

Imaging of Thumb Injuries

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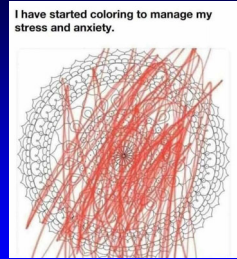
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Disclosures

- Consultant: Bioclinica
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- Contractor: POCUS PRO
- Advisory Board: Philips
- Not relevant to this talk



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Objectives

- To list the anatomic structures of the thumb
- To differentiate Bennett from Rolando fracture
- To describe the imaging findings of a Stener lesion
- To describe the dynamic maneuvers to evaluate Gamekeeper's thumb during ultrasound scanning

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Introduction: thumb

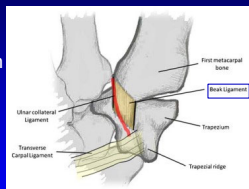
- Opposing thumb: functionally important
 - Present in humans, apes, pandas, koalas, lemurs, chameleons
 - Thankfully not in cats or dogs
 - Important for texting and deleting emails
- Injury mechanism: direct impact or fall
 - Skiing, football, rugby, even pickleball
- Hand injuries: 15% of all football injuries
- Bone, joint, tendon, ligament
- Osteoarthritis: 1st CMC joint very common



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Anatomy: joints

- First carpometacarpal (CMC) joint:
 - Or trapeziometacarpal joint
 - Unique configuration: 3 plane motion
 - Up to 16 dorsal and volar ligaments
 - Anterior oblique ligament:
 - Primary stabilizer
 - Superficial and deep layers
 - Volar trapezium to proximal MC
 - Beak ligament: deep or both layers

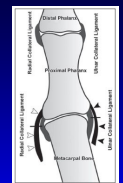


From: Teixeira PAG et al. Skeletal Radiology 2011; 40:897

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Anatomy: joints

- Metacarpophalangeal (MCP) joint:
 - Radial and ulnar collateral ligaments of capsule
 - Proper and accessory components
 - Proper taut in flexion
 - Accessory: more palmar, taut in extension
 - *Also attaches to volar structures
 - Adductor pollicis aponeurosis: superficial to UCL
- Interphalangeal joint: UCL and RCL
- Volar plate: fibrocartilaginous



From: Hirschmann A. et al. AJR 2014; 202:819



From: Heyman P et al. J Am Acad Ortho Surg 1997; 5:225

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Anatomy: tendons

- Adductor pollicis: ulnar sesamoid of 1st MCP and PP
- Flexor pollicis brevis: radial sesamoid and PP
- Flexor pollicis longus: courses between sesamoids, inserts on distal phalanx
 - Pulleys: A1 (MCP joint), oblique (PP), A2 (IP)
 - Variable annular pulley
 - No cruciform pulleys
- Extensor pollicis brevis: PP base
- Extensor pollicis longus: DP



From: Schubert MF et al. J Hand Surg 2012; 37A:2278

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Outline

- Fractures
 - Bennett, Rolando, pathologic
- Ligament injuries:
 - Gamekeeper's thumb
 - Other ligament injuries
- Tendon and pulley
 - Tear
 - Trigger thumb

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Bennett Fracture

- 1st metacarpal base
- Intra-articular
- 2-part
- Volar and ulnar aspect
- Avulsion: anterior oblique ligament
- Treatment:
 - Closed reduction, immobilization
 - Kirschner wires: if >30% articular surface



Teaching Point:
80% of thumb fractures involve the base

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Rolando Fracture

- 1st metacarpal base
- Intra-articular
- Comminuted: Y or T shape
- Treatment:
 - Closed reduction, immobilization
 - Crossed Kirschner wires may be needed



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Distal Phalangeal Fractures

- Tuft:
 - Injury to nail matrix and digit pulp
- Mallet:
 - Avulsion dorsal base distal phalanx
 - Extensor pollicis longus
 - Less common than other digits
 - Surgery: if >50% of articular surface
- Seymour fracture:
 - Displaced physeal fracture
 - Nailbed injury



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Pathologic Fracture

- Typically lytic
- Enchondroma: benign
 - Lucent, endosteal scalloping
 - Often expansile
 - May show stippled mineralized matrix
- Malignant:
 - Uncommon
 - Usually with soft tissue mass
 - Primary or met (lung)



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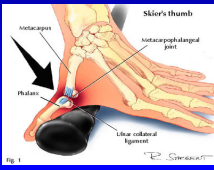
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Gamekeeper's Thumb


