



# General Anesthesia Techniques

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# Lecture Objectives..

Students at the end of the lecture will be able to:

1. Define General Anesthesia
2. Learn about several equipment, adjuncts and agents used for induction of general anesthesia including intravenous agents, inhalation agents, neuromuscular blocking agents and reversal agents.
3. Understand basic advantages and disadvantages of these agents.
4. Anesthesia Work Station anesthesia machine structure
5. Complications commonly encountered during general anesthesia



# What is Anaesthesia?

“Without sensation”

1846 by Wendell Holmes to describe ‘state of sleep from ether’.

Early drugs: opium, alcohol, cocaine

N<sub>2</sub>O (1844) & CO<sub>2</sub>

Ether (1846, Morton in Boston)

Chloroform (1847, Simpson)

NMBDs (1942)

Halothane (1956)

Thiopental

Propofol

Iso/Sevo/Des-flurane





General anesthetics have been used since 1846 when Morton demonstrated the first anesthetic (using ether) on 16th of Oct 1846 in Boston, USA.

Local anesthetics arrived later, the first being scientifically described in 1884.





# Definitions

Term	Definition
<b>General anesthesia</b>	A state of unconsciousness, analgesia, and amnesia with skeletal muscle relaxation and loss of reflexes.
Inhalational anesthesia	Anesthesia induced by inhalation of drug
Minimum alveolar concentration (MAC)	The alveolar concentration required to eliminate the response to standardized painful stimulus in 50% of patients
Analgesia	A stage of decreased awareness of pain , sometimes with amnesia.
<b>Balanced anesthesia</b>	<b>Anesthesia produced by a mixture of drugs, often including both inhaled and intravenous agents..</b>

# ANESTHESIOLOGIST → is a superman Doctor *IS NOT JUST IN THE OPERATING ROOM*

- **Operating room**
  - hospital
  - surgicenter
- **Labor & delivery suite**
- **Other procedural areas**
- **Intensive care unit (ICU)**
- **PACU**
- **Pain management**
  - acute pain
  - chronic/ cancer pain
- **Emergency Medicine**
- **“Code Blue” team**
- **Respiratory therapy**
- **Administration**
  - operating room
  - hospital
  - medical school
- **Education**
  - health professionals
  - public
- **Research**
- **Managers**

# General Anesthesia Goals



Primary goal:

1. Oxygenation
2. Ventilation
3. Monitoring
4. Amnesia: patient should forget any unpleasant feeling.
5. Hypnosis: Unconscious state
6. Analgesia: No pain sensation
7. Autonomic Block: Reflexes blocked
8. Optimal conditions: all the above along with good muscle relaxation.

**SAFETY AND PATIENT CARE IS THE PRIORITY**





# General Anesthesia

- Assessment
- Planning I: Monitors
- Planning II: Drugs
- Planning III: Fluids
- Planning IV: Airway Management

## Process of Anesthesia

- Premedication
- Induction
- Maintenance
- Emergence
- Postoperative care





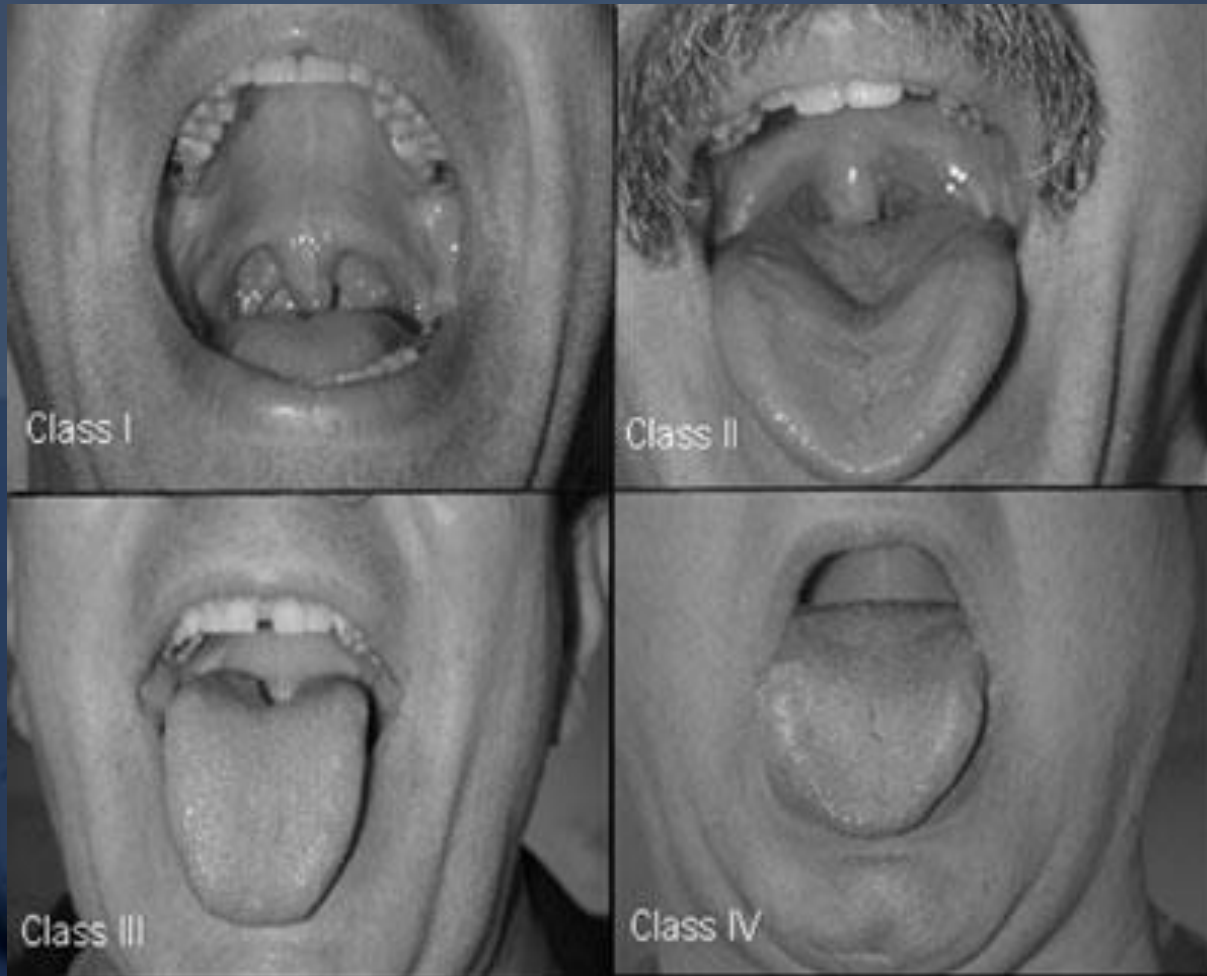
# Physical status classification

- Class I: A normal healthy patient.
- Class II: A patient with mild systemic disease (no functional limitation)
- Class III: A patient with severe systemic disease (some functional limitation)
- Class IV: A patient with severe systemic disease that is a constant threat to life (functionality incapacitated)
- Class V: A moribund patient who is not expected to survive with or without the operation within 24 hours.
- Class VI: A brain-dead patient whose organs are being removed for donor purposes
- Class E: Emergent procedure



# Airway examination

## Mallampati classification



Class I:  
uvula, faucial  
pillars, soft and  
hard palate visible

Class II:  
faucial pillars, soft  
and hard palate  
visible

Class III:  
soft and hard  
palate visible

Class IV:  
hard palate visible



# NPO status

- NPO, Nil Per Os, means nothing by mouth
- Solid food: 8 hrs before induction
- Liquid: 4 hrs before induction
- Clear water: 2 hrs before induction
- Pediatrics: stop breast milk feeding 4 hrs before induction



# Anesthetic plan

## Stages of general anaesthesia (Arthur Ernest Guedel 1937)

Based on inhalation of diethyl Ether

Stage 1 stage of analgesia start (Joseph Frank Artusio 1954)

