Chapter 15 : ASPHYXIA

Asphyxia

Types:

1. Mechanical:
    - Strangulation.
    - Hanging
    - Choking (physical obstruction within the airways)
    - Compression asphyxia
    - Smothering
2. Non-mechanical:
    - Carbon monoxide poisoning.
    - Cyanide poisoning.
3. Drowning.

Asphyxia Episodes:

The general sequence of events currently described in most 'Asphyxial episodes' is:

1. The dyspnea phase: expiratory dyspnea with raised respiratory rate, cyanosis and tachycardia (1 minute)
2. The convulsive phase: loss of consciousness, reduced respiratory movements, facial congestion, bradycardia, hypertension, fits (may last a couple of minutes)
3. The pre-terminal respiratory phase: no respiratory action, failure of respiratory and circulatory centers, tachycardia, hypertension (may last a couple of minutes)
4. Gasping for breath: respiratory reflexes
5. The terminal phase: loss of movements, areflexia, pupillary dilation

Asphyxia

Classic Signs:

1. Petechial hemorrhages in the skin of the face and the lining of the eyelids. **(Most important to the forensic pathologist)**
2. Congestion and edema of the face.
3. Cyanosis of the skin of the face.
4. Right heart congestion and abnormal fluidity of the body.

However, these are not specific to asphyxia.

In Survivors of an Asphyxial Episode:

1. Pain and tenderness around the neck and structures within the neck.
2. Damage to the larynx and associated cartilages.
3. Damage o the hyoid bone.
4. Dried saliva around the mouth.
5. Cyanosis (particularly if the survivor was found immediately after the attack)
6. Congestion and edema of the structures above the level of compression.
7. Petechiae above the level of the compressive force that caused the asphyxia.
8. Hemorrhage from the mouth, nose and ears, presumably as a consequence of raised intravascular pressure.
9. Incontinence of feces and urine.

Types of Mechanical Asphyxial Mechanisms

Pressure to the Neck:

Three most important forms in forensic medicine:

1. Manual strangulation
2. Ligature strangulation
3. Hanging

The application of pressure to the neck may lead to any of the following depending on the type, site and extent of the pressure:

1. Obstruction of the jugular veins, causing impaired venous return of the blood from the head to the heart (cyanosis, congestion and petechiae)
2. Obstruction of the carotid arteries. (If severe cerebral hypoxia)
3. Stimulation of the carotid sinus baroreceptors at the bifurcation of the common carotid arteries neurologically mediated cardiac arrest.
4. Elevation of the larynx and tongue closing the airway at the level of the pharynx. (Unless extreme pressure is applied to the neck, the cartilaginous trachea is more resistant to compression.

Following mechanical pressure to the neck, loss of consciousness can occur rapidly. Traditionally, loss of consciousness following hanging was though to occur within 10 seconds. Filmed hanging analysis suggests a lack of recognizable respiratory movements after 2 minutes and lack of muscle movements within 7.5 minutes.

Vagal Inhibition or Reflex Cardiac Arrest:

Mechanical Stimulation of the carotid sinus baroreceptors in the neck. Can result in unpredictable, and sometimes fatal outcomes.

Strangulation:

- Manual strangulation is used to describe the application of pressure to the neck using the hands, and is a relatively common mode of homicide, particularly where there is disparity between the sizes of the assailant and victim.
- The external signs of manual strangulation can include bruises and abrasions on the front and sides of the neck, and the lower jaw; Bruises caused by fingertip pressure and fingernail scratches may be seen, the latter being made either by the assailant or the victim.
- When pressure to the neck is sustained, additional features of manual strangulation can include the 'classic asphyxial signs', including facial petechiae.
- In the living victim, clinical evaluation may reveal pain on swallowing, hoarseness, stridor, neck, head or back pain.
- Ligature strangulation may be homicidal, suicidal or accidental and involves the application of pressure to the neck by an item capable of constricting the neck, (like holding a belt around someone's neck until he dies).
- There is frequently a clear demarcation of congestion, cyanosis and petechiae above the level of the constricting ligature, and there is usually a 'ligature mark' on the neck at the site of constriction (so the belt well leave a mark on the neck).
- Soft and broad-surface ligatures, however, may leave very little evidence of compression on the skin of the neck, or even injury to underlying structures.
- Distinguishing ligature strangulation from hanging, in which the individual's body weight against a ligature leads to pressure being exerted on the neck (Strangulation vs hanging).
- The 'strap muscles' in the neck and injury to the superior horns of the thyroid cartilage, are particularly vulnerable to compressive injury. Calcification and ossification of the hyoid bone and thyroid cartilage occurs with increasing age, and such change is associated with less flexible structures that are more prone to injury following neck compression.

Hanging:

- Hanging describes suspension of the body by the neck (الجسم يكون معلق) Any material capable of forming a ligature can be used for hanging.
- The pressure of the ligature on the neck is produced by the weight of the body.
- As with ligature strangulation, a ligature mark is commonly present.
- Hanging by judicial execution involves a 'drop', for example through a trapdoor, calculated to result in cervical spinal cord injury and fracture-dislocation of the cervical spine, but without decapitation.

