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# **MECHANICAL Asphyxia-**

**(Part1: General features of asphyxia, 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

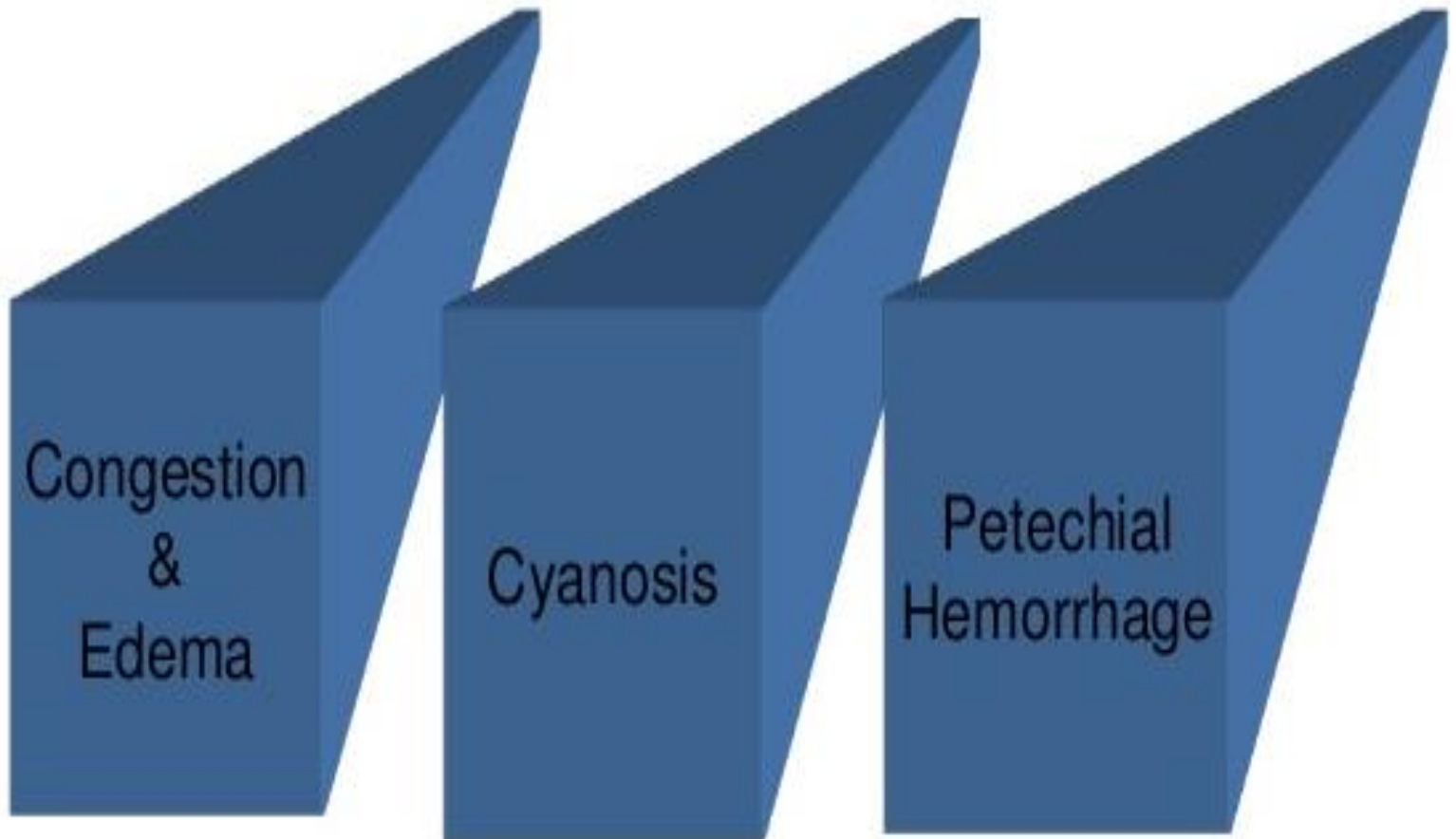
## **Stagnant anoxia**

Circulation impaired - lack of oxygenated blood transported to the tissues

## **Histotoxic anoxia**

Oxygen freely available but cannot be utilized by tissues egs: cyanide poisoning,  $\text{CO}_2$  poisoning etc

