

Asphyxial deaths

DEATH BY ASPHYXIA

ASPHYXIA = *'absence of pulsation'*

'Lack of oxygen'

Effective Respiration

depends upon a combination of three critical elements:

1. an open and patent airway
2. a functional muscular pump
3. an adequate gas exchange

Asphyxial deaths

***Violent deaths initiated by
interference with respiration***

Rapid hypoxic / anoxic deaths

Causes

1. Hypoxic hypoxia– defective or total failure of oxygenation

a. Breathing in vitiated atmosphere:

- i. by displacement of O₂ by inert gas fumes in wells and vats
- ii. By exposure to gases in atmosphere – sewer gas

b. Mechanical interference:

- i. closure of external respiratory passages – smothering and overlaying
- ii. Obstruction of air passages – drowning, choking, throttling, strangulation, hanging

c. Interference with respiratory movements:

traumatic asphyxia

d. Paralysis Of Respiratory Center:

electrocution, some acute poisonings

2. Anemic hypoxia – reduced O₂ carrying capacity of blood
acute CO poisoning, acute massive hemorrhage

3. Stagnant hypoxia – impaired circulation O₂ ↓
delivery per unit time
shock

4. Histotoxic hypoxia / anoxia – depression of oxidative
processes in tissues
acute cyanide poisoning

Sequence of events that may be seen in asphyxial episode

- Dyspnoea phase
 - Expiratory dyspnoea with raised respiratory phase, cyanosis and tachycardia
- Convulsive phase
 - Loss of consciousness, reduced respiratory movement, facial congestion, bradycardia, hypertension and fits
- Pre-terminal respiratory phase
 - No respiratory action, failure of respiratory and circulatory centers
- Gasping for breath
 - Respiratory reflexes
- Terminal

Post-mortem Findings

**General non-specific
pathologic changes**



due to

increased

Capillary permeability

Endothelial fragility

(hypoxia/anoxia)

**Specific asphyxial
changes**



due to

Unique mechanism

of asphyxial death

PETECHIAL HEMORRAGES

(Tardieu's Spot)

Pinpoint (1 – 2 mm) collections of blood in serosal & skin surfaces due to rupture of small venules under pressure.

Externally Most often seen on face and conjunctivae

Bleeding from nasal mucosa and the external auditory meatus.

Internally

Most often seen on serous membranes of thorax. Mostly on visceral pleurae , and rarely on parietal pleura.

Commonly seen on

heart surface

Thymus in infants

Never seen on peritoneal serosa.

Significance of petechial hemorrhages

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Signs of asphyxia

- 1 Petechial hemorrhages**
- 2 Visceral congestion**
- 3 Cyanosis**
- 4 Cardiac dilatation**
- 5 Fluidity of blood**

Death due to pressure on Neck

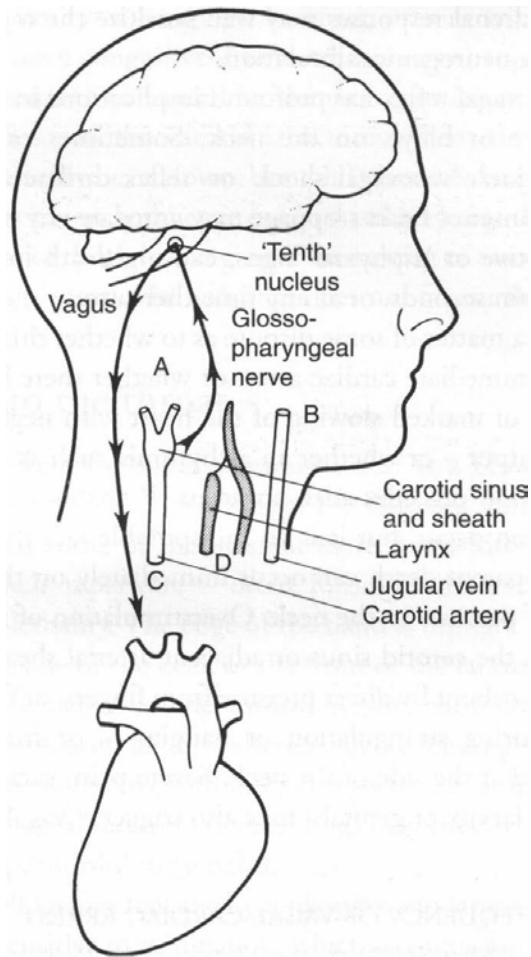
1. Strangulation

- a. Strangulation by hands (called **Throttling or Manual Strangulation**)
- b. Strangulation by ligature

