

التخدير-كورس اول

COMMON PERIOPERATIVE COMPLICATION

Sawa University

جامعة ساوة الاهلية

College of health and medical techniques

كلية التقنيات الصحية والطبية

Department of Anesthesia

قسم تقنيات التخدير

3rd Stage cours 1

المرحلة الثالثة

محاضرة رقم 5

نظري

Lecture No. 5

Theoretical

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M.B.CH.B / F.I.C.M.S of Anes. And IC

Malignant Hyperthermia

- Pharmacological disease of skeletal muscle
- Hypermetabolic crisis
- Induced by exposure to volatile anaesthetic agents or Suxamethonium
- Loss of normal calcium homeostasis
- Unregulated release of Calcium from the sarcoplasmic reticulum
- Myocyte hypermetabolism
- Majority of MH susceptible patients have mutations on RYR1 or DHP genes
- Inherited or spontaneous
- 50% Autosomal Dominant

Key signs and symptoms of Malignant Hyperthermia

EARLY	DEVELOPING	LATE
Prolonged masseter spasm after suxamethonium Inappropriately raised end tidal carbon dioxide or tachypnoea during spontaneous respiration Inappropriate tachycardia Cardiac arrhythmias, particularly ventricular ectopic beats	Rapid rise in temperature (0.5°C per 15 min) Progressive respiratory and later metabolic acidosis (ABG) Hyperkalaemia Profuse sweating Cardiovascular instability Decreased SpO₂ or mottling of skin Generalised muscular rigidity	Coloured urine – due to myoglobinuria Generalised muscle ache (in an awake patient) Grossly raised serum CK Coagulopathy Cardiac arrest

MANAGEMENT

- **Immediate Actions**

- 1.. **Discontinue Triggering Agents:**

Stop all anesthetic gases and agents that could have triggered the MH reaction.

2. **Ventilate with 100% Oxygen:**

The patient should be hyperventilated with 100% oxygen to prevent hypoxemia.

3. **Administer Dantrolene:**

Give the antidote, dantrolene, intravenously as soon as the MH episode is suspected. This medication works by stopping the excessive release of calcium into muscle cells.

4. **Begin Active Cooling:**

Initiate measures to cool the patient, such as applying ice packs, using a cooling blanket, or administering chilled IV fluids

Supportive Care

- **Correct Metabolic Imbalances:**

Treat acidosis, often with sodium bicarbonate, and address any electrolyte imbalances.

- **Treat Arrhythmias:**

Administer medications to correct any abnormal or irregular heartbeats that may occur.

- **Maintain Urine Output:**

Ensure adequate kidney function by providing fluids and possibly furosemide to maintain a urine flow of at least 2 mL/kg/hr.

- **Provide Supportive Monitoring:**

Continuous monitoring of core body temperature, blood pressure, heart rate, and breathing is essential.

- **Perform Laboratory Tests:**

Frequent lab tests are needed to check for muscle breakdown (indicated by enzymes like creatine kinase) and kidney damage.

ASPIRATION UNDER ANAESTHESIA

- Pulmonary aspiration is defined by the inhalation of oro-pharyngeal or gastric contents into the larynx and the respiratory tract.
- Aspiration of solid matter can cause hypoxia by physical obstruction, whereas aspiration of acidic gastric fluid can cause a pneumonitis with the syndrome of progressive dyspnoea, hypoxia, bronchial wheeze and patchy collapse, consolidation on chest X-ray or all. The risk of mortality and serious morbidity increases with bronchial exposure to greater volumes and acidity of aspirated material.
- **Risk factors for the aspiration**
- **Obesity:**
- **Gastrointestinal (GI) issues:**
- **Swallowing dysfunction:**
- **Pregnancy:**
- **impaired consciousness:**
- **Emergency surgery**
- **Position: .**
- **Type of surgery**
- **Duration**

IMMEDIATE MANAGEMENT DURING ANESTHESIA

- **Alert the team.** Notify the entire surgical and anesthesia team of the event.
- **Position the patient.** If feasible, turn the patient's head to the side and place them in a Trendelenburg (head-down) position to help drain material away from the larynx.
- **Suction the airway.** Use a powerful suction device to clear the oral cavity and trachea of any visible aspirated material.
- **Administer 100% oxygen.** Maximize the patient's oxygenation immediately.
- **Confirm intubation.** If not already done, intubate the trachea with a cuffed endotracheal tube to secure the airway and prevent further aspiration.
- **Check breath sounds.** Auscultate the lungs to verify ventilation and assess for wheezing or unequal breath sounds.
- **Initiate bronchoscopy.** If particulate matter was aspirated, a flexible or rigid bronchoscope may be needed to remove it from the smaller airways.
- **Treat bronchospasm.** Administer bronchodilators like nebulized albuterol if wheezing is present.

