Regional Anesthesia

By Adam Kahn

Adam grew up in the Chicagoland area before earning a BS in neuroscience at Emory University in Atlanta. From there, he went on to Loyola University Chicago for a master's degree in biology. In 2014, he graduated from Chicago Medical School and went on complete a residency in Anesthesiology at Medical College of Wisconsin in Milwaukee. He then moved across the country to New Hampshire where he completed a fellowship in Regional Anesthesia and Acute Pain Medicine at Dartmouth Hitchcock Medical Center. He stayed continued to work there as an Assistant Professor for 5 years before transitioning to his current position as a Staff Physician at the WRJ VAMC and still maintains his title of Assistant Professor with Geisel School of Medicine. During his free time he enjoys scuba diving, roasting coffee and making his own maple syrup. He was able to create this presentation with the love and support of his wife and two sons.

What is Regional

- Injection of local anesthetics on nerves to promote analgesia with the intent to treat pain or promote optimal surgical conditions

Types of Regional Anesthesia

- Peripheral nerve block
- Neuraxial
- Intravenous

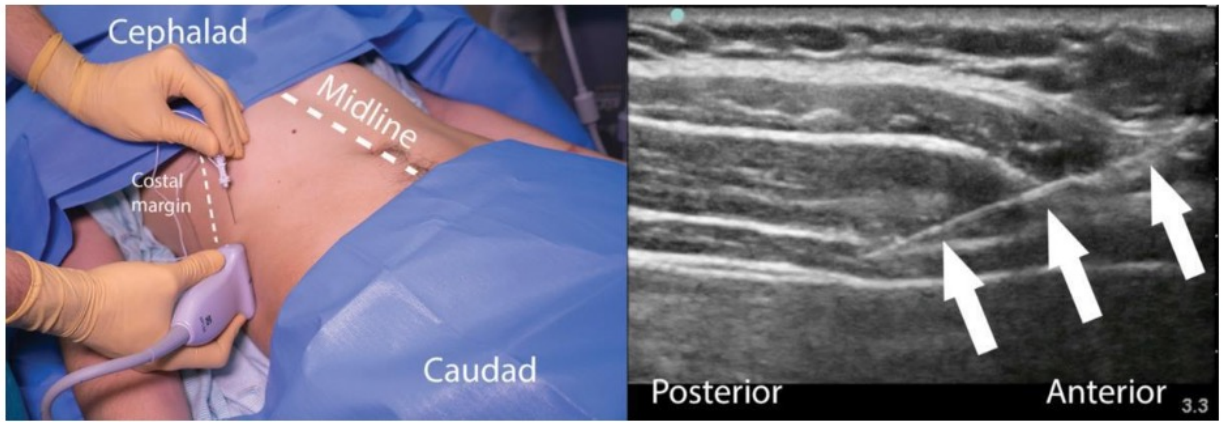
Common Blocks

- Upper extremity
  - Interscalene
  - Supraclavicular
  - Infraclavicular
  - Axillary
- Lower Extremity
  - Femoral
  - Sciatic
  - Adductor Canal/Saphenous

A

Common Blocks

- Truncal
  - TAP
  - QL
  - Paravertebral
  - PEC
- Neuraxial
  - Spinal
  - Epidural



Locations for Procedures

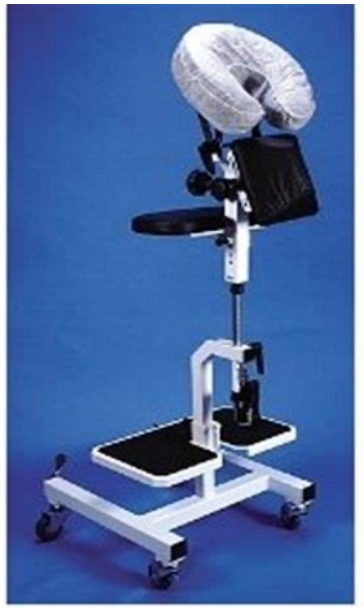
- Pre op staging area
- Operating rooms
- PACU
- Patient room
- Emergency Department

Common Equipment

- Ultrasound
- Needles
- Syringes
- Catheters
- Gel
- Sterile probe cover
- Cleaning solution
- Sterile Gloves
- Local Anesthetic
- Saline
- Adjuncts (Epinephrine, Clonidine, dexamethasone)
- Gown
- Mask
- Drapes

Miscellaneous Equipment

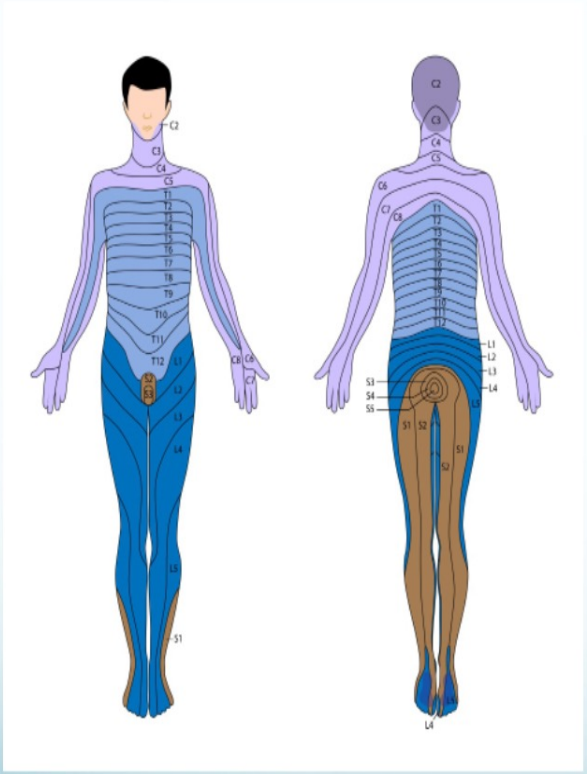
- Table to lay out equipment
- Fluoroscopy
- X-ray safe lead
- Epidural chair
- Tourniquets
- Nerve Stimulator
- Chlorohexidine Tegaderm/Tape
- Foam pads or blankets
- Medication Pumps (epidural, ambit)



