



**ORTHO ATLANTA**  
Orthopaedic and Sports Medicine Specialists




### Common Elbow Injury Pitfalls (and some pearls!)



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Hand and Upper Extremity

Atlanta Trauma Symposium  
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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



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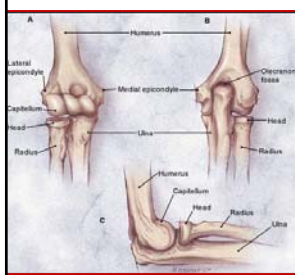
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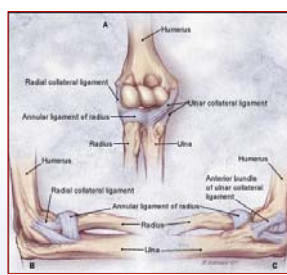
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### Osteology



### Desmology



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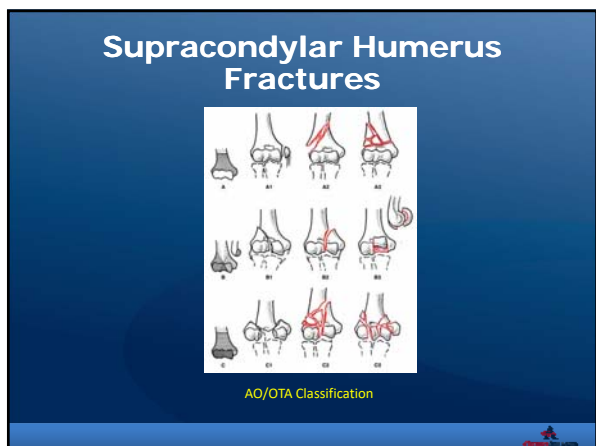
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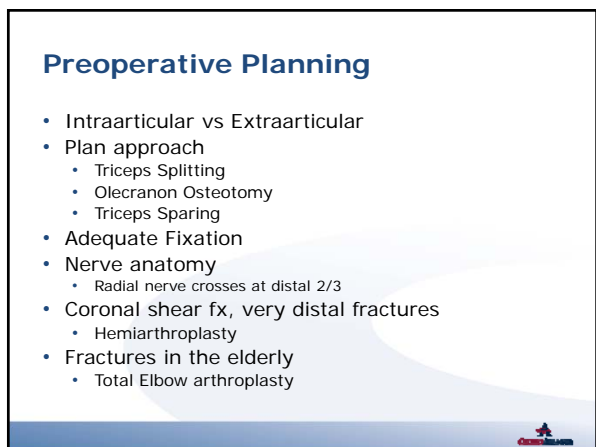
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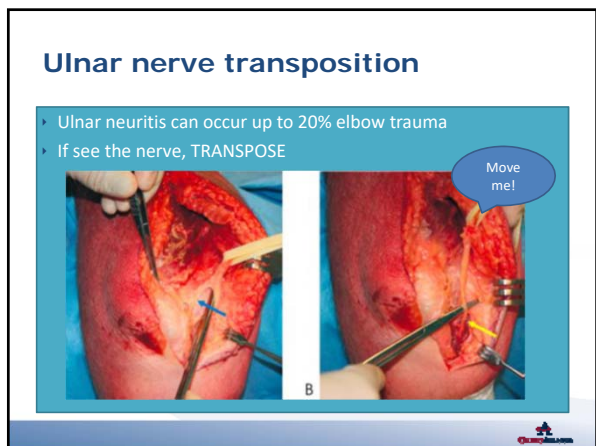
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### APPROACH

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



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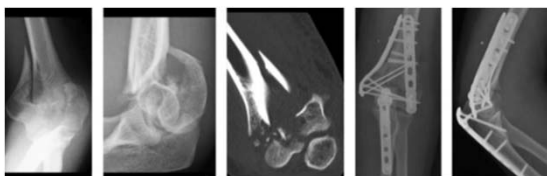
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### 90-90 Plating

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



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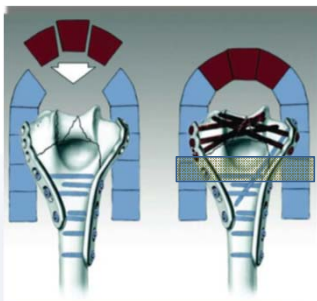
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### Parallel Plating

- › Keystone construct
- › Maximize screws through plate distally
- › Avoid olecranon fossa
- › Interdigitate screws
- › Bicolumnar compression
- › Allows shortening of columns due to comminution



