FRACTURE NECK FEMUR

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“THE UNSOLVED FRACTURE”
Sir A . Cooper

- Unpredictable results despite best efforts
  - No consensus amongst surgeons
- Avascular necrosis
- High rate of delayed and nonunion

why unsolved ?

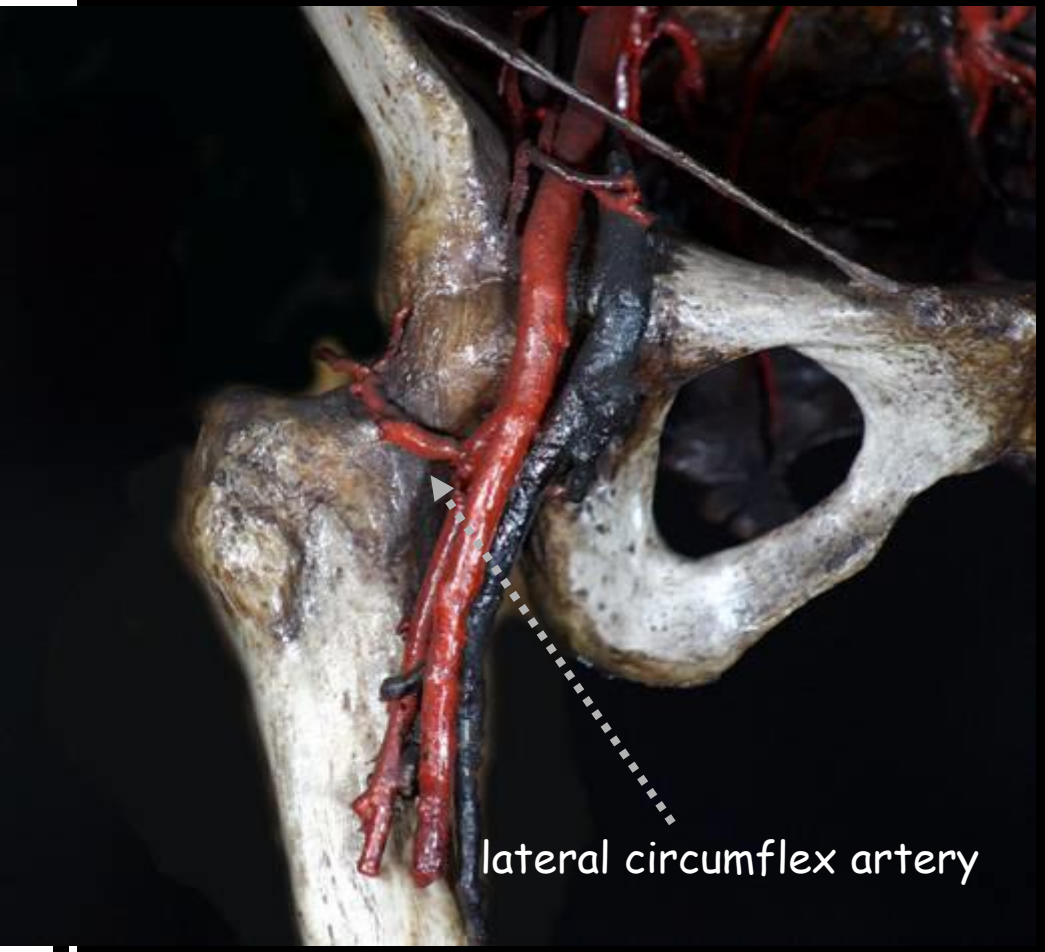
Cambium layer of periosteum is absent

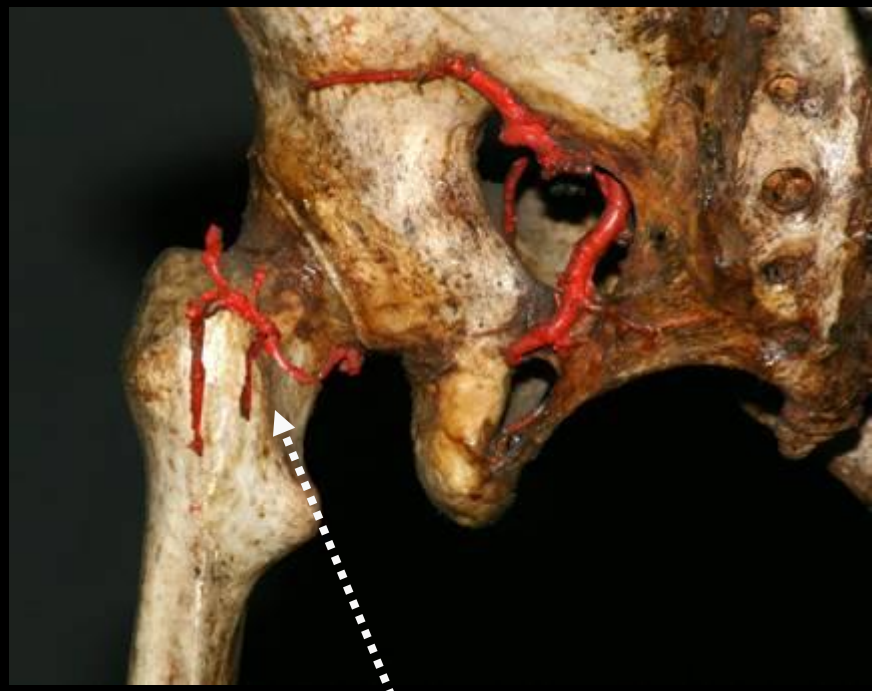
Only endosteal callus forms

Synovial fluid hinders clotting

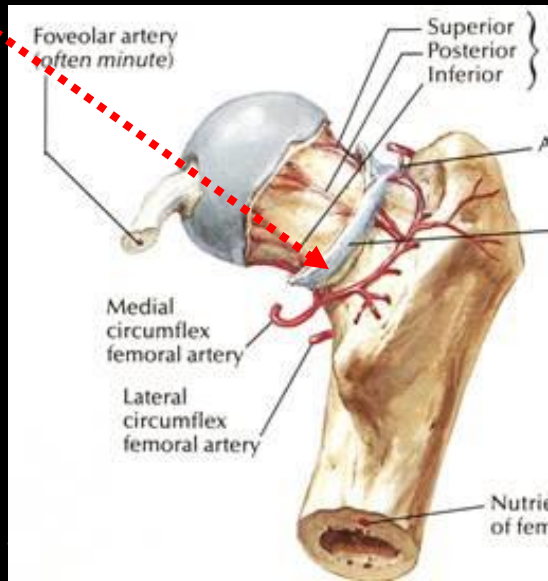
Displaced fracture leads to avascularity

Hematoma inside joint capsule increases intracapsular pressure and further damages the head



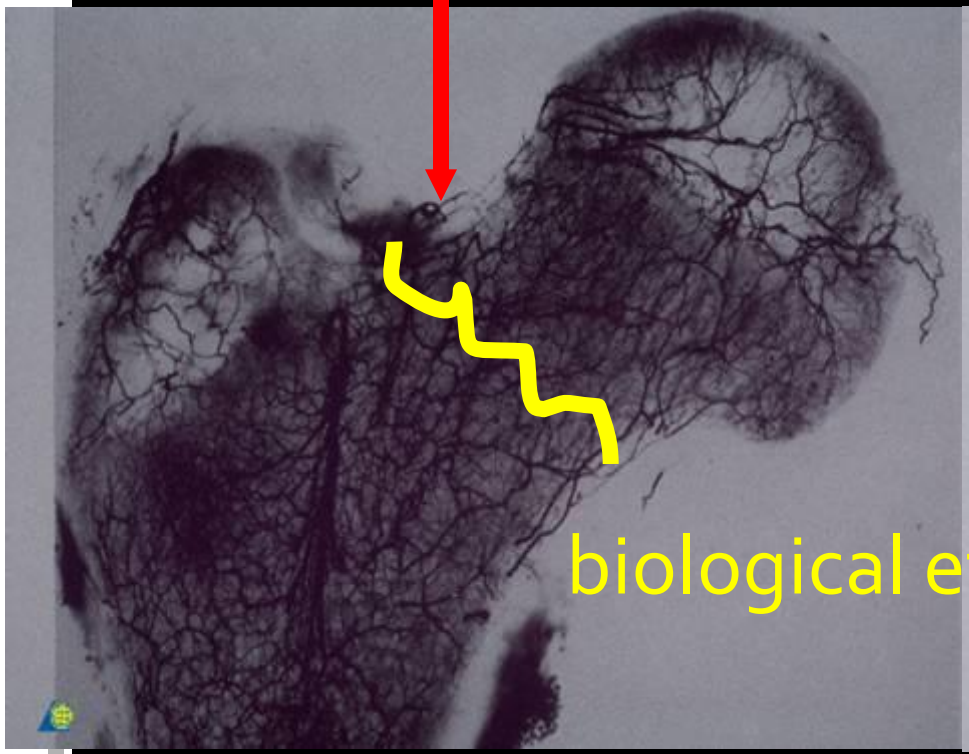


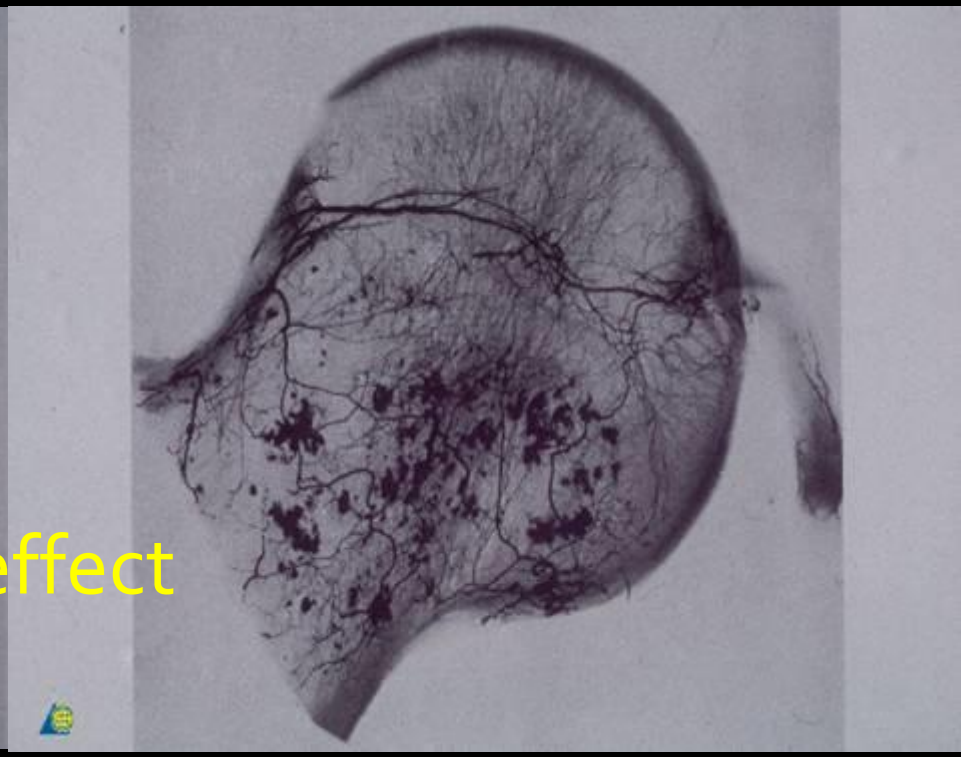
Blood supply



Blood supply

Cranial anastomosis





The posterior retinuacular vessels from the medial circumflex artery provides the main nutrition of the femoral head

