

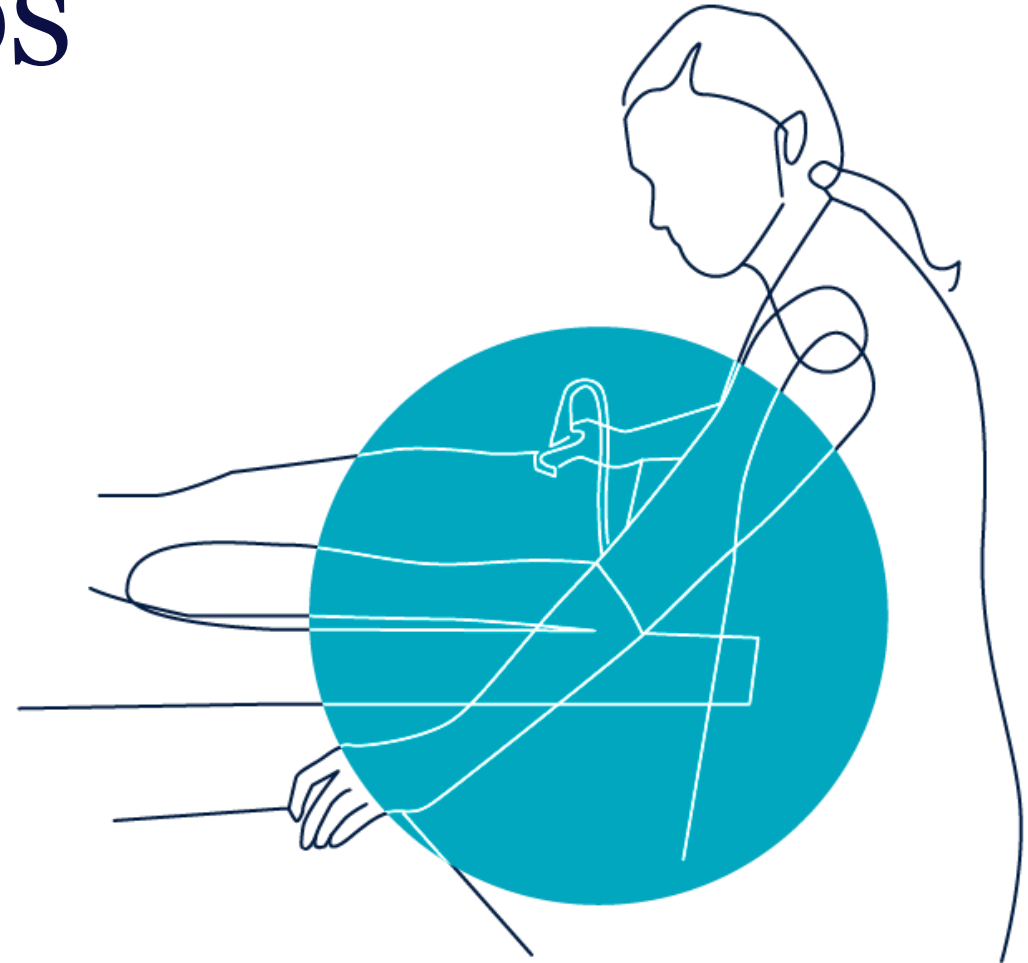
# Rural POCUS ROUNDS

## Pediatric MSK

Kevin Fairbairn

August 25th, 2023 | 12:00

Intended for  
intermediate PoCUS users



THE UNIVERSITY OF BRITISH COLUMBIA

**Continuing Professional Development**

Faculty of Medicine

# LAND ACKNOWLEDGMENT

We acknowledge that we work on the traditional, ancestral and unceded territory of the Ktunaxa Nation.



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# PRESENTER DISCLOSURES

## Relationships with commercial interests:

- Medical Lead HOUSE program UBC CPD



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# MITIGATION OF BIAS

- All content developed as part of this program was reviewed for potential bias by the members of the program planning committee.
- Relationships do not affect my choices in developing content.
- Financial relationships are unrelated to presentation.
- Not speaking about any products or medications.



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# LEARNING OBJECTIVES

- Learn how to assess pediatric arm fractures using POCUS
- Identify POCUS findings of radial head subluxation
- Review how POCUS can be used in the assessment of SCFE
- Understand how POCUS can improve the assessment of the growth plate/physis
- Recognize various applications for pediatric MSK POCUS

Joint effusion (and hips):

- <https://ubccpd.ca/mar-11-2022-ultrasound-guided-arthrocentesis>



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# LINEAR PROBE



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# CASE #1

6 yo male

Favouring R wrist

Last seen on a trampoline...



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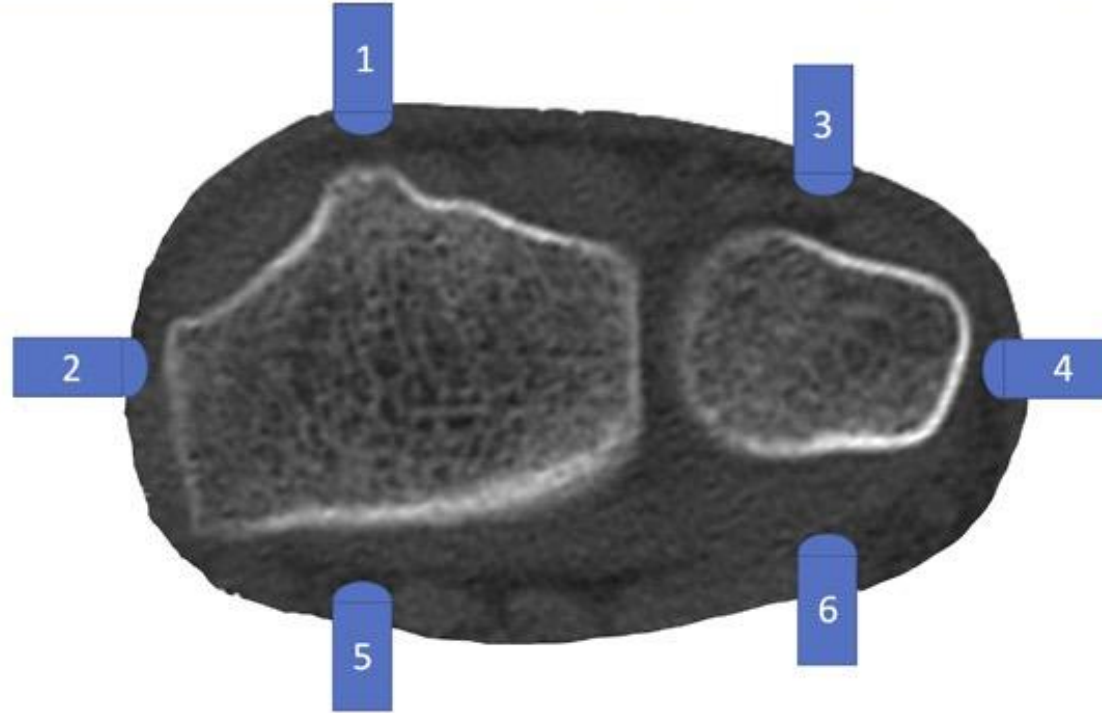
# FOREARM FRACTURES

- ~1/3 peds #
- 1.7% of peds ED presentations
- FOOSH common mechanism



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# NURSE PRACTITIONERS

- Sn 94.6% Sp 85.3% for dx of forearm fractures (Snelling 2021)
- Sn 81.0% Sp 95.9% for other (cortical breach) vs buckle or no fracture



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# FOREARM FRACTURES

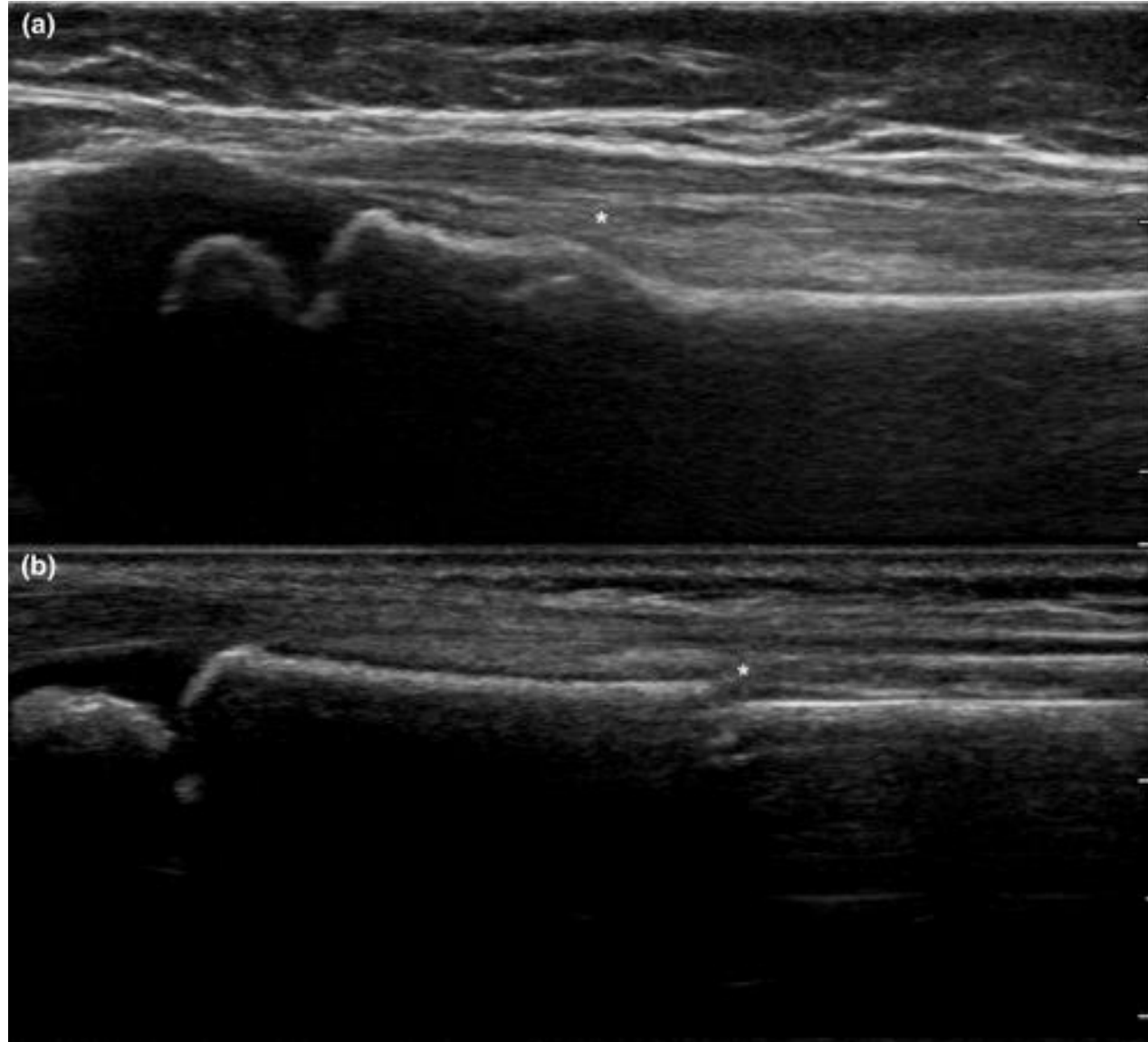
- Buckle fracture
  - Asymmetrical (compared with uninjured side) angulation or deformity of the cortex without disruption on any aspect
- Greenstick or transverse fracture
  - Disruption (breach of the cortex) at the point of mechanical strain
  - Demonstrated by a hypoechoic zone through the cortex of the bone



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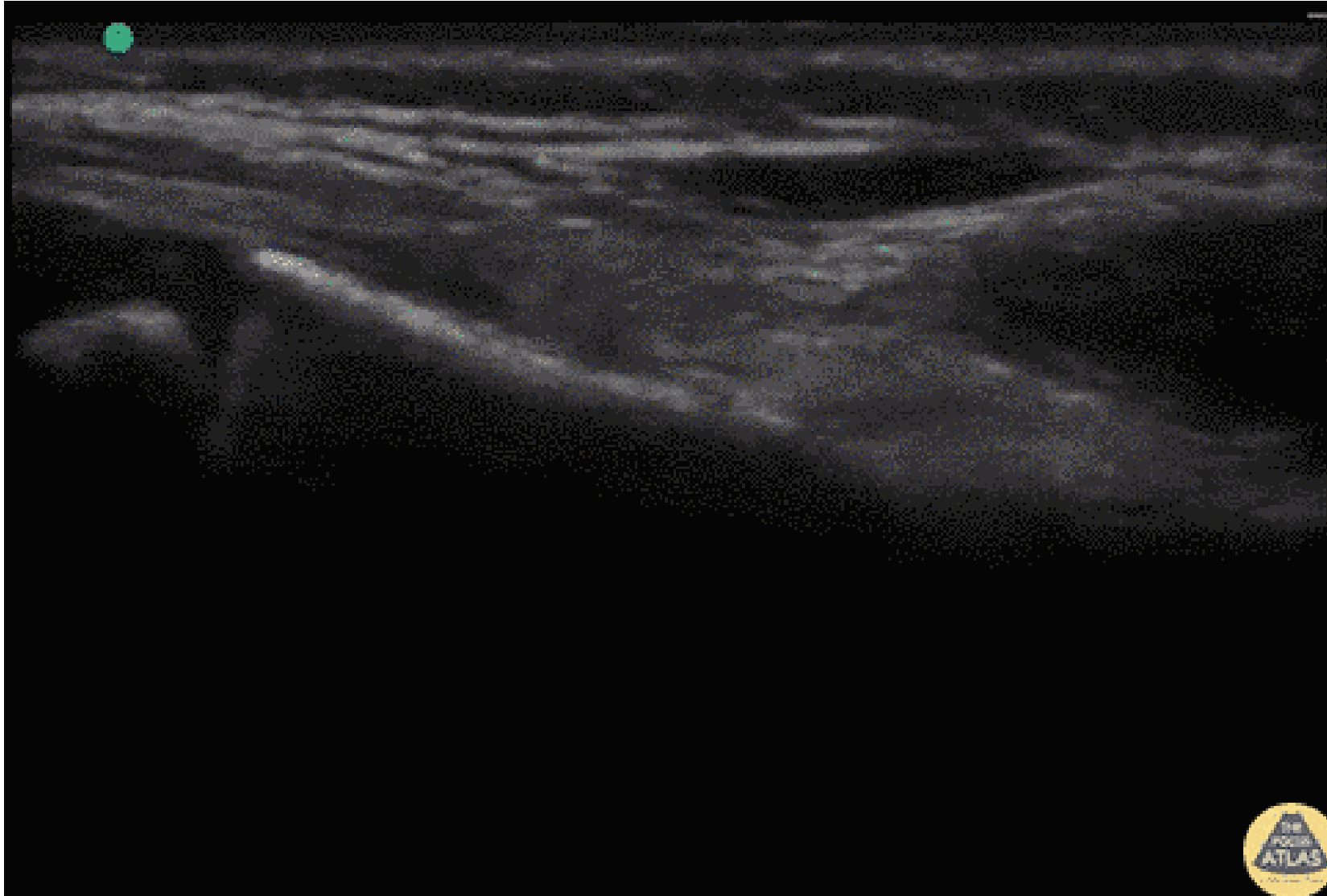
# FOREARM FRACTURES