Choking:

- Accidental ingestion of objects or food can cause choking, the internal obstruction of the upper air passages by an object or substance impacted in the pharynx or larynx.
- Choking is, most commonly, accidental and common causes include misplaced dentures (fake teeths) in adults and inhaled objects such as small toys, balls, etc., in children.
- In medical practice there are risks associated with individuals who are sedated or anaesthetized, Obstruction commonly leads to respiratory distress with congestion and cyanosis of the head and face.
- ***Café coronary:*** One of the commonest causes of choking is the entry of food into the air passages, If food enters the larynx during swallowing, it usually causes gross choking symptoms of coughing, distress and cyanosis, which can be fatal unless the obstruction is cleared by coughing or some rapid treatment is offered.
- However, if the piece of food is large enough to occlude the larynx completely, it will prevent not only breathing but also speech and coughing.
- The individual may die silently and quickly, the cause of death remaining hidden until the autopsy.

Compressional and positional asphyxia:

- Pressure on the trunk (chest and/or abdomen) can result in an inability to breathe effectively and result in death (unable to expand their chests to breath).
- Occasionally, individuals are crushed by the weight of many other people fleeing danger, such as during a fire in a sports stadium (like in hajj) or they may, for example, attempt to squeeze through small gaps in railings, or small open windows, and become wedged preventing expansion of the chest (يعني يدخلون أماكن ضيقة ماتكفيهم) .

Suffocation and smothering:

- Suffocation is a term usually used to describe a fatal reduction of the concentration of oxygen in the respired atmosphere, and often incorporates 'smothering'.
- A reduction in atmospheric oxygen can occur, for example, in a decompressed aircraft cabin, or in a grain silo.
- Mechanical obstruction of the upper airways can lead to suffocation, as is seen when plastic bags are accidentally, homicidally, or suicidally placed over the head

(يعني الأكسجين المحيط بالشخص يقل بدرجة شديدة زي اللي ينامون في بيت شعر مسكرين النوافذ ومولعين المشب).

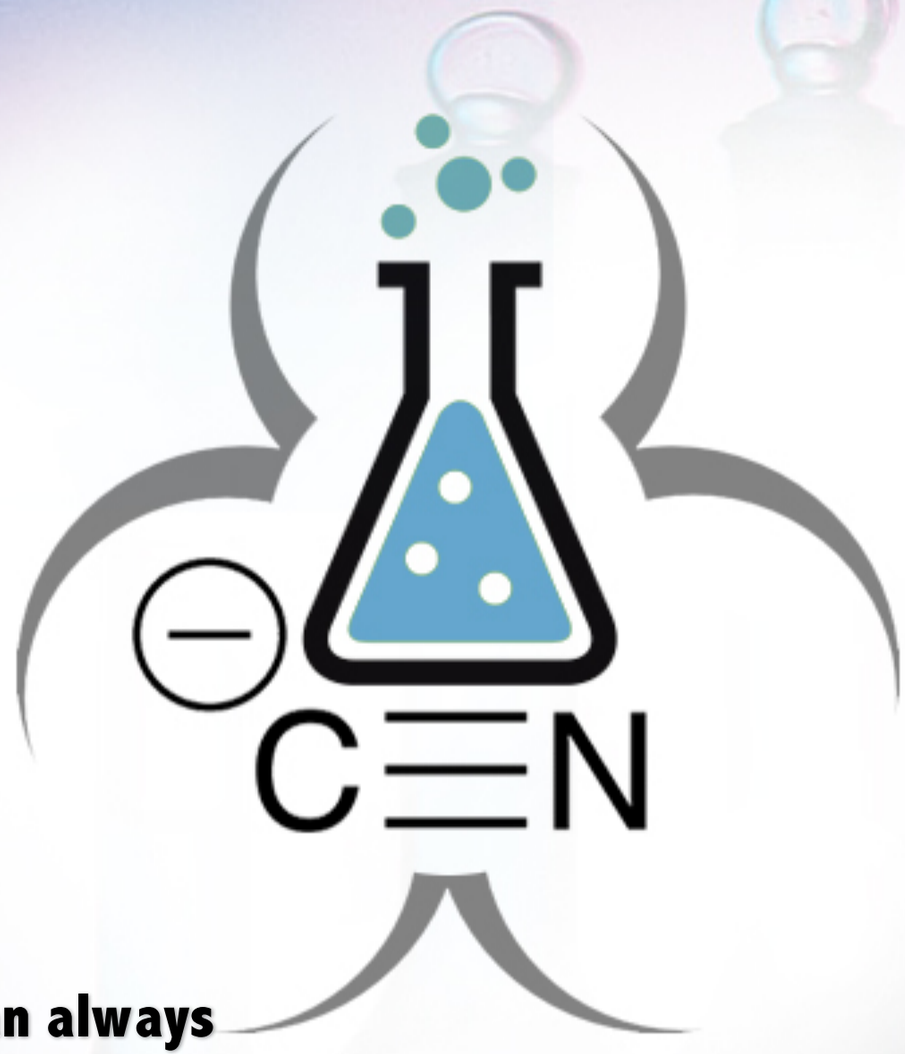
- Similarly, smothering – the physical occlusion of the nose and mouth – may leave no 'asphyxial signs' in survivors or the deceased.
- If the individuals are unable to struggle, owing to extremes of age or intoxication, for example, they may have no evidence of injury, including around the mouth or nose.

Autoerotic asphyxia:

- Autoerotic asphyxia is the term used to describe those fatalities occurring during some form of solitary sexual activity.
- The recurrent feature tends to be the use of a device, appliance or restraint that causes neck compression, leading to cerebral hypoxia, with the aim of heightening the sexual response.
- The presence of the following features should be considered when 'diagnosing' autoerotic asphyxiation: evidence of solo sexual activity; private or secure location; evidence of previous similar activity in the past; no apparent suicidal intent, The presence of injuries suggestive of assault must be looked for carefully, and the possibility of third-party involvement must always be considered in such cases.

Example of Asphyxial Conditions:

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)



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