avoid devitalizing fragments – joystick with pins
- need 'stable' fixation to allow early mobilization





shs v. imn

- shs had been the standard device
- adoption of imn was made largely w/o evidence of improved results (initial results of imn had higher complication rates)
- as of 2005, candidates sitting for abos were using more imn than shs

Nail or Plate Fixation of Intertrochanteric Hip Fractures: Changing Pattern of Practice

A Review of the American Board of Orthopaedic Surgery Database

J Bone Joint Surg Am. 2008;90:700-7

By Jeffrey O. Anglen, MD, and James N. Weinstein, DO, on Behalf of the American Board of Orthopaedic Surgery Research Committee

shs v. imn

- evidence assessing for optimal implants is weak (low level, underpowered)
- early generations of imn (cephalomedullary) were prone to problems (ie., fracture at the tip) – which have improved with improved design

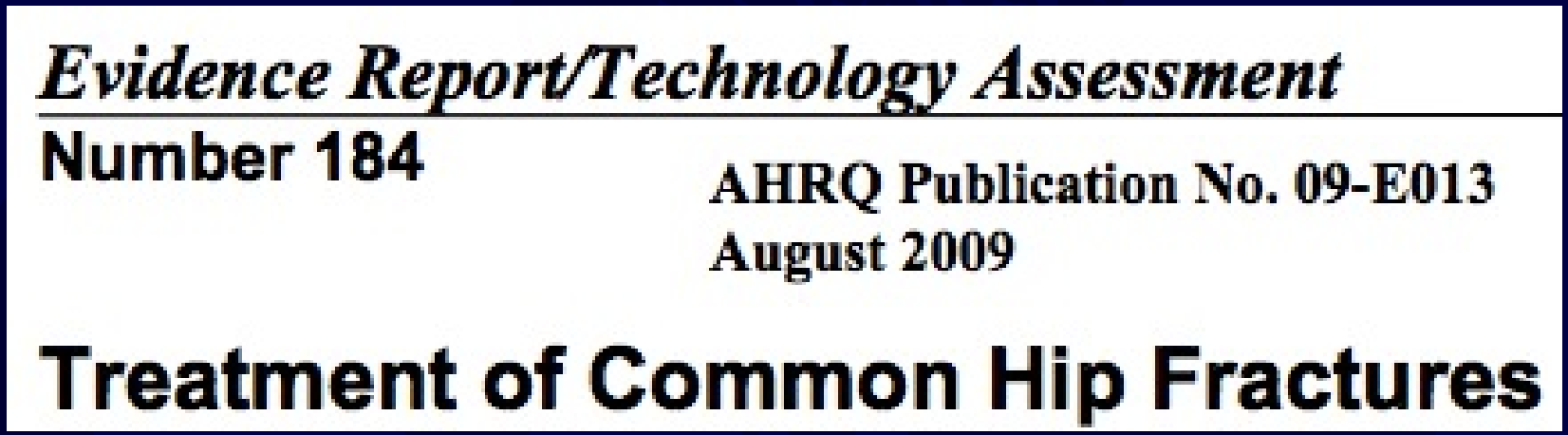
Gamma Nails Revisited: Gamma Nails Versus Compression Hip Screws in the Management of Intertrochanteric Fractures of the Hip: A Meta-Analysis

J Orthop Trauma • Volume 23, Number 6, July 2009

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

shs v. imn

- "*No recommendation for device based on patient outcomes.*"



- future research recommendations
  - 'better research' (paraphrased) (consistent use of outcome measures, assess and quantify surgical technique, data pooling)

Treatment

- open (continued)
  - arthroplasty
  - insufficient data to determine advantage of arthroplasty over internal fixation

Replacement arthroplasty versus internal fixation for extracapsular hip fractures in adults (Review)

Cochrane Database of Systematic Reviews 2006, Issue 2. Art. No.: CD000086.

Parker MJ, Handoll HHG

- improved clinical outcome with imn, no difference with function
  - ↑ blood loss
  - ↑ mortality

CEMENTLESS CALCAR-REPLACEMENT HEMIARTHROPLASTY COMPARED WITH INTRAMEDULLARY FIXATION OF UNSTABLE INTERTROCHANTERIC FRACTURES

A PROSPECTIVE, RANDOMIZED STUDY

THE JOURNAL OF BONE & JOINT SURGERY · JBJS.ORG
VOLUME 87-A · NUMBER 10 · OCTOBER 2005

BY SHIN-YOON KIM, MD, YONG-GOO KIM, MD, AND JUN-KYUNG HWANG, MD

Investigation performed at the Department of Orthopedic Surgery, Kyungpook National University School of Medicine, Daegu, South Korea

Treatment - Timing

- ‘expedient’
  - don’t rush to surgery ‘emergently’
  - get ‘judicious’ w/u (avoid the $1M w/u – usually just delays surgery
  - don’t treat as purely elective – ‘book it for 2 days from now’
  - literature is observational – selection bias for the patients who go to surgery quickest (healthier patients)

Treatment - Timing

- surgery w/in 48h associated with decreased mortality

Postoperative Complications and Mortality Associated with Operative Delay in Older Patients Who Have a Fracture of the Hip[*†]

THE JOURNAL OF BONE AND JOINT SURGERY VOL. 77-A, NO. 10, OCTOBER 1995

BY JOSEPH D. ZUCKERMAN, M.D.‡, MARY LOUISE SKOVRON, DR.P.H.‡, KENNETH J. KOVAL, M.D.‡, GINA AHARONOFF, M.P.H.‡, AND VICTOR H. FRANKEL, M.D., PH.D.‡, NEW YORK, N.Y.

- no difference in mortality – increase complications

The Effects of Time-to-Surgery on Mortality and Morbidity in Patients following Hip Fracture

June 15, 2002 THE AMERICAN JOURNAL OF MEDICINE® Volume 112

Julia P. Grimes, DO, MPH, Patrice M. Gregory, PhD, MPH, Helaine Noveck, MPH, Mark S. Butler, MD, Jeffrey L. Carson, MD

Treatment - Timing

- pts are less likely to return to independent living if delayed 36-48h
- 80% of pts w/o dementia returned to indep living w/in 4 mos (<36h)
- 31% of demented pts returned to indep living
- fewer pressure sores if <24h

Early Operation on Patients with a Hip Fracture Improved the Ability to Return to Independent Living

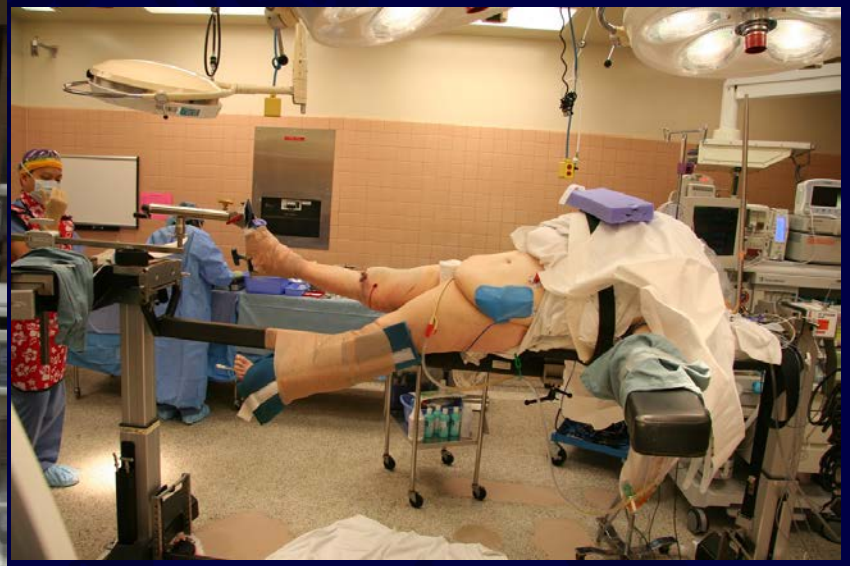
A Prospective Study of 850 Patients

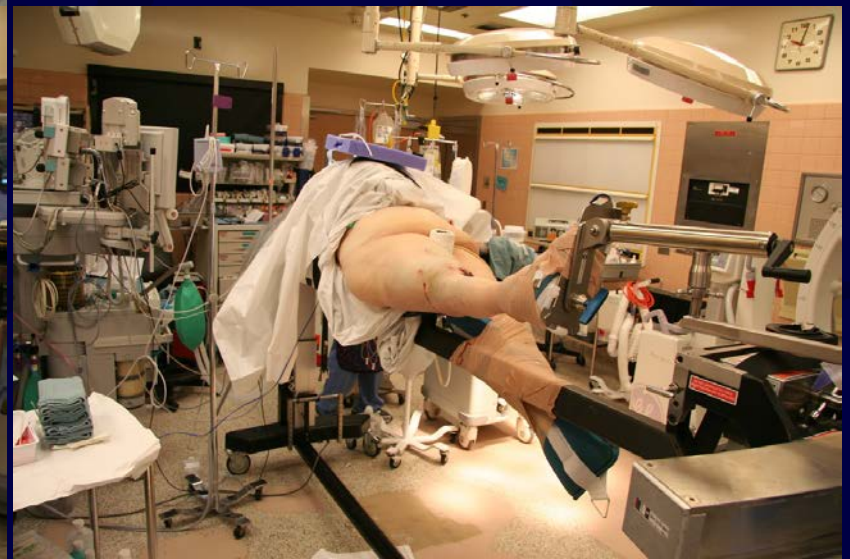
J Bone Joint Surg Am. 2008;90:1436-42 • doi:10.2106/JBJS.G.00890