- Injury of the ulnar collateral ligament (UCL) of the thumb MCP
 - Historically, chronic injury in Scottish gamekeepers
 - Frequently, due to acute MCP joint hyperabduction
 - Skier's thumb: up to 86% of thumb base injuries



Acute Mechanism



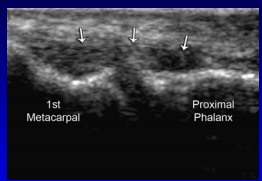
Chronic Mechanism



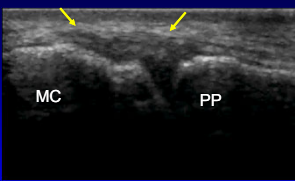
From: Campbell CS, JBJS(Br) 1955; 37:148

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Ulnar Collateral Ligament: thumb



1st Metacarpal Proximal Phalanx




MC PP




Note: sliding of adductor aponeurosis with isolated interphalangeal joint flexion

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Ulnar Collateral Ligament: thumb




1
Normal




2
Sprain



3
Partial Tear



4
Nondisplaced Complete Tear (+ fracture)

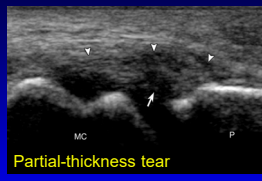


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Displaced Complete Tear (Stener Lesion) (80%?)


From: Radiographics 2006;26:1007

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UCL: tears



Partial-thickness tear



Full-thickness tear





Normal


Teaching Point:
90% of UCL injuries are distal

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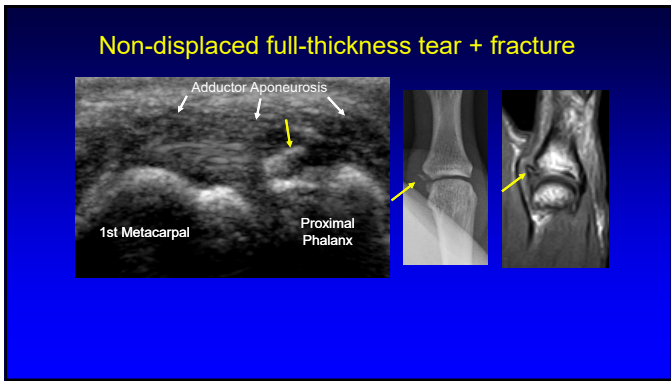
UCL: non-displaced tear



