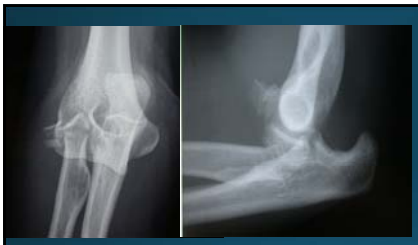
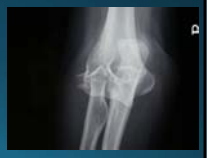


Jeffrey D Stone MD

Terrible Triad

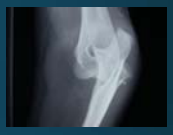
Treatment Goals:

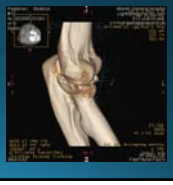
- Restore Stability
  - Render capable of Ligamentous and Bony Healing
- Protect Reconstruction
- Allow Early Mobilization
- Stability and Protection >>> Motion



Pearls

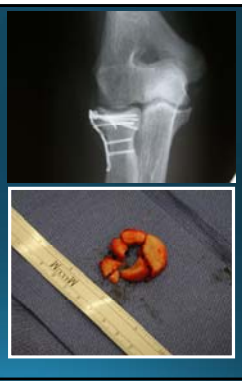
- Preoperative planning
  - Radial Head: fixation vs arthroplasty
  - Coronoid fixation
  - Anchors- ligament repair
  - Ex fix
- Surgical Approach
  - Kocher vs Universal posterior skin incision
- Repair Coronoid 1st
  - Anterior Capsule Repair (Small Frags)
  - ORIF vs Graft Reconstruction





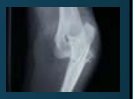
Pearls

- Radial Head : Fix or Replace
  - <3 Fragments ➡ Screw Fixation
  - >3 Fragments ➡ RHA
  - Strongly Consider RHA for Comminuted Neck
  - Do Not Excise
- Careful Implant Placement
  - Safe Zone
  - Countersink
  - Avoid PRUJ
  - Avoid Plates? (PIN & restriction of rotation)



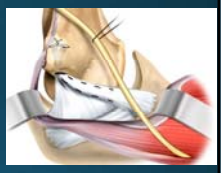
Pearls

- RHA -Restore "Fit"
  - Place radial head 1 mm distal to coronoid
  - Avoid over and under-stuffing
- Repair LCL and Extensor Origin
- Trans-Olecranon
  - Expose through Olecranon fracture



Pearls

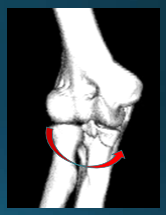
- MCL - high rate of healing Fortham et al. JHS 2007 32A
- If Persistent Instability
  - Repair or reconstruct MCL & Flexor Pronator Origin
  - Internal Bracing
  - Ex Fix
  - Pinning
  - Increase Elbow Flexion



Richard et al. JBJS 2008

Pearls

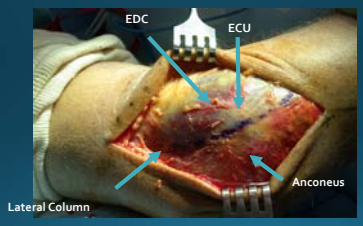
- Beware fx's Anteromedial Coronoid facet
  - CT
  - Association with LCL Avulsion Small fragments
    - → Rotatory instability
  - Gravity assisted Varus Stress Test



Pearls

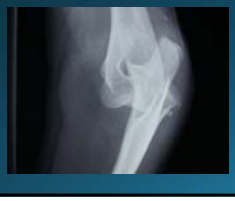
- Fluoroscopy Elbow and Wrist
- Look for Essex Lopresti
- Beware Posterior Subluxation of Radial Head
- "Radial-Pull test" Smith et al. JBJS 2002
  - +If Radial Neck Contacts Capitellum
- DRUJ Instability

Surgical Approach

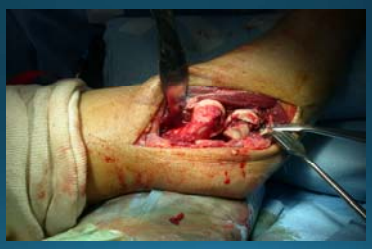


Posterior Approach

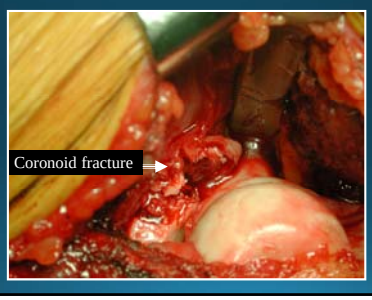
- Extensive Ligamentous Injury
- Ulna More Proximal to Humerus



