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MECHANICAL Asphyxia

(\textbf{Part1}: General features of asphyxiation, hanging & strangulation)
Asphyxia

lack of oxygen
Asphyxia

Greek word implying – “pulse less ness”
or
absence of pulsation.
Few other definitions.....

**Hypoxia-**
Inadequate supply of oxygen to the tissues (or impaired cellular utilization of oxygen)

**Hypoxemia-**
Decreased carriage of oxygen in the arterial blood

**Anoxia-**
Absence of oxygen
Anoxic anoxia
Prevention of oxygen from reaching the lungs

Anemic anoxia
Inability of blood to carry sufficient oxygen - low hemoglobin

Stagnant anoxia
Circulation impaired - lack of oxygenated blood transported to the tissues

Histotoxic anoxia
Oxygen freely available but cannot be utilized by tissues egs: cyanide poisoning, CO₂ poisoning etc
Asphyxial Triad

Congestion & Edema

Cyanosis

Petechial Hemorrhage
Other Asphyxial Signs

1. Pulmonary oedema
2. Engorgement of right side of heart
3. Fluidity of blood
4. Bleeding from ear and nose
1. Cyanosis

Greek word— ‘dark blue’

- Bluish discoloration of skin, mucous membrane & of internal organ
5 g of reduced haemoglobin per 100 ml of capillary blood.
• parts having abundant capillary & venous circulation

  lips,
  tip of nose,
  nail-beds,
  ear lobes,
  tip of tongue etc.
Asphyxia

- Deficient oxygenation in lungs
- Reduced pulmonary flow
- Diminished venous return to heart
- Stasis of blood in organs
- Capillary engorgement
- Capillary stasis
- Capillary dilatation
- Reduction in O2 tension
2. Increased capillary permeability (congestion)

- Reduced oxygen tension
- Capillary dilatation
- Stasis of blood
- Fluid exudes in tissue spaces
- Oedema of tissues
3. Engorgement of right side of heart & fluidity of blood.

Non-specific phenomena
Due to generalized rise in venous pressure.
Petechial haemorrhages

- Tardieu’s spots
- Bayard’s ecchymosis
- Small pin-head size collections of blood
• Venular in origin

• d/t acute rise in venous pressure leads to rupture of thin walled venules. (palpebral, bulbar & unsupported serous membrane like pleura & epicardium)

• antemortem & postmortem.
Clinical effects of Asphyxia

- Asphyxia → Sphincter relaxation → Voiding of urine, stools, semen
- Asphyxia → Decreased oxygen tension and reduced Hb → Cyanosis → Unconsciousness
- Asphyxia → Capillary endothelium damage → Increased capillary permeability → Pulmonary edema
- Capillary rupture → Tardieu’s spots
Classification of asphyxia

From medicolegal point-of-view:

1. Mechanical asphyxia
   Physical impediments

2. Non-Mechanical asphyxia
   Physiological impediments
2. Non-Mechanical Asphyxia

Exclusion of oxygen

- depletion & replacement by another gas.
- chemical interference with its uptake & utilization.

- insufficient oxygen in the atmosphere itself.
Egs....

- High altitude
- Inhalation of co
- Sewer gases
- Pure helium
Mechanical asphyxia

- Compression of neck
  - Hanging
  - Strangulations
- Submersion of mouth & nostrils under fluid
- Drowning
- means other than compression at neck & drowning (Suffocation)
  - Compression & mechanical fixation of chest (Crush asphyxia /traumatic asphyxia)
Hanging

violent asphyxial deaths due to compression of the neck, as a result of suspension of the body by means of ligature in such a manner, that the whole weight of the body or part of the body weight acts as a constricting force.
Ligature

Any material used for compressing neck with some extra length for suspension.

