



## WEBINAR

# Regenerative Medicine: Building POCUS Skills for Safe and Accurate PRP Injections

December 2023



# Your Host



**Shelley Guenther, CRGS, CRCS**

Sonographer | Clinical Marketing Manager

# Accuracy of Intraarticular Injections: Blind vs. Image Guided Techniques–A Review of Literature

“

...image-guided intra-articular injections, particularly **ultrasound**, have been shown to be **more accurate** than palpation-guided IAs for all joints.

Saha P, Smith M, Hasan K. Accuracy of Intraarticular Injections: Blind vs. Image Guided Techniques-A Review of Literature. *J Funct Morphol Kinesiol.* 2023 Jun 29;8(3):93. doi: 10.3390/jfmk8030093. PMID: 37489306; PMCID: PMC10366715.

## Accuracy of Intraarticular Injections: Blind vs. Image Guided Techniques–A Review of Literature

Prasenjit Saha<sup>1</sup>, Matthew Smith<sup>2</sup>, Khalid Hasan<sup>2</sup>

Affiliations + expand

PMID: 37489306 PMCID: PMC10366715 DOI: 10.3390/jfmk8030093

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### Abstract

Intra-articular injections are widely used for diagnostic and therapeutic purposes of joint pathologies throughout the body. These injections can be performed blind by utilizing anatomical landmarks or with the use of imaging modalities to directly visualize the joint space during injections. This review of the literature aims to comprehensively identify differences in the accuracy of intra-articular injections via palpation vs. image guidance in the most commonly injected joints in the upper and lower extremities. To our knowledge, there are no such comprehensive reviews available. A narrative literature review was performed using PubMed and Google Scholar databases to identify studies focusing on the accuracy of blind or image-guided intra-articular injections for each joint. A total of 75 articles was included in this review, with blind and image-guided strategies being discussed for the most commonly injected joints of the upper and lower extremities. Varying ranges of accuracy with blind and image-guided modalities were found throughout the literature, though an improvement in accuracy was seen in nearly all joints when using image guidance. Differences are pronounced, particularly in deep joints such as the hip or in the small joints such as those in the hand or foot. Image guidance is a useful adjunct for most intra-articular injections, if available. Though there is an increase in accuracy in nearly all joints, minor differences in accuracy seen in large, easily accessed joints, such as the knee, may not warrant image guidance.

**Keywords:** accuracy; blind; image-guided; intra-articular injections; joints.

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### Conflict of interest statement

The authors declare no conflict of interest.

### References

1. Masala S, Fiori R, Bartolucci D.A., Mammucari M., Angelopoulos G., Massari F., Simonetti G. Diagnostic and Therapeutic Joint Injections. *Semin. Interv. Radiol.* 2010;27:160–171. doi: 10.1055/s-0030-1253514. - [DOI](#) - [PMC](#) - [PubMed](#)
2. Berkoff D.J., Miller L.E., Block J.E. Clinical utility of ultrasound guidance for intra-articular knee injections: A review. *Clin. Interv. Aging.* 2012;7:89–95. - [PMC](#) - [PubMed](#)
3. Stephens M.B., Beutler A.I., O'Connor F.G. Musculoskeletal injections: A review of the evidence. *Am. Fam. Physician.* 2008;78:971–976. - [PubMed](#)
4. Ayhan E., Kesmezacar H., Akgun I. Intraarticular injections (corticosteroid, hyaluronic acid, platelet rich plasma) for the knee osteoarthritis. *World J. Orthop.* 2014;5:351–361. doi: 10.5312/wjo.v5.i3.351. - [DOI](#) - [PMC](#) - [PubMed](#)
5. Rozental T.D., Sculco T.P. Intra-articular corticosteroids: An updated overview. *Am. J. Orthop.* 2000;29:18–23. - [PubMed](#)

# Ultrasound guidance improves accuracy of knee injections

“...ultrasound-guided knee injections were more accurate across every anatomical needle injection site compared with blind injections.”

Fang WH, Chen XT, Vangsness CT Jr. Ultrasound-Guided Knee Injections Are More Accurate Than Blind Injections: A Systematic Review of Randomized Controlled Trials. *Arthrosc Sports Med Rehabil.* 2021 Jun 26;3(4):e1177-e1187. doi: 10.1016/j.asmr.2021.01.028. PMID: 34430899; PMCID: PMC8365196.

Review > [Arthrosc Sports Med Rehabil.](#) 2021 Jun 26;3(4):e1177-e1187.

doi: 10.1016/j.asmr.2021.01.028. eCollection 2021 Aug.

## Ultrasound-Guided Knee Injections Are More Accurate Than Blind Injections: A Systematic Review of Randomized Controlled Trials

[William H Fang](#)<sup>1</sup>, [Xiao T Chen](#)<sup>1</sup>, [C Thomas Vangsness Jr](#)<sup>1</sup>

Affiliations + expand

PMID: 34430899 PMCID: [PMC8365196](#) DOI: [10.1016/j.asmr.2021.01.028](#)

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### Abstract

**Purpose:** To review the current literature to determine which injection technique and needle portal placement provide the greatest accuracy for intra-articular access to the knee.

**Methods:** This study followed Preferred Reporting Items and Systematic Reviews and Meta-Analyses guidelines. A comprehensive literature search was conducted in March 2020 and repeated in May 2020 using electronic databases PubMed, MEDLINE, and the Cochrane Library. Data on the accuracy of intra-articular knee injection (successful injections/total number of injections) were collected. Only Level I studies were included. Study design, demographic variables, needle sizes, and method of validating accuracy were recorded. The Jadad score was used to assess methodologic quality, and a risk-of-bias assessment was performed.

**Results:** A total of 12 Level I human studies (1431 patients, 1315 knees) were included in this review. Seven of the studies did a direct comparison between ultrasound-guided and blind knee injections. Ultrasound-guided injections were more accurate compared with blinded knee injections in every study. The most accurate anatomical approach was an isometric quadriceps contraction method with the superolateral approach.

**Conclusions:** This study showed that ultrasound-guided knee injections were more accurate across every anatomical needle injection site compared with blind injections. Injections made by a blind/anatomically guided method had inconsistent accuracy rates that seemed highly dependent on the portal of entry.

**Level of evidence:** Level I, systematic review of Level I studies.

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### Figures



# The use of ultrasound-guided platelet-rich plasma injections in the treatment of hip OA: a systematic review

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...Hip intra-articular **PRP injections**, when performed under **ultrasound-guidance**, appear to be well tolerated and may be efficacious in delivering long-term and **clinically significant pain reduction** in patients with hip OA.”

Ali M, Mohamed A, Ahmed HE, Malviya A, Atchia I. The use of ultrasound-guided platelet-rich plasma injections in the treatment of hip osteoarthritis: a systematic review of the literature. *J Ultrason*. 2018;18(75):332-337. doi: 10.15557/JoU.2018.0048. PMID: 30763018; PMCID: PMC6444309.

## The use of ultrasound-guided platelet-rich plasma injections in the treatment of hip osteoarthritis: a systematic review of the literature

Mohammed Ali,<sup>1</sup> Ahmed Mohamed,<sup>2</sup> Hussam Elamin Ahmed,<sup>3</sup> Ajay Malviya,<sup>1</sup> and Ismael Atchia<sup>1</sup>

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### Abstract

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**Purpose:** This review aims to determine whether ultrasound-guided platelet-rich plasma injection has any role in improving clinical outcomes in patients with hip osteoarthritis. **Methods:** A search of the National Institute for Health and Care Excellence database using the Healthcare Databases Advanced Search tool was conducted. The PubMed database was also utilised to search the Medical Literature Analysis and Retrieval System Online, Excerpta Medica database, Cumulative Index of Nursing and Allied Health and Allied and Complimentary Medicine databases. The Preferred Reporting Items for Systematic Review and Meta-Analysis methodology guidance was employed and a quality assessment was performed using the Jadad score. **Results:** Three randomised clinical trials met the inclusion criteria and were included for analysis. All three trials were of good quality based on the Jadad score. A total of 115 patients out of 254 received platelet-rich plasma injections under ultrasound guidance. The platelet-rich plasma recipient group included 61 males and 54 females with an age range from 53 to 71 years. Outcome scores show an improvement of symptoms and function maintained up to 12 months following platelet-rich plasma injection. **Conclusions:** Literature to date concludes that intra-articular platelet-rich plasma injections of the hip, performed under ultrasound guidance to treat hip osteoarthritis, are well tolerated and potentially efficacious in delivering long-term and clinically significant pain reduction and functional improvement in patients with hip osteoarthritis. Larger future trials including a placebo group are required to further evaluate these promising results. **Level of evidence:** Level I, a systematic review of level I studies.

**Keywords:** platelet-rich plasma, hip joint, osteoarthritis, ultrasound guidance injection

### Introduction

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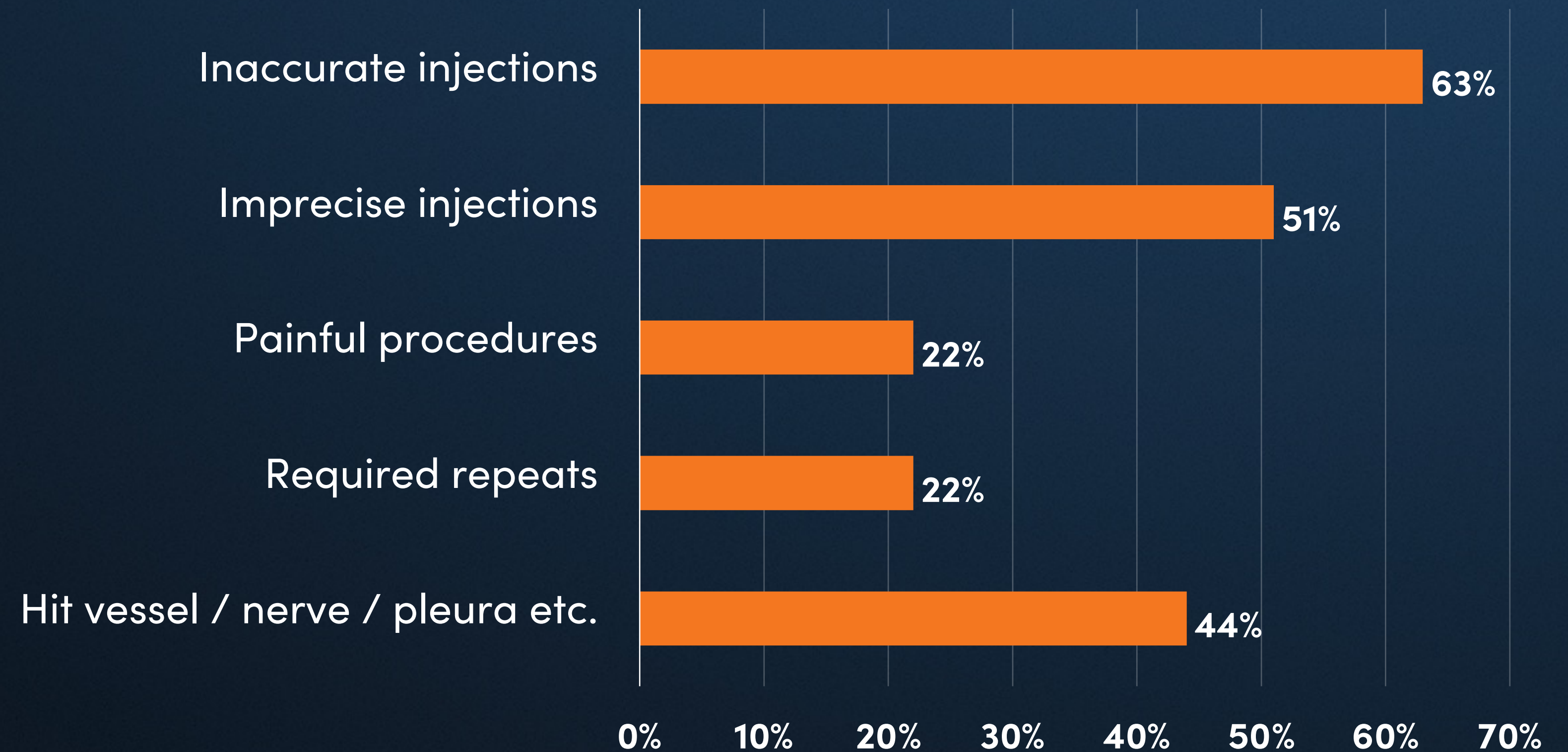
Osteoarthritis (OA) is a syndrome of joint pain and dysfunction that is caused by joint degeneration<sup>(1)</sup>. OA affects more people than any other joint disease, and has widespread economic and social consequences. The problem is likely intensified by current demographic trends, including the pandemic of obesity and higher recreational activity levels of our elderly population<sup>(2)</sup>. Currently, there is no known cure for OA. Therefore, treatment is aimed at decreasing pain, maintaining or improving joint mobility, and limiting functional impairment<sup>(3)</sup>. Inflammation has been postulated as a key driver for pain in OA<sup>(4)</sup>, but a recent meta-analysis concluded that disease-modifying antirheumatic drugs (DMARDs) do not provide pain relief beyond placebo in OA<sup>(5)</sup>.

Lately, platelet-rich plasma (PRP) has become increasingly popular among the orthopaedic community as a minimally invasive technique for enhancing tissue healing in different conditions including rotator cuff pathology<sup>(6)</sup>, greater trochanteric pain syndrome<sup>(6)</sup>, knee osteoarthritis<sup>(7)</sup>, lateral epicondylitis<sup>(8)</sup>, osteochondral lesions of the talus<sup>(9)</sup> and other orthopaedic conditions. It has been postulated that PRP



## Interactive Poll

# What do you see as the risks and limitations to blind injections for pain management?



# Your Host



**David Rosenblum, M.D.**

Interventional Pain Management

# **Regenerative Medicine**

**Ultrasound Guided Platelet Rich Plasma Injections**

**David Rosenblum, MD**



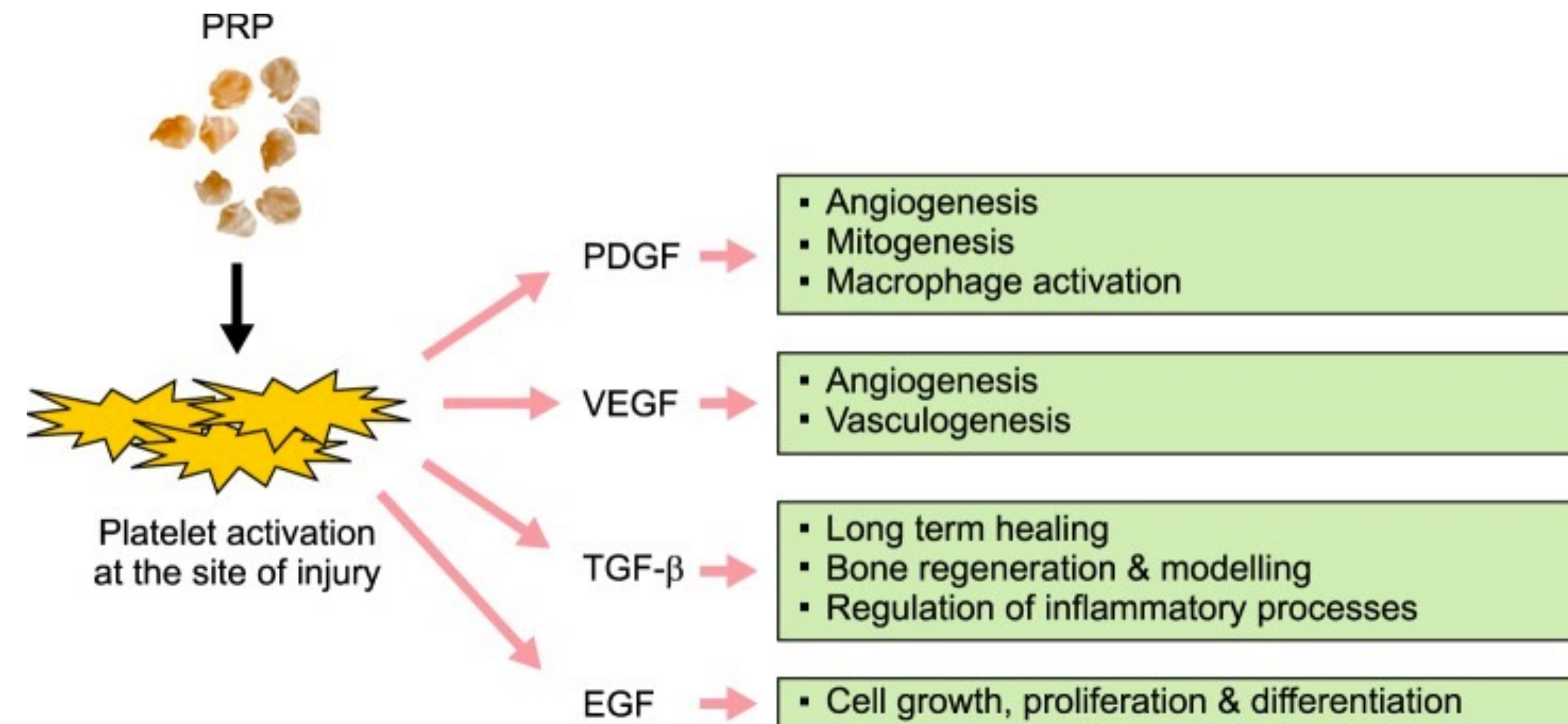
# Platelet Rich Plasma

- Platelet-rich plasma (PRP) is an autologous product that concentrates a large number of platelets in a small volume of plasma



