COMPLEX ELBOW INSTABILITY

-

THE ROLE OF THE RADIAL HEAD

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ACUTE ELBOW INSTABILITY
ELBOW DISLOCATION

simple: - ligaments
- no bone

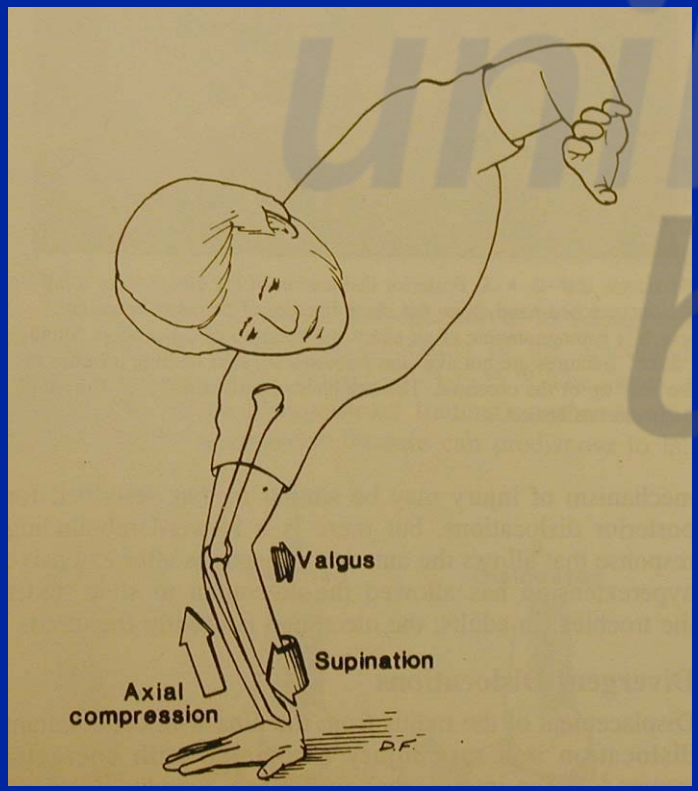
→ **simple dislocation**

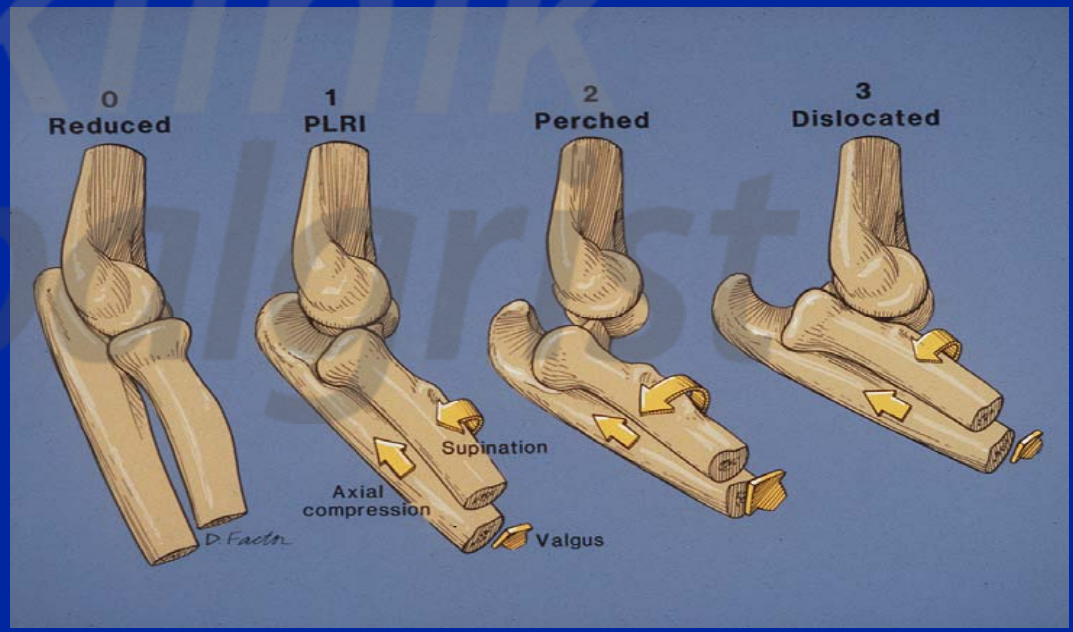
complex: - ligaments
- fracture of articular surface

→ **fracture dislocation**

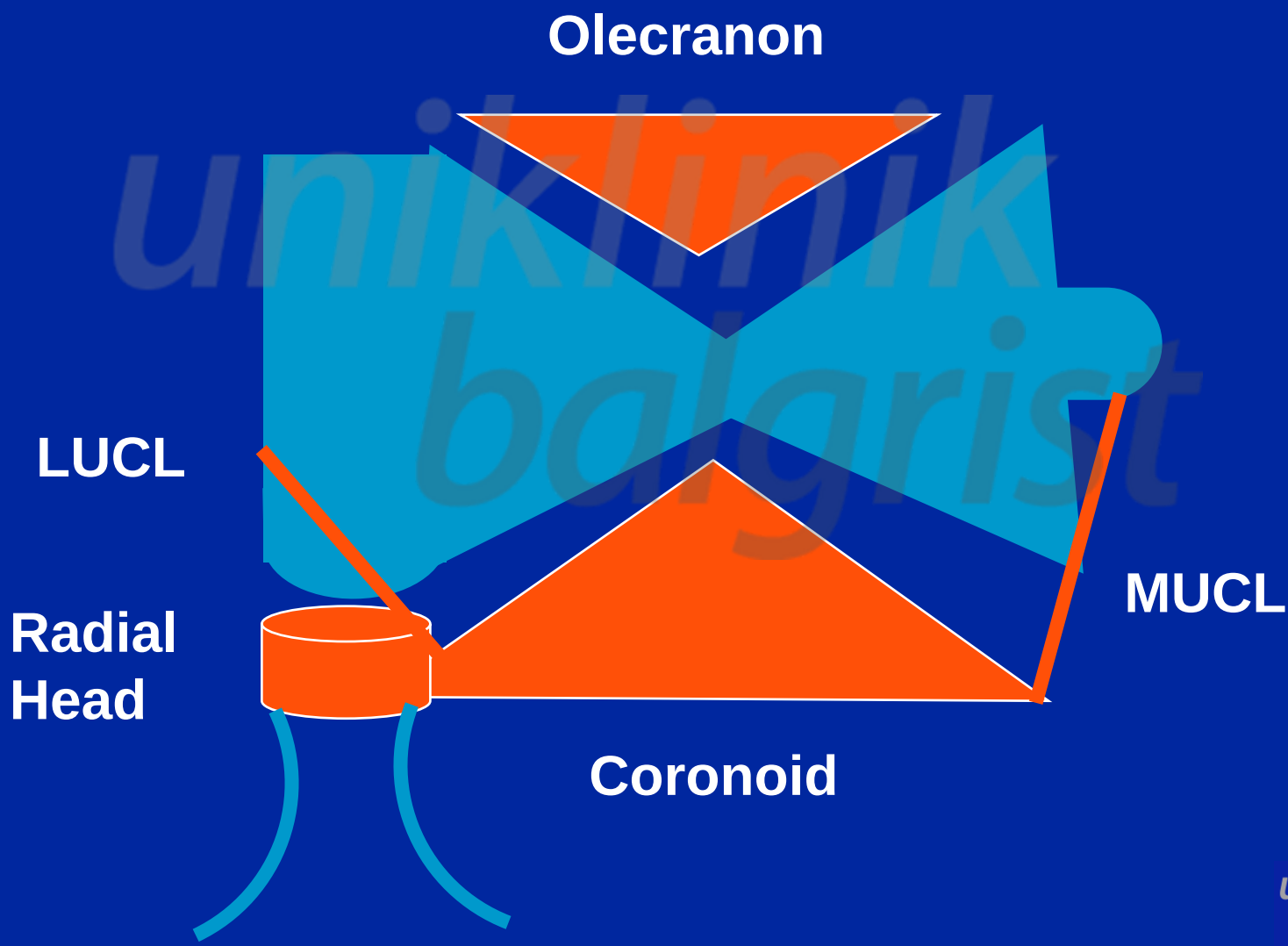
ELBOW DISLOCATION MECHANISM

extension - supination torque





ELBOW
STABILIZING FACTORS



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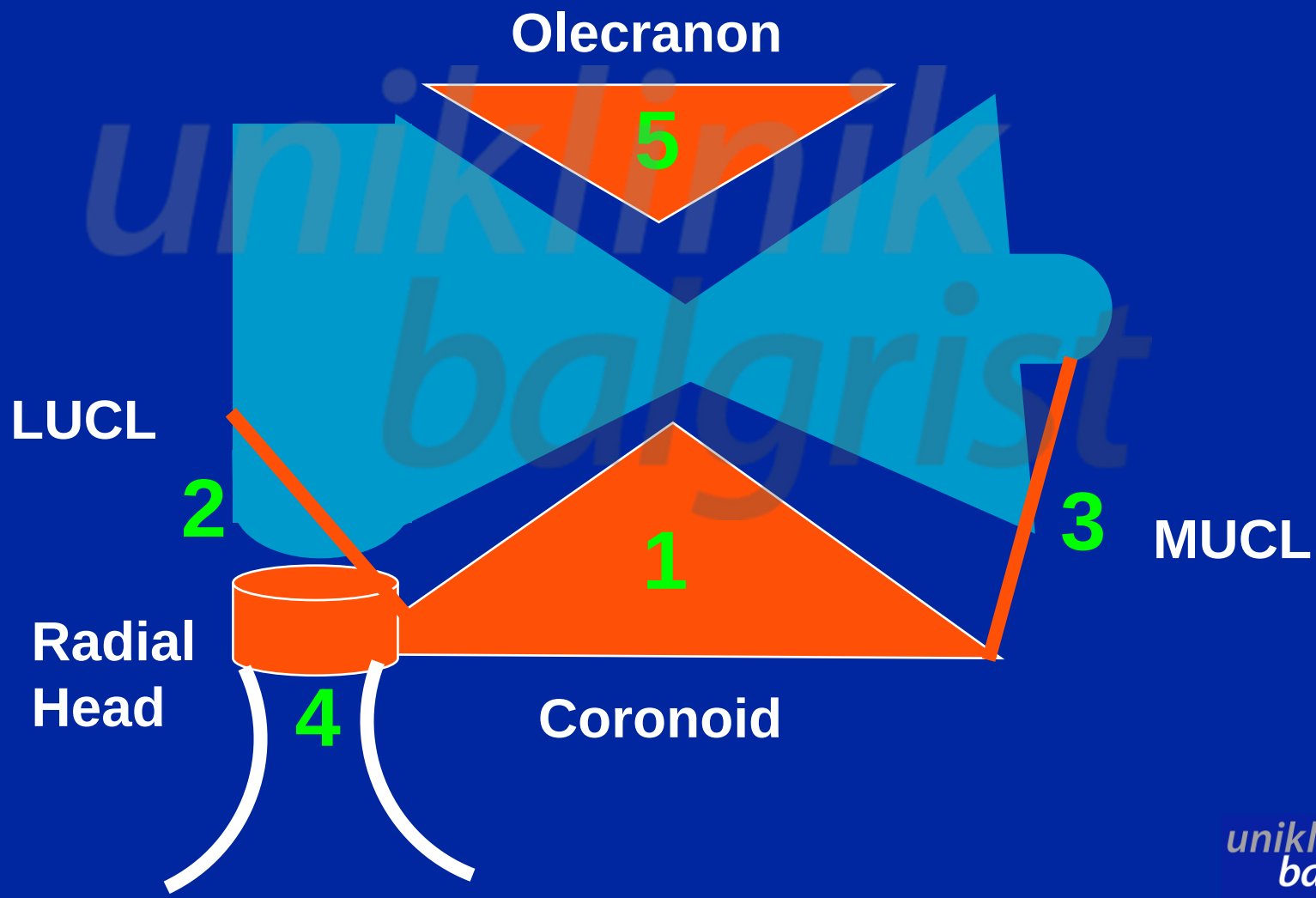
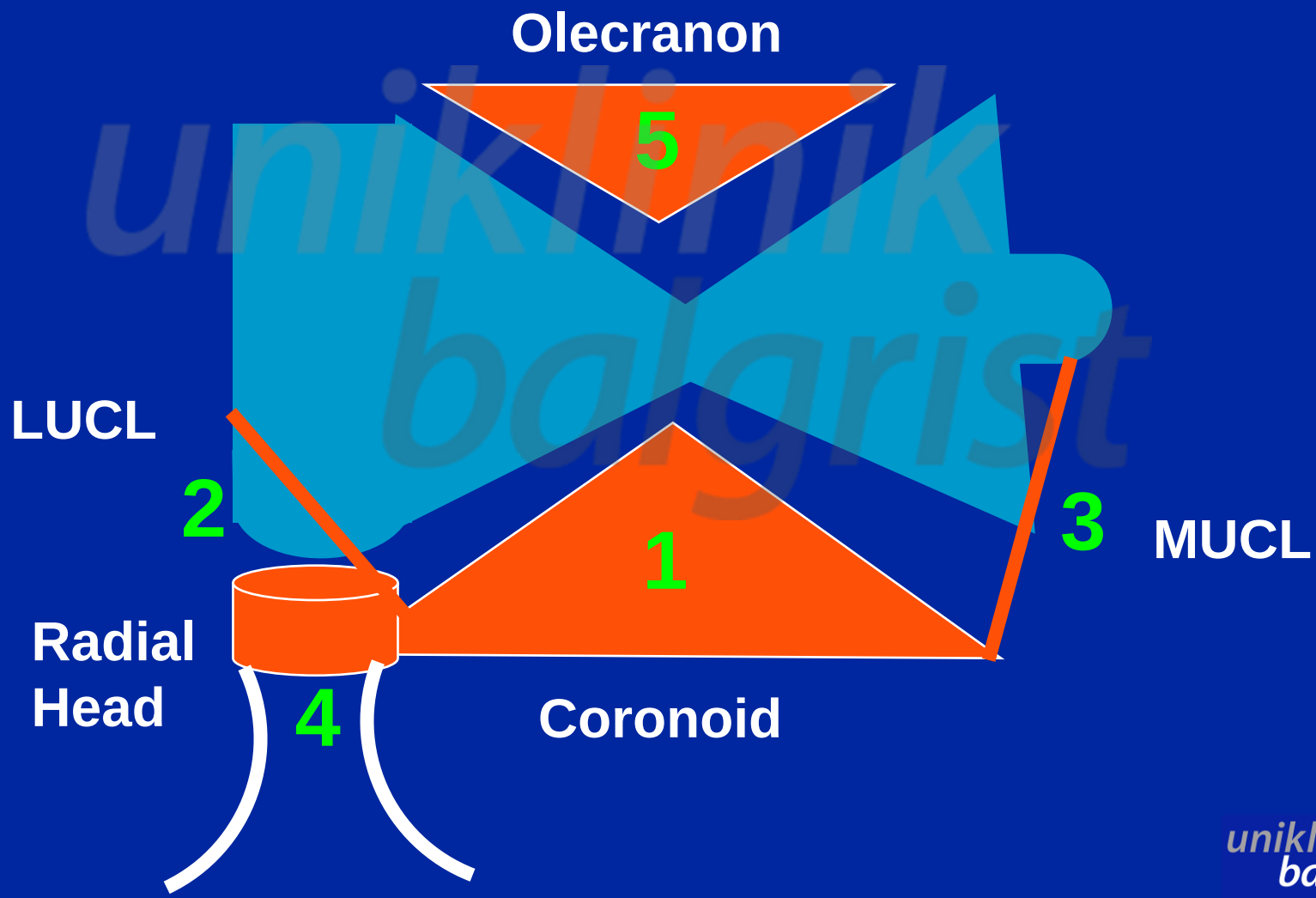
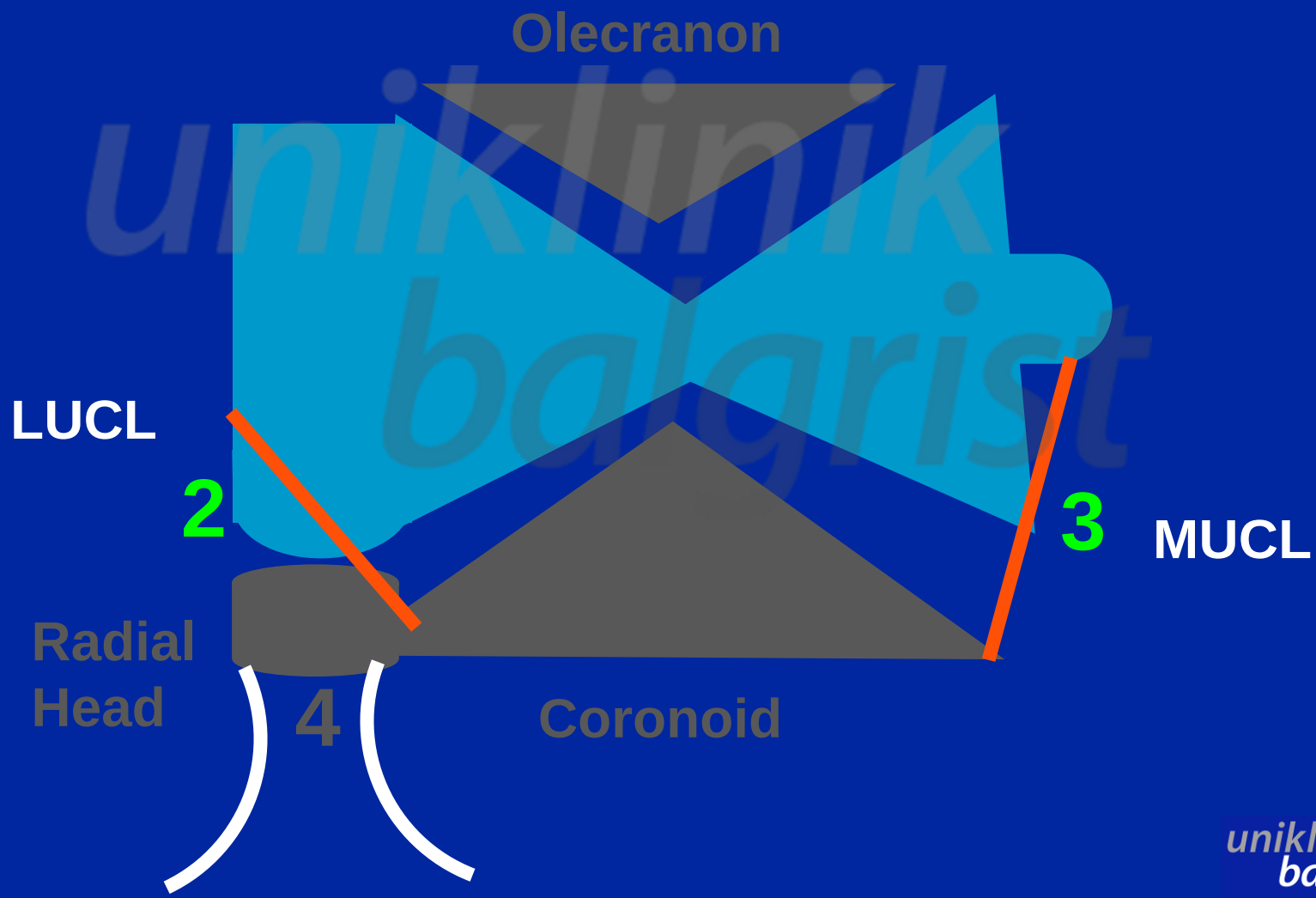