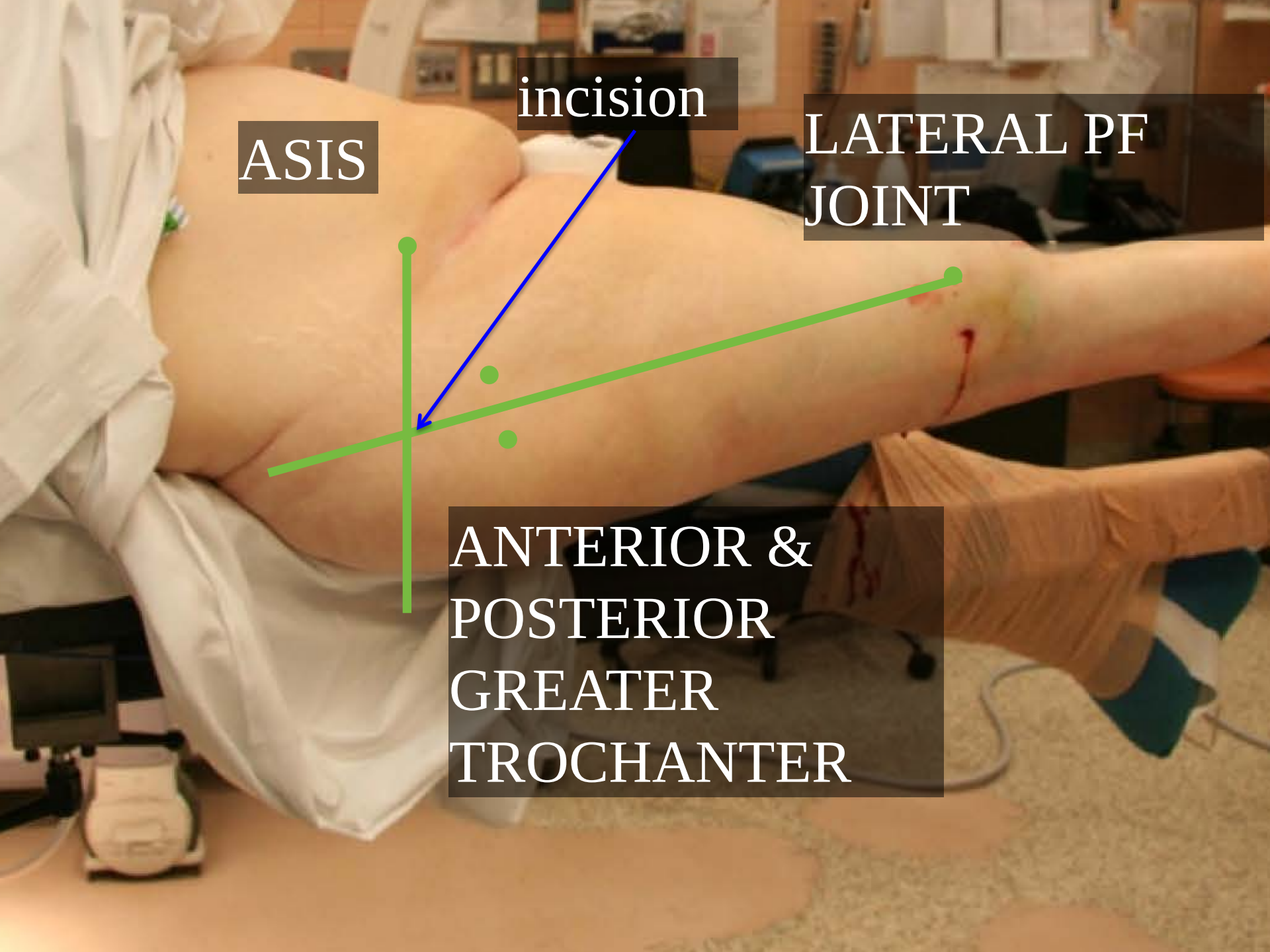
By Amer N. Al-Ani, MD, Bodil Samuelsson, RN, Jan Tidermark, MD, PhD, Åsa Norling, RN, Wilhelmina Ekström, MD, Tommy Cederholm, MD, PhD, and Margareta Hedström, MD, PhD

