

Ultrasound of the Lateral and Posterior Elbow

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Disclosures

- Consultant: Bioclinica
- Book Royalties: Elsevier
- Not relevant to this lecture

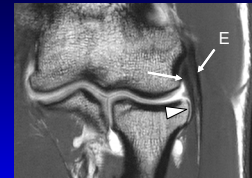
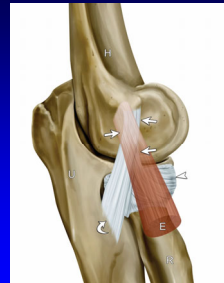
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Outline

- Lateral elbow:
 - Common extensor tendon
 - Radial collateral ligament complex
 - Radial nerve
 - Synovial fold and elbow joint
 - Capitellum and radial head
- Posterior elbow
 - Triceps brachii
 - Olecranon recess

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Lateral Collateral Ligament Complex



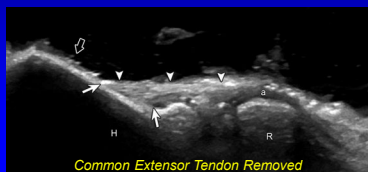
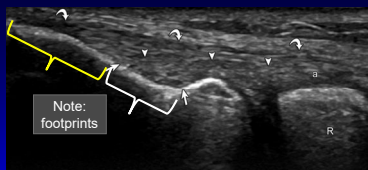
- Radial collateral ligament (arrows)
- Common extensor tendon (E)
- Annular ligament (arrowhead)
- Lateral ulnar collateral ligament (curved arrow)

Jacobson J. et al. J Ultrasound Medicine 2013; 33:1041

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Lateral Collateral Ligament Complex

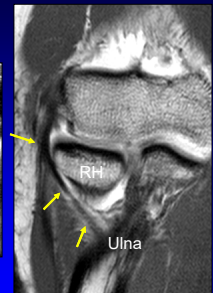
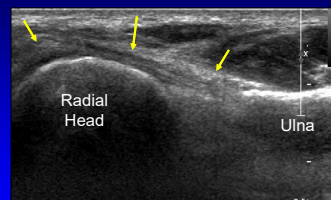
- Common extensor tendon (curved arrows)
- Radial collateral ligament (arrowheads)
- Annular ligament (a)



Jacobson J. et al.
J Ultrasound Medicine
2014; 33:1041

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Lateral Ulnar Collateral Ligament (LUCL)



Long Axis

*LUCL attaches at crista supinator of ulna

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"Epicondylitis"

- Common flexor and extensor tendons
- Abnormal hypoechoogenicity
 - Mucoïd degeneration, tendinosis
- Anechoic: partial-thickness tear
- No inflammatory cells*

Potter, Radiology 1995; 196:43
Connell, AJR 2001; 176:777

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Common Extensor Tendon: elbow

- Often called "tennis elbow" or "lateral epicondylitis" or "lateral epicondylitis" or "epicondylosis" or
- All terms are misnomers
- Those inflicted usually do not play tennis (professionally or correctly)
- It is not inflammatory
- It is not a primary problem of the epicondyle

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Common Extensor Tendinosis

Long Axis Short Axis

Note: normal radial collateral ligament (white arrow)

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Common Extensor Tendon: tendinosis

Lateral Epicondyle Radial Head

Longitudinal Coronal T2w

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Common Extensor Tendon: partial tear