Eg...rope, dhoti, saree, chunni, turban, belt, gown, neck-tie etc.
Classification of hanging

A. On basis of position of the knot
   i. Typical Hanging
   ii. Atypical Hanging

B. On the basis of degree of suspension
   i. Complete Hanging
   ii. Incomplete/ partial Hanging
ON BASIS OF POSITION OF KNOT

Typical hanging-point of suspension placed centrally over the occiput, i.e. the knot is at the nape of the neck on the back.

Atypical hanging-point of suspension is at any other position.

Commonest location is ---mastoid process or angle of mandible or under chin.
Atypical hanging
ON BASIS OF DEGREE OF SUSPENSION

Complete hanging

body is fully suspended
& no part of the body touches the ground.

constricting force = whole weight of the body

Incomplete or partial hanging

Only a part of the body weight act as constricting force.
i.e. hanging in lying, sitting, or kneeling position.
Constricting force = Weight of head
Complete Hanging
Force required for compression

(4-5 kgs)

(2 kg)

(15 kgs)

Vertebral arteries = 30 kgs
Causes of death

1. Asphyxia
2. Venous congestion
3. Combined asphyxia & venous congestion***
4. Cerebral anemia
5. Reflex vagal inhibition
6. Fracture/dislocation of cervical vertebrae—seen in judicial hanging
Fatal period

Depends on mechanism of death

Immediate – if cervical vertebrae is fractured
Rapid – asphyxia
Least rapid – if coma is responsible

Usual period is 3-5 mins extending to 5-8 mins
Symptoms

• Only few survivors (near hanging)
• Flashes of light & hissing sound in ears
• Sensation of warmth & tingling
• Feeling of stupefaction ,
• intense mental confusion
• incoherent thoughts & feeling of helplessness.
• unconciousness & convulsions
Signs

- Face congested & red
- Cyanosis marked
- Neck veins of the temple congested
- Dribbling of saliva from angle of mouth
Autopsy findings

• Photography of the victim along with ligature (if present) is recommended.
Imp. point

After describing the manner of application of ligature, condition, type & location of the knot ligature material to be removed by cutting it away from knot & both ends secured, then properly labelled, sealed & handed over to police.
Ligatures
EXTERNAL FINDINGS

General External Findings

Face pale
• vagal inhibition or injury to spinal cord
• Complete hanging

Face congested
• asphyxia
• Venous congestion
• Incomplete hanging
Eyes
closed or partly
+ protruding,
petechial haemorrhages
(subconjunctival region).

Le facies Sympathique ----- 
Eye on same side remain open
with dilated pupil.
Petechial haemorrhages
Tongue
Swollen & blue, forced in between teeth, bloody froth seen

Saliva
Dribbling from angle of mouth (opposite to knot)
** absent-vagal inhibition, cervical fracture
Neck
Stretch & elongated in prolonged & complete hanging

Hands
Clenched,
sometimes shows presence of fibres or any other material involved in hanging (cadaveric spasm)
Genitals

**male**- Engorgement of penis (d/t hypostasis) & discharge of semen

**Female**- engorgement of vagina, blood-stained fluid discharge.

- Urine & faeces may escape d/t relaxation of sphincters
Postmortem staining-
  glove & stocking

Cyanosis-
Deep cyanosis seen in the lips, fingertips, nail-bed, tip of the nose & ear lobules.
Local external findings

The principal external mark

Ligature mark on neck

Type of pressure abrasion
• single
• high up above the thyroid cartilage
• grooves & furrows (fresh-inconspicuous & yellow after sometimes-dark brown & parchment like).
• oblique directed backwards & upwards
• Incompletely encircle the neck **
• Width of ligature either equal or less than width of ligature material
Inverted V-shaped at neck
Appearance of ligature depends upon:

1. Composition of ligature material:
2. Period of suspension
3. Degree of suspension
4. Weight of the body
5. Tightness of ligature
6. Single or multiple turn
7. Intervening material
8. Slipping of ligature material
9. Design of ligature material
Hanging by a broad ligature (Dupatta)
INTERNAL FINDINGS

First to dissect head then thorax**.

