

FORENSIC & TOXICOLOGY SUMMARY

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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 (high altitude, irrespirable gases like CO₂, N₂).
 - b. Central: Depression of respiratory center; Opioids and barbiturates.
 - c. Peripheral: Paralysis or spasm of respiratory muscles; overdose of succinylcholine, botulism, OPP.
 - d. Mechanical (violent asphyxia).
2. **Anemic anoxia:** Decreased oxygen carrying capacity of blood due to:
 - a. Abnormal hemoglobin (CO poisoning).
 - b. Hemolysis.
3. **Stagnant anoxia:** Decreased blood flow to the tissue and organs; HF, shock, ...
4. **Histotoxic anoxia:** Diminished ability of cells to use oxygen; 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 (retro-orbital edema) with subconjunctival hemorrhage.
- Protruded tongue and ear & nasal bleed.
- Dark blue hypostasis.

B. Internal signs

- Congestion of the viscera and the mucosa of air passages with bloody froth.
- Petechial hemorrhage "Tardieu's spots".
- Salivary spots: grey spots appear sub-pleural due to increased intra-alveolar pressure during convulsion phase leading to rupture of the unsupported alveoli.

<u>Asphyxia types</u>	<u>Definition & mechanism of death</u>	<u>Postmortem signs</u>
<u>Smothering</u>	<p>* Manual obstruction of the external respiratory orifices by hands or soft object.</p> <p>* Mechanism of death: Mechanical anoxia.</p>	<p>A. General:</p> <ol style="list-style-type: none"> 1. External & internal asphyxia signs. 3. Ventral hypostasis in cot death. <p>B. Local:</p> <ol style="list-style-type: none"> 1. Pallor around the mouth & nostril. 2. Semilunar nail abrasions & bruises at external respiratory orifices (absent if soft object is used). 3. Bruises & contusion in the inner aspect of the lips, cheeks and gum.
<u>Choking</u>	<p>* Blockage of the internal respiratory passages at level of pharynx, larynx, or trachea.</p> <p>* Mechanisms of deaths:</p> <ol style="list-style-type: none"> 1. Asphyxia (due to FB obstruction + laryngeospasm or increased mucous secretion). 2. Reflex cardiac inhibition (RCI); <u>Café coronary</u>: The obstructing foreign body will wedge into laryngopharynx & stimulate vagal nerve endings resulting in reflex cardiac arrest. 	<p>A. General: External & internal signs of asphyxia</p> <p>B. Local: Foreign bodily in air passages. In an epileptic, tongue may show bite marks or bruising.</p>
<u>Gagging</u>	<p>Fabric or adhesive tap occludes the mouth, nasal opening remain patent but later blocked by mucus and/or edema may lead to death.</p>	
<u>Suffocation</u>	<p>Reduction of the oxygen concentration in the atmosphere.</p> <p>* Mechanism of death: Hypoxia or RCI</p>	<p>The classical signs of asphyxia are almost always absent with negative autopsy findings.</p>
<u>Throttling</u>	<p>Neck is constricted forcibly by the hands.</p> <p>Pressure must be applied for <u>at least 2 minutes</u> to cause death.</p> <p>Mugging is application of pressure to the neck by the arm</p> <p>* Mechanism of death:</p> <ol style="list-style-type: none"> 1. Mechanical anoxia (chief cause) 2. RIC 3. Cerebral anemia (compressor carotid artery) 	<p>A. General: External & internal signs of asphyxia</p> <p>B. Local:</p> <ol style="list-style-type: none"> 1. Semilunar nail abrasions & bruises on the front & sides of the neck. 2. Linear abrasion. 3. The most significant internal sign: extravasating of blood in subcutaneous tissue underneath the external marks

	<p>4. Delayed edema of glottis</p>	<p>4. The most diagnostic finding: <u>inward compression fracture of hyoid bone</u></p> <p>5. Damaged larynx and fracture or split of the thyroid cartilage</p> <p>6. Fracture of cricoid cartilage</p>
<p><u>Strangulation</u></p>	<p>Neck is constricted by a rope or any ligature</p> <p>*Mechanism of death:</p> <ol style="list-style-type: none"> 1. Mechanical anoxia (chief cause). 2. Reflex cardiac inhibition. 3. Delayed edema of the glottis. 	<p>A. General: External & internal signs of asphyxia</p> <p>B. Local:</p> <ol style="list-style-type: none"> 1. Ligature marks; formed of abrasions and contusions and surrounded by congestion, petechiae and hyperemia <ul style="list-style-type: none"> - Transverse, below laryngeal prominence - Complete circle 2. Congestion & bruises of neck muscle 3. Fracture of thyroid cartilage and hyoid bone with inward displacement (less severity than throttling).
<p><u>Hanging</u></p>	<p>Suspension of the body from the neck by a ligature</p> <p>Based on degree of suspension:</p> <ol style="list-style-type: none"> 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. <p>Based on knot position:</p> <ol style="list-style-type: none"> 1. Typical: The knot is centrally located over the occiput. 2. Atypical: The knot is anywhere other than on the occiput. <p>Mechanism of death:</p> <ol style="list-style-type: none"> 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. 	<p>A. General:</p> <ol style="list-style-type: none"> 1. External & internal signs of asphyxia 2. Hypostasis of the lower parts of the body (gloves and stocking hypostasis). 3. Engorged genitalia with ejaculation in males <p>B. Local:</p> <ol style="list-style-type: none"> 1. Ligature marks <ul style="list-style-type: none"> - Incomplete circle - Oblique and located high up in neck 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.

