

SMILE

Symptomatic minor instability of the lateral elbow

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Financial Disclosure



Royalties - Adler Ortho, ITALY

Consultancy - Arthrex inc, USA

Partner – BeeMed



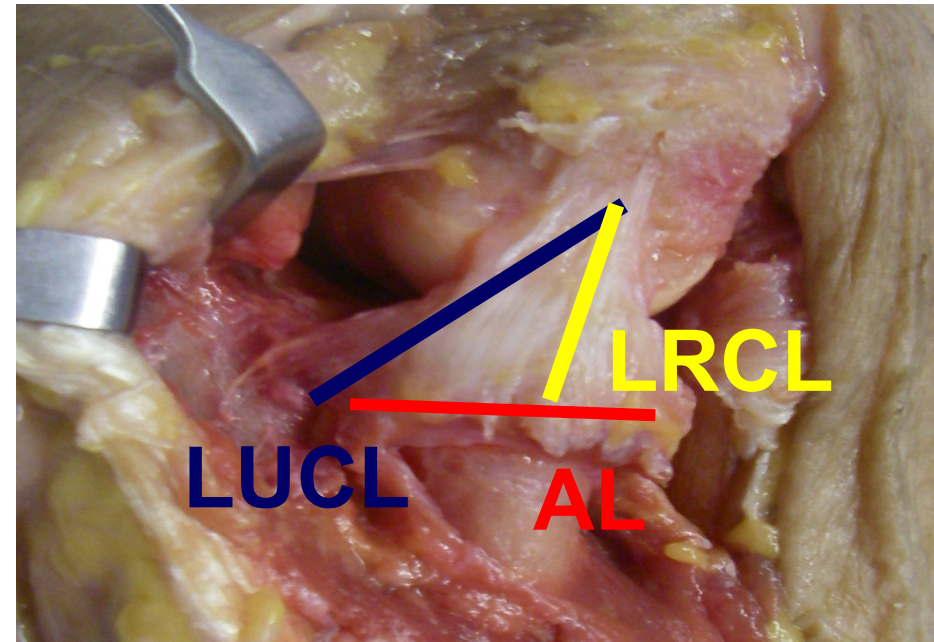
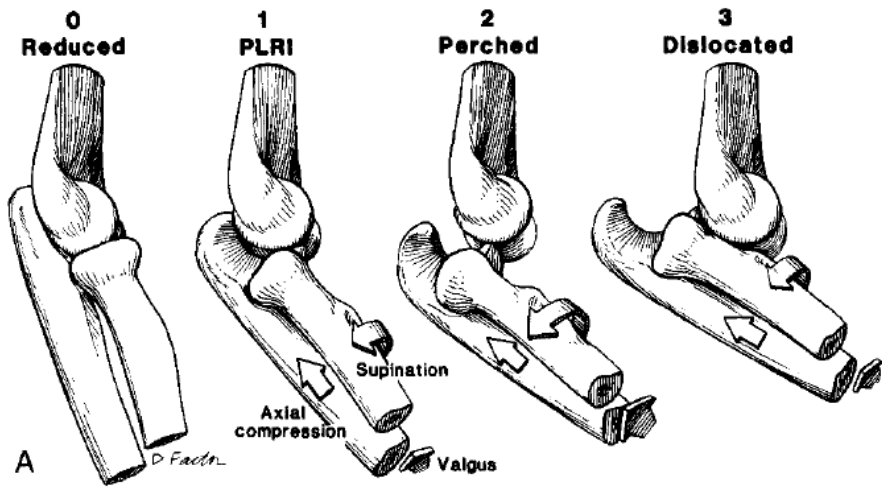
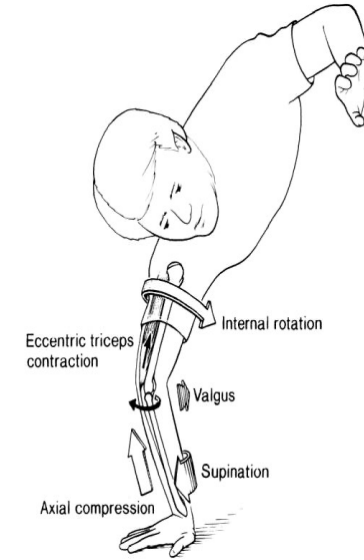


Acute – Traumatic

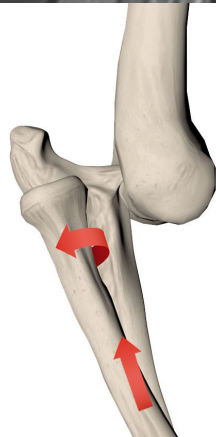
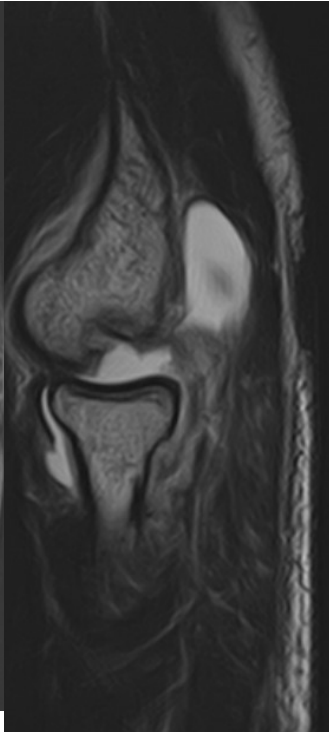
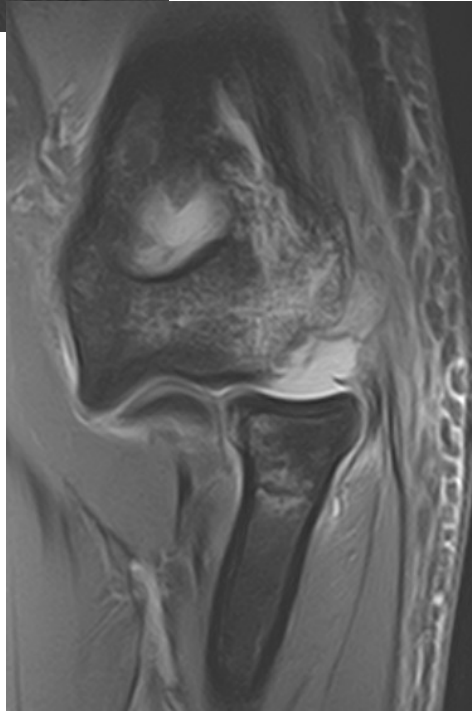
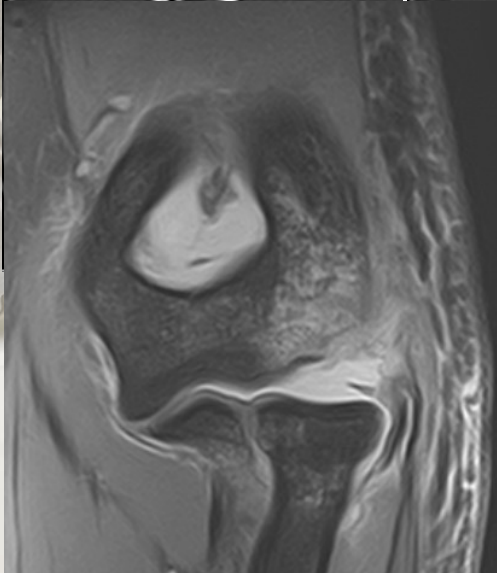
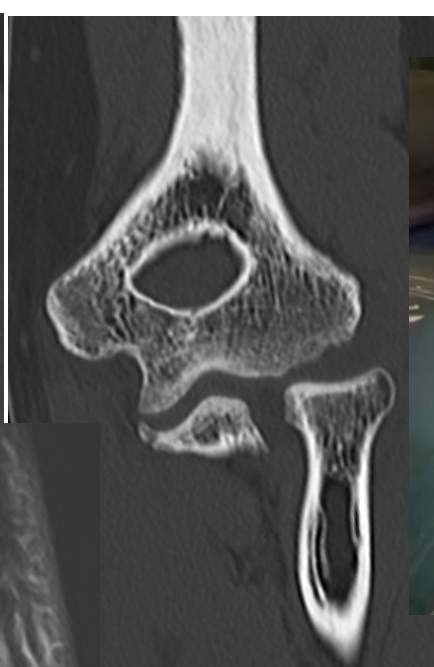
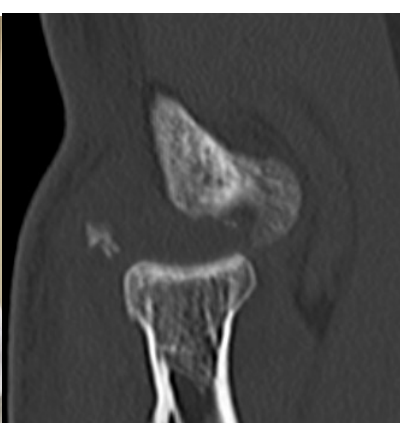
**Postero Lateral Rotatory
Instability**

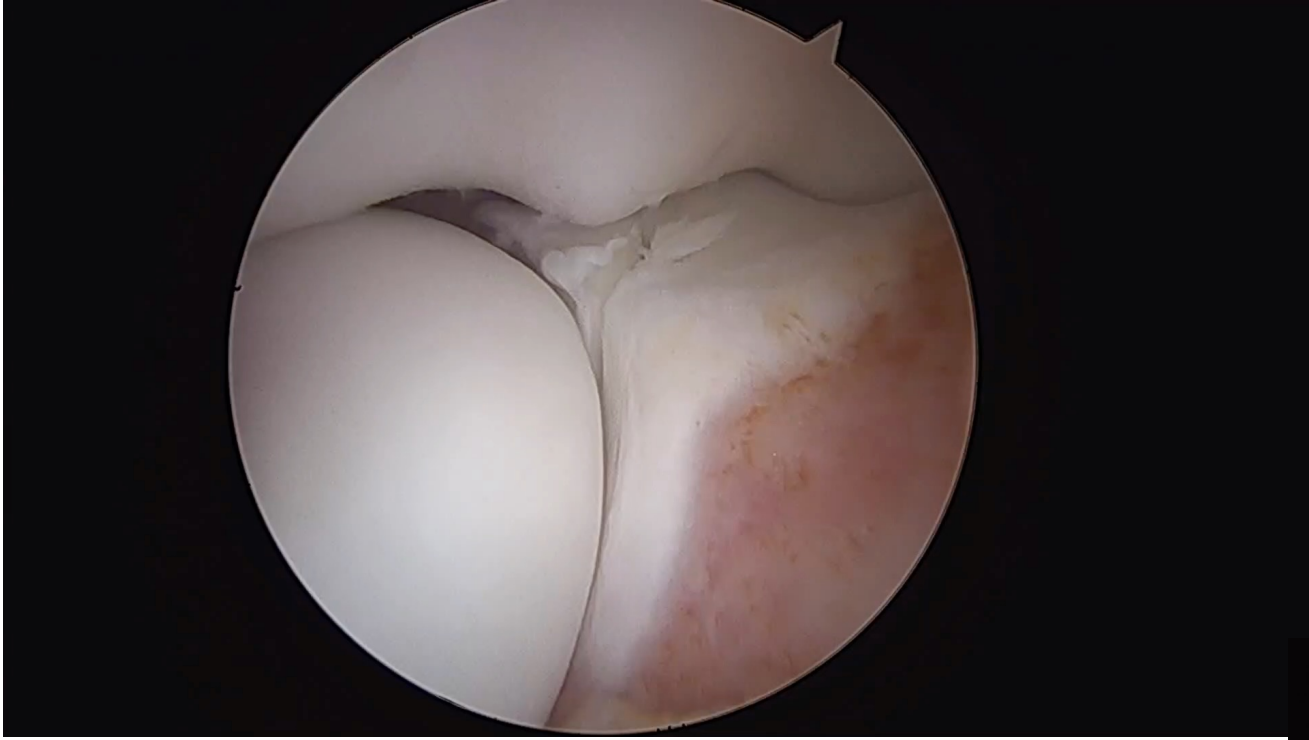
Compression - valgus stress - supination

Singleton 2004 – O' driscoll 2000



LCL avulsion from capitulum humeri (52%)

