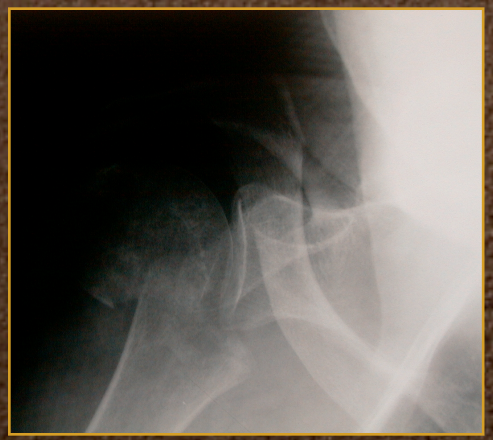
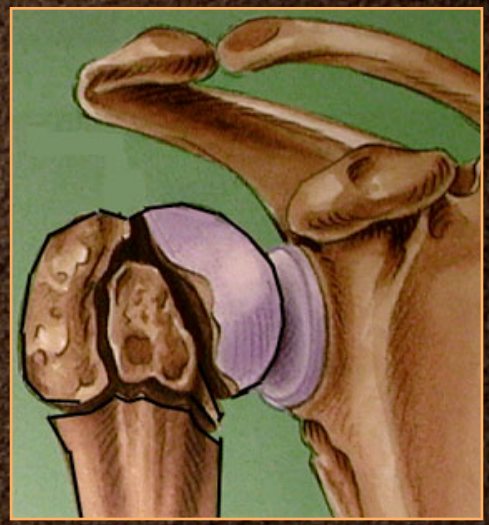
Fractures of the shoulder





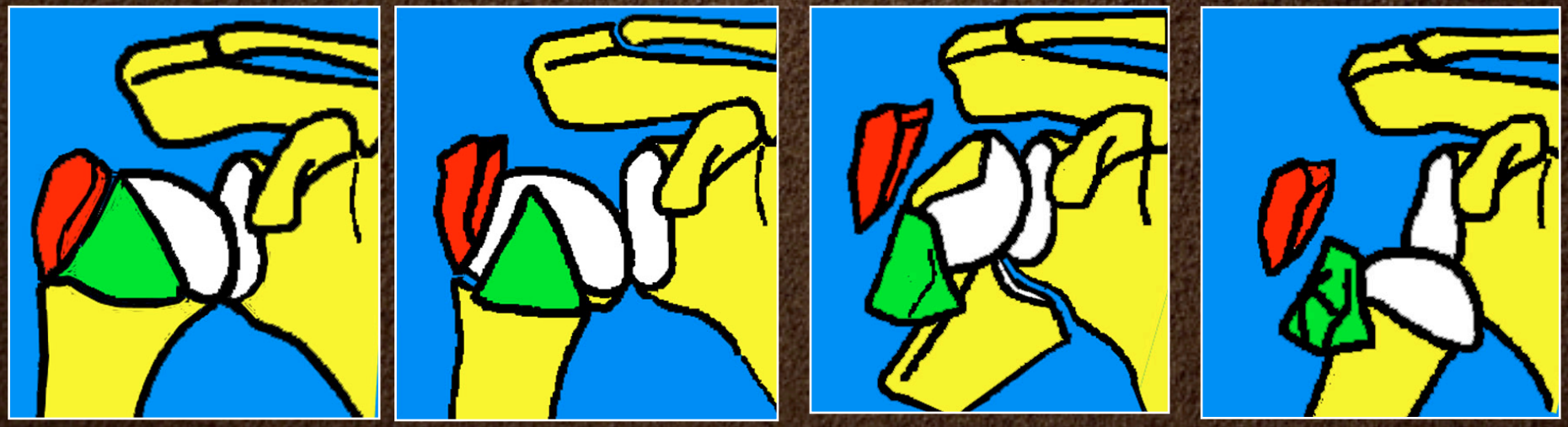
Christian Dumontier
Institut de la Main & Hôpital saint-Antoine,
Paris

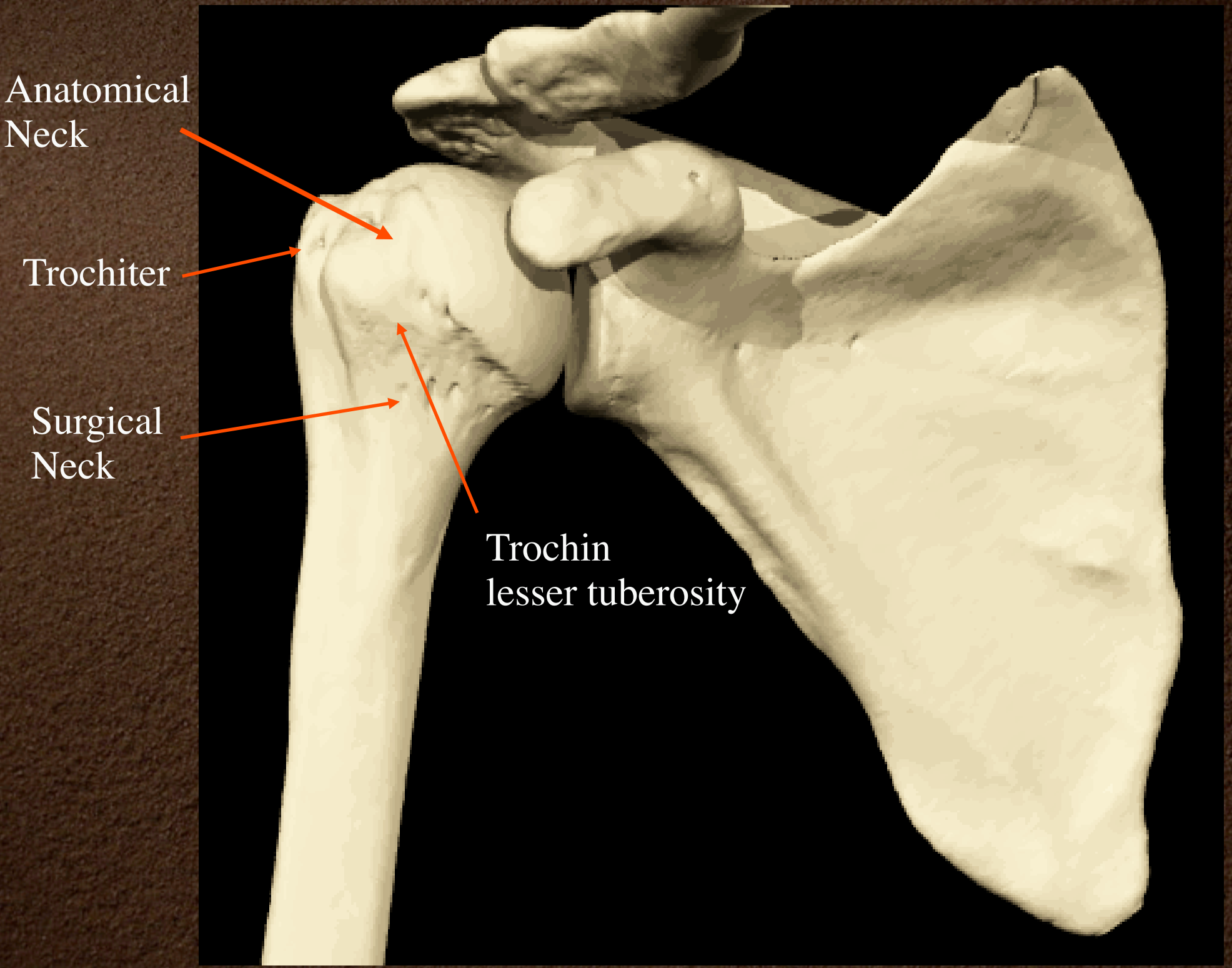
Epidemiology

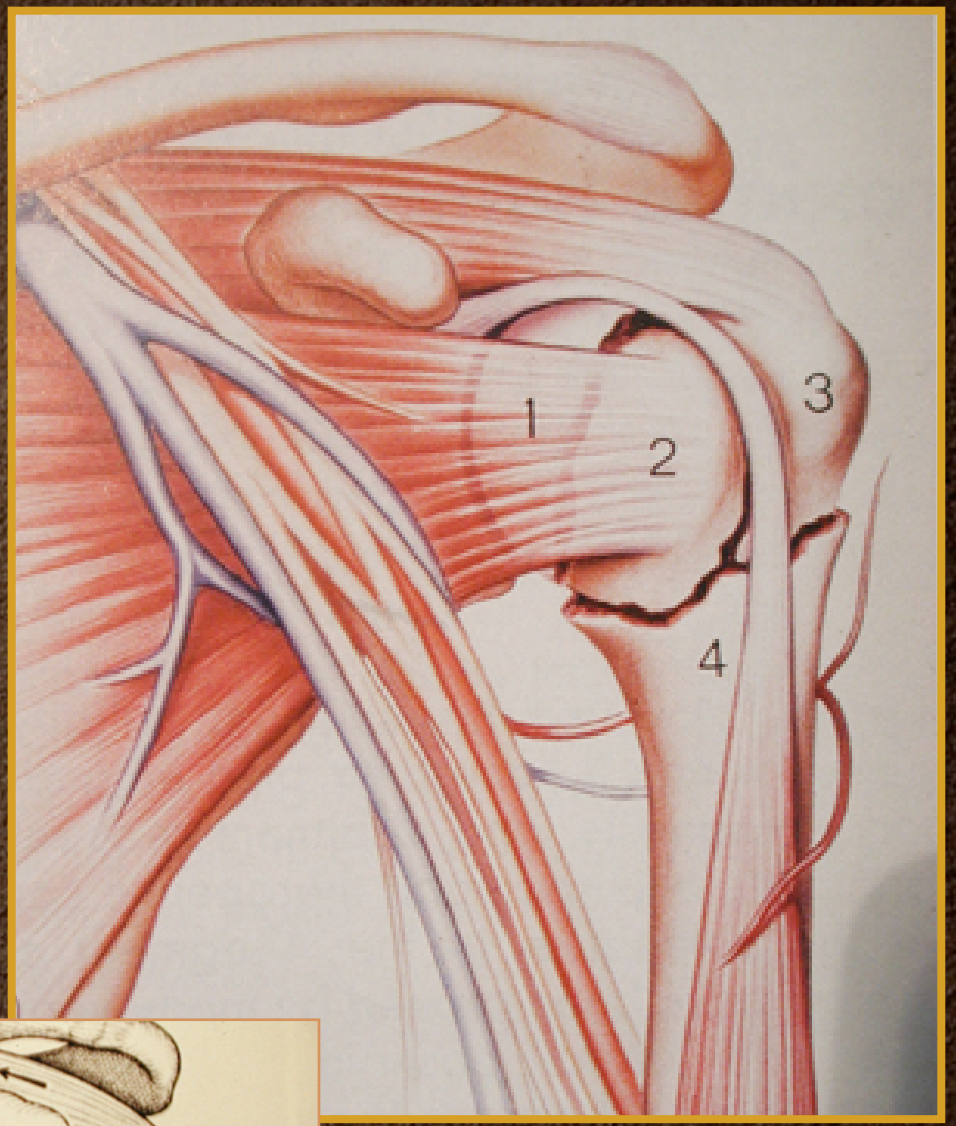
- Second in frequency
  - 70% of hip fractures
  - ≈ 105/100,000 cases/year
- Increased frequency due to osteoporosis

Classification

- Many have been described
- Neer (1970) described the four-fragments classification after Codman




Anatomical Neck
Trochiter
Surgical Neck
Trochin
lesser tuberosity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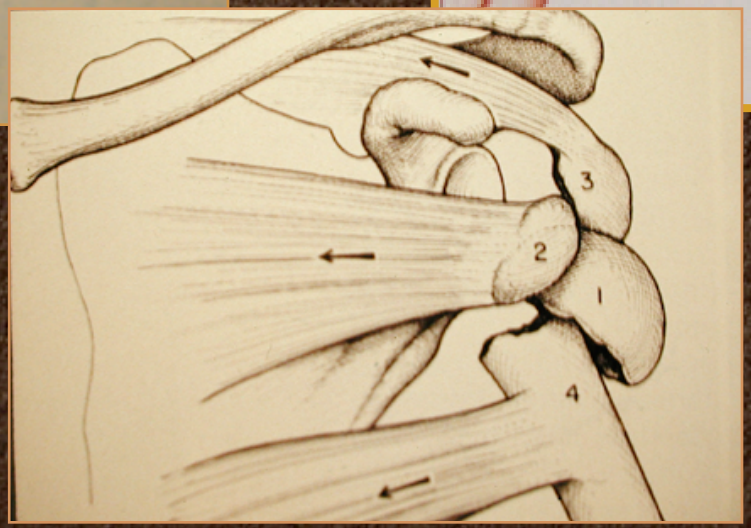
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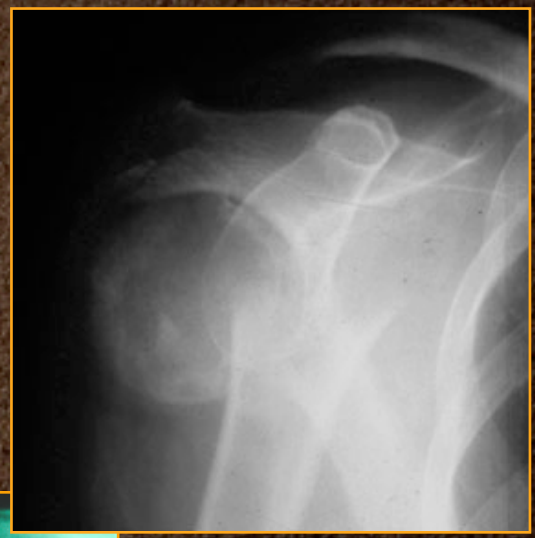
4

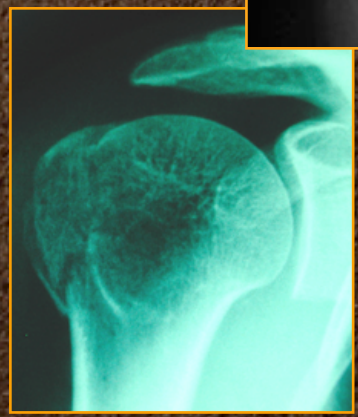
Neer's classification

- Do not apply for non-displaced fractures (≈ 80%)
- Only apply for displaced fractures
  - Displacement of at least 1 cm
  - Angulation of over 45°

Displaced Fractures

	2-part	3-part	4-part	Articular Surface
Anatomical Neck				
Surgical Neck	a, b, c			
Greater Tuberosity				
Lesser Tuberosity				
Fracture-Dislocation — Anterior				
Fracture-Dislocation — Posterior				
Head-Splitting				





Neer's classification

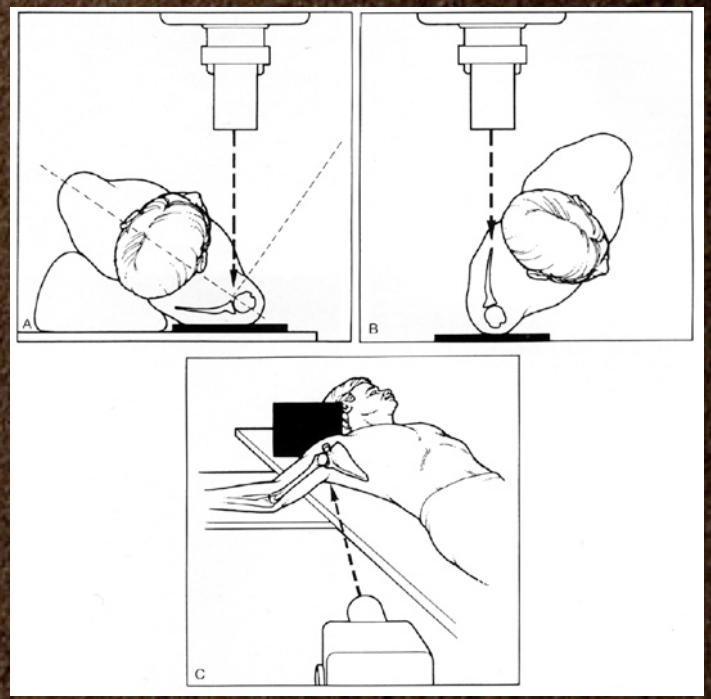
- Greater tuberosity stands 8 +/- 3,2 mm under the top of the articular segment
- Displacement of > 5 mm (> 3 mm for GT) can have significant clinical impact

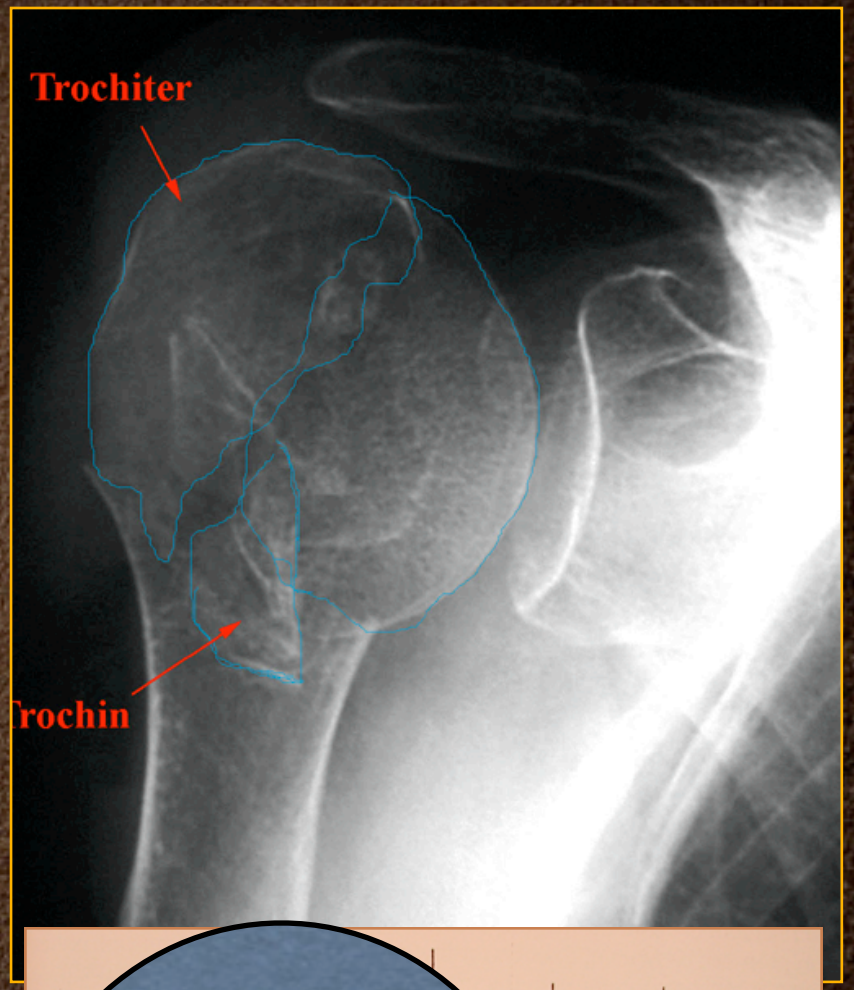
Imaging techniques

- To correctly define the type of fracture, one must have adequate X-rays
- The "trauma series" described by Neer

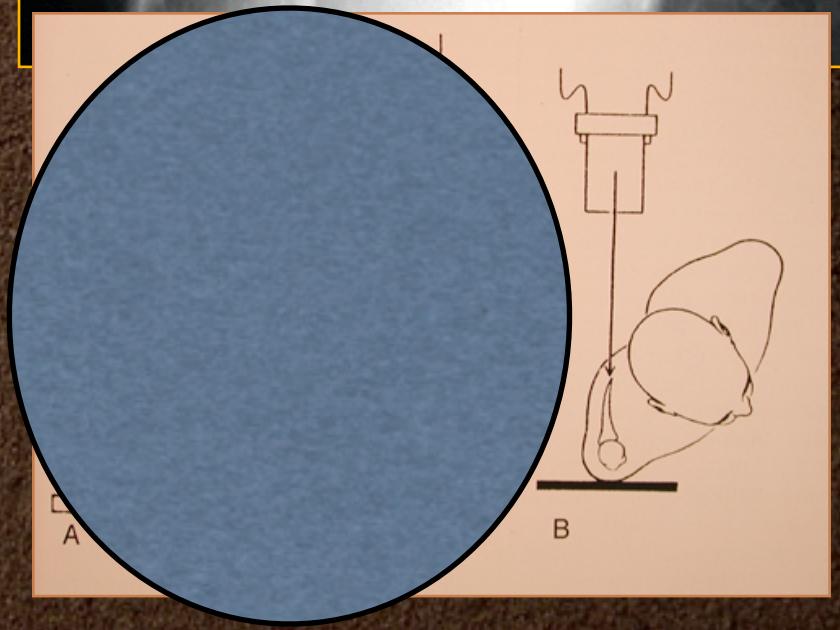
Plain X-Rays, the trauma series

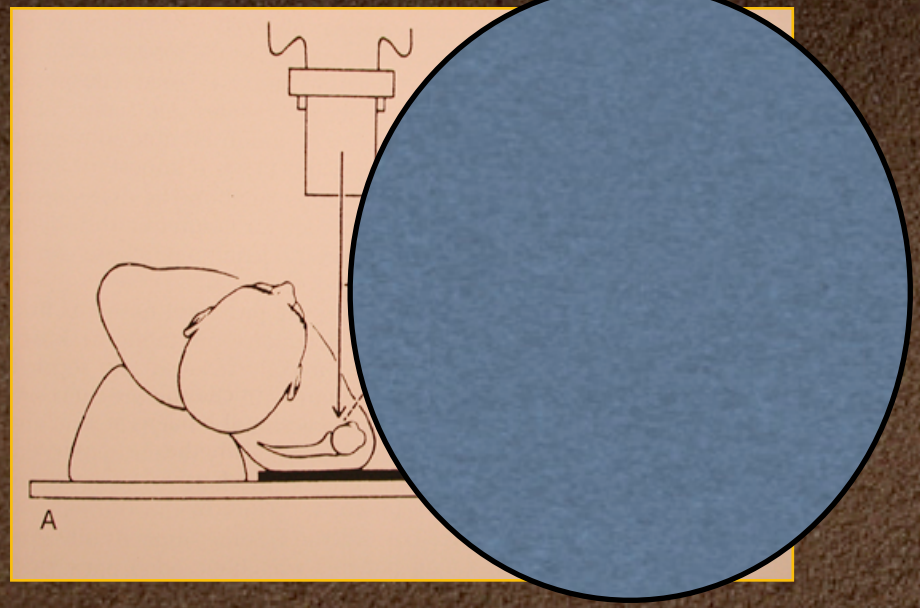
- AP view (in internal rotation)
- Lateral view
  - Scapular Y view (Neer's)
  - Axillary view