	<p>3. Mechanical asphyxia: due to backward displacement of the base of the tongue.</p> <p>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.</p>	<p>*Fracture dislocation is most common between C2-C3.</p> <table border="1"> <thead> <tr> <th>Ligature mark</th> <th>Strangulation</th> <th>Hanging</th> </tr> </thead> <tbody> <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> </tbody> </table>	Ligature mark	Strangulation	Hanging	1- Site	Low below larynx	High above larynx	2- Shape	Complete circle	Incomplete circle (except running noose/ double turns).	3- Direction	Transverse	Oblique	4-Compression	Symmetrical	Asymmetrical
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Traumatic	<p>Fixation of the chest and abdomen by external mechanical compression preventing respiratory movements.</p> <p>Mechanism of death:</p> <ol style="list-style-type: none"> 1. Mechanical asphyxia. 2. Injury of vital organs. 	<ol style="list-style-type: none"> 1. Blue congestion of the face, neck and upper part of the chest with pallor at site of compression. 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 															
Sexual	<p>Death in sexual asphyxia is accidental self- induced; that happens suddenly during attempts of inducing hypoxia in order to reduce the blood supply to the brain; which appear to produce auto erotic hallucinations in some persons during the course of solitary sexual activity.</p>																

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 <ul style="list-style-type: none"> • Direction • Continuity • Level in the neck • Parchmentization • Vital reaction 	<ul style="list-style-type: none"> Oblique Non-continuous Above thyroid Present Present 	<ul style="list-style-type: none"> Circular Continuous At or below thyroid Absent Absent
4.	Knot	Single, simple, on one side of neck	Multiple, granny or reef type on occiput/chin
5.	PM staining <ul style="list-style-type: none"> • Above ligature mark • In lower limbs • Glove-stocking like 	<ul style="list-style-type: none"> Present Present Present 	<ul style="list-style-type: none"> Absent Absent Absent
6.	Evidence of injury <ul style="list-style-type: none"> • Self-inflicted • Struggle • Tear of carotid artery intima • Imprint abrasion 	<ul style="list-style-type: none"> Present Absent Present Present 	<ul style="list-style-type: none"> Absent Present Absent 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
11.	Histochemistry of ligature mark	Increased serotonin and histamine	Not so



Smothering

*Manner: Homicidal.

Smothering

*Accidental.
*Most commonly in alcoholics or epileptics.

Throttling

*Contusions.
*Manner: Homicide.
*Insard Hyoid bone fracture is suspected.



Strangulation

* Suicidal

Chocking

Mugging

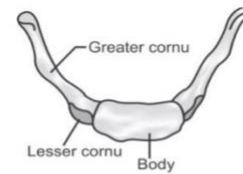
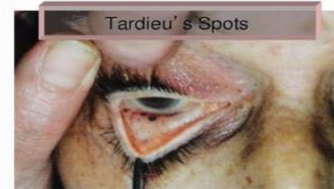
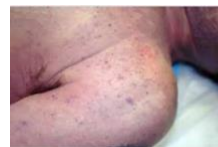


Strangulation

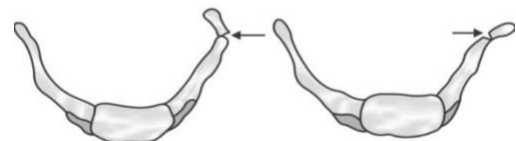
* Pressure contusions
* Transverse and complete circle

Hanging

* Imprint abrasion.
* The constricting force is produced by the body weight.
* Mostly the manner of death in hanging is suicidal.

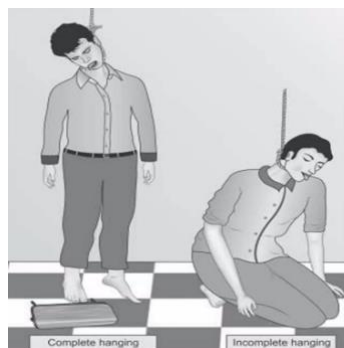


Parts of hyoid bone



Throttling (Inward compression)

Hanging (Outward compression)



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