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# FOREARM FRACTURES



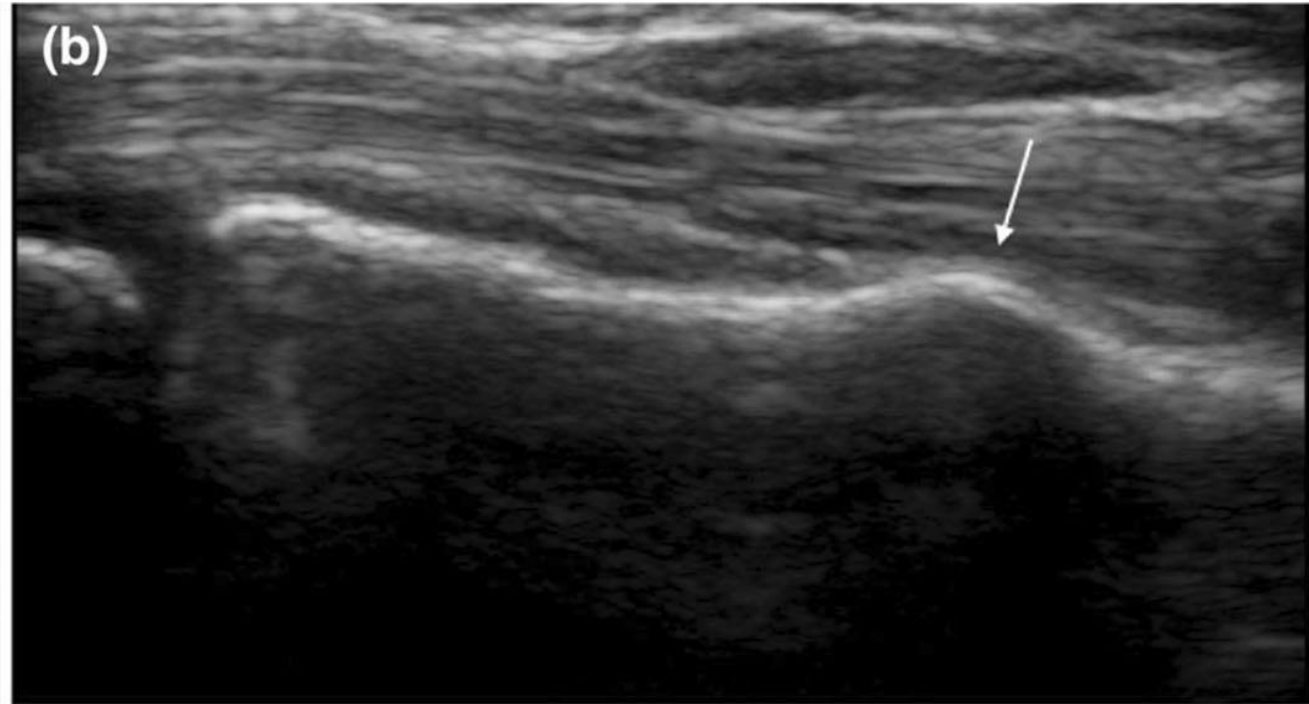
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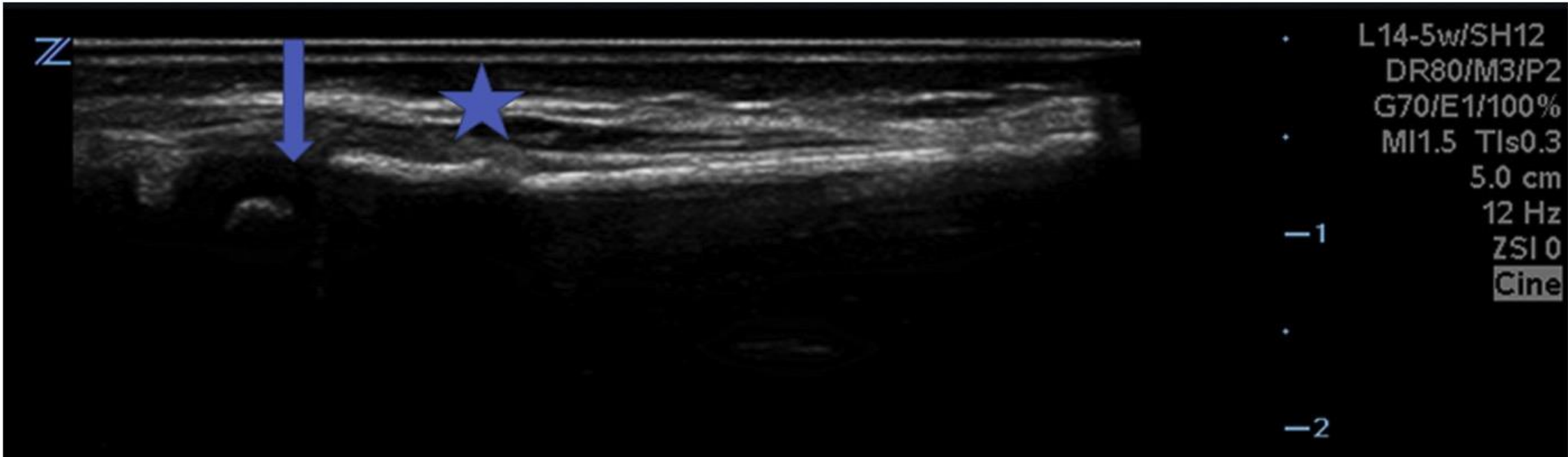


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# PHYSIS

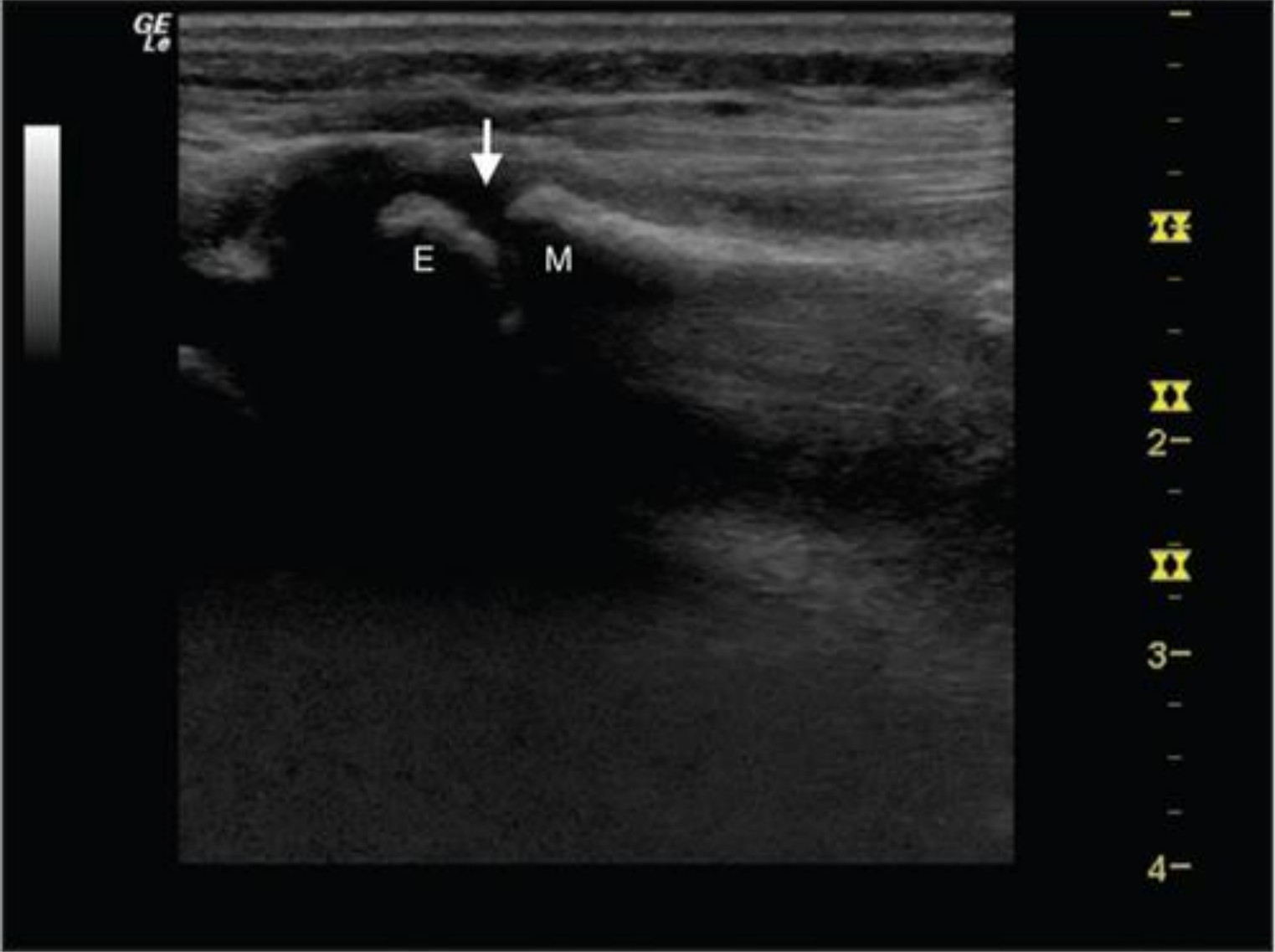
- Be mindful of the physis and joint space
- These will be rounded in appearance



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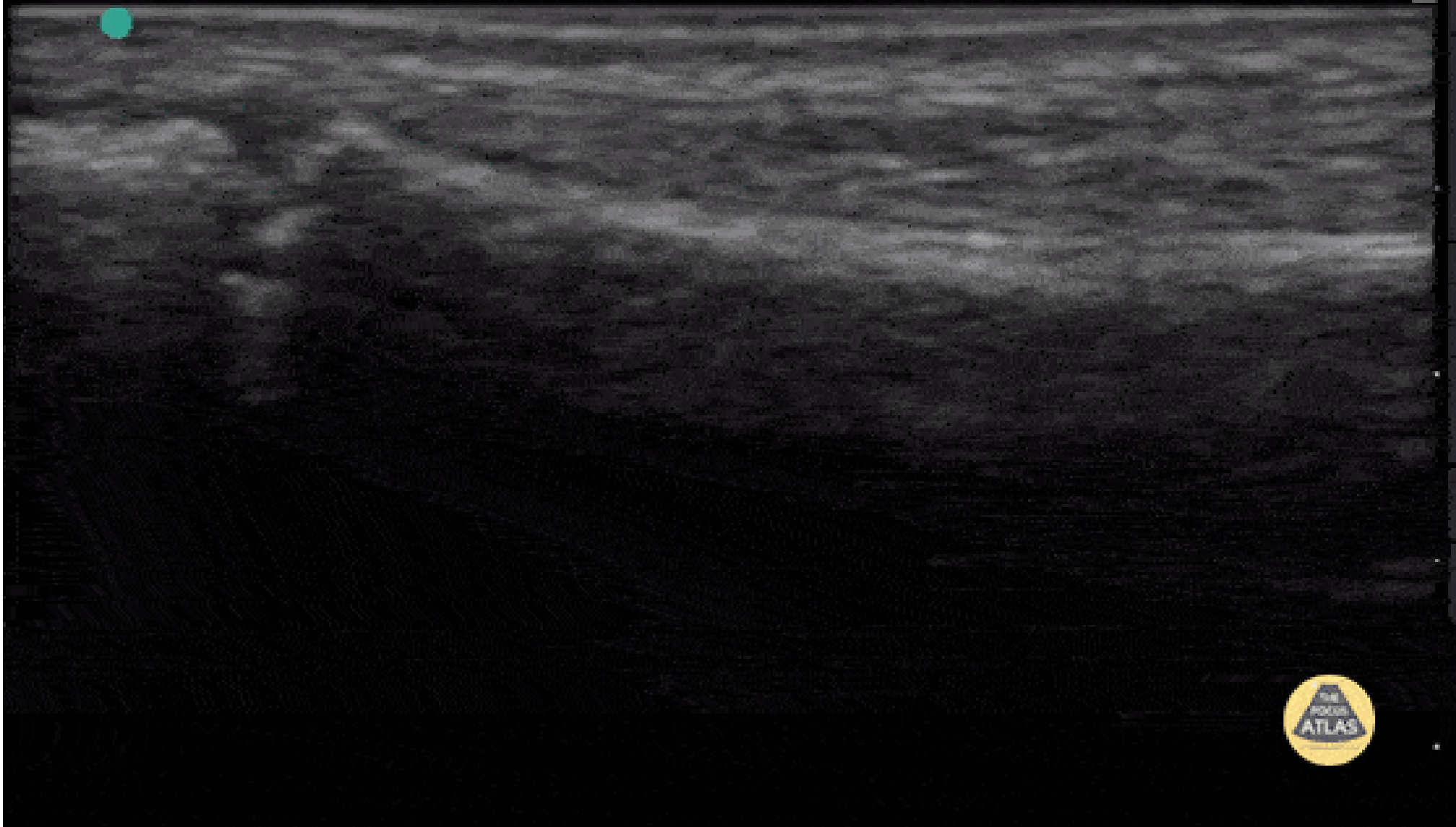
# PHYSIS