Y-shaped incision is preferred **.
General internal findings

Lungs - congested, distended, emphysematous with plenty of tardieu spots subpleurally
Brain – congested, multiple tardieu spots
Heart- right full left empty.
Viscera- all abdominal organs congested
Blood- fluid & purplish.
b. Local internal findings.

Layer by layer dissection of skin

Subcutaneous tissue under ligature mark (in prolonged hanging)—**dry, white & glistening**
Platysma & SCM ms. Ruptured only when sufficient violence has been used.

In some case cornua of thyroid cartilage is fractured (old)

Epiglottis is congested, mucous membrane of trachea congested
Medicolegal aspects

1. Suicidal hanging:
Hanging is considered to be suicidal unless the circumstancial & other evidences are strong enough to rebut the presumption.

2. Accidental hanging:
Common can occur accidentally while at work, or playing, showing some performance in circus. Etc. Auto-erotic hanging is an eg. Of accidental hanging.
Auto-erotic hanging

Asphyxiaphilia
Hypoxiphilia
Kotzwarism
Masochistic hanging
Sexual asphyxia
• Erotic fantasies deliberately induced by cerebral ischaemia—Common in adolescent males
• Masochism
• Transvestism
• Voyerism

• MLI- if misdiagnosed as suicide
3. Homicidal hanging

Rare only seen in children, old or person incapacitated with drugs or alcohol.

Lynching
Judicial hanging.
Lynching

• m/c in North America—where a black used to be lynched by white angry mob.
• Word’ lynch’ –
• Extrajudicial execution
• To put person to death by mob action for an alleged offence without a legal trial.
Judicial hanging

• Justifiable homicide
• Atypical hanging (Knot is submental or sub aural.
• complete hanging & drop at least 2m .
• Fracture of cervical column(m/c C2 -C3 fracture & some C3-C4 very rarely C1-C2)
• Compresses or lacerates the spinal cord – instantaneous death.
• Congestive changes absent in autopsy
• pharynx is injured, intima of carotid arteries show transverse tears and separation of pons & medulla
Atlas (the first cervical vertebra)

Axis (the second cervical vertebra)

Spinous Process

Transverse process

Vertebral body

C1

C2

C3

C4

C5

C6

C7

T1
<table>
<thead>
<tr>
<th>Features</th>
<th>A/M Hanging</th>
<th>P/M Hanging</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Salivary dribbling marks</td>
<td>+ve</td>
<td>-ve</td>
</tr>
<tr>
<td>2. Fecal &amp; urinary stains</td>
<td>+/-</td>
<td>-ve</td>
</tr>
<tr>
<td>3. Ligature marks</td>
<td>Oblique</td>
<td>Horizontal</td>
</tr>
<tr>
<td>Direction</td>
<td>Non-continous</td>
<td>Continuous</td>
</tr>
<tr>
<td>Continuity</td>
<td>Above thyroid</td>
<td>At or below thyroid</td>
</tr>
<tr>
<td>Level in neck</td>
<td>+nt</td>
<td>-ve</td>
</tr>
<tr>
<td>Parchmentization</td>
<td>+nt</td>
<td>-ve</td>
</tr>
<tr>
<td>Vital reactions</td>
<td>Single/simple, on one side of neck</td>
<td>Multiple/on occiput or chin</td>
</tr>
<tr>
<td>4. Knot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. p/m staining</td>
<td>+nt</td>
<td>-ve</td>
</tr>
<tr>
<td>Above ligature mark</td>
<td>+nt</td>
<td></td>
</tr>
<tr>
<td>Glove &amp; stocking like</td>
<td>-nt</td>
<td>+ve</td>
</tr>
<tr>
<td>6. Evidence of injury</td>
<td>-ve</td>
<td></td>
</tr>
<tr>
<td>Self-inflicted</td>
<td>-ve</td>
<td></td>
</tr>
<tr>
<td>Struggle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Elongation of neck</td>
<td>+nt</td>
<td>-ve</td>
</tr>
<tr>
<td>8. Cyanosis</td>
<td>-nt</td>
<td>+ve</td>
</tr>
<tr>
<td>9. Emphysematous bullae on lungs</td>
<td>+nt</td>
<td>-nt</td>
</tr>
<tr>
<td>Deeply +ve</td>
<td>-nt</td>
<td>-nt/faintly +nt</td>
</tr>
<tr>
<td>10. Point of suspension</td>
<td>Compatible with self</td>
<td>Not so</td>
</tr>
<tr>
<td>suspension.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
STRANGULATION
Voilent asphyxial death caused by constriction of air passage at the neck by means of a ligature or by any means other than suspension of the body.
Types