Plane 1 no amnesia, no analgesia

Plane 2 amnesia, partial analgesia

Plane 3 full amnesia and analgesia

Stage 2 stage of excitement unconsciousness

Stage 3 stage of surgical anaesthesia

Plane 1 regular respiration

Plane 2 eyeball movement

Plane 3 intercostal muscles

Plane 4 diaphragm

Stage 4 stage of medullary depression diaphragm paralysis



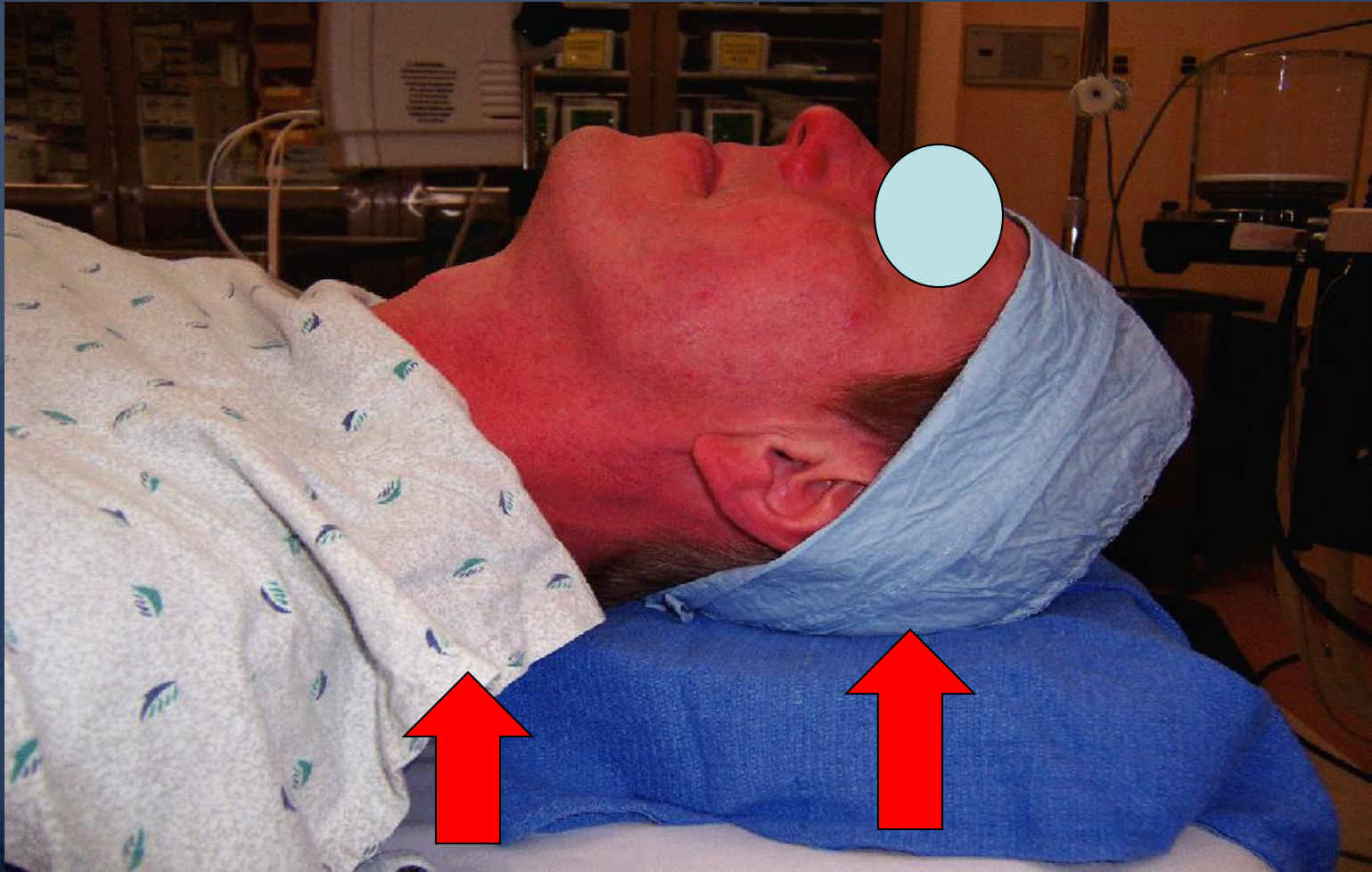


# General Anesthesia

1. Monitor
2. Pre-oxygenation
3. Induction ( including RSI & cricoid pressure)
4. Mask ventilation
5. Muscle relaxants
6. Intubation & ETT position confirmation
7. Maintenance
8. Emergence
9. Post operative recovery



# Sniffing position



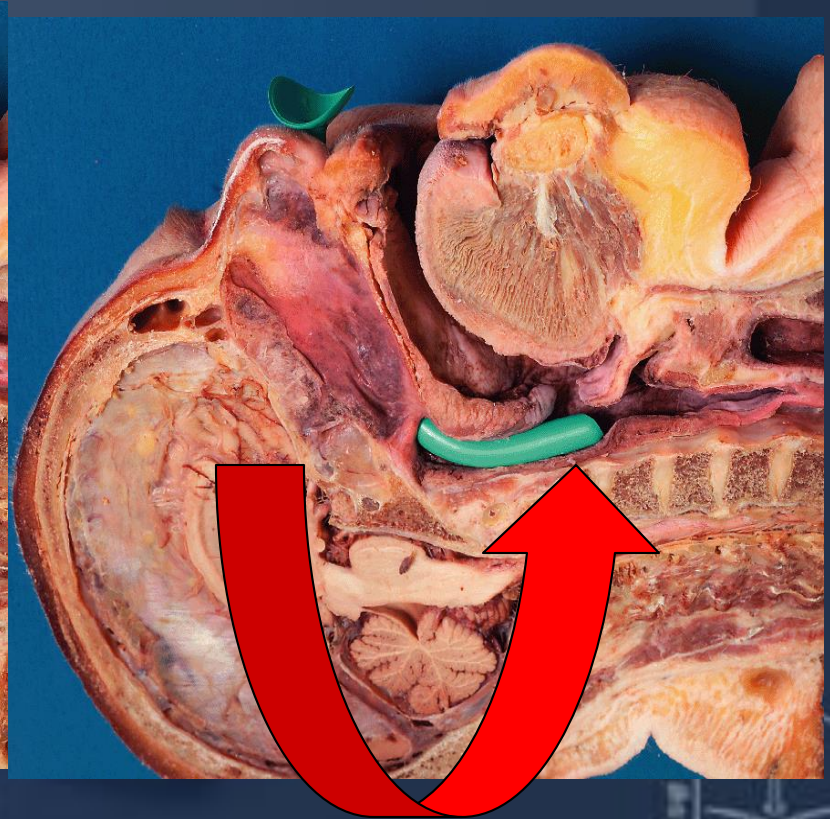
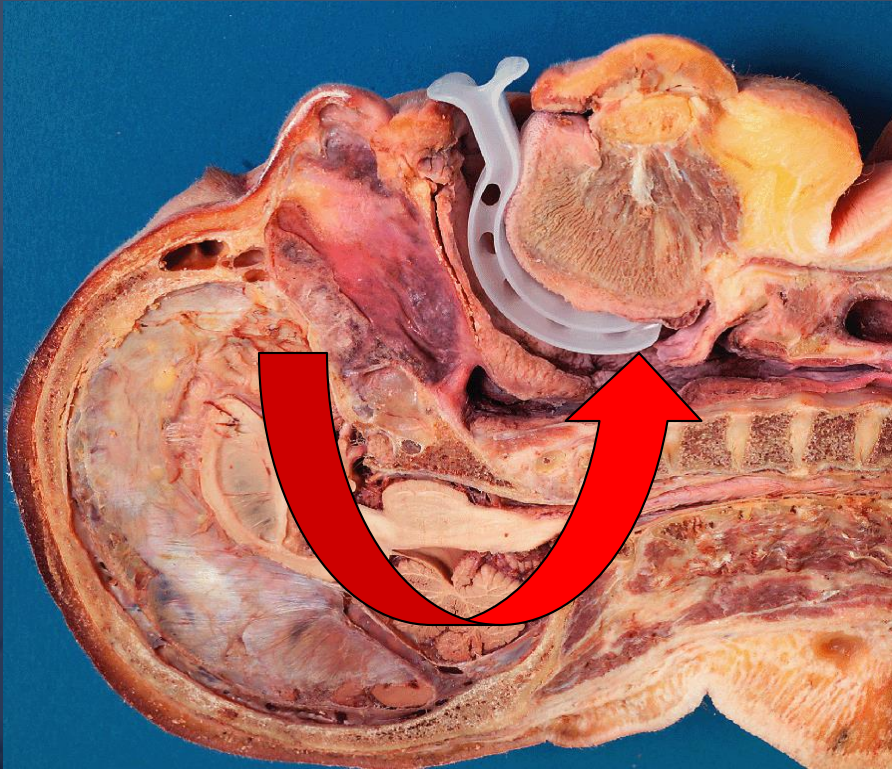