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# SALTER HARRIS II

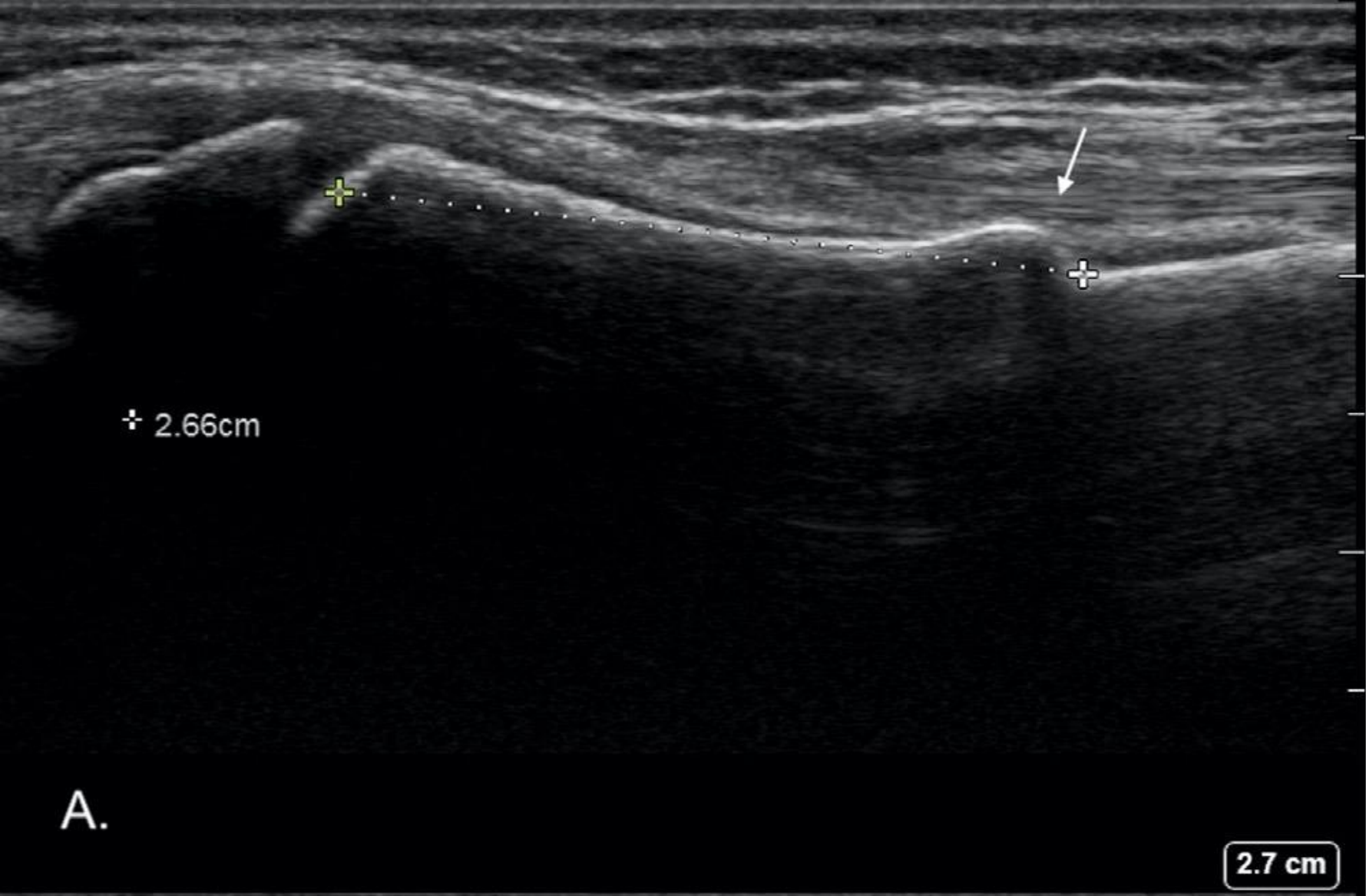
- Involve the physis
- Could potentially displace
- Complications include growth arrest
- Consider 1cm rule (Snelling 2023)



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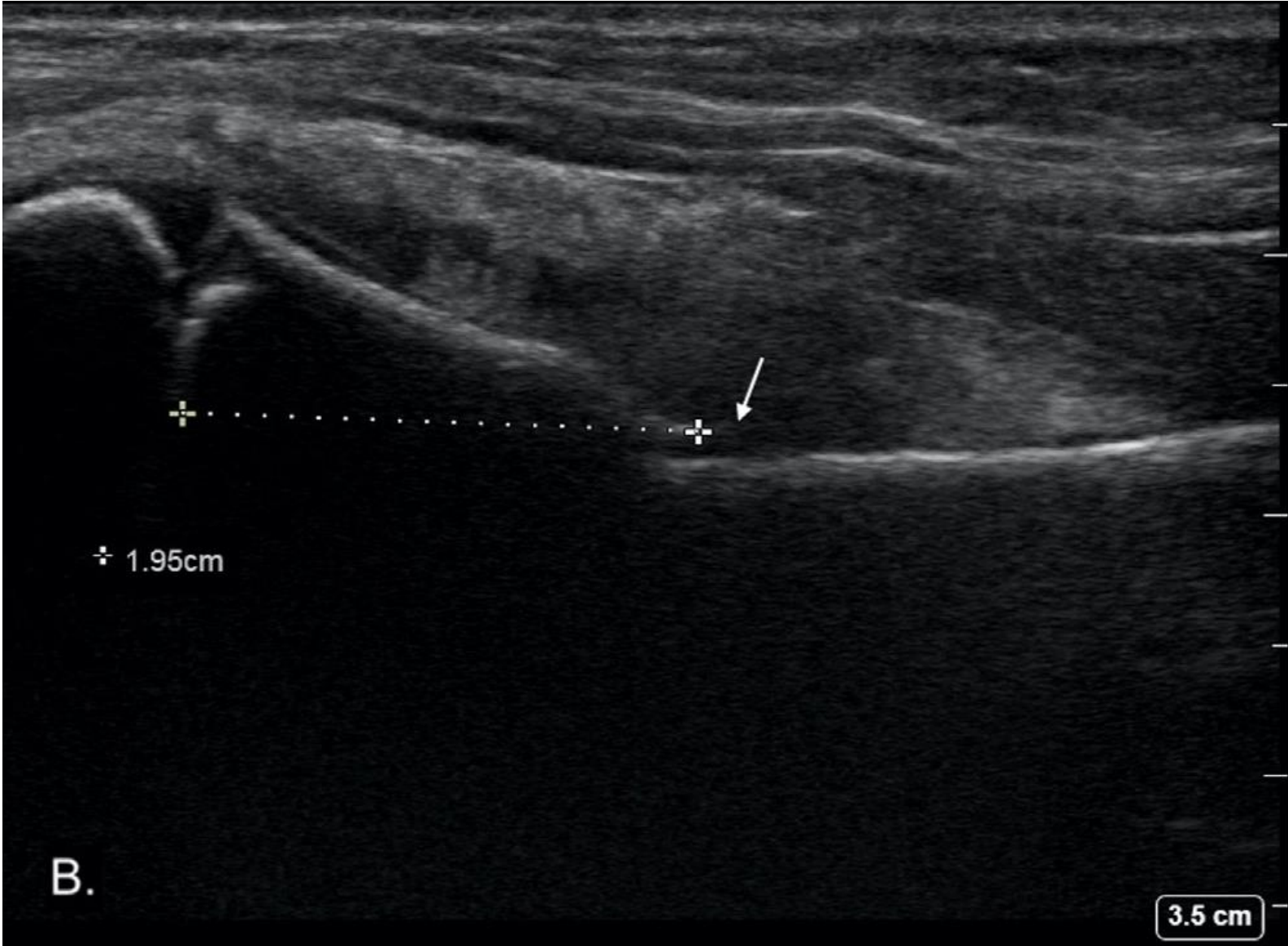
# SALTER HARRIS II



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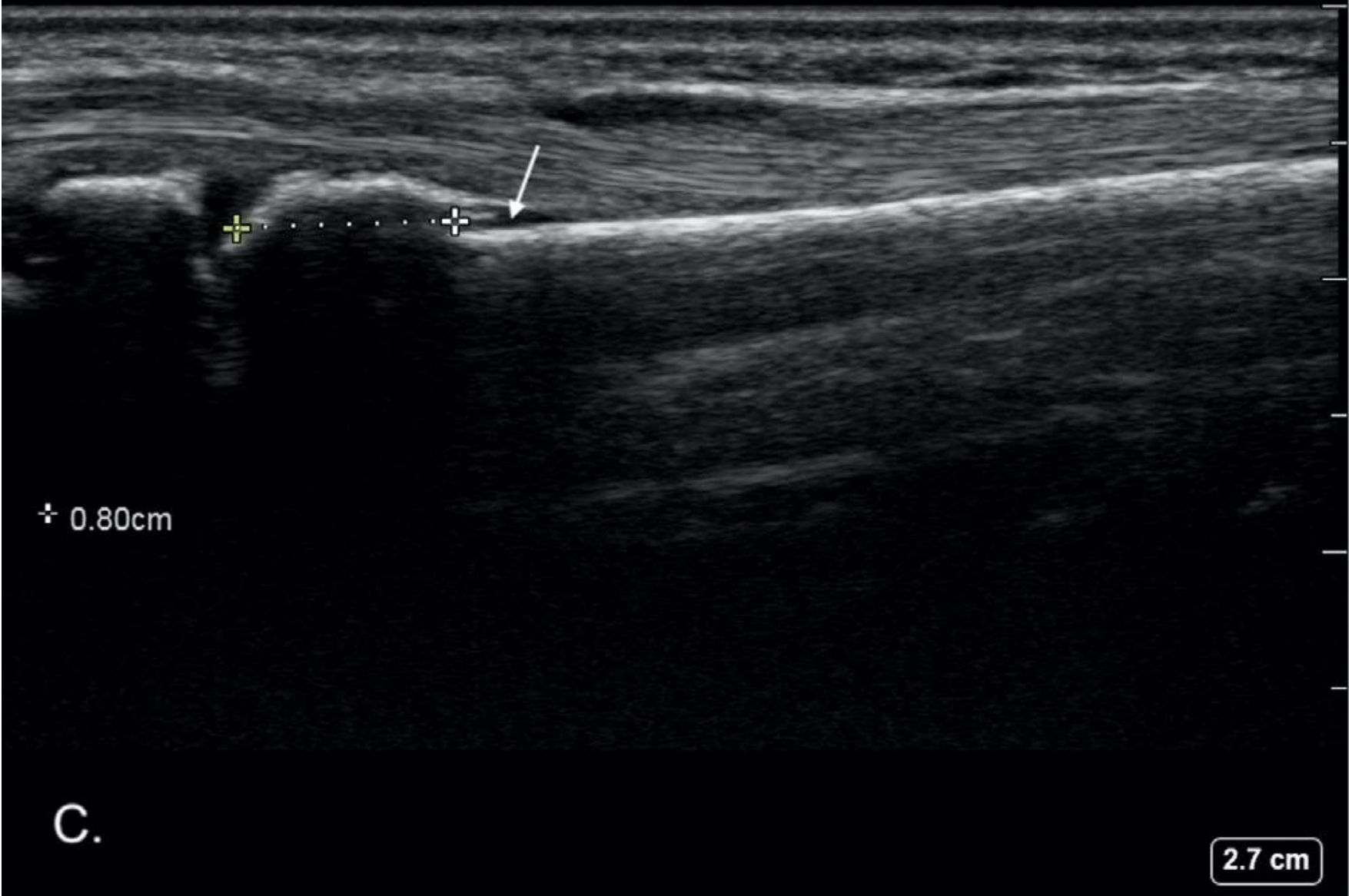
# SALTER HARRIS II



