Ultrasound Guided Injections
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Disclosures

- Relevant Financial Relationship(s)
  - None
What is ultrasound guided injections?

- Injections are traditionally given "blind" or now known as “injection by palpation” and “clinically examination injection.” Which required the physician to have a certain degree of experience and surface anatomy competency.

- Ultrasound guided injections helps the physician to visualize the needle in real time as it enter the body.

- Ultrasound guided injections will show the physician the needle's location as it reaches to the desired location for the injection.
What is ultrasound guided injections?

- The ultrasound guidance also allows the physician to visualize fluids to see the medication is being distributed or if the fluid that needs to be removed.

- The transducer is placed near or adjacent to the targeted tendon, bursas, nerve, or joint. When the physician has identified the anatomic landmarks on the screen, the injection will be delivered using a standard sterile needle and syringe.

http://bentfleetphysiotherapy.co.uk/wp-content/uploads/2017/12/injection-arrows.png
Why use ultrasound?

- No radiation
- The patient failed injection by palpation
- Avoid neurovascular structures
- Assess anatomy/pathology
- Great tool for regenerative medicine
Ultrasound vs. Fluoroscopy

- **Ultrasound**
  - No radiation.
  - No need for contrast agents.
  - Visualization of soft tissues, nerves, and blood vessels.
  - Patient’s body habitus can limit the view.
  - Can not visually pass bones.
  - Difficult to master.

- **Fluoroscopy**
  - See bones very well.
  - Patient’s body habitus does not limit the view.
  - No visualization of soft tissue, nerves, and blood vessels without contrast.
  - Easier to master.
Ultrasound Tools

FIGURE 1-1  Transducers. Photographs show linear 12-5 MHz (A), curvilinear 9-4 MHz (B), and compact linear 15-7 MHz (C) transducers.
Ultrasound Basics

FIGURE 1-2 Transducer positioning. A and B, Photographs show that the transducer is stabilized with simultaneous contact of the transducer, the skin surface, and the examiner’s hand.
Ultrasound Basics

Ultrasound Basics

Figure 9-1 Needle guidance: in plane. A, Image shows that needle is parallel to the transducer and in plane with sound beam. B, Ultrasound image shows needle (arrows) in plane with sound beam. Note posterior reverberation artifact when needle is perpendicular to sound beam.
Ultrasound Basics

**FIGURE 9-2** Needle guidance: out of plane. A, Image shows that needle is 90 degrees to transducer axis or crossing the plane of the sound beam, which results in (B) a hyperechoic focus (arrow) and reverberation artifact at ultrasound. Note that it is unclear whether B shows the needle tip or shaft.
FIGURE 9-8 Oblique needle orientation. Photograph (A) shows needle oblique to transducer sound beam producing (B) a short segment of the needle (arrows) visible at ultrasound.
Ultrasound Basics

**FIGURE 9-3** Needle entry site: flat versus curved surface. Illustrations show (A) needle entry over the flat surface of an extremity, which results in oblique orientation of needle relative to sound beam. Needle entry (B) over the curved surface allows the puncture site to be farther from the transducer and the needle orientation perpendicular relative to sound beam. A similar arrangement can be obtained (C) by moving the transducer away from the puncture site using heel-toe maneuver to deform the overlying soft tissues. (Adapted from illustrations by Carolyn Nowak, Ann Arbor, Mich; http://www.carolyncnowak.com/MedTech.html.)
Ultrasound Basics: Anisotropy

- **Anisotropy** is an artifact encountered in ultrasound. It notably occurs in muscles and tendons during a msk ultrasound scans. In musculoskeletal applications, the artifact may prompt an incorrect diagnosis of tendinosis or tendon tear.

- This anisotropic effect is dependent on the angle of the insonating beam. The maximum return echo occurs when the ultrasound beam is perpendicular to the tissue. Decreasing the insonating angle on a normal tendon will cause it to change from brightly hyperechoic to dark hypoechoic image. If the angle is then increased, the tendon will again appear hyperechoic.

- If the artifact causes a normal tendon to appear hypoechoic, it may falsely lead to a diagnosis of tendinosis or tear.
Ultrasound Basics

FIGURE 9-7 Needle anisotropy and beam steering. Ultrasound image with needle oblique to sound beam shows (A) poor visualization of needle (arrows) due to anisotropy. The use of beam steering (B) will direct the sound beam perpendicular to needle, eliminating anisotropy and increasing echogenicity of needle (arrows).
FIGURE 9-4 📸 Skin marking: freehand direct in-plane approach. A and B, Photographs show the transducer positioned between the X at site of needle insertion and a line defining the transducer position and imaging plane.
Ultrasound Guided Injection Techniques

- Standard injections
- Needle aspiration
- Anesthesia regional blocks
- Percutaneous needle tenotomy
- Barbotage
- Hydrodissection
Standard Injection Techniques

https://www.americanhipinstitute.com/non-surgical-regenerative-medicine.html
Needle aspiration
Anesthesia regional blocks

Anesthesia regional blocks

https://anesthesiaexperts.com/uncategorized/12926/
Percutaneous needle tenotomy

https://www.beaconortho.com/blog/percutaneous-needle-tenotomy-2-2/
http://www.ijri.org/article.asp?issn=0971-3026;year=2012;volume=22;issue=4;spage=284;epage=292;aulast=Singh
Hydrodissection
Hydrodissection

https://anesthesiaexperts.com/uncategorized/12926/
Sacroliliac Joint Injection

Caudal Epidural

https://link.springer.com/chapter/10.1007/978-1-4939-7754-3_13

https://www.semanticscholar.org/paper/A-Comparison-of-Two-Techniques-for-Caudal-The-of-of-Doo-Kim/ebaq2c846afd1288fe9d76e26a9ef1c1019a38c5/figure/0
Cervical facet ultrasound injections

Lumbar facet ultrasound guided injection

“PTSD Shot” Stellate Ganglion Block

https://www.dovepress.com/cr_data/article_fulltext/s197000/197139/img/JPR_A_197139_O_F0006g.jpg
Horner’s Syndrome after a stellate ganglion block

https://drseanmulvaney.com/stellate-ganglion-block-procedure
Is ultrasound guidance injection any good?

A randomized, double-blind, controlled study of ultrasound-guided corticosteroid injection into the joint of patients with inflammatory arthritis†

Joanna Cunnington, Nicola Marshall, Geoff Hide, Claire Bracewell, John Isaacs, Philip Platt, David Kane

First published: 29 June 2010 | https://doi.org/10.1002/art.27448 | Cited by: 9

† ISRCTN: 75459849.
Is ultrasound guidance injection any good?

- **Results**
  - One-third of CE-guided injections were inaccurate.
  - US-guided injections performed by a trainee rheumatologist were more accurate than the CE-guided injections performed by more senior rheumatologists (83% versus 66%; \(P = 0.010\)).
  - There was no significant difference in clinical outcome between the group receiving US-guided injections and the group receiving CE-guided injections.
  - Accurate injections led to greater improvement in joint function, as determined by VAS scores, at 6 weeks, as compared with inaccurate injections. Clinicians who used US guidance reliably assessed the accuracy of joint injection (\(P < 0.001\)), whereas those who used CE guidance did not (\(P = 0.29\)).

- **Conclusion**
  - US guidance significantly improves the accuracy of joint injection, allowing a trainee to rapidly achieve higher accuracy than more experienced rheumatologists. US guidance did not improve the short-term outcome of joint injection.
References