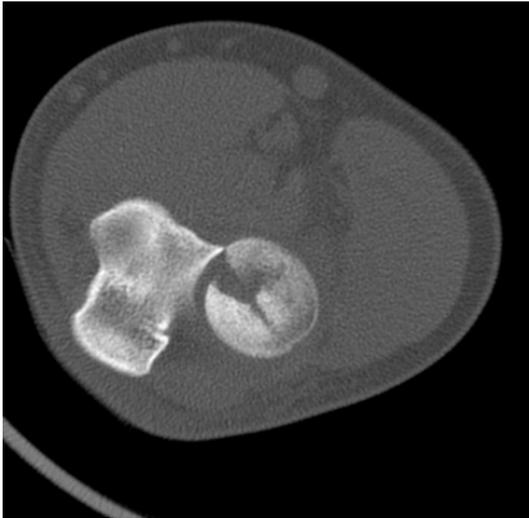


# Radial head fracture – resect, repair, replace or retain?



*Lars Adolfsson  
Professor  
Department of Orthopaedics  
Linköping /Örebro Universities*

As long as the fracture does not cause mechanical problems (interfere with motion), joint surface incongruence seems of less importance  
(*Ring et al, vRiet et al*)



But, radial head fractures never come alone!

Balanced stability!

The key to restored elbow function



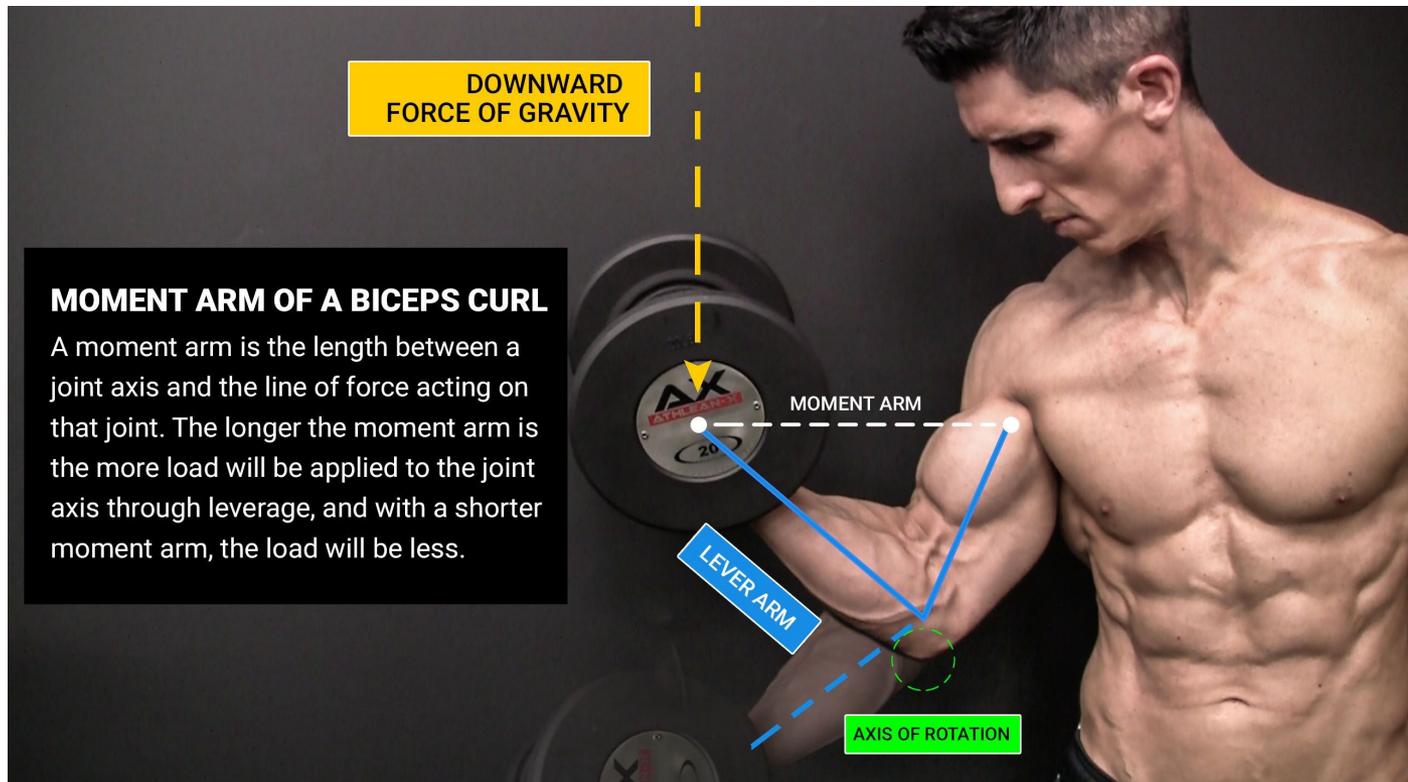
# Radial head fracture – seen as an indicator of soft tissue lesions



