FORENSIC & TOXICOLOGY

SUMMARY

Done by Shahed Atiyat

Asphyxia

Exactly the word asphyxia means 'absence of pulsation', yet it is commonly used to describe lack of oxygenation either partial (hypoxia) or absolute (anoxia).

Types of anoxia:

1. Anoxic anoxia: failure to deliver oxygen from environment.

a. Ambient: decreased oxygen content in the atmosphere (e.g. high altitude, irrespirable gases like CO2, N2).
b. Central: depression of respiratory center (e.g. opioids and barbiturates poisoning).
c. Peripheral: paralysis or spasm of respiratory muscles (e.g. overdose of succinylcholine, botulism, OPP)
d. Mechanical (violent asphyxia).

2. Anemic anoxia: decreased oxygen carrying capacity of blood due to:

a. Abnormal hemoglobin (e.g. COHb in CO poisoning).
b. Hemolysis (e.g. Incompatible blood transfusion).

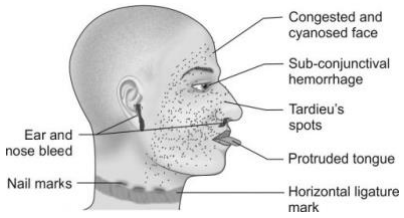
3. Stagnant anoxia: decreased blood flow to the tissue and organs (e.g. HF, anaphylactic shock).

4. Histotoxic anoxia: diminished ability of cells to use oxygen (e.g. cyanide poisoning or cold exposure).

The classical stages of asphyxia:

1. Stage of **dyspnea**; stimulation of respiratory center due to lack of oxygen in blood.
2. Stage of **convulsions**; cerebral irritation due to anoxia and hypercapnia.
3. Stages of **paralysis**; irreversible brain damage.

Classical signs of asphyxia:



A. External signs:

- Cyanosis.
- Facial edema and petechial hemorrhage (Tardieu's spots).
- Prominent eyeball (due to retro-orbital edema) with subconjunctival hemorrhage.
- Protruded tongue and ear & nasal bleeding.
- Dark blue hypostasis.

B. Internal signs

- Congestion of the viscera and the mucosa of air passages with bloody froth.
- Petechial hemorrhage "Tardieus's spots".
  - ✓ They are caused by an acute rise in venous pressure >> causes over distention and rupture of thin-walled peripheral venules.
- Salivary spots: shinny grey spots appear sub-pleural due to increased intra-alveolar pressure during convulsion phase >> rupture of the superficial unsupported sub-pleural alveoli.

Types	Definition & mechanism of death	Postmortem signs
Smothering	Manual obstruction of the **external** respiratory orifices (**mouth** & nose) by hands or soft object. *** Mechanism of death:** Mechanical anoxia.	**A. General:** 1. External & internal asphyxia signs. 2. Ventral hypostasis in cot death. **B. Local:** 1. Pallor around the mouth & nostril. 2. Semilunar nail abrasions & bruises at external respiratory orifices. 3. Bruises & contusion in the inner aspect of the lips, cheeks and gum.
Choking	Blockage of the **internal** respiratory passages at level of pharynx, larynx, or trachea. *** Mechanisms of deaths:** 1. Asphyxia (due to FB obstruction + laryngeospasm or ↑ mucous secretion). 2. Reflex cardiac inhibition (RCI) **Café coronary**: The obstructing foreign body will wedge into laryngopharynx & stimulate **vagal nerve endings** resulting in reflex cardiac arrest.	**A. General:** External & internal signs of asphyxia **B. Local:** Foreign body in air passages. In an epileptic, tongue may show bite marks or bruising.
Gagging	Fabric or adhesive tap occludes the mouth, nasal opening remain patent but later blocked by mucus and/or edema may lead to death.	
Suffocation	Reduction of the oxygen concentration in the atmosphere. *** Mechanism of death:** Hypoxia or reflex cardiac inhibition.	The classical signs of asphyxia are almost always **absent** with **negative** autopsy findings.
Throttling	Neck is constricted forcibly by the **hands.** Pressure must be applied for at least 2 minutes to cause death. **Mugging** is application of pressure to the neck by the arm *** Mechanism of death:** 1. Mechanical anoxia (chief cause). 2. Reflex cardiac inhibition. 3. **Cerebral anemia** (compressor carotid artery). 4. Delayed edema of glottis.	**A. General:** External & internal signs of asphyxia **B. Local:** 1. Semilunar nail abrasions & bruises on the front & sides of the neck. 2. The most significant internal sign: extravasating of blood in subcutaneous tissue underneath the external marks. **3. The most diagnostic finding: inward compression fracture of hyoid bone** 4. Damaged larynx and fracture or split of the thyroid cartilage. **5. Fracture of cricoid cartilage.**
Strangulation	Neck is constricted by a **rope** or any ligature ***Mechanism of death:** 1. Mechanical anoxia. 2. Reflex cardiac inhibition. 3. Delayed edema of the glottis.	**A. General:** External & internal signs of asphyxia **B. Local:** 1. Ligature marks; formed of abrasions and contusions and surrounded by congestion, petechiae and hyperemia ○ **Transverse & complete circle.** ○ **Below laryngeal prominence.**

