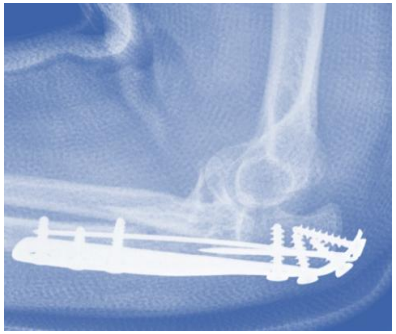
POST INJURY ELBOW SUBLUXATION:

"I thought I fixed that, now what should I do?"

Kenneth J. Faber MD MHPE FRCSC
Associate Professor
Western University
London ON



ROTH | McFARLANE
HAND & UPPER LIMB CENTRE
ST. JOSEPH'S HEALTH CARE LONDON

DISCLOSURE

- I have something relevant to disclose:
  - Consultant: Exactech
  - Royalties: Exactech

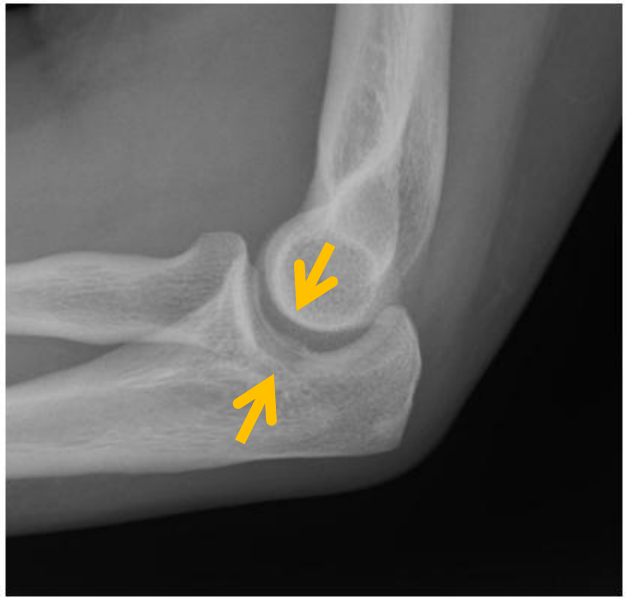
LEARNING OBJECTIVES

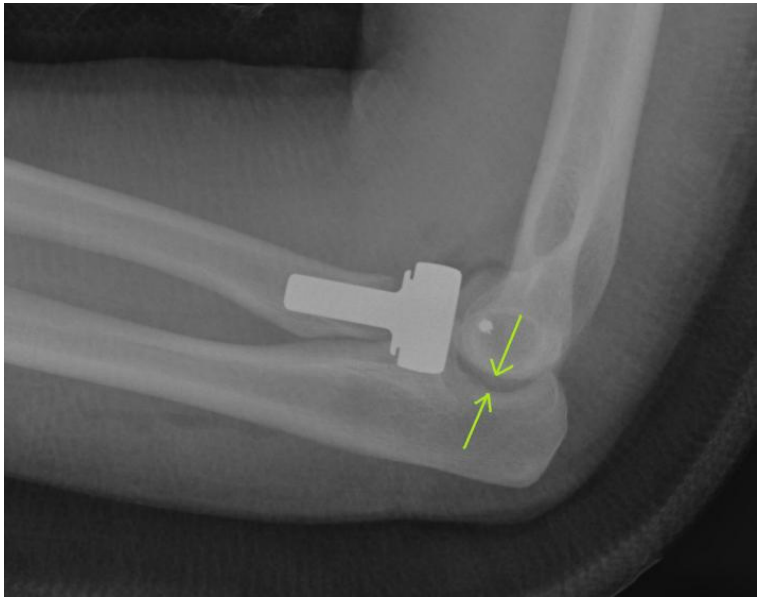
1. Define the “Drop Sign”

2. Outline treatment plan
   - Emphasis on **therapy(ist)** principles

3. Examples: surgical pitfalls
   - Coronoid
   - Monteggia
   - Trans-olecranon

THE DROP SIGN





Journal of Shoulder and Elbow Surgery

The drop sign, a radiographic warning sign of elbow instability

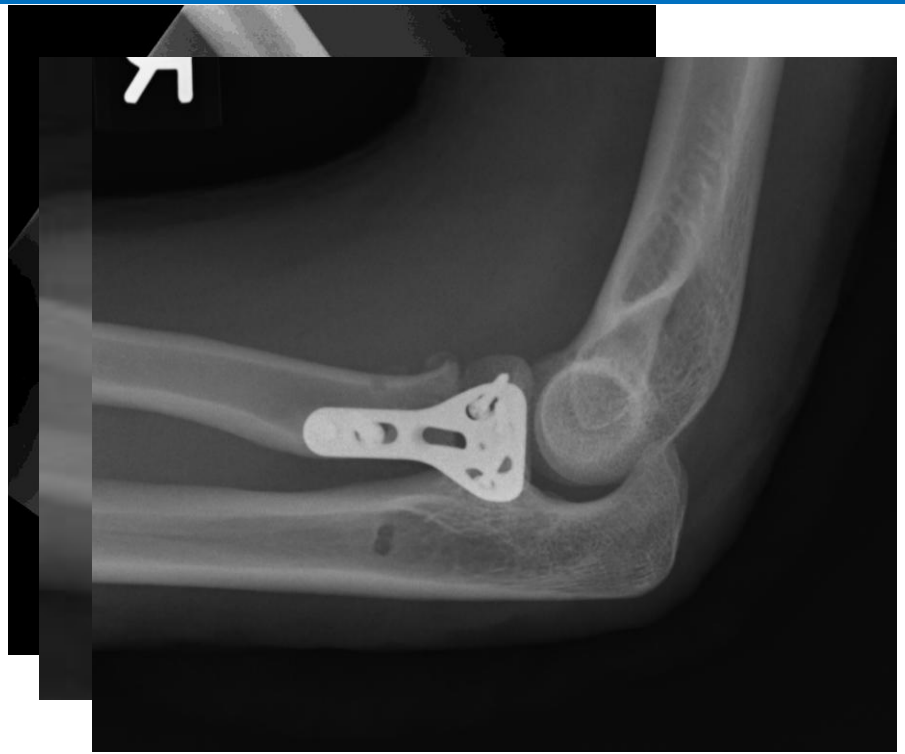
Ralph W. Coonrad, MD,[a] Thomas F. Roush, MD,[b] Nancy M. Major, MD,[a] and Carl J. Basamania, MD,[a]
Durham, NC

WHY DOES IT HAPPEN?

1. Edema / hemarthrosis
2. Ligament injury
3. Muscle inhibition
4. Gravity
5. Tissue interposition

WHICH SIDE IS UNSTABLE?

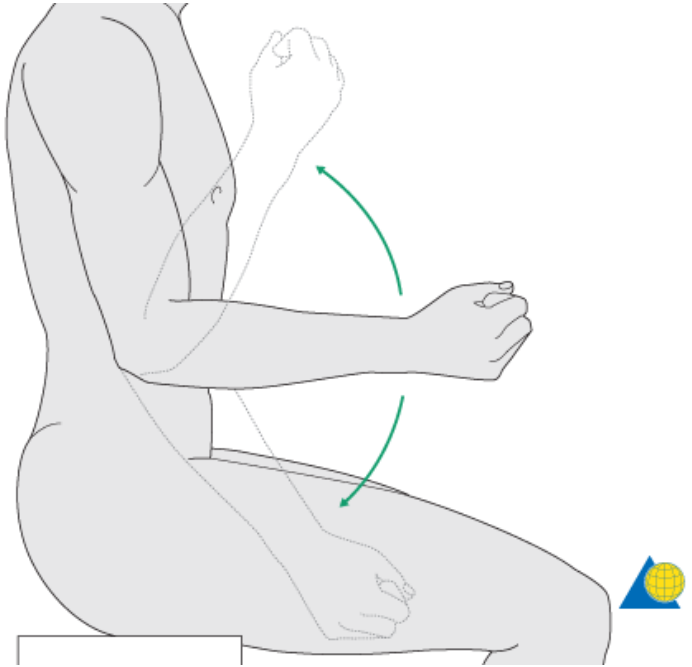
1. Lateral
2. Medial
3. Both



GENERAL PRINCIPLES

Edema Control

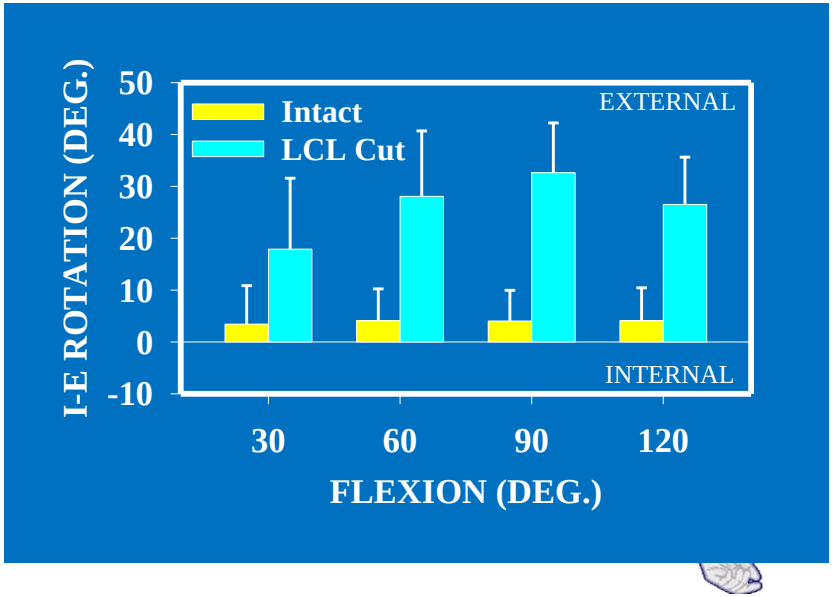
1. Medication
2. Cold packs
3. Compressive Bandages
4. Motion - Stimulates
   - Venous and lymphatic return



