WEBINAR

Visualize Your Needle: Ultrasound for Painless and Accurate MSK Injections

October 2021







Your Host



Dr. Oron Frenkel, MD, MS

Emergency Physician & POCUS Educator Chairman, Clarius Medical Advisory Board





Effectiveness of Ultrasound Guidance on Intraarticular & Periarticular Joint Injections



"Intraarticular and periarticular injections using ultrasound guidance significantly improves the accuracy of joint injections, and there is a significant decrease in visual analog scale scores for up to 6 wks after injection."

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/



Accuracy of Blind Versus Ultrasound-**Guided Suprapatellar Bursal Injection**



"US-guided HA injection exhibited a significantly greater accuracy (48 of 50 knees, 96.0%) than blind injection (41 of 49 knees, 83.7%)."

articular injection via the supreputation vi Us-guided injection group and 49 to the pull of the knee joint, a specified injection group and 49 to the pull of 28. PN hyaluronic acid (HA) and contrast dye through the suprapatellar bursa into the knee joint, a specified waterial had 1898 897. Source: https://pubmed.ncbi.nlm.nih.gov/22033897/ radiographic image was obtained in each case to ascertain whether all injected material had 1898 897.

hibited a conficently greater accuracy (48 of 50 knees, 96,0%) the intra-articular space.



Ultrasound-Guided Knee Injections are More Accurate Than Blind Injections

"Injections made by a blind/anatomically guided method had inconsistent accuracy rates that seemed highly dependent on the portal of entry."

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 Versus Blind Subacromial-Subdeltoid Bursa Injection

National Library of Medicine Found 1 result for Ultrasound-guided versus blind subacromial—subdeltoid bu... 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 subacromialsubdeltoid 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 PMID: 26590864 DOI: 10.1016/j.semarthrit.2015.05.011 Objective: This systematic review and meta-analysis aimed to assess the effectiveness of ultrasound-guided (USG) versus blind (landmark-guided, LMG) corticosteroid subacromialles and sconus from database inception SC versus I SG injections for

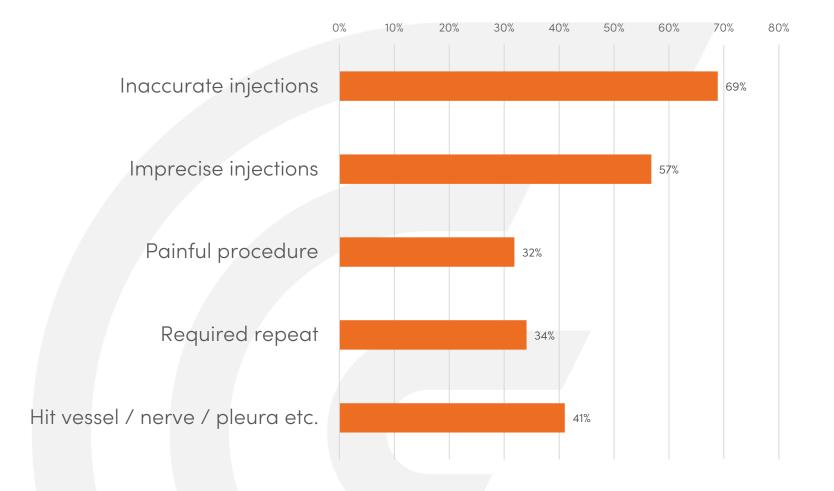
"Ultrasound-guided corticosteroid injections potentially offer a significantly greater clinical improvement over blind SASD bursitis injections in adults with shoulder pain."

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/



Poll

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





Your Expert Guest Speaker



Alan M Hirahara, MD, FRCSC

Orthopaedic Surgery | Sports Medicine



Visualize Your Needle: Ultrasound for Painless and Accurate MSK Injections



Medical Director Sacramento State Athletics

Alan M. Hirahara, M.D., FRCS(C)

Board Certified in Orthopaedic Surgery & Orthopaedic Sports Medicine Specializing in arthroscopic shoulder surgery



Team Physician Sacramento River Cats AAA Affiliate – San Francisco Giants





Disclosures

The following relationships exist:

- Consultant / Royalties / Research & education support
- Consultant
- Medical Advisory Board
 - Stock options
- Committee Member
- Committee Member
- Committee Member

Arthrex Inc.

LifeNet Health, Inc.

Clarius Mobile Health

American Shoulder & Elbow Surgeons Foundation

National Collegiate Athletic Association

Big Sky Athletic Conference

Ultrasound Improves Injection Accuracy

FICTION: Other physicians may miss, but I don't!!!

FACT: Anatomical or landmark based injections often miss their intender lirahara



Society & Agency Recommendations Ultrasound Guided Placement of Central Lines

- US Agency for Health Research & Quality (AHRQ)
 - Shojania et al, 2001
- US Centers for Disease Control & Prevention (CDC)
 (2001)
- UK National Institute for Health Care Excellence (NICE) (2002)



Anesthesiology Ultrasound – "The Standard of Care"

- Nerve blocks
 - Reduces opioid use and need post-op
- Epidurals
- Vascular access or line placement

- Abrahams et al. Ultrasound guidance compared with electrical neurostimulation for peripheral nerve block: a systematic review and meta-analysis of randomized controlled trials. Br J Anaesth. 2009;102(3):408-17
- Beaudoin et al. A comparison of ultrasound-guided three-in-one femoral nerve block versus parenteral opioids alone for analgesia in emergency department patients. Acad Emerg Med. 2013 Jun; 20(6):584-91



Procedural Complications

Central Venous Catheterization

- Van De Bos et al, 2011
- latrogenic pneumothorax
 - Most expensive (Cost US healthcare system \$580 million in 2008)
 - Lengthen hospital stay (4-7 days) with additional cost
 (\$45000/stay, Zhan et al 2004)

- Fragou et al, 2011
 - Ultrasound guided CVC
 - Reduced PTX/HTX rates to0%
 - Vs. 4.9% & 4.4%



