Introduction to Anesthesia

"Understanding the Concept"

Dr. Ahmad Arraqap

Anesthesia dept.

Faculty of Medicine

Jordan University

Learning Objectives

- Define anesthesia and related terms
- Understand types and stages of anesthesia
- Recognize the triad of general anesthesia
- Appreciate the scope and role of anesthesiologists
- Review history and evolution of anesthesia

- Anesthesiology is a young specialty historically, especially when compared with surgery or internal medicine.

- Discoveries in anesthesiology 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.

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

- Partial or complete loss of sensation
- with or with out loss of consciousness
- 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) .**

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- 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

•**Definition:**
A pharmacologically induced state of **sleep-like unconsciousness**.

•**Key features:**
- ❑Loss of awareness of surroundings.
- ❑Patient cannot be aroused by verbal command.
- ❑Still may respond to painful stimuli if analgesia is not also provided.

•**Clinical use:**
- ❑One of the **three pillars (triad)** of general anesthesia (Hypnosis, Analgesia, Muscle Relaxation).
- ❑Achieved with drugs like **propofol, thiopental, sevoflurane**.

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Narcosis

- Definition: Drug-induced state of stupor or unconsciousness
- Produced pharmacologically (e.g. opioids, sedatives)
- More accurate than 'hypnosis' to describe drug-induced sleep
- Rarely used today → replaced by 'general anesthesia' or 'sedation'
- Narcosis may lack pain relief
- Common misuse: 'narcotics' often refers to opioids of abuse

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Sedation

A medical process where medications are used to:

- Calm or relax a patient,
- Reducing anxiety and discomfort,
- Without fully putting them to sleep.

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Sedation

- 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)

Sedation Levels vs Clinical Features

Feature	MILD	Moderate	Deep
Responsiveness	Normal response	Purposeful response to verbal/tactile stimuli	Purposeful response only after repeated/painful stimuli
Airway	Unaffected	Usually maintained	May require support
Spontaneous Ventilation	Unaffected	Adequate	May be inadequate
Cardiovascular Function	Unaffected	Usually maintained	Usually maintained
Use Examples	Anxiolysis (pre-op meds)	Endoscopy, minor surgery	Debridement, painful procedures

Feature	Hypnosis	Narcosis	Sedation
Definition	Drug-induced sleep-like unconsciousness	Drug-induced stupor/unresponsiveness	Continuum of reduced consciousness (mild → deep)
Patient Awareness	No awareness of surroundings	No awareness, stupor-like	Variable (relaxed, may respond)
Response to Stimuli	Absent unless very strong	Absent	Present in light/moderate; painful only in deep
Use in Anesthesia	Core part of Triad of GA	Historical term, rarely used	Common for minor procedures, anxiety control
Drugs	Propofol, thiopental, inhaled agents	Historically morphine/opioids	Benzodiazepines, low-dose propofol

Important Notes !!

- **Hypnosis ≠ Narcosis ≠ Sedation**.

❑*Sedation* = lighter continuum, patient partly responsive.

❑*Narcosis* = drug-induced stupor, older term, not precise.

❑*Hypnosis* = controlled, reversible unconsciousness used in anesthesi

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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.

<u>**So, Anesthesia and analgesia are not interchangeable words!</u>

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).

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 <u>been **rendered reversibly unconscious by DRUGS**</u>

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

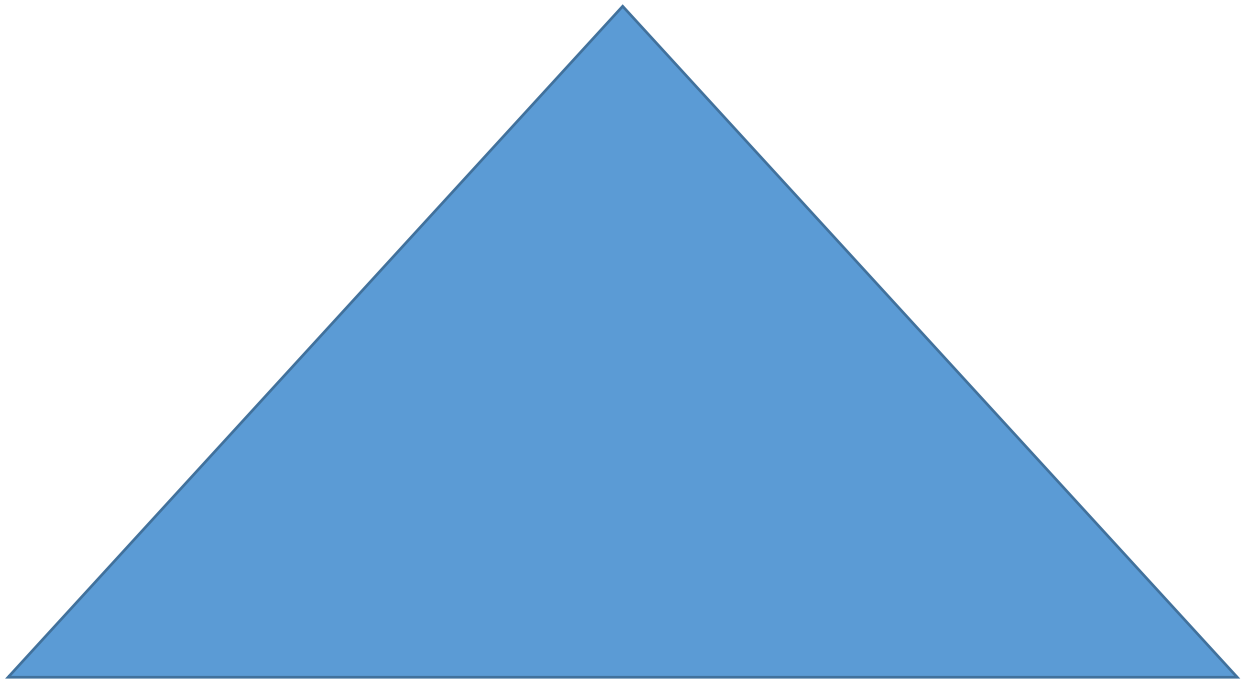
- An altered physiologic state, characterized by Reversible loss of Consciousness, analgesia of the entire body, amnesia, and some degree of Muscle Relaxation.
- This is brought about by different groups of drugs that has different specific actions:

  - **Hypnotic drugs for effecting Loss of Consciousness.**
  - **Analgesic Drugs for effecting analgesia.**
  - **Muscle relaxant Drugs for effecting muscle paralysis.**

- **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



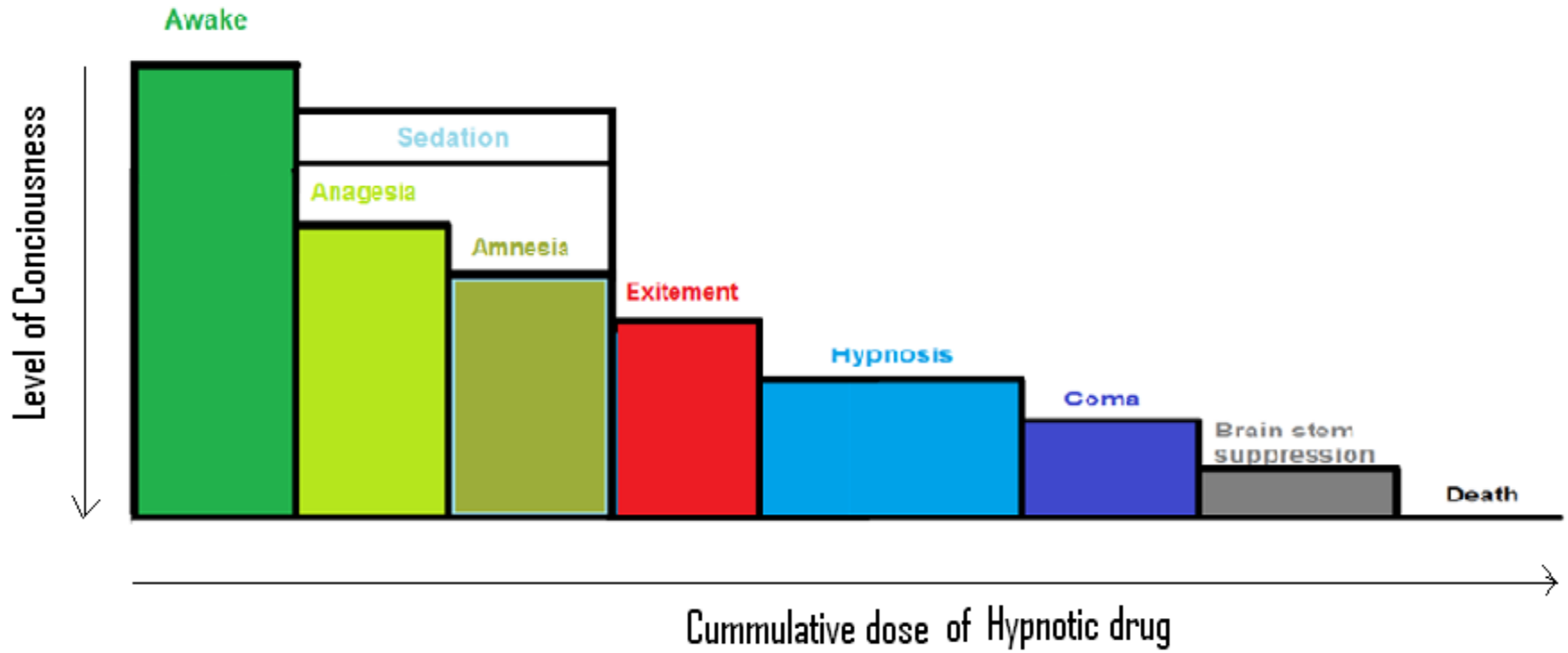
Analgesia

Muscle relaxant

❑*General Anesthesia*

- *IT is <u>not</u> a single, all-or-non state of altered Consciousness; rather, it **<u>is a continuum</u>** of alteration of Consciousness, brought about by increasing plasma and CNS levels of the anesthetic agent.*

- *This **<u>continuum</u>** can be classified into stages characterized by cumulative development of different clinical states of consciousness.*


Awake
Sedation
Anagesia
Amnesia
Exitement
Hypnosis
Coma
Brain stem suppression
Death
Level of Conciousness
Cummulative dose of Hypnotic drug

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 anestheic 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 paradoxic facilitation of excitatory neurotransmitters.

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

Stage 2: (Stage of Excitement):

- **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.**

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.

- It begins with the recurrence of regular breathing and extends to complete cessation of spontaneous respiration.

Stage 3: Stage of Surgical Anesthesia:

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.

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.

- 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.

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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 Like To See Immediate Results.

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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

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.

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.

Ether Day – October 16th, 1846

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

Before anesthesia:…

….. 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)

Thank You