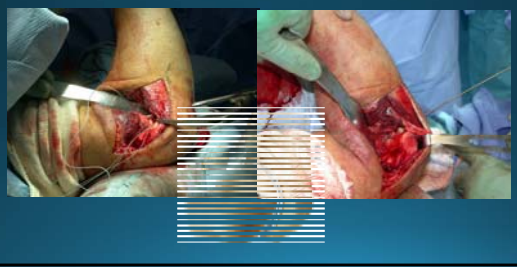
"Bald Epicondyle"
LCL & Extensor Origin Avulsion



Coronoid Fracture

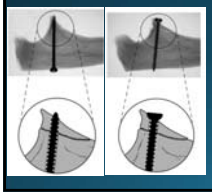
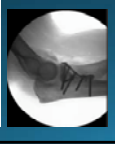
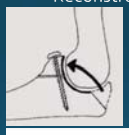


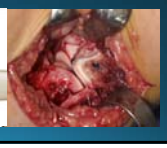
Anterior Capsule and Coronoid Fixation



Larger and Comminuted Coronoid

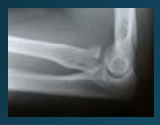
- Repairable
  - ORIF
- Reconstruction Options

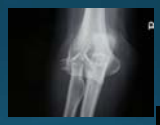


Radial Head

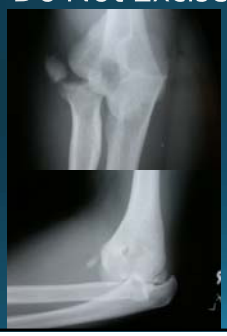
<3 Fragments – "Fixable"




>3 fragments – "Not Fixable"

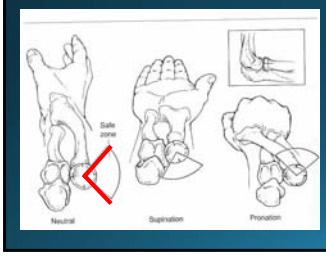


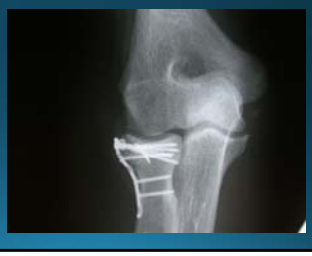

Do Not Excise This!



Contraindications for RH Excision
- Incompetent MCL
- IOM Injury
- Elbow Dislocation

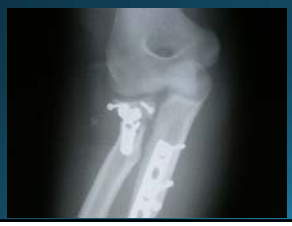
Safe Zone

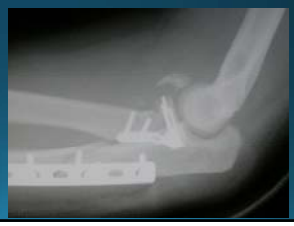




Avoid Tenuous Fixation

- Failed Fixation
- Poorer Outcomes

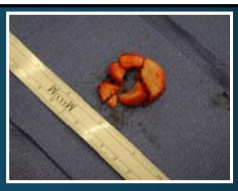


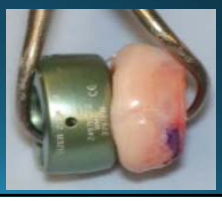


RHA: Exposure

- Deliver Proximal Radius Laterally
- Pronate
  - Avoid PIN (Avg 4cm)

Sizing

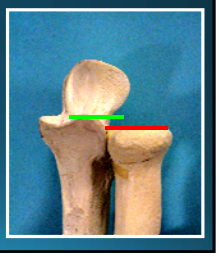




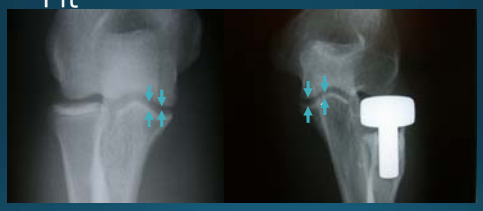
Reference Point for Radial Head Implant Position

Doornerg et al. JHS 2006

- CT Study
- Place radial head 1 mm distal to lateral edge of coronoid
- Overlengthening 2.5mm
  - Significant increase RC pressure
    - Cohn JHS 2014