Treatment

- position - fx table with well limb

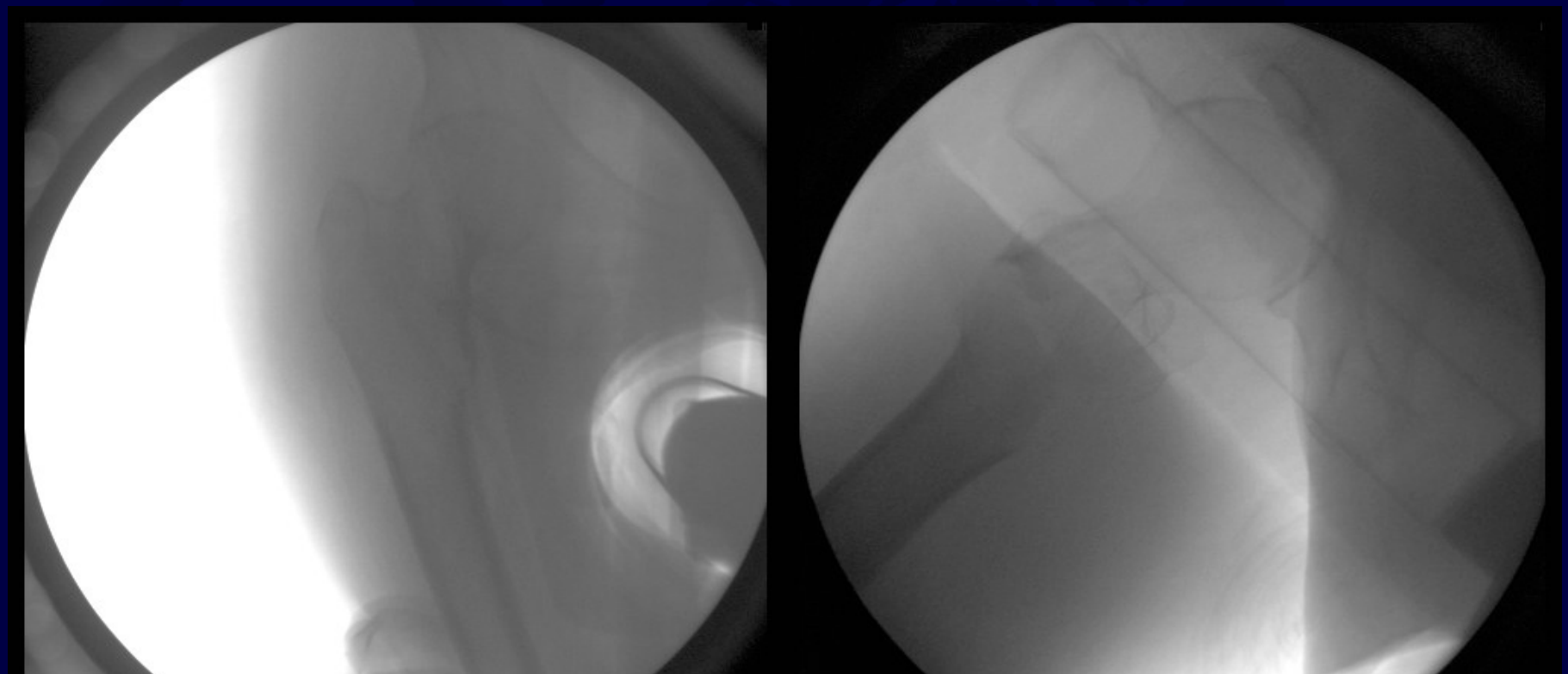





incision
ASIS
LATERAL PF JOINT
ANTERIOR & POSTERIOR GREATER TROCHANTER

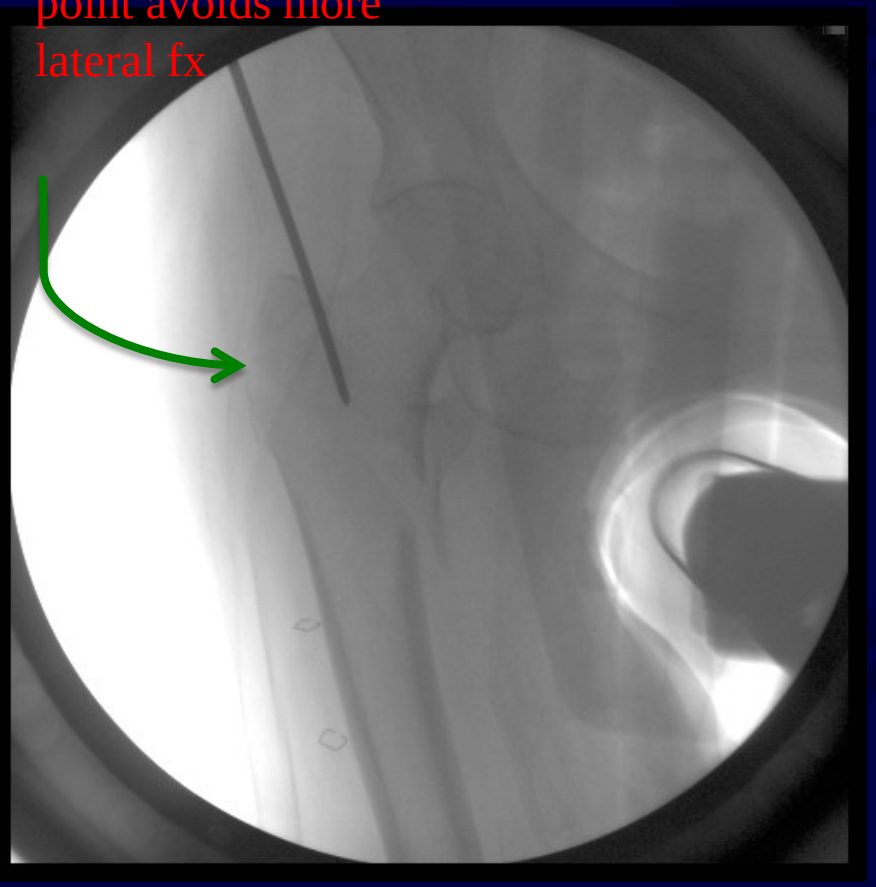
Treatment

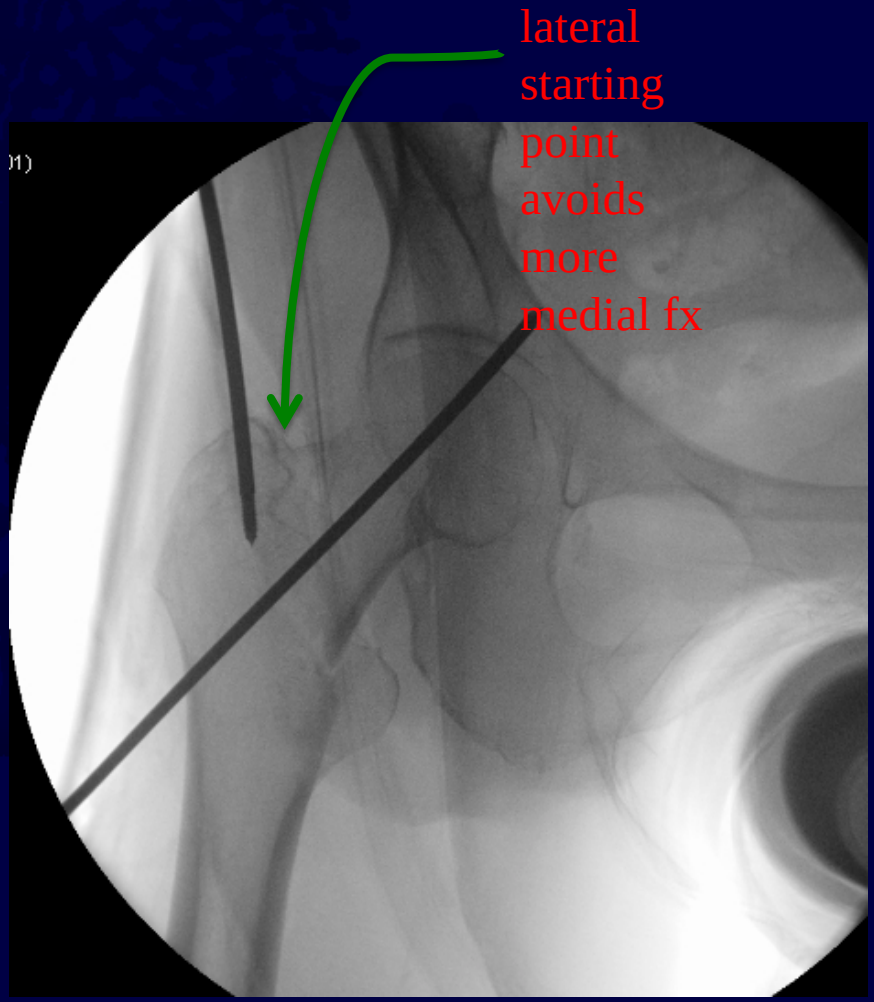
- I make a stab incision so if i’m fighting soft tissue (adipose) I can adjust without making a huge incision (another stab)
- reduce fracture on the table



Treatment

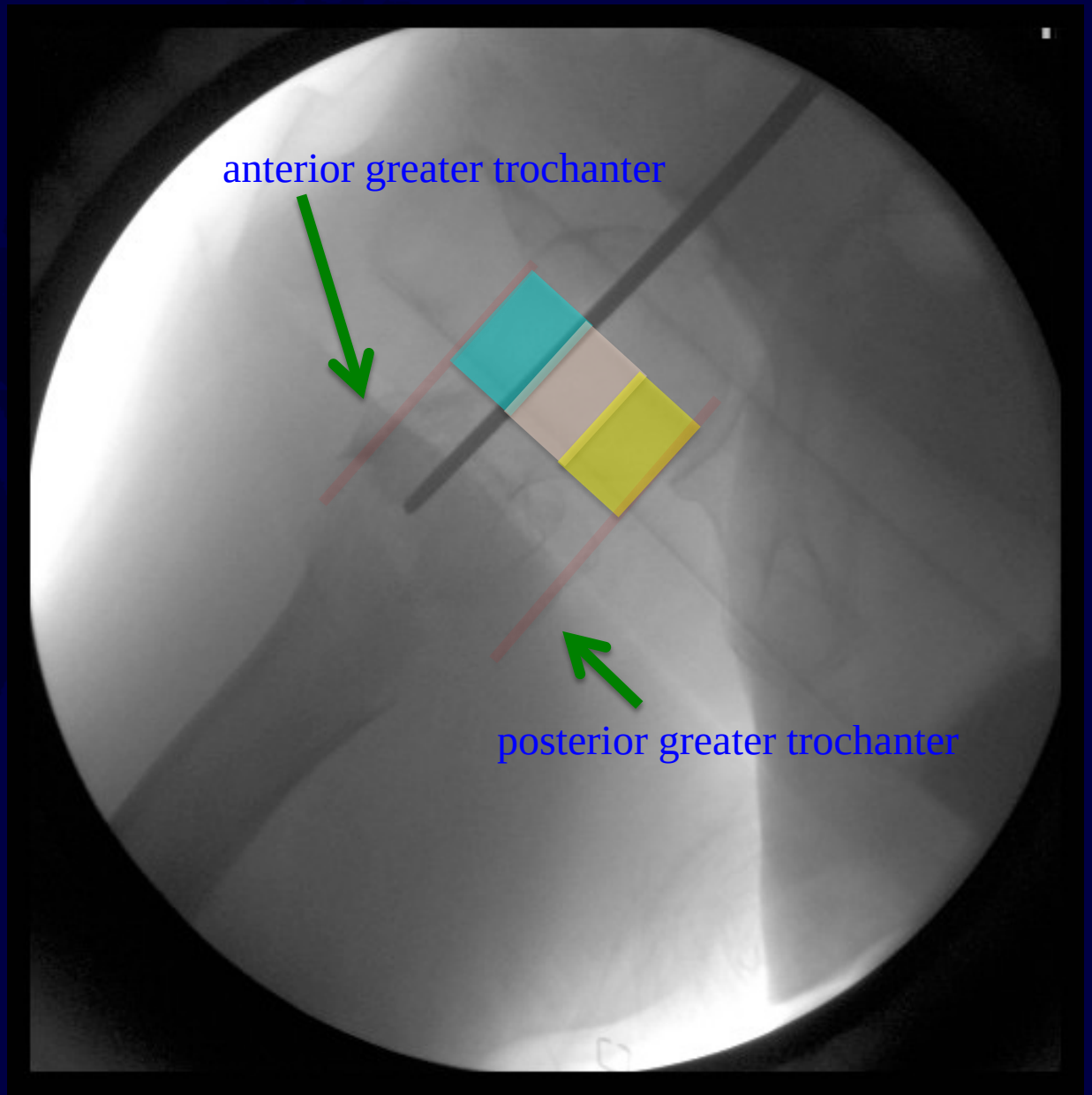
- pick a starting point that keeps the reamer from falling into the fx