Post-aspiration management

- Intensive monitoring.** The patient should be monitored closely in the Intensive Care Unit or Post-Anesthesia Care Unit for signs of respiratory distress, infection, and hemodynamic instability.
- Respiratory support.** The patient may require mechanical ventilation with positive end-expiratory pressure (PEEP) to support lung function.
- Delayed extubation.** Extubation may be postponed until the patient is fully awake and breathing effectively to avoid repeat aspiration.
- Antibiotics:** Prophylactic antibiotics are not recommended for chemical pneumonitis. **Corticosteroids:** Steroids are generally not recommended for aspiration pneumonitis and have not been shown to improve outcomes.
- Physical therapy:** Chest physiotherapy and early mobilization can help clear secretions and improve lung function

BRONCHOSPASM

- Bronchospasm or a bronchial spasm is a sudden constriction of the muscles in the walls of the bronchioles
- It is caused by the release (degranulation) of substances from mast cells or basophils under the influence of anaphylatoxins
- **Signs and symptoms**
 - Wheezing
 - Prolonged expiration
 - ↑ Peak inspiratory pressure
 - ↓ Exhaled tidal volume
 - ↓ Oxygen saturation
 - A delayed rise in end-tidal CO₂ on capnograph
 - Hypotension
 - Moderate tachycardia

MANAGEMENT

1. **Call for help:** Alert the surgical and anesthesia teams immediately.
2. **Assess the patient:** Look for the signs listed above and consider potential triggers.
3. **Deliver high-flow oxygen:** Increase the oxygen supply to the patient.
4. **Deepen anesthesia:** Increase the level of anesthetic, using a non-irritating volatile or intravenous agent.
5. **Administer bronchodilators:**
 5. Salbutamol (via the breathing circuit or intravenously).
 6. Nebulized ipratropium bromide.
 7. Intravenous magnesium sulfate or ketamine can also be used.
6. **Check the airway:**
 5. Rule out other causes, such as endotracheal tube misplacement, kinking, or mucous plugging.
 6. Ensure the tube is not kinked against the tracheal wall.
 7. Consider a deep suction if secretions are suspected.
7. **Consider adrenaline:** In severe, refractory cases, intravenous or nebulized adrenaline may be necessary.
8. **Consider corticosteroids:** These may be administered to reduce inflammation in more severe cases.

High spinal anesthesia

High spinal anesthesia is a complication of central neuraxial techniques that include spinal and epidural anesthesia

- It is defined as a spread of local anesthetic affecting the spinal nerves above T4
- The effects are of variable severity depending on the maximum level that is involved but can include **cardiovascular and/or respiratory compromise**
- In total spinal anesthesia, there is an intracranial spread of local anesthetic resulting **in loss of consciousness**

Contributing factors

Positioning of patient

*Local anesthetic dose

- Pre-existing epidural block
- Unrecognized Dural puncture and intrathecal injection
- Accidental subdural block
- Accidental intradural space

SYMPTOMS

T1-T4 Cardiac sympathetic fibers blocked	Hypotension Bradycardia
C6-C8 Hands and arms	Paresthesia numbness hands/arms Weakness of hands/arms Shortness of breath (accessory respiratory muscles affected)
C3-5 Diaphragm and shoulders	Shoulder weakness – respiratory compromise imminent Hypoventilation and/or desaturation Respiratory arrest
Intracranial spread Brain stem	Slurred speech\ Sedation \ Loss of consciousness



MANAGEMENT

- **Immediate recognition:** A high spinal must be recognized quickly for effective management.
- **Supportive care:**
 - **Airway management:** Administer oxygen and be prepared for ventilatory support if needed.
 - **Circulation support:** Use IV fluids and vasopressors (like ephedrine) to maintain blood pressure and heart rate.
 - **Positioning:** Placing the patient in a semi-Fowler's position can sometimes help to manage a high spinal.
- **Rapid delivery:** In obstetric cases, rapid delivery of the fetus can help improve maternal circulation.

LOCAL ANESTHETICS SYSTEMIC TOXICITY

local anesthetics are commonly used in most medical and dental practices. while adverse effects are rare*, the rising prevalence of local anesthetics in practice has resulted in a greater incidence of local anesthetic toxicity.

accidental intravascular injection during the administration of local anesthetics has long been recognized as the most common cause of last. however, certain comorbidities can also increase the risk of local anesthetic overdose, and in turn systemic toxicity.

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CAUSES & RISK FACTORS FOR LAST

DRUG	Potency (Lipophilicity) Dose (Volume & Conc.) Rate of injection Addition of vasoconstrictor (Epinephrine/Phenylephrine)
PATIENT RISK FACTORS	Extremes of age Pregnancy Respiratory / Metabolic Acidosis Hypoxia Hyper K+ Drug interaction (Class I Antiarrhythmic , β blockers , Ca ²⁺ channel blockers) Genetic predisposition Cardiac Renal & Hepatic Disease