Lateral Epicondyle Radial Head

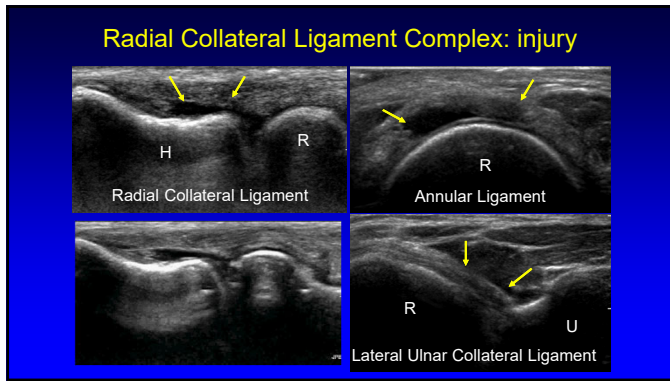
Longitudinal Coronal T2w

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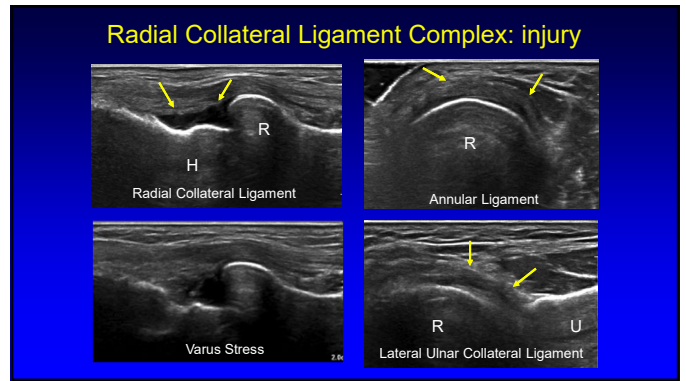
Common Extensor Tendinosis + RCL Tear

Radial Head

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Posterolateral Rotatory Instability

- Trauma:
 - Fall (outstretched arm); iatrogenic
 - Severe chronic extensor tendinopathy
- Injury: lateral collateral ligament complex
- Radial head and ulna rotate off humerus
- US posterolateral rotatory stress test:
 - Transducer: transverse plane, lateral epicondyle to olecranon
 - Supination torque
 - Lateral ulnohumeral laxity: >4 mm

Camp CL et al. PM R 2017; 9:275

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Posterolateral Rotatory Instability

- Elbow: 30 degrees of flexion
- Transducer: transverse to ulna
- Approximately 1 cm distal to olecranon tip
- Supination torque

Images from Camp CL et al. PM R 2017; 9:275

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Radial Head: posterolateral rotatory instability

Abnormal radial collateral ligament complex

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Annular Ligament: injury

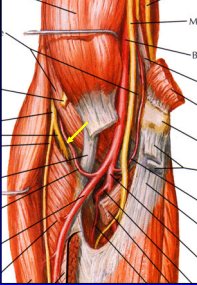
- Adults: + lateral collateral ligament
- Child:
 - Rupture or dislocation
 - Due to immature radial head
 - Monteggia:
 - Radial head dislocation + ulnar shaft fracture
 - Nursemaid elbow:
 - Transient radial head subluxation + entrapped annular ligament
- Snapping: rare

Chai JW et al. Ultrasonography 2015; 34:71

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Radial tunnel

- Radial nerve: deep branch
 - Originates from radial nerve between brachioradialis and brachialis
 - Passes between deep and superficial layers of supinator muscle
 - Exits as posterior interosseous nerve

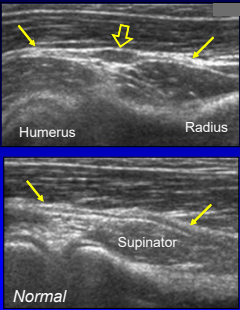


Jacobson JA, et al. Sem Musculoskel Rad 2010; 14:473

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Radial Nerve: deep branch

- Supinator syndrome:
 - Motor deficits (wrist, finger extension)
 - Abnormal electrodiagnostic studies
 - Nerve enlargement: entrapment
- Radial tunnel syndrome:
 - Pain, no motor deficits, normal EMG
 - Muscle denervation on MRI
 - No nerve enlargement

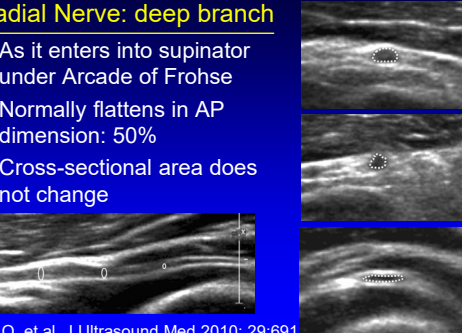


Ferdinand BD et al. Radiology 2006; 240:161

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Radial Nerve: deep branch

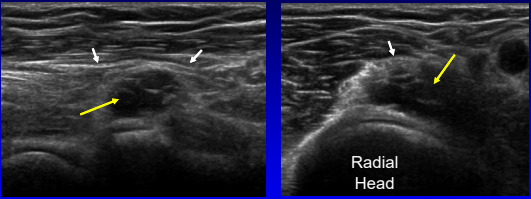
- As it enters into supinator under Arcade of Frohse
- Normally flattens in AP dimension: 50%
- Cross-sectional area does not change



Dong Q, et al. J Ultrasound Med 2010; 29:691

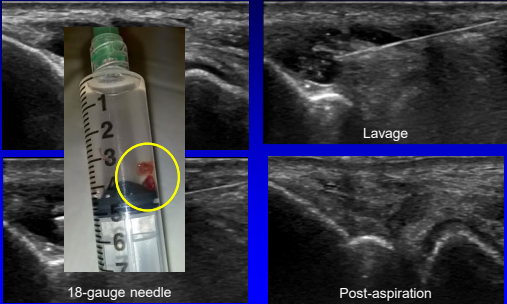
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Ganglion Cyst: radial nerve compression



