WEBINAR

# Visualize Your Needle: Ultrasound for Painless and Accurate MSK Injections

October 2022

clarius

# Your Host

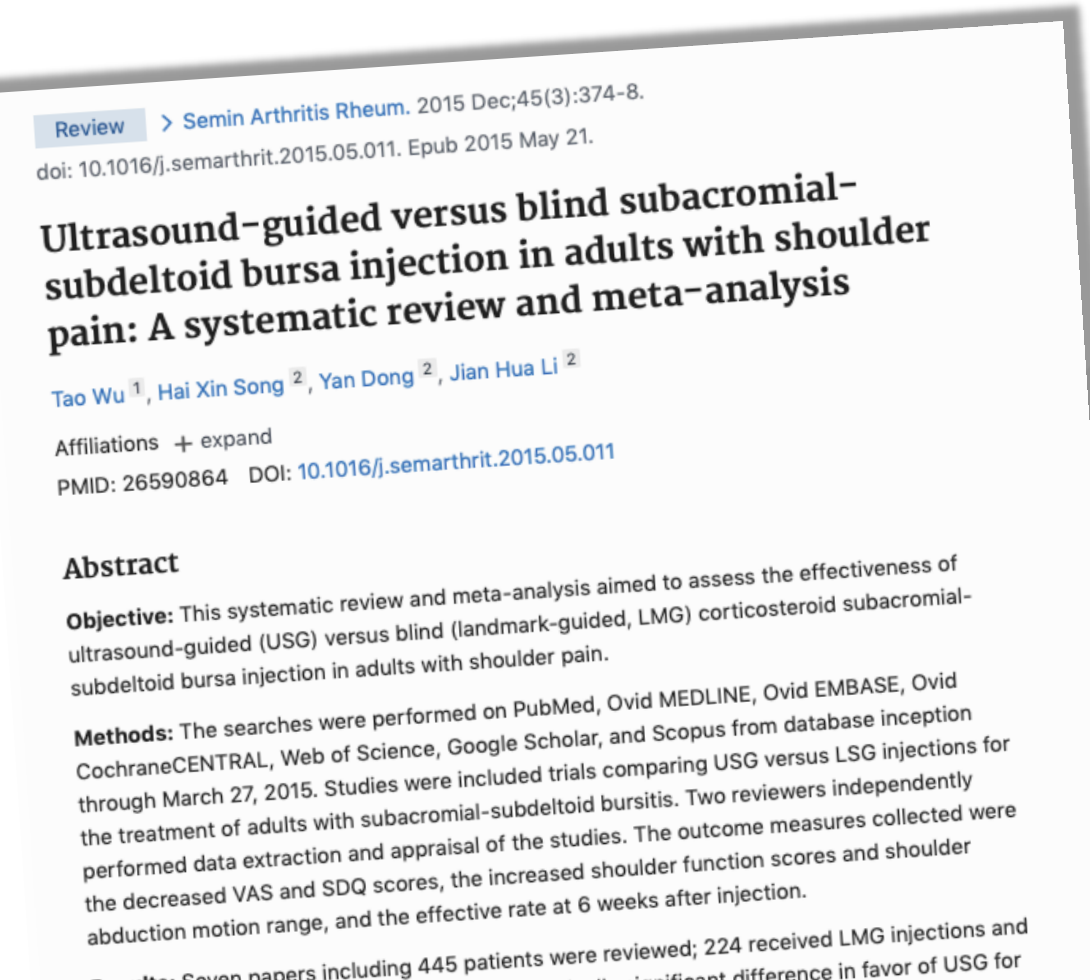
## Dr. Oron Frenkel, MD, MS

Emergency Physician & POCUS Educator

Chairman, Clarius Medical Advisory Board

clarius Ultrasound Anywhere

# Ultrasound-Guided Versus Blind Subacromial-Subdeltoid Bursa Injection



Review > Semin Arthritis Rheum. 2015 Dec;45(3):374-8.
doi: 10.1016/j.semarthrit.2015.05.011. Epub 2015 May 21.

**Ultrasound-guided versus blind subacromial-subdeltoid bursa injection in adults with shoulder pain: A systematic review and meta-analysis**

Tao Wu [1], Hai Xin Song [2], Yan Dong [2], Jian Hua Li [2]

Affiliations + expand
PMID: 26590864 DOI: 10.1016/j.semarthrit.2015.05.011

**Abstract**

**Objective:** This systematic review and meta-analysis aimed to assess the effectiveness of ultrasound-guided (USG) versus blind (landmark-guided, LMG) corticosteroid subacromial-subdeltoid bursa injection in adults with shoulder pain.

**Methods:** The searches were performed on PubMed, Ovid MEDLINE, Ovid EMBASE, Ovid CochraneCENTRAL, Web of Science, Google Scholar, and Scopus from database inception through March 27, 2015. Studies were included trials comparing USG versus LSG injections for the treatment of adults with subacromial-subdeltoid bursitis. Two reviewers independently performed data extraction and appraisal of the studies. The outcome measures collected were the decreased VAS and SDQ scores, the increased shoulder function scores and shoulder abduction motion range, and the effective rate at 6 weeks after injection.

**Results:** Seven papers including 445 patients were reviewed; 224 received LMG injections and

*"Ultrasound-guided corticosteroid injections potentially offer a significantly greater clinical improvement over blind SASD bursitis injections in adults with shoulder pain."*

Korbe S, Udoji EN, Ness TJ, Udoji MA. Ultrasound-guided interventional procedures for chronic pain management. Pain Manag. 2015;5(6):465-82. doi: 10.2217/pmt.15.46. Epub 2015 Sep 24. PMID: 26402316; PMCID: PMC4976830. Source: https://pubmed.ncbi.nlm.nih.gov/26402316/

# Ultrasound-Guided musculoskeletal interventional procedures around the shoulder

*"most Ultrasound-guided musculoskeletal interventional procedures around the should produce better results in terms of accuracy and clinical efficacy than those performed in a blinded fashion."*

> J Ultrason. 2021 Jun 7;21(85):e162-e168. doi: 10.15557/JoU.2021.0026. Epub 2021 Jun 18.

**Ultrasound-guided musculoskeletal interventional procedures around the shoulder**

Silvia Tortora [1], Carmelo Messina [2], Salvatore Gitto [3], Vito Chianca [4 5], Francesca Serpi [1], Angelo Gambino [2], Luigi Pedone [2], Gianpaolo Carrafiello [6 7], Luca Maria Sconfienza [2 3], Domenico Albano [2 8]

Affiliations + expand

PMID: 34258042 PMCID: PMC8264815 DOI: 10.15557/JoU.2021.0026

Free PMC article

**Abstract**

Ultrasound is a fast, accessible, reliable, and radiation-free imaging modality routinely used to assess the soft tissues around the shoulder. It enables to identify a wide range of pathological conditions. Furthermore, most ultrasound-guided musculoskeletal interventional procedures around the shoulder produce better results in terms of accuracy and clinical efficacy than those performed in a blinded fashion. Indeed, intra-articular and peri-articular interventional procedures can be easily performed under continuous ultrasound monitoring to ensure the correct position of the needle and to deliver the medication to a specific target. Several technical approaches and medications can be used to treat different causes of painful shoulder. Intra-articular injections are applied to treat acromioclavicular osteoarthritis as well as glenohumeral joint osteoarthritis and adhesive capsulitis. Subacromial-subdeltoid bursitis, either presenting as a primary inflammatory condition or secondary to rotator cuff disorders, can be easily approached using ultrasound guidance to aspirate synovial effusion and to inject medications. Ultrasound-guided percutaneous irrigation is a well-established technique increasingly applied to treat patients with rotator cuff calcific tendinopathy. Also, degenerative rotator cuff tendi... image-guided inter...

Tortora S, Messina C, Gitto S, Chianca V, Serpi F, Gambino A, Pedone L, Carrafiello G, Sconfienza LM, Albano D. Ultrasound-guided musculoskeletal interventional procedures around the shoulder. J Ultrason. 2021 Jun 7;21(85):e162-e168. doi: 10.15557/JoU.2021.0026. Epub 2021 Jun 18. PMID: 34258042; PMCID: PMC8264815.

# Palpaption Versus Ultrasound-Guided Acromioclavicular Joint Intra-articular Corticosteroid Injections: A Retrospective Comparative Clinical Study

Comparative Study > Pain Physician. 2015 Jul-Aug;18(4):333-41.

**Palpation Versus Ultrasound-Guided Acromioclavicular Joint Intra-articular Corticosteroid Injections: A Retrospective Comparative Clinical Study**

Ki Deok Park [1], Tai Kon Kim, Jihae Lee, Woo Yong Lee, Jae Ki Ahn, Yongbum Park

Affiliations + expand

PMID: 26218936

Free article

**Erratum in**

In errata.

[No authors listed]

Pain Physician. 2015 Sep-Oct;18(5):517.

PMID: 26431127 No abstract available.

**Abstract**

Primary osteoarthritis (OA) is the most common cause of pain arising from the incidence is unknown because of differences in the criteria sis of AC joint OA requires a thorough

*"US-guided AC joint IA injection for the treatment of symptomatic AC joint OA resulted in better pain and functional status improvement than palpation-guided IA injection."*

Park KD, Kim TK, Lee J, Lee WY, Ahn JK, Park Y. Palpation Versus Ultrasound-Guided Acromioclavicular Joint Intra-articular Corticosteroid Injections: A Retrospective Comparative Clinical Study. Pain Physician. 2015 Jul-Aug;18(4):333-41. Erratum in: Pain Physician. 2015 Sep-Oct;18(5):517. PMID: 26218936.

