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Introduction to Anesthesia

“Understanding the Concept”

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- Introduction
- Defintions and Terms
- Stage of anesthesia
- Scope.
- History of anesthesia.



- Anesthesiology is a young specialty historically, especially when compared with surgery or internal medicine.
- Discoveries in anesthesia have taken decades to build upon the observations and experiments of many people, and in some instances, we are still searching.

(i.e the ideal volatile)



- Much of our current anesthesia equipment is the direct result of anesthesiologists being unhappy with existing tools and needing better ones to properly anesthetize patients.
- Many safety standards have been established through the work of anesthesiologists who were frustrated by the status quo.



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Consciousness:

- *Can perhaps be described as :*

"Our continuing stream of Awareness of either our surroundings or our sequential thoughts"

Anesthesia

Anaesthesia: Loss of feeling or Sensation

**Latin terminology:* An =====> No,
aesthesia → Sensation

ANESTHESIA

- Partial or complete loss of sensation
- with or without loss of consciousness
- as result of disease, injury, or administration of an anesthetic agent, usually by injection or inhalation

Anesthesia has three main types:

1-General anesthesia :

Induces a reversible, **controlled state of unconsciousness**, along with a lack of sensation and memory during them procedure.

2- Regional anesthesia :

Blocks sensation in a larger region of the body, such as an arm or lower body (**patient remain conscious**).

3-Local anesthesia :

Numbs a small, specific area of the body(**patient Remain conscious**) .



The goal is to make the procedure pain-free and ensure the patient remains safe and relaxed. The types of anesthesia, including local, regional, and general anesthesia, each used depending on the procedure and the patient's needs.



Hypnosis

"The state of being asleep and consequently unaware of the surrounding"

To the anesthetist it technically implies:

- There is deprivation of critical faculties induced by "hypnotism".
- It is pharmacologically induced to a level at which the patient cannot be roused to consciousness by physical stimuli
- patient can still react unconsciously by withdrawal or autonomic reflexes if not deep enough to block nociception, or not given sufficient analgesia as well.



Narcosis

- * A state of stupor produced by drugs (i.e. it is pharmacologically induced).
- It is more accurate than Hypnosis.
- It is confusingly used for Morphine-like drugs of addiction
 - i.e. They take them for their euphoric action and not to get stuporous.

Sedation

A medical process where medications are used to calm or relax a patient, reducing anxiety and discomfort, but without fully putting them to sleep.

It can range from:

- Mild sedation (where the person is still awake and aware but feels relaxed)
- Moderate sedation (more relaxed and may feel drowsy, but they are still conscious and can respond to verbal cues or physical stimuli.)
- Deep sedation (where the person may be on the edge of consciousness but still able to respond to stimuli)

Pain vs. Nociception

- The word "Painful Stimulus" should be restricted to conscious patients who are aware of the pain.
- Under General Anesthesia, the word "**Nociceptive stimulus**" is better used.
- A Nociceptive stimulus will cause pain in the conscious patient and reflex response (*e.g. Tachycardia*) in the unconscious one.

Analgesia

- “The state of freedom from pain”
- Can be effected locally, and the patient is still conscious “e.g. by use of local Anesthetics”.
- Can be generalized and patient still coconscious
 - Systemic Analgesic Drugs.
 - “stage-one general Anesthesia” (*see below*)
- Can be part of deep general Anesthesia.

****So, Anesthesia and analgesia are not interchangeable words!**



Anxiolysis

- A reduction in anxiety (Fear, apprehension, and stress due to awareness of an impending unpleasant experience).
- Sedation will lead to Anxiolysis, but Anxiolysis can be effected by certain non-sedative drugs (e.g. Tranquilizers).

Tranquillizers and antidepressants

- **Tranquillizers:**

Drugs which acts at a lower level of the central nervous system than the cerebral cortex to produce a calming effect.

- **Antidepressants:**

Drugs that alter the mood and mental reactions of patients.

Important Notes !!

- ❑ All hypnotic sedatives, tranquilizers and antidepressants in **large doses** will cause loss of consciousness, respiratory depression and abolition of the protective reflexes.
- ❑ The difference between drugs commonly used for sedation and those used for intravenous induction of general anesthesia is **the therapeutic margin**.



Muscle Relaxation

“ Rendering the muscles less tense by decreasing their tone, or even paralyzing them ”.

- Can be obtained in different ways:

- **By Central depression of the nervous system.**
- **By local anesthesia of peripheral nerves.**
- **By blocking the neuromuscular junction.**

*** Any drug which causes a muscle to relax could be called a Muscle Relaxant, but in **anesthesia** practice this term is almost exclusively reserved for the group of intravenously administered drugs which block the chemical transmission of a nerve impulse at the **Neuromuscular Junction** leading to muscle paralysis.*



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General Anesthesia

General Anesthesia clinically implies that:

The patient has been rendered reversibly unconscious by DRUGS

for the execution of a painful operative or diagnostic test.