Complications of Blind Injections

Chargers QB Tyrod Taylor's lung punctured by team doctor before Chiefs game



OS ANGELES CHARGERS - Published September 23

Chargers' Tyrod Taylor out 'indefinitely' after team doctor accidentally punctures lung: report

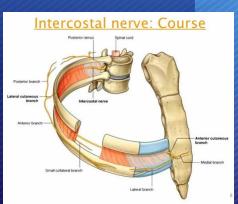
The NFLPA announced Wednesday that it would be investigating the incident

Report: Tyrod Taylor's injury came after Chargers' doctor accidentally punctured his lung



by Jeremy Chua September 23, 2020

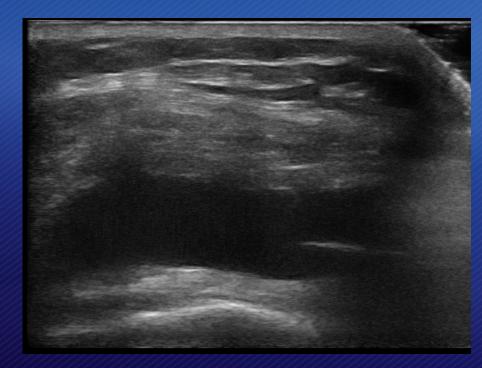






Accuracy of Knee Injections

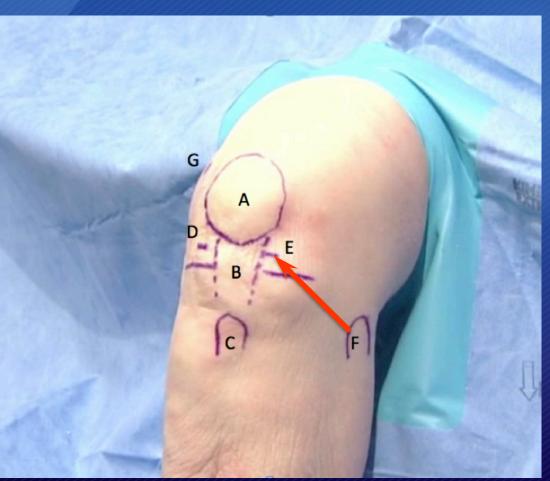
- Jackson et al, JBJS-A, 2002
 - 7-29% of knee injections are NOT intra-articular
- Berkoff et al, Clin Interv Aging, 2012
 - Needle placement accuracy ranges from 39-100%
 - Avg 22.2% miss rate
- Sibbitt et al., J Rheumatol, 2009
 - 43% reduction in procedural pain (p < 0.001)
 - 59% reduction (p < 0.001) in absolute pain scores at
 2 weeks vs. anatomical-guided injections





The Knee Joint

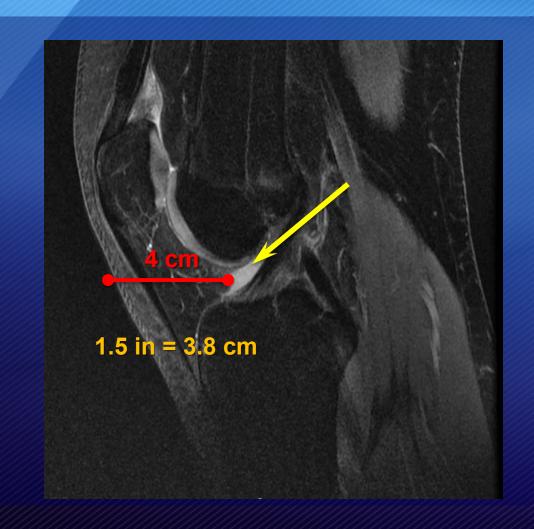






The Knee Joint







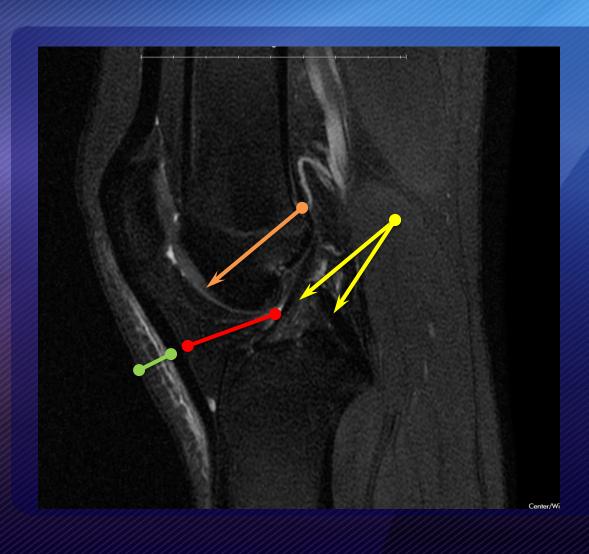
The Joint Space – Painful?







The Joint Space - Painful?



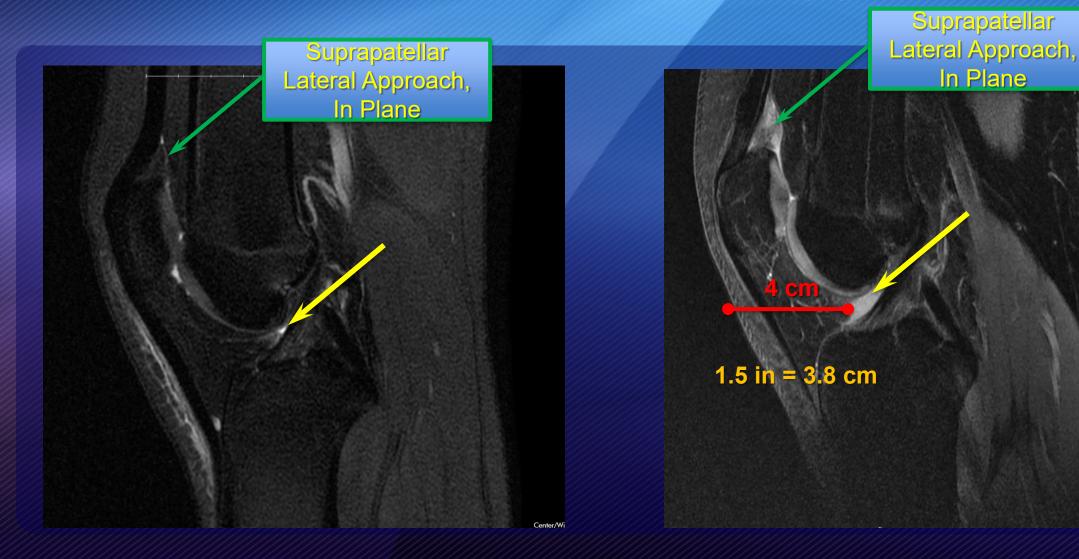
What Could You Hit?