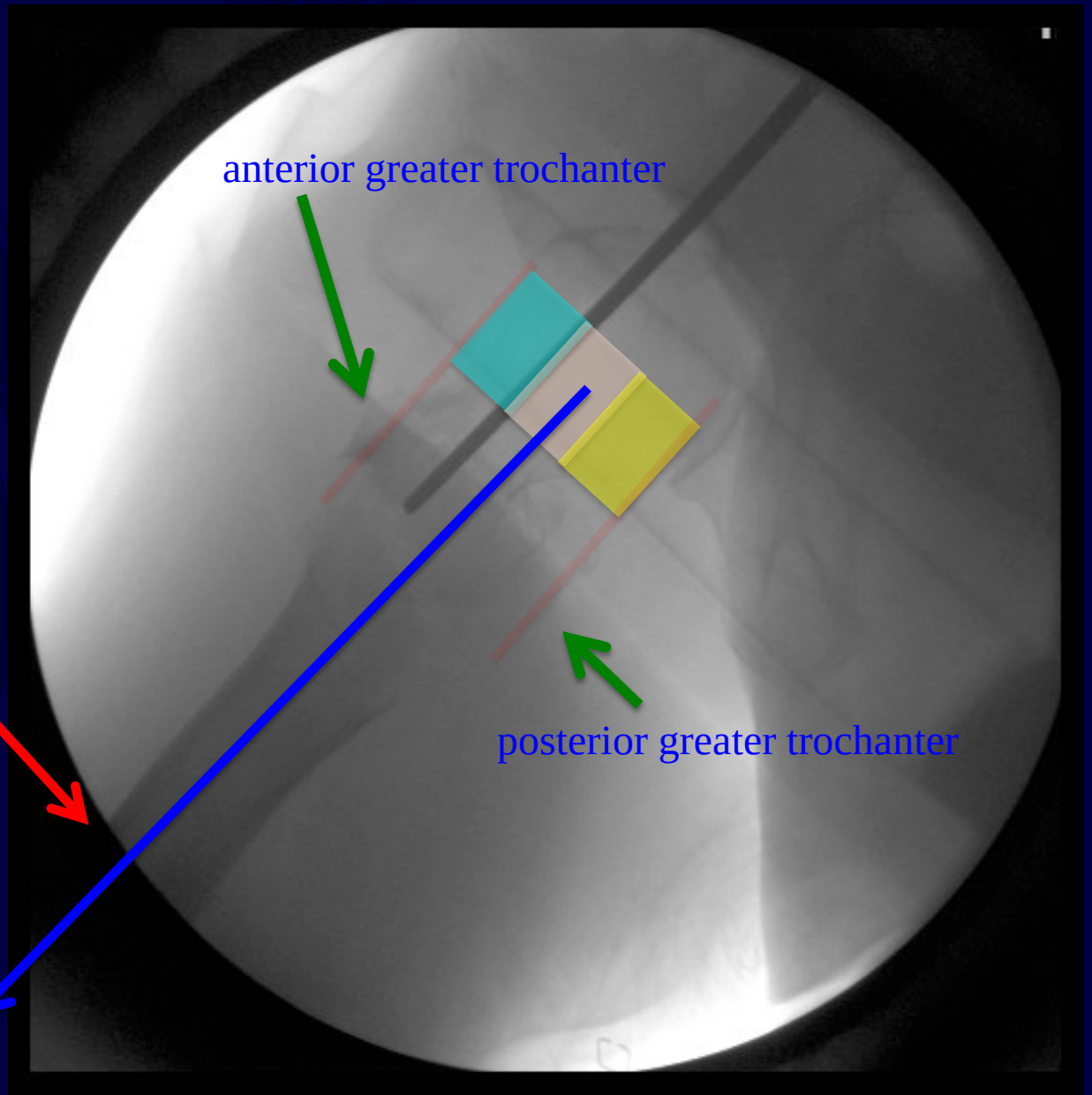
Treatment

- lateral view
  - the pin should be at the jxn of the anterior & middle 1/3's of the greater troch
  - not centered!
  - if it's centereed it won't align with the neck and the shaft



