REGIONAL ANESTHESIA

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OBJECTIVES

- Review history of regional anesthesia and its implications on current practices
- Outline basics of nerve conduction and peripheral nerve stimulators/ ultrasound
- Discuss implements and supplies used in regional anesthesia
- Identify indications, contraindications, anatomy and administration of regional anesthesia
- Detail adverse outcomes associated with regional anesthesia and treatments

HISTORY OF REGIONAL ANESTHESIA

- 1884- William Halstead used cocaine for brachial plexus
  - Cut down technique
- Quickly transitioned to paresthesia technique
- 1912 – Perthes introduced electrical current to elicit nerve response
  - Nerve stimulator emerges 20 years later
- 1958- U/S for pregnancy imaging
- 1978- ultrasound use for PNB

BENEFITS OF REGIONAL ANESTHESIA

- Can be used for intra-operative anesthetic and/ or post-operative analgesia
- Anesthesia Effects:
  - Less impact systemically (compared to GA or Neuraxial)
  - Reduction in potent analgesics
- Post-operative
  - Improved pain control and reduced opioid consumption
    - Reduced side effects such as: lethargy, nausea/ vomiting, GI dysfunction
  - Easier breathing due to improved analgesia
  - Improved mobility
    - Reduced pulmonary complications
    - Reduced DVT occurrence
  - Improved cognition
  - Improved financials

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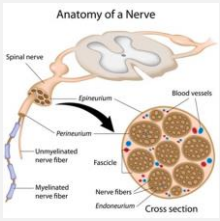
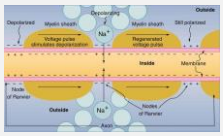
NERVE CONDUCTION BASICS





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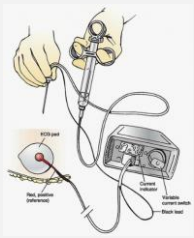
PERIPHERAL NERVE STIMULATORS

- Anatomical landmarks used
- Electrical current conducted through needle
- As needle approaches nerve, twitch is elicited
  - 1mA → movement due to nerve stimulation
  - > 1 mA→ movement due to pain
- Reduce current to assess for proximity to nerve
  - Strong twitches seen at 0.2 mA may indicate intraneural placement→ possibility for permanent nerve injury
  - Once twitch is loss (just above 0.2 mA), local anesthetic is injected



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ULTRASOUND BASICS

- First use 1958 for Pregnancy
- 1978 for PNB
- Use of sound waves from 2-15 MHz
  - Seven Characteristics:
    - Period, Frequency, Propagation speed, Amplitude, Power, Intensity & Wavelength
- U/S waves emitted via probe and passes through tissue
  - Waves are reflected or absorbed
  - Reflected waves are received via probe
  - Absorbed waves are transmitted into different forms of energy
  - Image is generated
- Credit card thickness

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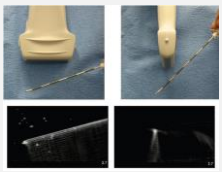
ULTRASOUND GUIDED REGIONAL ANESTHESIA (USGRA)



- Scanning Basics
  - Probe Selection
- Approach (In-plane vs Out-of-plane)
- Image Adjustment
  - Brightness
  - Contrast
  - Gain
- Needle Visualization
  - Echogenecity
  - Angle of approach
  - Wave Loss
- USGRA with PNB
- Injection
  - "Wiggling"
  - Aspiration
  - Effects of Air on image quality

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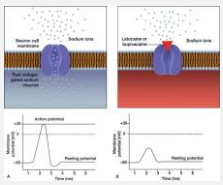
LOCAL ANESTHETICS

- Nerve conduction is dependent on permeability of Na via voltage- gated Na channels
  - Requires a stimulus greater than membrane resting potential
- Local anesthetics thought to work via these channels
  - Binds to NA channel preventing stimuli from opening gate and subsequent Na influx
- Action based upon hydrophobicity, protein binding, pKa
  - Primarily water soluble
  - Protein Binding (Albumin)
  - pKa/ pH and efficacy, onset
- Selection depends on desired endpoint