# Mechanism of Action

- PRP has 7 fundamental proteins: platelet derived growth factors (PDGF), transforming growth factor- $\beta$  (TGF- $\beta$ ), vascular endothelial growth factor (VEGF), epidermal growth factor (EGF), and adhesive proteins – fibrin, fibronectin, and vitronectin
- PDGF is a glycoprotein, which emerges from degranulation of platelets at the site of injury.
- It activates cell membrane receptors on target cell which in turn develop high energy phosphate bonds, which activates the signal proteins to initiate specific activity of target cells.
- These specific activities include mitogenesis, angiogenesis and macrophage activation



# Indication

- Abundant high-quality evidence supports the use of LR-PRP injection for lateral epicondylitis and LP-PRP for osteoarthritis of the knee.
- Moderate high-quality evidence supports the use of LR-PRP injection for patellar tendinopathy and of PRP injection for plantar fasciitis and donor site pain in patellar tendon graft BTB ACL reconstruction

## Controversial....

- There is insufficient evidence to routinely recommend PRP for rotator cuff tendinopathy, osteoarthritis of the hip, or high ankle sprains.
- Current evidence demonstrates a lack of efficacy of PRP for Achilles tendinopathy, muscle injuries, acute fracture or nonunion, surgical augmentation in rotator cuff repair, Achilles tendon repair, and ACL reconstruction.

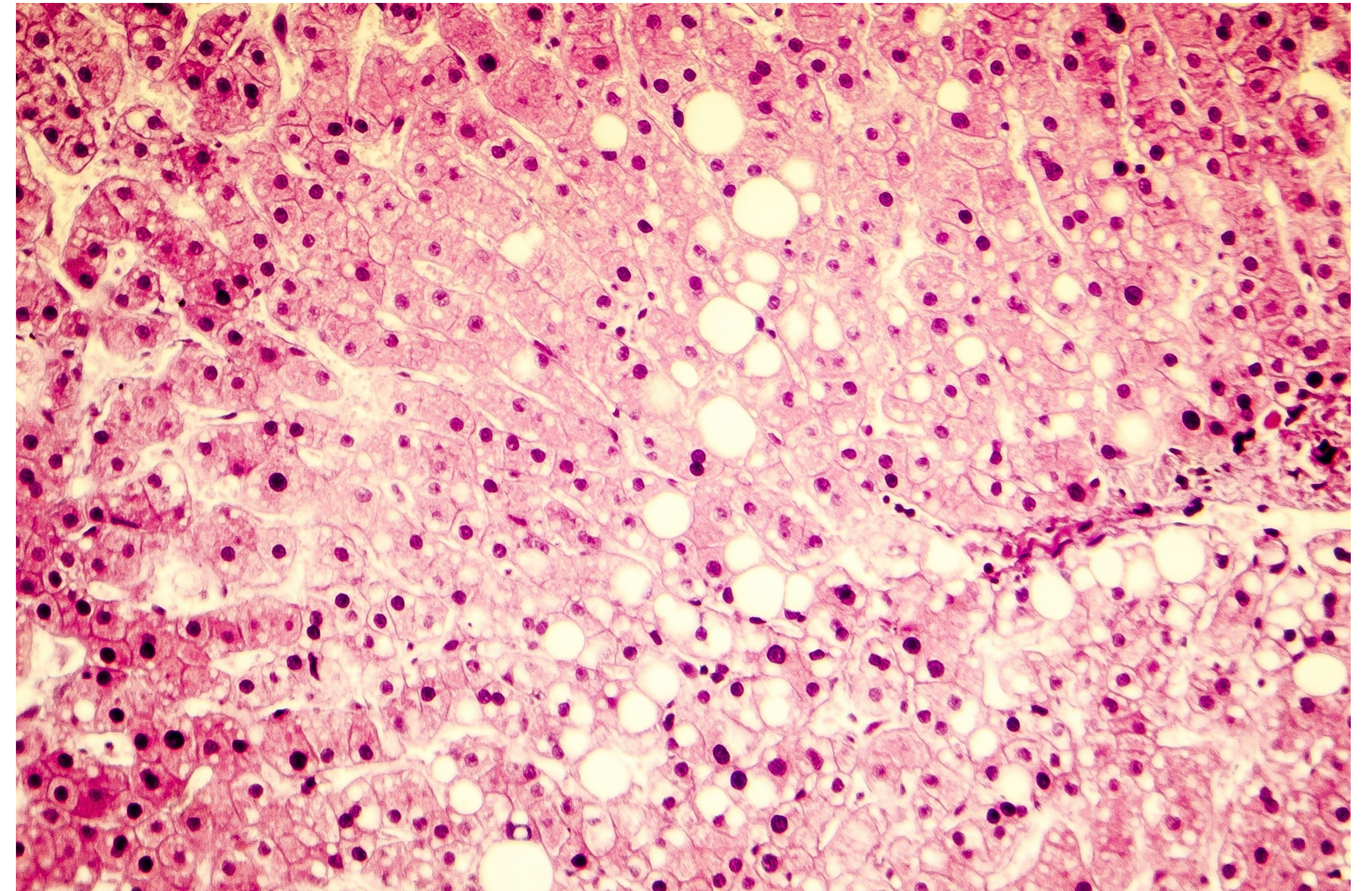


# Side effects

- Since the procedure uses the patient's own blood, there are normally very few side effects.
- Mild side effects that have been reported include mild nausea, dizziness and fainting

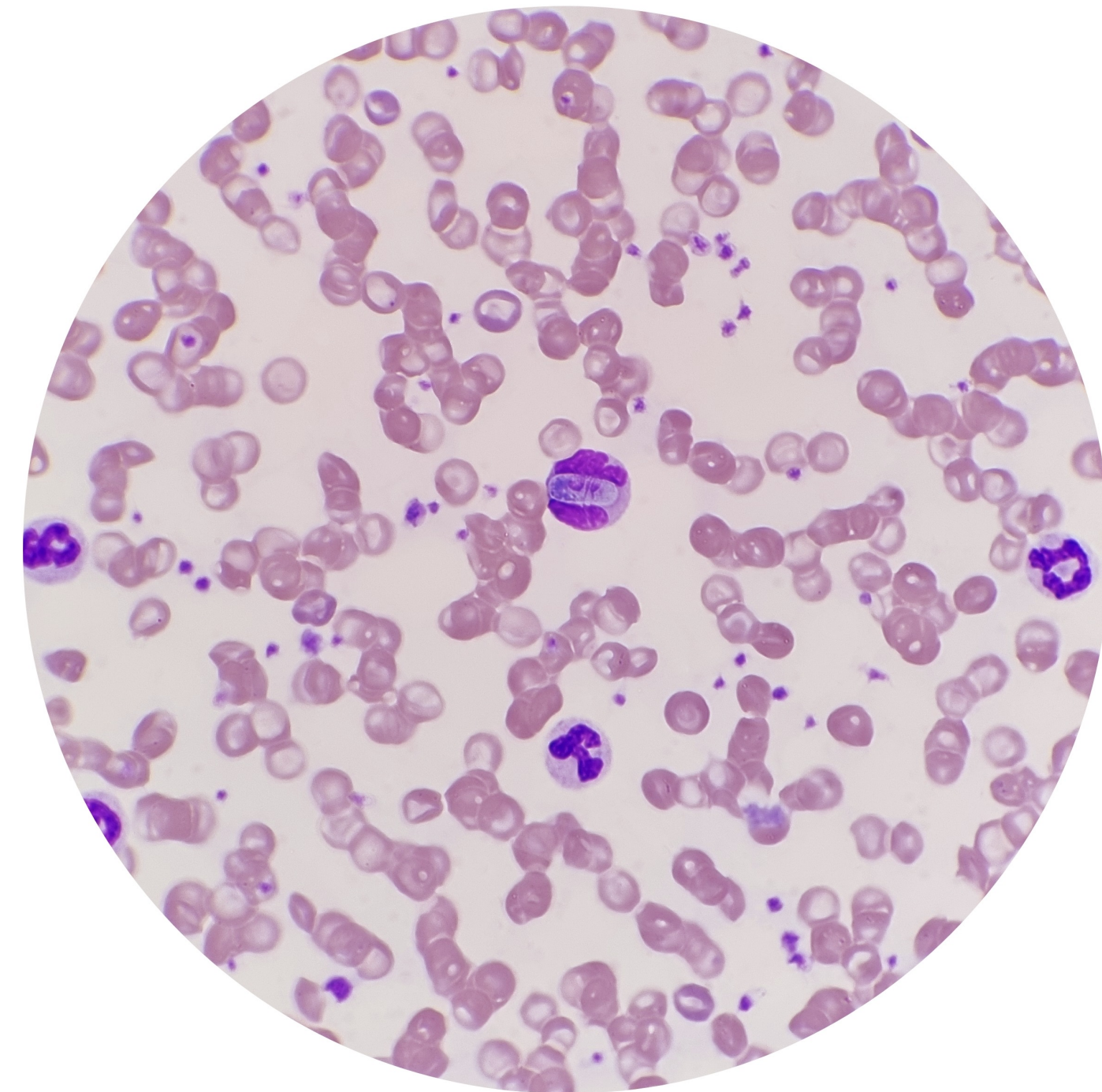
# Contraindications

- History of Metastatic disease
- Possibility of Infections in the areas Targeted for PRP therapy
- Pregnancy or Breastfeeding
- Anticoagulant Prescription Medications or Antiplatelet Therapy
- Corticosteroid Injections and NSAIDS
- History of Severe Liver Disease
- Allergies to Bupivacaine HCL, Lidocaine, or Bovine Thrombin



# Types of PRP

- **Leukocyte- and platelet-rich plasma (L-PRP)**
  - resulted in a higher incidence of side effects in the treatment of osteoarthritis
- **Pure platelet-rich plasma (P-PRP)**
  - had a lower leukocyte concentration, possibly due to the fact that leukocytes in PRP may deliver pro-inflammatory cytokines, such as interleukin-1 $\beta$  (IL-1 $\beta$ ) and tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ), at the site of injection, resulting in the production of destructive proteases that inhibit the formation and promote the degradation of extracellular matrix



# Return to Play

- Purpose: Evaluating outcomes of ultrasound guided injections of PRP into the injured anterior - inferior tibiofibular ligament (AITFL) in athletes by monitoring “return to play” and “dynamic stability”.
- Method: 16 elite athletes with AITFL tears were included - PRP (2 injections, 7 days apart) vs. a control group (no intervention - only rehab program). Both groups had the same rehab course and return to play protocol’s. Pre-treatment and 6-week follow up ultrasounds were done to assess the dynamic stability of the joint and also AITFL scarring. The primary measure was time needed for athletes to return to full pre-injury training intensity.
- Results/ Conclusion: “**Athletes suffering from high ankle sprains benefit from ultrasound-guided PRP injections with a shorter RTP, re-stabilization of the syndesmosis joint and less long-term residual pain.**” - Level 2 evidence
- <https://link.springer.com/article/10.1007/s00167-014-3119-x>





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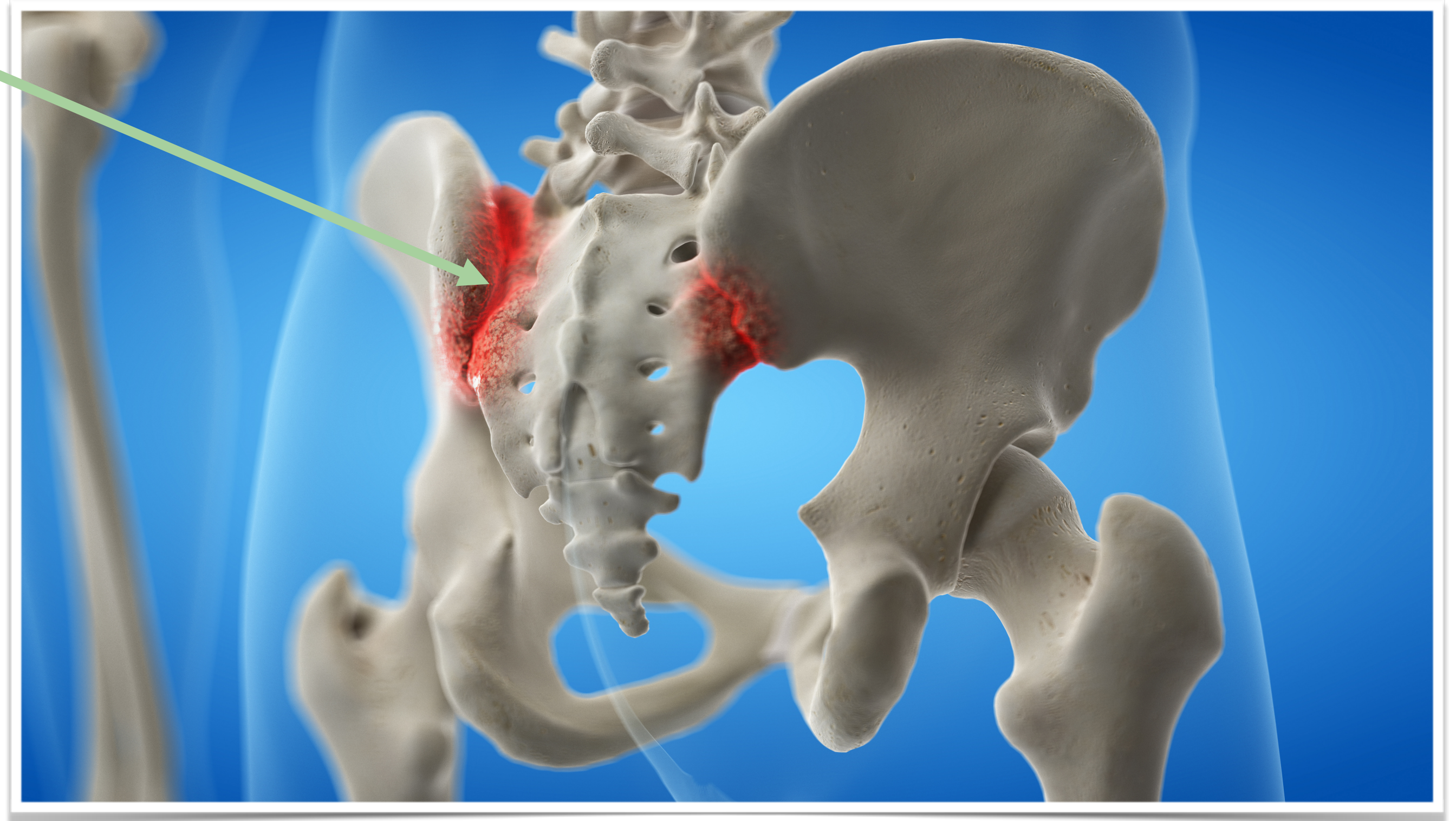