LCL INJURY: Forearm Position

PASSIVE FLEXION - LCL CUT

SUPINATED



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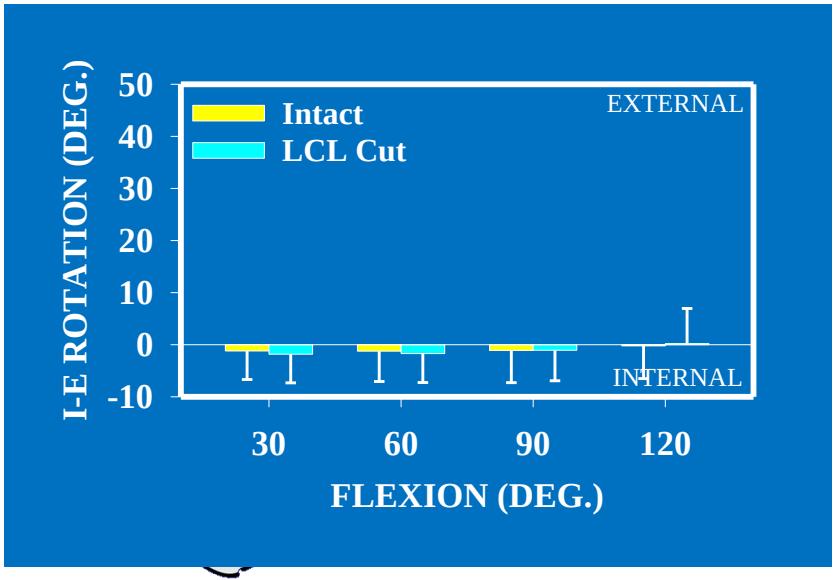
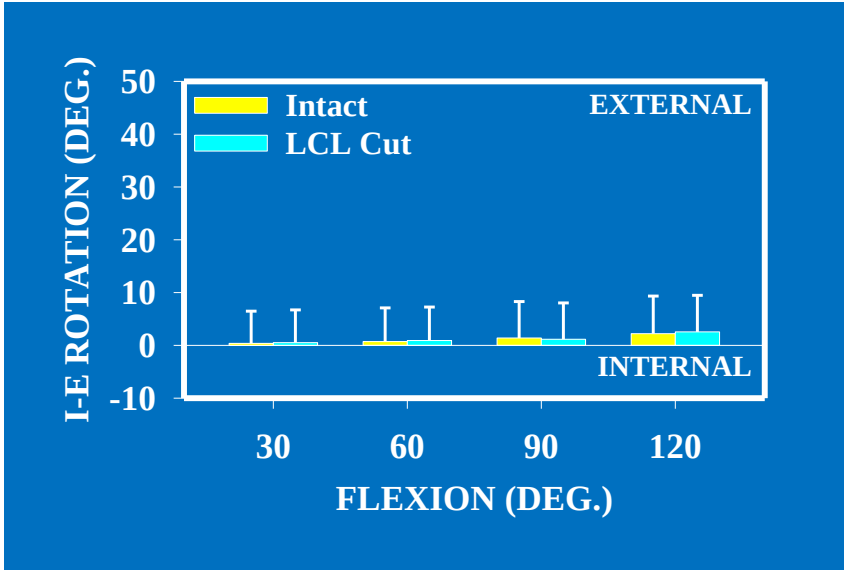


Dunning 2001

LCL INJURY: Muscle Contraction

ACTIVE FLEXION - LCL CUT

SUPINATED



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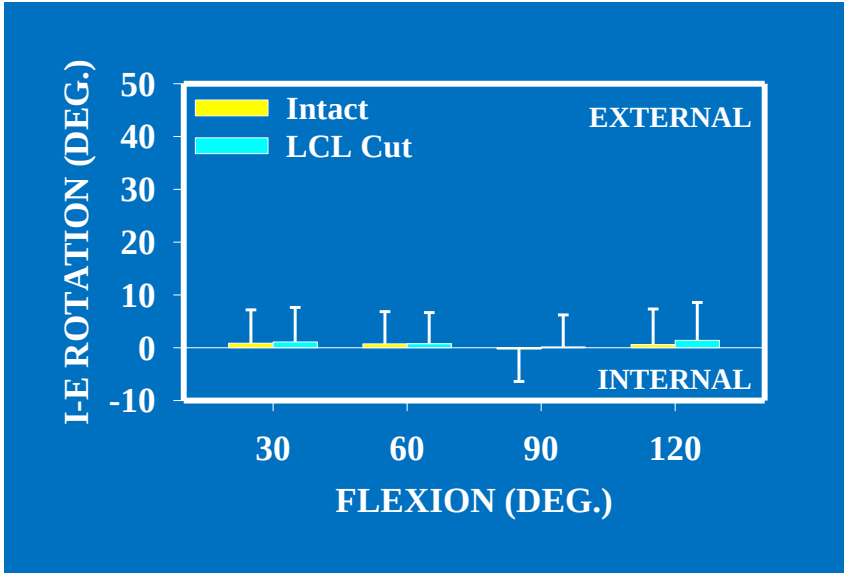


