

Distal humerus – intraarticular fractures and complications

Johan Scheer
MD, PhD

AO Advanced Principles
Fredericia 2025

Disclosure: No potential conflicts of interest

Faculty: Johan Scheer

The commercial entities with which I have a financial relationship do not produce health-care related products or services relevant to the content of my presentation.

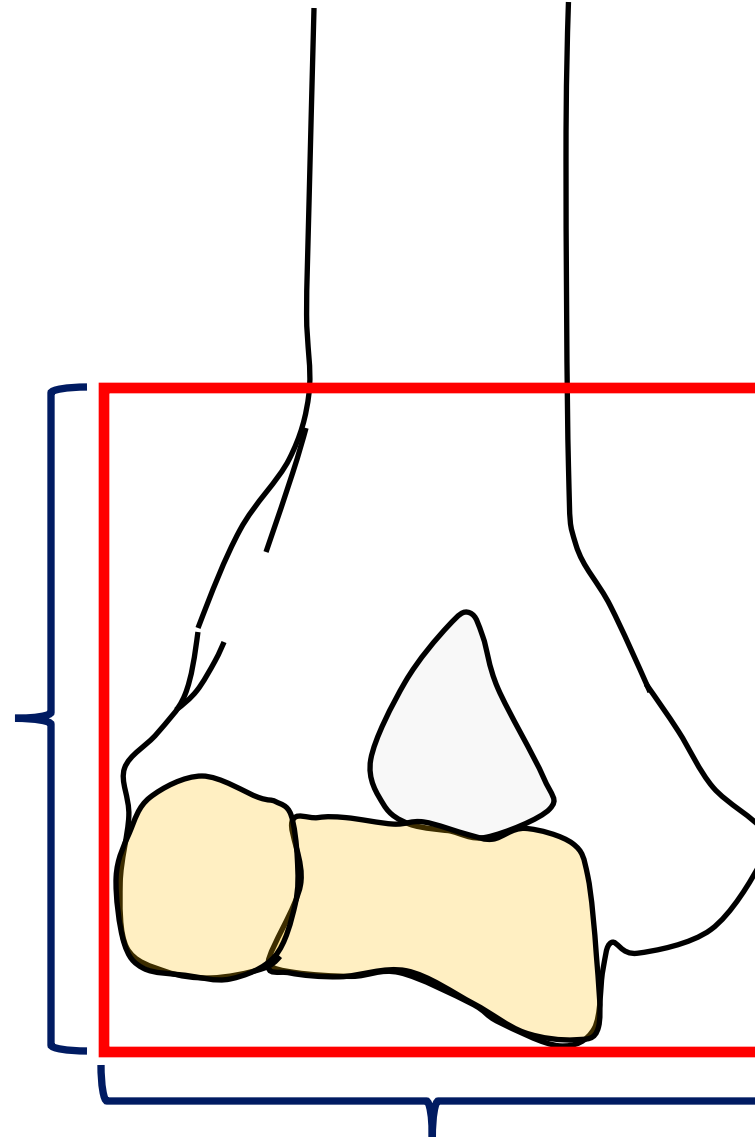
Learning objectives

Know how the AO-classification dictates approach and mode of fixation

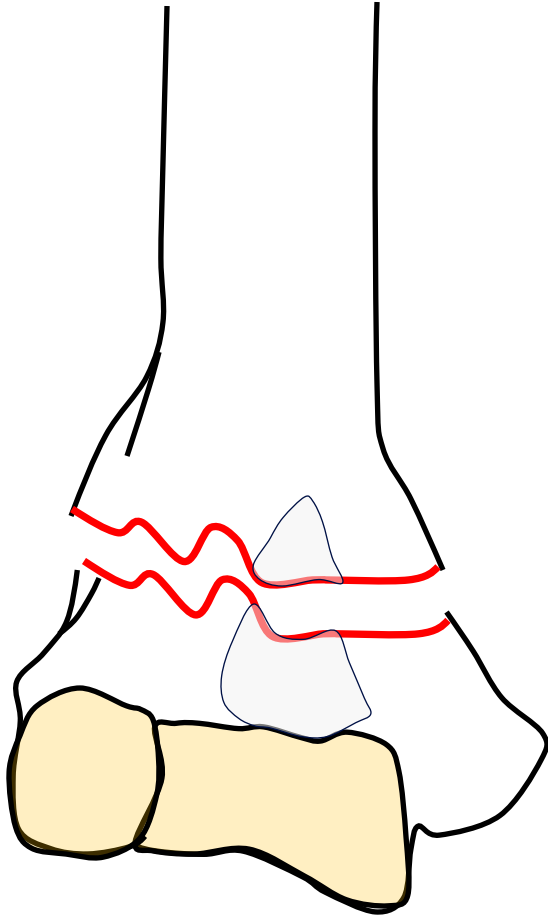
Describe expected outcome and potential treatment for the most common complication: stiffness

AO classification for joint-adjacent fractures

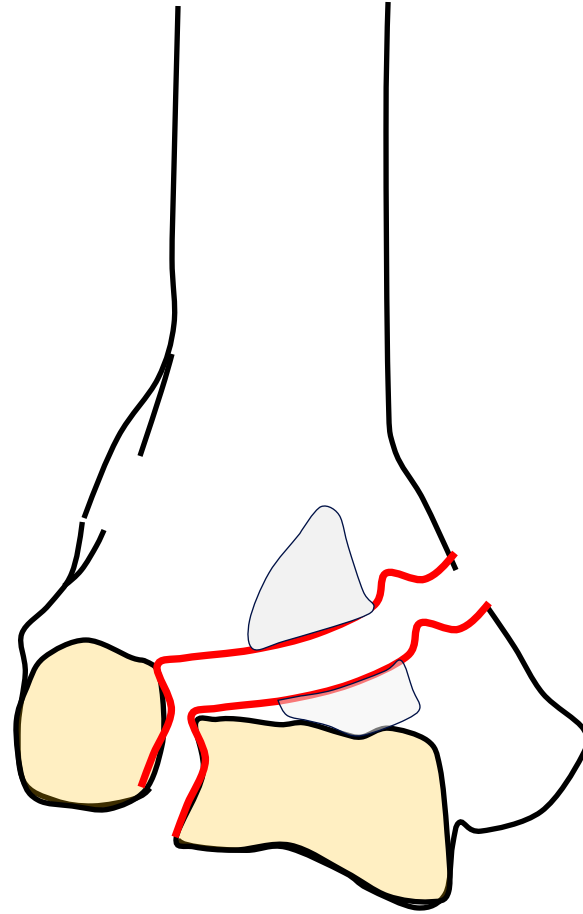
- Create a square with the same height as the width of the articular segment
- Is the center within the box?



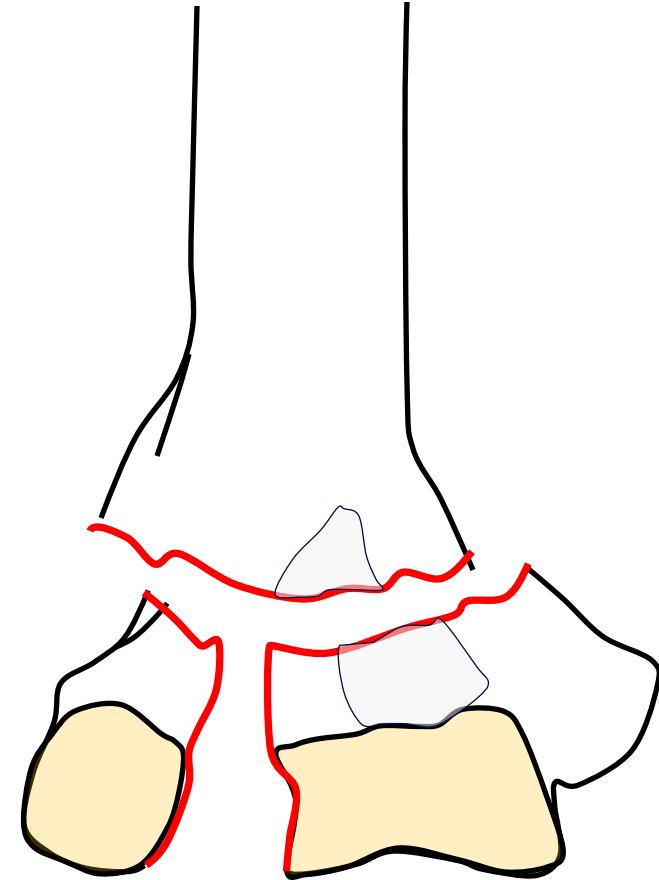
AO classification for joint-adjacent fractures