# Asphyxial Triad



# Other Asphyxial Signs

1. Pulmonary odema
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

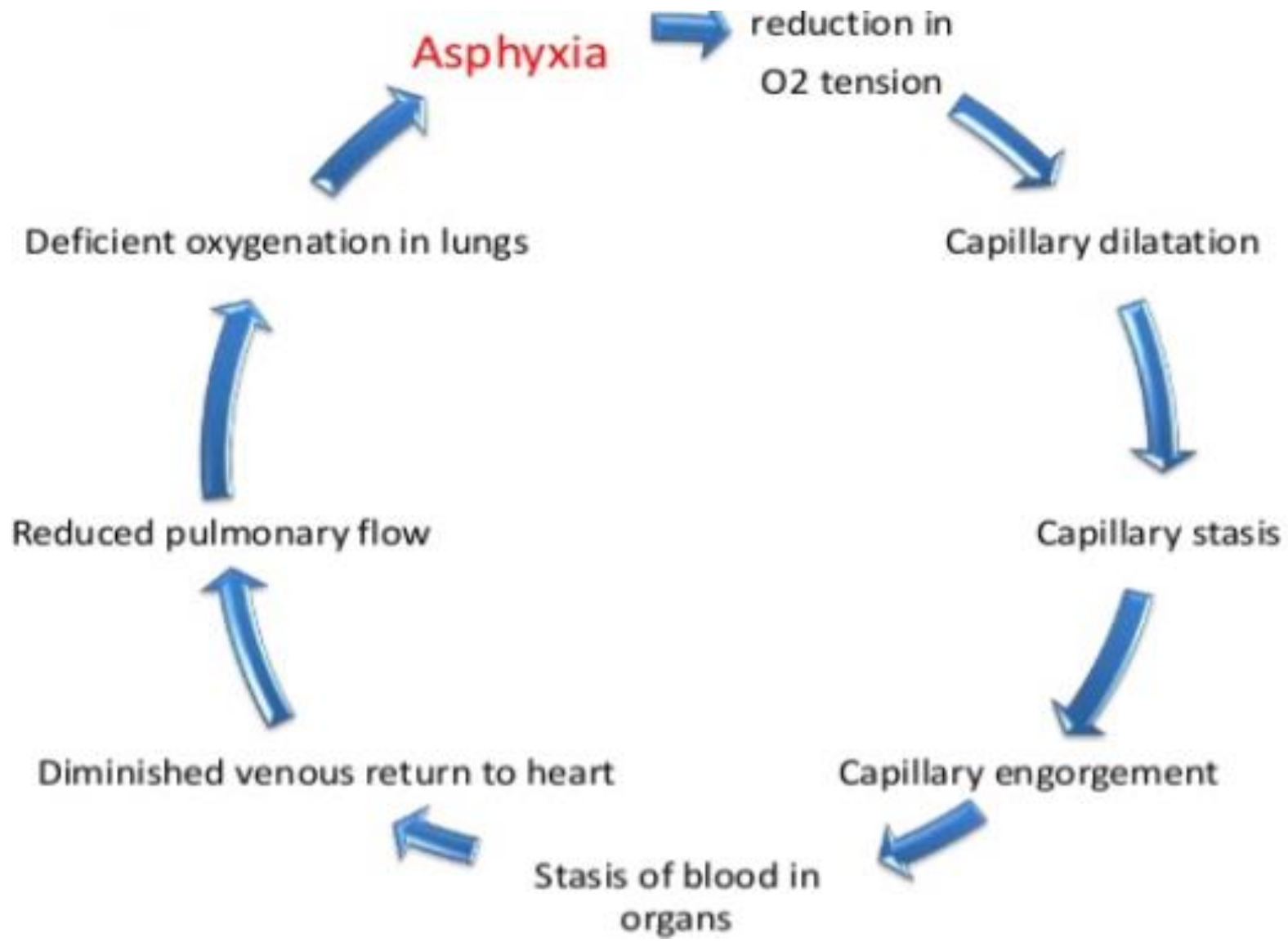
lips,

tip of nose ,

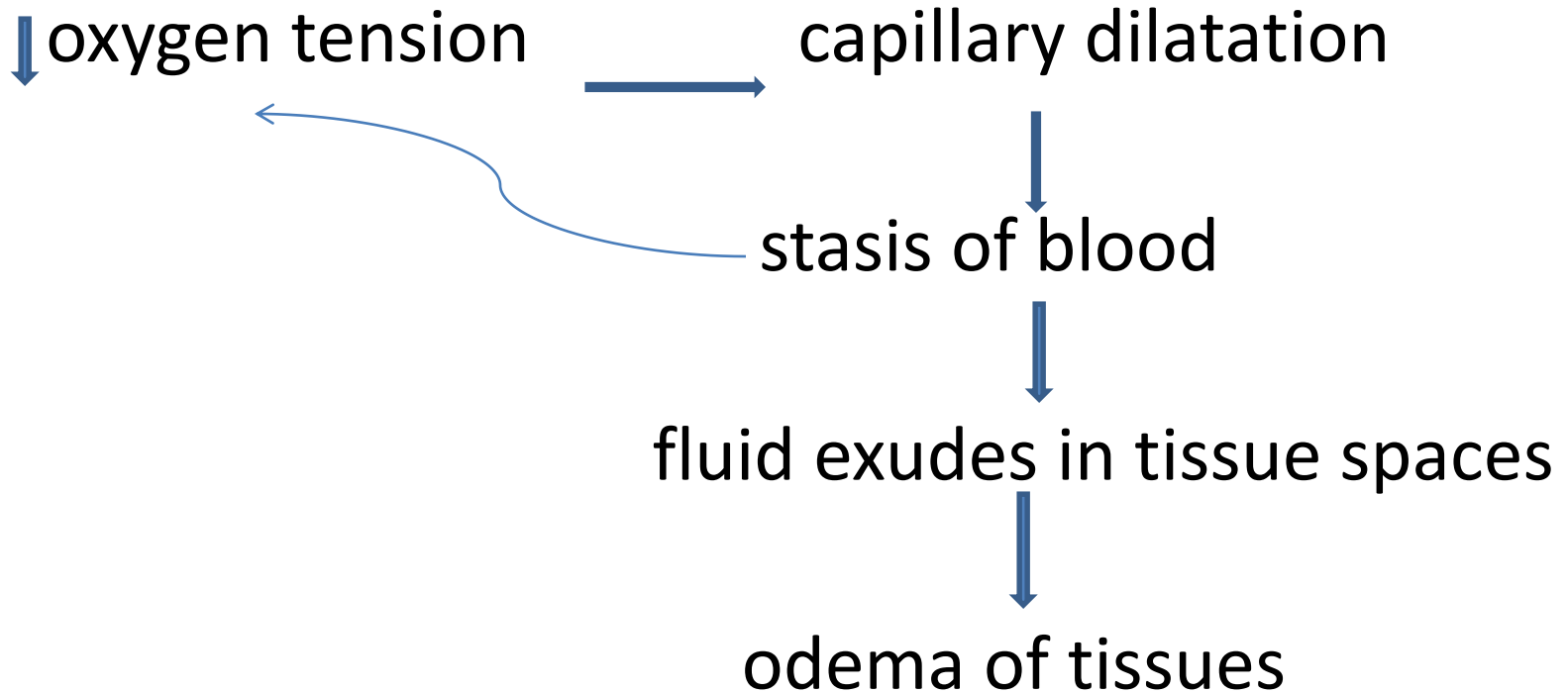
nail-beds,

ear lobes,

tip of tongue etc.



## 2. Increased capillary permeability (congestion)



### 3. Engorgement of right side of heart & fluidity of blood.

Non-specific phenomena

Due to generalized rise in venous pressure.