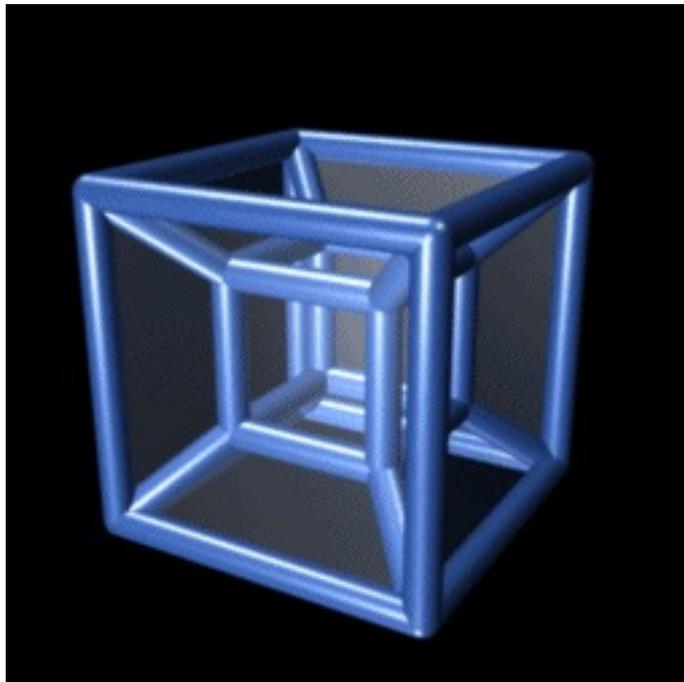
Instability is usually poorly tolerated and can often lead to secondary osteoarthritis



# Long lever arms with considerable forces affecting the elbow joint



However; there are more than two dimensions!

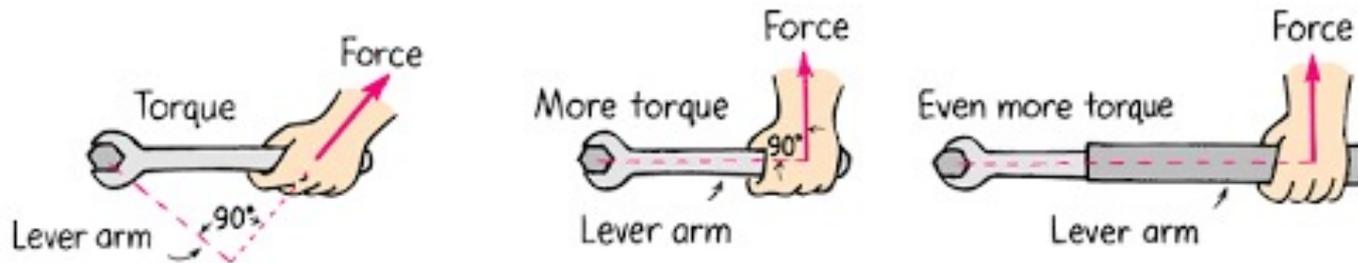


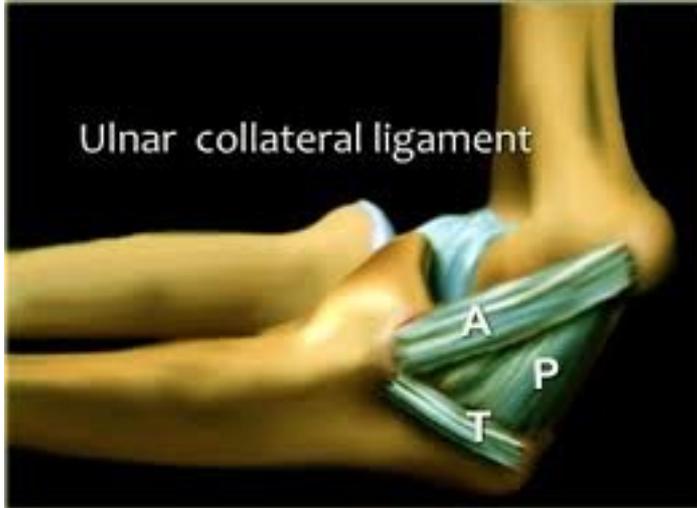
**Stability is a factor in 3D**

The elbow is subjected to significant rotational forces, particularly in internal rotation (force directed in valgus)