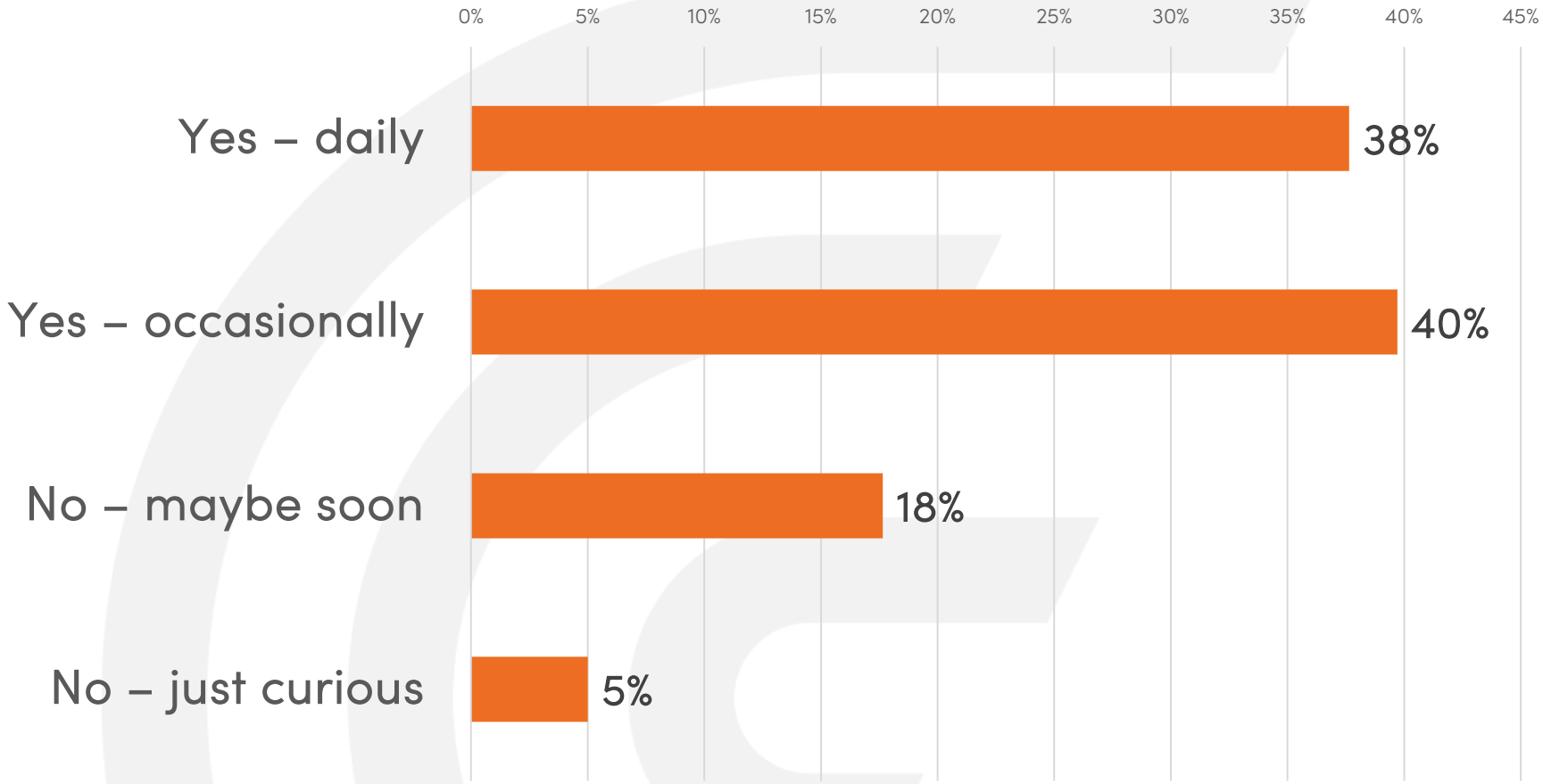
# Ultrasound-Guided Suprapectoral Tenodesis of the Long Head of the Biceps Brachii

*"Ultrasound provides surgeons with a safe and non-invasive tool to visualize the biceps tendon as it exits the bicipital groove, negating the need for unroofing and other pitfalls associated with traditional techniques."*


Andersen WJ, Barcelos M, de Paiva Raffaelli M, Hirahara AM. Ultrasound-Guided Suprapectoral Tenodesis of the Long Head of the Biceps Brachii. Arthrosc Tech. 2020 Dec 21;9(12):e2071-e2076. doi: 10.1016/j.eats.2020.08.039. PMID: 33381421; PMCID: PMC7768307.


# Poll

## *Do you use ultrasound to guide procedures? If so, how often?*



# Your Expert Guest Speaker

## Alan M Hirahara, MD, FRCSC

*Orthopaedic Surgery | Sports Medicine*

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# EXPERT ULTRASOUND GUIDANCE FOR ACCURATE MSK INJECTIONS

## PART 1: THE SHOULDER

Alan M Hirahara, MD, FRCSC

Hirahara MD

SPORTS MEDICINE / SHOULDER & KNEE
ARTHROSCOPY / ULTRASOUND / ORTHOBIOLOGICS

HORNETS SACRAMENTO STATE

SACRAMENTO RIVER CATS

# Disclosures

- Consultant / Royalties
- Consultant
- Speaker / Stock options
- Committee member
  - CSMAS
  - Health & Safety
  - Industry
  - Development
- Arthrex Inc.
- LifeNet Health, Inc.
- Clarius Mobile Health
  - National Collegiate Athletic Association
  - Big Sky Athletic Conference
  - ASES Foundation
  - AANA

# Objectives

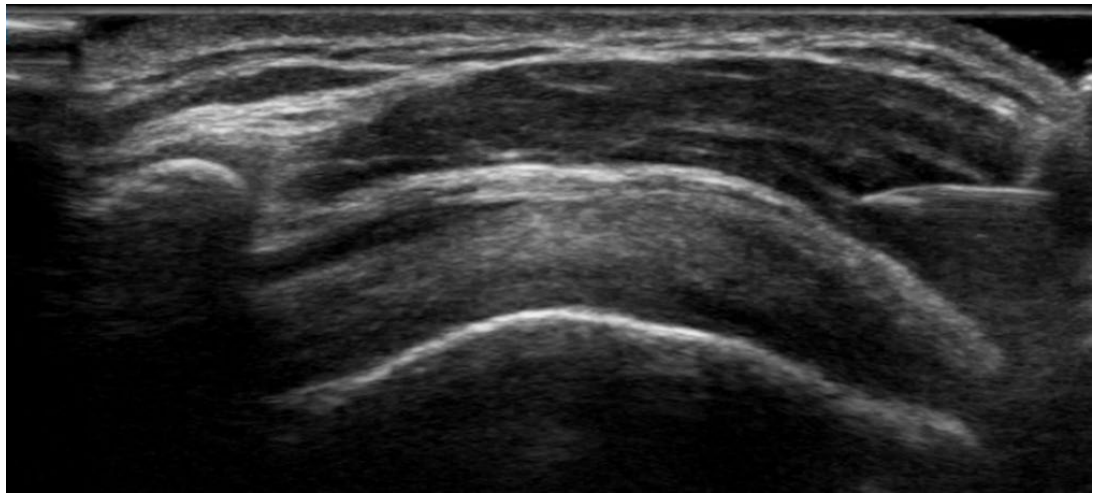
- How to accurately inject into the biceps and subscapularis tendons or sheaths
- Visualization of supraspinatus tendon abnormalities and PRP injection guidance
- The best approach for needle visualization during a subacromial space injection
- Accurate and effective AC joint and intra-articular shoulder injections
- Tips to pinpoint the optimal location for successful suprapectoral biceps tenodesis