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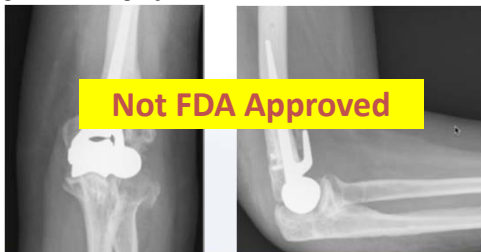
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### Hemiarthroplasty

- › Very distal fractures in active patient
- › Must have minimum one column support and ligament integrity



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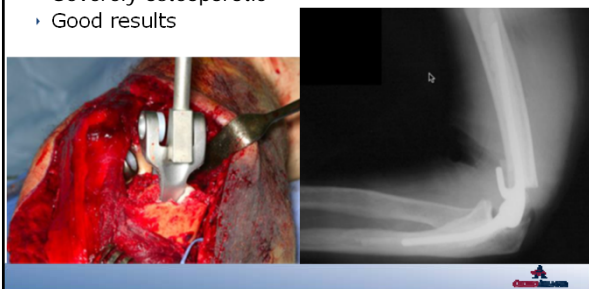
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### Total Elbow Arthroplasty

- › Elderly/Low demand
- › Severely osteoporotic
- › Good results



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### Lessons Learned

- › Inspect fracture pattern and joint, and CONSIDER THE PATIENT
- › Avoid olecranon osteotomy if considering TEA
- › The fracture is usually worse than 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

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## 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




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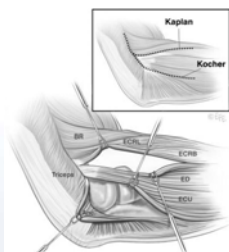
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## Extensile Approach

- ▶ 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




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## Double Arc Sign

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




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### 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

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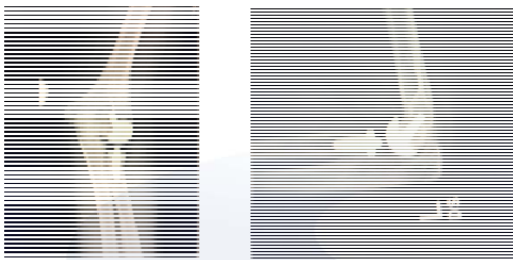
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### Radiocapitellar arthroplasty



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### Radial Head Fracture

Most commonly missed on initial xray

Intervention can be nonop, ORIF, or arthroplasty



Mason Classification  
(IV is with dislocation)

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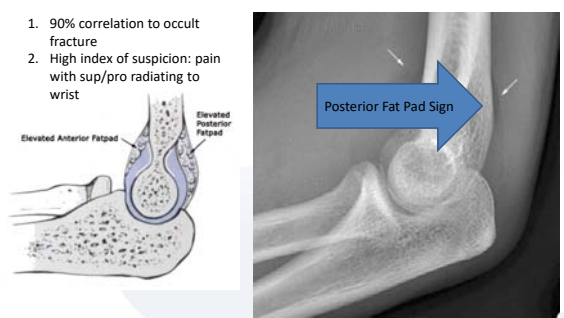
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### Diagnosis

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



Elevated Anterior Fat Pad

Elevated Posterior Fat Pad

Posterior Fat Pad Sign

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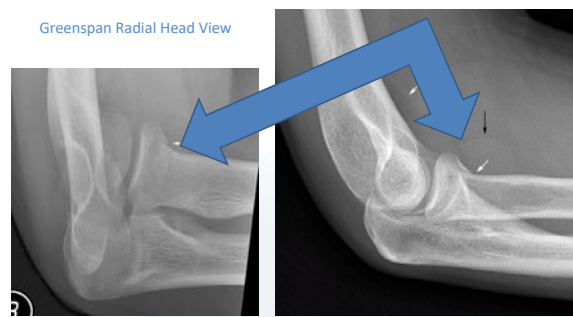
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### Further Imaging

Greenspan Radial Head View



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### 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

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### Hardware Pitfalls

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

The diagram shows a lateral view of the distal radius. A dashed line indicates a 90-degree arc starting from the radial styloid and extending to Lister's tubercle. This area is labeled as the '90° Safe Zone'. Other labels include 'Radial styloid', 'Lister's tubercle', and 'Proximal view of Left Radius'.

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### Hardware Pitfalls

- Beware of overstuffing
  - Delta Sign
  - Increase in stiffness and radiocapitellar contact force
- Canal fixation
  - Avoid cementing press fit stem
  - Cerclage for fracture

The radiograph shows the elbow joint. A yellow arrow points to the radiocapitellar joint space, which is abnormally wide, indicating the 'Delta sign' of overstuffing.