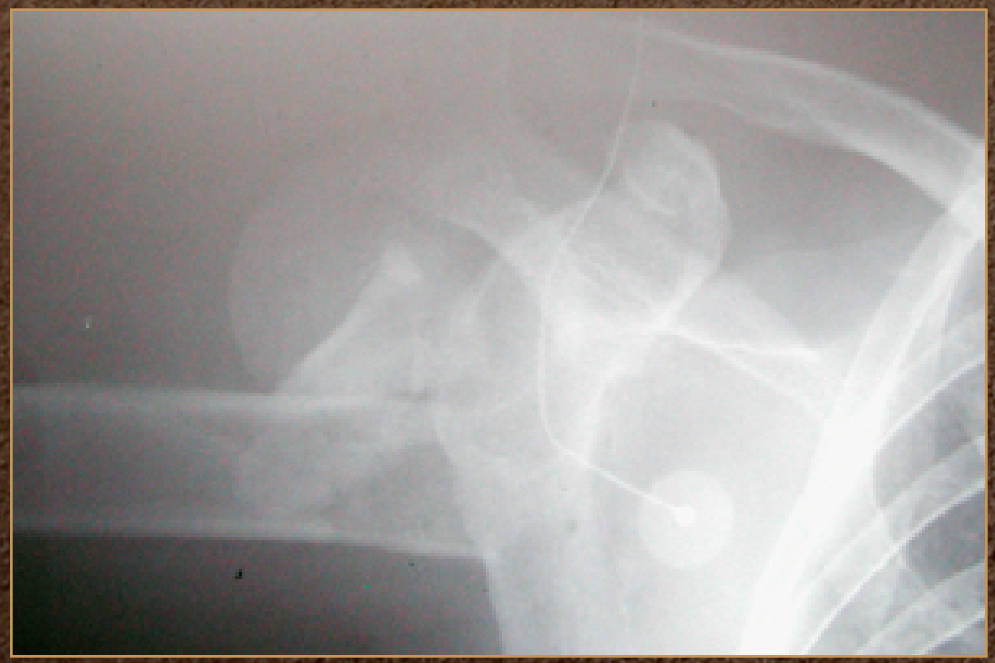
AP view

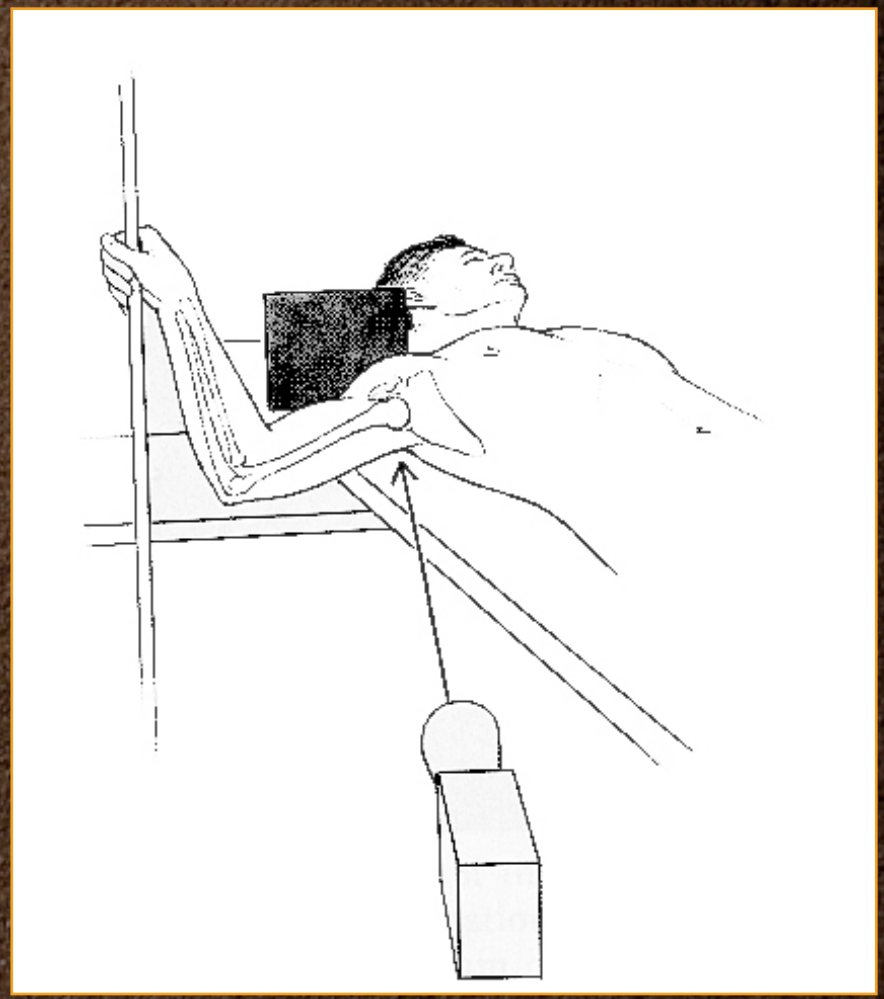




Lateral, scapular view

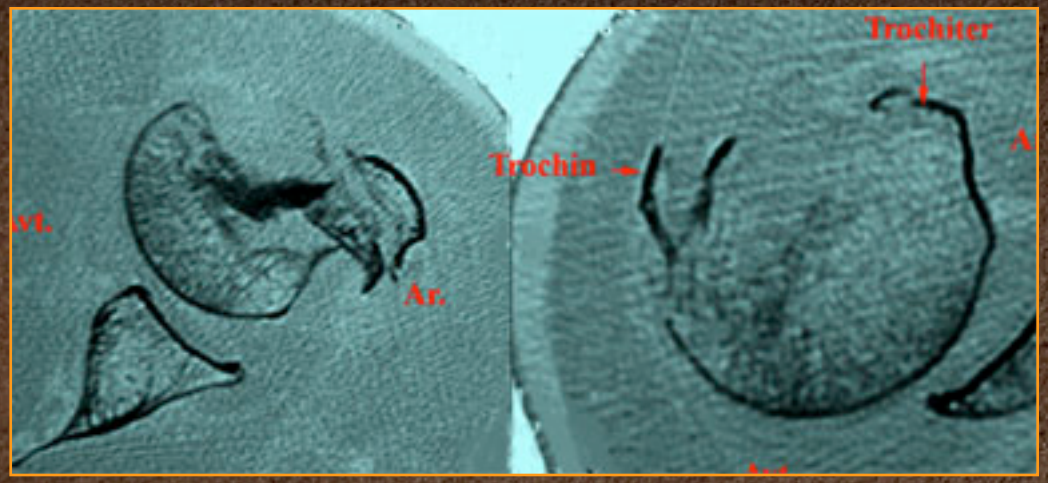
Axillary view

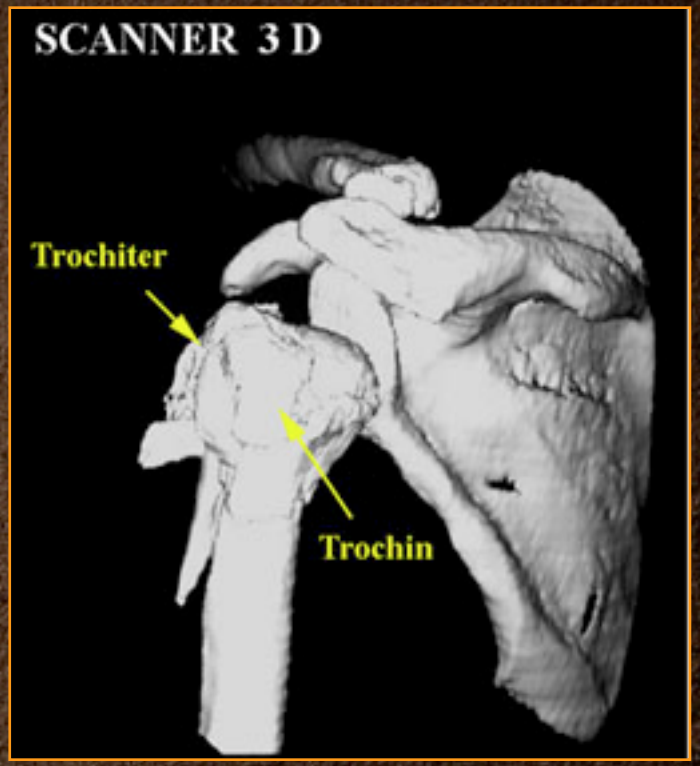




Other techniques

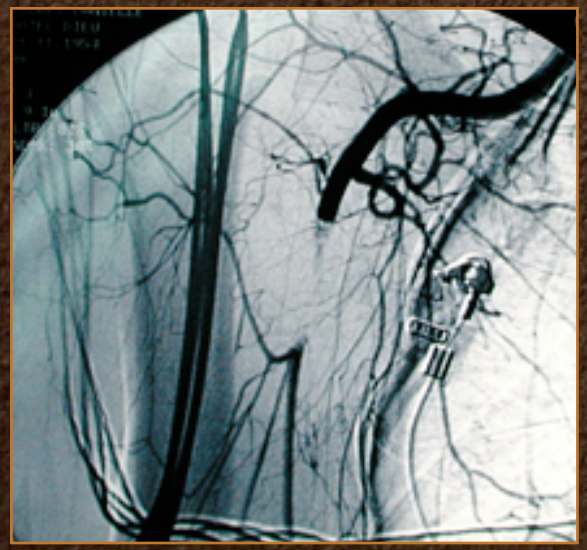
- A complete description of the fracture may be difficult using plain X-rays
- CT-Scan is helpul
  - To precise the number of fragment and their displacement
  - To choose the surgical approach

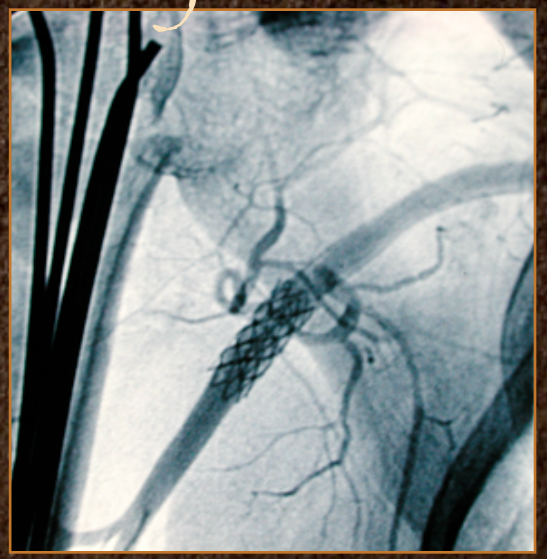

Trochiter
Trochin
Ar.


SCANNER 3 D
Trochiter
Trochin


A 64

Vascular injuries



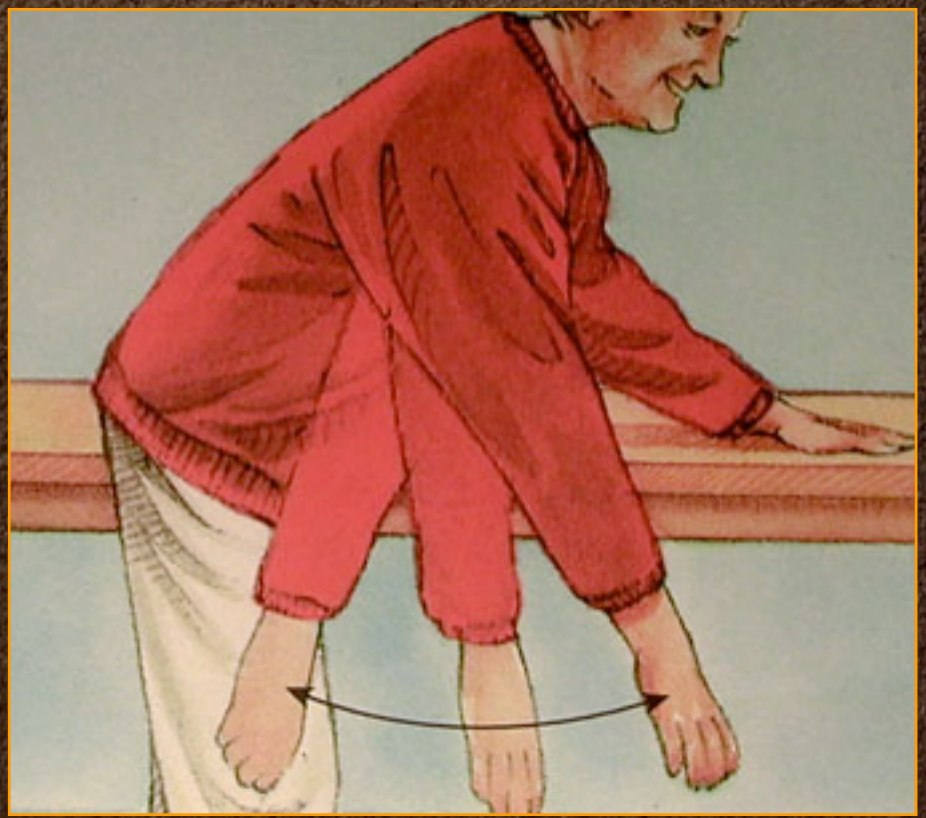


Non-displaced fractures

- The most frequent
- One complication = stiffness
- One treatment option = mobilise as soon as possible !

2-4 weeks
partial
immobilization

Start
pendulum
exercices
at D15



X-ray
control
every
week

Results

- Good to excellent in 77% of cases
- Fair or Poor in 23% of patients
  - Stiffness +++

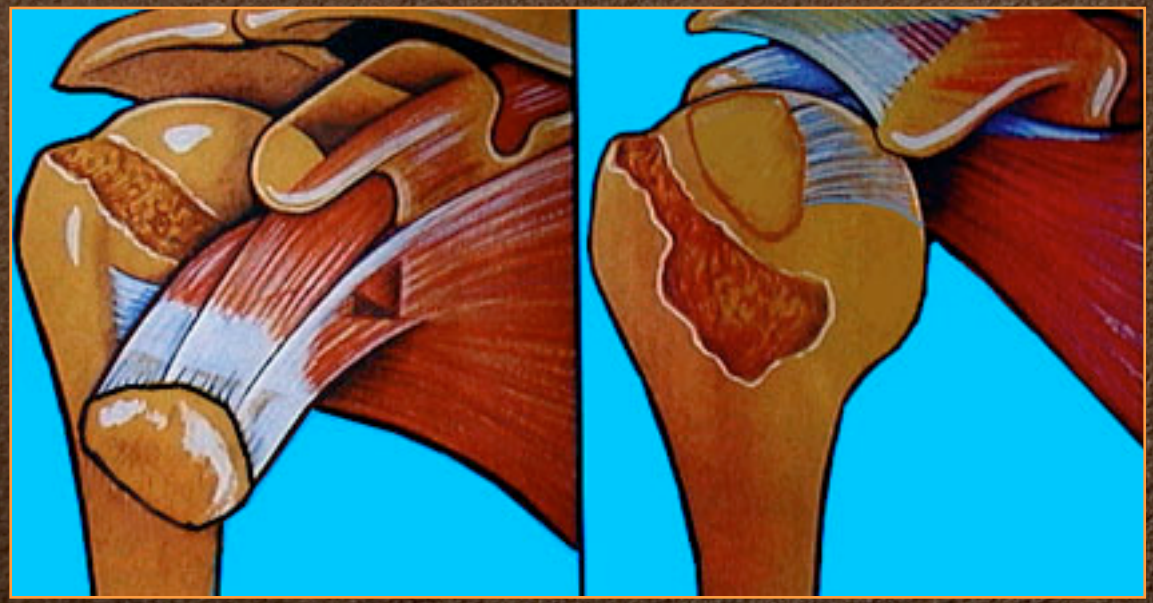
2-parts fracture

- Trochiter
- Trochin (lesser tuberosity)

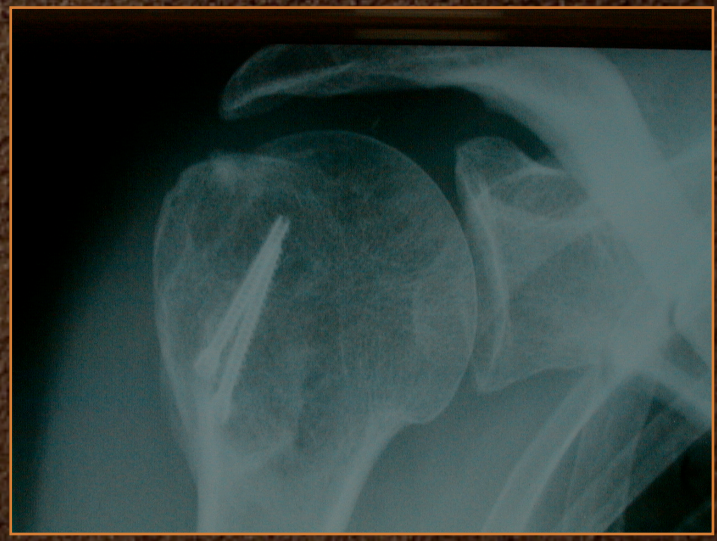
] Surgery

- Surgical neck → Surgery, rarely orthopedic

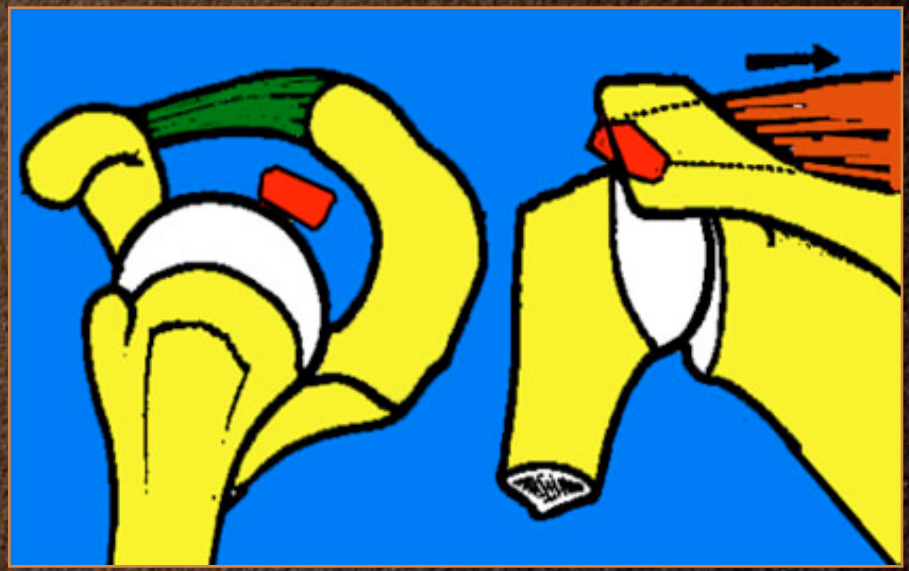
Fracture of the trochin



Rare fractures
Delto-pectoral approach



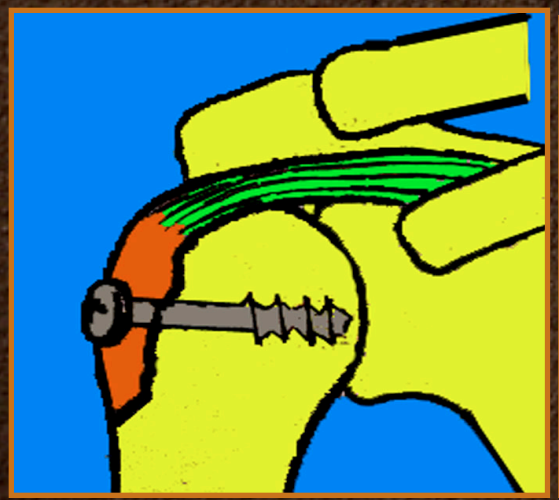
Fracture of the trochiter

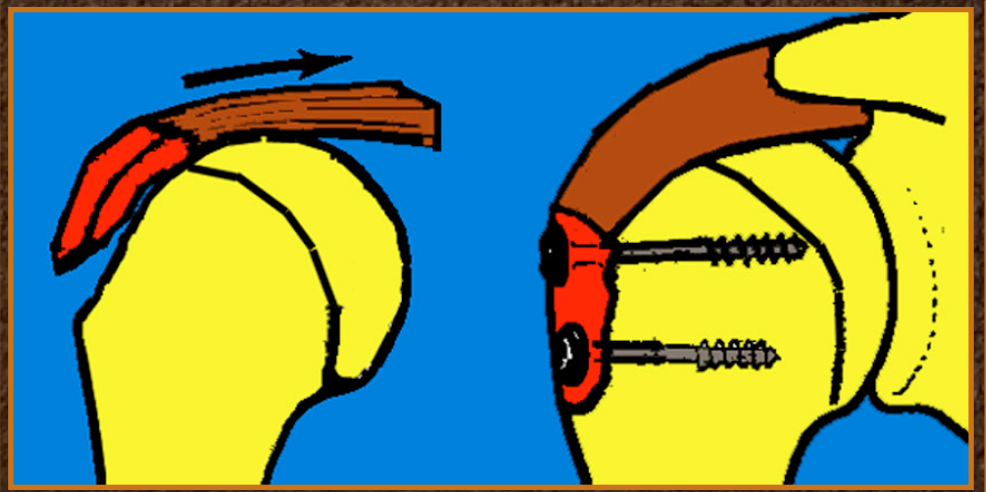


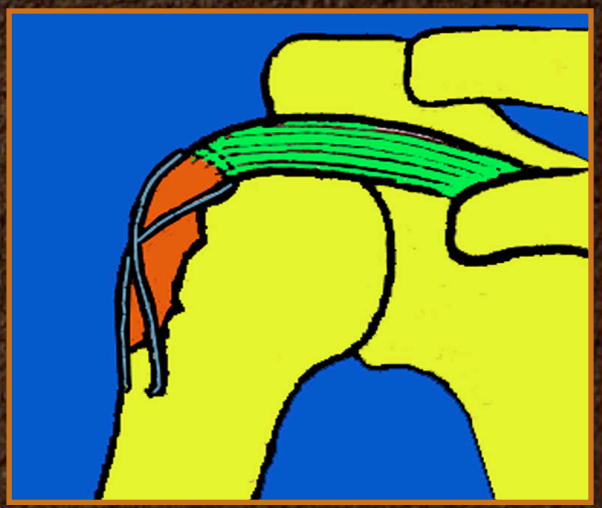
- Represents the equivalent of a large rotator cuff tear
  - The greater tuberosity displaces superiorly and posteriorly

Fracture of the trochiter

- Surgical reduction and fixation is mandatory: bone is fragile while the cuff is the solid part for fixation







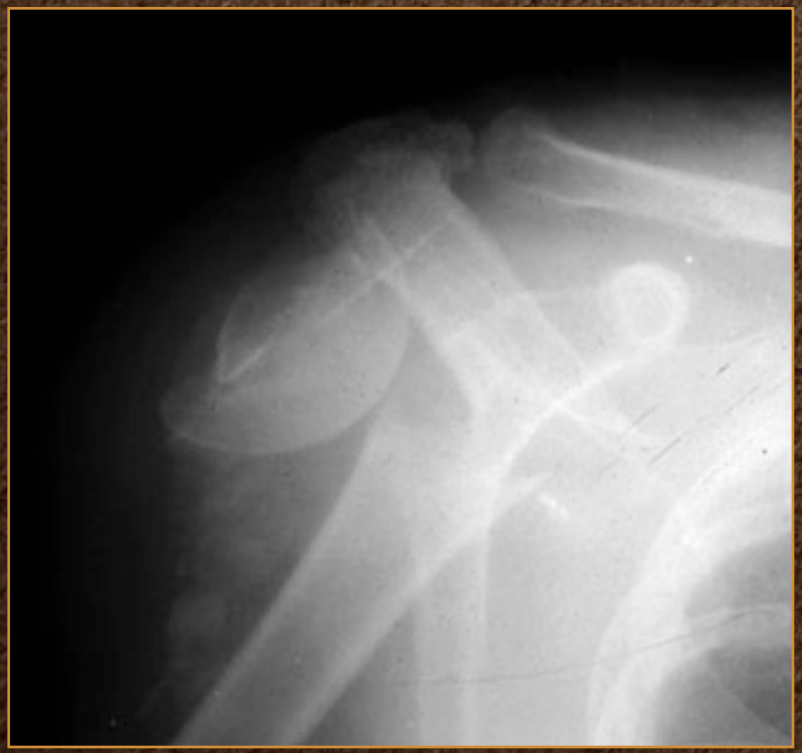
Surgical neck fractures

- Displacement is usually a combination of medial translation and posterior angulation

Orthopedic treatment ?