Epidemiology

Bimodal distribution:

Elderly: low energy trauma

Poor balance and vision, CNS problems, Osteoporosis

INCIDENCE DOUBLES WITH EACH DECADE BEYOND AGE 50

Young: high energy trauma

Challenges today

- Severity of the injury…classification?
- Predictability of the union
- Predictability of AVN
- Closed or open reduction
- Best modality of fixation
- Fixation or arthroplasty in old pts
- Hemi / bipolar / total hip

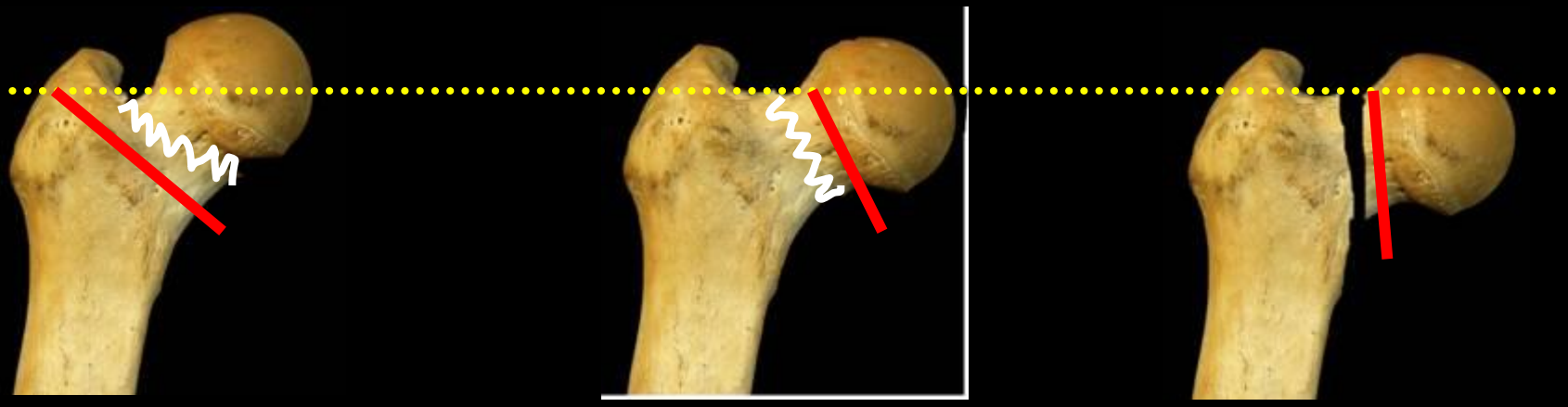
Garden Classification (1961)

I II III IV

appearance of the trabeculae of the femoral head on AP X-ray

- high degree of interobserver variation
- difficult to predict complication (esp. grade III and IV)
- only division on undisplaced (I, II) and displaced (III, IV)

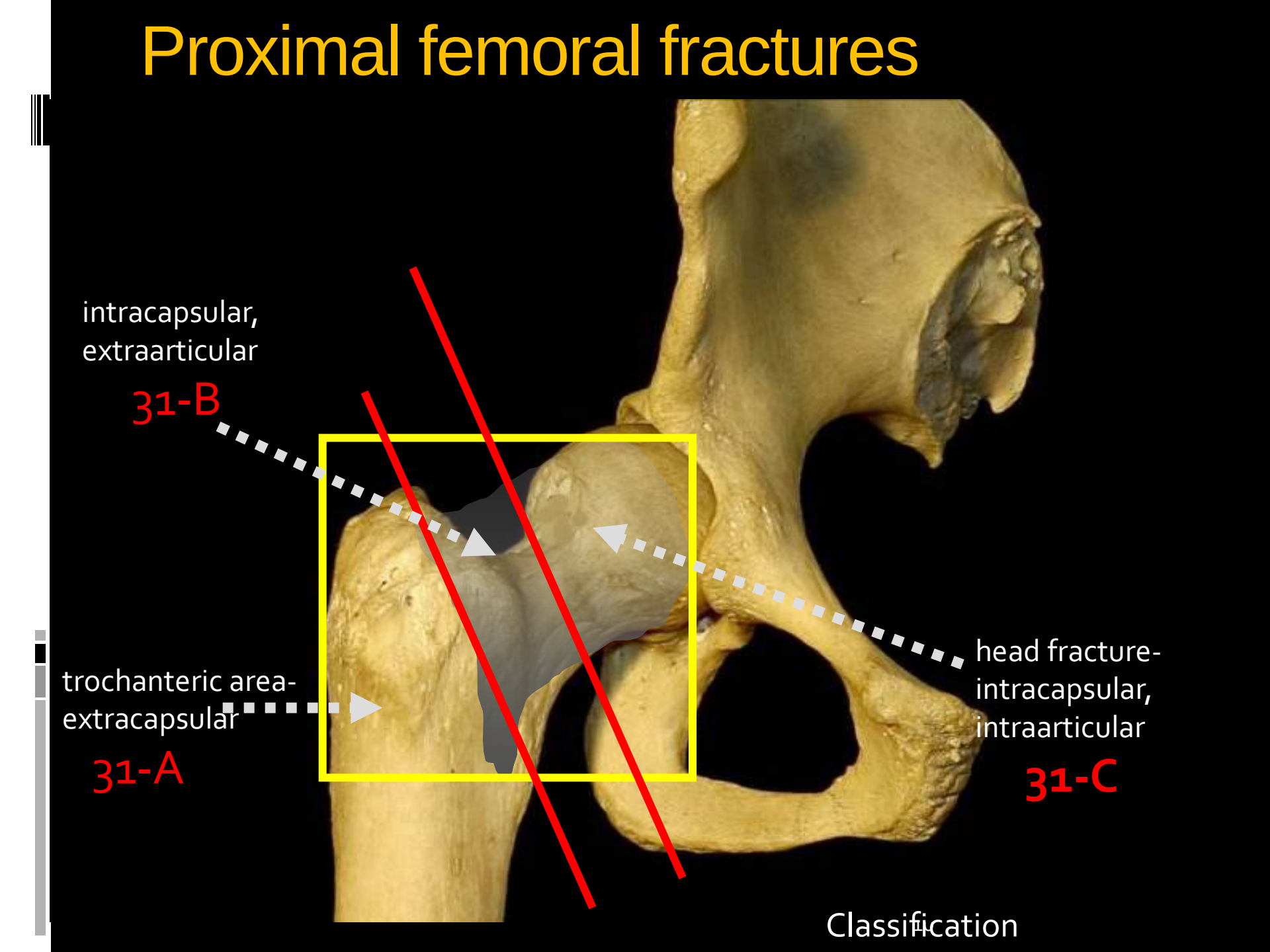
Pauwels classification (1935)



shearing forces at the site of fracture

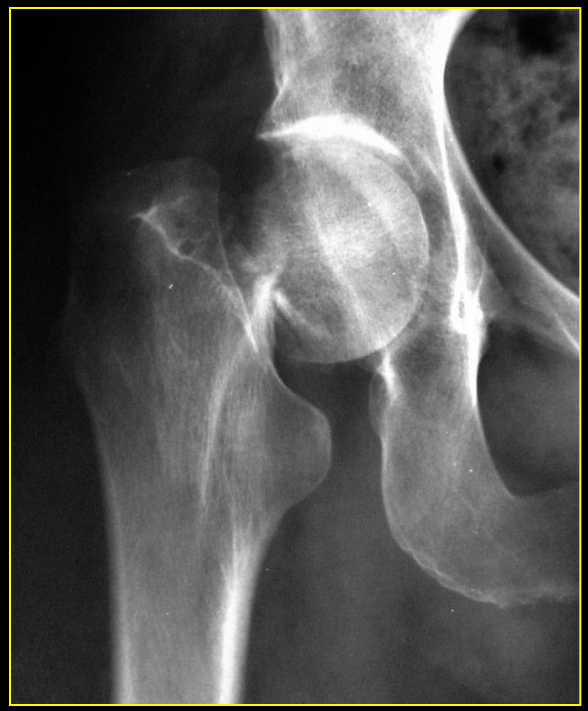
- high degree of inter and intraobserver variation
- preoperative angle has no correlation with the subsequent incidence of complications (except undisplaced fractures)

Proximal femoral fractures



Classification?
What determines outcome?

- displacement—undisplaced vs displaced
- stability—stable vs unstable



Investigations

- X-ray
  - Pelvis with Both Hips AP View
  - ‘Cross table’ lateral view of affected hip
- C.T. SCAN
- MRI scan
- Bone Scan

FACTORS TO CONSIDER

Patient Characteristics

Young (arbitrary physiologic age < 65)

Elderly (arbitrary physiologic age > 65)

- Comorbidities
- Pre-existing hip disease

Fracture Characteristics

Stable : valgus impacted

Unstable : subcapital vertical , displaced

TREATMENT

NON OPERATIVE

OPERATIVE

- ✓Cannulated screws.
- ✓ DHS.
- ✓ Hemiarthroplasty.
- ✓ Total hip replacement.
- ✓ Resection Arthroplasty

Non operative treatment

INDICATIONS

- Totally undisplaced fractures
- Valgus impacted #s
- Unfit patients

PROTOCOL:

- 3 WKS bedrest in abduction
- Attempt ambulation partial wt bearing

Non operative treatment

Complications

- Secondary displacement : 25-62%
- Uti , bedsores , dvt, pneumonia : 63%
- Mortality : 50%