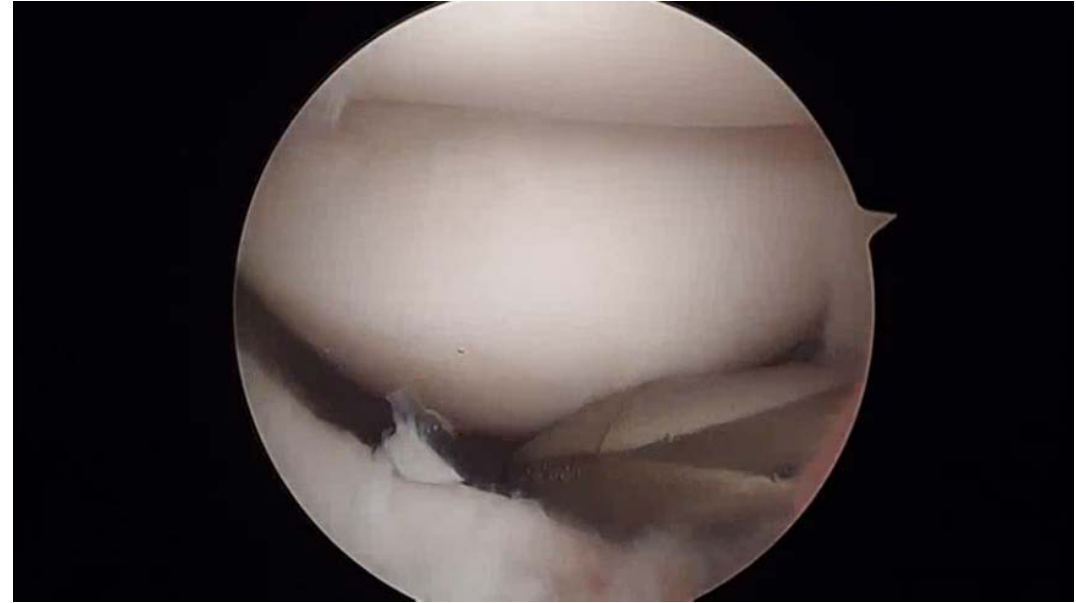




Minor Atraumatic Lateral Elbow Pain and Instability

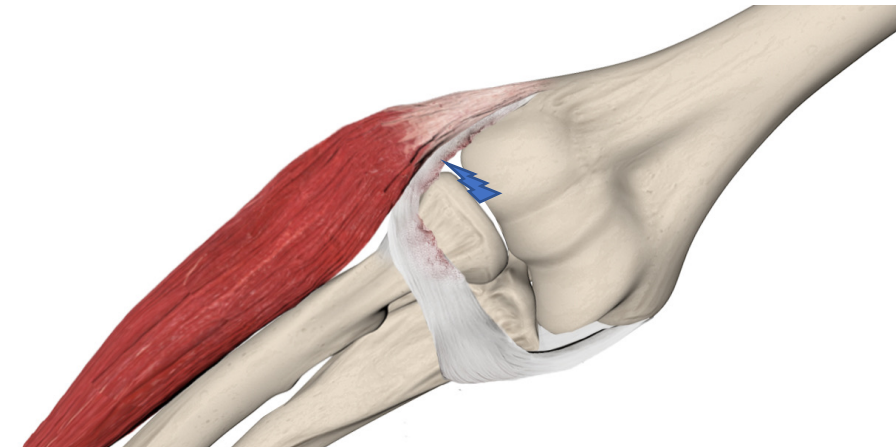
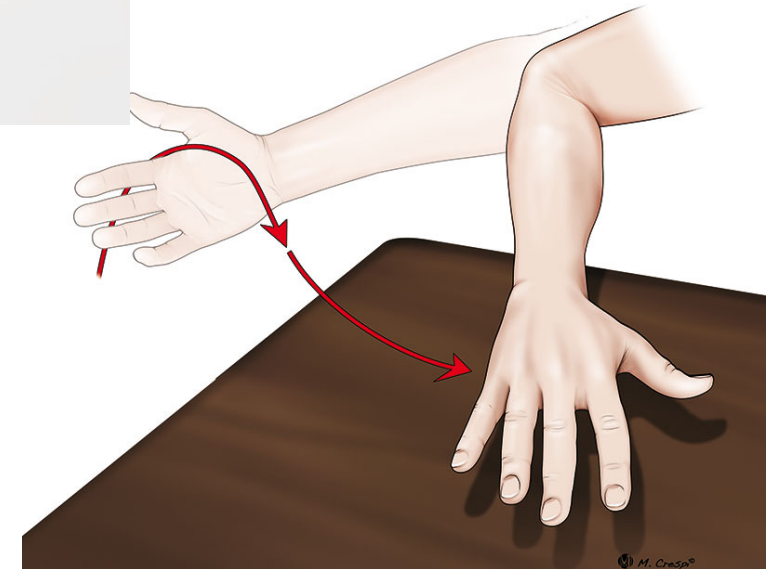
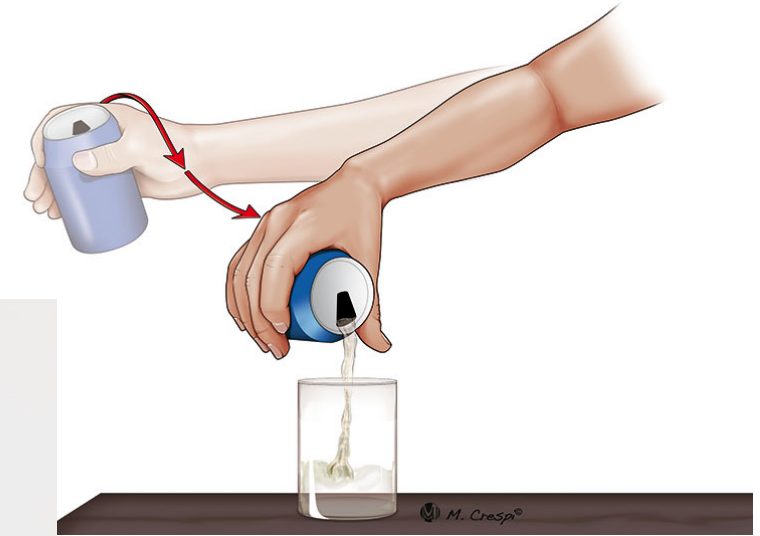
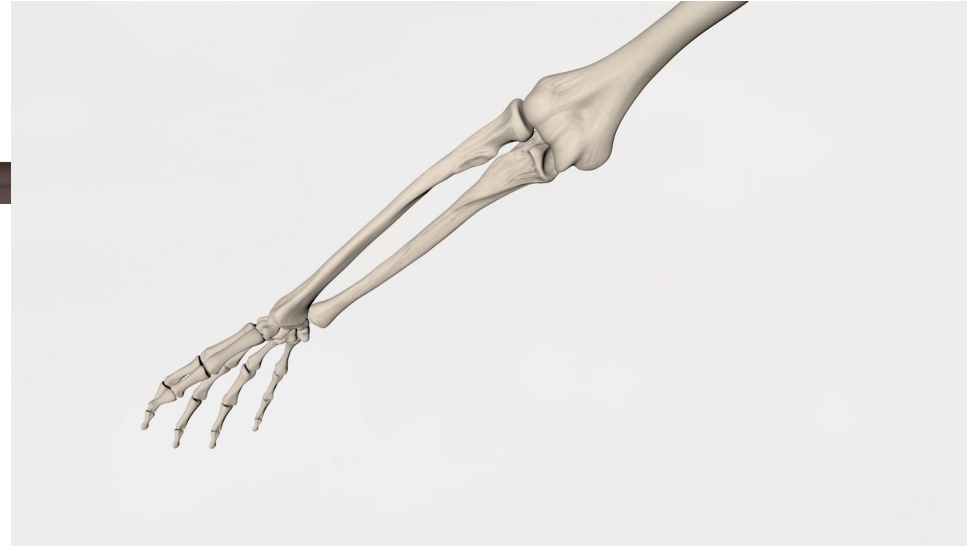
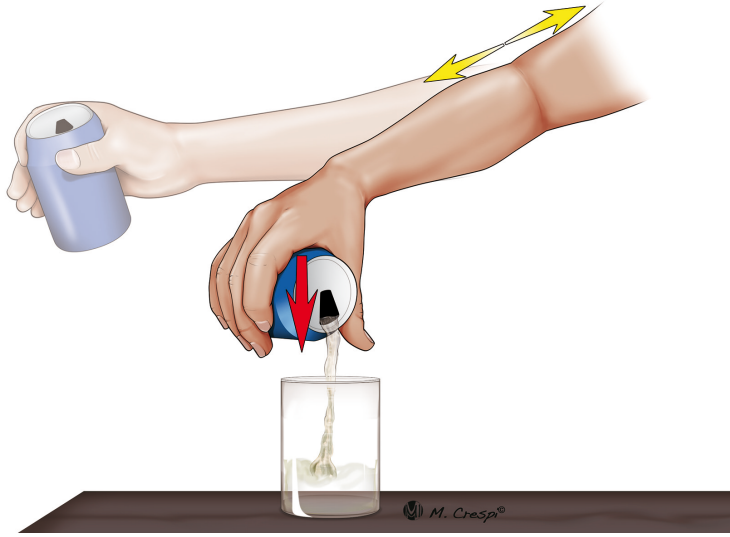


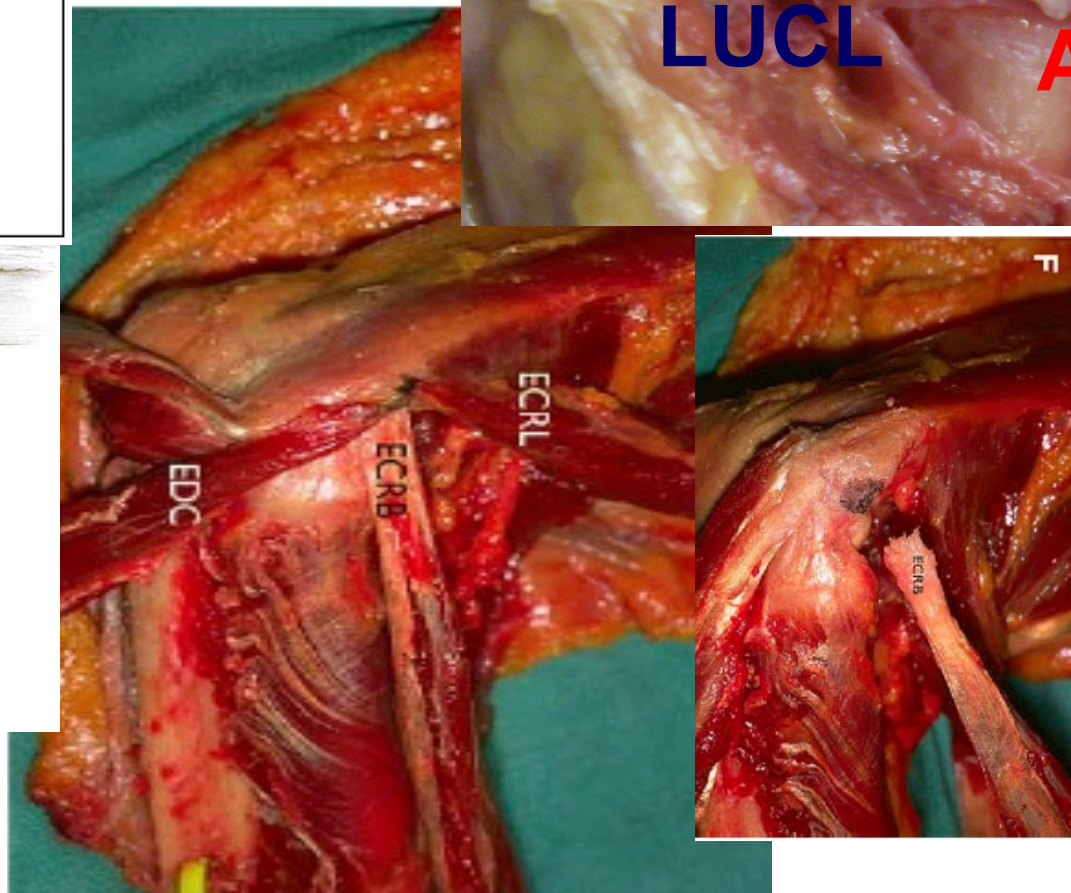
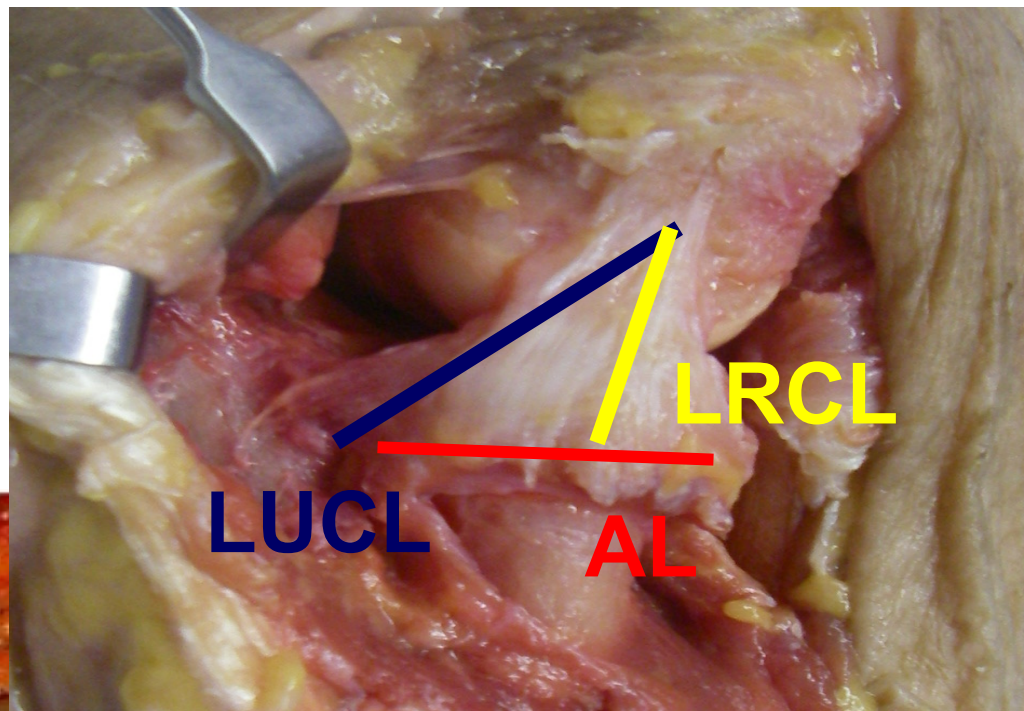
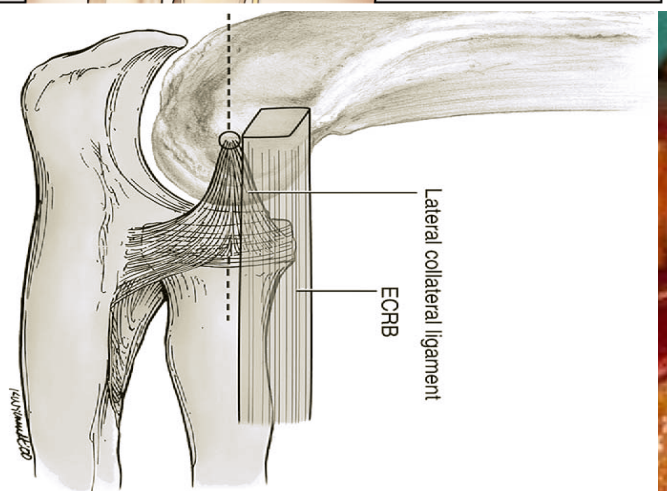
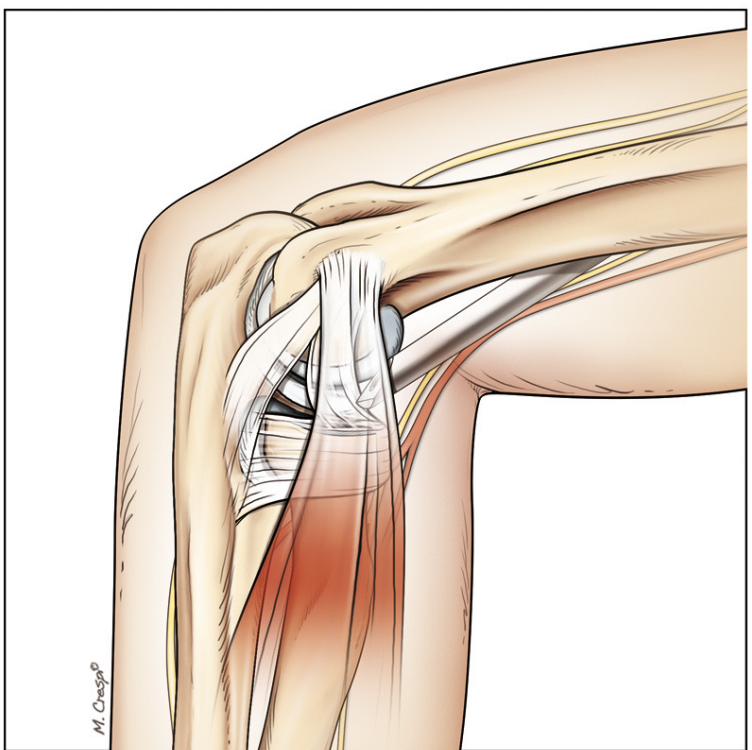
4 dislocations
Posterolateral Rotatory Instability
-
Negative ballottment