- Can be tried but frequently fails
- Under general anesthesia
- Orthopedic reduction
- X-Ray control (difficult)
- Immobilisation (difficult) prevents early mobilisation

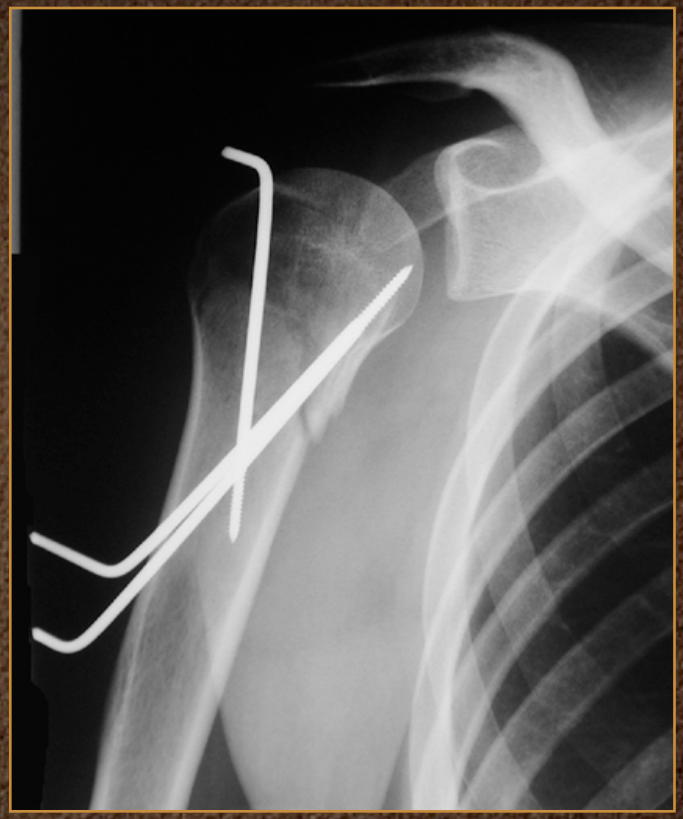
Axial traction adduction reduction and release

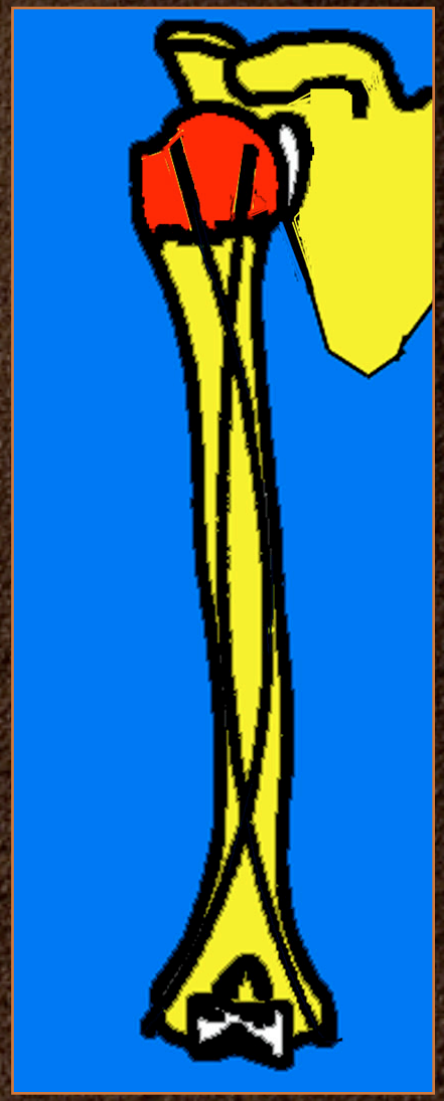


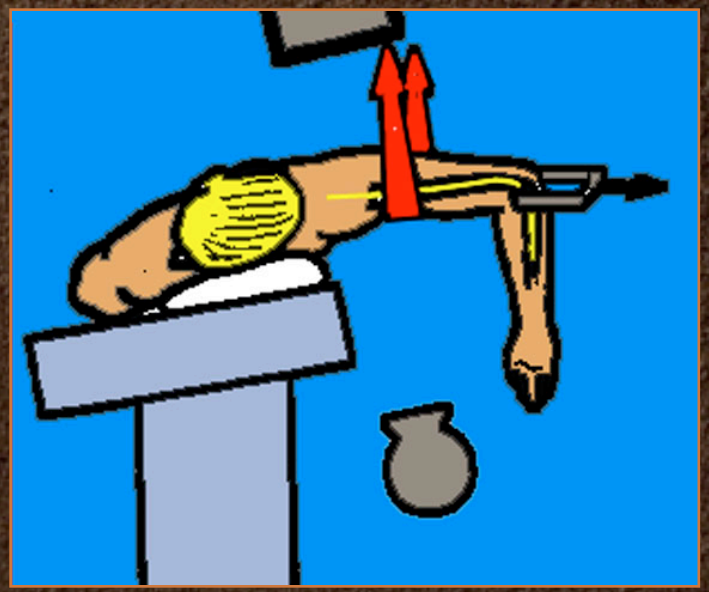
Humeral head necrosis after orthopedic treatment

Surgical techniques

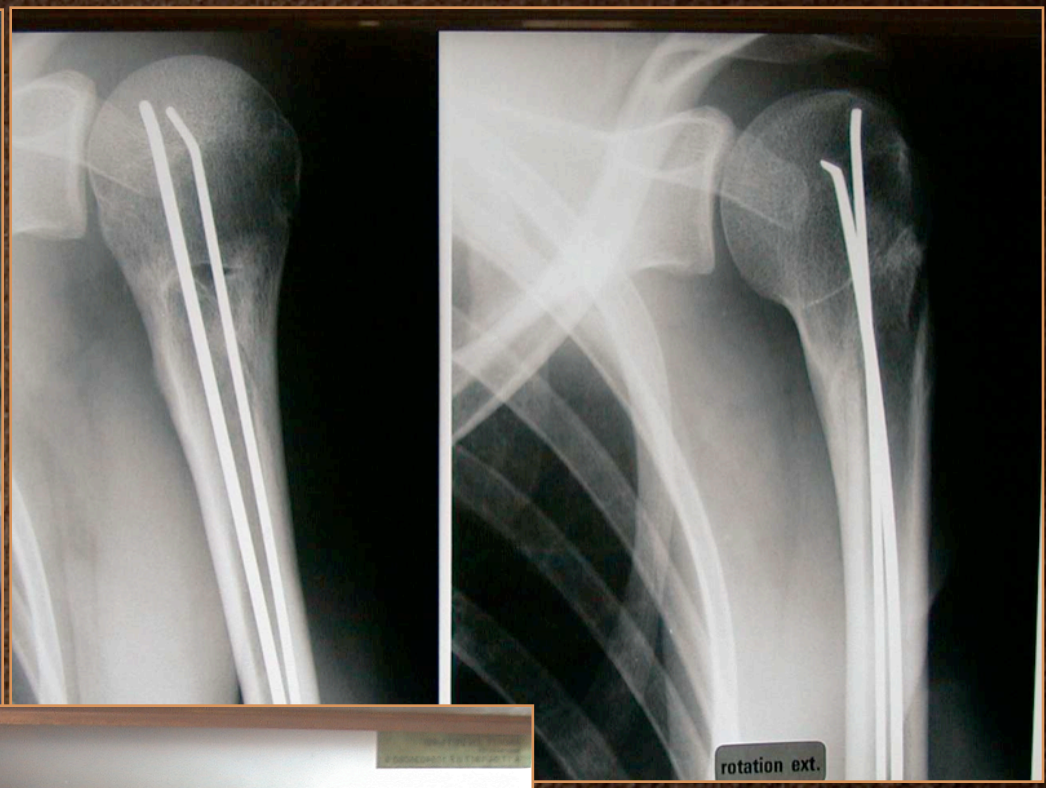
- Per-cutaneous K-Wires
- Intra-medullary K-Wires (Hacketal, Kapandji,...)
- IM nailing
- Plates

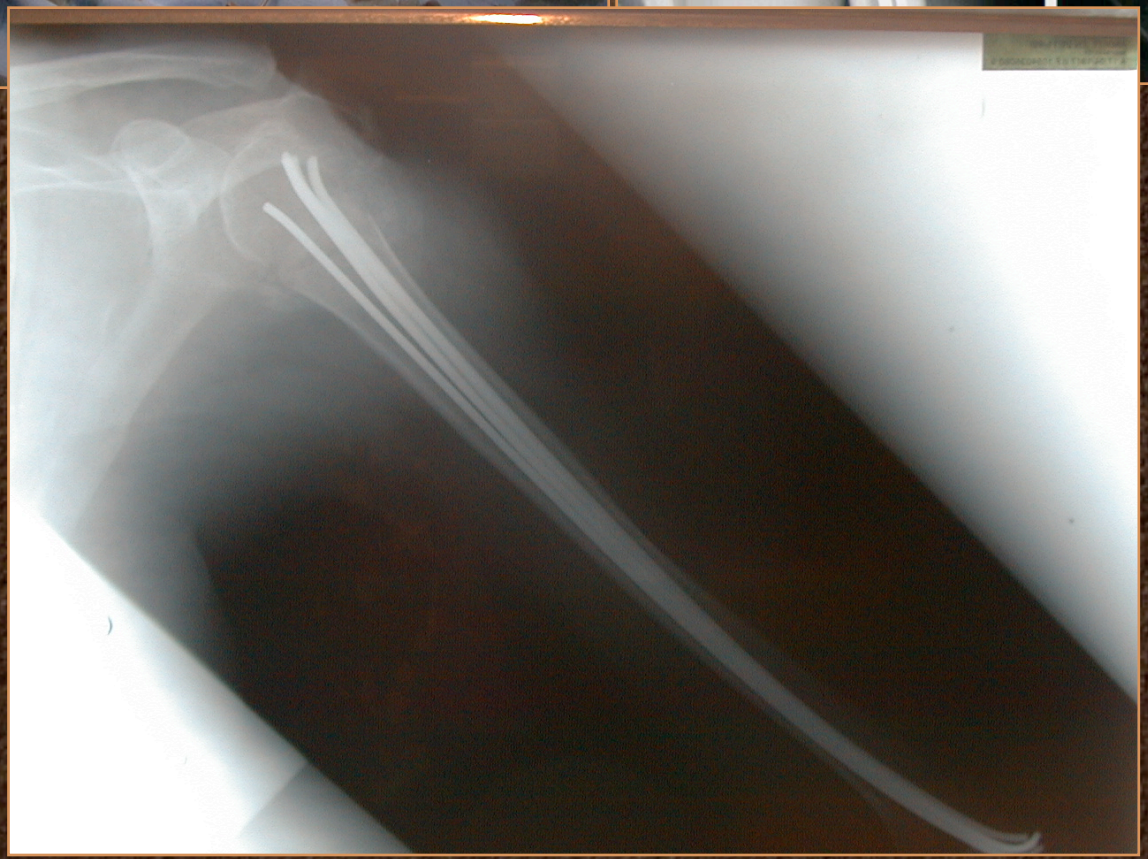


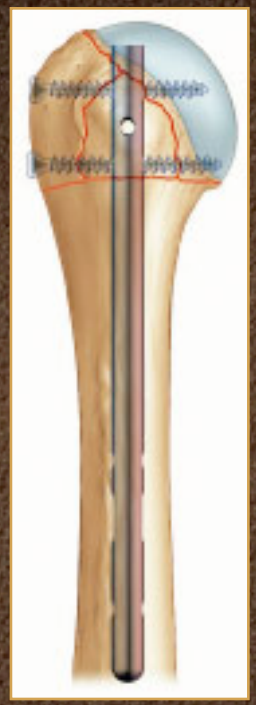


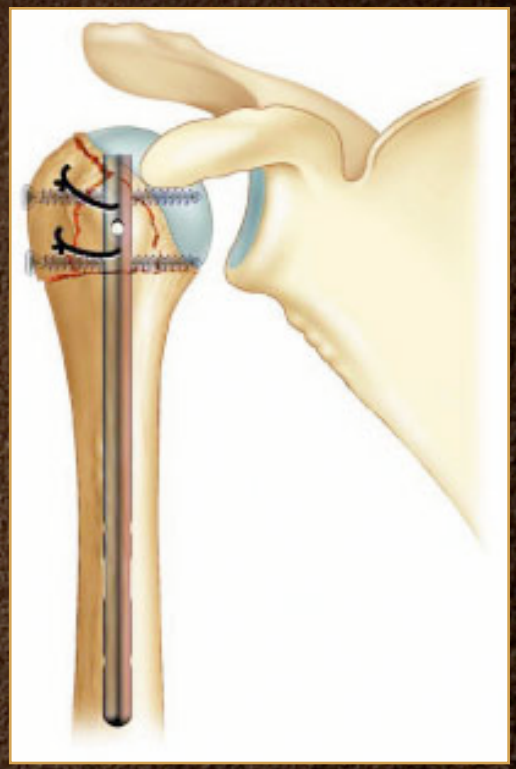


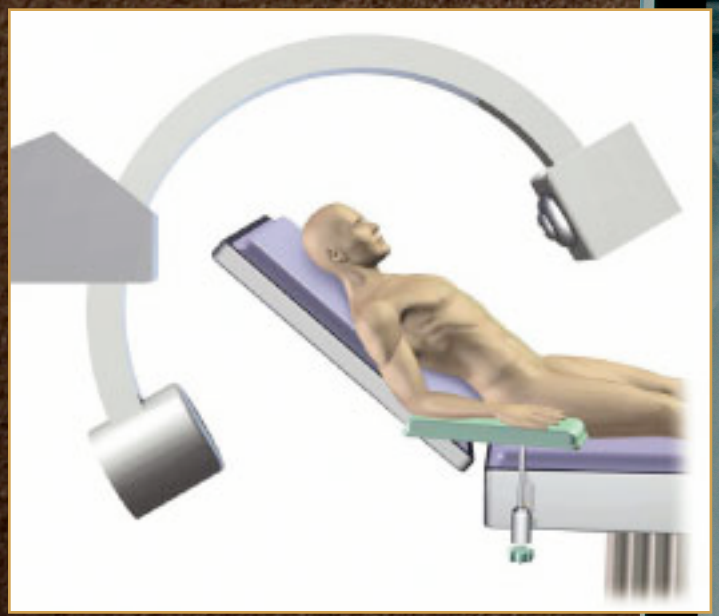
Easy and cheap but biomechanically insufficient

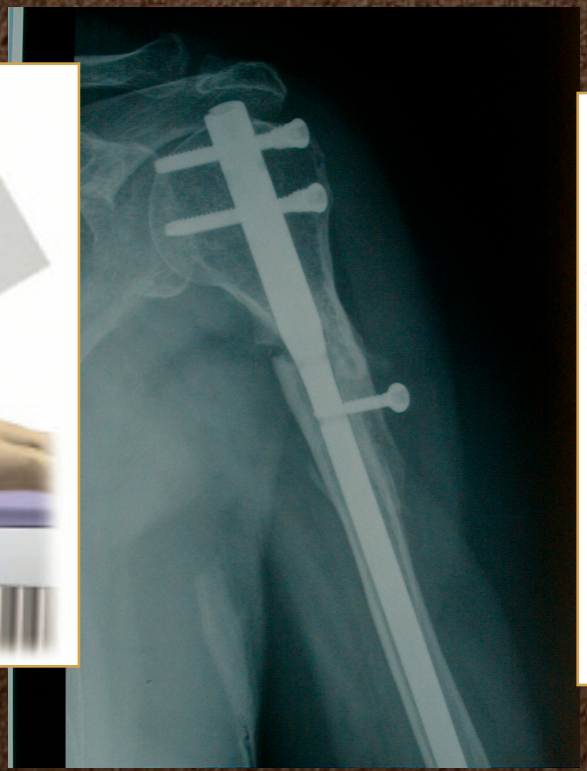

rotation ext.

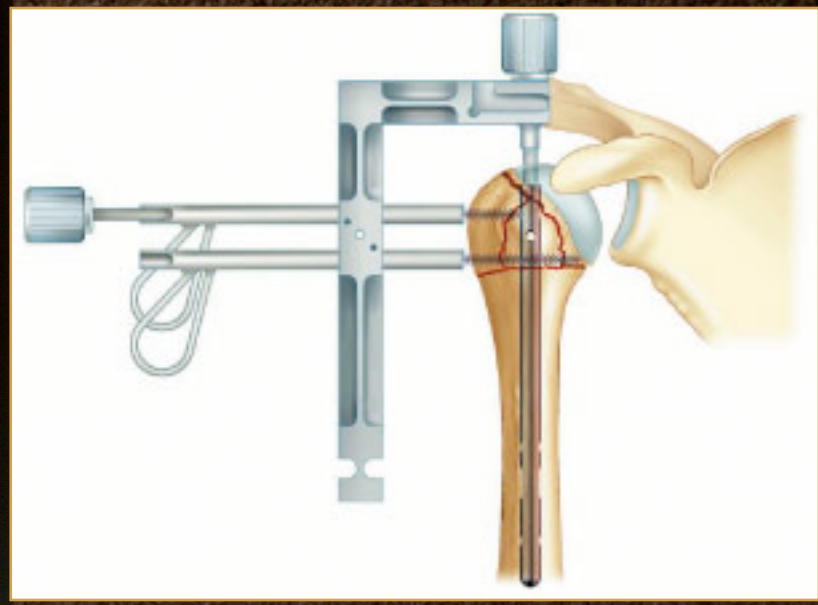






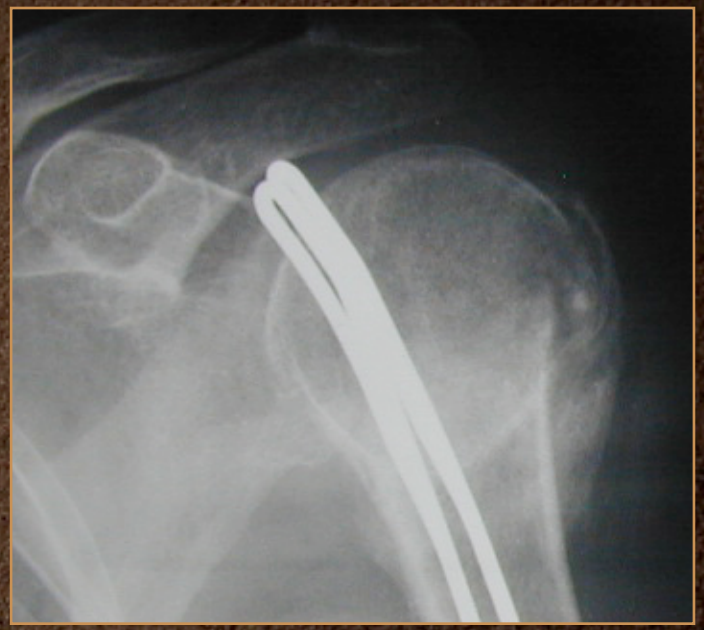






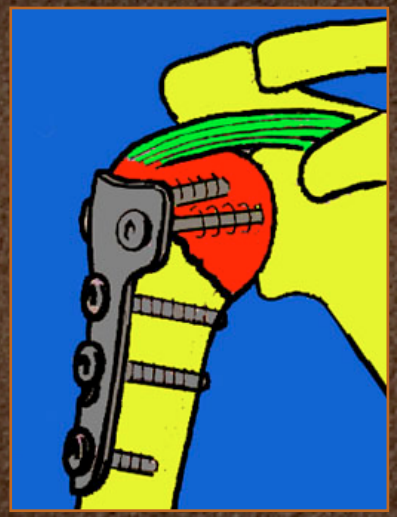
Complications

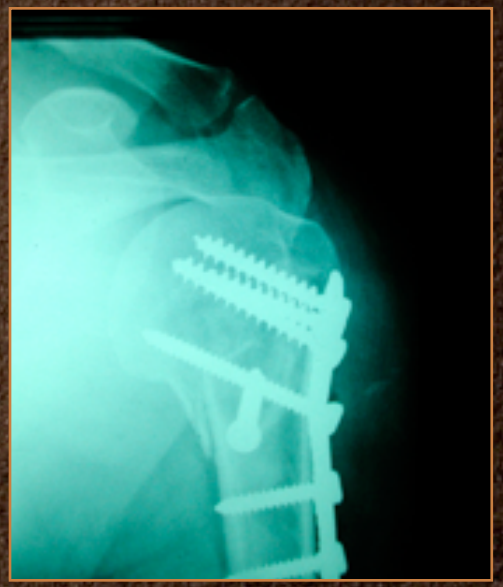
- Not rare
- Lack of fixation (osteoporosis)
- Pseudarthrosis
- Malunion (Greater tuberosity +++)
- Stiffness (CRPS I)