# Mask and airway tools





# Oral and nasal airway





# Mask ventilation and intubation



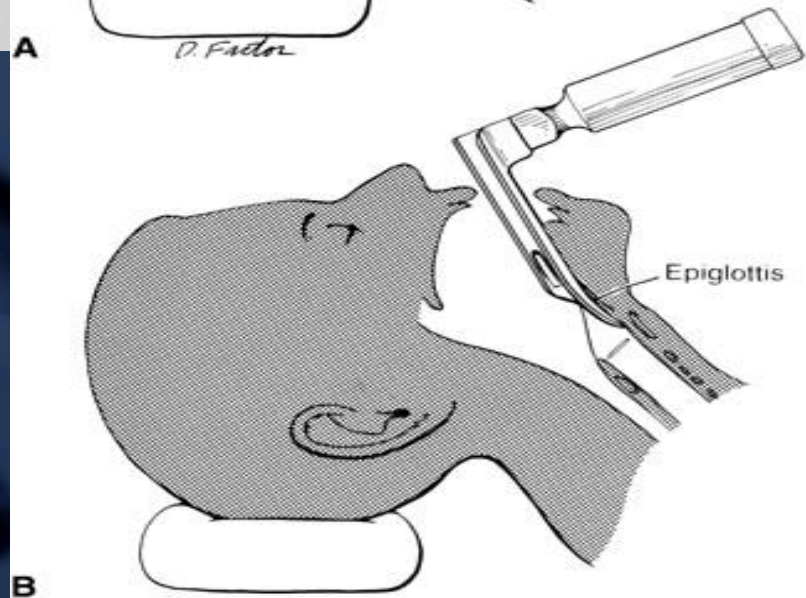
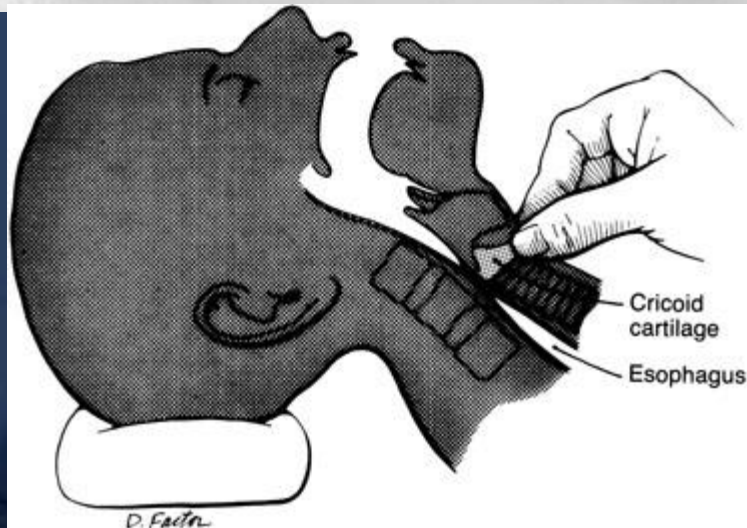
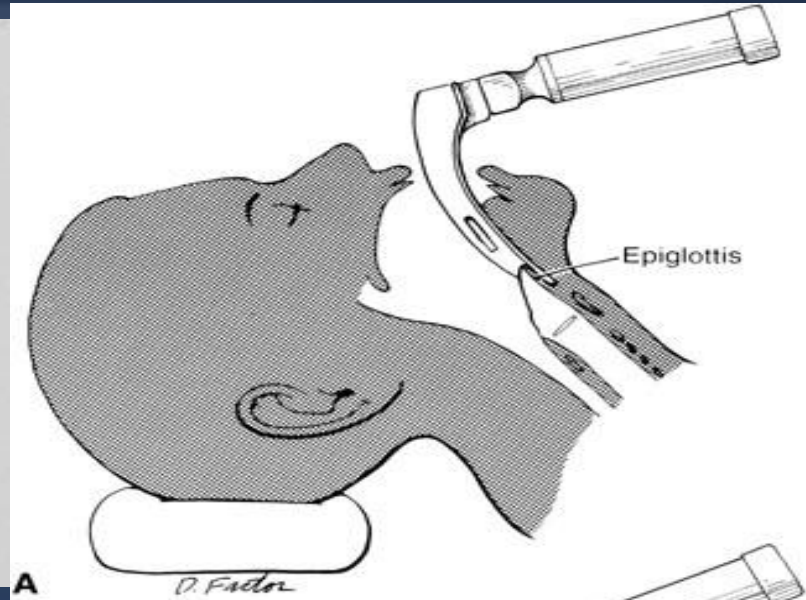
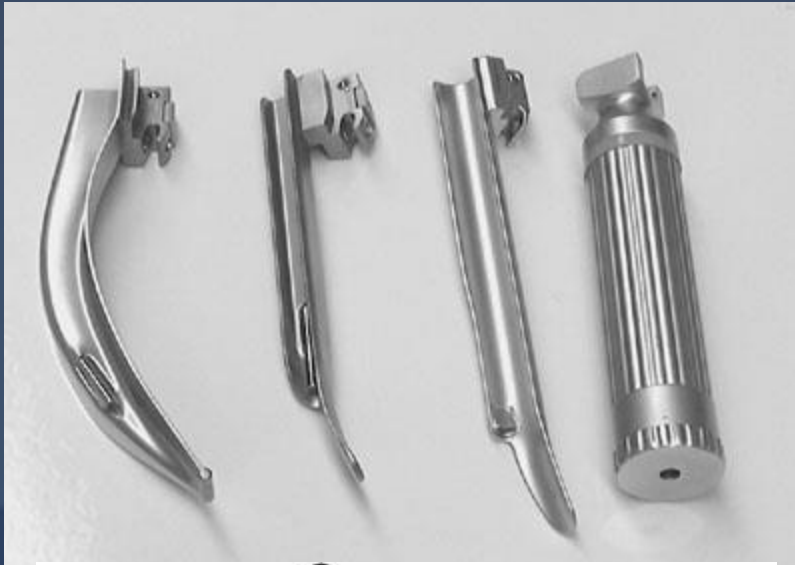
# Difficult BMV- MOANS

- **MASK SEAL:** mask seal requires normal anatomy, absence of facial hair, lack of interfering substances like vomitus or bleeding & ability of apply mask with pressure.
- **OBSTRUCTION/ OBESITY:** Obstruction of upper airway, obesity (BMI greater than 26) is an independent marker. Redundant upper airway tissue, chest wall weight & resistance from abdominal contents impede airflow.
- **AGE:** General loss of elasticity & increased incidence of restrictive /obstructive lung disease with increasing age.
- **NO THEETH:** Edentulous creates difficulty.
- **STIFFNESS:** Resistance to ventilation with COPD, Asthma, Pulmonary edema.





