ULTRASOUND GUIDED NERVE BLOCKS

Elizabeth Kwan, MD
UCSF High Risk Emergency Medicine 2014

Instructors
Kristin Berona
Reza Danesh
Sally Graglia
Daniel Kievlan
Starr Knight
Allison Mulcahy
Carmen Partida
Cecily Reynolds
Margaret Salmon
Nate Teismann
Nick Villalon
Dina Wallin

Ultrasound Models
University of Hawaii Manoa School of Nursing
Sonosite
PLAN

• Why use nerve blocks
• Safety
• Technique Femoral and Forearm Blocks
• Focus will be Hands on scanning
  • Femoral Anatomy
  • Forearm Anatomy
  • Nerve Model for injection technique

WHY NERVE BLOCKS?

• Control acute pain, decrease pain meds. Oligoanalgesia
• May prevent need for IV or for sedation: reduce, splint, lacs
• Faster workup, disposition
• Femoral, Forearm: high yield, few complications

takes time to titrate IV pain meds
avoid opiate side effects, especially in elderly
opiates compromise neuro/mental status exam, may cause hypotension
nerve block can provide quick pain relief in multi trauma before off to CT scan
CAVEATS?

• Generally very safe if you take precautions

• Systemic toxicity RARE, from large volume injection into vessel

• Allergies

• Nerve damage 2-4/10,000 without ULS

• Patient selection
  • ALOC, coagulopathic, immunosuppressed, neuro deficit, compartment syndrome

• Communication to patient, consultants: consent, mark skin, chart

SAFETY PRECAUTIONS

• RARE complication: local anesthetic systemic toxicity (LAST) cardiovascular collapse, seizures

• IV O2 Monitor for femoral block, larger volume

• Lidocaine safer than Bupivicaine

• Be aware of Maximum doses

• Have Intralipid (antidote) available for systemic toxicity

<table>
<thead>
<tr>
<th>Anesthetic</th>
<th>Duration</th>
<th>Max dose</th>
<th>Min Toxic dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lidocaine</td>
<td>2h</td>
<td>4.5mg/kg up to 300mg</td>
<td>0.4mg/kg</td>
</tr>
<tr>
<td>Lidocaine w/Epi</td>
<td>4h</td>
<td>7mg/kg</td>
<td></td>
</tr>
<tr>
<td>Bupivicaine</td>
<td>4h</td>
<td>2.5mg/kg up to 175mg</td>
<td>1.6 mg/kg</td>
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<tr>
<td>Bupivicaine w/Epi</td>
<td>8h</td>
<td>3mg/kg</td>
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SAFE INJECTION

• Aim adjacent to, but NOT directly at nerve
• Watch for needle tip
• Inject slowly
• Watch for spread of anesthetic
• Don’t inject if high pressure
• Use epinephrine, watch monitor

Slow controlled injection, while watching spread of anesthetic around nerve
If not seeing spread, may be in blood vessel or not watching needle tip
If feeling resistance/pressure may be in nerve sheath, fascicle--STOP

Can use lidocaine with epinephrine to see early changes on monitor to suggest intravascular injection. May extend duration of anesthesia as well.
ULTRASOUND

- High frequency linear probe
- ULS image is what's directly underneath probe
- Confirm probe alignment
- Nondominant hand holds probe steady-- effortless
- Dominant hand advances needle
- In plane approach safer, easier for beginners

Always check direction of probe is lined up correctly
OPTIMIZING IMAGE

- **Anisotropy**: Nerve best seen perpendicular to probe-- Fan
- Needle best view: parallel to probe, larger gauge, NO AIR
- “Test” injections. Better image as anesthesia spreads
- Not seeing needle? May not be perfectly in plane

SETUP

- Comfort: yours and patient’s
- Able to see screen and needle without turning head
- Sterile prep: chlorhexadine or betadine, sterile gloves
- Tegaderm, Glove, or Probe cover
- In plane approach to see needle tip

Prime needle with anesthetic so NO AIR injected -- will ruin ultrasound view
“3 IN 1”
FEMORAL NERVE BLOCK

- Fracture Dislocation Hip, Femur, Patella. Soft tissue anterior thigh
- “3 in 1” femoral, obturator, lat femoral cutaneous, not 100%
  - Proximal spread within nerve sheath
  - Pressure distally, dilute lidocaine in saline for more volume
  - Block misses sciatic, superior gluteal N. but small contribution
- Quadriceps motor block-- Fall risk
- 10-20mL lidocaine 1% can dilute for better spread
  - wheal with 25G, block with 22G needle (better visualization can use 20G)

Machine plugged in and across for femoral block. Can easily look at field and screen without turning
Optimize depth, gain (brightness) tegaderm on probe, skin prepped

Oligoanalgesia: Not a failed block if partial pain relief. Can dramatically reduce need for pain meds even if not 100% blocked
Procedure itself quick and not very painful
Results get better with practice
Some anatomical variation- patient may have more contribution from sciatic or superior gluteal nerves which are not blocked
May need spinal needle if obese, measure needle path with ULS.
Closer to inguinal ligament= more superficial
**FEMORAL ANATOMY**

Inject below Fascia Iliaca (FI)

Appearance of nerve on ultrasound
Must get anesthetic deep to *fascia iliaca* -- *aim needle at iliopsoas muscle, just posterolateral to nerve*

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**FEMORAL INJECTION**

Video of injection
Note reversal lateral and medial compared to last slide
FEMORAL INJECTION

Video
Pocket of anesthetic getting bigger

Video
Use pocket of anesthetic to advance needle posterior to nerve
Can see nerve more distinctly as fluid separates it away from surrounding tissue
FOREARM BLOCKS

• Anesthesia to hand, like wrist blocks

• NOT for wrist fractures or forearm fractures

• 3-5mL lidocaine 1% per nerve

• wheal with 25G, then may change to larger needle for visualization

• Always get all air out of needle!
FOREARM BLOCKS

Radial nerve is radial to artery

Ulnar nerve is ulnar to artery

Median nerve has no artery

Video
Set up again: machine plugged in, across so you can see field and screen easily
LOCATING THE NERVES...

Video
finding median nerve
Appearance of nerve: honeycomb, bright (hyperechoic) where fascial planes meet. Median no paired vessel, in mid forearm, nothing looks like it distally. Tendons look like nerve, but proximally turn to muscle less prominent.

Anisotropy—nerve clearest when probe perpendicular, fan to find best view.
Have faith—nerve will not be visible distally, find pulse, follow area radial to radial artery with your eye as you slide probe proximally. Fan as you go to best visualize nerve (anisotropy). Radial nerve becomes visible, then flattens out, separates out from artery to provide good target.
INJECT ANESTHETIC

Ulnar nerve is *ulnar* to ulnar artery. Will also separate from artery as you slide probe proximally and fan probe. Best access may require repositioning arm since can be very medial.
INJECTION MEDIAN NERVE

raise wheal for skin anesthesia
air out of needle (will ruin uls image)
needle parallel to probe
watch needle tip
inject adjacent to, not at nerve
INJECTION MEDIAN NERVE

Video
Use spread of anesthetic pocket to advance needle

RESOURCES

Ultrasound Learning Seminars: ulscourse.com
New York School of Regional Anesthesia: NYSORA.com
Neuraxiom.com
Sonoguide.com
USRA.CA
Philips Ultrasound Guided Regional Anesthesia Tutorial
http://www.healthcare.philips.com
http://vimeo.com/mikestone