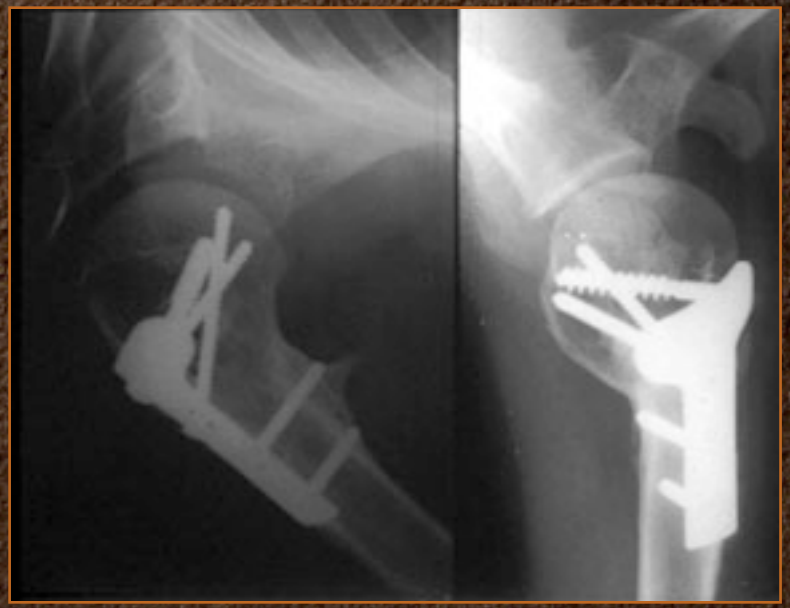


Complications

Plates

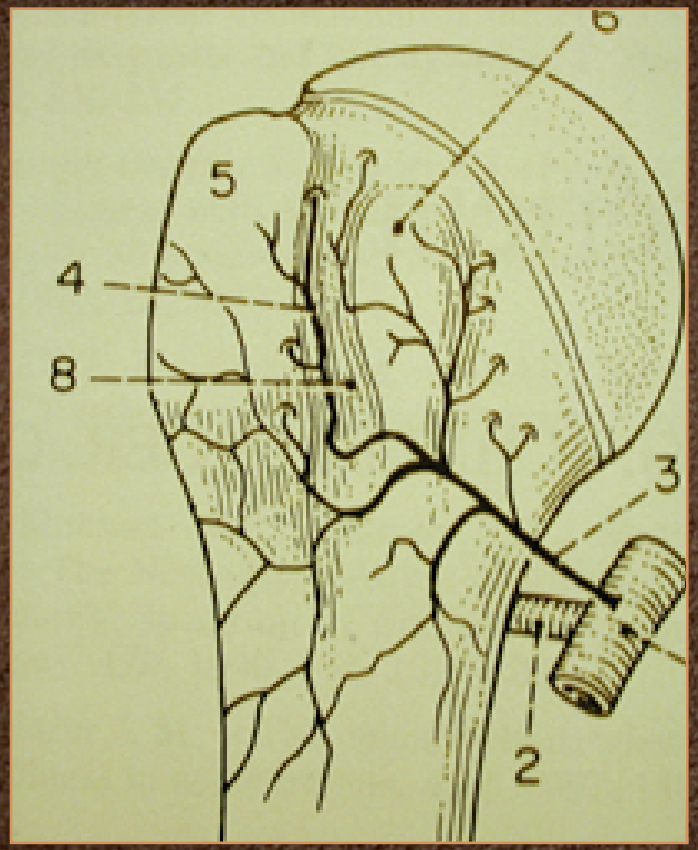






Plating

- Is a theoretical good option but has two major drawbacks
  - Incision along the bicipital groove may divide the major vascular supply of the humeral head
  - Fixation of screws is limited is the osteopenic patient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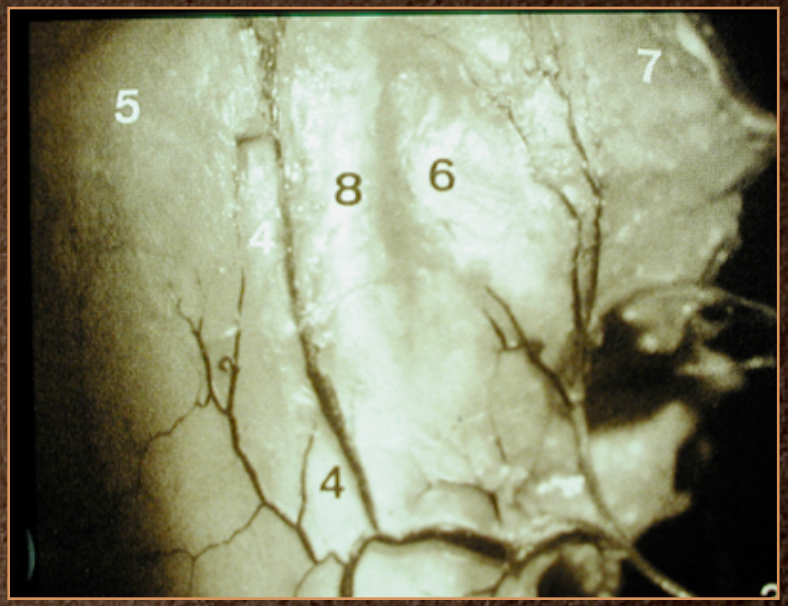
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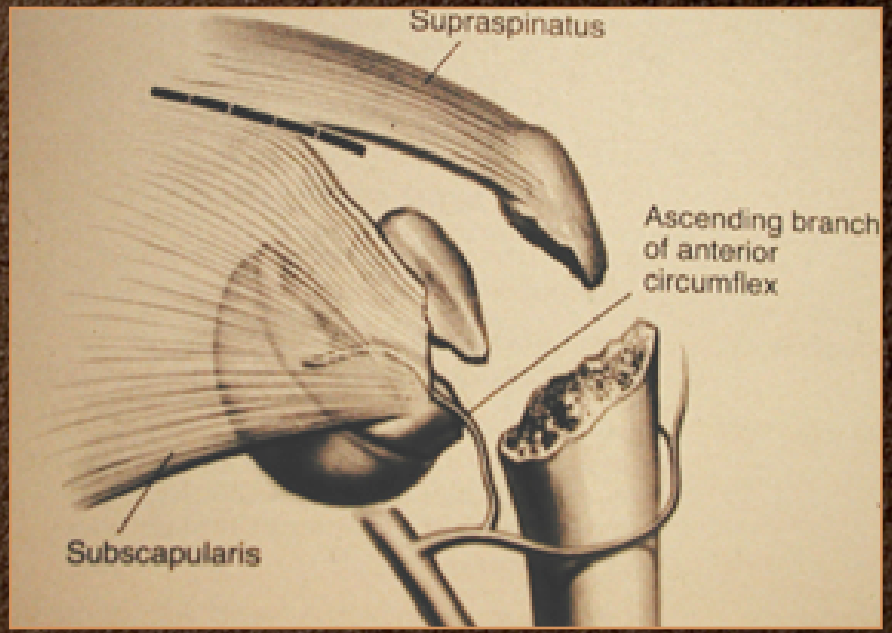
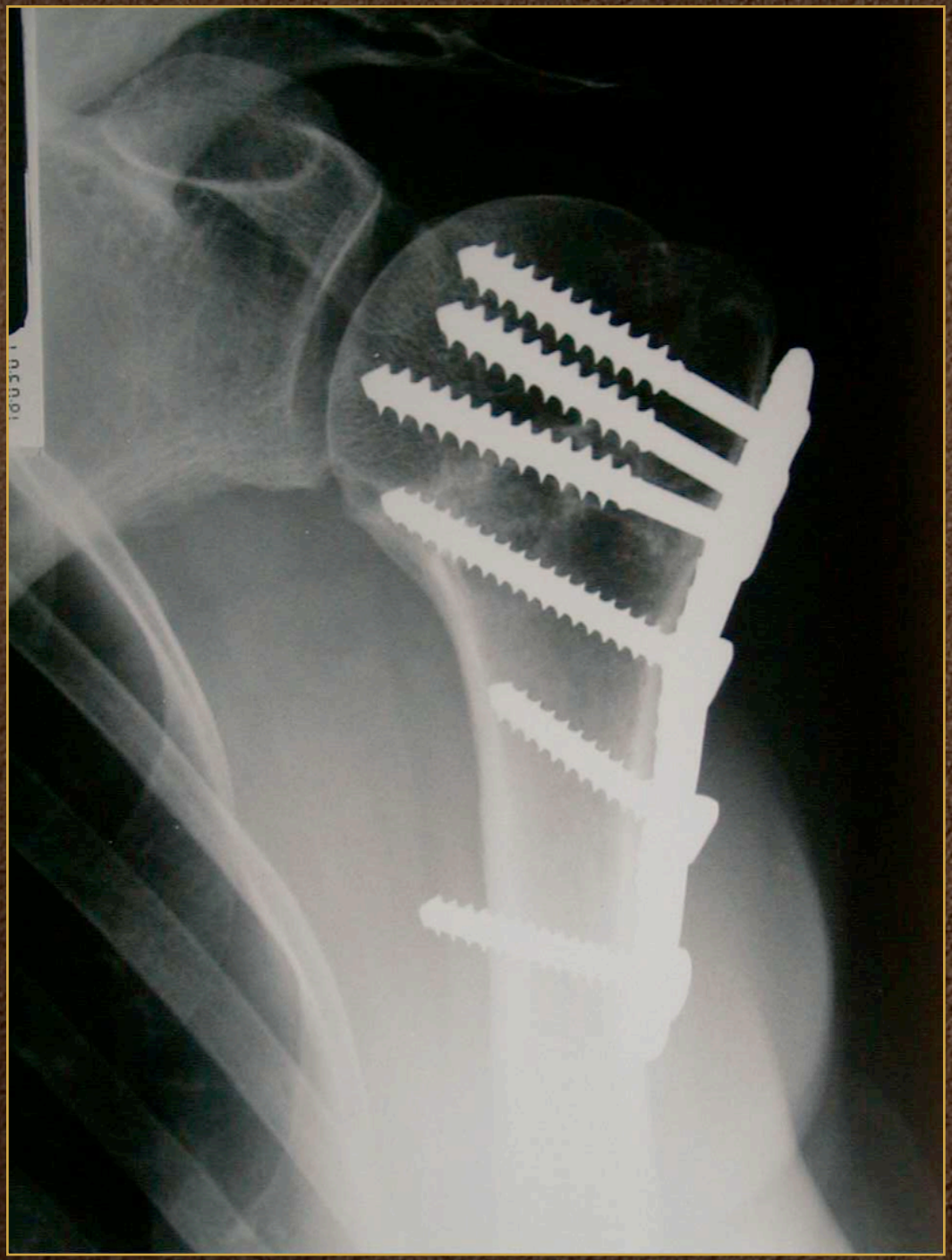
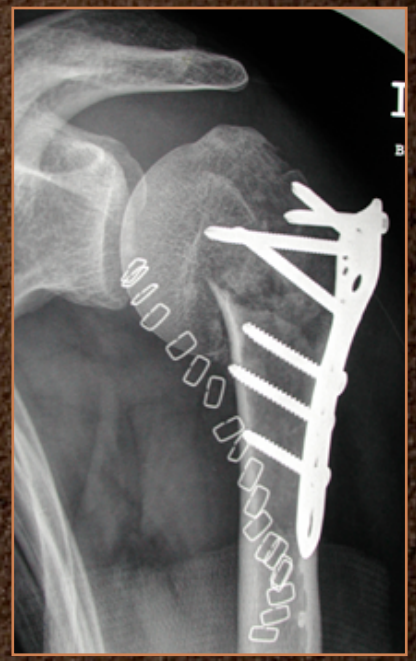
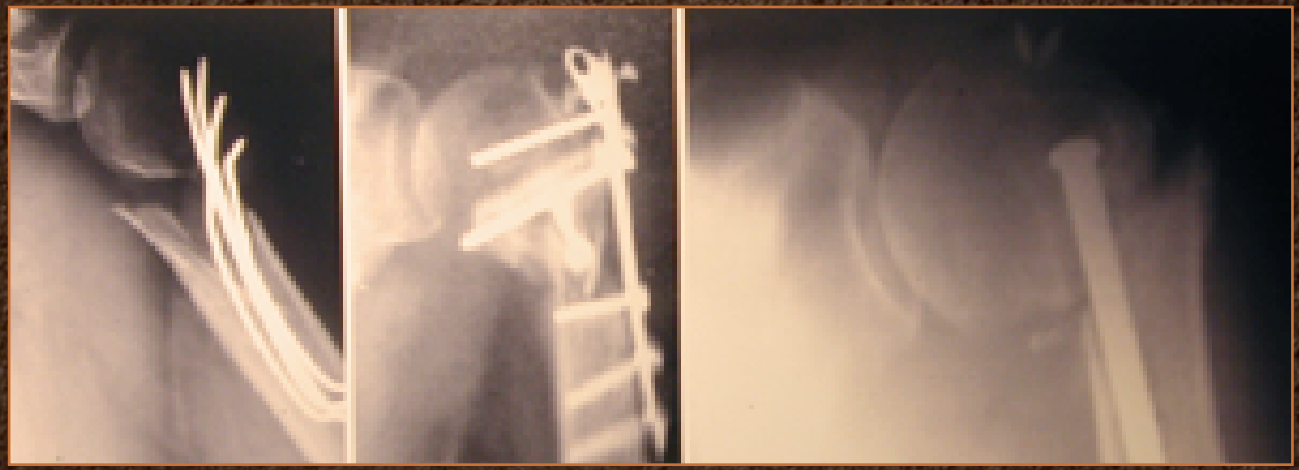

Supraspinatus
Ascending branch
of anterior
circumflex
Subscapularis



Failure of fixation in osteopenic patients

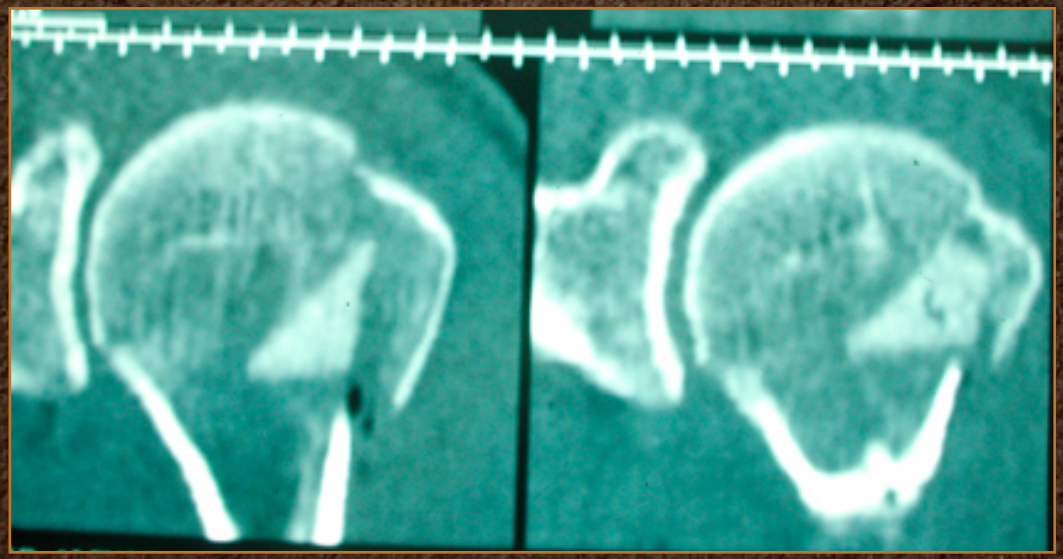


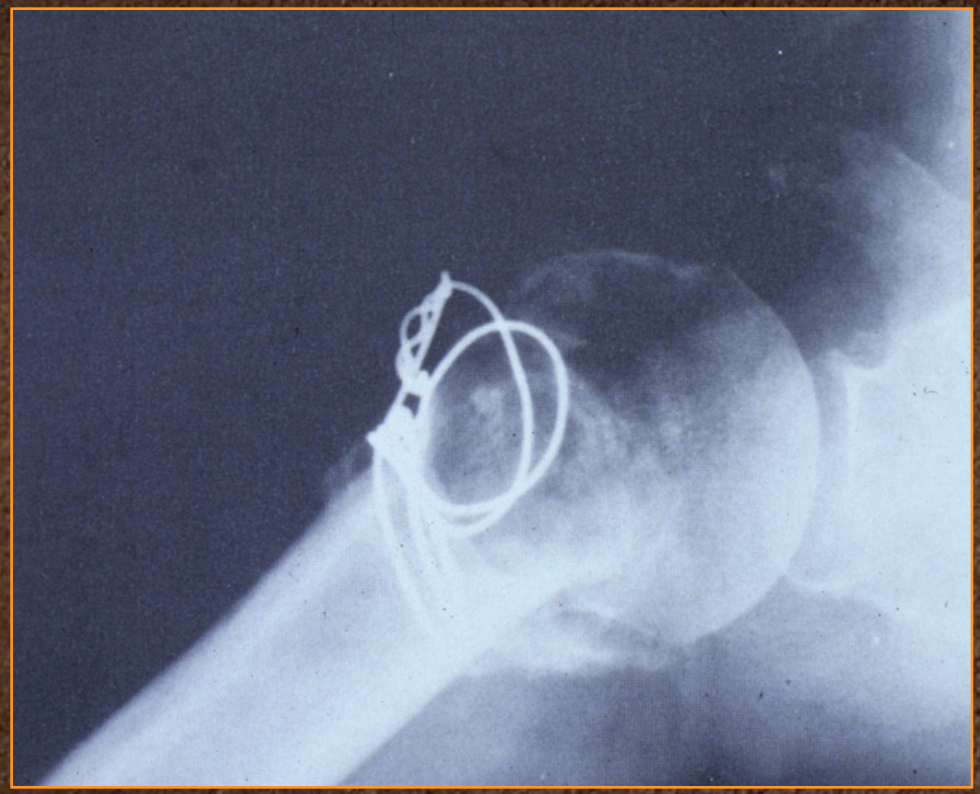


3-parts fracture

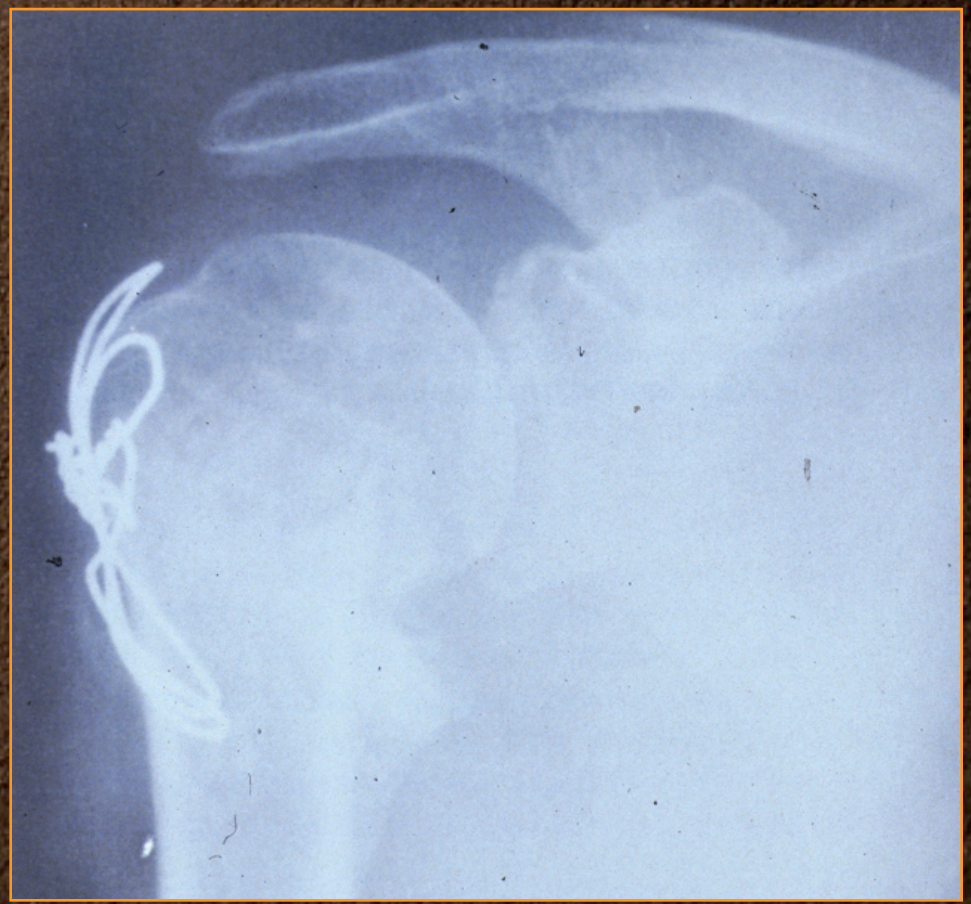
- IM nailing can be considered
- ORIF is a good solution
  - Bone graft/synthesis
  - Plate
  - Bilboquet
- Humeral prosthesis is the other option

