Interventional Neuromuscular Ultrasound

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Disclosures

• I do not have any financial disclosures.
• I would like some.
• I am an advocate for liberal use of triamcinolone, lidocaine, and phenol.
• I have not been contacted by their speaker’s bureau. Waiting...

Objectives

• Define Interventional Neuromuscular Ultrasound
• Technical aspects of interventional ultrasound
• Indications for ultrasound guided interventions
• Description of interventions
• Billing/Pearls/Vingettes
• Discussion and questions

Neuromuscular Ultrasound

“Neuromuscular ultrasound is an emerging diagnostic subspecialty field that focuses on primary diseases of nerve and muscle. It is distinct from musculoskeletal ultrasound, which focuses on traumatic and degenerative changes of tendons and synovial joints.”


NMS Ultrasound

• Neuromusculoskeletal Ultrasound (NMS US)
Types of Procedures

- US-guided regional anesthesia
- US-guided biopsy of nerve lesions
- US-guided therapy with therapeutic agents such as corticosteroids


Current Controversies in Injection Therapy

- What are we treating?
- Are we always treating the inflammation?
- Are there subgroups who respond better?
- What medications?
- What dosage?
- Aseptic venue?
- Timing of injection?

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  - Pearls

Indirect versus Direct Guidance

- Indirect
  - Mark the site
  - Not real time guided
- Direct
  - Real time guided

- How useful is the confirmation of placement of the injection by imaging?
Approaches

In plane

Anisotropy in Ultrasound Interventions

Example of “stand off”

Out of plane

Disadvantages of Out of Plane

“Walking Down” out of plane

Superficial versus deep structures

Pearl: Needle Tracking
- Adjust the transducer position
- Adjust the needle position
- Always keep the tip of the needle in view

Needle tracking techniques
- Caffeine tremor
- Doppler

Needle Tracking Techniques: Beam Steering

Equipment for Interventional Neuromuscular Ultrasound

Equipment: References
Equipment: Echogenic Needle

Ergonomics

Do a screening scan and mark the site of needle entry
  • Turn on doppler to avoid blood vessels
  • Choose the approach that has the least distance between the skin and the target

Probe Cover
**Injection Tray**

**Pearl**
- Keep the needle out of the view of the patient
- Have the patient lay down
  - Especially true of tattooed muscular marines

**PVP Prep**

**Drape**

**Coupling**

**Pearl**
- Always have another person in the room when you are doing these interventions
  - Can assist when you forget things
  - Turn off lights
  - Hit the freeze button so you can capture the image
  - Adjust settings
  - Distract the patient for you
Vapocoolant Spray

- Don’t spray vapocoolant on the transducer directly
- This is important

Pearl

- Inject local anesthetic (with small gauge), then inject medication

Other anesthetic options

- Lidocaine wheel (27 gauge ½ inch)
- Vapocoolant alone
- 1:2:3 POKE
  -(Poke them on 2)
- None (not recommended)

Pearl

- Use the fingers not holding the probe to maintain contact with the skin

Pearl

- Make sure that you know which side the needle is coming in from

Practicing Interventions
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Pearl
Practice on cadavers first, if possible

A Perfect Hit!
Advantages of ultrasound guided interventions

- Allows patient to “see” the pathology
- Allows provider to assess anatomy
- Superior soft tissue resolution
- Helpful in high risk populations
  - Anticoagulation
- Helpful when radiation is contraindicated
  - Pregnancy

Ultrasound Guided Carpal Tunnel Injection: Indications

- Failed non-guided injections
- Increased pain/paraesthesia after non-guided injections
- Post-carpal tunnel release with persistent symptoms
- Anticoagulated states
- Patient or physician preference


Carpal Tunnel Injection: Contraindications

- Absolute
  - Adverse reaction to corticosteroid or local anesthetic
  - Patient does not want an injection
  - Active systemic or local infection
  - Compromised skin integrity over the wrist
- Relative
  - Planned electrodiagnostic study (debatable)

Carpal Tunnel Injection: Medications and Needles

- 1 mL 1% lidocaine
- 1 mL (40mg) triamcinolone
- 27 gauge ½ needle
- 6mg celestone???

