

## INTRODUCTION TO ANAESTHESIA

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## ⊗ TYPES OF ANAESTHESIA

➤ General

➤ Regional

➤ Monitored anesthesia care

## DEFINITION OF ANAESTHESIA

- It's a pharmacologically induced partial or complete loss of sensation, with reverse of the sensation lost

- Pharmacologically By means of anesthetic medication
- Complete = general anesthesia
- Partial = regional / local anesthesia

\* Coma : traumatic-induced

- loss of consciousness
- Not controlled
- May be irreversible.

## GENERAL ANESTHESIA 5 components

- ① Essential Components of general anesthesia :

- 1. Hypnosis
- 2. Analgesia
- 3. Neuro- muscle relaxation

Golden triangle

- ② Non Essential Components of general anesthesia :

- 4. Amnesia & Sedation
- 5. control of reflexes

## HYPNOSIS

• A state of reversible loss of consciousness by means of hypnotic anesthetic drugs

- 1] Barbiturates & Non barbiturates  
2] Inhalational & Non inhalational

## ANALGESIA

• A state of blunted response to pain by means of analgesic drugs

## CLASSIFICATION

### ❖ Barbiturates

Thiopental Sodium : mostly used

SE : Hypotension

Cardiorespiratory depression

### ❖ Non barbiturates

Methohexital  
Anticonvulsants

Ketamine

Propofol

Etiomodate

Benzodiazepines

\* Ultra-short : better  
\* Middle acting  
\* long acting

local anesthetic :  
↳ better to be long acting

certain doses for hypnosis  
certain doses for sedation

## CLASSIFICATION OF ANALGESICS

### • Opioids

natural (Morphine)

semisynthetic (Pethidine)

synthetic (Fentanyl), Remifentanyl, Alfentanil

↳ More advanced

Shorter action

less dependence

### ❖ None Opioids

• NSAIDs

• Steroids

• Opioid like acting drugs (Tramadol)

↳ SE: Euphoria

## OPIOIDS ANALGESIC DRUGS

- Opioids analgesic drugs are the most common drugs used for analgesia and pain management perioperatively
- Morphine is the mainstay of opioids analgesic drugs and all Opioids potencies are measured according to morphine potency And it's a naturally occurring opioid
- Of all opioids analgesic drugs, Fentanyl and its derivatives are the most commonly used drugs intra operatively due to its unique properties

## NEUROMUSCULAR RELAXATION

- A state of pharmacologically induced muscle paralysis by the use of neuromuscular blocking agents (NMBA)

### CLASSIFICATION OF NMBA

- They can be classified according to the mood of action into :

#### ➤ Depolarizing muscle relaxants

- Suxamethonium Ch L (scoline) →

Muscle fasciculation  
Muscle flaccid

#### ➤ None Depolarizing muscle relaxants

- Rocuronium (Esmerone)

reop. failure

- Pancuronium Br.

reop. failure

- Atracurium

reop. failure

- Cis atracurium

Major SE:- Scoline apnea

muscle fasciculation

severe muscle pain

Bradycardia [severe

finger malignant can cause arrest]

### CLASSIFICATION OF NMBA

- Or can be classified according to the duration of action into :

#### ➤ Short acting NMBA :

Suxamethonium (scoline)

Rocuronium (Esmerone)

#### ➤ Intermediate acting NMBA :

Atracurium

#### ➤ Long acting NMBA :

Pancuronium Br.

## SEDATION AND AMNESIA

- Sedation and Amnesia are considered of the nonessential components of General anesthesia used to decrease the stress response and anxiety
- Mainly achieved by the use of Benzodiazepines → low dose
- The most common drugs used are Midazolam and Diazepam
- ✓ Remember : sedatives are hypnotics in a large dose and hypnotics are sedatives in small doses

## STAGES OF GENERAL ANAESTHESIA

### Guedel's classification of inhalational anaesthesia stages

- Stage I (Analgesia): patient is conscious, respiratory rate normal, heart rate normal, blood pressure normal, eye pupils normal, hyporeflexia, hypotension, hyperreflexia (irritability)
- Stage II (agitation): patient is semiconscious, respiratory rate increased, heart rate increased, blood pressure increased, eye pupils constricted, muscle hyperreflexia, unstable (laboured squint not fixed)
- Stage III (surgical anaesthesia): the patient is unconscious, respiratory rate decreases toward normal, heart rate decreases towards normal blood pressure decrease toward normal, eye pupils meddilated
- Stage IV (overdose): the patient is unconscious, respiratory rate decreases below normal, heart rate decreases below normal, blood pressure decreased, eye pupils dilated

3 levels:

level 1 → not agitated (ing-), RR ↓ to Baseline, pupil central  
 level 2 → deep anaesthesia + absent reflexes & constricted  
 level 3 → pupil med dilated  
 bradycardia, arrhythmia, apnea

## CONTROL OF REFLEXES

- standard continues routine Monitoring of the main vital signs through the operation at all times.
- special monitoring and control for organs and systems in special circumstance and for specific indication.