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# SALTER HARRIS II

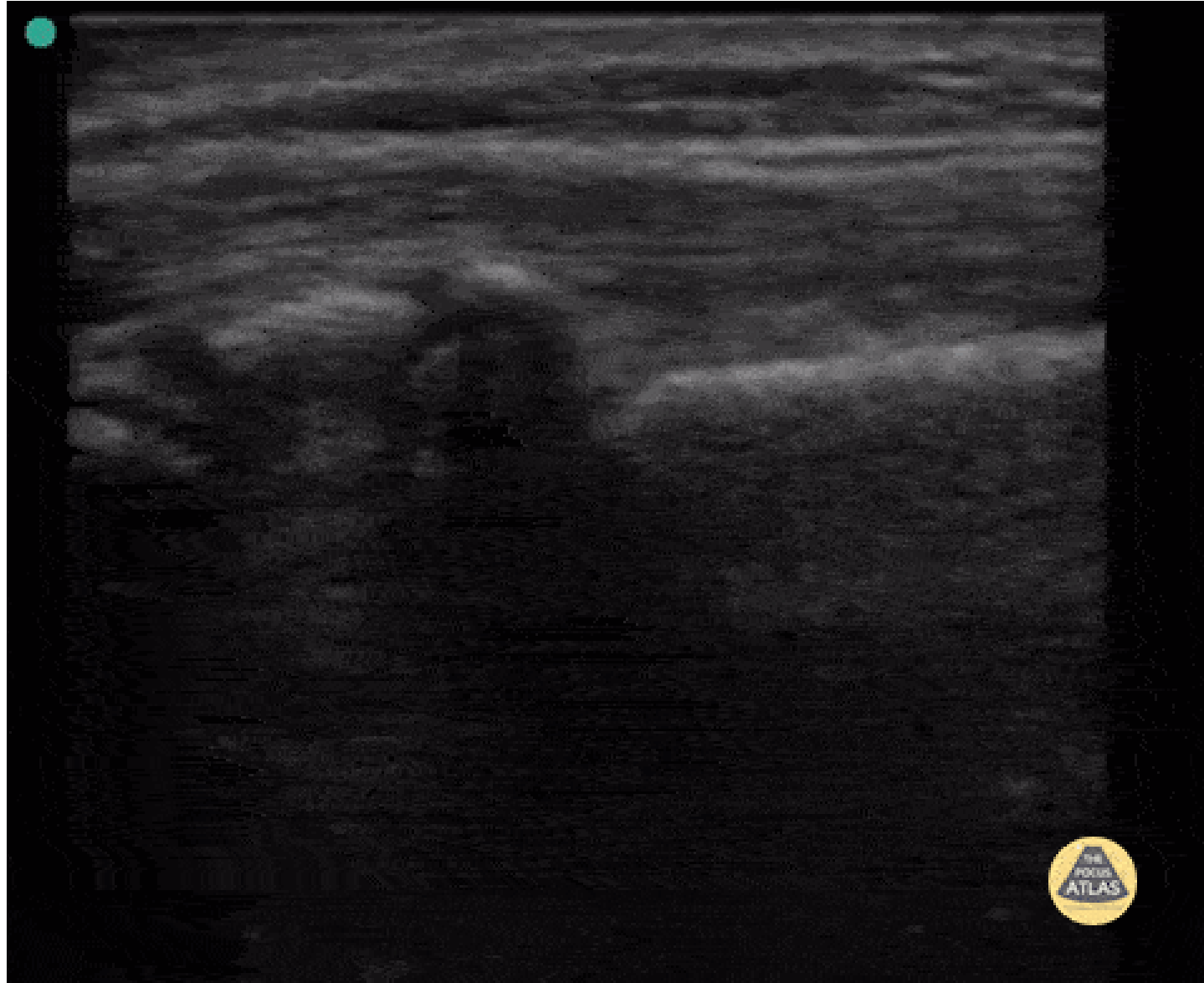


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# TIPS

- Mind pain - consider analgesia
- Lots of gel - avoid pressure
- PoCUS where it hurts
- Consider 6 point assessment, sliding distally to physis
  - (Volar, dorsal, lateral)
- Start in transverse to identify anatomy
- Lawnmower / slide



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# TIPS

- Be cautious around growth plate
- Order X-ray if in doubt
- May consider splint if uncomplicated buckle fracture
- Assess stages of fracture healing
- Use PoCUS to guide reduction



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# ULTRASOUND OF FRACTURE HEALING

- Mound of bridging callus over the superficial cortex on grayscale sonographic images
- Hyperemia of the adjacent soft tissues on colour Doppler imaging
- Hyperechoic tissue filling the fracture gap and obscuring visualization of intramedullary implants



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# ULTRASOUND OF FRACTURE HEALING



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# RADIAL REDUCTION - ADULT



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# RADIAL REDUCTION - ADULT



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# CASE #2

Not moving arms bilaterally

No hx trauma

Complex medical hx: Heart failure, pleural effusions, tamponade, cardiac sx, query autoimmune condition (under work up)



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# CASE #2

2 yo female

Not moving arms bilaterally

No hx trauma

Complex medical hx: Heart failure, pleural effusions, tamponade, cardiac sx, query autoimmune condition (under work up)



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# RADIAL HEAD SUBLUXATION

- Assess the radiocapitellar line
- Supinator muscle curling over the radial head along with an exaggerated synovial fringe (hook sign)
- Compared to contralateral side
- Repeat scan after reduction



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# RADIAL HEAD SUBLUXATION



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# RADIAL HEAD SUBLUXATION



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# RADIAL HEAD SUBLUXATION



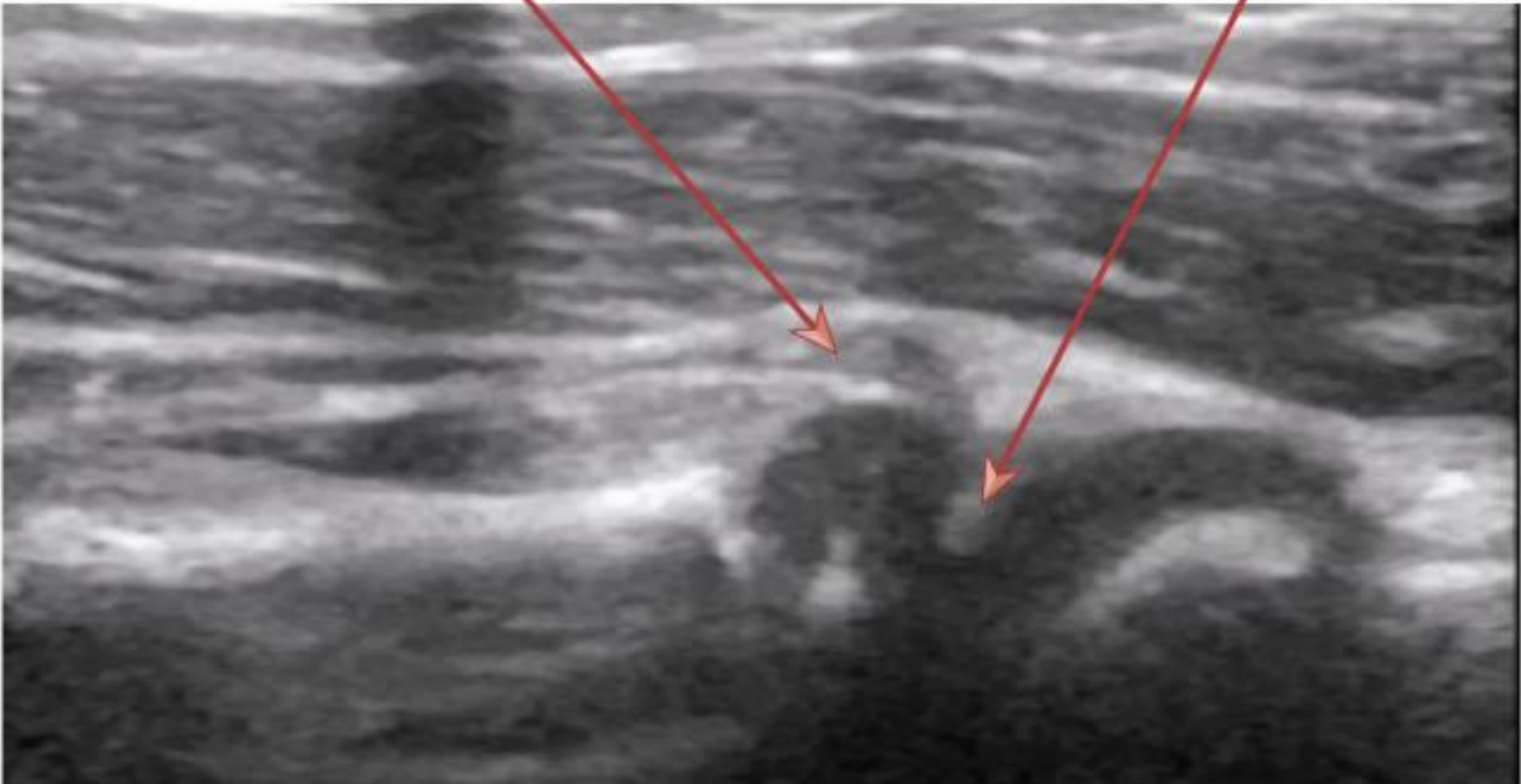
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# RADIAL HEAD SUBLUXATION

Supinator Muscle - "Hook Sign"

Synovial Fringe

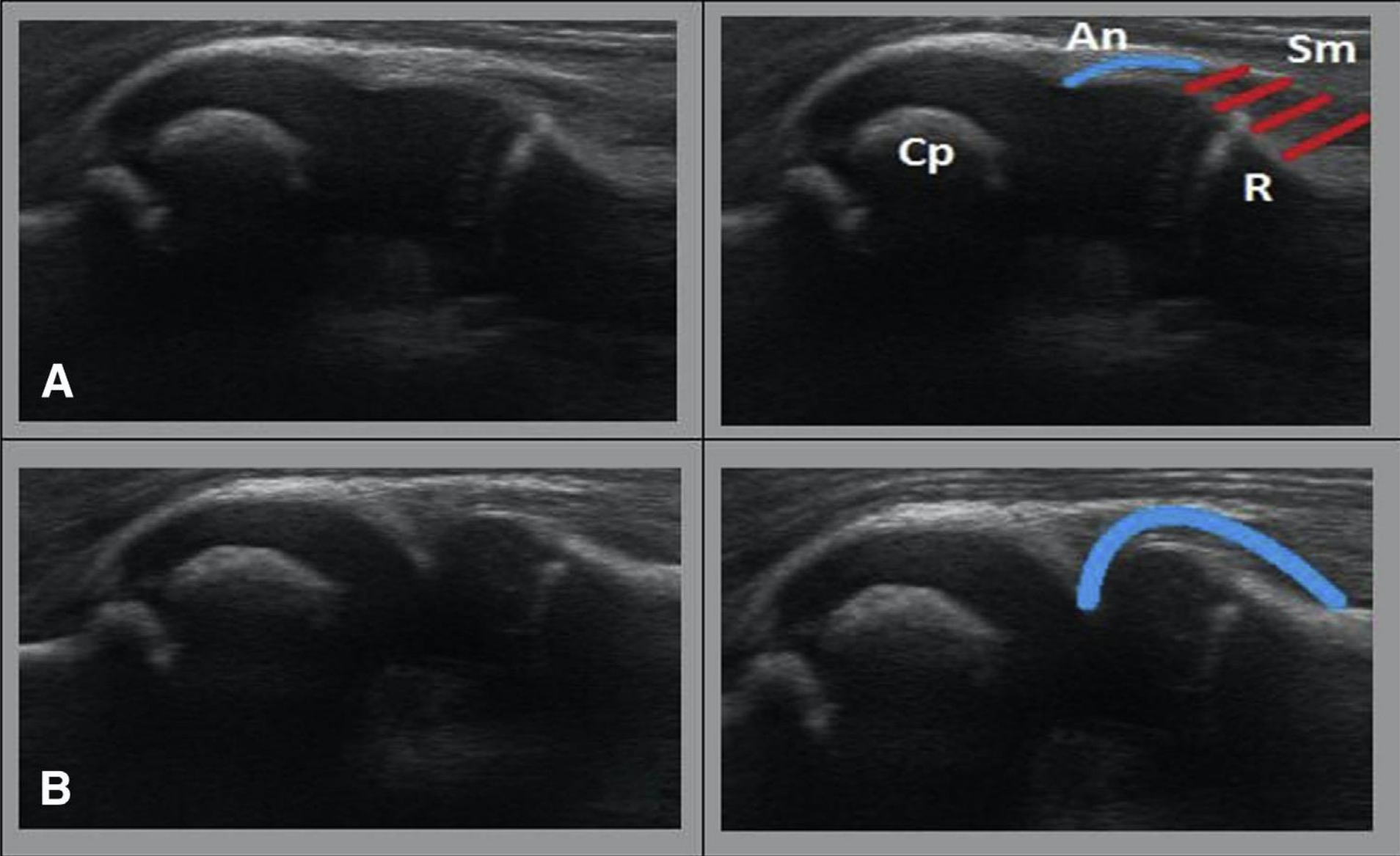


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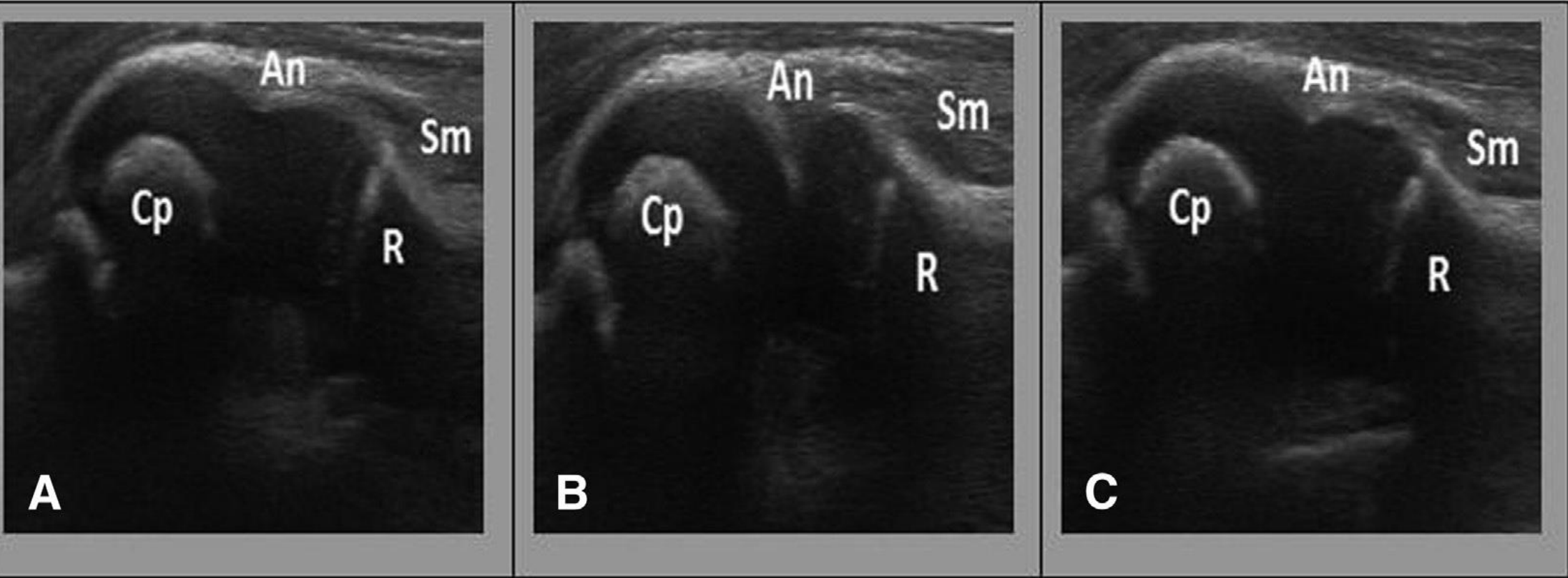
# RADIAL HEAD SUBLUXATION