# Sacroiliac Joint Pain

## Risk factors

Stressors that effect the SIJ include gait abnormalities, prior lumbar fusion, obesity, lumbar spinal stenosis, pregnancy, leg length discrepancy, and scoliosis



# Sacroiliac Joint Pain

## Diagnosis

- No single physical exam maneuver is diagnostic combination of specific findings and provocative tests can be essential in determining SIJ disorders.
- Specific physical exam provocative tests for SIJ dysfunction include FABER, compression, distraction, thigh thrust, and Gaenslen tests.
- Typically, SIJ pain is diagnosed when at least three out of the five provocative maneuvers are positive.
- Of the three positive tests, either the thigh thrust or compression test should be positive.
- By performing these provocative maneuvers, there is an 85% pretest probability that an intra-articular joint injection will be successful. Another study confirmed that three or more pain provocation SIJ tests have a 91% sensitivity and 78% specificity”

# Faber



# Thigh Thrust Test (Posterior Shear Test)



# Gaenslen Test



# Compression Test



# Distraction Test

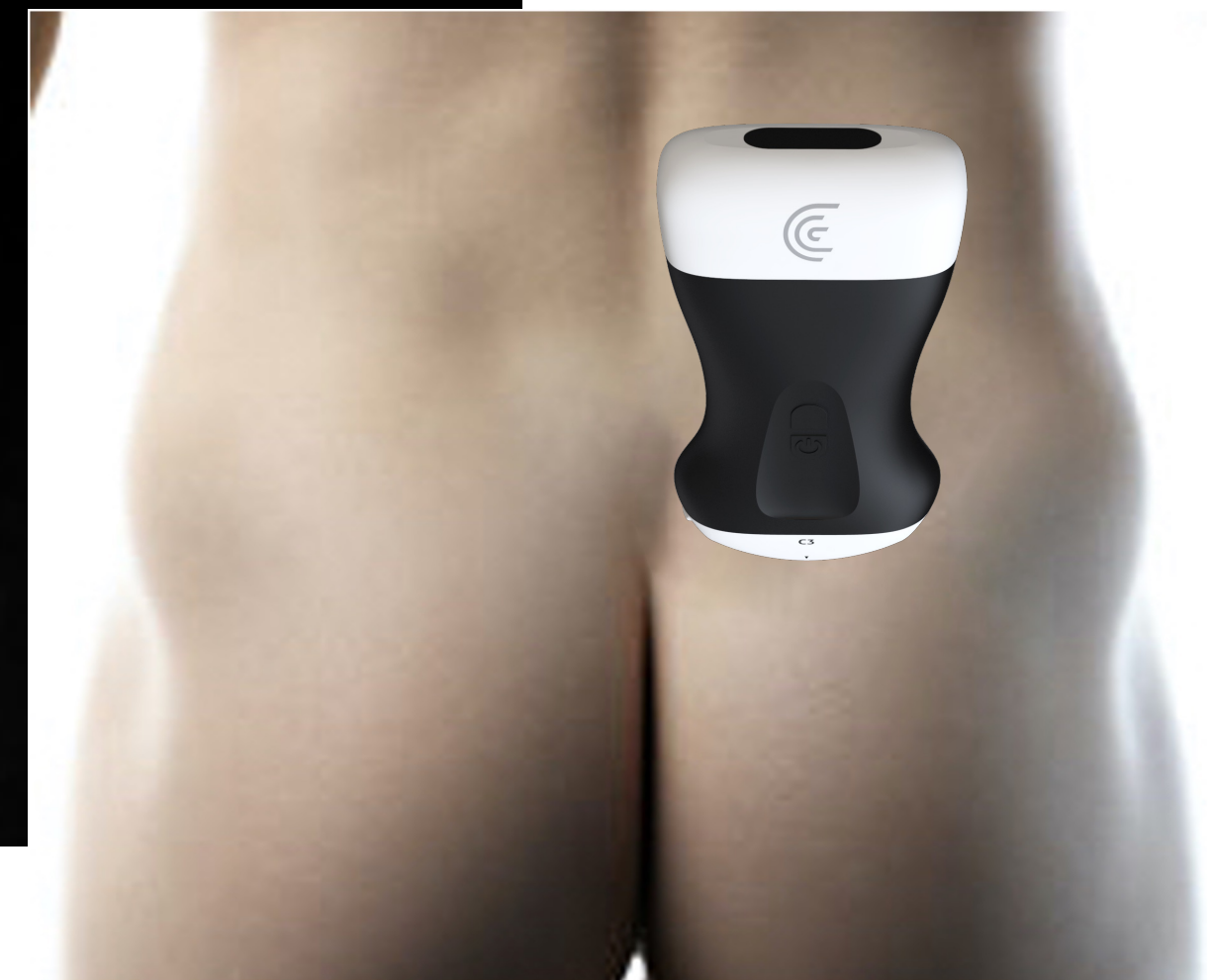
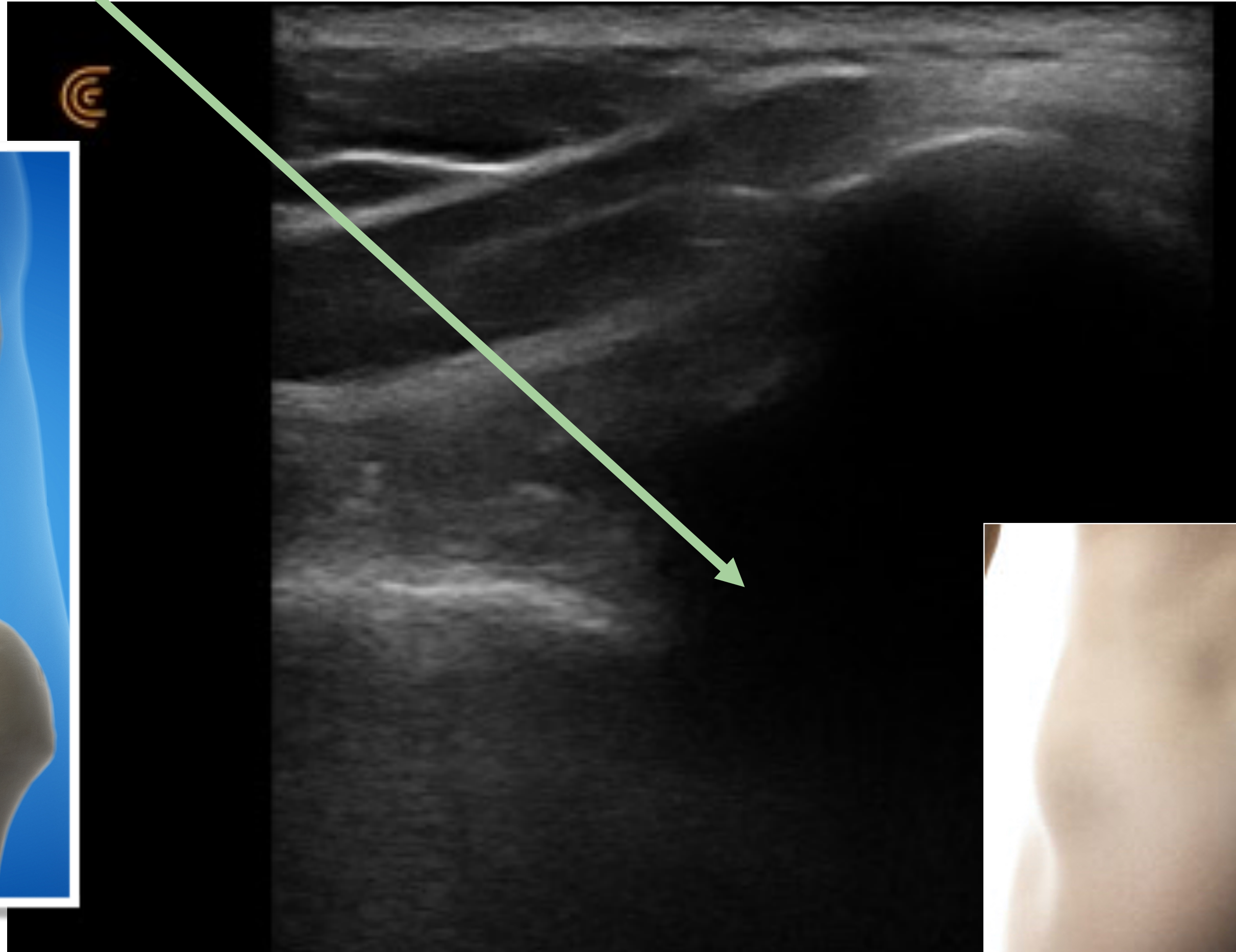
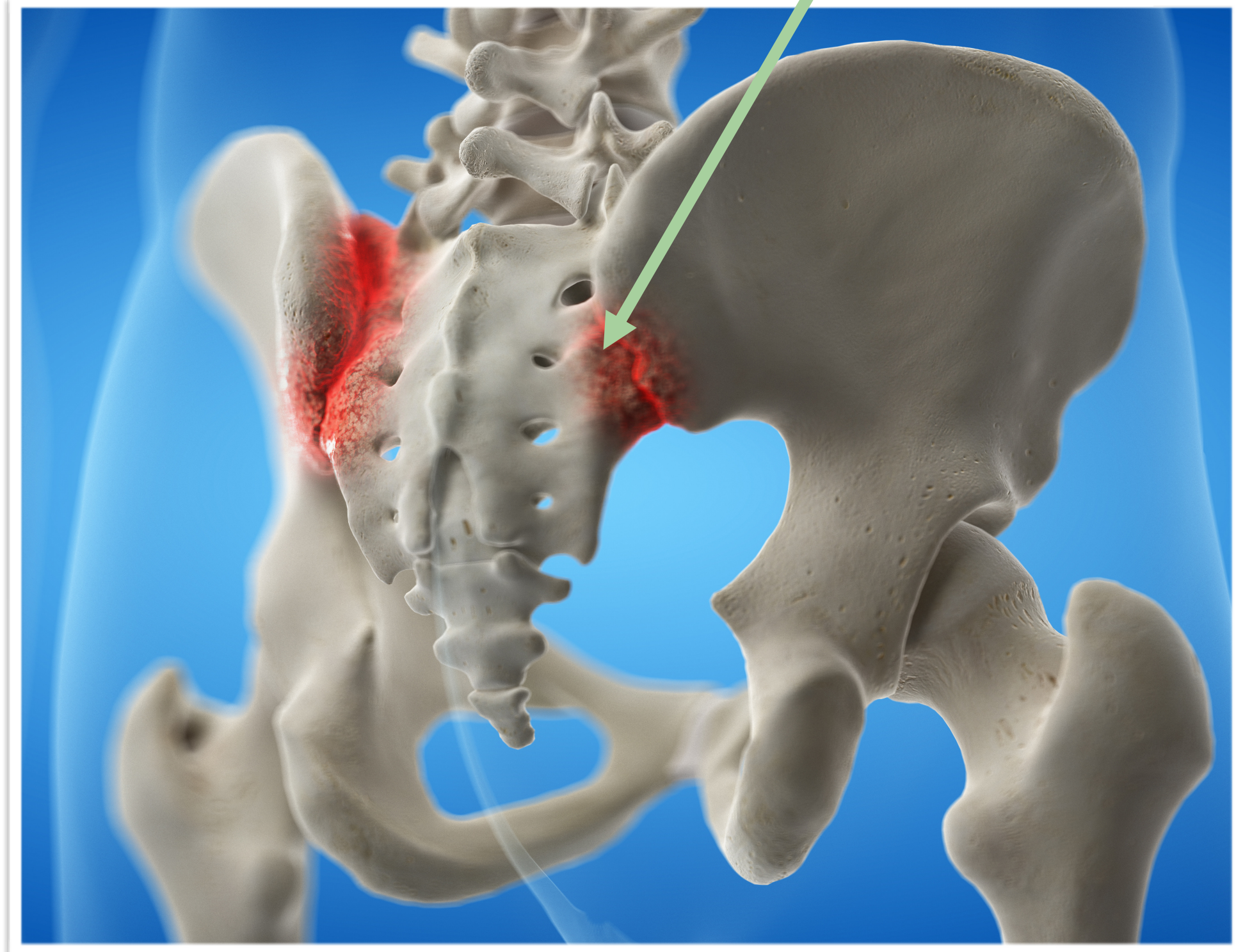


## Reference

Buchanan P, Vodapally S, Lee DW, Hagedorn JM, Bovinet C, Strand N, Sayed D, Deer T. Successful Diagnosis of Sacroiliac Joint Dysfunction. *J Pain Res.* 2021 Oct 8;14:3135-3143. doi: 10.2147/JPR.S327351. PMID: 34675642; PMCID: PMC8517984.

# Sacroiliac Joint

## PRP Injection





19

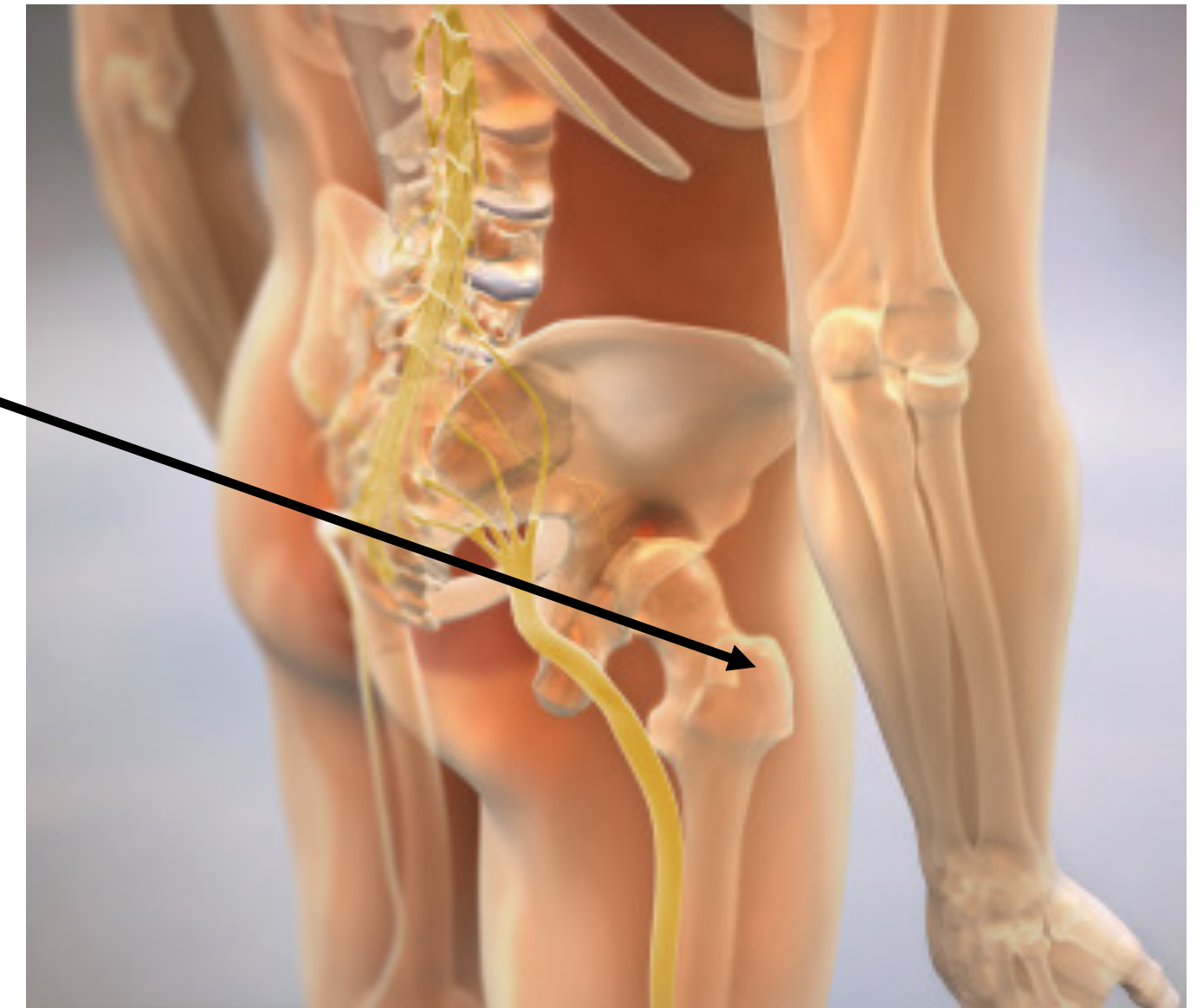
NRAP 2023  
Nerve/Pain

MI 0.43  
TIS 0.04  
TIB 0.05

5 cm

# Greater Trochanteric Bursitis

- Describes disorders of the peritrochanteric space, including trochanteric bursitis, abductor tendon pathology, and external coxa saltans.
- GTPS is a common cause of lateral hip pain and tenderness, with an annual incidence as high as 1.8 per 1000 adults in the primary care setting.
- While GTPS is seen in all age groups, it most commonly affects patients during their fourth to sixth decades of life, with a female predominance of 2–3 to 1