The elbow joint is designed to withstand large rotational forces



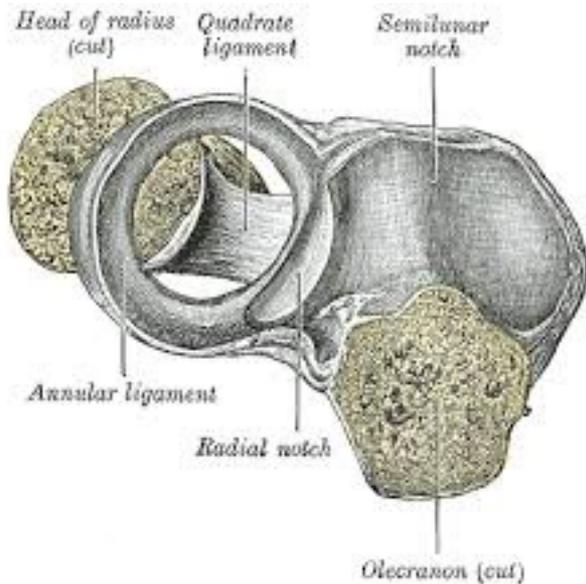
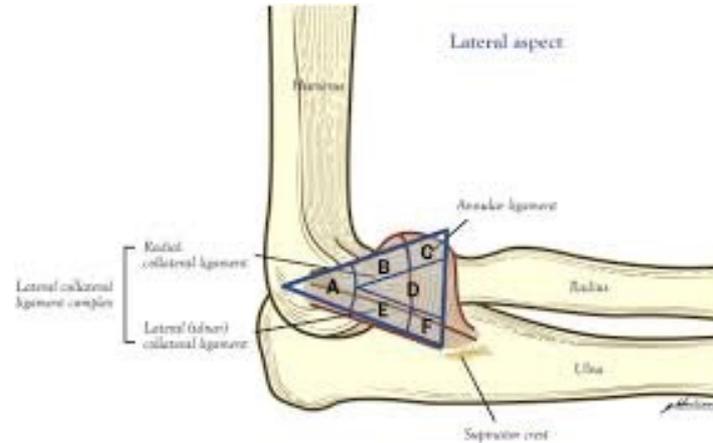
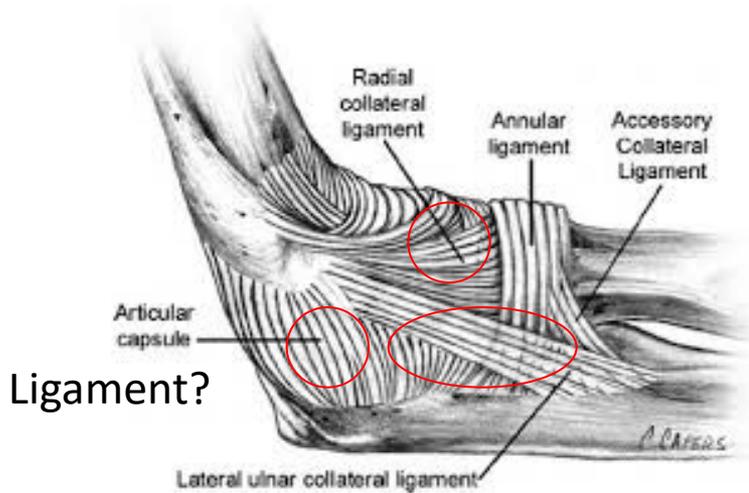


