Drowning, near drowning

Definition

- drowning- death from asphyxia due to suffocation caused by water entering lungs and preventing the absorbtion of oxygen leading to cerebral hypoxia
- WHO: the process of wxperiencing respirátory impairment from submersion/ immersion in liquid
- near drowning- survival of drowning event involving uncouciousness or water inhalation, can lead to serious complications, even death, after event

Epidemiology

- 3rd leading cause of unintentional injury death worldwide (WHO)
- 96% of deaths occures in low- and middle- income countries
- one of the leading causes of death in children under 12 years
- more frequent in males and the young

Etiology

Primary causes

- infants: bathtubes, bucket of water, mostly during briefe lapse of adult supervision (less than 5 min)
- children 1-5 y: residential swimming pools (no physical barrier)
- young adults: ponds, lakes, rivers, ocean (alcohol, drugs frequently involved)
- Non-swimmers, exhaustion

Etiology

Secondary causes

- seisure
- MI, syncopal episode
- anxiety/panic
- diabetes, hypoglycaemia
- water sport hazards
- substance abuse
- cervical spine injury, head trauma
- natural disasters

Classification

Wet drowning:

- Inhalation of water, which interferes with respiration and causes the circulatory systeme collapse

Dry drowning:

- around 10% drownings, often due to immersion in cold water
- muscle spasms around the voice box block the airway, no water enters the lungs
- leads to negative pressure pulmonary edema (forced inspiration against closed glottis)- increased capillary endothelium permeability with surfactant disturbance- ARDS or acute lung injury

Dry drowning- pathophysiology

- Laryngospasm
- Low O2 in blood, increased CO2
- Cardiac arrest
- Brain damage caused by hypoxia (longer period in cold water)

Wet drowning- pathophysiology

- Intentional breath holding (about 1 min.), then overcome onf inspiration drive and aspiration of some liquid, which leads to cough reflex and laryngospasm
- Hypoxemia, acidosis- if drowning continues, lead to relaxation of laryngospasm and aspiration
- Unconciousness within 2 min., apnoe
- Cardiac arrest

Pre-hospital management

On scene:

- airways check for foreign material/ vomitus (patient with altered mental status)
- immediate rescue breathing (even in water)
- *Heimlich maneuver- not effective in removing aspired water, delays start of resuscitation*
- wet clothing removal (hypothermia), external rewarming
- CPR- initially 5 rescue breaths ! (cardiac arrest usually secondarily due to hypoxia)
- oxygen administration once possible
- consider trauma- C-spine precautiouns

Emergency department

- ABCDE evaluation, trauma survey
- C-spine stabilisation
- vital functions monitoring
- warm IV fluid administration, passive rewarming (nobody is dead until warm and dead)
- O2 supplementation/ OTI, mechanical ventilation
- bronchoscopy in selected cases
- correction of heart arrythmias

Investigations

- ECG for dysrhytmias
- ABG
- Labs: electrolytes, renal functions, CBC, glucose
- CXR

Hospital care

- ICU/CCU monitoration
- Airway management, maintaining SpO2 >94%, bronchodilators
- Nasogastric tube
- Prevention of cerebral edema (secondary brain damage): upper body elevation, diuretics administration, normoglycaemia, normotension, controled hyperventilation

Complications

Hypoxic/ischemic events effecting lungs/brain/heart

- Hypoxic encephalopathy
- Pulmonary edema
- Dysarythmia
- Acidosis
- Hemodilution (?)
- Late: pneumonia, ARDS, empyema

Morbidity/ mortality

- Drowning time > 5 min
- Start of BLS > 10 min
- Prolonged resuscitation > 25 min
- Age > 14 years
- GCS < 5
- Drowning in contaminated water