

# Injury related to Changes of Atmospheric Pressure

MUDr.Irena Duskova  
Institute of Forensic Medicine  
2nd Medical Faculty

# Injury related to changes of atmospheric pressure

- On the sea surface  $0,1 \text{ MPa} = 1 \text{ Atm} = 760 \text{ mmHg}$
- Every 10 m of water column to the depth increases with 1 Atm
- In 5000 m above the sea surface decreases to  $1/2$ , in 9000 m... $1/3$
- ↑- occasions in which the atmospheric pressure can increase – diving, landing with plane
- ↓- occasions in which the atmospheric pressure can decrease – stay in high altitudes, rapid decompression

# Increased atmospheric pressure

- especially recreational and sporting diving
- fast fall to the depth ...the increased pressure surrounding chest cause the respiratory volume decreased (volume of air in the lungs is decreased as the pressure increasing) → the pressure of the pulmonary circulation and tissue wall continues to increase → result in pulmonary oedema → followed by vessel rupture and haemorrhage

**Barotalgia** – bulge indrawn of eardrum, vertigo, dizziness, rupture of eardrum



# Decreased atmospheric pressure

- sudden, too rapid decompression → physical damage from volume changes
- **dysbarism** - all adverse effects of pressure
- **barotrauma** – the mechanical damage from gas released into the tissues
- may occur in only 2 or 3 m of water
- arterial gas embolism, decompression sickness, platelet aggregation → DIC, alveolar walls may be ruptured → interstitial emphysema
- nitrogen narcosis – like drunkenness
- visceral bleeding
- fat embolism – explosive releasing of nitrogen

# The autopsy in dysbarism and barotrauma

- most deaths associated with diving caused by drowning, hypothermia
- expert advisers – the equipment
- crepitation of the skin
- the eardrums – otoscope
- subcutaneous, mediastinal, retroperitoneal and subpleural emphysema
- Interstitial emphysema → subpleural bullae



# Explosive injuries

- Explosion – explosive material is suddenly converts into al large volume of gas with release of a tremendous amount of energy
- near an explosion – body in many pieces, severe burns
- greater distance – injuries by the shock wave (wave of pressure concentrically spreading from the blast centre) – air blast, underwater blast
- injuries by flying missiles, buildings debris
- intoxications from fumes formed as a result of an explosions

# Air blast

- Blast wind pushes in one direction in the pressure phase (positive shock wave) and pulls in the other direction in suction phase (negative shock wave)
- Pressure is the highest in place of an explosion and it falls rapidly (almost exponentially)
- The worst effects of air blast – organs with higher content of air – ear, lung, GIT
  - ✓ Ear – rupture of eardrum, haemorrhage to the middle and inner ear – deafness
  - ✓ Lung – alveolar haemorrhage, emphysema, pneumothorax
  - ✓ GIT – haemorrhage beneath peritoneum of the gut, rupture of mesentery (predominantly caecum and colon)