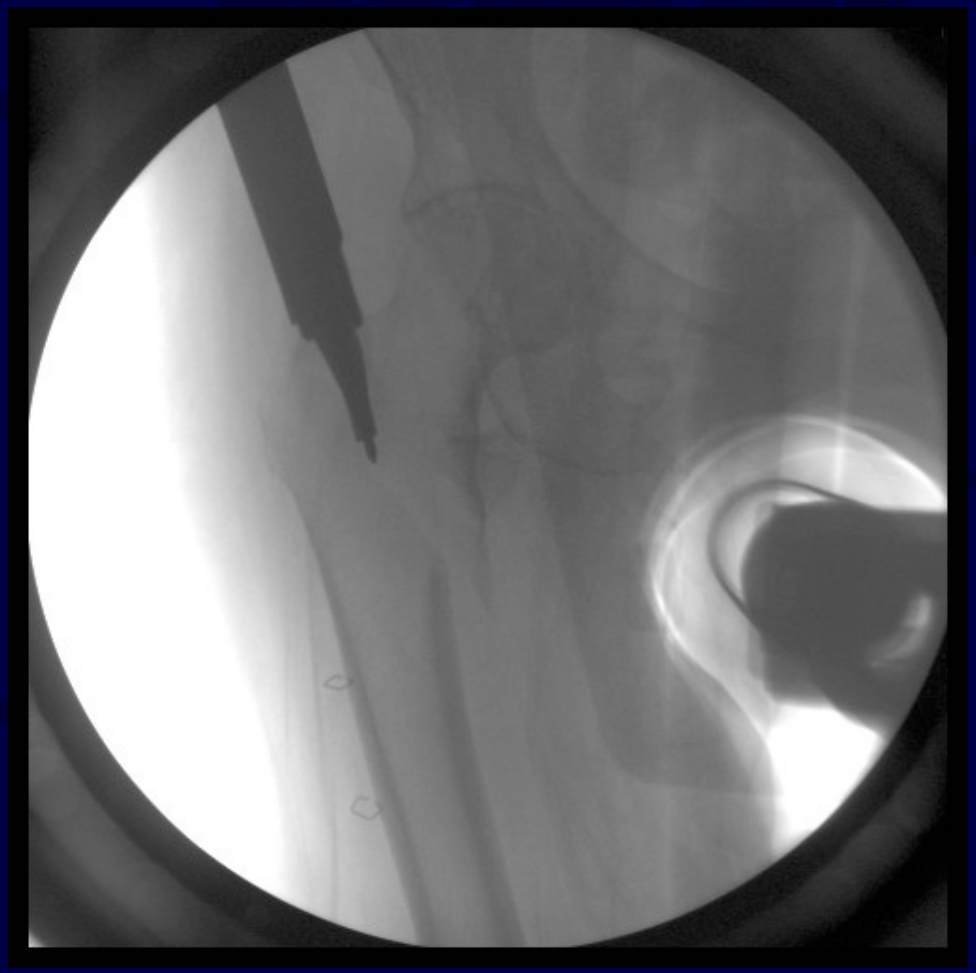
Treatment

- if it's too posterior – distal end of nail can abut the anterior cortex



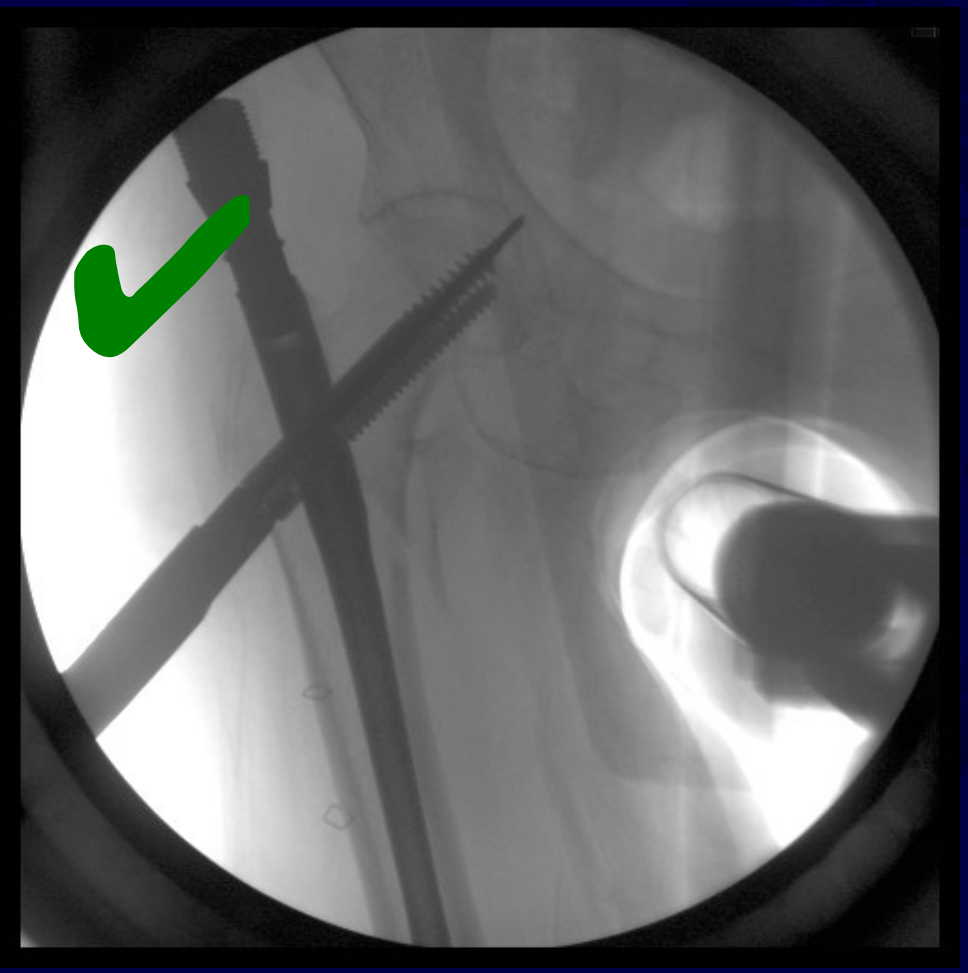
Treatment

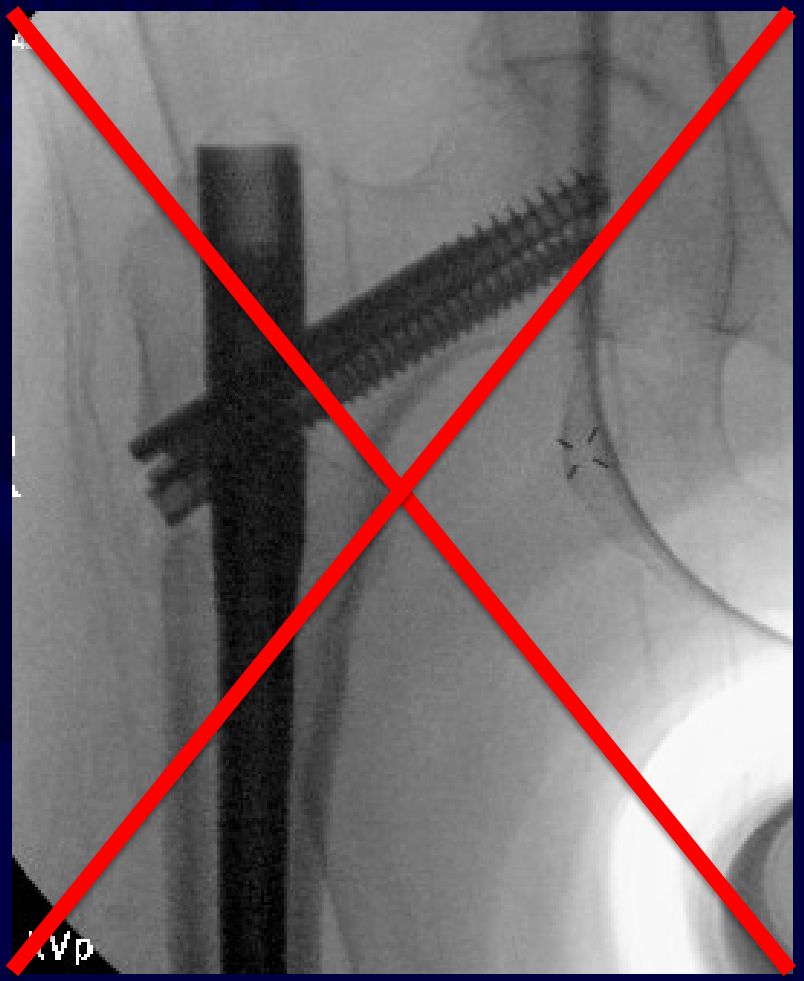
- guide the reamer down to avoid reaming into the neck or out laterally



Treatment

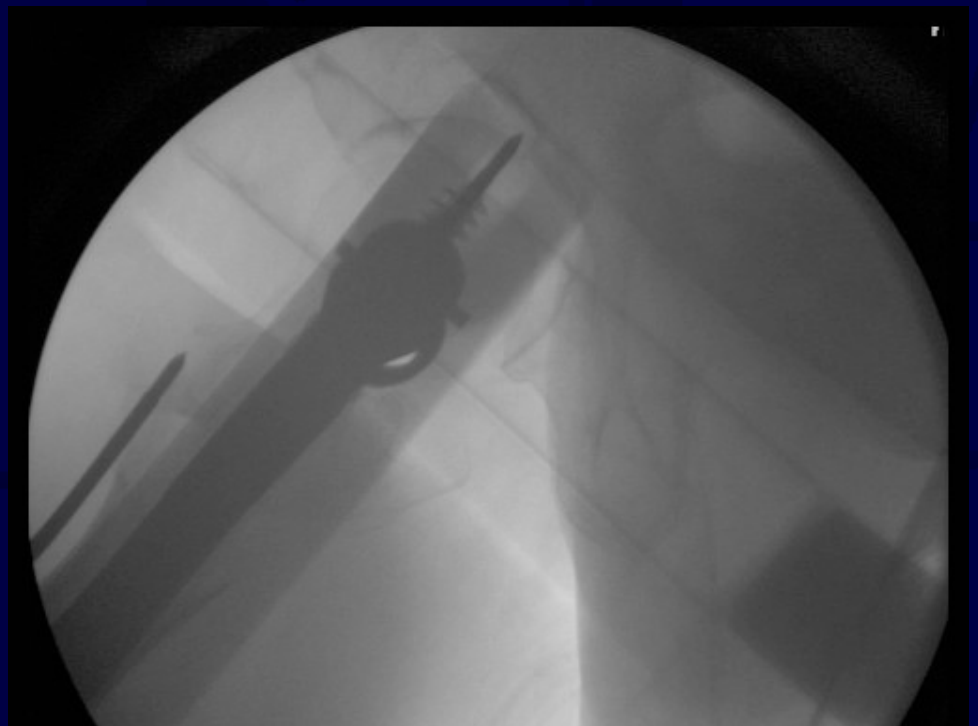
- prior to proximal fixation add traction to eliminate varus (as needed)





