

Breathless Clues

A close-up photograph of a person's neck. A bright red, circular mark is visible on the skin. Two hands are positioned over the neck, with fingers spread, possibly indicating the location of the mark or a point of interest. The person is wearing a white shirt.

The Forensics
of Violent Asphyxia
Make sure to check the notes!!

Circumstances Surrounding Death

- Cause
- Manner
- Mechanism
- Mode

Basic revision before we start:

Cause: the disease or injury that causes death

Manner: natural vs unnatural (suicide, accidental, homicide)

Mechanism: the physiological derangement that causes death (e.g., “exsanguination” due to an axe wound)

Mode: the abnormal physiological state in an individual at the time of death (eg, asphyxia)



A 45-year-old man was found deceased in his living room, suspended from a ceiling beam using a rope.

A suicide note was present.

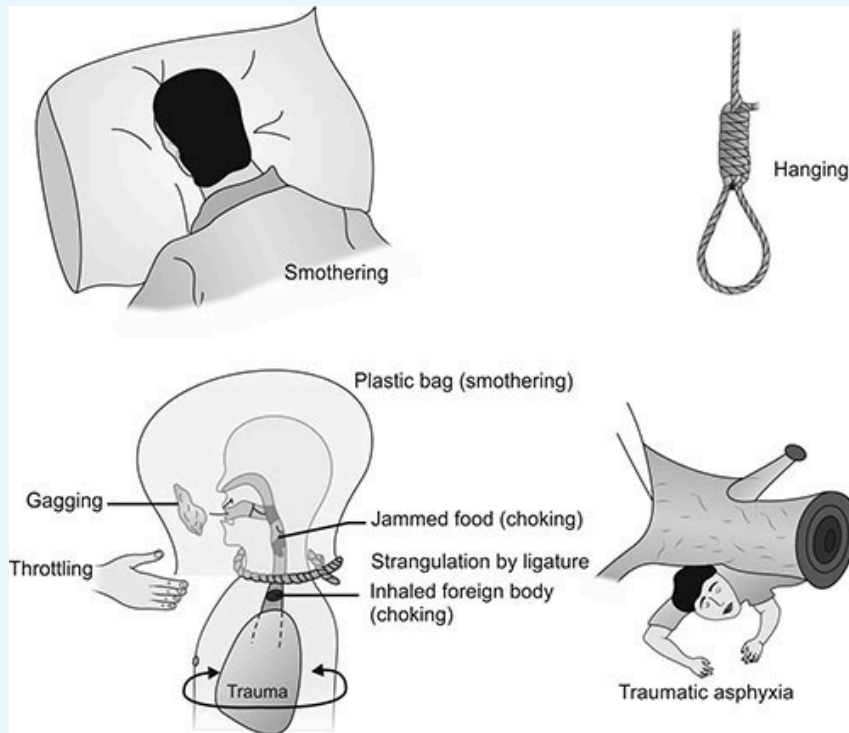
Autopsy showed an oblique ligature mark below the thyroid, conjunctival petechiae, and neck muscle hemorrhage.

Cause: Hanging Ligature strangulation

Manner: Suicide

Mechanism: Cerebral Hypoxia due to neck compression, vascular compromise...

Mode: Asphyxia



In all of these cases, asphyxia is the MODE of death!

Asphyxia: Etymology Vs Convention

Etymologically:

Asphyxia means "**absence of pulsation.**"

- (from Greek a- = "without" + sphyxis = "pulse")

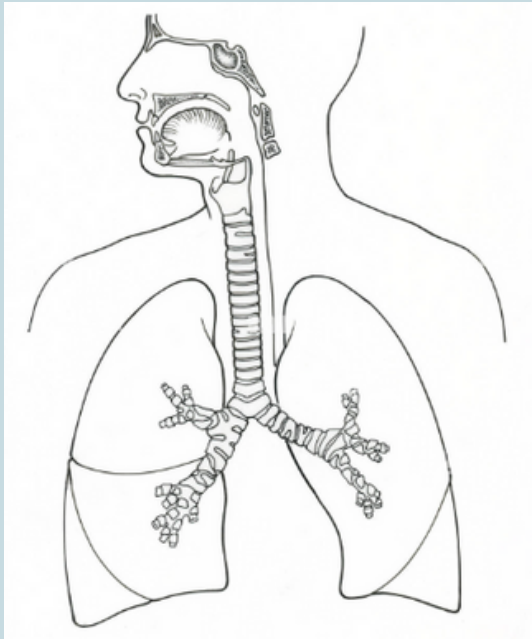
Conventionally:

Asphyxia means "**lack of oxygen.**"

- Broadly referring to any process that impairs oxygen delivery to tissues.

