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_2O (1844) & CO_2

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 in1884.

Definitions

Term	Definition
General anesthesia	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.
Balanced anesthesia	Anesthesia produced by a mixture of drugs, often including both inhaled and intravenous agents..

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
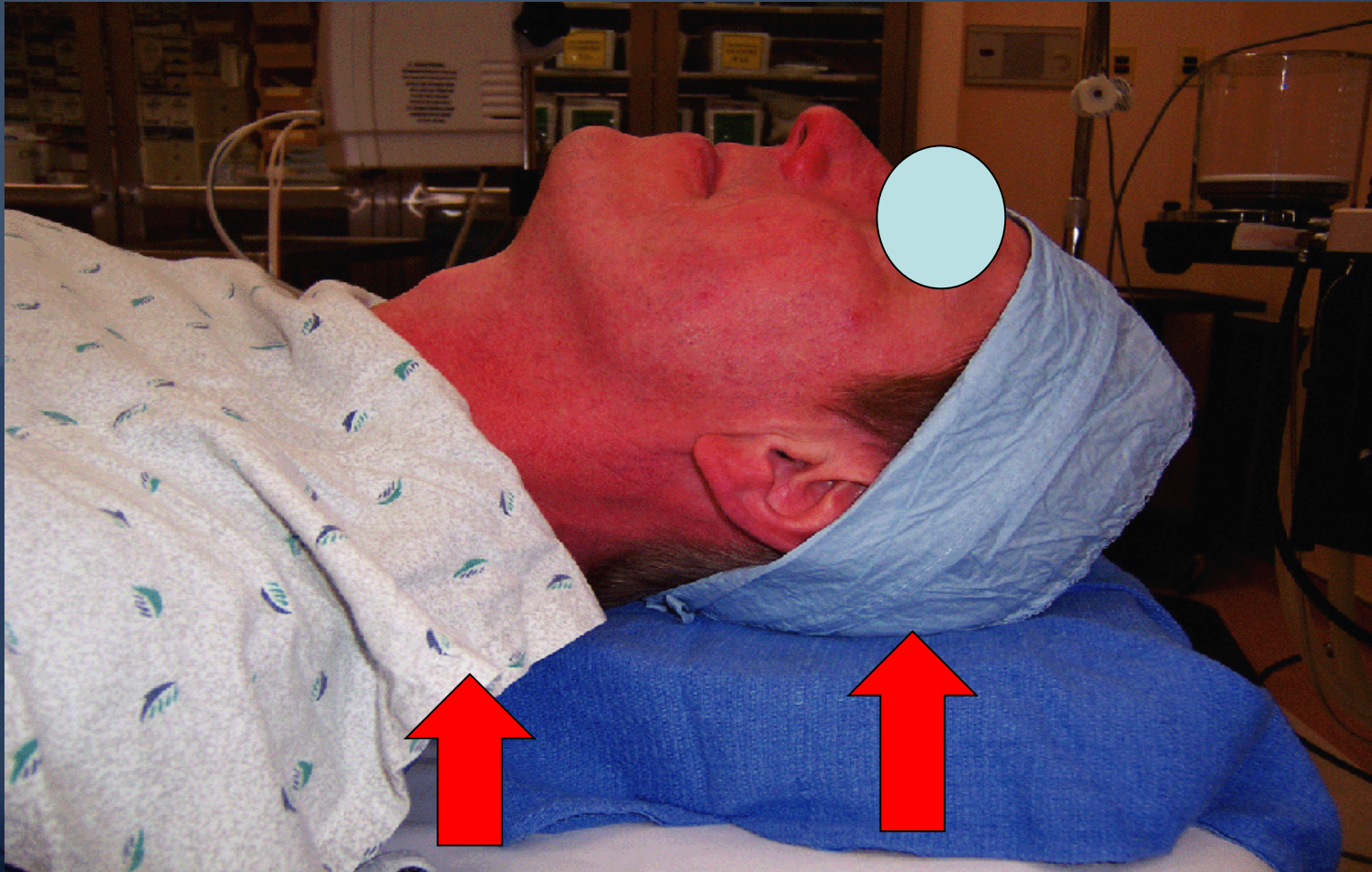
Mask and airway tools