# Petechial haemorrhages

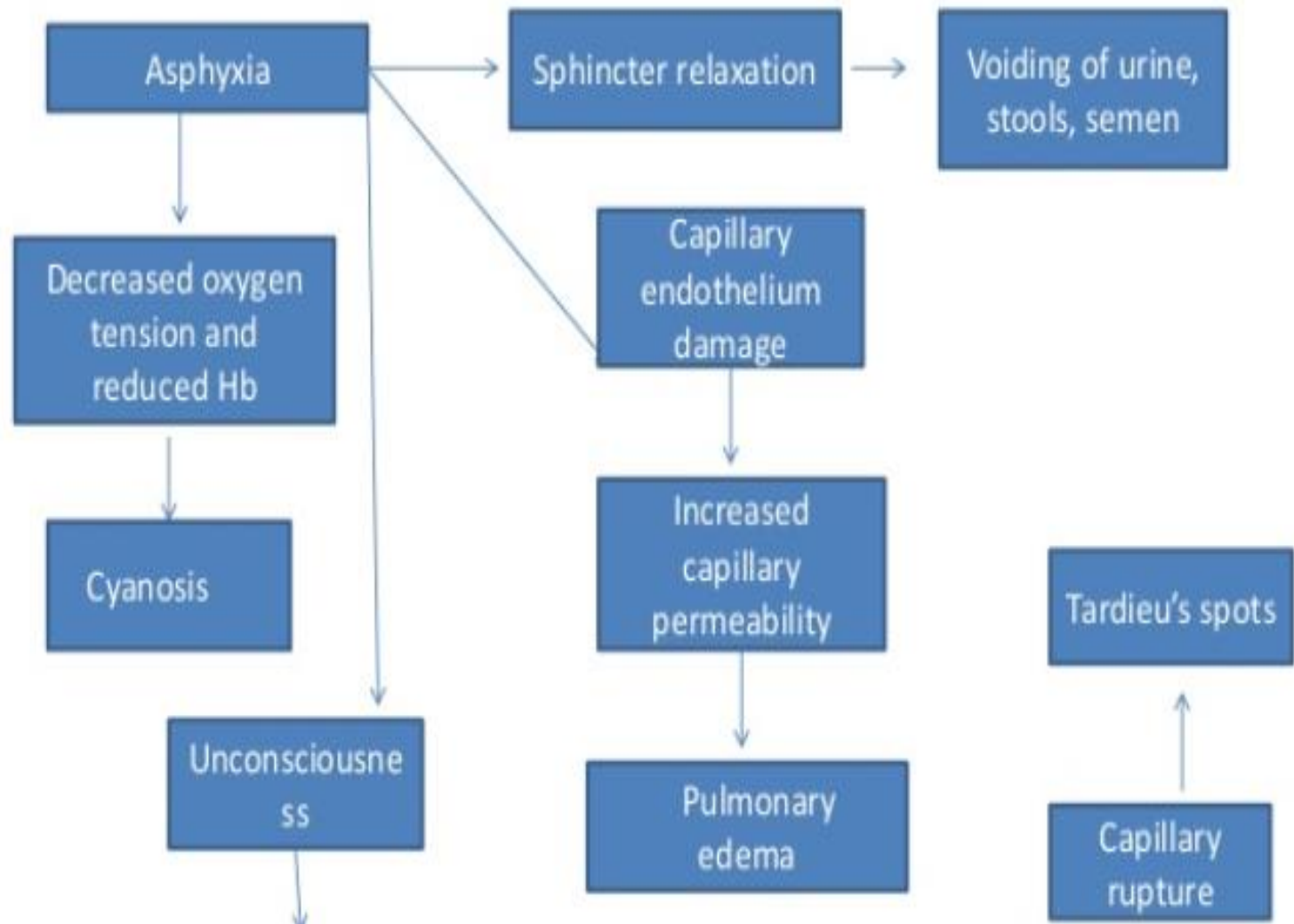


- Tardieu's spots
- Bayard's ecchymosis
- Small pin-head size collections of blood

- 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



# 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.

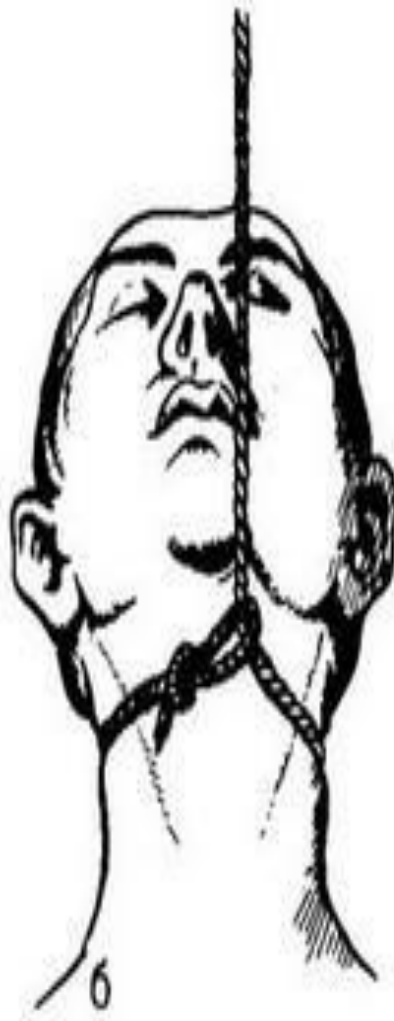
## Atypical hanging

point of suspension is at any other position .

Commonest location is ---mastoid process or angle of mandible or under chin



A



B



C

# 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.

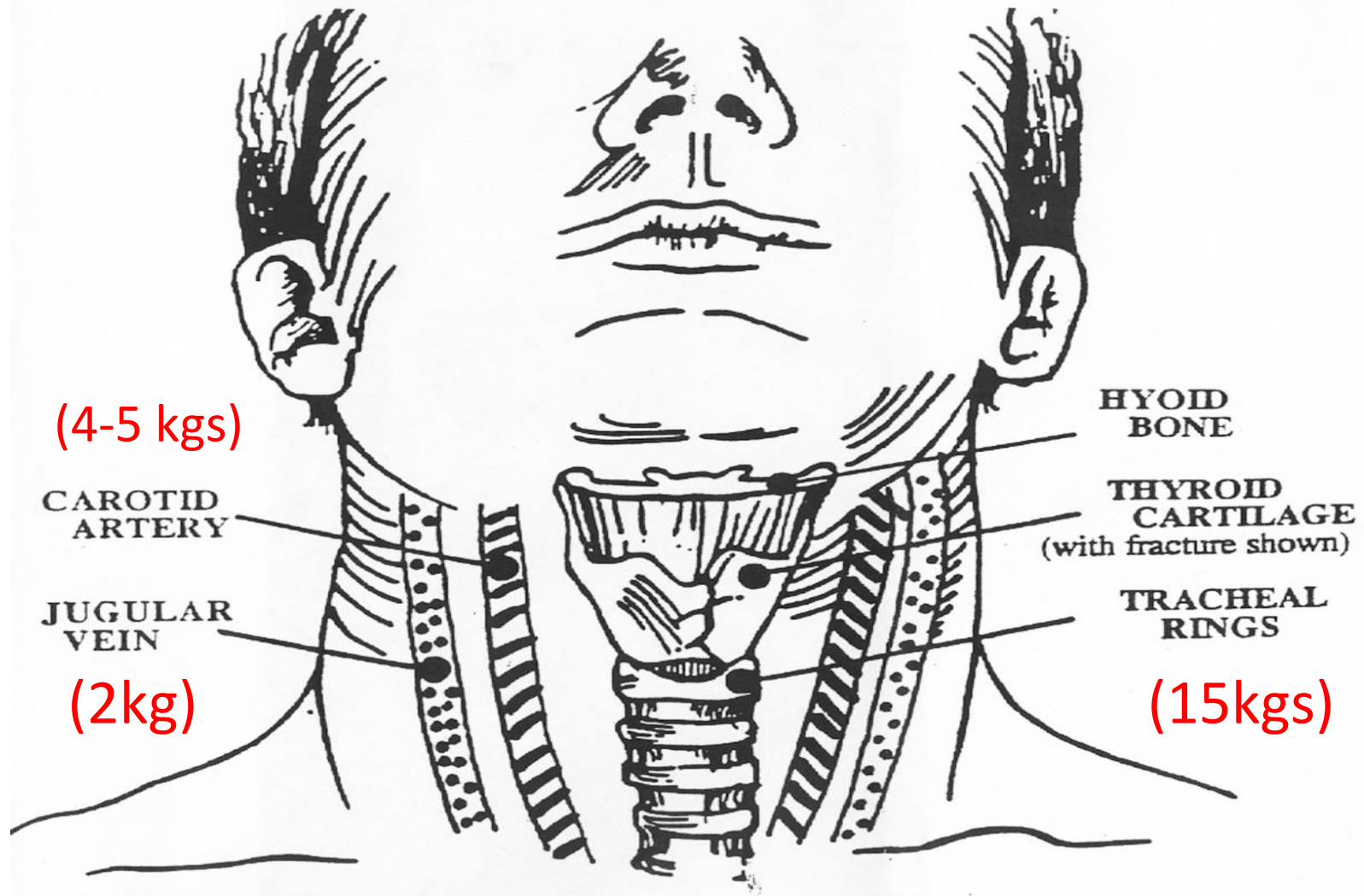
i.e hanging in lying ,  
sitting or kneeling  
position.

