

Anesthesia Art-I

lecture-4

Maintenance of anesthesia

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September 2023

Maintenance of Anesthesia

Anesthesia may be continued using:

- 1. Inhalational agents.***
 - 2. Intravenous anesthetic agents.***
 - 3. Intravenous opioids.***
- Either alone or in combination.***
 - Regional anesthesia may be used to supplement any of these techniques to achieve any components of the triad of (hypnosis , analgesia and relaxation).***

Inhalational Anesthesia with spontaneous breathing

Appropriate form of maintenance for:-

- 1. Superficial body surgery.***
- 2. Minor surgery which produce little reflex or pain.***
- 3. When profound neuromuscular relaxation is not required.***

Conduct

After induction of anesthesia:

- ***N₂O 67% in oxygen and a volatile agent is used in the patient breathing spontaneously .***
- ***The volatile agent's inspired concentration used is (Isoflurane 1-2% ,Sevoflurane 2-3%, or Desflurane 3-6%) ,depending on:***
 - 1. Nature of the surgery.***
 - 2. Use of analgesia in the premedication.***
 - 3. Patient's response (assessed by the observation of ventilation, circulation).***

Conduct

- ***Control of the depth of anesthesia without overdose is achieved by changing the inspired concentration of volatile agent and assessing the patient's reaction to anesthesia and surgery.***
- ***This rapid control is one of the advantages of inhalational anesthesia.***
- ***Signs of inadequate anesthesia include tachypnea ,tachycardia ,hypertension and sweating.***

Signs of Anesthesia

- ***Guedel's classic signs** of anesthesia are seen in patients pre-medicated with Morphine and Atropine and breathing Ether in Air.*
- *Other inhalational agents follow the same course but the division between the stages and planes are less precise.*
- *Anesthesia signs pass through **4 stages**.*

Stages of anesthesia

Stage 1: the stage of analgesia:

This stage is attained when using N₂O 50% in O₂.

Stage 2: stage of excitement:

This stage is seen during inhalational induction but passed rapidly during i.v. induction.

Signs of stage 2

- 1. Respiration is erratic.***
- 2. Breath-holding may occur.***
- 3. Pharyngeal and laryngeal reflexes are active(insertion of Guedel's airway or LMA may induce gag-reflex and/or laryngeal spasm).***
- 4. Eye-lash reflex as a sign of unconsciousness with i.v. induction is abolished.***
- 5. Eye-lid reflex(resistance to eyelid elevation) is present.***

Stages of anesthesia

Stage 3: surgical anesthesia:

This deepens through 4 planes (in practice three –light-medium deep) with increasing concentration of anesthetic agents:

- 1. Respiration becomes rhythmic.*
- 2. Thoracic component diminishes with depth of anesthesia.*
- 3. Respiratory reflex become suppressed except carinal reflex which is abolished only at plane IV. Therefore too long tracheal tube may produce carinal reflex at an otherwise adequate depth.*
- 4. The pupils are central and gradually dilated with depth of anesthesia.*
- 5. Lacrimation is active in light planes but absent in planes III and IV (a useful sign in a patient not pre-medicated with Atropine).*

Stages of anesthesia

Stage 4: stage of impending respiratory and circulatory failure.

- 1. Brain stem reflexes are depressed by the high anesthetic concentration .*
 - 2. Pupils are dilated and unreactive to light.*
 - 3. Breathing is shallow and rapid.*
 - 4. Sluggish circulation.*
- The patient must not reach this stage .*
 - Withdrawal of anesthetic drug and administration of 100% oxygen lightens anesthesia.*

Stages of anesthesia

Observation of other reflexes provide a guide to the depth of anesthesia.

- ***Swallowing occurs in light planes of stage 3.***
- ***Gag reflex is abolished in upper stage 3.***
- ***Stretching of the anal sphincter produces reflex laryngospasm even in plane-III of stage 3.***

Complications and difficulties

- 1. Airway obstruction: treated by appropriate positioning and use of airway equipment.***
- 2. Laryngeal spasm: usually occurs in the light planes of stage 3 as a result of stimulation. Treated by:***
 - a) Stopping stimulation.***
 - b) Administration of 100% O₂ with a tightly applied face mask..partial opening of the larynx allows flow of oxygen and gradual relief of the spasm.***
 - c) Airway is maintained by hands.(Jaw thrust)***
 - d) Press the reservoir bag but attempts to ventilate the lungs usually causes gastric inflation.***
 - e) Further gentle deepening of anesthesia may then take place .***
 - f) In severe cases i.v. succinylcholine ,lung ventilation and tracheal intubation is advised.***

Complications and difficulties

3. Bronchospasm:

- *May occur if volatile agent are introduced rapidly ,specially in smokers and those with excessive bronchial secretions or in case respiratory tract infection.*
- *Usually warm humidified gases minimize it.*
- *May accompany laryngospasm.*
- *Brochdilators may be required.*

4. Malignant hyperthermia.

5. Atmospheric polution: use scavenging system.

Complications and difficulties

4. Raised intracranial pressure.

- All volatile anesthetic agents may increase ICP.***
- This is accentuated by CO₂ retention which accompanies spontaneously breathing volatile agents.***
- Therefore spontaneous ventilation techniques are contraindicated in patients with intracranial mass or cerebral edema.***

Minimum Alveolar Concentration (MAC)

- ***MAC is the minimum alveolar concentration of a inhalational anesthetic agent which prevents reflex movement in response to surgical incision in 50% of subjects.***
- ***MAC is reduced by opioids medications and hypothermia.***
- ***MAC is higher in neonates and reduced in elderly.***
- ***The effect of inhalational anesthetics are additive which means that:***
***1MAC-equivalent = 70% N₂O (0.67 MAC) +
0.4% Isoflurane (0.33 MAC)***

Minimum Alveolar Concentration (MAC)

- ***MAC is not equal to Inspired concentration of inhalational anesthetic agent.***
- ***The rate at which MAC is attained may be increased by:***
 1. ***Increasing inspired concentration .***
 2. ***Avoidance of airway obstruction.***
 3. ***Increasing ventilation at a constant inspired concentration.***