# SHOULDER INJECTIONS

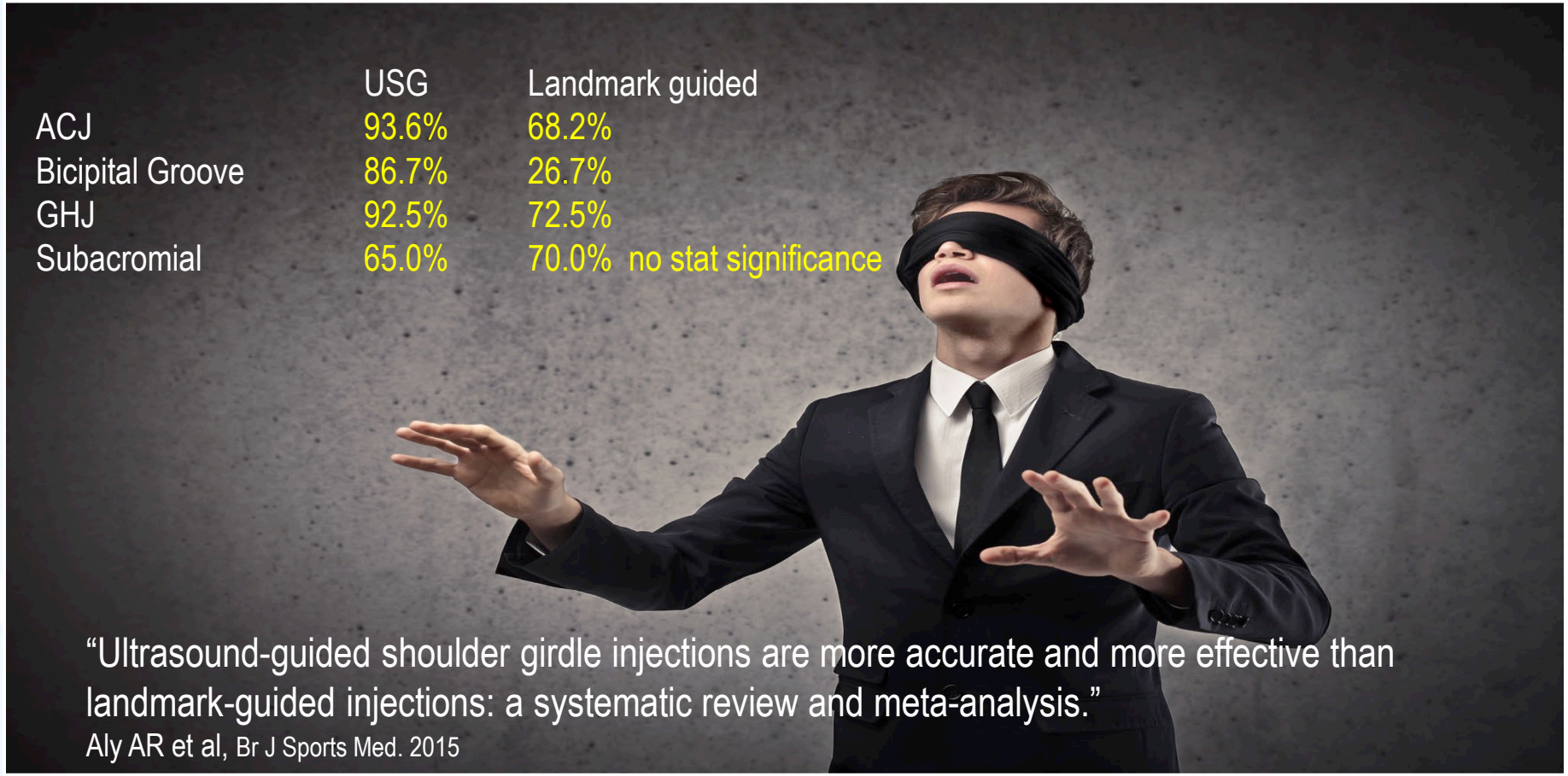
# Improved Accuracy

- Despite overwhelming evidence that accuracy in injections is quite low and ultrasound significantly improves this accuracy, many DO NOT BELIEVE

- Many physicians will feel that they are “excellent” at injections and “never” miss

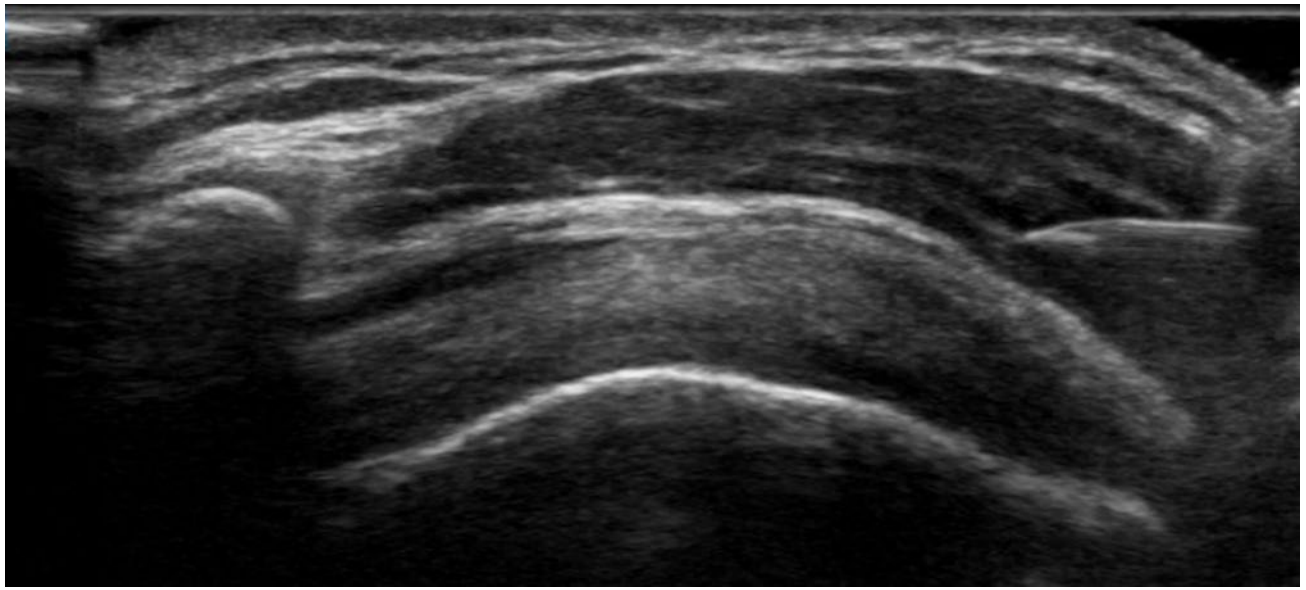


# Shoulder Injections



# My Experience

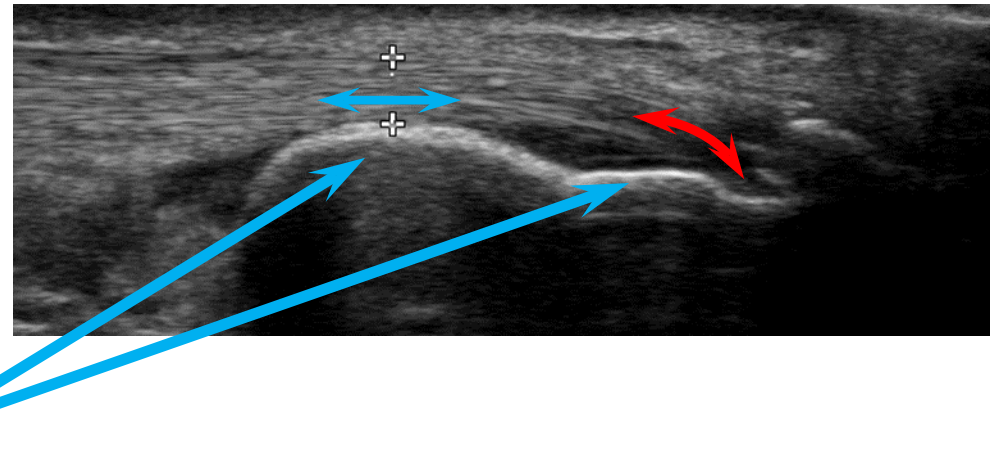
- "My patients have significantly less pain when done under ultrasound guidance"