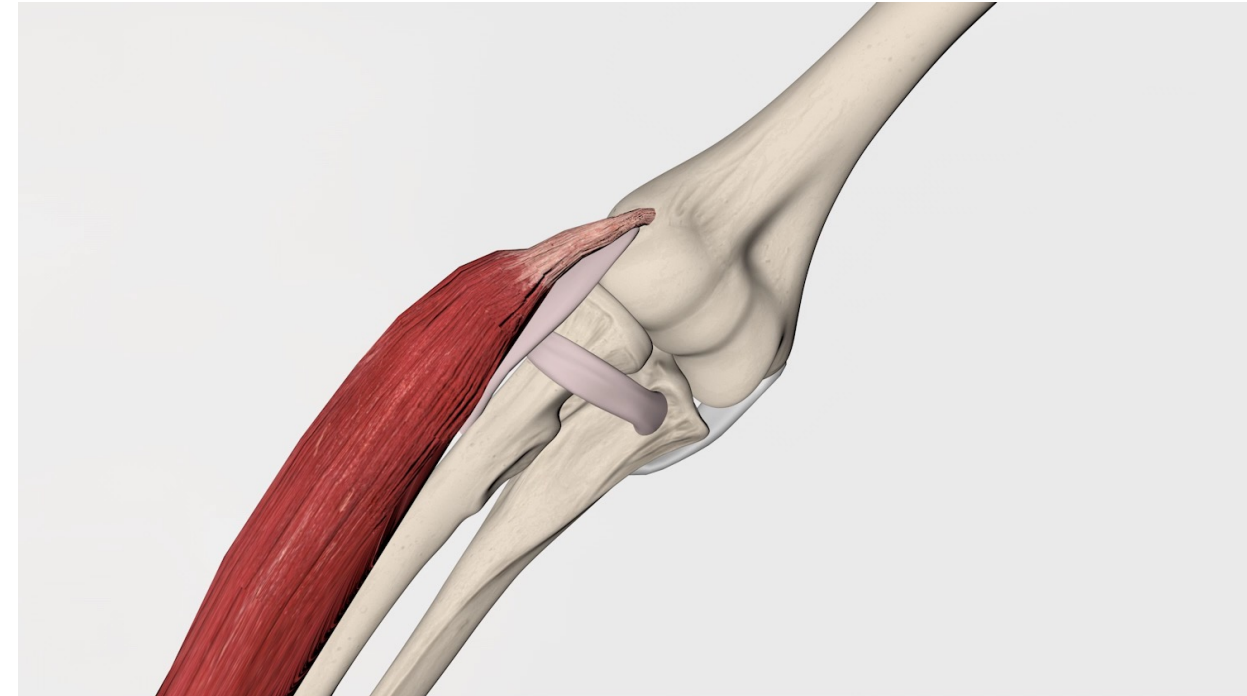
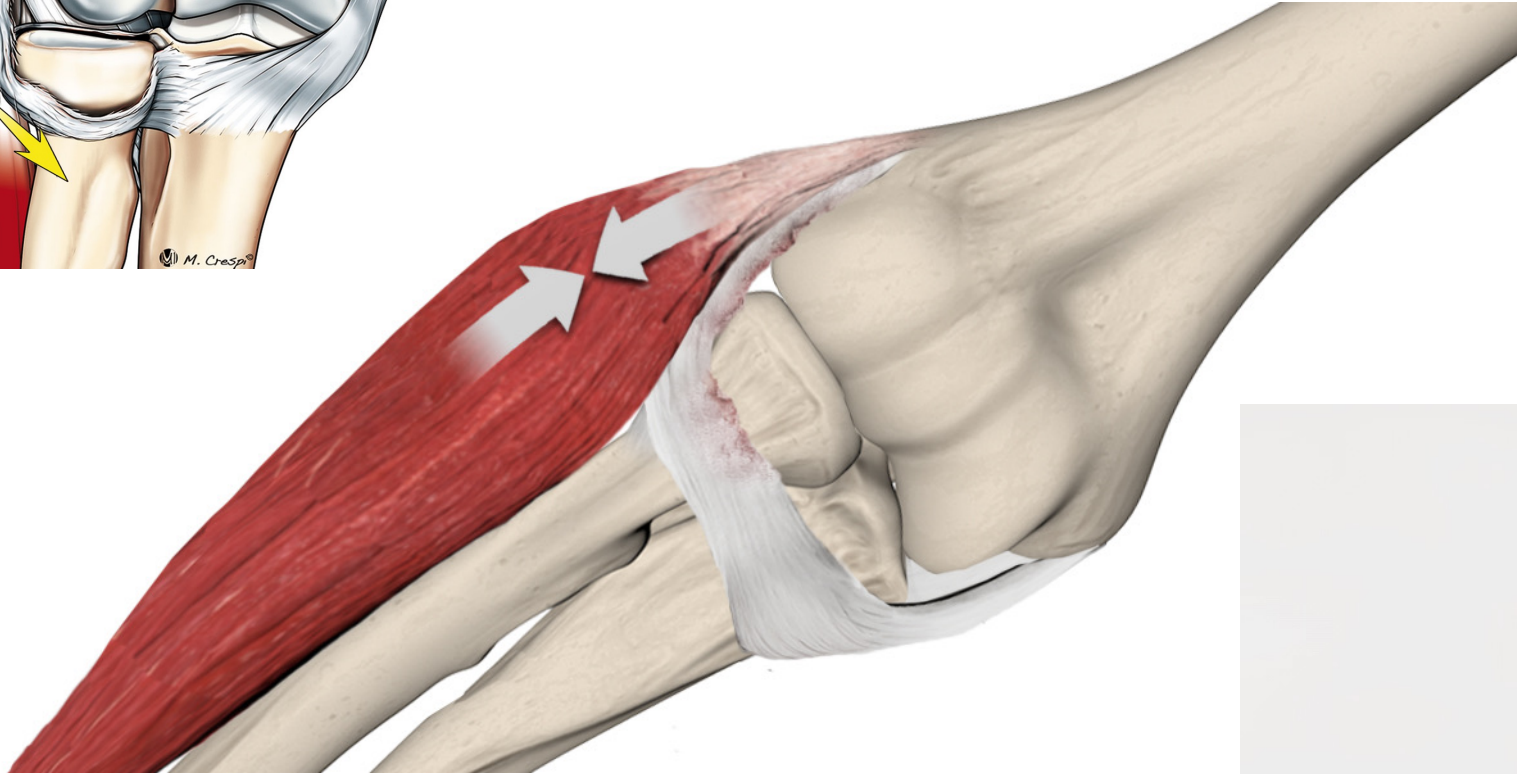
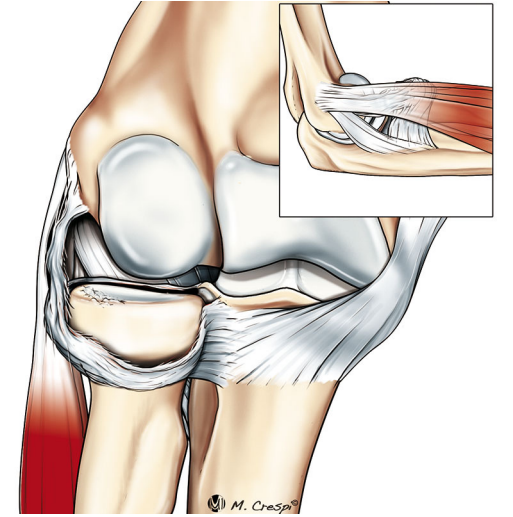
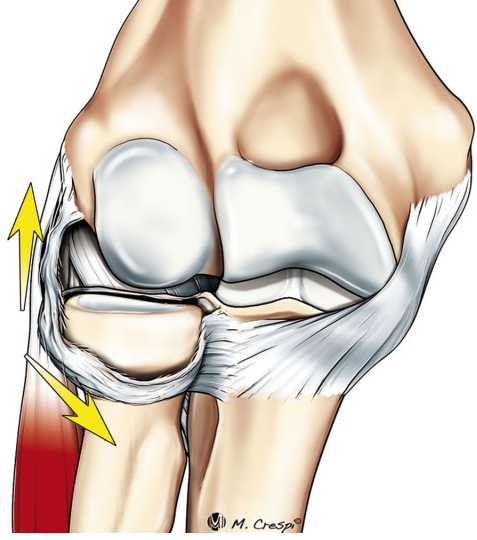


No dislocation
-
Chronic Lateral
Elbow pain

Varus pronation overuse

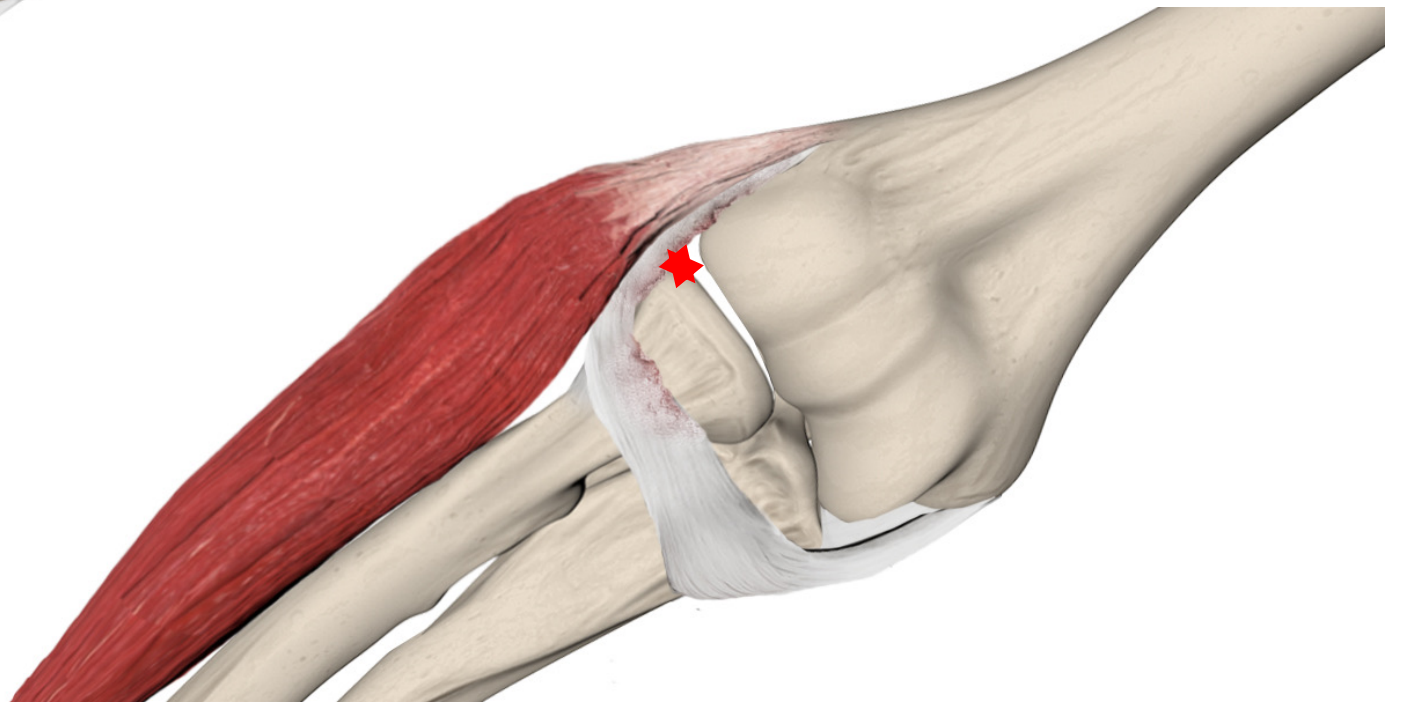
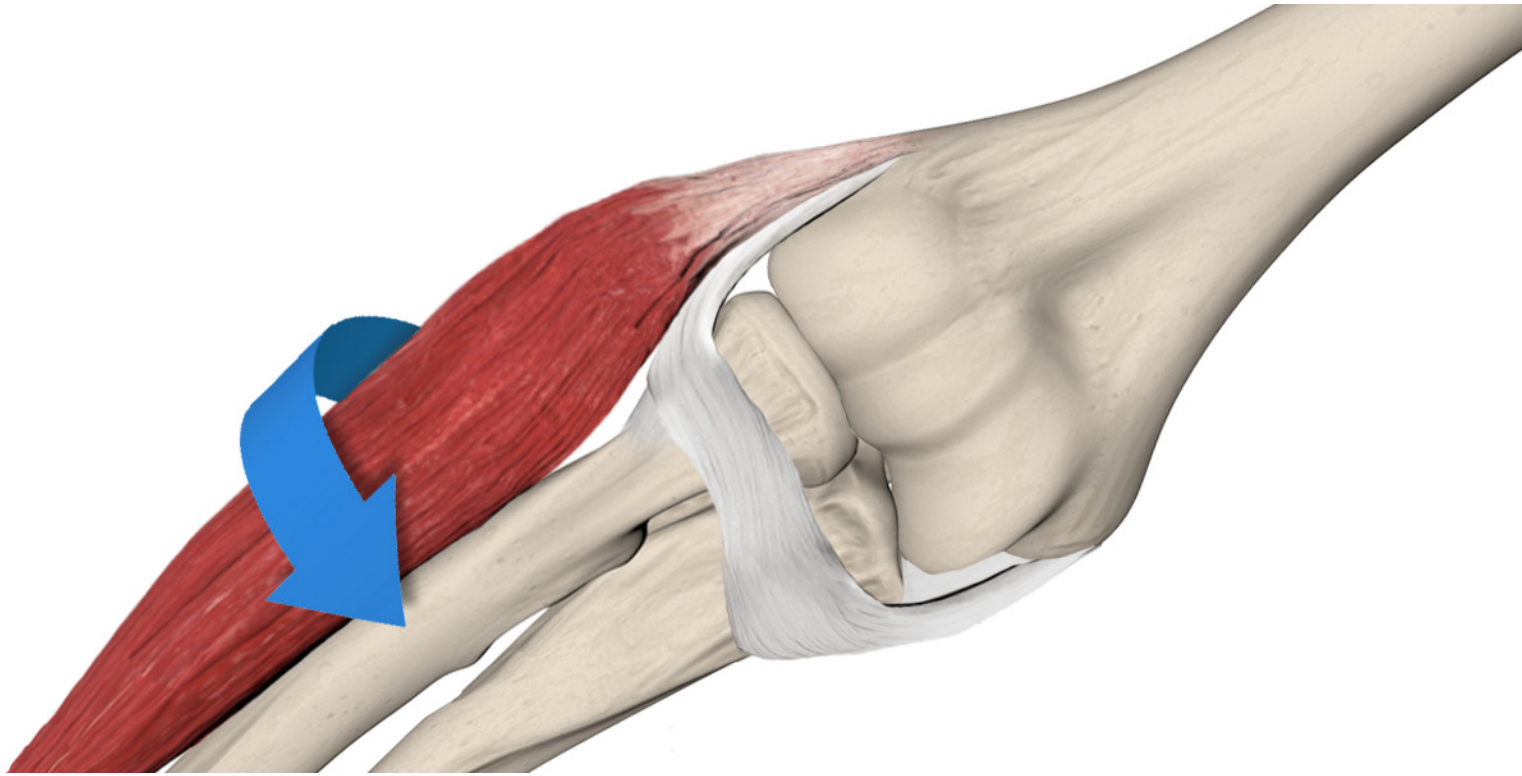


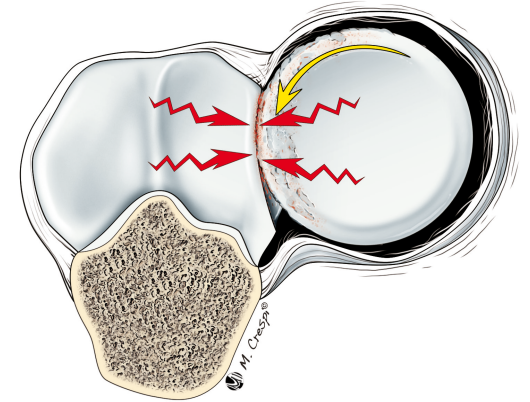
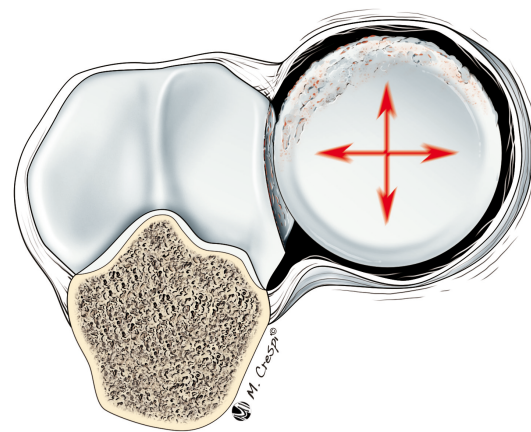




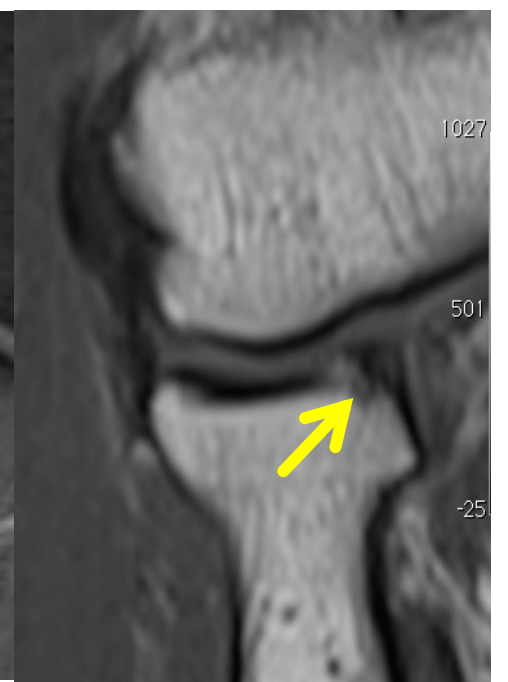
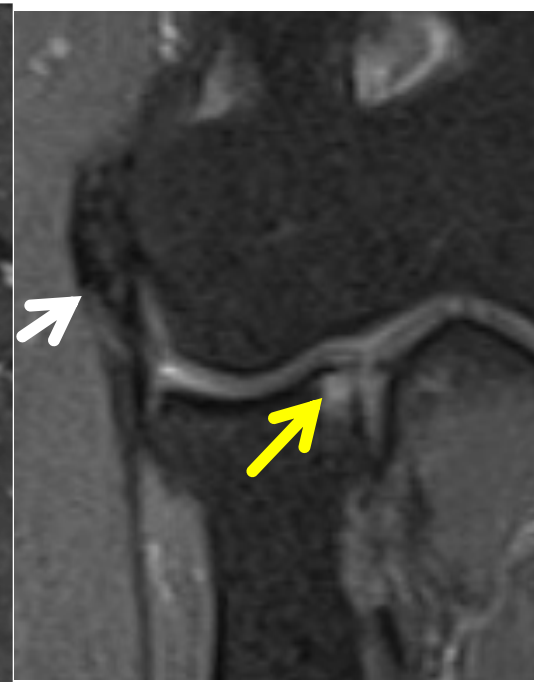
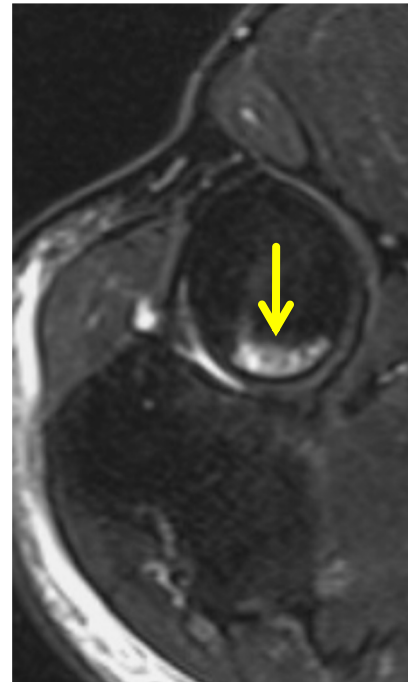
Dynamic stabilization