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Ganglion Cyst (elbow): aspiration



18-gauge needle

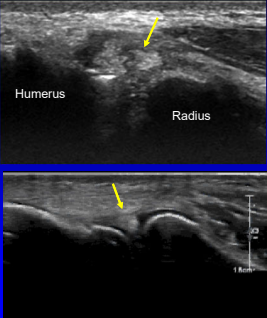
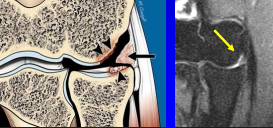
Lavage

Post-aspiration

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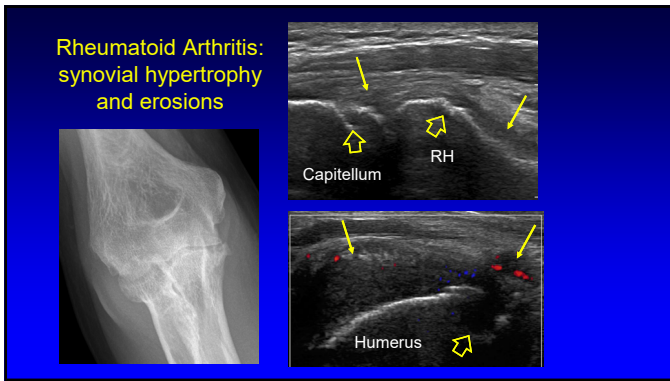
Synovial Fold Syndrome

- Normal capsular tissue
 - Hyperechoic, triangular
- Abnormal:
 - Thickened > 3 mm
 - Heterogeneous
 - Adjacent synovitis