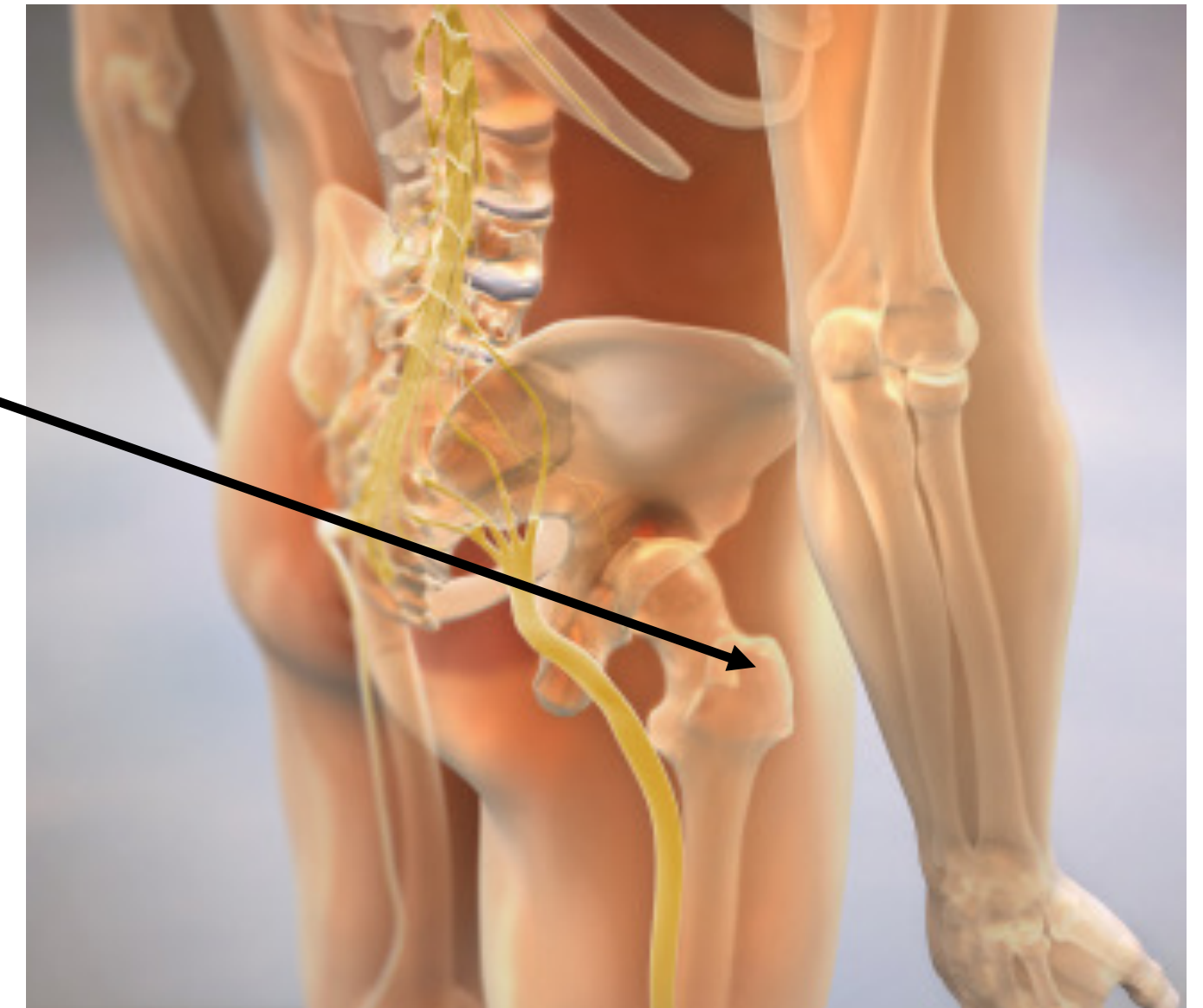




# Greater Trochanteric Bursitis

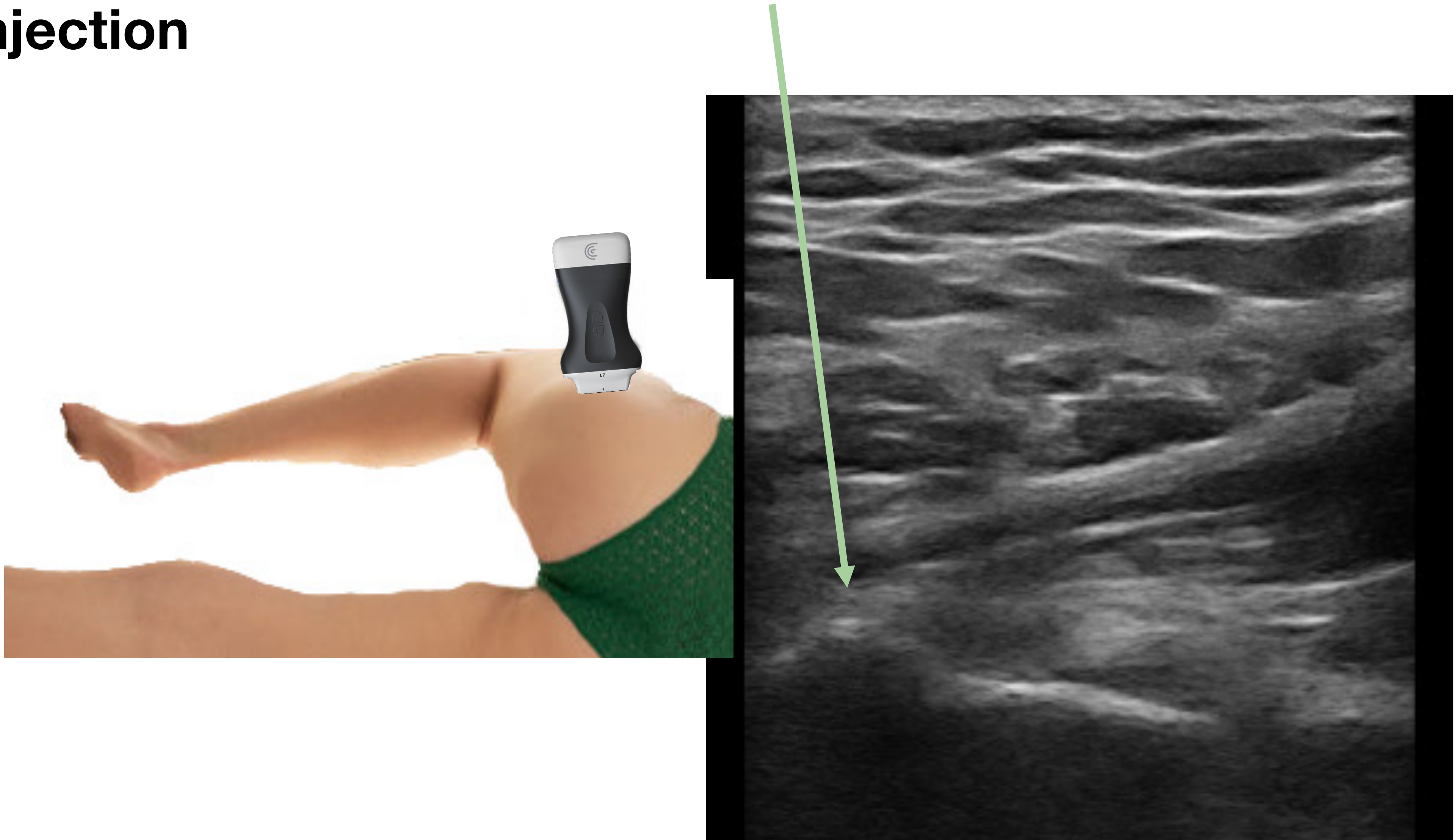
## Risk Factors:

- Increased age
- Obesity
- Osteoarthritis of the knee or hip
- Lower back pain
- Leg length discrepancy