Peters-Veluthamaningal et al. 2010

- 69 patients with carpal tunnel syndrome
- Randomized into triamcinolone or saline injection
- Triamcinolone group had better outcomes than control at one week
- Those who didn’t respond, got bailout treatment
- 49% of the responders had recurrences

Blind injection efficacy

Peters-Veluthamaningal et al. BMC Family Practice 2010, 11:54
Description of the ulnar approach

- Patient positioned supine with slight supination and wrist in dorsiflexion
- Evaluate for volar ganglion cysts, flexor tendon tenosynovitis, and tumors


Ulnar Approach: Anatomy

35 year old policeman with wrist pain and numbness

- 2 month history carpal tunnel syndrome
  – Impairment
- Difficulty with repetitive hand motions
  – Activity Limitation
- Difficulties with subduing suspects with baton
  – Participation Restriction
- Was still able to discharge firearm
  – Adaptation to disability

Inferior Margin

Superior Margin
Role of subsynovial connective tissue in Carpal Tunnel Syndrome


Anatomic Variation: Bifid Median Nerve

Anatomical Variation: Aberrant Ulnar Artery

Aberrant Ulnar Artery

Lateral Femoral Cutaneous Nerve
Painful stump neuroma

Pearl

Ultrasound “Tinel’s Sign”

Chipman JN, Mott RT, Stanton CA, Cartwright MS

Be Careful!


Piriformis Syndrome

Experimental Procedures

- Percutaneous Needle Release of the Carpal Tunnel
- Injection of the Ulnar Nerve at the Elbow
- Cervical Procedures

Percutaneous "Ligamentomy"

PMR 2010 2: S35
ECU Ultrasound Laboratory Protocol for Ultrasound Guided Percutaneous Needle Release of the Carpal Tunnel

1. Put wrist in extension
2. Mark site of entry proximal to ligament
3. Raise Lidocaine Wheel
4. Anesthetize tract with 27g
5. Fluid dissect
6. Fenestrate with 22g
7. Inject 20mg kenalog
**Anesthetize and begin fluid dissection**

**Continue Fluid Dissection and begin fenestration with a 27 gauge**

**Continue Fenestration with a 22 gauge**

**Short Axis View**

**Last Step**

- Apply Bandaid

**Patient Email 24 hours later: Pain Gone**

“I just wanted to let you know that I am doing very well after yesterday’s procedure. I am a little bruised on my wrist, with a little tenderness or tingling in my thumb and forefinger. Everything else is perfect! I stayed at home all yesterday, but I am back to work today”
Patient 48 hours later

- Didn’t wake up last night with pain in my hand
- (Previously had woken up about 10 times per night)

Injection of the Ulnar Nerve at the Elbow

\[\text{Alblas CL et al. Injection with corticosteroids (ultrasound guided) in patients with an ulnar neuropathy at the elbow, feasibility study.} \text{ Eur J Neurol. 2012 Feb 16.}\]

\[\text{Figure 1 Example of injection of 1 ml methylprednisolone at the thickest part of the ulnar nerve at the elbow.}\]

Cervical Procedures

Be Careful

There are some blood vessels

\[\text{Alblas CL et al. Injection with corticosteroids (ultrasound guided) in patients with an ulnar neuropathy at the elbow, feasibility study.} \text{ Eur J Neurol. 2012 Feb 16.}\]

Word of Caution

\[\text{Cunnington 2010}\]

- 184 patients with inflammatory arthritis
- Randomized to ultrasound guided versus clinical exam guided
- Shoulder, elbow, wrist, knee and ankle
- 83% accurate with US, 66% accurate with clinical exam
- Ultrasound did not improve the short term outcome
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Billing

- 76882: Ultrasound Guided Procedure
- -50 modifier if bilateral
- 20526: Injection Carpal Tunnel
- 64450: “Other” peripheral nerve block
- 64614: “Destroy nerve,” extremity, trunk muscles

CPT 2011
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Final Thought: Practice is key

Thank you for listening

• Questions
• Comments
• Concerns
• Pearls of your own
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