Constricting force =  
Weight of head

# Complete Hanging



# Force required for compression



Vertebral arteries=30kgs

# 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.
- unconsciousness & 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.

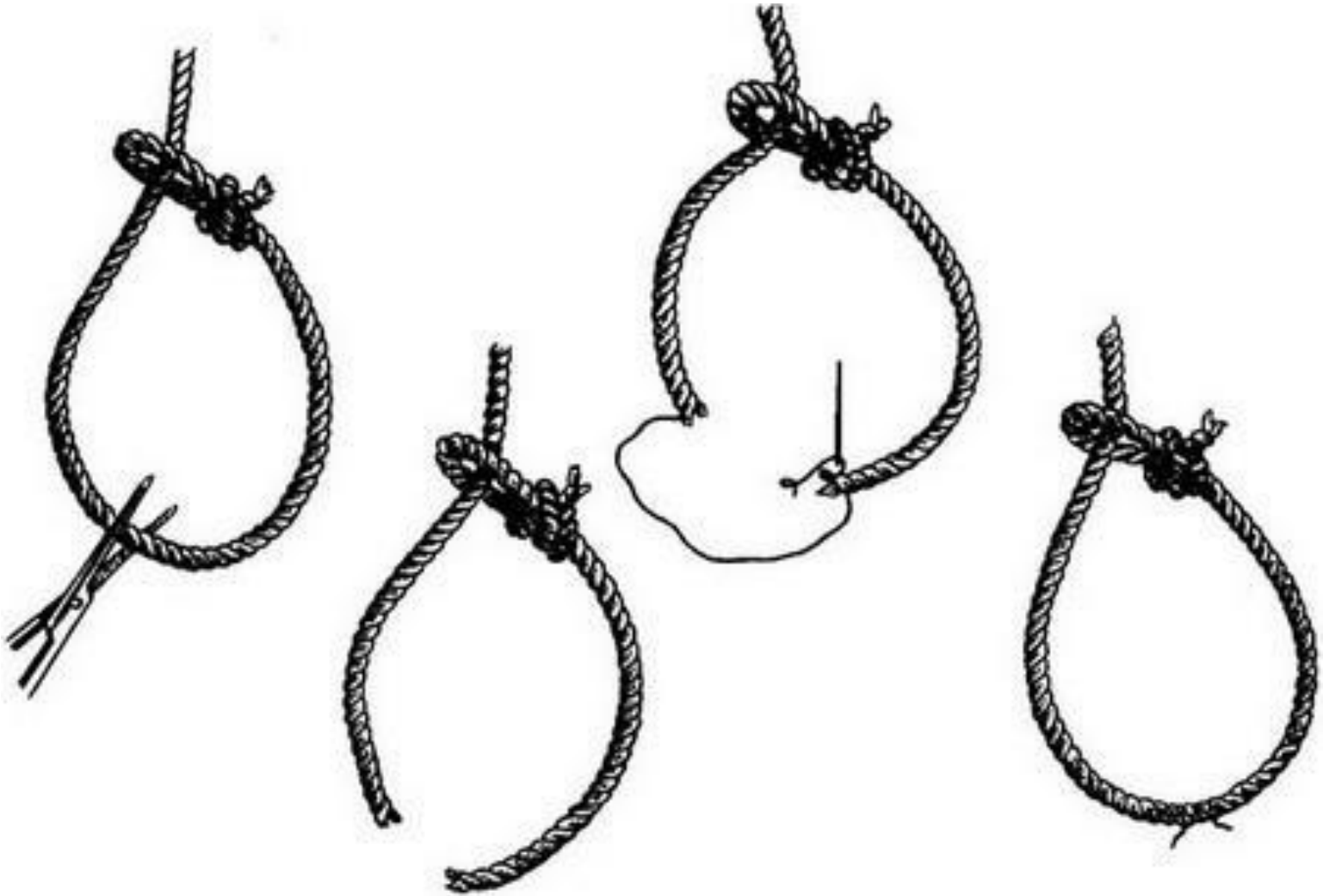
## Imp. point

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



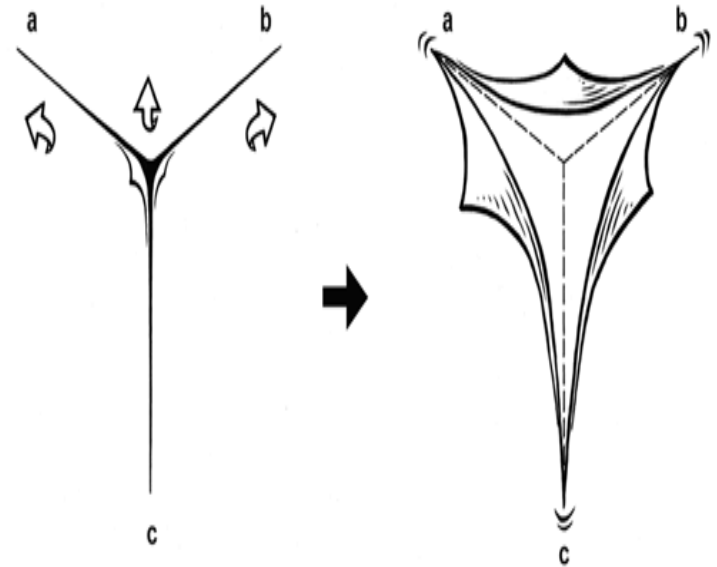
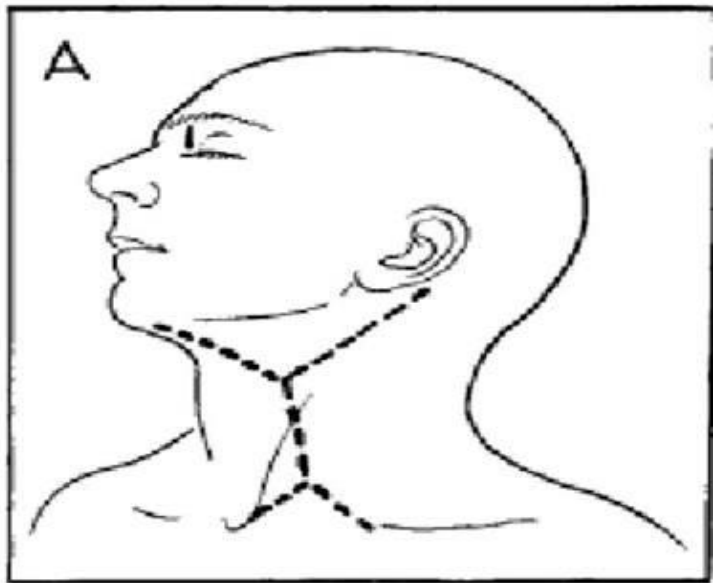
# Hanging by a broad ligature (Dupatta)