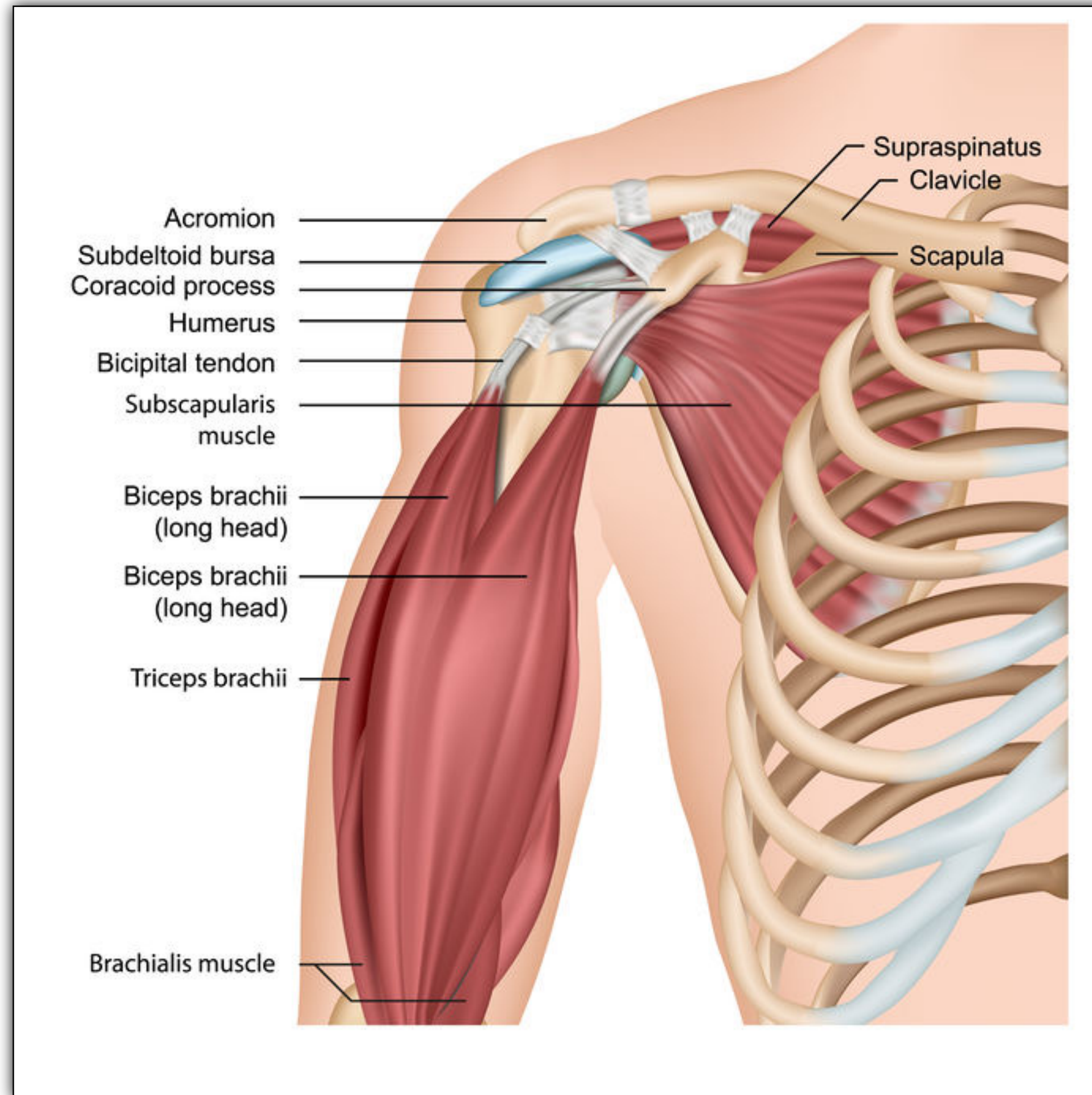
# Greater Trochanteric Bursa

## PRP Injection



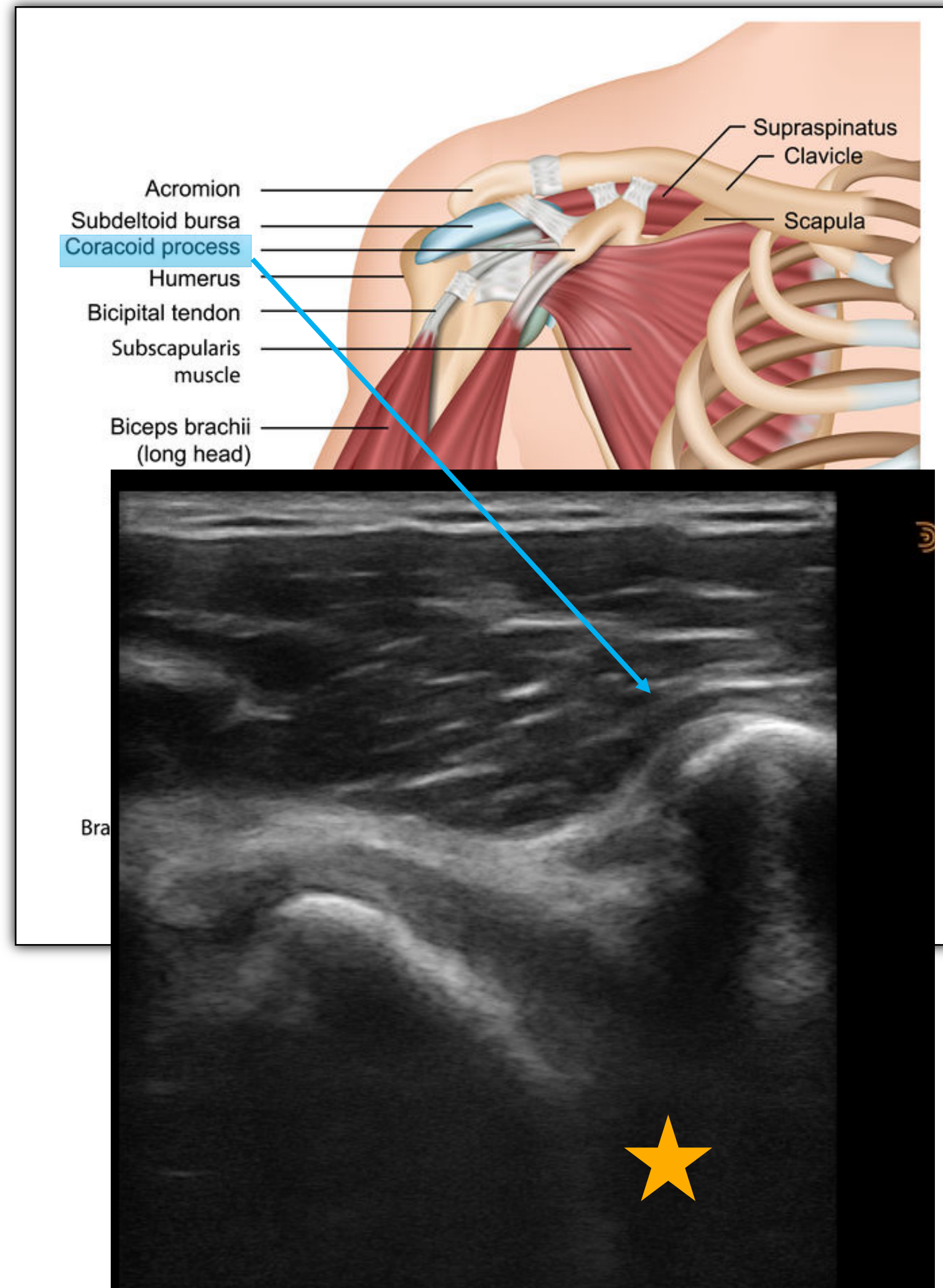
# The Shoulder

## Biologic Targets



# Glenohumoral Joint Injection

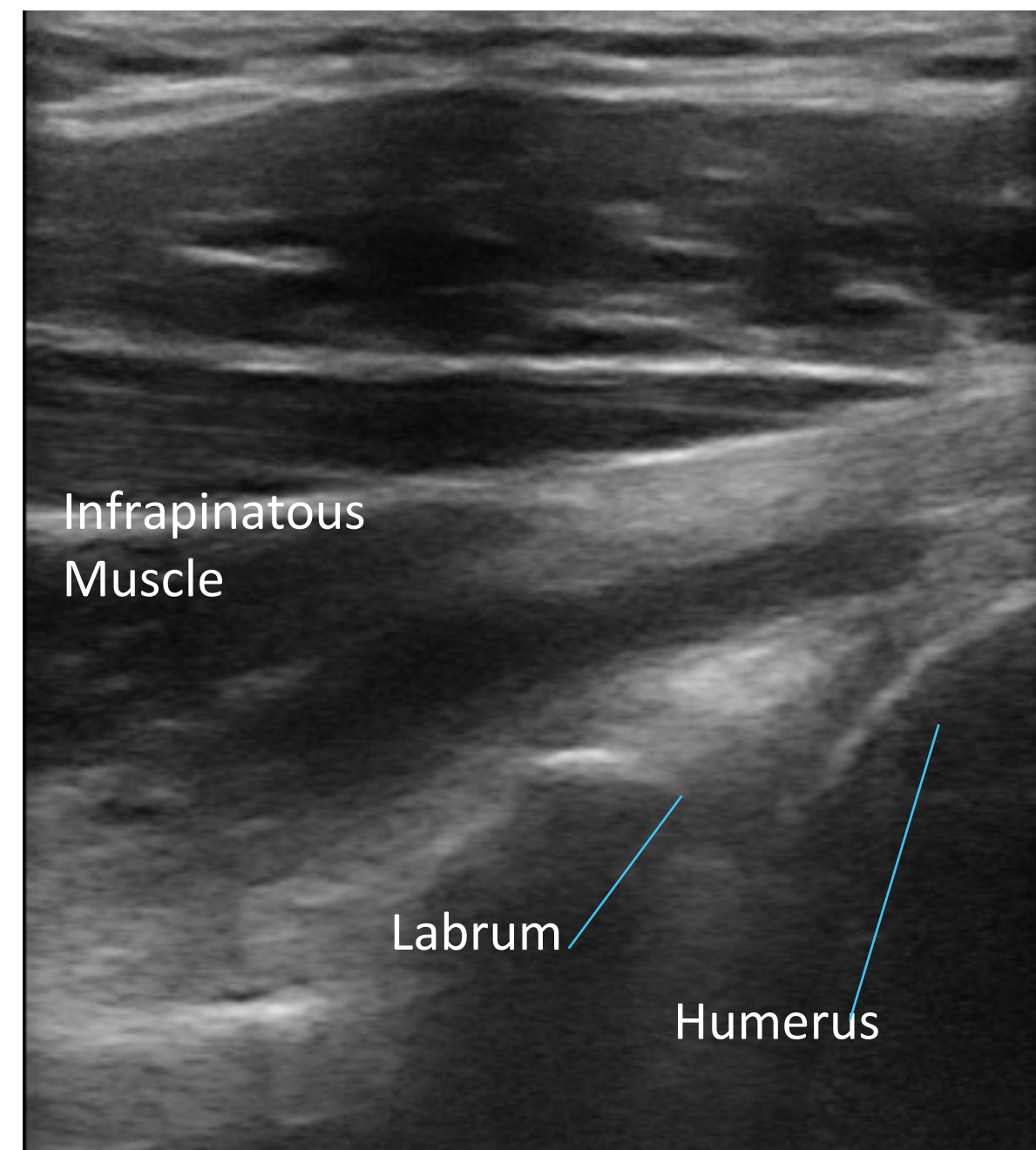
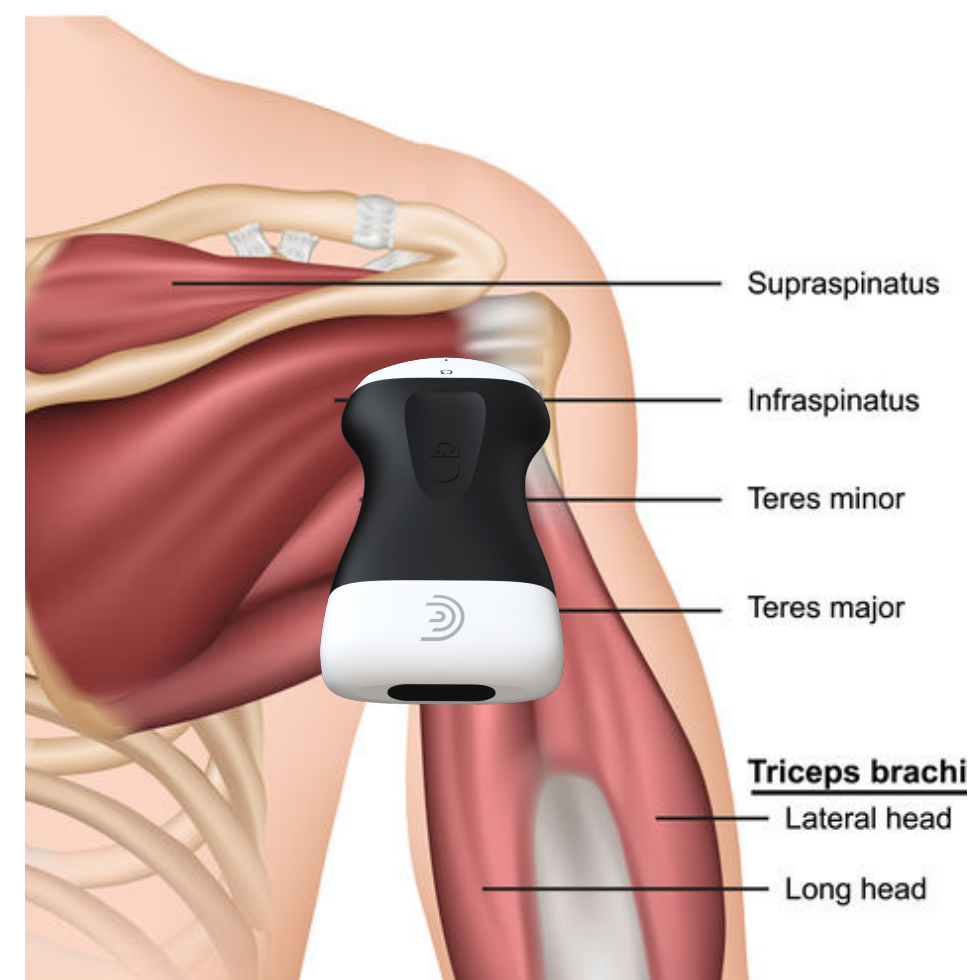
## Anterior Out of Plane