Type A – extra-articular



Type B – parts of joint in contact with the shaft



Type C – combination of A and B

Ground rule is surgical treatment

Historical data:

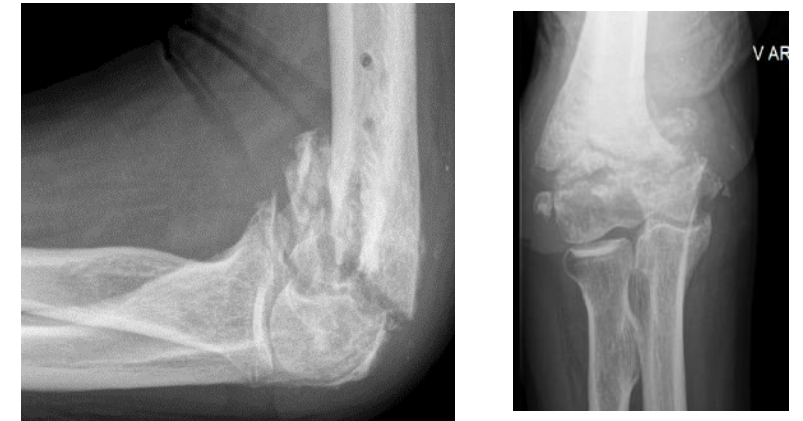
1. **Malunion** (70-80%):

Reduced ROM, sometimes pain

2. **Non-union** (20-30%):

Pain (!) + floppy elbow

Malunion much better than non-union



Watson-Jones 1960
Miller 1964
Zagorski 1986
Aitken 2015

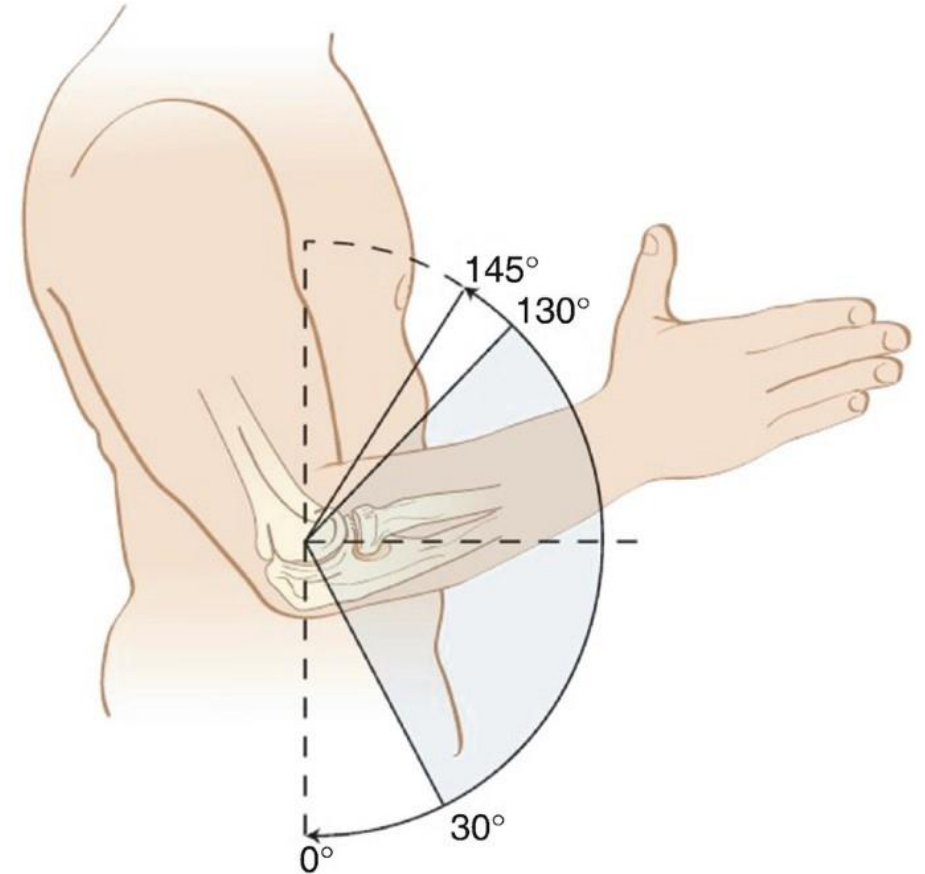
Goals of surgical treatment

Eventually:

- Functional range of motion
30°-130°

Initially:

- Stable osteosynthesis that
allows for early mobilization
(<1 week)