Subdivisions of General Anesthesia

Are based on the route by which the drug is introduced into the body and thence via the blood stream to the brain:

➤ *Intravenous.*

➤ *Inhalational.*

➤ *Intramuscular.*

➤ *Rectal.*

Modern “Balanced” General Anesthesia

- An altered physiologic state, characterized by Reversible loss of Consciousness, analgesia of the entire body, amnesia, and some degree of Muscle Relaxation.
- This is brought about by different groups of drugs that has different specific actions:
 - **Hypnotic drugs** for effecting Loss of Consciousness.
 - **Analgesic Drugs** for effecting analgesia.
 - **Muscle relaxant Drugs** for effecting muscle paralysis.

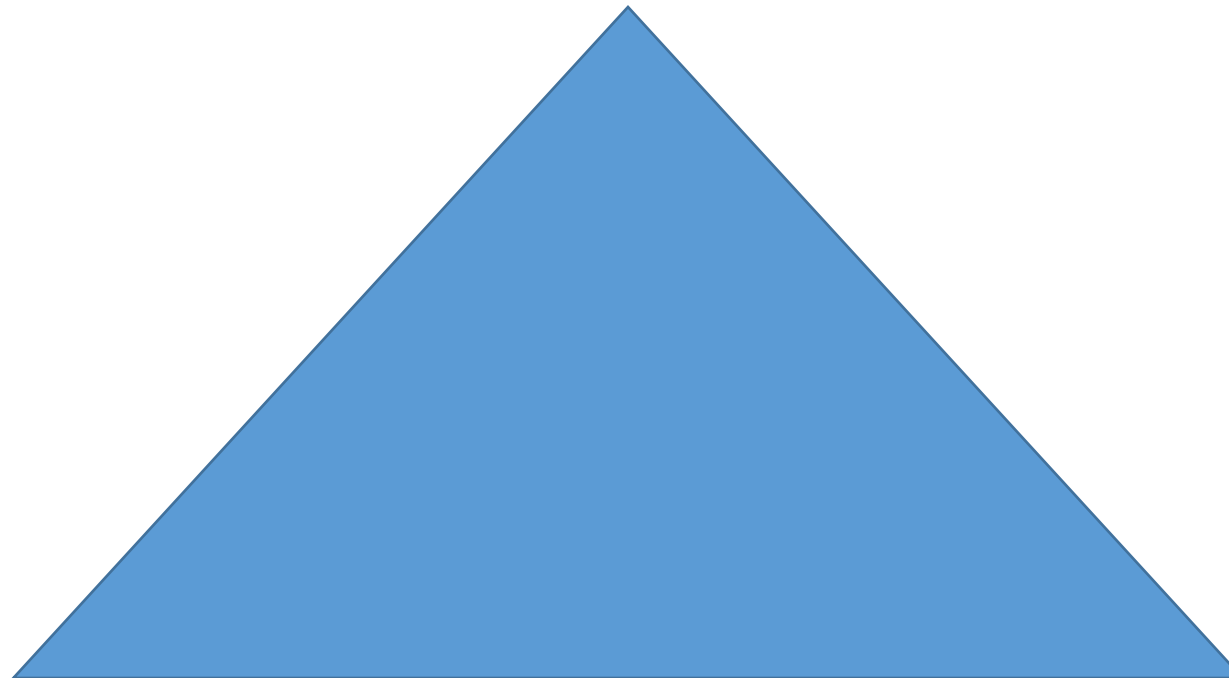
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This is in comparison with “Old Anesthesia” where all of the above actions were effected by a single agent (e.g. Ether) at high concentrations with higher incidence of side effects.