Tanaka et al Arch Orth 2002

Undisplaced fractures

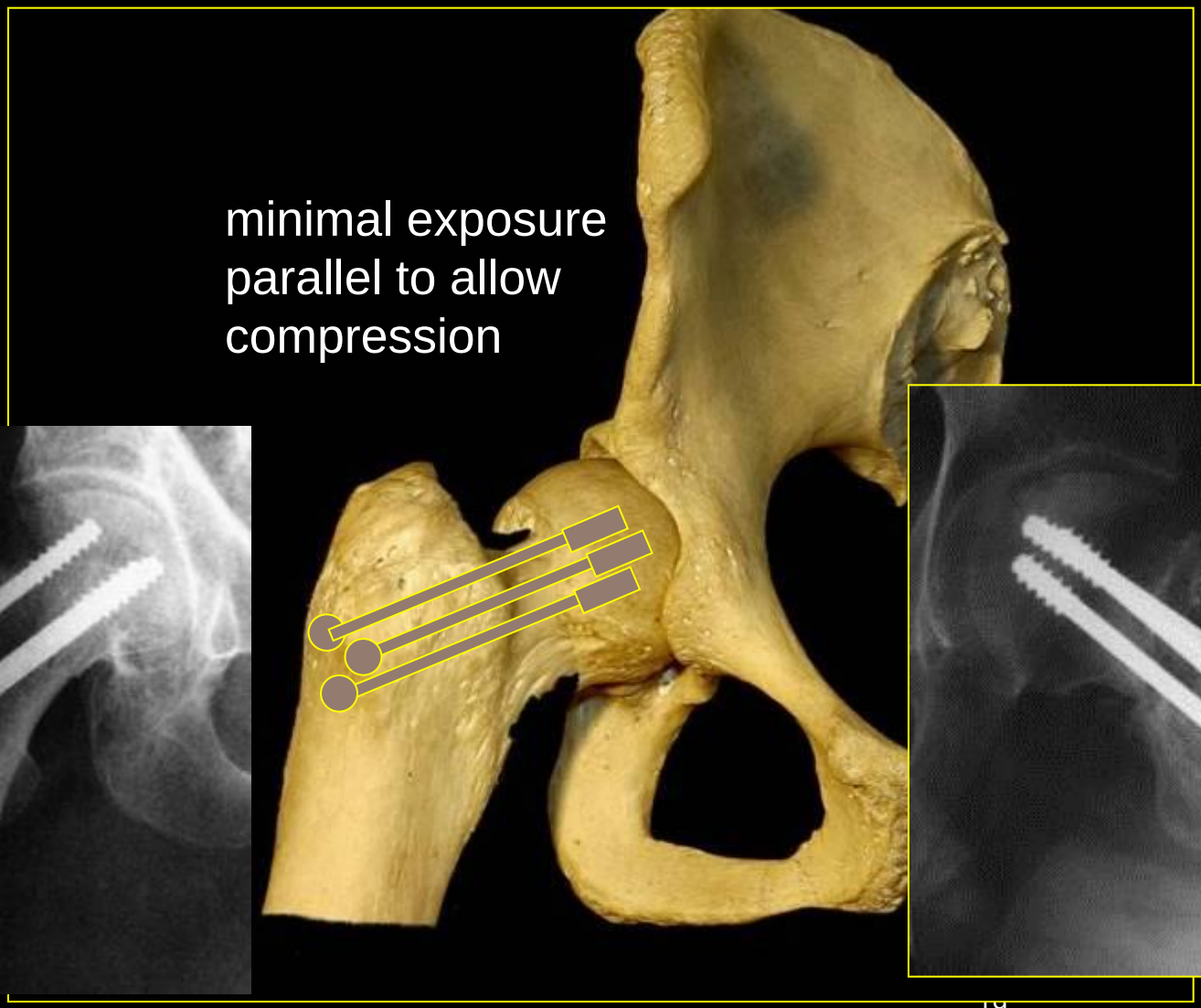
- Internal fixation will result in only 10% failure rate
- Safe and simple to fix
  - Percutaneous or mini-open

impacted
valgus
stable

do not reduce !

Indication for fixation

Impacted and undisplaced fracture: cannulated screws—implant of choice



ALL DISPLACED #S IN Physiologically Young pts

Goal → anatomic reduction

stable fixation

irrespective of :

displacement

duration since injury

Preserve the head !!

Operative treatment of femoral neck fractures in patients between 15-50 years

JBJS A 2004 Haidukewych GJ, et al

- ✓ 73 % follow-up for 6.6 years
- ✓ 55 displaced fractures

73 % healed without AVN
23 % AVN - 14% in undisplaced #
- 27% in displaced #
8 % of nonunion

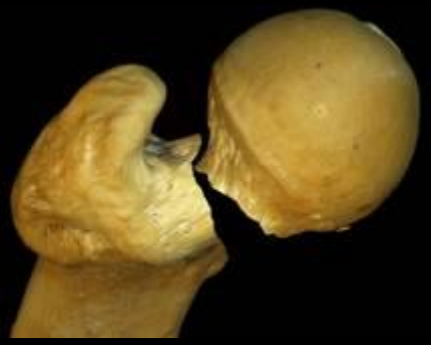
85 % of overall good results
influenced by fracture displacement
and quality of reduction

Displaced fractures

- Elderly patients (the majority)
  - High rate of failure for internal fixation
  - Joint arthroplasty gives most reliable results
    - Early weight bearing
    - Lower failure rate
- Young patients
  - Internal fixation is more reliable than in elderly
  - Arthroplasty is less reliable

Treatment algorithm

Displaced



UNDER 60 YRS

60-75 YRS

>75 yrs

TIMING : does it matter?

- Treat as emergency in young pts.
- Sx in < 8 hrs = less AVN (20%)

Swiontkowsky et al JBJS A 1984

Jain , kroder JBJS A 2002

"SURGICAL EMERGENCY "

Level of evidence III , IV

Does timing matter ?

- No association with timing of surgery & AVN
- No association wth rate of union & timing
- No difference in pts treated before & after 48 hrs

- *Haidukewich et al JBJS A 2004*
- *M.Bhandari et al OCNA 2010 metanalysis of 18 studies 547 #s in pts below 50 yrs*
- *Upadhyay , jain, mishra JBJS B 2004*
- **Level I evidence**

CAPSULE DECOMPRESSION

- No significant benefits of capsulotomy on AVN

- *Maruenda et al CORR 1997*
- *Upadhyay , et al JBJS B 2004,*

….Prospective RCT : level I evidence

What matters most ??

- Initial displacement
- Quality of reduction
- Quality of fixation

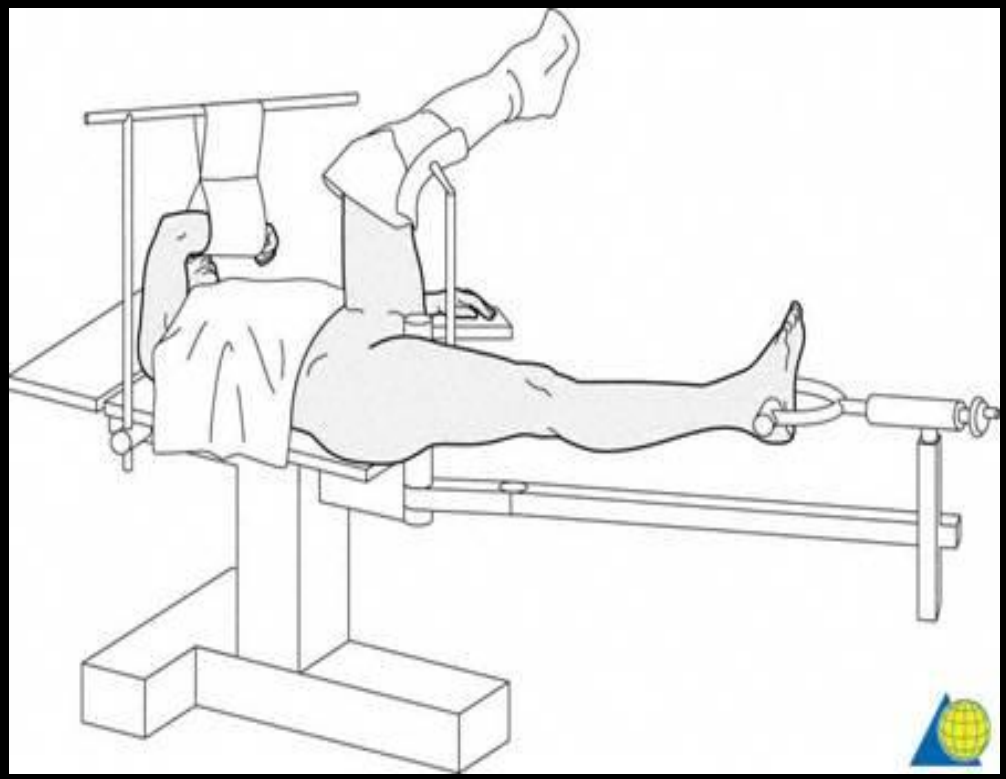
- Varus reduction & posterior displacement of head

increases NU rate by 10 %

….*Swiontkowsky ICL of AAOS 2009*

Reduction

- **Traction table**
- **Open reduction if required**



Reduction techniques :

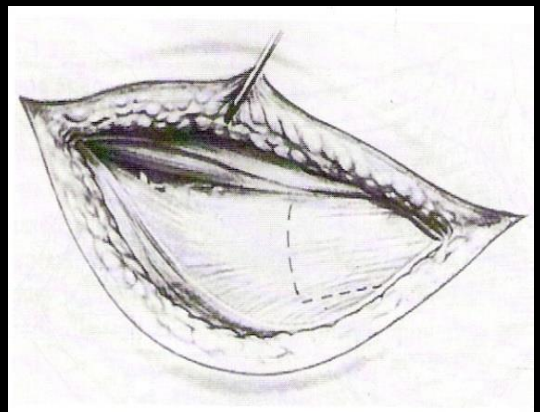
Closed

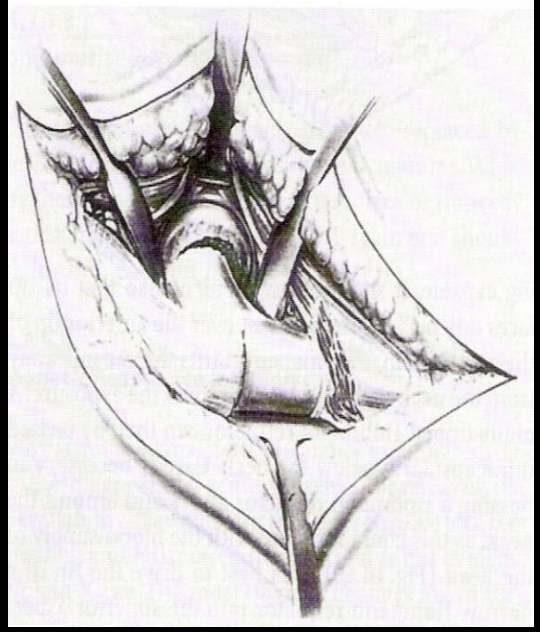
With hip in extension : Whitman

With hip in flexion : Lead better

Open

Lateral : Watson – Jones approach





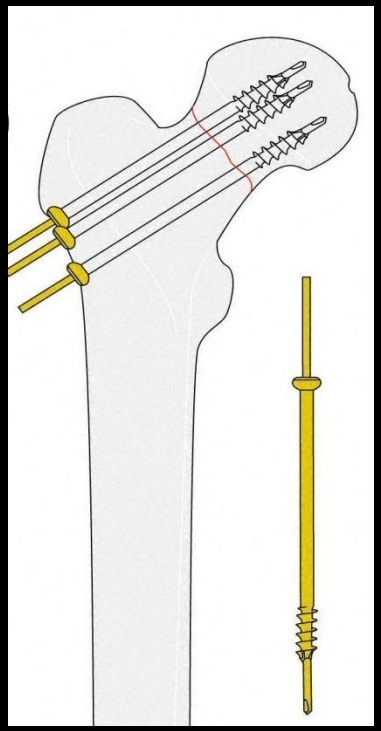
Reduction assessment

1. intactness of the posterior cortex
2. no displacements with rotation
3. no varus
4. calcar cortex aligned supporting the femoral head

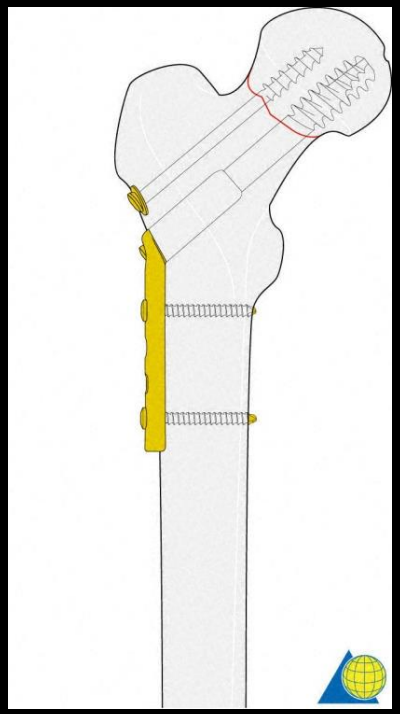
Do not proceed with internal fixation UNTIL an acceptable reduction is achieved by either closed or open means.