Distinct and stronger medial ligaments  
and medial facet of trochlea



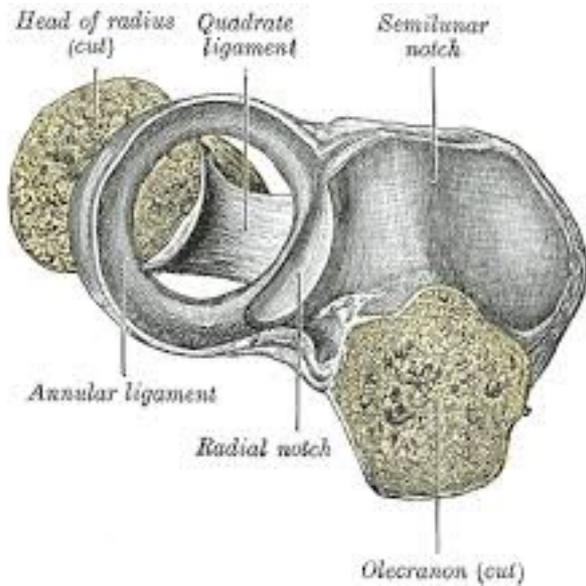
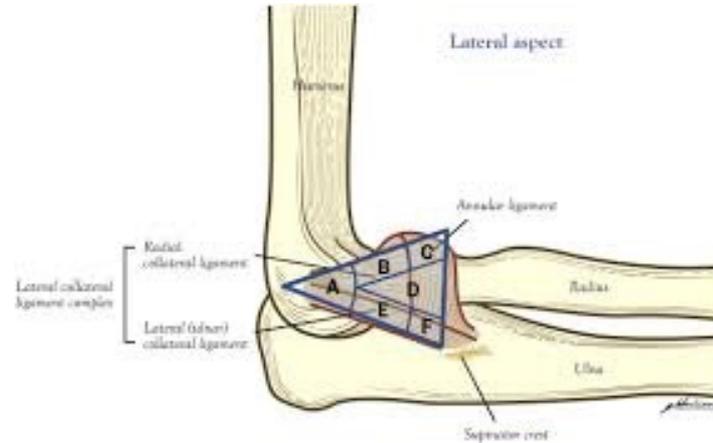
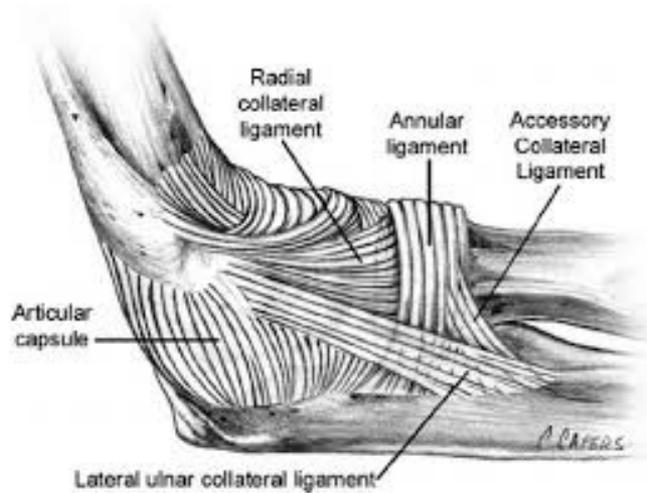
If injured, underlines when the  
radial head is important for  
elbow joint stability

# *LCL complex*



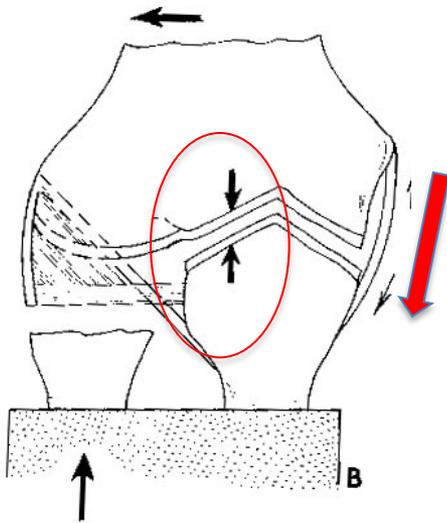
Designed to protect against varus load but also external rotation (supination) of the forearm and tension in the annular ligament

# Varus loads are usually less pronounced



What will happen if we remove the radial head?

### Altered load distribution



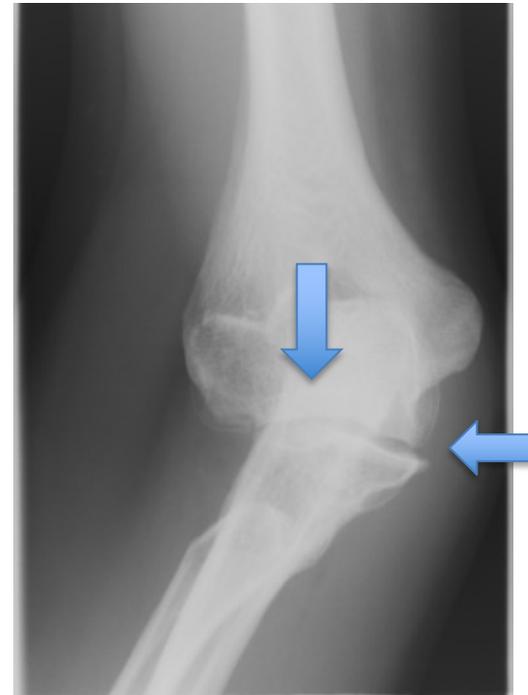
**Tension in the IM significantly increases after RH resection**  
*(Lanting et al 2013)*





**OA will ensue** – but after a long time and not necessarily symptomatic  
*(Antuna et al 2010)*

*-provided that the rest of the ligamentous apparatus is preserved*



## **Long-term consequences**

- Valgus position (instability)
- Proximal radial migration
- Medialisation of proximal radius
- DRUJ incongruence
- OA elbow and wrist

Having a radial head is always better than being without!  
- As long as it's not the cause of problems