- My Explanation:
  - ***"I was missing!"***

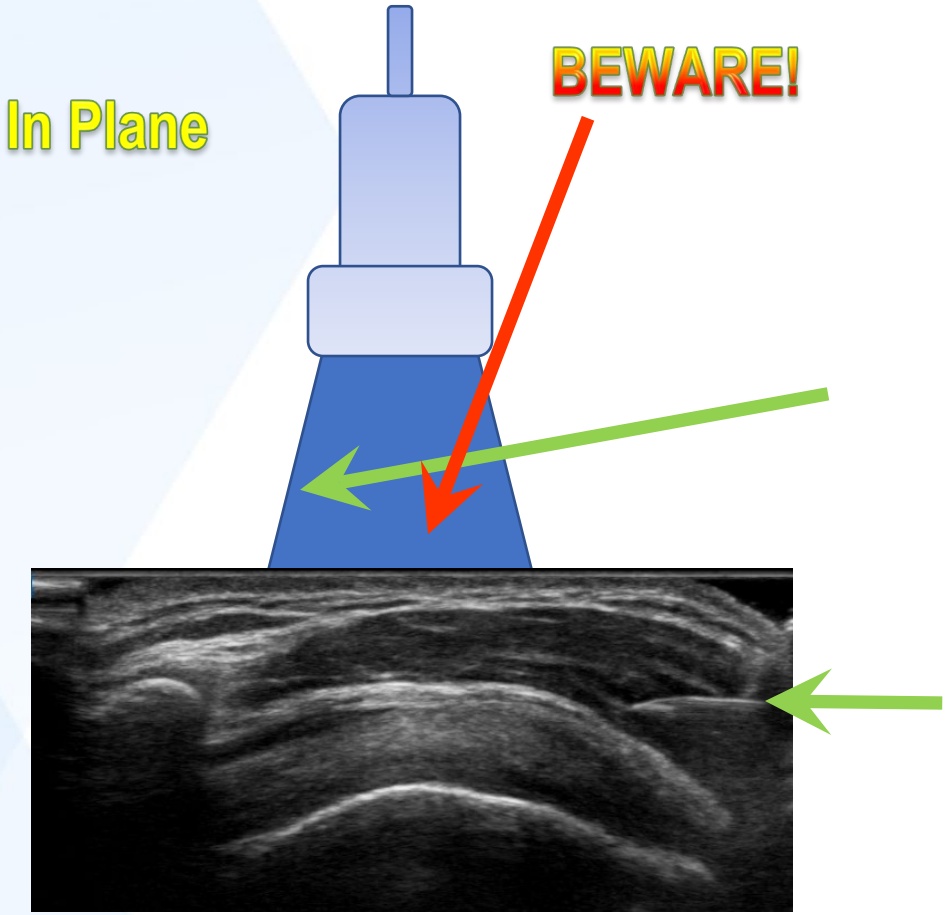
# Anisotropy

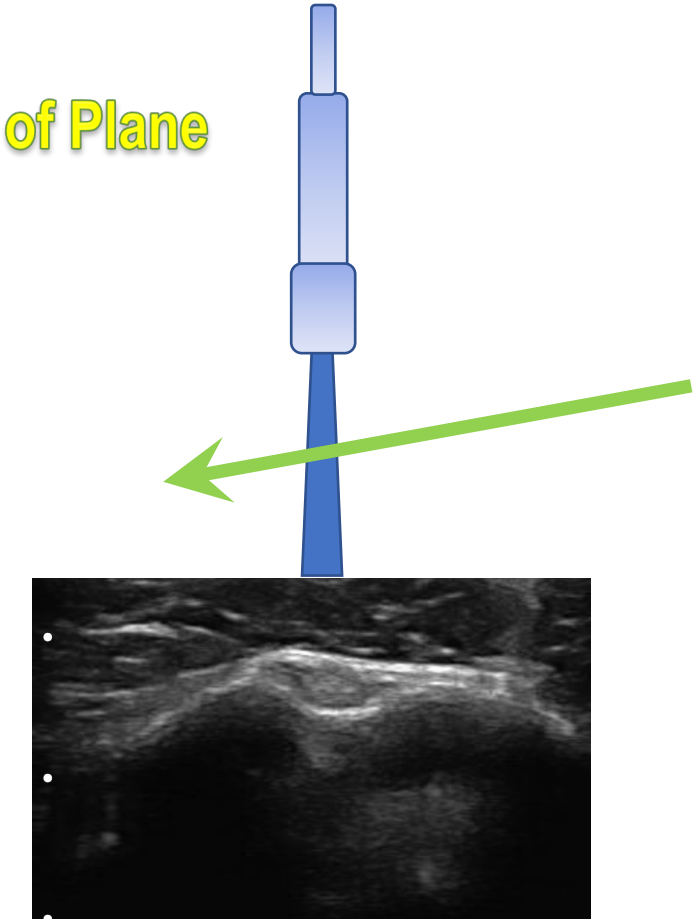
- *Sonographic artifact* associated with linear structures
  - Occurs when a linear structure is *not 90°* to ultrasound beam
  - Muscle, Tendon, Ligament, Cortex and Nerve
  - Tilting the transducer will cause the structure to appear artificially absent
  - *Shoulder Imaging PEARL:* If the *bone is bright*, the tendon typically is also



Courtesy of Daniel Shelton

# Injections



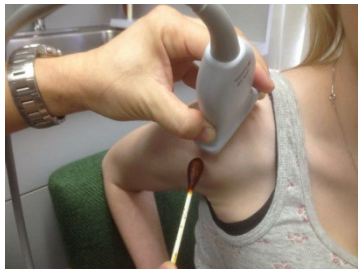



# HOW DO I DO INJECTIONS?

# What Do You Need?

- Sterile gloves / gown / mask / hat
- Sterile drapes
- Sterile transducer sheath or cover
- Sterile gel
- Sterile operating room