- Getting There:
 - Skin / Subcutaneous Fat
 - Hoffa's Fat Pag

- If you miss:
 - Cruciates
 - Condyles / Cartilage
 - Meniscus



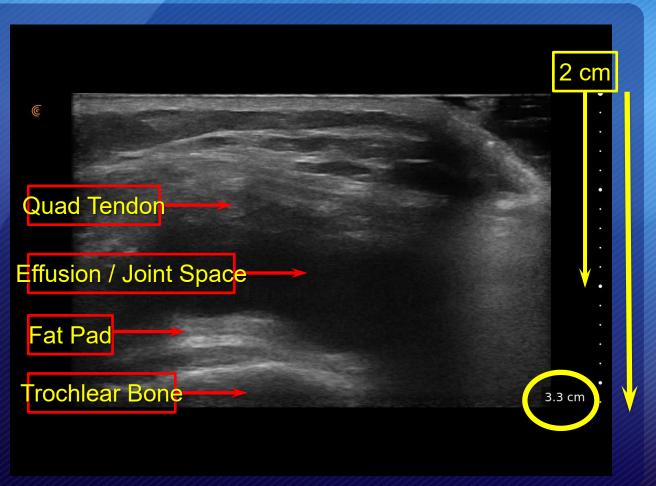
The Knee Joint – My Suggestion





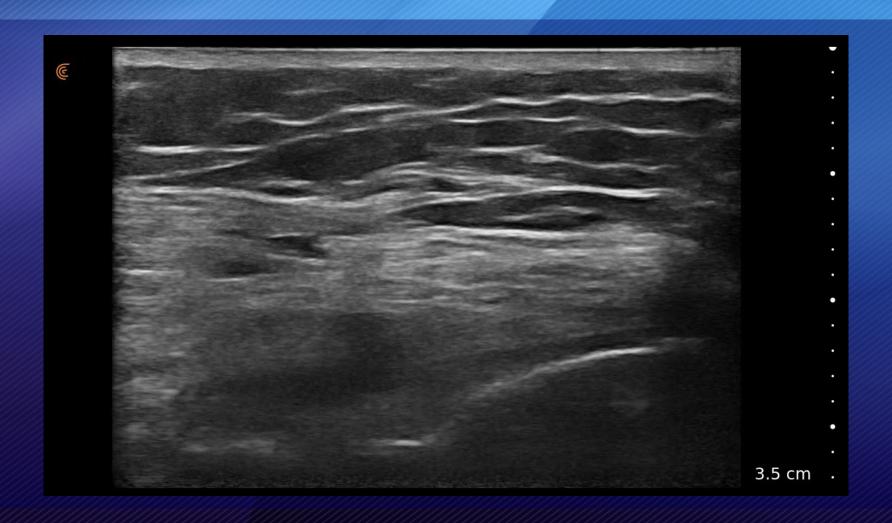
Knee Joint Suprapatellar Injection







Knee Joint Injection No Effusion



Ultrasound Improves Efficiency

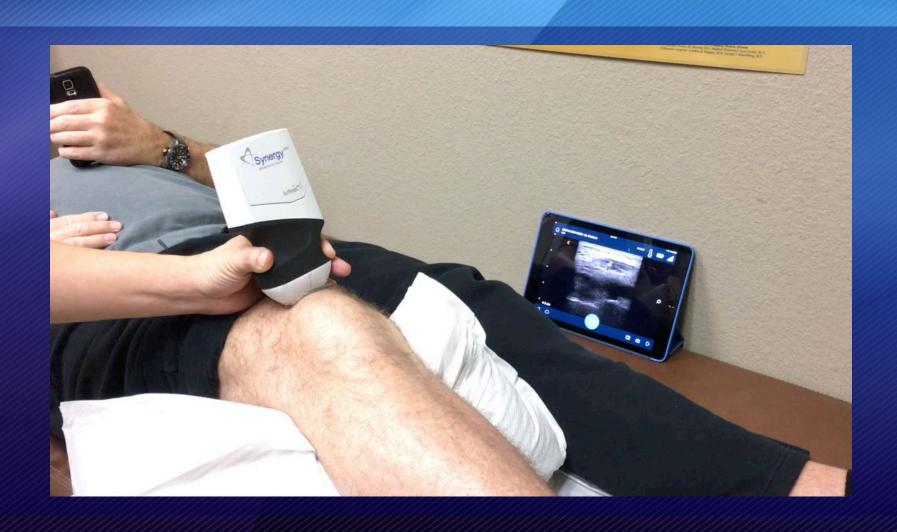
FICTION: Using ultrasound in my office takes too long!!!

FACT: Proper ultrasound incorporation for in office injections adds negligible time and may be more efficient





In Clinic: Injections, No Lost Time!





