Regional Anesthesia: An Introduction

SPECIAL ARTICLE

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History of the Development and Evolution of Local Anesthesia Since the Coca Leaf

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THE development of anesthesia in general and local anesthetics, in particular, required a cultural change. The concept of pain (especially obstetric pain) was linked to the concept of original sin, and the ability to endure pain was regarded as a sign of character and, in up to 0.7-1.8% by weight. Many species of this genus have been grown in Nicaragua, Venezuela, Bolivia, and Peru since pre-Columbian times. The earliest cultivation and use of the coca leaf in the Bolivian and Andean region date back to 700 B.C., though

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Objectives

- Understand the basic mechanism of action for local anesthetics
- Understand the difference between neuraxial and peripheral nerve blocks
- Be able to name some of the benefits and risks associated with regional anesthesia
- Be familiar with some of the common regional techniques used at University Hospital
Local Anesthetics: Cornerstone of Regional Anesthesia

- Temporary blockade of neuronal transmission when local anesthetics (LAs) injected near nerve fibers
- Results in motor and sensory blockade
- Dilute concentrations of LAs can provide sensory blockade while preserving motor function
Motor and Sensory Blockade

Diagram of a neuron showing the components such as dendrites, soma, axon hillock, myelin sheath, axon, presynaptic terminals, and muscle fiber.
Mechanism of Action

- Local Anesthetics cross nerve membranes where they stop axonal conduction
- Local Anesthetics exist in 2 forms
  - the unionized weak base form .....LA
    - crosses nerve membranes
  - The ionized form.........................LAH+
    - binds NA channels preventing depolarization
Mechanism of Action

- Unionized form.. LA.. crosses nerve membrane
- Becomes ionized .. LAH⁺.. and blocks sodium channels
Local Anesthetic Structure

Aromatic Ring

Intermediate Chain

Tertiary Amine

CH$_3$

O

NH

C

CH$_2$

N

C$_2$H$_5$

C$_2$H$_5$

MAYO CLINIC
Local Anesthetic Structure

\[
\begin{array}{c}
O \\
\text{NH} \quad \text{C} \quad \text{CH}_2
\end{array}
\]

Intermediate Chain

- Determines Local Anesthetic Class and Metabolism
Types of Regional Anesthesia

- **Neuraxial Anesthesia**
  - Local anesthetic is injected into the neuraxis
  - Site of action is at the nerve root
  - Results motor and/or sensory block which follows a dermatomal pattern
  - Includes epidural and spinal anesthesia

- **Peripheral Nerve Blockade**
  - LA injected near peripheral nerves
  - Resulting block follows the innervation of each particular nerve
Why Regional Anesthesia?

Benefits of a Regional Technique

- avoidance of general anesthesia
  - no airway instrumentation
  - no risk of malignant hyperthermia
  - less risk of post-op nausea and vomiting
Benefits Continued

- decreased incidence of DVT, PE
- decreased amount of intraoperative blood loss
- improved pain control and patient satisfaction
- less opioid use
- earlier ambulation and improved rehabilitation outcomes
Risks of Regional Anesthesia

- Block Failure
- Direct Tissue Damage
  - hematoma formation
  - direct nerve trauma
  - damage to other organs or structures
- Local Effects
  - nerve toxicity
Risks Continued

- Systemic Effects
  - Allergic reactions
  - Excessive or high block
    - hypotension
    - bradycardia
    - loss of airway
  - Local anesthetic toxicity
    - seizures
    - CV collapse
Neuraxial Anesthesia
spinal and epidural

• Results in dermatomal pattern of blockade
Epidural and Spinal

- epidural catheter placement for labor analgesia
Epidural Catheter Placement

- Epidural needle
- Catheter
Peripheral Nerve Blockade at the University Hospital

• Common Block Procedures
  • Popliteal Fossa
  • Sciatic Nerve
  • Femoral Nerve
  • Lumbar Plexus
  • Brachial Plexus
    • Interscalene, Supraclavicular
    • Infraclavicular, Axillary
Peripheral Nerve Blockade

- Single injection popliteal nerve block for foot and ankle surgery

www.nysora.com
Peripheral Nerve Blockade

- Sciatic nerve block for LE surgery

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Peripheral Nerve Block

• Femoral Nerve block for post-op pain control following knee surgery
Peripheral Nerve Blockade

- Psoas compartment block placing LA into the lumbar plexus
- Utilized in hip replacement surgery
Peripheral Nerve Blockade

- Interscalene approach to the brachial plexus
- Used in shoulder replacement and rotator cuff repair
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