ULTRASOUND GUIDANCE FOR PERIPHERAL NERVE PROCEDURES

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DISCLOSURES

• Member of Muscle and Nerve Editorial Board
• Textbook Royalties from
  Demos Medical Publishing

Introduction to
Musculoskeletal Ultrasound
Getting Started
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Ultrasound Evaluation of Focal Neuropathies
Correlation with Electrodagnosis
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HYDRODISSECTION OF PERIPHERAL NERVES

- Currently little literature support (case reports and anecdotal).
- Ultrasound guided.
- Introduces large volumes for fluid around peripheral nerves to alleviate entrapment.
- Often D5W, NS, steroid, local anesthetic.
- Live visualization, better than surgical field.
- No post-surgical scar.
- Can be performed safely
- Many positive case reports.
- More studies needed.

CASE REPORT:

- 42 year old woman sent for ultrasound evaluation for persistent pain and “RSD” after an ankle contusion 6 months prior.
- Refractory to treatment.
- Clinically sensitive over the superficial fibular distribution
- EDX: Demonstrates absent a very low superficial fibular SNAP amplitude.
ULTRASOUND

Left intermediate branch of superficial fibular nerve injection

Left intermediate branch of superficial fibular nerve injection
ELECTED HYDRODISSECTION
PRINCIPLES OF IMAGING PERIPHERAL NERVES WITH ULTRASOUND IN PRE-SCANNING

• Correctly identify the nerve tissue
• Use good technique
• Know the surrounding anatomy
• Use consistent measurement techniques
• Assess in both short and long axis
• Follow the course of the nerve
US GUIDED INJECTION BASICS

- Pre-plan, pre-scan
- Consider depth of the injection
- Use an oblique standoff when needed
- Understand in-plane vs out-of-plane injections
- Use toggling and heel-to-toe rocking to optimize needle conspicuity
- Be aware of needle reverberation artifact
- Avoid too many moving parts

PRESCAN

Actual depth of image is 3.3 cm

1 cm

2 cm
SUPERFICIAL VS DEEP

STEEP ANGLE
DANGER OF OUT-OF-PLANE

HEEL-TO-TOE ROCK
EFFECT OF HEEL-TO-TOE ROCK

TOGGLE
NEEDLE ARTIFACT

ULTRASOUND GUIDED NERVE INJECTIONS

• Helpful for delivering the injectate (steroid, anesthetic, saline) close to the nerve.
• Allows visualization of the procedure in real time.
• Helpful to avoid vascular structures.
• Can be useful with therapeutic injections, peripheral nerve blocks and hydrodissection.
REMEMBER:

- Accurate identification of the nerve tissue is needed for effective injections.
- Pre-scan the surrounding region for potential areas to avoid and to facilitate the proper approach with the needle.
- Have a straight line between the patient and injection site, and ultrasound screen.
- Do a checklist for all necessary equipment in advance and have it within reach during the procedure.

NERVE SAFETY

- Transducer must be placed perpendicular to the nerve for accuracy.
- Identify the outer epineurium.
- Optimize Focal Zone.
- Optimize Gray Scale Mapping
- Set depth so target takes up majority of the screen.
- Use highest frequency with effective penetration to visualize the nerve.
- Caution with intraneural injections
  - Must avoid injuring the fascicles.
PERIPHERAL NERVE INJECTIONS: GENERAL

- Need to know course and function of the nerve.
- Do adequate pre-scan.
- High frequency linear transducer is used for most nerve injections.
- Most injections will use a short-axis view of the nerve and in-plane view of the needle.
- With hydrodissections, might also use long-axis view of needle.
- Creating a halo around the nerve with injectate will increase conspicuity.
- The patient should be positioned between the ultrasound screen to allow easy visualization of both the needle at the target site and the ultrasound image.

WRONG!
PROCEDURE: GENERAL

- Oblique standoff can help provide direction with superficial injections.
- The injectate used for each procedure is based on the desired intervention.
- Local anesthetics alone in a volume of 1-4 mL are typically used for most nerve blocks.
- Injectable corticosteroids are often used in conjunction with the anesthetic if the goal is longer lasting relief, particularly in the context of entrapment neuropathies.
- The flow of the injectate should always be initiated slowly and watched carefully to insure proper location because of the potential vulnerability of the target.
- Larger volumes of injectate are used for hydrodissection. This can consist of 10 to 15 mL of a combination of normal saline and local anesthetic. Some also use dextrose solution.
STERILE TECHNIQUE

SUPRASCAPULAR NERVE AT SUPRASCAPULAR NOTCH
SUPRASCAPULAR NERVE: INDICATIONS

• For intractable shoulder pain.
• Acutely in post-operative pain.
• Diagnostic trial with anesthetic agent.
• Longer acting agents: steroids, toxic agents such as phenol, radiofrequency ablations
• Drainage of compressive cyst

SUPRASCAPULAR NERVE: ANATOMY AND IDENTIFICATION
SUPRASCAPULAR NERVE: ANATOMY

• Derived from C5 and C6 roots.
• Provides motor function to the supraspinatus and infraspinatus
• External rotation of the shoulder
• Sensory innervation to acromioclavicular and glenohumeral joint

SUPRASCAPULAR NERVE: SCANNING

• Visualized at the suprascapular notch and spinoglenoid foremen.
• Transducer is placed in the same plane as the spine of the scapula.
• Use internal and external rotation (and Doppler) to distinguish the artery and vein.
SUPRASCAPULAR NERVE: PROCEDURE

- Needle: 22 gauge 2.5-3.5 inch
- Patient position: Seated with hand on opposite shoulder or prone with arm hanging off the end of the table.
- Transducer position: parallel to the spine of the scapula over the suprascapular notch.
- Needle approach: medial to lateral or lateral to medial are both effective.
- Target: near the suprascapular nerve at the suprascapular notch. The needle should be directed deep to the superior transverse scapular ligament.
- Avoid: intravascular injection of the suprascapular artery and vein.
- Tip: there is often temporary resistance when passing through the superior transverse scapular ligament.
EXTRINSIC GANGLIA

CONCLUSIONS

- Understanding of basic scanning and imaging techniques is needed for successful use of this modality in performing effective injection techniques.
- Injections around peripheral nerves requires reasonable caution because of the vulnerability of the targets.
- Preparation with knowledge of the course of the nerve and surrounding anatomy, adequate pre-scanning and planning preparation can lead to success.
THANK YOU!