2. Hanging

- a. Complete hanging
- b. Partial hanging

*Mugging



- Carotid sinus reflex leading to cardiac arrest
- Jugular venous compression leading to cyanosis and petechie
- Carotid artery compression leading to unconsciousness

HANGING

is a form of asphyxia as a result of suspension of the body by a ligature around the neck

The constricting force being the weight of the body

- ★ **Complete hanging**
- ★ **Partial hanging**

- **Mechanism of death**

Causes of death in hanging

- Cerebral ischemia
- Cerebral congestion
- Blockage of air passage
- Vagal inhibition
- Injury to spinal cord

Fatal period

Positions of ligature

- (a) Usual position with fixed noose and high suspension point.

The mark rises high to a gap.

- (b) If a slipknot is used, the tightness
- of the deeply impressed loop tends to find the smallest circumference on
- the neck, and may be lower and more horizontal.
- (c) If the suspension
- point is low and the subject leans away, the mark can be horizontal.

Autopsy findings

External

Ligature mark

Ligature mark in hanging

In fixed noose ligature

In running or slip-noose ligature

Internal findings

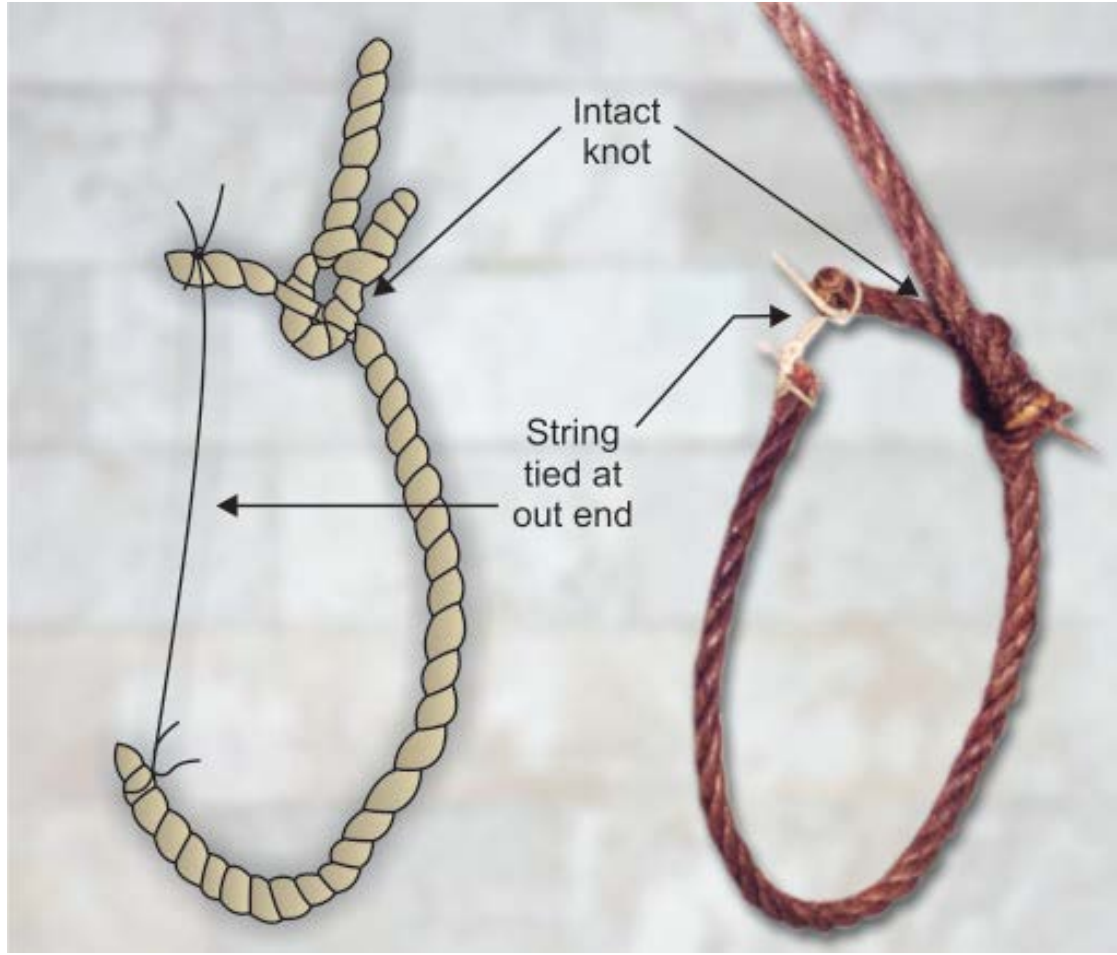
Ante mortem hanging

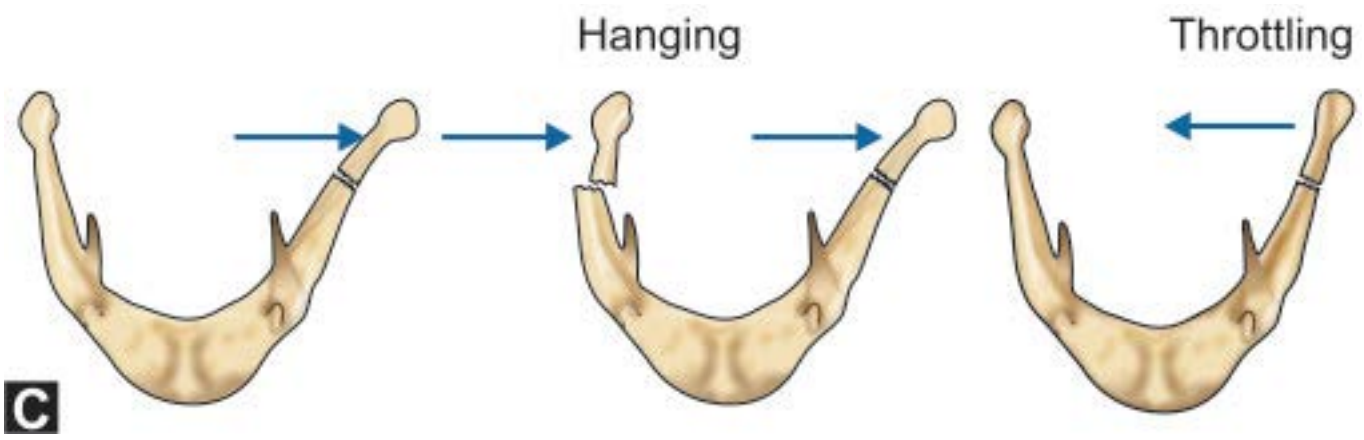
Hanging

Manner of death

Judicial hanging

- Lynching
- Accidental hanging
 - Infants
 - Children
 - Adolescent
 - **Autoerotic hanging**





STRANGULATION

is the constriction of neck by means other than the weight of the body itself.

A ligature is usually used.

Methods other than ligature

- Mugging
 - Compress victim neck against arm
- Garroting
 - Attack from back without warning
- Bansdola
 - Neck is compressed between two hard objects or sticks

External appearance

- Vagal inhibition
- Slight vagal effect and some venous constriction
- Moderate venous constriction and some respiratory obstruction
- Pronounced venous and respiratory obstruction
- Instant death
- Slight asphyxial signs
- Moderate asphyxial sign
- Well marked asphyxial signs