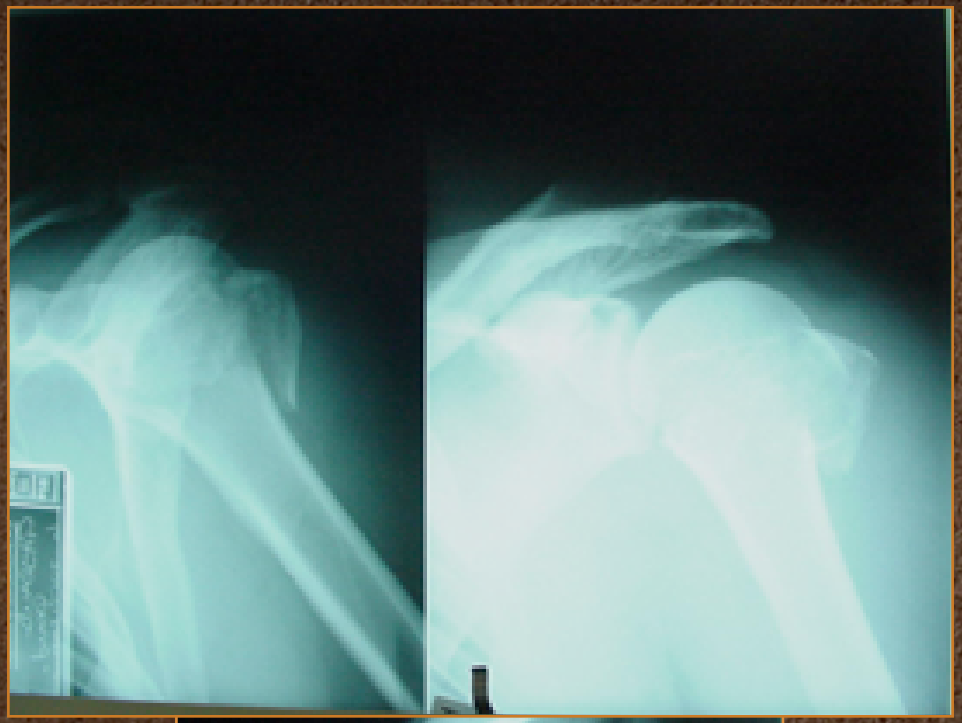
Bone grafting

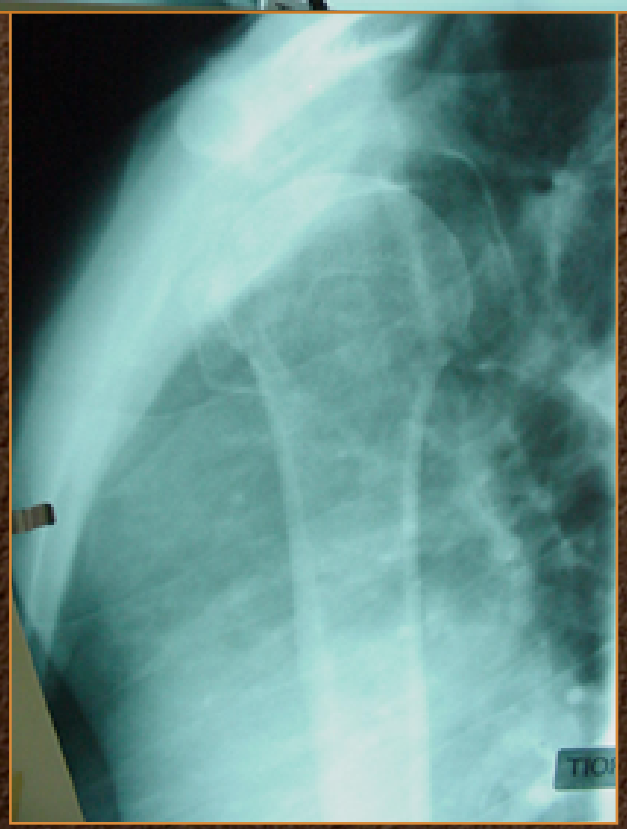


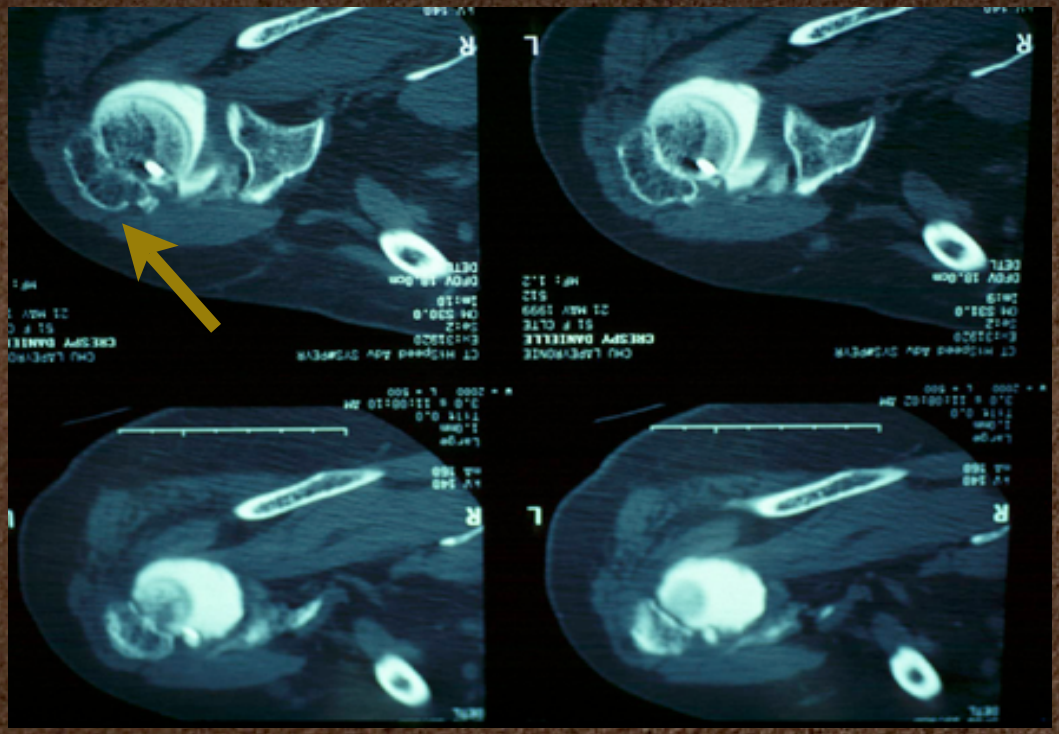


Minimal
osteosynthesis

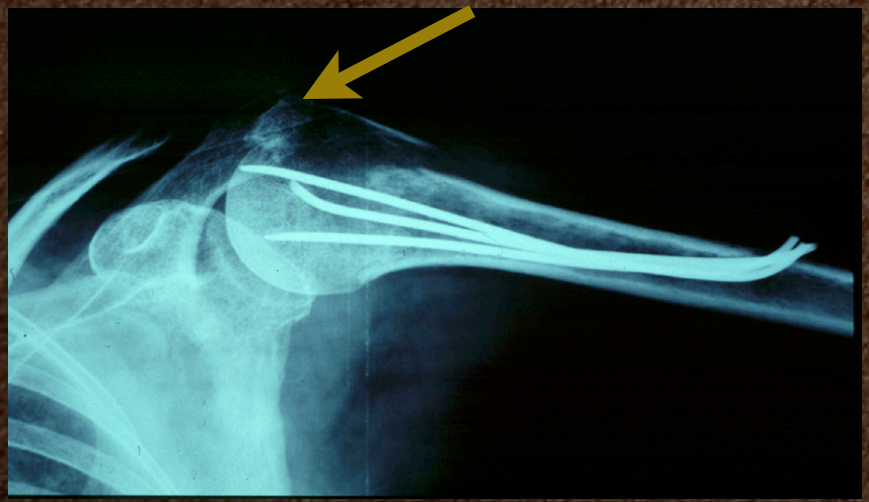


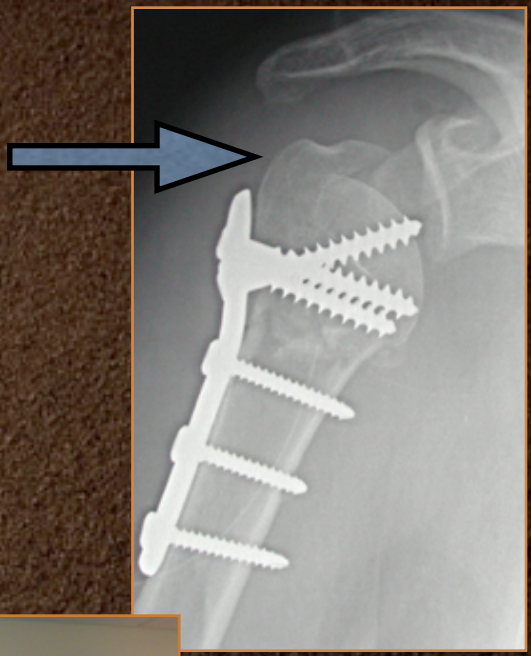


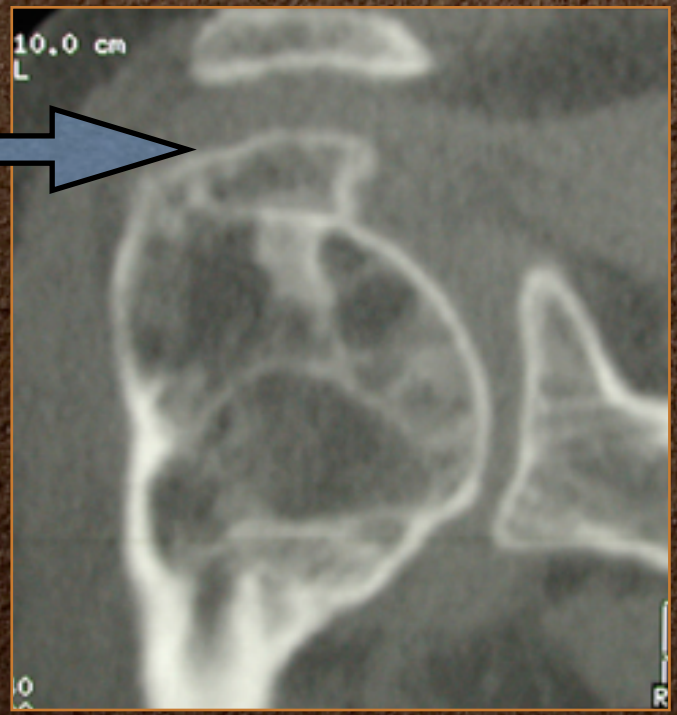




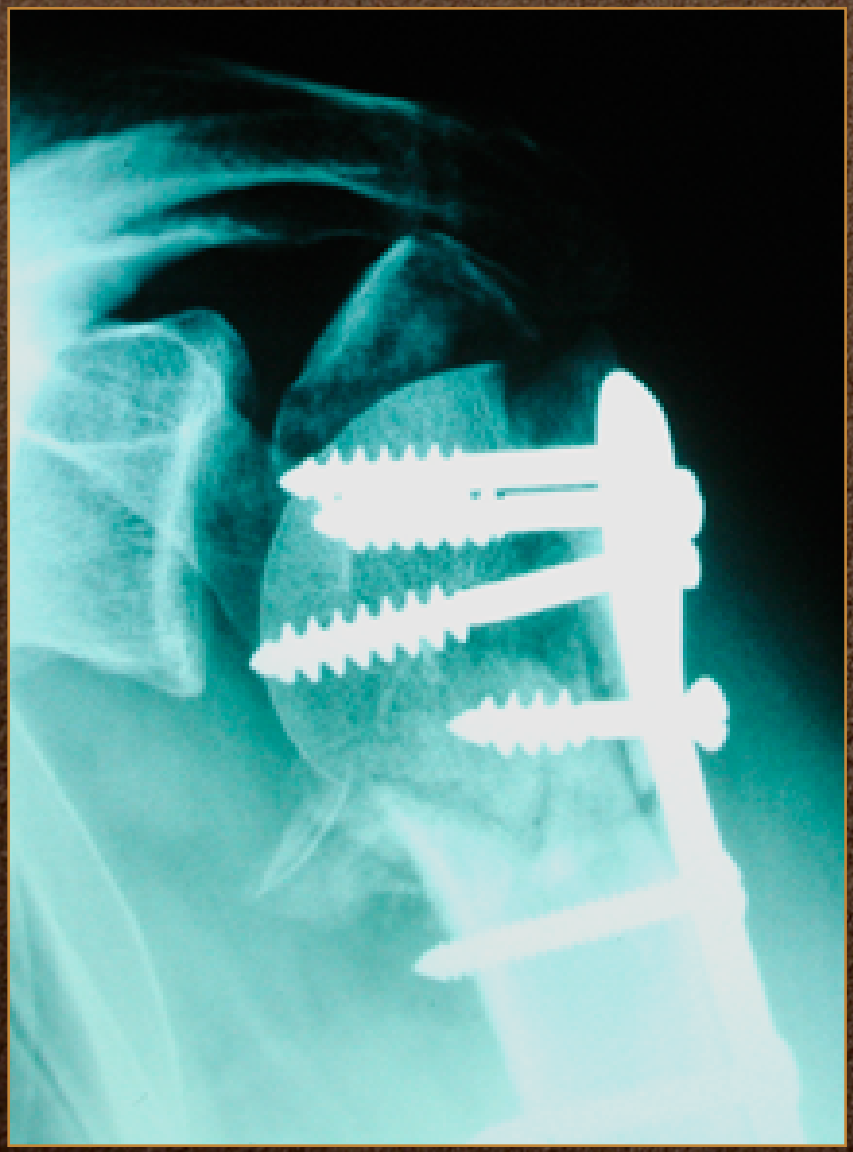
Stiffness secondary to malunion of the greater tuberosity