# Glenohumoral Joint

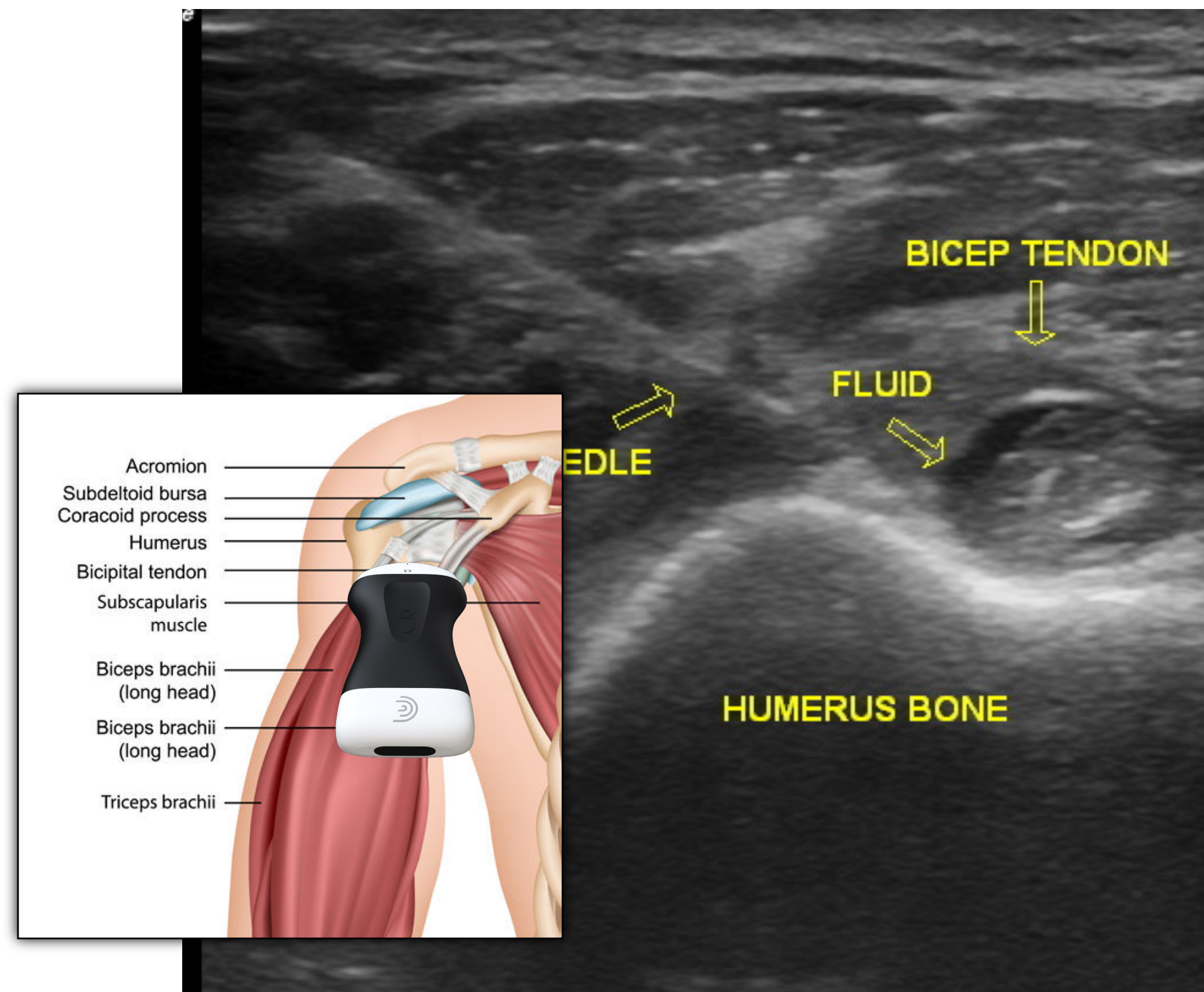
## Posterior Approach: Out of Plane

Posterior View



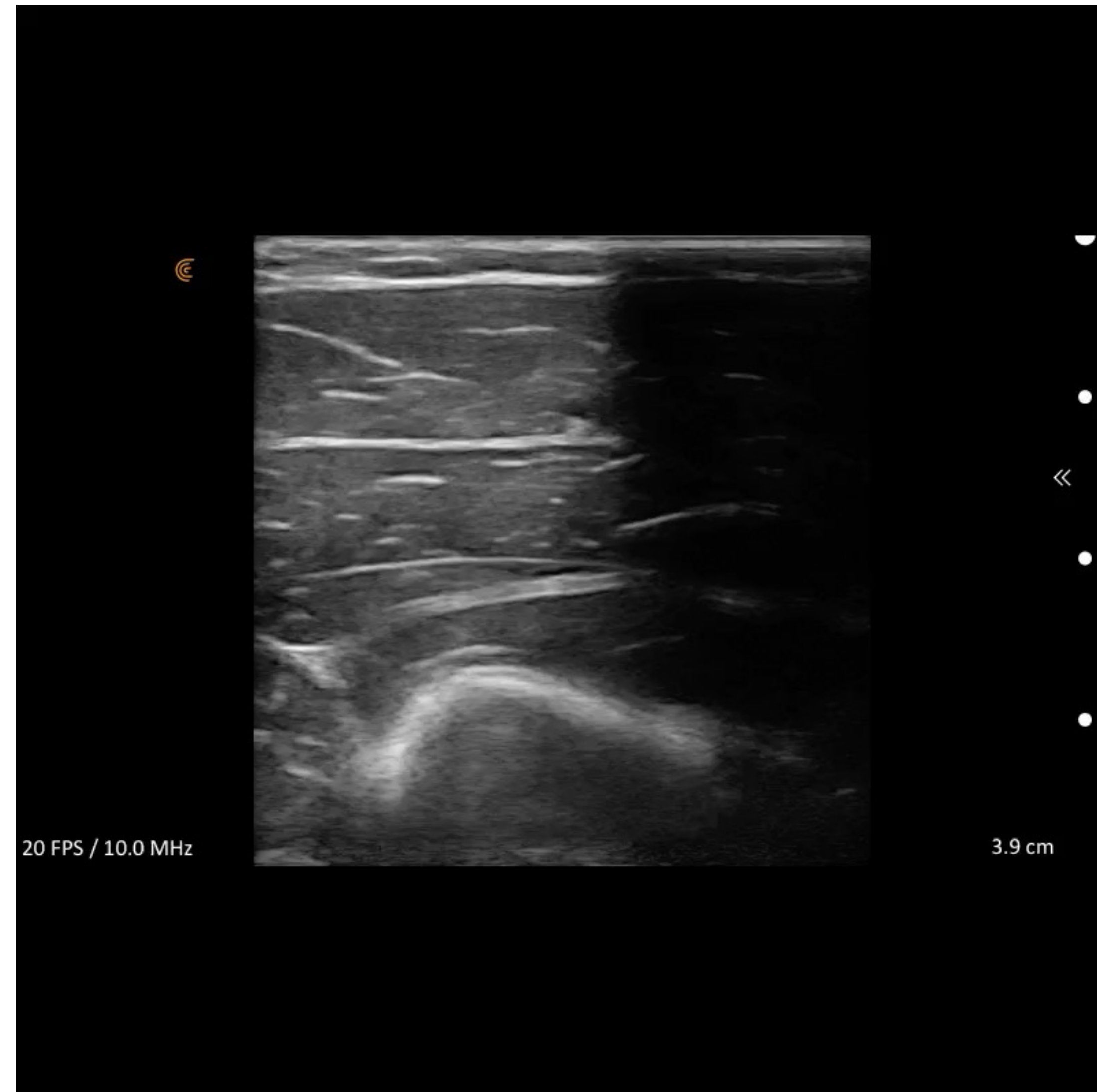
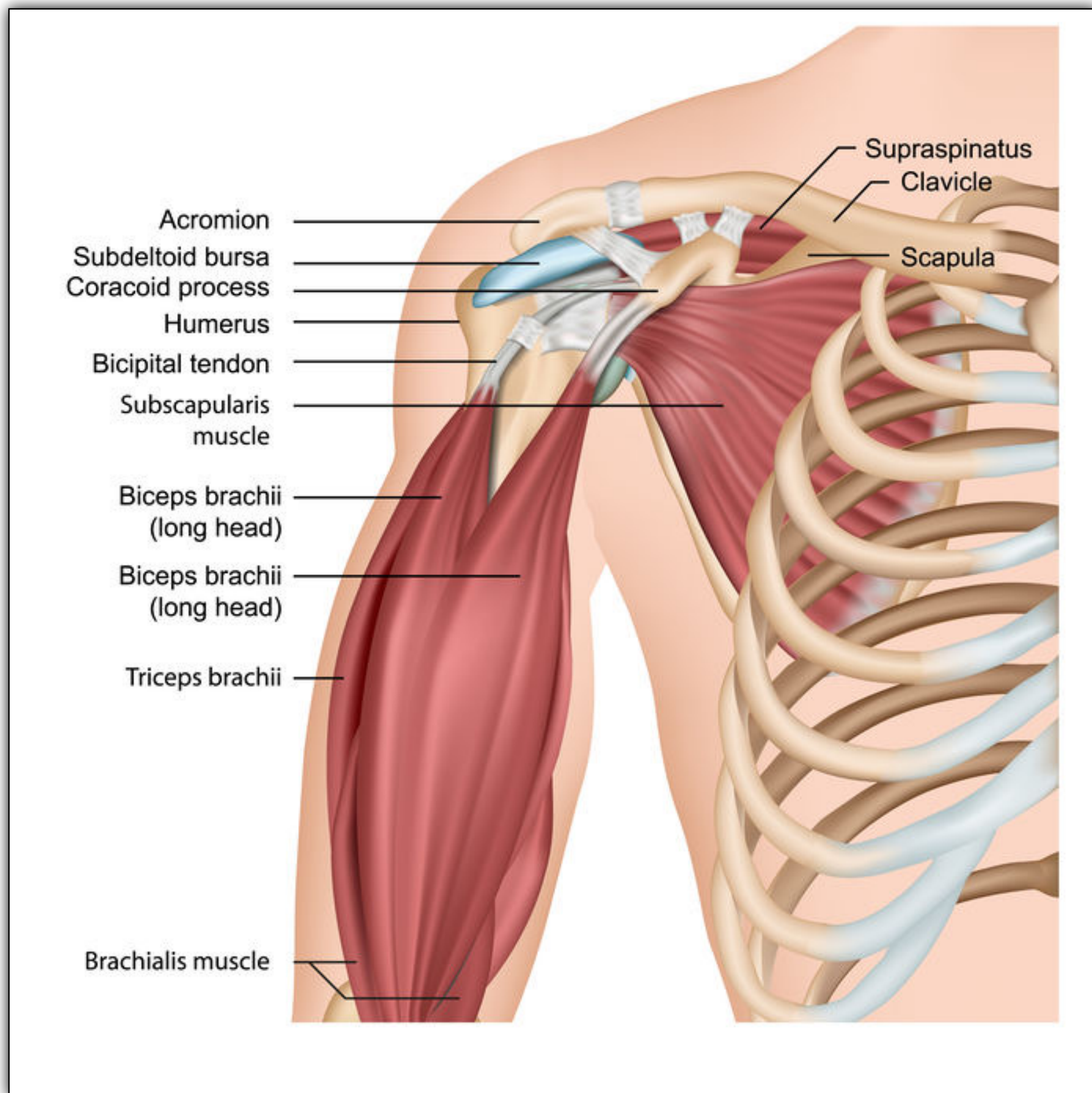
# Biceps Tendon

## Tendinopathy and Inflammation on Imaging



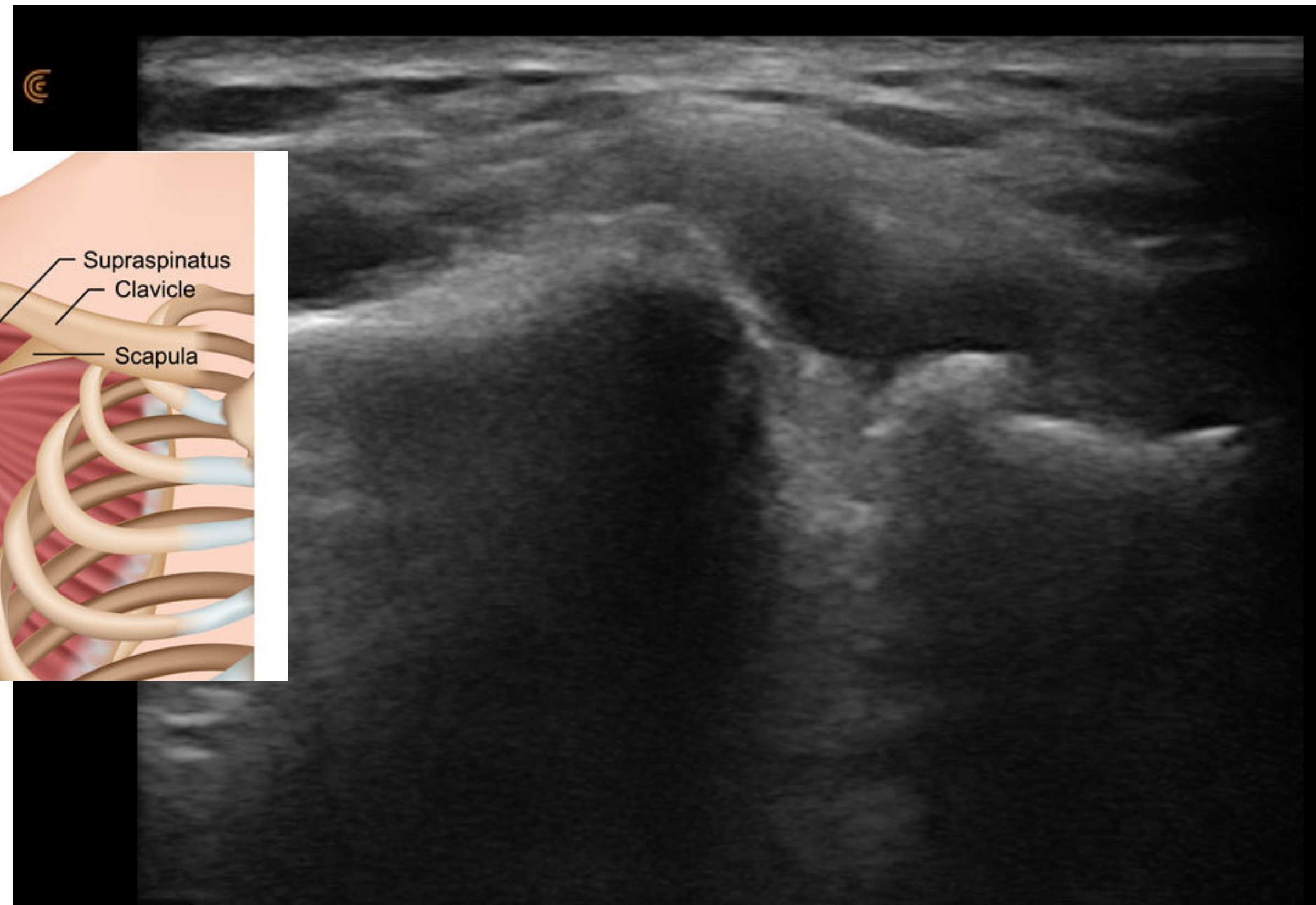
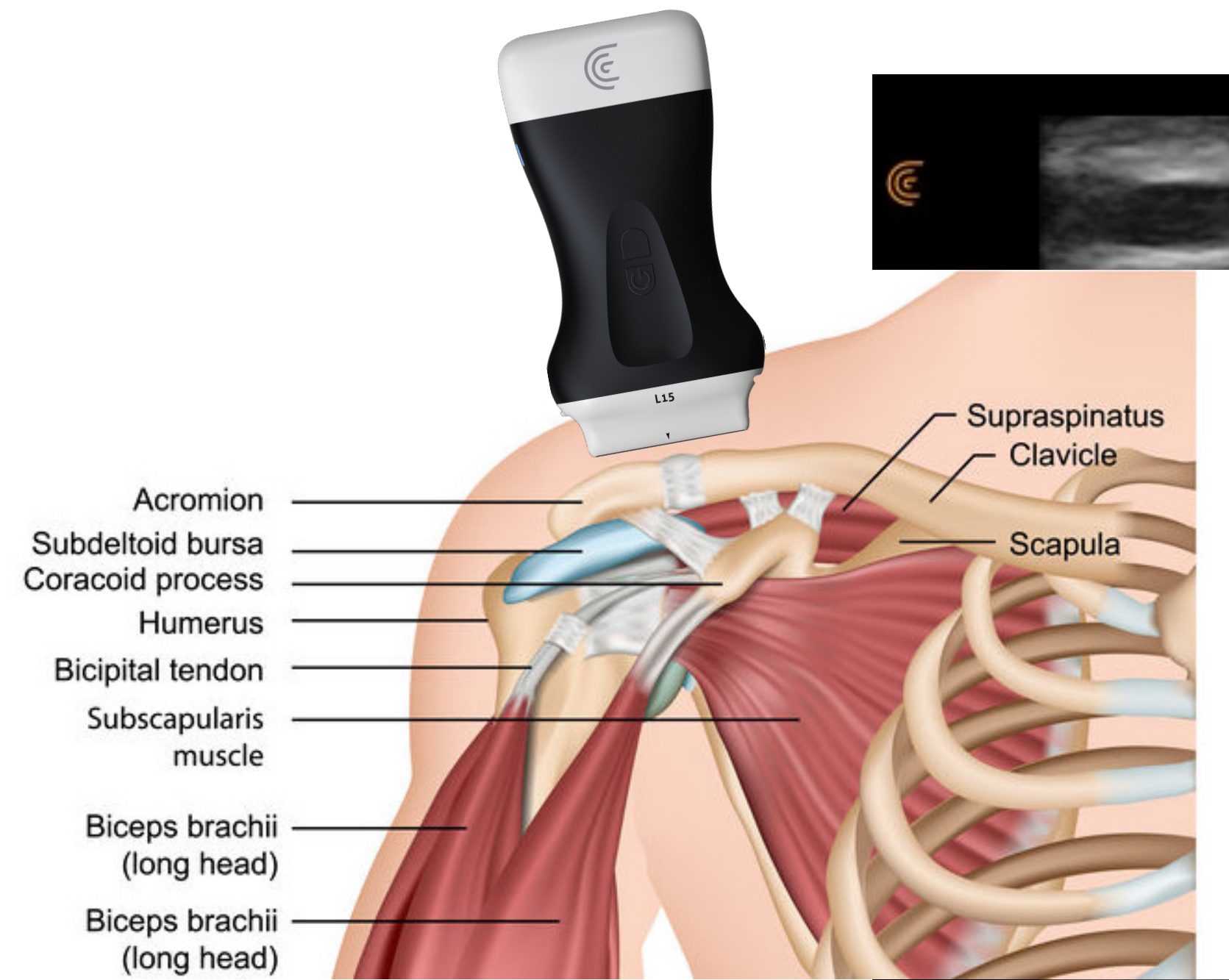
# Biceps Tendon