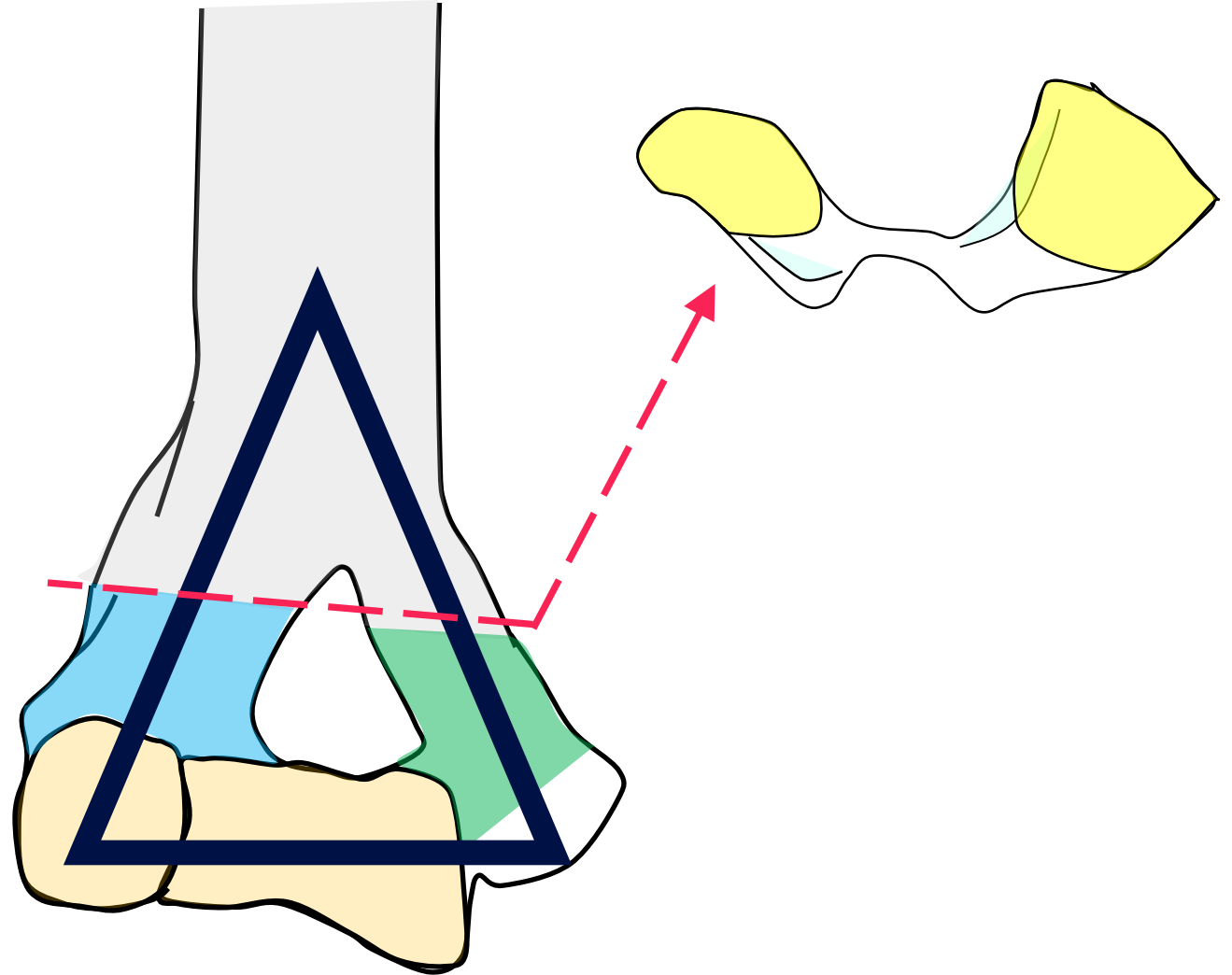
Morrey 1981, Sardelli 2011

Basic surgical anatomy

The joint segment is connected to the shaft via two thin pillars

Each pillar must be stable
Joint segment must be firmly connected to the shaft

Elbow mainly subjected to **rotational forces**

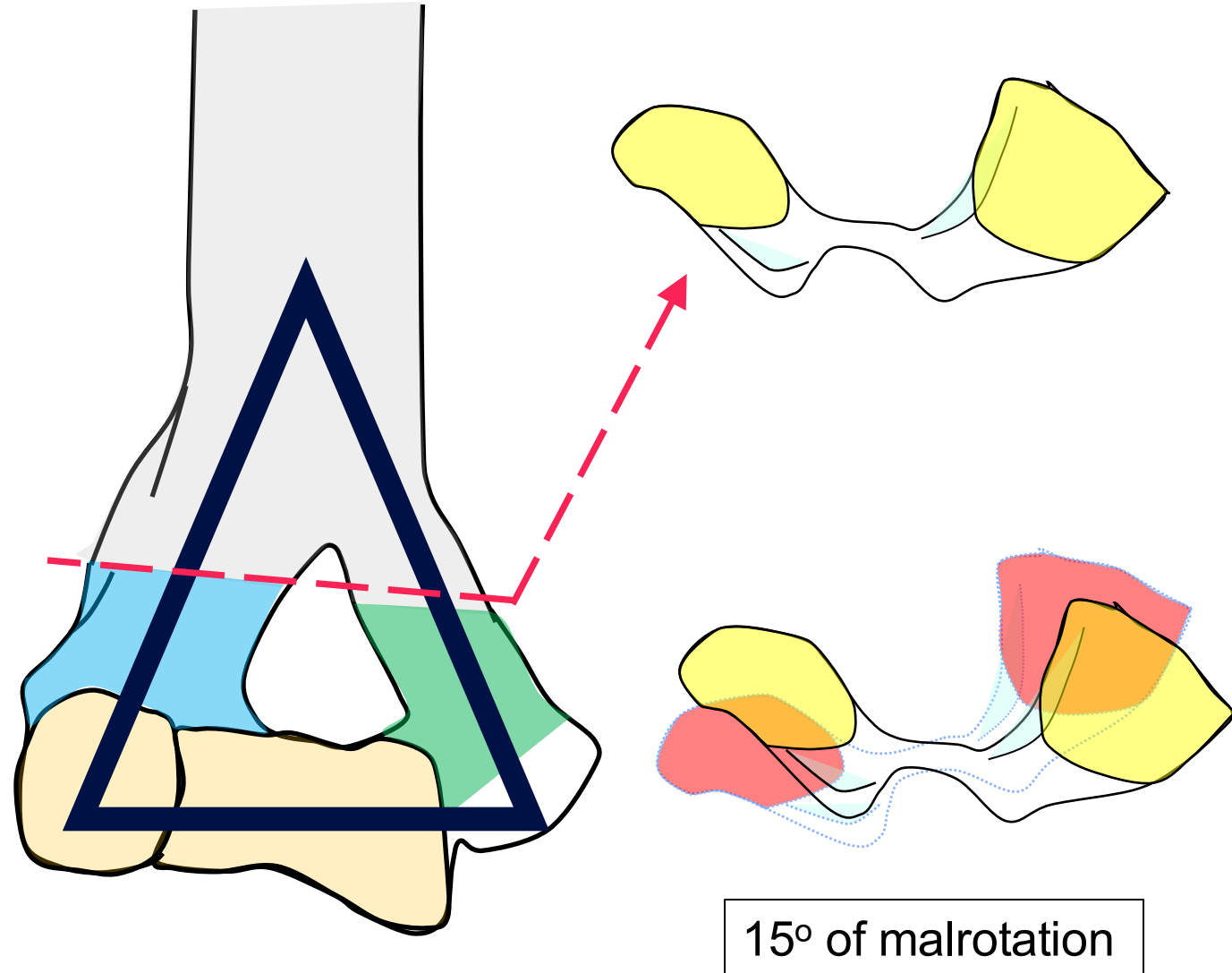


Basic surgical anatomy

The joint segment is connected to the shaft via two thin pillars

Each pillar must be stable
Joint segment must be firmly connected to the shaft

Elbow mainly subjected to **rotational forces**



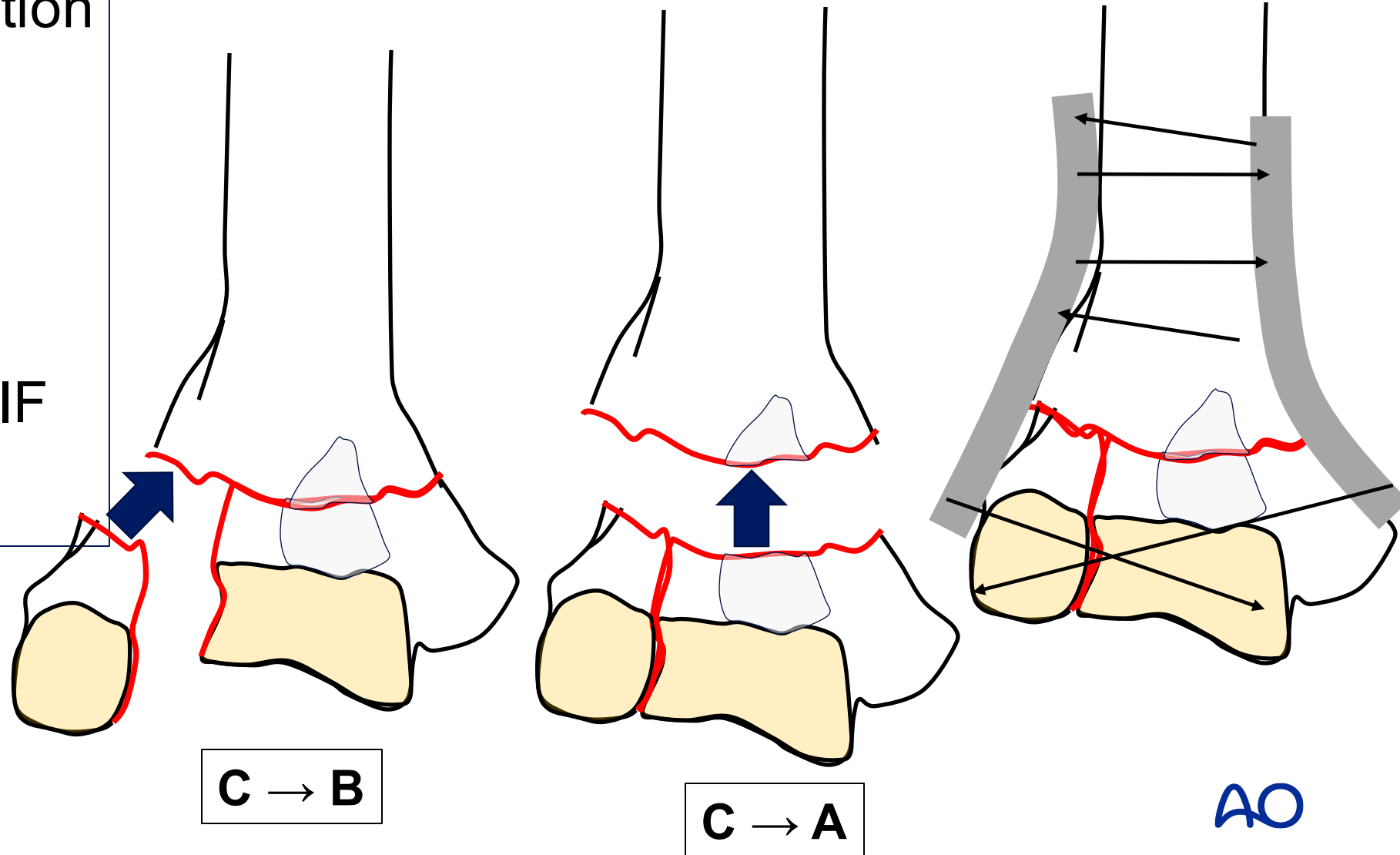
Surgical plan: AO type A and C fractures