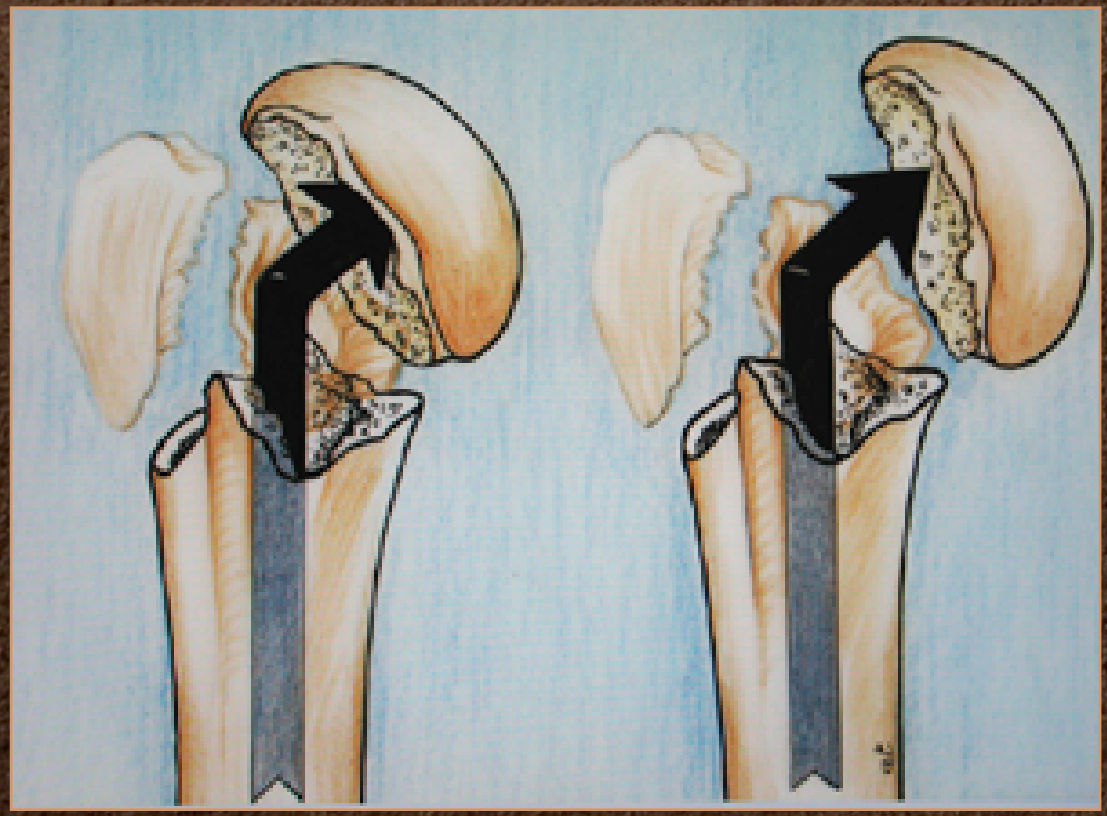


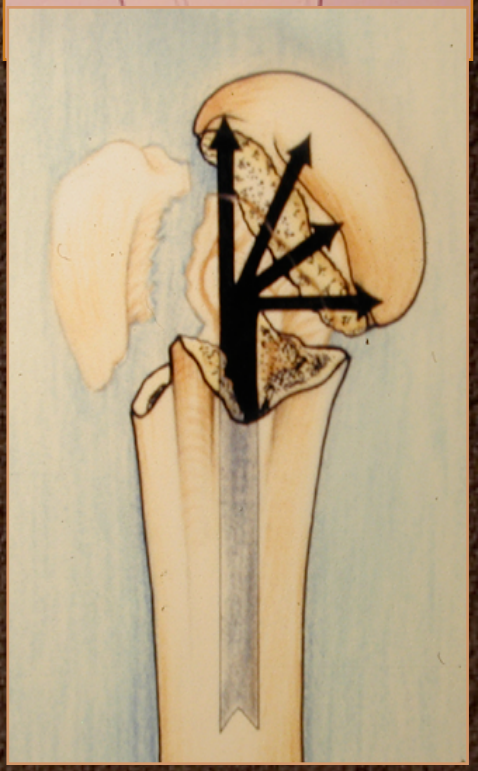

10.0 cm
L
R

Complete failure of fixation with osteonecrosis

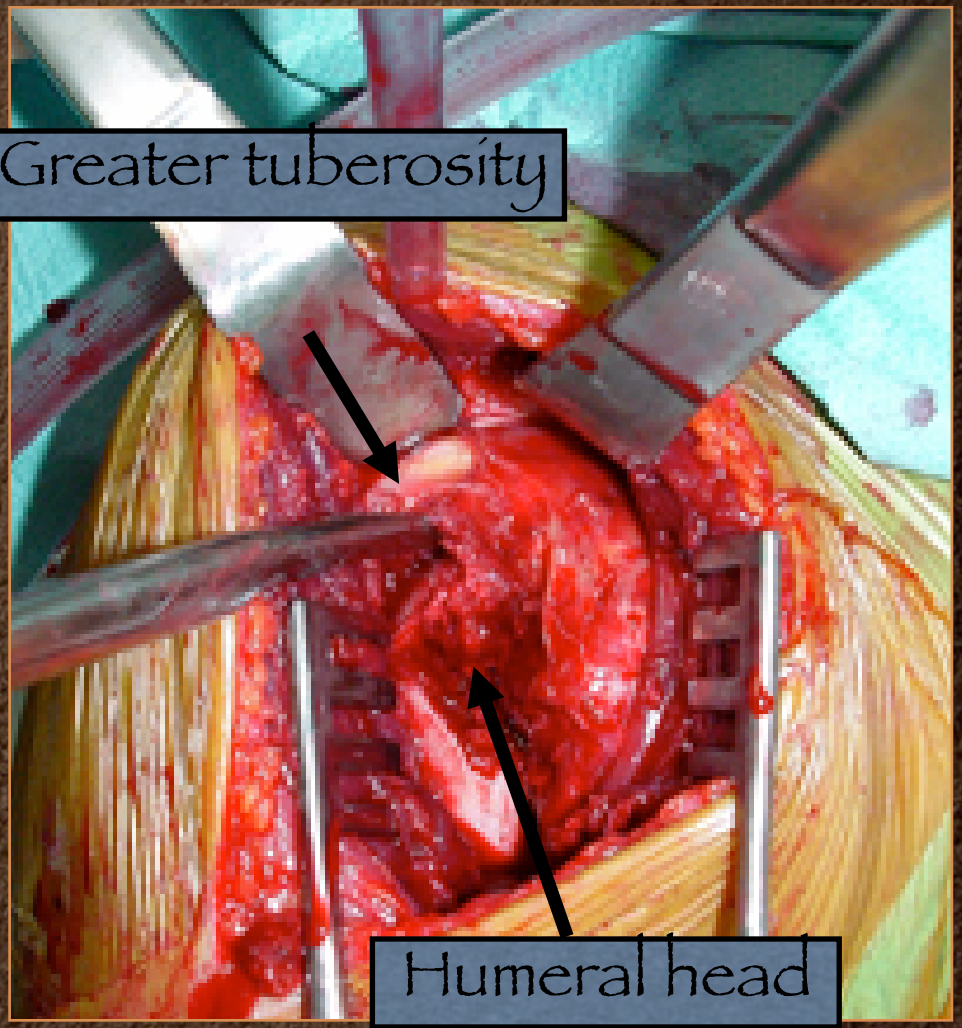


The bilboquet technique

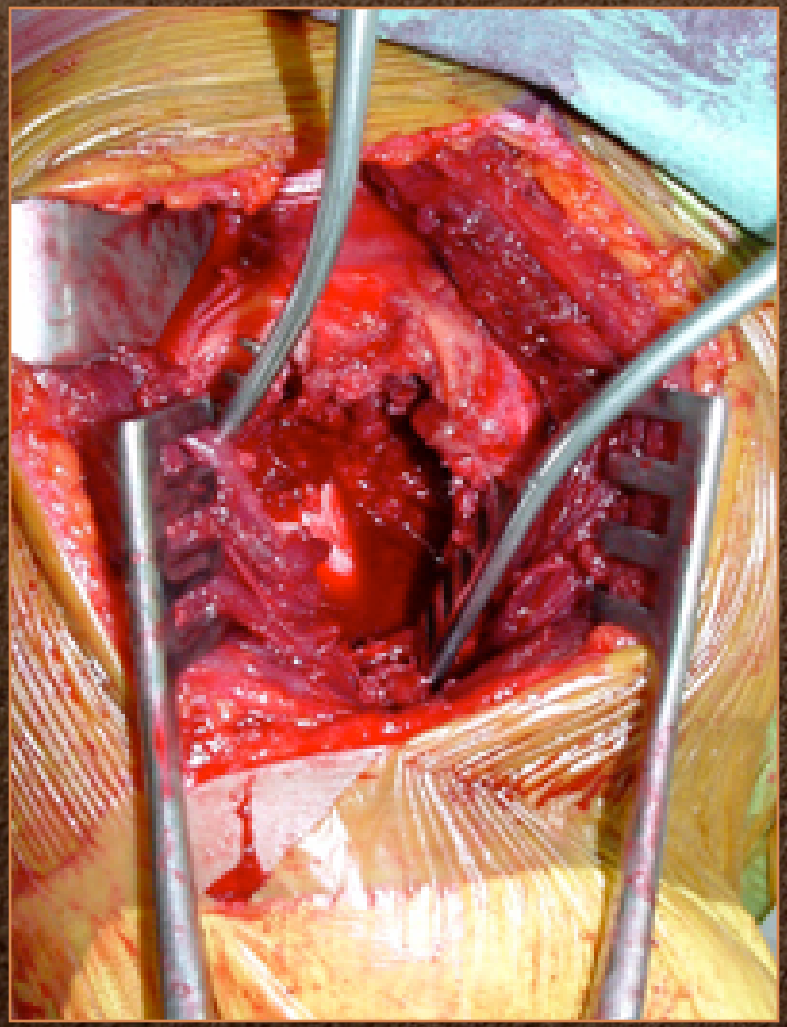


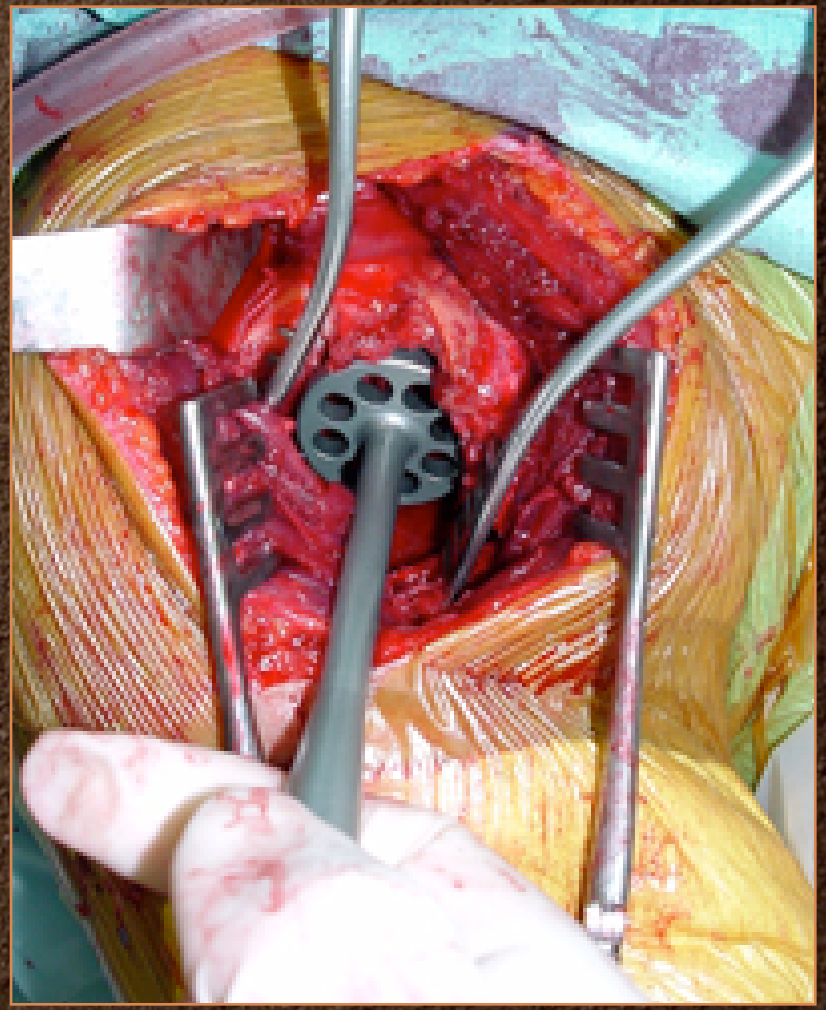


2001 Stryker Howmedica Osteonics

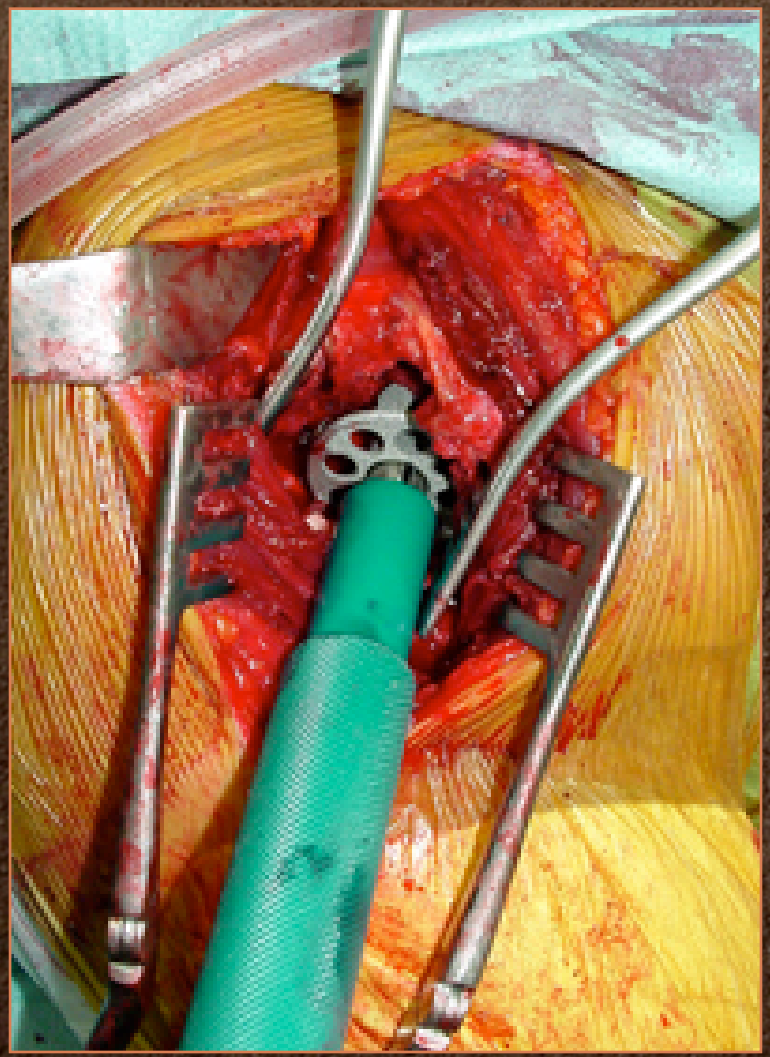

Greater tuberosity
Humeral head

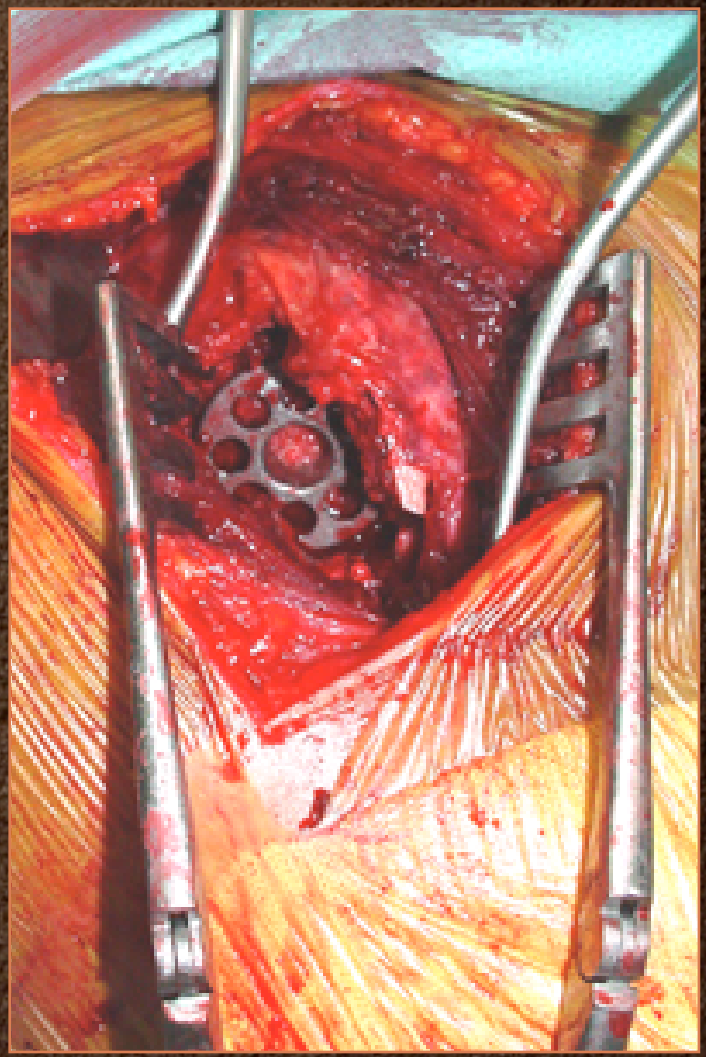
Replace the head with your finger



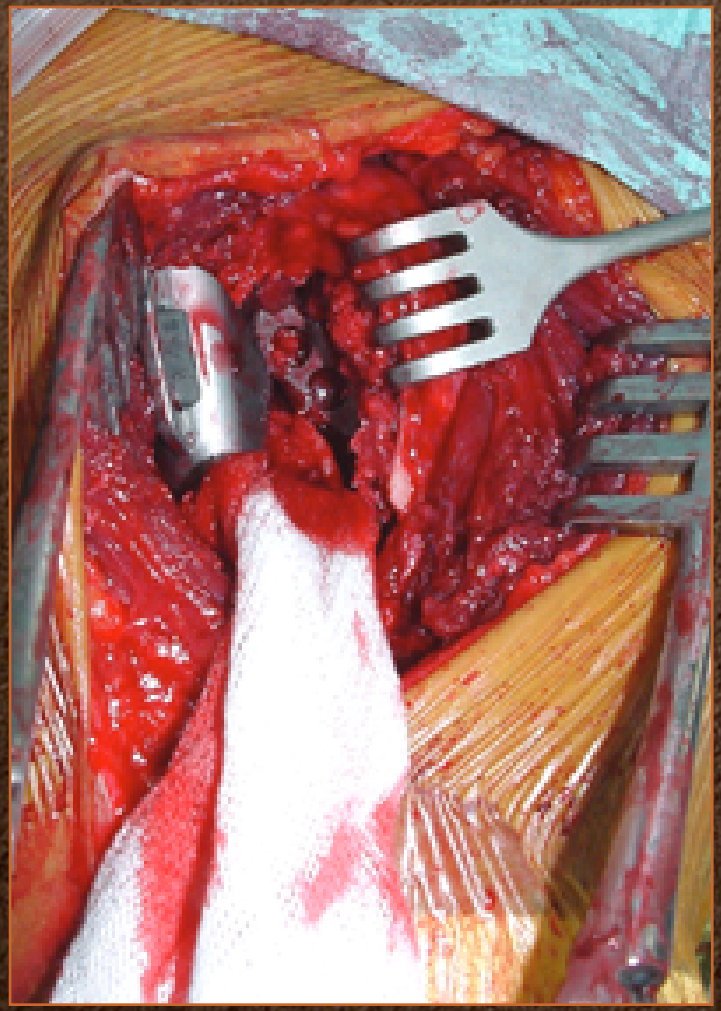


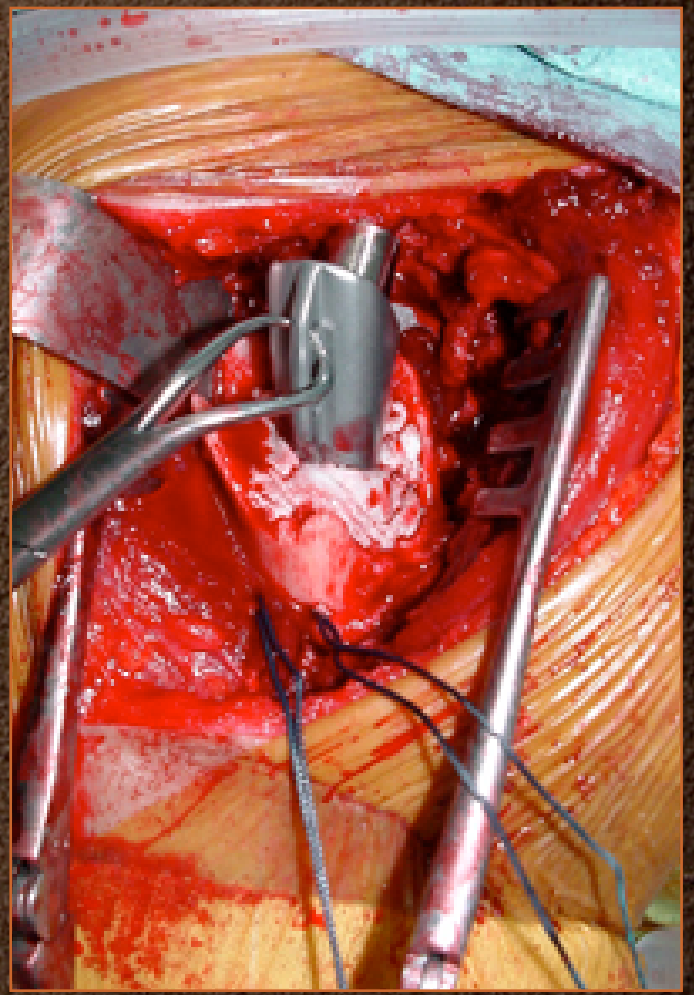
Place and impact the staple



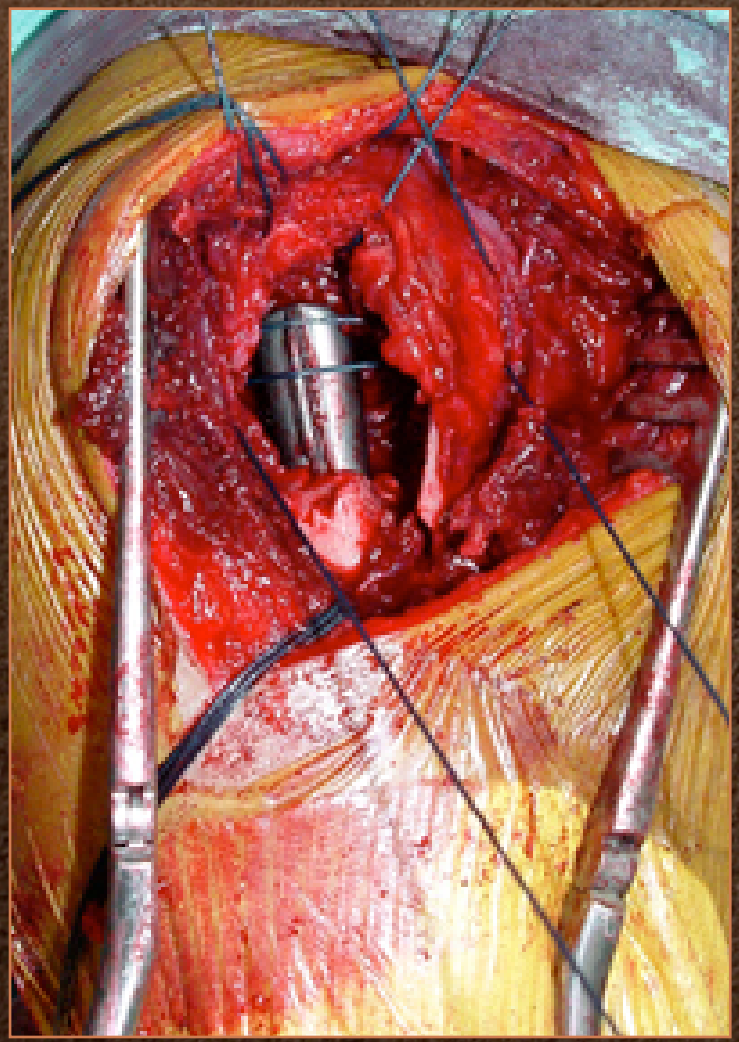


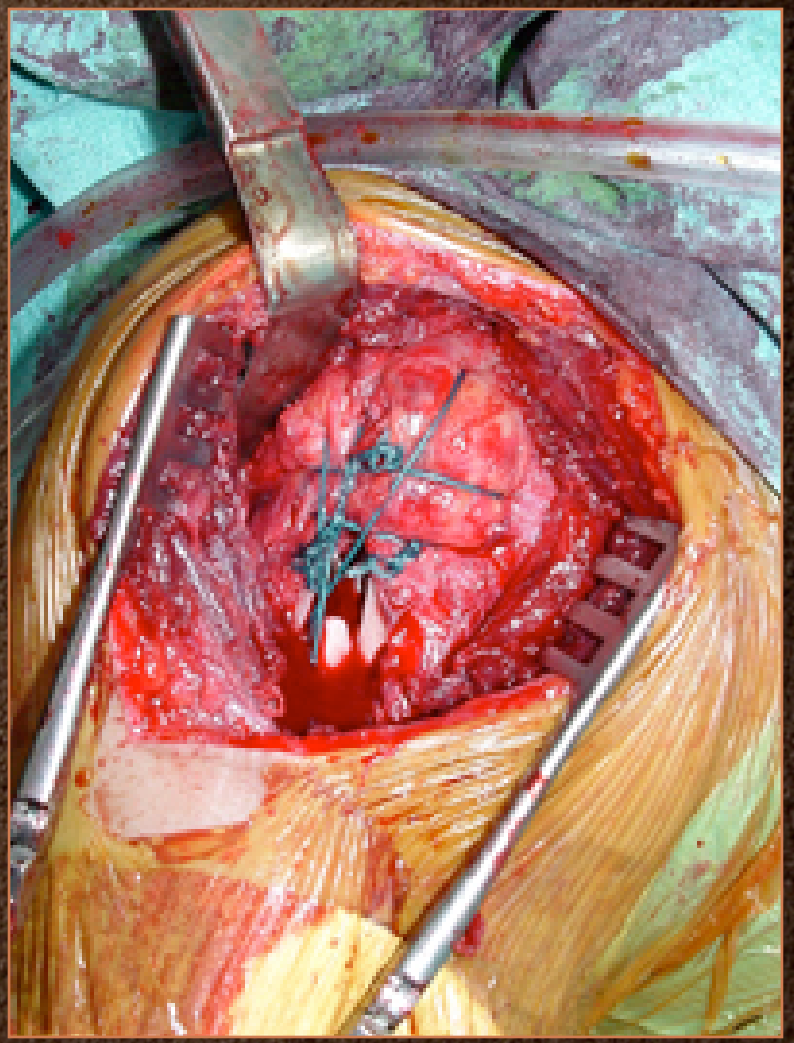
Then fix the stem in the medullary canal with cement