Dunning 2001

MCL STUDIES

- Similar themes
  - Supination > Pronation
  - Active ROM > Passive ROM

Armstrong 2000

PROTECTIVE ORTHOSIS

Forearm Pronated:
- ✓ Protects LCL

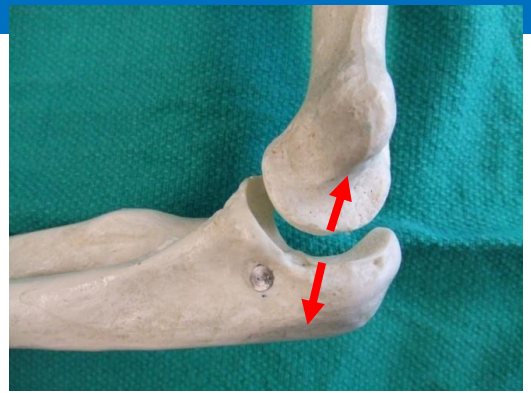
Dunning 2001

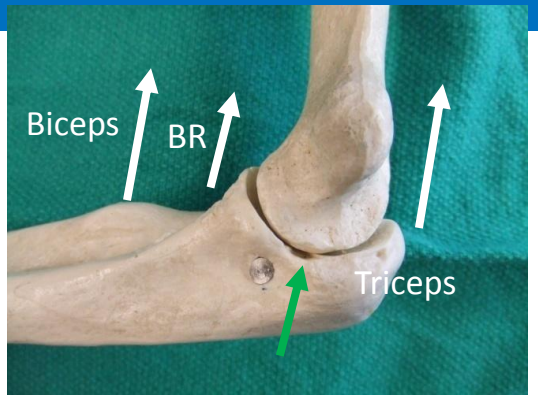
Forearm Supinated
- ✓ Protects MCL

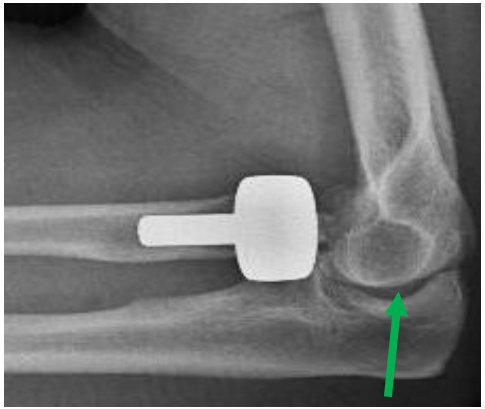
Armstrong 2004

Forearm Neutral:
- ✓Protects both

Isometric Contraction



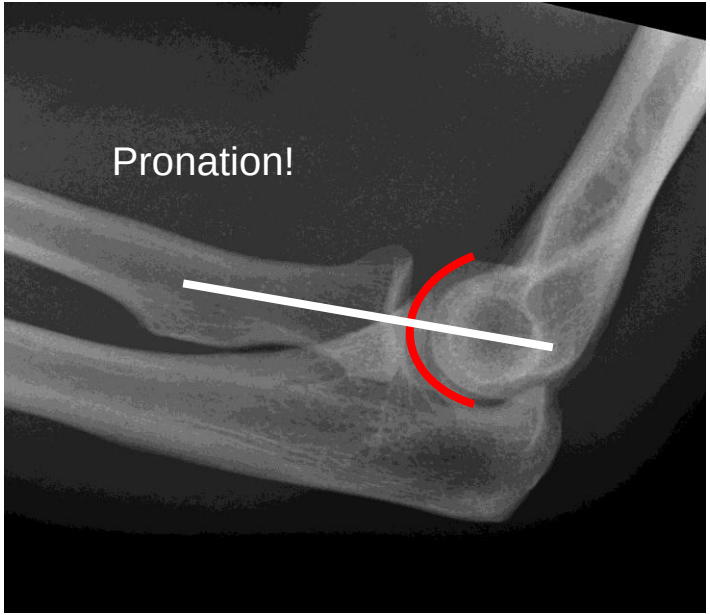




54 YR OLD HOMEMAKER

Slipped on ice

EFFECT OF FOREARM ROTATION



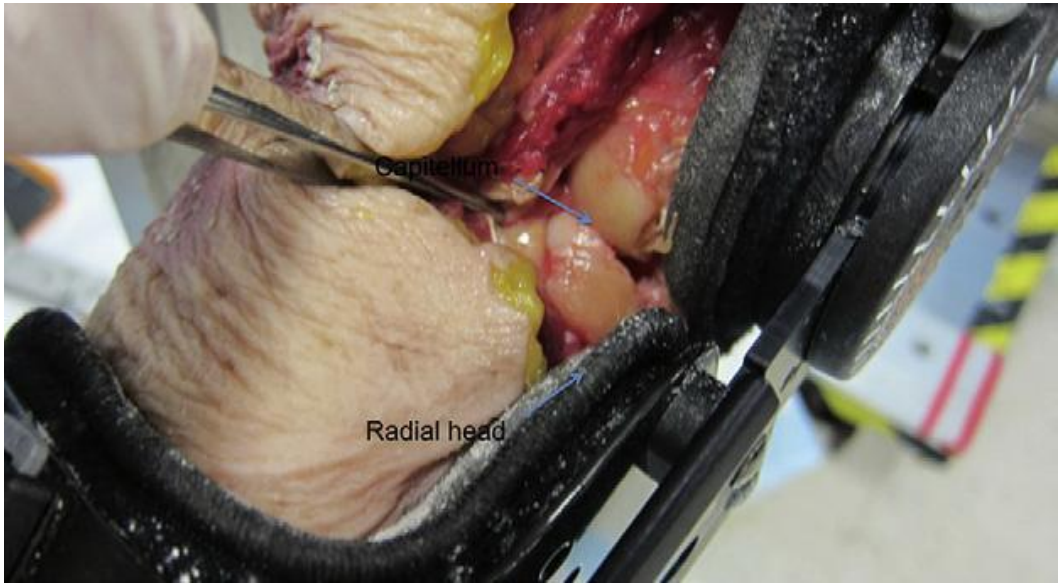
12 MONTHS POST INJURY

Splinted for 6 weeks, early mobilization

GRAVITY AND THE DROP SIGN

- Cadaveric Study

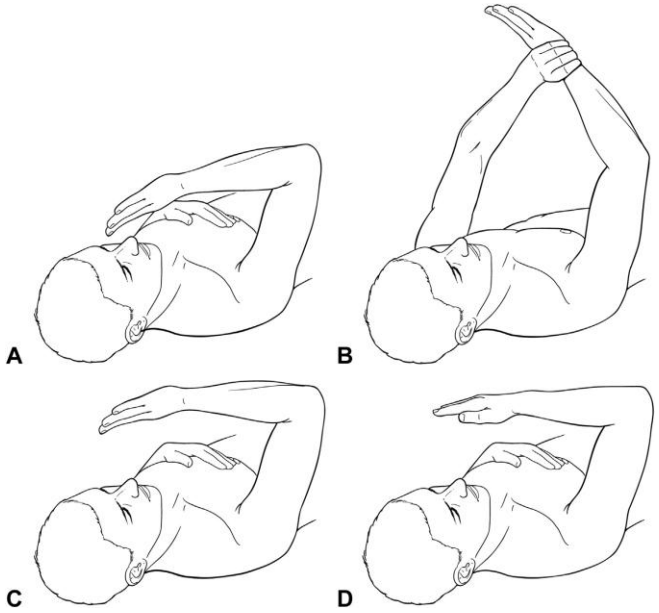
- Compared:
  1. **Upright**
  2. **Upright + Brace**
  3. **Supine Overhead**



Lee, JSES. 2013;22(1):81-87

Conservative Management of Elbow Dislocations With an Overhead Motion Protocol

- Retrospective review
- Early overhead motion is safe
- Final outcome was 6°-137°



Schreiber JJ, JHS(Am) 2015

OVERHEAD REHAB

Pipicelli JG, Chinchalkar SJ, Grewal R, King GJ. JHT 2012; 25(3):346-53

DROP SIGN:
Ligament Specific Rehab

1. Splint
   - Flexed:
     - Pronated / Supination

2. Active ROM
   - Dynamically compresses joint surfaces

3. Supine position
   - Overhead exercises
   - Gravity assistance

Armstrong AD. J Hand Surg [Am]. 2000

Dunning CE. Clin Orthop. 2001

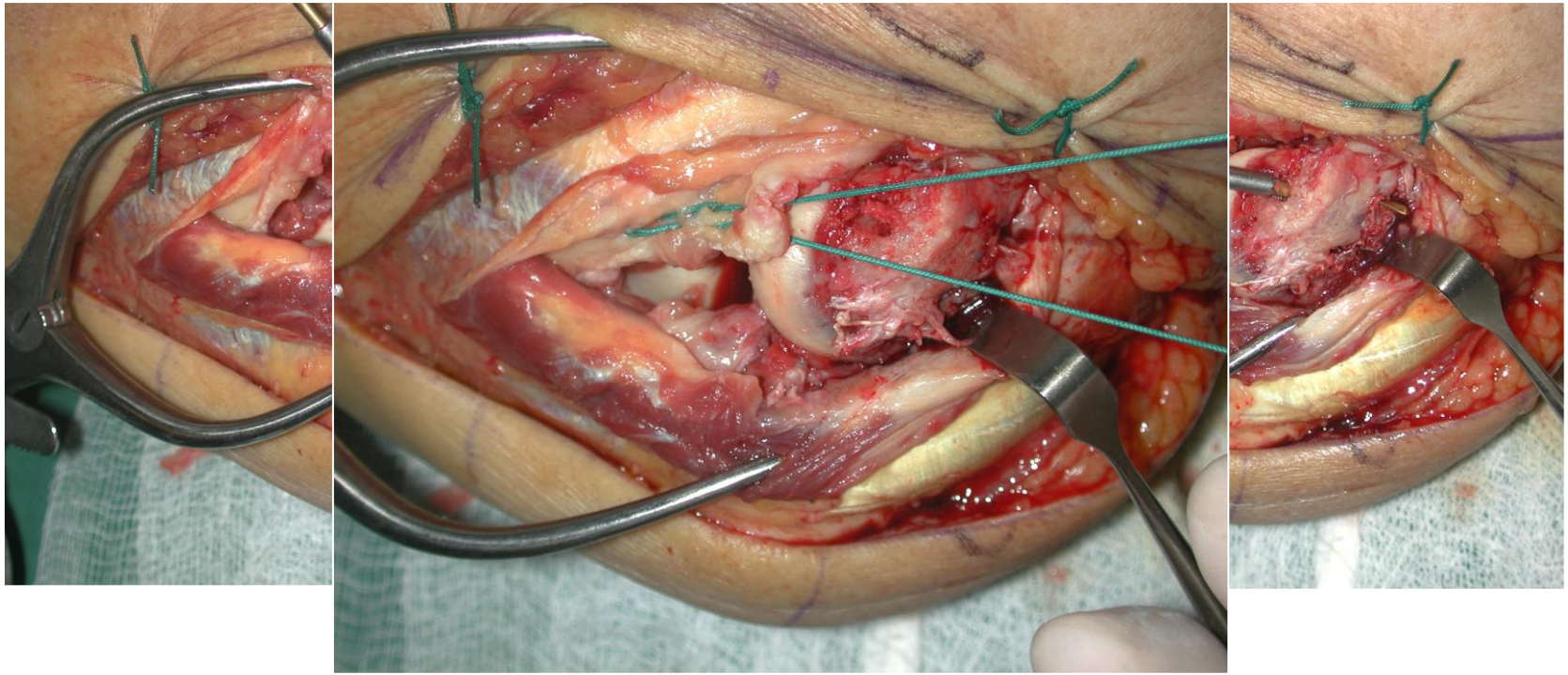
CASES!