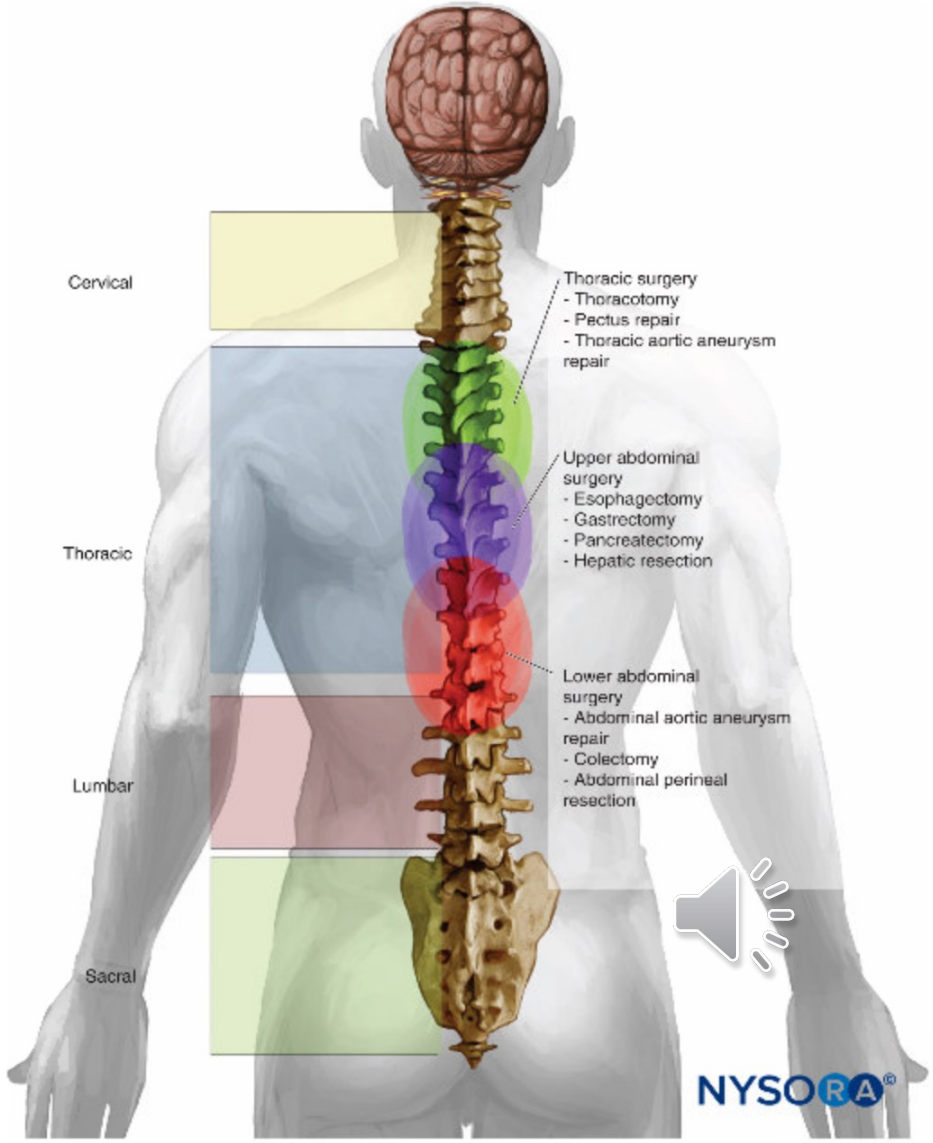
Monitors

- Pulse oximetry
- EKG
- Blood Pressure
- Capnography when providing sedation

Neuraxial Anesthesia



SURGICAL INCISION	SUGGESTED EPIDURAL LEVEL
CHEST	T1 – T5
Upper Abdomen	T6 – T9
Lower Abdomen	T 10- T12
Lower Extremity	L1 – L4



Epidural Technique

- Use of Touhy needle + LOR syringe to identify epidural space
- Thread catheter into epidural space
- Confirm placement with aspiration and test dose
- Secure catheter using Tegaderm and tape

Spinal Technique

- Place introducer needle
- Pass spinal needle through introducer needle
- Confirm placement with return of CSF
- Single injection of medication
- Remove both needles

https://en.wikipedia.org/wiki/Spinal_anaesthesia

OR Table Positioning Tip

Figure 35-14 Tilting the operating table can encourage the patient to flex her hips and lumbar spine.