Internal fixation

- **Multiple cannulated screws**



- **Dynamic hip screw**

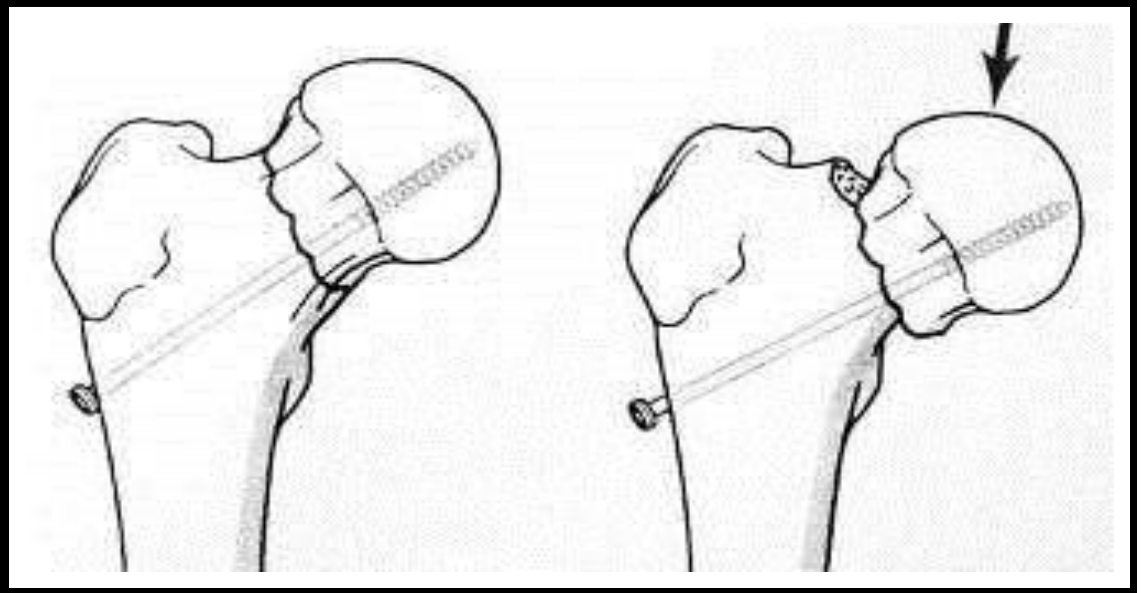


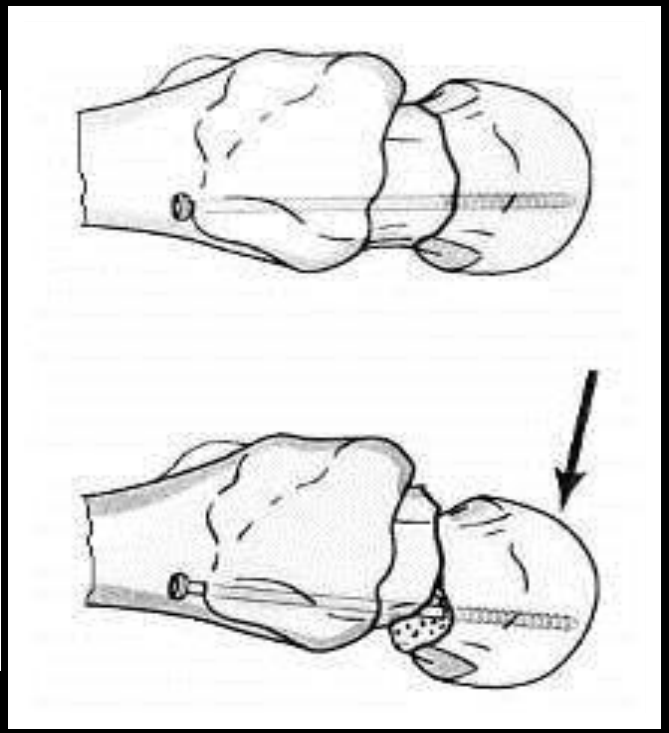
WHAT TO CHOOSE ?

- **Multiple cannulated screws**
  - Minimal exposure
  - Parallel to allow compression
- Dynamic hip screw
  - Increased stability
  - Increased exposure and bone loss
  - Allow compression

Cannulated screws

- **Femoral head tends to displace inferior and posterior**





Screw number / configuration

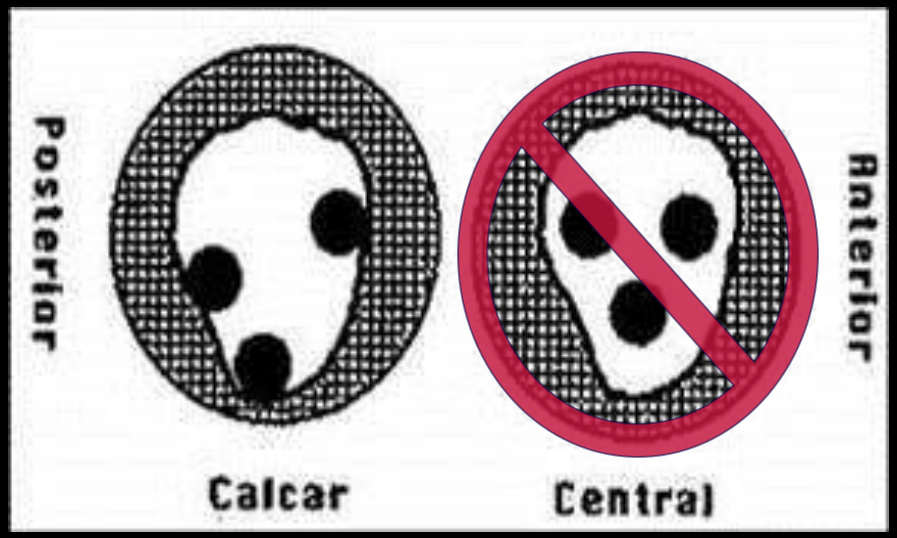
No advantage to > 3 screws

Placement:

1. Inferior along calcar

2. Posterior along neck

3. Superior screw
at tensile surface
of the fracture



Booth et al 1998
Tornquist et al JOT 1995

SHORT VS LONG THREADS

- No difference in healing rates or complications related to the length of the threads.

