Basic Physics

- Ultrasound machines produce sound waves
- They listen for what returns and create an image
- Denser tissues reflect more waves
  - tissues are more “hyperechoic” or white
- Less Dense tissues allow them to pass through
  - Tissues which are “hypoechoic” reflect waves poorly or not at all

Basic Physics, cont.

- Low frequency waves
  - Penetrate deep into tissues
  - Resolution not as good
  - Great for deep structures
  - Curvilinear probe
  - Appropriate for deep (>5cm) U/S blocks

Preferred Ultrasound Machine

- High Frequency: 10MHz - 15MHz
- Depth 1-6 cm (for linear probe)
- Needle finding technology
- Color capability for vascular structures
- Time Gain Compensation
- Wireless capability for Medical Record upload
- As few buttons as possible/necessary
Ultrasound Basics

- **Depth**
  - Find ideal depth!
  - Use as little depth as needed for a block, it will improve your picture of the structures you want
  - Increased depth, means decreased frequency will be needed to have a good picture
  - Due to low frequency, resolution will suffer!

Gain:
- Amplifies returning sound waves, to make signal brighter or darker... Need to get it JUUUST right.
- Newer machines are optimized, don’t change

Ultrasound basics

How to use a Probe

- **Gel:** Allows for transmission of sound waves
- **Always support your hand against the patient**

- **Anisotropy:**
  - small changes in tilt of probe can vastly improve picture

How to use a Probe & Needle

- **Find your favorite view, and stick with it!**
- Only small changes in anisotropy
- **Don’t chase your needle!**
  - Finding it in “no man’s land” does not help
  - Improve needle placement
    - So that changes in anisotropy will make it visible
  - Look at your hands, before the screen
  - Practice!

Ultrasound and Needle

- **Before the Block:**
  - Know how to manage Local Anesthetic Toxicity!
  - Practice hand/eye coordination
  - Know your anatomy
  - Be patient and optimize picture (depth/gain)
  - Position your patient to optimize view and ergonomics

- **Block Time!**
  - Use in-plane view when possible
  - Don’t advance needle if unsure of position
  - Do not penetrate nerve
    - Paresthesia, pain or difficult injection? Pull back, re-direct
  - Ensure good local anesthetic spread
  - Use less local anesthetic if block looks good

Principles of UGRA
New Format for CRASH 2018

- Two Nights!
- Beginner
- Advanced

- 8 stations with models
- Blue Phantom/needle station for practice!
  - If you are beginner, this is a great place to start!

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