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LOCAL AND REGIONAL ANESTHESIA: INDICATIONS AND TECHNIQUES

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ABSTRACT

Local and regional anesthesia is an essential part of modern anesthesia, widely used for pain-free surgical procedures. This article provides a detailed overview of the types, indications, contraindications, drugs used, and application techniques of local anesthesia. It also describes the main methods of regional anesthesia, their advantages and disadvantages, possible complications, and preventive measures. Modern recommendations for improving anesthesia effectiveness and safety are also included.

Keywords: local anesthesia, regional anesthesia, lidocaine, novocaine, spinal anesthesia, epidural anesthesia, pain management

INTRODUCTION

Local and regional anesthesia is an integral part of modern medicine, widely used in surgical procedures, diagnostic interventions, and pain management. These methods provide localized anesthesia without affecting the patient's overall condition. First introduced by Karl Koller in 1884 in ophthalmology, local anesthesia has since undergone continuous development.

Local anesthesia refers to the temporary blockage of nerve impulse conduction in a specific anatomical area to eliminate pain sensation. Regional anesthesia involves acting on major nerve trunks to anesthetize broader anatomical regions. These methods offer advantages such as safety, efficacy, reduced need for general anesthesia, and a significant role in reducing postoperative pain.

TYPES OF LOCAL ANESTHESIA

• Terminal (surface) anesthesia: Applied directly to mucous membranes or skin surfaces. Used in ophthalmology, ENT, and dentistry. Drugs: lidocaine, benzocaine, tetracaine.
• Infiltration anesthesia: The most common type; anesthetic solution is gradually injected into tissues. Used in minor surgical procedures.
• Conduction anesthesia: The anesthetic is injected near the nerve trunk, resulting in complete anesthesia in the nerve distribution area.
• Intravenous regional anesthesia (Bier's method): Used in limb surgeries; involves venous occlusion and anesthetic injection into the vein.

MAIN METHODS OF REGIONAL ANESTHESIA

• Spinal anesthesia: Anesthetic is injected into the subarachnoid space. Used for lower abdominal and limb surgeries. Pros: fast onset, deep anesthesia, muscle relaxation. Cons: headache, hypotension.
• Epidural anesthesia: Anesthetic is injected into the epidural space. Lower risk of headache, dose adjustable. Common in labor and long surgeries.
• Paravertebral anesthesia: Anesthetic is injected into the paravertebral space. Used in thoracic procedures.
• Plexus anesthesia: Anesthetic is injected into major nerve plexuses such as brachial and lumbosacral plexuses.

ANESTHETIC AGENTS

• Ester group:
  - Procaine (novocaine): classic, rapidly hydrolyzed
  - Chloroprocaine: short-acting, rapid elimination
  - Tetracaine: long-acting, higher toxicity
• Amide group:
  - Lidocaine: optimal duration, good penetration
  - Bupivacaine: long-acting, cardiotoxic
  - Articaine: fast onset, common in dentistry
  - Ropivacaine: less cardiotoxic, differential block
• Additives:
  - Epinephrine: vasoconstrictor, prolongs effect
  - Sodium bicarbonate: raises pH, faster onset
  - Clonidine: enhances analgesic effect

TECHNIQUE OF ADMINISTRATION

Preparation:
- Patient assessment and history
- Identify contraindications
- Prepare equipment and drugs
- Follow aseptic and antiseptic measures
- Obtain patient consent

Steps:
- Identify anatomical landmarks
- Disinfect skin/mucosa
- Apply local anesthesia if needed
- Insert needle and confirm position
- Perform aspiration test
- Inject anesthetic slowly
- Monitor patient and assess effectiveness

Effectiveness indicators:
- Loss of pain sensation

- Altered touch perception
- Muscle strength and reflex changes
- Observation of vegetative signs

INDICATIONS

Local anesthesia:
- Minor surgeries
- Diagnostic procedures
- Superficial tissue pathology
- Wound suturing and dressing
- Dental interventions
- Dermatologic manipulations

Regional anesthesia:
- Limb surgeries
- Lower abdominal operations
- Urological and gynecological procedures
- Orthopedic surgery
- Pain management

Special indications:
- Contraindication to general anesthesia
- Airway pathology
- Cardiovascular diseases
- Patient preference
- Ambulatory surgery

CONTRAINDICATIONS

Absolute:
- Allergy to anesthetics
- Infection at injection site
- Coagulopathy
- Patient refusal
- Severe psychiatric disorders

Relative:
- Hypertension
- Cardiac arrhythmias
- Demyelinating diseases
- Pregnancy (for some drugs)
- Severe vascular pathology

COMPLICATIONS AND PREVENTION

Local:
- Hematoma
- Infection

- Nerve damage
- Vascular injury
- Spread to non-target tissues

Systemic:
- Allergic reactions
- Toxicity
- Circulatory or respiratory issues
- CNS effects

Specific:
- Headache (post-spinal)
- Hypotension
- Bradycardia or tachycardia
- Visual or hearing disturbances

Prevention:
- Proper indication assessment
- Accurate dosing
- Strict aseptic techniques
- Continuous monitoring
- Emergency readiness

POSTOPERATIVE CARE

Immediate:
- Monitor anesthesia resolution
- Vital signs observation
- Pain assessment
- Detect early complications
- Assess motor function

Long-term:
- Analgesic therapy
- Anti-inflammatory measures
- Physiotherapy and rehabilitation
- Follow-up visits
- Lifestyle recommendations

MODERN TRENDS

Technological innovations:
- Ultrasound-guided blocks
- CT-guided blocks
- Fluoroscopy guidance
- Electrostimulation
- Robotic systems

New drugs:
- Long-acting agents
- Liposomal forms
- Nanopreparations
- Combination solutions
- Bioactive additives

Minimally invasive methods:
- Microneedles
- Laser anesthesia
- Cryoanesthesia
- Electroanalgesia
- Acupuncture combination

CONCLUSION

Local and regional anesthesia are vital components of modern medicine, providing safe and effective analgesia. With proper indications, techniques, and safety precautions, these methods achieve high efficacy and minimal complications. Essential principles include deep anatomical knowledge, precise technique, sterile conditions, continuous patient monitoring, and readiness for emergencies.

In the future, anesthesia will become even safer and more effective with advancements in technology and pharmaceuticals.

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