It is a generic term that indicates a condition resulting from an interference with respiration due to the lack of oxygen in the air or the blood, a failure of cells to utilize oxygen, or a failure of the body to eliminate carbon dioxide

- Body does not receive or utilize an adequate amount of oxygen
- Impairment of oxygen and carbon dioxide exchange
- Loss of consciousness and death result from progressive hypoxia/anoxia



‘Level’ of Asphyxia

- external atmosphere
- external obstruction
- internal obstruction
- thoracic restriction
- lung pathology
- cardiac dysfunction
- O₂ use inability

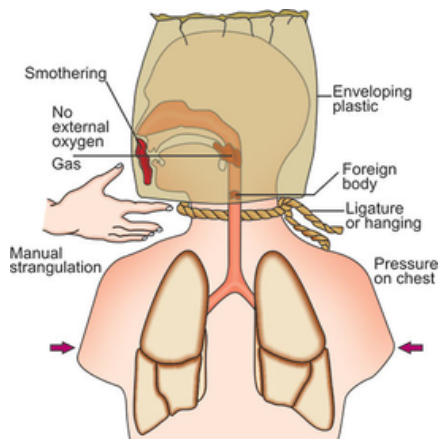
The usual relevance of asphyxia in a forensic context is in mechanical asphyxia, rather than some of the internal conditions mentioned above, which are more likely to arise as a result of natural disease or toxic conditions. (So only the first 4 points)

Classification of asphyxia

- **Mechanical**
 - Strangulation
 - Hanging
 - Choking
 - Smothering
- **Non-Mechanical**
 - CO/ CN poisoning
- **Misc.**
 - Drowning

This is the most relevant classification of asphyxia. As in the second part of the lecture, we will be discussing mechanical causes only.

Basic Terminology



Underlying cause of death	Name
Lack of oxygen in the inspired air	Suffocation
Blockage of the external orifices	Suffocation/smothering
Blockage of the internal airways by obstruction	Gagging/choking
Blockage of the internal airways by external pressure	Strangulation/hanging
Restriction of chest movement	Traumatic asphyxia
Failure of oxygen transportation	(For example carbon monoxide poisoning)
Failure of oxygen utilization	(For example cyanide poisoning)

Pathophysiology of Asphyxia

Impairment of 3 components; single or combined

- **Respiratory**
 - obstruction of the airways or impairment of respiration.
- **Vascular**
 - compression of the neck vessels.
- **Nervous:**
 - compression/stimulation of specific reflex areas of the neck

Phases and signs of Asphyxia

Box 15.1 Sequence of events that may be seen in asphyxial episodes

- **Dyspnoea phase** – expiratory dyspnoea with raised respiratory rate, cyanosis and tachycardia (may last for a minute or more)
- **Convulsive phase** – loss of consciousness, reduced respiratory movements, facial congestion, bradycardia, hypertension, fits (may last for a couple of minutes)
- **Pre-terminal respiratory phase** – no respiratory action, failure of respiratory and circulatory centres, tachycardia, hypertension (may last a couple of minutes)
- **Gasping for breath** – respiratory reflexes
- **Terminal** – loss of movement, areflexial, pupillary dilatation

These components will vary between hanging and suffocation, for example.
The box shows asphyxia phases in the living person, not important.

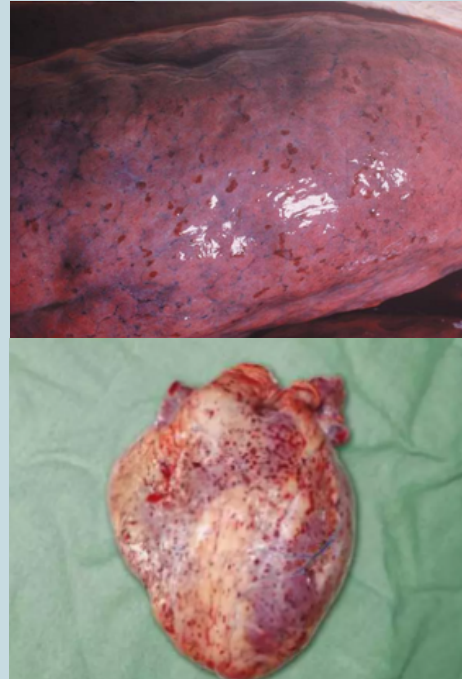
'CLASSIC' SIGNS OF ASPHYXIA

- Petechial hemorrhages
- Congestion and edema
- Cyanosis
- 'Right heart congestion and abnormal fluidity of the blood'

****Nonspecific, may support the diagnosis in the context of a thorough medicolegal investigation.**

- The last one is considered forensic mythology

Petechial Hemorrhages



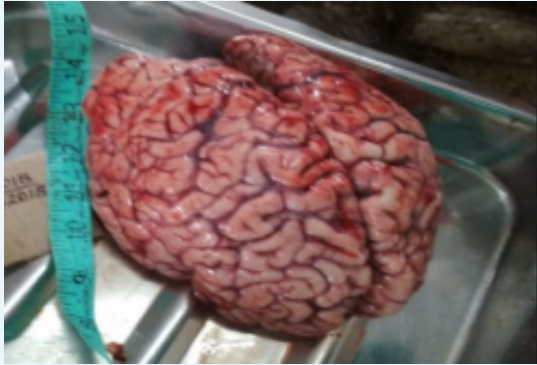
Small pin-point collections of blood lying in the skin, the sclera or conjunctivae, and under thoracic serous membranes such as the pleura or pericardium

These are caused by an acute rise in venous pressure that in turn causes overdistension and rupture of thin-walled peripheral venules, especially in lax tissues, such as the eyelid, and in unsupported serous membranes, such as the pleura and epicardium.