Parker M, Ali ….injury 2010

RCT of 432 pts. , level I evidence

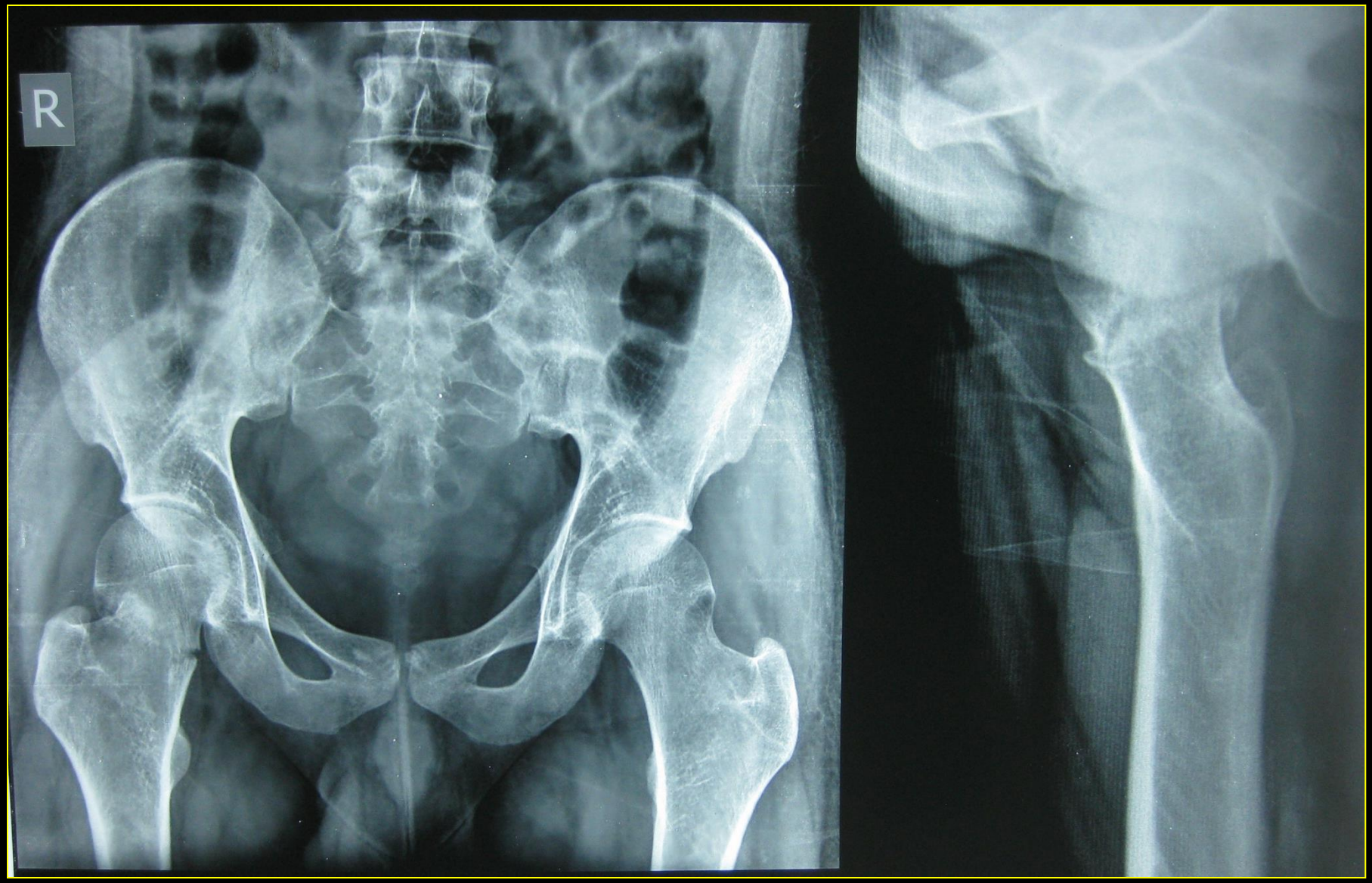
Multiple screws

- Parallel screws are not important
- 3 divergent screws in coronal plane

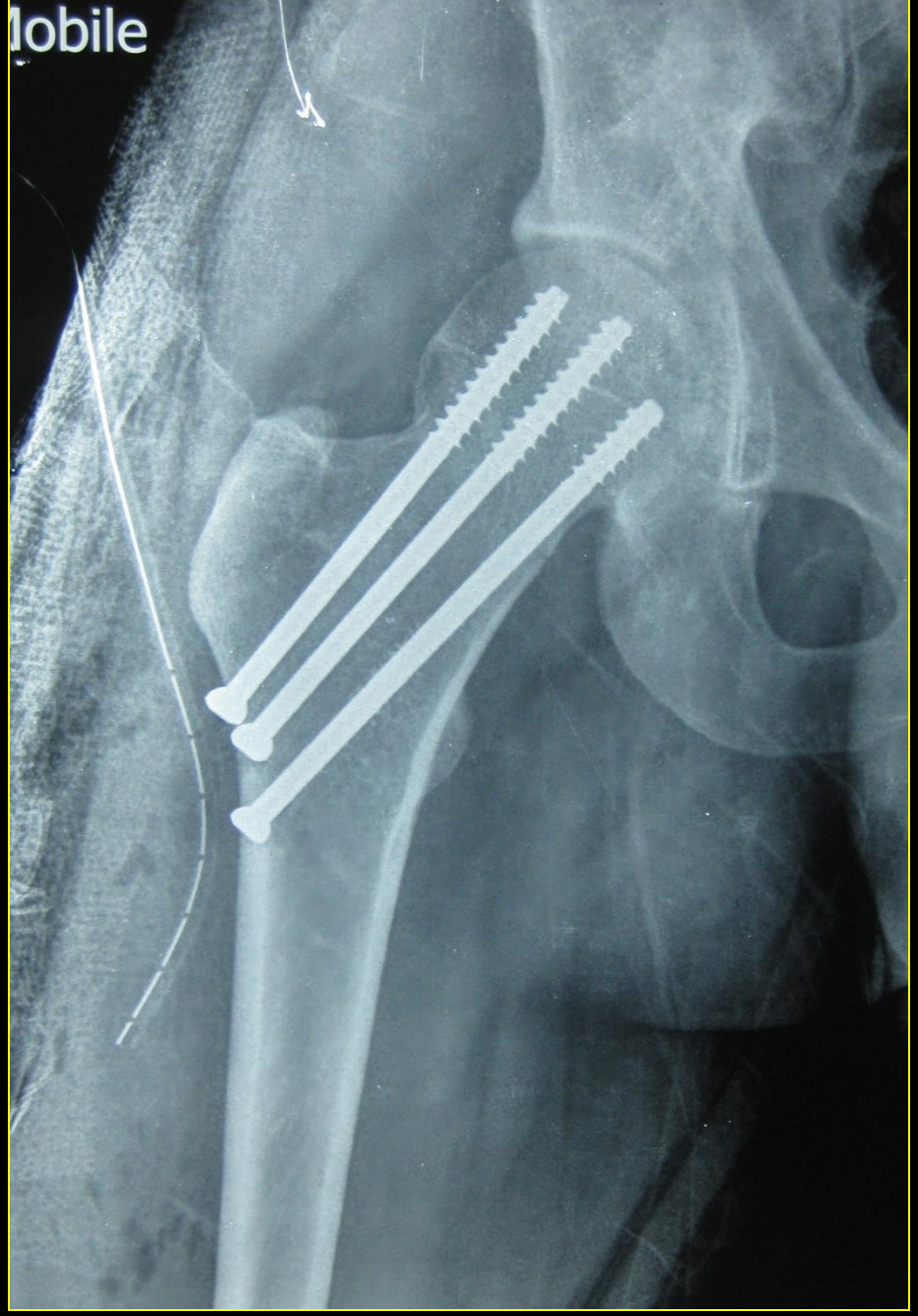
Atleast 1 screw engaging the calcar & post cortex.

Nikolopoulos K, Papanastassiou ID, Mavrogenis AF, Kokkalis ZT, Skourtas K, Papagelopoulos J

J Long Term Eff Med Implants. 2011;21(1):63-9



25 yr old male


lobile

Multiple Screws or DHS ?

- Meta – analysis (Parker M J , Cochrane review)
- N= 27 studies wth 5269 pts & 5274 fractures
- **No difference amongst various implants about outcomes but 25% reduction in complication rate wth DHS**
- **Level II evidence**

DHS

- Superior biomech properties
- Less displacement under load
- Especially in porotic bones
- Posterior communition

Kaufmann et al JOT 1999

Harvey et al metaanalysis of 25 RCTs 4925 pts

Acta orth scan. 1998

DHS

DHS can achieve a higher union rate than using screws

However, osteonecrosis of the femoral head may occur with use of DHS because of greater intramedullary vascular damage as a result of wider reaming

Wu CC, Chen WJ

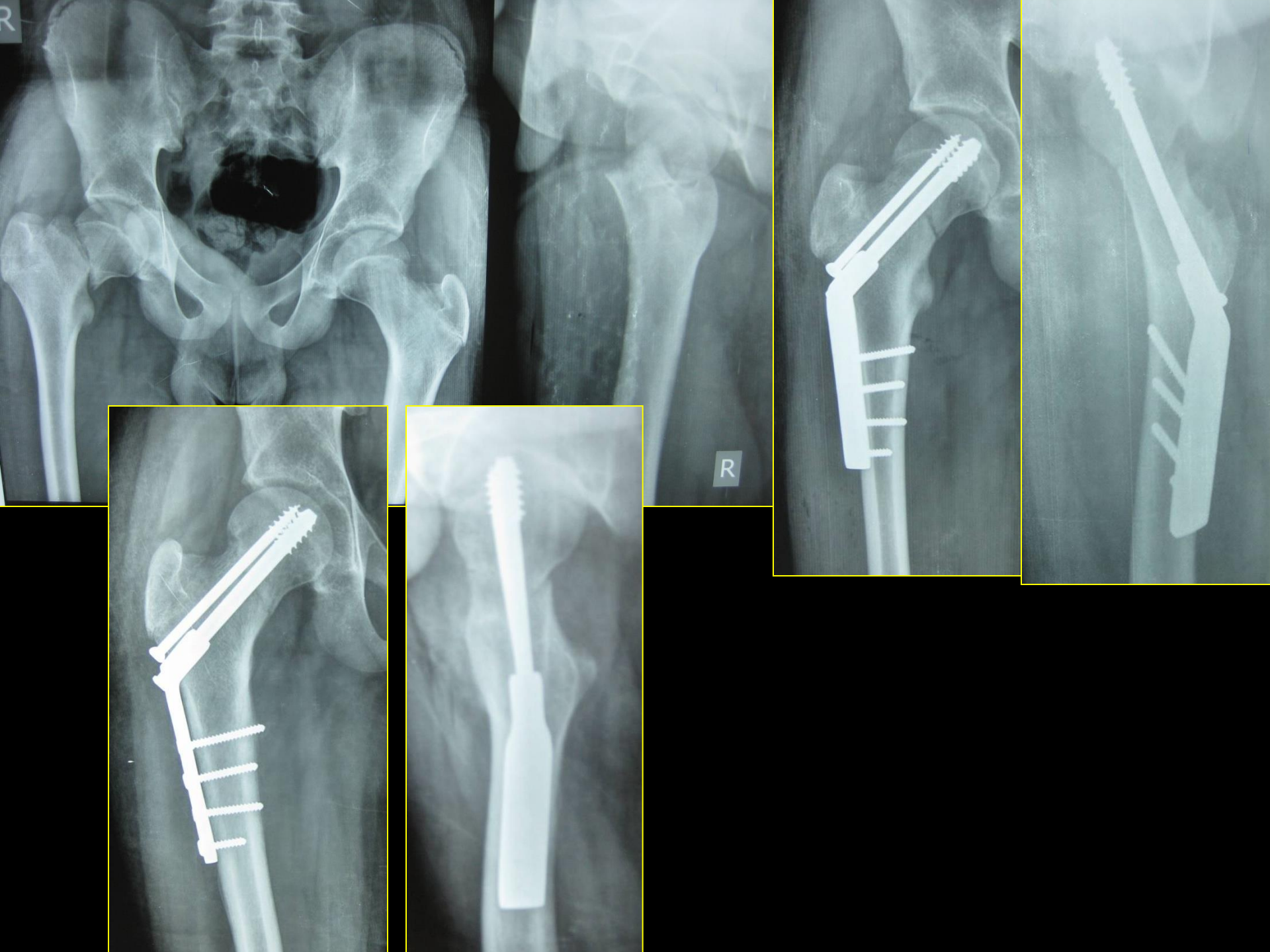
J Orthop Surg (Hong Kong)2003 Dec;11(2):129-36.

DHS

Irrespective of fracture morphology, compression screw and side-plate fixation provides better stabilisation to the bony fragments and improves early mobilisation in comparison with only screws