## PRP Injection

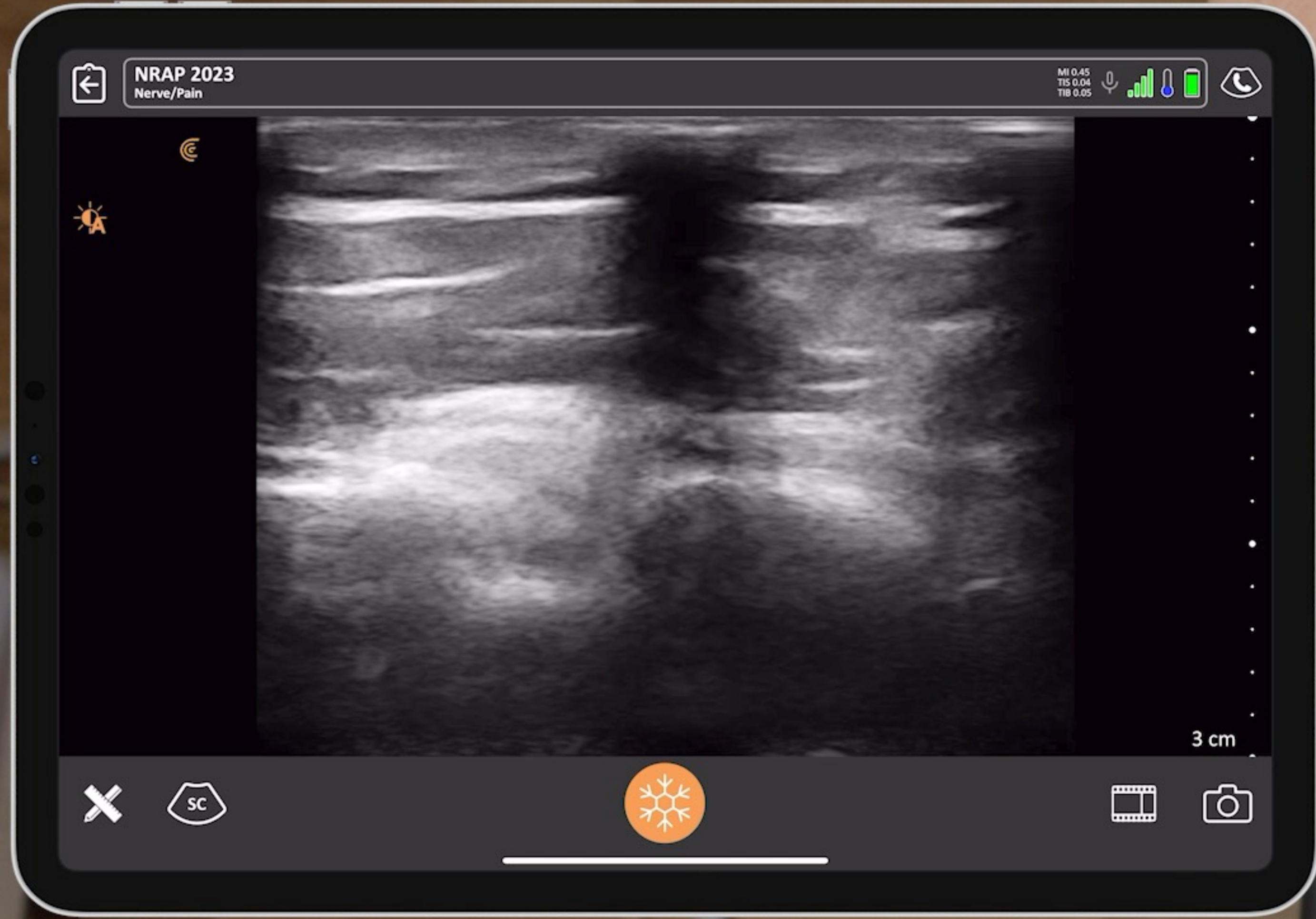


# The Acromioclavicular Joint

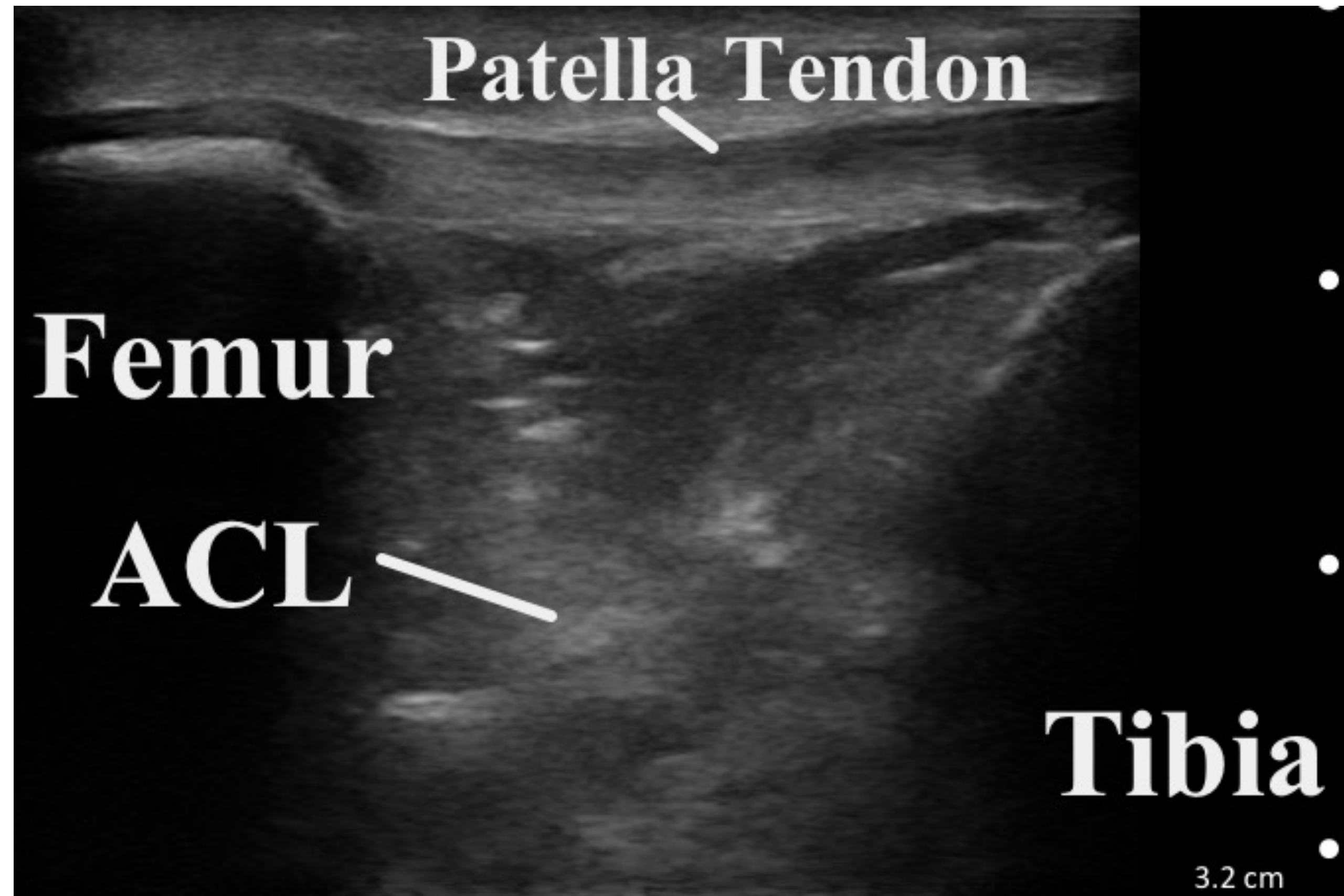
## PRP Injection

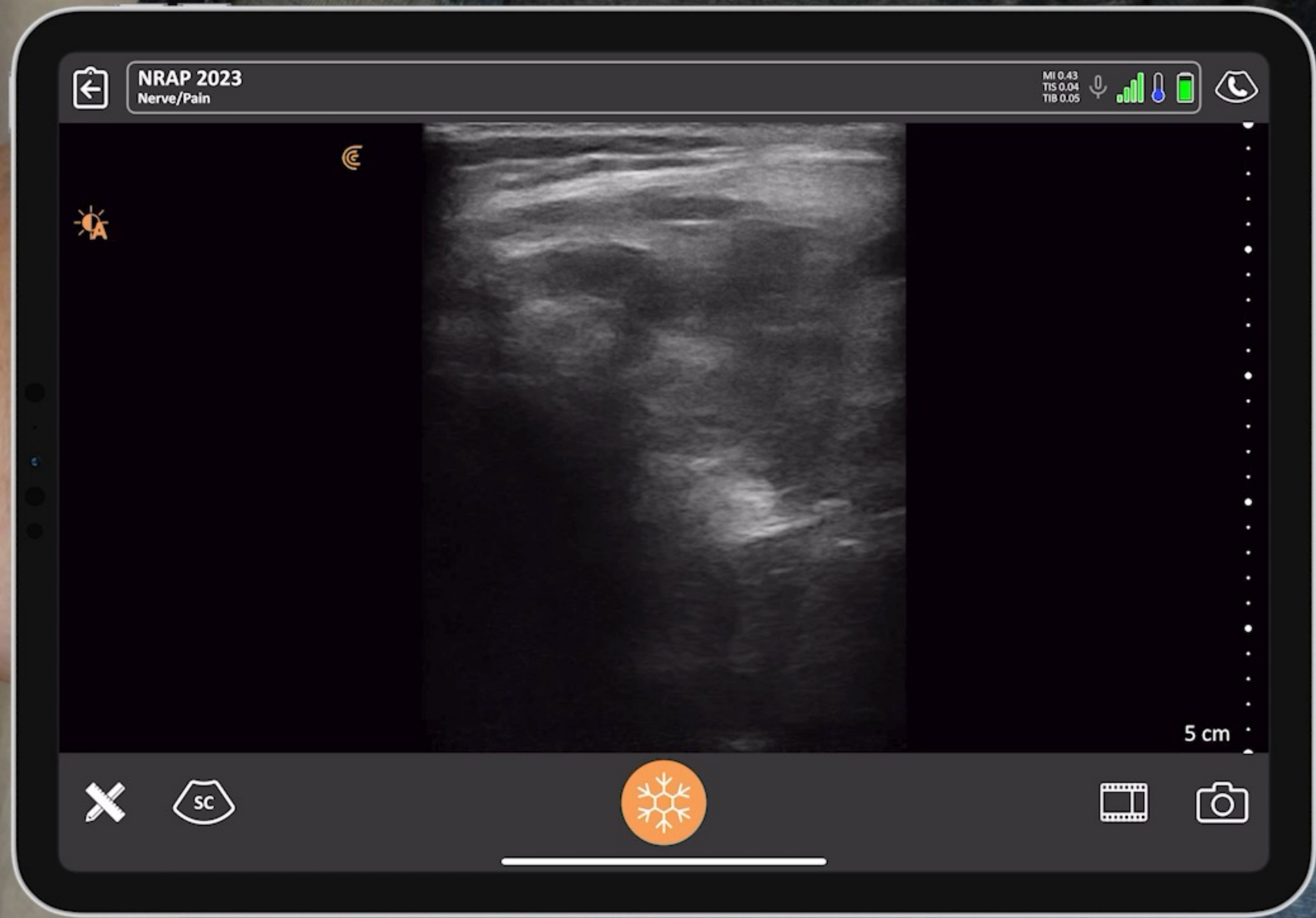






# The Knee



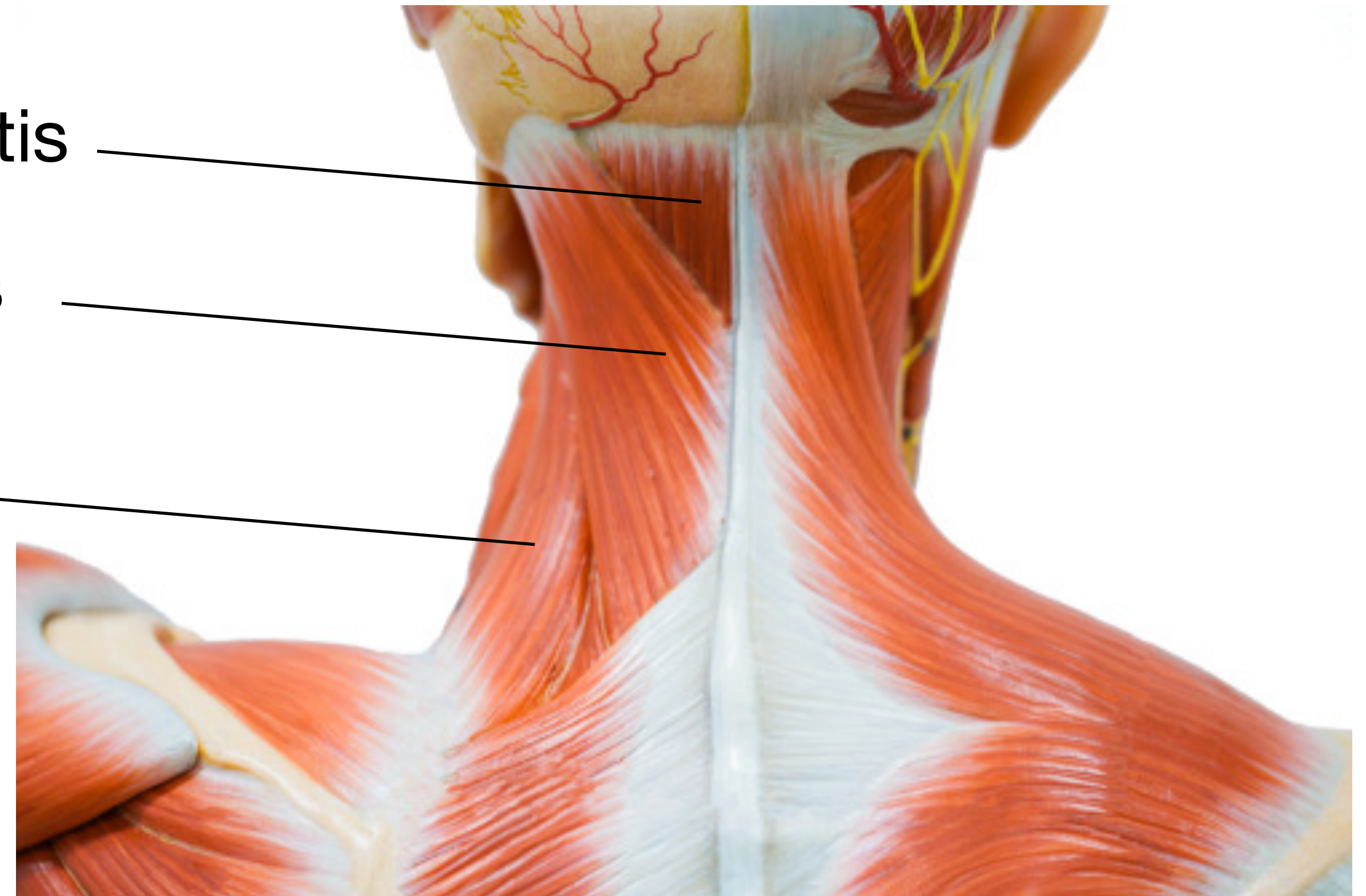


# Cervical Trigger Point Injections

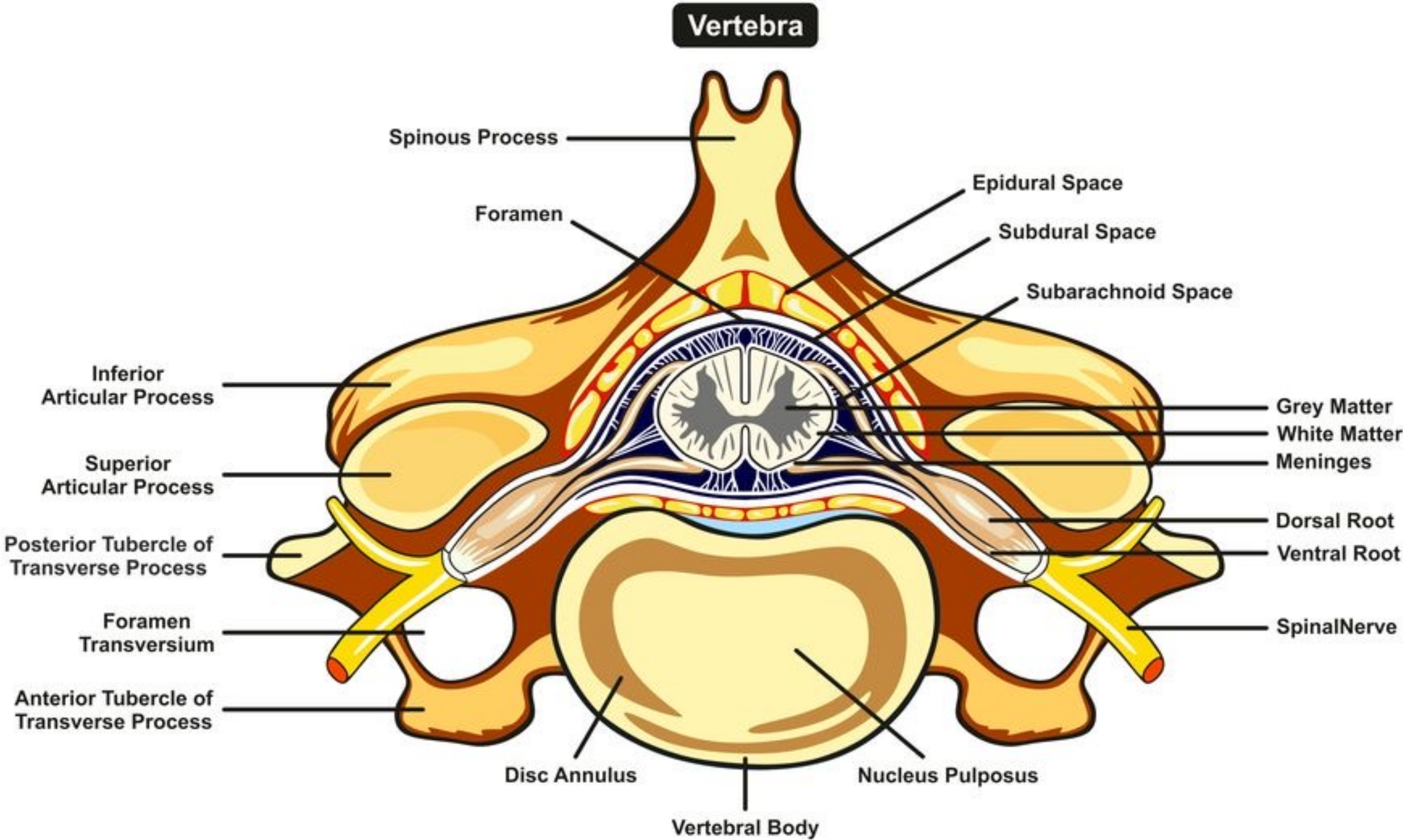
Semispinalis Capitis

Splenius Capitis

Levator scapular

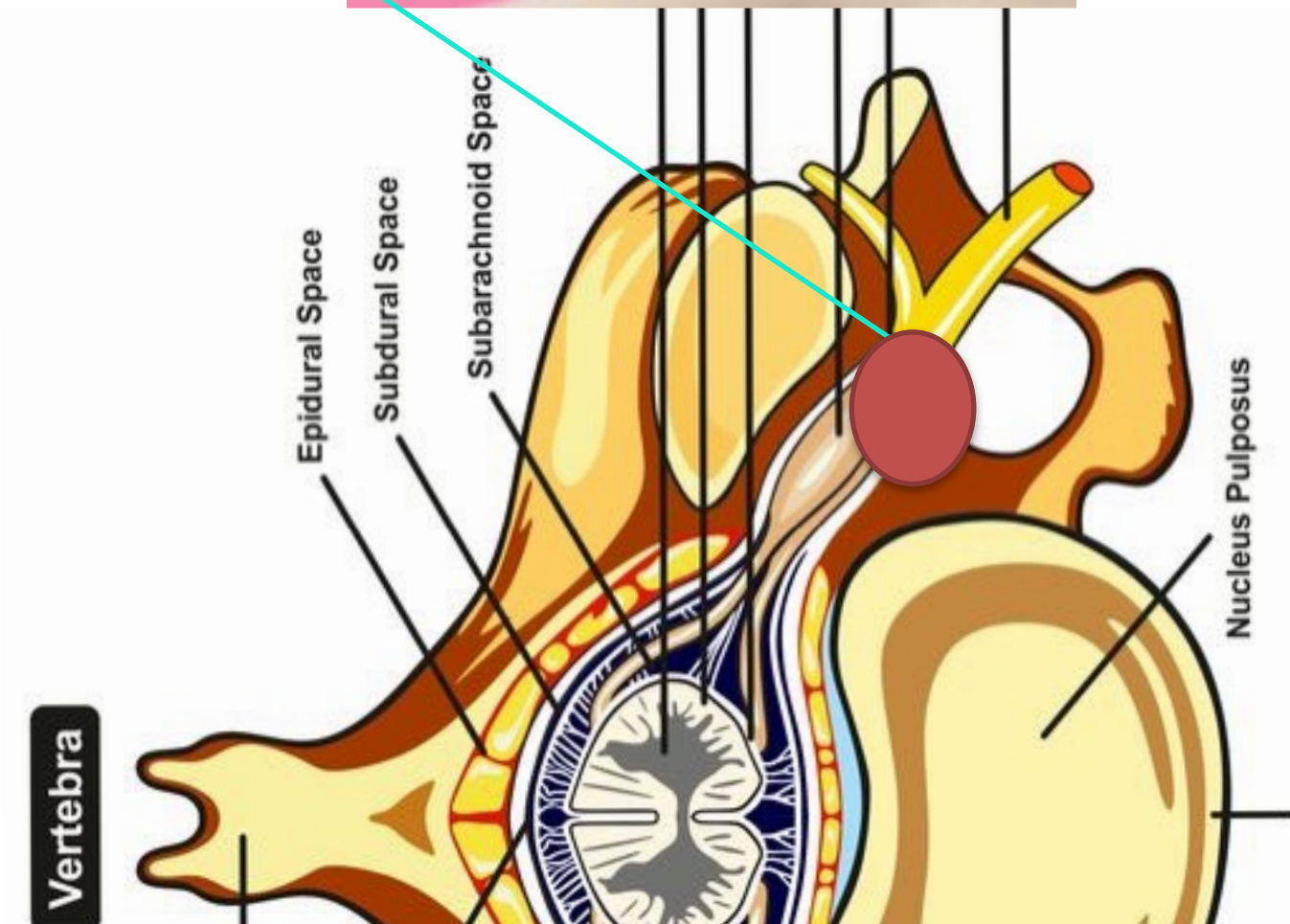
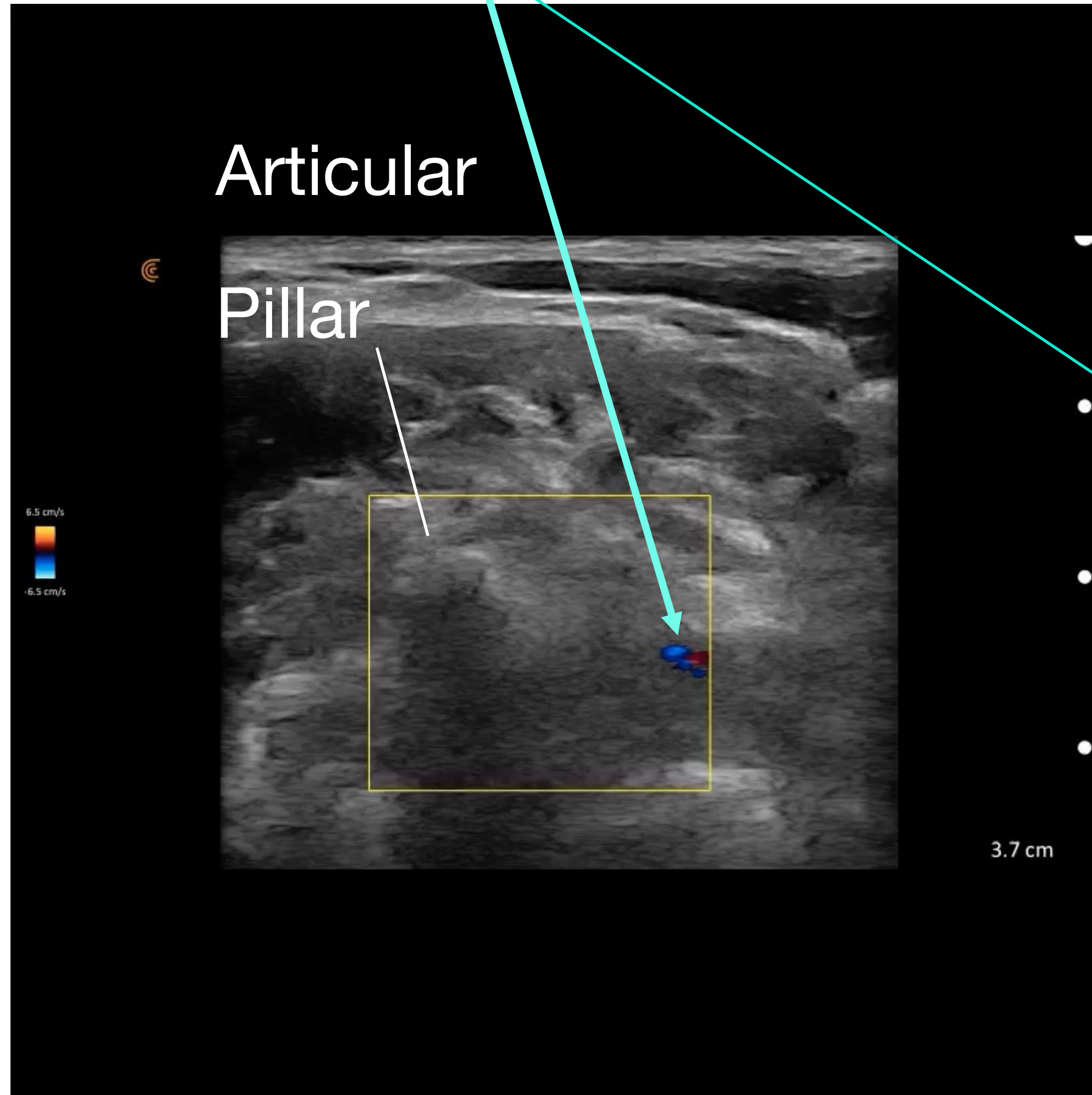


# Cervical Trigger Point Peri-Articular Injections



# Cervical Anatomy

## Vertebral Artery





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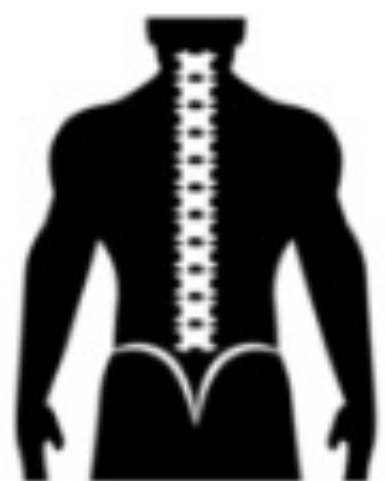
MI 0.99  
