

Asphyxia – Dr. Barzan

Respiratory insufficiency or failure leads to deprivation of the tissues from oxygen needed for the vital activities of the many tissues and cells. The sensitivity of the cells and tissues to the oxygen deficiency is more in the brain and the heart.

Causes of asphyxia

1. Causes in the respiratory center:

- a. Diseases → intoxication, renal failure
- b. Traumas
 - i. Pressure on the respiratory center, e.g.: fractures or hematomas in the brain
 - ii. Electrocutation
 - iii. Direct effect of poisons: e.g. Opioids, barbiturates

2. Blockage of respiratory inlets:

- a. Accidental
 - i. House collapse (fall)
 - ii. Sand aspiration
 - iii. Vomitus aspiration
 - iv. Blood aspiration
- b. Homicidal → smothering

3. Causes in the respiratory airways:

- a. Pathological
 - i. Blockage of the larynx
 - ii. Edema in the reed
 - iii. Tumor
 - iv. Pathologic membrane
 - v. Croup
- b. Accidental
 - i. Pieces of food
 - ii. Any other foreign bodies in the larynx or trachea
- c. Homicidal → strangulation by: hanging, ligature, throttling

4. Paralysis of respiratory muscles: paralysis of the diaphragm because of cutting or paralysis of nerves or contraction or spasm of the muscles by citrinin toxicity.

5. Causes in the lungs

- a. Inflammations
- b. Hemorrhage
- c. Pus
- d. Pneumonia
- e. Tumors

6. Stoppage of the respiratory act by putting a pressure on the chest.

7. Oxygen deprivation

- a. Severe hemorrhage or failure in the myocardium
- b. When hemoglobin can't bind with oxygen in the blood and can't be carried like in poisoning by CO (anoxic anoxia)
- c. When the tissues can't use the available oxygen (tissue anoxia) → tissue hypoxia, metallic poisons, cyanide poisoning

Stages of asphyxia

- **1st stage:**
 - Increasing respiratory rate
 - Expiration is dominant (exhalation)
- **2nd stage:**
 - Tachycardia
 - Hypertension
 - Contractions
 - Hyporeflexions
- **3rd stage:**
 - Slow, shallow, irregular breathing
 - Tachycardia
- **4th stage:**
 - Paralysis of the vagus nerve
 - Tachycardia
 - Hypotension
 - Pupil dilation
 - Muscle relaxation
 - Respiration (breathing) stops with continuous heart beating
 - The patient can be saved in this stage that lasts (3-4) minutes

Anatomical findings in cases of asphyxia

1. Congestion of the dead body internally and externally

- a. Presence of petechial hemorrhage on the corpse internally and externally which are called (tardieu spots). They will be present under the serous membranes which are the: pericardium, pleura, peritoneum
- b. Cyanosis of the extremities
- c. Hypostasis
- d. Increased blood fluidity because of increased CO₂, increased fibrinolysin, increased fibrinolysis

2. Changes in the organs and tissues

- a. The heart → blood fluidity, tardieu spots
- b. The respiratory system → congested, froth, congestion of lungs and increase in their size
- c. CNS → increased petechial hemorrhage

3. Biochemical changes:

- a. Oxygen deficiency
 - b. CO₂ increases
 - c. Pathological changes
- The general features (signs) of asphyxia are not dependable alone in the diagnosis, but they must be associated with the specific signs of each type of asphyxia by its different methods.

Asphyxia by violent mechanical methods

1. Violence upon the respiratory openings:

- a. Smothering
 - i. Causes of death:
 1. Instant
 2. Late (by a non-healing pneumonia)
 - ii. Findings
 1. General findings (features of asphyxia)
 2. External localized changes → abrasions and bruises (maybe not evident if the victim was drugged or was a child or they may be few because of presence of cloths)
 3. Internal changes → (bruises and wounds on the inner surface of the lips and gum and cheeks)
 - iii. Smothering maybe:
 1. Accidental → under the effect of:
 - a. Alcohol
 - b. Narcotics
 - c. House collapse (falling down)
 - d. Piles of sand
 2. Homicidal
- b. Overlying
 - i. A type of violent asphyxia where breathing is stopped by pressing on the chest and abdomen and closing the respiratory openings.
 - ii. Cause of death is asphyxia
 - iii. Findings → abrasions and bruising
 - iv. Asphyxia from overlying maybe:
 1. Accidental
 - a. houses or sand piles falling on workers
 - b. In cases of overcrowding
 2. Homicidal → in cases of infanticide