Stiasny J et alD

Ortop Traumatol Rehabil.2008 Jul-Aug;10(4):350-61.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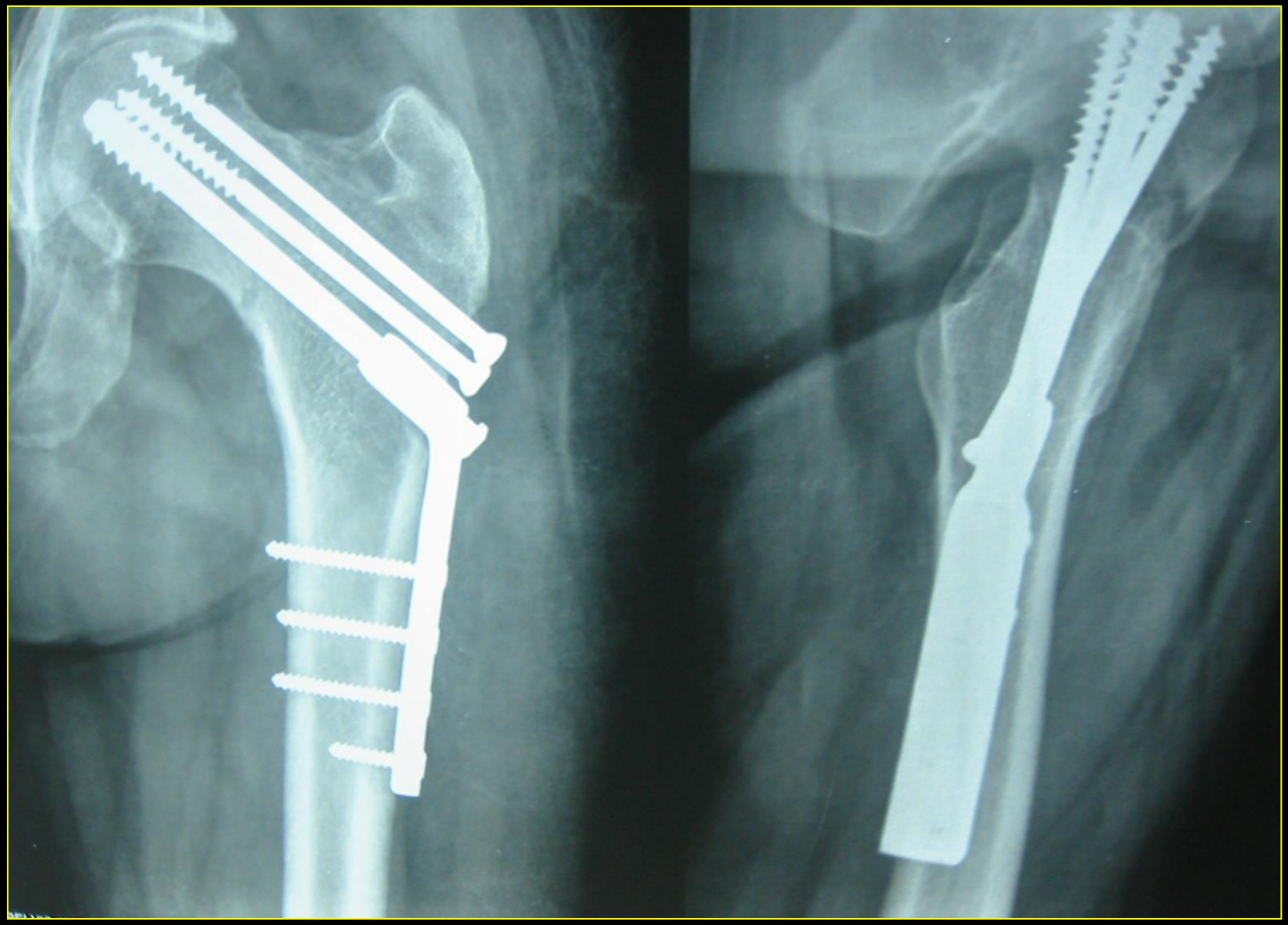
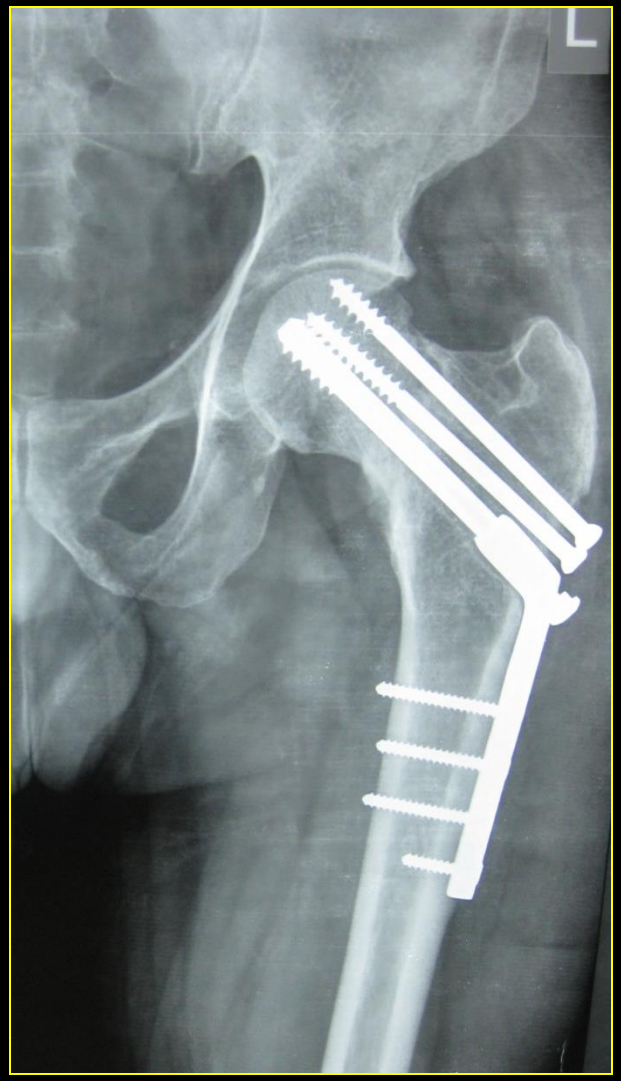
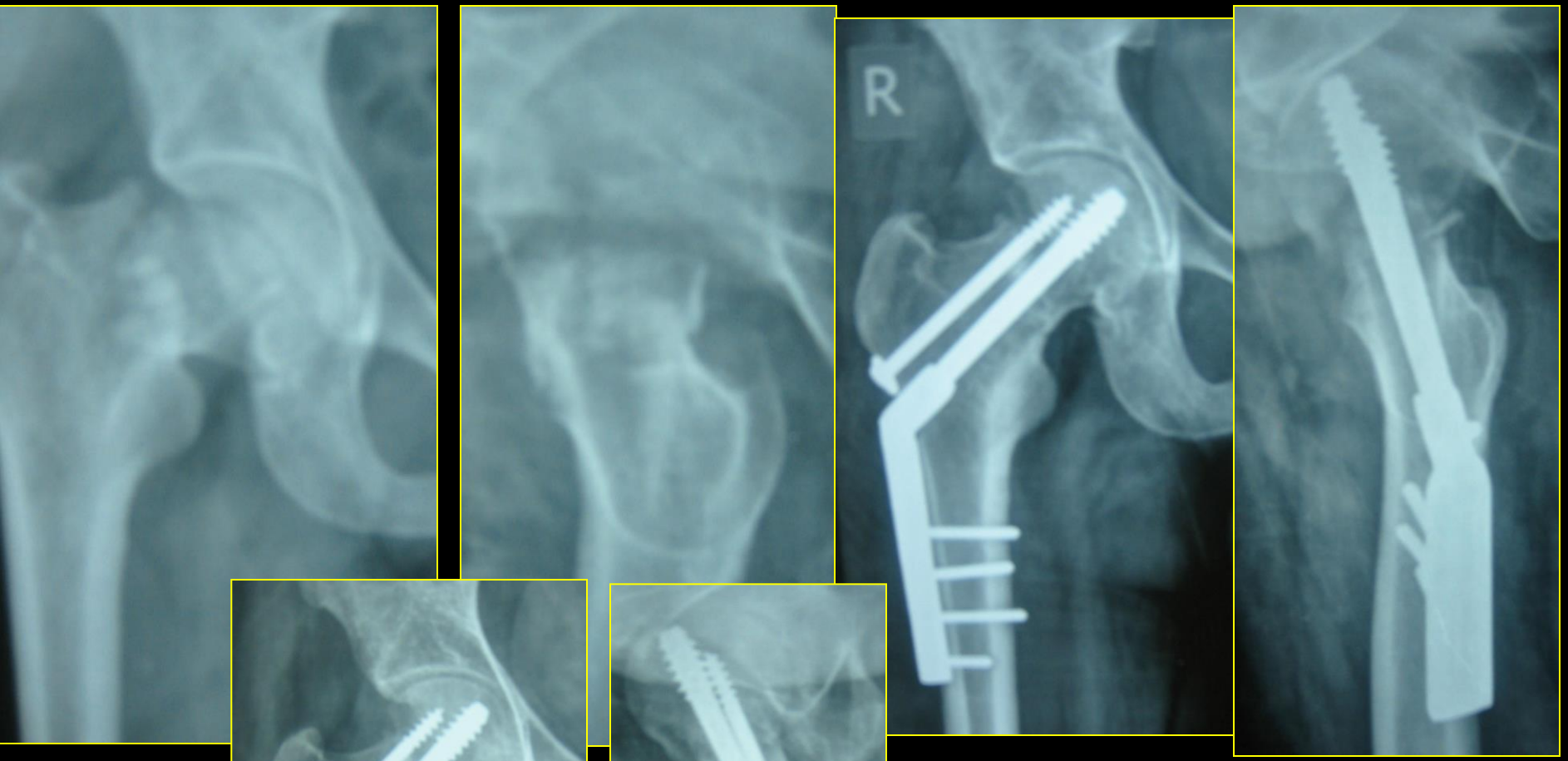
25 yr old male with ICNF : posterior communition