# 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 circumstantial & other evidences are strong enough to rebutt 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

Asphyxiophilia

Hypoxiphilia

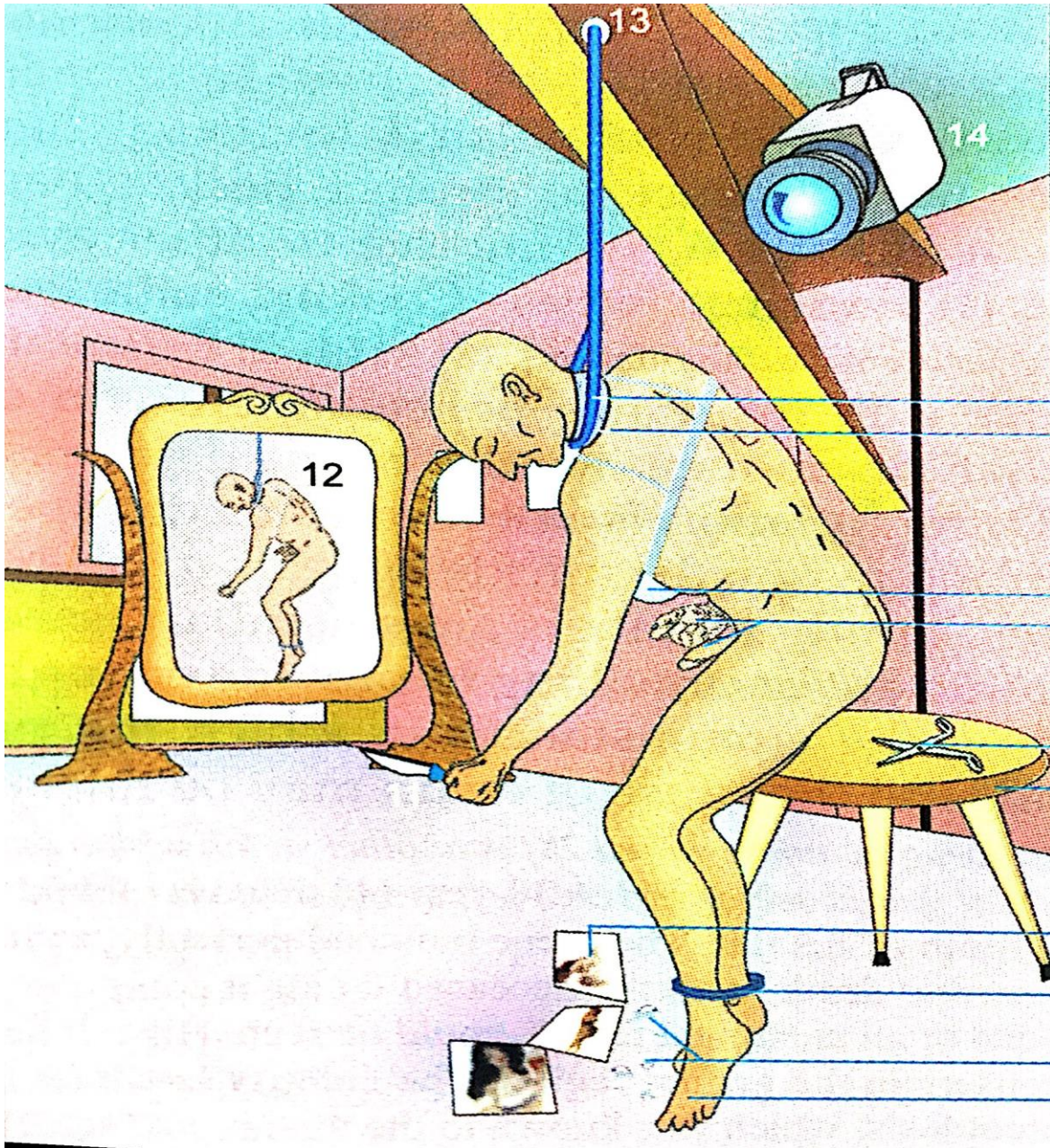
Kotzwarism

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.