Oral and nasal airway
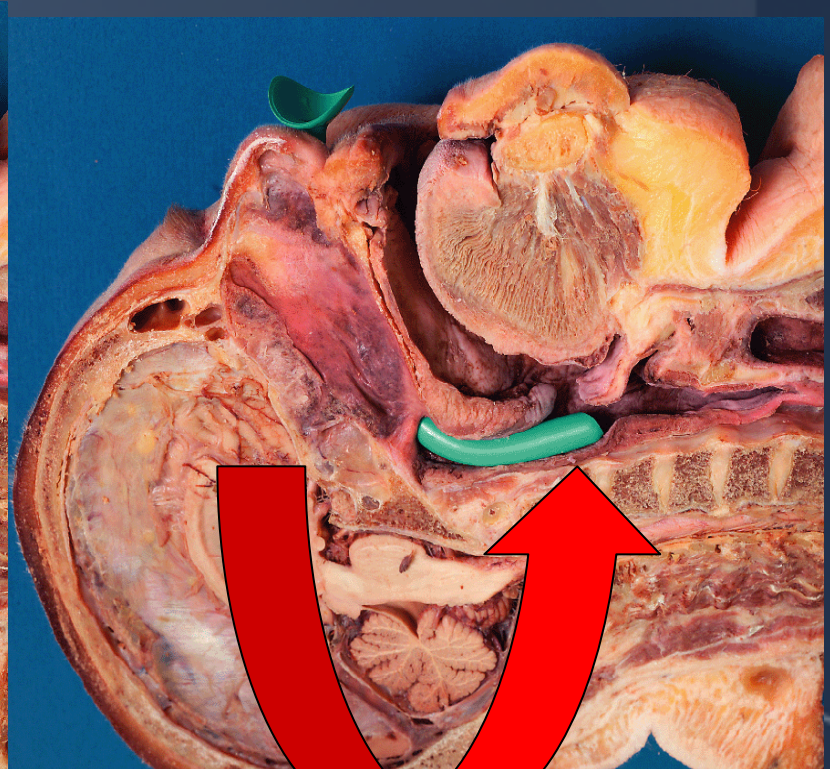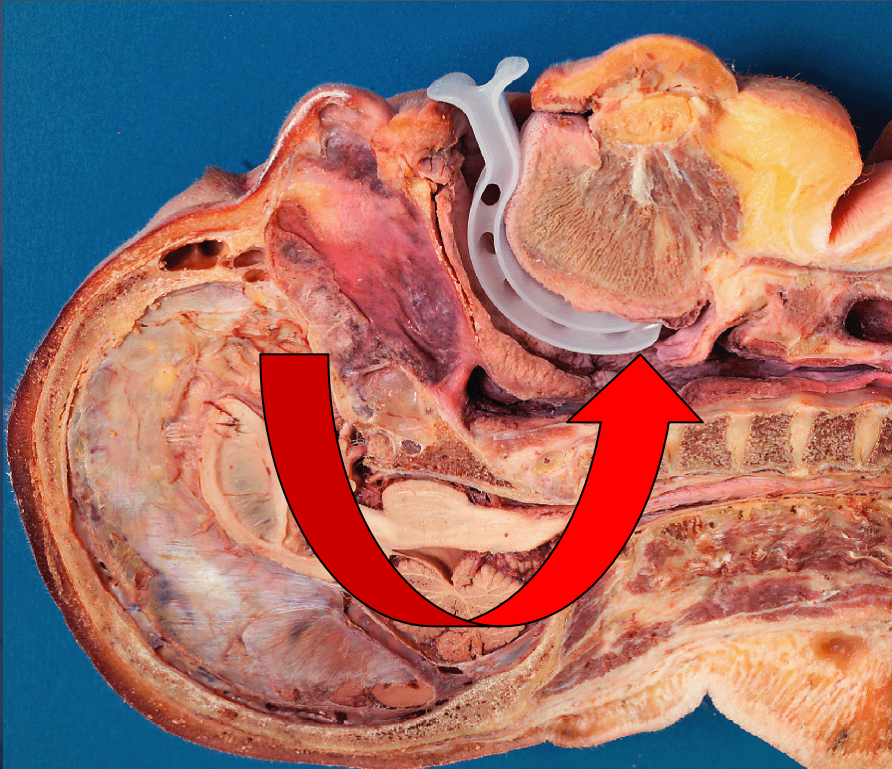
Mask ventilation and intubation

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.

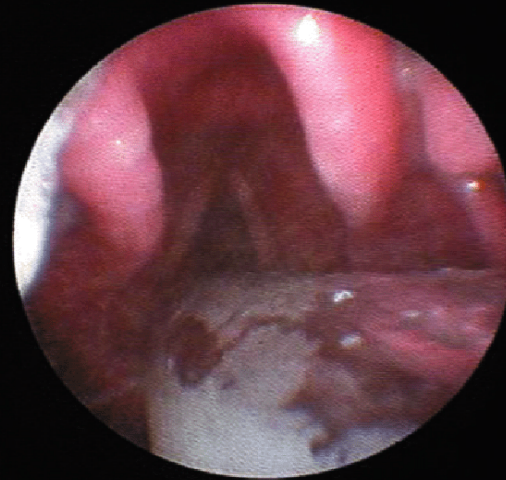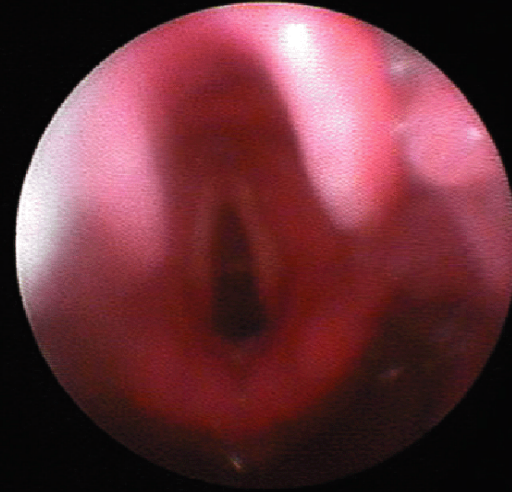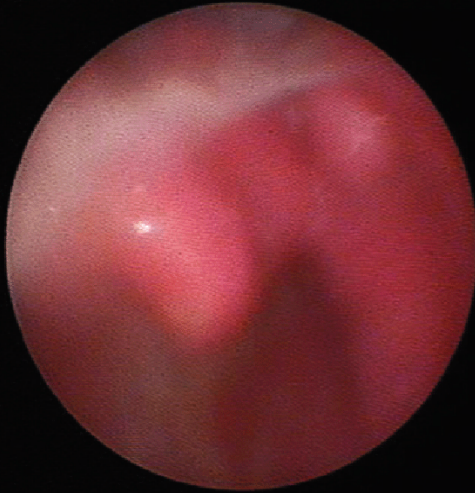- **STIFFNESS:** Resistance to ventilation with COPD, Asthma, Pulmonary edema.
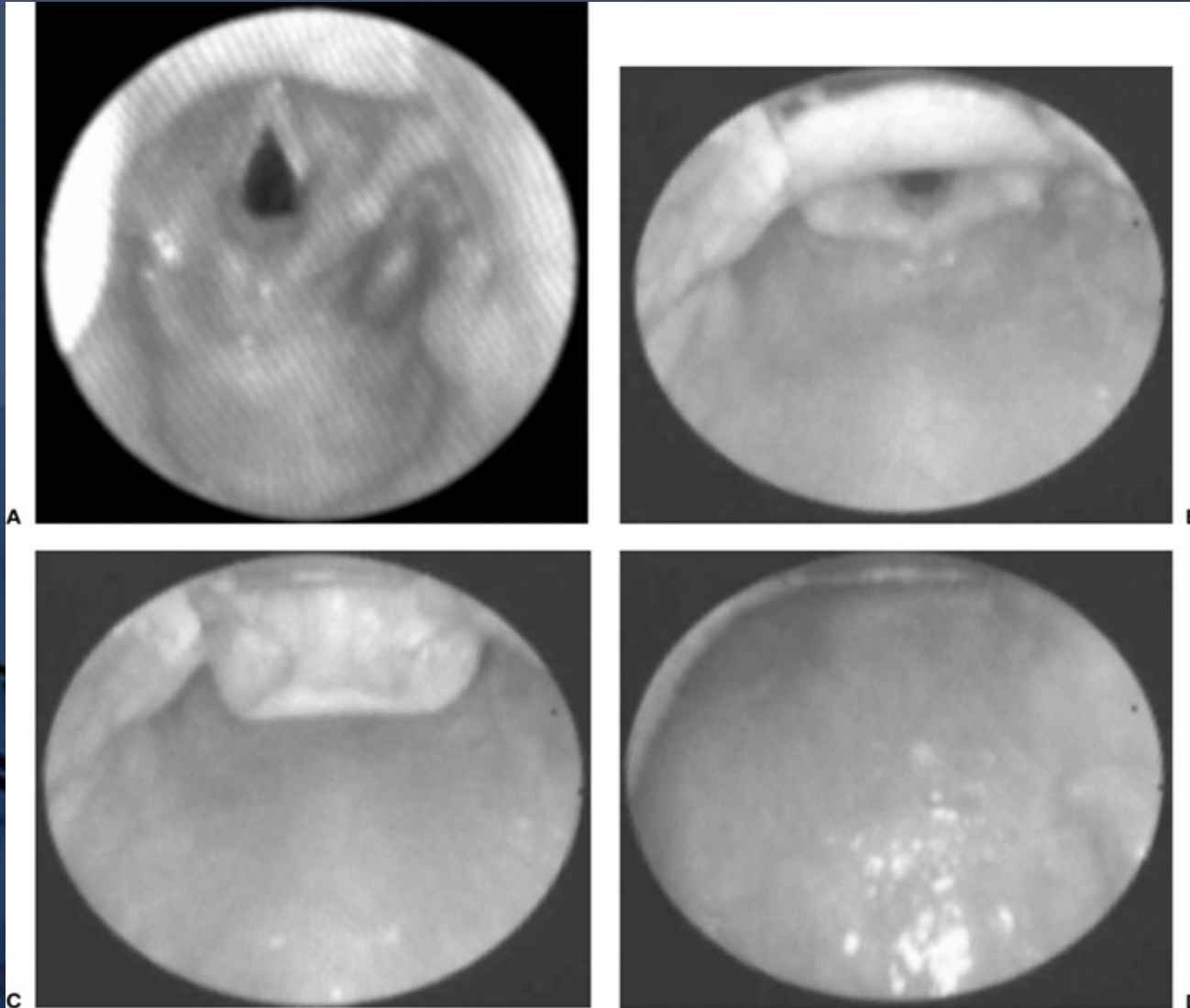
Intubation