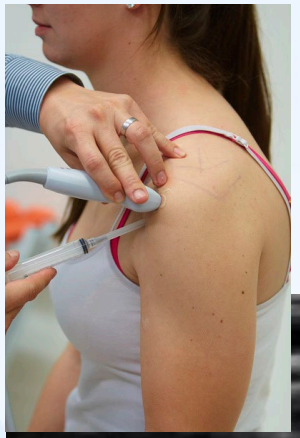
# Sterile Technique

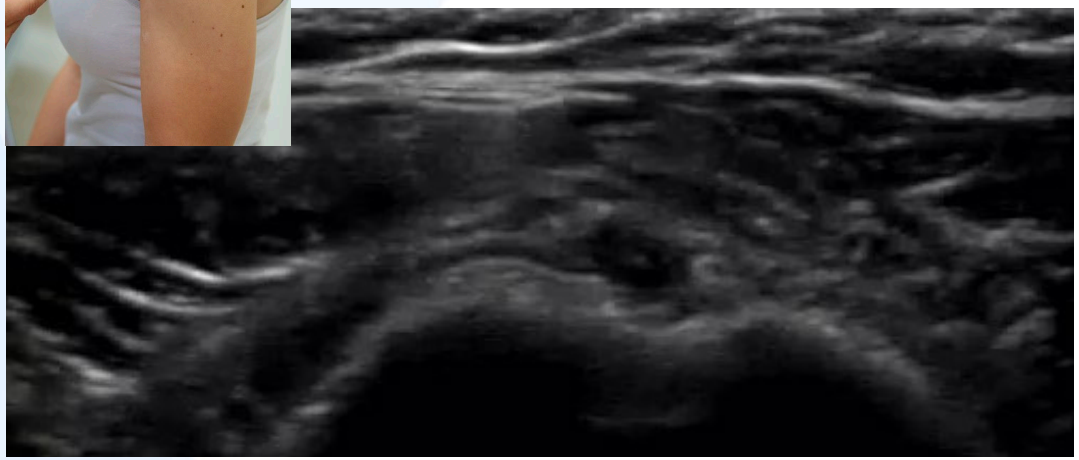




# BICEPS TENDON / GROOVE INJECTIONS

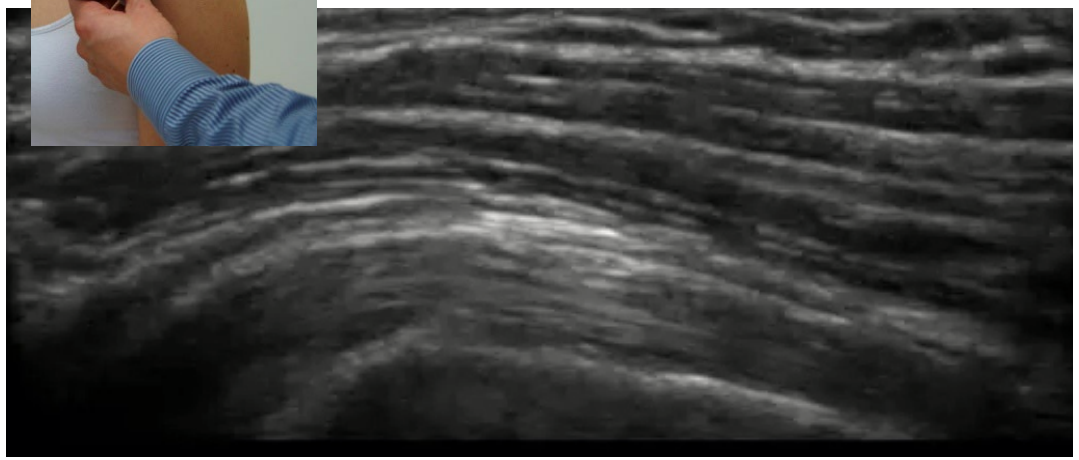
# Biceps Sheath Injection

## Out of Plane





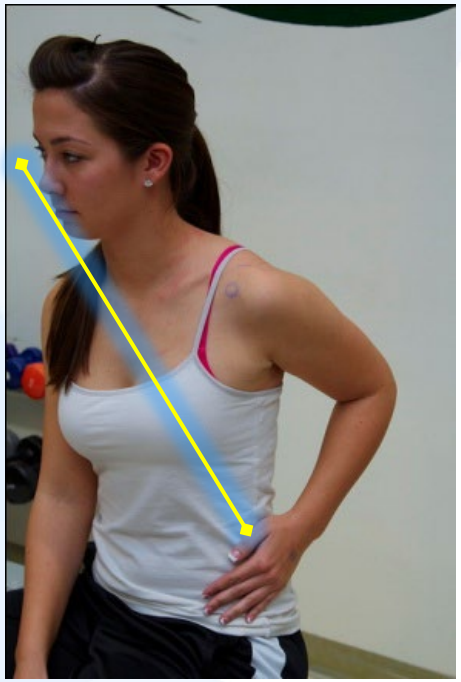
## In Plane

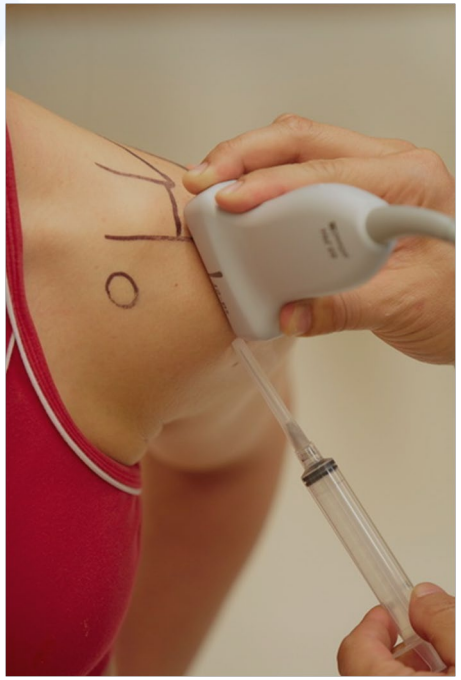


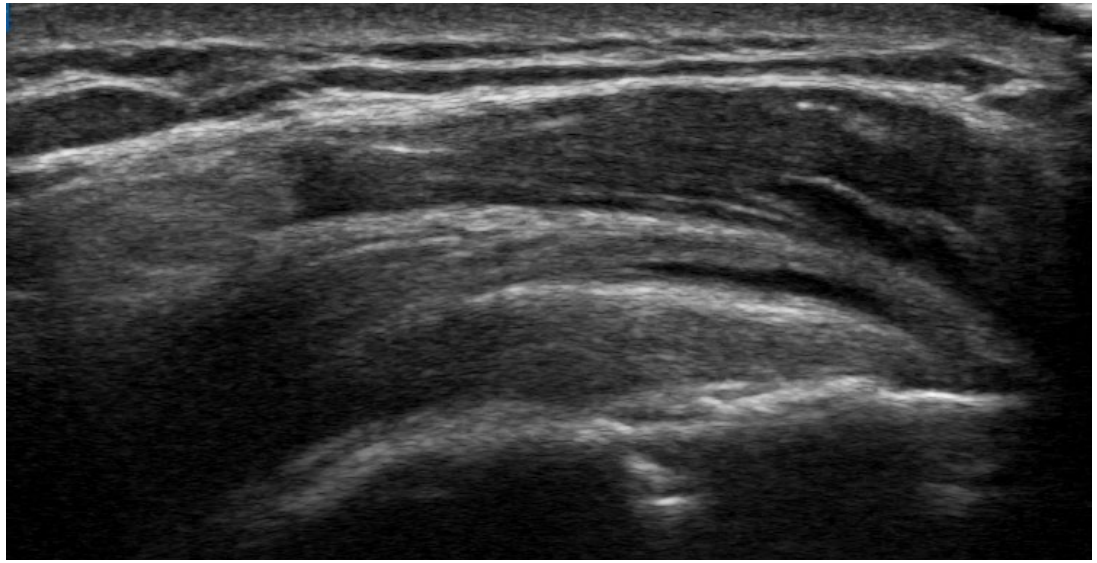
# Biceps Tendon Injection

# SUPRASPINATUS / SUBACROMIAL INJECTIONS

# Subacromial Injection



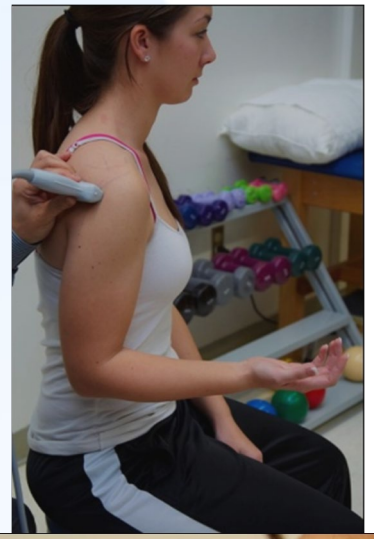


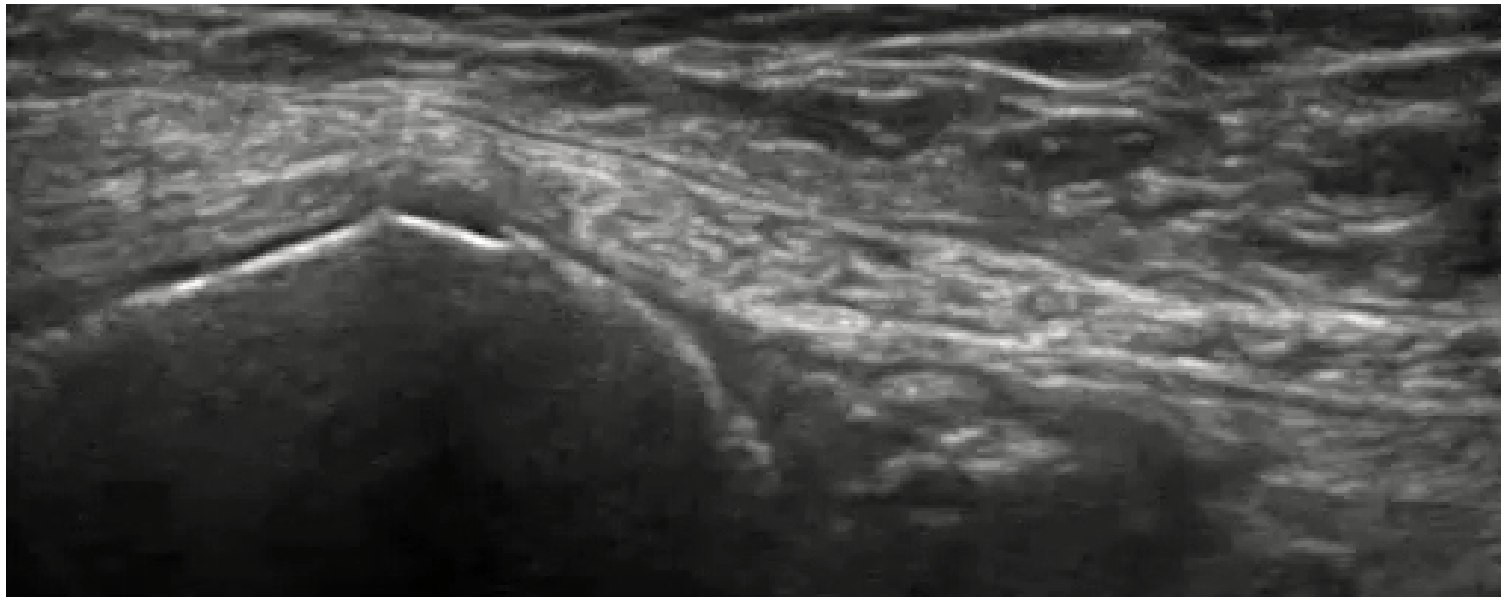


# Supraspinatus / Subacromial Injections

# GLENOHUMERAL JOINT INJECTIONS

# Shoulder Joint Injection



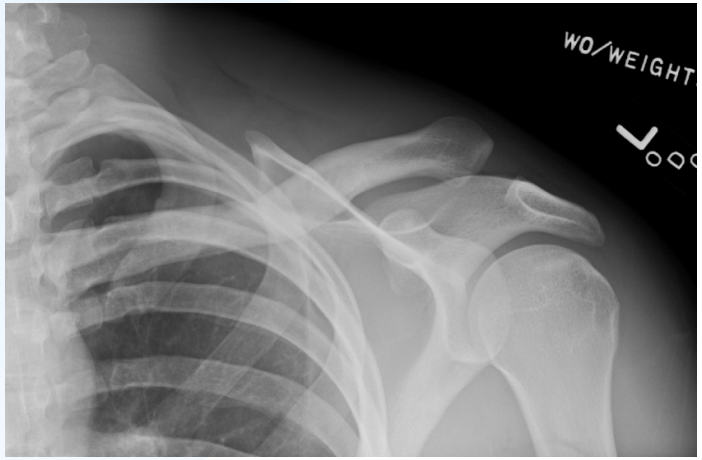


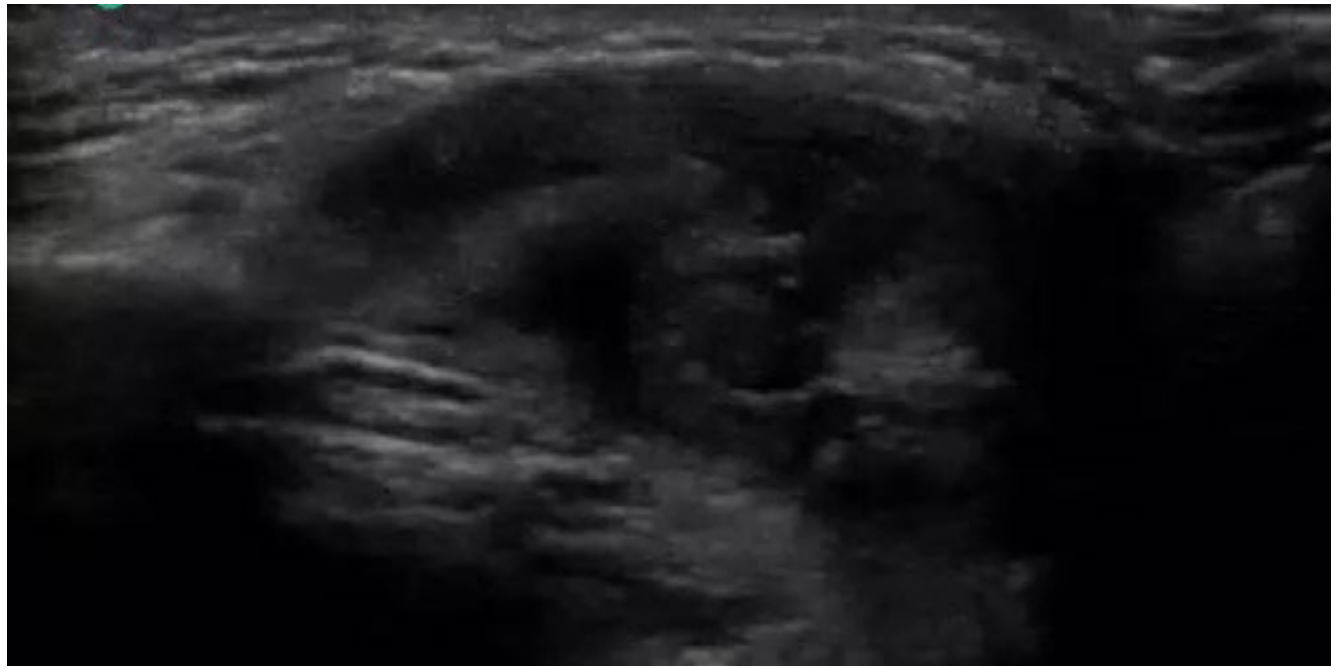
# Glenohumeral Joint Injection

# AC JOINT INJECTIONS

# AC joint injection long axis needle

# AC Separation – Injection



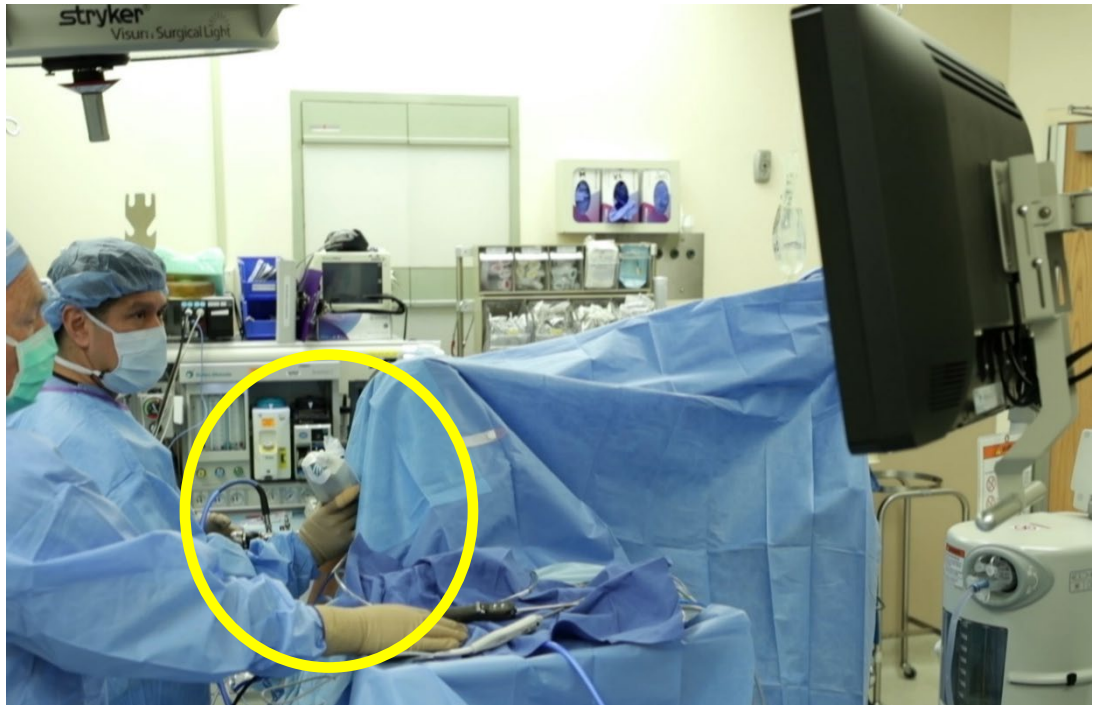
# AC Joint Injection

# SURGICAL APPLICATIONS

# Ultrasound Assisted Surgery

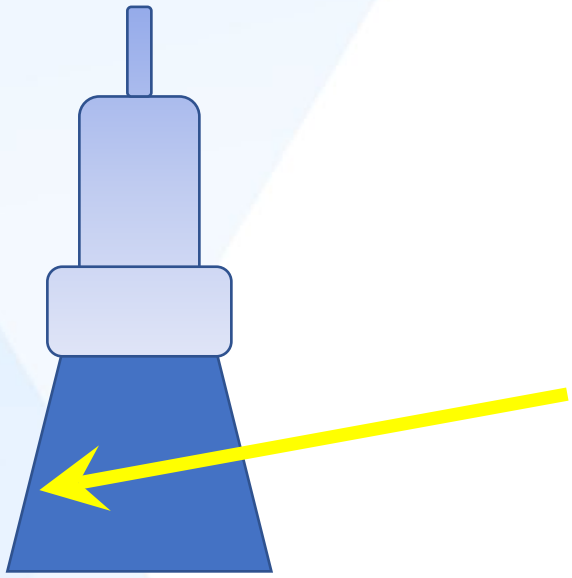
- Take advantage of the tools:
  - Can identify anatomy / pathology
  - Can put a needle on it
  - Can use the centerline function
  - Can use the crosshairs