32 YR OLD LABOURER

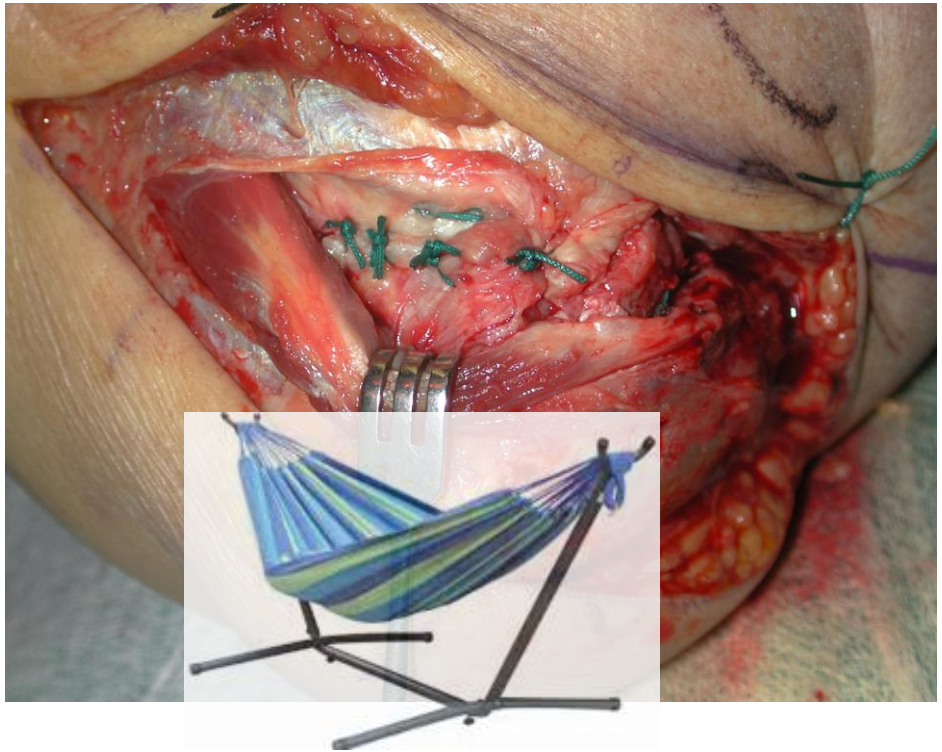
Bicycle crash

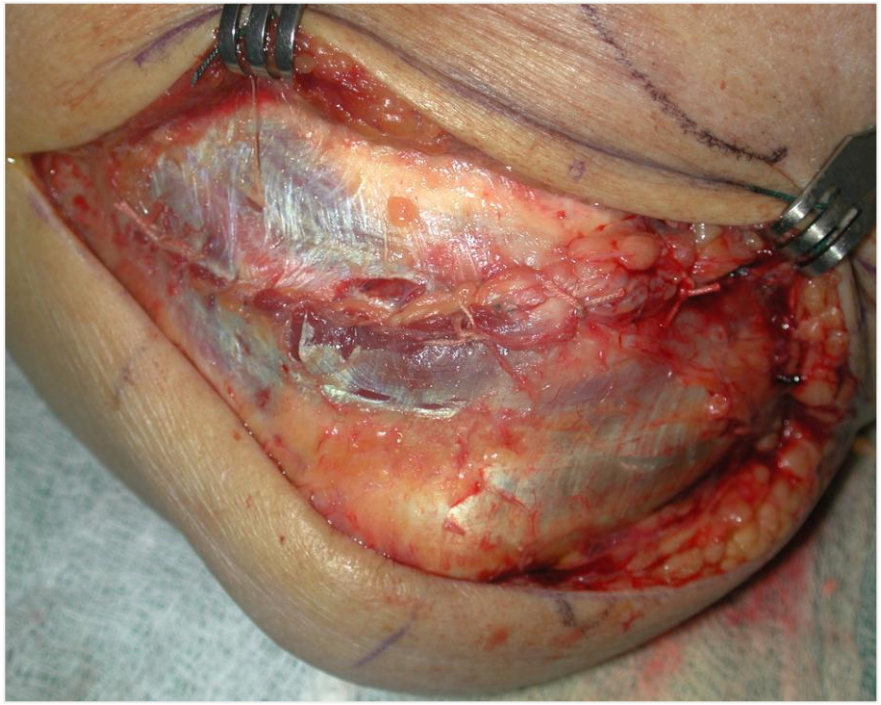
1 MONTH LATER

LCL REPAIR

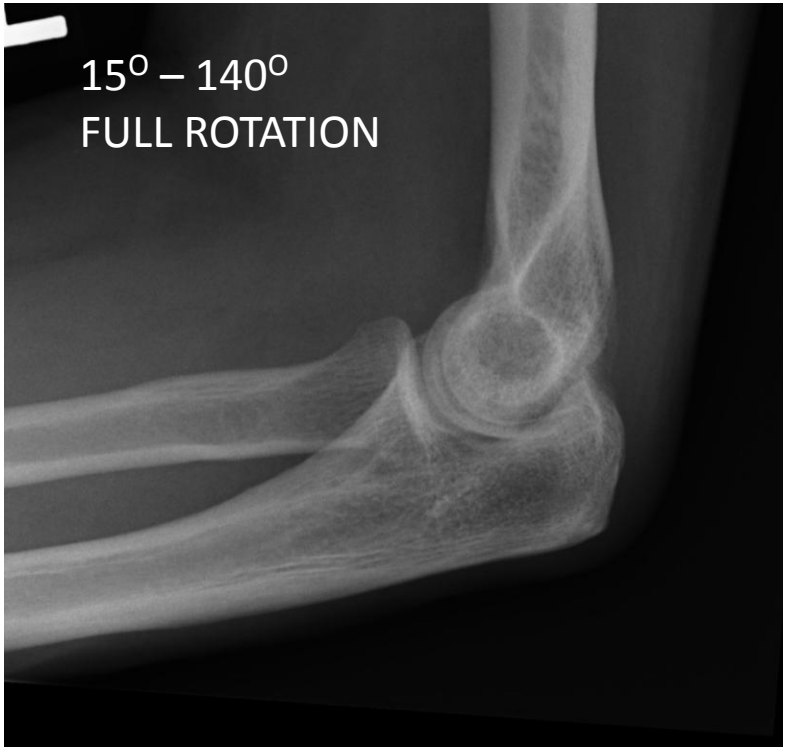


Capsule and Fascial Repair



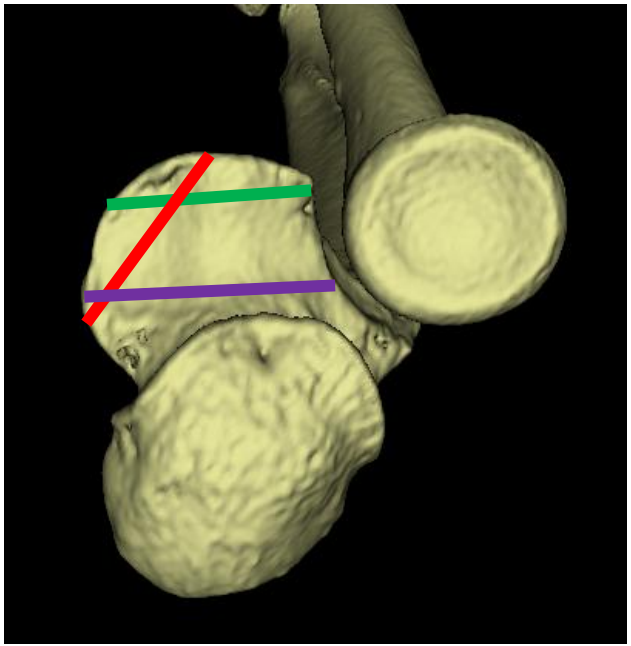


ONE YEAR POST INJURY



CORONOID FRACTURES

- **Tip**
  - <2mm
  - >2mm
- **Anteromedial**
  - AM rim
  - with tip
  - with sublime
- **Basal**
  - >50%
  - with olecranon