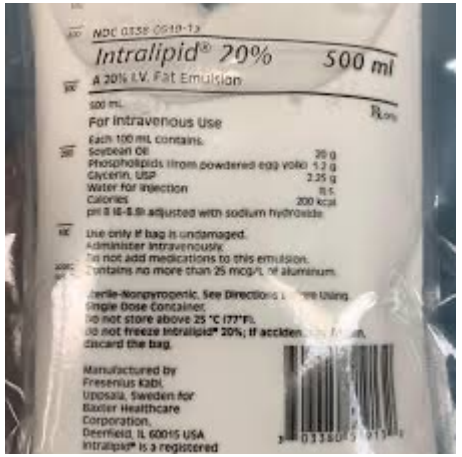
Prep

Epidural Supplies

Epidural trays
Sterile gloves
Sterile prep sticks
Extra epidural needles/catheters
Extra loss of resistance syringes
Sterile dressings
Tape

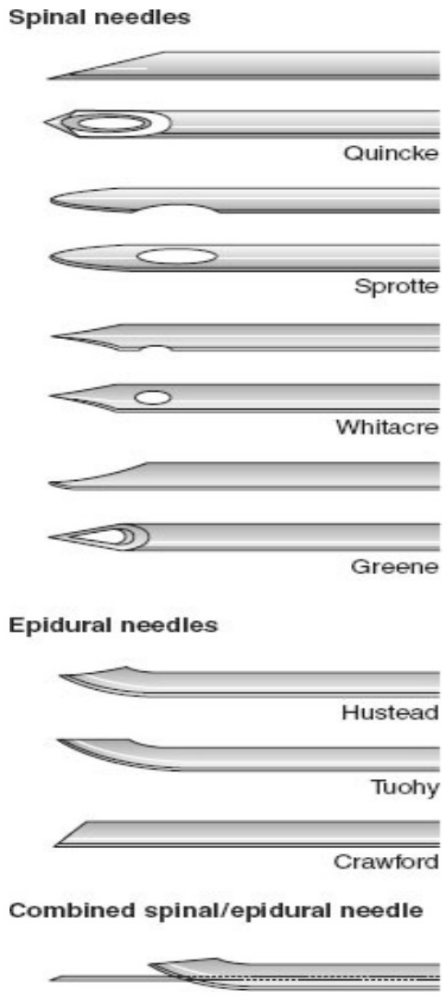
Emergency Equipment

Self-inflating bag–valve mask
Oral airways
Working laryngoscope and blade
Endotracheal tubes/supraglottic airways
20% lipid emulsion



Types of Spinal and Epidural Needles

- Sharp/Cutting
- Pencil Point



Combined Spinal Epidurals and Dural Puncture Epidurals

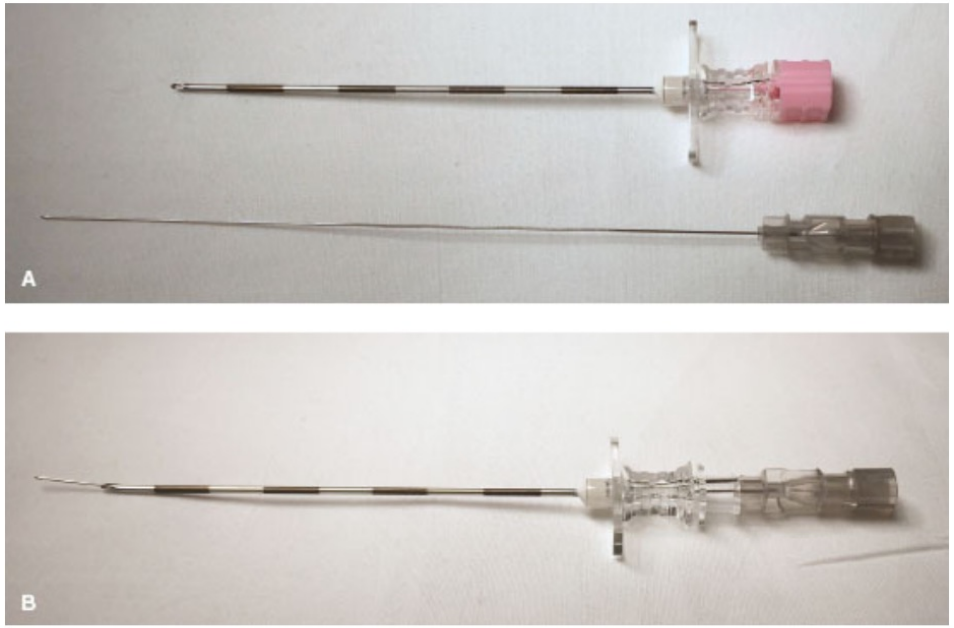
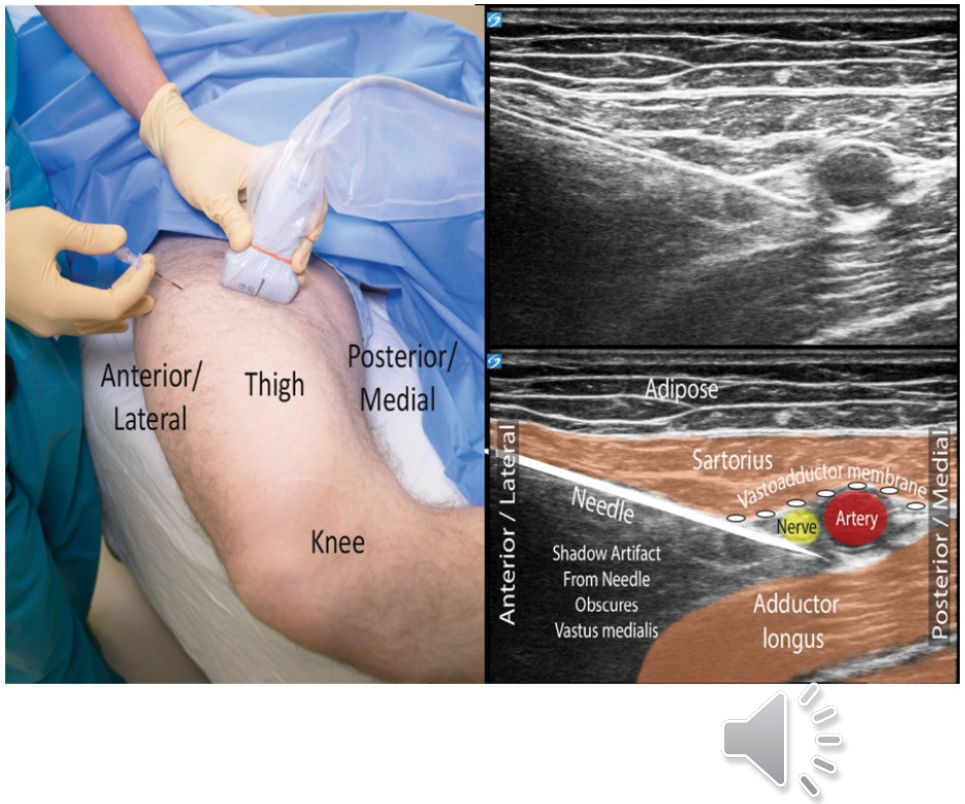


