Asphyxia -I

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Objectives

- At the end of the lecture the students should be able to,
  - Understand / define the term asphyxia
  - Understand the conditions resulting in asphyxial death in forensic context.
  - Know the significance of so called "classic signs" of asphyxia
  - Know the factors necessary for autopsy diagnosis of asphyxia.
  - Understand the autopsy findings, circumstances and mechanisms of deaths in various types of mechanical asphyxias. (environmental hypoxia and upper airway obstruction)

What is asphyxia?

- Failure of cells to receive or utilize oxygen.

- Anything that interferes with oxygen transfer can be called asphyxial, hypoxial/anoxial agent.

Examples of conditions interfering with oxygen transfer

1. **Reduced oxygen tension in the respirable atmosphere (Environmental hypoxia)**
   - Replacement of oxygen by inert gases
   - Reduced barometric pressure
2. **Upper airway obstruction**

   Smothering

   Gagging

   Overlaying

   Plastic bag suffocation

   Choking

Examples of conditions interfering with oxygen transfer

3. pressure on the neck

- Hanging
- Strangulation (Manual/ligature)

4. positional asphyxia

- Crush asphyxia
- Postural asphyxia
- Restraint asphyxia

Examples of conditions interfering with oxygen transfer

5. **Disease of the lung that reduce gaseous exchange**
   - Pneumonia
   - ARDS
   - Fibrosis
6. **Reduction in cardiac function (Stagnent anoxia)**
7. **Reduced ability of blood to transport oxygen**
   - Carbon monoxide intoxication
   - Severe anaemia
8. **Inability of the peripheral tissue cells to utilize the oxygen**
   - Cyanide intoxication

Asphyxia in forensic practice

In common forensic usage **asphyxia** denotes **mechanical asphyxia.**

Therefore, the conditions listed above under number 5-8 are not included

Asphyxia in forensic practice

- Asphyxia is not a cause of death but a mechanism of death.

- **No specific gross or microscopic changes to determine asphyxia**
  - Best is to determine the cause of asphyxiation from direct evidence

So called 'classic signs' of asphyxia

- The co called 'classic signs' of asphyxia;
  - cyanosis,
  - fluidity of blood,
  - visceral congestion
  - petechiae

now considered nonspecific and unreliable.

Petechial haemorrhages

- They are 1-2mm
- In areas of little surrounding soft tissue support

(conjunctiva, sclera eyelids, lining of the mouth ect)

- It was believed that petechiae result from tissue effects of hypoxia.
- It is now known – They are due to rupture of small blood vessels (Increase JVP)

SIGNIFICANCE OF PETECHIAE

- Useful in cases of evidence of compression of the neck or chest
- Does not automatically indicate asphyxia.
- Seen in any condition leading to increased JVP
- Thus, also seen in valsalva manouvres

Problems associated with interpretation of petechial haemorrhages

- One of the most frequent causes of ocular petechiae is sudden cardiac death from ischaemic heart disease.

- Also present in normal post-mortem hypostasis due to postmortem leaking.

Problems associated with interpretation of petechial haemorrhages

- Can appear and enlarge as a postmortem phenomenon (Prinsloo and Gordon artifact)

- All punctuate lesions are not petechiae.
  - (Eg: pigment foci, intravascular venous pools and microbullae in pleura)

Petechial haemorrhages

Congestion and oedema:

- Even more nonspecific
- Result of obstructed venous return.
- Often associated with tissue swelling
- Thus can often associated with trauma
- Tissue oedema from -continuation to the venous obstruction

Congestion and oedema

PROBLEMS ASSOCIATED WITH

- Pulmonary oedema - seen in some but not all the hypoxic deaths.

- Conversely, other conditions lead to marked pulmonary edema.
  - pneumonia
  - Drug overdoses

Cyanosis

- Cyanosis is excess de-oxygenated haemoglobin in the venous blood
- Nonspecific sign again
- Follows congestion
- Seen in non asphyxial deaths and may not be seen in real asphyxia deaths.

Engorgement of the right heart and fluidity of blood

- It is nonspecific and is a myth

- Postmortem clotting of the blood and dissolution has no relationship to hypoxia.

Autopsy diagnosis of asphyxia

- No specific signs to diagnose asphyxia
- Postmortem blood gases for asphyxia- erroneous
- Do a careful assessment of the history and the circumstances of death

Autopsy diagnosis of asphyxia

- Meticulous autopsy and look for cause for airway obstruction.
- Exclude other causes of death.
- Together with physical or firm circumstantial evidence of mechanical obstruction, the nonspecific ‘classic signs’ may play a role

Reduced oxygen tension in the respirable atmosphere (Environmental hypoxia/suffocation)

- Oxygen desaturation of the respirable atmosphere
- Closed space confinement - in wells.
- Fires in confine spaces:
  - Here inhalation of toxic gases (Cn/Co)causes death more quickly than hypoxia.