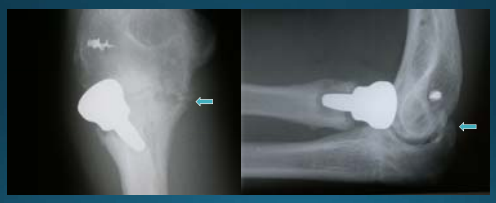


Intraoperative Imaging "Fit"



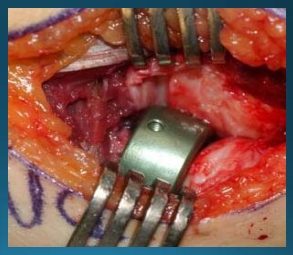
Medial Portions of Ulnohumeral Joint should be = Width

Overstuffed: Progressive OA



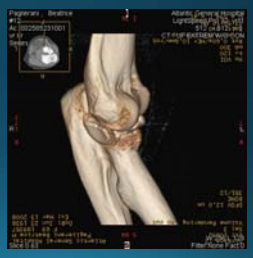
Tracking

-Downsize Stem if RC Mal-tracking
-Upsize Head if Edge Loading



Best Radial Head Implant?:

- **Debatable**
  - Rigidly fixed stem (cement/ ingrowth)
    - +/- Bipolar
  - Loose polished stem – **Mobile Spacer**



25 RADIAL HEAD INGROWTH ANATOMIC IMPLANT VS. SMOOTH STEM MONOBLOCK IMPLANT IN ACUTE TERRIBLE TRIAD INJURY: A PROSPECTIVE STUDY

*David Rodriguez-Quintana, MD, **Francisco López Gonzalez, MD**, Department of Orthopaedic Surgery, University of Puerto Rico/ Medical Sciences Campus, San Juan, Puerto Rico, USA*

ASES Abstracts 2015

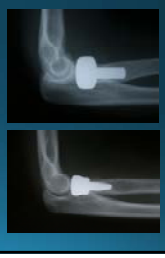
Ingrowth vs Smooth Stems:

Similar Outcomes at 1 yr

Proximal Radial Resorption > Ingrowth

Proximal Radial Thickening, HO > Smooth

Conclusion: At one year follow up; functional and clinical results were similar with both implant designs with the exception of supination that was better in the ingrowth group. The proximal radius seems to react different to each implant. Proximal radial thickening and heteratopic bone were more common in the smooth stemmed group possibly because of the loads transmitted through the loose stem to the area. On the other hand, the Anatomic in-growth implant did not achieve ingrowth in at least 4 cases. In 2 cases proximal radial resorption was noted most likely secondary to stress shielding in a well fixed implant.

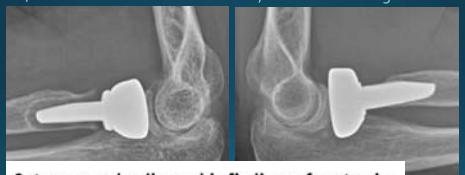


Press Fit Stems and Loosening

JSES 2016

40% Radiolucencies

67% Stress Shielding

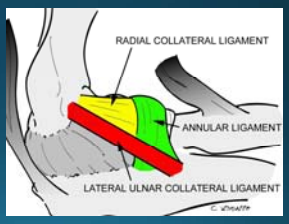


Outcomes and radiographic findings of anatomic press-fit radial head arthroplasty

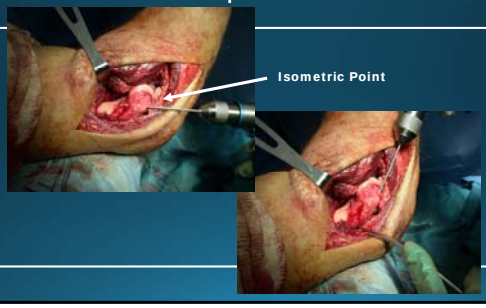
Jonathan C. Levy, MD*, Nathan T. Formaini, DO, Jennifer Kurowicki, BS

LUCL

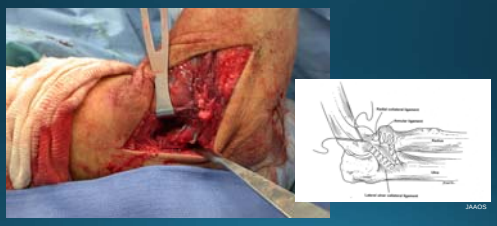
- Isometric
- Poor Healing
- Repair as Last Step on Lateral side
- Reconstruct if Irreparable