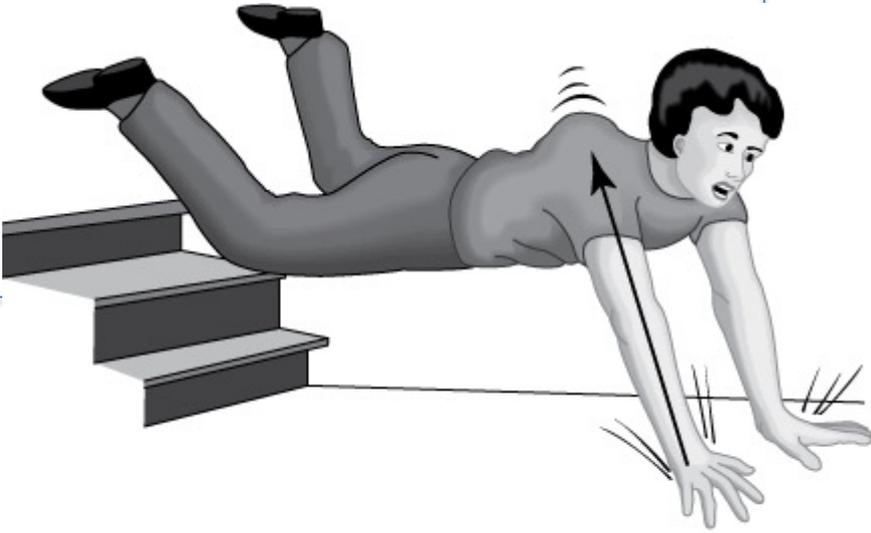


**Pathomechanics:** the mechanics of living systems in motion resulting in, or leading to, dysfunction or injury.



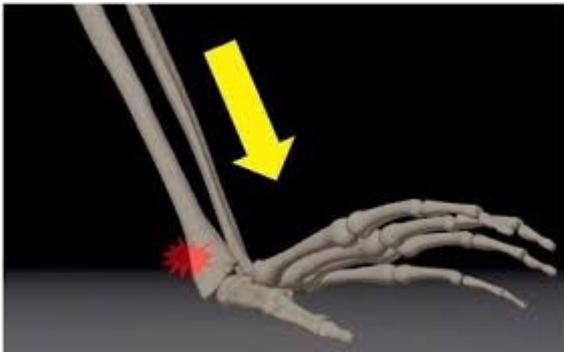
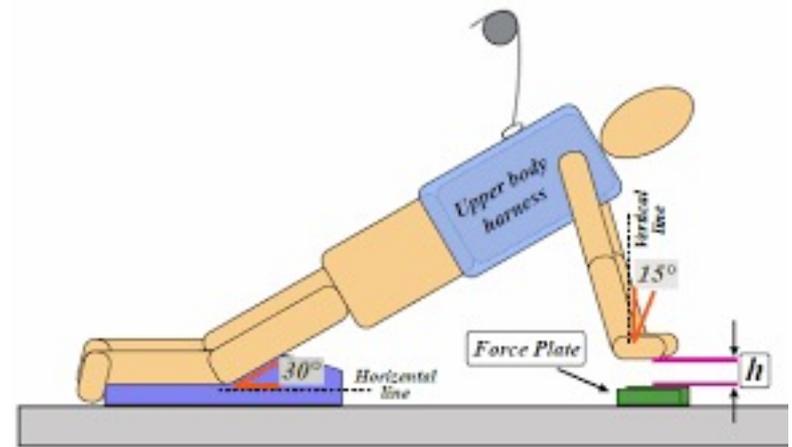
The mechanism by which a pathological condition occurs

How do we most often fall?



$$\text{Kinetic energy } \frac{mv^2}{2}$$

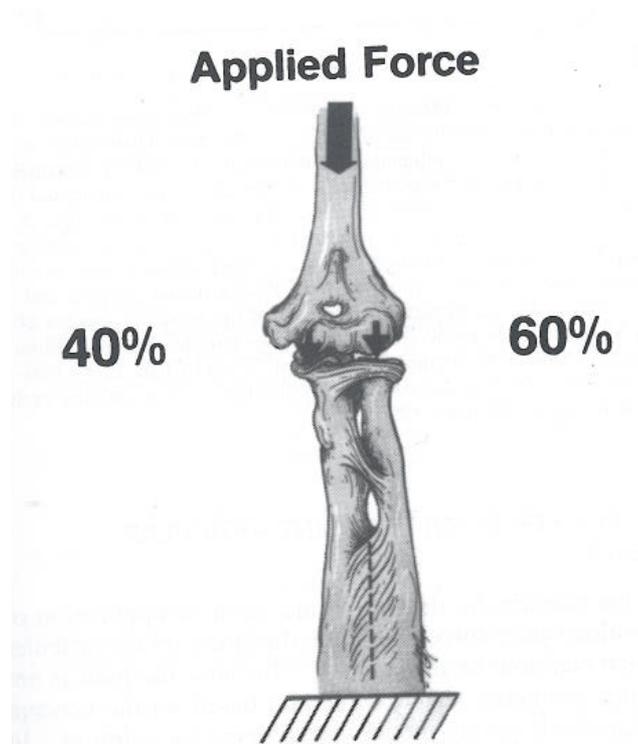
Equals 2-3 times body weight



The radius sustains almost all of the force that is transmitted to the forearm

A substantial part of the force is transmitted via the RH

Static compression of an extended elbow



Force largest in **extension and pronation**

*(Morrey et al 1988, Amis et al 1980)*

The pathomechanisms should be considered in the decision making:

It is not the forearm that is displaced in relation to the upper arm, it is usually humerus that is forced downwards on the forearm!





