General & Local Anesthesia
General Anesthesia: Inducing

- Quick
- Safe
- Easily reversible

Unconsciousness for any desired period
Drugs in Anesthesia are given:

1. Before surgery
2. During surgery:
   • Unconsciousness
   • Analgesia
   • Muscle relaxation
3. After surgery:
   • Reversal of neuromuscular block
   • Relief of pain
   • other
Stages of General anesthesia:
Stage One: Analgesia
Stage two: Delirium
Stage Three: Surgical anesthesia
Stage Four: Medullary paralysis, death
1-Before surgery: (Premedication)
A- Anxiolysis and Amnesia.

- Patient is apprehensive clear explanation of what to expect
- Reassurance.
- Very anxious patient can be helped by benzodiazepines
B-Analgesia for patient in pain.
Or to:
Prevent post operative pain
-Parenteral opiates morphine

C-Drying of bronchial secretions.
Anti muscarinic drugs
Rarely used
Glycopyrronium is used one hour before surgery
Gastric content can lead to pulmonary aspiration:

- Single dose of anti acid
- Ranitidine
- Metoclopramide

*Fasting for at least 6 hours before anesthesia*
2-During surgery:
The Aim is to induce:
• Analgesia
• Unconsciousness
• Muscle relaxation (Intra abdominal surgery)
General anesthesia will include two steps:
A- Induction of anesthesia.
B- Maintenance.
A-Induction: Usually IV (Pre-Oxygenated patient)
• Small doses of opiates
• Fentanyl
• Followed by Thiopental (Ultra short acting Barbiturate)
  or: Propofol
B-Maintenance: (Inhalation)

• Nitrous oxide (N2O) and Oxygen
• Volatile agents +Oxygen + Air.
  ▪ Isoflurane
  ▪ Sevoflurane
  ▪ Halothane

Or

Continuous iv infusion of Propofol (IV)
3-After surgery:

• Patient is not left alone until consciousness regained:
• Effect of neuromuscular blockade either wane off or reverted by Antidote.
• Relief of pain
Dissociative Anesthesia:
• Profound Analgesia
• Antegrade Amnesia
• Minimal Hypnosis
Mode of action:

- On brain primarily on midbrain reticular formation system.
- Lipid solubility is important as the more lipid soluble is the drug the more its effect on the brain.
- GABA receptor activation is also another proposed mechanism.
**Individual Anesthetics:**

Gases and Volatile Agents:

(Inhalation anesthesia)

Effect correlate with the partial pressure of anesthetic agent.

Agents with low solubility in blood provide rapid effect

- N2O (Nitrous Oxide)
- Sevoflurane
Nitrous Oxide (N2O):
Gas used since 1844
• Not inflammable
• Not explosive
• Light anesthesia
Advantages of Nitrous Oxide: (N2O)

- Strong Analgesic action
  50% N2O in Oxygen provide profound analgesia.
- Recovery is very fast
- Around 4 minutes
Disadvantages of Nitrous Oxide: (N2O)

• Expensive
• Must be used with more potent drug to produce surgical anesthesia.
• Post operative nausea and vomiting

Uses:
Use d to maintain surgical anesthesia with other agents e.g. Isoflurane
Contra indications of Nitrous Oxide (N2O):
Any closed distended air filled space will expand
• Intra ocular surgery
• Middle ear
• Lung
Precaution of Nitrous Oxide (N2O):
Adverse reactions:
Nausea and vomiting
  When used for more than 4 hours
  • Megaloblastic changes in blood.
  • Teratogenicity to staff?
Halogenated anesthetics:
(Volatile Agents)
• Halothane
• Isoflurane
• Sevoflurane
Isoflurane:

• Volatile colorless liquid
• Not flammable under normal conditions
• Pungent odor
• Can cause bronchial irritation
Effects of Isoflurane:

Respiratory

- Respiratory depression
- Increased respiratory rate

CVS:

- Slight depression in CVS
- And cardiac output
- Reduce Blood Pressure and peripheral vasodilatation.
Sevoflurane:
Chemical analogue to Isoflurane
**Enflurane** causes more respiratory depression
Halothane (Fluothane):
- Slow recovery
- Decrease cardiac output
- Sensitize heart to catecholamine (Arrhythmia)
- 20% metabolized and induce liver enzymes
- Fever, anorexia, nausea, vomiting
- Hepatic damage (rare but serious)

Hepatitis is reported adverse reaction in 1:50000
- Immune reaction
Intravenous anesthesia:

- Extremely rapid induction
- It is common practice to use iv induction and inhalation agents for maintenance.
- When volatile anesthesia is stopped it is eliminated quickly through the lungs.
Propofol:
• Inductions within 30 sec
• Recovery is rapid
• Nausea and vomiting are extremely rare
Thiopental (Pentothal):

• Very short acting barbiturate
• Induces anesthesia smoothly

**Dose is 3-5 mg /kg**

• Half life = 4 min allows recovery after a single dosage (Patient is awake after 10-15 min)
Metabolized in the liver
Can damage tissue if extravasated

CNS:
• No analgesia
• Decrease intracranial pressure

CVS:
• Hypotension
• Tachycardia
• Decrease respiratory rate
Ketamine (Ketalar):

- Hallucinogen
- Dissociative anesthesia
- Sedation amnesia dissociation
- Analgesia
- 15 min after a single IV injection
- Can be given IM
Used for Minor surgical interventions
Tachycardia
*Increased blood pressure
Cardiac output
Has an advantage in Shocked patients
Bronchodilatation.
Disadvantages of Ketamine:

- No muscle relaxation
- Increase intracranial and intra ocular pressure
- Hallucination during recovery

Decrease by diazepam
Contra indication of Ketamine:

- Hypertension
- Congestive cardiac failure
- Cerebral trauma
- Increased intracranial pressure
- Pregnancy (Contra indication in pregnancy)
**Muscle relaxants in Anesthesia:**

Abdominal surgery requires muscle relaxation (Deep general anesthesia can cause relaxation)

**Neuromuscular blocking agents**
Deep general anesthesia is not advised

Light general anesthesia + selective neuromuscular block
Local anesthesia
Mode of action

- Prevent the initiation and propagation of the action potential (nerve impulse)
- Reducing the passage of sodium through voltage-gated sodium channel
- They block conduction
The distribution of a single dose la is determined by diffusion into the tissue.

Plasma half life is few mints.

By infiltration local anesthesia act within 5 min. And have a useful duration of effect for 1-1.5 hors.

Can be doubled by vasoconstriction.

Local anesthesia is used as an acid salt = HCL.
Dissociate in Basic Media

Liberating the active compound HCL
Free base

In abnormally acidic media (abscess)

This dissociation can be delayed
Also risk of spreading infection
Absorption of topical anesthesia on mucus membrane can be extremely rapid and give plasma concentration comparable to injection.

*This is important specially in urethra*
Chemical classification of local anesthetics:

1-Esters:
   Cocaine, Procaine, tetracaine, Benzocaine

2-Amides:
   Lignocaine (Xylocaine) Lidocaine Prilocaine, Pupivacaine
- Effect is terminated by removing the local anesthetic from the circulation.

- Most LA cause dilatation with the exception of cocaine
- Addition of epinephrine (Adrenaline) increase the duration of lidocaine
Never use adrenaline in extremities = fingertips, nose, toes, etc.

Can lead to Gangrene!
Uses of local anesthesia:

1- Surface anesthesia: solution jelly cream
2- Infiltration anesthesia
3- Regional anesthesia
   - Nerve block
   - Intravenous regional anesthesia
   - Epidural anesthesia
   - Intrathecal (Spinal anesthesia)