Ligature mark in Strangulation is horizontal, completely encircles the neck, and is situated below, or at the level of thyroid cartilage. Knot may be anywhere

Bruising of underlying skin.

Injuries to deeper neck tissues are common.

Internal appearance

- **Manner of death**
- **Suicidal**
 - Uncommon
- **Homicidal**
 - Infanticide by strangulation
- **Accidental**
 - New born
 - Child restrained by harness
 - Scarf and necktie in machinery

Difference between hanging and strangulation

Throttling

Manual strangulation

Mechanism of death

- pressure on neck \longrightarrow constriction of larynx : hypoxic hypoxia
- pressure on carotid sinuses \Rightarrow reflex cardiac inhibition through vagal stimulation
- obstruction of carotid art / jugular veins \Rightarrow cerebral hypoxia

Throttling

Manual strangulation

Autopsy findings

- non-specific general pathologic changes

Injuries on face and chest

tongue may be bruised

bitten by teeth and protruding

face and eyes may show petechial hemorrhages

Body temperature may be raised

Injuries on the neck

Depends upon relative position of the victim and assailant ,manner of grasping of neck and amount of pressure

When only one hand is used

When two hands are used

Throttling

Manual strangulation

Internal appearance

Throttling

Manual strangulation

Whether the death was due to
throttling

Throttling

Manual strangulation

Manner of death

homicidal

accidental

- The garrotte was used for judicial execution in Spanish jurisdictions, in the form of a metal band encircling the neck .
- The collar could either be drawn backward suddenly by a long counter weighted lever or tightened by quick-threaded screw and flywheel.
- The Catalan garrotte was supplemented by a spike entering
- the back of the neck, simultaneously severing the spinal cord at the spinomedullary junction.
- Death from spinal dislocation and high-level cord destruction was supposedly instantaneous, ensuring a similar bloodless outcome to modern judicial hanging.