Figure 35-17 Combined spinal epidural using standard needles. **A:** An 18-gauge, 90-mm Tuohy needle and 27-gauge, 127-mm Whitacre needle side by side. **B:** Whitacre needle inserted through Tuohy needle.

Ultrasound Guided Peripheral Nerve Blocks

- Find target using sterile ultrasound probe
- Anesthetize skin and direct needle to location
- Aspirate syringe to ensure not in a blood vessel
- Inject local anesthetic and repeat aspiration every 5 cc
- Monitor patient to for signs of LAST (toxicity)



Nerve Stimulator

Stimulus amplitude (mA)

Pulse width (msec)

Frequency (Hz)

Impedance (kΩ)

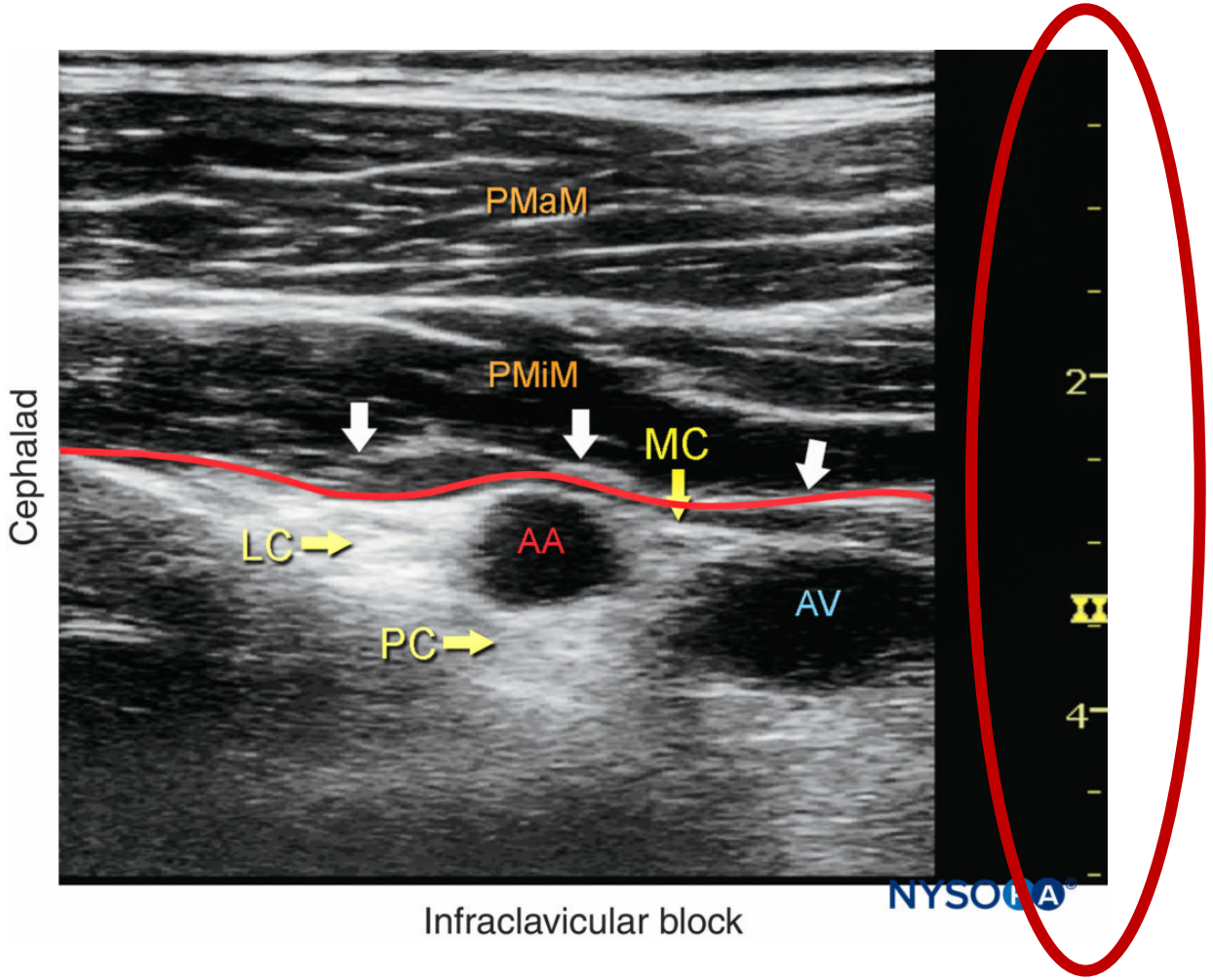
Ultrasound Probes

- Small Linear
  - Low depth but high resolution
  - Good for vascular access
  - Useful when small surface area
- High Frequency Linear
  - Most commonly used
  - Nerve blocks
- Curved
  - Deeper images >6cm