Epiglottis

Cricoid cartilage

Esophagus

A

B
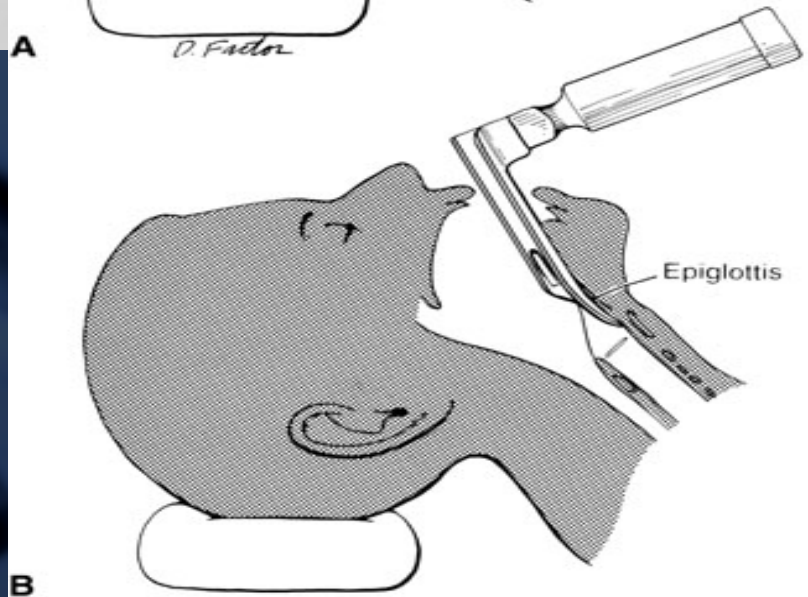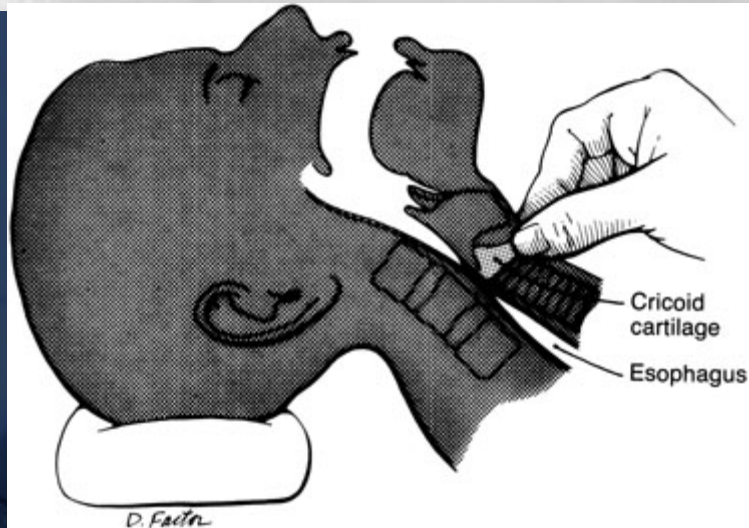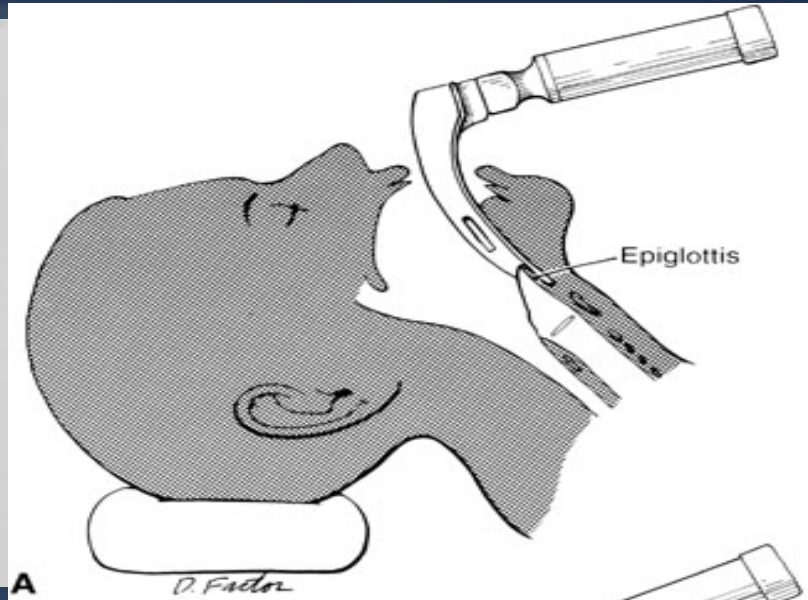
Intubation

