

FLORIDA ORTHOPAEDIC INSTITUTE

Terrible Triad: Tricks for Dealing with the Unstable Elbow

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Disclosure



- Paid Consultation
- Research Support
- Speakers Bureau



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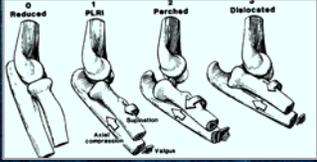
The Terrible Triad Injury

1. Coronoid Fracture
2. Radial Head Fracture
3. Elbow Dislocation



Biomechanics of Elbow Dislocation

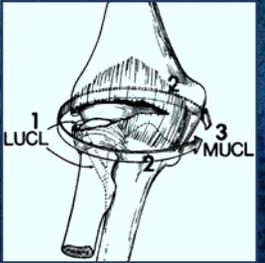
- May involve bone or soft tissue
- Radial head becomes a critical stabilizer if coronoid is fractured
- Pivots on anterior band of the MCL



Biomechanics of Elbow Dislocation

Injury occurs from lateral to medial

1. LUCL disrupted
2. Anterior & posterior capsule disruption
3. MCL



The Terrible Triad Injury: 2 Year Clinical Results

Ring JBJS, 2002

- 11 patients
- Radial head resected in 4
- LUCL repaired in 3
- No coronoid fractures repaired
- 5 re-dislocated, including all 4 where radial head was resected
- 7/11 rated the treatment unsatisfactory

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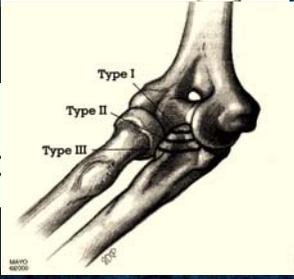


Coronoid Fracture

Classification

- Type I
- Type II
- Type III
- Sagittal Split

May involve MCL

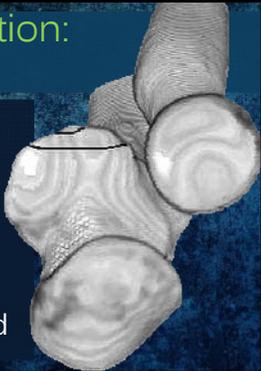


O'Driscoll Classification: The Modern Classification

- CT-based classification
- Accounts for instability patterns/associated injuries
- Guides treatments

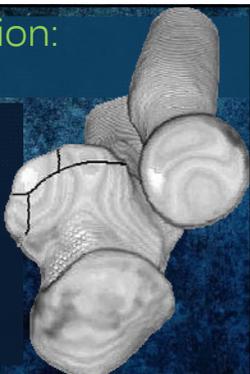
O'Driscoll Classification: Type I

- Transverse fracture of coronoid tip
- 2 subtypes
 1. < 2 mm of coronoid bone (i.e. flake)
 2. > 2 mm of coronoid bone
- Associated with terrible triad



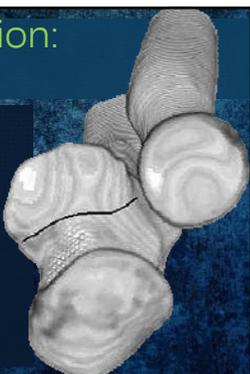
O'Driscoll Classification: Type II

- Anteromedial facet fracture
- 3 subtypes
 1. Anteromedial rim
 2. Anteromedial rim & tip
 3. Anteromedial rim, tip, & sublime tubercle
- VPMI instability pattern
- LCL always injured unless olecranon or coronoid base fracture



O'Driscoll Classification: Type III

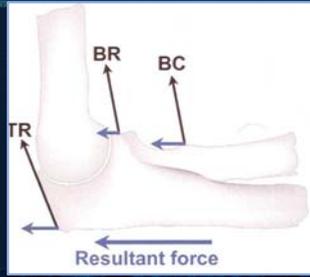
- Coronoid base fractures
- 2 subtypes
 1. Coronoid body & base
 2. Trans-olecranon basal coronoid fractures
- Associated with anterior & posterior trans-olecranon fracture dislocations



Coronoid Fracture

Complex instability of the elbow results from posterior-directed forces

TR (triceps) • BR (brachialis)
BC (biceps)



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Metal RH Arthroplasty for Unreconstructible Fractures

Moro JBJS, 2001

- 25 radial head fractures
 - Mason Type III & Mason-Johnston Type IV
- All had metal RH replacement
- Most had ligamentous injuries/other elbow fractures
- Results: MEPS 17 good/excellent

The Terrible Triad Injury

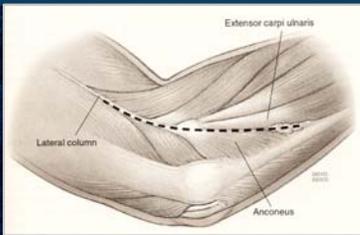
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Elbow Dislocation

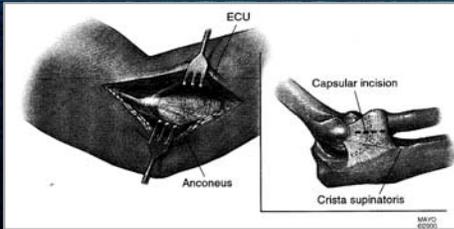
- In complex dislocations, the MCL is generally not repaired
- MCL tends to heal if elbow is reduced
- If instability persists, an accessory medial incision can be made to address the MCL