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### Hardware Pitfalls

- Beware of overstuffing
  - Delta Sign
- Canal fixation
  - Avoid cementing
  - Cerclage for fracture
- Essex Lopresti: radius pull test
  - 3 mm of proximal migration after radial head resection
  - Longitudinal forearm instability: pin DRUJ in neutral for 6 weeks

The radiograph shows the elbow joint. A yellow arrow points to the radiocapitellar joint space, which is abnormally wide, indicating the 'Delta sign' of overstuffing.

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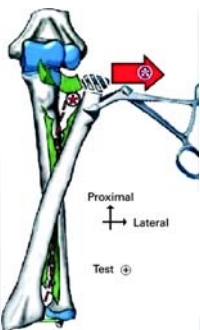
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### Essex Lopresti Injury

- › 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



Sobeyrand, et al. The Bone and Joint Journal, Dec. 2011




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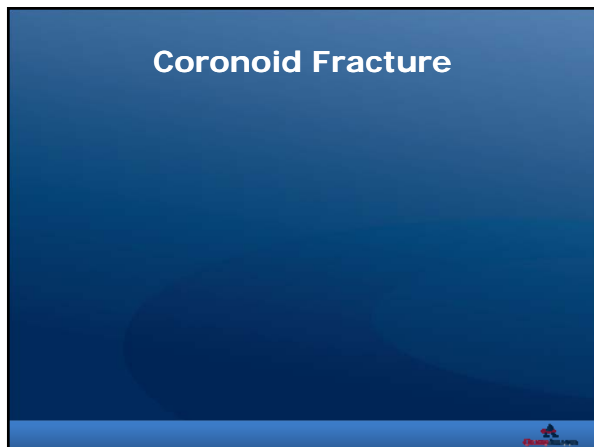
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### Coronoid Fracture




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### 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




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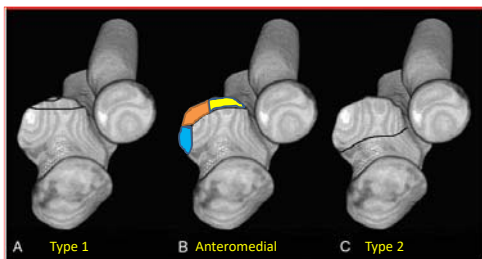
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### Coronoid fracture Types



Morrey vs O'Driscoll Classification



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### 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



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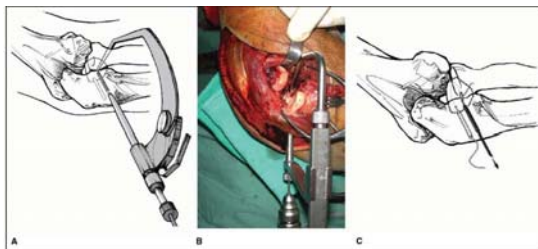
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### Suture fixation of avulsion fracture



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### Anteromedial fixation

Hotchkiss Medial Approach



OrthoMotion

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### Elbow Dislocation



OrthoMotion

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### 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

- Coronoid fracture
- Radial head fracture
- Instability (LUCL +/-MUCL rupture)

OrthoMotion

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### 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




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### 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