Anatomic LCL Repair



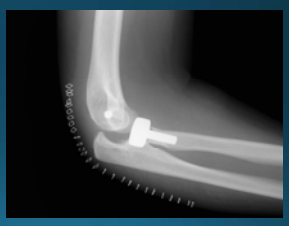
LCL Repair



Krackow sutures in LUCL/ Ext. mass/ Anconeus

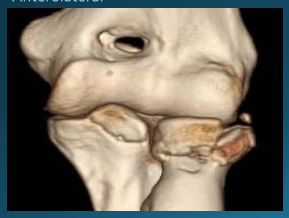
LCL Reconstruction

Drop Sign: Overstuffed vs Residual Instability

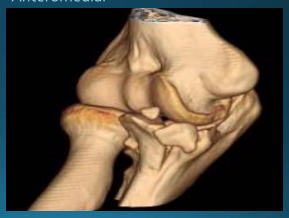


Typical Patterns of Coronoid fracture

Anterolateral

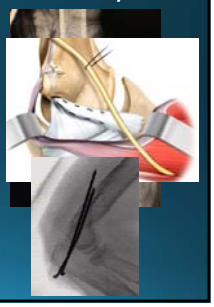


Anteromedial



Persistent Ulno-humeral Instability

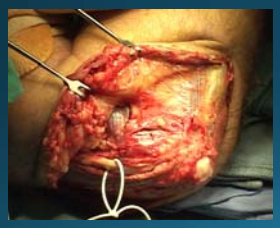
- MCL Repair and/or Reconstruction
- Internal brace
  - Suture Anchor Construct
- Steinman Pins across Ulna through Humerus
- Dynamic/ Hinged Ex Fix
- Static Ex Fix
- Hyper flex the Elbow

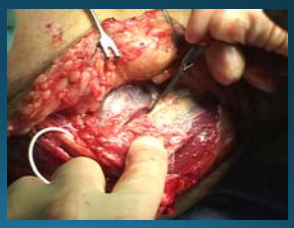


Medial Approach

-Varus Posteromedial Instability
-MCL

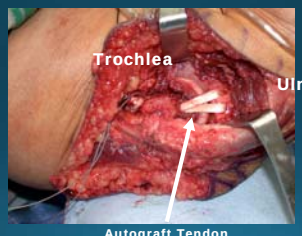
Flexor-pronator split



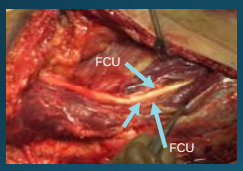


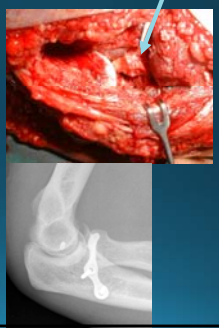
MCL Reconstruction

+Flexor Pronator Repair



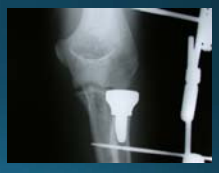
Medial Approach: ORIF Coronoid





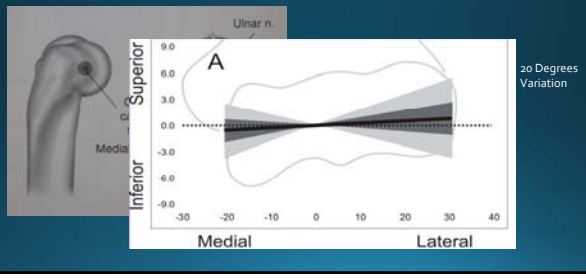
EX-FIX

- Neutralization Device
- Not Compensation for inadequate bony and soft tissue reconstruction



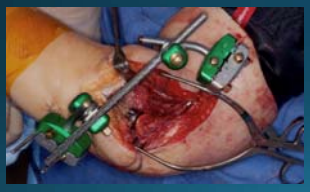
Axis Pin: Difficult to place accurately!!