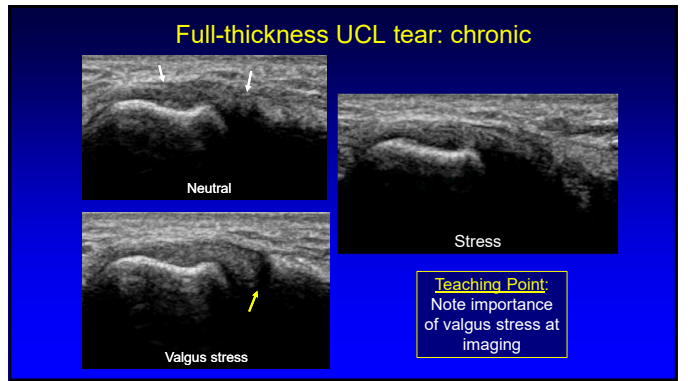




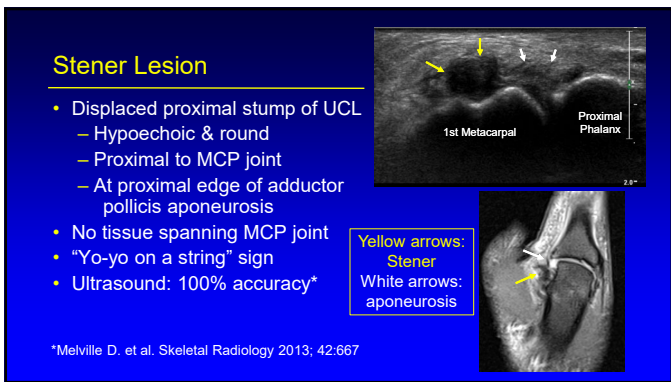
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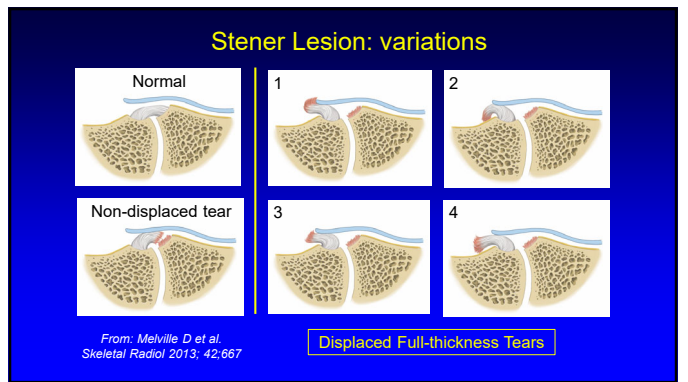
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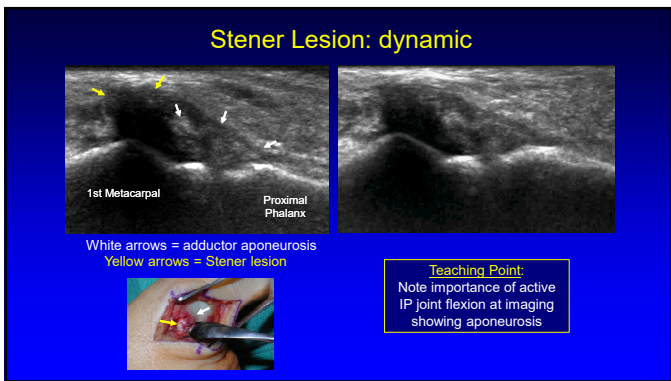
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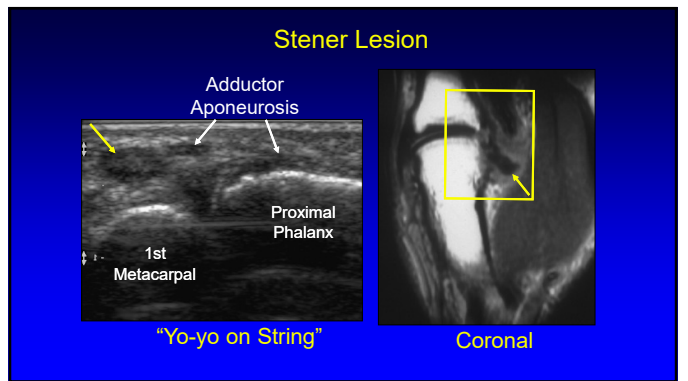
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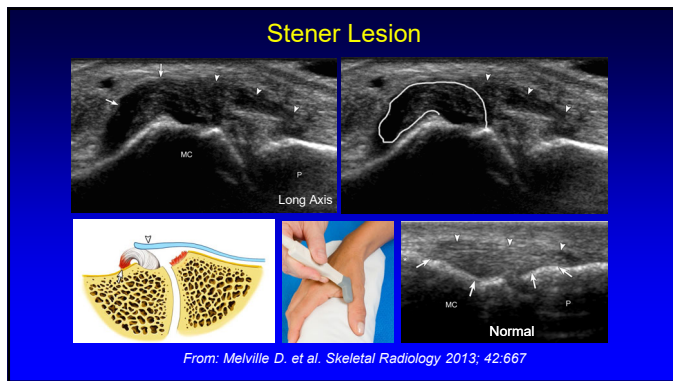
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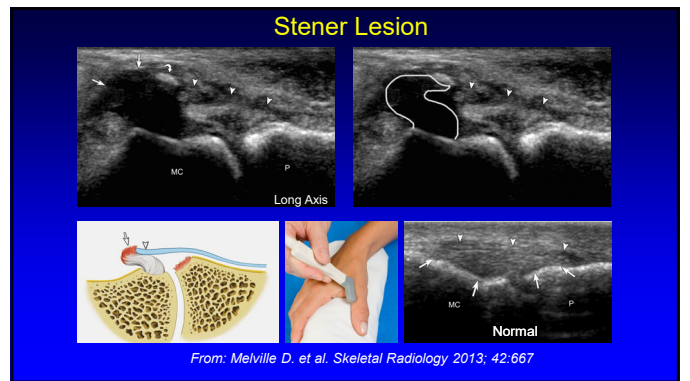
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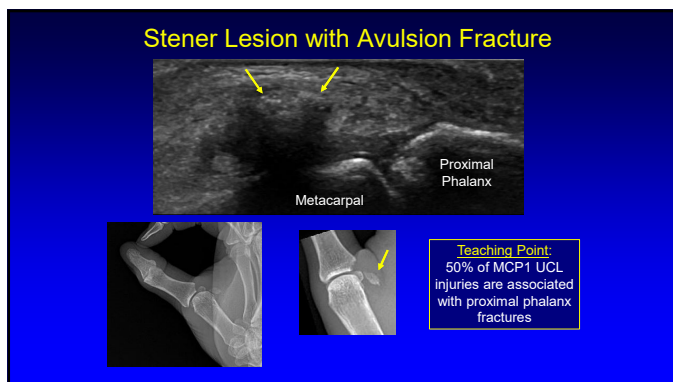
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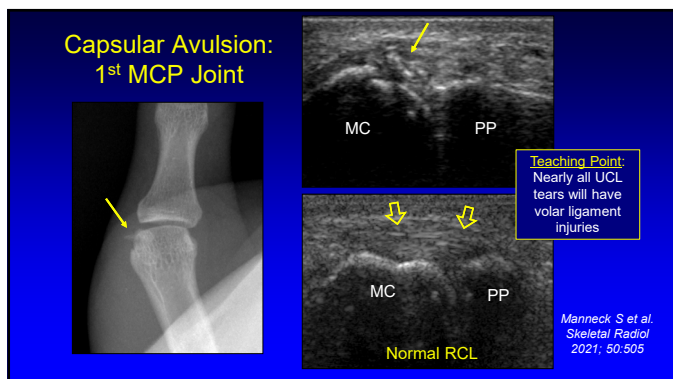