- Anatomical reduction of joint segment
- Compression ORIF
- One plate/pillar



Surgical plan: AO type A and C fractures

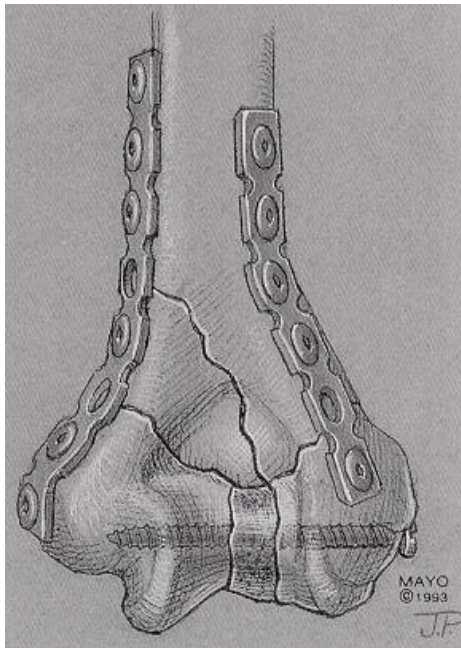
- Anatomical reduction of joint segment
 - C → A
 - C → B
- Compression ORIF
- One plate/pillar



Plating principles

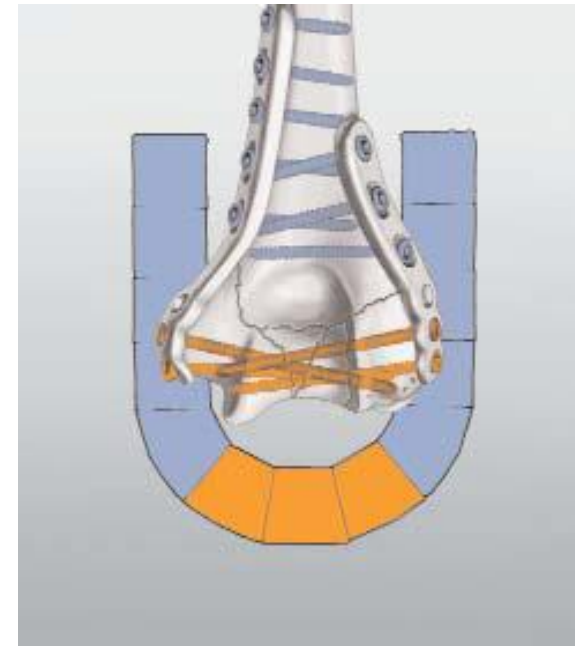
AO

1-2 screws in the joint segment
Orthogonal (90°) plating



Mayo

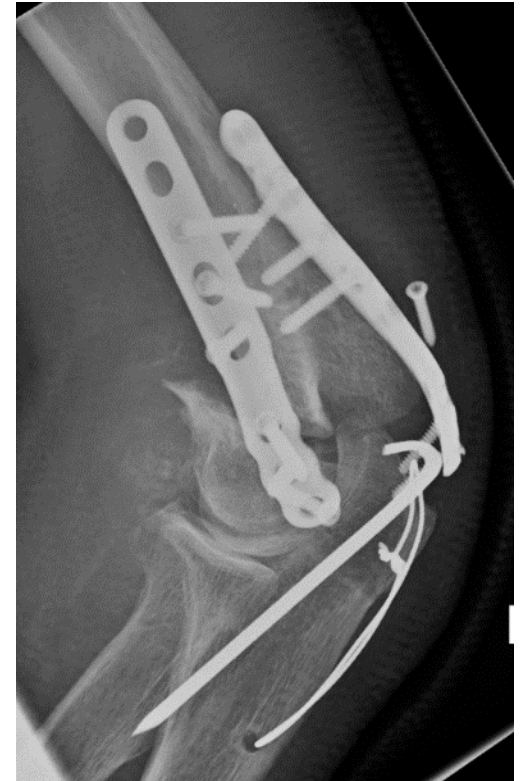
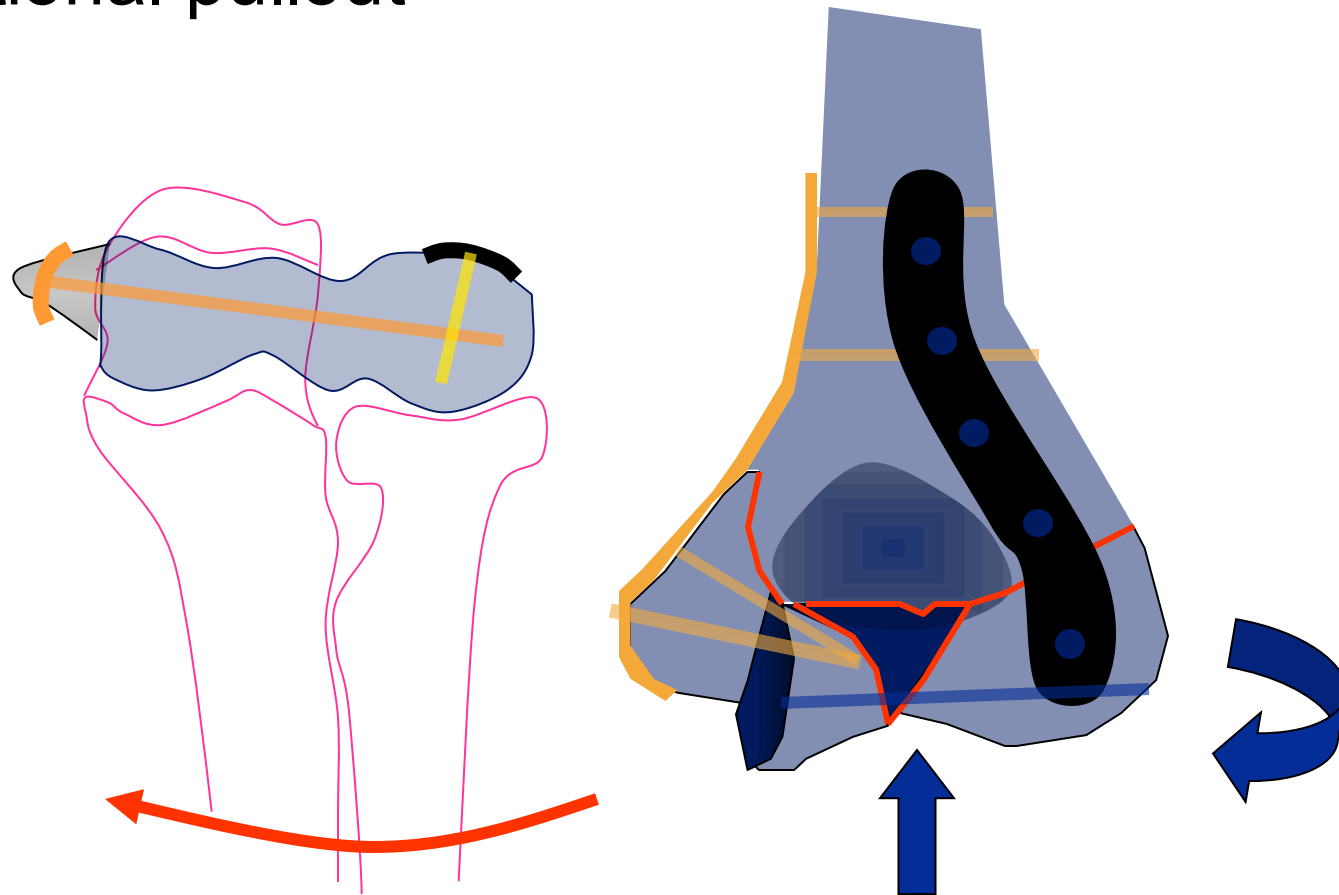
Parallel plates (160°)
All distal screws goes through a plate