# Intubation

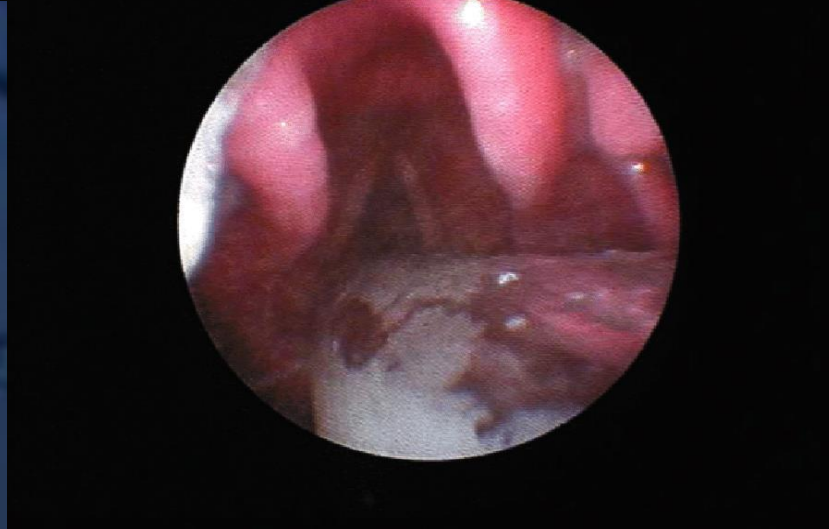
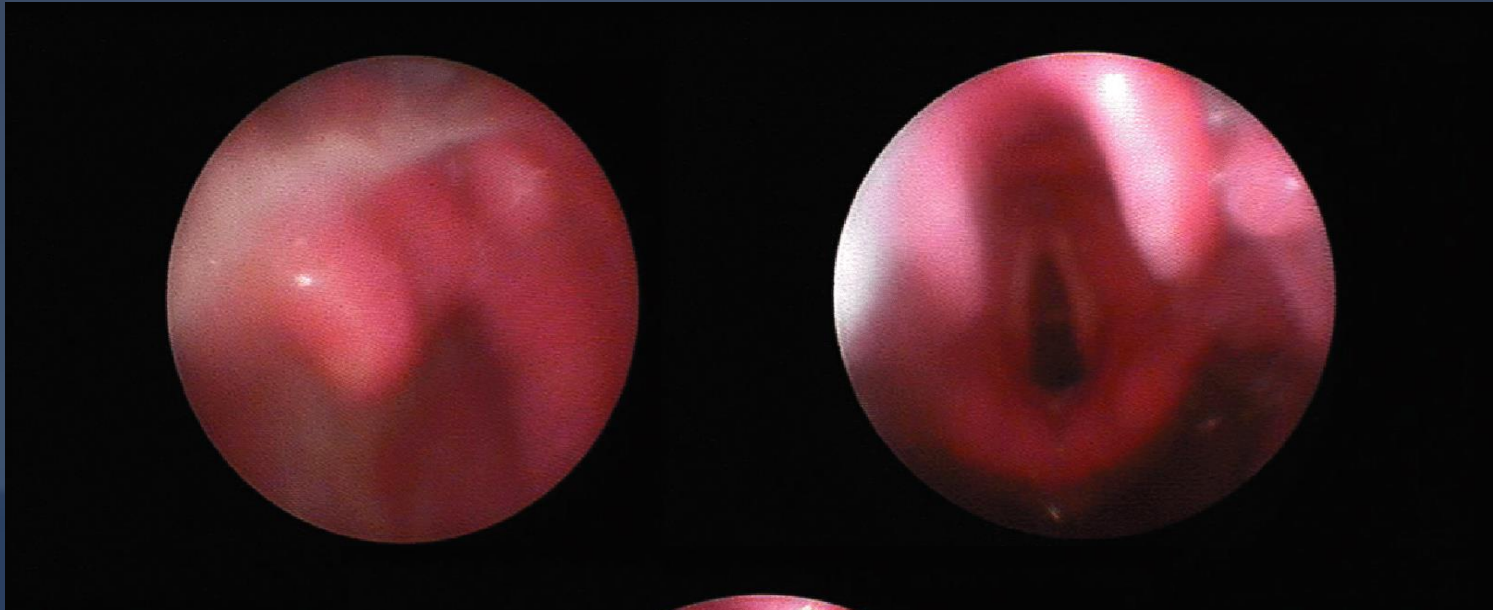