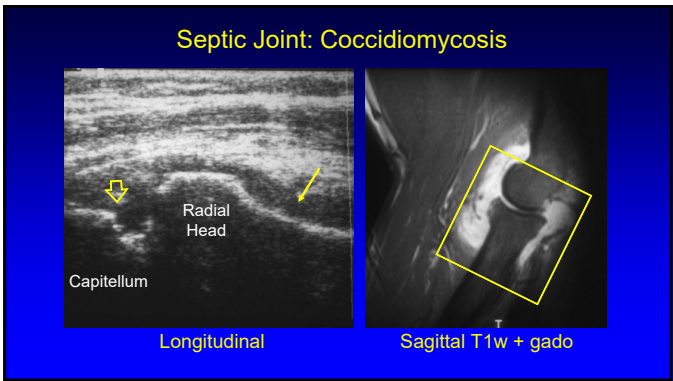



Cerezal et al. AJR 2013; 201:W88

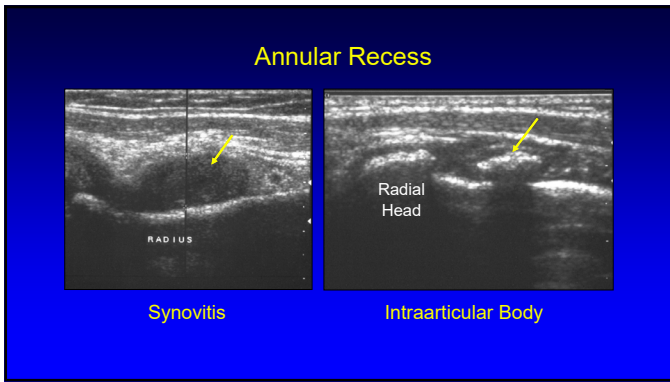
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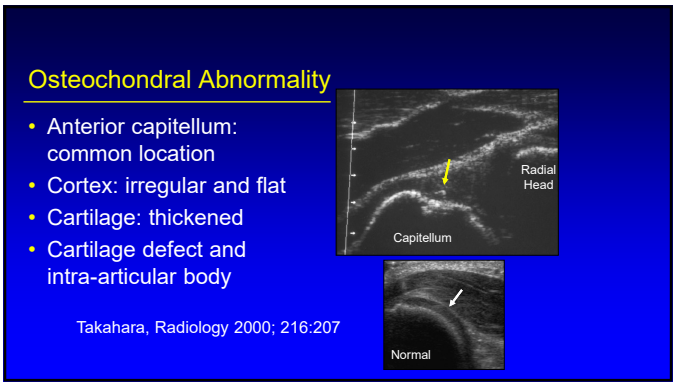
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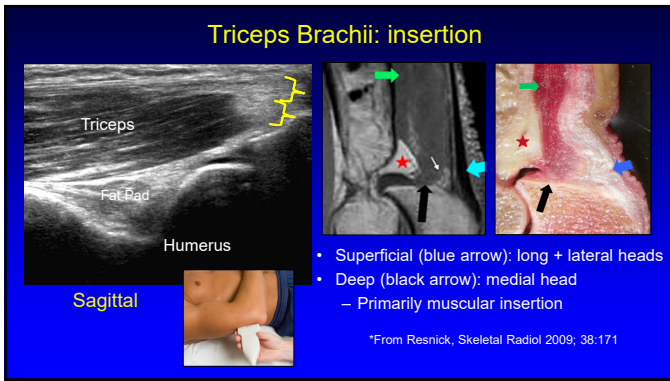
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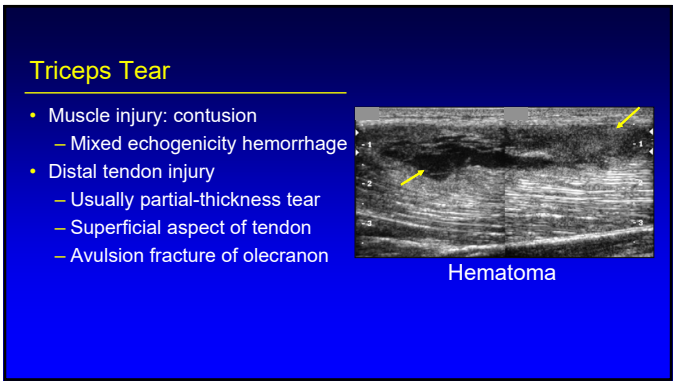
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Triceps Tear: partial thickness tear

- Superficial layer torn
 - Long and lateral heads
- Intact deep layer (medial head)
- Associated enthesophyte bone fragment
 - 1 – 2 cm in size
 - 2.5 – 4 cm retraction
 - No donor site

J Ultrasound Med 2011; 30:1351

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Triceps Tendon: partial tear + avulsion

Long Axis (Sagittal Plane)

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Triceps Tendon: partial tear + avulsion

Long Axis (Sagittal Plane)

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Triceps Tendon: medial head tear

Courtesy of M. M. Chiavaras, Hamilton, Ontario

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Snapping Triceps Syndrome

- Ulnar nerve and medial triceps dislocate over apex of medial epicondyle
- Ulnar nerve and medial triceps remain in contact with each other
- Palpable snap felt through transducer

Jacobson JA et al. Radiology 2001; 220:601

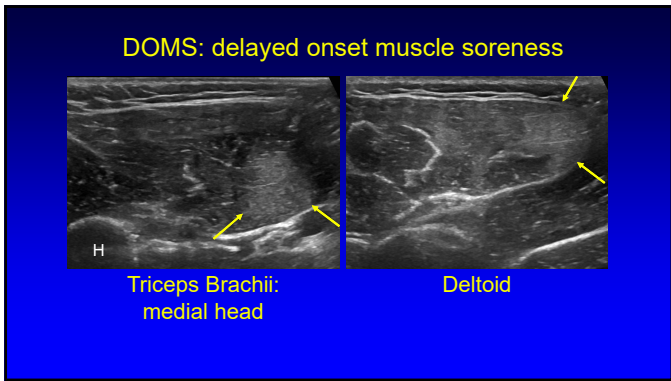
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Muscle Injury: DOMS

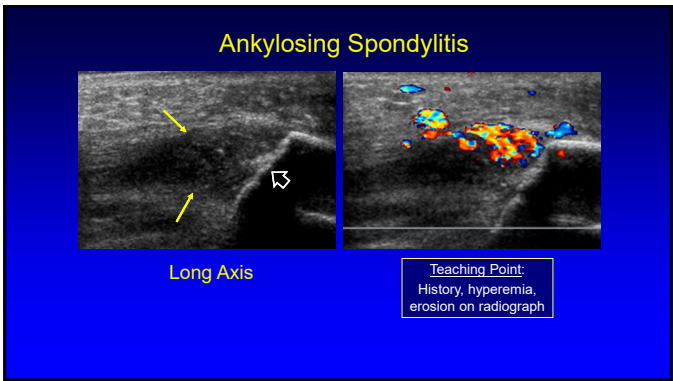
- Delayed onset muscle soreness
- Type 1 muscle strain
- Pain after intense physical activity:
 - Microtrauma: inflammation and edema
 - Onset: day 1, peak day 2-3, resolves day 7
 - Possible increased creatine kinase
- Upper extremity: triceps, biceps, brachialis
- Muscle enlargement with Increased echogenicity