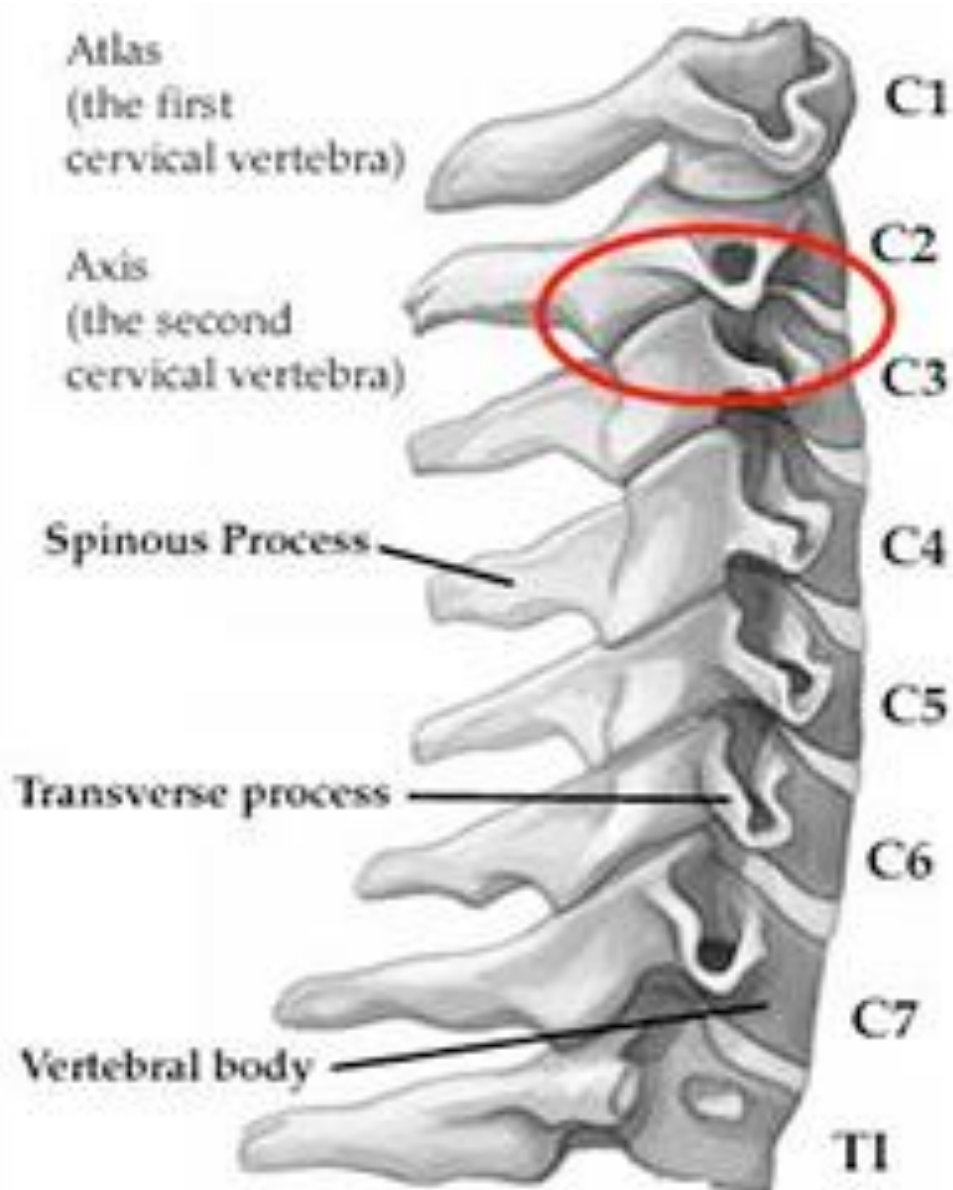
# Lynching

- 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 subaural).
- 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





Features	A/M hanging	P/M hanging
1. Salivary dribbling marks	+ve	-ve
2. Fecal & urinary stains	+/-	-ve
3. Ligature marks		
• Direction	Oblique	Horizontal
• Continuity	Non-continous	Continous
• Level in neck	Above thyroid	At or below thyroid
• Parchmentization	+nt	-ve
• Vital reactions	+nt	-ve
4. Knot	Single/simple ,on one side of neck	Multiple/on occiput or chin
5. p/m staining		
• Above ligature mark	+nt	-ve
• Glove & stocking like	+nt	-ve
6.Evidence of injury-		
• Self-inflicted	+nt	-ve
• Struggle	-nt	+ve
7. Elongation of neck	+nt	-nt
8. Cyanosis	Deeply +ve	-nt/faintly +nt
9. Emphysematous bullae on lungs	-nt	+nt
10. Point of suspension	Compatible with self suspension.	Not so



# **STRANGULATION**

# Defination.....

**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 #)



# BANSDOLA

Practiced in N-India

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

# GAROTTING

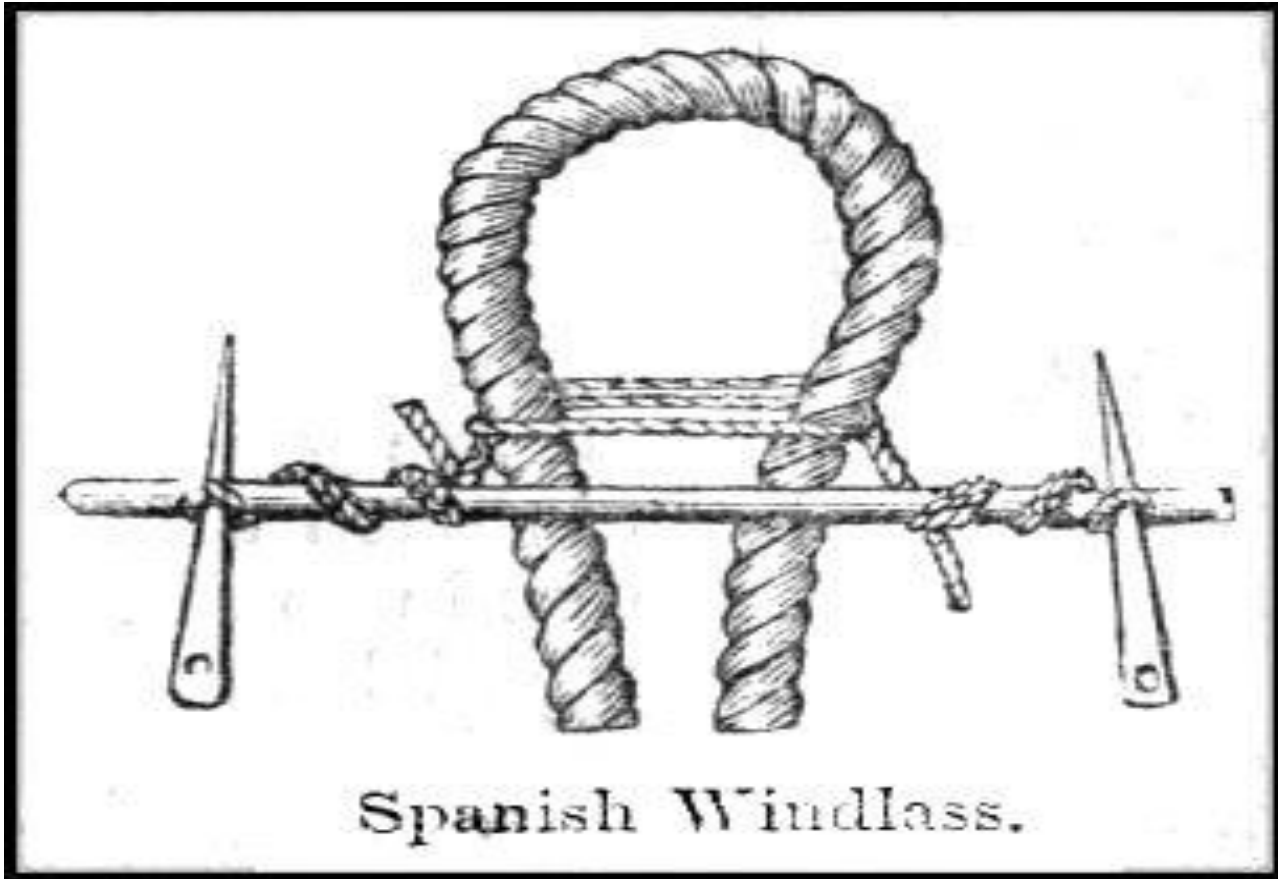
In 1862 in India , m/c used by 'thugs'.

A method used for judicial execution in Spain ,  
Portugal, turkey.