# Intubation

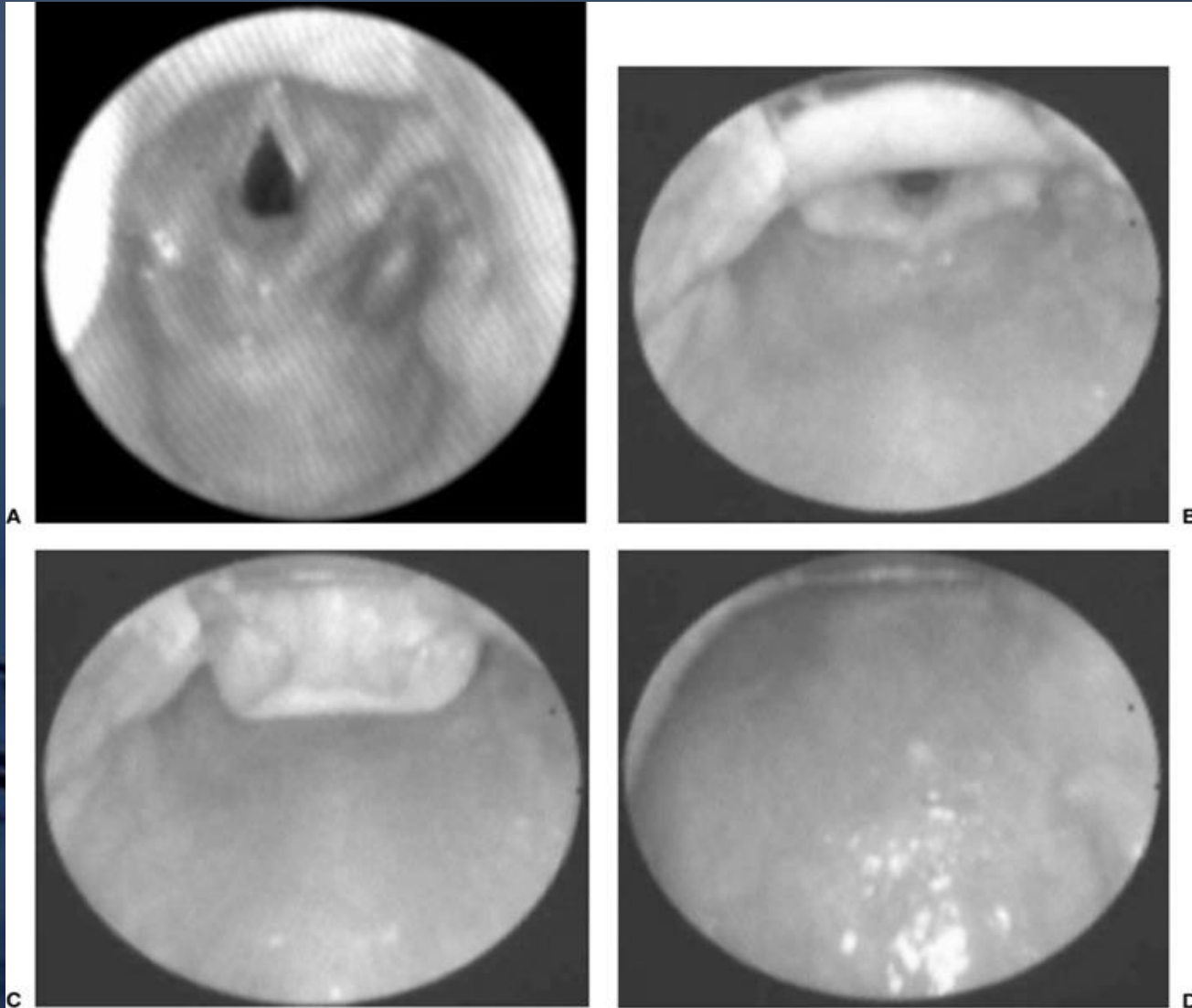




# Laryngeal view



# Laryngeal view scoring system



# Difficult airway



A



B





# The LEMON Approach

- **LOOK EXTERNALLY:** Abnormal facies, unusual anatomy or facial Trauma.
- **EVALUATE (3-3-2 rule):** 3 fingers between the incisors, 3 fingers along the floor of the mandible b/w the mentum and the neck mandible junction & 2 fingers in the superior laryngeal notch. This predicts difficulty in visualizing the glottis.
- **MALLAMPATTI SCORE:** III predicts difficulty and IV predicts extreme difficulty.
- **OBSTRUCTION/ OBESITY.**
- **NECK MOBILITY.**



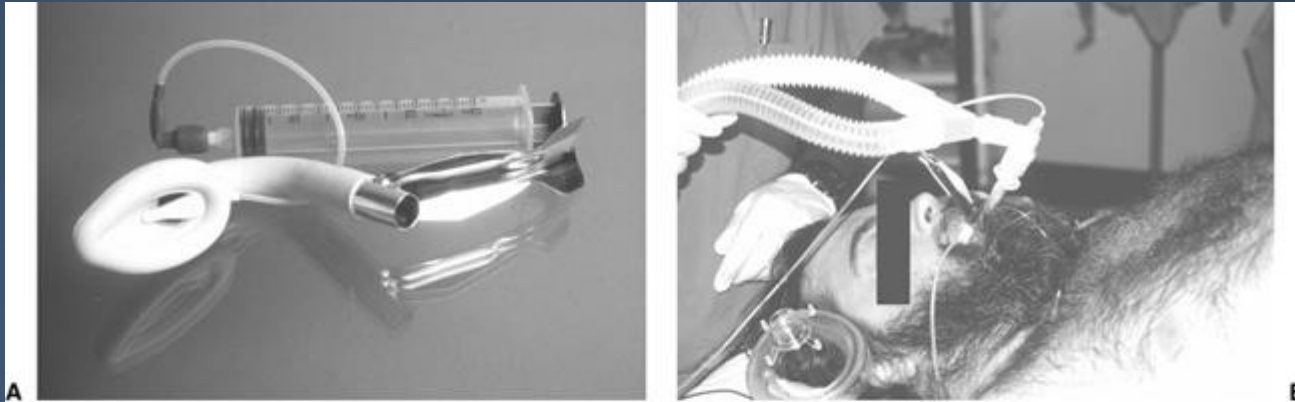
# Glidescope



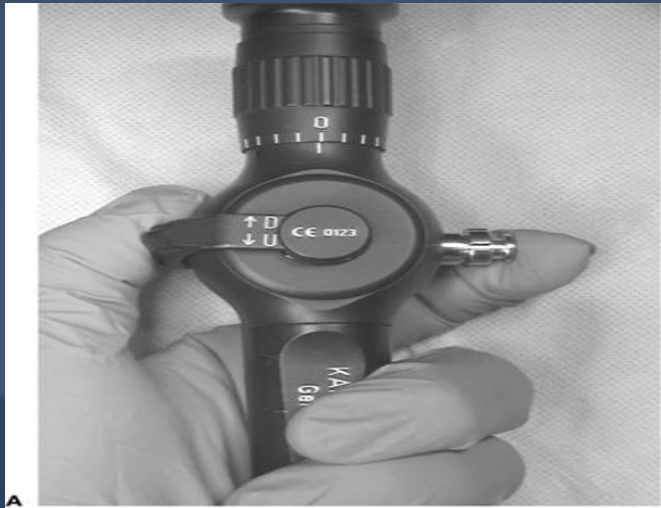




# Fast track LMA



# Fiberoptic intubation



A



B

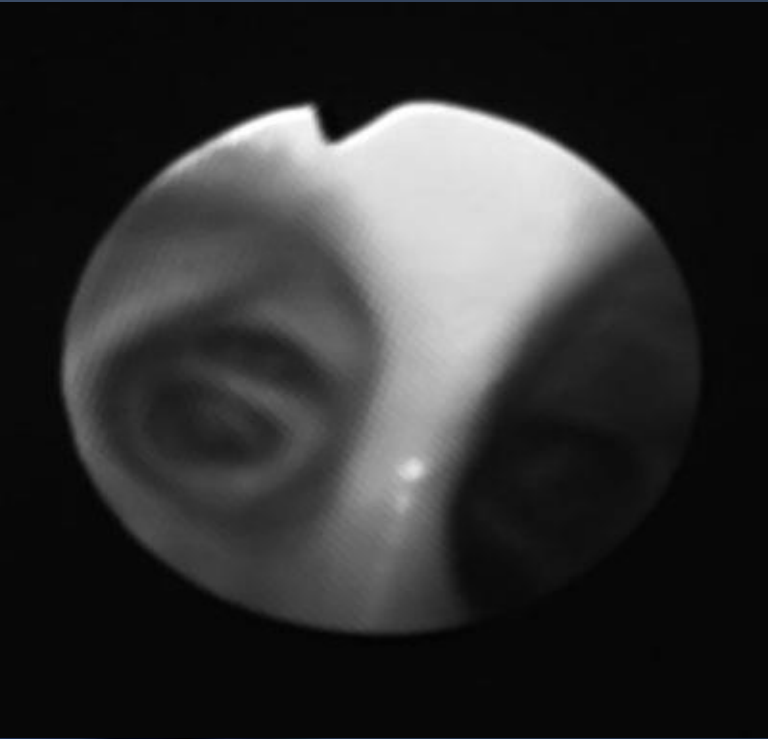
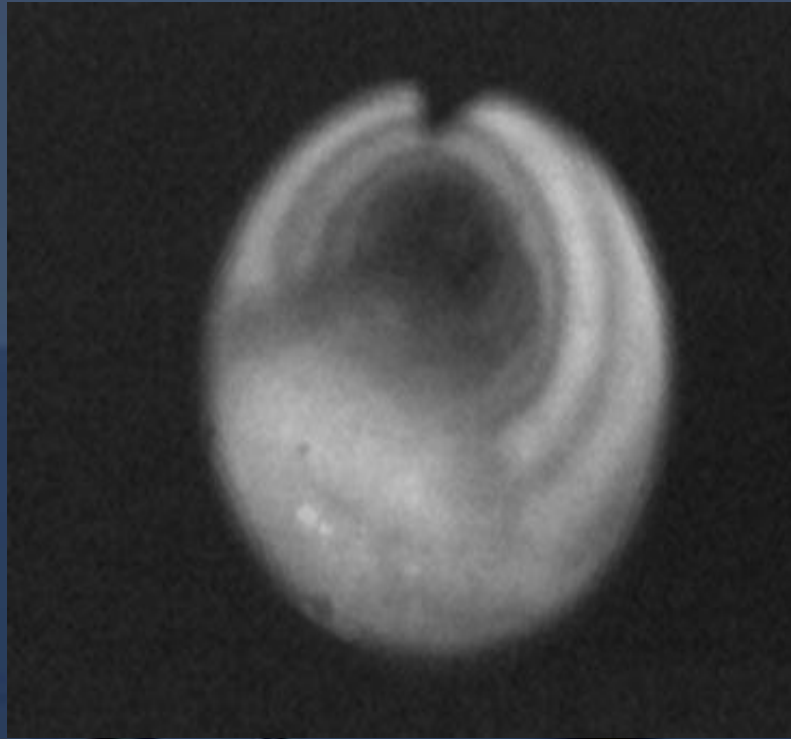