1. Ligature strangulation
2. Throttling/manual strangulation / palmar strangulation
3. Mugging
4. Bansdola
5. Garroting
6. Accidental strangulation.
LIGATURE STRANGULATION.

Violent form of asphyxial death which results from constricting the neck by means of ligature without suspending the body.
THROTTLING /MANUAL STR./PALMAR STR.

Constriction produced by pressure by the fingers & palm upon the throat.

* Hyoid bone # commonly seen (old age) (inward compression #)
BANSDOULA

Practiced in N-India

Strong bamboos or lathi placed across the throat end another across the back of the neck.
GAROTTING

In 1862 in India, m/c used by ‘thugs’.

A method used for judicial execution in Spain, Portugal, Turkey.
Garotte machine- works on technique of spanish windlash,
Spanish Windlass.
MUGGING

Holding neck of victim in the bend of elbow or knee of the assailant.

Also known as choke hold or arms lock
ACCIDENTAL STRANGULATION

- Entanglement of scarf, neck-tie in any running machinery
- Strangulation by umbilical cord
- Children while playing
Symptoms

Complete occlusion of windpipe

Powerless to call for assistance, becomes insensible & may die instantly.

Windpipe not completely closed

Face cyanosed, bleeding from mouth, nostrils & ears, hands clenched, convulsions precedes death
Cause of death

1. Asphyxia
2. Venous congestion
3. Combined asphyxia & venous congestion
4. Cerebral anemia
5. Reflex Vagal inhibition- m/c
Local external findings: (constriction of neck by ligature)

1. low down below thyroid cartilage
2. horizontal**, completely encircle the neck
3. marks may be multiple & also more than 1 firm knot
**mark oblique-
when victim dragged by cord after he is strangled in a recumbent posture
Lig. Applied from behind (garroting)
4. Base of mark - grooved/furrowed, soft & reddish
5. Margins ecchymosed
6. Adjacent to skin - abrasions & ecchymosis
7. Minutes fibres & other material from ligature can be present deeply embedded in the ligature mark**

**lifted with transparent adhesive tapes.
Throttling

Marks found on either side of windpipe.

**Thumb mark** - usually high & wider on one side

**Finger marks** - situated on opp. Side
  obliquely downwards & outwards
  one below the other
  disc shaped bruises 1-2cm in dia.

k/a **six penny bruises** (initially red, later on dark, dry & parchmentised)
Finger nail marks- linear / crescentric

When both hands used – all fingers on one side & thumb marks on otherside.
Abrasion & bruises on the mouth, nose, cheeks, forehead, lower jaw or any other body part --- sign of struggle
c. Bansdola:

Bruises in middle of front of neck across the windpipe.

Width of bruise corresponds to the width of subs.

Used.

Similar marks on nape of neck – if 2 sticks are used.
General external findings

1. Face puffy & cyanosed with petechiae
2. Eyes, prominent, bulging, conjuntiva suffused, & petechiae present.
3. Pupils dilated
4. Lips cyanosed
5. Bloody froth from mouth & nostrils
6. Frank blood from mouth, nose, ears---indicating great violence.
7. Tongue – swollen, bruised, protuding, occasionally bitten by teeth.