**–IN REAL TIME!**

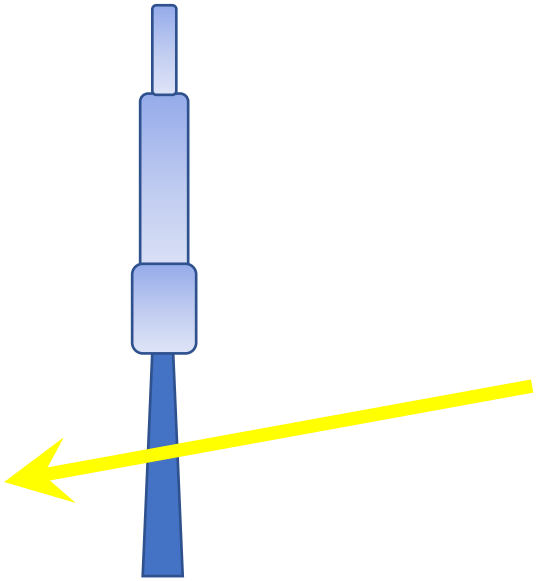


# Ultrasound-Guided, Percutaneous Placement

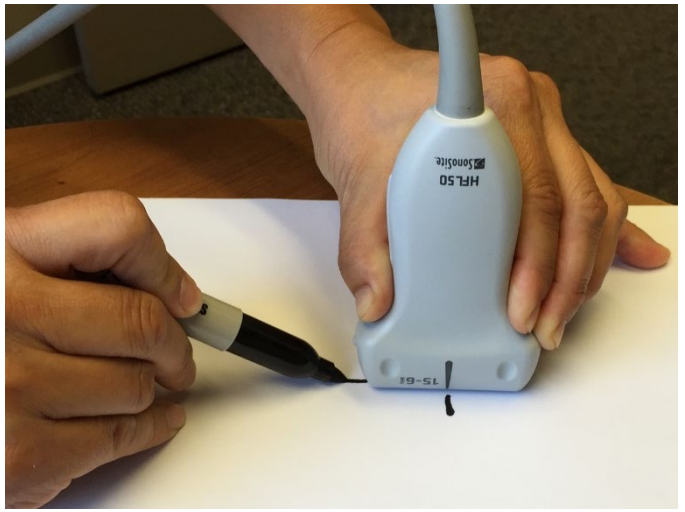
## In plane needle

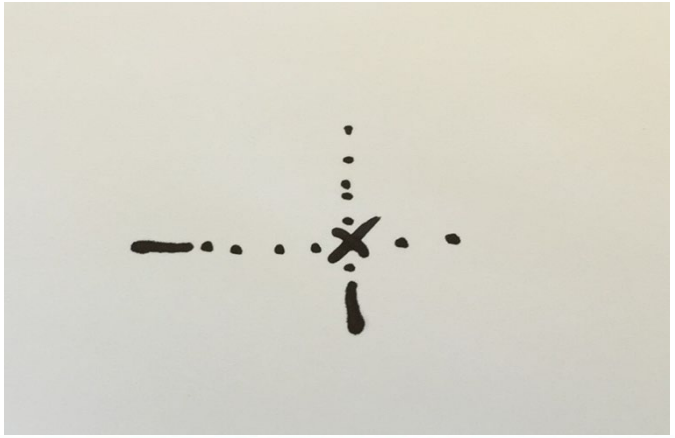


## Out of plane needle



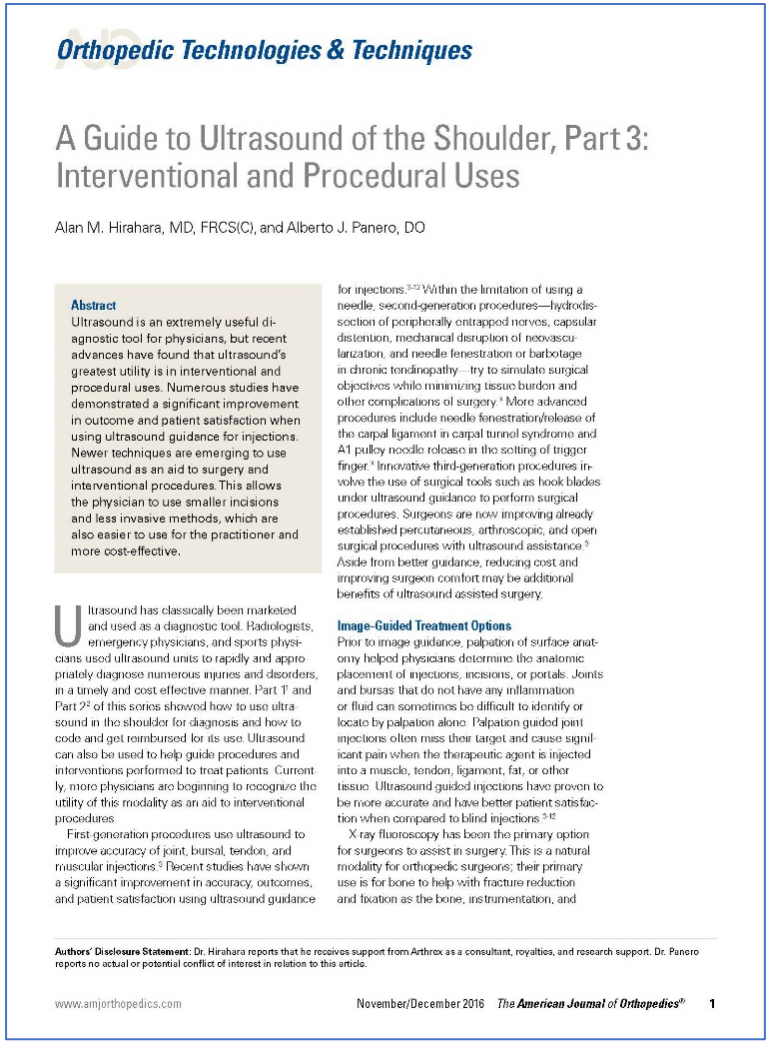
## Crosshair markings



# Publications

- A Guide to Ultrasound of the Shoulder, Part 3: Interventional & Procedural Uses
  - Hirahara A, Panero A
  - Am J Orthop, Nov-Dec 2016



Orthopedic Technologies & Techniques

A Guide to Ultrasound of the Shoulder, Part 3: Interventional and Procedural Uses

Alan M. Hirahara, MD, FRCS(C), and Alberto J. Panero, DO

**Abstract**

Ultrasound is an extremely useful diagnostic tool for physicians, but recent advances have found that ultrasound's greatest utility is in interventional and procedural uses. Numerous studies have demonstrated a significant improvement in outcome and patient satisfaction when using ultrasound guidance for injections. Newer techniques are emerging to use ultrasound as an aid to surgery and interventional procedures. This allows the physician to use smaller incisions and less invasive methods, which are also easier to use for the practitioner and more cost-effective.