COMPLEX DISLOCATION
PRIMACY OF CORONOID

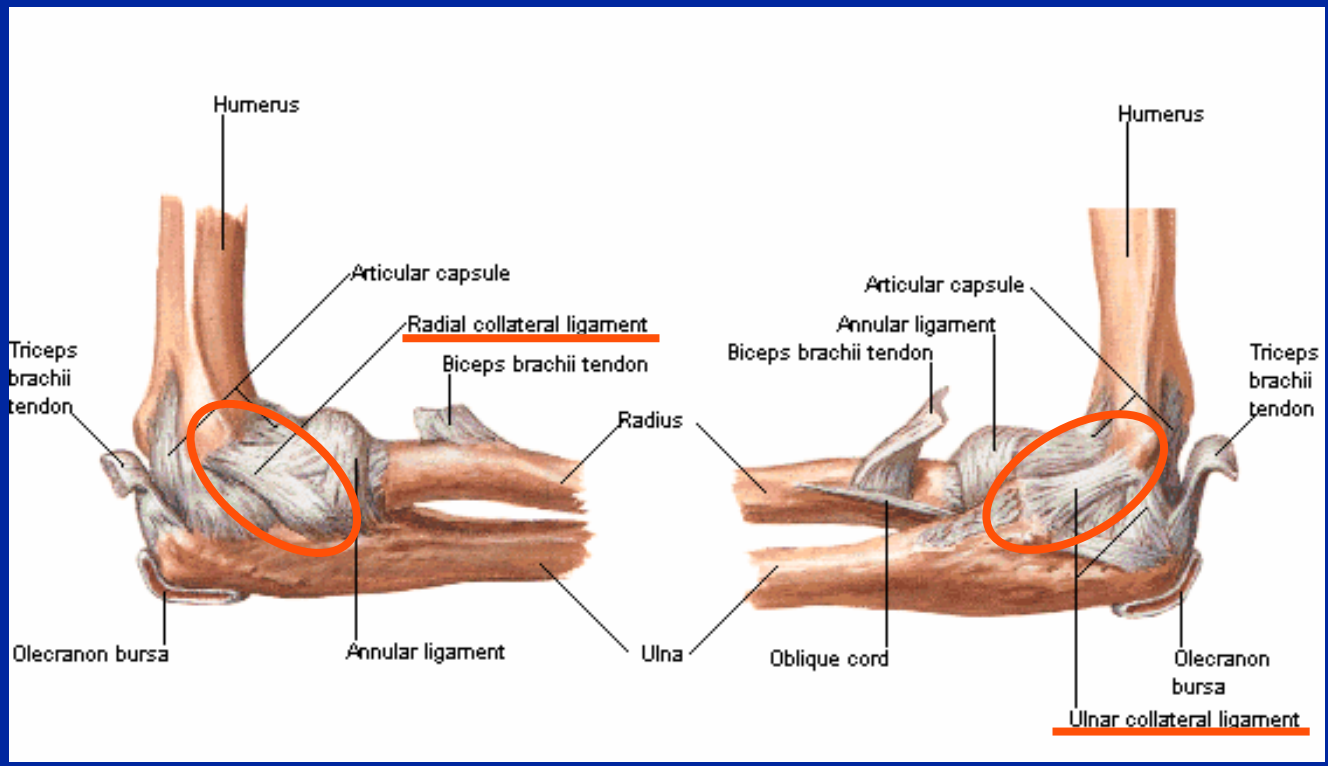


COMPLEX DISLOCATION LIGAMENTS



ELBOW LIGAMENTS

LCL-complex ⟶ lateral ulnar collateral ligament (LUCL)



MCL-complex ⟶ medial ulnar collateral ligament (MUCL)

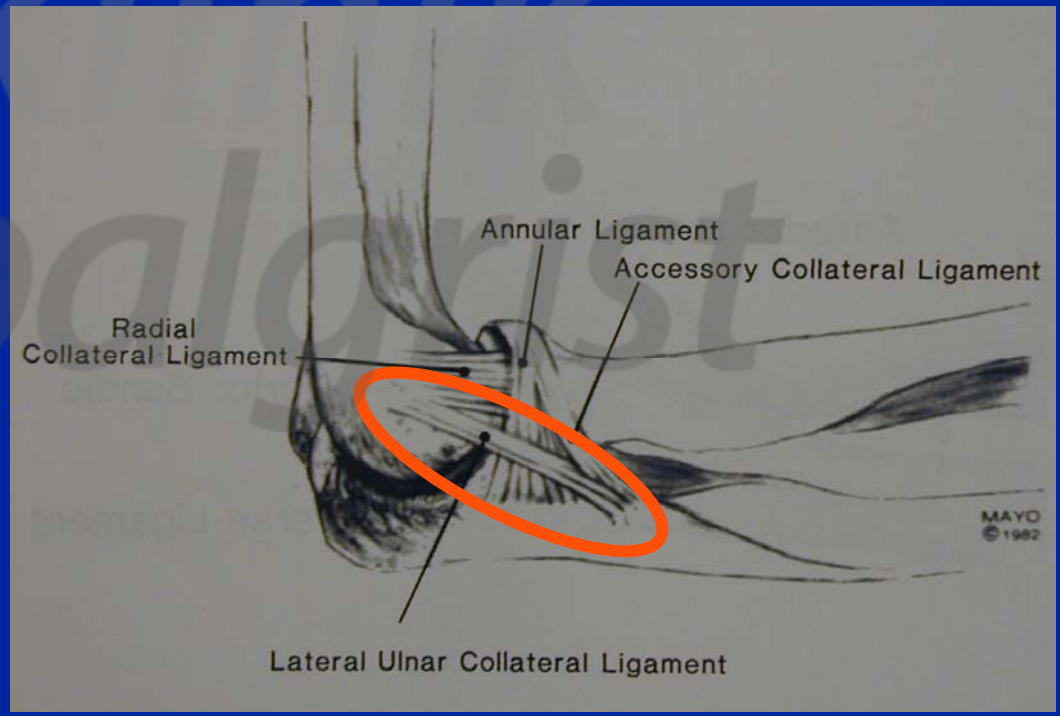
LATERAL STABILIZER
LAT. ULNAR COLL. LIGAMENT (LUCL)

→ = posterolateral rotatory instability

anatomy LCL:

- 3 parts
- LUCL

→ major stabilizer

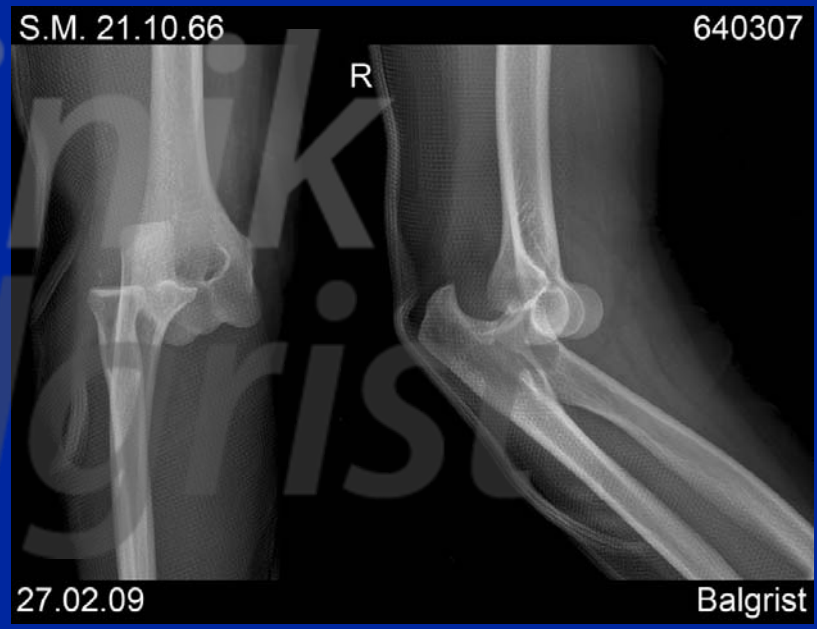


SIMPLE DISLOCATION LIGAMENT REPAIR

acute ligament repair:

results comparable to non-surgical

→ **no repair**



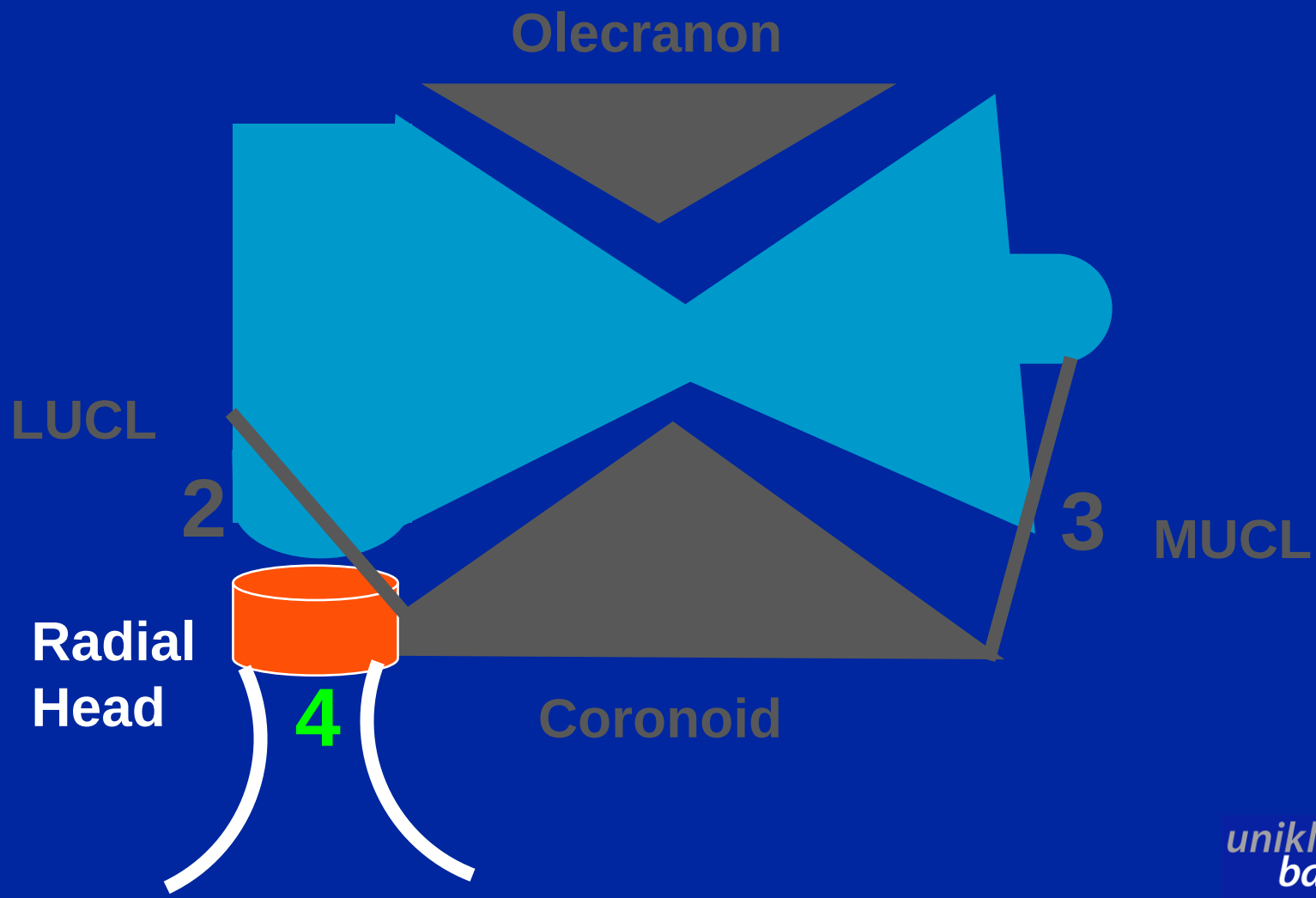
Josefsson PO, JBJS, 69A: 605, 1987

COMPLEX DISLOCATION
LIGAMENT REPAIR

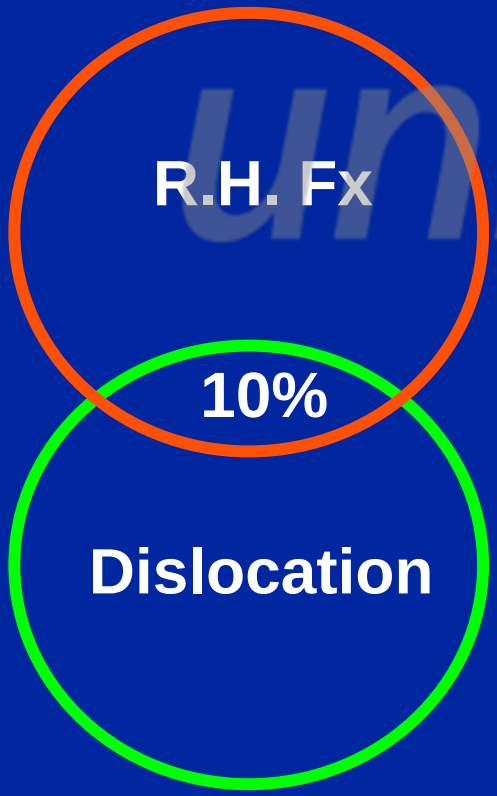
→ often not necessary (MUCL),

... but if you are there then repair (LUCL)

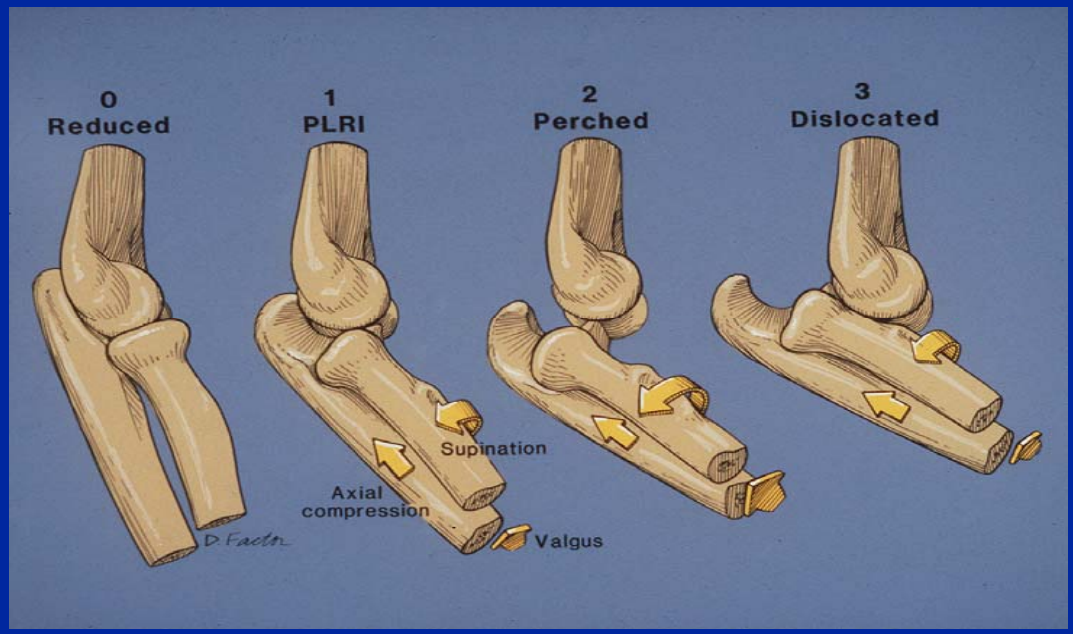
COMPLEX DISLOCATION
RADIAL HEAD

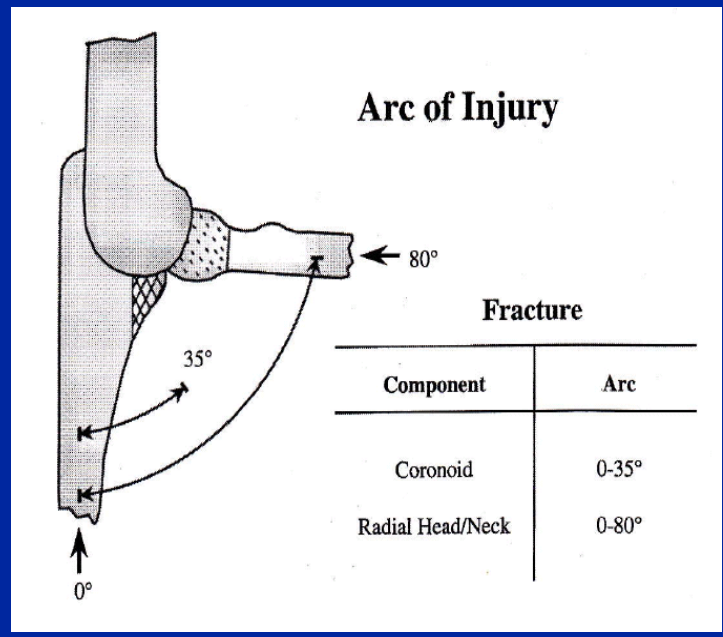


COMPLEX DISLOCATION
RADIAL HEAD FRACTURES

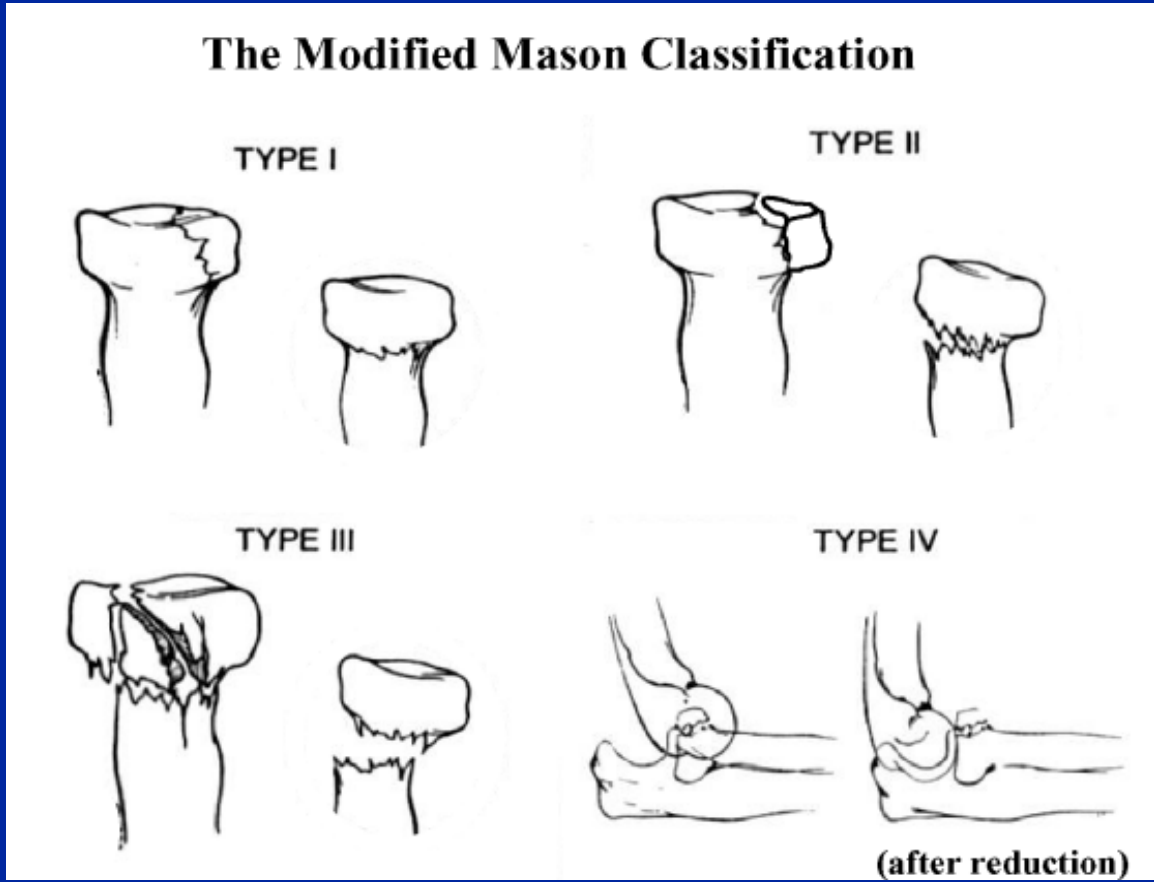


FRACTURE MECHANISM





RADIAL HEAD FRACTURES CLASSIFICATION



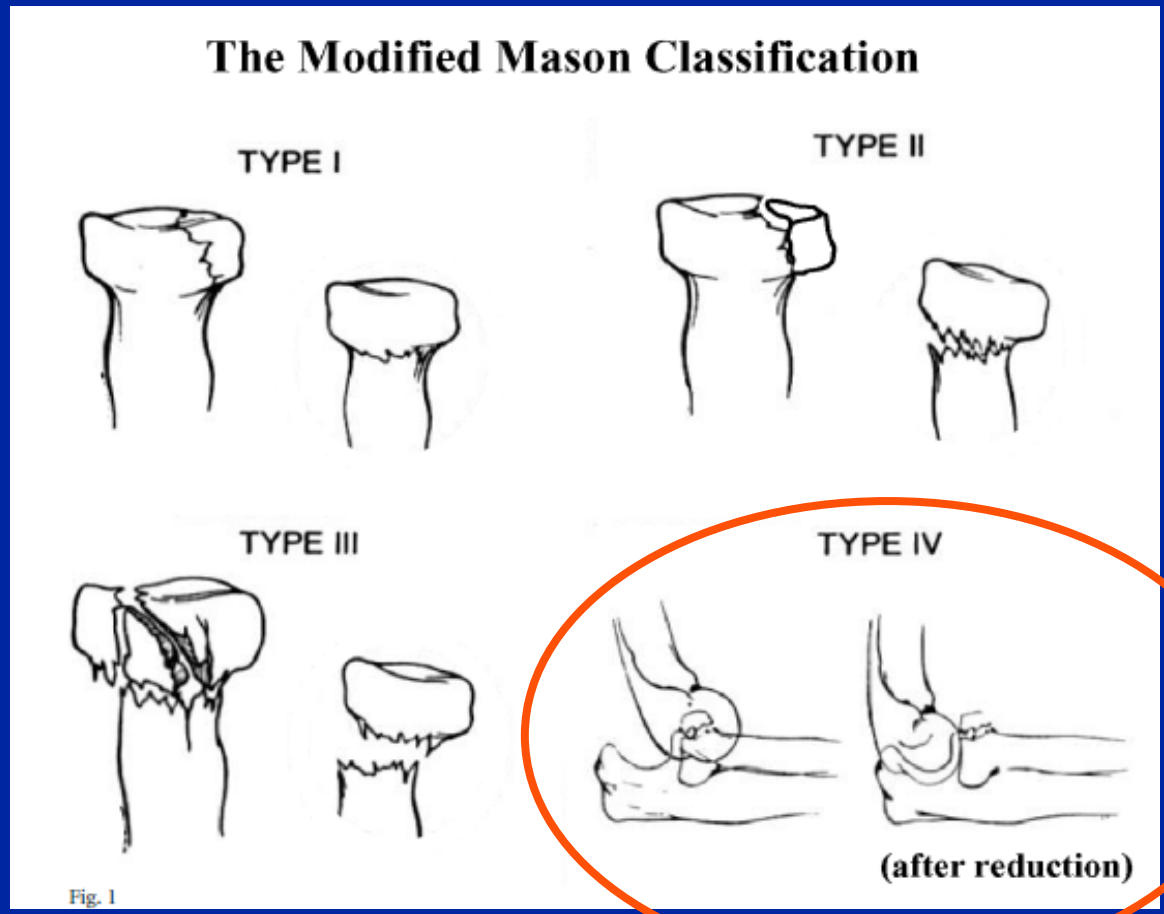
Mason ML, Br J Surg 42: 123, 1954
Brodberg MA and Morrey BF, JBJS 68A: 669, 1986