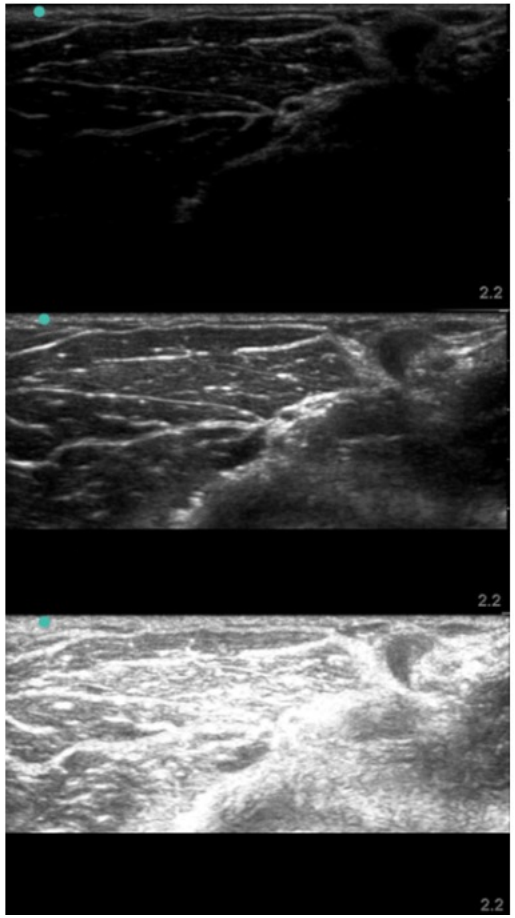
Ultrasound Features

- Depth
- Gain
- Focus
- Color
- Biopsy/Midline

Depth



Gain



Focus

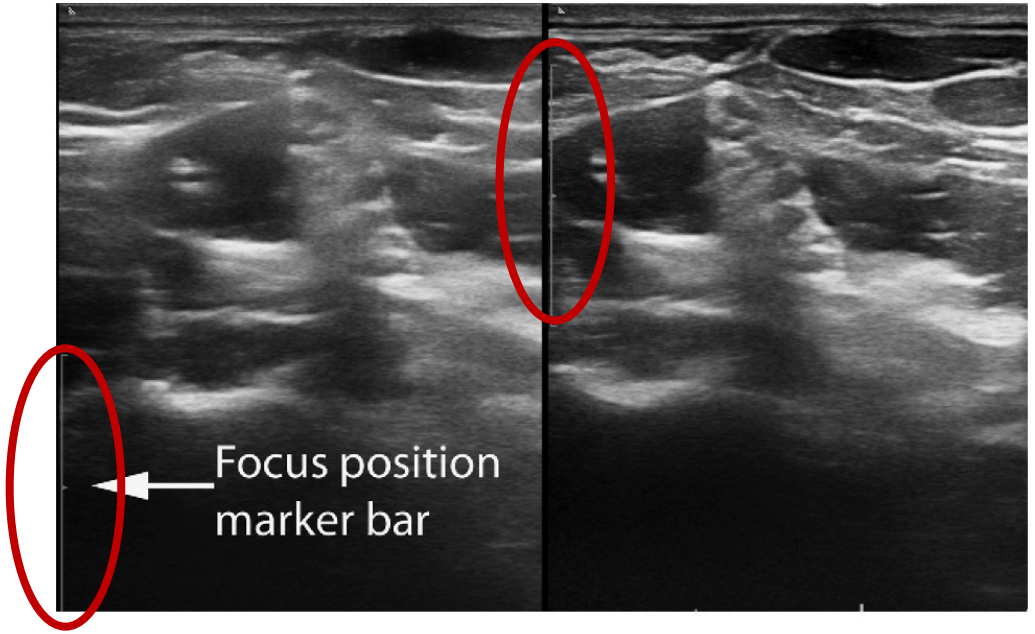
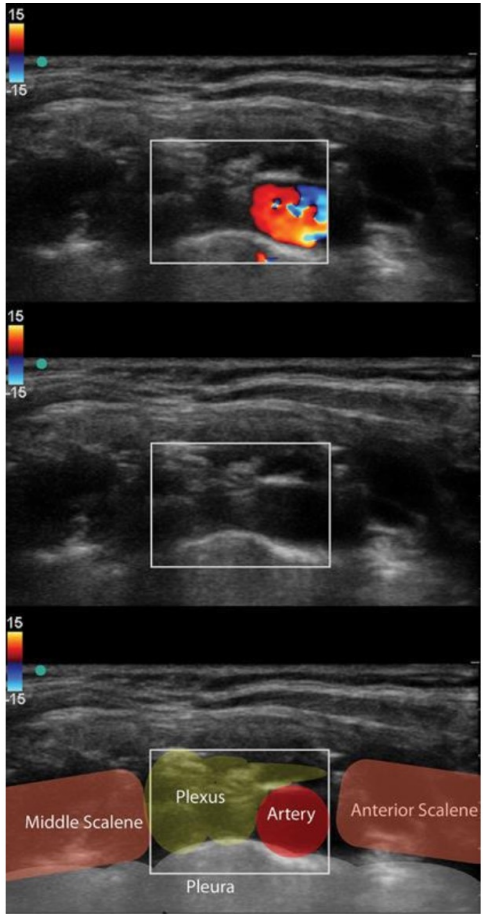


Figure 1-4 Focus position affects image quality. The identical interscalene anatomy is scanned on two images. On the left, the focus is set deep, and on the right, the focus is set at the level of the targeted nerves. The fascicles of the nerves are easier to identify on the right because the focus is set at the optimal depth for visualization of the nerve roots at the interscalene level.