Ultrasound has classically been marketed and used as a diagnostic tool. Radiologists, emergency physicians, and sports physicians used ultrasound units to rapidly and appropriately diagnose numerous injuries and disorders, in a timely and cost effective manner. Part 1[1] and Part 2[2] of this series showed how to use ultrasound in the shoulder for diagnosis and how to code and get reimbursed for its use. Ultrasound can also be used to help guide procedures and interventions performed to treat patients. Currently, more physicians are beginning to recognize the utility of this modality as an aid to interventional procedures.

First-generation procedures use ultrasound to improve accuracy of joint, bursal, tendon, and muscular injections.[3] Recent studies have shown a significant improvement in accuracy, outcomes, and patient satisfaction using ultrasound guidance for injections.[3-12] Within the limitation of using a needle, second-generation procedures—hydrodissection of peripherally entrapped nerves, capsular distention, mechanical disruption of neovascularization, and needle fenestration or barbotage in chronic tendinopathy—try to simulate surgical objectives while minimizing tissue burden and other complications of surgery.[4] More advanced procedures include needle fenestration/release of the carpal ligament in carpal tunnel syndrome and A1 pulley needle release in the setting of trigger finger.[5] Innovative third-generation procedures involve the use of surgical tools such as hook blades under ultrasound guidance to perform surgical procedures. Surgeons are now improving already established percutaneous, arthroscopic, and open surgical procedures with ultrasound assistance.[3] Aside from better guidance, reducing cost and improving surgeon comfort may be additional benefits of ultrasound assisted surgery.

**Image-Guided Treatment Options**

Prior to image guidance, palpation of surface anatomy helped physicians determine the anatomic placement of injections, incisions, or portals. Joints and bursas that do not have any inflammation or fluid can sometimes be difficult to identify or locate by palpation alone. Palpation guided joint injections often miss their target and cause significant pain when the therapeutic agent is injected into a muscle, tendon, ligament, fat, or other tissue. Ultrasound guided injections have proven to be more accurate and have better patient satisfaction when compared to blind injections.[3-12]

X-ray fluoroscopy has been the primary option for surgeons to assist in surgery. This is a natural modality for orthopedic surgeons; their primary use is for bone to help with fracture reduction and fixation as the bone, instrumentation, and

**Authors' Disclosure Statement:** Dr. Hirahara reports that he receives support from Arthrex as a consultant, royalties, and research support. Dr. Panero reports no actual or potential conflict of interest in relation to this article.



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# Publications

- Hirahara, Andersen. Ultrasound-guided percutaneous reconstruction of the *anterolateral ligament*: Surgical technique & case report. Am J Orthop. 2016 Nov-Dec;45(7):418-60.
- Hirahara, Andersen. Ultrasound-guided percutaneous repair of the *medial patellofemoral ligament*: Surgical technique & outcomes. Am J Orthop. May-June 2017;46(3):152-157.
- Hirahara A, Mackay G, Andersen W. "Ultrasound-guided suture tape augmentation and stabilization of the *medial collateral ligament*", Arthrosc Tech, 2018 Feb 5; 7(3): e205-10. doi: 10.1016/j.eats.2017.08.069. PMID: 29881691
- Andersen J, Barcelos M, Raffaelli M, Hirahara A. "Ultrasound-guided suprapectoral tenodesis of the long head of the *biceps brachii*", Arthosc Tech, 2020 Dec 21; 9(12): e2071-6. doi: 10.1016/j.eats.2020.08.039. PMID: 33381421

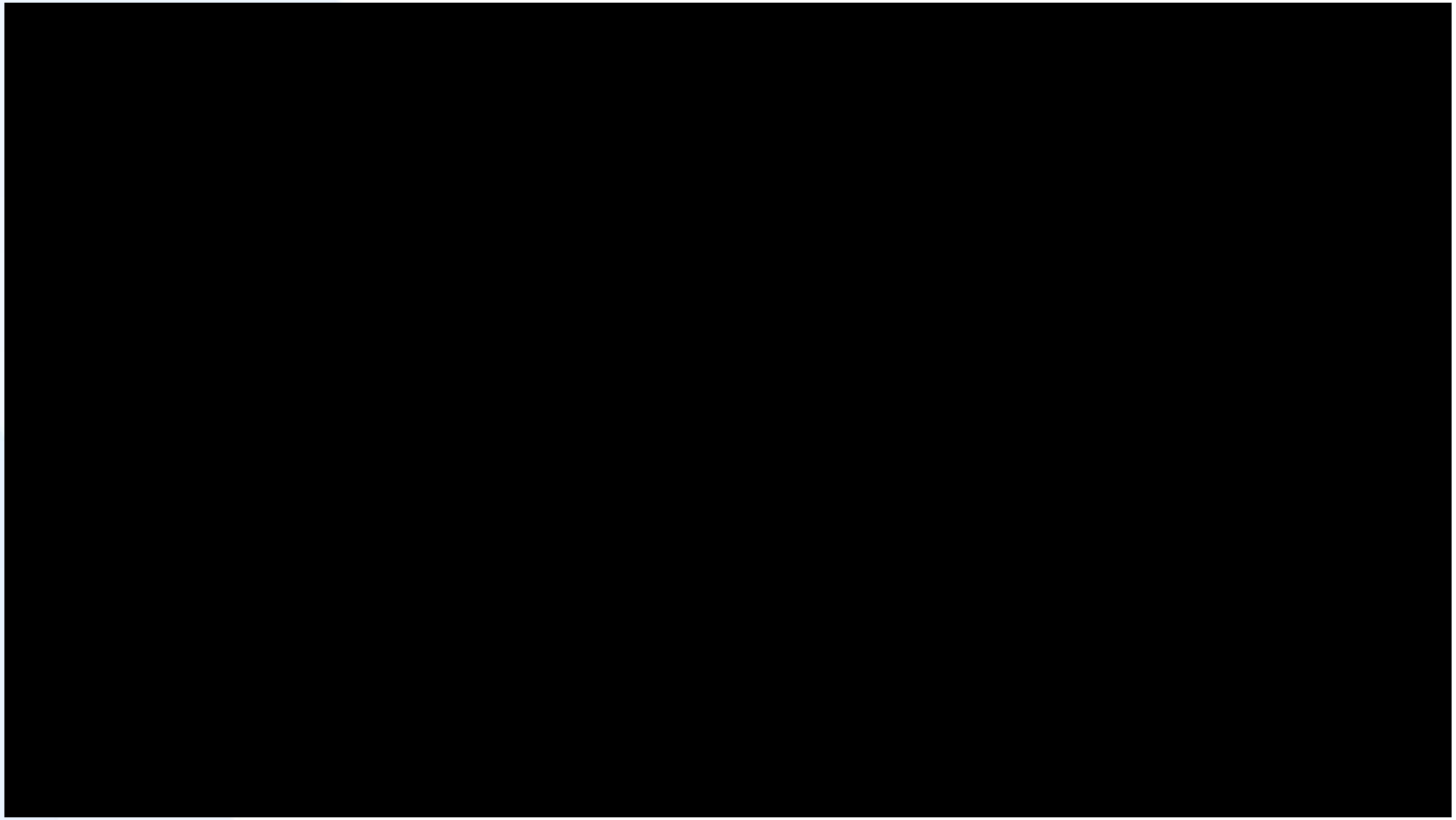
# Ultrasound Assisted Shoulder Surgery

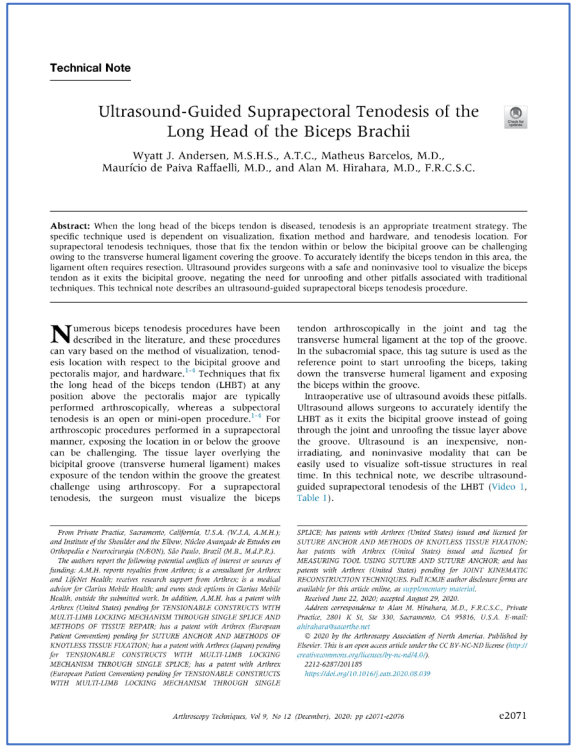
- Biceps tenodesis
  - Find the groove, place the portals
- Calcific tendonitis
- Loose bodies

# What's in My Bag?

- Linear, high-definition scanner
- Frequency:  5 – 15 MHz
- Depth Max:  7 cm
- Connection:  Wireless (no cords)

# Suprapec Arthroscopic Biceps Tenodesis





Technical Note

Ultrasound-Guided Suprapectoral Tenodesis of the Long Head of the Biceps Brachii

Wyatt J. Andersen, M.S.H.S., A.T.C., Matheus Barcelos, M.D., Maurício de Paiva Raffaelli, M.D., and Alan M. Hirahara, M.D., F.R.C.S.C.

**Abstract:** When the long head of the biceps tendon is diseased, tenodesis is an appropriate treatment strategy. The specific technique used is dependent on visualization, fixation method and hardware, and tenodesis location. For suprapectoral tenodesis techniques, those that fix the tendon within or below the bicipital groove can be challenging owing to the transverse humeral ligament covering the groove. To accurately identify the biceps tendon in this area, the ligament often requires resection. Ultrasound provides surgeons with a safe and noninvasive tool to visualize the biceps tendon as it exits the bicipital groove, negating the need for unroofing and other pitfalls associated with traditional techniques. This technical note describes an ultrasound-guided suprapectoral biceps tenodesis procedure.