C



**Trachea view**

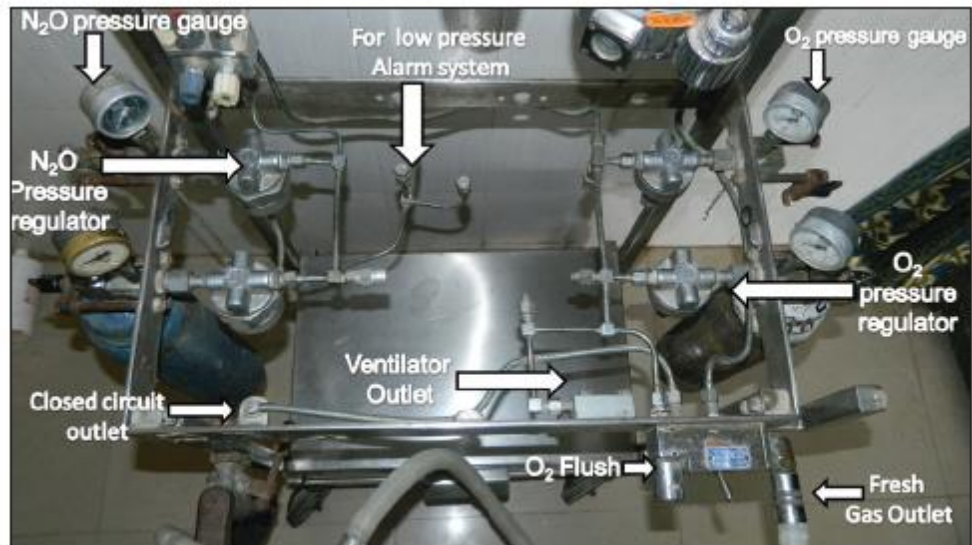
**Carina view**





# Anesthesia Machine

- Anesthesia is delivered via a machine from the main gas supply to the patient.

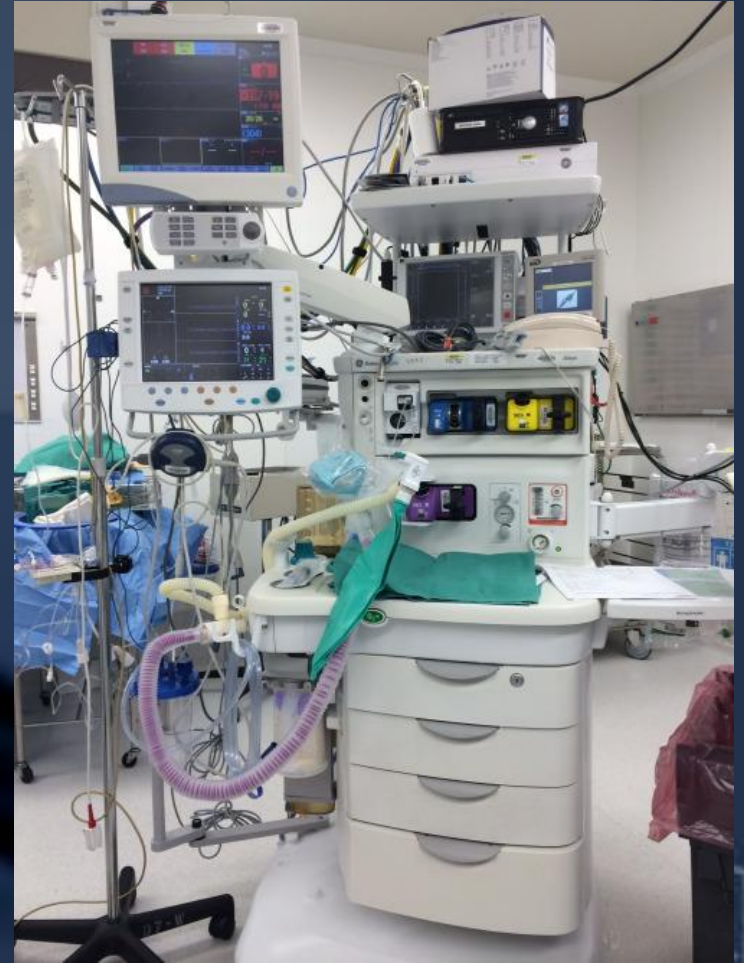


**Figure 3:** Internal assembly of basic anaesthesia machine when viewed from above with covering plate removed



# Anesthesia Machine

## Anesthesia Workstation



# Anesthesia Machine

## FUNCTIONS OF ANAESTHESIA MACHINE

The machine performs four essential functions:

1. Provides O<sub>2</sub>,
2. Accurately mixes anaesthetic gases and vapours,
3. Enables patient ventilation and
4. Minimises anaesthesia related risks to patients and staff.





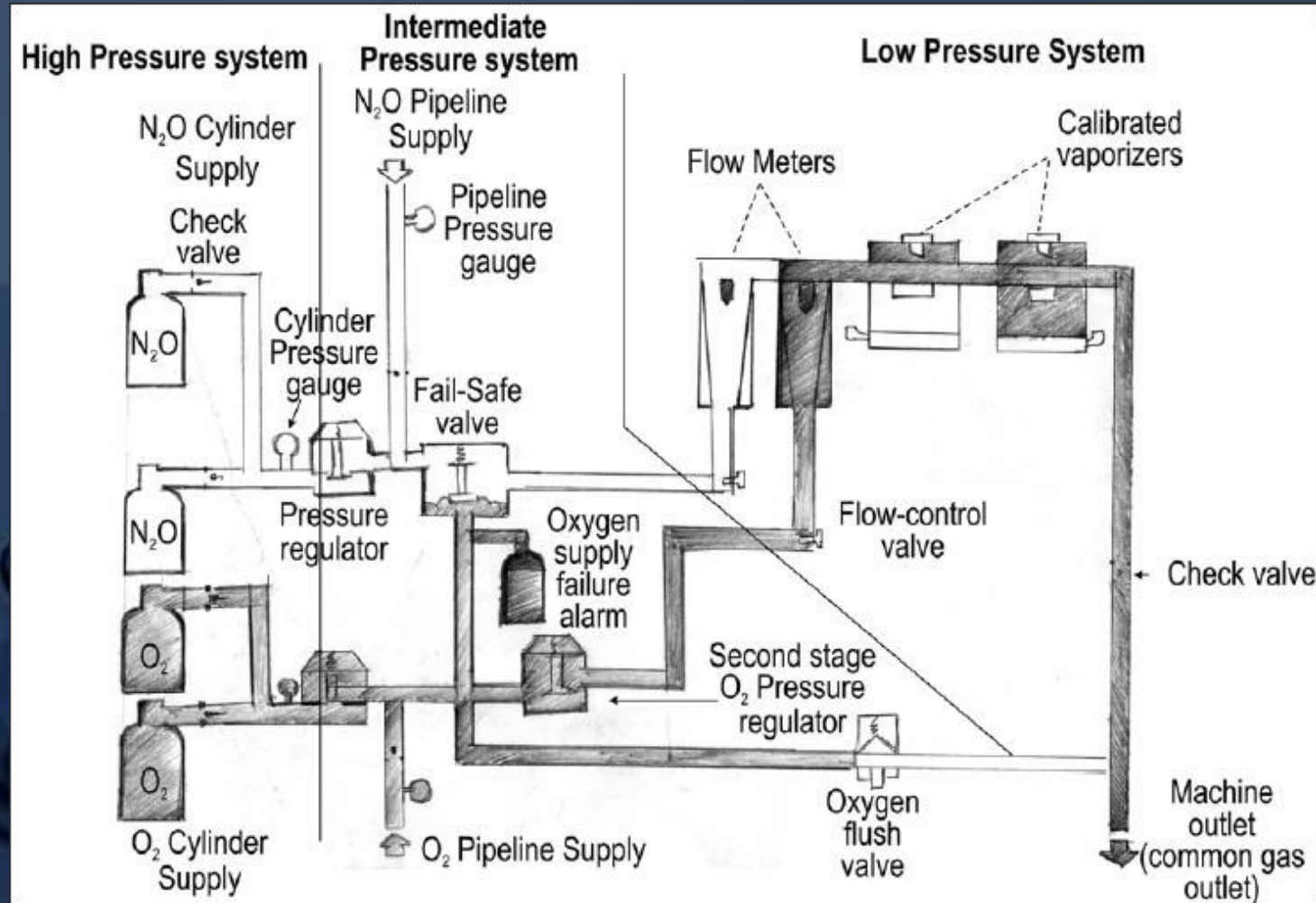
# Anesthesia Machine

Gas supplies: From the central pipeline to the machine as well as cylinders.