2. Violent asphyxia of the airways: (from outside)

- a. Hanging
 - i. Causes of death:
 1. Asphyxia
 2. Cerebral congestion
 3. Cerebral ischemia
 4. Sudden cardiac arrest
 5. In legal hanging (fracture of the odontoid process of the axis vertebra)
 - ii. General examinations:
 1. General signs of asphyxia
 2. Neck examination
 - a. Externally → rope signs → site (above the thyroid cartilage)
 - Partial OR complete
 - The depth depend on the amount of pressure and type of the rope
 - b. Internal signs in the neck:
 - Hemorrhage
 - Hemorrhagic bruising in the internal tissues
 - Rupture in the platysma muscle
 - Rupture of arteries
 - Fracture of the axis
 - Fracture of the hyoid bone

- iii. Hanging maybe:
 1. Accidental → in children and workers
 2. Suicidal
 - a. presence of a chair
 - b. The way the rope was tied
 - c. Other (previous) suicide attempts
 - d. No signs of struggle (fight)
 3. Legal
 4. Homicidal (rare) → mostly the victim was killed by another way then was hanged to appear as suicide
- b. Ligature strangulation
 - i. Causes of death:
 1. Airway blockage
 2. Reflex cardiac arrest
 3. Anemia
 - ii. Findings
 1. Struggle signs
 2. Congestion of the face
 3. Protrusion of the eyes
 4. Conjunctival congestion
 5. Subconjunctival hemorrhage
 6. Bloody froth in the mouth
 7. Bleeding from the nose and ears
 - iii. Neck examination:
 1. Ligature marks which surround the neck completely
 2. Differentiated from hanging by the type of the ligature (it's length) and by the direction of the pressure caused by the ligature (or rope)
 3. Internally → bruising and contusions in neck muscles
 4. Fractures in neck cartilage (thyroid cartilage)
 5. (Rarely) fracture of the hyoid bone
 - iv. It maybe:
 1. Accidental
 - a. Workers (who carry things by ropes)
 - b. Children
 - c. During birth (by umbilical cord)
 2. Suicidal → mentally retarded patients
 3. Homicidal → most common
 - a. Struggle marks and injuries are seen on the body
 - b. Causes maybe: stealing, revenge, shame, illegal pregnancies
 - c. Sometimes the murderer burn the dead body to cover the crime
- c. Manual strangulation (throttling): Pressure on the airways from outside by hands
 - i. Causes of death:
 1. Air deprivation in the trachea
 2. Reflex cardiac arrest
 3. Cerebral ischemia
 - ii. Findings
 1. Cyanosis in the face and lips
 2. Petechial hemorrhage
 3. Abrasions and bruising around the nose
 4. Struggle marks (signs)
 5. Asphyxia signs

- iii. Neck examination:
 - 1. Externally
 - a. a hand or 2 hand marks with forearm mark on the skin from the front or back of the neck
 - b. Bruisings and nail marks (abrasions) on sides of the neck
 - 2. Internally (on autopsy) → bleeding from the tissues, muscles and vessels
 - a. Fracture in the hyoid bone
 - b. Fracture of the thyroid cartilage
 - c. Contusions in the upper 3 rings of the trachea
- iv. It maybe:
 - 1. Homicidal → in all ages (including children and elderly), Under effect of narcotics
 - 2. Accidental → in fights
 - 3. Suicidal → not common

3. Violence upon the airways (from inside) (choking)

- a. Blockage of the airways from inside by a foreign body. E.g.:
 - Vomitus
 - Food
 - Teeth
 - Blood
 - Saliva
 - Amniotic fluid (in fetuses)
- b. Site of blockage → Larynx, Trachea, Bronchi
- c. Causes of death:
 - Blockage of the laryngeal inlet by a large object
 - Blockage by a small object + edema
- d. Death may be delayed when there is
 - Aspiration pneumonia
 - Pus in the lungs
 - Bronchiectasis
- e. Findings:
 - General signs of asphyxia
 - Abrasions and bruising in the airways
- f. It maybe:
 - i. Accidental
 - 1. In children (by buttons or coins)
 - 2. In elderly and drunks (by food like bones of fish or chicken)
 - 3. In surgeries (blockage by base of the tongue)
 - 4. After surgeries (forgetting a gauze inside)
 - ii. Homicidal
 - 1. In children (by pushing a piece of tissue, cotton or gauze inside the mouth)
 - 2. When there is rupture or bleeding from the gum and mouth as a result from any violence against them