RADIAL HEAD FRACTURES TREATMENT

type I	→	conservative
type II	→	ORIF or excision
type III	→	excision or prosthesis

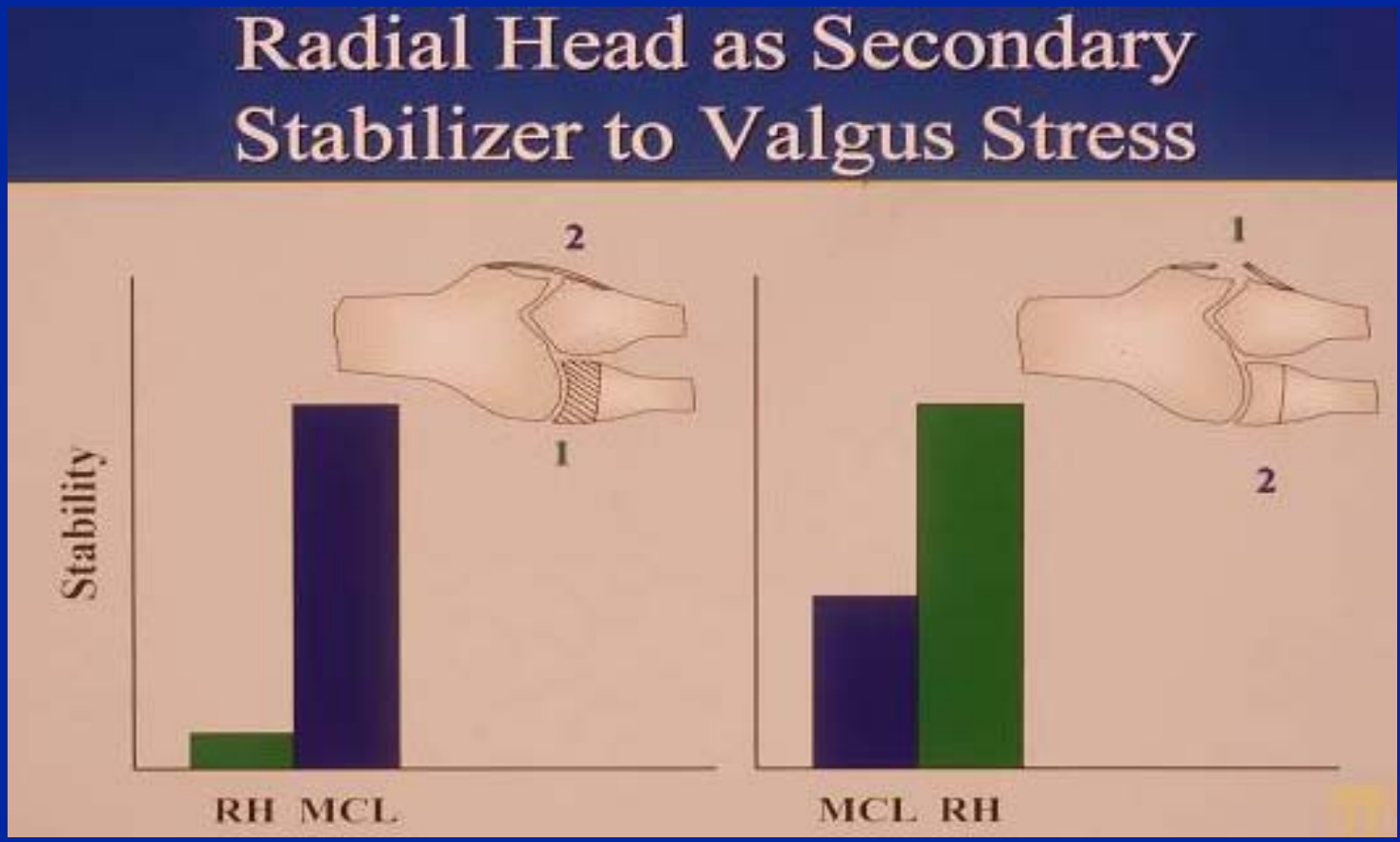
Rockwood and Green, Fractures in Adults: 940ff, 2001

RADIAL HEAD FRACTURES CLASSIFICATION



RADIAL HEAD SECONDARY STABILIZER

medial collateral ligament (MCL)



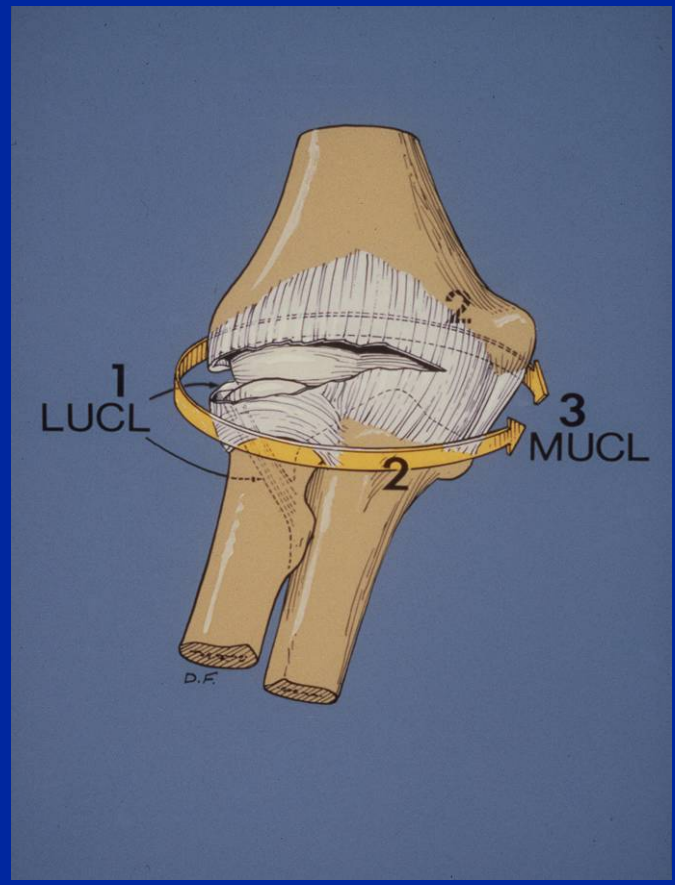
ELBOW DISLOCATION
SOFT TISSUE CONSTRAINTS

from lateral to medial:

1. LUCL

2. ant. + post. capsule

3. MUCL



RADIAL HEAD SECONDARY STABILIZER

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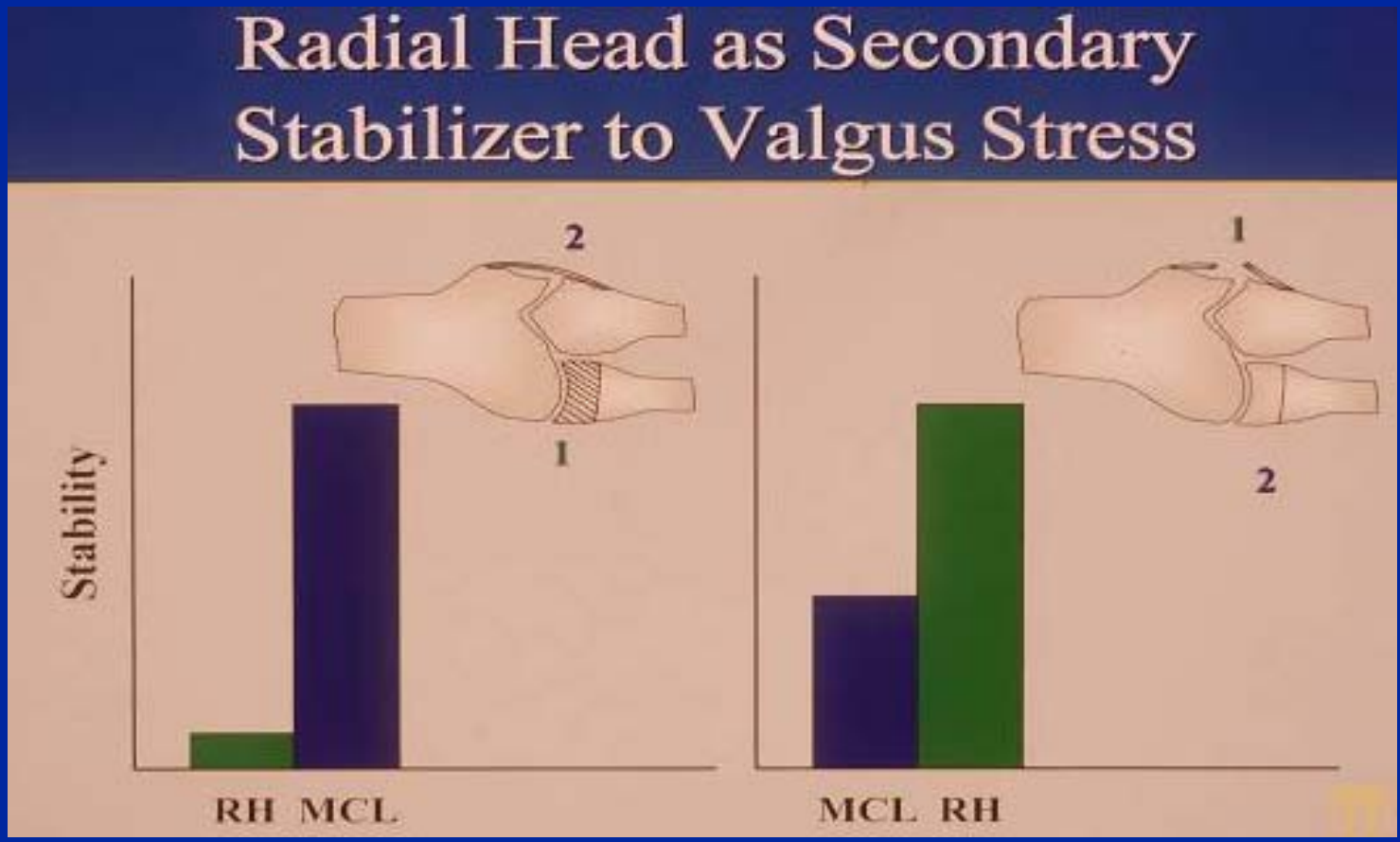


TYPE IV RADIAL HEAD FRACTURES TREATMENT

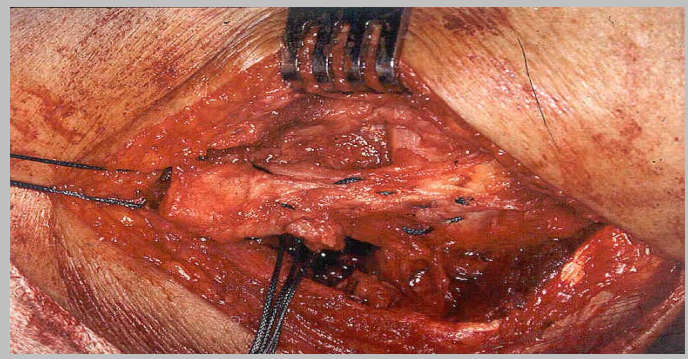
- leave
- resection, if <25% of radial head
- ORIF (screws, plates), screws preferred
- radial head prosthesis (metal, modular)
- (excision → hinged external fixator)

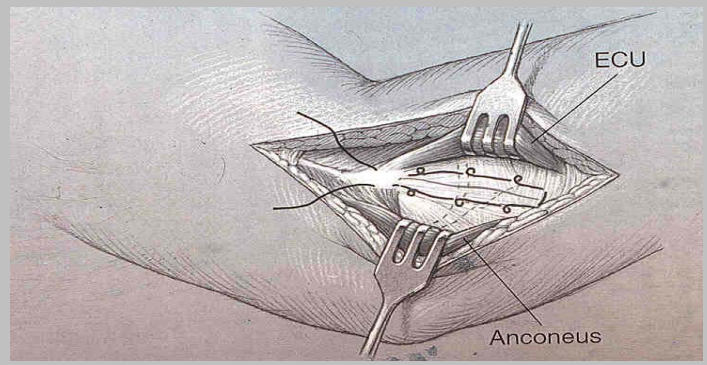
→ stable radial head or prosthesis

Ring D, JBJS 84A: 547, 2002
Zeiders GJ, JBJS 90-A: 75, 2008
DiPaola M, Hand Clin 24:39, 2008

COMPLEX DISLOCATION RADIAL HEAD FRACTURES

→ … and fix LUCL





Beingessner DM, JBJS 86A: 1730, 2004

COMPLEX DISLOCATION
TERRIBLE TRIAD

elbow dislocation

+ coronoid fracture

+ radial head fracture

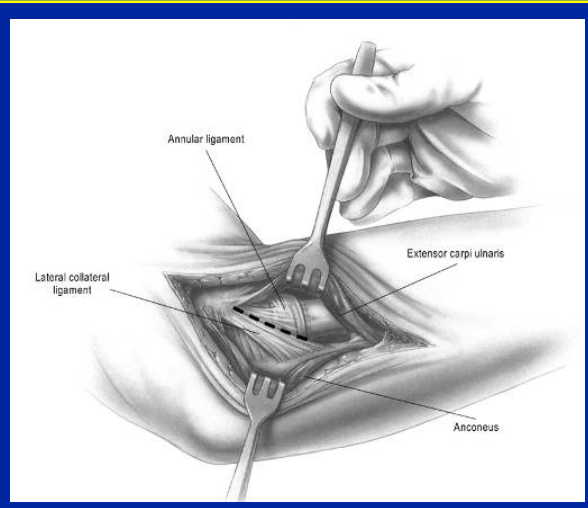
Hotchkiss NR. Rockwood and Green's fracture in adults: 929, 1996
Ring D, JBJS 84A: 547, 2002

COMPLEX DISLOCATION TREATMENT

- reduction under anesthesia
- testing of ulno-humeral stability
- CT before or after reduction
- repair of bony and soft tissue structures if necessary
- surgical approaches:
  - lateral (Kocher)
  - posterior (lateral and medial)
  - medial (muscle splitting)
- hinged brace or external fixateur for 6 weeks