Triad of General Anesthesia



Hypnosis

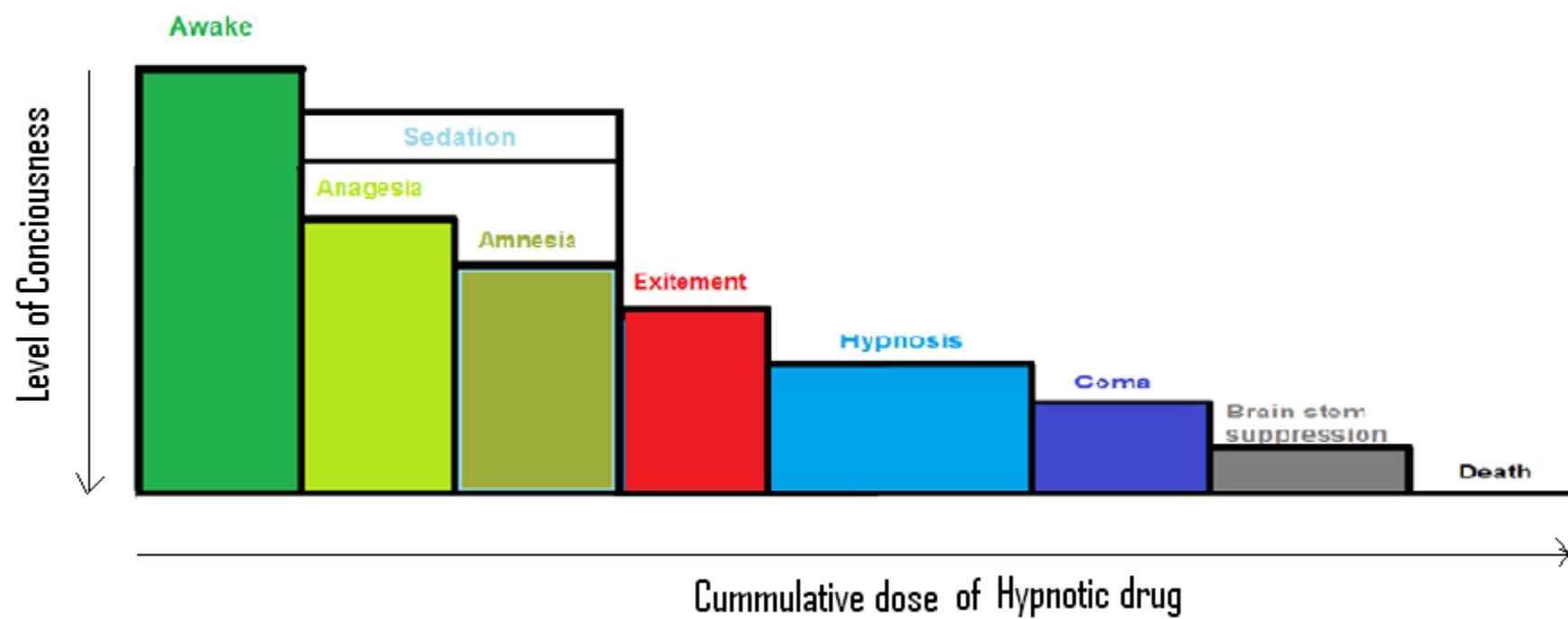


Analgesia

Muscle relaxant



- **General Anesthesia** is not a single, all-or-non state of
- altered Consciousness; rather, it **is a continuum** of alteration of Consciousness, brought about by increasing plasma and CNS levels of the anesthetic agent. This **continuum** can be classified into stages characterized by cumulative development of different clinical states of consciousness.





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Stages of Anesthesia

- FOUR STAGES:

STAGE 1: Stage of conscious sedation

STAGE 2: *Stage of Excitement*

STAGE 3 : *Stage of Surgical Anesthesia*

STAGE 4: *Stage of Medullary depression*

STAGE 1: (Stage of conscious sedation):

- Low anesthetic Concentrations in CNS → Decrease activity of neurons in cells of Substantia Gelatinosa in Spinal Cord → interruption of the function of Spinothalamic tract → some degree of Analgesia.
- Clinically: The patient initially experiences analgesia without amnesia. However, later in stage 1 both analgesia and amnesia ensue.

Stage 2: (Stage of Excitement):

- complex neuronal actions take place, including blockade of many small inhibitory neurons such as Golgi type II cells, together with a paradoxical facilitation of excitatory neurotransmitters.

- Clinically:

During this stage the patient appears to be delirious and excited but definitely is amnesic.

Also:

- **Respiration is irregular in rate and volume.**
- **Retching and vomiting may occur.**
- **Incontinence and struggling sometimes occur.**
- **Regular breathing marks the end of this stage.**



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Stage 3: Stage of Surgical Anesthesia:

- there will be a progressive depression of pathways in the reticular activating system, together with suppression of spinal reflex activity that contributes to muscle relaxation.
- Clinically:
It begins with the recurrence of regular breathing and extends to complete cessation of spontaneous respiration.

** Four planes of stage III have been defined, representing increasing depth of anesthesia:

Plane 1: From the return of regular respirations to the cessation of REM.

Plane 2 :The Surgical Plane: from the cessation of REM to the onset of paresis of the intercostal muscles.

Plane 3 :From the onset to the complete paralysis of the intercostal muscles.

Plane 4: From the paralysis of the intercostal muscles to the paralysis of the diaphragm - at the end of this plan the patient will be apneic.



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Stage 4: Stage of Medullary depression:

- At high CNS drug concentrations, the activity of neurons in the respiratory and vaso-motor centers in the brain stem - which are relatively insensitive to anesthetic drugs – is depressed, leading to Cardio-Respiratory Collapse.