Treatment

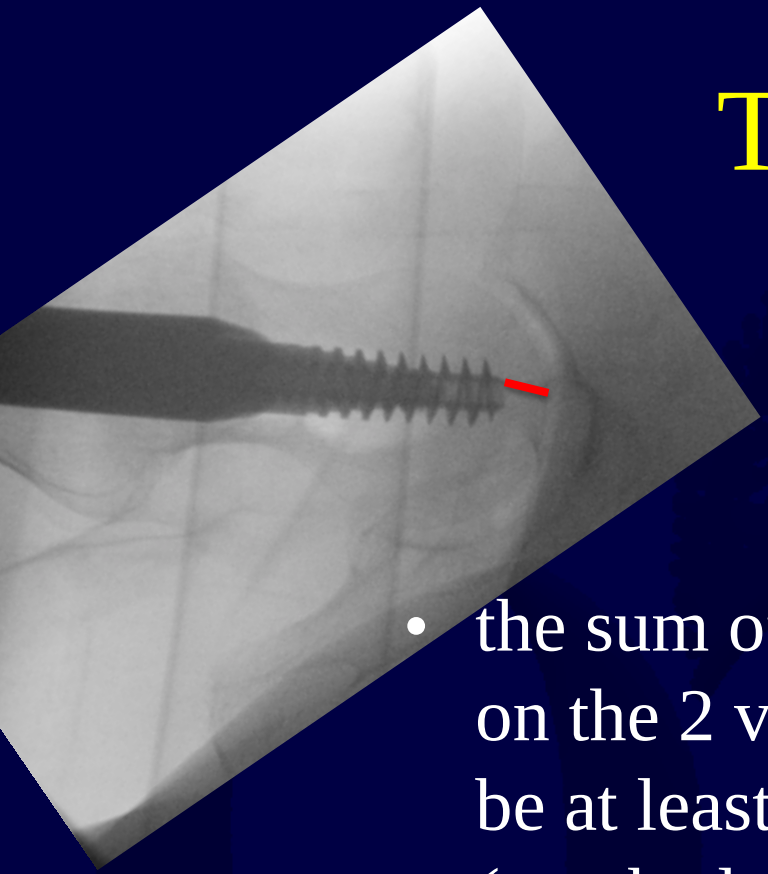
- ‘perfect’ lateral – the nail is centered over the femoral neck and head – then rotate the nail until the jig to direct the pin trajectory to the center of the head



Treatment

- screw should be deep in the head, centered or lower on the AP, centered on the lateral
- lock distally if axial or rotational instability

Treatment



- the sum of the distances on the 2 views should be at least <25mm (maybe less)

The Value of the Tip-Apex Distance in Predicting Failure of Fixation of Peritrochanteric Fractures of the Hip*

THE JOURNAL OF BONE AND JOINT SURGERY

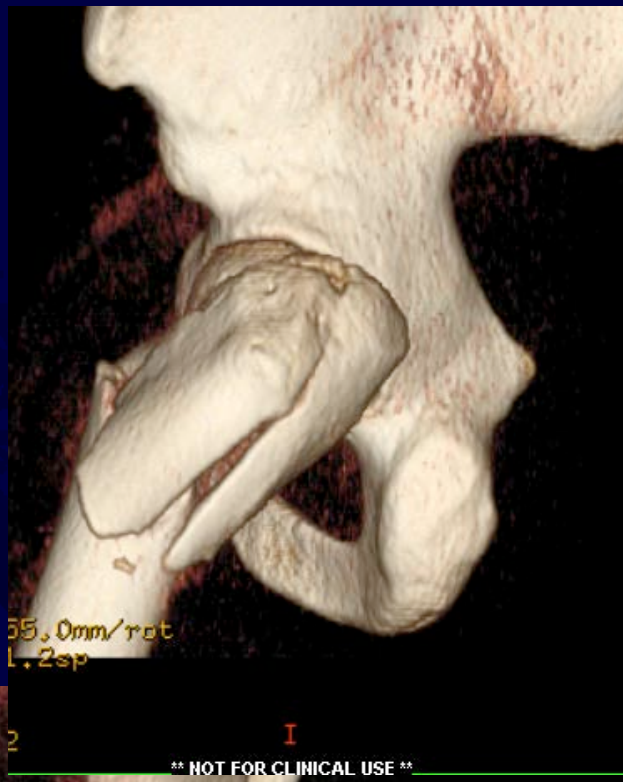
BY MICHAEL R. BAUMGAERTNER, M.D.†, STEPHEN L. CURTIN, M.D.†, DIETER M. LINDSKOG, B.A.†, AND JOHN M. KEGGI, M.D.‡, NEW HAVEN, CONNECTICUT

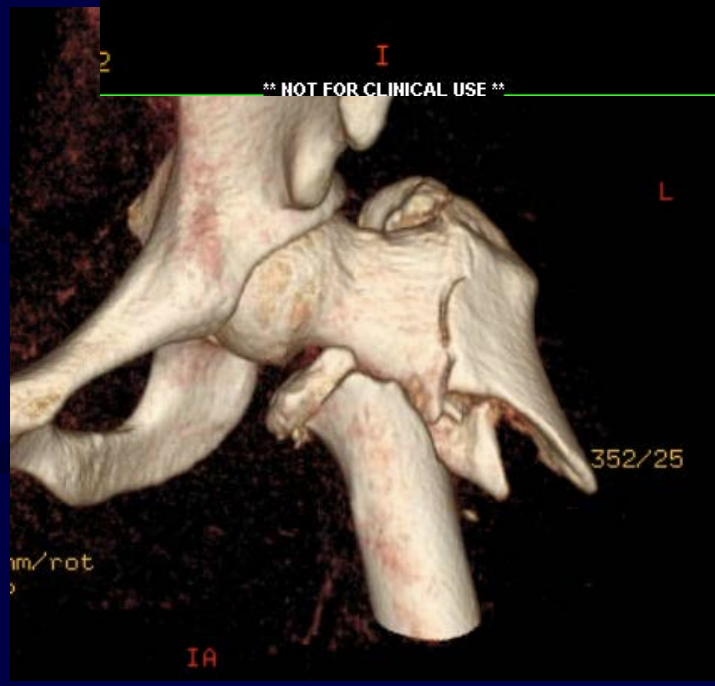
VOL. 77-A, NO. 7, JULY 1995

Investigation performed at the Department of Orthopaedics and Rehabilitation, Yale University School of Medicine, New Haven

Treatment

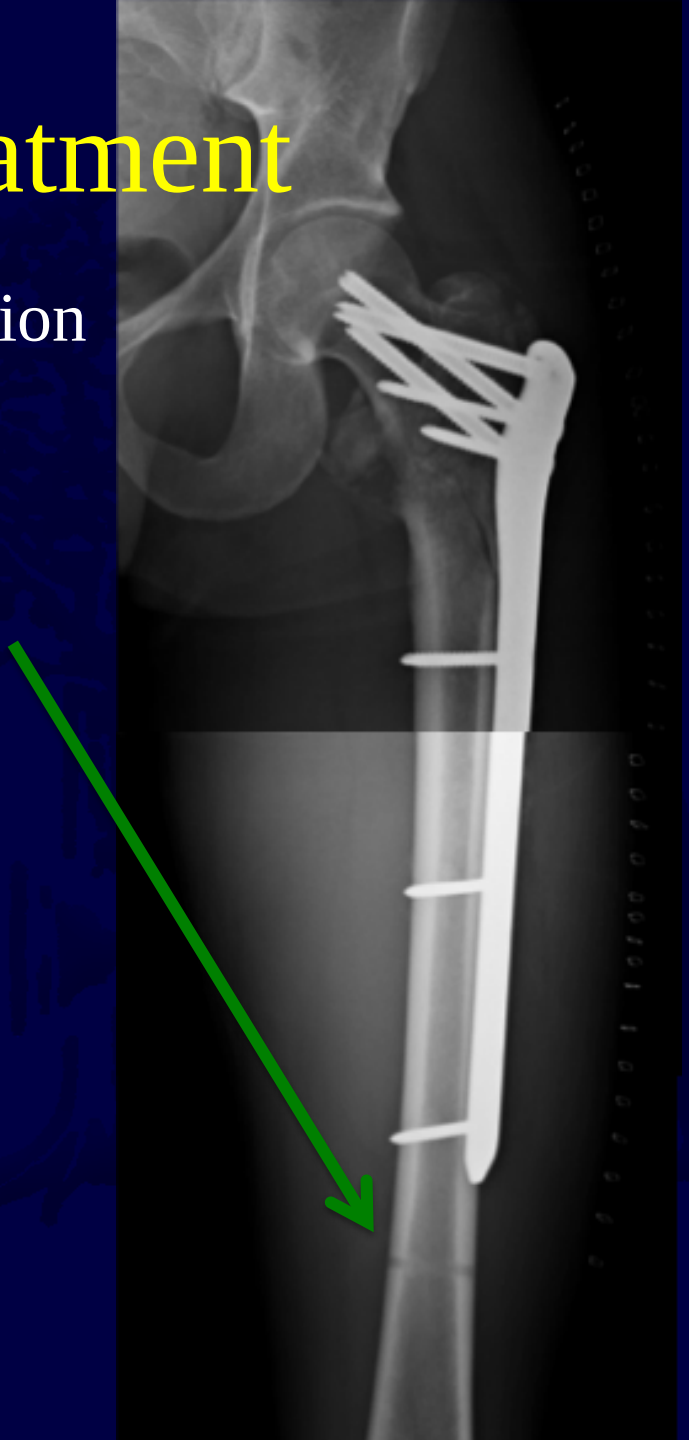
- high energy reverse oblique in 32y man
- option for imn (risk to displace the coronal split at lateral cortex) or plate - ? maintain alignment – concern for varus