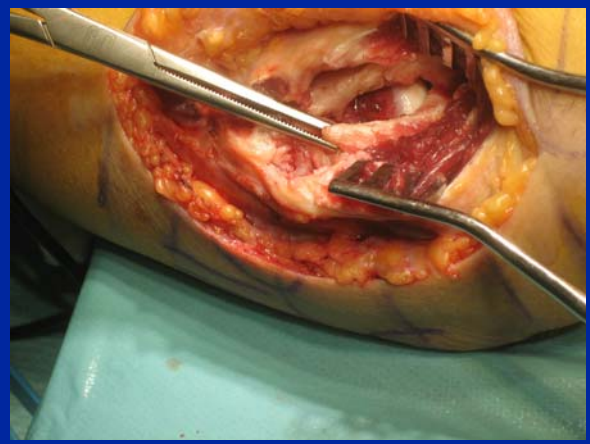
COMPLEX DILSOCATION SURGICAL APPROACHES

- lateral (Kocher)



(- posterior (lateral and medial))

(- medial (muscle splitting)**)



** Smith GR, AJSM 24:575, 1996
Jobe FW, JBJS Am 68: 1156, 1986

COMPLEX DISLOCATION
POSTOPERATIVE BRACE OR EXT FIX

- immobilization: never longer than 3 weeks !*
- wrist in pronation (protection of LUCL)
- brace extension stop at 30° for 6 weeks

* Melhoff TL, JBJS, 70-A: 244, 1988

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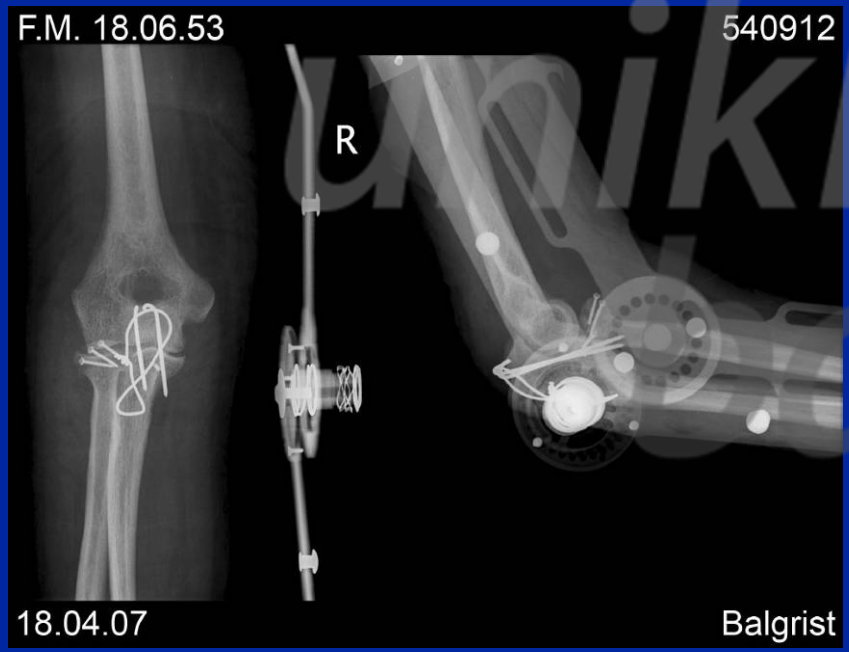
COMPLEX DISLOCATION
TERRIBLE TRIAD + OLECRANON FX

COMPLEX DISLOCATION
TERRIBLE TRIAD + OLECRANON FX



COMPLEX DISLOCATION
TERRIBLE TRIAD + OLECRANON FX

COMPLEX DISLOCATION
COMMINUTED RADIAL HEAD FX

COMPLEX DISLOCATION
COMMINUTED RADIAL HEAD FX

COMPLEX DISLOCATION
COMMINUTED RADIAL HEAD FX

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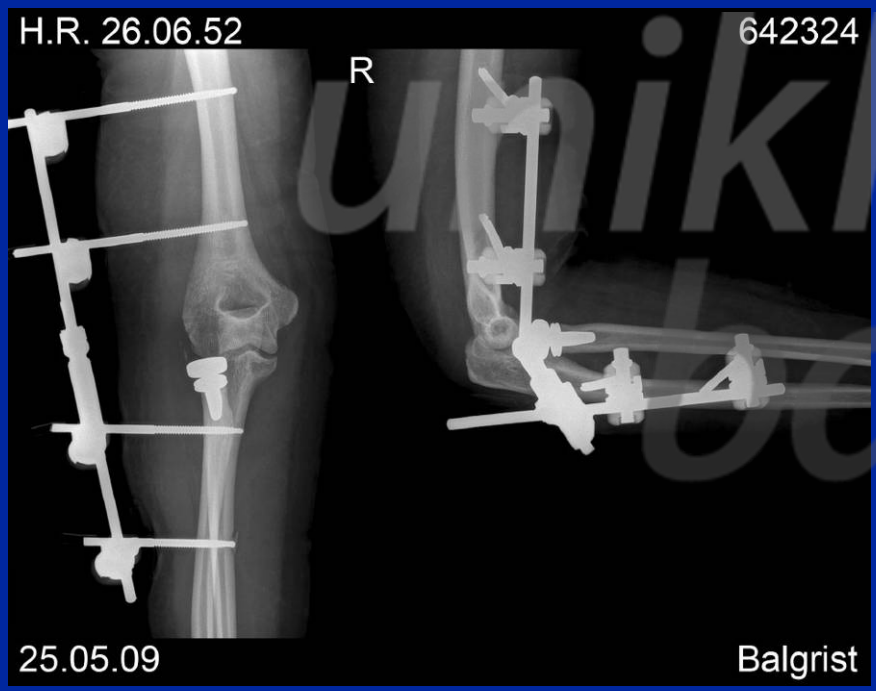
COMPLEX DISLOCATION
5 WEEKS OLD

COMPLEX DISLOCATION
HINGED EXTERNAL FIXATOR



COMPLEX ELBOW DISLOCATION WITH RADIAL HEAD FRACTURE

- treat the radial head fx like without any dislocation, but never resect it

- at the end you need a stable lateral column
  → stable radial head or prosthesis

- if there is not you need a (hinged) external fixator

- if you are there then repair the LUCL

- initial stability comes before everything else

- when healed and stable head resection is well tolerated later

THANK YOU

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ELBOW INSTABILITY

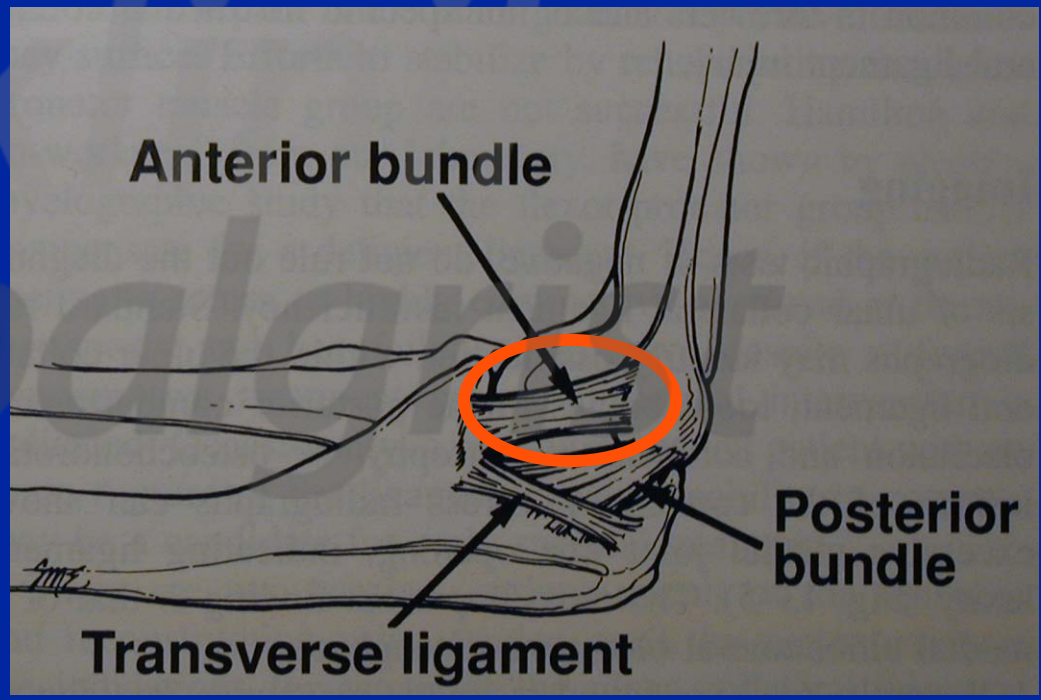
- acute (dislocation) : simple
  complex
- subacute / recurrent : medial (valgus)
  lateral (varus)

VALGUS INSTABILITY
MEDIAL COLLATERAL LIGAMENT

anatomy MCL:

- 3 parts
- ant. part (MUCL)

→ major stabilizer



VALGUS INSTABILITY ETIOLOGY

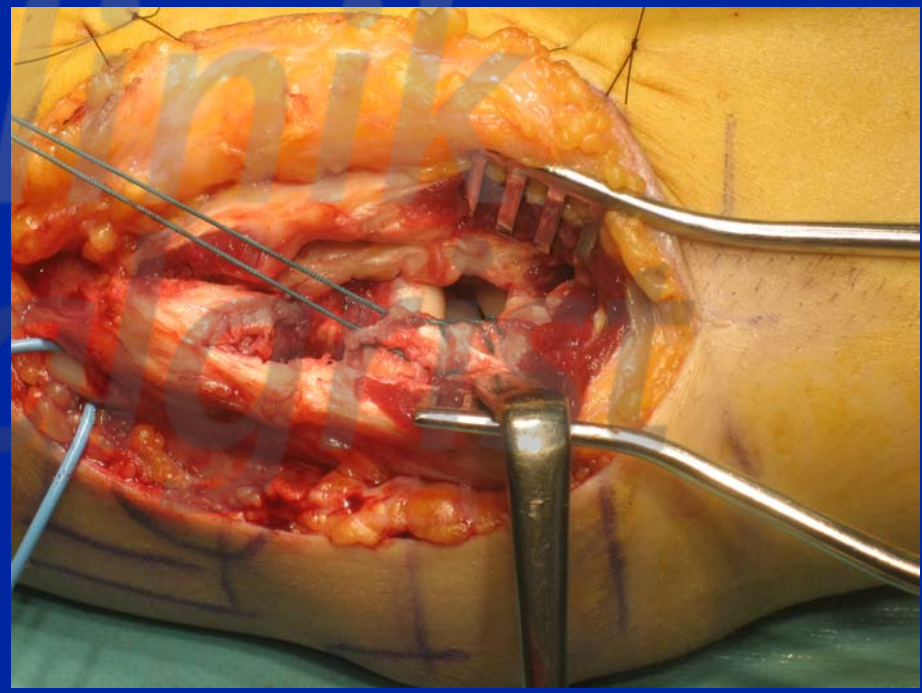
- following dislocation
- repetitive valgus stress
- throwing sports
- iatrogenic

PRIMARY MCL REPAIR

- transosseous repair

- suture anchors

- no graft reconstruction

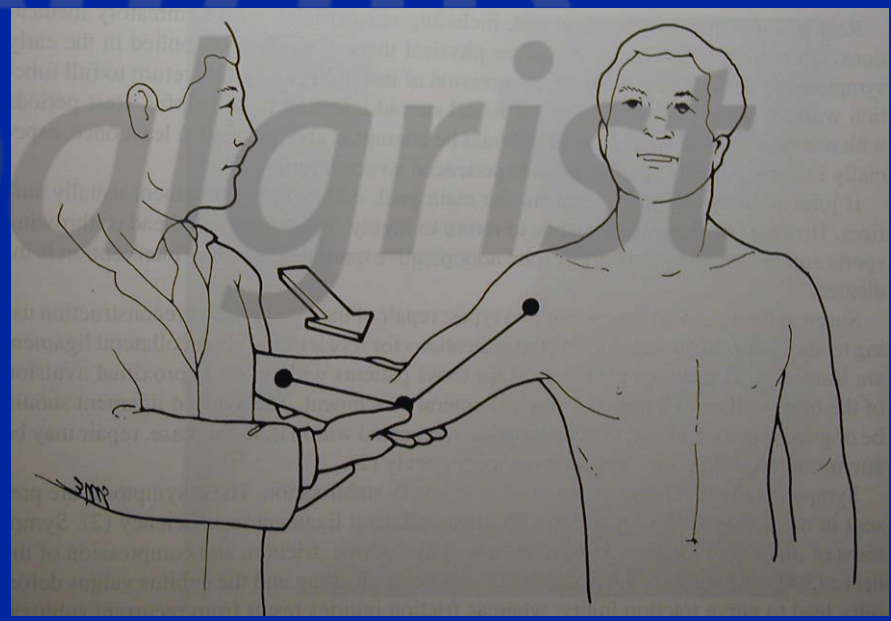


VALGUS INSTABILITY DIAGNOSIS

valgus stress test (supination, ~30° flexion)