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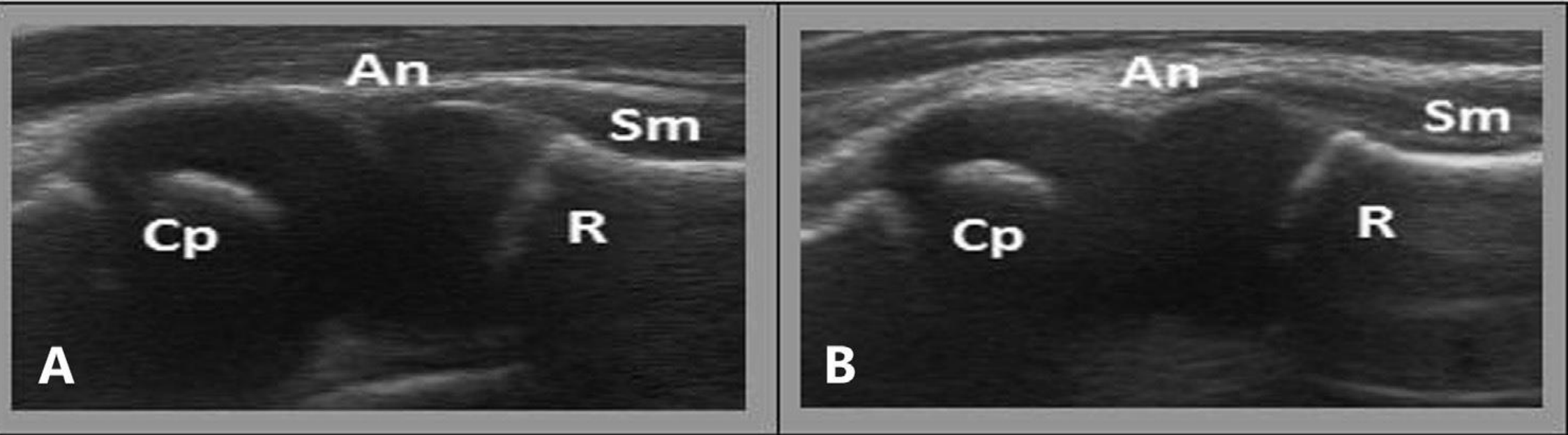
# RADIAL HEAD SUBLUXATION



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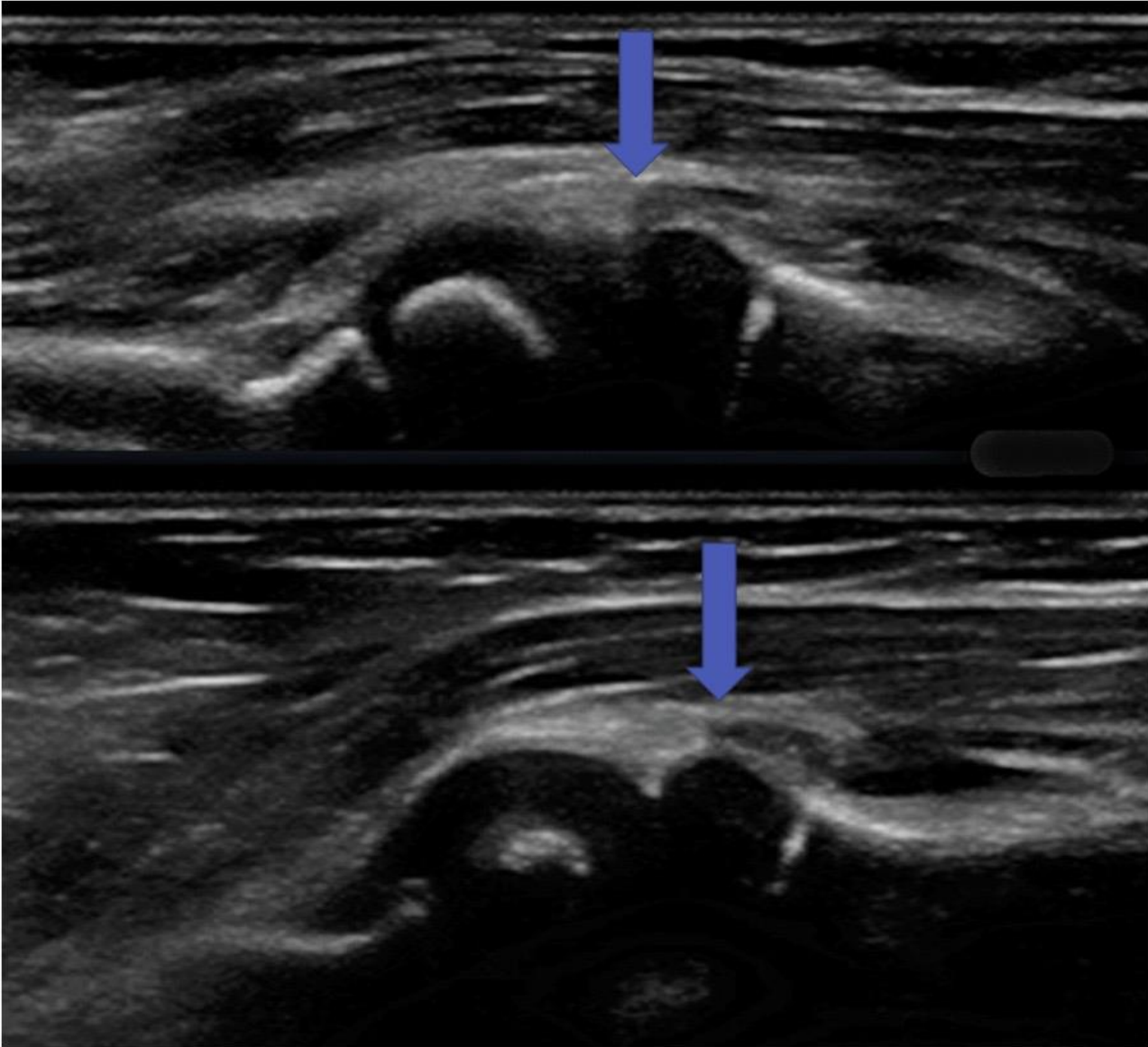
# RADIAL HEAD SUBLUXATION



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# RADIAL HEAD SUBLUXATION



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# RADIAL HEAD SUBLUXATION



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# UNDIFFERENTIATED ELBOW INJURY

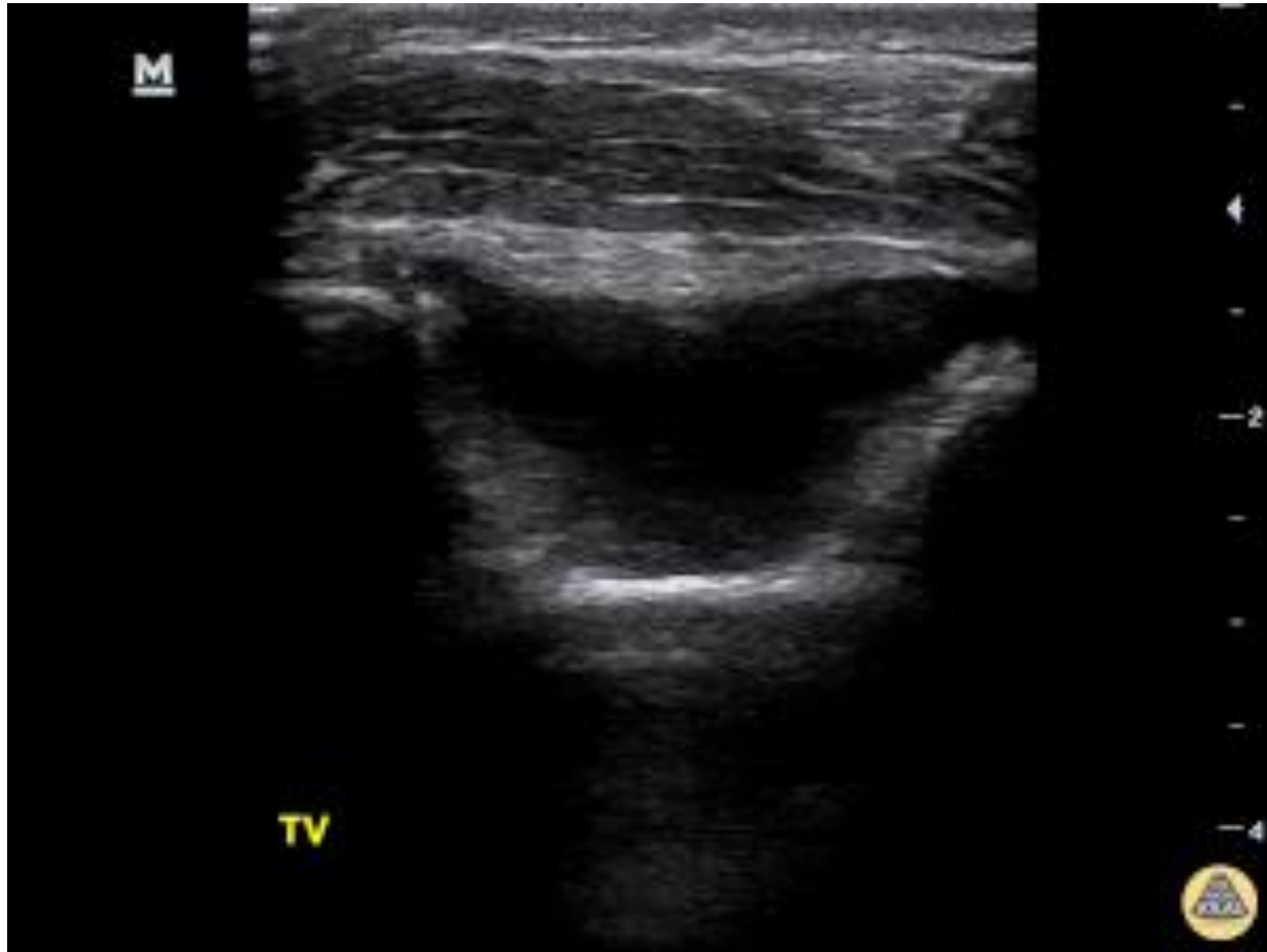
- Joint effusion - posterior fat pad
- Distal humerus - cortical disruption
- Radial head - cortical disruption
- Radial head - subluxation



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# POSTERIOR FAT PAD



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# POSTERIOR FAT PAD



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# POSTERIOR FAT PAD

- Elbow effusion in trauma setting (lipohemarthrosis)
  - X-ray



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# UPPER EXTREMITY INJURY

- **Distal radius** - cortical disruption
- Elbow effusion - posterior fat pad
- Distal / **proximal** humerus - cortical disruption
- Radial head - cortical disruption
- Radial head - subluxation



