General Anaesthesia

It is the induction of the state of controlled total loss of consciousness resulting from general anaesthetic Drugs, and it is a reversible process

Aim of Anaesthesia
Unconsciousness
Amnesia
Analgesia
+/- paralysis
But ....

• Unable to maintain adequate airway protection and/or spontaneous ventilation as a result of muscle paralysis

• Cardiovascular changes secondary to stimulant/depressant effects of anesthetic agents
Advantages

- Reduces intraoperative patient awareness and recall
- Allows proper muscle relaxation for prolonged periods of time
- Facilitates complete control of the airway, breathing, and circulation
- Can be used in cases of sensitivity to local anesthetic agent
- Can be administered without moving the patient from the supine position
- Can be adapted easily to procedures of unpredictable duration or extent
- Can be administered rapidly and is reversible
Disadvantages

• Requires increased complexity of care and costs
• Requires some degree of preoperative patient preparation
• Can induce physiologic fluctuations that require active intervention
• Associated with less serious complications such as nausea or vomiting, sore throat, headache, shivering, and delayed return to normal mental functioning
• Associated with malignant hyperthermia, a rare, inherited muscular condition in which exposure to some (but not all) general anesthetic agents results in acute and potentially lethal temperature rise, hypercarbia, metabolic acidosis, and hyperkalemia
Stages of general anesthesia

Stage 1: Induction
a period between the administration of the induction and loss of consciousness

Stage 2: Excitement
marked excitement and delirious activity
modern rapid onset drugs can by pass this stage
DO NOT TOUCH THE PATIENT!

Stage 3: Surgical Anaesthesia

Stage 4: Overdose Anaesthesia
( Brain Stem and Medullary depression )
Conducting Anaesthesia

**Induction:** (intravenous vs inhalation)

**Maintenance:** MAC (minimal alveolar concentration)
The alveolar concentration of an inhaled anaesthetic that prevent movement in 50% of patients in response to a standardized stimulus e.g. surgical Incision

**Reversal:** stop Anaesthetic, give muscle relaxant reversal, administer 100% Oxygen

**Recovery** (PACU)
Stages of general anesthesia

Stage 1: Induction

This stage can be achieved by:

- Intravenous injection of **induction agents** (drugs that work rapidly, such as **propofol** or the slower **inhalation of anesthetic** vapors delivered into a face mask, or by a combination of both.)

- **Adding opioid analgesic**, such as fentanyl (a synthetic opioid many times more potent than morphine).
  - Induction agents and opioids work synergistically to induce anesthesia
  - Prepare for painful events: as endotracheal intubation and incision of the skin (which may raises the blood pressure and heart rate)
• The next step of the induction process is securing the airway

• a laryngeal mask airway or endotracheal tube (if will use muscle relaxant)
Stages of general anesthesia

Stage 2: Maintenance:
Mostly by anesthetic gases (vapors) into the patient's lungs. These may be inhaled as the patient breathes spontaneously or delivered under pressure by each mechanical breath of a ventilator.

The most stable part of anaesthesia, just control the level of anaesthesia according to the surgery.
Monitoring during Anaesthesia

ECG (electrocardiograph)
NIBPM (non invasive Blood Pressure monitoring)
Pulse oximeter (arterial O2 Saturation, SaO2%)
Capnograph (End tidal CO2): CO2 in exhaled air, an indirect monitor of the CO2 partial pressure in the arterial blood

Inhalation Agents Concentration
PNM (peripheral neuromuscular monitoring)
BIS (Bispectral index): depth of anesthesia (electroencephalographic parameters)
Patients Assessment & Preparation

To assess patient's fitness for Anaesthesia and assessment of risk factors by:

Relevant Medical history
Examination
Appropriate investigations
Identification of **risk factors:**

*Patient risk factors*
*Procedure risk factor*
Patient risk factors
American Society of Anaesthesiology
Classification (ASA)

I. A healthy Patient

II. A patient with mild systemic disease (controlled)

III. A patient with severe systemic disease that limits activity but is not incapacitating

IV. A patient with an incapacitating systemic disease that is a constant threat to life

V. A moribund patient not expected to survive 24 hours with or without operation

E. If the procedure is performed as an Emergency
Patient risk factors

Respiratory (severity of SOB, smoking, PFT)

Cardiovascular (chest pain, smoking, Cholesterol, stress test)

Tolerance of physical activities
Search

Difficult Airway risks – Mallampati, neck, tongue, teeth

Medications e.g. Dose, frequency of administration

Allergies e.g. LATEX

Fasting status
FASTING

• 3hrs for clear liquid

• 6hrs for solid
Difficult airway management

- Small or receding jaw
- Prominent maxillary teeth
- Short neck
- Limited neck extension
- Poor dentition
- Tumors of the face, mouth, neck, or throat
- Facial trauma
The Mallampati assessment

- Performed when the patient is seated with the mouth open and the tongue protruding without phonating.