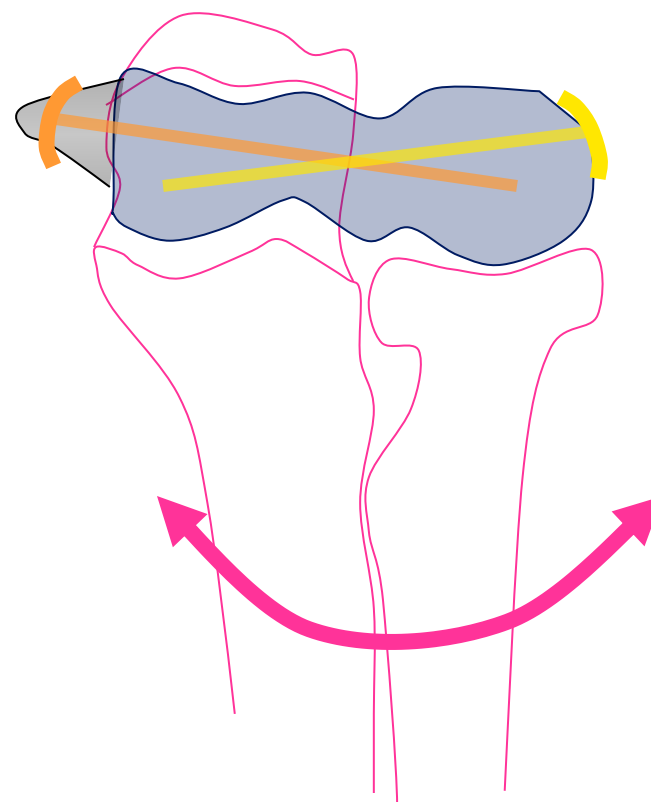
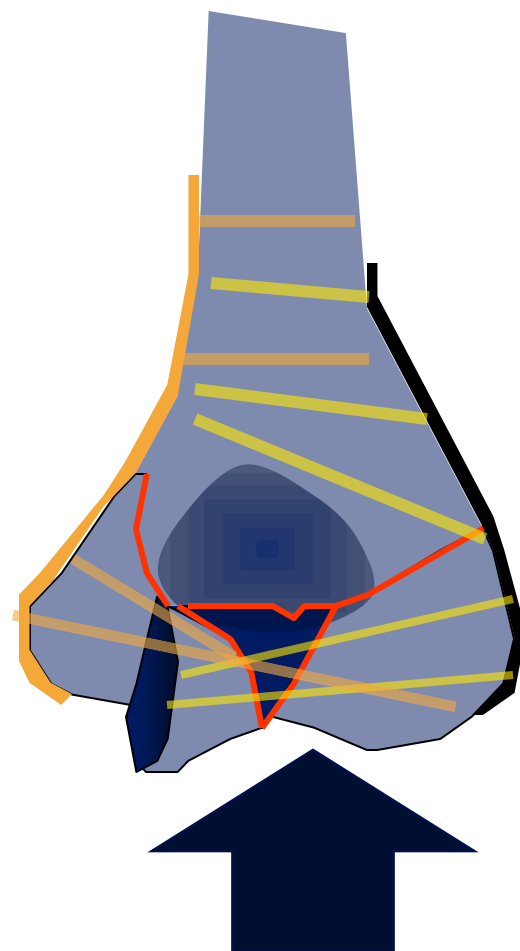
AO

Few screws in the distal segment

Risk of rotational pullout



Mayo

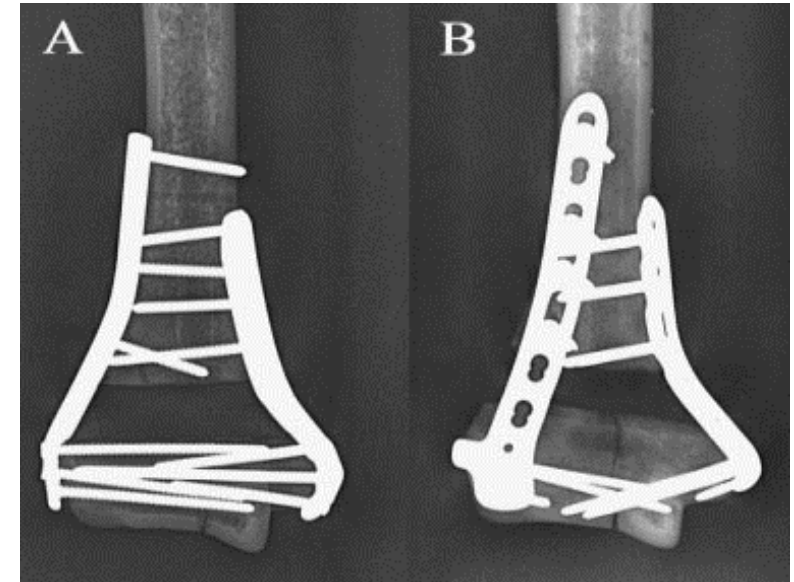


Comparison AO – Mayo

1. Biomechanical studies [*Vennettilli JHS 2012*]
 - Eight studies: 6/8 favour parallel plating
2. One randomized study [*Shin JSES 2010*]:
 - 2/17 AO failed on the lateral side
 - 0/18 Mayo failed

Conclusion:

Parallel plating is safer esp. in bad bone

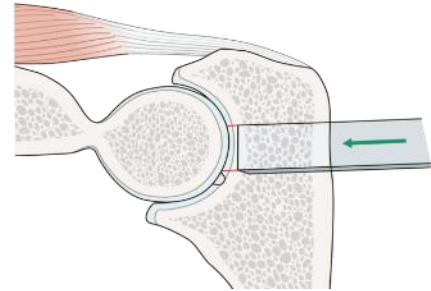
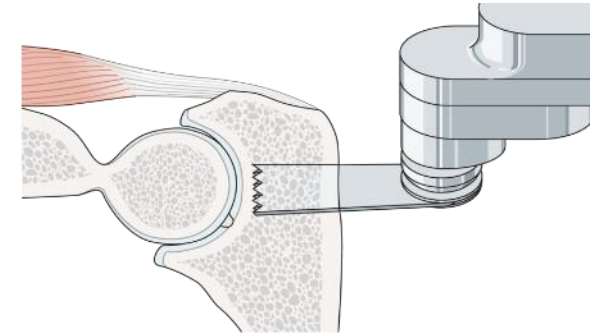
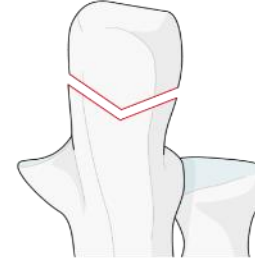


AO

Handling of triceps

1. Olecranon osteotomy

C-fractures

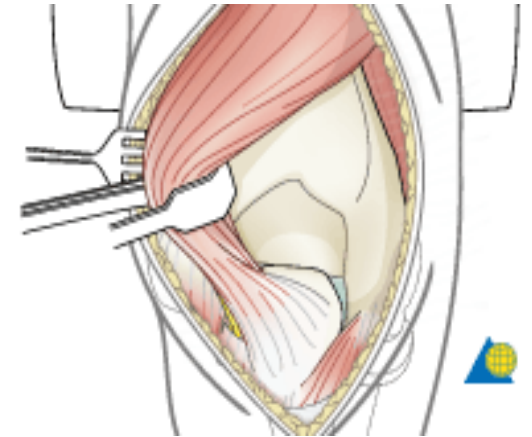
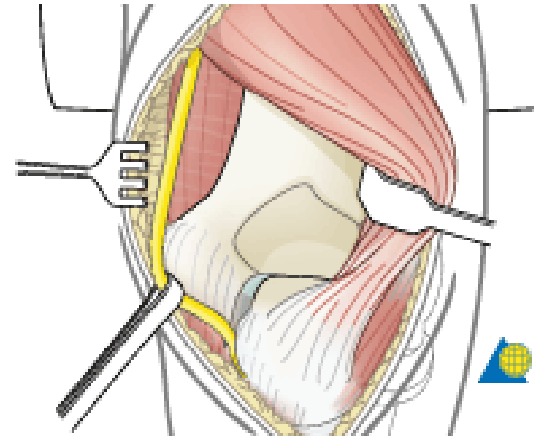