<table>
<tr><td></td><td></td><td>2. Scratches and abrasions on either side of the neck as a sign of resistance.
3. Fracture of thyroid cartilage and hyoid bone with inward displacement (less severity than throttling).</td></tr>
<tr><td><u>Hanging</u></td><td>Suspension of the body from the neck by a ligature. The constricting force is produced by the body weight.
<u>Based on degree of suspension:</u>
1. Complete: The body does not touch the ground at any point.
2. Incomplete: If any part of the body touches the ground, almost always homicidal.
<u>Based on knot position:</u>
1. Typical: the knot is centrally located over the occiput.
2. Atypical: the knot is anywhere other than on the occiput.
Mechanism of death:
1. Cerebral anemia: the commonest cause; stretch carotids and with subsequent narrowing. This mechanism explains the rapid loss of consciousness (victim cannot save himself).
2. Reflex cardiac inhibition: due to pressure on the carotid sinus.
3. Mechanical asphyxia: due to backward displacement of the base of the tongue.
4. Tearing of the medulla: following fracture dislocation of the cervical vertebrae. Common with “Judicial hanging” due to the long drop of more than two meters. The knot is placed below the chin.</td><td>A. General:
1. External & internal signs of asphyxia.
2. Hypostasis of the lower parts of the body (lower limbs, hand, lower abdomen, genitalia) — gloves and stocking hypostasis.
3. Engorged genitalia with ejaculation in males.
B. Local:
1. Ligature marks:
○ Incomplete circle, oblique.
○ Located high up in neck.
○ Asymmetrical: deepest opposite the point of suspension and fades gradually upwards to be absent at the site of the knot.
2. Dribbling of saliva due to pressure on the submandibular gland.
3. Transverse untimely rupture of carotid arteries
4. Outward fracture of the hyoid bone or posterior horn of the thyroid cartilage.
* Fracture dislocation is most common between C2-C3 >> Hangman's fracture.
<table><tr><th>Ligature mark</th><th>Strangulation</th><th>Hanging</th></tr><tr><td>1- Site</td><td>Low below larynx</td><td>High above larynx</td></tr><tr><td>2- Shape</td><td>Complete circle</td><td>Incomplete circle (except running noose/ double turns).</td></tr><tr><td>3- Direction</td><td>Transverse</td><td>Oblique</td></tr><tr><td>4-Compression</td><td>Symmetrical</td><td>Asymmetrical</td></tr></table></td></tr>
<tr><td><u>Traumatic</u></td><td>Fixation of the chest and abdomen by external mechanical compression preventing respiratory movements.
Mechanism of death:
1. Mechanical asphyxia.
2. Injury of vital organs.</td><td>1. Blue congestion of the face, neck and upper chest & pallor at compression site.
2. Conjunctiva is congested and hemorrhagic.
3. Local bruises and abrasions of chest wall, may be with fractured ribs or sternum / ruptured heart or lungs.
4. Lungs are dark with Tardieu’s spots.</td></tr>
<tr><td><u>Sexual</u></td><td colspan="2">Death in sexual asphyxia is accidental self- induced; that happens suddenly during attempts of inducing hypoxia to reduce the blood supply to the brain;</td></tr>
</table>

	which appear to produce auto erotic hallucinations in some persons during the course of solitary sexual activity.

Smothering

Throttling

***Contusions/ Manner: Homicide.**

***Inward Hyoid bone fracture is suspected.**

Strangulation

* **Pressure contusions**

* **Complete, transverse circle**

Strangulation

* **Suicidal**

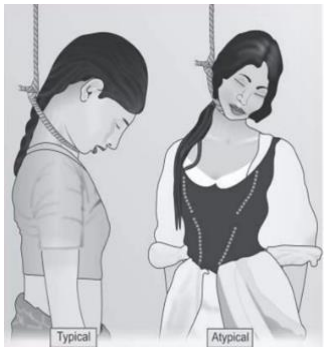
Mugging

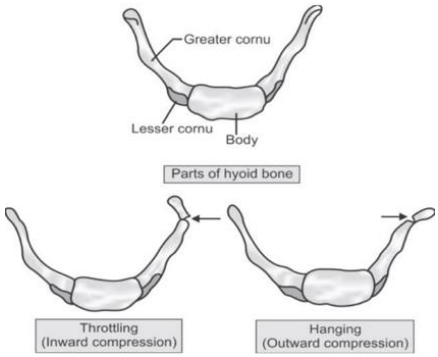
Hanging

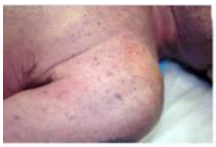
* **Imprint abrasion.**

* **The constricting force is the body weight.**

* **Mostly the manner of death in hanging is suicidal.**







Differentiation 10.1: Antemortem and postmortem hanging

S.No.	Feature	Antemortem hanging	Postmortem hanging
1.	Salivary dribbling mark	Present	Absent
2.	Fecal/urinary stains	May be present	Absent
3.	Ligature mark		
	• Direction	Oblique	Circular
	• Continuity	Non-continuous	Continuous
	• Level in the neck	Above thyroid	At or below thyroid
	• Parchmentization	Present	Absent
	• Vital reaction	Present	Absent
4.	Knot	Single, simple, on one side of neck	Multiple, granny or reef type on occiput/chin
5.	PM staining		
	• Above ligature mark	Present	Absent
	• In lower limbs	Present	Absent
	• Glove-stocking like	Present	Absent
6.	Evidence of injury		
	• Self-inflicted	Present	Absent
	• Struggle	Absent	Present
	• Tear of carotid artery intima	Present	Absent
	• Imprint abrasion	Present	May/may not be present
7.	Elongation of neck	Present	Absent
8.	Cyanosis	Deeply positive	Absent or faintly present
9.	Emphysematous bullae on lungs	Absent	Present
10.	Point of suspension	Compatible with self-suspension	Not so