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Ultrasound Pitfalls: Gamekeeper's thumb

- Not scanning in correct plane
 - Use bone contours for guidance
- Misinterpretation of adductor aponeurosis as intact fibers
 - Passively flex interphalangeal joint
- Not recognizing a chronic full-thickness tear
 - Dynamic valgus stress imaging
- Not recognizing Stener lesion:
 - Round area proximal to joint

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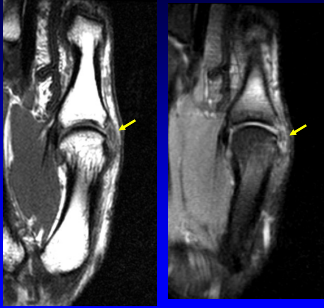
Adductor Pollicis Aponeurosis

- Superficial to UCL of 1st MCP
- Examine long axis to UCL with passive 1st IP joint flexion/extension
- Commonly injury with Gamekeeper's thumb
 - Hypochoic and thickened
- Isolated injury: uncommon
 - Diffusely hypochoic thickened

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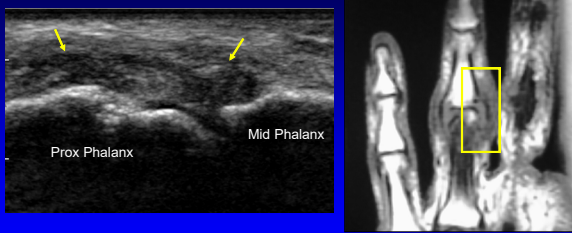
1st MCP Joint: RCL Tear

- Varus stress injury
- Abnormal increased signal on MRI
- Hypoechoic on ultrasound
- Volar and ulnar subluxation of proximal phalanx
- 25% with UCL tears will also have RCL tear



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Radial Collateral Ligament Tear: PIP joint



Prox Phalanx Mid Phalanx

Long Axis Coronal T1w

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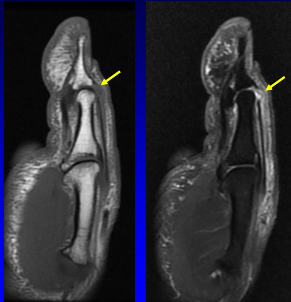
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Tendon Tear

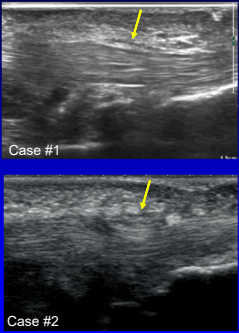
- Extensor pollicis longus attachment
- Imaging:
 - Discontinuity
 - Retraction
 - Possible fracture: Mallet finger



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Trigger Thumb

- Stenosing tenosynovitis: A1 pulley
- Thick and hypoechoic pulley
- Hyperemia: 91%
- Tendinosis: 48%
- Tenosynovitis: 55%



Case #1 Case #2

Guerini et al. J Ultrasound Med 2008; 27:1407

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Take-home Points

- 1st MCP UCL injuries associated with RCL and volar injuries
- Ultrasound is 100% accurate in diagnosis of Stener lesion
- Stener: variable appearance
- Ultrasound: dynamic evaluation:
 - IP flexion: abductor aponeurosis
 - Valgus stress: chronic tear

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Syllabus on line and other educational material:
www.jacobsonmskus.com
Twitter handle: @jjacobsn