Conduct of Anesthesia

Anmar Magharbeh
Rina Karborani
Enas omar
Conduct of Anesthesia

Objectives:

1. Inhalational induction. (procedure, indications, difficulties and complications)

2.1. Conduct of inhalational anesthesia with spontaneous ventilation.
2.2. Difficulties and complications
2.3. Airway maintenance delivery of inhalation agents:
   - face mask (when and how applied, signs of obstruction and treatment)
   - laryngeal mask (insertion, indications, contraindications)
   - tracheal intubation (preparation, indications, complications)
Conduct of Anesthesia

Objectives:

3. Anesthesia for tracheal intubation.

3.1. Inhalational technique for intubation.
3.2. Relaxant anesthesia. (indications)
3.3 Early and late complications

(procedure, Complications)
Guedel’s classification for stages of anesthesia

stage 1 (induction) period between the administration of induction agents and loss of consciousness
Stage 2, also known as the excitement stage, is the period following loss of consciousness and marked by excited and delirious activity. During this stage, the patient's respiration and heart rate may become irregular. In addition, there may be uncontrolled movements, vomiting, suspension of breathing, and pupillary dilation
Stage 3, also known as surgical anaesthesia, the skeletal muscles relax, vomiting stops, respiratory depression occurs, and eye movements slow and then stop. The patient is unconscious and ready for surgery.
Stage 4, also known as overdose, occurs when too much anaesthetic medication is given relative to the amount of surgical stimulation and the patient has severe brainstem or medullary depression, resulting in a cessation of respiration and potential cardiovascular collapse. This stage is lethal without cardiovascular and respiratory support.
Induction of anesthesia

Transition from awake to anesthetized state

**Advantages of inhalational anesthesia**

- Completely painless induction
- No IV (intravenous) access needed
- Rapid appearance of drug in arterial blood
- Safe: as long as patient is breathing satisfactorily, elimination of agent and emergence from anesthesia is essentially guaranteed.
inhalational induction

Indications

1. no accessible veins (neonates, infants & young children)
2. upper airway obstruction, e.g. epiglottitis
3. lower airway obstruction with foreign body
4. bronchopleural fistula or empyema.
5. Needle phobia
inhalational induction
PROCEDURE

Delivery tube may be preferred to young children, some favor allowing child to play with mask before connecting anesthetic tube.

• The mask is introduced gradually to the face from the side.

• While talking to the patient & encouraging him to breathe deeply the anesthetist adjusts the mixture of gas flow & observes the patient’s reaction.

• Initially No2 70% in O2 is used.
inhalational induction

PROCEDURE

• Anesthesia deepened by gradual introduction of a volatile agent. (e.g. halothane 1-3%).
• A single breath technique for patient’s who are able to cooperate.
• Observe the color of patient’s skin, pattern of ventilation, palpate peripheral pulses, monitor ECG & spo2.
• Insertion of an oropharyngeal airway, a laryngeal mask airway or tracheal tube may be considered when anesthesia has been established.
Inhalational induction

Difficulties and complications

1. Slow induction of anesthesia.
2. Airway obstruction and bronchospasm.
3. Laryngeal spasm and hiccups.
4. Environmental pollution.
Maintenance of anaesthesia.

Anesthesia can be maintained using:

1. inhalational agents.
   Sevoflurane, Isoflurane but also Halothane 1-2 MAC may be employed in a mixture of nitrous oxide 70% in oxygen

2. i.v. anesthetic agents.

3. i.v. opioids (Fentanyl, Alfentanil, Remifentanil)
   (alone or combinations)
   (TIVA: Propofol and Opioid)

- Tracheal intubation w/o muscle relaxants may be employed.

- Regional anesthesia may be used to supplement any of these techniques.
Maintenance of anaesthesia.

- Depending on:
  - Nature of surgery
  - Provision of analgesia in the premedication
  - Patient’s response (ventilation, circulation, HR & rhythm).
- Tracheal intubation w/o muscle relaxants may be employed.
Maintenance of anesthesia.
Conduct of inhalational anesthesia with spontaneous ventilation.