4. Violence upon the chest (traumatic or crush asphyxia):

- a. It happens when
 - There is a pressure on the chest or the abdomen by a heavy object
 - A person is buried alive under a collapsed house
 - Children or elderly are stepped on by a crowd
- b. Findings on autopsy:
 - Facial congestion with severe cyanosis in upper body parts
 - Pallor in the lower body parts
 - Bruises and abrasions in the neck
 - Fractured ribs and contusions in the inner organs
- c. It may be: Accidental (commonly), Homicidal (rarely)

Drowning

- Death from asphyxia as a result of immersion of the body into a liquid, not necessarily completely because death happens if only nose and mouth were immersed.
- Causes of death
 - a. Instantly (in 2-5 minutes):
 - Air replaced by water
 - Fatal hypothermia
 - Aspiration of air into the larynx
 - Laryngeal spasm (dry drowning)
 - Fatal head traumas
 - b. Late (in those who survive the drowning):
 - Aspiration pneumonia
 - Bronchitis
 - Edema
 - Renal failure (as a result of hemolysis)
- Findings on autopsy:
 - a. Indefinite signs:
 - Signs of immersion of the body in water
 - Quick hypothermia (as it happens 2 times quicker in water than in air)
 - Hypostasis is in the head, neck and anterior of the chest
 - Color of hypostasis is pink-red
 - Congested conjunctiva with petechial hemorrhage in them
 - Washerwoman's hands
 - Skin slippage
 - Wrinkled skin because of contraction of erector pili muscles
 - Slow putrefaction
 - When the body floats or taken out, putrefaction happens quickly because of increased humidity
 - b. Definite signs:
 - i. Depending on the duration the person lived after falling in water and when he/she was saved, divided into:
 - ii. External signs
 1. Drowning froth on the mouth and nose, which is white colored, odorless, if removed it forms again and it comes out more by pressing on the chest.
 2. Cadaveric spasm, when the drowning person holds anything to survive. It is a definite sign of drowning, helps to know the location of drowning.
 3. Abrasion on the fingers and contusions on the nails
 - iii. Internal signs:
 1. The lungs
 - a. Presence of froth, sand and sea weeds (plants) in the airways
 - b. Laryngeal congestion
 - c. Bleeding under the pleura
 - d. Hemothorax
 - e. Enlarged lungs surrounding the heart
 - f. Imprintings of the ribs on the lungs
 - g. Pale color of the lungs
 - h. On microscopic examination diatoms and plankions are seen

2. The heart
 - a. Congestion inside the heart, filled with a dark colored blood which is very liquidy
 - b. Difference in the (NaCl) level in the heart, salty water is more in the left side, and fresh water is less in the left side.
 - c. Wall of the aorta becomes red colored because of hemolysis
3. The stomach
 - a. Filled with fluids
 - b. Contains sea weeds and plants
 - c. A definite sign is presence of salty water (when drowning in sea)

➤ All these definite signs may not be evident inspite of being sure that it's a drowning case, this may happen in:

1. Death due to reflex cardiac arrest
2. Occurrence of a heart attack at the time the person fell in water
3. Head injuries
4. Quick laryngeal spasm (in dry drowning)

- Drowning maybe

- a. Accidental

- Swimming in the sea
- Fishing
- Epilepsy attack
- Bloats (or ships) sinking
- To distinguish it from other types, what is important are:
 1. The witnesses
 2. Circumstances of drowning
 3. When the body is taken out with its full clothing may imply accidental drowning

- b. Suicidal

- Mainly in people who lived next to seas or rivers
- When the body is taken out, previous wounds of suicide attempts are seen, and before drowning he/she may tie his/her hands or legs

- c. Homicidal (rare)

- Can be proved by investigations
- In children and newborns
- In adults after drugging them
- In those who can't see the perpetrator (blind people)
- Drunk people
- In adults after being tied by weights

➤ Immersion after death:

1. To hide a homicide
2. The body is tied by heavy rocks so it stays under water and the crime is not revealed
3. There isn't any definite sign of drowning