Mini DHS with 2 screws



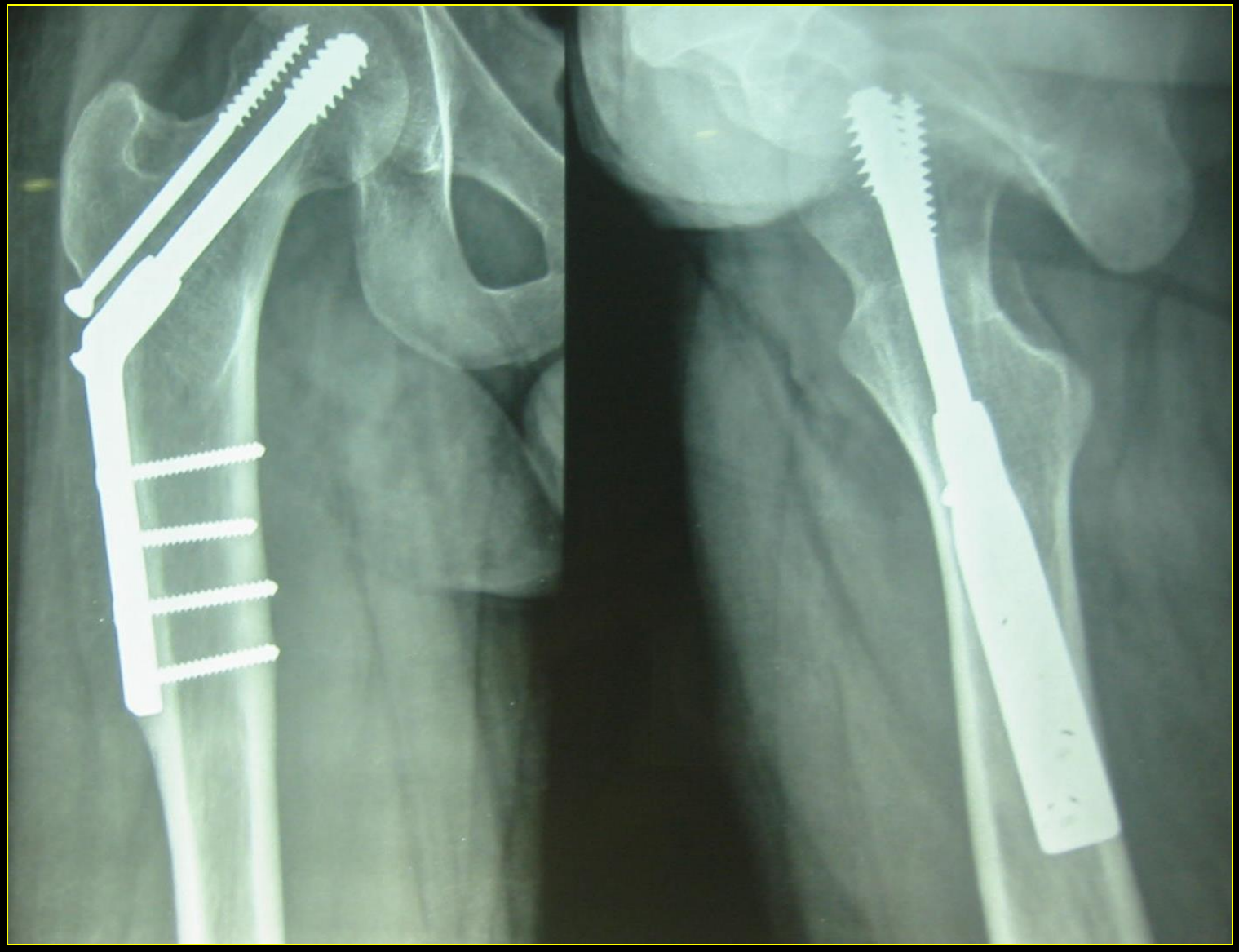
1 year post op



42 yr old male
Communited
ICNF

Sub capital with posterior communition

Paediatric DHS with a derotation screw



Proximal femoral nail

Biological advantage

minimally invasive

Preserve fracture hematom

Quick procedure

Bio mechanical advantage

Load sharing

PFN : COMPLICATIONS

reduction with persisting varus

distraction in the fracture line,

incorrect placement of the screw

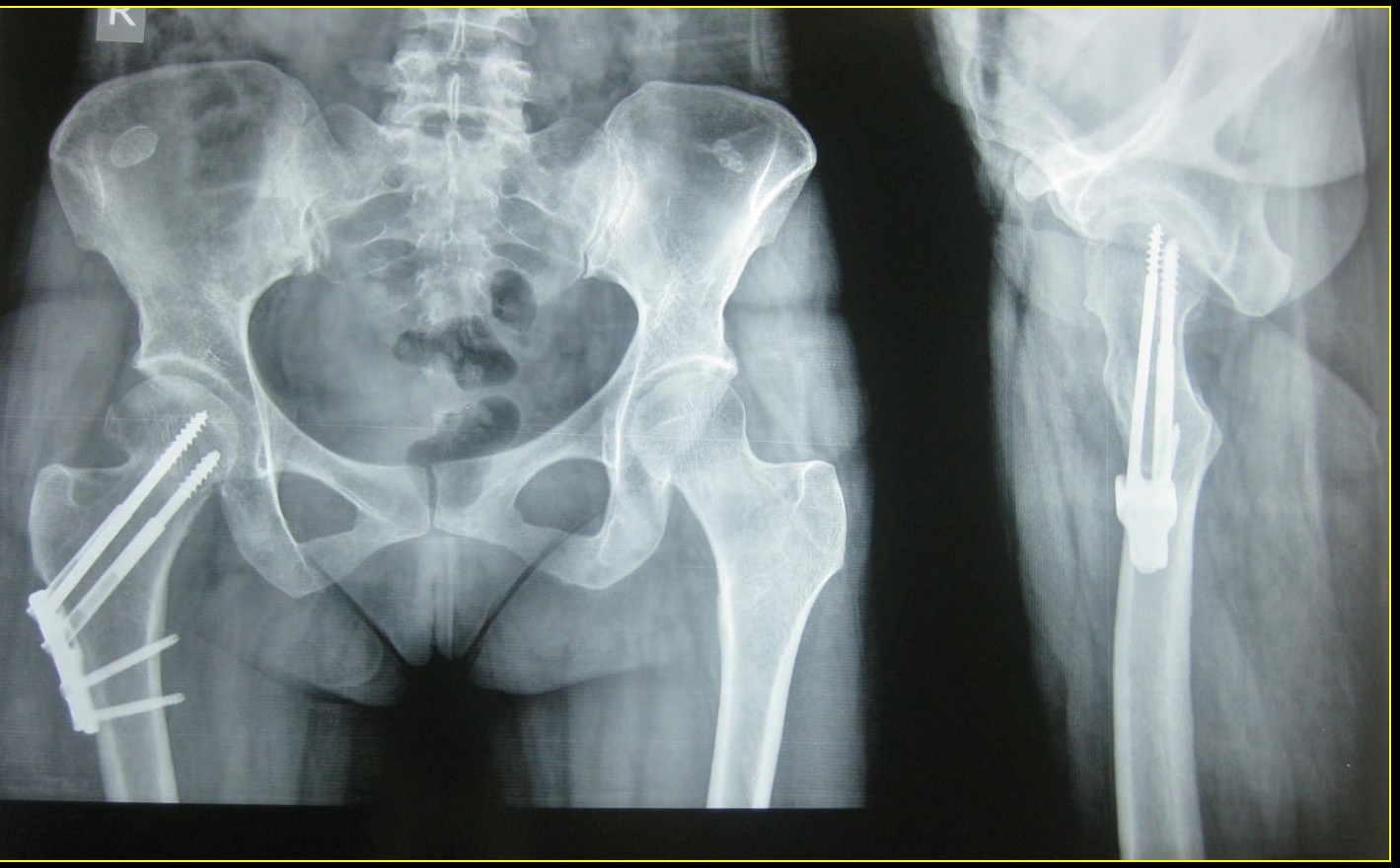
insertion of the implant may cause damages

Pavelka T, Matejka J, Cervenková H.

Acta Chir Orthop Traumatol Cech. 2005;72(6):344-54.

TARGON

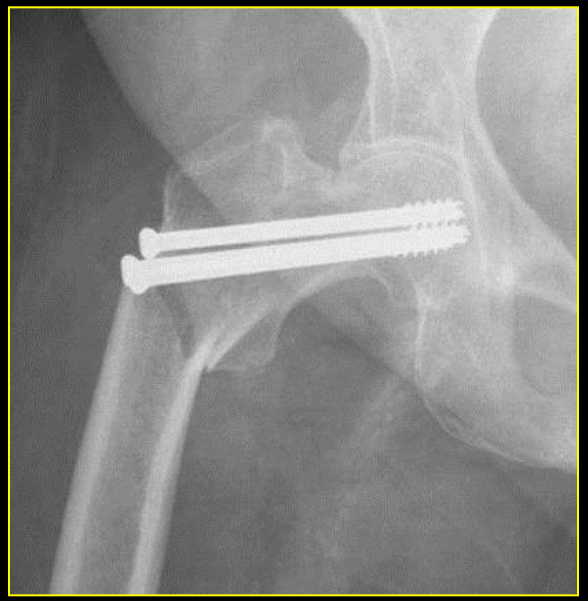
32 yr old female



Fracture healed at 3 months

Internal fixation—complications

- 30% fixation failure / loss of reduction
- Avascular necrosis
- Non-union
- Subtrochanteric Fracture



