

CAUSES OF DEATH IN ASPHYXIA OF VARIOUS ORIGINS, POST-ASPHYCTIC STATES

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Abstract: Asphyxia is an acute or subacute disturbance of external respiration, leading to insufficient oxygen supply to the body and the accumulation of carbon dioxide in it.⁵ In some cases, with asphyxia, death may occur not from a lack of oxygen, but due to reflex cardiac arrest due to irritation of the upper laryngeal nerve from compression of the neck or during aspiration of a foreign body.

Key words: Post-asphyctic states, mechanic asphyxia.

Depending on the origin, asphyxia may occur.

Pathological (due to disease) - as a result of pathology of the respiratory center, respiratory muscles and pathways, for example, with hemorrhage in the brain stem;

Toxic - when the function of the respiratory center, respiratory muscles and pathways is impaired under the influence of a toxic substance, for example, paralysis of the respiratory muscles under the influence of chicken-like compounds;

Mechanical - if a violation of external respiration occurs due to a mechanical obstruction to the movement of air through the respiratory tract.

Depending on the circumstances and mechanism of occurrence, the following types of mechanical asphyxia are distinguished:

1. Mechanical asphyxia from compression of the respiratory tract:

1) Strangulation - from compression of the neck organs during hanging, strangulation with a noose, hands, or compression of the neck with other objects.

Thus, with a complete hanging with a jerk, almost instantaneous death is possible as a result of a reflex arrest of cardiac activity and respiratory movements. When the loop is tightened slowly, for example, when using your hands to secure an object on which the loop is attached, the irritation of the receptors is weaker. In this case, the rupture becomes the direct cause of death.

With incomplete hanging, the force of compression on the neck is less and the dying process lasts longer.

Compression of the neck by hands is more often than other types of mechanical asphyxia, accompanied by fractures of the hyoid bone and cartilage of the larynx. Death can occur from reflex cardiac arrest due to irritation of the branches of the vagus nerve and carotid sinus, especially in persons with diseases of the cardiovascular system.⁶

2) Compression - from compression of the chest and abdomen with blunt hard objects or loose masses. The severity of asphyxia and the speed of death depend on the severity of objects compressing the chest and abdomen, the area of pressure and its direction. When the body is compressed in the anteroposterior direction, death occurs more quickly than when it is compressed in the lateral direction.

Compression of the upper abdomen is especially difficult to bear, since in this case an obstacle is created not only to the movements of the diaphragm, but also to cardiac activity. The cause of death can be both asphyxia and hemodynamic shock - a sudden reverse flow of blood through the superior vena cava. It is also possible to combine several causes: asphyxia, traumatic shock, acute blood loss and prolonged compartment syndrome.

3) Traumatic – with multiple fractures of the ribs with paradoxical movements of the affected area of the chest wall.

2. Mechanical asphyxia from closure of the airway:

- 1) Obstructive - from closing the openings of the nose and mouth, upper respiratory tract with foreign bodies.
- 2) Aspiration - from closing the airways with gastric contents, blood or liquid during drowning.
- 3) Inhalation - when non-toxic gaseous substances or aerosols enter the respiratory tract of a person located in a limited volume of a confined space with a current of inhaled air.

An example of mechanical asphyxia from closure of the airway is drowning. Death from drowning occurs from the cessation of air flow into the respiratory tract due to their closure with liquid.

3. Mechanical asphyxia from being in a confined space (from a lack of oxygen in the inhaled air).

Asphyxia from a lack of oxygen in the air is most often observed when a person is in a confined space due to the gradual consumption of oxygen and an increase in the content of carbon dioxide in the air. This type of mechanical asphyxia is possible during landslides, in earthen pits, compartments of sunken ships, hermetically sealed tanker rooms, in airplane cabins, and less often as a result of an accident in refrigerators, chests, etc. Often such death befalls children who entered there out of prank and were unable to get out. Adults die due to ignorance of safety rules or their violation, as well as when trying to provide assistance to victims. Cases of murder in this manner are casuistically rare.

A special variation of this type of mechanical asphyxia is suffocation in a plastic bag.

Death from mechanical asphyxia that occurs at the scene of the incident occurs either through acute hypoxic damage to the brain or through cardiac mechanisms. This refers to the possibility of reflex cardiac arrest associated with parasympathetic (vagal) inhibition of cardiac functions in response to irritation of receptors located in the carotid sinuses, on the mucous membrane of the bronchi, trachea and pharynx, as well as damage to the vagus and upper laryngeal nerves in case of neck injury. Thus, when strangulated by hand, reflex cardiac arrest can occur within 15-30 seconds from the onset of traumatic impact on the area of the carotid sinus. In this case, there are no general signs of mechanical asphyxia, the victim's face remains pale, and morphological changes in the internal organs are more likely to indicate sudden cardiac death than mechanical asphyxia.

Post-asphyxial conditions are observed in cases where the process of asphyxia is interrupted. Survivors experience peculiar disorders that can be divided into the following stages.

1. Respiratory-comatose, characterized by lack of breathing, unconsciousness, lack of pupillary response.
2. Stage of decerebral rigidity, when the inhibitory influence of the midbrain is still absent. At this stage, convulsive movements appear, mainly of a tonic nature.
3. Stage of clouding of consciousness. At this stage, a wide variety of extrapyramidal symptoms are observed: tremor, catalepsy, autonomic disorders, etc.
4. Amnestic stage, when, with full consciousness, more or less pronounced retrograde amnesia is noted.
5. The stage of affective consequences is expressed by an acute manic outbreak, the development of a depressive-melancholic state, etc.

Immediate causes of death in case of post-asphyxial conditions:

Necrosis of brain tissue in areas of vital centers.

Edema and swelling of the brain with the development of dislocation syndromes.

Pulmonary edema. It can develop already in the first 1.5-2 hours and is a sign of an unfavorable prognosis. It is associated with hypoxic damage to the myocardium and increased permeability of the walls of the pulmonary capillaries.

Acute cardiovascular failure due to acute post-acute myocardial dystrophy. An ECG in those who have suffered asphyxia reveals signs of myocardial ischemia, various rhythm and conduction disturbances, among which asystole is the most dangerous.

In rare cases, myocardial infarction occurs, which also leads to the death of the victim.

Acute respiratory or pulmonary-cardiac failure as a result of bilateral confluent pneumonia. In its genesis, circulatory and ventilation disorders in the lungs, neuroreflex disorders, suppression of surfactant formation, as well as aspiration of saliva and gastric contents play a role.

Acute renal failure due to hypoxic dystrophy of the tubular epithelium resulting in acute necrotic nephrosis.

Acute liver failure due to parenchymal degeneration of hepatocytes resulting in focal liver necrosis.

Acute ulcers of the stomach and duodenum, focal necrosis of the small intestine, complicated by massive bleeding or perforation.⁷

Mechanical asphyxia can be the result of an accident, a method of murder or suicide, so the medical examiner must actively identify features that may be important in determining the manner of death.

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