The forces acting on the forearm are created by the falling body weight via the humerus when the radius is fixed to the ground

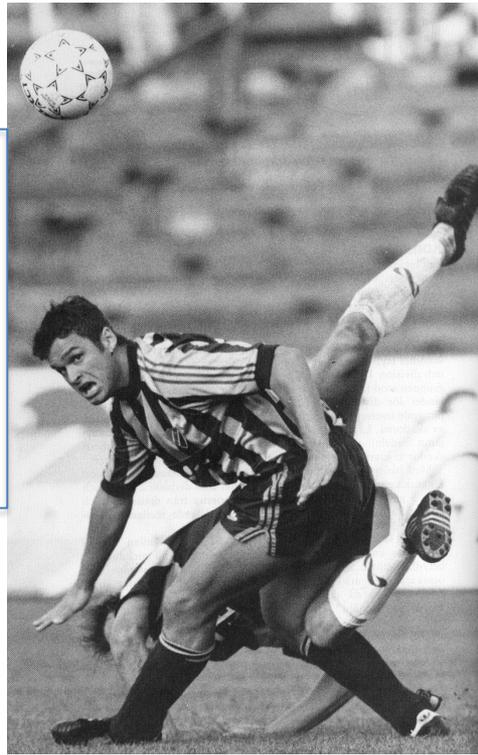
The resultant force vector is dependent on the position of the elbow joint

How do we most often fall?

Forwards

Slightly flexed elbow

Forearm in neutral or pronation

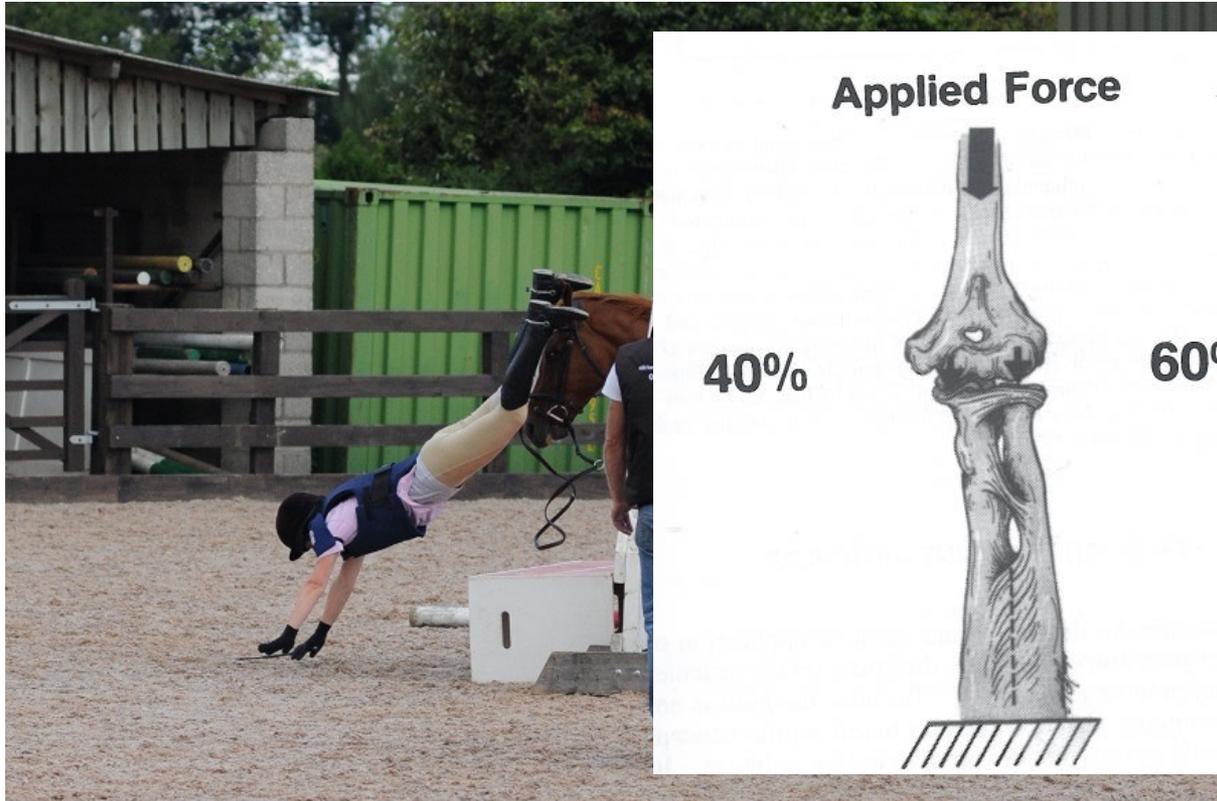


This allows the forearm to "escape" under the humerus

What if the elbow is in full extension with a longitudinally directed force?