- Guedel's classic signs of anaesthesia (stages of anaesthesia). They are seen in patients premedicated with atropine and morphine and anesthetized by ether but are not so obvious with recent inhalational agents.

| Stage                                                   | Respiration                                        | Pupils size                                                                         | Eye reflexes                                                                                         | Respiration reflexes                                                                            |
|---------------------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| 1-Anaesthesia by 50% N <sub>2</sub> O in O <sub>2</sub> | -Regular<br>-Small volume                          |  | -All are present                                                                                     | -All are present                                                                                |
| 2-Excitement                                            | -Irregular and erratic with breath holding         |  | -Eyelash reflex is absent                                                                            | -Pharyngeal reflexes are depressed<br>-Vomiting and gag are depressed<br>-Swallowing is present |
| 3-Anaesthesia Plane I                                   | -Regular<br>-Large volume                          |  | -Eyelid reflexes are absent with resistance to lid elevation<br>-Conjunctival reflexes are depressed | -Laryngeal reflexes are present e.g. anal stretch causing laryngeal spasm                       |
| Plane II                                                | -Regular<br>-Large volume                          |  | -Corneal reflexes are depressed                                                                      | -Laryngeal reflexes are depressed                                                               |
| Plane III (Surgical Plane)                              | -Regular<br>-Irr. diaphragmatic<br>-Small volume   |  | -Lacrimation is absent                                                                               | -Cardinal reflex is depressed                                                                   |
| Plane IV                                                | -Irregular<br>-Irr. diaphragmatic<br>-Small volume |  |                                                                                                      |                                                                                                 |
| 4-Overdose                                              | -Respiratory (and CVS) depression → apnea          |  | -All brain stem reflexes are depressed then absent                                                   | -All brain stem reflexes are depressed then absent                                              |

## ASA CLASSIFICATION

- What is ASA ?

ASA is the American society of Anesthesia one of the biggest and leading anesthesia organizations world wide , that implemented many of anesthesia guides used by many anesthetist around the world .

- ASA classified patients undergoing Anesthesia and classified them into 6 main categories

## ASA CLASSIFICATION

| ASA I   | Fit healthy patients with no comorbid diseases                             |
|---------|----------------------------------------------------------------------------|
| ASA II  | A patient who have one or more comorbid diseases that are under control    |
| ASA III | A patient who have one or more comorbid disease that are not controlled    |
| ASA VI  | A patient with one organ or multi organ failure                            |
| ASA V   | A patient who is going to die within 24 hours with or without an operation |
| ASA VI  | Brain death patients candidates for organ transplantation                  |

E : detonates an emergency in any one of the classes above

[Stage 1-25] ASA 2 E → ASA 2 E  
 \* Pt. age 50 , controlled DM , HTN , appendectomy

## ASA FASTING GUIDELINES

### ASA Fasting Recommendations

| Ingested Material | Minimum Fasting Period |
|-------------------|------------------------|
| Clear liquids     | 2 h                    |
| Breast milk       | 4 h                    |
| Infant formula    | 6 h                    |
| Nonhuman milk     | 6 h                    |
| Light meal        | 6 h                    |
| Meal              | 8 h                    |

These recommendations apply to healthy patients who are undergoing elective procedures.

The pregnant women's more than 28 weeks who are undergoing elective procedures must have fasting period at least 8 h.

The fasting periods noted above apply to patients of all ages.

- Clear liquids include water, fruit juices without pulp, carbonated beverages, clear tea, and black coffee.
- Light meal consists of toast and clear liquids.
- Meals include fried or fatty foods or meat.

### \* RAPID SEQUENCE INDUCTION OF G.A. (R.S.I) → Emergency

- Pre oxygenate ( de nitrogenation ) the patient form 3 to 5 minutes.
- Use rapid onset N.M.B.A. ( Rocuronium )
- Apply crecioid pressure . ( B.U.R.P ) (Backward, upward , right pressure) self maneuver
- Intubate as fast as possible . < 1 mint (40sec) 2 persons
- Used in emergency full stomach patients .

### \* CRUSH INDUCTION

- Used in unconscious patients
- Without the use of N.M.B.A.

Notes  
 fasicid  
 unconscious  
 No hypotensive  
 crecioid pressure  
 intubation  
 esophageal rupture  
 with 2-3 persons  
 crecioid as 2 persons  
 forward, down, right pressure  
 with 2-3 persons  
 crecioid as 2 persons  
 forward, down, right pressure  
 with 2-3 persons  
 crecioid as 2 persons  
 forward, down, right pressure

## SPECIAL ANESTHETIC CONCERNS

- Standard monitoring
- Malignant Hyperthermia
- Scolin Apnea

## MALIGNANT HYPERTHERMIA (MH)

1/50 K

### Congenital

### Familial

### Triggers

### Muscle

### Excitation

### First sign

### Hypercardia

### Hyperk

### Unable to

### Do

### ventilation

### hyperthermia (muscle)

### denaturation of protein

Malignant hyperthermia (MH) is an uncommon pharmacogenetic disorder inherited as an autosomal dominant condition of muscle induced by exposure to triggering agents as succinylcholine and all the volatile anaesthetic agents leads to an uncontrolled release of free calcium from the sarcoplasmic reticulum of skeletal muscle.