Color


15
-15
15
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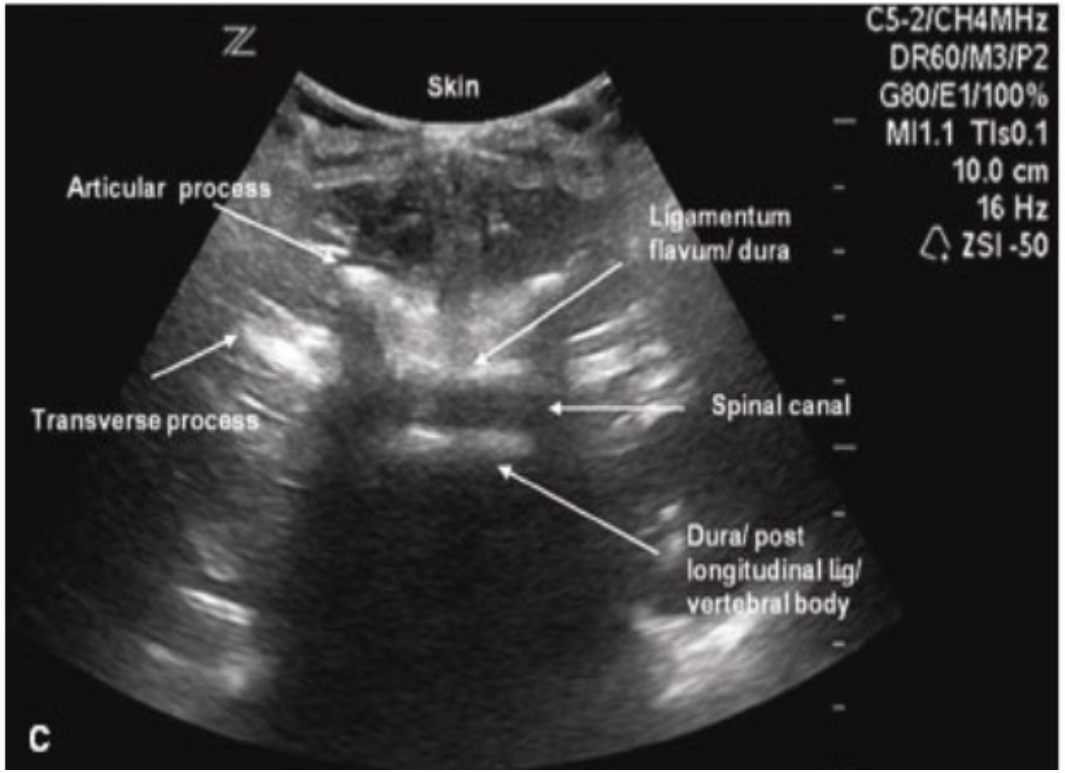
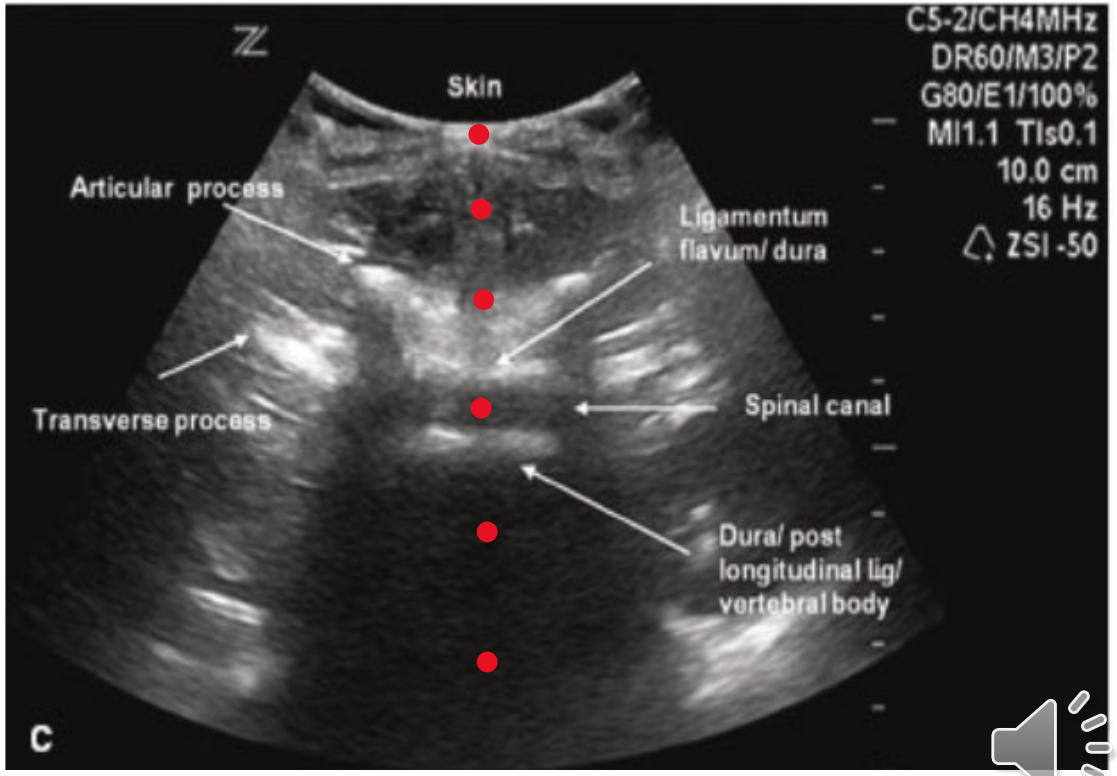
-15
Middle Scalene
Plexus
Artery
Anterior Scalene
Pleura