Laryngeal view

Laryngeal view scoring system

Difficult airway

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.

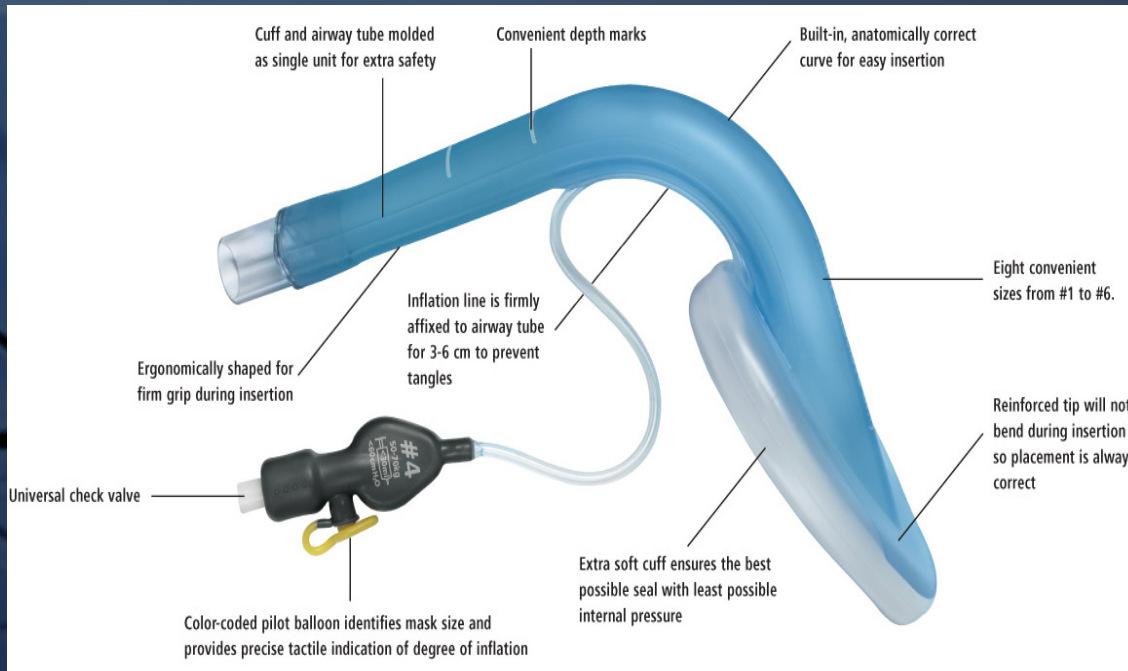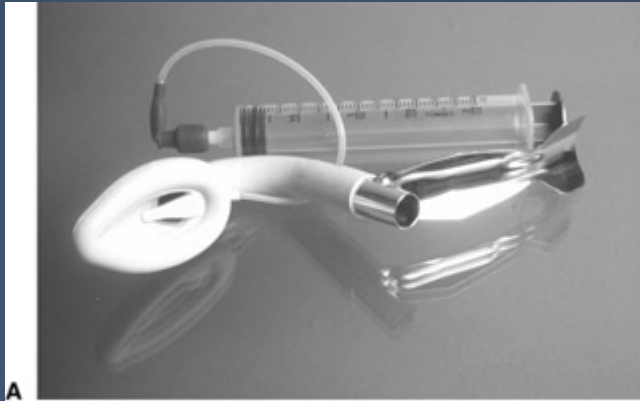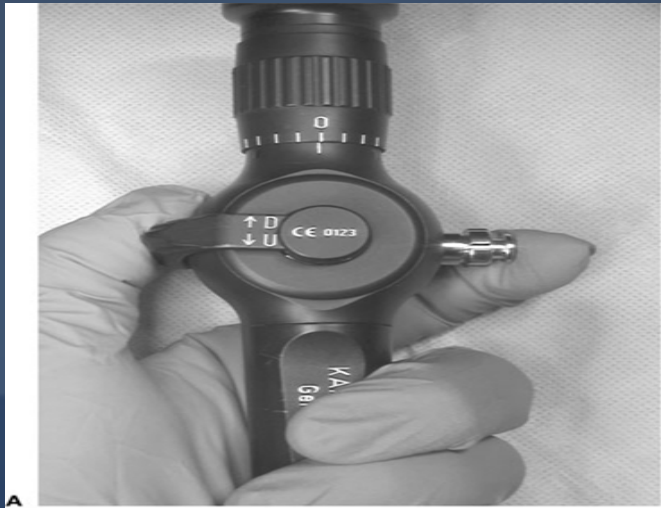- **OBSTRUCTION/ OBESITY.**

- **NECK MOBILITY.**

Glidescope

A   B

LMA

Cuff and airway tube molded as single unit for extra safety

Convenient depth marks

Built-in, anatomically correct curve for easy insertion

Eight convenient sizes from #1 to #6.

