

DROWNING

Drowning - definition

- asphyxial death caused by immersion in a liquid and aspiration of water (or without it)
- submerging only mouth and nose into a liquid is enough to drown...
- drowning in another liquid than water (kerosene, oil, beer, liquid manure)

PATOPHYSIOLOGY

1. HYPOXIA

- irreversible cerebral *anoxia*
- *obstruction* of airways with liquid (asphyxia)
- liquid presses the air in bronchi and causes *pulmonary emphysema*

2. SYSTEMIC EFFECTS of the absorbed fluid (fresh water – hypervolemia, haemodilution ... mineral disruption, cardiac failure)

3. REFLECTORY mechanisms (vagal reflexes – 4 – e.g. diving reflex, cold shock)

4. HYPOTERMIA - in cold water cooling is accelerated (20-25 times)

Autopsy findings I

NO TYPICAL SIGNS

- signs of asphyxia

!!! diagnosis is based on the circumstances of death, plus a variety of nonspecific findings

- foam around mouth and nose, goose bumps, cyanosis of the face, constriction of the skin of penis, scrotum, nipples, maceration of skin – hands of the washerwoman (after 2-4hrs)
- pulmonary ‘emphysema aquosum’
- white or hemorrhagic foam of trachea and bronchi

Autopsy findings II

- water in lumen of stomach and duodenum
- fissures of mucosa of stomach
- silt, small stones, water plant in trachea and bronchi
- Paltauf spots – subpleural dot-like haemorrhages as a result of rupture of alveolar septa (lighter colour than the petechiae described previously)
- signs of subgaleal haemorrhage
- postmortem injuries

Drowning - classification

1. wet drowning – MAJOR cause of „death by drowning“! – water gets into airways
 2. dry drowning – atypical, death caused by laryngospasm (vagal, reflectory death) – submersion of mouth and nose without aspiration of water
- immersion (submersion) death – syn.hydrocution
 - near-drowning (syn.secondary drowning, delayed drowning syndrome) – death several days after drowning, caused by systemic effects of inhaled fluid

- Type of water:
- fresh water: large volumes of water can pass through the alveolar capillary membranes and alters or denatures pulmonary surfactant – hypervolaemia – reduction of level of sodium, chlorides, potassium and plasma proteins – death: combination of alternation of ions and hypoxia
- salt water: dilutes or washes surfactant away – liquid in lungs increases – decreasing circulating blood – death: combination of acute pulmonary oedema + hypovolemic shock
- Tests for drowning – Gettler chloride test, diatoms(algae) in tissues

.. yet another classification

- primary (active) drowning – healthy individual, no trauma**
- secondary (passive) drowning – drowning of unconscious, shallow water drowning (AMI, epilepsy, cervico-cranial trauma, intoxication)**

Criminological context

- mostly accidental
- may be suicidal – difficult to prove (suicide note, circumstances)
- homicide – difficult to prove, rare

Dead body in water

- Causes of death of dead persons pulled out of water may differ!
 1. SD occurred before falling into water (SCD)
 2. SD occurred in water (+/- secondary drowning)
 3. traumatic death caused by injuries that were inflicted before so. was thrown (fell) into water (homicide - body thrown into water)
 4. traumatic death caused by injuries that happened in water (typically cervico-cranial trauma, impact on a pier, bottom of a pool...)
 5. death caused by laryngospasm - contact of the body with cold water – reflectory death - dry drowning
 6. wet drowning