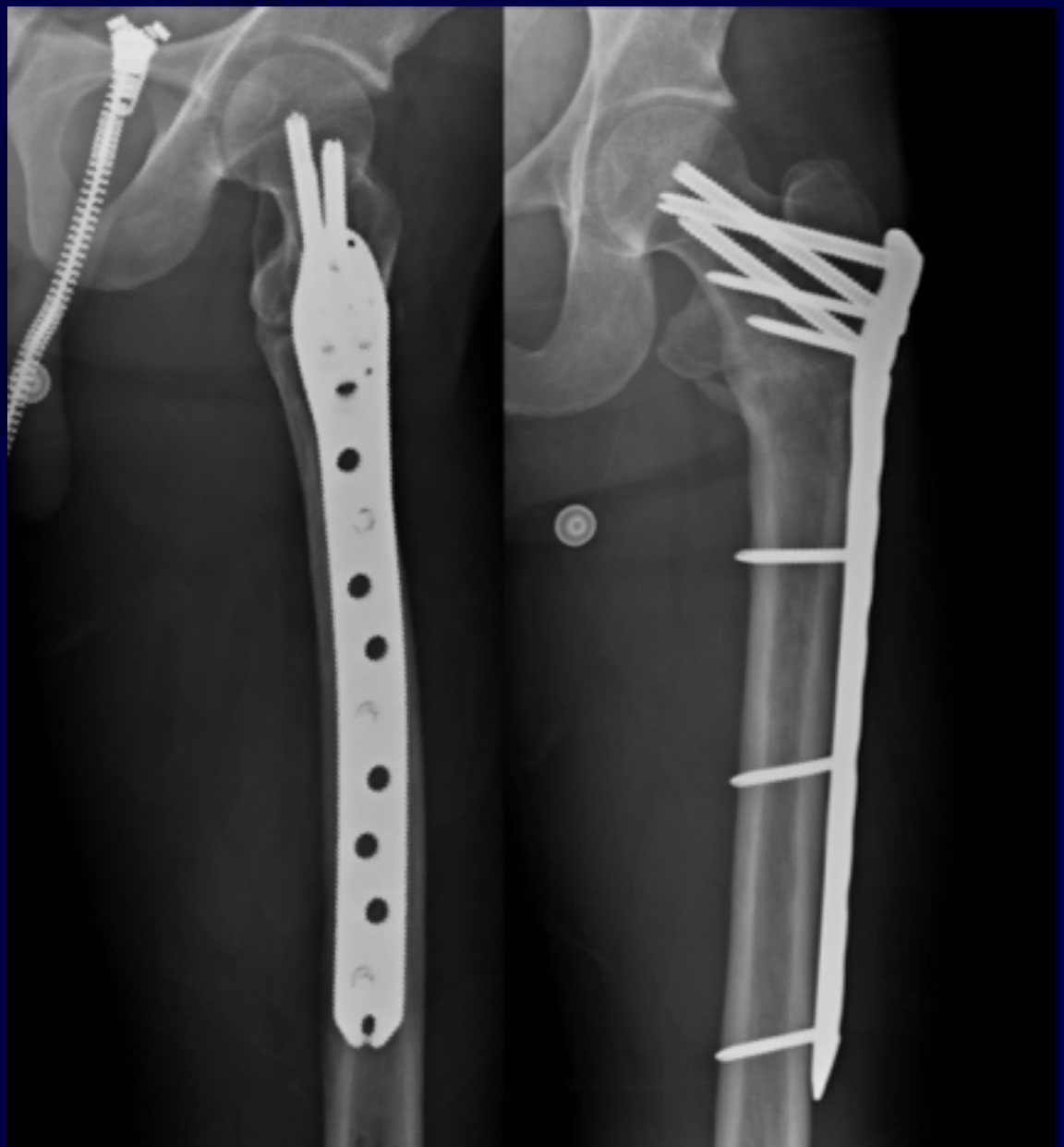
Treatment

- reduce and get proximal fixation
- articulated tensioner
  - helps eliminate varus
  - tensions the construct
  - compresses the fracture



Treatment

- healed and remodeled at 9 months



Treatment

- implants removed due to pain (prominent implant)

Rehabilitation

- early mobilization
- wbat immediately or within 1-2 weeks of surgery
  - non-demented patients – ‘voluntarily limit weight-bearing on the basis of the degree of discomfort or apprehension that such weight-bearing causes’ (self protected weight bearing)
  - demented patients (they do what they want)?

Postoperative Weight-Bearing after a Fracture of the Femoral Neck or an Intertrochanteric Fracture*

THE JOURNAL OF BONE AND JOINT SURGERY

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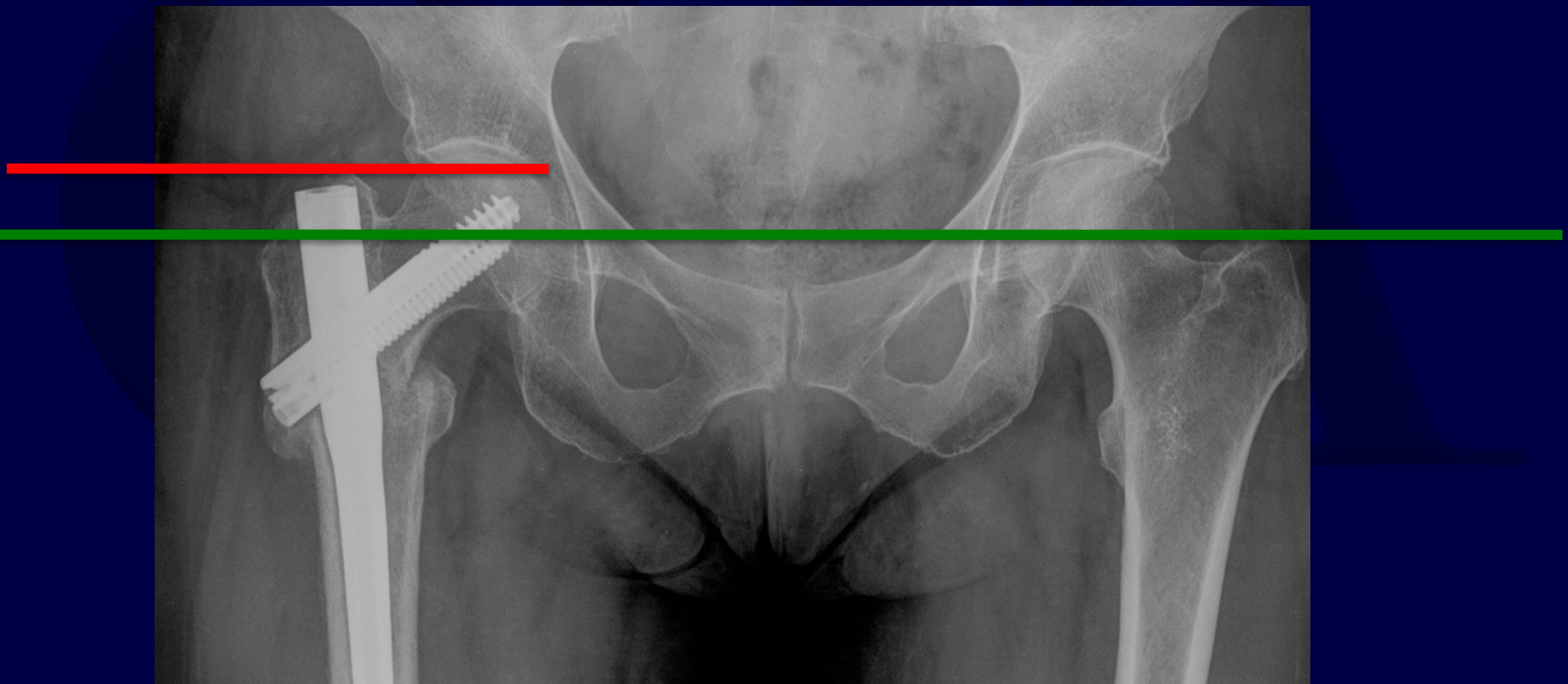
Investigation performed at the Department of Orthopaedic Surgery, Hospital for Joint Diseases, New York City