Inflation line is firmly affixed to airway tube for 3-6 cm to prevent tangles

Ergonomically shaped for firm grip during insertion

Reinforced tip will not bend during insertion so placement is always correct

Universal check valve

Extra soft cuff ensures the best possible seal with least possible internal pressure

Color-coded pilot balloon identifies mask size and provides precise tactile indication of degree of inflation
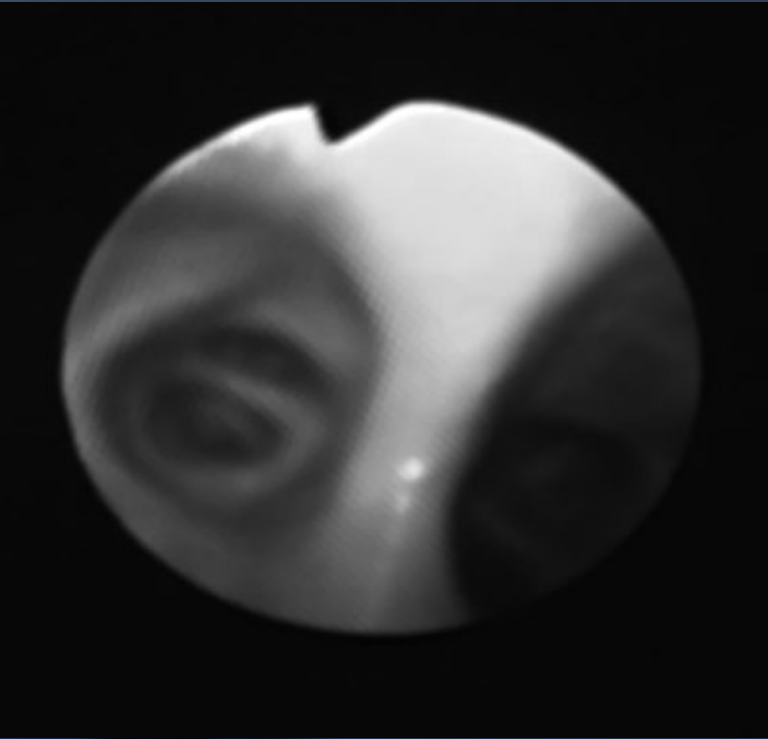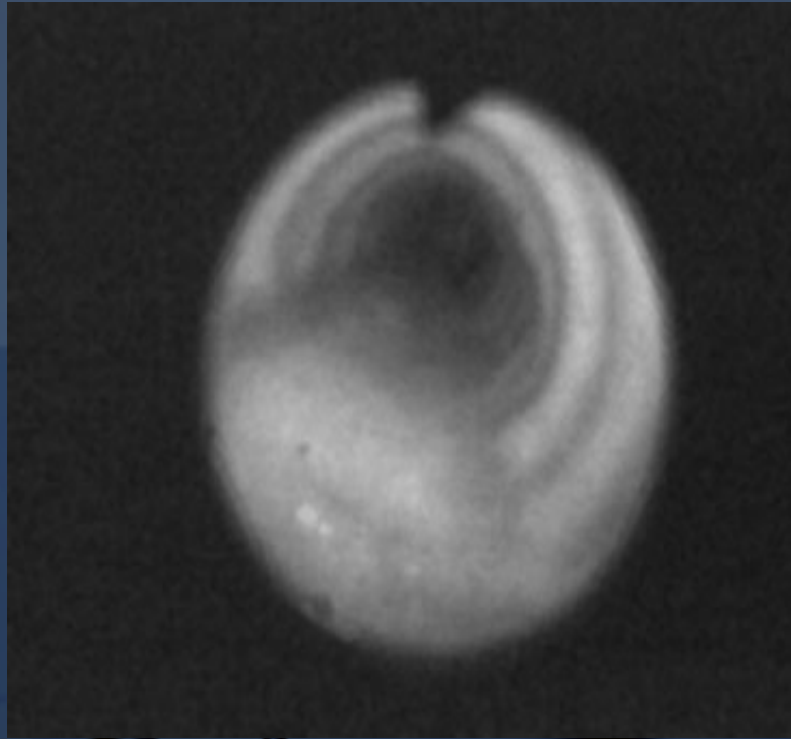
Fast track LMA

Fiberoptic intubation

Trachea view   Carina view

Anesthesia Machine

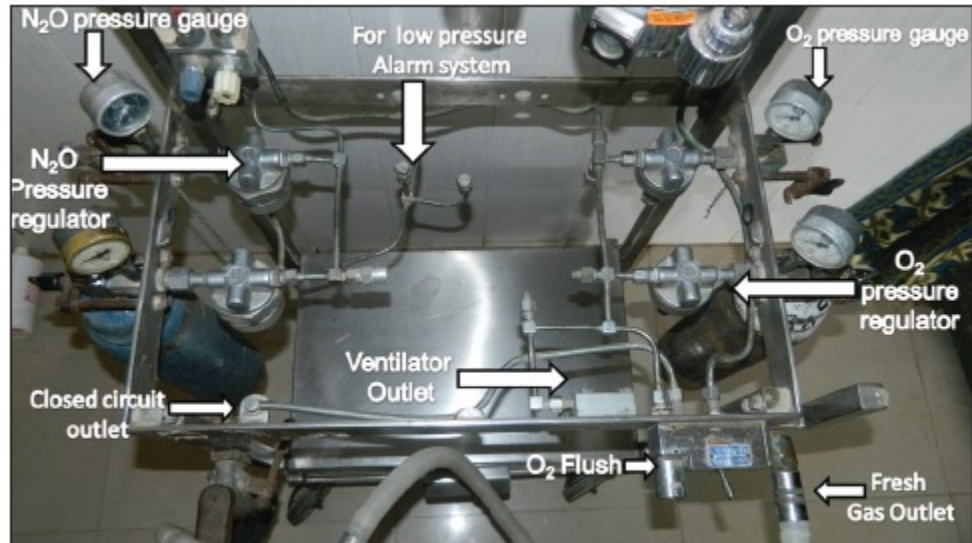- Anesthesia is delivered via a machine from the main gas supply to the patient.