O'Driscoll 2003

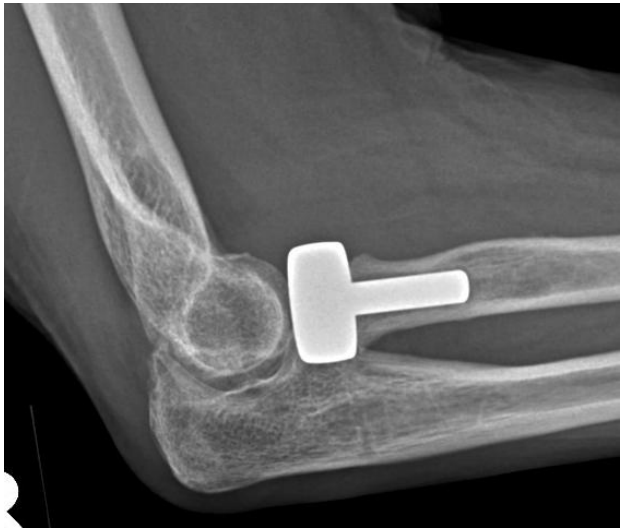
76 Yr Old F

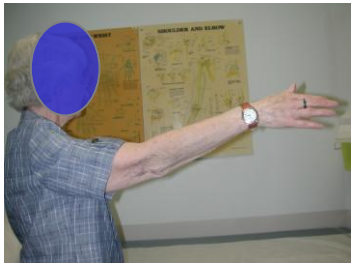
1 wk Post Injury

3 Weeks Post Injury

CT

12 Months Post Op



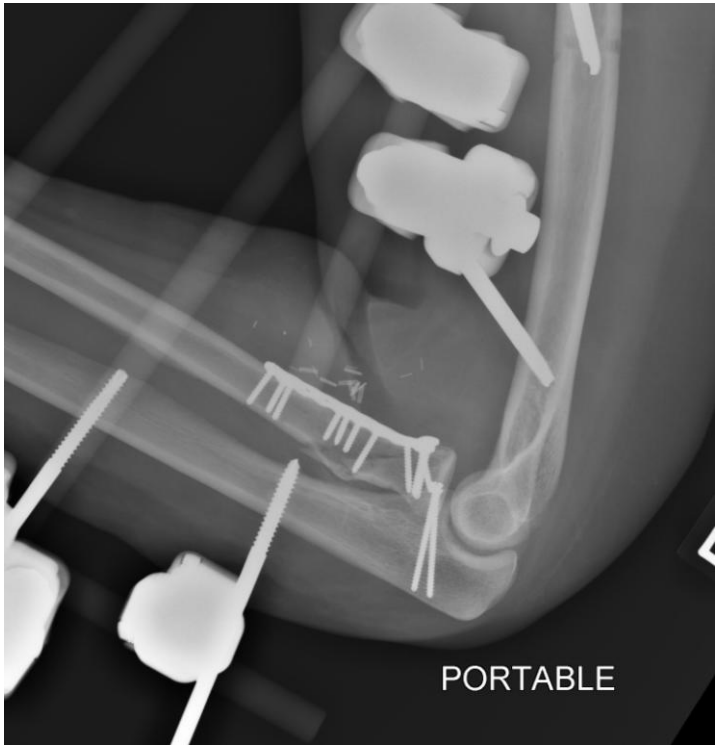


52 YR OLD FEMALE MVC

52 YR OLD FEMALE MVC

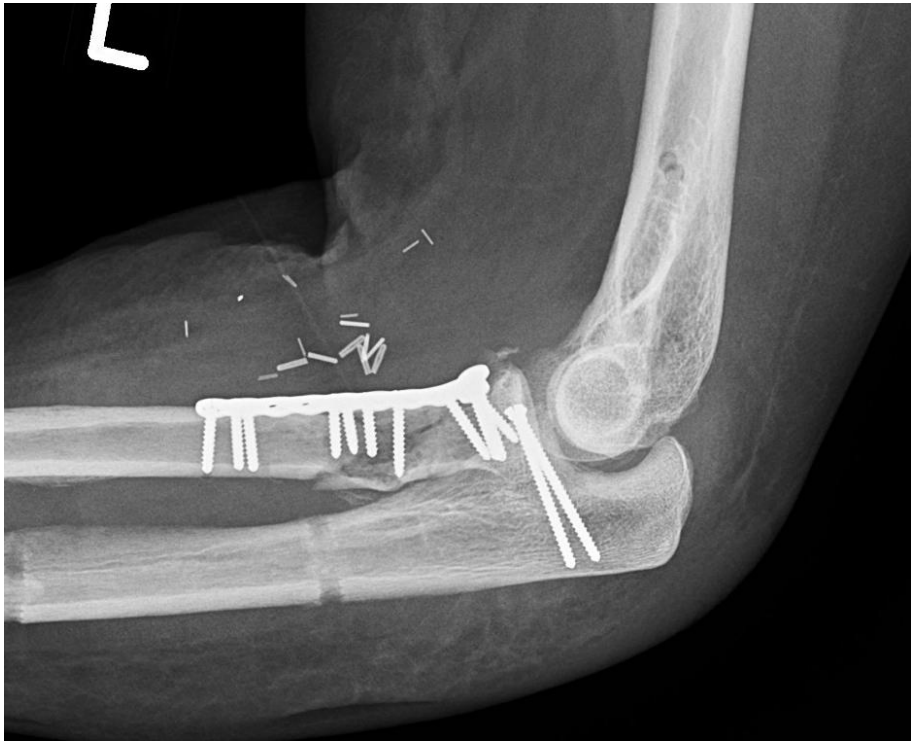
52 YR OLD FEMALE

I&D, ORIF, Static ExFix



52 YR OLD FEMALE

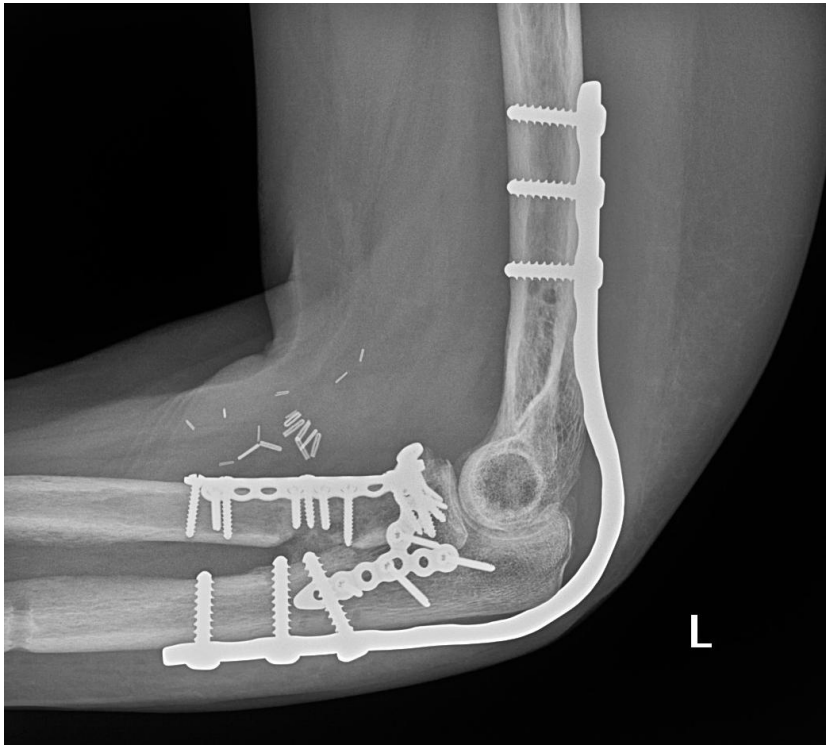
5 months post op



52 YR OLD FEMALE
Subluxation, Synostosis

52 YR OLD FEMALE

ICBG Coronoid, Excision HO, Temporary Fusion



ANTEROMEDIAL CORONOID FRACTURE

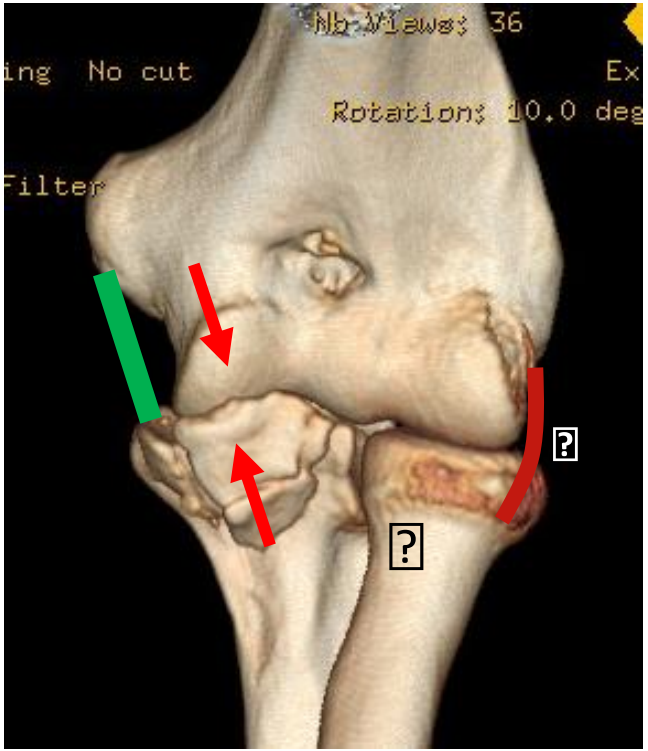
HALLMARKS

- Younger patients

- LCL fails “in tension”
- Coronoid fracture
  - Compression

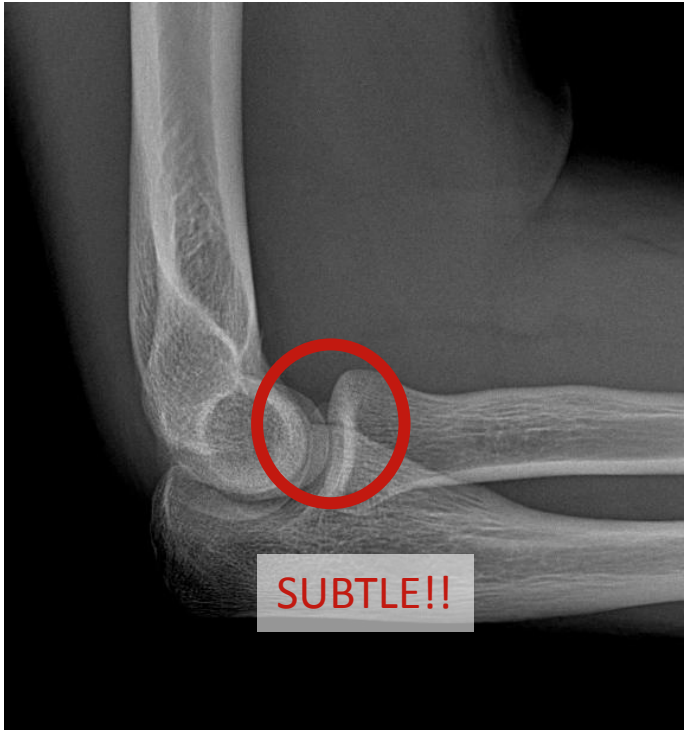
- Radial head intact
- MCL usually intact