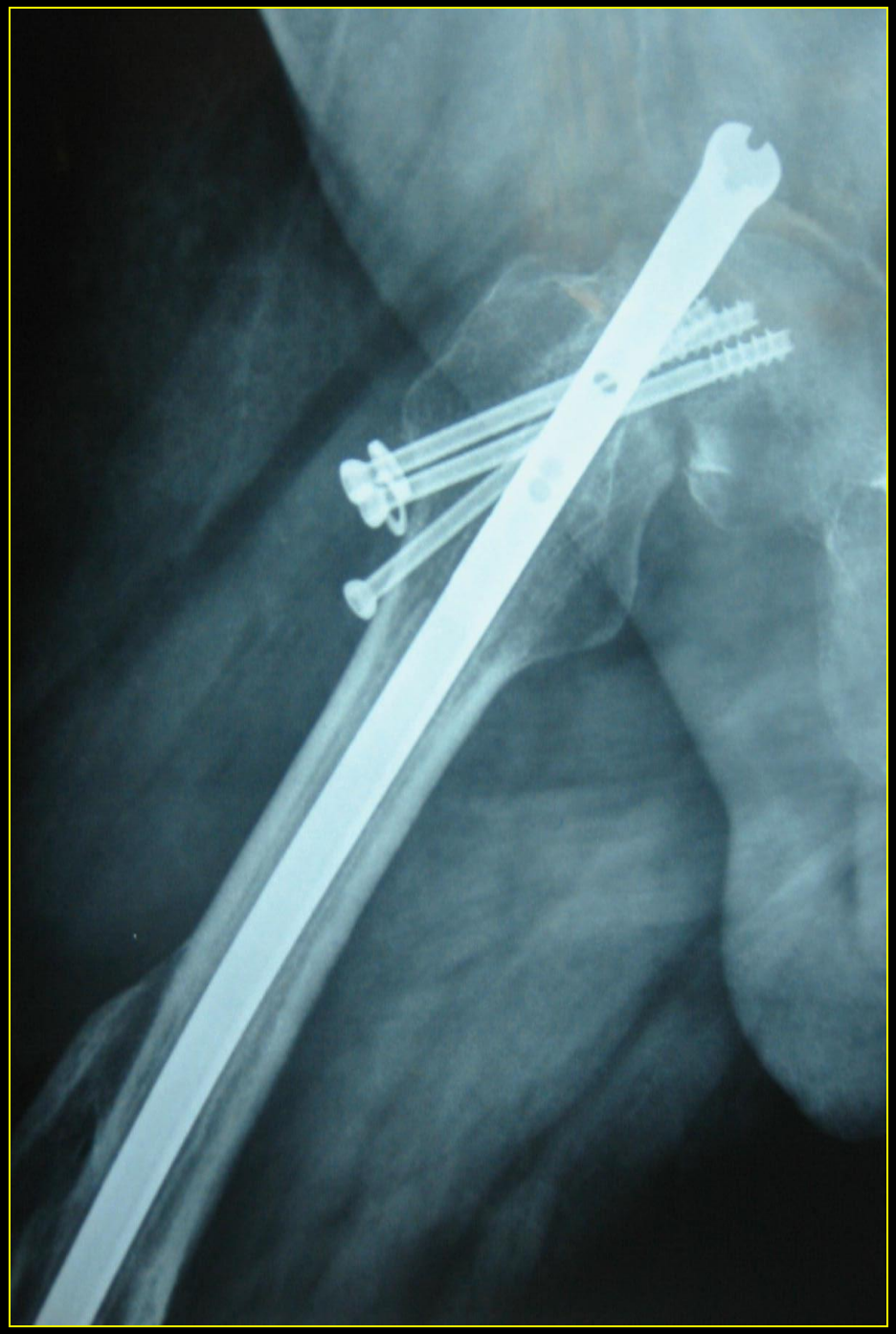
Nonunion

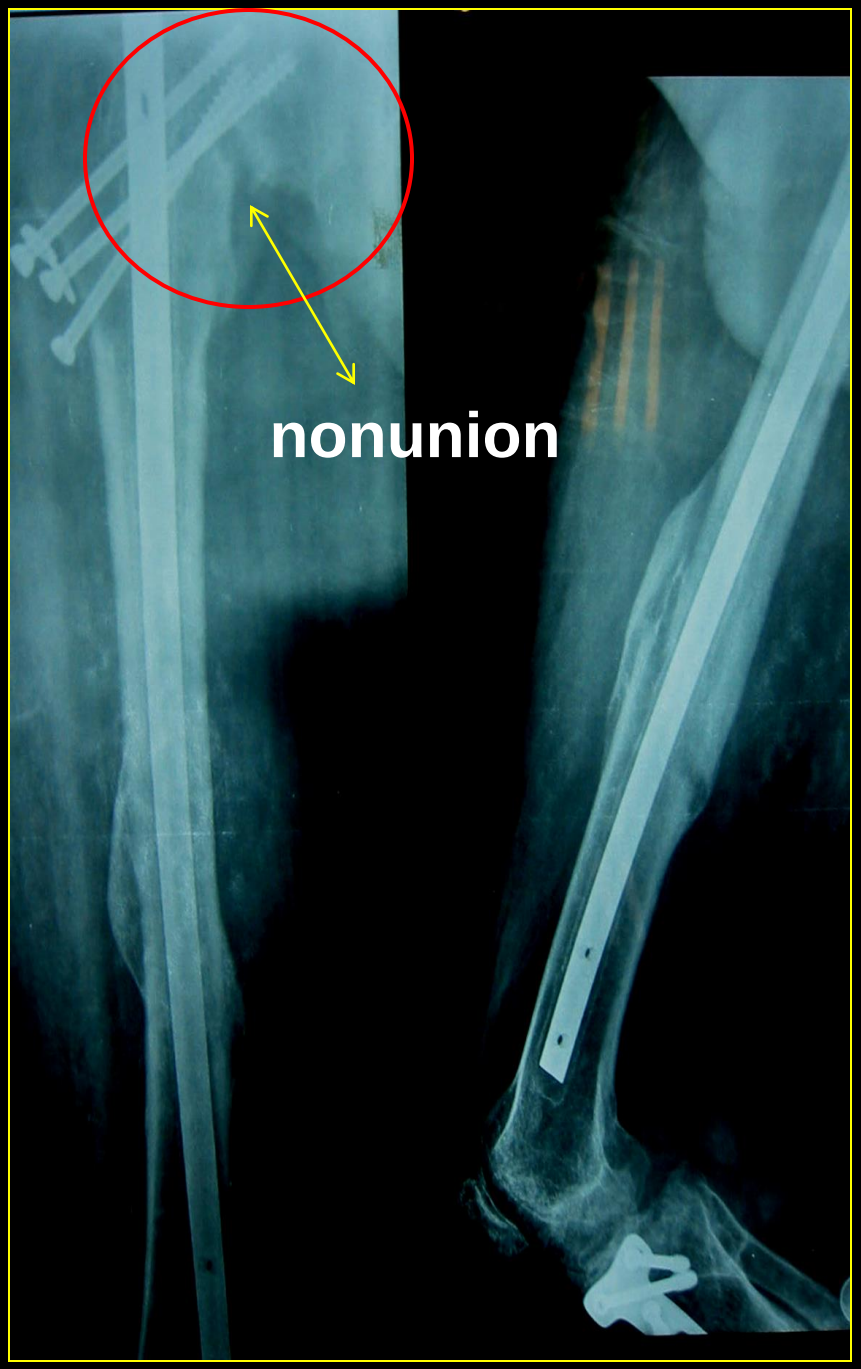
0-5% in Non-displaced fractures

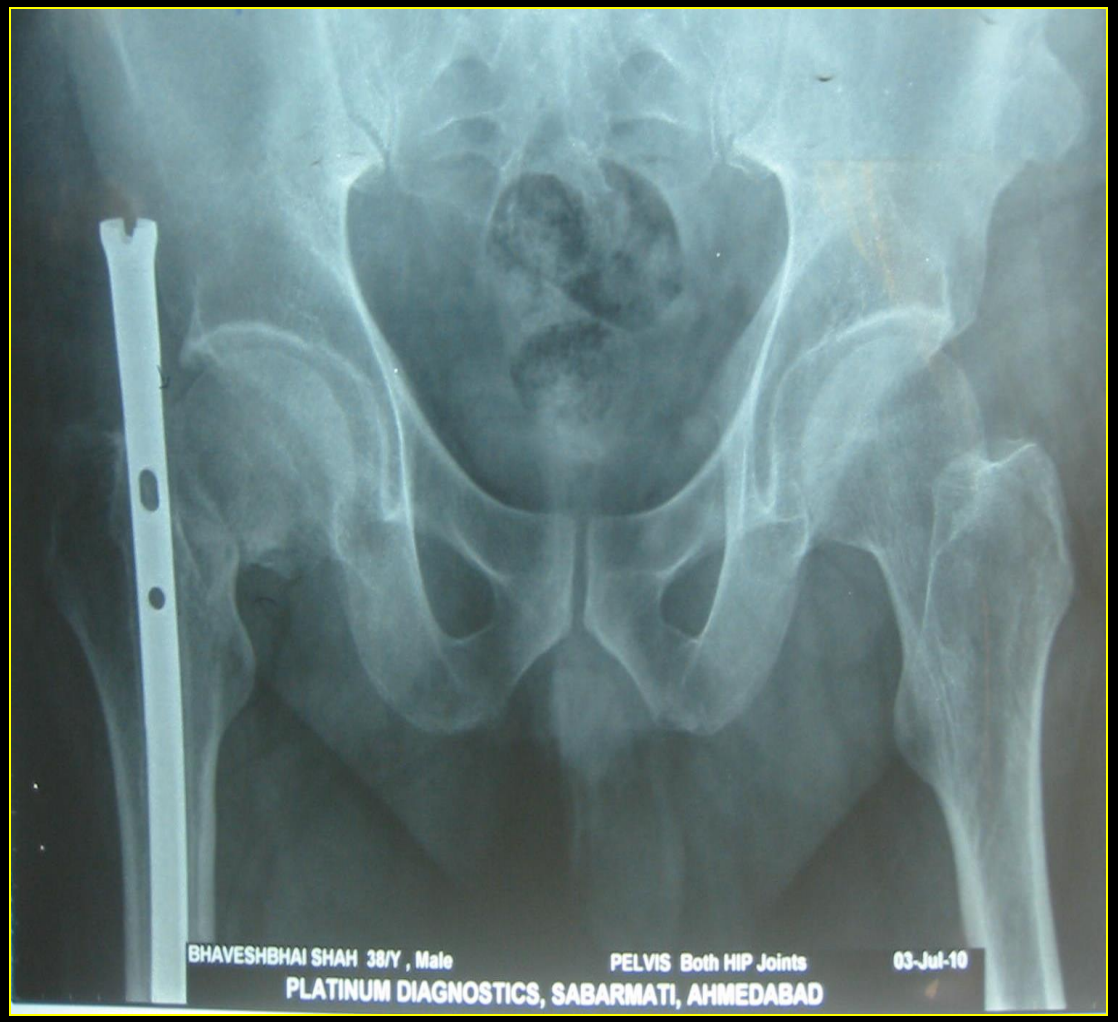
9-35% in Displaced fractures

Increased incidence with

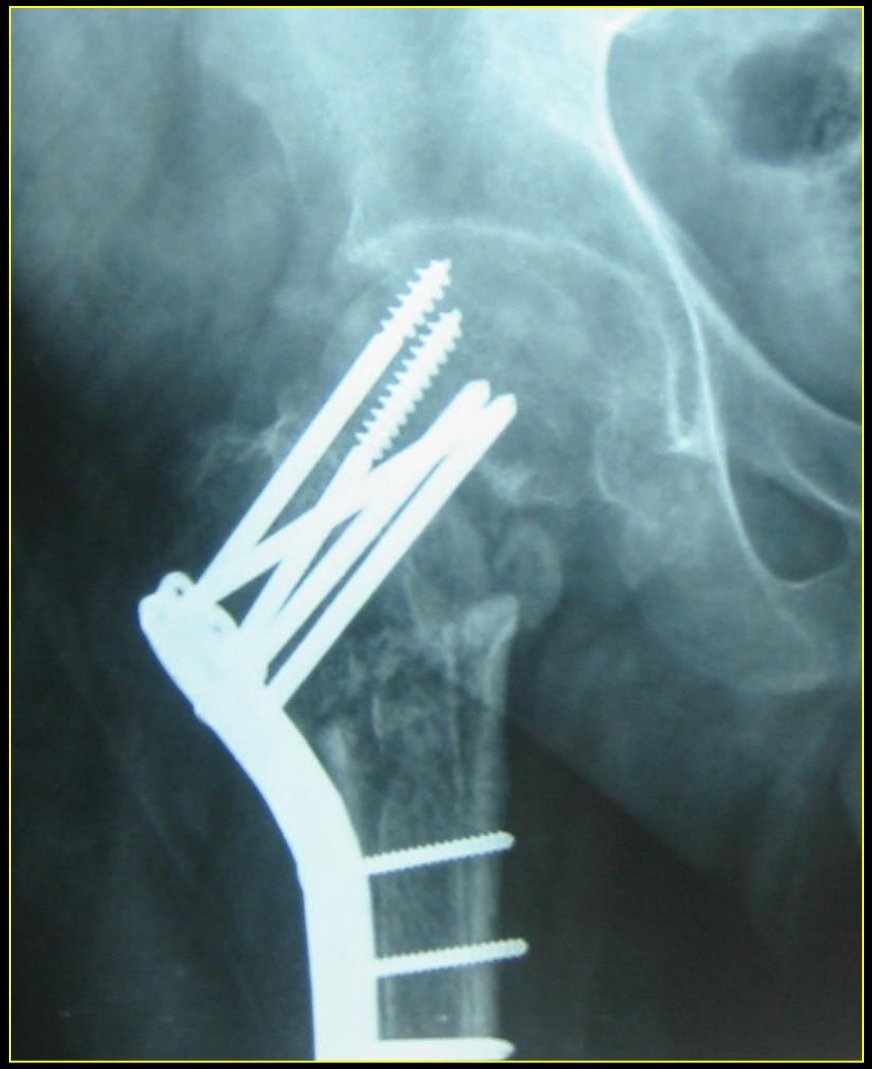
- Posterior comminution
- Initial displacement
- Inadequate reduction
- Non-compressive fixation

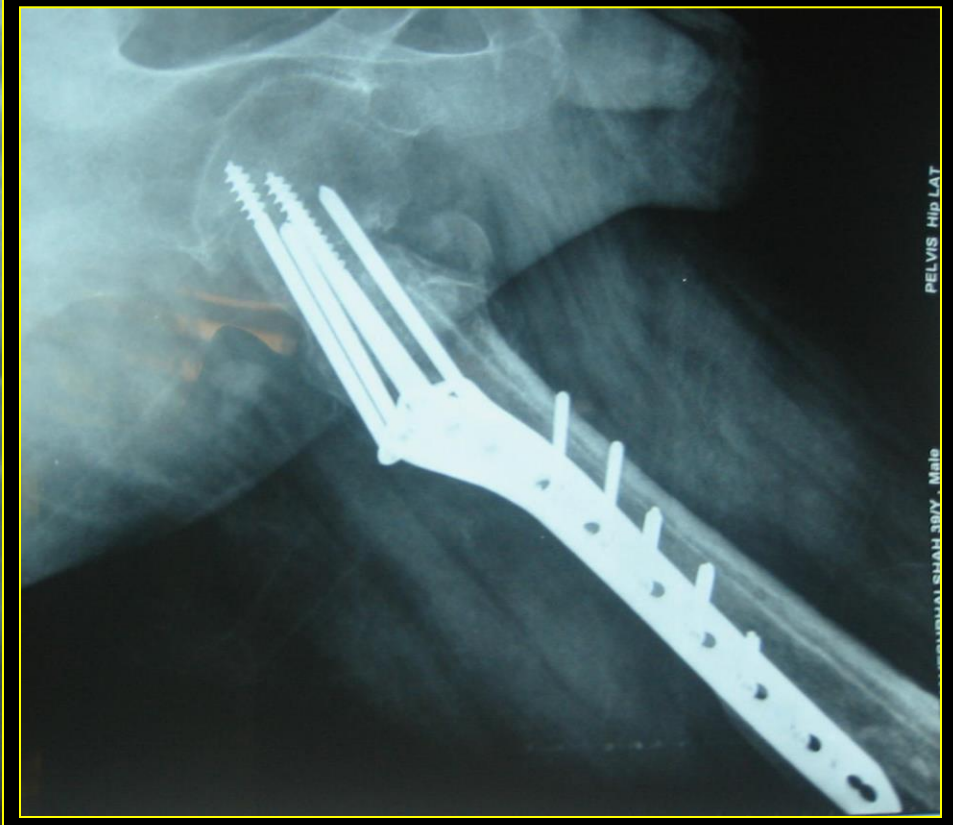



nonunion


BHAVESHBHAI SHAH 38/Y , Male
PELVIS Both HIP Joints
03-Jul-10
PLATINUM DIAGNOSTICS, SABARMATI, AHMEDABAD


BHAVESHBHAI SHAH 38/Y , Male





Valgus abduction osteotomy

4 months post-op

Avascular necrosis

5-8% Non-displaced fractures

20-45% Displaced fractures

Increased incidence with

- INADEQUATE REDUCTION
- Delayed reduction
- Initial displacement
- Associated hip dislocation

Message

- ICNF : unpredictable results despite perfect treatment
- Not an emergency
- Capsular tap does not help
- Reduction : utmost importance!
- Parallel screws are not necessary
- DHS better than 3 screws
- Arthroplasty : better results in elderly.
- AVN & NU depend on quality of reduction & fixation

Thank you !