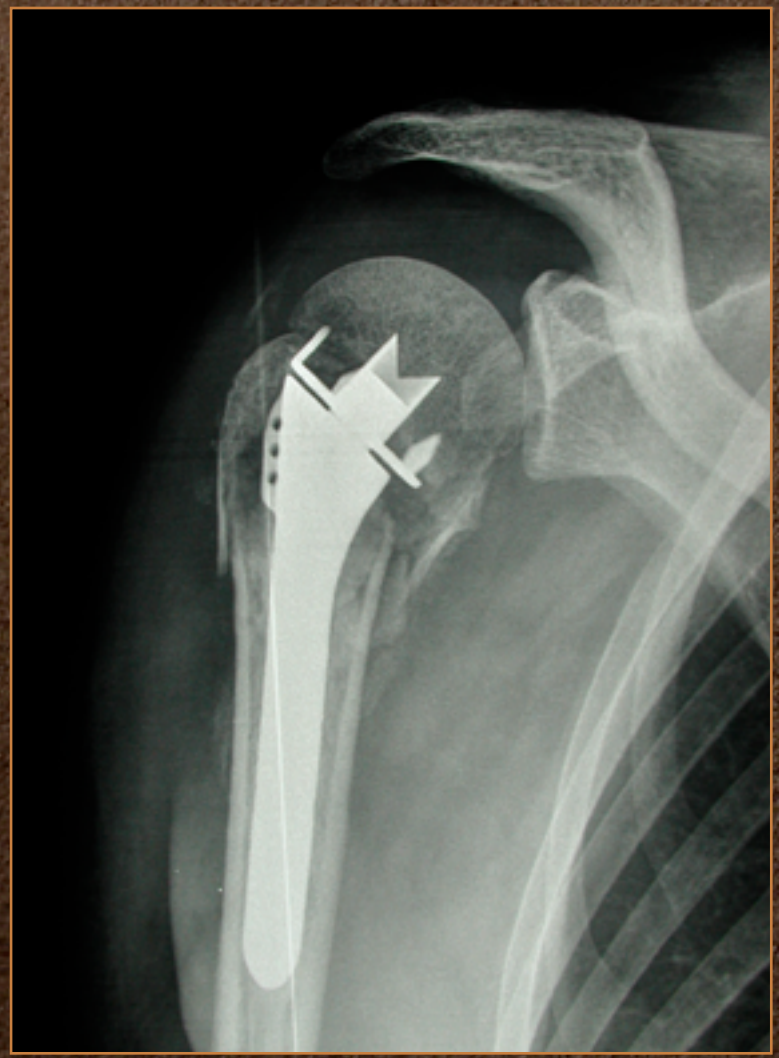


Replace and fix the tuberosities

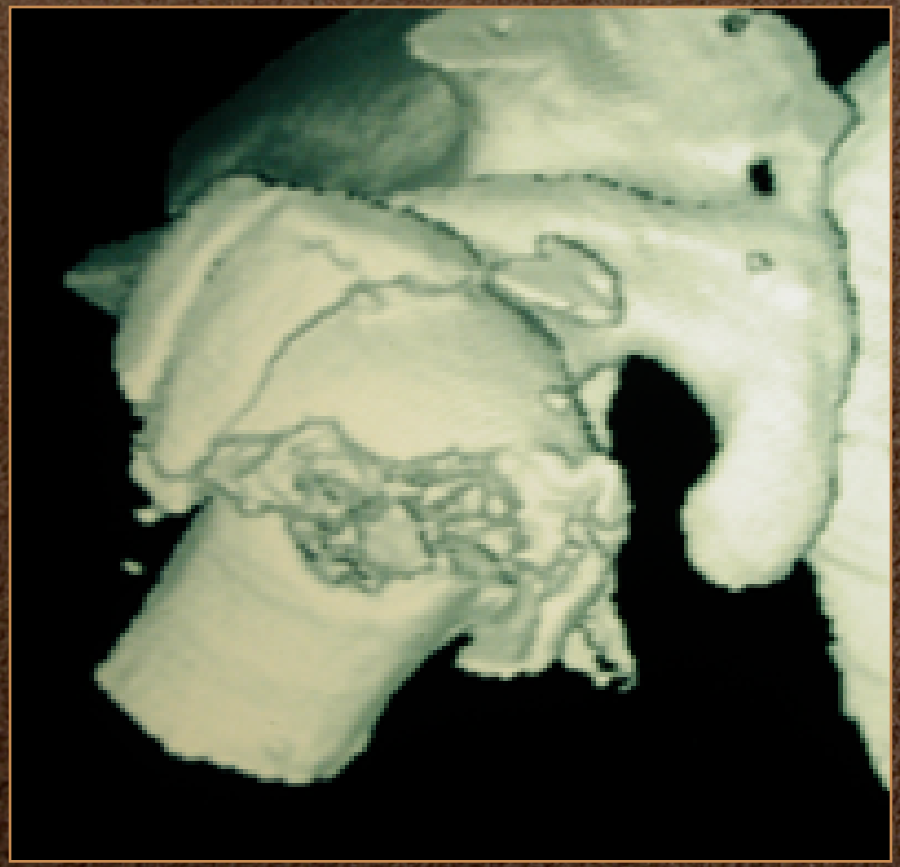


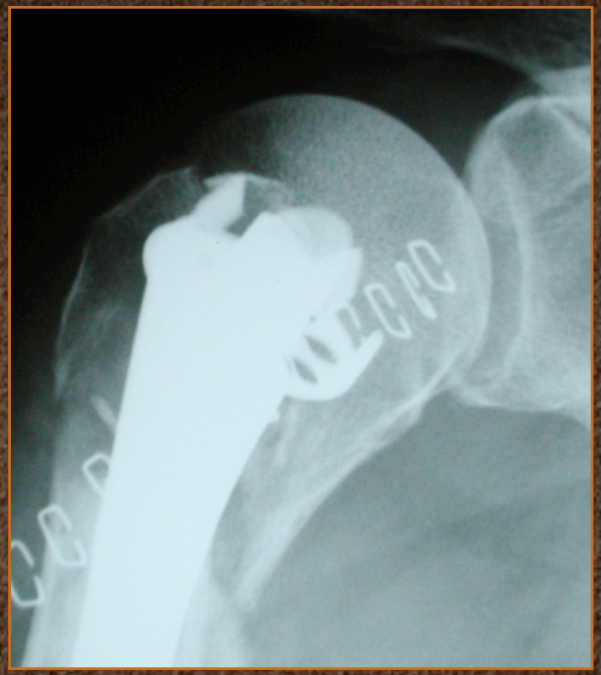


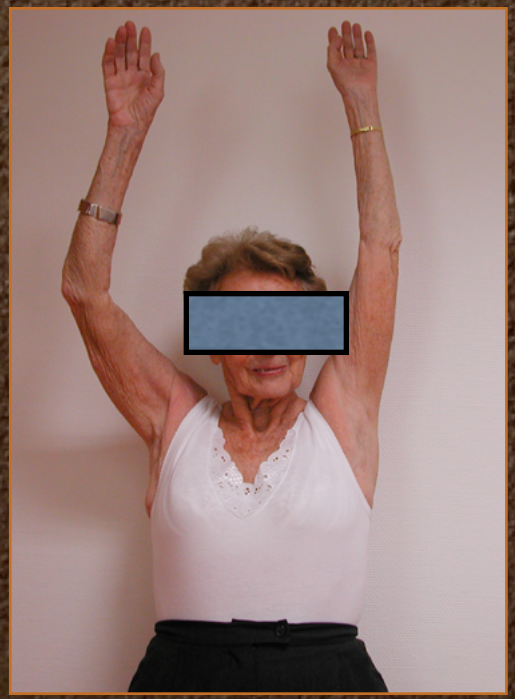
Intra-medullary fixation

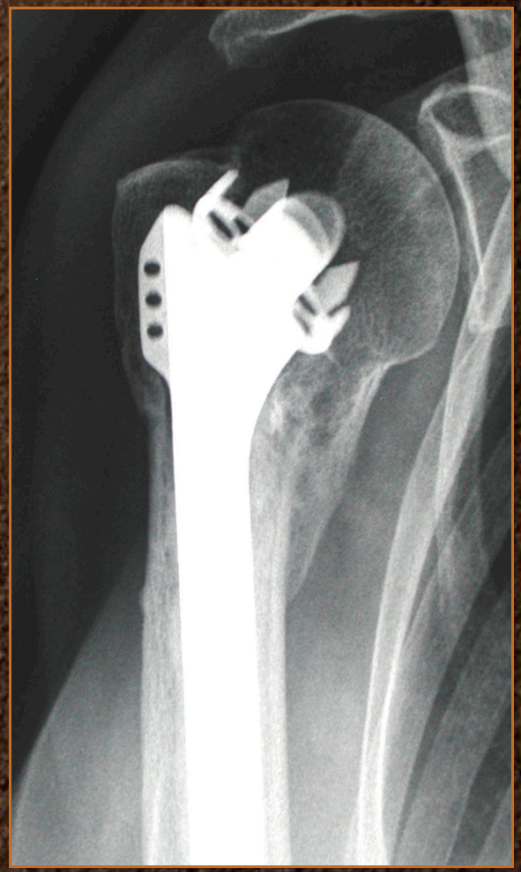


With preservation of humeral length





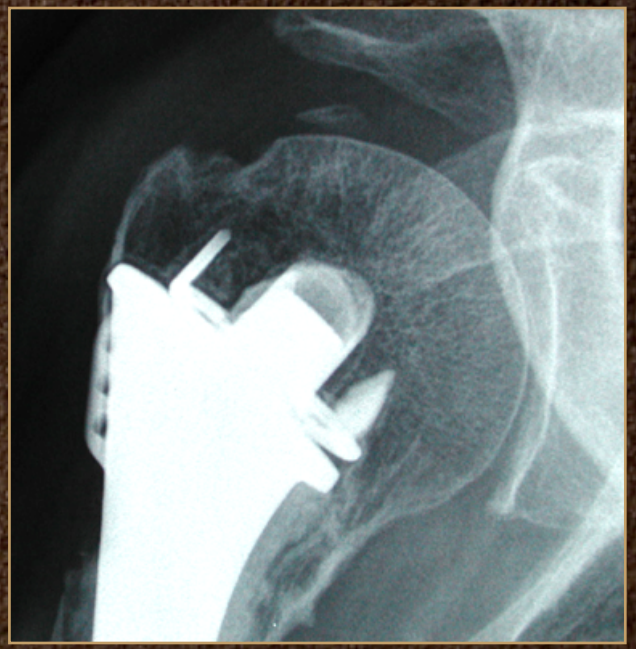




1998

3 part

2002



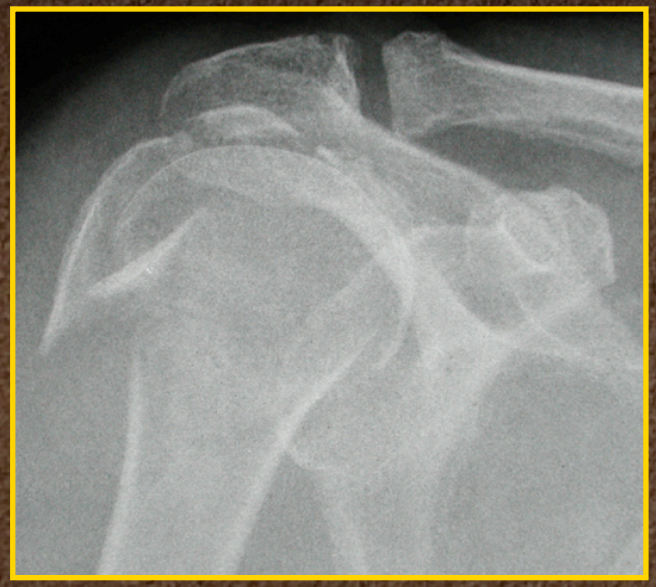
3-part 95yrs

at 2 years

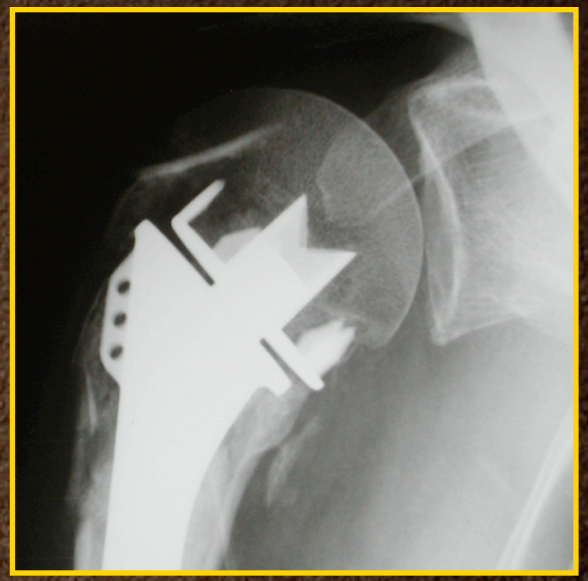
4-parts fracture

- Necrosis rate is about 50%
- Humeral prosthesis has been recommended, but fixation of the tuberosities is still a problem
- ORIF is considered a good option by some teams (especially for valgus impacted fracture)

2000



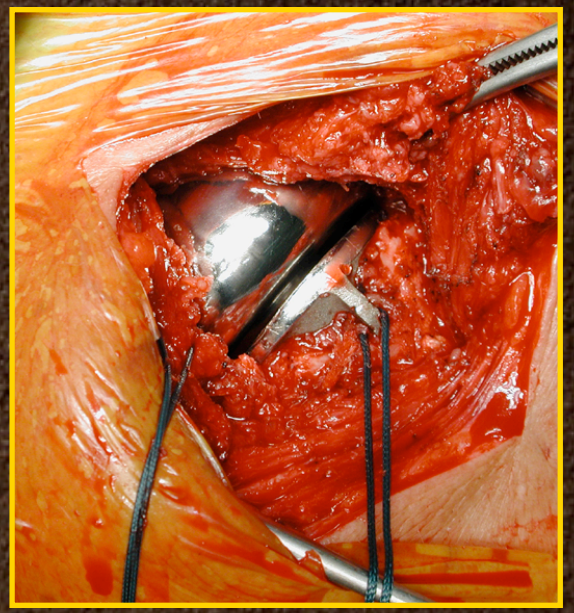
Mrs O… 71 - 4-part



Conversion

Pain, AVN

2001



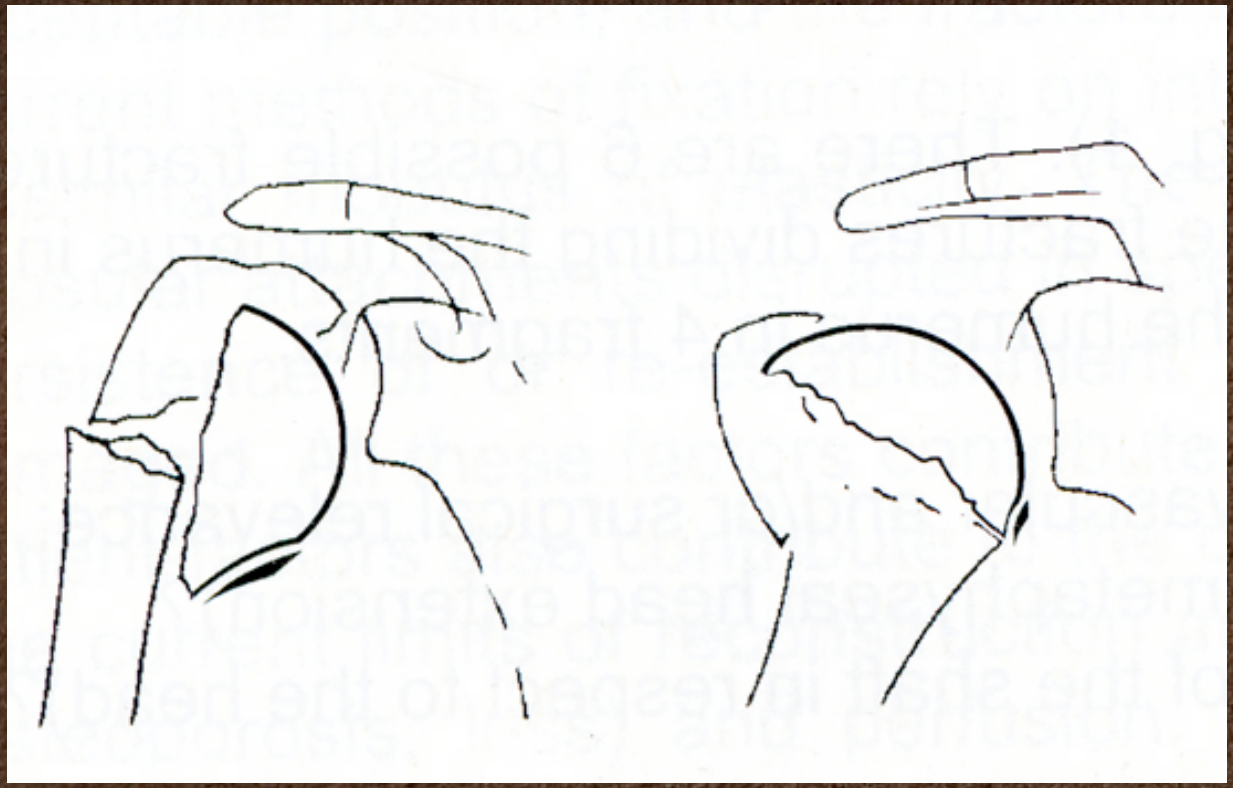
30% of AVN in 4-part fractures, but only 10% convert to a prosthesis

1996

1998

Valgus-impacted 4-part fractures

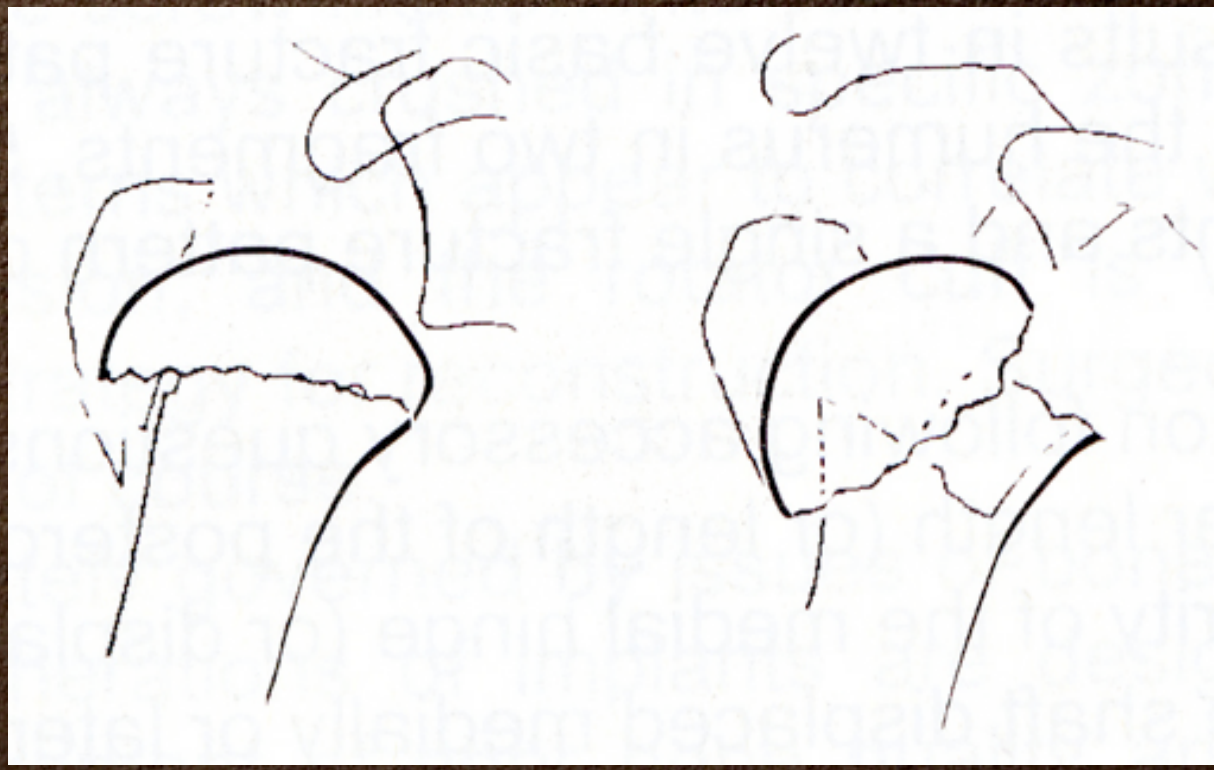
- Vascularisation of the humeral head may be preserved
- Sustaining the head may be all that is needed

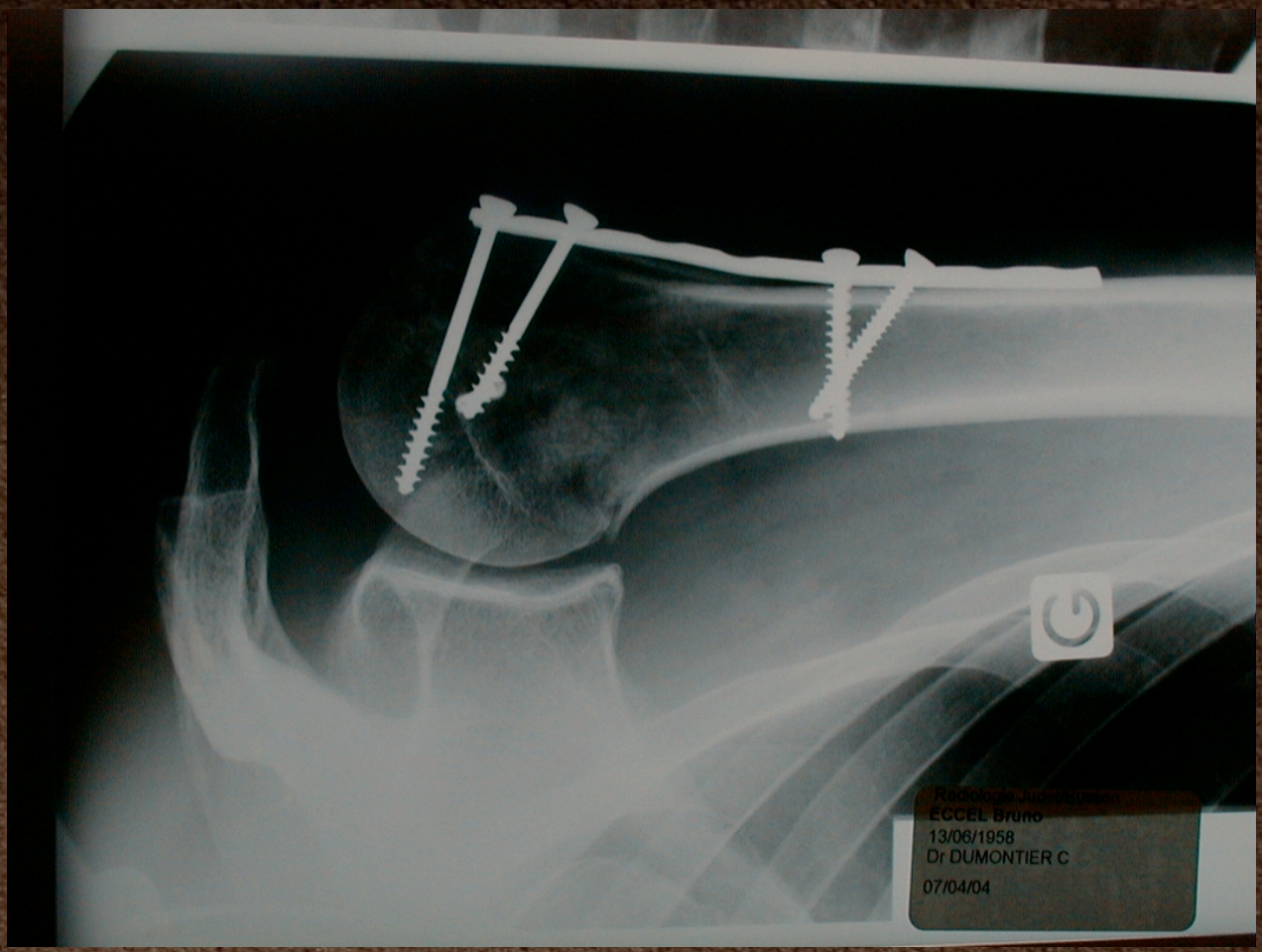


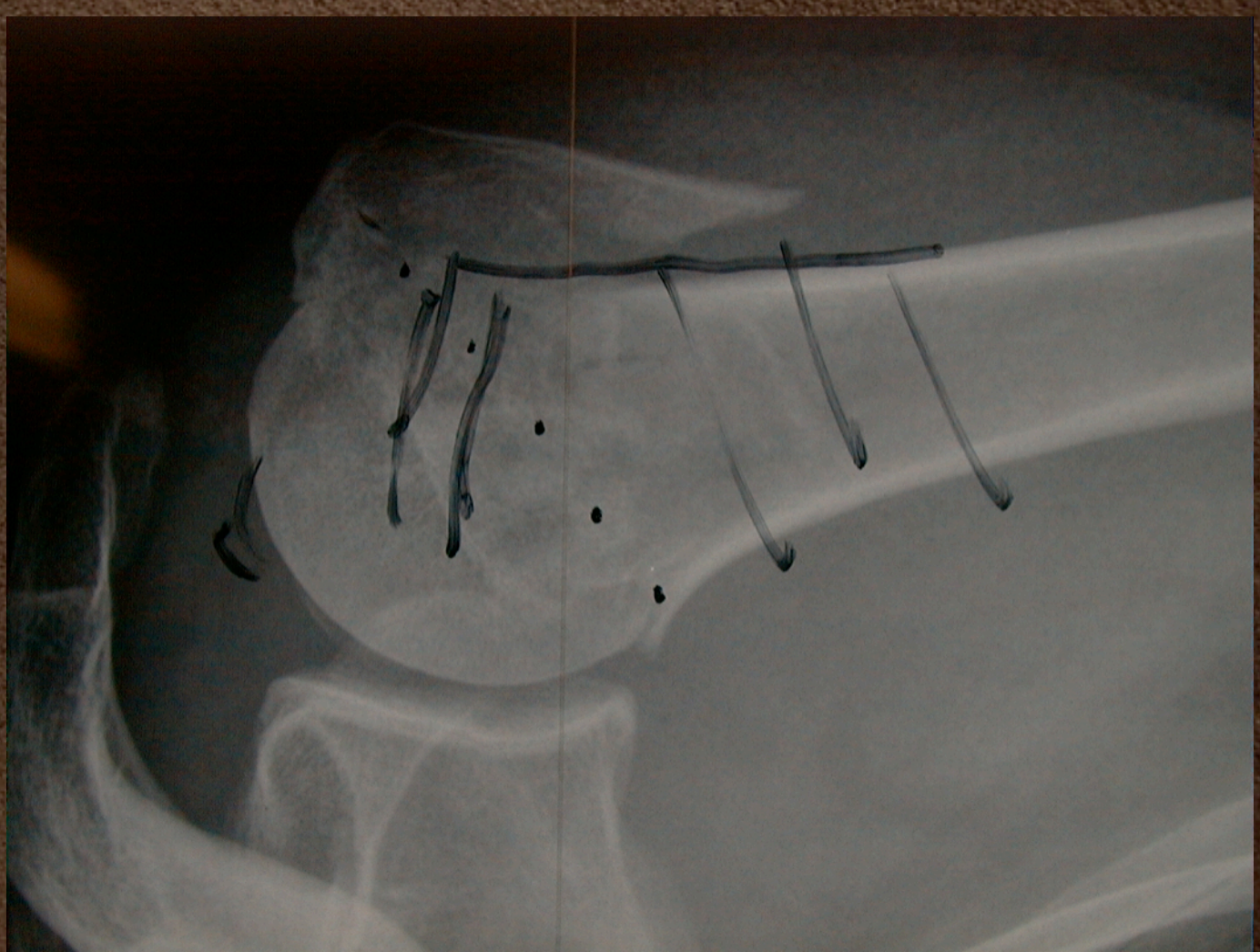
Vascularisation is preserved if > 10 mm of calcar is intact