- **Late sequelae: ARTHRITIS**
  Doornberg JBJS 2006



17 YR OLD ♂

Fall From Motocross



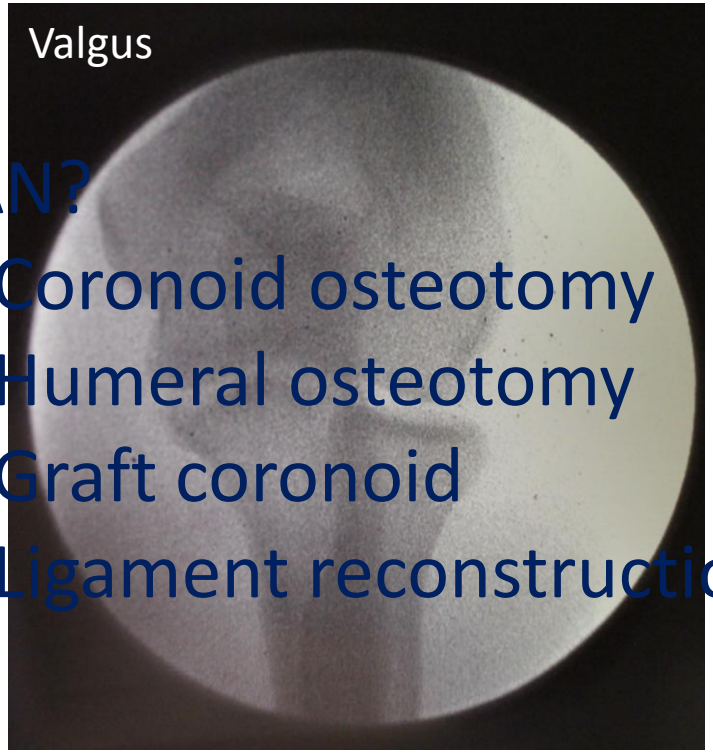
27 YR OLD ♂

Pain and Instability

10 YRS POST INJURY

HEALED FRACTURE, OA

FLUORO EXAM



PLAN?

1. Coronoid osteotomy
2. Humeral osteotomy
3. Graft coronoid
4. Ligament reconstruction

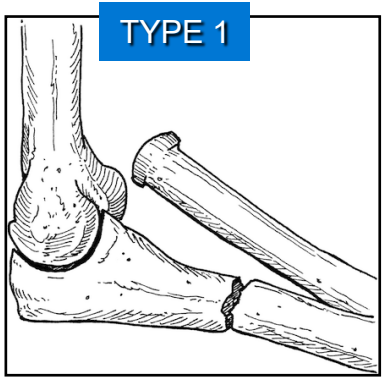
LCL RECONSTRUCTION

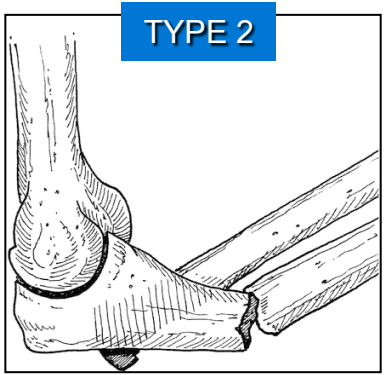
MONTEGGIA FRACTURES

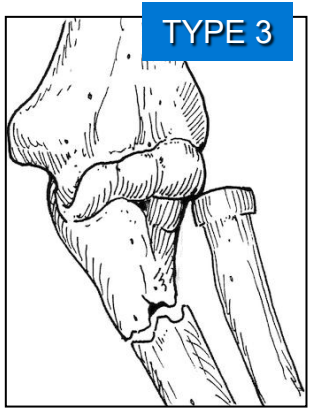
DEFINITION

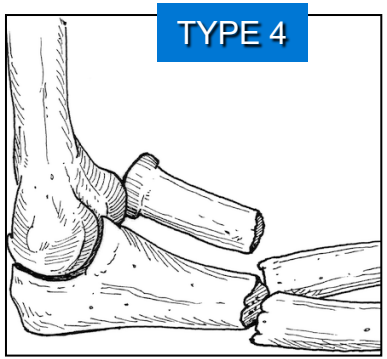
Fracture of the forearm with ***dislocation of the proximal radioulnar joint***

BADO







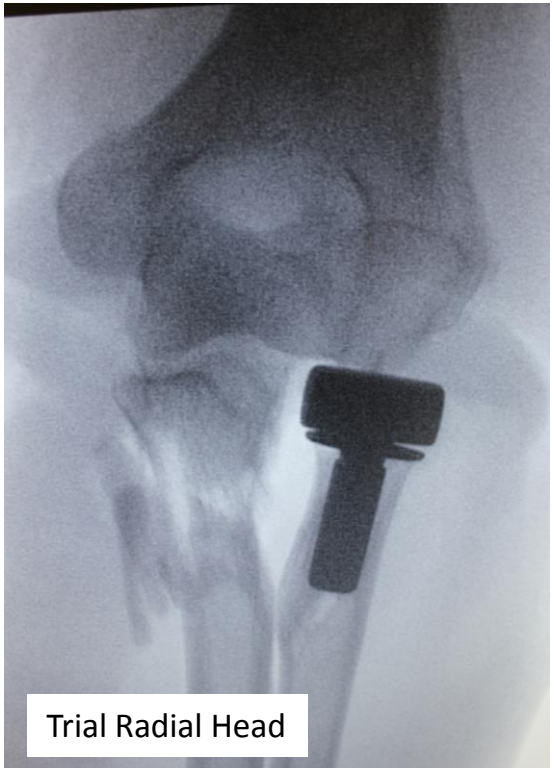


TREATMENT PRINCIPLES

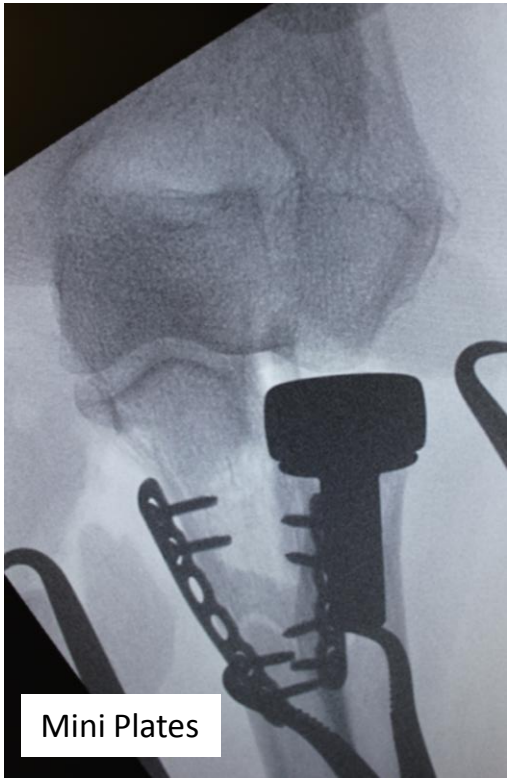
1. Anatomic reduction is critical
   - Ulna length
   - Ulna angulation
   - Coronoid
   - Radial head
2. Stable fixation:
   - Fixation of all components is essential
   - Avoid use of 1/3 tubular or reconstruction plates
3. Assess Ligaments!!