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 O2,

2. Accurately mixes anaesthetic gases and vapours,

3. Enables patient ventilation and

4. Minimises anaesthesia related risks to patients and staff.
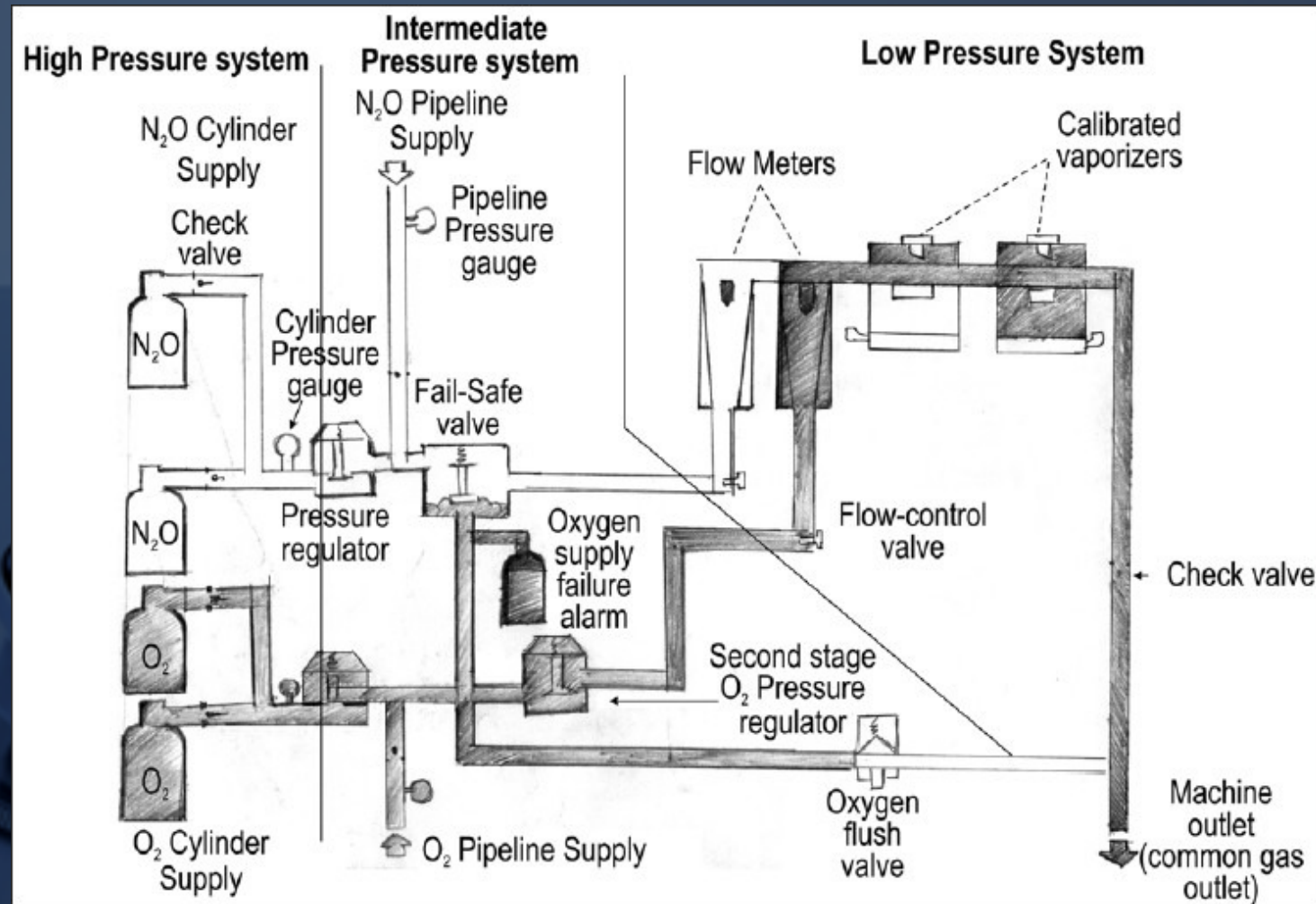
Anesthesia Machine

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

- Flow meters.

- Vaporizers.