Garotte machine- works on technique  
of spanish windlash,





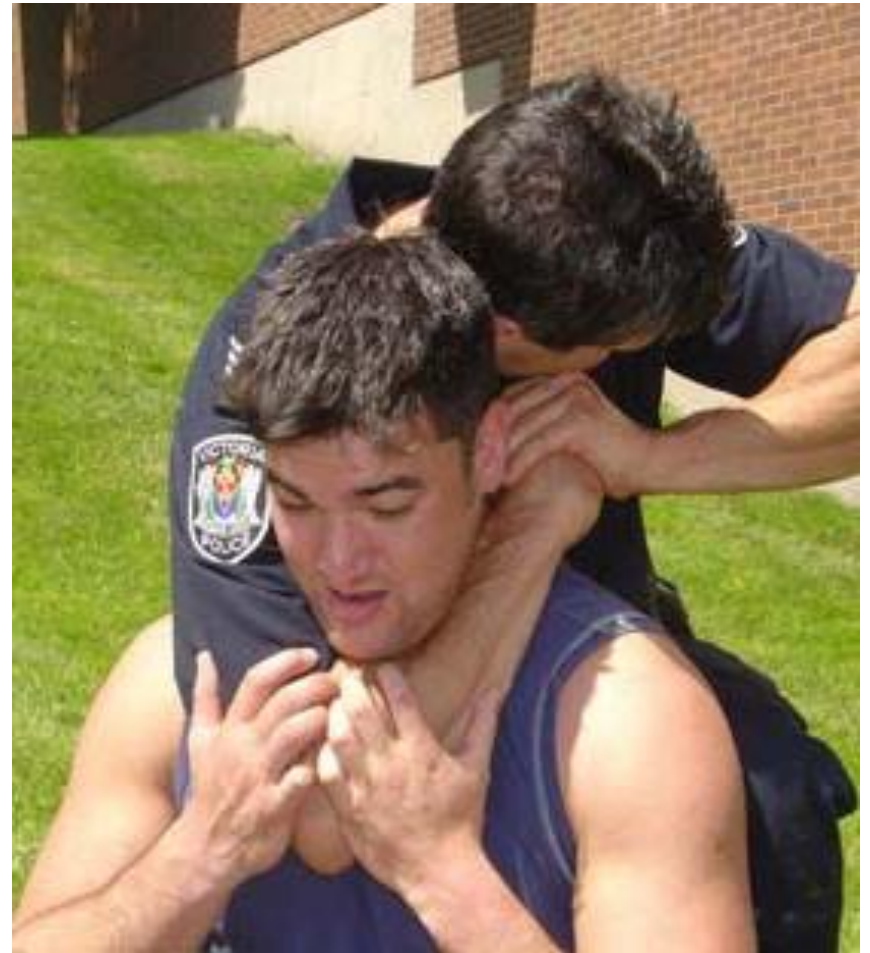


Spanish Windlass.

# 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**
6. Fracture/dislocation of cervical vertebrae-  
very rare.

# 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 & parchmented)



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 :

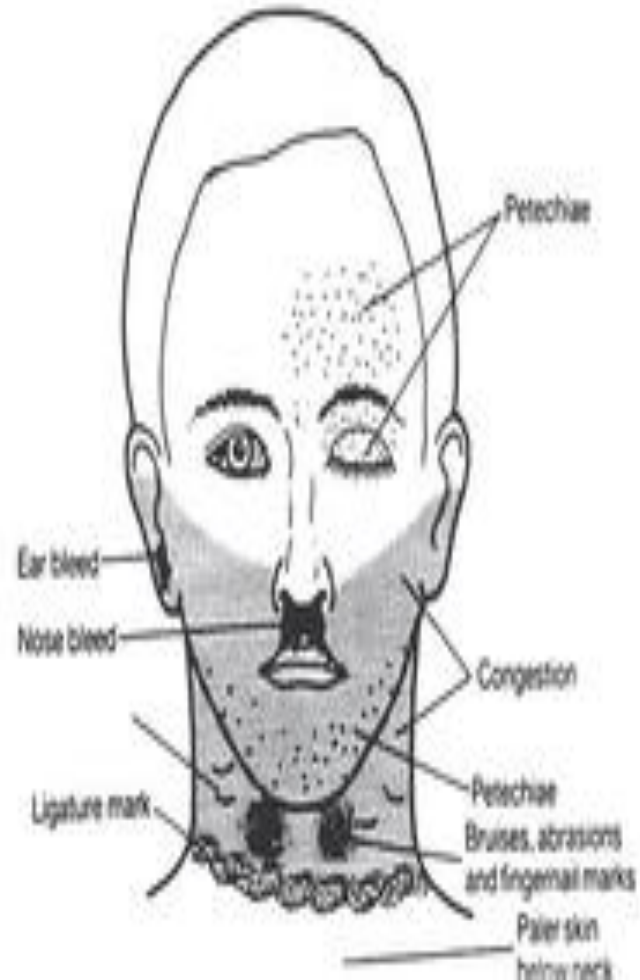
Bruises in middle of front of neck across the windpipe

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, conjunctiva 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, protruding, occasionally bitten  
by teeth.
8. Hands usually clenched
9. Genital organs congested, discharge of urine ,  
feces & seminal fluid.
10. p/m lividity – on dependent parts  
rigor mortis- sets in early.

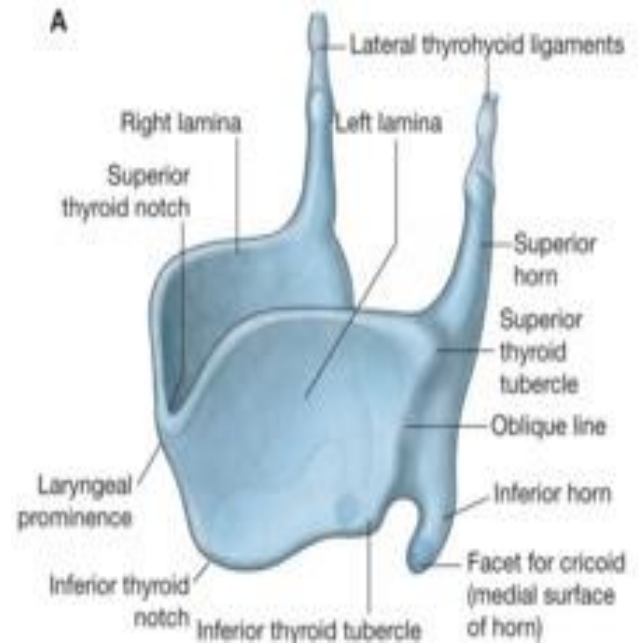
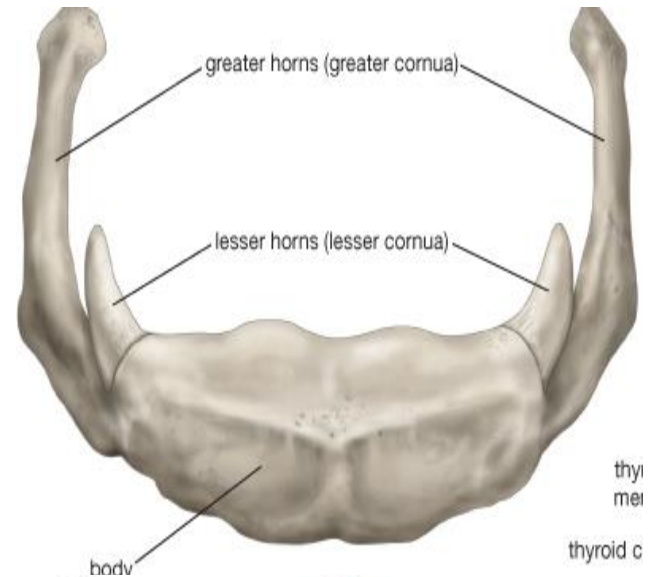
## Internal appearance:

**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 winded 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.

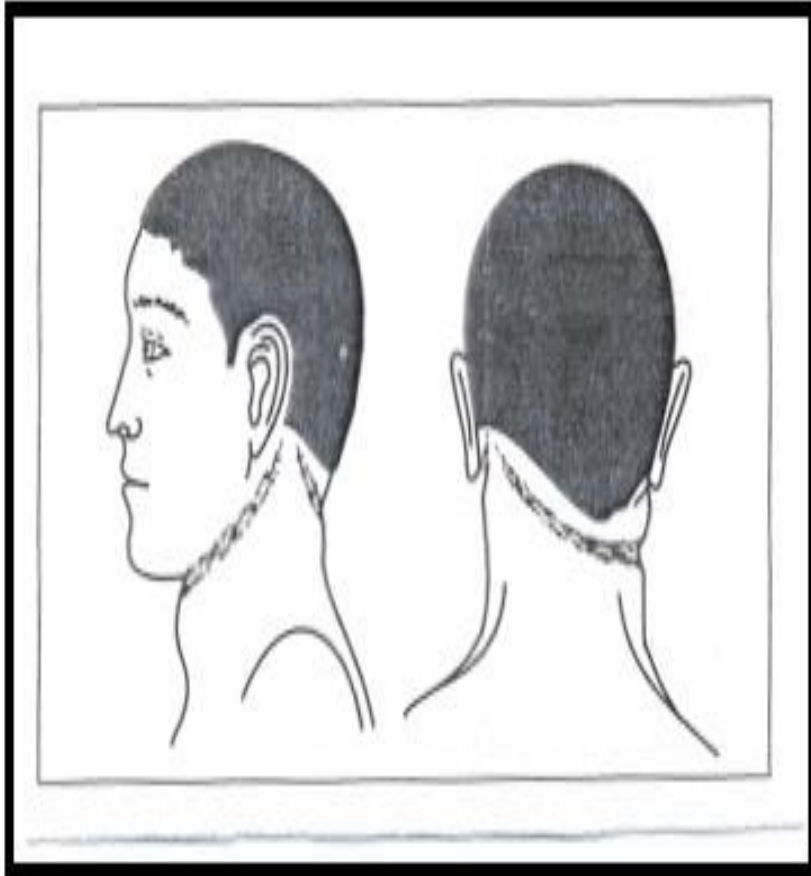
Dignosed- by dissection



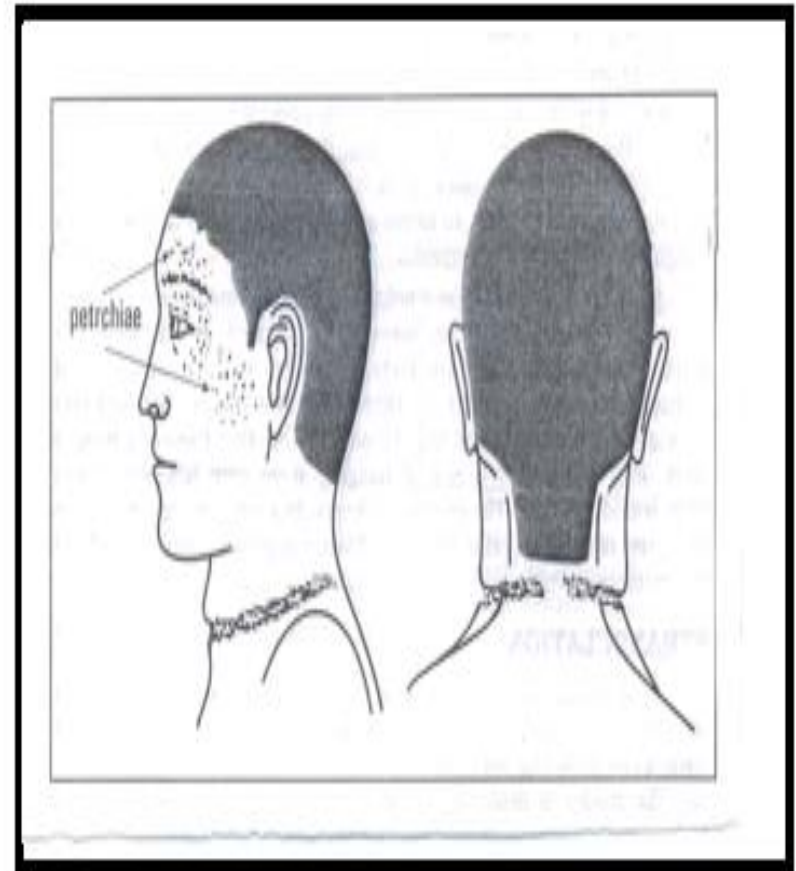
p/m lividity in fat obese person after putrefaction sets in.



## Hanging



## Strangulation



Feature	Hanging	strangulation
1.Cause	Suicidal	Homicidal
2.Face	Pale, petechiae rare	Congested,livid ,petechiae +
3.Saliva	Saliva dribbling marks +nt on angle of mouth , chin & chest	-nt
4.Bleeding	Nose ,mouth & ears –rare	+nt
5.ext. signs of asphyxia	Less marked	More marked
6.neck- i. length ii.ligature mark	Elongated & stretched <b>Oblique, non-continous,high</b> up in the neck,Base-hard,yellow & parchment like,Abrasion& ecchymosis around lig. Mark rare	Not so <b>Horizontal,continous,low</b> down, base of groove soft & reddish,abrasion & ecchy. around lig mark +
iii. S.c iv. Neck ms.	<b>White , hard, &amp; glistening.</b> Injury rare	<b>Ecchymosed ,torned</b> Injury common
7. Carotid a. rupture, # of larynx & trachea & # dislocation of cervical vetebrae.	Rare (only in judicial hanging) <b># of thyroid</b>	Commonly seen <b># of hyoid</b>
8. Signs of struggle.	Not seen	+nt usually
9. Emphysematous bullae	-nt	+nt
10. Signs of sexual assault.	-nt	Sometimes +nt