Class 1:
Full visibility of tonsils, uvula and soft palate

Class 2:
Visibility of hard and soft palate, upper portion of tonsils and uvula

Class 3:
Soft and hard palate and base of the uvula are visible

Class 4:
Only Hard Palate visible
Figure 2: Mallampati views
Continue chronic medical ttt except

- **Anticoagulants** to avoid increased surgical bleeding
- **Oral hypoglycemics** (For example, metformin is an oral hypoglycemic agent that is associated with the development of metabolic acidosis under general anesthesia)
- **Monoamine oxidase inhibitors** (risk of drug interactions and decreased sympathetic stability)
- **OCs**: increase DVT
Procedure risk factors

**Minor** e.g. Superficial, Endoscopy

**Intermediate** e.g. Head and neck, Prostate

**Major** e.g. Emergency in elderly, prolonged procedure + large fluid shift
Premedications

Aim:
- To reduce the risk of aspiration by refluxes and airway secretions
- To have the patient arrive in the operating room in a calm, relaxed frame of mind

1. Decrease anxiety e.g. Benzodiazepams: Midazolam (short acting)

2. Decrease airway secretion e.g. Anticholinergics (atropine, scopolamine)

3. Prophylaxis against aspiration e.g. H2 blockers
Anaesthesia Drugs: **Hypnotics**

Drugs which induce sleep e.g. intravenous induction agents, two main classes:

- **Barbiturate** e.g. Thiopental

- **Non-barbiturate** e.g. Propofol, Etomidate, Ketamine
  - **Propofol**, a nonbarbiturate intravenous anesthetic, (less postoperative nausea and vomiting and a more rapid, clear-headed recovery.
  - In addition to being an excellent induction agent, propofol can be administered by slow intravenous infusion instead of vapor to maintain the anesthesia.
Anaesthesia Drugs: **Sedatives**

Drugs which depress CNS, causing calmness and reduction of anxiety

**Benzodiazepines**

e.g. Midazolam, Diazepam, Larazepam, Temazepam
Anaesthesia Drugs: **Analgesics**

Drugs which relieve pain, they can be classified as peripherally acting and centrally acting drugs.

e.g.
**NSAID** (Paracetamol, Diclofenac or Voltaren)

**Opiates** (Morphine, Fentanyl)

- Old: Morphine, meperidine, and hydromorphone
- Synthetic opioids, (less fluctuation in blood pressure and are shorter acting). These include **fentanyl**, sufentanil, and remifentanil
Anaesthesia Drugs: Inhalational anaesthesia

Drugs which are administered via the respiratory system (inhaled by vaporizers)

- Inorganic nitrous oxide (N2O) (weaker)
- Volatile agents

Induce and maintain general Anaesthesia

- They are liquid at room temperature but evaporates easily and administered by inhalation

- The prototype of modern anesthetic vapors is halothane (no longer used) it was displaced by isoflurane and enflurane, agents that were cleared from the lungs faster and more rapid action. Recently, desflurane and sevoflurane came into use
Anaesthesia Drugs: **Muscle relaxant**

- Known as neuromuscular blockers (NMB)

- Cause reduction of muscle tone (paralysis) by inhibiting Acetylcholine (Ach) action at neuromuscular end plate

- Two main classes
  - Depolarizing NMB e.g. Suxamethonium
  - Non-depolarizing NMB e.g. Rocuronium, Vecuronium
Anaesthesia Drugs: **Local anaesthesia**

Drugs which produce reversible conduction blockade of impulses along central and peripheral nerve pathways (autonomic, sensory, somatic motor)

**Two main classes**

* Esters e.g. procaine, chlorprocaine, tetracaine
* Amides e.g. Lidocaine (Xylocaine), Bupivacaine, Ropivacaine
Anaesthesia Drugs: **Anticholinesterase**

Drugs assist to antagonize the effect of non-depolarizing NMB e.g. Edrphonium, **Neostigmine**
Post operative complications

**Mortality**
- 1:100,000 (modern anaesthesia)

**Common non serious:**
- Vomiting 10-20%
- Nausea 10-40%
- Sore throat 25%
- Incisional pain 30%
Common post operative complications

**GIT**
- Nausea & Vomiting
- Constipation (decrease bowel motility secondary to Morphine)

**CNS**
- Pain
- Confusion/Delirium
- Delayed recovery

**Cardiovascular**
- low/high BP
- MI
- Arrhythmias
- Bleeding
Common post operative complications

**Respiratory**
- Atelectasis
- Pneumonia
- Pulmonary embolism
- Hypoventilation
- Hypercapnia
- Hypoxaemia
- Airway obstruction
- Bronchospasm
- Aspiration
- Respiratory failure
Post operative complications

- Anaphylaxis
- Malignant Hyperthermia
- Delayed recovery