→ laxity, medial opening

→ diffuse medial pain / tenderness



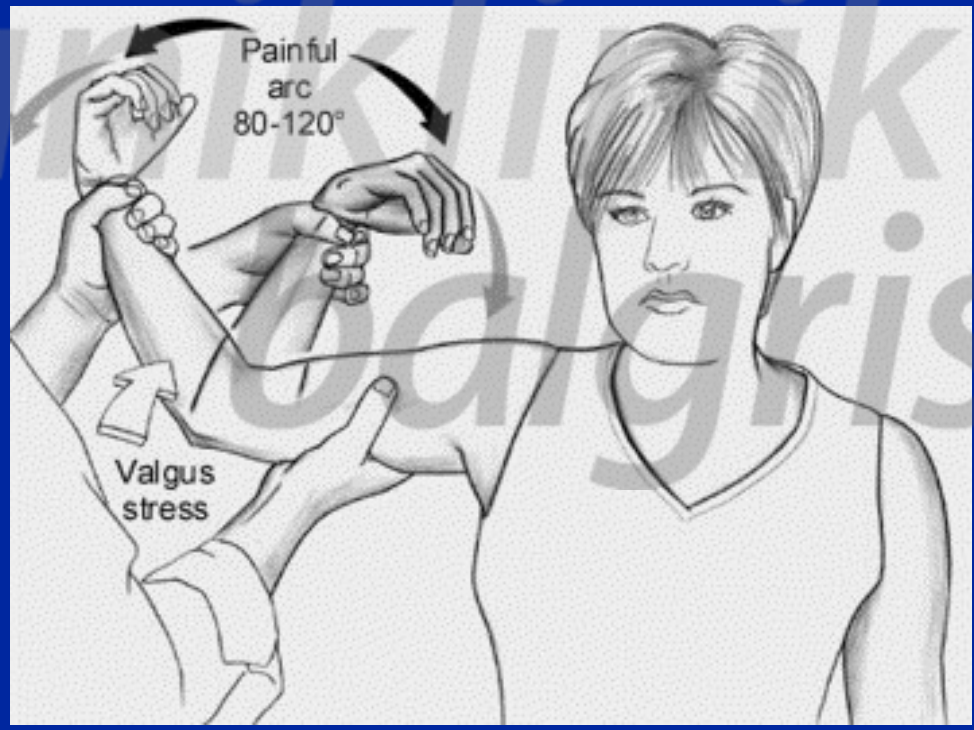
VALGUS INSTABILITY DIAGNOSIS

Milking maneuver

Veltri DM, AAOS, 1994

VALGUS INSTABILITY DIAGNOSIS

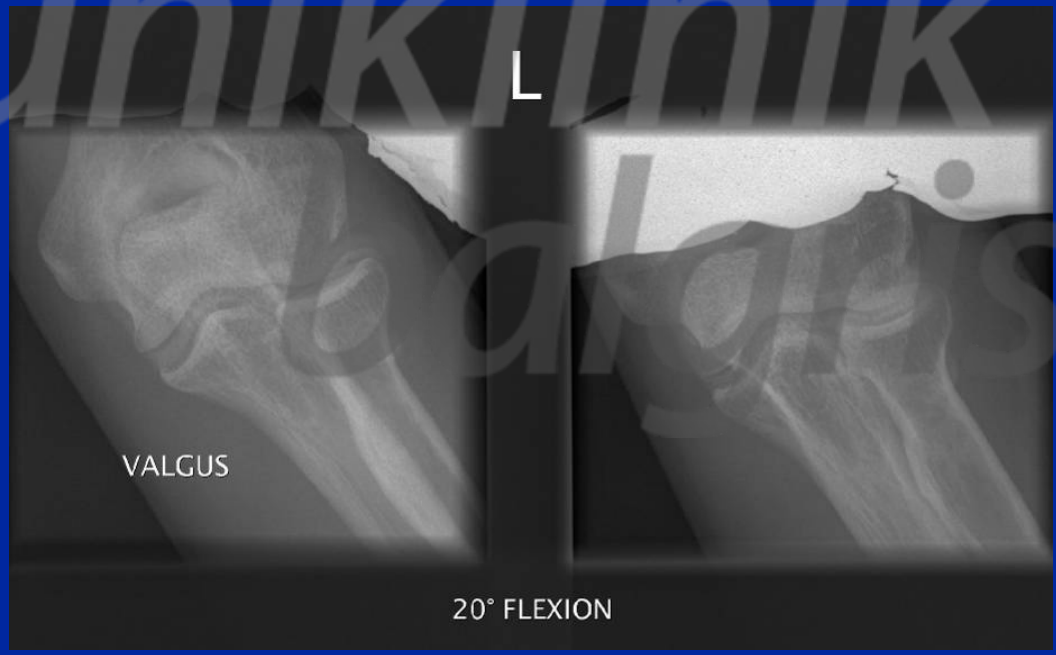
“moving valgus stress test”



O’Drsicoll SW, AJSM 33: 231, 2005

VALGUS INSTABILITY
X-RAYS

- X-rays: medial ulnohumeral olecranon osteophyte*
- valgus stress X-rays: excessive medial opening (>2mm)**



*Andrews JR, AJSM 23: 407, 1995

**Thompson WH, JSES 10: 152, 2001

VALGUS INSTABILITY
MRI

useful in complete acute and chronic tears*

→ but caution in partial tears**

*Kaplan LJ, Magn Reson Imaging Clin N Am 21: 221, 2004

**Munshi M, Radiology 231:797, 2004

VALGUS INSTABILITY SURGICAL TREATMENT

MCL repair

versus

MCL reconstruction with tendon graft

VALGUS INSTABILITY SURGICAL TREATMENT

MCL repair

versus

MCL reconstruction with tendon graft
(e.g. palmaris longus)

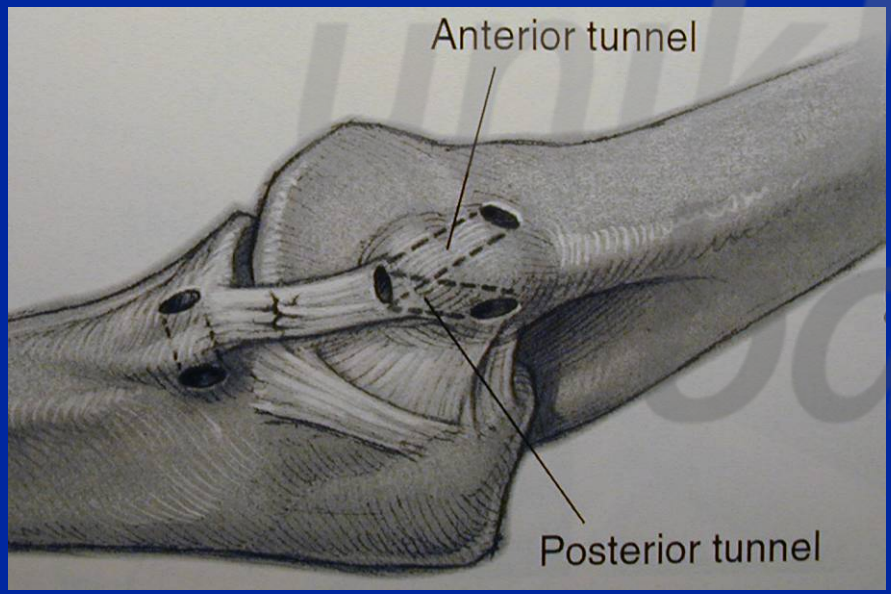
Jobe FW, JBJS Am 68: 1156, 1986

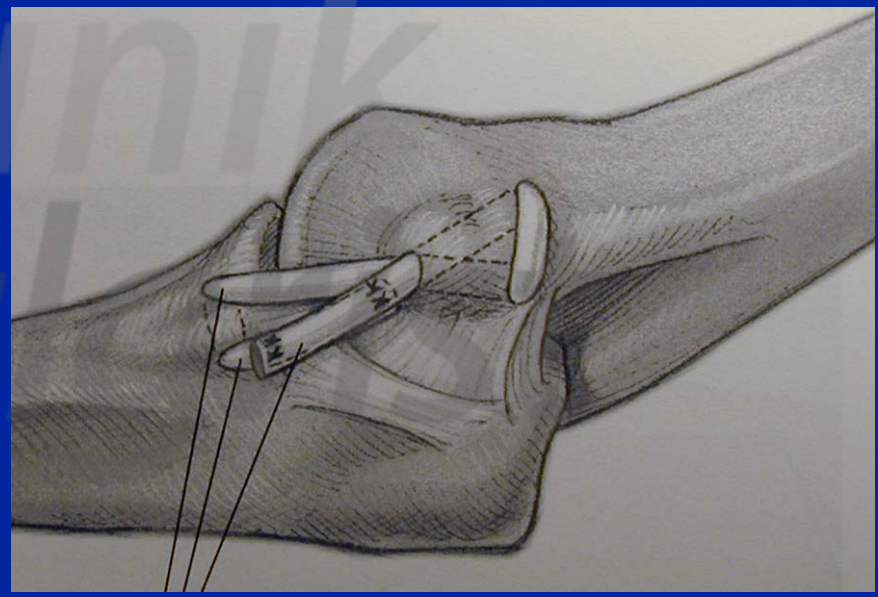
Conway JE, JBJS Am 74: 67, 1992

Azar FM, AJSM 28: 16, 2000

VALGUS INSTABILITY SURGICAL TECHNIQUE

reconstruction with tendon graft trough bone tunnels

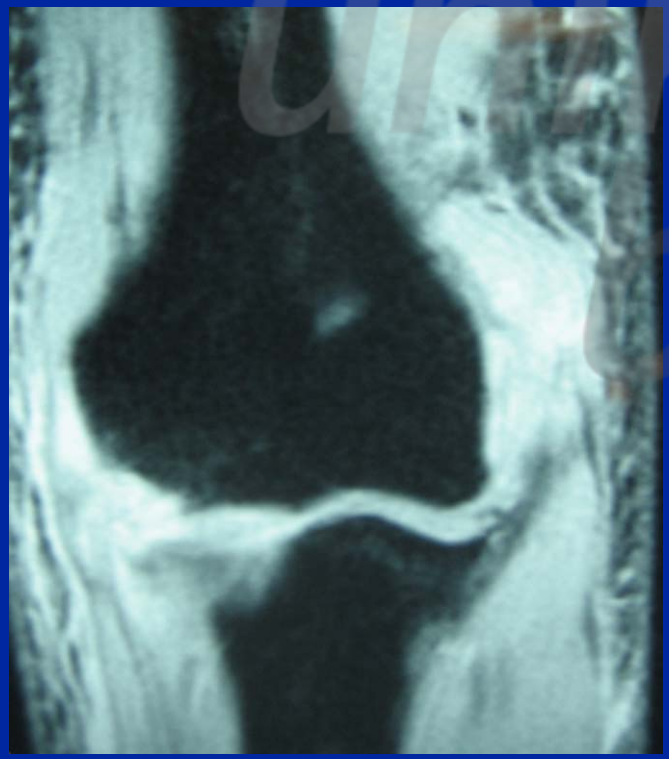


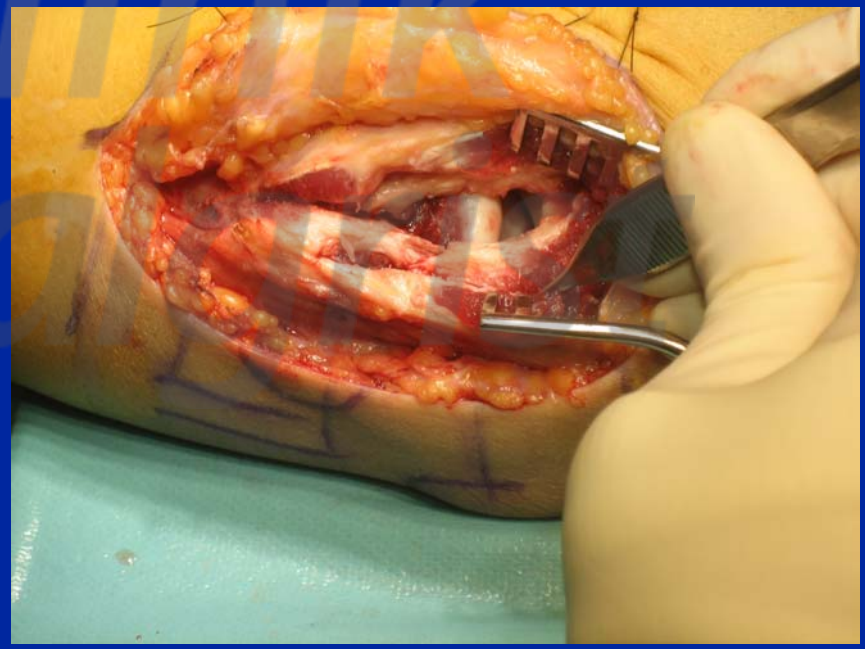


Jobe FW, JBJS Am 68: 1156, 1986
Morrey BF, Master Techniques: Elbow, 1994

MCL RECONSTRUCTION

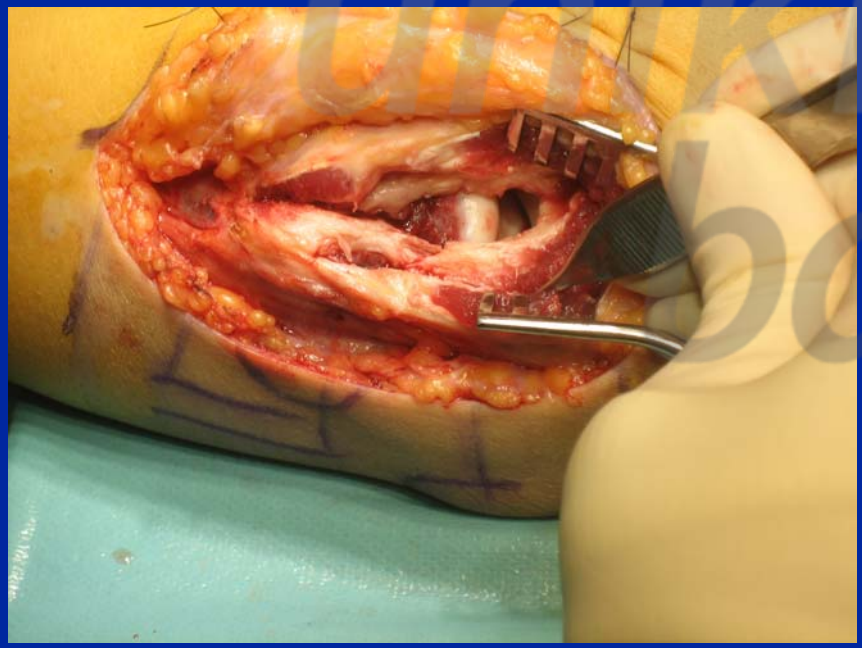
- curved incision over the medial epicondyle
- protect antebrachial cutaneous nerve

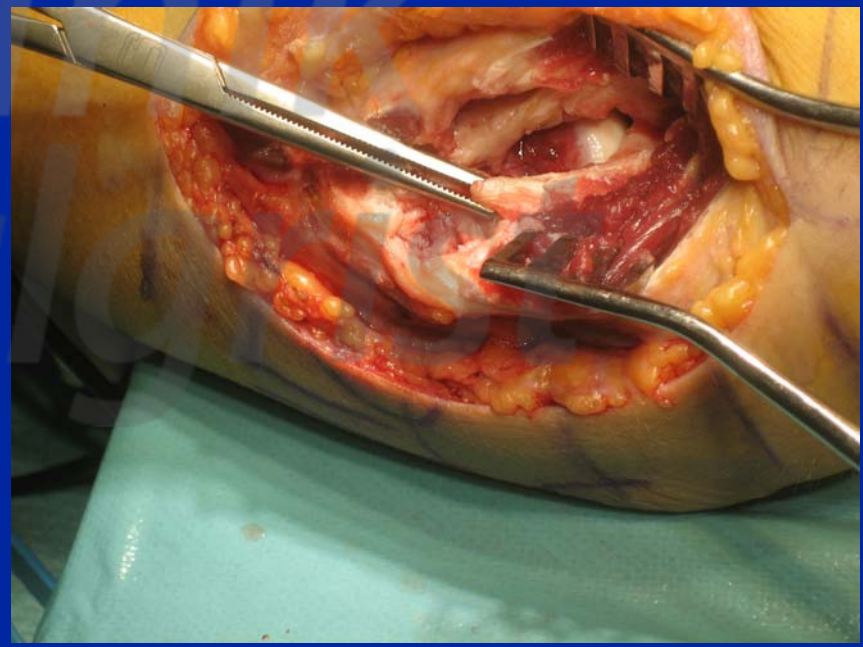




MCL RECONSTRUCTION

- muscle-splitting approach*
  (decrease of ulnar nerve problems <21%**)