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# UPPER EXTREMITY APPROACH



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# UPPER EXTREMITY APPROACH



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# UPPER EXTREMITY APPROACH

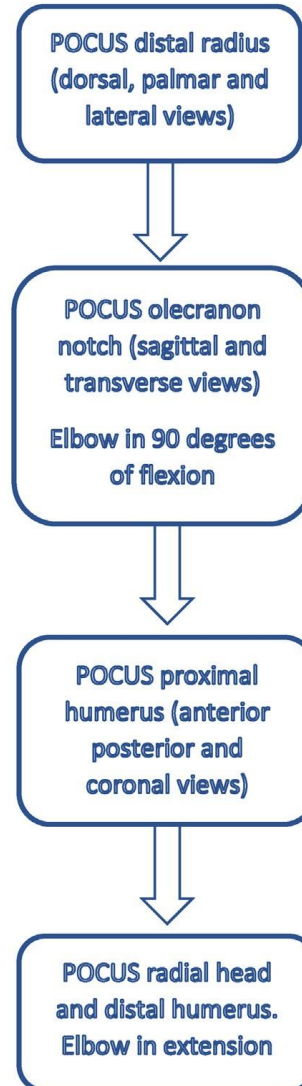


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# UPPER EXTREMITY APPROACH

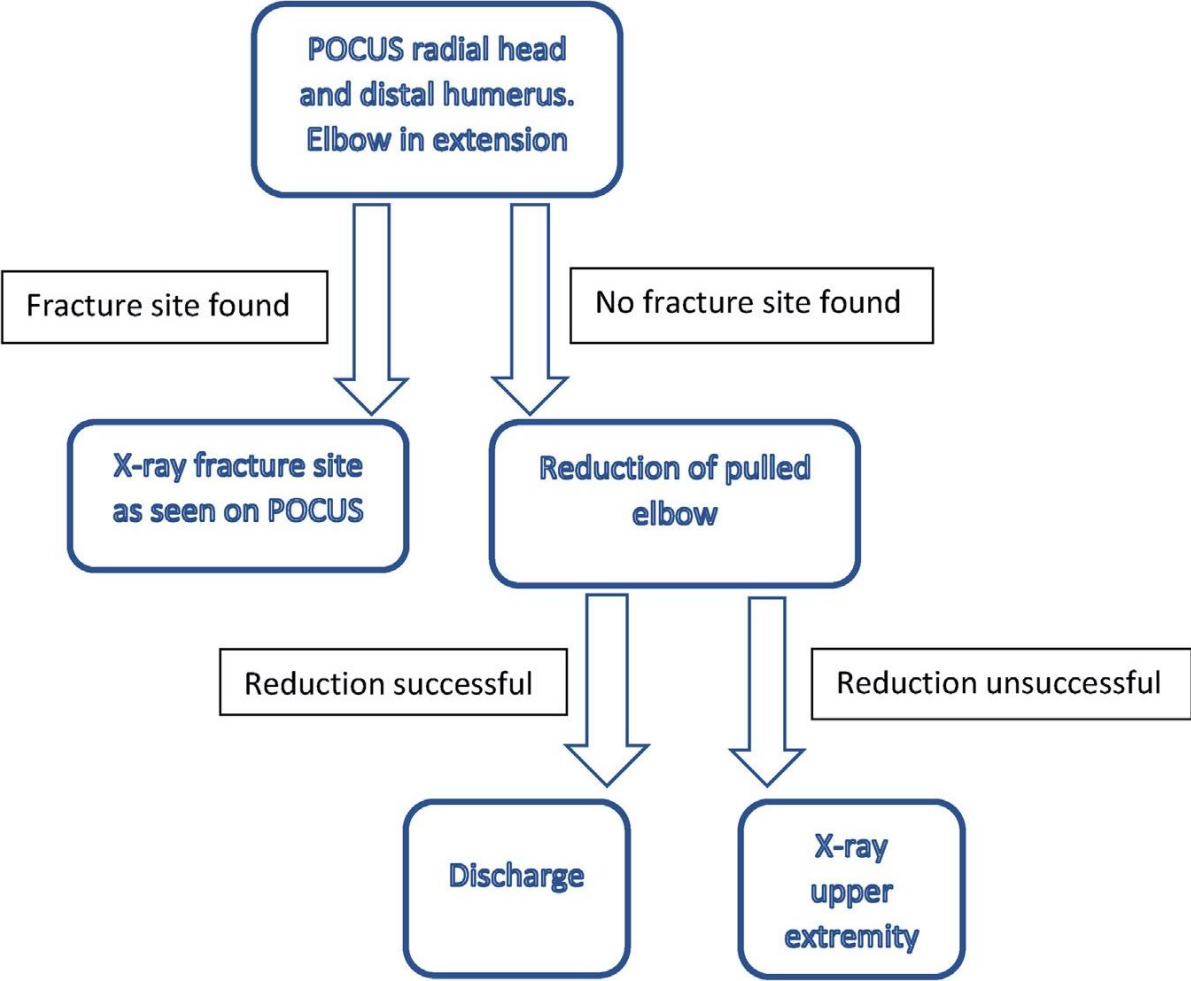


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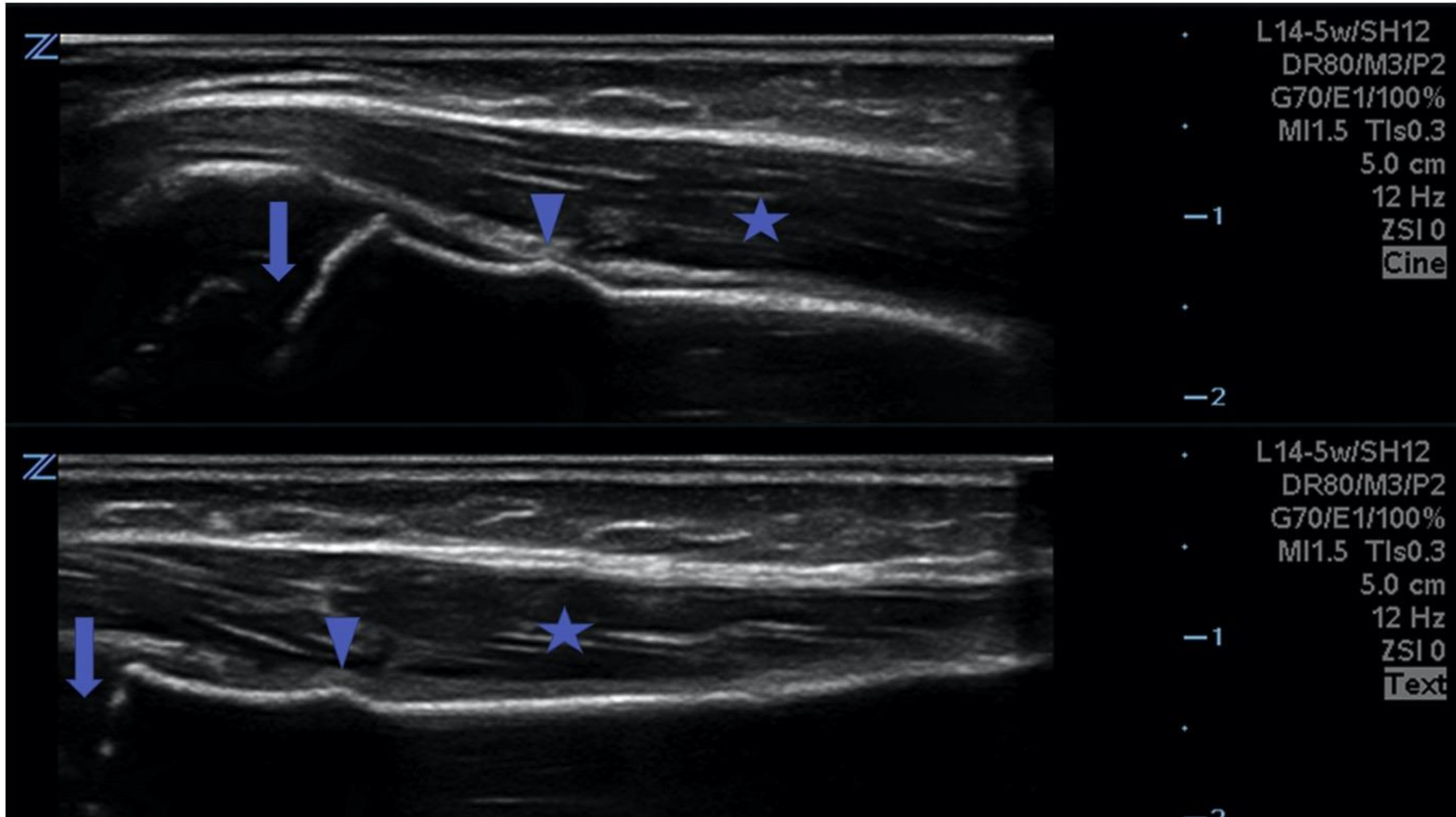
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# UPPER EXTREMITY APPROACH



# HUMERUS FRACTURES



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# HUMERUS FRACTURES



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# CASE #3

11 yo male

Presents with non traumatic limp



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# HIP POCUS



Source: The Ultrasound Journal, Jan. 2010. Stone, M.



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# HIP POCUS



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# HIP POCUS



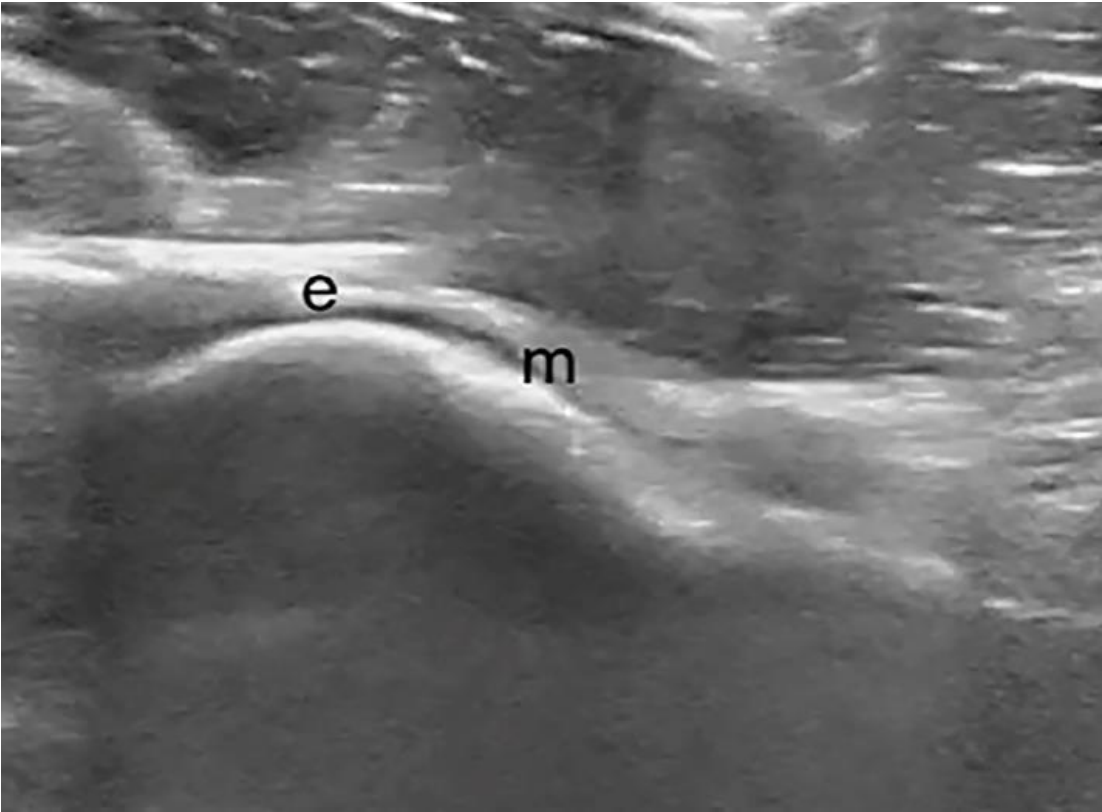
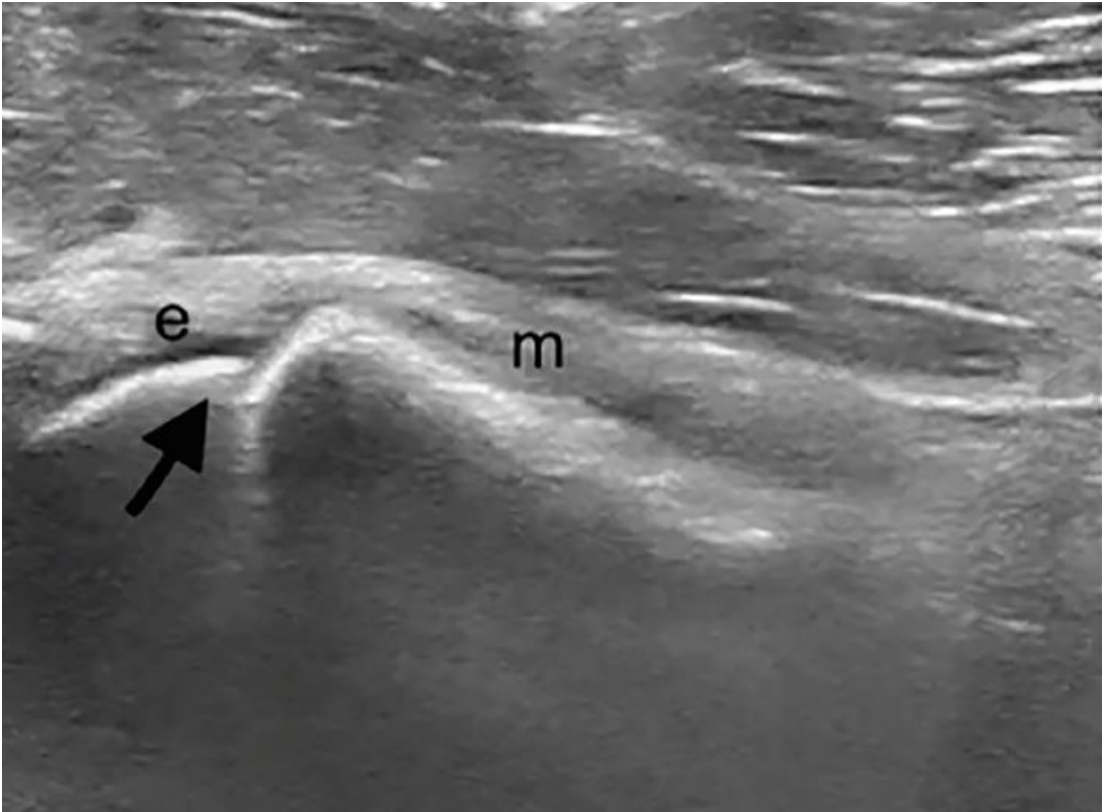
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# SCFE POCUS



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Source: Clin Pract Cases Emerg Med

# SCFE POCUS



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# SCFE POCUS

> [J Bone Joint Surg Br. 1991 Nov;73\(6\):884-9. doi: 10.1302/0301-620X.73B6.1955429.](#)

## Ultrasonography in slipped capital femoral epiphysis. Diagnosis and assessment of severity

[P E Kallio](#)<sup>1</sup>, [G W Lequesne](#), [D C Paterson](#), [B K Foster](#), [J R Jones](#)

Affiliations + expand

PMID: 1955429 DOI: [10.1302/0301-620X.73B6.1955429](#)

- 26 patients with SCFE
- “We recommend ultrasonography for the diagnosis, staging and follow-up management of slipped upper femoral epiphysis.”