62 YR OLD ♀ BICYCLE CRASH

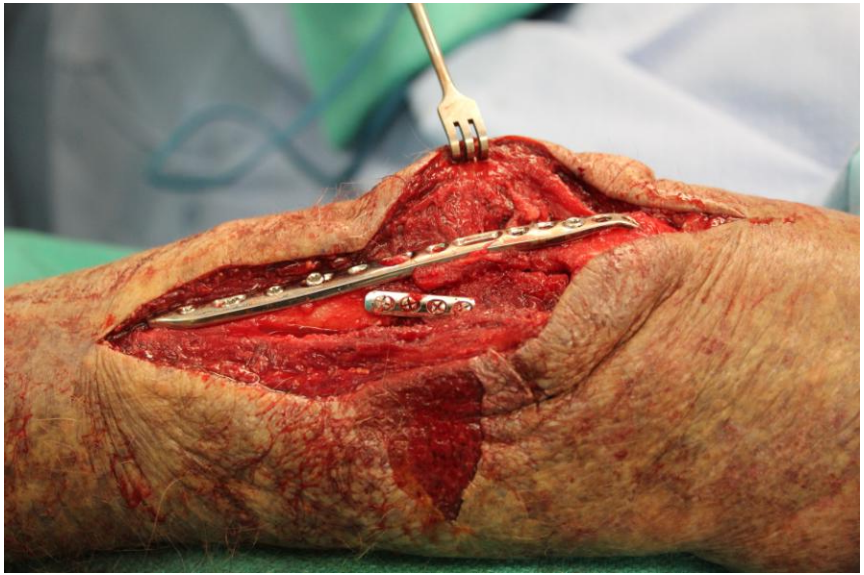
62 YR OLD ♀ BICYCLE CRASH



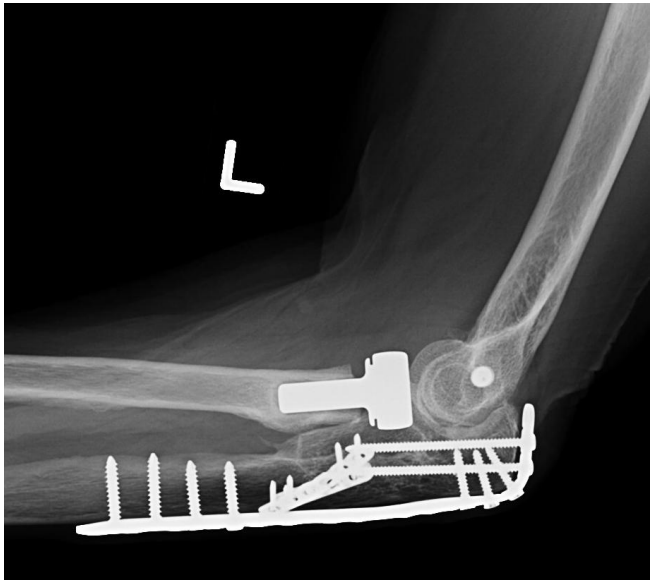
ULNAR LENGTH



62 YR OLD ♀ BICYCLE CRASH



62 YR OLD ♀ BICYCLE CRASH



SOME PITFALLS

1. Ulna malreduction

2. Neglected coronoid

3. Improper implant

25 YR OLD ♂ MVC

RADIAL HEAD REDUCTION?

If the radial head won't reduce, recheck the ulnar reduction.

If it still won't reduce, check it again!

The proximal ulna dorsal angulation: A radiographic study

Dominique M. Rouleau, MD, FRCSC, Kenneth J. Faber, MD, FRCSC,
George S. Athwal, MD, FRCSC*

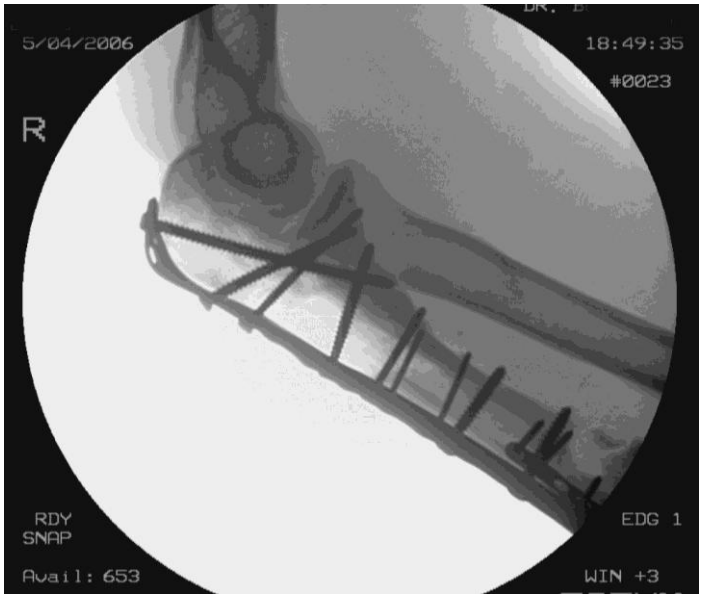
PUDA = 6°

Plates are straight!!

Journal of Shoulder and Elbow Surgery

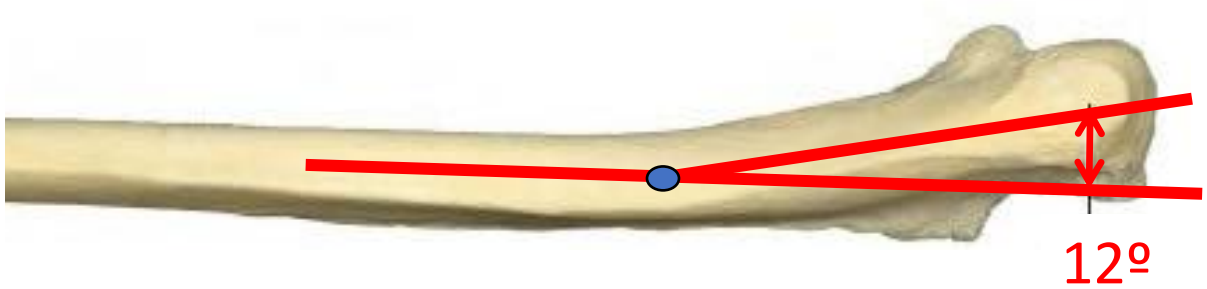
ULNA REDUCTION is KEY

Ulnar shaft must be **PERFECTLY REDUCED** for stability.



Morphometric analysis of the proximal ulna using three-dimensional computed tomography and computer-aided design: varus, dorsal, and torsion angulation

Woon Jae Yong · Jun Tan · Arnold Adikrishna · Hyun Joo Lee · Jin Woo Jung · Dong-Woo Cho · In-Ho Jeon

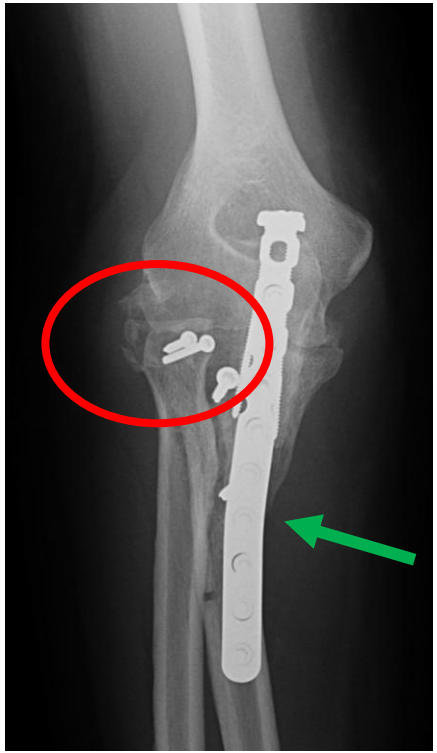


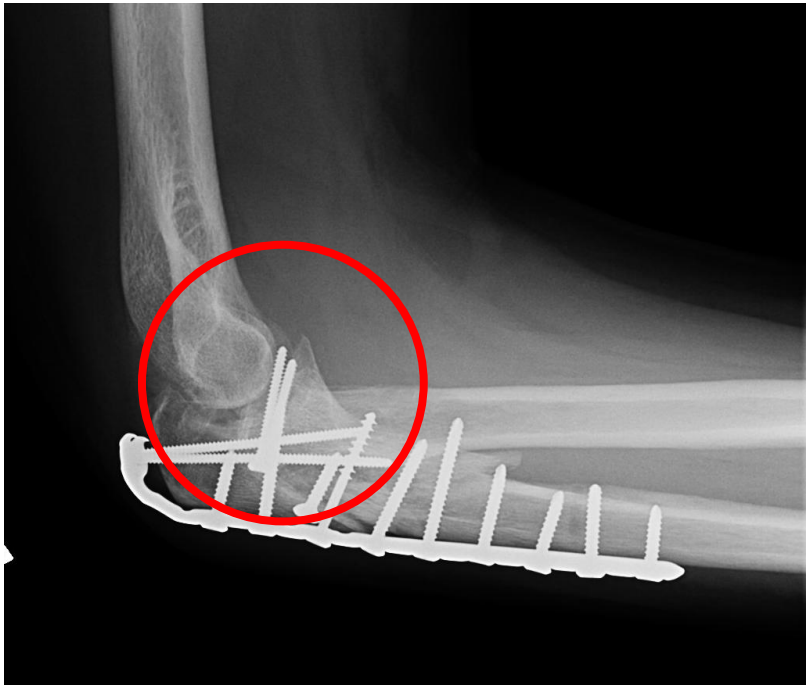
Surg. Radiol. Anat. 2014

37 YR OLD MALE TRUCKDRIVER

37 YR OLD MALE TRUCKDRIVER

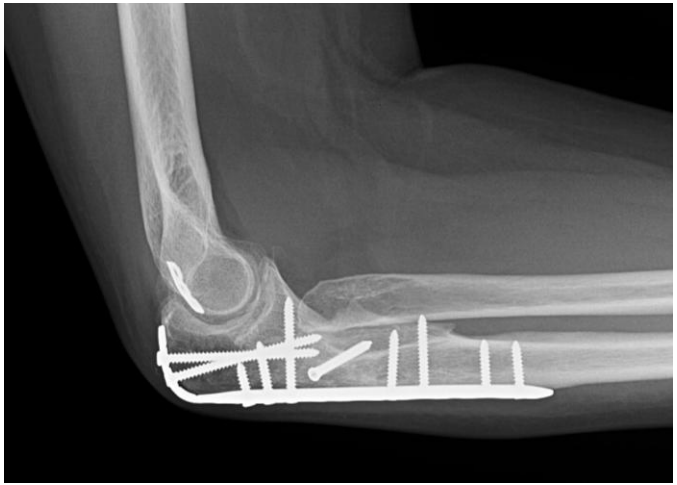
3 MONTHS POSTOP: 50-90°, MINIMAL ROTATION