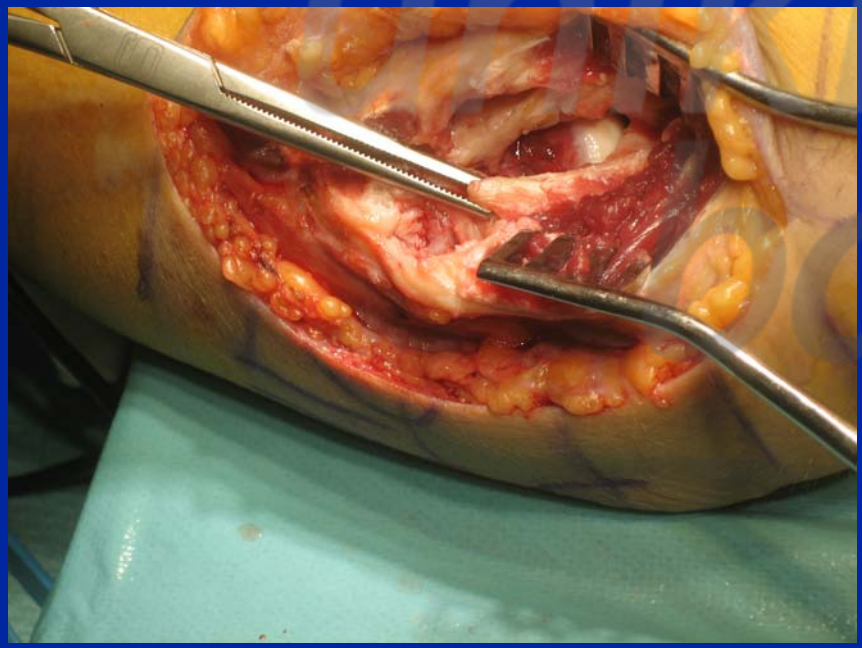


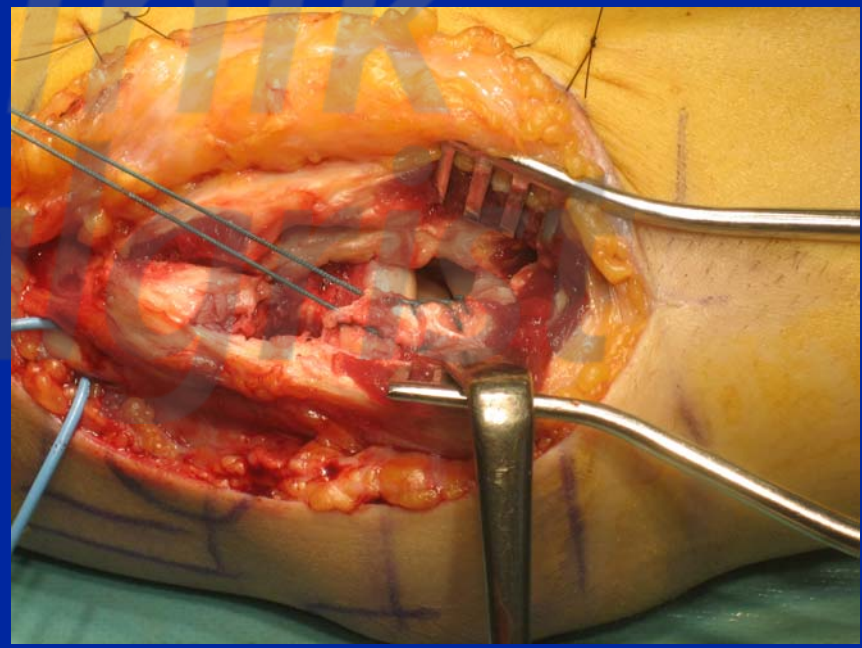


*Smith GR, AJSM 24:575, 1996
**Jobe FW, JBJS Am 68: 1156, 1986

MCL RECONSTRUCTION

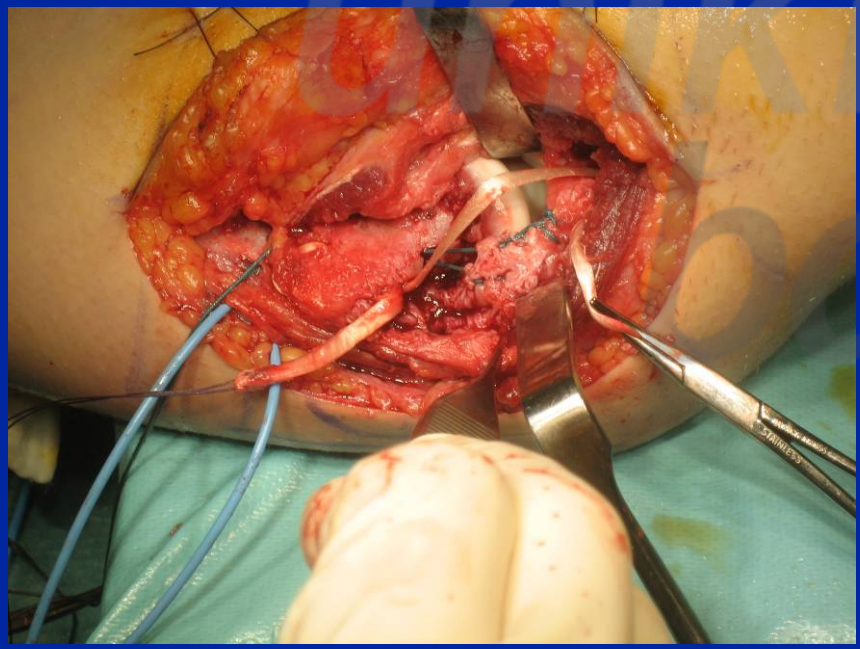
- ulnar nerve identified, no transposition
- repair of the MCL

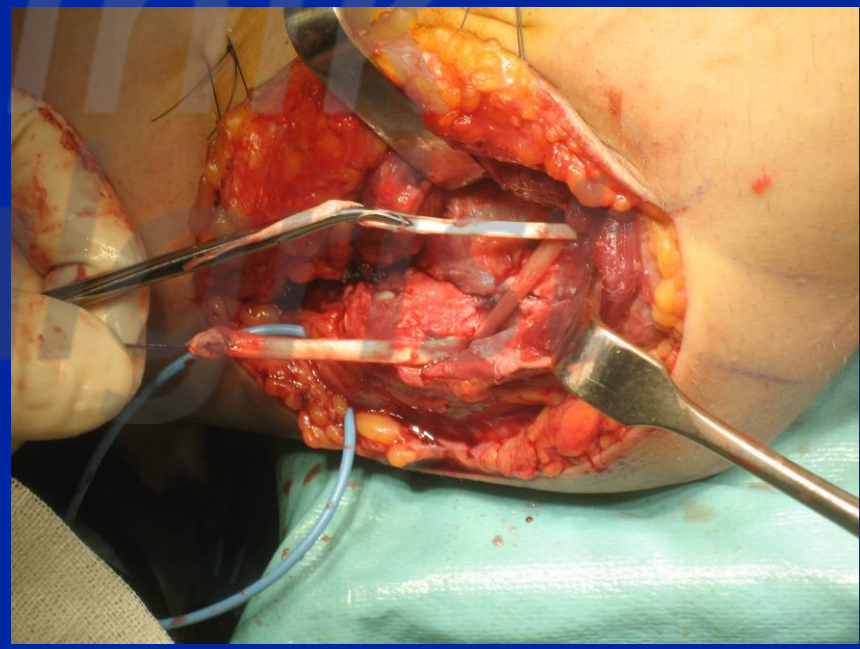




MCL RECONSTRUCTION

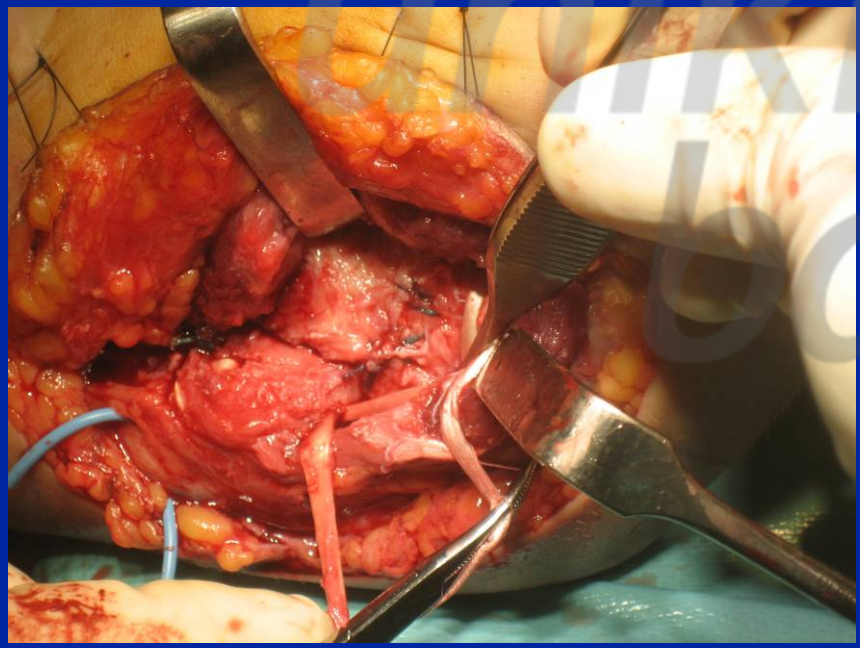
- palmaris longus graft trough bone tunnels
  in ulna and medial epicondyle

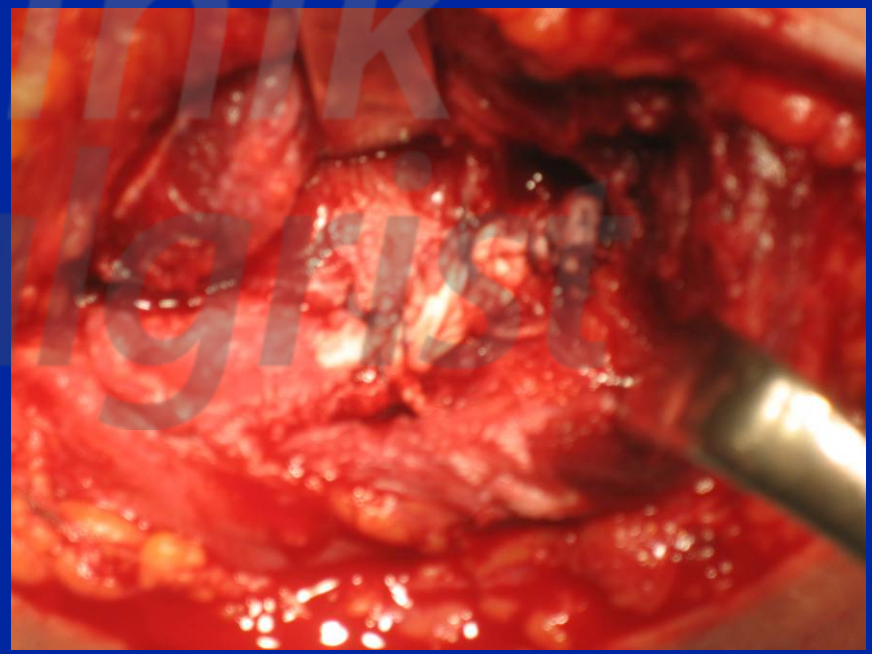




MCL RECONSTRUCTION

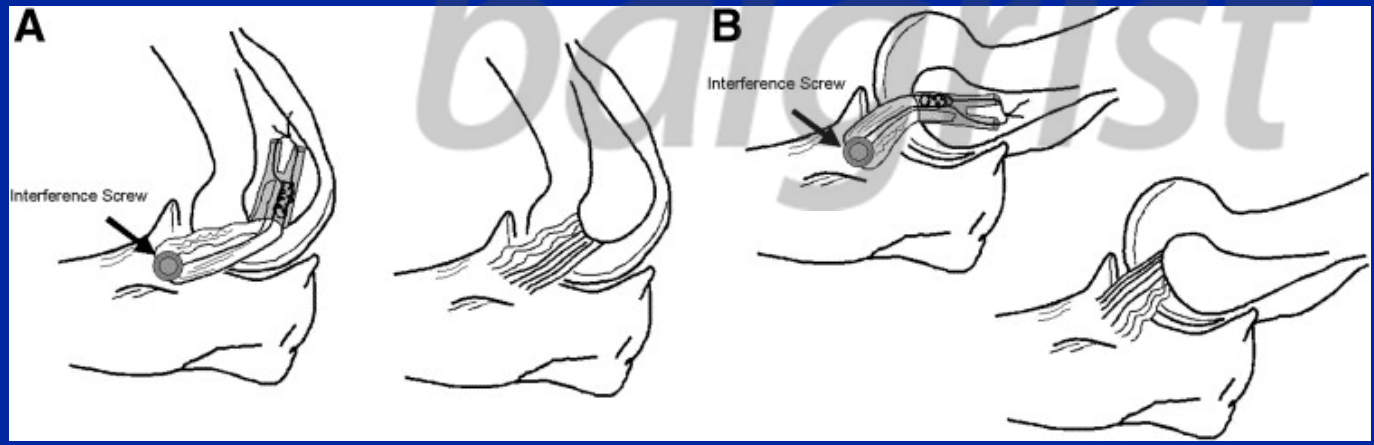
- tightening MCL repair
- tightening graft





MCL RECONSTRUCTION OTHER TECHNIQUES

- different bone tunnels
- suture anchors
- inference screws
- hybrid technique



Safran M, Arthroscopy 21: 1381, 2005

POSTOPERATIVE REHABILITATION

- hinged splint	6 w
- in plane flex strength	6 w
- no valgus or varus stress	12 w
- progressive activity	6 w - 9 m
- full recovery	9 m - 12 m