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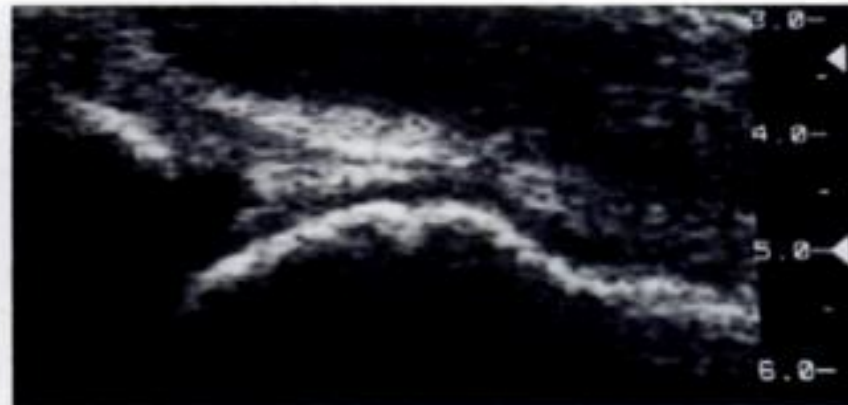


# SCFE POCUS



Fig. 3

Radiographic appearance of a minimal right SCFE in a 14-year-old boy. The duration of symptoms was one week. The head-shaft angle difference was  $10^\circ$  and the percentage slip was 7%.



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# SCFE POCUS

- 95% sensitivity with ultrasound ([Magnano 1998](#))
- Can show hip effusion or metaphyseal step-off when radiographs are negative
- Operator dependent



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# CASE #4

8 yo female

Limping, R ankle injury

MOI rolled ankle skateboarding



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# ?ANKLE POCUS

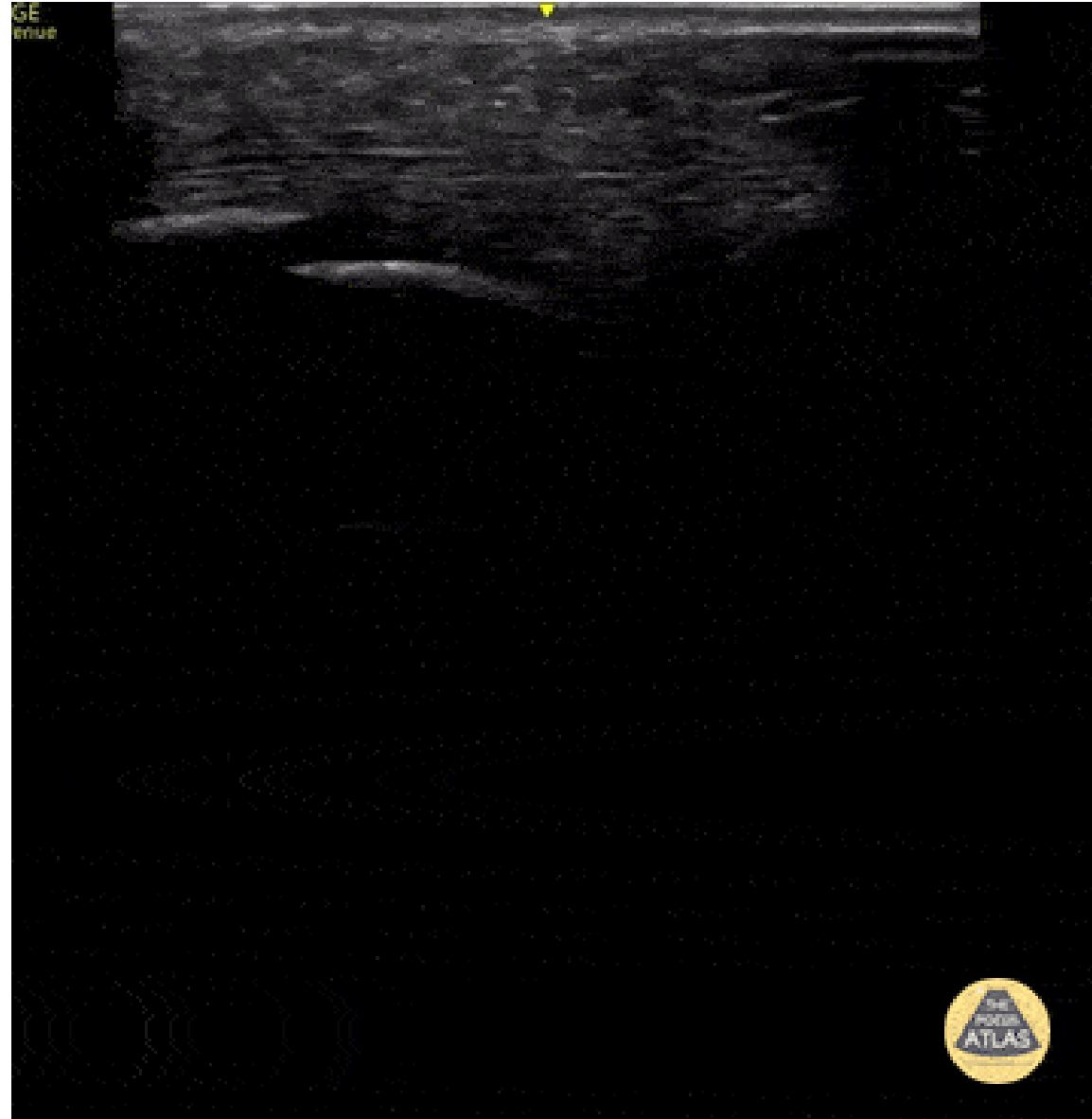
- Sn of 56% Sp 82% (Malia 2021)



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# ?ANKLE POCUS



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# PHYSIS SALTER-HARRIS I



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# PHYSIS SALTER-HARRIS I

- (Dion 2021)
- PEM accuracy rate of 34% for physis identification
- The mean distance between 7.4 mm
- PEM physicians were unable to accurately identify the distal fibular physis on physical examination

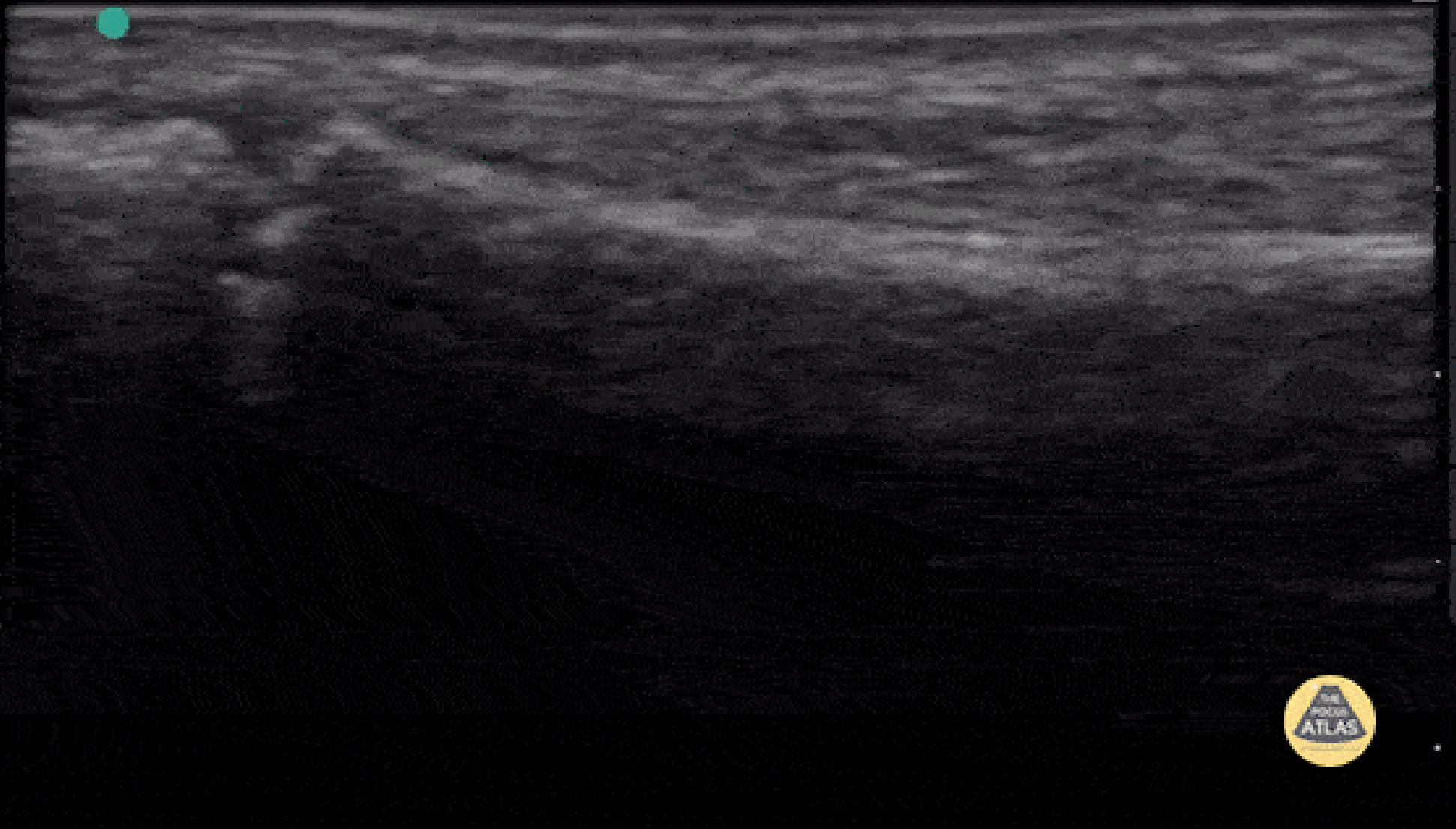


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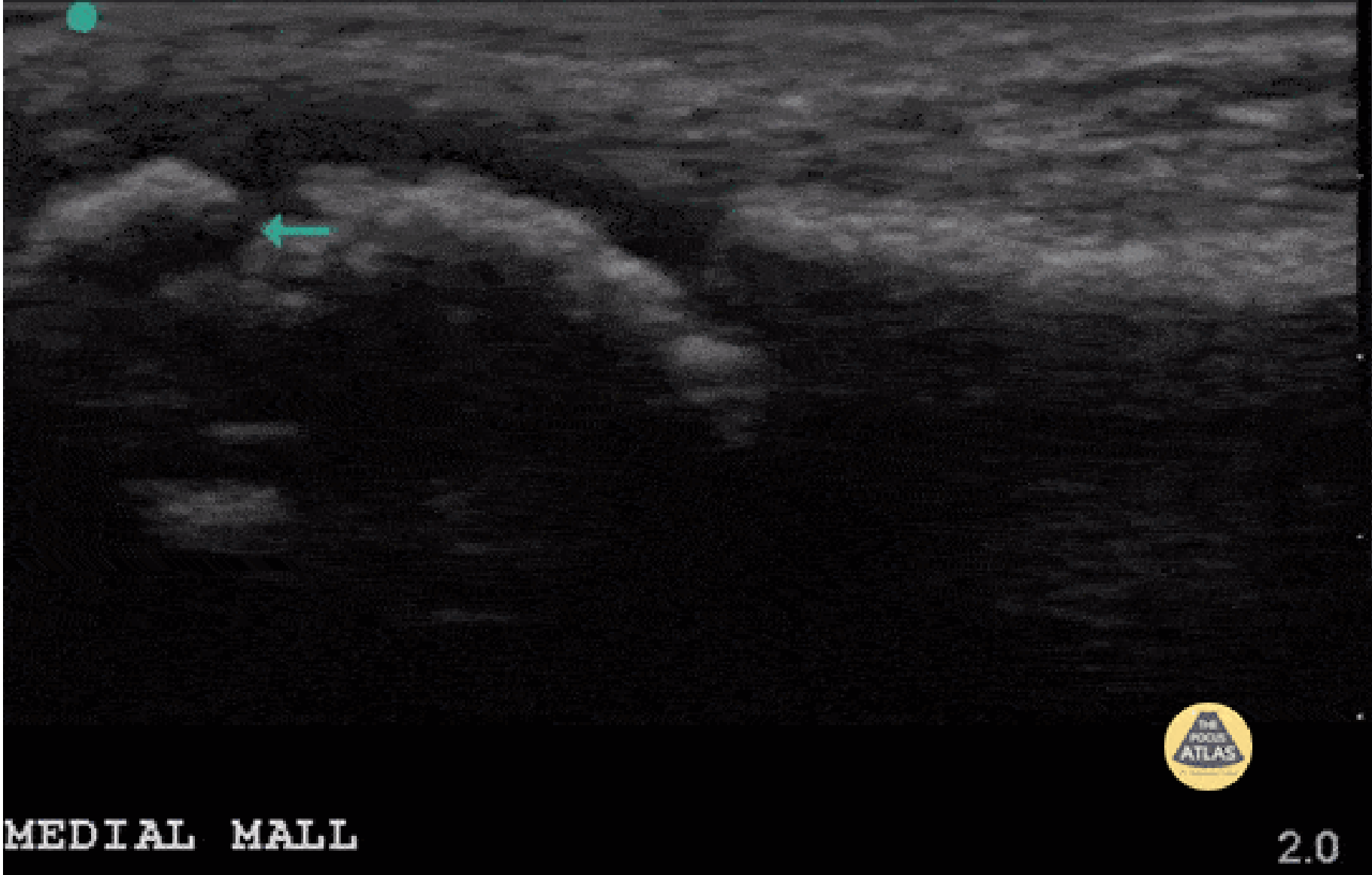
# ?ANKLE # PHYSIS