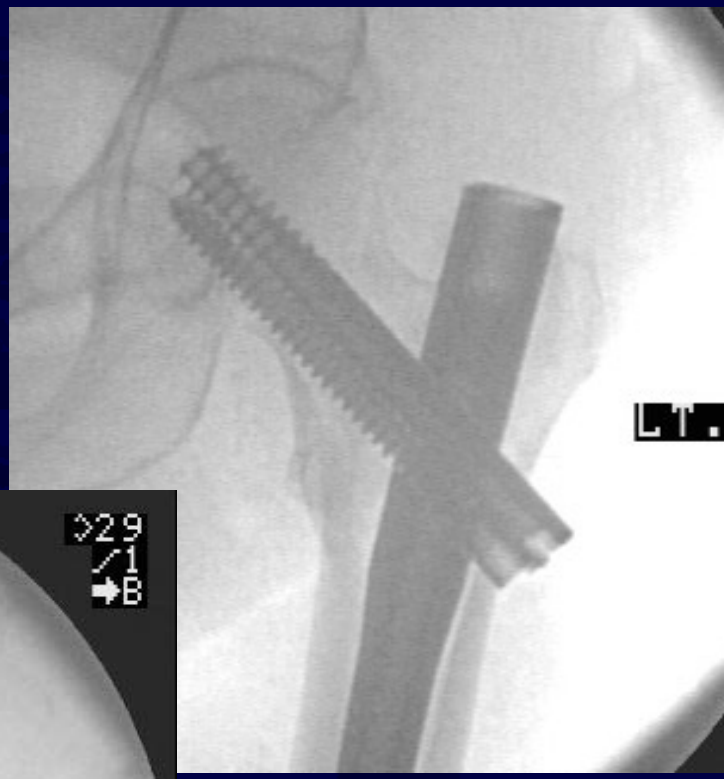
Complications

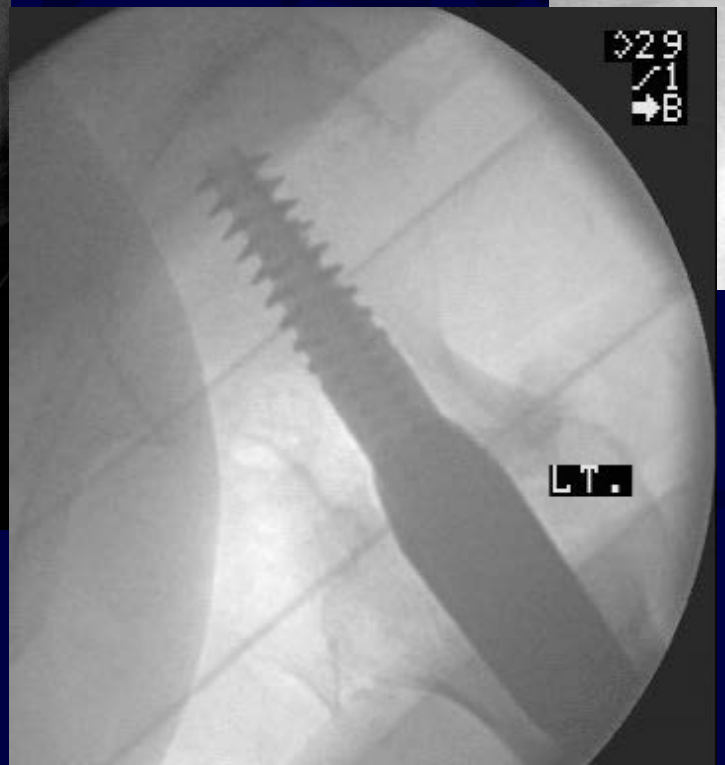
- (aside from mortality, ulcers, poor function)
- malalignment – varus – line through center of femoral heads should be at the top of the greater trochanter



Complications

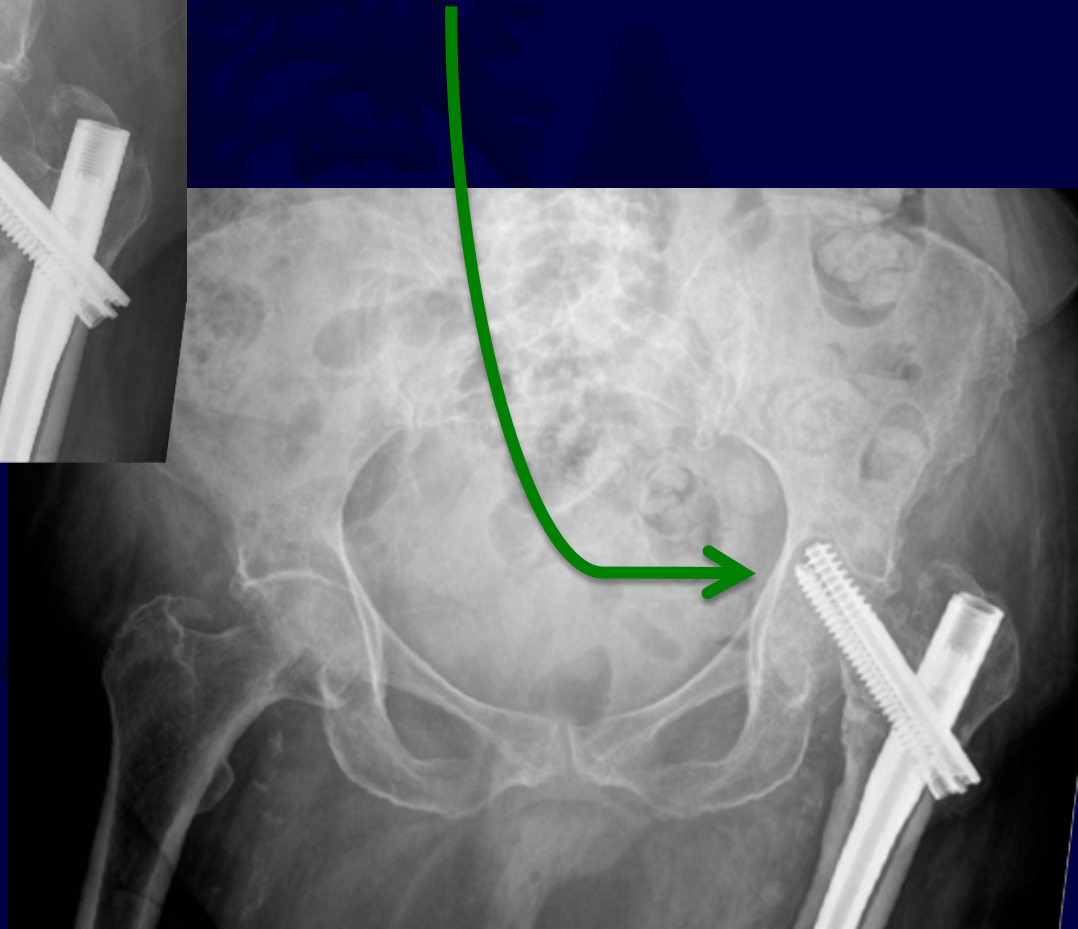
- basicervical fracture





Complications

- avn / collapse



Summary

- 20% mortality in geriatric fx at 1 year
- no definitive evidence to guide implant choice
- if surgery within…
  - 48h - ↓ mortality
  - 36-48h – ↑ return to independent living
  - 24h – ↓ complications (decubitus ulcers)
- surgical goal – anatomic reduction with stable fixation to allow mobilization
- counsel patients and family about outcomes

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