MCL RECONSTRUCTION RESULTS OF ATHLETES

79% - 97% return to their sport

~80% to the same level

Safran M, Arthroscopy 21: 1381, 2005

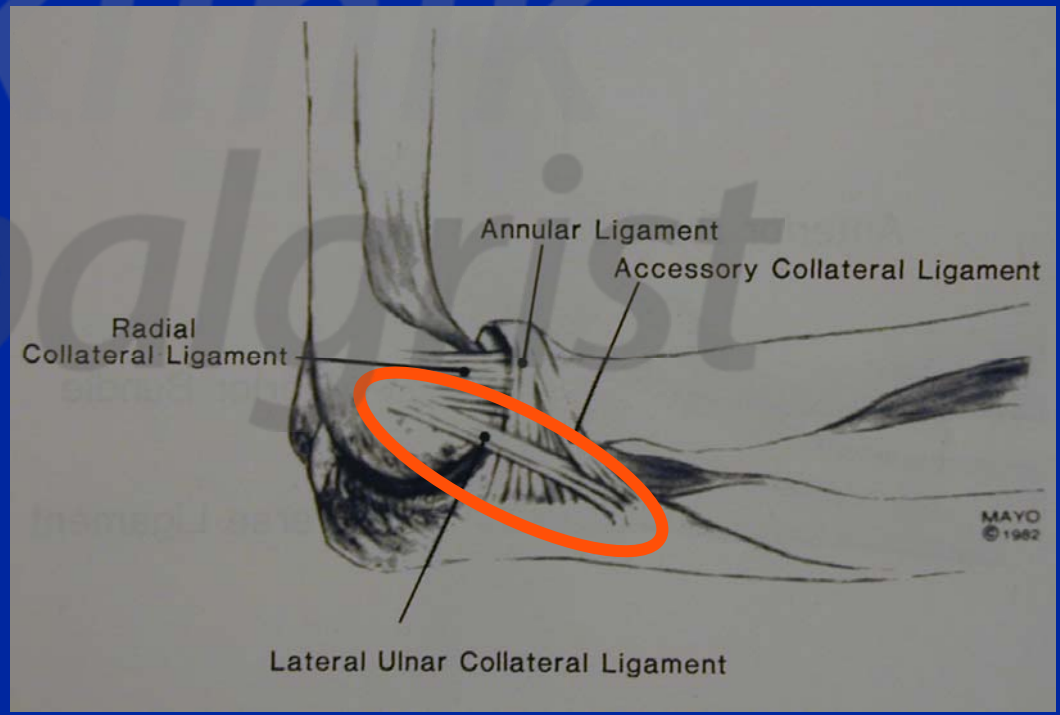
VARUS INSTABILITY
LAT. ULNAR COLL. LIGAMENT (LUCL)

→ = posterolateral rotatory instability

anatomy LCL:

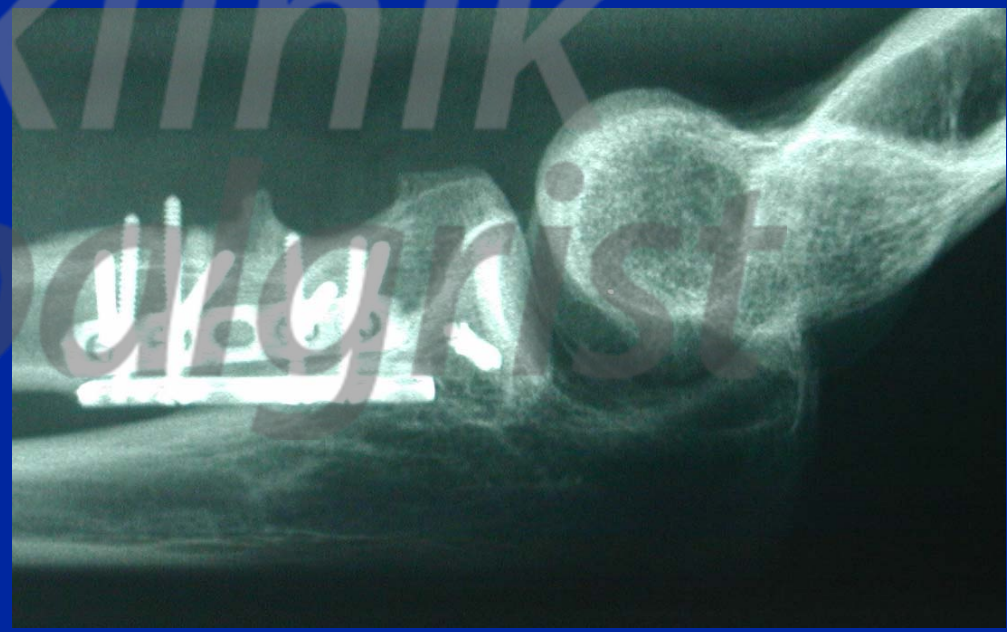
- 3 parts
- LUCL

→ major stabilizer



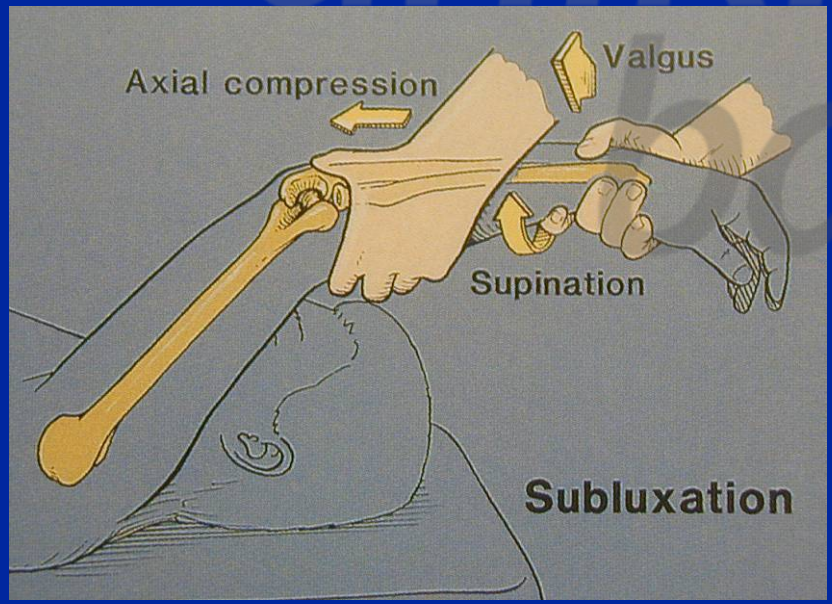
POST.LAT. ROTATORY INSTABILITY ETIOLOGY

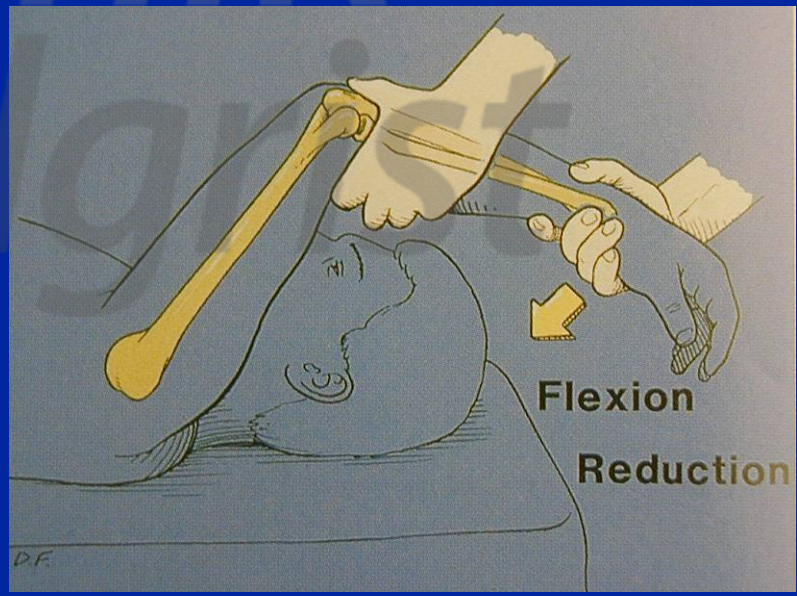
- dislocation
- varus stress
- iatrogenic



POST.LAT. ROTATORY INSTABILITY DIAGNOSIS

pivot-shift test: → **“clunk”**
→ **lateral pain**





POST.LAT. ROTATORY INSTABILITY DIAGNOSIS

stress x-rays: → **pivot shift**

→ **varus stress**

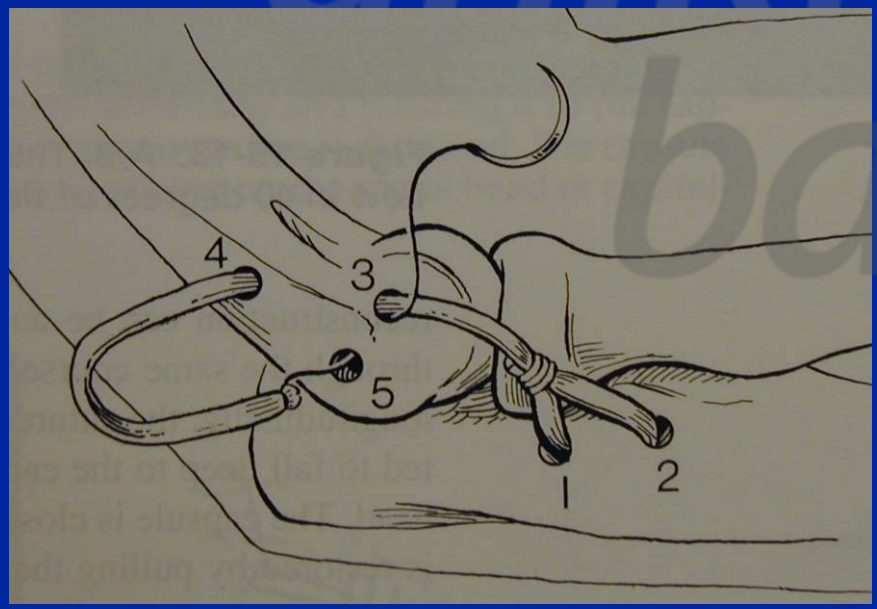
LAT. ULNAR COLL. LIGAMENT (LUCL) MRI

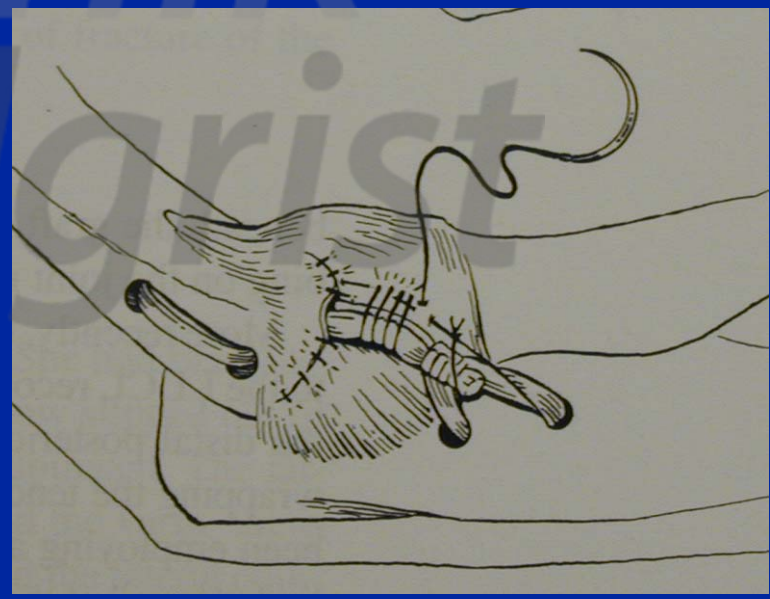
- accurate in detecting a ligament pathology*
- 50% signal intensity in asymptomatic**

*Potter HG, Radiology 204: 185, 1997
**Terada N, JSES 13: 214, 2004

POST.LAT. ROTATORY INSTABILITY TREATMENT

- acute: transosseous repair
- reconstruction with tendon graft
  → (e.g. palmaris longus)





Morrey BF, Master Techniques: Elbow, 1994

POST.LAT. ROTATORY INSTABILITY REHABILITATION

- hinged splint:	30° stop	3 - 4 w
	full ext	6 - 8 w
- ADL		3 m
- full recovery		6 - 12 m

POST.LAT. ROTATORY INSTABILITY RECONSTRUCTION

- stability restored 90%

- excellent 60%

- complaints assoc. with previous surgery

Morrey BF, Master Techniques: Elbow, 1994

THANK YOU

uniklinik balgrist

SIMPLE DISLOCATION TREATMENT LOGIC

→ immobilization: never longer than 3 w !*

- if stable: 3-5 d

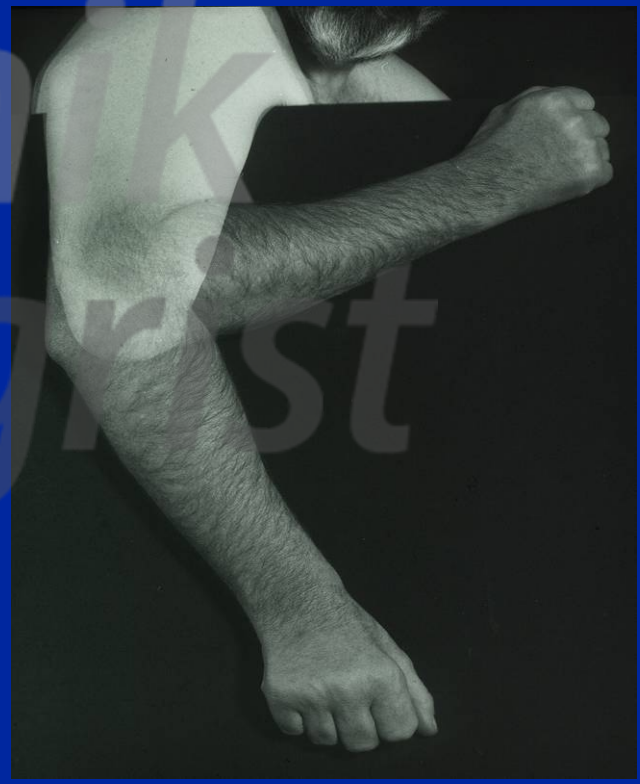
- if unstable: 10-14 d
  - define save arc
  - brace (ext. stop, 30°)

* Melhoff TL, JBJS, 70-A: 244, 1988

SIMPLE DISLOCATION TREATMENT LOGIC

→ not all do well

	%
- motion loss >30°	15
- pain	15
- recurrence	1-2



Morrey BF, The Elbow and Its Disorders, 2000