Numerous biceps tenodesis procedures have been described in the literature, and these procedures can vary based on the method of visualization, tenodesis location with respect to the bicipital groove and pectoralis major, and hardware.[1-3] Techniques that fix the long head of the biceps tendon (LHBT) at any position above the pectoralis major are typically performed arthroscopically, whereas a subpectoral tenodesis is an open or mini-open procedure.[1-3] For arthroscopic procedures performed in a suprapectoral manner, exposing the location in or below the groove can be challenging. The tissue layer overlying the bicipital groove (transverse humeral ligament) makes exposure of the tendon within the groove the greatest challenge using arthroscopy. For a suprapectoral tenodesis, the surgeon must visualize the biceps tendon arthroscopically in the joint and tag the transverse humeral ligament at the top of the groove. In the subacromial space, this tag suture is used as the reference point to start unroofing the biceps, taking down the transverse humeral ligament and exposing the biceps within the groove.

Intraoperative use of ultrasound avoids these pitfalls. Ultrasound allows surgeons to accurately identify the LHBT as it exits the bicipital groove instead of going through the joint and unroofing the tissue layer above the groove. Ultrasound is an inexpensive, non-irradiating, and noninvasive modality that can be easily used to visualize soft-tissue structures in real time. In this technical note, we describe ultrasound-guided suprapectoral tenodesis of the LHBT (Video 1, Table 1).

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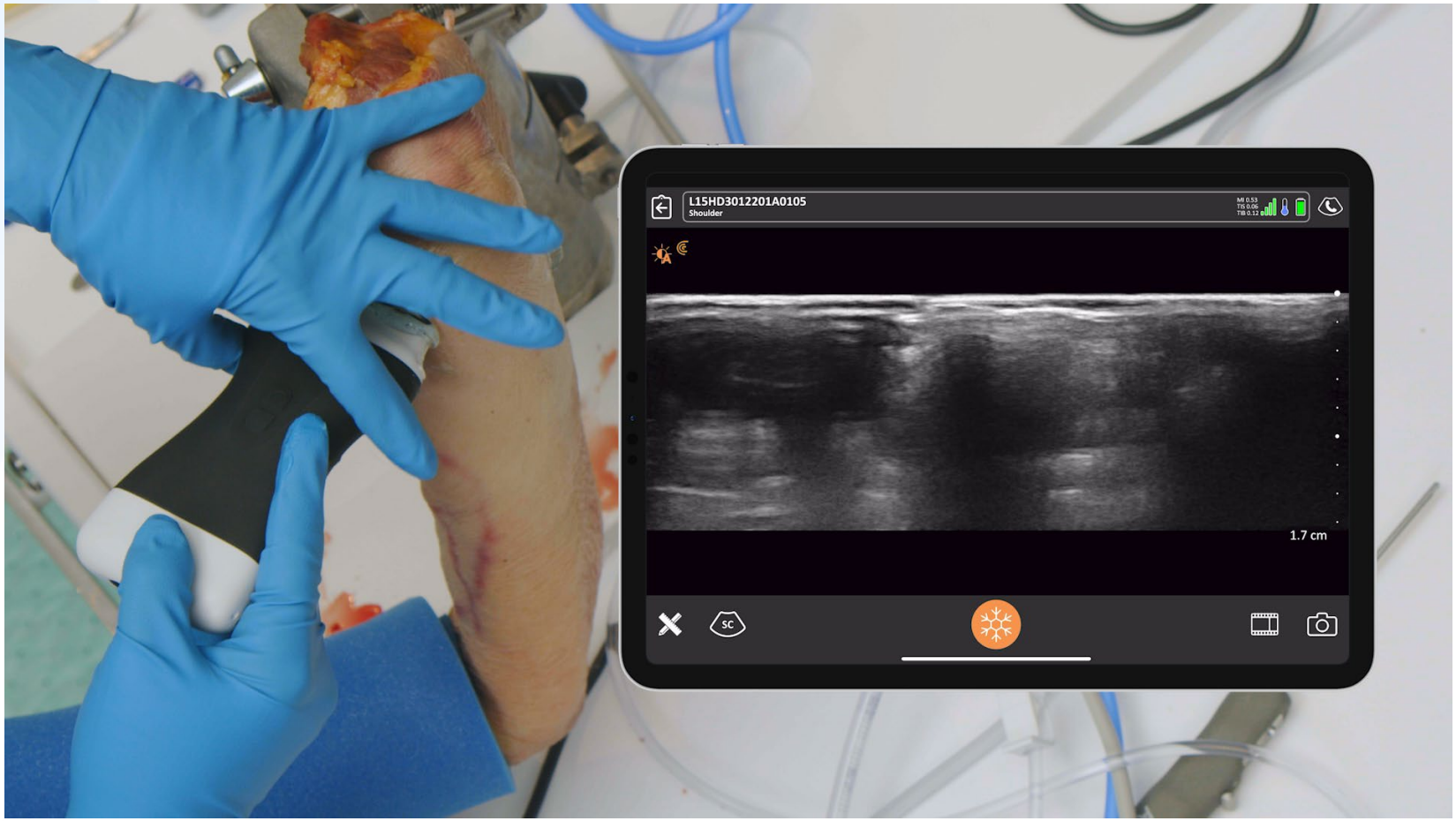
# Ultrasound-Guided Biceps Tenodesis



# Summary of Ultrasound

- *Tool* like fluoroscopy or arthroscopy
- *Inexpensive* and widely available
- Allows for *visualization* of anatomic structures
- Helps *guide* injections or surgeries
- Transforms surgeries from open to *percutaneous*

# THANK YOU!

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## Shelley Guenther

*Clinical Marketing Manager*

clarius Ultrasound Anywhere

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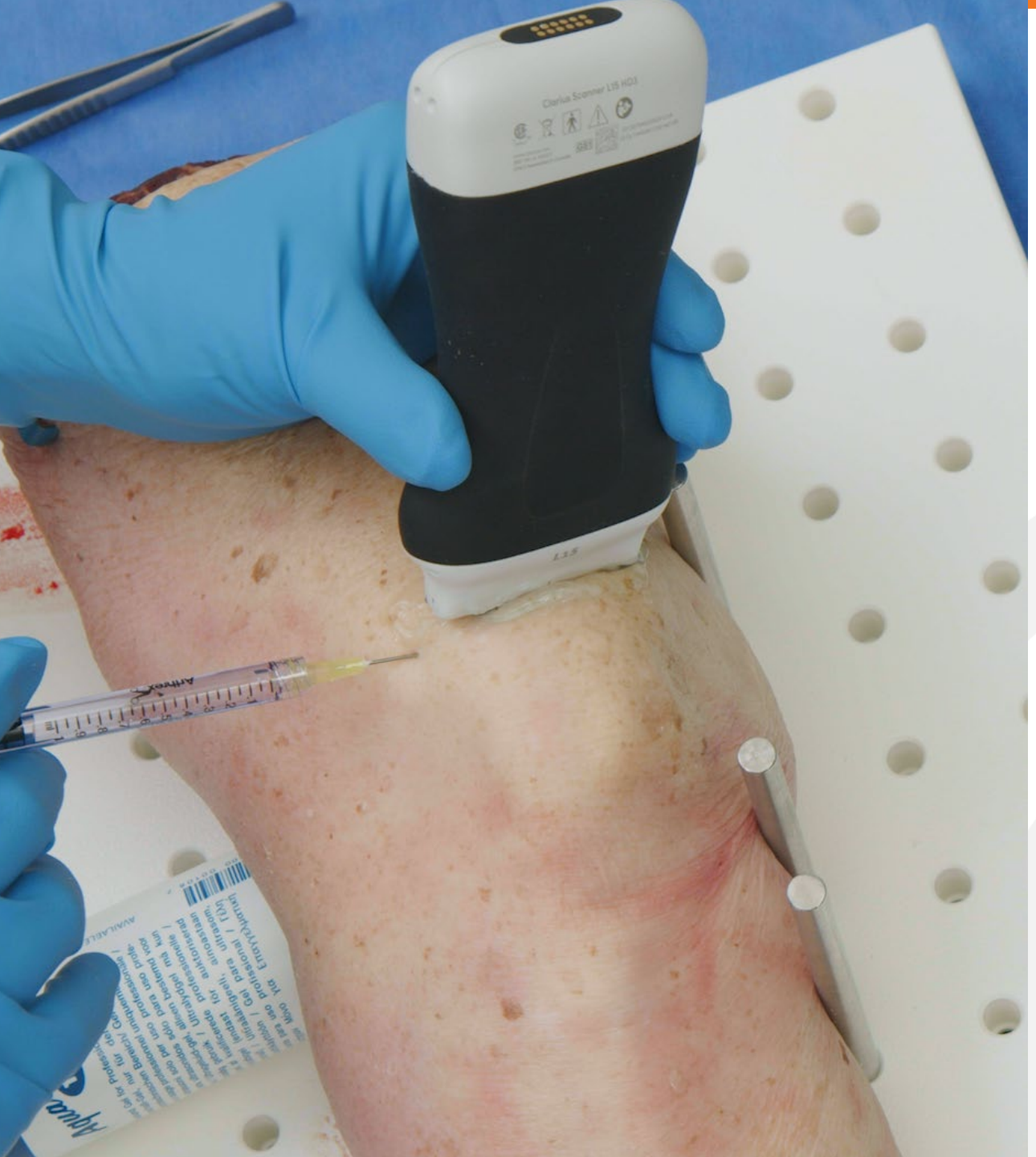

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# Questions

*Dr. Hirahara*

*Dr. Frenkel*

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*Thank you!*

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