8. Hands usually clenched


10. p/m lividity – on dependent parts
    rigor mortis - sets in early.
Internal appearance:

Extravasation of blood into s.c tissues under ligature mark or finger marks & adjacent muscles of neck.
Sometimes laceration of the sheath of carotid arteries & internal coats with effusion of blood
• Fracture of greater cornua of hyoid bone & also superior cornua of thyroid (rare)---common in old age & in throttling.
4. Larynx & trachea congested, contains frothy mucus

5. Cartilage of larynx & trachea rings may be # when great force used.
6. Lungs:

congested, haemorrhagic patches +nt petechiae +nt on section- dark fluid blood emphysematous bullae on surface (d/t over distension & rupture of inter-alveolar spaces)
7. Heart: Rt. Full  Lf.- empty
8. Organs-congested
9. Brain- congested with petechial haemorrhages
Medicolegal importance

1. Always homicidal unless & until proved

* signs of struggle both at the scene & on victims body

* evidence of sexual assault +nt
2. Suicidal – rare

i. lig. around neck once or twice or > & finally tying of free ends

ii. Spanish windlash technique - single turn ligature around neck, small piece of rod/stick passed through ligature & twisted as lever.

iii. Running noose free end wounded around the rt.
   Hand or weight is put or thrown over bed end

Self strangulation by hands not possible.
3. Accidental:

- Entanglement of scarf, neck-tie in any running machinery
- Strangulation by umbilical cord
- Children while playing
4. Pseudo-strangulations -

Seen in fat obese person or children – where neck fold are present. & due to pm lividity, it appears like ligature mark.

Also seen in person wearing tight collar etc.

Diagnosed - by dissection
p/m lividity in fat obese person after putrefaction sets in.
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<thead>
<tr>
<th>Feature</th>
<th>Hanging</th>
<th>strangulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cause</td>
<td>Suicidal</td>
<td>Homicidal</td>
</tr>
<tr>
<td>2. Face</td>
<td>Pale, petechiae rare</td>
<td>Congested, livid, petechiae + -nt</td>
</tr>
<tr>
<td>3. Saliva</td>
<td>Saliva dribbling marks +nt on angle of mouth, chin &amp; chest</td>
<td></td>
</tr>
<tr>
<td>4. Bleeding</td>
<td>Nose, mouth &amp; ears –rare</td>
<td>+nt</td>
</tr>
<tr>
<td>5. ext. signs of asphyxia</td>
<td>Less marked</td>
<td>More marked</td>
</tr>
<tr>
<td>6. neck- i. length</td>
<td>Elongated &amp; stretched</td>
<td></td>
</tr>
<tr>
<td>ii. ligature mark</td>
<td><strong>Oblique, non-continous, high</strong> up in the neck, Base-hard, yellow &amp;</td>
<td>**Horizontal, continous, low down, base of groove soft &amp; reddish, abrasion &amp; ecchy.</td>
</tr>
<tr>
<td>iii. S.c</td>
<td>parchment like, Abrasion &amp; ecchymosis around lig. Mark rare</td>
<td>around lig mark +</td>
</tr>
<tr>
<td>iv. Neck ms.</td>
<td>White, hard, &amp; glistening.</td>
<td><strong>Ecchymosed, torned</strong></td>
</tr>
<tr>
<td>7. Carotid a. rupture, # of larynx &amp; trachea &amp; # dislocation of cervical vertebrae.</td>
<td></td>
<td>Injury common</td>
</tr>
<tr>
<td>8. Signs of struggle</td>
<td>Not seen</td>
<td>Commonly seen</td>
</tr>
<tr>
<td>9. Emphysematous bullae</td>
<td>-nt</td>
<td># of hyoid</td>
</tr>
<tr>
<td>10. Signs of sexual assault</td>
<td>-nt</td>
<td>+nt usually</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+nt</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sometimes +nt</td>
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</tbody>
</table>