What if the elbow is in full extension with a longitudinally directed force?



If the coronoid remains intact, much of the forces will be absorbed by the forearm

Essex-Lopresti lesion =  
Excision of the radial head with  
an IM insufficiency



Peter Essex-Lopresti  
1916-1951

What is seen in the radiographs is a result of disrupting forces

Consider pathomechanisms



### 3 Mason type 2 fractures

Consider pathomechanisms



Compression



Angulation



Dislocation

## Consider pathomechanisms



Compression

Force: longitudinal

Angulation

valgus

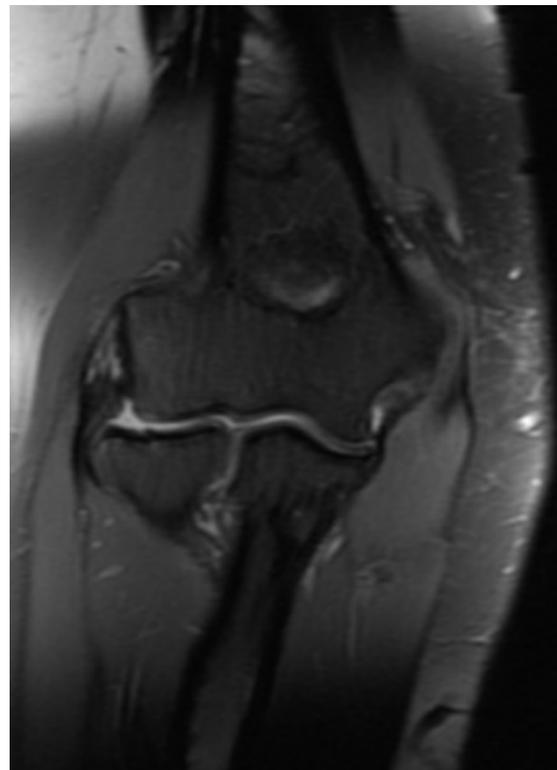
Dislocation

rotation

What is needed to restore stability?



## Valgus 1: (Mason type 1)



Associated soft tissue or joint surface injuries in  $> 90\%$

*Kaas et al 2011*

*Wänström et al 2023*

## Valgus 1:

Moderate valgus force and axial compression without subluxation

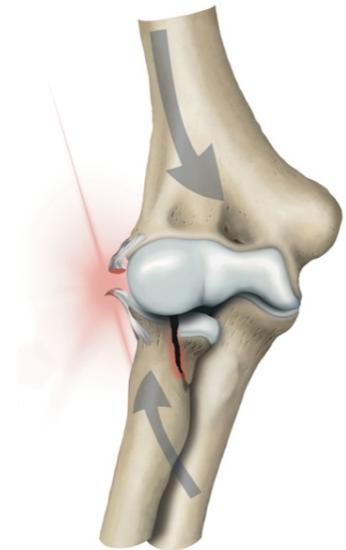


Action: Leave RH, check for pronounced medial laxity

Valgus 2:

Valgus and internal rotation of humerus.

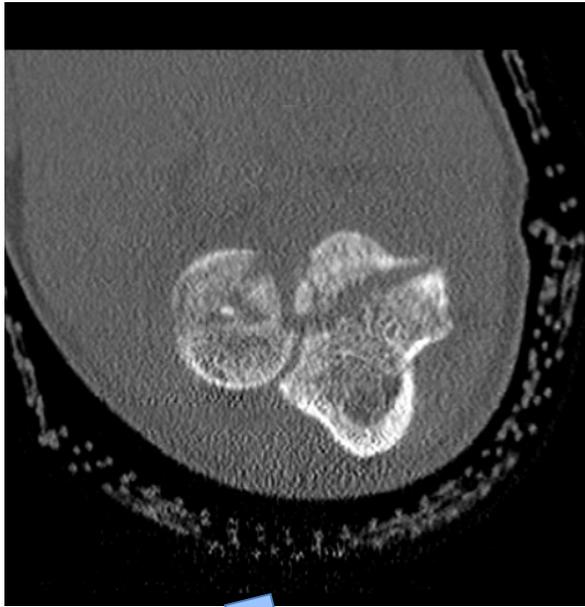
May lead to posterolateral subluxation of the forearm