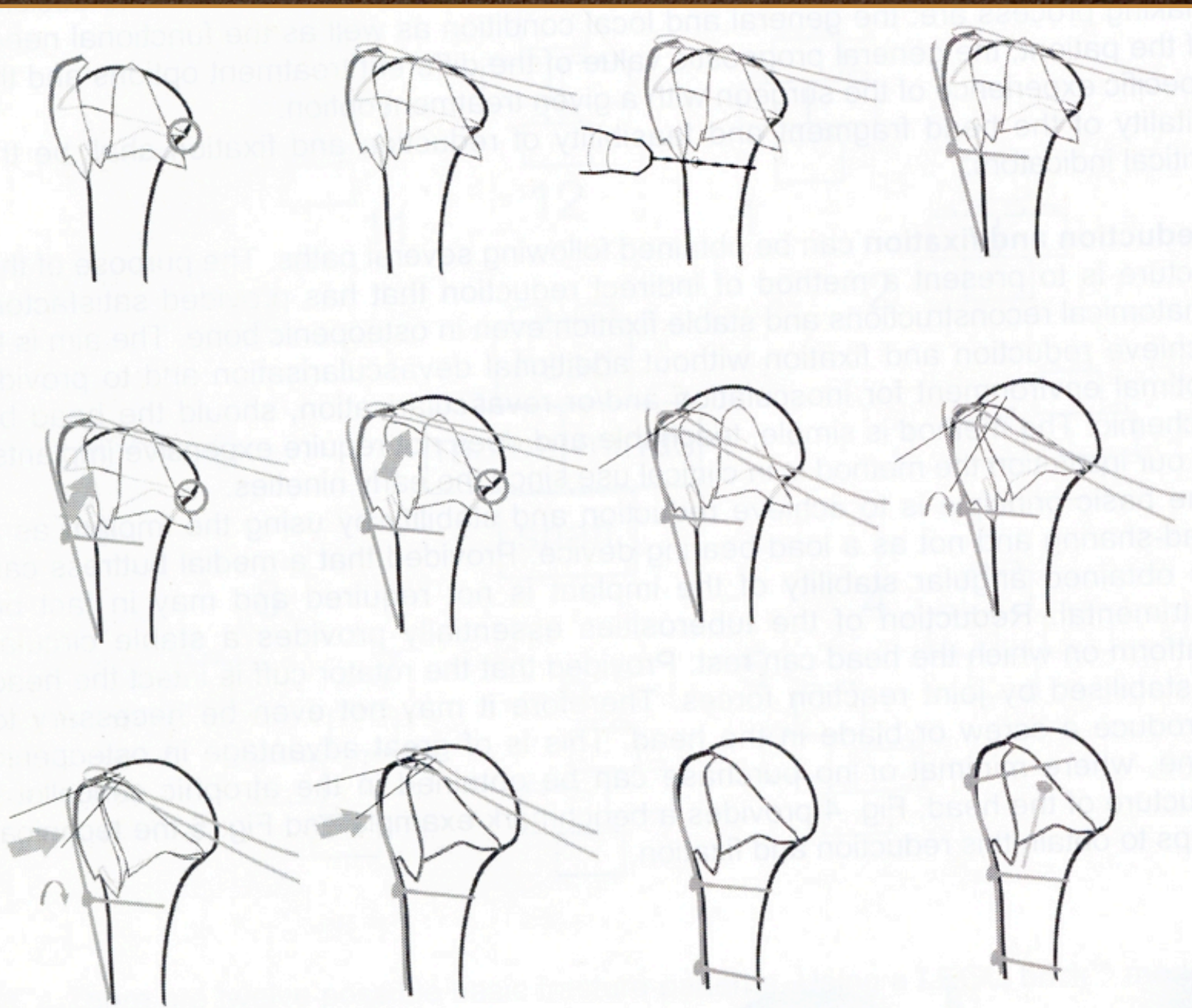
No necrosis

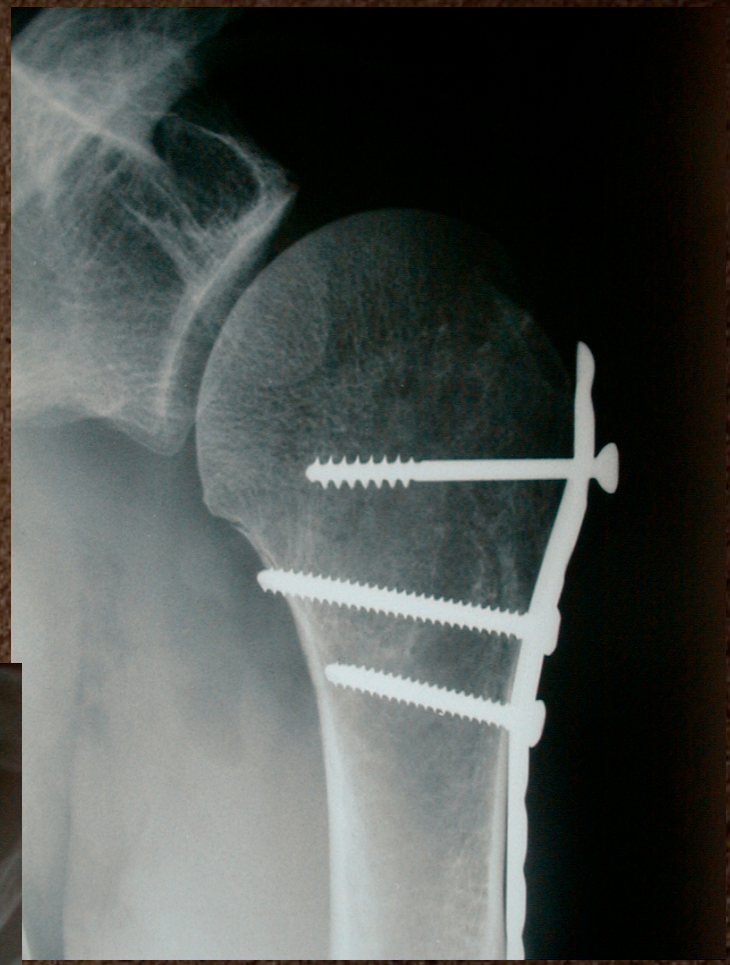
Possible necrosis




ECCEL Bruno
13/06/1958
Dr DUMONTIER C
07/04/04





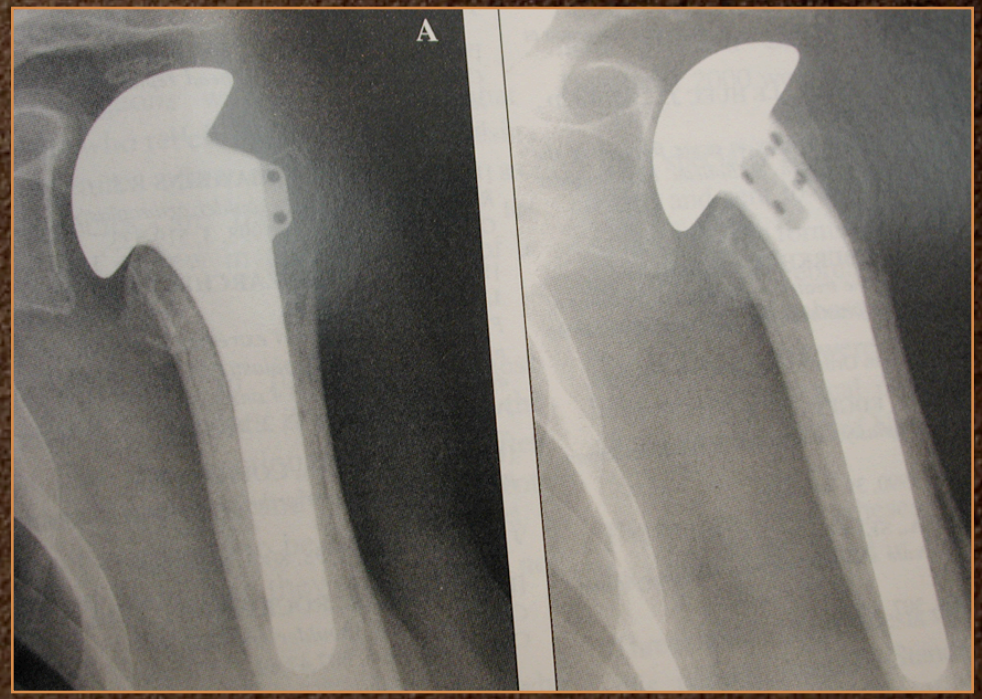


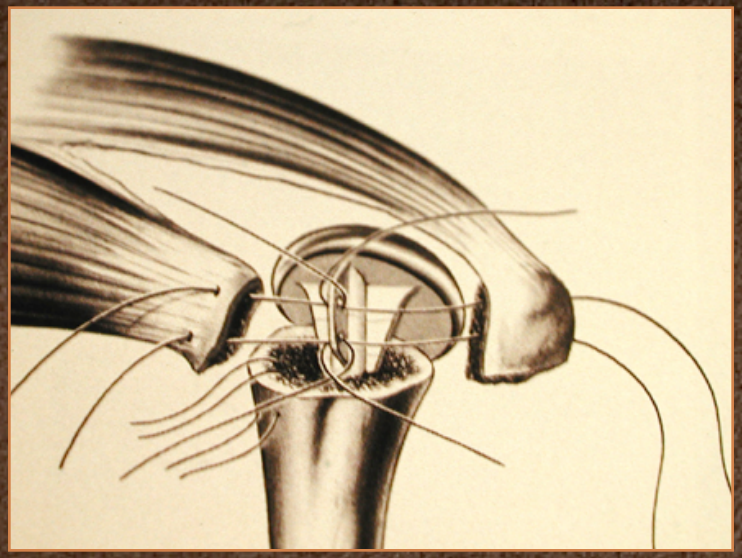
Humeral prosthesis

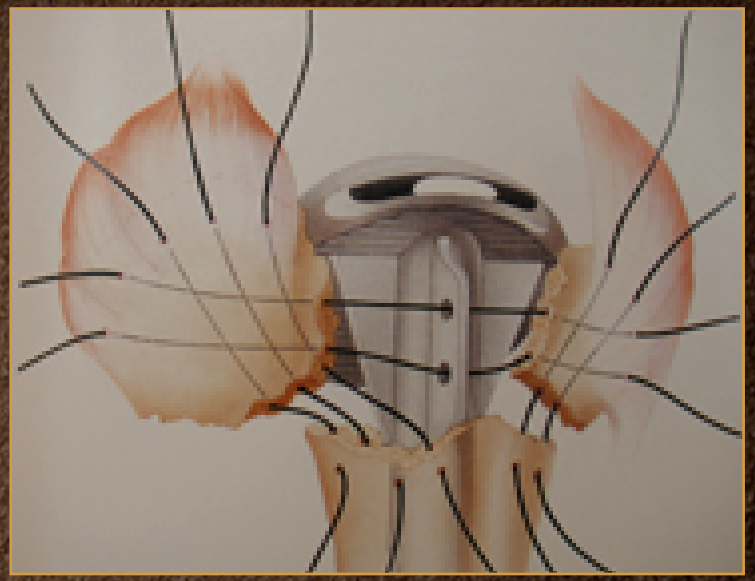
- Introduced by Neer in the 50's
- Has gained popularity in the 80's but limited functional results lead to a diminution of its indication
  - Splitted head
  - 4-part fracture non amenable to osteosynthesis

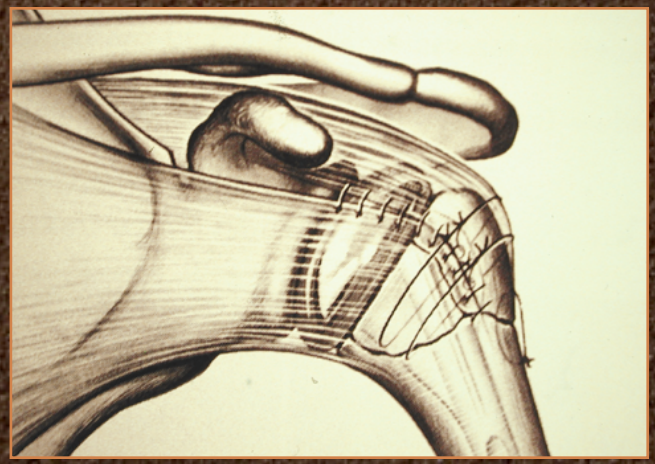
Gerber (Sulzer)

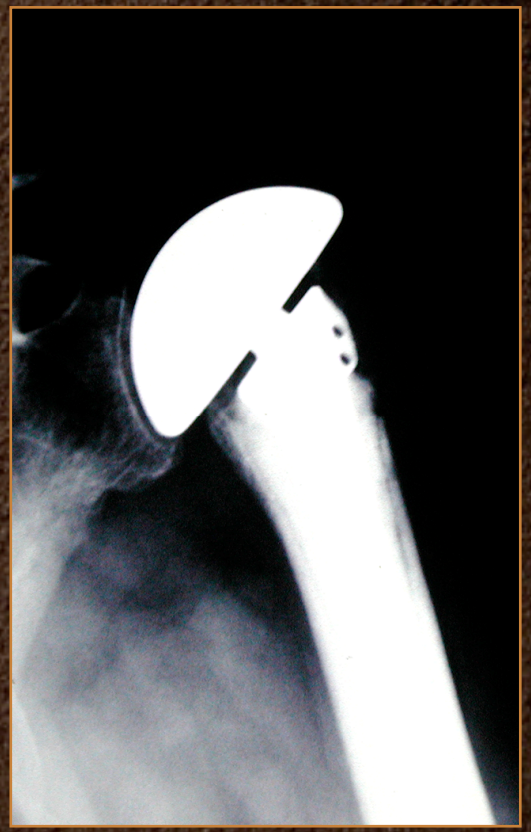
Walch (Tornier)

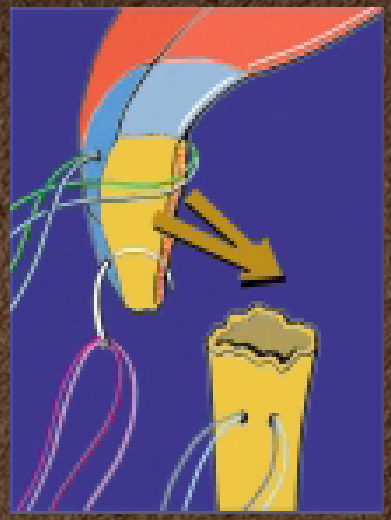


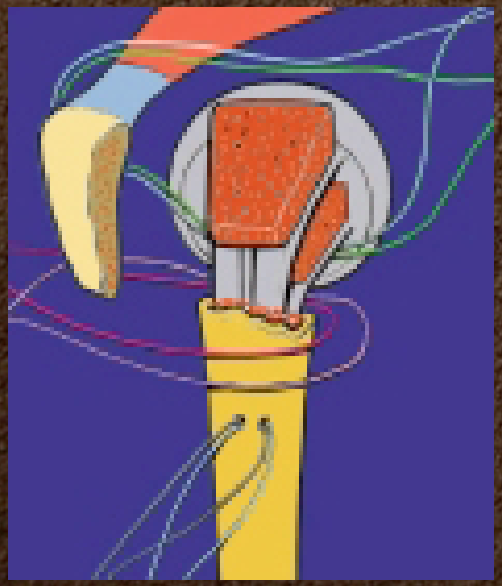


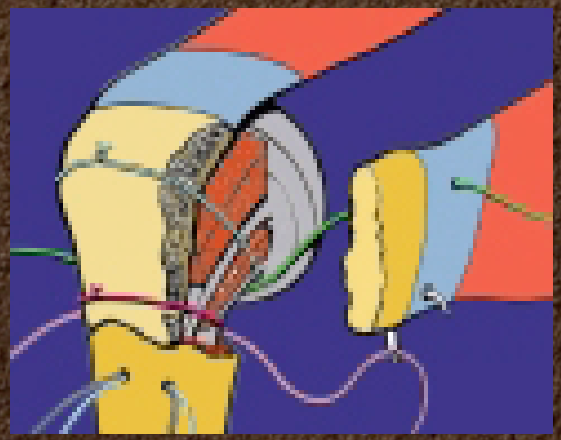


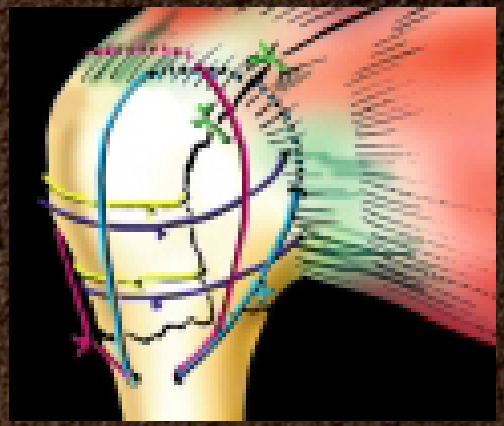






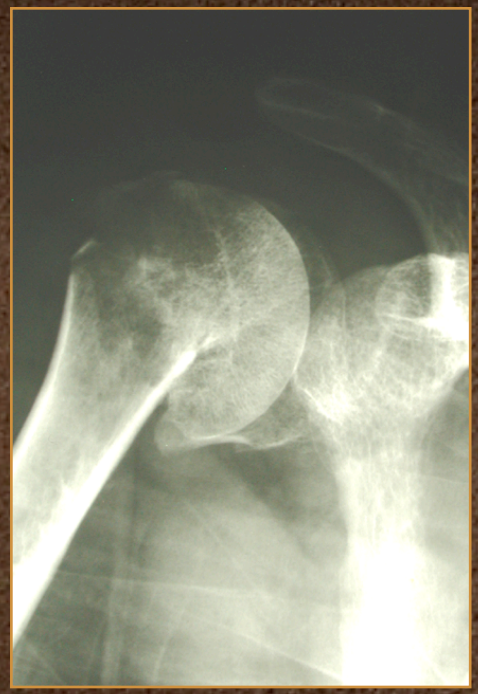


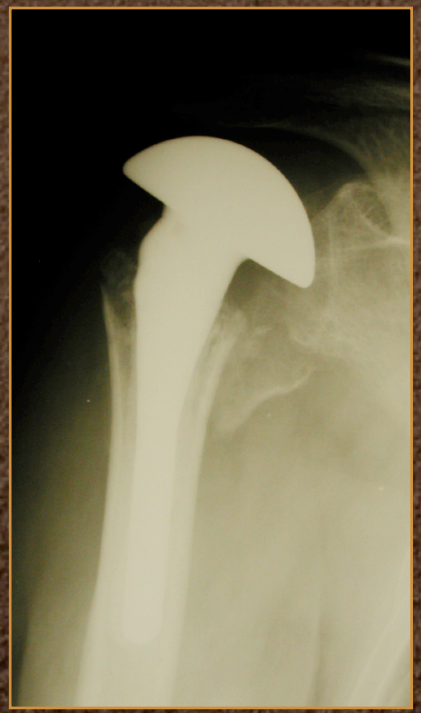




Late onset complications in 178 of 300 patients (59,3%)

Nonunion, malunion of one or both tuberosities	160 (53%)
Stiffness	25 (8,3%)
Algodystrophy	16 (5,3%)
Pseudo-paralysis	11 (3,6%)
Persisting nerve injury	5 (1,6%)
Infection	5 (1,6%)
Dislocation	5 (1,6%)
Humeral aseptic loosening	8 (2,6%)
Glenoid erosion	3 (1%)
Miscellaneous	1 (0,3%)





Conclusion (1)

- Most fractures are non-displaced and can be managed non-operatively with acceptable results
- More severe fractures should be operated on. Functional results may be poor

Conclusion (2)

- Young adults have good bones but it is usually a high velocity injury with associated lesions
- In aged people, poor bone quality leads to poor fixation of all the devices available

Thank you