- Fresh gas delivery: Breathing systems and ventilators.
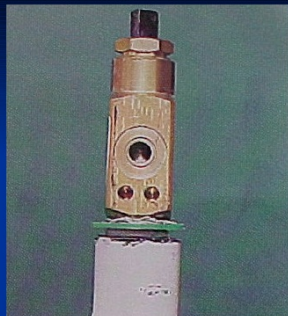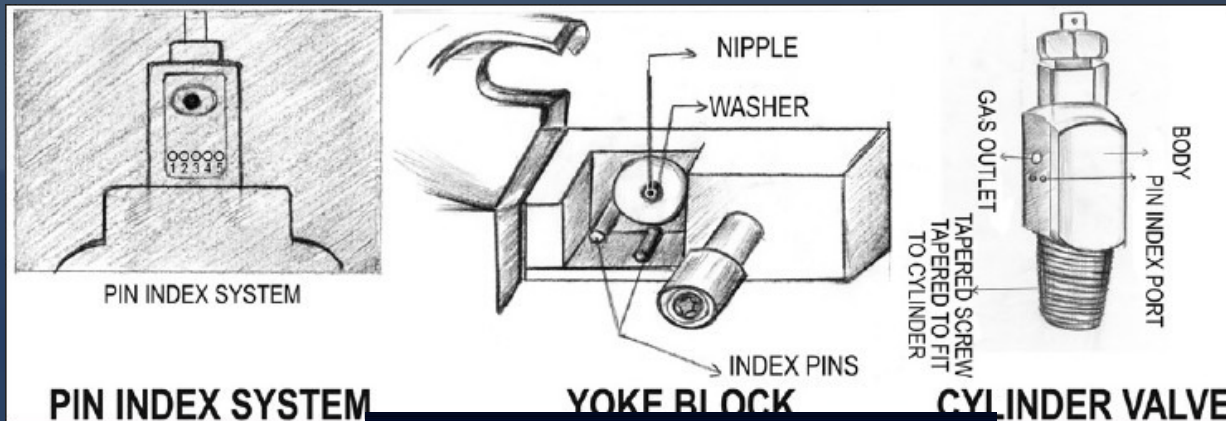
- Scavenging.

- Monitoring.

Diagram of Anesthesia Machine

Safety Features

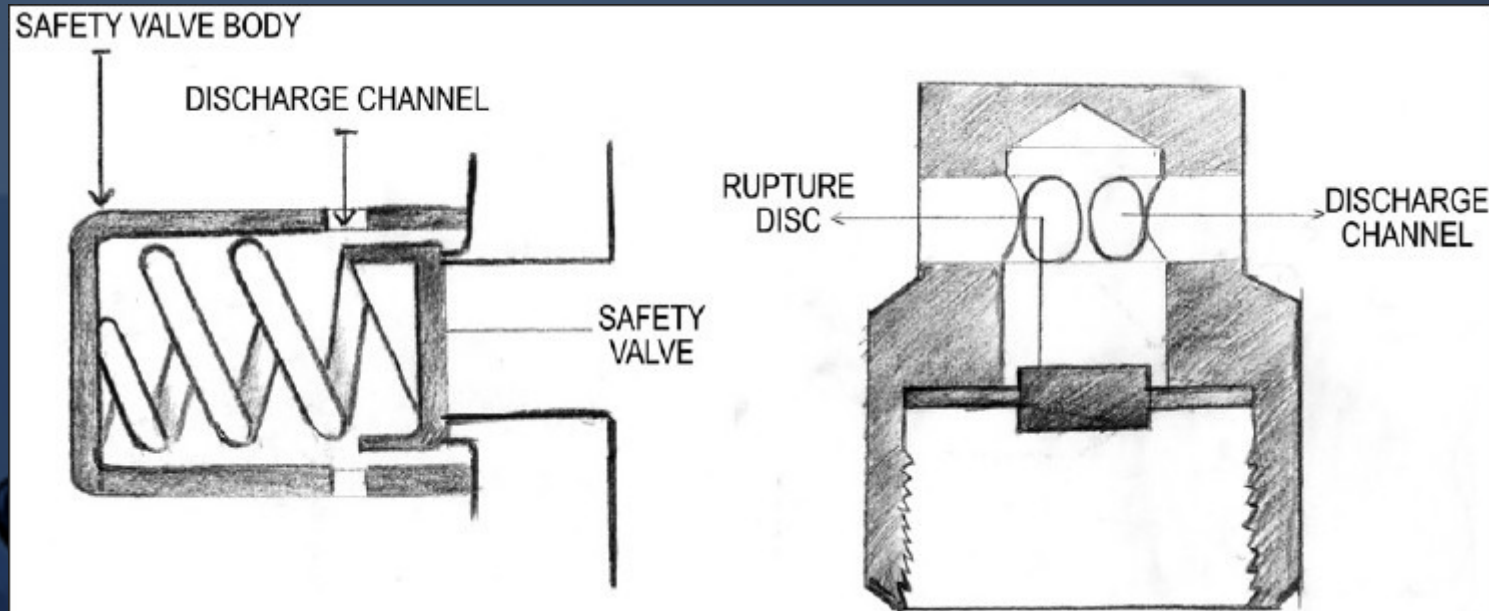## Pin Index safety system

Oxygen cylinder valve and pin index

Nitrous cylinder valve and pin index
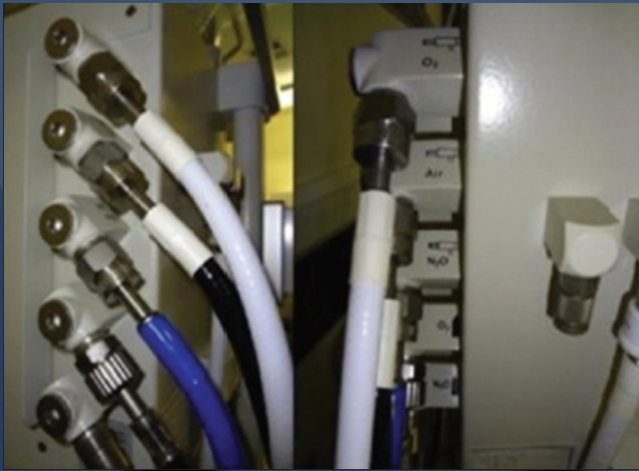
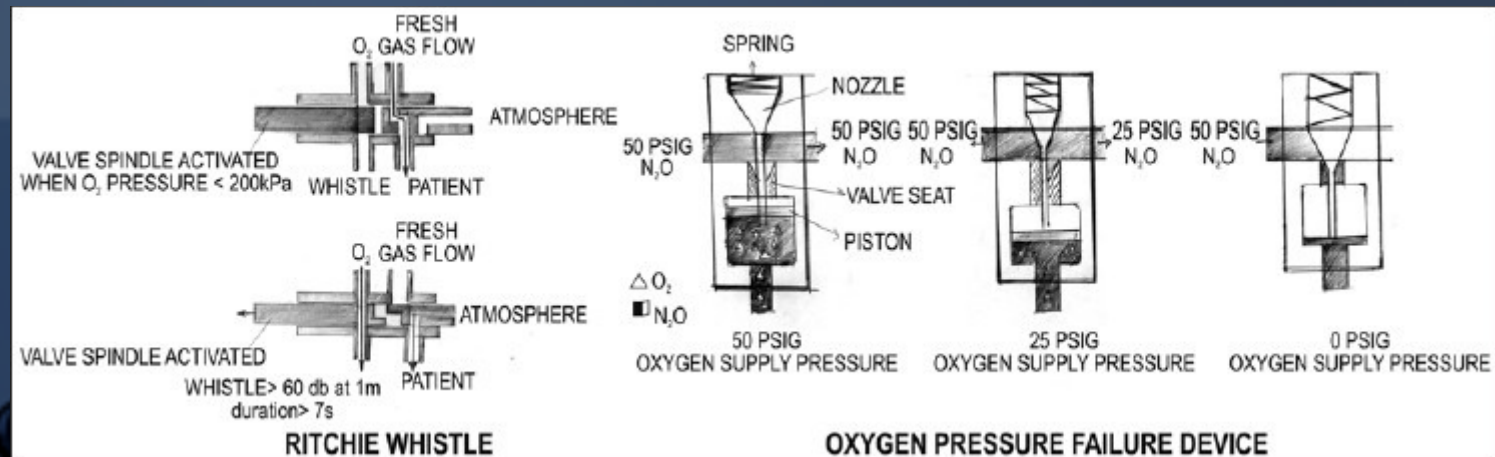# Safety Features