Midline


Skin
Articular process
Ligamentum flavum/ dura
Transverse process
Spinal canal
Dura/ post longitudinal lig/ vertebral body
C5-2/CH4MHz
DR60/M3/P2
G80/E1/100%
MI1.1 TIs0.1
10.0 cm
16 Hz
ZSI -50
C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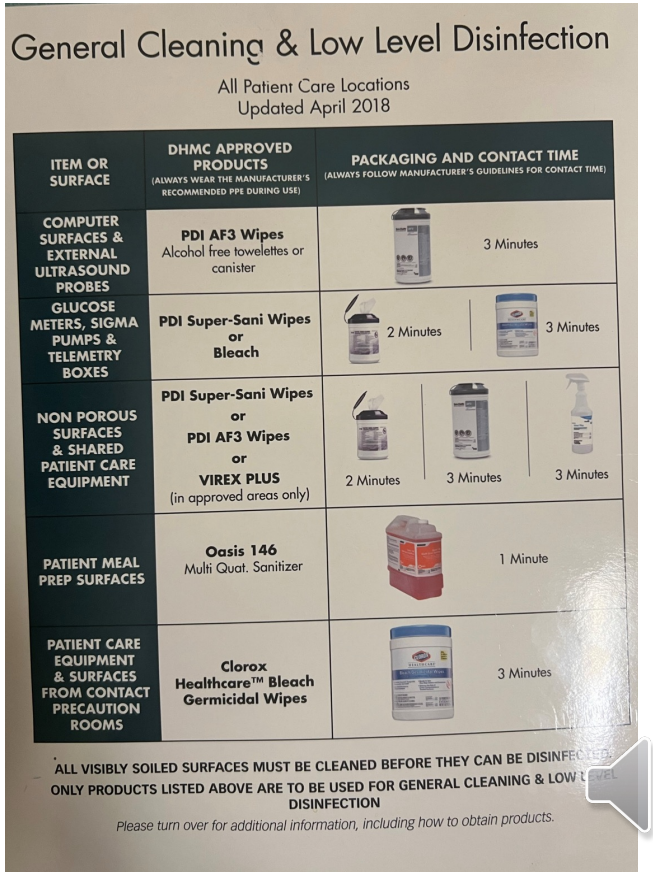
C5-2/CH4MHz
DR60/M3/P2
G80/E1/100%
MI1.1 TIs0.1
10.0 cm
16 Hz
ZSI -50
C

Appropriate Cleaning

- Institution and Machine Dependent
- Standard Cleaning
  - PDI AF3 Wipes for 3 minutes
- Contact Precautions
  - Bleach Wipes for 3 minutes



General Cleaning & Low Level Disinfection

All Patient Care Locations
Updated April 2018

ITEM OR SURFACE	DHMC APPROVED PRODUCTS (ALWAYS WEAR THE MANUFACTURER'S RECOMMENDED PPE DURING USE)	PACKAGING AND CONTACT TIME (ALWAYS FOLLOW MANUFACTURER'S GUIDELINES FOR CONTACT TIME)
COMPUTER SURFACES & EXTERNAL ULTRASOUND PROBES	**PDI AF3 Wipes** Alcohol free towelettes or canister	3 Minutes
GLUCOSE METERS, SIGMA PUMPS & TELEMETRY BOXES	**PDI Super-Sani Wipes or Bleach**	2 Minutes | 3 Minutes
NON POROUS SURFACES & SHARED PATIENT CARE EQUIPMENT	**PDI Super-Sani Wipes or PDI AF3 Wipes or VIREX PLUS** (in approved areas only)	2 Minutes | 3 Minutes | 3 Minutes
PATIENT MEAL PREP SURFACES	**Oasis 146** Multi Quat. Sanitizer	1 Minute
PATIENT CARE EQUIPMENT & SURFACES FROM CONTACT PRECAUTION ROOMS	**Clorox Healthcare™ Bleach Germicidal Wipes**	3 Minutes

ALL VISIBLY SOILED SURFACES MUST BE CLEANED BEFORE THEY CAN BE DISINFECTED

ONLY PRODUCTS LISTED ABOVE ARE TO BE USED FOR GENERAL CLEANING & LOW LEVEL DISINFECTION

Please turn over for additional information, including how to obtain products.