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BEFORE WE GET STARTED

- You're participation in regional anesthesia (i.e. what parts of the block you can be involved in) depends specifically on your state's NPA and hospital policies
  - This includes the administration of sedation for the procedure

CONSIDERATIONS

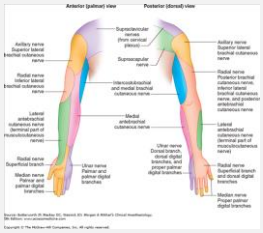
Absolute Contraindications	Considerations
• Patient refusal • Infection at injection site • Allergy to local anesthetics • Those at risk for LAST	• Difficult patients • Pediatrics, combative, etc. • Bleeding disorders? • Pre-existing neuropathies? • Septicemia?

TYPICAL SET UP

- U/S
  - Linear or curvilinear
- Cleaning agent
  - Chlorhexidine vs others
- Block needles/ catheters
- Sterile gel
- LA +/- Additives
- Sterile set-up
  - Sheath, Gloves, Towels, Gowns
- Nerve stimulator if used

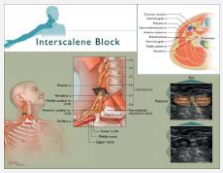
UPPER EXTREMITY BLOCKS

Brachial Plexus: Interscalene, Supraclavicular, Infraclavicular & Axillary



INTERSCALENE

- Origin: Brachial Plexus (C4-T1)
  - Form Ulnar, Median, Radial, Musculocutaneous and Axillary Nerves
- Anatomy: lateral neck over external jugular
- Indication: shoulder, clavicle and upper arm surgery
- Side effects:
  - Horner's syndrome most common
    - Ptosis, miosis, anhidrosis, phrenic nerve palsy, recurrent laryngeal nerve palsy
  - Pneumothorax
- Local anesthetic of choice 7-20 mL
- Positioning: head turned



Wu & Raja, 2011

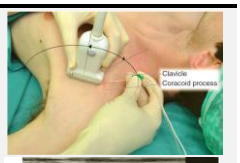
SUPRACLAVICULAR

- Origin: Brachial Plexus
- Anatomy: superior to middle clavicle
- Indication: shoulder, arm, elbow forearm or hand surgery
- Side Effects:
  - Pneumothorax (1 cm of wiggle room)
  - Artery puncture
  - Reduced risk of Horner's syndrome (phrenic palsy)
- Local anesthesia of choice 20-25 mL
- Considerations:

Bendtsen, Lopez & Vandepitte (n.d.)

INFRACLAVICULAR

- Origin: Brachial Plexus (Radial, Median, MC and Ulnar)
- Anatomy: Inferior to clavicle, coracoid process.
- Indication: Midshaft of humerus and below
- Side Effects: reduced likelihood of pneumothorax
- Local anesthesia of choice 20-25 mL



Infraclavicular block

Arshadian, Vasudyan & Lopez (n.d.)

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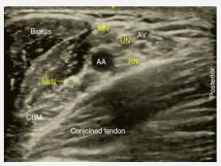
AXILLARY

- Origin: Brachial Plexus (Musculocutaneous spared)
- Anatomy: Axilla. Distal to pec insertion
- Indication: Surgery on elbow, forearm or hand
- Side effects: Arterial puncture
- Local anesthesia of choice 15-20mL



Vasudyan, Lopez, Jalil, (n.d.)