Replacement of oxygen with inert gases

- Re breathing within a plastic bag closed overhead.
- Replacement of oxygen with inert gases

Environmental hypoxia ctd..

- Manner - accident, suicide or homicide.
- No ‘classic signs’ of asphyxia
- No specific post mortem findings
- Diagnosis is made by:
  - assessment of scene
  - history
  - excluding other pathology and trauma.
- Blood analysis to exclude intoxication of carbon monoxide or other toxic gases.

Upper airway obstruction (smothering)

- Mechanical occlusion of the mouth and nose.
- Smothering agent:
  - Fabric
  - Hand
  - Impervious sheet (plastic bag
  - Mobile solid (mud, sand, coal, grain, flour) in industrial accic

SMOTHERING

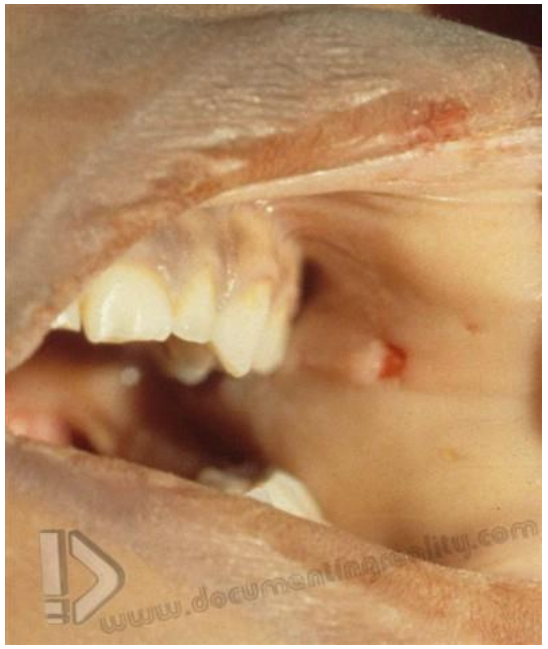
- May occlude the facial orifices by:
  - agent pressing down or
  - by passive weight of the head pressing down it.
- Victims of homicide by smothering:
  - Elderly, debilitated and infants
- Accidents can occur among
  - Drunken
  - Drugged
  - Comatose and epileptics etc.
- Extremely difficult to prove homicidal smothering from autopsy findings.

Homicidal smothering

Baby smothered

smothering cont…

- Facial dissection may show contusions around the nose, chin and mouth-
- Buccal surface of the mouth may be bruised or abraded
- If soft pillow is used these may be absent
- The ‘classic signs’ of asphyxia are often absent



Gagging

- Gagging is;
  - Obstruction of the mouth / mouth and nose by a fixed physical barrier
  - That is held in place by tying or adhesion (knotted rag or duct tape)
  - Or if the gag is thrust into the mouth

- At first- may let air in but later as it gets soaked with saliva/mucous it becomes impermeable.

Gagging

- At autopsy the main findings are related to the
  - nature of the gag
  - secondary effects of gagging.
- Nature of the gag easy to ascertain if left

- If the gag had been removed - remnants of it or injuries produced by it (Adhesive material)

GAGGING

Overlaying of infants

- It is an assumption
  - when an infant is found dead in the morning in maternal bed.
- No physical signs at autopsy
- Doubtful diagnosis

Plastic bag suffocation

- A plastic bag is placed over th head down to neck
- May tie the open end of the bag
- Flat sheets of polythene had killed infants
- Difficult to prove- unless the bag is still present
- The 'classic signs' - absent.
- Manner is suicidal or homicidal and accidents among children.

summary

- Asphyxia is failure of cells to receive or utilize oxygen.
- Mechanical asphyxia is commonly discussed under asphyxia in forensics.
- Depending on the level of occlusion there are several modes of mechanical asphyxia
  - **Reduced oxygen tension in the respirable atmosphere (Environmental hypoxia)**
  - **Upper airway obstruction**
  - **positional asphyxia**
  - **pressure on the neck**

- There are no specific signs to diagnose asphyxia at autopsy
- 'Classic signs' of asphyxia are now considered nonspecific and unreliable.

◉ Best way to diagnose asphyxia is to determine the cause of asphyxiation from direct evidence at autopsy


Thank you