Late Failure and Tendinopathy





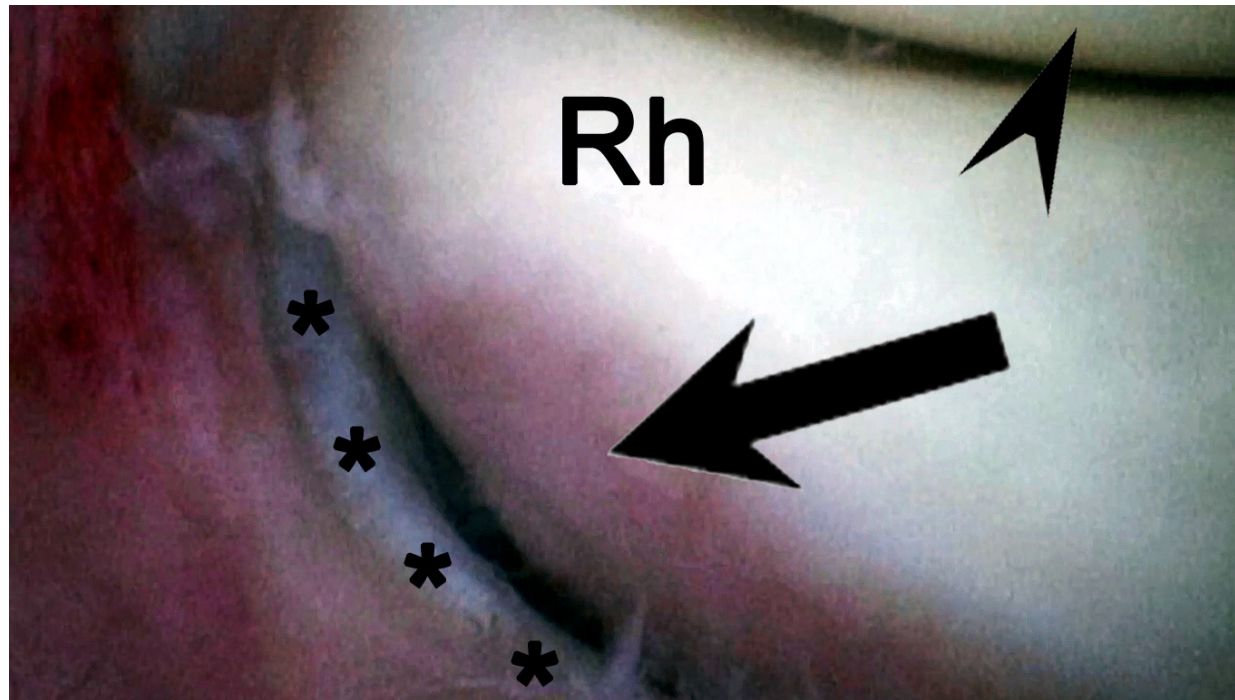
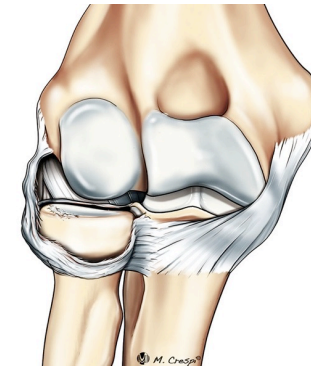
1 - Horizontal PRUJ instability – RH
Chondropathy



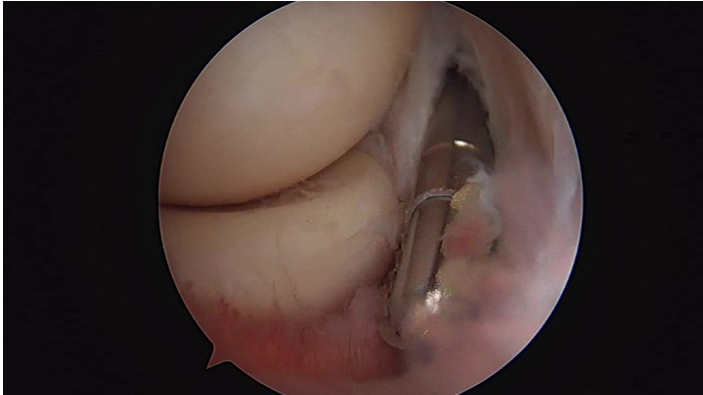
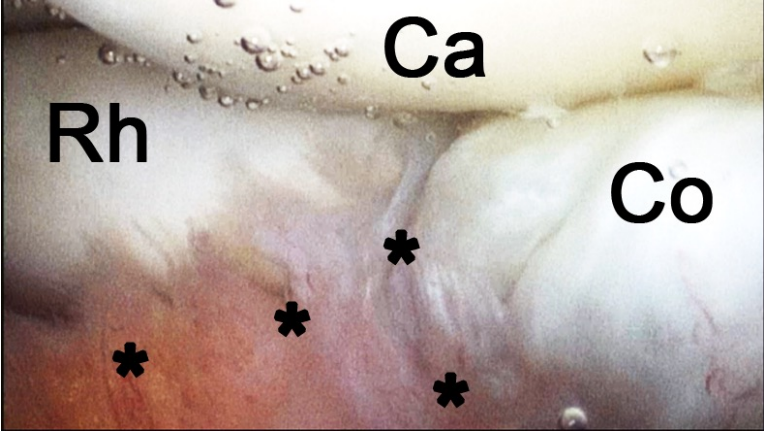
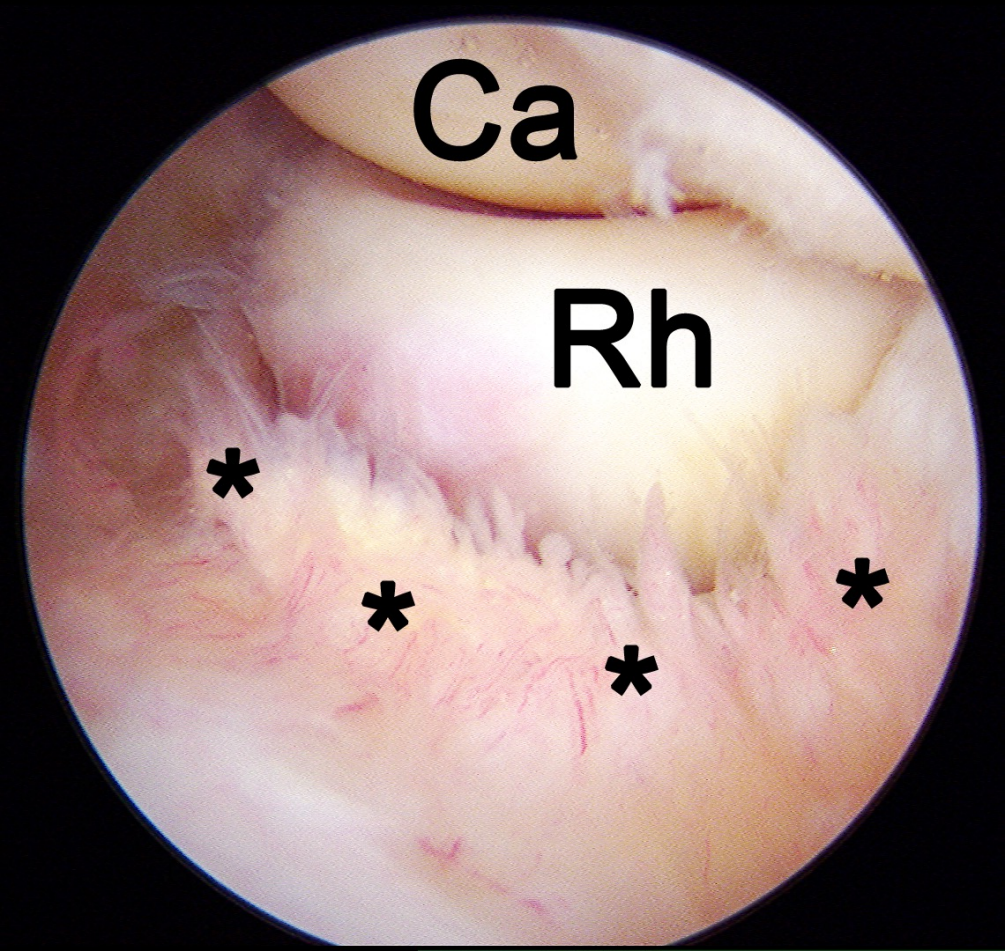
2 - Radial neck exposure (“loose collar” sign)

RH Ballottment

Diffuse patholaxity

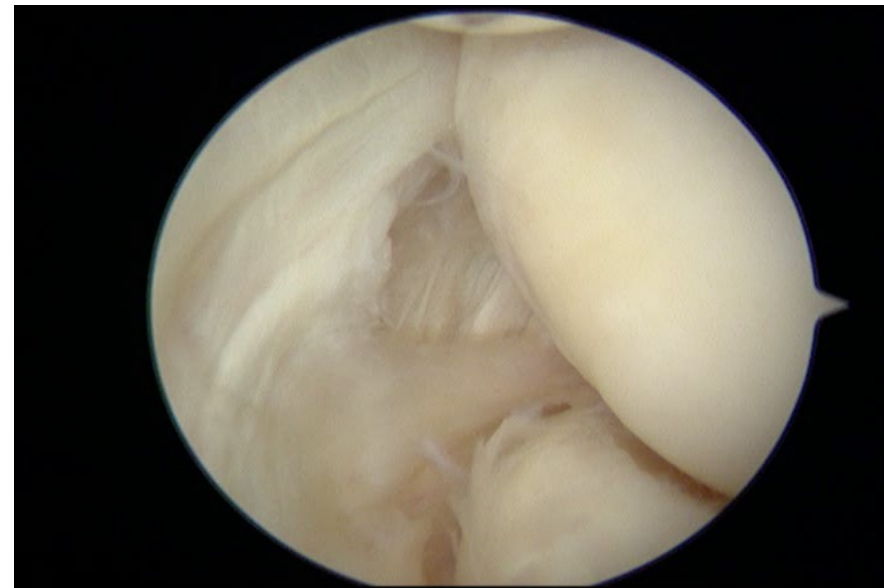
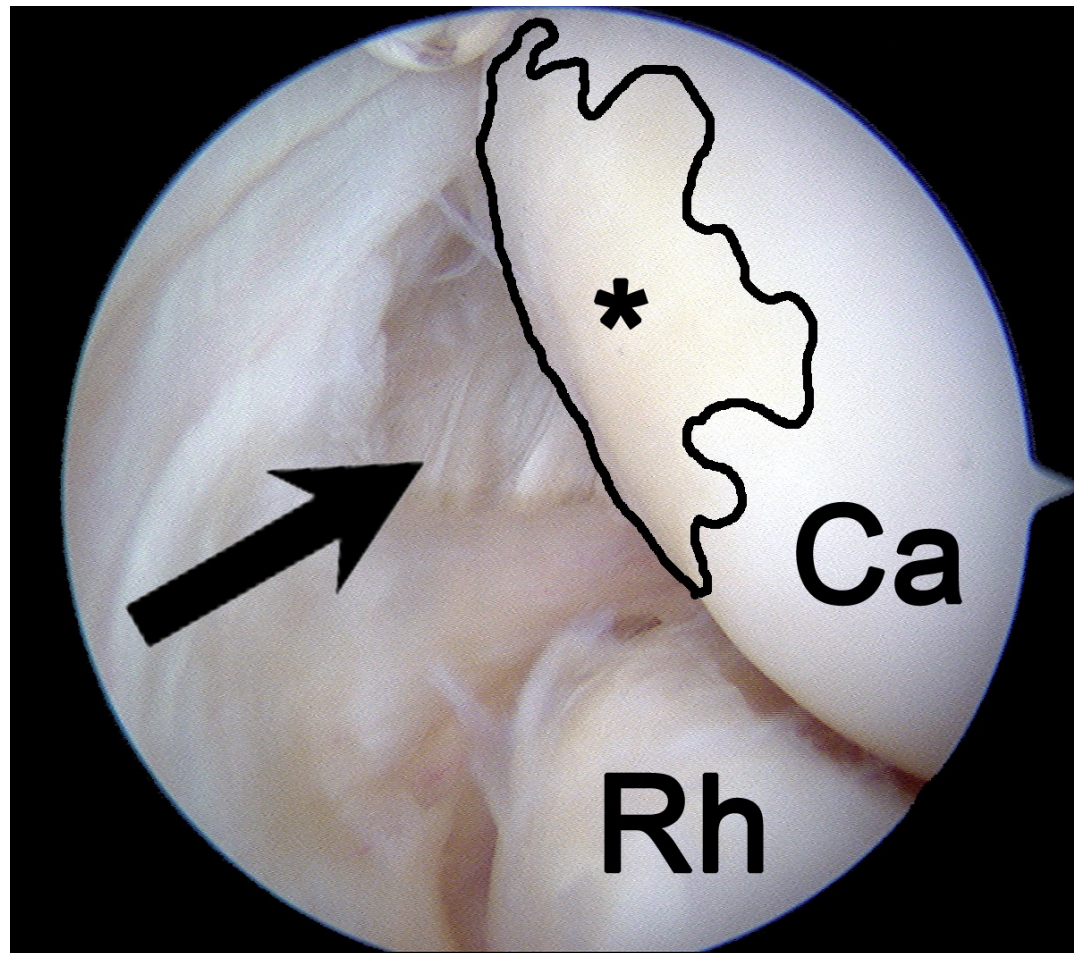


3 - Synovitis



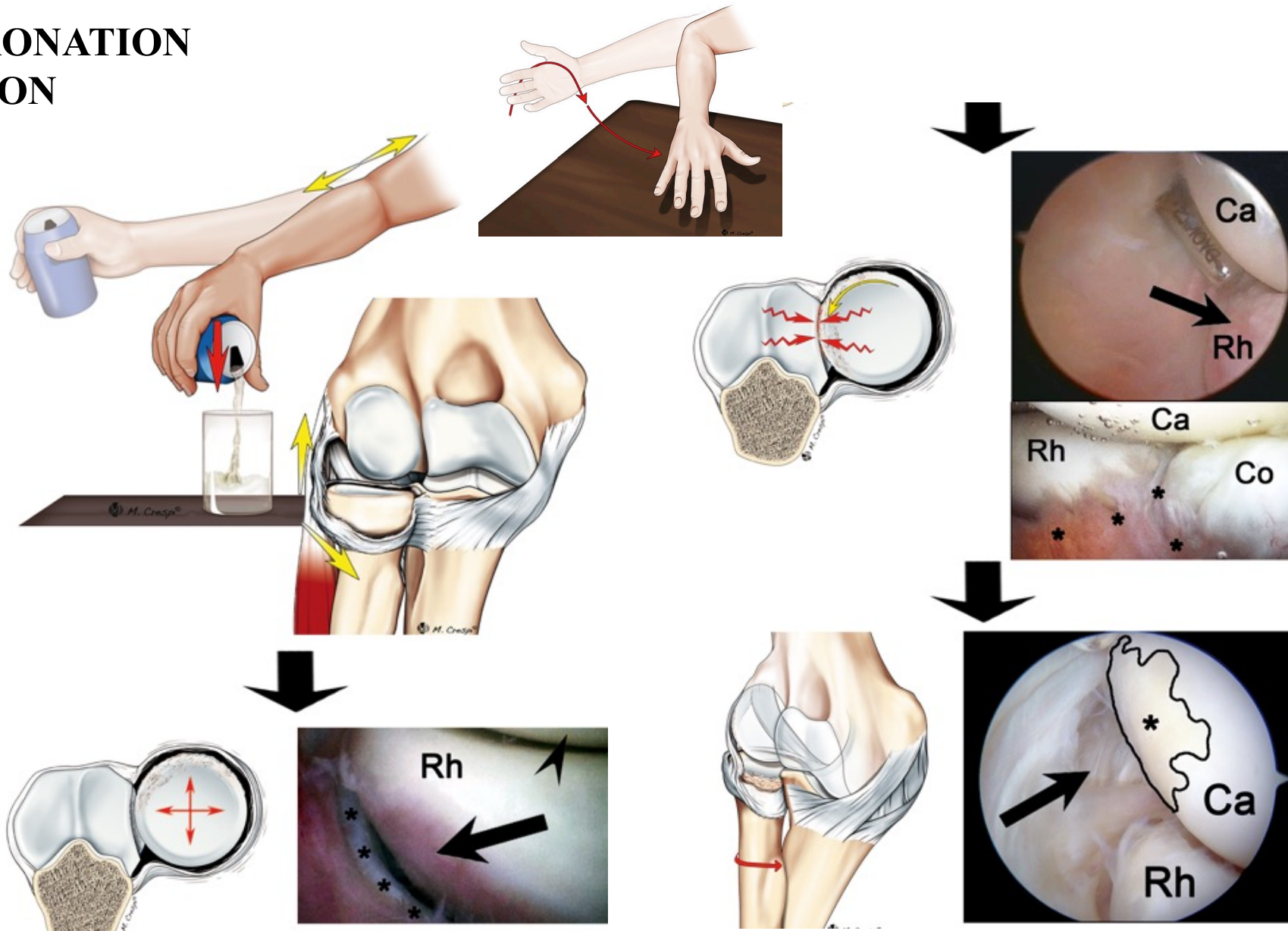
4 CLAC lesion“ - Condropathy of the Lateral Aspect of the Capitellum”