Appropriate form of maintenance for:

1. Superficial operations.
2. Minor procedures which produce little reflex or painful stimulation.
3. Operations for which profound muscle relaxation is not required.
Maintenance of anesthesia

Difficulties and Complications

1. Airway obstruction \{due to loss of muscle tone\}
is relieved by appropriate positioning & equipment

2. Laryngeal spasm

What is laryngeal spasm? It is the sustained closure of the vocal cords resulting in partial or complete loss of patient’s airway

**Cause:** stimulation during light Anesthesia
Treatment: 1) stop stimulation
2) apply continuous positive airway pressure of 100%O2 applied with face mask
3) Visualize and clear the airways
4) gently deepening of anesthesia with propofol
5) Intubate and ventilate the patient
3. Bronchospasm

**Cause:** Allergy, smokers, Irritants, upper respiratory infection

**Treatment:** increasing the depth of anesthesia with additional induction agents or volatile agent, or by administering IV or endotracheal lidocaine 1-2 mg/kg. humidification and warming of gases, bronchodilators

4. Malignant hyperthermia (volatile Anesthetics, suxamethonium and amide local anesthetics are triggering substances)

5. Raised intracranial pressure (accentuated by CO2 retention)

6. Atmospheric pollution (scavenging apparatus is needed to prevent pollution)
Airway maintenance delivery of inhalation agents:

1. **Face Mask**
   - Applied **before**, **during** and **after** loss of consciousness at anesthetic induction and the selection of the correct fit is important to provide a gas-tight seal.
   - The mandible is held into the mask by the anesthetic (holding rather than pressing)
   - The mandible is held forward, helping to prevent posterior movement of the tongue and obstruction of the airway.
   - It has variants of types and sizes (0 to 5).
• **Airway obstruction with Face Mask:**

A. soft tissue in drawing in the suprasternal and supraclavicular areas is evidence of obstruction of the upper airway.

B. noisy ventilation or inspiratory stridor provides further evidence that airway obstruction requires correction.

• the patient’s head position during mask anesthesia is very important

• maintenance of the airway may be assisted further by oropharyngeal or nasopharyngeal airways.

• **Note:** An appropriate stage of anesthesia must be reached before insertion of the airway as stimulation of the pharynx will produce coughing, laryngospasm or breath-holding.
Airway maintenance delivery of inhalation agents:

2. Laryngeal Mask

What is it? It is an acceptable alternative to mask anesthesia in the operating room. It is often used for short procedures when endotracheal intubation is not necessary.

LMA insertion: appropriate depth of anesthesia is required.

1. Patient's head is extended.
2. Mouth is opened.
3. Pre deflated LMA is inserted into the Pharynx.
4. LMA is swept distally into the laryngopharynx.
5. Inflate the cuff.
6. Confirmation of the correct placement.
7. LMA is secured in place.
2. Laryngeal Mask

Indications:

a. Provide clear airway without the need to support a mask.
b. Avoid the use of tracheal intubation during spontaneous ventilation.
c. In a case of difficult intubation, to facilitate subsequent insertion of a tracheal tube.
d. Appropriate for elective cases, as a rescue device, in expected difficult airway situations or in fasting patients. It can be used in CPR situations if the patient is profoundly unresponsive.

Contraindications:

a. Full stomach (non-fasting) or any condition leading to delayed gastric emptying.
b. Morbidly obese patients.
c. Thoracic surgery.
d. An unusual position (Prone).
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<th>PATIENT SIZE (kg)</th>
<th>MAXIMUM CUFF VOLUME (mL)</th>
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<td>Neonates up to 5</td>
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3. **tracheal intubation**: is the placement of a flexible plastic tube into the trachea to maintain an open airway or to serve as a pathway for drug administration.

**Preparation:**

1. the anesthetist must check the availability and function of the necessary equipment.
2. should have a dedicated and experienced assistant
3. laryngoscopes of the correct size are chosen and the function of bulb and batteries checked
4. patency of tracheal tube is checked.
3. **tracheal intubation.**

**Indications:**

1. Inability to maintain airway patency.
2. Surgical procedures in which the anesthesiologist cannot easily control the airway (e.g., prone, sitting, or lateral decubitus procedures).
3. Head and neck operation (nasotracheal tube).
4. Inability to protect the airway against aspiration; Protecting the respiratory tract from aspiration of gastric contents.
5. Surgical procedures within the chest, abdomen, or cranium

6. Severe pulmonary and multisystem injury associated with respiratory failure (e.g., severe sepsis, airway obstruction, hypoxemia, and hypercarbia of various etiologies)

7. Failure to ventilate (Positive-pressure ventilation)
Principles of Intubation

• Hold the curved endotracheal tube with your right hand with its distal end directed forward.

