Common Elbow Injury Pitfalls
(and some pearls!)

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Orthopaedic Mantras

- EXPECT THE UNEXPECTED
- IT’S NOT A COMPLICATION UNTIL YOU LEAVE THE OPERATING ROOM
- FAILURE TO PREPARE IS PREPARING TO FAIL
  - Coach John Wooden

Osteology

Desmology
Preoperative Planning

- Intraarticular vs Extraarticular
- Plan approach
  - Triceps Splitting
  - Olecranon Osteotomy
  - Triceps Sparing
- Adequate Fixation
- Nerve anatomy
  - Radial nerve crosses at distal 2/3
  - Coronal shear fx, very distal fractures
    - Hemiartthroplasty
  - Fractures in the elderly
    - Total Elbow arthroplasty

Ulnar nerve transposition

- Ulnar neuritis can occur up to 20% elbow trauma
- If see the nerve, TRANSPOSE
**APPROACH**

- Thick Skin Flaps
- Preserve Anconeus in elderly for possible future flap
- Careful osteotomy
  - Complete with osteotome

**90-90 Plating**

- Careful not to penetrate capitellum articular cartilage
- Plate on tension side

**Parallel Plating**

- Keystone construct
- Maximize screws through plate distally
- Avoid olecranon fossa
- Interdigitate screws
- Bicolumnar compression
- Allows shortening of columns due to comminution
**Hemiarthroplasty**
- Very distal fractures in active patient
- Must have minimum one column support and ligament integrity

**Total Elbow Arthroplasty**
- Elderly/Low demand
- Severely osteoporotic
- Good results

**Lessons Learned**
- Inspect fracture pattern and joint, and CONSIDER THE PATIENT
- Avoid olecranon osteotomy if considering TEA
- The fracture is usually worse that the image depicts
- Consider significant cartilage injury and/or shear that is not evident on CT scan/xray
- Informed consent: expect bailout procedures
  - Have arthroplasty set available
Capitellum Fracture

Exposure can be limited especially with intact Radial Head
Beware of comminution and medial extension
Fixation can be difficult
Avoid posterior stripping, may lead to AVN

Extensile Approach

- Surgical approach to lateral fractures:
- Lateral column approach (EDC and ECRB)
  - Access to anterior joint and capsule
  - LUCL less likely to be injured
  - Able to access fracture, especially if extension medially
  - Able to detach common extensor tendon proximally

Double Arc Sign

Previously not described, a fracture extending well past the lateral lip of the trochlea. Further exposure required for adequate fixation
Lessons Learned

- CT scan all capitellum fractures (all elbow fractures for that matter)
- Extensile approach: better to see entire articular cartilage/anterior joint
- Headless screws from anterior to posterior
- If severe comminution, consider radiocapitellar uniarthroplasty

Radiocapitellar arthroplasty

Radial Head Fracture

Most commonly missed on initial xray

Intervention can be nonop, ORIF, or arthroplasty

Mason Classification (IV is with dislocation)
Diagnosis

1. 90% correlation to occult fracture
2. High index of suspicion: pain with sup/proc radiating to wrist

Further Imaging

Greenspan Radial Head View

INTERVENTION

- No need to fix
  - Intraarticular fx < 2 mm stepoff, full ROM with no catching
  - May use lidocaine injection

- Fix
  - 3 or less fragments, blocked motion

- Replace
  - Comminution over 3 fragments, unstable neck fracture
  - Excision contraindicated in instability and Essex-Lopresti injury
Hardware Pitfalls

- Safe Zone
  - 90 degree arc from Lister's Tubercle to radial styloid
  - May use headless screws in the articular portion

Hardware Pitfalls

- Beware of overstuffing
  - Delta Sign
  - Increase in stiffness and radiocapitellar contact force

- Canal fixation
  - Avoid cementing press fit stem
  - Cerclage for fracture

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- Essex Lopresti: radius pull test
  - 3 mm of proximal migration after radial head resection
  - Longitudinal forearm instability: pin DRUJ in neutral for 6 weeks
Essex Lopresti Injury

- Radius pull test
  - 3 mm of proximal migration after radial head resection
- Radius joystick test
  - Lateral motion of proximal radius
- Longitudinal forearm instability: pin DRUJ in neutral for 6 weeks

Coronoid Fracture

Coronoid Fracture

Bony and soft tissue injury

- Coronoid fracture is not only bony but involves attachment of ANTERIOR CAPSULE
  - Anterior stability = coronoid, anterior capsule and radial head
- Anteromedial fracture (+/- tip or sublime tubercle)
- Varus posteromedial instability
- Type I or III in Terrible Triad
- Assess in Monteggia/transolecranon variations
Coronoid fracture Types

Morrey vs O’Driscoll Classification

Fixation

- Based on Fracture Type
  - Avulsion or Type I: suture anchor or bone tunnels
  - Use aiming arm, K wire with eyelet, suture passers
  - Type III: screw fixation
  - Type II/Anteromedial fragment: plate fixation
- Pass sutures first, then tie last after elbow reduced
- Careful: Neurovascular structures anterior to brachialis

Suture fixation of avulsion fracture
Anteromedial fixation
Hotchkiss Medial Approach

Elbow Dislocation

Terrible Triad Injury
Closed elbow dislocation
- Lateral to Medial injury
- MUCL last to tear
- Usually stable after reduction
- Start ROM in stable arc of motion
- Hinged brace to limit varus/valgus
- MRI for mechanical symptoms or persistent instability

- Terrible triad injury
  - Coronalid fracture
  - Radial head fracture
  - Instability (LUCL +/- MUCL rupture)
Type of instability

- Medial
  - MUCL instability
  - Varus posteromedial instability

- Lateral
  - Posterolateral rotatory instability

- Terrible Triad (coronoid fx, radial head fx, LUCL injury)
- Dislocations
- Monteggia fracture/dislocations

Fix medial to lateral
(And then medial again)*

- Stabilize Coracoid
  - Through lateral incision or medial approach
- Replace or fix radial head
- Lateral stabilizers
  - Primary: LUCL – repair with suture anchor or bone tunnels
  - Secondary: common extensor origin
- *If necessary, fix MUCL
- If still unstable, place hinged external fixator

Algorithm
Ex fix placement, 6 wks out

Lessons Learned

- See the lessons from coronoid and radial head fractures
- CT can all elbow fracture dislocations
  - Subtle fracture
  - Loose bodies
  - Coronoid status
  - Subluxation of joint

Forearm Fracture

- Monteggia fracture dislocation
- More common in children
  - Anterior dislocation of radial head (Bado Type I)
  - Transolecranon fracture dislocation variant in adults
    - Posterior > anterior dislocation of radial head (Bado Type II)
  - It is not the usual (olecranon fracture)
    - Especially if fx is distal to coronoid
Transolecranon Fracture Dislocation

- POSTERIOR more common than ANTERIOR

Olecranon Fractures

- Comminuted/Dislocation
  - Plate fixation

  - Simple Transverse
    - Tension band technique with K wires or IM screw (must engage distal canal)
    - BEWARE anterior cortex overpenetration: injury to AIN

  - Comminuted in Elderly
    - ≤50% involvement of joint surface
    - Excision and triceps advancement at articular level (NOT dorsal cortex)

IM screw fixation and failure

- Not enough canal engagement: Failure of tension band
- Canal engagement with 6.5 to 7.3 mm screw (ave. canal diameter is 7 mm)
Anterior cortex penetration with K wire or home run screw could injure Anterior Interosseous nerve.

**Tension Band Construct**

Create loop on one side so that both sides can be tensioned evenly.

Join Today! Be a part of the solution...