TIS 0.33  
TIB 0.50

5 cm



**David Rosenblum, MD**  
Course Director

Director of Pain Management,  
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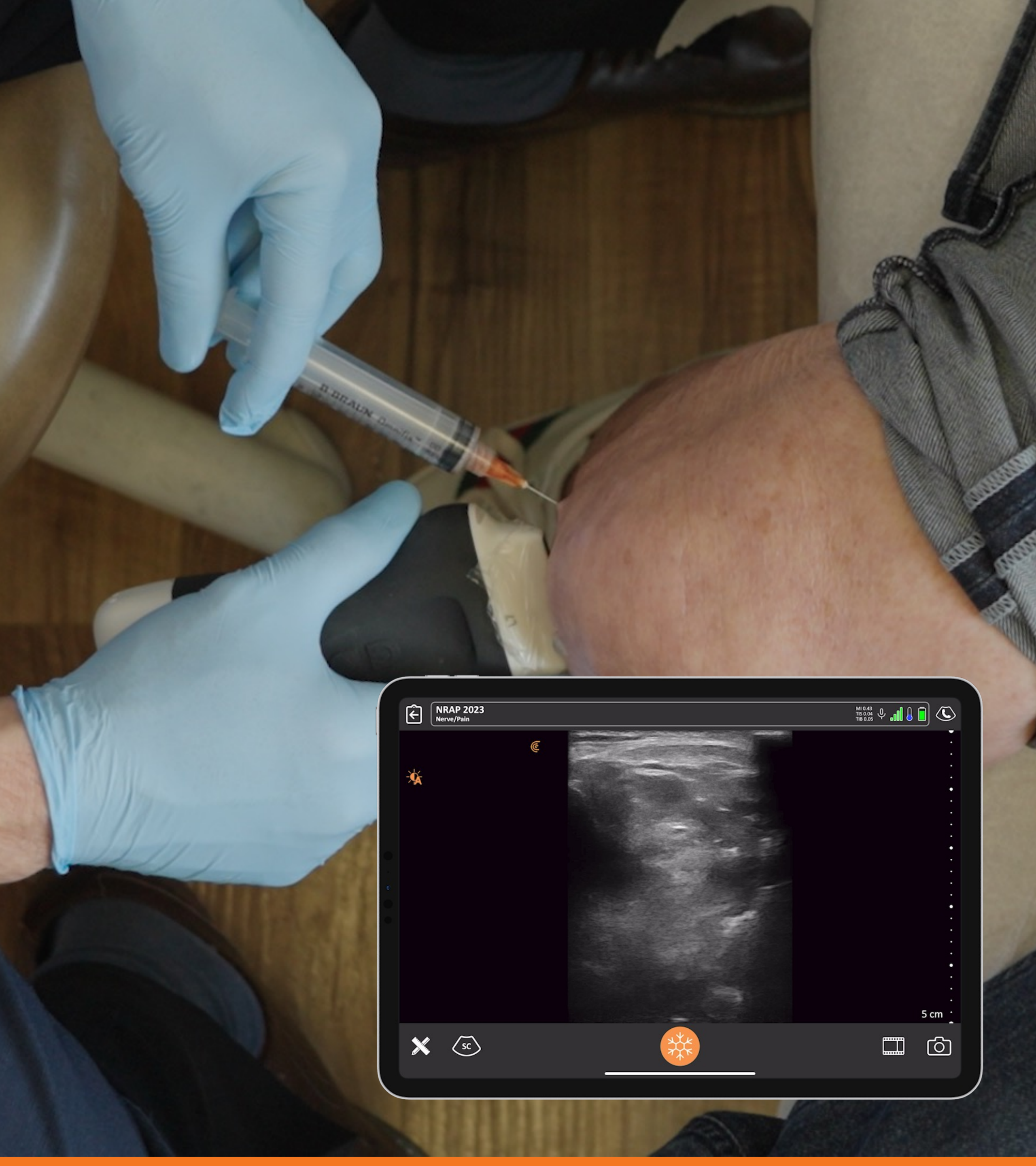


# Live Demonstration



**Shelley Guenther, CRGS, CRCS**

Sonographer | Clinical Marketing Manager



What additional information would you like?

Interactive Poll

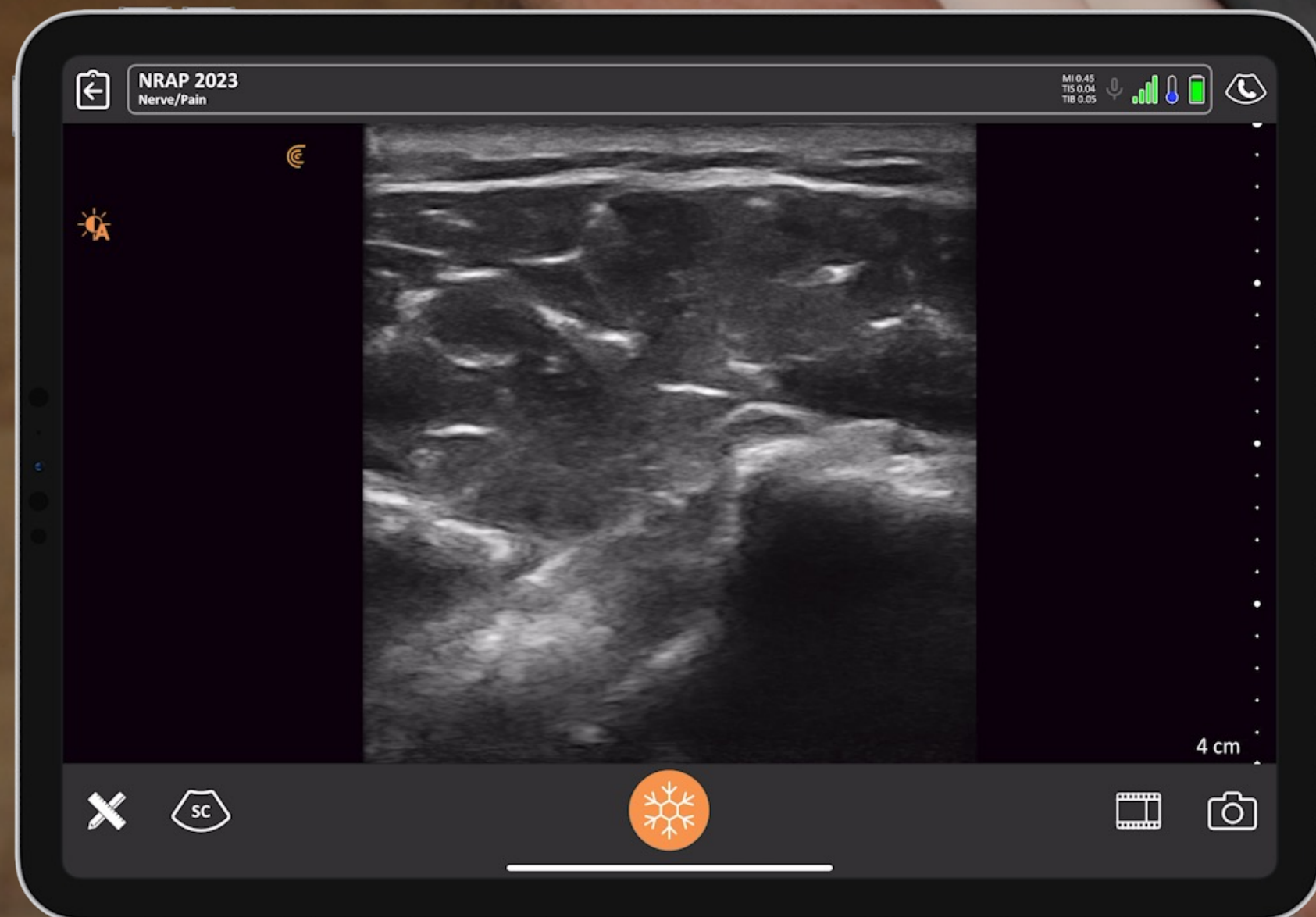
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# Questions



**Dr. David Rosenblum, M.D.**

Interventional Pain Management

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**Shelley Guenther**

Sonographer

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Thank you!