Suffocation

smothering & overlaying

Manner of death

accidental mechanical suffocation
suicidal
homicidal

Mechanism of death

hypoxic hypoxia **anoxic anoxia**

Autopsy findings

non-specific general pathologic changes
specific findings
 PM lividity
 external wounds over face

Traumatic asphyxia

“Restraint Asphyxia.”

Mugging

Arm-lock

Mechanical Restraint of agitated and violent patients and transporting patients in ambulances

Positional Asphyxia

occurs when the position of a person's body interferes with respiration, resulting in death from asphyxia or suffocation.

At death, the victim must be found in a position that interferes with pulmonary gas exchange (breathing). Such a position may range from one that causes obstruction of the mouth and nares, to one that causes restriction of the chest or diaphragm.

The inability of the victim to escape this position must be explained. In positional asphyxia deaths unrelated to restraints, unconsciousness due to acute alcohol intoxication is the most frequent explanation of the victim's inability to escape from the asphyxiating position.

All other causes of death – natural or unnatural, medical or traumatic – must be explored by autopsy and excluded to a reasonable degree of medical certainty.

Hobble Restraint

also been called "hog-tying." frequently employed by police officers for control of significantly combative parties

Drowning

Drowning

- Who is the person
- How long has the person been in the water
- Did the person drown
- Why did the person drown
- died from natural disease before falling into the water
- died from natural disease while already in the water
- died from injury before being thrown into the water
- died from injury while in the water
- died from effects of immersion other than drowning
- died from drowning.
- All the above may show signs of immersion on examination

- Typical drowning

- Wet drowning

- Fresh water
 - Salt water

- Atypical drowning

- Dry drowning
 - Immersion syndrome
 - Submersion of the unconscious
 - Near drowning /secondary drowning

Various events of mechanism of drowning

- Stage of surprise
 - Last for 5-10 sec
- First stage of respiratory arrest
 - Last for 1 min and involve struggle to reach at surface
- Stage of deep respiration
 - Last for 1 min coupled with formation of froth /foam
- Second stage of respiratory arrest
 - Last for 1 min sensibility was lost and hypoxic convulsions occur
- Terminal gasping
 - Last external signs of death
 - It take 3-4 minutes

Mechanism of froth formation



Death due to natural disease

- Cause before entering the water
 - Well establish pathology
- Natural death whilst in water
 - Pre existing condition may be exacerbated by physical exertion
 - Splanchnic shunt after heavy meal

How long has the person been in the water

- Cooling of the body
- Rigor mortis
- Hypostasis
- Decomposition
- Maceration of skin
- Formation of adipocere

Drowning / immersion

Specific pathologic findings



Drowning / immersion

Internal findings



Drowning / immersion

Physiochemical test

Diatoms test

unicellular algae.

Resist acid digestion ,heat and putrefaction

Isolated by acid digestion of bone marrow ,lung,blood,kidney

Centrifugation and washing

Examined by phase contrast microscopy

Chloride content

diagnosis of cause of death by chloride estimation

chloride content from left and right side of heart

Difference of 25 mg/100ml is significant

Salt water drowning produce opposite effect
injuries on drowned bodies

Estimation of duration of immersion

- If no wrinkling of the finger pads is present
- Wrinkled fingers, palms and feet
- Early decomposition
- Bloating of face and abdomen with marbling of veins and peeling of epidermis on hands and feet and slippage of scalp
- Gross skin shedding
- Less than few hours
- ½ day -3 days
- 4-10 days
- 2-4 weeks
- 1-2 months

Drowning / immersion

Additional medico-legal points

injuries on drowned bodies

Drowning / immersion

Manner of death

Suicidal

Homicidal

Accidental

Paltauf's spots/hemorrhages

Marine predator injuries
circular defects caused by crustaceans