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# ?ANKLE # PHYSIS



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# PEDIATRIC MSK POCUS APPLICATIONS

## Fractures

Forearm, supracondylar, and proximal humerus, long bones, ankle, skull, clavicle, sternum

Radial head subluxations

SCFE

Septic arthritis / transient tenosynovitis

## Skin and Soft Tissue

FOB

Abscess vs cellulitis

Intramuscular Hematoma

Synovial cysts

Vascular malformations (Hemangiomas)



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# SKULL #



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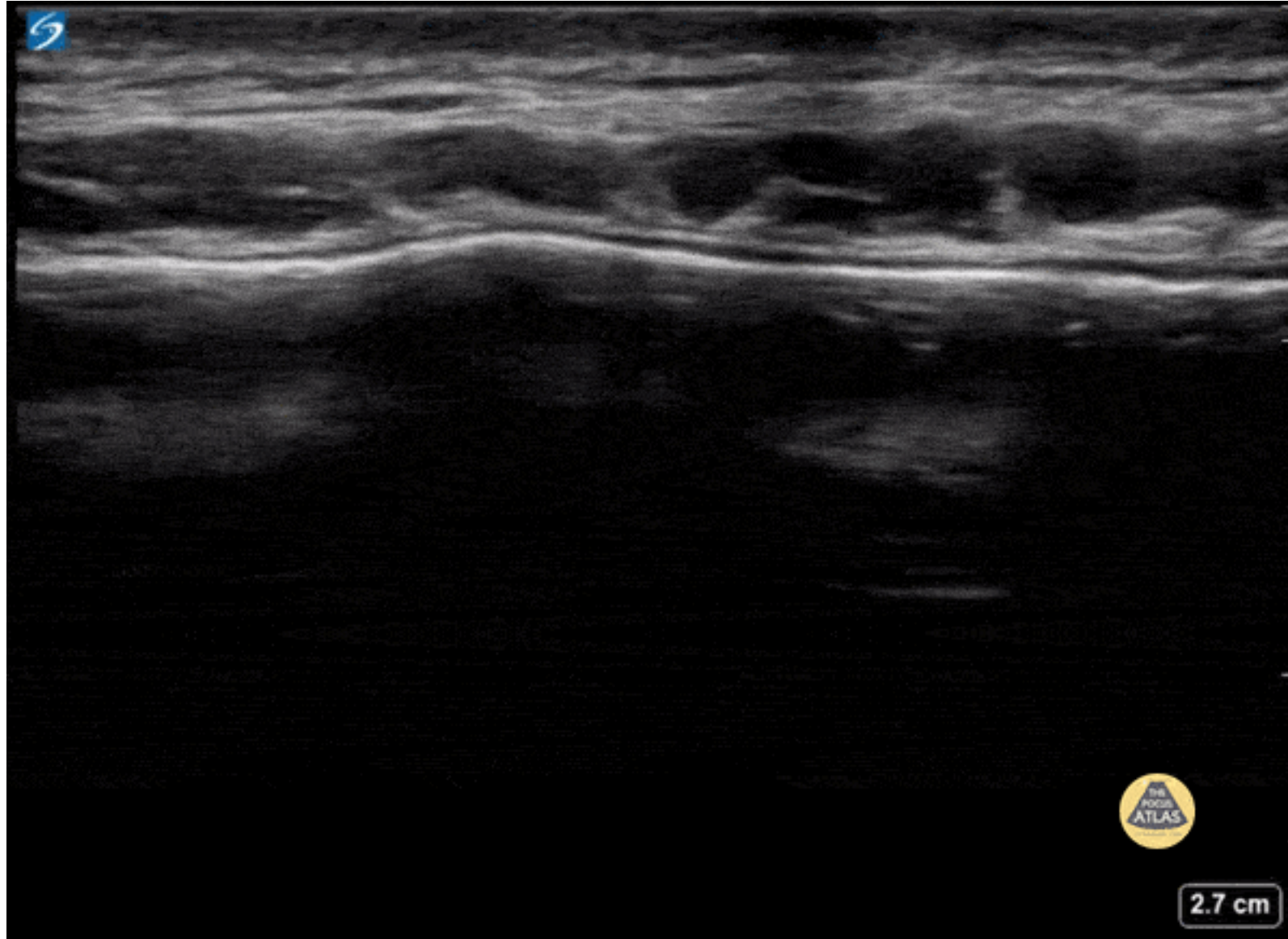
# CLAVICLE #



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# STERNAL #

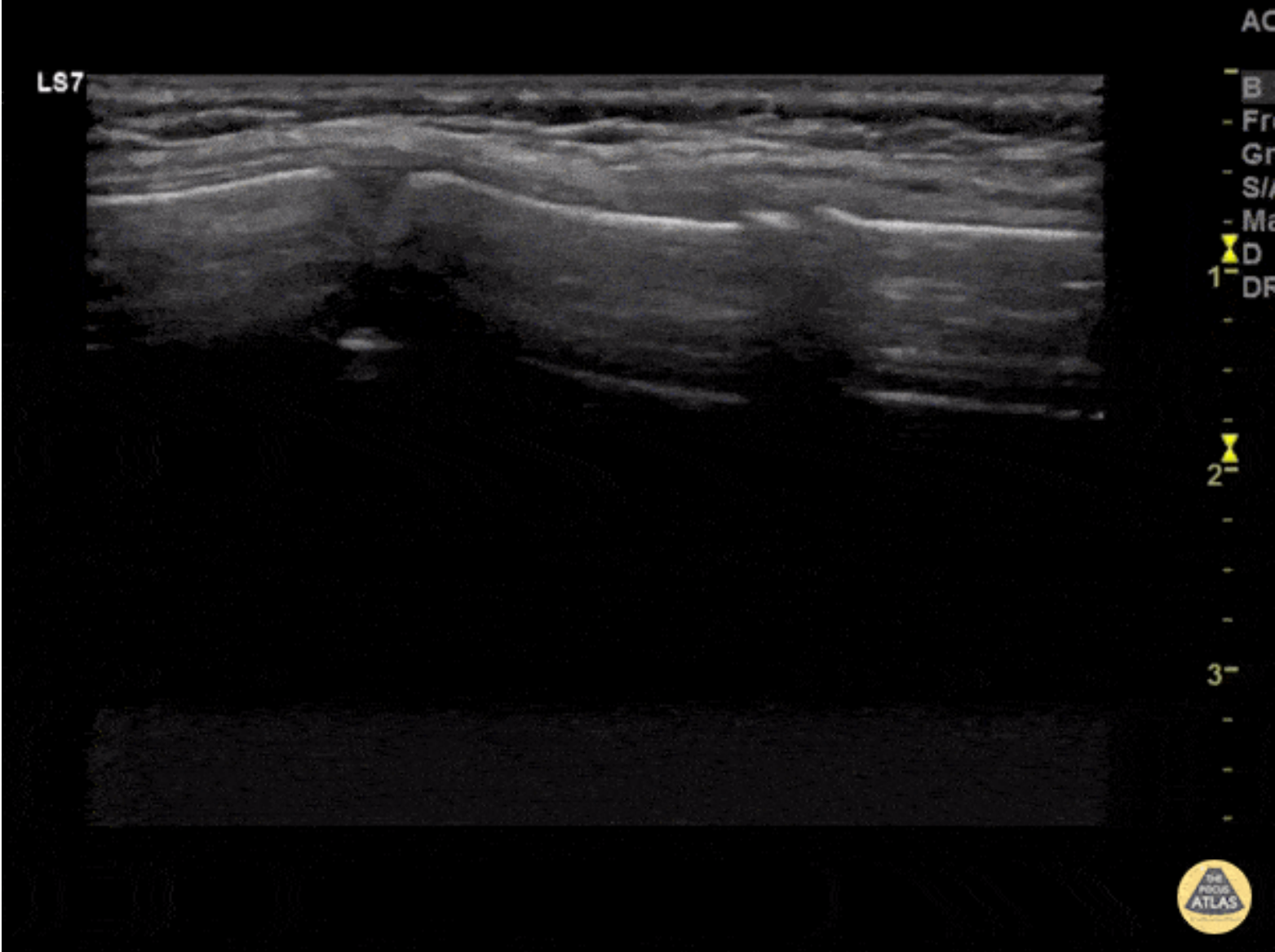


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# STERNAL #



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# FEMUR # LONG & SHORT



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# REVIEW

- ?no X-ray for simple (non angulated, >1cm from physis) distal radius buckle #s
- PoCUS for radial head subluxation!
- Child with a limp (SCFE) - consider PoCUS first
- Ankle (SH I) - mind the physis



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## Upcoming Rural PoCUS Rounds - MSK:

Sept 15th - Skin and Soft Tissue - Dr. Virginia Robinson

Oct 27th - The Achillies - Dr. Tracy Morton

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Nov 17th - Ultrasound Guided MSK Injection - Dr. Oron Frenkel

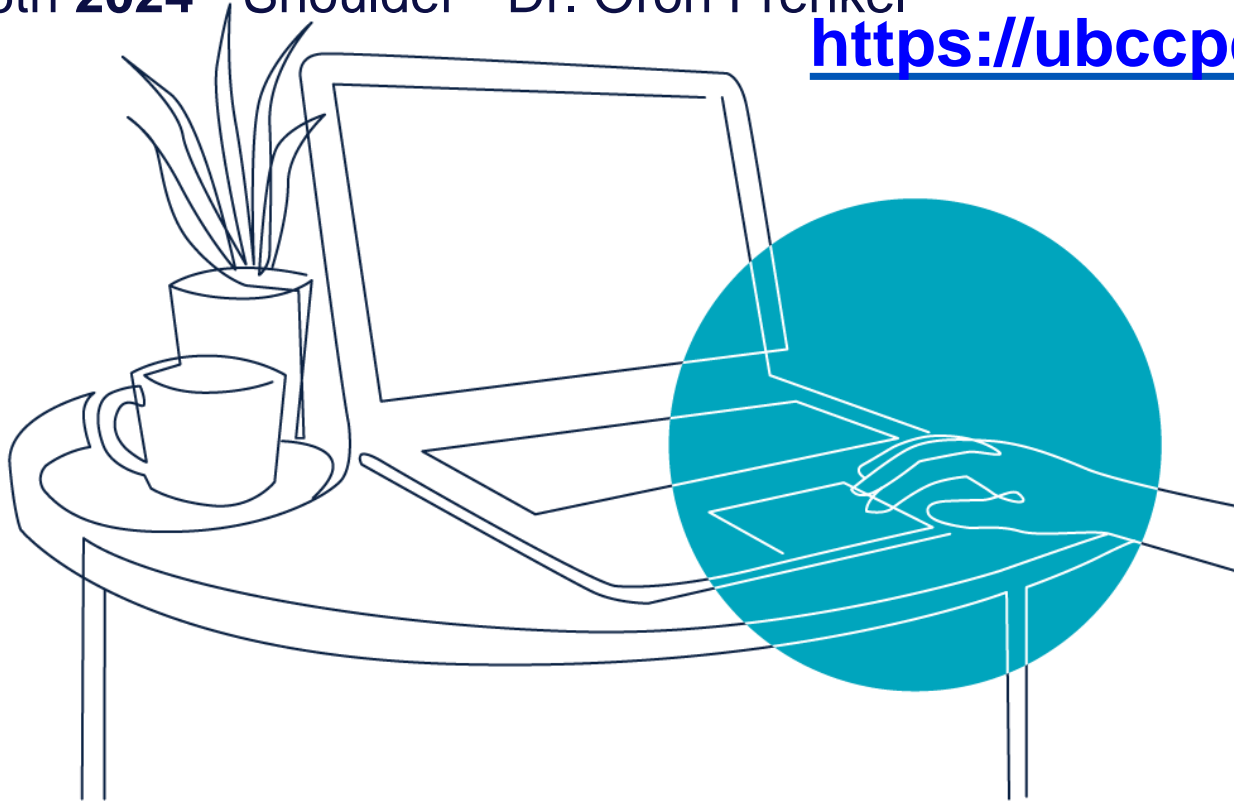
Jan 16th **2024** - Shoulder - Dr. Oron Frenkel

<https://ubccpd.ca/rural-pocus-rounds>



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# QUESTIONS

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# RESOURCES MENTIONED

- <https://www.aliem.com/pem-pocus/>
- <https://www.bcpocus.ca/>
- <https://www.ultrasoundgel.org/>
- <https://www.thepocusatlas.com/>
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