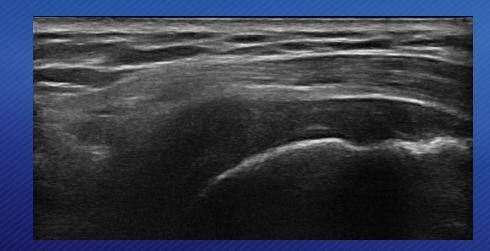
DJD, Intra-articular Hydraluronic Acid Injection





Accuracy of Shoulder Injections

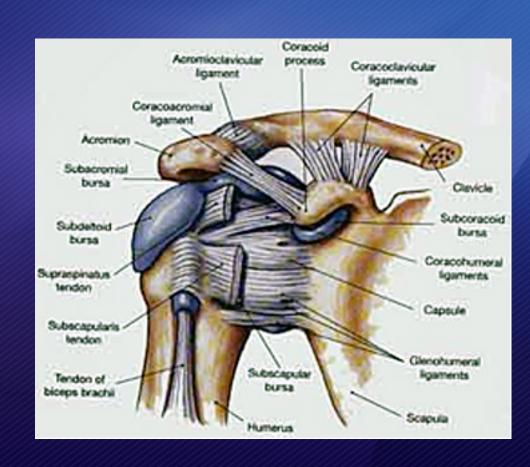
- 30% of injections miss subacromial bursa Experts
 - Eustace et al, Ann Rheum Dis., 1997
 - Yamakado, Arthroscopy, 2002
 - Henkus et al, Arthroscopy, 2006
 - Sethi et al, Orthopedics, 2006

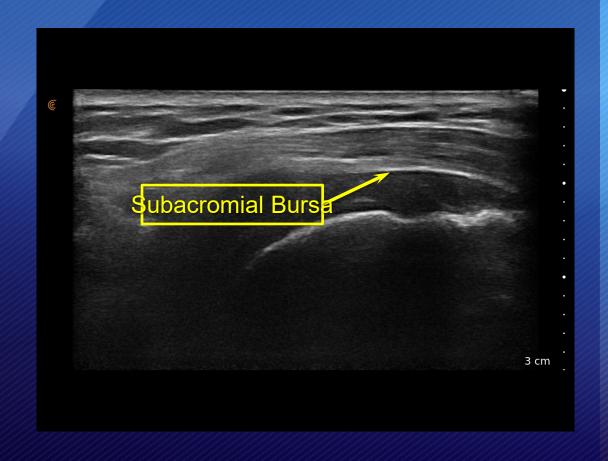


- Naredo et al., J Rheumatol.,2004
 - Randomized cohort (41 patients) to blind vs. U/S guided subacromial cortisone injection
 - VAS (p=0.001) & SFA (p=0.012) sig better in U/S guided group



The Shoulder Subacromial Space

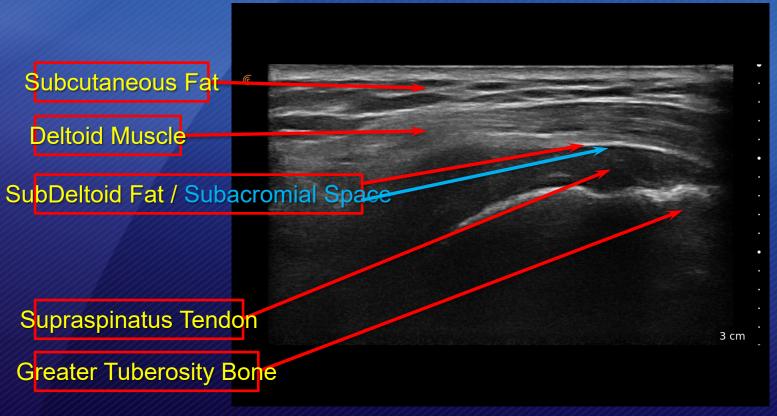






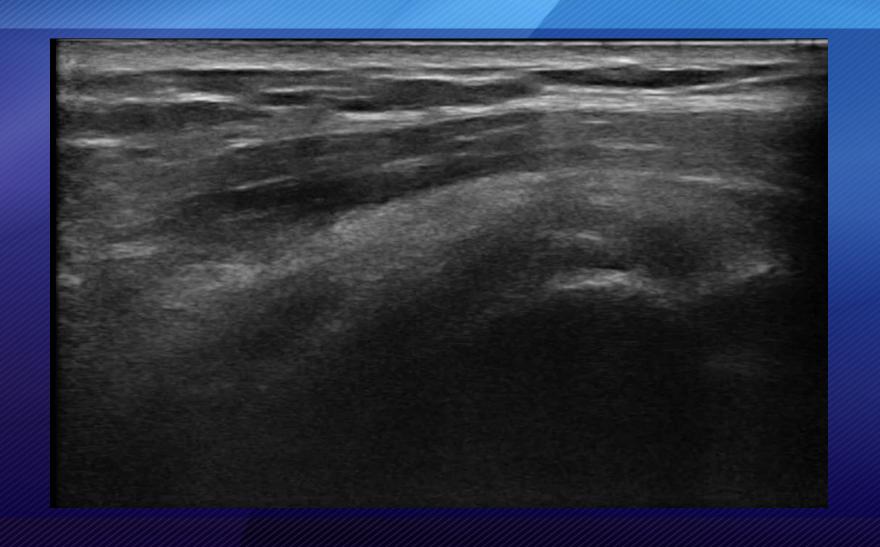
Subacromial Injection





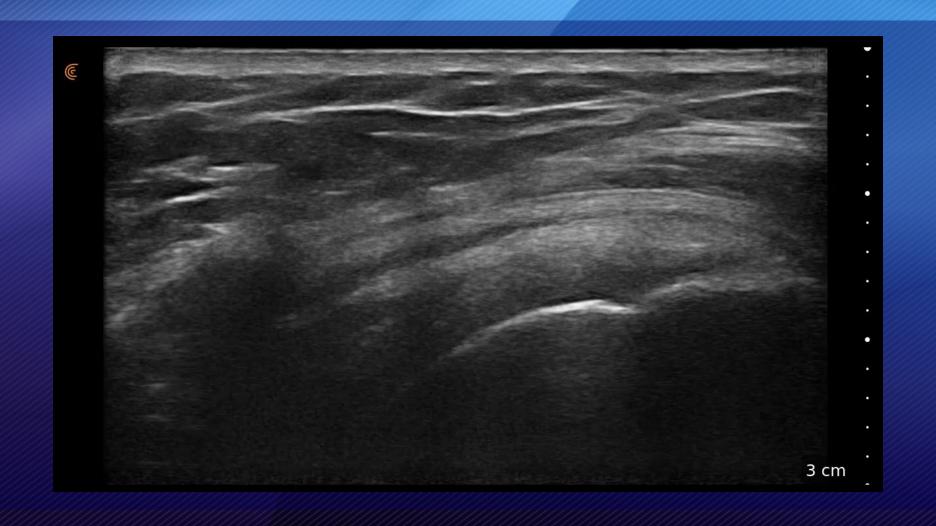


Optimizing the Image





Subacromial Injection



Ultrasound Improves Reimbursement

FICTION: It costs too much!!!