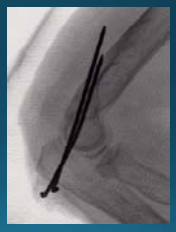
Brownhill et al. 2006



20 Degrees Variation

Static Ex Fix vs Pinning

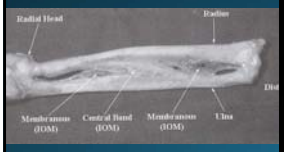


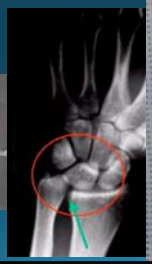


Check Wrist Alignment- DRUJ

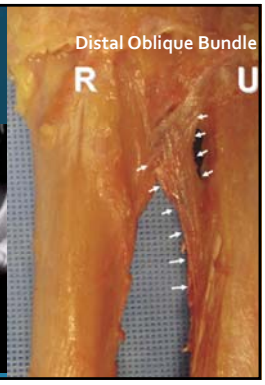
IOM Disruption Essex Lopresti

- Membranous Portions
  - •Proximal and distal



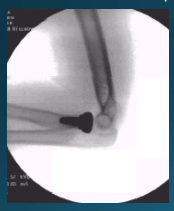


Pfaeffle et al, JHS 2000
Birkbeck et al, JHS 1997

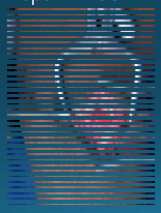


Treatment Essex Lopresti

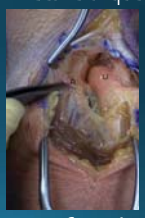
Preserve Radial Head/RHA



Repair TFCC



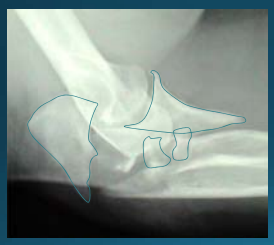
Repair Distal Oblique Bundle

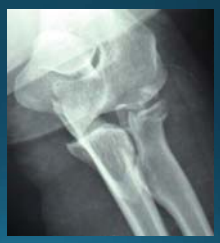


Early Recognition

Reconstruct IOM for Chronic

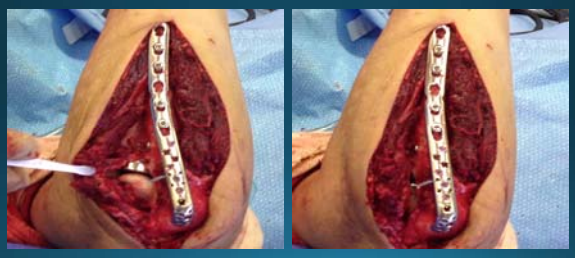
Trans-olecranon Fracture dislocation



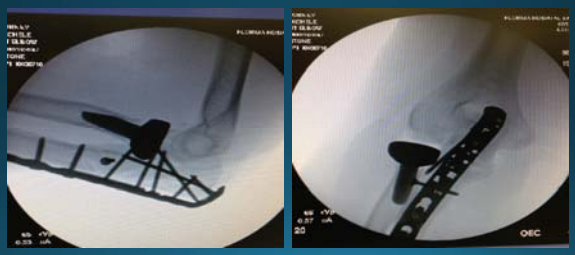


Posterior Olecranon Fracture Dislocation

Posterior Olecranon Fracture Dislocation

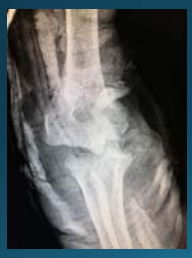


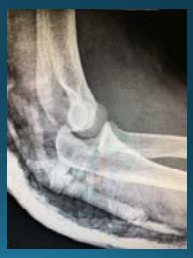
Intra op Imaging



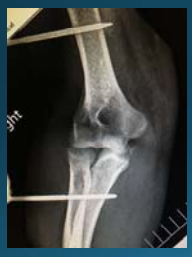
Posterior Olecranon Fracture Dislocation

51 yo Alcoholic





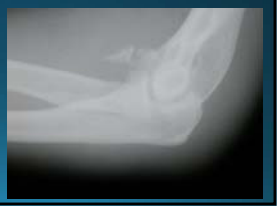
Ex fix



Increased Flexion

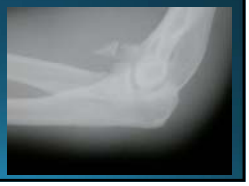
Terrible Triad

- Be Prepared
- Approach?
- Fix the Coronoid/ Anterior Capsule 1st
  - Suture lasso
  - Screw
  - Plate
- Fix or Replace Radial Head?
  - Protects Ligamentous healing
  - Minimizes risk for Longitudinal Instability DRUJ/ Essex Lopresti
- LCL and Extensor Origin Repair
  - (Except Trans-olecranon)
  - Work through fracture



Terrible Triad

- Medial Exposure?
  - Plate Coronoid/ Anteromedial facet
  - MCL? – Not Always Injured
  - MCL good healing potential vs LUCL
  - Flexor Pronator Avulsion common
- Fluoroscopy
- Ex- fix, Pinning are neutralization devices
- More Flexion?



Thank you