Technique for Reconstruction



Supine on hand table: Lateral column approach

Technique for Reconstruction



Capsular incision stays above LUCL

Soft Tissue Injury

- Avulsion of LUCL
- Often leaves a bare spot on lateral condyle
- Avulsion of extensors



Coronoid Fracture Fixation: Screws

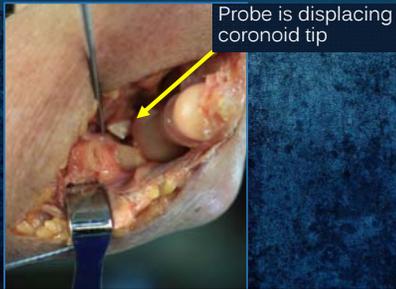
- Large coronoid fractures are fixed with 1-2 lag screws
- Variable pitch screws can also be reliably employed
- May tie down fragment with sutures, via the lateral incision & radial head defect

Coronoid Fracture Fixation

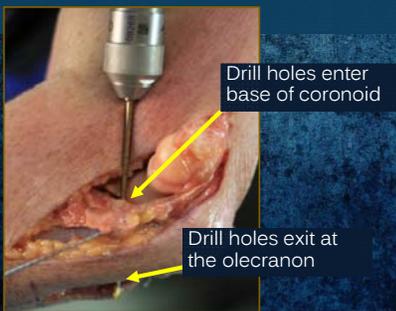
- Multiple techniques of fixation
- Depends on fragment size
- Most complex elbow fracture dislocations involve Type I or Type II fragments

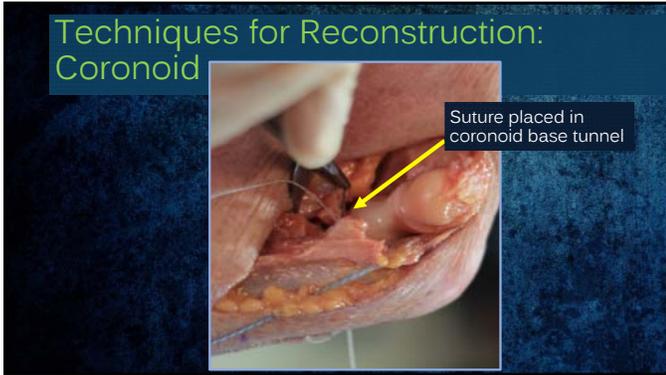


Techniques for Reconstruction: Coronoid

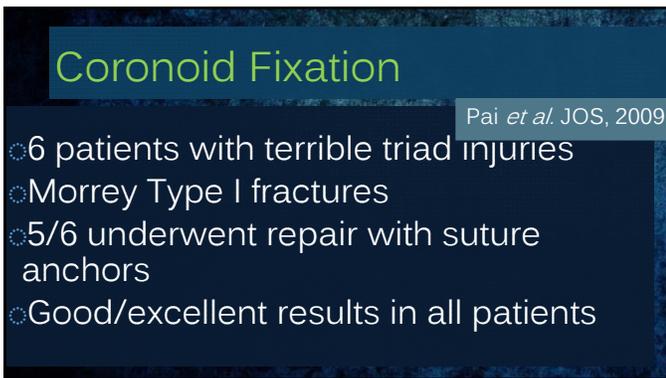


Techniques for Reconstruction: Coronoid









Radial Head Fixation

- Primary goal: Stable anterior buttress
- Fixation with a headless/3 mm screw that engages the head & is directed distally into the shaft
- Can also place small plate in "safe zone"

Overstuffing Radiocapitellar Joint



Detrimental Effect of Overstuffing

Van Glabbeek *et al.* JBJS, 2004

- Cadaveric study
- Medial collateral deficient elbows
- Conclusions
 - The pressure in the radiocapitellar joint was significantly increased with > 2.5 mm lengthening
 - Altered kinematics with ulna tracking in varus & external rotation

LUCL Repair

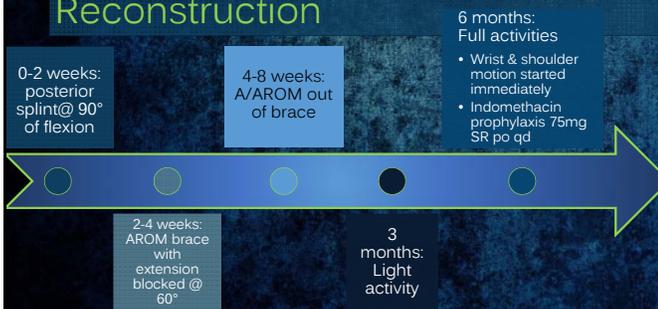
- Isometric repair of LUCL
- Repair
 - Drill holes in conjunction with an anchor placed just proximal to the COR
- If significant instability remains, repair or reconstruct the MCL

Technique for Reconstruction: Terrible Triad

- Fluoroscopy to ensure anatomic & stable reduction



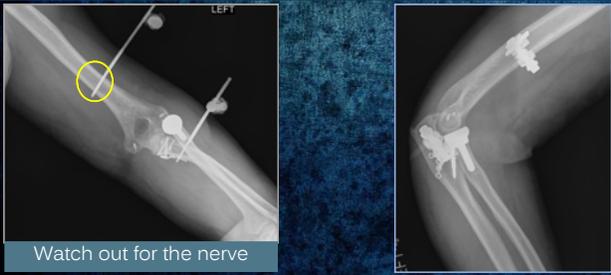
Rehabilitation Protocol After Reconstruction



Case 1: PreOp Radiographs



Case 1: Radiographs



Case 1: PostOp Radiographs