FACT: Billing can be done effectively & implementation will improve reimbursement





Coding & Reimbursement

- A Guide to Ultrasound of the Shoulder Part 1: Coding and Reimbursement
 - Hirahara A, Panero A
 - Am J Orthop, Mar-Apr 2016

Codes to Know

A Guide to Ultrasound of the Shoulder, Part 1: Coding and Reimbursement

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

Abstract

dynamic study that has many advantages over other imaging modalities. Several studies have shown the need for ultrasound during procedures, with significantly improved outcomes and patient satisfaction. Other studies have also shown that ultrasound has medical and economic advantages over magnetic resonance imaging. With the increased use of ultrasound in the

Ultrasound is an inexpensive, easy, mobile, office, operating room, and during athletic competitions, the need for accurate coding is essential. Reimbursement is viable for both radiologists and non-radiologists. In the coming year, "appropriate use criteria" will be introduced and implemented. Physicians need to be prepared and informed of all the necessary requirements and coming changes regarding the use and billing of ultrasound procedures

many years, the technology is underutilized. It has been used primarily by the raciologists and obstetricians-gynecologists. However, orthogodic surcoons and sports medicine doctors are beginning to realize the utility. of this imaging mode ity for their specialties. Ultrasound has classically been used as a

diagnostic tool. This usage is beneficial. to sports medicine specialists for on-field coverage at sports competitions to efficiently evaluate injuries without the need for taking the athletes back to the locker room for an x-ray or magnetic resonance imaging (MRI). Ultrasound can quickly assess for damage to soft tissue, joints, and superficial benefits is its use as an adjunct to treatment. Ultrasound has

been shown to vastly increase the

accuracy of injections and carribe used

techniques or to identify structures that previously required radiation-exposing fluoroscopy of arce incisions to find by feel or eye

Ultraspund is a technic an-dependent modalby The surgeon and physician must become facile with the use of the probe and how ultrasound works. The use of the probe is similar to an arthroscope, requiring small movements of the hand to reveal the best imaging of the tissues. Rather than relying on just the patient's position with an immobile machine, the user nust use the probe position and the placement of ultrasound. Doing so saves time, money, and exposure to dangerous radiation. In a retrospective study of 1012 patients treated over a 10-month period, Sivan and colleagues' concluded that the use of clinic-based musculoskeletal bones. Another of ultrasound's (VSK) ultrasound enables a one-stop approach. reduces repeat hospital appointments, and moroves quality of care.

With the increased use of ultrasound comes the need to accurately code and bill for the

Authors' Disclosure Statement: Dr. Hirahara reports that he receives support from Archrex as consultant fees, royalties, and research support

The American Journal of Orthopedics" March/April 2016

www.amiorthopodics.com

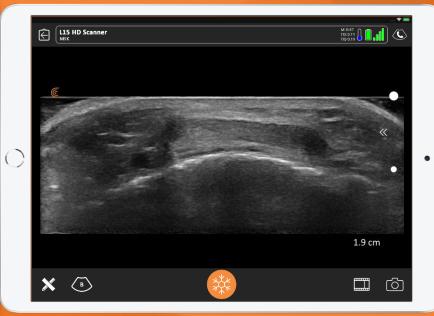


Clarius L15



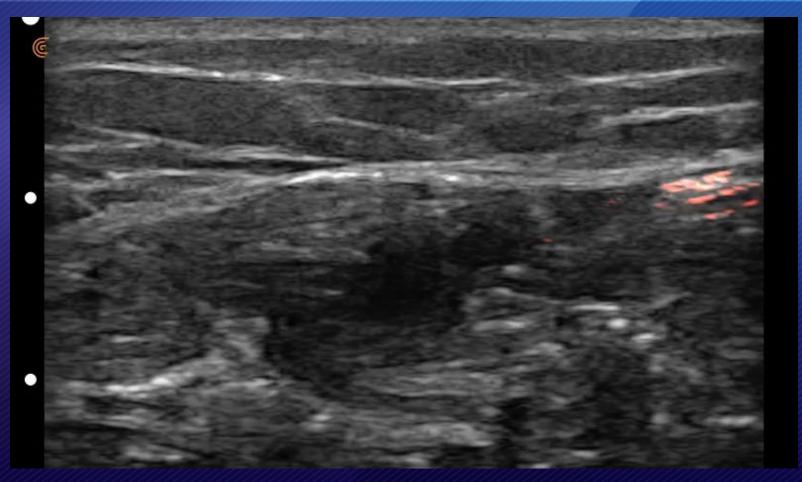
- Handheld
- Wireless
- Use app on iPad or iPhone for display
- Lightweight
- Inexpensive







Needle Enhancement







Tendonopathy / Subacromial Injection Video



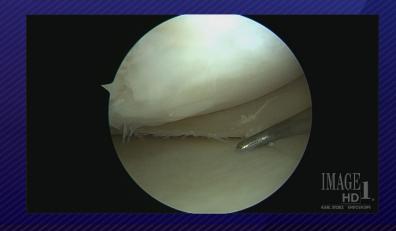
Ultrasound Enhances Treatment Options

FICTION: What I do works & I don't need it!!!