Action: Fix fracture. Lateral ligament repair.  
Medial ligaments most often OK

## Valgus 3:

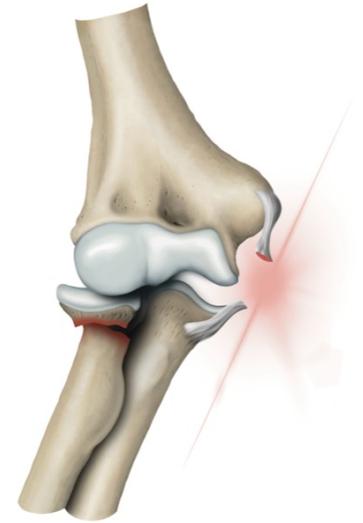
Valgus and dislocation with RH and coronoid fractures – Terrible Triad



Action: Repair or replace RH.  
Repair coronoid and medial ligaments

## Valgus 4:

Valgus force without subluxation but medial ligament rupture



**Action:**

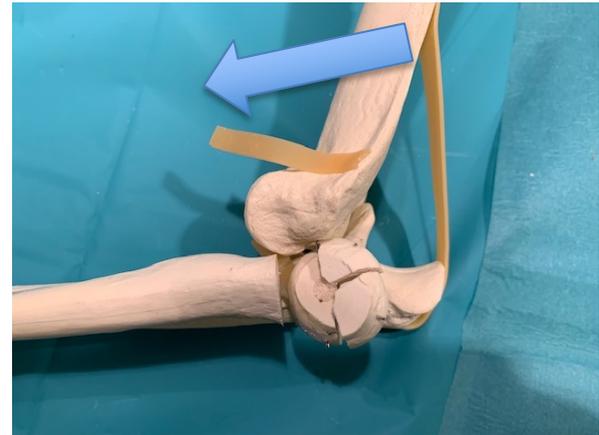
Repair RH/neck preferably with tripod screws.

Repair medial ligaments



Valgus 5:

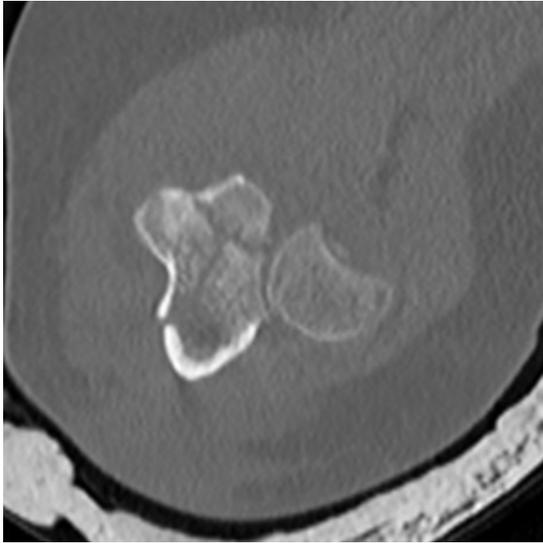
Valgus/posterolateral rotation with dislocation



Action: Replace RH.  
Repair ligaments on both sides

Straight anterior:

Coronoid and RH fracture and dislocation - Terrible Triad



Action: Repair coronoid. Repair or replace RH.  
Assess ligaments on both sides. Repair as necessary.

Varus 1:

Varus force, fracture of sublime tubercle and lateral ligament rupture



Action: Repair coronoid and lateral ligaments

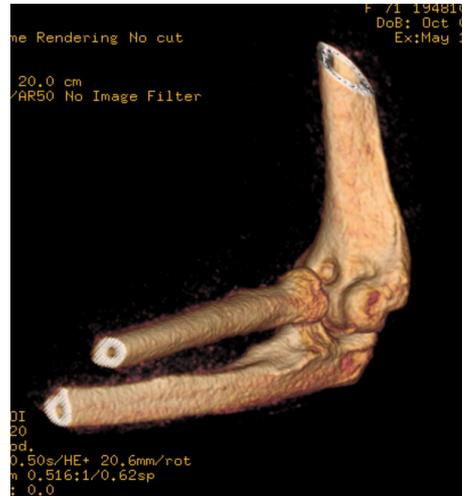
Varus 3:

Varus force with coronoid base fracture and lateral ligament rupture



Action: Repair coronoid and lateral ligaments

# Uncommon injuries with PRU dissociation



Action:  
Repair fractures  
and bilateral ligaments.  
Including annular  
ligament insertions

Balanced stability is the goal of treatment – both sides of the joint need to be assessed and treated when necessary



This situation can be avoided

## **In conclusion:**

- \* Many types and variations of injuries
- \* CT scan helpful in complex injuries
  - *Figure out where fracture fragments belong*
  - *Figure out which soft tissues that are involved*
- \* Ultrasound may prove useful
- \* Understanding pathomechanisms facilitates treatment
- \* **Restoration of stability has priority**

The radial head is usually worth preserving

- or replacing
- unless there are good arguments against