Found most often in the face and eyes of victims of compression of the neck or fixation of the chest.

THE MORE petechial hemorrhages present, THE MORE FORCE USED.

Congestion and Edema



Congestion is often associated with tissue swelling if the venous obstruction continues.

The oedema is the result of rapid transudation through capillary and venule walls, again mainly a function of back pressure in the venous system.

Tissue fluid also escapes rapidly into the brain in strangulation that continues for even a few minutes, though here, the well-known effect of hypoxia might be an added factor. Pulmonary oedema, causing excess fluid to enter the alveoli, is often found in hypoxic deaths.



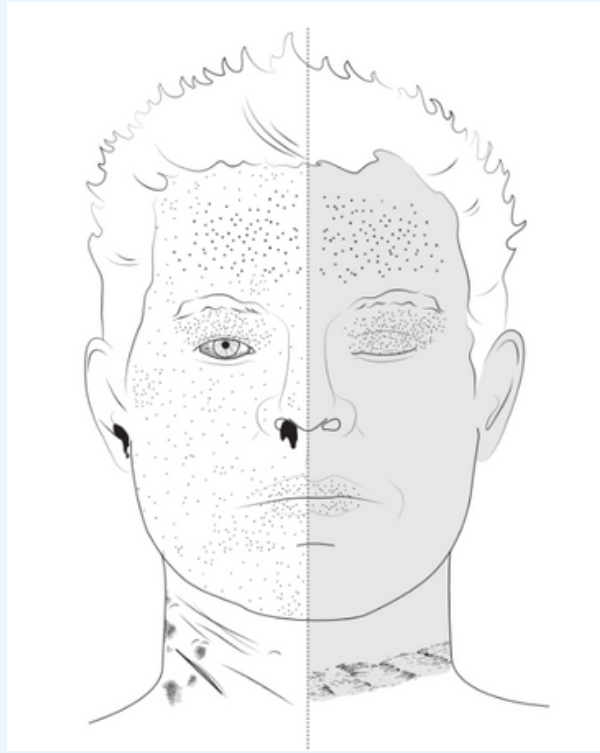
Cyanosis

- Depends on the absolute amount of reduced hemoglobin in the arterial blood.
- In neck compression: on the face as a result of jugular veins obstruction, which prevents adequate venous return from the cerebral circulation.

In the common forensic event of constriction of the neck, cyanosis almost invariably follows congestion of the face, as venous blood containing much reduced haemoglobin after perfusing the head and neck is dammed back and becomes more blue as the blood accumulates.

If and when the airway becomes blocked, then impaired oxygenation in the lungs leads to a diminution in the oxygen content of arterial blood. This will lead to a darkening of all organs and tissues, and will accentuate the cyanosis of the face

Descriptions of an abnormal fluidity of the blood seen at autopsy in asphyxial deaths are part of forensic mythology



Repeat overview, with some more specific local signs such as imprint abrasion in ligature strangulation to the right, vs scratch marks and six penny signs in manual strangulation to the left.

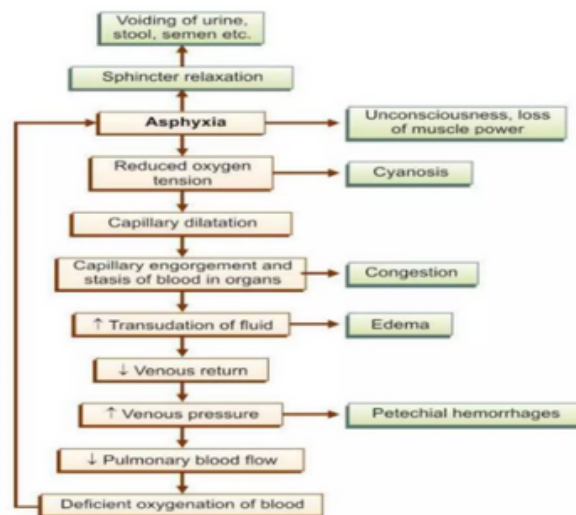


FIG. 15.3: Mechanism of appearance of classical signs of asphyxia

Overview of mechanisms



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A suicide note was present.

Autopsy showed an oblique ligature mark below the thyroid, conjunctival petechiae, and neck muscle hemorrhage.

Revisiting this case to use it for a Mini-OSCE style question.



- What are these deep furrowed marks called?
- What is the mode of death?
- Name 2 classical changes associated with this case?

ANS: Imprint or pressure abrasion, asphyxia, petechial hemorrhage, cyanosis, and congestion.