5 - Capsular Lesion

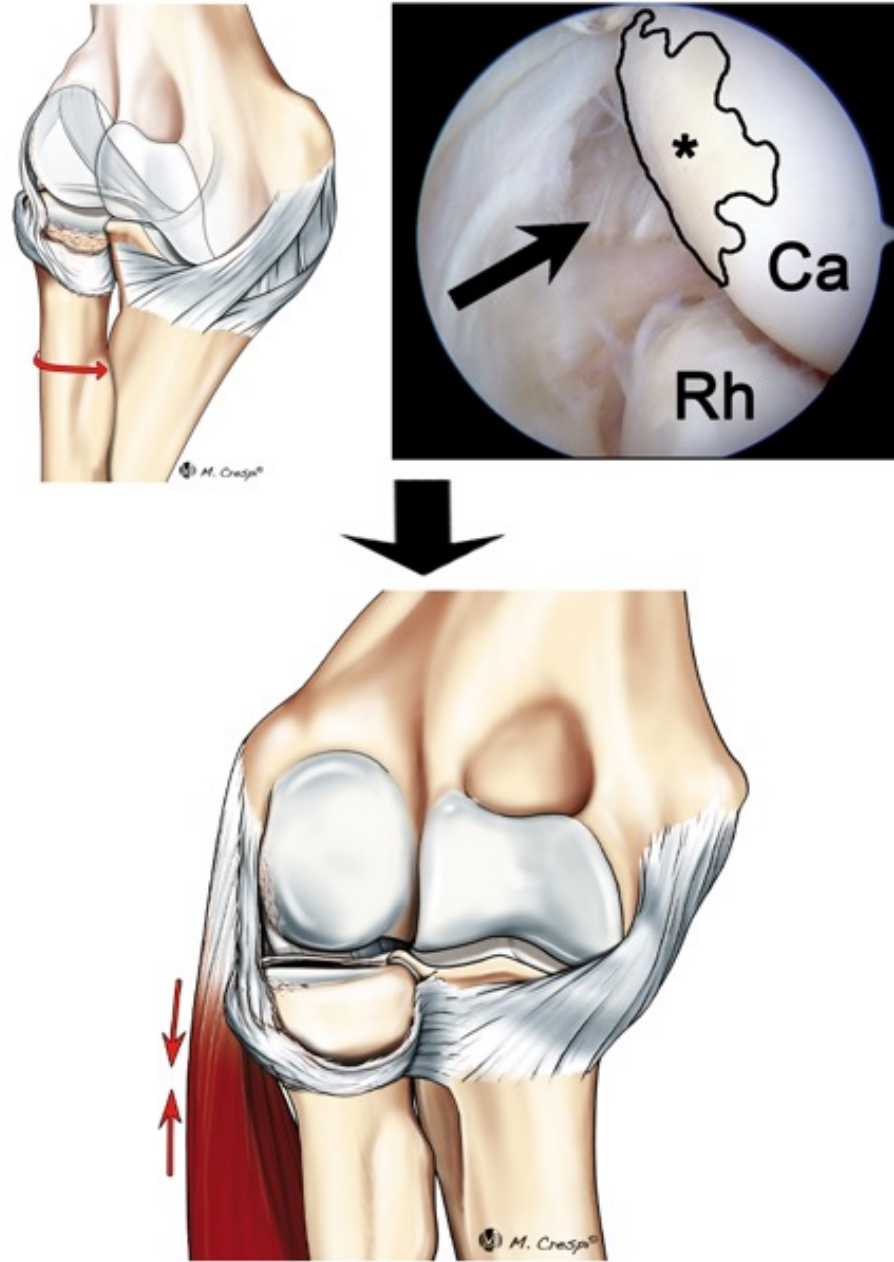


VARUS / PRONATION ELONGATION

Model



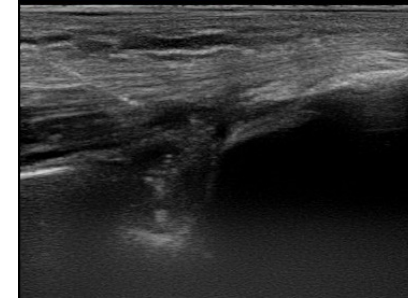
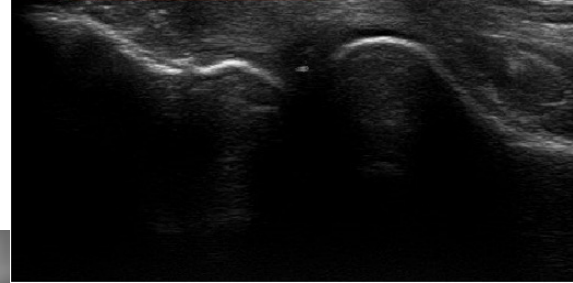
S ymptomatic
M inor
I nstability of the
L ateral
E lbow





Overuse-related instability of the elbow: the role of CT-arthrography

Andrea Zagarella^{1*}, Giulia Signorelli², Giulia Muscogiuri², Roberta Colombo², Gianluca Folco², Paolo Arrigoni³, Mattia Radici⁴, Pietro Simone Randelli^{5,6,7} and Mauro Battista Gallazzi¹





Overuse-related instability of the elbow: the role of CT-arthrography

Andrea Zagarella^{1*}, Giulia Signorelli², Giulia Muscogiuri², Roberta Colombo², Gianluca Folco², Paolo Arrigoni³, Mattia Radici⁴, Pietro Simone Randelli^{5,6,7} and Mauro Battista Gallazzi¹

Table 1 Variables and possible scores for assessing elbow instability using the SMILE score

	0	1	2	3	4
Chondromalacia of the radial head dish	Absent	Present	-	-	-
Chondromalacia of the radial head side	Absent	Present	-	-	-
Chondromalacia of the central capitellum	Absent	Present	-	-	-
Chondromalacia of the Lateral Aspect of the Capitellum (CLAC)	Absent	Present	-	-	-
Chondromalacia of the lateral trochlear ridge	Absent	Present	-	-	-
Synovial thickening	Absent	Anterior or posterior	Anterior and posterior	-	-
Joint space asymmetry	Absent	Present	-	-	-
Annular ligament	Normal	Patholaxity	Dislocation (within distal 50% of radial head)	Dislocation (beyond distal 50% of radial head)	-
Articular capsule	Normal	Patholaxity	Ligament permeation	Extensor tendon permeation	Full-thickness tendon tear

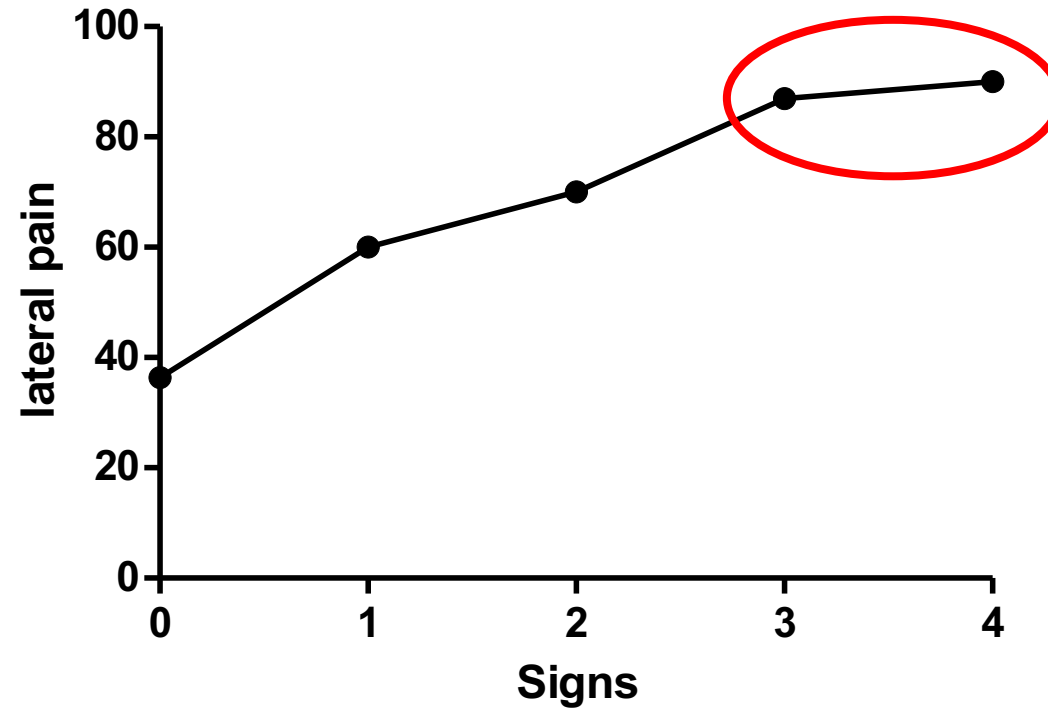
SMILE SCORE

ARTHRO-CT SIGNS

1. **C:** chondropathy
2. **S:** synovitis
3. **I:** iodinated fluid impregnation
4. **P:** patholaxity/loose collar