• Introduce the tube through the Vocal cords into the trachea for an adequate distance until the horizontal black line mark on the tube is at the vocal cord level)

• Avoid undue force when introducing the tube (try slight rotation of the tube of it did not bypass the laryngeal inlet, otherwise, check the tube size)

• Gently withdraw the laryngoscope blade out with your right hand firmly holding the tube in place

• Inflate the tube Cuff with proper volume( adequate to provide the seal, and not exceeding not exceeding 30 cmH O) 2

• Ventilate through the tube and check that both lungs are equally ventilated by auscultating both lungs

• The tube distal end should ideally be 1 to 2 cm above the Carina otherwise cm above the Carina, otherwise right bronchial intubation is likely with only the right lung being ventilated

• Firmly secure the tube by plaster taping it to the face or by the use proper tying tape
You have to check breath sounds during intubation by using stethoscope.

Rt broncho-intubation 😞
Anesthesia for tracheal intubation

It can be done:

a. Under general anesthesia (either i.v. or inhalational +\- muscle relaxation).

b. Awake Intubation under local anaesthesia using (topical spry , transtracheal spry and superior laryngeal nerve block).
Anesthesia for tracheal intubation:  
**Inhalational technique for intubation:**

- Adequate depth of anaesthesia is necessary to depress the laryngeal reflexes and to provide muscles relaxation.

- Using *halothane* in concentrations up to 4% may provide the necessary depth.

- The adequate depth can be confirmed when there is predominance of diaphragmatic breathing.
Relaxant Anesthesia for intubation:

- After i.v. or inhalational induction of anesthesia, muscle relaxant (example: suxamethonium short acting depolarizing agent) may be used to provide muscle relaxation for intubation. *Suxamethonium* is administered in a dose of 1 to 1.5mg/kg.
- Assisted ventilation is maintained via the face mask until muscle relaxation occurs (except in emergency patients and those likely to regurgitate).
- Then the mask is removed and laryngoscopy & intubation performed. The anesthetic circuit is then connected to the tracheal tube and anesthetic maintained at a depth appropriate for surgery.
**Indications of Relaxant Anesthesia for intubation:**

It provides muscle relaxation, permitting **anesthesia for:**

1. major abdominal, intra peritoneal, thoracic or intracranial Operations
2. prolonged operations
3. prolonged ventilation
Complications of tracheal intubation:

Early Complications

a. Trauma to lips and teeth.
c. Damage to larynx and vocal cords.
d. Nasal intubation may produce epistaxis, trauma to pharyngeal wall.
e. Obstruction or kinking.
f. Bronchial intubation.
g. Arrhythmias, hypertension.

Late Complications

a. Tracheal stenosis (rare).
b. Damage to tracheal mucosa from a cuffed tube.
c. Trauma to vocal cords may result in ulceration and may require surgical removal.
Conduct of extubation.

Positioning:

May take place with the patient supine if the anesthetist is satisfied that airway patency can be maintained by the patient in this position and there is no risk of regurgitation, but in patients at risk of regurgitation and potential aspiration, the lateral position is preferred.

Procedure:

Oxygen 100% replaces the anesthetic gas mixture before extubation to:
- avoid the potential effects of diffusion hypoxia.
- provide a pulmonary reservoir of oxygen.

Tracheobronchial suction via the tracheal tube is carried out using a soft sterile suction catheter should be performed before tracheal extubation to remove gastric fluid.

Extubation is performed preferably during an inspiration.
• Preoxygenation precedes suctioning as the oxygen stores may be depleted by tracheal suction
• After extubation, the patient ability to maintain the airway is ensured, the ability to cough and clear secretions is assessed. Administration of oxygen is continued by face mask.
• The patient airway is supported until respiratory reflexes are intact.

Complications:

a. Laryngeal spasm
b. Regurgitation/inhalation
c. Hemodynamic changes (Extubation is accompanied by transient hypertension and tachycardia in most adults.)
d. Glottic edema (Tracheal and laryngeal trauma may result in glottic Edema)