2. Triceps on

A-fractures

3. Triceps sparing approaches

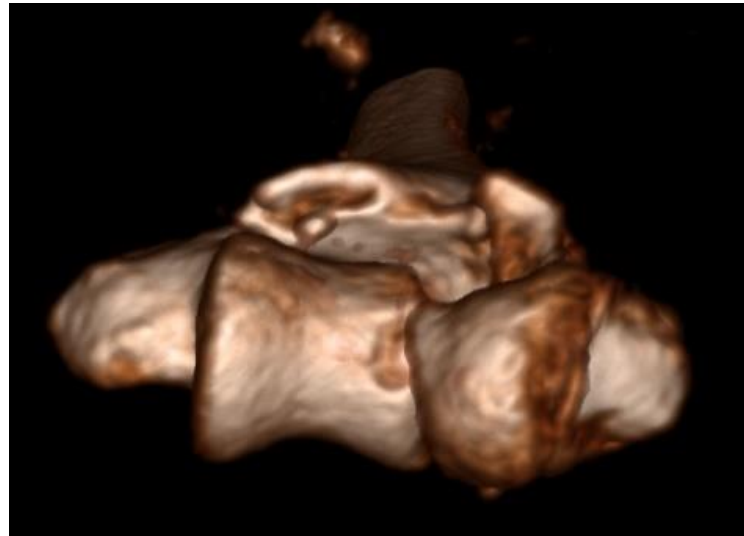
Type C in experienced hands



Left elbow – Type C fracture



Anterior

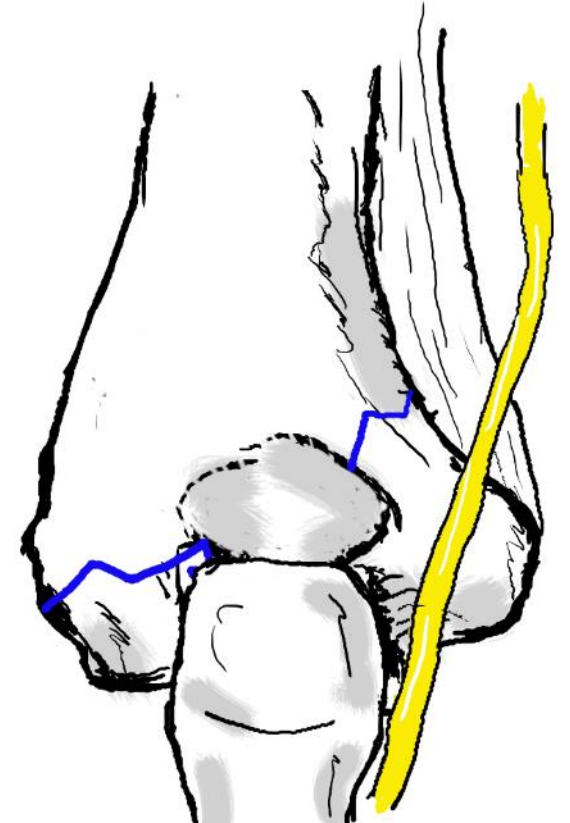
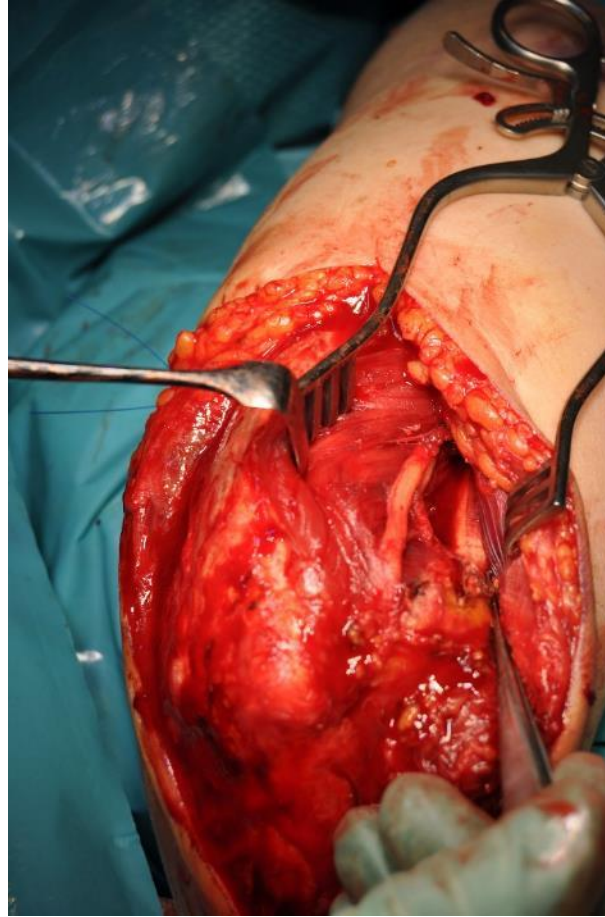


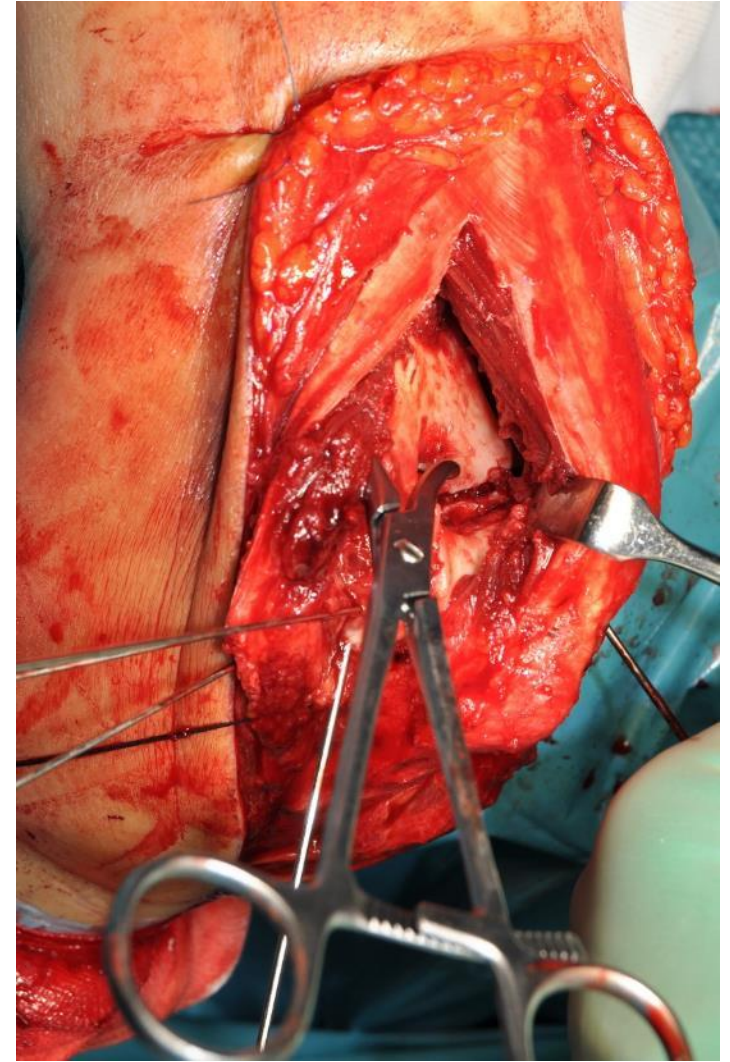
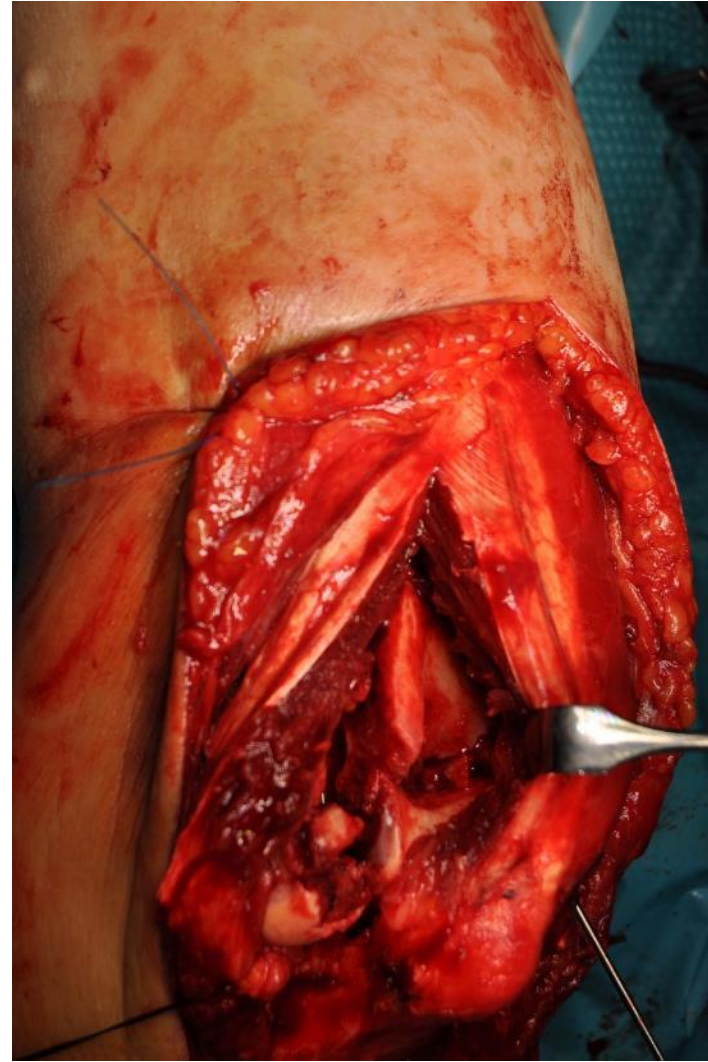
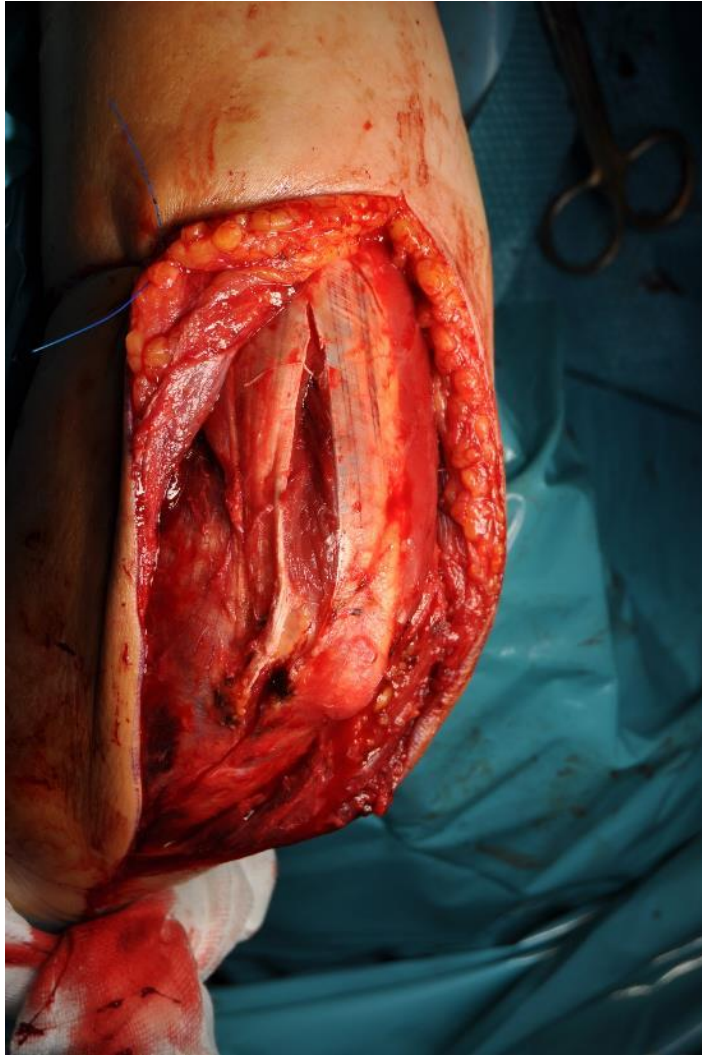
Inferior