Corticosteroid Risks

- Soften or damage cartilage
- Weaken or rupture tendons
- AVN or thinning of bone
- Increase risk of infection



- Diminish activity of immune system
- Temporary increase blood sugar
- Soft tissue (fat) atrophy
- Crystal deposition
- Steroid flare
- Hypopigmentation
- Thinning of skin or soft tissue (locally)



Negative Effect of Pre-operative Cortisone Injections on

RCR Outcome & Increased Risk of Revision

- Agarwalla et al, Arthroscopy, 2019
- Desai et al, Arthroscopy, 2019
- Forsythe, JBJS-Am, 2019
- Lee et al, KSSTA, 2015

- Maman et al, AJSM, 2015
- Traven et al, Arthroscopy, 2019
- Weber et al, Arthroscopy, 2019
- Werner et al, AANA Abstract, 2018

Number and Timing of Injections & Risk of RCR Revision

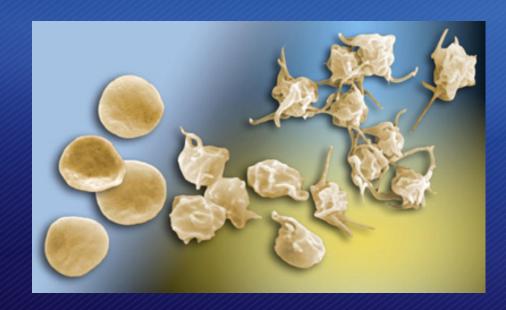
- Single injection elicits small risk of revision
- Injections closer to time of index RCR places patients at higher risk
- 2 or more injections places patients at significant risk of revision

- Desai et al, Arthroscopy, 2019
- Forsythe et al, JBJS-Am, 2019
- Traven et al, Arthroscopy, 2019
- Weber et al, Arthroscopy, 2019
- Werner et al, AANA Abstract, 2018



Platelet Rich Plasma

- PRP in the literature, first described
 - O'Brien et al, J Clin Pathol, 1969
- PRP first reported use following an open heart surgery
 - Ferrari et al, 1987
- Exogenous fibrin clot for meniscal repair
 - Arnoczky & Warren, 1988
- Ophthalmology uses PRP
 - Kelly et al., 1989
- Dental community uses PRP in oral surgery
 - Marx, 1998
- FDA Approves PRP for use in the US in 1999





Basic Science Research

- Augments proliferation of tenocytes, osteoblasts, myocytes
 - Mazzocca 2012
- Diminishes inflammation
 - Bendinelli 2010, van Buul 2011, Wu 2011, Pereira 2013, Fortier 2014, Mazzocca 2015
- Diminishes pain
 - Lee 2012, Fortier 2014
- Augments HA secretion
 - Anitua 2007, Fortier 2014
- Augments stem cell migration & proliferation
 - Kakudo 2008, Zaky 2008, Drengk 2009, Mishra 2009, Kruger 2012, Moreira 2012, Murphy 2012, Hildner 2013



Level I Evidence PRP in DJD

PRP Superior to Hyaluronic Acid

- Cerza et al, AJSM 2012
- Sanchez et al, Arthroscopy 2012
- Vaquerizo et al, Arthroscopy 2013
- Chang et al, ACRM, 2014 (Meta-analysis)
- Cole et al, Preliminary data 2014

PRP Superior to Placebo

- Patel et al, AJSM 2013
- Chang et al, ACRM, 2014 (Meta-analysis)
- Smith et al, Preliminary data 2014



Level I Evidence PRP in Patellar Tendinopathy & Partial RC Tears

Dragoo et al, AJSM, 2014

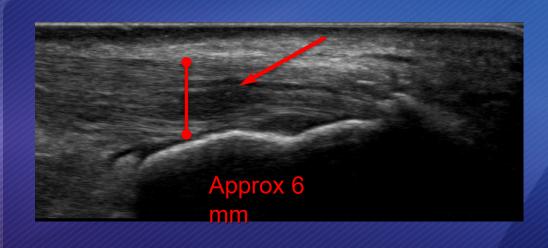
- 23 patients, RCT
- Patellar tendinopathy
- US-guided PRP-LR/needling vs dry needling alone
- 12 wk f/u
 - PRP with significantly better VISA score
 - 25.4 improved vs 5.2 with needling alone
- No treatment failures in PRP group

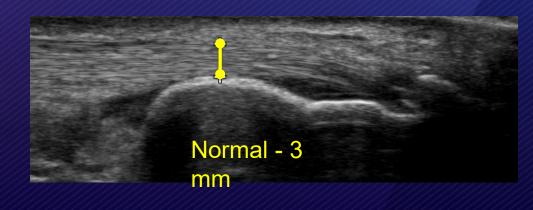
Kwong et al, Arthroscopy, 2020

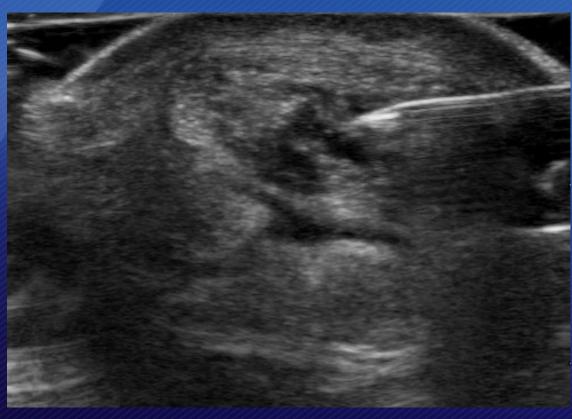
- 99 patients, Double blinded RCT
- Partial rotator cuff tears
- US-guided cortisone vs PRP
- @ 3 mos, PRP sig imp over cortisone
 - VAS (-13.6 vs. 0.4, p=0.03)
 - ASES (13.0 vs. 2.9, p=0.02)
 - WORC (16.8 vs. 5.8, p=0.03)
- No difference @ 1 yr



Achilles Tendinopathy (July 18, 2018)