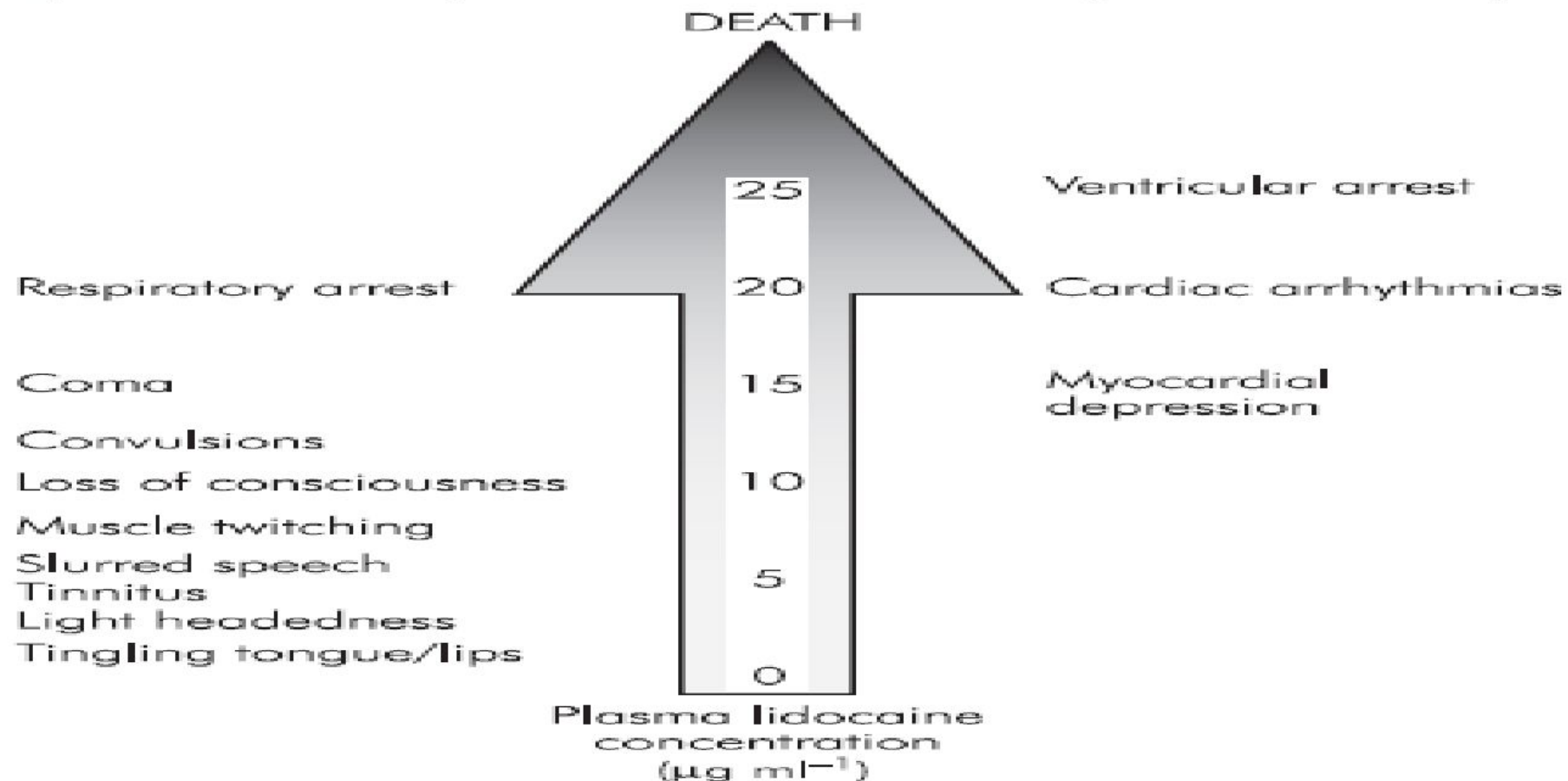
SIGNS AND SYMPTOMS

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Central nervous system toxicity

Cardiovascular system toxicity



CNS effects of local anaesthetic toxicity

- Numbness and paraesthesiae of tongue, mouth and lips
- Metallic taste
- Light-headedness
- Tinnitus
- Slurred speech
- Muscle twitching
- Shivering
- Tremors
- Grand mal convulsions
- Coma
- Apnoea

Cardiovascular effects of local anaesthetic toxicity

- Prolongation of PR interval
- Supraventricular tachycardia
- Decreased automaticity
- Widening of QRS complex
- Ventricular ectopic beats
- Prolongation of ST interval
- T-wave changes

Respiratory effects of local anaesthetic toxicity

- Apnoea with systemic toxicity affecting the respiratory centre
- Bronchodilatation secondary to relaxation of bronchial smooth muscle

LAST Treatment

- **Airway management.** immediate ventilation and [oxygen therapy](#) to manage breathing.
- **Seizure prevention or treatment.** [benzodiazepines](#).
- **IV infusion of [lipid emulsion](#).** It helps reverse LAST by absorbing local anesthetic from blood and tissues. This decreases the concentration of anesthetic in brain and heart.
- **[CPR](#).** If LAST affects the functioning of heart, CPR and use other methods to stabilize it.
- After treatment, monitor for at least six hours to make sure the treatment is effective and don't have any other complications.

Any questions?

*Thank
You*