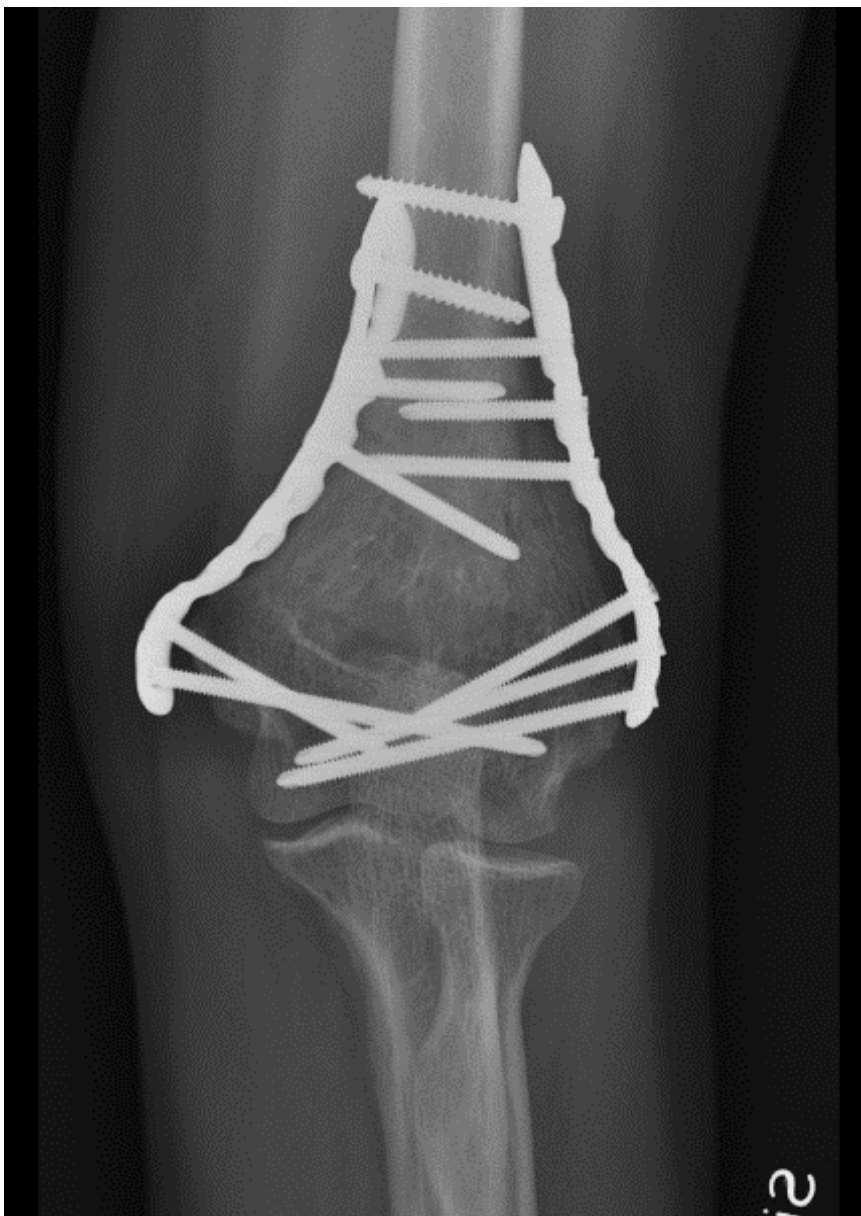


Posterior

Left elbow







Is the fracture un-fixable?

Osteoporotic bone

Certain fracture patterns
with ≥ 4 joint fragments



Elbow arthroplasty – for unfixable fractures

Total elbow arthroplasty

Life long load limitations



[McKee 2009]