**** Full Respiratory and Circulatory support are a must, Otherwise, Coma and Death will ensue.**



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- The stages of General Anesthesia used to be clinically distinct in old anesthesia because of slow onset time of older drugs (Ether, etc...).
- In Modern Anesthesia, the distinctive signs of each of the 4 stages are obscured due to:
 - Use of drugs with rapid onset of action.
 - Use of means of mechanical ventilation.
 - Pre or intra-operative use of drugs that influence the signs of anesthesia.



Scope of Anesthesia

- Work In Every Area Of Medicine
 - OR, PACU, ICU, OB, Peds, Pain Clinic
- Work With The Most Diverse Patient Population
 - Premature Infants To Geriatrics
- Provide Medical Care & Critical Care
 - Prior To, During, And After Surgical Procedures
- Work With Advanced Technology

You Might Like Anesthesia If...

- You Enjoy Performing Procedures
- You Are Interested In Critical Care
- You Enjoyed:
 - Pharm, Physio, Cardiology, Pulmonology.
- You Like All Areas Of Medicine
 - You Can Specialize Though.
- You Like To See Immediate Results.

Role of the Anesthetist

- Anesthetist is the perioperative physician.
- Provides medical care to each patient:
 - Pre-operative evaluation.
 - Patient counseling and informed consent.
 - Consultation with surgical team.
 - Providing pain control.
 - Supporting life functions during surgery.
 - Supervising immediate post-operative care.



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Scope of Anesthesia

- Anesthesia for surgical procedures in the operating theatres.
- Anesthesia and sedation in remote areas:
 - ✓ *Day case surgery*
 - ✓ *Radiology*
 - ✓ *Endoscopy*
 - ✓ *Dental*
 - ✓ *Shockwave Lithotripsy*
 - ✓ *Cardioversion*
 - ✓ *Electroconvulsive therapy*
- Cardiopulmonary resuscitation.
- Labor analgesia.
- Pain management: Acute and chronic.

Brief History

- Pre-1800: Surgery Without Anesthesia.
- 1846: First Ether Anesthetic.
- 1847: Chloroform was introduced by James Simpson.
- 1884: Cocaine For Local Anesthesia.
- 1910s-1930s: Endotracheal Intubation.
- 1921: Epidural Anesthesia Described.
- 1943: Curare Clinical Trial Success (Montreal).
- Mid 1950s: halothane.
- 1960: Short Acting Opioids.
- 1982: Transesophageal Echo.
- 1983: Laryngeal Mask Airway.



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Mandragora officinarum



Ether Day – October 16th, 1846



(Courtesy of the Francis A. Countway Library of Medicine, Boston Medical Library, Cambridge, MA.)

Source: [unreadable]
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ETHER ANESTHESIA
THROUGH THE YEARS

Even in the early days of inhalation anesthesia, when the purity of ether was not what it is today, ether was a widely used anesthetic agent. In fact, ether was the choice in a great many operations. Now, with ether of a higher level of purity, it is even more generally selected as an effective and reliable anesthetic agent. — MALLINCKRODT ETHER ANESTHESIA is carefully tested by U.S.P. and additional sensitive Mallinckrodt tests, verified with the Mallinckrodt general mechanical ether, and meets the confidence accorded it by the medical profession.

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Philadelphia
New York
London
Baltimore

PROTECTING THE POTENCY OF YOUR PRESCRIPTIONS SINCE 1847

Before anaesthesia:...

..... Surgery was a terrifying last resort in a final attempt to save life.

Dr D J Wilkinson, past Honorary Treasurer and Archivist, Association of Anaesthetists of Great Britain and Ireland

Liston, an eminent surgeon, was once operating for a bladder stone.

The panic stricken patient finally **broke** loose from the brawny assistants, **ran out** of the room, down the hall and **locked himself in the lavatory**.

Liston, hot on his heels and a determined man, **broke down** the door and carried the screaming patient back to complete the operative procedure.

(Rapier HR. Man against Pain London 1947;49).

- Fanny Burney, a well-known literary artist from the early 19th century, described a mastectomy she endured after receiving a “wine cordial” as her sole anesthetic.
- As **seven male assistants** held her down, the surgery commenced: “When the dreadful steel was plunged into the breast-cutting through veins-arteries-flesh–nerves, I needed no injunction not to restrain my cries. I **began a scream** that lasted unintermittently during the whole time of the incision—and I almost marvel that it rings not in my Earsstill! **So excruciating was the agony.** Oh Heaven!—I then felt the knife racking against the breast bone—scraping it! **This performed while I yet remained in utterly speechless torture.**”
- Burney’s description illustrates the difficulty of overstating the impact of anesthesia on the human condition.

Anaesthesia is now very safe, with mortality of less than 1 in 250,000 directly related to anaesthesia.

=====cf.=====

The global mortality rate due to traffic accidents was 19 per 100 000 population (1:5263)



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Thank You



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