Neuraxial anesthesia

Neuraxial Anesthesia is a type of regional anesthesia where drugs are administered into the central nervous system spaces around the spinal cord to block nerve signals. It includes spinal anesthesia, epidural anesthesia, and combined spinal-epidural anesthesia. This technique is widely used for surgeries, childbirth, and acute pain management.

Types of Neuraxial Anesthesia

Spinal Anesthesia (Subarachnoid Block):

Location: Injection into the cerebrospinal fluid (CSF) in the subarachnoid space (below the second lumbar vertebra in adults). Uses: Common in lower abdominal, pelvic, or lower limb surgeries. Onset: Rapid, typically within minutes. Duration: Shorter, depending on the drug used (e.g., 2-4 hours). Technique: Single injection using a fine needle. Drugs Used: Local anesthetics: Bupivacaine, Lidocaine. Adjuvants: Opioids (e.g., fentanyl, morphine), Clonidine. Epidural Anesthesia:

Location: Injection or infusion into the epidural space, outside the dura mater. Uses: Labor pain, thoracic surgeries, or postoperative pain management. Onset: Slower compared to spinal anesthesia (10-20 minutes). Duration: Longer with continuous infusion via a catheter. Technique: Placement of a catheter allows for intermittent or continuous drug administration. Drugs Used: Local anesthetics: Ropivacaine, Bupivacaine. Opioids: Fentanyl, Sufentanil. Combined Spinal-Epidural (CSE):

Location: Combines single-shot spinal with the continuous infusion capabilities of an epidural. Uses: Provides rapid onset and prolonged effect; useful in labor or complex surgeries. Advantages: Combines the benefits of both techniques. Mechanism of Action Local Anesthetics: Block sodium channels, inhibiting nerve signal transmission. Opioids: Act on opioid receptors in the spinal cord to reduce pain perception. Adjuvants: Enhance analgesic effects or prolong the duration. Indications Surgical Anesthesia: Lower abdominal, pelvic, hip, or lower limb surgeries. Obstetric Anesthesia: Labor pain relief (epidural) or cesarean section (spinal or CSE). Postoperative Pain Management: Especially after thoracic or abdominal surgeries. Chronic Pain Relief: Epidural for conditions like radiculopathy. Advantages Localized Effect: Reduces systemic drug exposure and side effects. Improved Recovery: Reduces reliance on systemic opioids postoperatively. Patient Consciousness: Maintains awareness during surgery when appropriate. Versatility: Can be tailored to the duration and intensity of procedures. Complications Common: Hypotension due to sympathetic blockade. Post-dural puncture headache (PDPH) after spinal anesthesia. Serious: Infection (e.g., meningitis, epidural abscess). Bleeding (epidural hematoma). Neurological injury. Local anesthetic systemic toxicity (LAST). Maternal Considerations: Epidural prolonging the second stage of labor. Fetal bradycardia in rare cases. Contraindications Absolute: Patient refusal. Infection at the injection site. Coagulopathy or anticoagulant therapy. Severe hypovolemia. Allergy to local anesthetics. Relative: Pre-existing neurological conditions. Spine deformities. Procedure Overview Pre-procedure: Informed consent. Evaluation of contraindications (e.g., bleeding disorders). Positioning: Patient in a sitting or lateral decubitus position. Technique: Identify the desired level of injection (usually L3-L4 for spinal, L2-L5 for epidural). Use sterile technique for needle placement and drug administration. Monitoring: Continuous assessment of blood pressure, heart rate, and oxygen levels.

Neuraxial drug delivery

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