Hemiarthroplasty

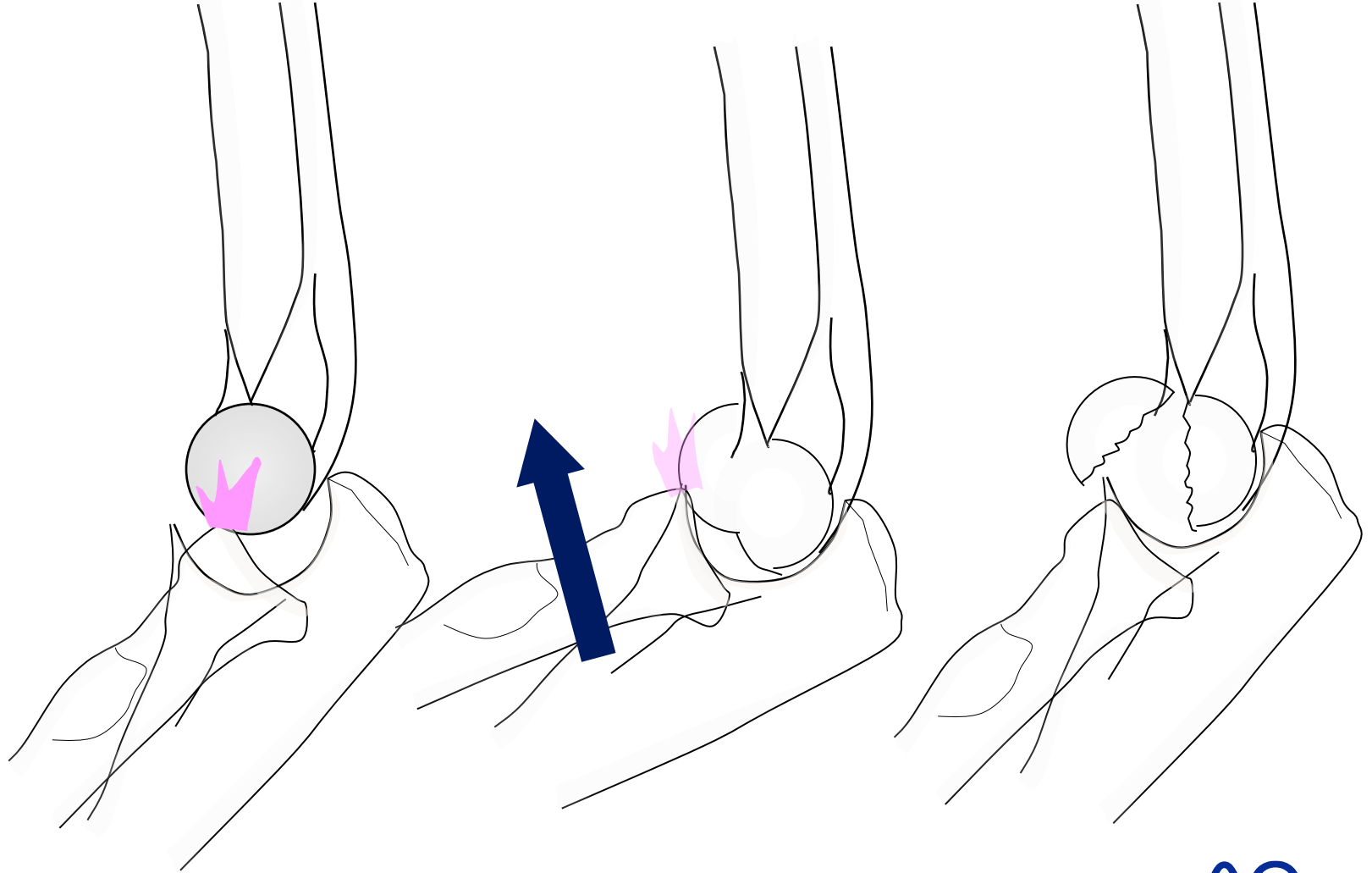
Relatively new concept

Collateral ligaments must work



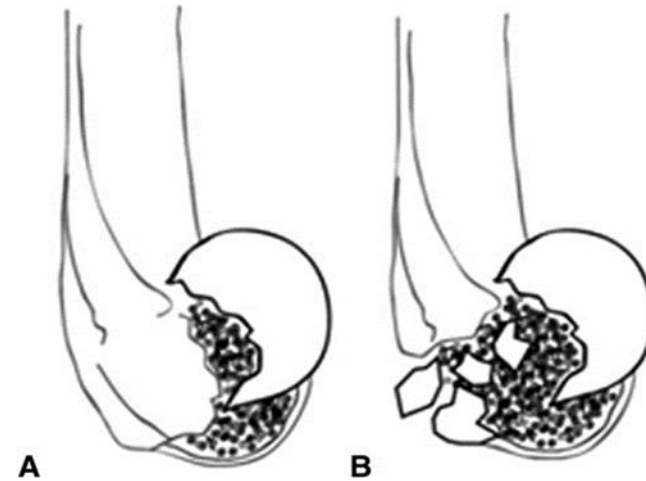
[Nestorson 2015]

Coronal shear – AO type B



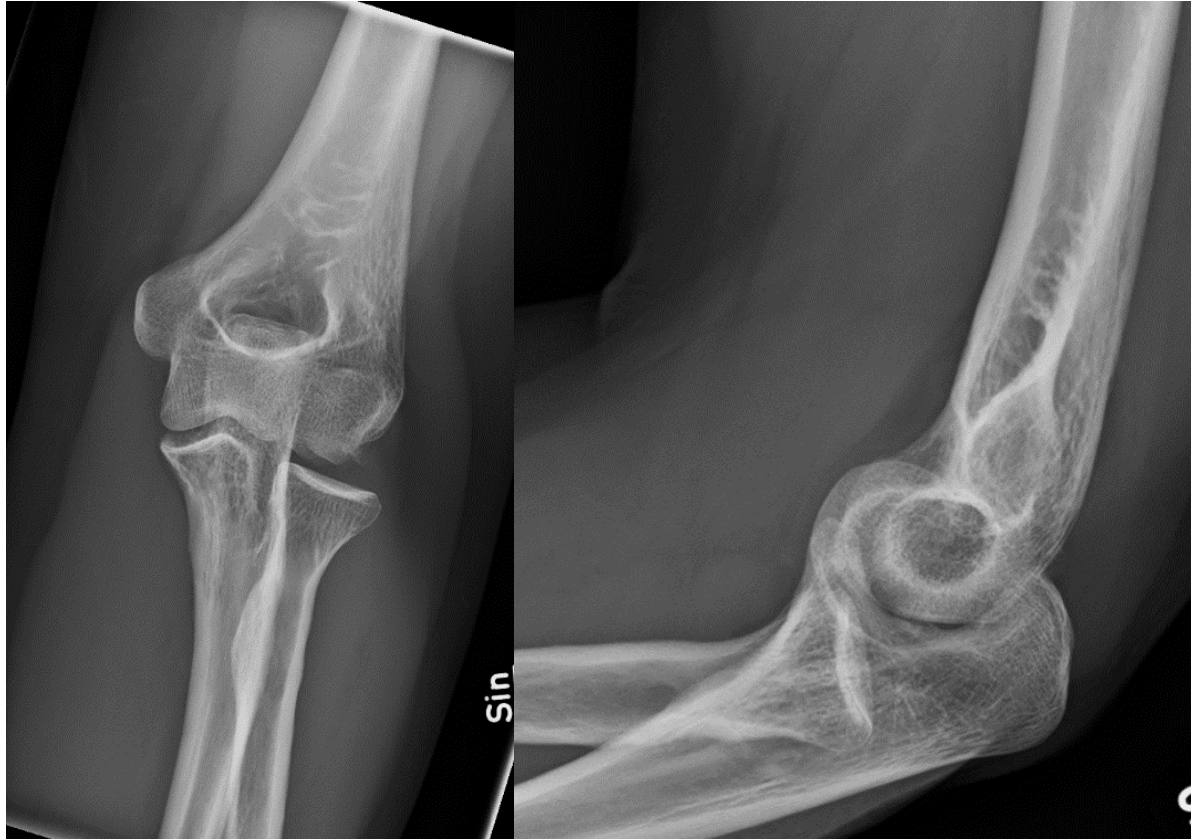
Dubberly classification

- A. Without** posterior comminution
- B. With** posterior comminution

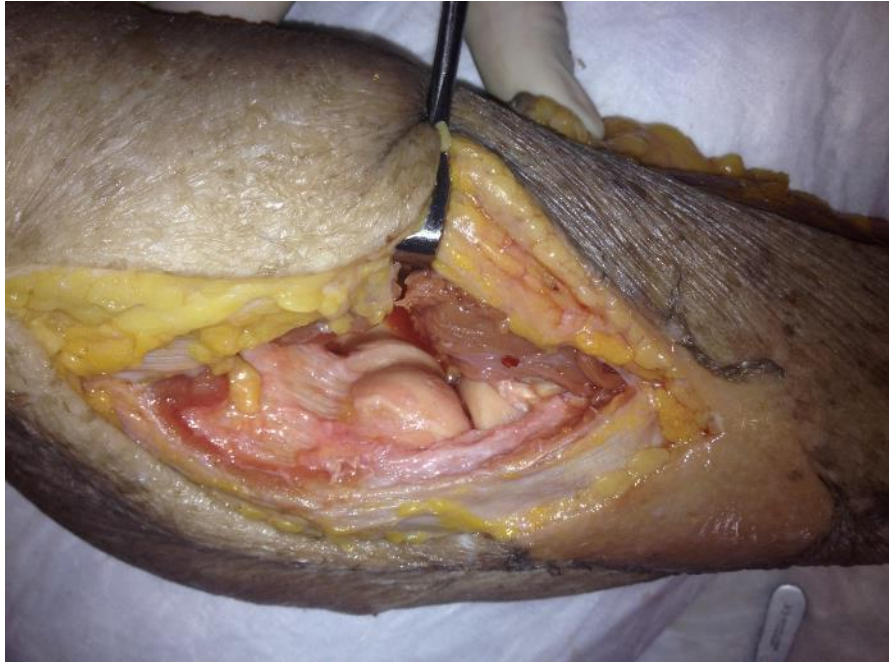


[Dubberly JBJS 2006]

Dubberly A



Dubberly A



Persisting stiffness: ROM < 30°-130°

Elbow capsule prone to stiffness:

Fibroblasts transforms into myofibroblasts

After 6 months “cold elbow”=unresponsive to physiotherapy

IF the joint is congruent, usually a ROM of 30°-130° **can** be achieved

Persisting stiffness - analysis

Congruent joint:

1. Heterotopic ossification
 - Resect
 - Approach after CT analysis
2. Soft tissue restraint
 - “Lateral column procedure” – capsular release and mobilisation
 - Intense physiotherapy afterwards



Distal humeral fractures – treatment principles

Daytime surgery by an experienced surgeon

AO type A and C

Posterior approach

Double (parallel) plating

AO type B

Rare injuries

Various approaches

Different fixation techniques

Elbow arthroplasty (total/hemi) should be considered in non reparable fractures