Arthro CT - Diagnostic performance



MR arthrography

MRI TSE T2w fat sat

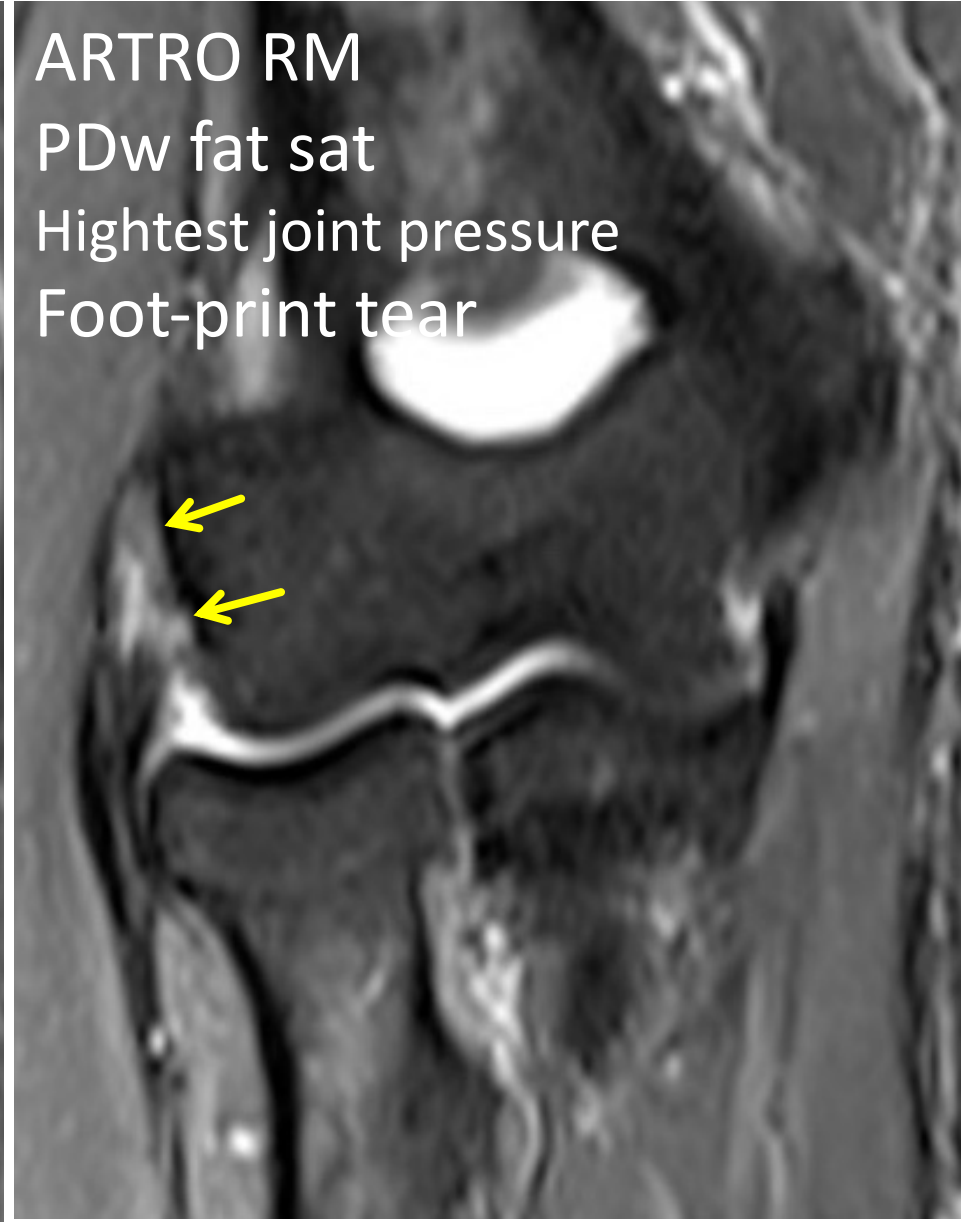


ARTRO RM

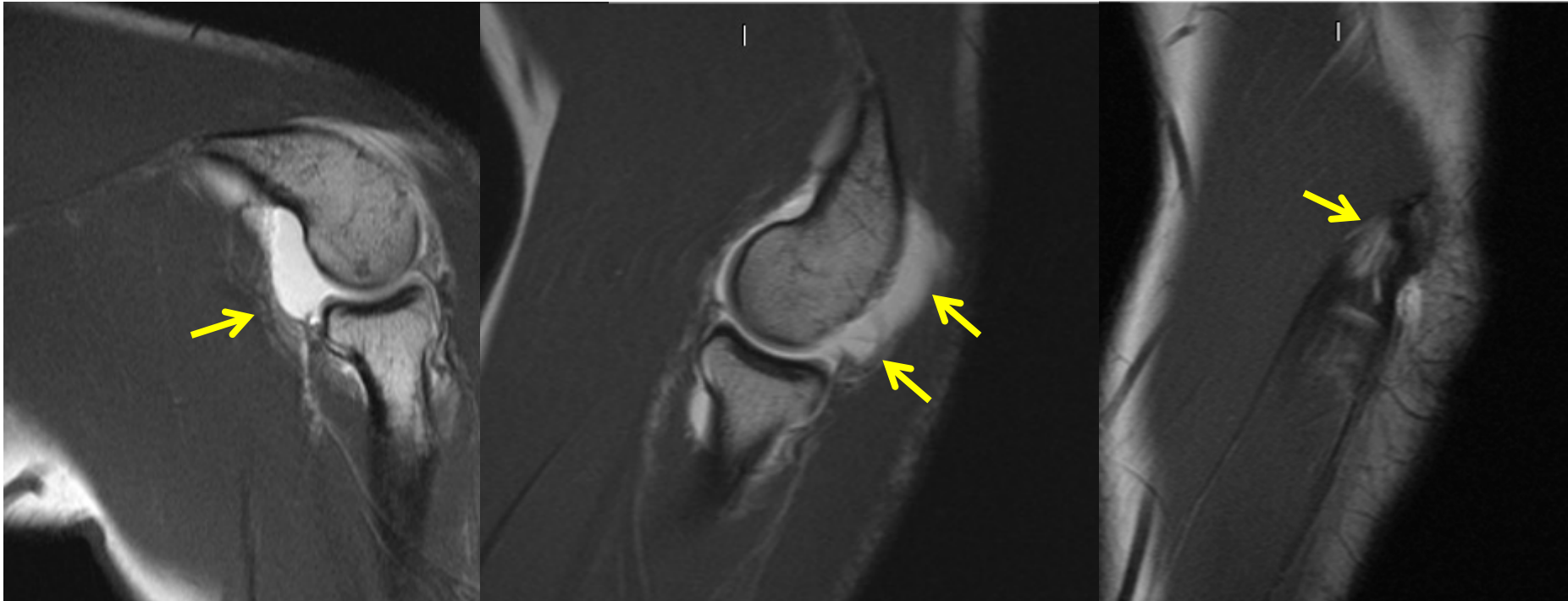
PDw fat sat

Highest joint pressure

Foot-print tear



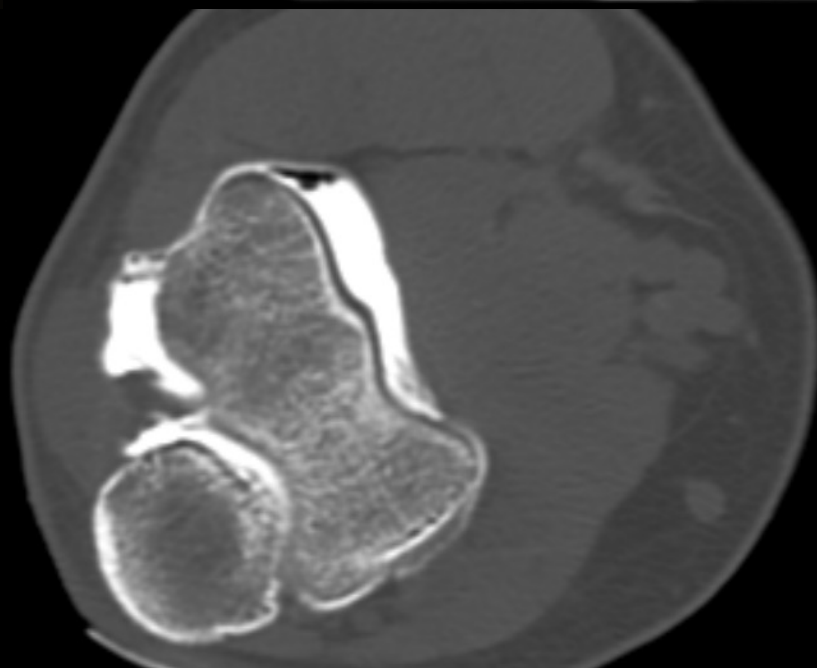
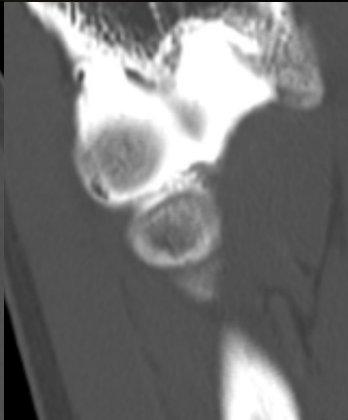
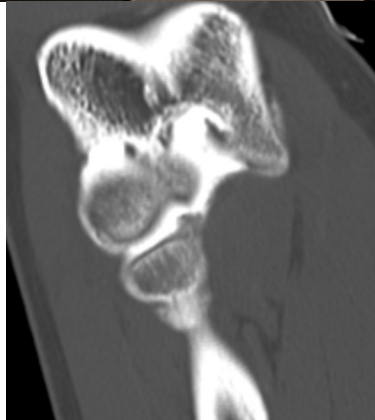
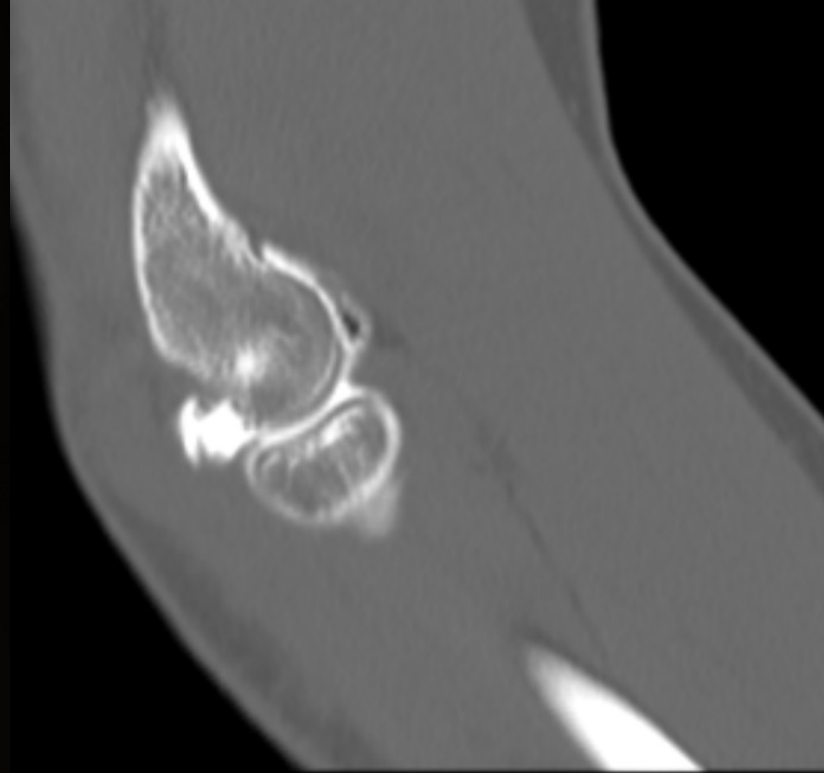
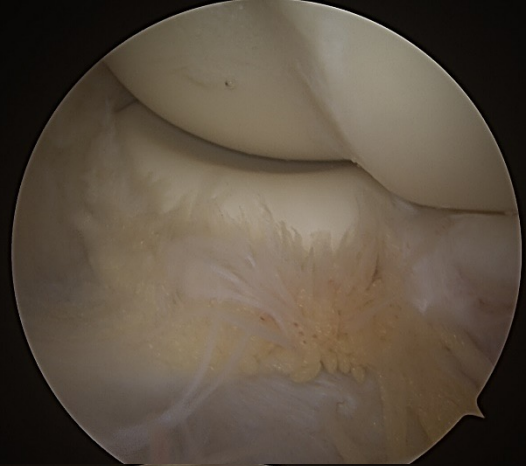
Flexion Arthrography MR



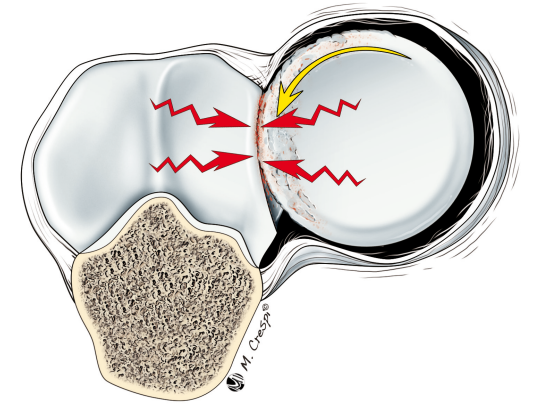
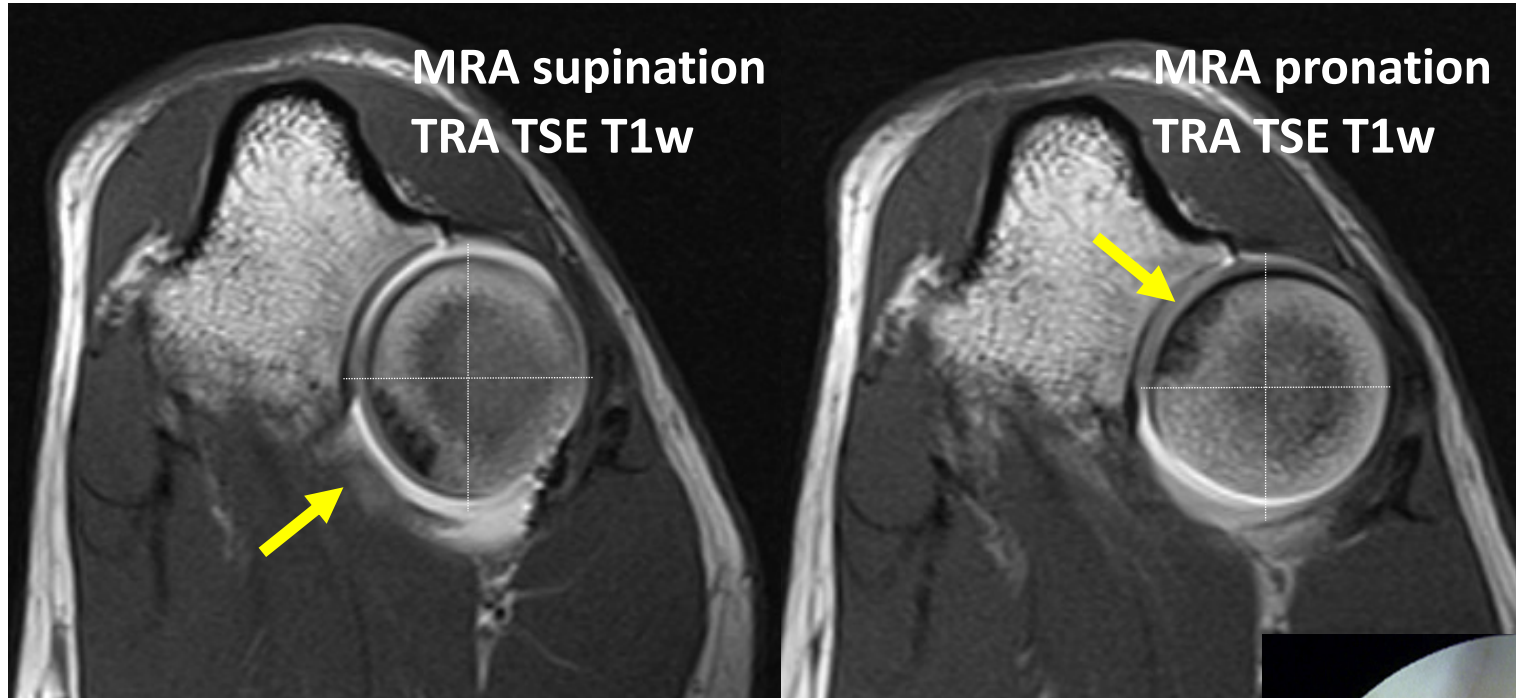
Flexed elbow
Anterior capsular wall

Postero lateral
capsular wall

Partial tear
Extensor tendon
contrast media
infiltration

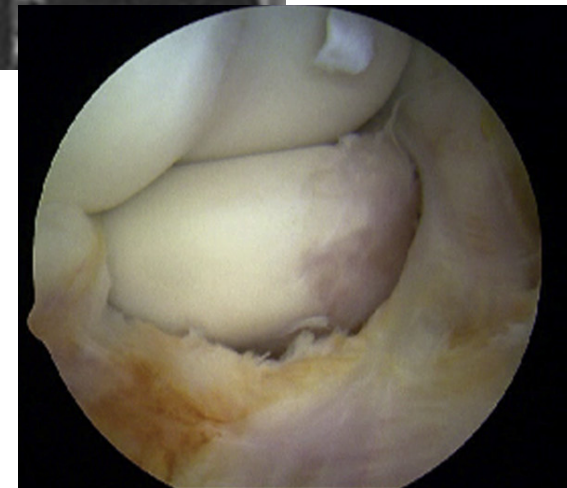


Prono – supination study : chondral defect in chronic SMILE syndrome



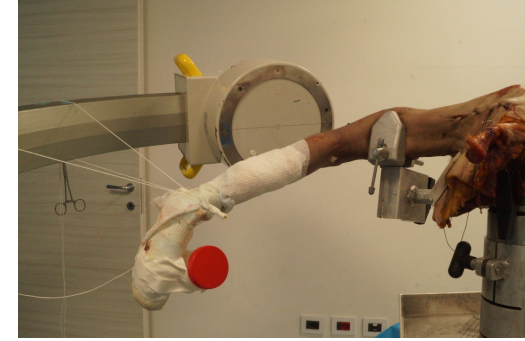
Radial Head Condriopathy

Annular laxity



Role of R-LCL

Study design



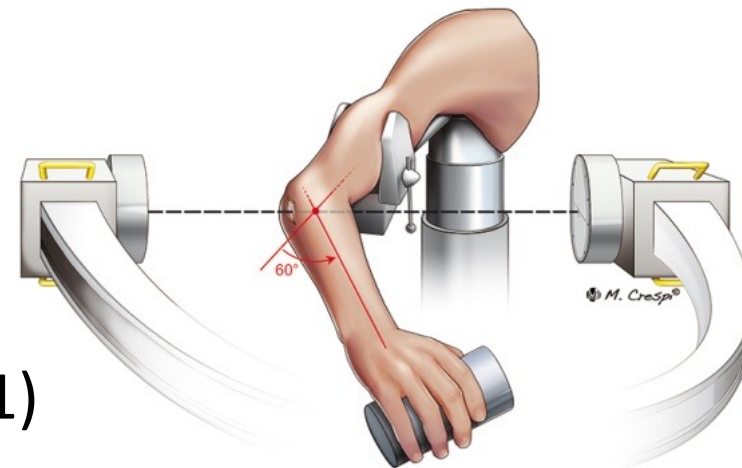
Ten fresh-frozen cadaver specimens
Humerus fixed, hand hanging free, 60° elbow flexion

Stress testing sequence:

under gravity load alone (0)

0,5 kg applied load to the hand (1)

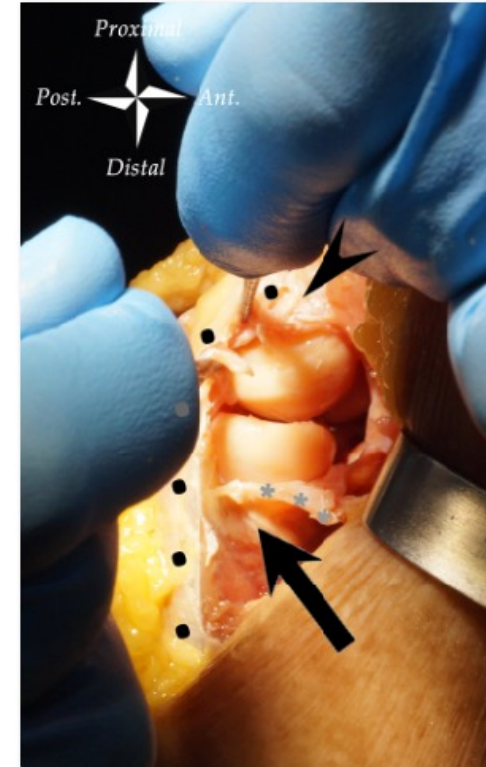
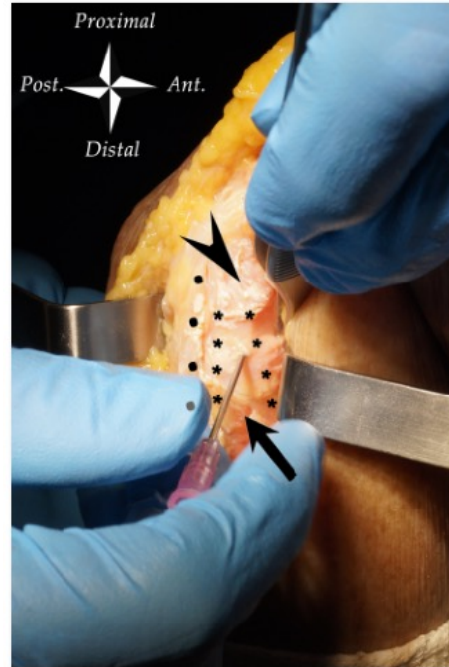
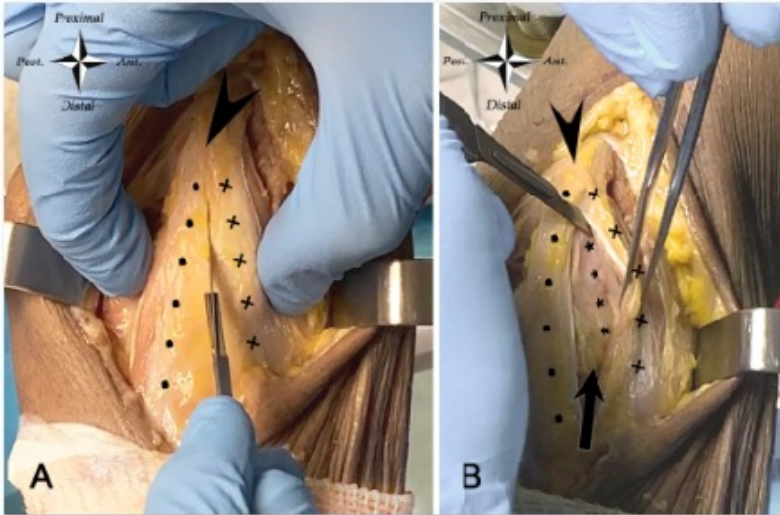
1 kg load applied load to the hand (2)