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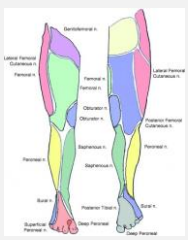
LOWER EXTREMITY BLOCKS

Lumbosacral Plexus (L4-S3): Sciatic, Femoral, Lateral Femoral Cutaneous, Obturator



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SCIATIC

- Origin: S1-4
- Anatomy:
  - Anterior: Proximal medial thigh
  - Transgluteal: Posterior buttock b/t ischial tuberosity& greater trochanter
  - Subgluteal: Gluteal crease
- Indication: surgery involving posterior leg (mid-thigh down)
- Side Effects:
  - Puncture of pelvic contents& large arteries.
  - Increase chance of nerve damage
  - Motor weakness (consider w/ ambulation)
- Local anesthesia of choice 10-20 mL

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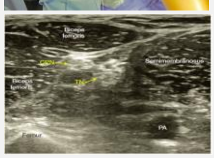
POPLITEAL

- Origin: Sciatic nerve bifurcates into common peroneal and tibial nerve
- Anatomy: 7 cm above popliteal crease. Superficial to artery
- Indication: Foot & ankle surgery
  - Of note, this does not cover the femoral component and a saphenous block may be indicated
- Side effects: Arterial puncture
- Local anesthesia of choice 15-20 mL



Hadzis, Lopez, Vandepitte& Sala-Blanch (n.d.)

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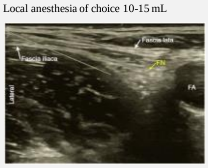
FEMORAL

- Origin: L2-4
- Anatomy: Femoral crease
- Indication: Surgery on upper leg and knee
- Side Effects:
  - Motor weakness (consider w ambulation)
- Local anesthesia of choice 10-15 mL



Atchabahian, Leunen, Vandepitte & Lopez (n.d.)

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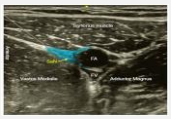
ADDUCTOR CANAL

- Origin: Femoral nerve branches into saphenous
- Anatomy: Middle to distal third of thigh under Sartorius muscle
- Indication: Surgery from knee to medial foot. Sensory only
- Side Effects:
  - Vascular puncture
  - Persistent paresthesia
- Local anesthesia of choice 5-10mL



Brothers, Lopez & Clark (n.d.)

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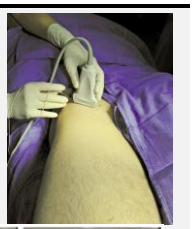
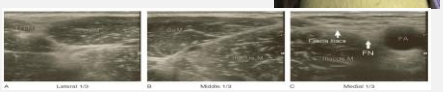
FASCIA ILIACA

- Origin: Femoral nerve/ lateral femoral cutaneous
- Anatomy: Femoral crease. Lateral to femoral artery
- Indication: surgeries involving hip and ant thigh/knee. No motor block
- Side Effects:
  - Femoral nerve lies in close proximity. Increased likelihood of being blocked
- Local anesthesia of choice 20-40 mL





Archabaldus, Lesnes, Vandepitte & Lopez (2017)

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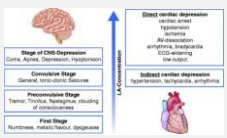
LOCAL ANESTHESIA TOXICITY SYNDROME (LAST)

- Local anesthetics injected into systemic circulation
- MOA: Interruption of fatty acid metabolism with in cell
- Symptoms are a result of blocking of Na and Ca channels
  - Initially prodromal
  - Can progress to cardiac arrest
- Duration dependent on local anesthetic injected
- Treatment
  - Supportive
  - Intralipids



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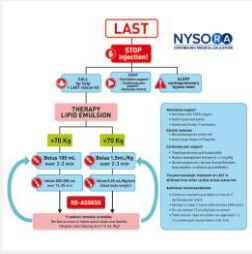
TREATMENT OF LAST



UPPER EXTREMITY NERVE DAMAGE

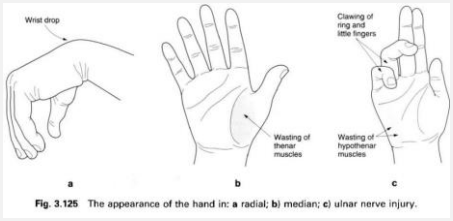


Fig. 3.125 The appearance of the hand in: **a** radial; **b**) median; **c**) ulnar nerve injury.

SCIATIC NERVE DAMAGE


THANK YOU!