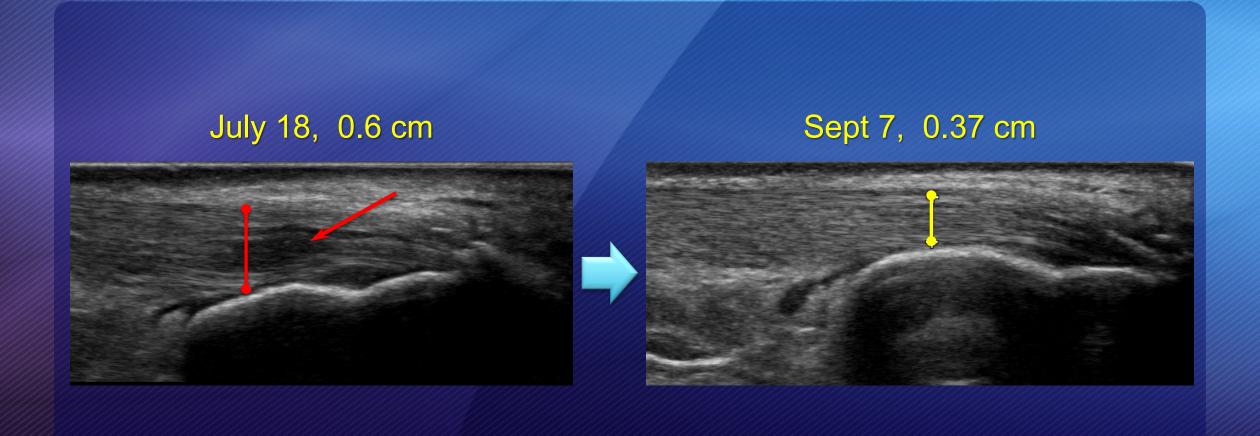








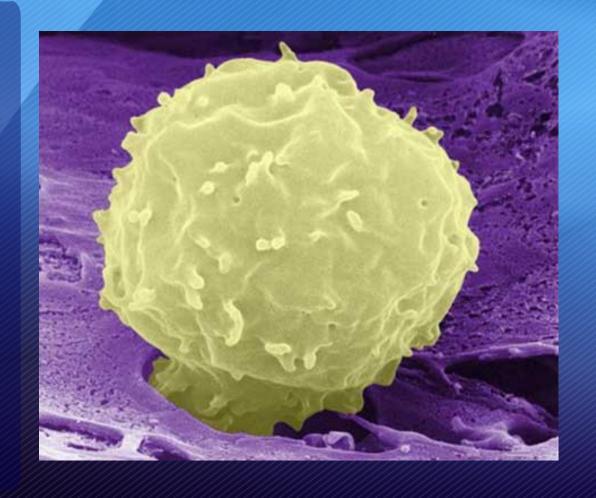
6 Weeks after PRP Injection





Stem Cells Proliferation & Migration Significantly Increased with PRP

- Kakudo et al, Plast Recontr Surg 2008
- Zaky et al, J Tissue Eng Regen Med 2008
- Drengk et al, Cells Tissues Organs 2009
- Mishra et al, Tissue Eng Part C Methods2009
- Kruger et al, J Orthop Res 2012
- Moreira Teixeira et al, Biomaterials 2012
- Murphy et al, Biomaterials 2012
- Hildner et al, J Tissue Eng Regen Med2013





MRI Analysis of Pelvis

- Hirahara, Panero, Andersen
 - AJO, 2018

- Purpose: Find the ideal entry point & approach angle for BMA from the PSIS
- MRI's from 13 males / 13 females



AJO The American Journal of Orthopedics

An MRI Analysis of the Pelvis to Determine the Ideal Method for Ultrasound-Guided Bone Marrow Aspiration from the Iliac Crest

Publish date: May 30, 2018

Alan M. Hirahara, MD, FRCSC Alberto Panero, DO Wyatt J. Andersen, ATC Author Affiliation | Disclosures

Authors' Disclosure Statement: Dr. Hirahara reports that he receives support as a consultant to Arthrex; receives royalties and research support as a consultant to LifeNet Health, Inc; and serves as a medical advisor for Clarius Mobile Health. Dr. Panero reports that he receives support as a consultant to Arthrex; and is a speaker for Tenex, Inc and Lipoqems. Mr. Andersen reports no actual or potential conflict of interest in relation to this article.

Dr. Hirahara is an Orthopedic Surgeon, private practice, Sacramento, California. Dr. Panero is a Physical Medicine and Rehabilitation Physician, private practice, Sacramento, California. Mr. Andersen is an Athletic Trainer and Research Assistant, Sacramento, California.

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Am J Orthop. 2018;47(5). Copyright Frontline Medical Communications Inc. 2018. All rights reserved.

Take-Home Points

- There is an ideal angle and distance for optimization of a bone marrow harvest from the iliac crest.
- Ultrasound is a reliable technology that allows clinicians to accurately and consistently identify the PSIS and avoid neurovascular structures.
- This safe, reliable bone marrow aspiration technique can lower the risk of serious potential complications.
- The ideal angle does not differ significantly between sexes, but the safe distance a clinician can advance does.
- The PSIS should be considered a "table" as opposed to a protuberance.

The lilac crest is an effective site for harvesting bone marrow stem cells. It allows for easy access and is superficial in most individuals, allowing for a relatively quick and simple procedure. Use of mesenchymal stem cells (MSCs) for treatment of orthopedic injuries has grown recently. Whereas overall use has increased, review of the literature reveals very few techniques for lilac crest aspiration, but these are not based on anatomic relationships or studies. Herniquo and colleaques a attempted to quantitatively evaluate potential "sectors" allowing for safe aspiration using cadaver and computed tomographic reconstruction imaging. We used magnetic resonance imaging (MRI) to analyze aspiration parameters. Owing to the illum's anatomy, improper positioning or aspiration extendique during aspiration can result in serious injury.** We hypothesized that there is an ideal angle