- Flow meters.
- Vaporizers.
- Fresh gas delivery: Breathing systems and ventilators.
- Scavenging.
- Monitoring.

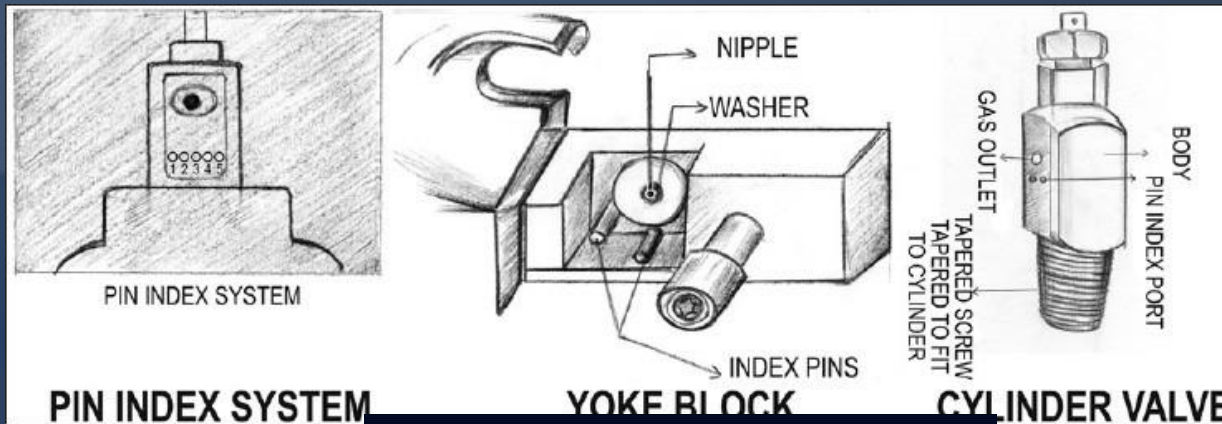


# Diagram of Anesthesia Machine



# Safety Features

## Pin Index safety system



Oxygen cylinder valve and pin index

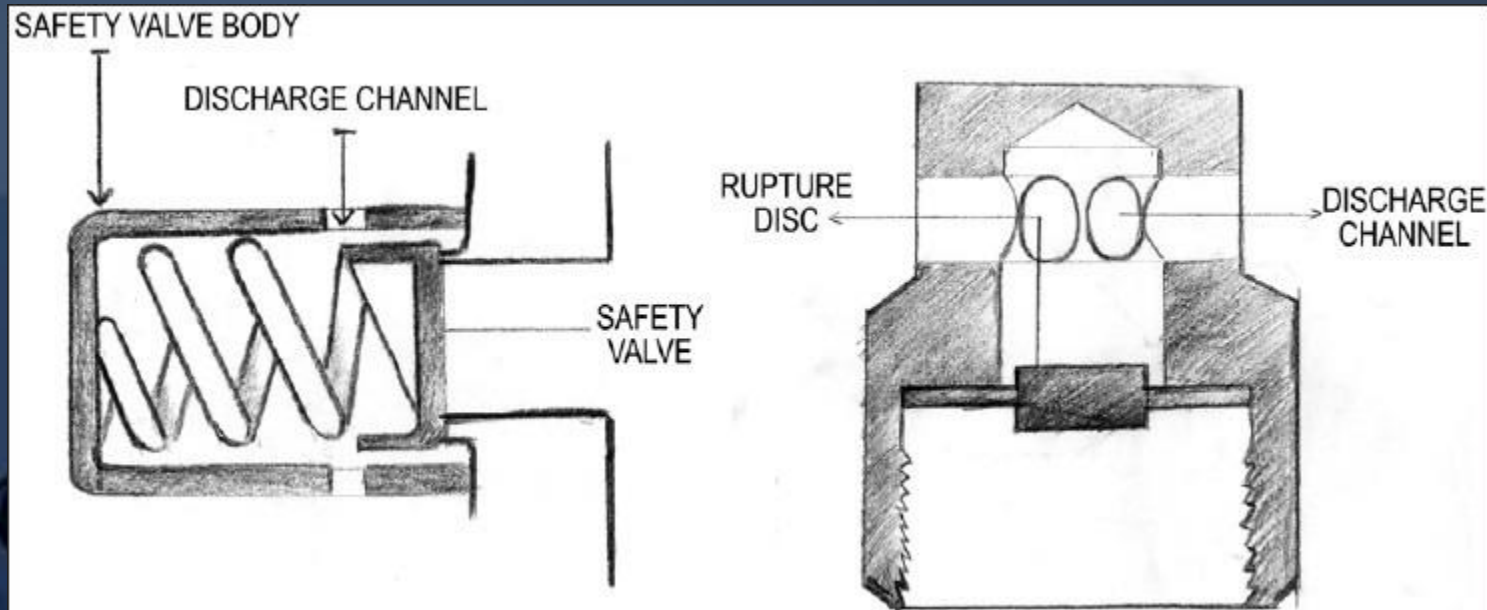


Nitrous cylinder valve and pin index



# Safety Features

## Pressure Regulators

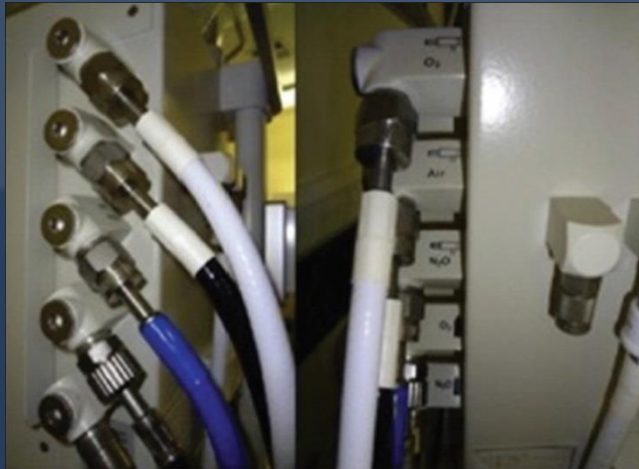




# Safety Features

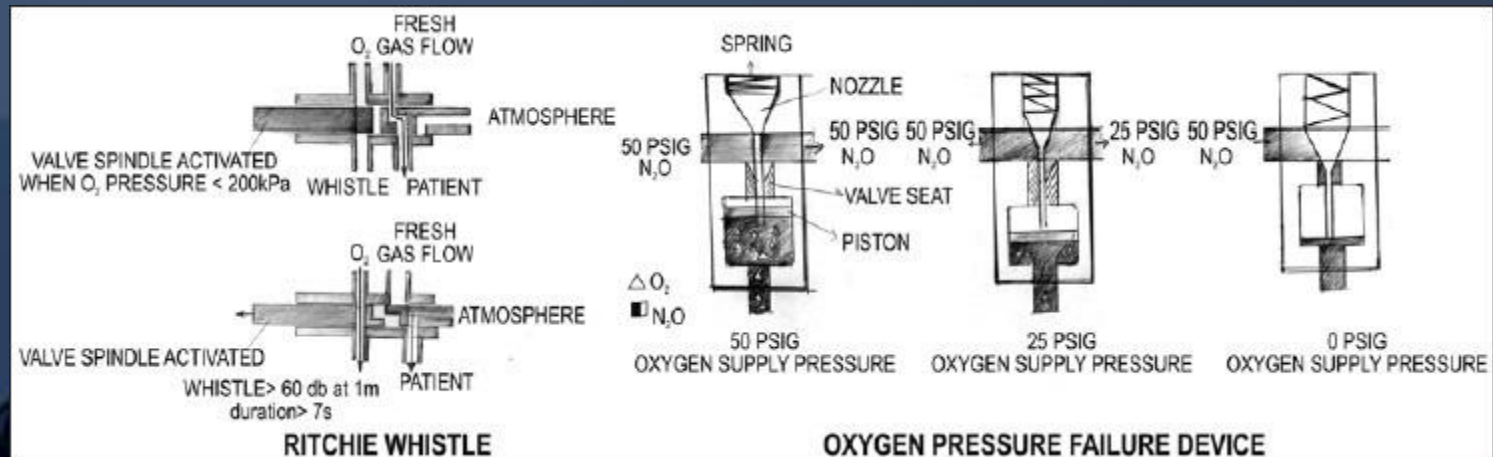
DISS safety connections

Non-interchangeable screw thread

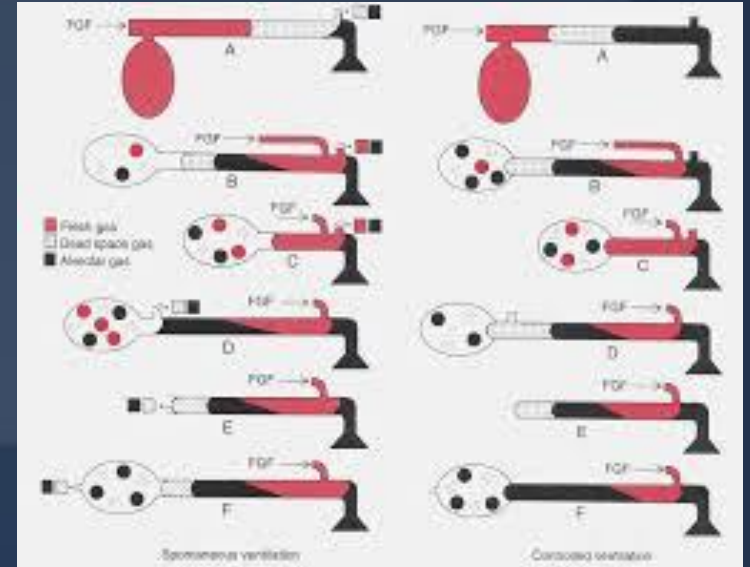
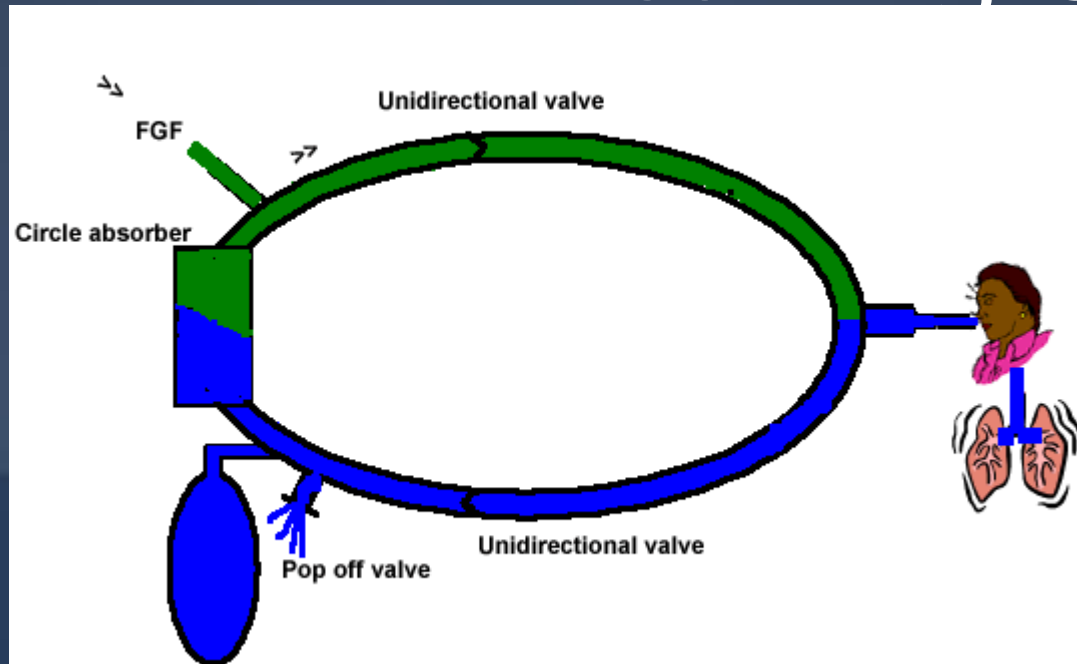


# Safety Features

## Oxygen Failures device



# Breathing Circuits



# Induction agents

## Analgesics:

- Opioids – Fentanyl, Sufentanyl, Remifentanyl

## Induction of unconscious:

- Propofol, Thiopental and Etomidate, Benzodiazepines

## Muscle relaxants:

- Depolarizing
- Non-depolarizing





# Induction

- IV induction
- Inhalation induction



# Intraoperative management

- Maintenance

Inhalation agents: N<sub>2</sub>O, Sevo, Deso, Iso.

Total IV agents: Propofol

Opioids: Fentanyl, Morphine

Muscle relaxants

Balance anesthesia



# Intraoperative management

- Monitoring
- Positioning during surgery –
- Supine
- Lateral
- Prone
- Sitting
- Lithotomy

## Fluid management

- Crystalloid vs colloid
- NPO fluid replacement:

1<sup>st</sup> 10kg weight-4ml/kg/hr,

2<sup>nd</sup> 10kg weight-2ml/kg/hr and 1ml/kg/hr thereafter

- Intraoperative fluid replacement:

minor procedures 1-3ml/kg/hr,

major procedures 4-6ml/kg/hr,

major abdominal procedures 7-10ml/kg/hr



# Intraoperative Management and Recovery

Waking up is a crucial time where there is short period when the patient is aware of emergence without a full return to consciousness.

- Turn off the agent (inhalation or IV agents)
- Reverse the muscle relaxants
- Return to spontaneous ventilation with adequate ventilation and oxygenation
- Suction upper airway
- Wait for patient to wake up and follow command
- Hemodynamically stable





# Postoperative management

- Post-anesthesia care unit (PACU)
  - Oxygen supplement
  - Pain control
  - Nausea and vomiting
  - Hypertension and hypotension
  - Agitation
- Surgical intensive care unit (SICU)
  - Mechanical ventilation
  - Hemodynamic monitoring



# General Anesthesia Complications

- Respiratory complications
  - Aspiration – airway obstruction and pneumonia
  - Bronchospasm
  - Atelectasis
  - Hypoventilation
- Cardiovascular complications
  - Hypertension and hypotension
  - Arrhythmia
  - Myocardial ischemia and infarction
  - Cardiac arrest



# General Anesthesia Complication and Management

- Neurological complications
  - Slow recovery from anesthesia.
  - Stroke
- Malignant hyperthermia



# HYPOTHERMIA

Definition 35 C

Classification

Mild 35-32 C

Moderate 32-28 C

Severe 28-20 C

Mechanism

Heat loss

Radiation

Convection

Evaporation

Conduction

Therapeutic vs Accidental Hypothermia

Adverse effects

Prevention

Treatment





# Thank You