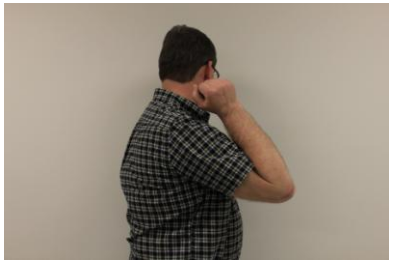


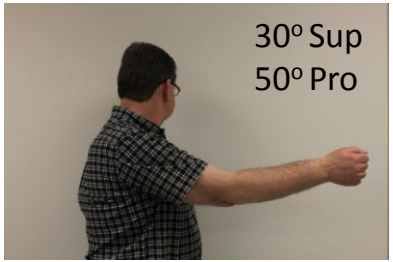


37 YR OLD MALE TRUCKDRIVER

REVISION ORIF, RH EXCISION, ANCONEUS INTERPOSITION







68 YR OLD FEMALE

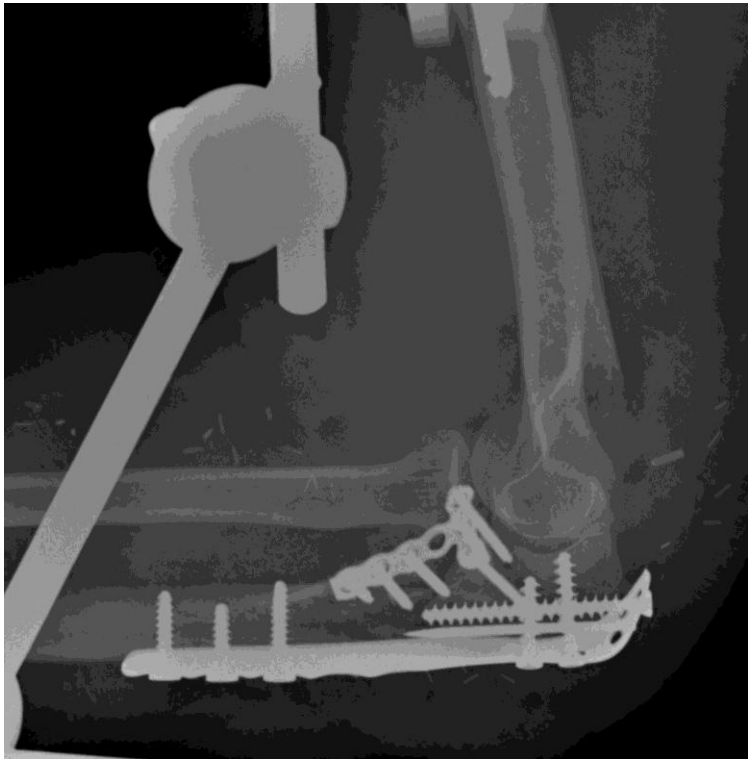
Neglected Basal Coronoid Fracture

4 WKS POSTOP

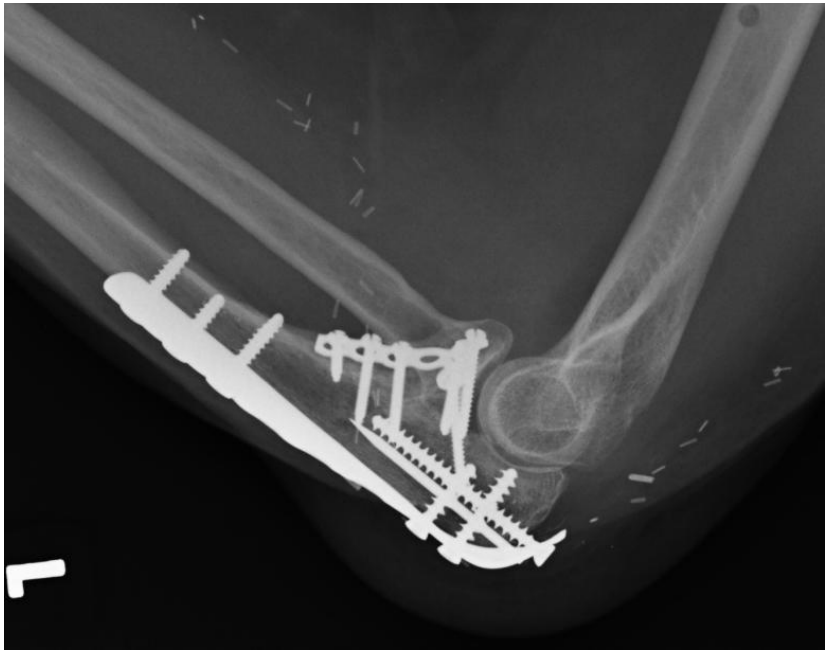
3D CT MONTEGGIA IIa

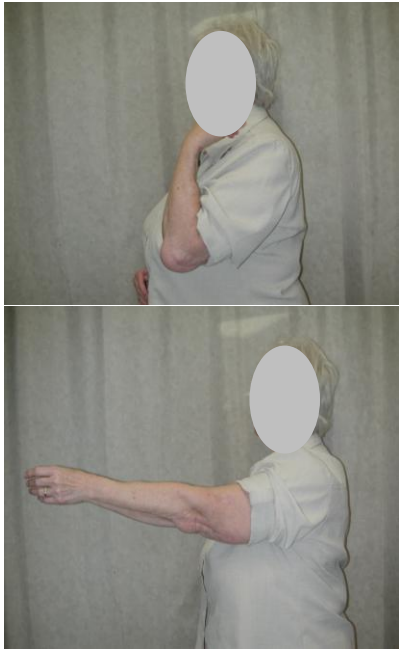
SURGICAL PLAN

- Revision fixation olecranon
- Ulnar nerve transposition
- ORIF coronoid
- LCL repair
- Static external fixator



1 Yr Post op





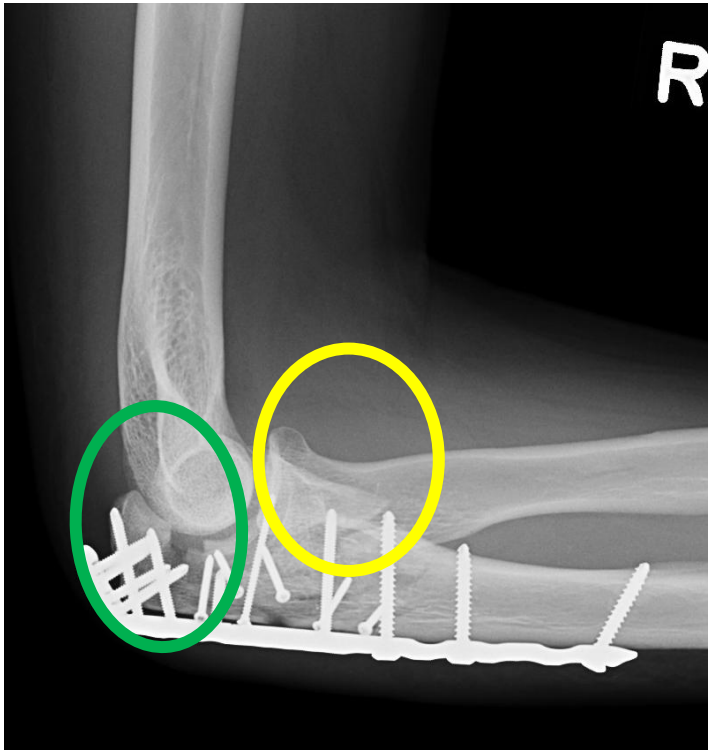
TRANSOLECRANON FRACTURE DISLOCATION

DEFINITION

Anterior fracture-dislocation of the elbow where the primary lesion is a complex disruption of the ulnohumeral articulation and the ***proximal radioulnar joint remains intact***

JV 31 YR OLD STUNTWOMAN

No Forearm Rotation, Flexion Crepitus



CT

REVISION ORIF

Medial and Trans-olecranon Approach

SUMMARY

1. Forearm position, Active ROM and Gravity:
   - have effects on stability
2. Unstable coronoid fixation:
   - consider temporary fixator
3. Monteggia:
   - The ulna must be perfect – in both planes
4. Transolecranon:
   - The greater sigmoid notch should be perfect!
5. Remember to assess the ligaments

THANK YOU