Longo V et al. J Ultrasound Med 2016; 35:2517

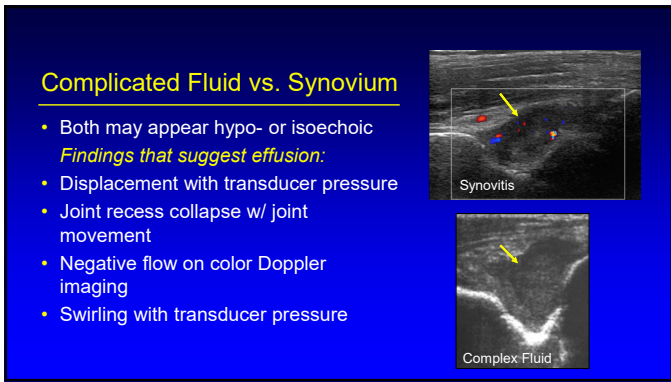
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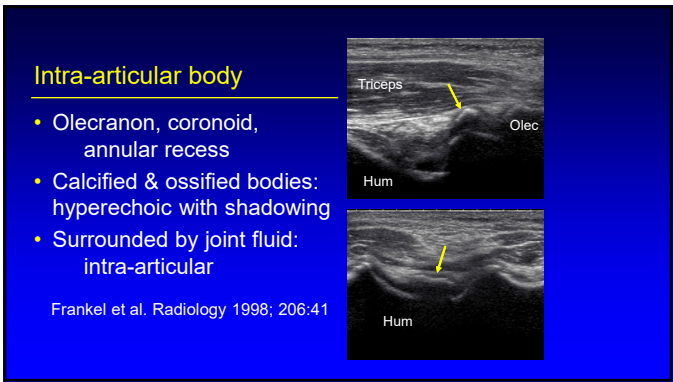
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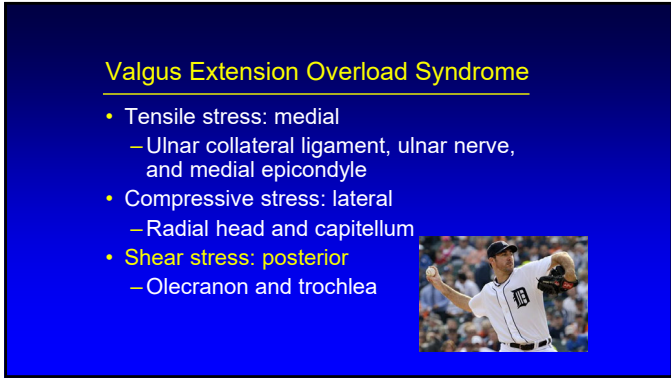
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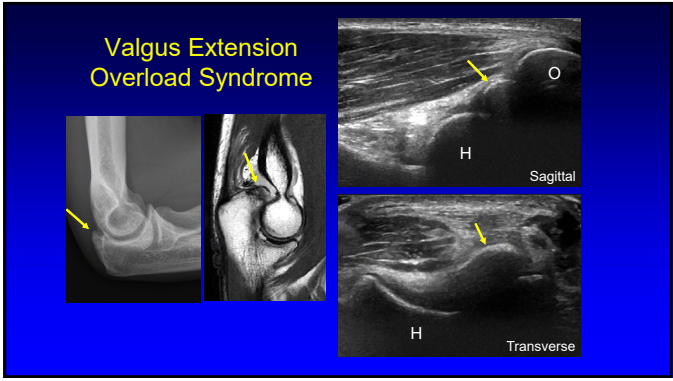
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Olecranon Bursitis:

- Over olecranon
- Anechoic or hypoechoic
- Well-defined
- Heterogeneous: complicated fluid
- Trauma, infection, gout, rheumatoid arthritis

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Olecranon Bursitis: rheumatoid arthritis

Sagittal Transverse

Note erosion (white arrow)

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Olecranon Bursitis: traumatic

Transverse Longitudinal

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Olecranon Bursitis: dynamic imaging

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Take-home Points

- Common extensor tendon: anatomy
- RCL complex: LUCL
- Radial nerve: overcalling entrapment
- Synovial fold syndrome
- Capitellum: osteochondral abnormalities
- Triceps: anatomy explains partial tears

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Thank you!

Syllabus and other educational material

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