Pressure Regulators

Safety Features

DISS safety connections

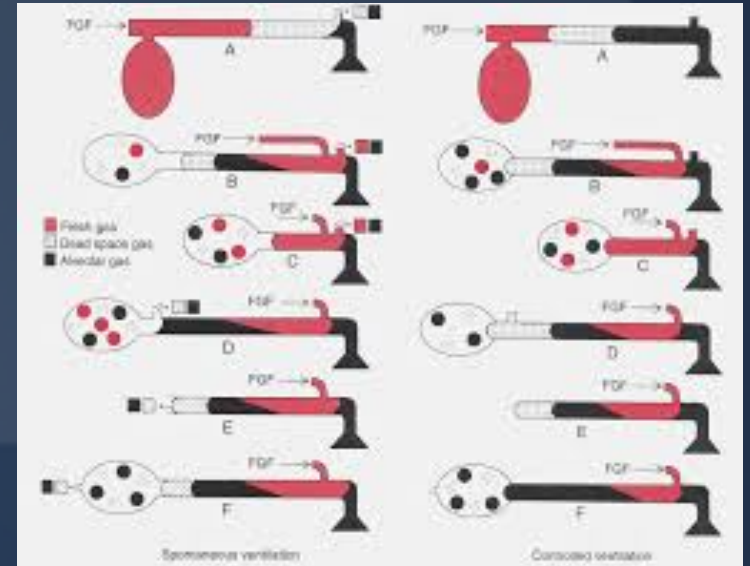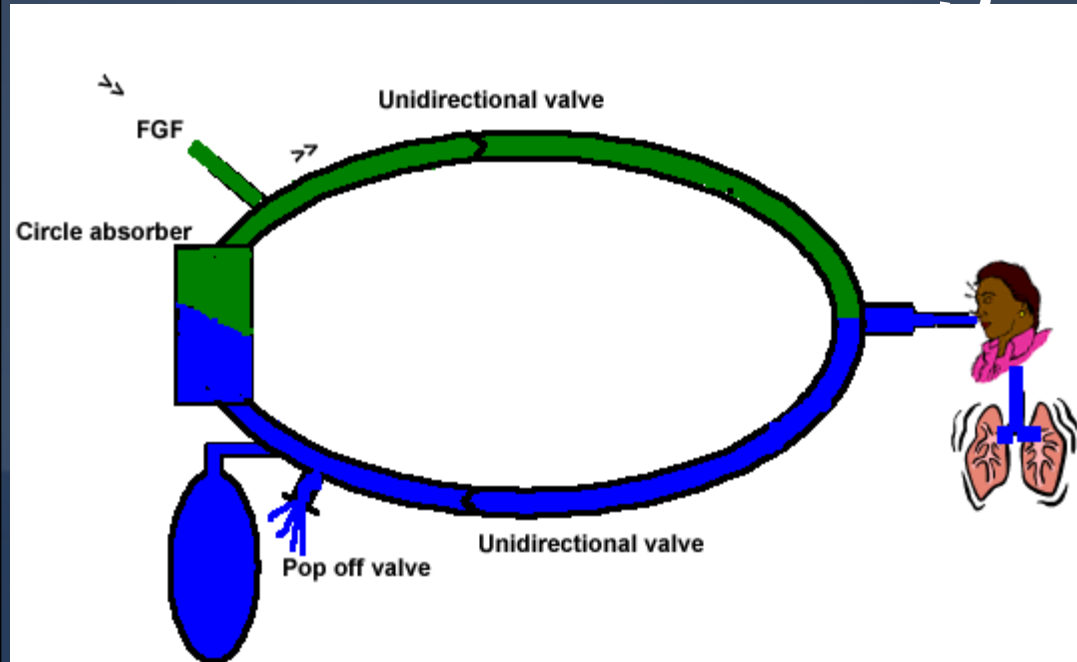Non-interchangeable screw thread

Safety Features

Oxygen Failures device

Breathing Circuits

Induction agents

Analgesics:

- Opioids – Fentanyl,Sufentanyl, Remifentanil

Induction of unconscious:

- Propofol,Thiopental and Etomidate, Benzodiazepines

Muscle relaxants:

- Depolarizing

- Non-depolarizing

Induction

- IV induction

- Inhalation induction

Intraoperative management

- Maintenance

   Inhalation agents: N_2O, 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:

1st 10kg weight-4ml/kg/hr,

2nd 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