Intravenous/Bier Block

Types of Local Anesthetics

- Fast
  - Chloroprocaine
- Intermediate
  - Lidocaine
  - Mepivacaine
- Long
  - Bupivacaine
  - Ropivaine

Drug	Duration		Prolongation by Epinephrine (%)
	Two-dermatome Regression (min)	*Complete Resolution (min)*	
2-Chloroprocaine 3%	45–60	100–160	40–60
Lidocaine 2%	60–100	160–200[a]	40–80[b]
Mepivacaine 2%	60–100	160–200	40–80
Ropivacaine 0.5%–1.0%	90–180	240–420	No
Bupivacaine 0.5–0.75%[c]	120–240	300–460	No

[a]Motor block can outlast sensory block.
[b]Epinephrine also improves quality of sensory block.
[c]Use only 0.5% bupivacaine in obstetric patients.

Maximum Doses

- Lidocaine: 5 mg/kg (7 mg/kg with epi)
- Mepivacaine: 4.5 mg/kg (7 mg/kg with epi)
- Bupivacaine: 3 mg/kg
- Ropivacaine: 3 mg/kg
- Chloroprocaine: 12 mg/kg

Local Anesthetic Systemic Toxicity

- **Neurologic**
  - Numb lips/mouth
  - Tinnitus
  - Metallic taste
  - Agitation
  - Confusion
  - Altered mental status
  - Seizure
  - Loss of consciousness
  - Coma

- **Cardiovascular**
  - Bradycardia
  - Tachycardia
  - Hypotension
  - Wide QRS Vtach
  - Cardiac arrest

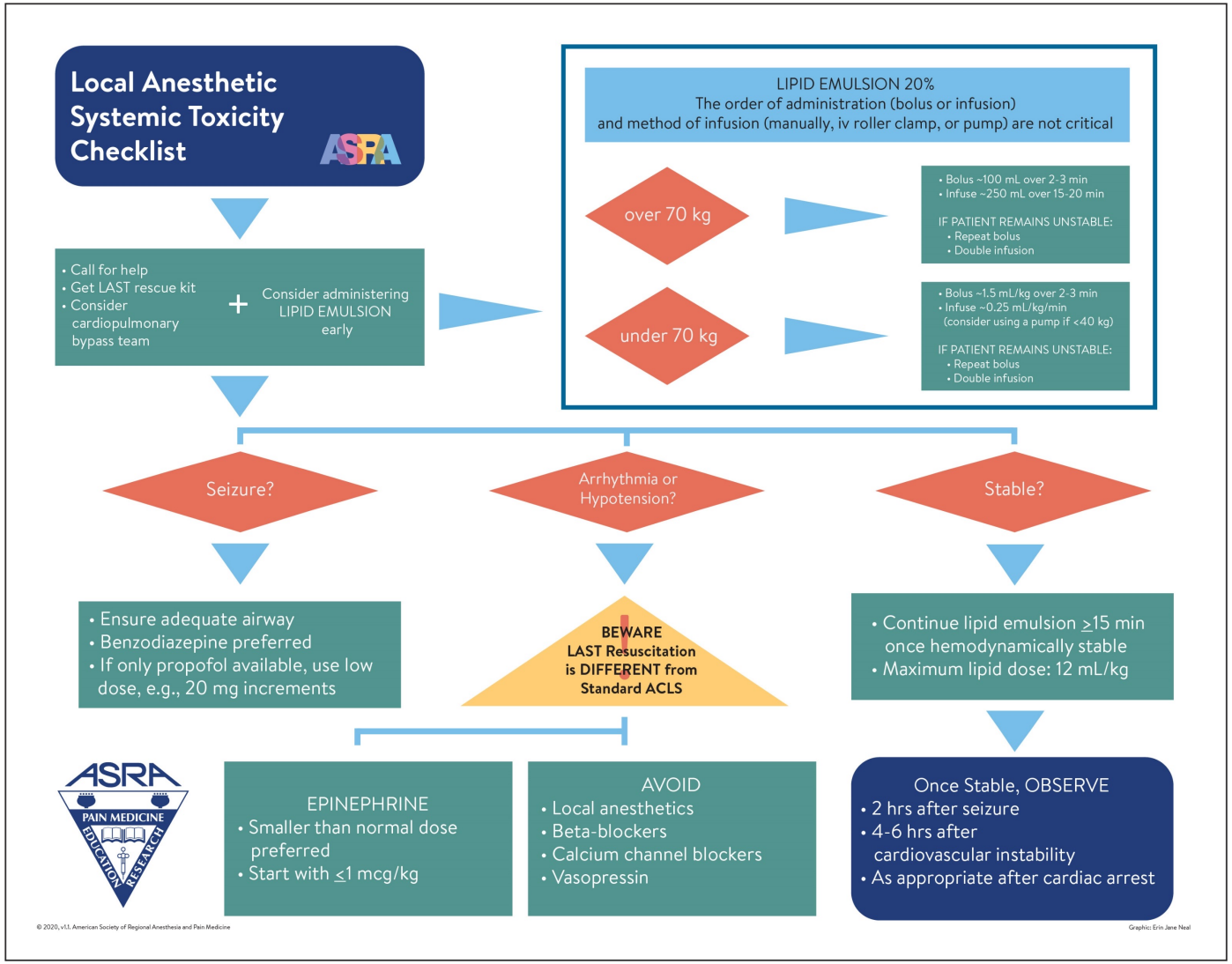
LAST Treatment

- Call for help
- Intralipid
  - 50-60 cc syringe
  - IV tubing
  - Smart pump for infusion
- Code cart
- Oxygen/Airway box

Intralipid Names

- Lipid fat emulsion
- 20% fat emulsion
- Fat emulsion

LAST Checklist



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