Study design

Release sequence:

- a. No release
- b. Release anterior half of the CEO
- c. Pie crusting of the R-LCL
- d. Complete R-LCL release



**Complete preservation
of LUCL**

Study design

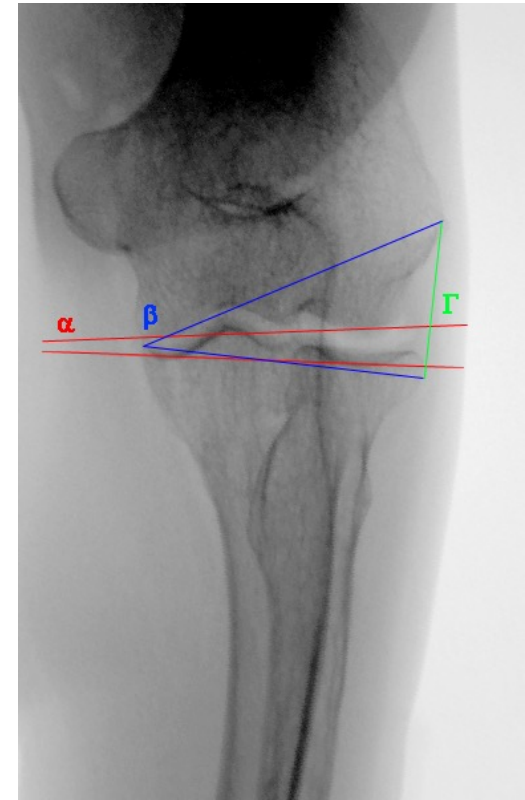
Outcome parameters:

Dynamic ultrasound (US) examination

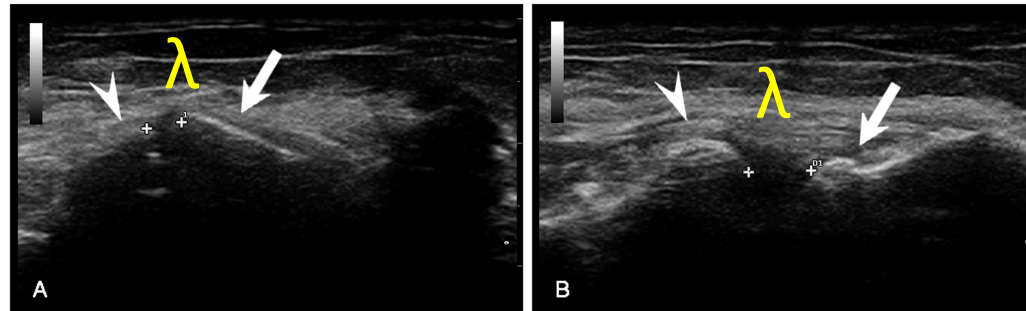
→ lateral joint line widening (λ)

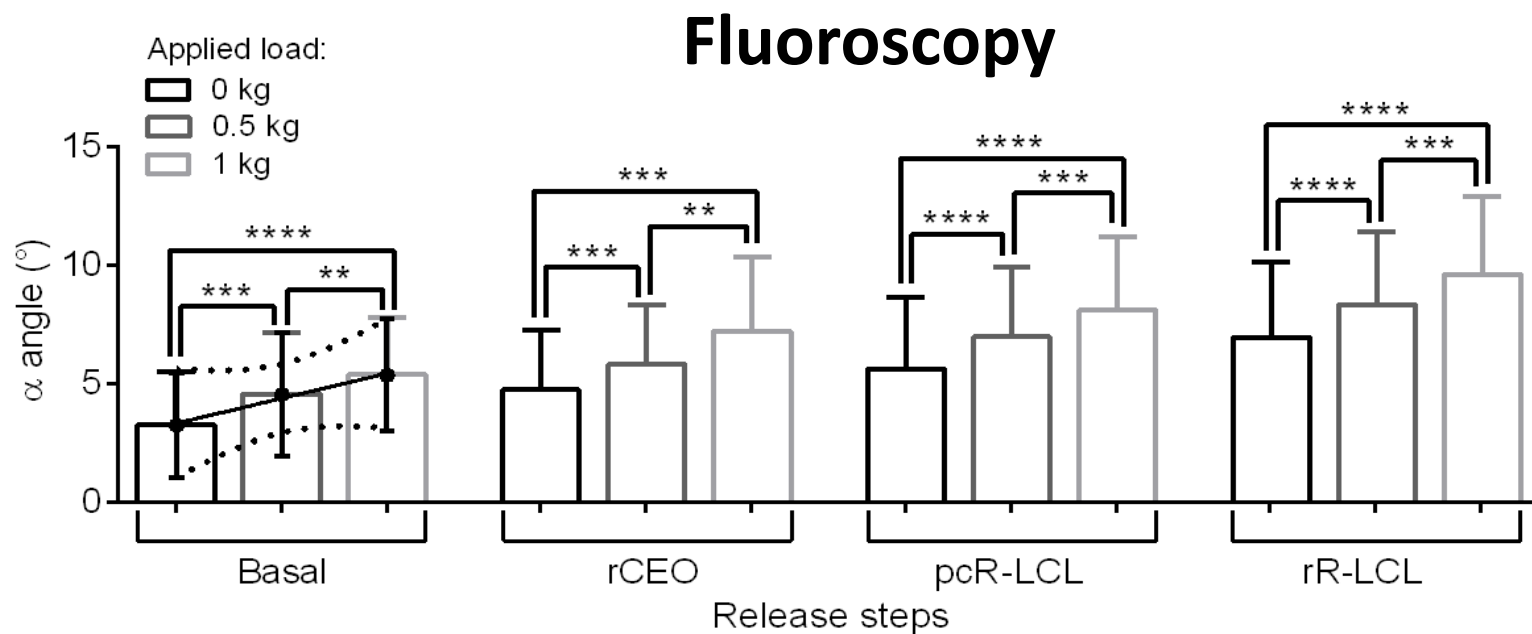
Fluoroscopy with radiocapitellar AP projection

→ varus joint angulation of the elbow (α)



Schnetzke M et al. *J Orthop Surg Res.* 2015;10(1):128.





Significant changes in α from the initial condition occurred after each release

A significant effect of weight on α was documented for all release steps.

Results (lateral joint line widening)



CEO 1/3 of lateral elbow stability against varus-pronation stress, R-LCL 2/3

A linear regression model to describe the effect of applied load (m) on α was created

$$\alpha = 2.116 \text{ }^\circ/\text{kg} \cdot m + 3.346 \text{ }^\circ$$

iatrogenic damage to the anterior half of the CEO (ECRB!)

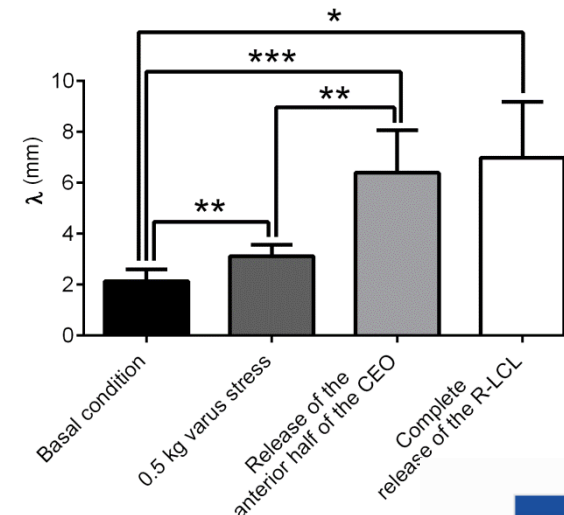
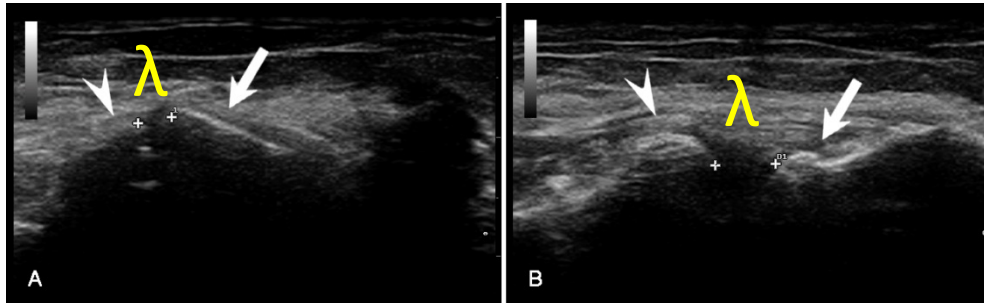
Overloads

the lateral static stabilizers as constantly carrying a 0,66 L bottle of beer does on a healthy elbow



Results: dynamic ultrasound evaluation

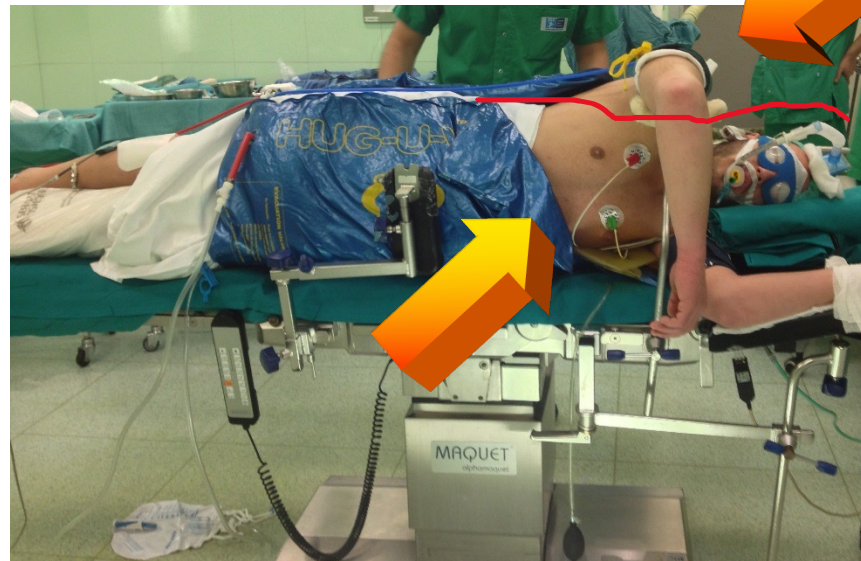
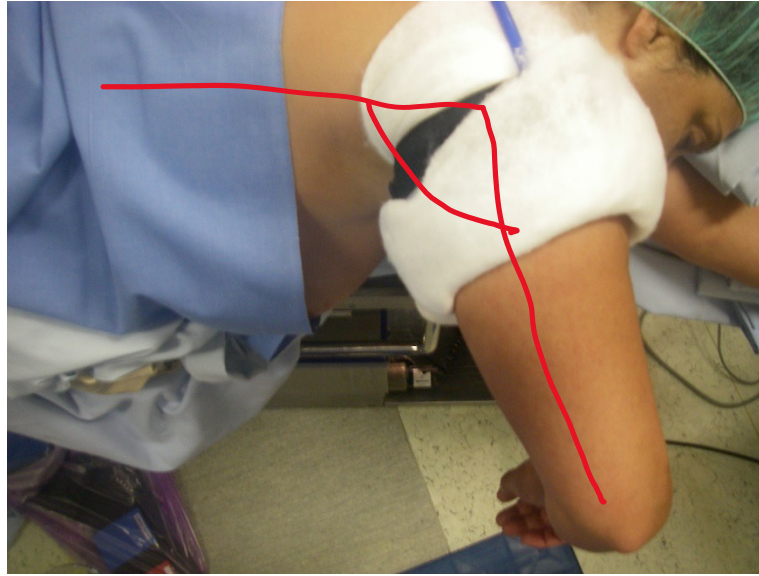
	Basal condition (no releases, no stress)	0.5 kg varus stress	Release of the anterior half of the CEO	Complete release of the R-LCL
	2.13 (\pm 0.46)	3.11 (\pm 0.45)	6.39 (\pm 1.67)	7.00 [5.25-7.65]
Elongation (% increase)	-	+ 46%	+ 200%	+ 228%
p-value to basal condition		0.0038	0.0008	0.0156
p-value to previous release step			0.0015	0.5703 (n.s.)

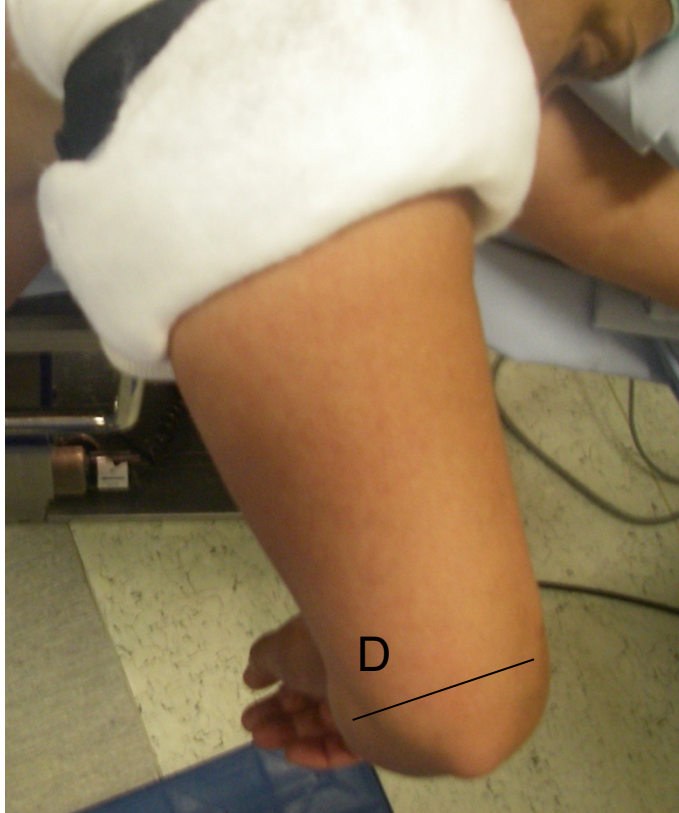


Ultrasound can detect changes related to injuries of the CEO but is not able to detect an additional lesion of the R-LCL