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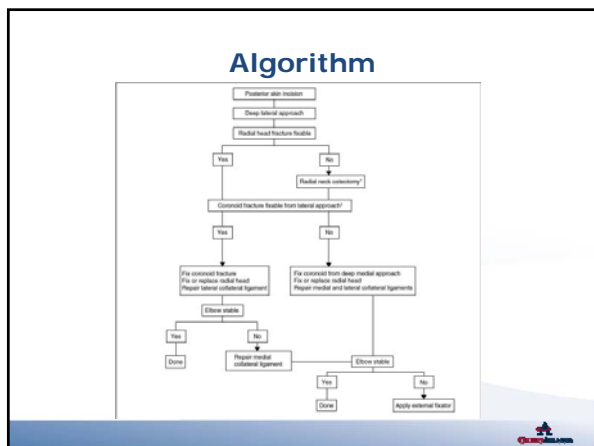
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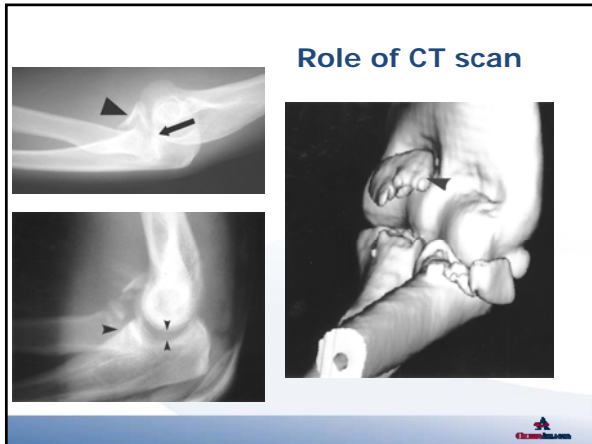
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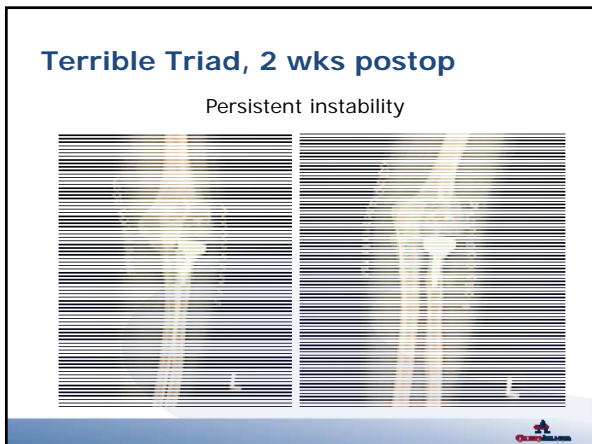
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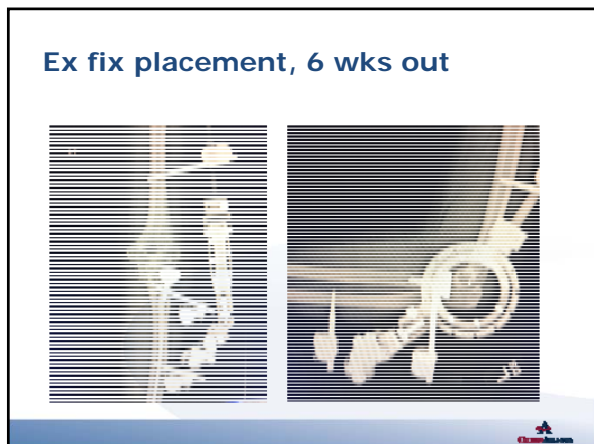
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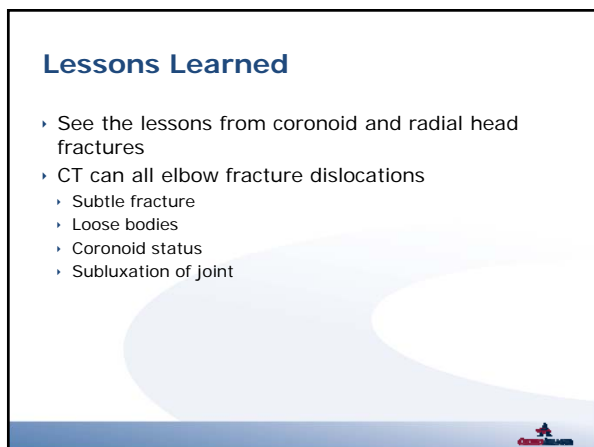
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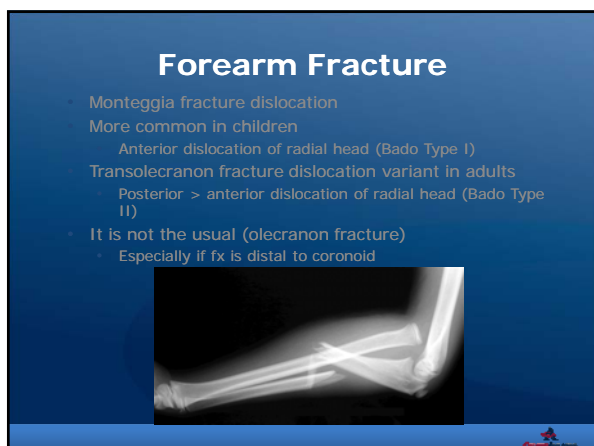
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### Transolecranon Fracture Dislocation



POSTERIOR more common than ANTERIOR

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### 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)

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### 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)

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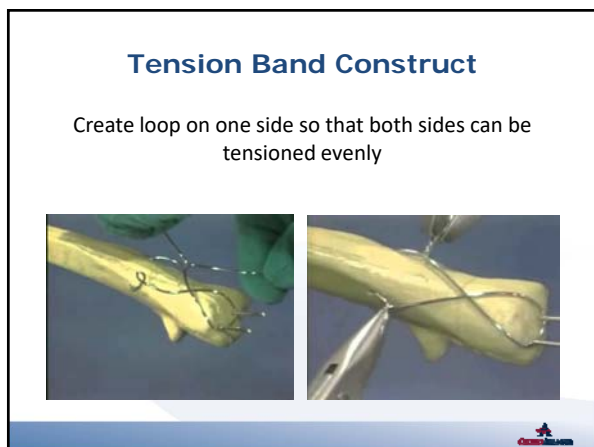
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