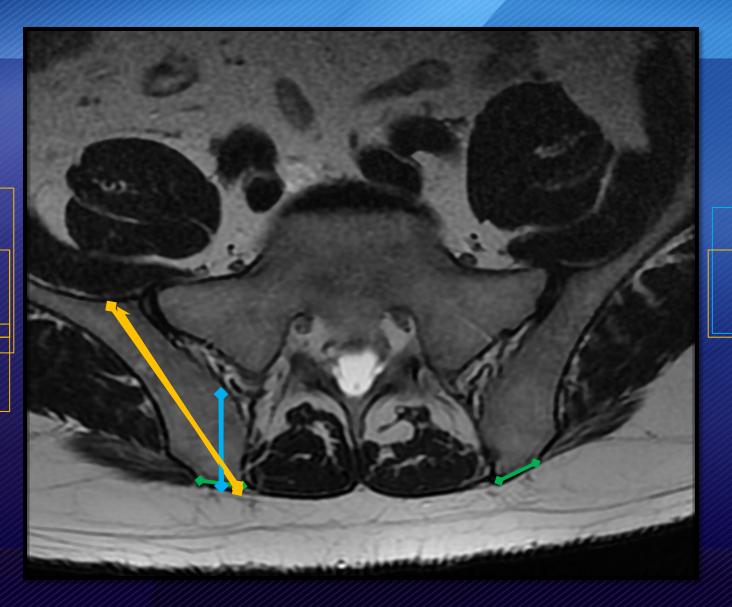
www.amjorthopedics.com

Jun 2018 The American Journal of Orthopedics ©



Bone Marrow Aspiration from the PSIS

Approach Angle:
Entering at
Approach Angle:
Entering Media
Associated 6535-8.8
Actual Approach
Angle: 23.98°



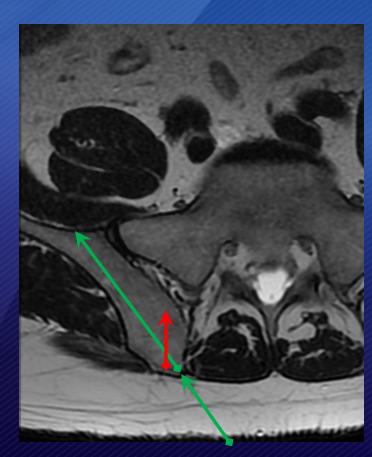
Entering

Regrestable what the PS150864cm



Pearls to PSIS Bone Marrow Aspiration

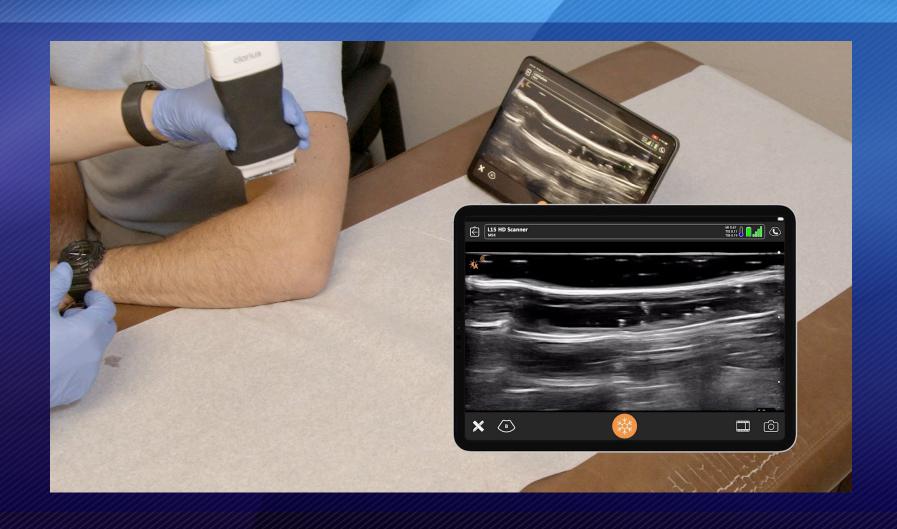
- Use ultrasound
- Find medial aspect of PSIS
- Angle 24° lateral
- Avg distance to anterior wall
 - 6.74 cm (♀) & 7.53 cm (♂)
- Perpendicular: 3.2 cm







Intra-tendonous / Lateral Epicondylitis Video





Tips / Tricks

- Optimize your image
 - Will improve your needle
 - Stay perpendicular as possible
 - Look at the bone
- Pre-plan approach
 - Use doppler
 - Measure depth / Needle length

Go to a course or site visit



Ultrasound Takes It Up a Notch!

- Significantly improve accuracy
- Improve patient satisfaction
- Improve office workflow
- Improve reimbursement

- Add orthobiologics to your paradigm
 - Diminish cortisone use
 - Treat more pathology nonsurgically



How Can You Get This Info?

- HiraharaMD.com
- Youtube.com/HiraharaMD
- Slideshare.net/HiraharaMD

References:

- Hirahara, Panero. A guide to ultrasound of the shoulder, Part 1: Coding & reimbursement. Am J Orthop. 2016 Mar-Apr;45(3):176-82.
- Panero, Hirahara. A guide to ultrasound of the shoulder, Part 2: The diagnostic evaluation. Am J Orthop. 2016 May-Jun;45(4):233-8.
- Hirahara, Panero. A guide to ultrasound of the shoulder, Part 3: Interventional & procedural uses. Am J Orthop. 2016 Nov-Dec;45(7):440-5.

Thank You!





5 Ways POCUS Can Help Your Practice

- 1. Optimize injection accuracy for improved patient safety.
- 2. Increase precision for consistent relief with every procedure.
- 3. Reduce risks and costs by lower volumes of medication.
- 4. Enhance patient confirm with less painful procedures.
- 5. Improve patient satisfaction and referrals.





Needle Enhance Demo







Dr. Kenneth Craig S Vincent, DPM; FACFAS; PGDip.

MSK Regenerative & Functional MotorControl Restoration

66 The use of ultrasound at the point of care is essential and valuable. Clinicians in sports medicine, physical therapy and general practice should be equipped with a Clarius given its price point. Immediate access to ultrasound imaging helps reaffirm the primary assessment of patients improving clinical decisions and reporting. It is simultaneously a great education tool that enhances patient interaction & the clinical experience. 99







Needle Enhance Demo







Clarius L15 HD

- Wireless Handheld
- High-Definition Image
- Easy & Affordable
- No Subscription
- Free Clarius Cloud
- Unlimited Users



Questions



Dr. Hirahara



Dr. Frenkel





Thank you!