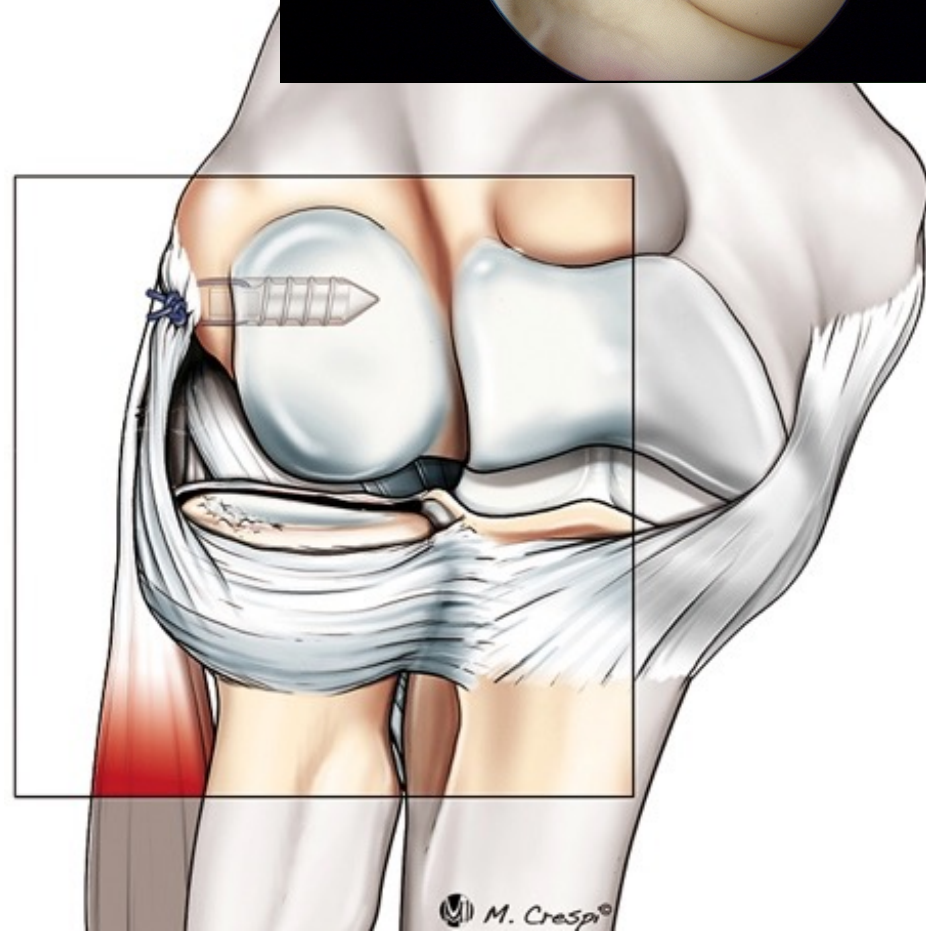
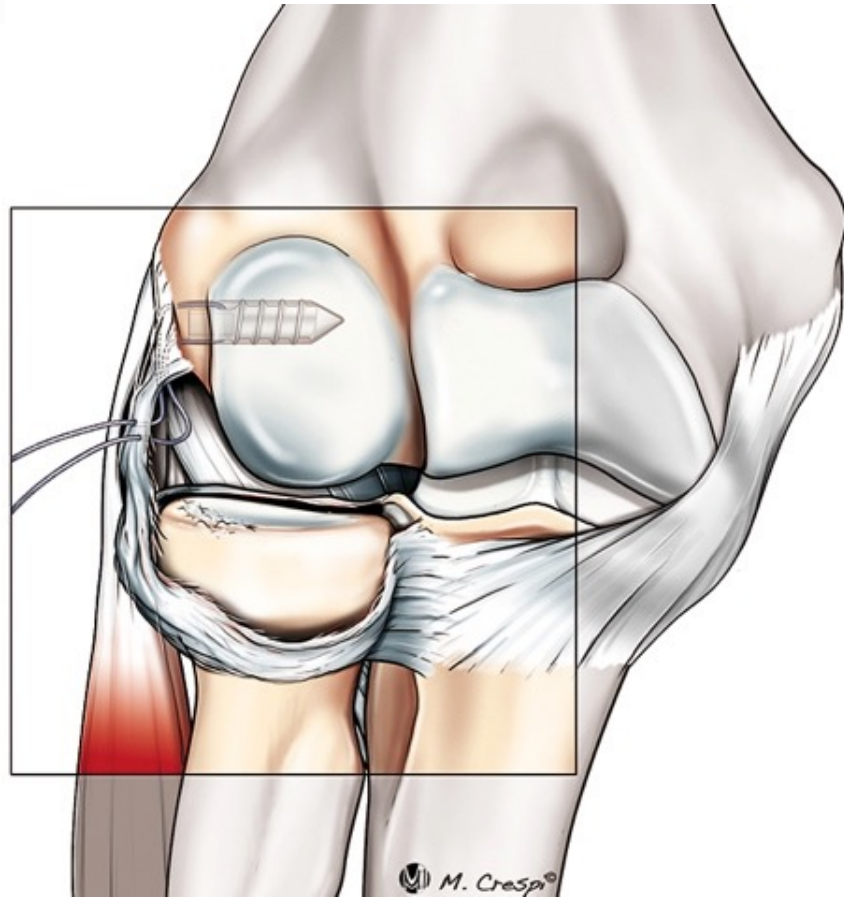
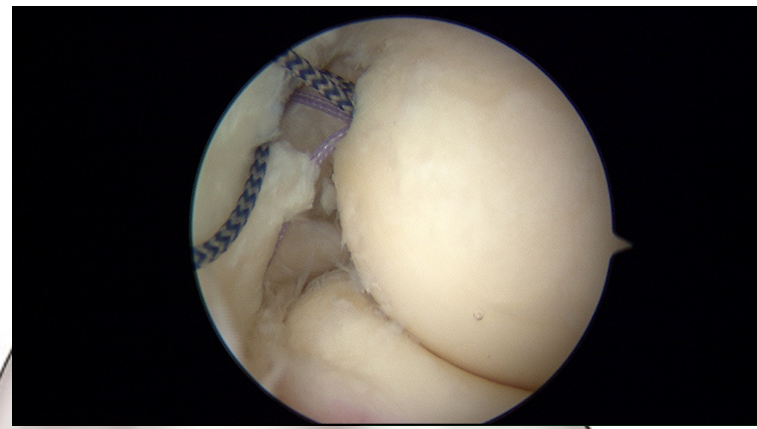
MAJOR IMAGING !!

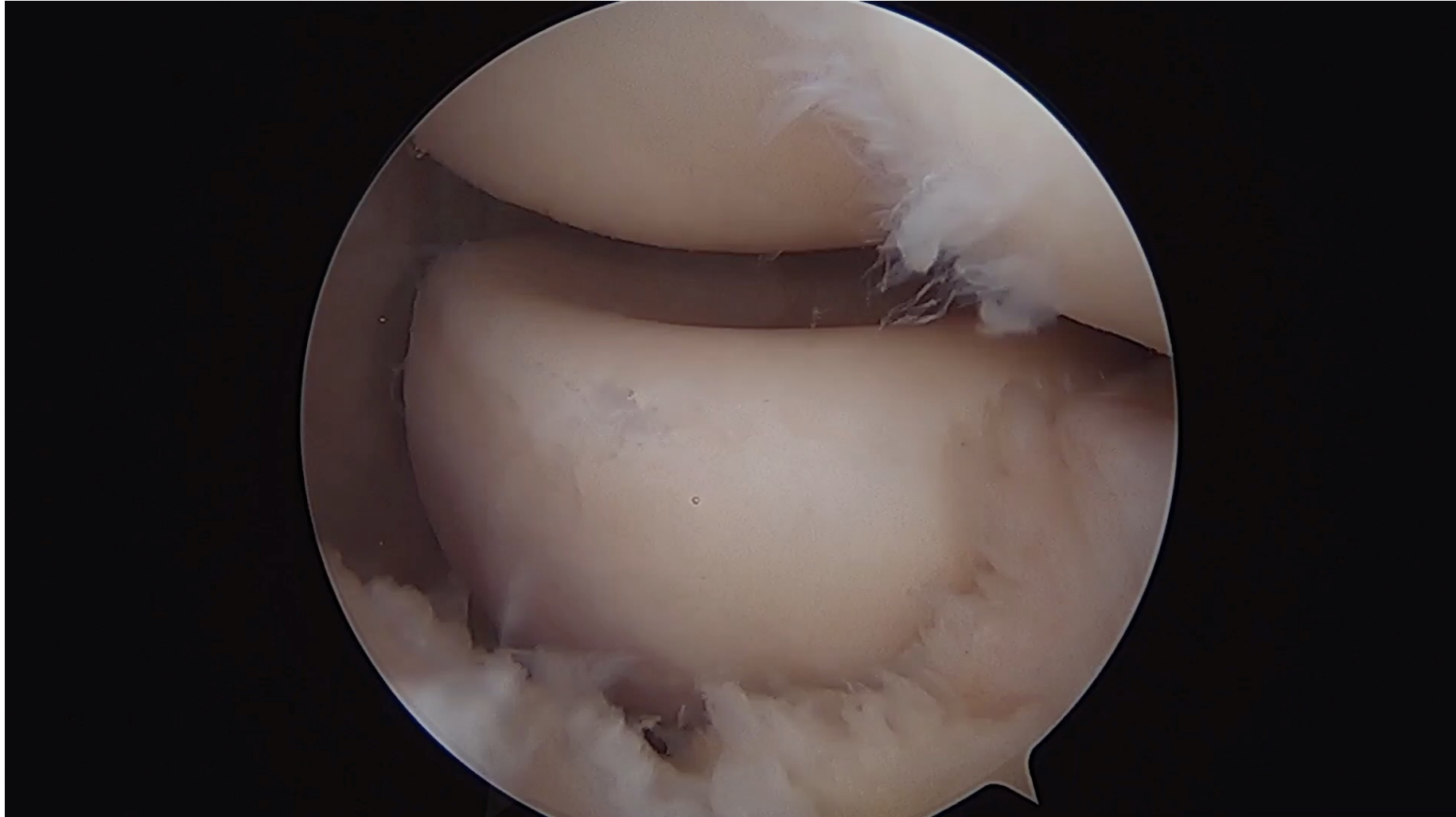
Set up

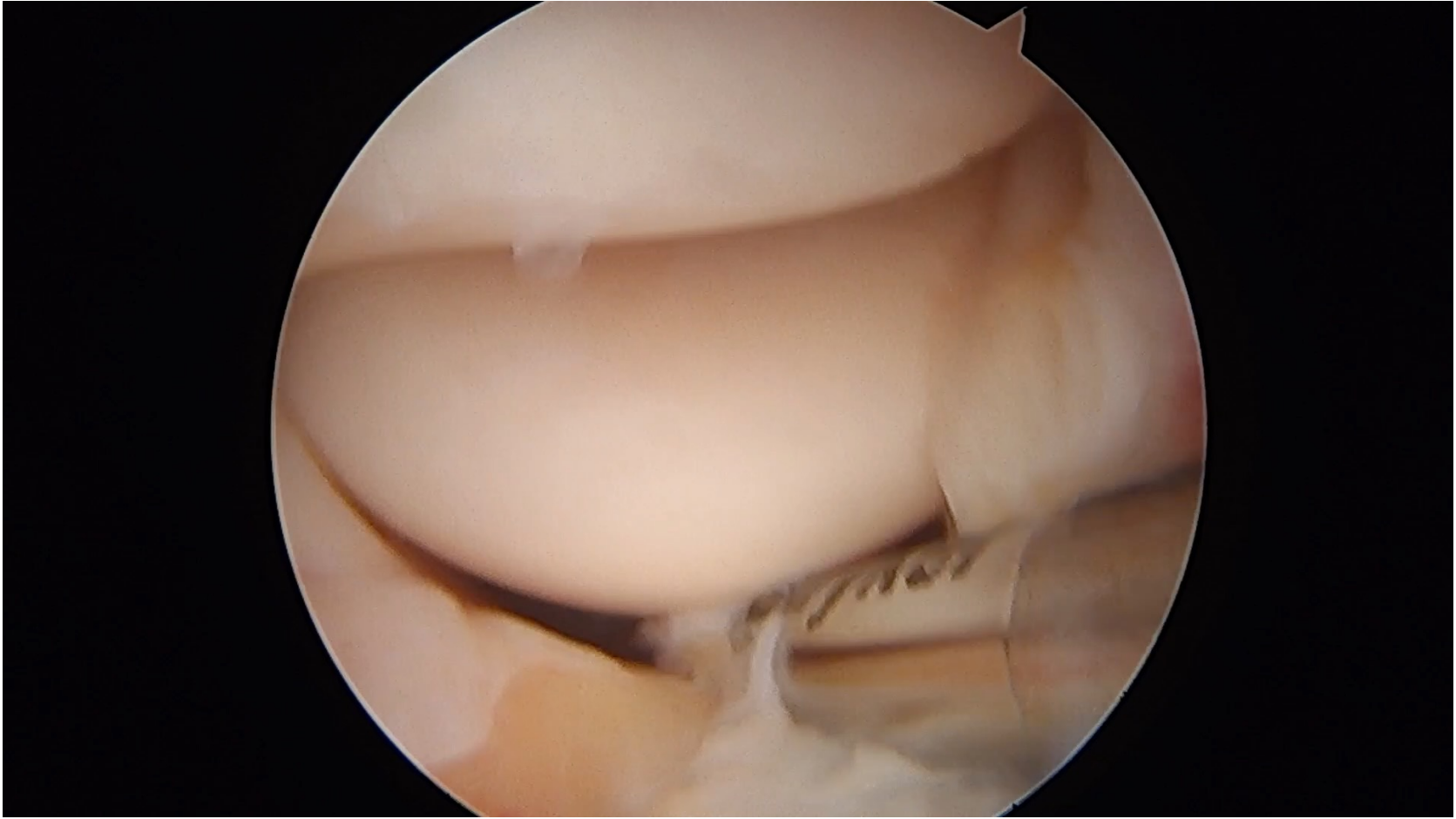




Safe area
S. Kamineni, B. Morrey JBJs

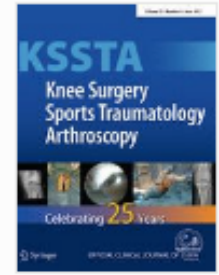




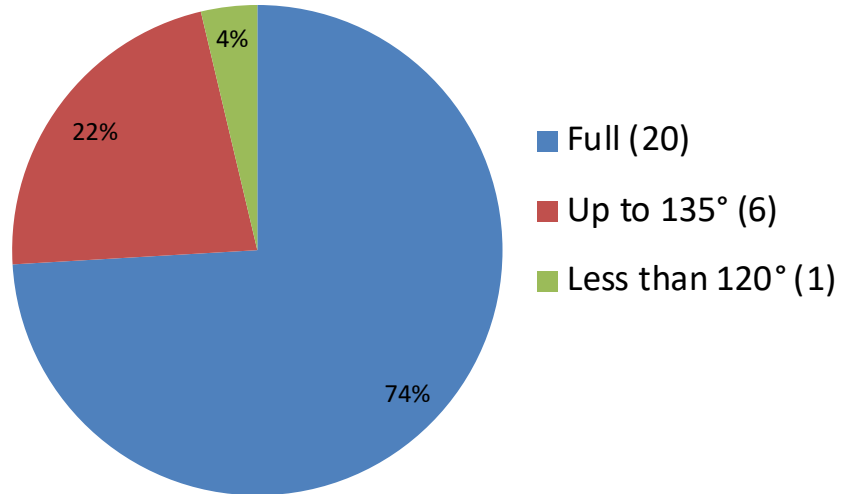


2 years follow up

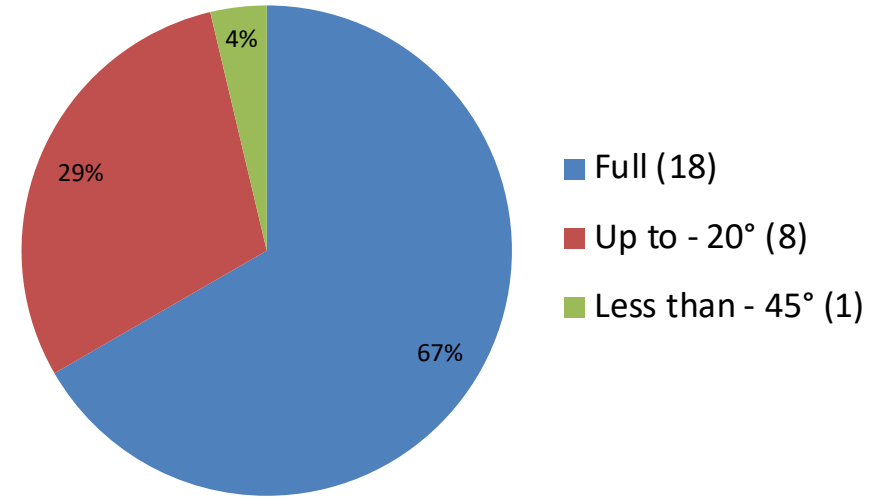
Good / excellent in 95% of the cases



Post-operative flexion



Post-operative extension



Postoperative flexion (SD)

141.11° (9.23°)

Postoperative extension (SD)

-8.52° (15.37°)

Remember always to **SMILE !!**

Role of R-LCL against VARUS
Varus Pronation model

Releasing R-LCL (Classic open procedure) is at potential risk
Intrarticular further imaging needed

ASST Gaetano Pini – CTO



Università degli Studi di Milano



Thanks

Paolo Arrigoni, MD

Milan, Italy

ASST Gaetano Pini – CTO

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