It is characterized by hypermetabolism, muscle rigidity and muscle injury.

In 50-70% of affected families there are links to the ryanodine receptor gene (RYR1) located on chromosome 19.

Incidence is approximately 1:10 000 - 15 000. All races are affected.

Previous uneventful anaesthesia with triggering agents does not preclude MH.

Mortality rates have fallen dramatically from 70-80% to 2-3% due to increased awareness, improved monitoring standards and the availability of dantrolene.

## STANDARD INTRAOPERATIVE MONITORS

- ASA classified intraoperative monitors into
  - I. Standard I
    - A vigilant, alert, expert anaesthesia provider able to early interpret and interfere at the right time and present at all times
  - II. Standard II
    - ☐ Essential
      - Pulse oxymetry  $SpO_2$
      - Blood pressure
      - Electrocardiography ECG
      - Capnography  $Et CO_2$
    - ☐ Non essential
      - Temperature
  - I. Standard III
    - ☒ Essential + invasive monitors (BP measure)
      - open heart  $CI$
      - Chest
      - Neurosurgery

## CLASSICAL CLINICAL PRESENTATION

- The diagnosis may be difficult as there is no one sign that is unique to MH.
- The clinical features are a direct consequence of loss of skeletal muscle homeostasis, resulting in increased intracellular calcium ion concentration, which causes muscle rigidity, hypermetabolism, and rhabdomyolysis. But classical may be presented as:
- Unexplained increased  $CO_2$  production and tachycardia rise in end-tidal  $CO_2$  in a ventilated patient is one of the earliest, most sensitive and specific signs of MH.
- Masseter muscle spasm may be the first sign of possible susceptibility to MH.
- Cardiac arrhythmias, hyperkalaemia and disseminated intravascular coagulation may develop.
- Arterial blood gas analysis shows hypercarbia with respiratory and metabolic acidosis.
- BP is often unstable, with a tendency for decreasing  $SpO_2$
- Generalised muscle rigidity, raised plasma CK and myoglobinuria are late signs

dantrolene

tx: dantrolene

use of dantrolene

hypermetabolism

physical cooling (30°C fluids etc.)

remove trigger

fresh O<sub>2</sub>

support

## TREATMENT OF MALIGNANT HYPERTHERMIA

- It need a high index of suspicion ,
- To early diagnose and treat is key to successful management
- *first Call for help*
- *Take measures to stop the MH process*
- Discontinue the administration of all inhalation agents and suxamethonium.
- Hyperventilate the patient with 100% O<sub>2</sub> at > 10 l/min via a clean breathing circuit.
- Do not wastetime securing another anaesthetic machine - use an Ambu bag and an O<sub>2</sub> cylinder initially.
- Stop surgery if possible. Otherwise maintain anaesthesia with intravenous agents such as propofol until surgery is completed.

## SUXAMETHONIUM APNOEA

(Schoine)

- Suxamethonium is metabolised by an enzyme in the blood called plasma cholinesterase. *congenital deficiency partial*
- Metabolism is normally complete within 5-10 minutes.
- Some patients lack this enzyme or have an altered enzyme that does not metabolise the suxamethonium rapidly.
- These patients may remain paralysed form 20 minjutes upto many hours after a standard dose of suxamethonium, and must be kept anaesthetised and ventilated until the suxamethonium has been eliminated spontaneously or by other, slower methods.

tx: [FFP]

tx: ventilation for 24 hr.

## TREATMENT OF MALIGNANT HYPERTHERMIA

- Commence active cooling – use cold i.v. fluids and place ice packs on the groin and in the axillae.
- Give dantrolene 2-3 mg/kg. Repeat doses of 1 mg/kg (up to a maximum of 10 mg/kg) should be given until the tachycardia, rise in CO<sub>2</sub> production and pyrexia start to subside.
- Assistance is helpful in mixing dantrolene, which is presented in 20 mg ampoules formulated with 3 g of mannitol. Each vial should be mixed with 60 ml of sterile distilled water. Dantrolene may dissolve faster if several ampoules are emptied into a sterile dish and a large volume of sterile water added.
- Consider gastric and bladder lavage & Avoid peripheral vasoconstriction, which will result from excessive use of ice to the skin, as this will prevent heat loss.

## SUXAMETHONIUM APNOEA

- However plasma cholinesterase activity is reduced in some people due to either genetic variation or acquired conditions, pregnancy, liver disease, kidney failure, heart failure, thyrotoxicosis, and cancer, as well as a number of other drugs, which results in a prolonged duration of neuromuscular block.
- If unrecognized by a clinician it could lead to awareness if anesthesia is discontinued whilst still paralyzed or hypoxemia (and potentially fatal consequences) if artificial ventilation is not maintained. Normal treatment is to maintain sedation and ventilate the patient on an intensive care unit until muscle function has returned. Blood testing for cholinesterase function can be performed