

Electrical fatalities

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Electrocution

- The passage of a substantial electrical current through the tissues can cause skin lesion, organ damage and death
- For biological damage the body must be incorporated into an electrical circuit → a passage of electrons through the tissues

Electrical injury

- ⦿ The severity of tissue damage related to a number of physical factors...
- ⦿ Mathematical relationship.....**Ohm's law** $U = R \times I$
- ⦿ **Voltage (U)** 110-240 V.... 220 kV
 - the higher voltage the higher temperature evolved (severe burns)
 - electrical arc – effects of electricity without a direct contact
- ⦿ **Resistance (R)** – tissue resistance important
 - Low R – vessels and nerves, wet thin skin (few hundred Ω)
 - High R – bones, thick dry skin (palm or sole – possibly one million Ω)
- ⦿ **Current (I)** – **direct** less dangerous (fatal is about 250 mA) x **alternating** (50-80 mA)
 - 30 mA – “hold on” effect – tetanoid muscle spasm
- **Frequency** – most dangerous 50 Hz (causes cardiac arrhythmias) – domestic supply

Electrical injury

- ⦿ The current enters at one point and leaves the body at an exit point → tends to take the shortest route
- ⦿ A) passage of a current across the heart
→ cardiac dysrhythmia, ventricular fibrillation
- ⦿ B) passage of a current across the chest and abdomen
→ respiratory paralysis from spasm of intercostal muscles and diaphragm
- ⦿ C) passage of a current through the head and neck
→ direct effect on the brainstem → cardiac and respiratory centres are paralysed

The cutaneous electric mark

- The point of contact on the body surface
- „**electrical burns**“, „**electrical marks**“
- might be absent – electrocution in the bath
- thermal burn from heating of the epidermis and dermis - sometimes hardly visible (brown spot of fused keratine, discreet blister)
- An areola of blanched skin at the periphery
- Firm contact x spark lesion
- Earthing or „grounding“ lesion are not often seen







Histological appearances

- metallic ions are embedded in the skin
- vacuolation in the epidermis and sometimes dermis
- the cells of the epidermis elongated, nuclei of the lower layers oriented and horizontally stretched
- heart → the wavy appearance of the myocardial fibres, contraction bands....not diagnostic

Internal appearances

- The current pathway is usually too diffuse to cause thermal damage
- no specific findings in fatal electrocution
- cardiac arrhythmia, respiratory paralysis....

The manner of death

- homicide rare
- suicide have increased in recent years
- accident often







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Death from lightning

- A lightning – huge electrical force producing millions amperes and volts
- Survivors : dead on the spot ratio = 1:1-1,5
- External findings – electrical lesions, burns (moderate to severe), bizarre appearance – fern or branch-like patterns – Lichtenberg figures, fractures, lacerations





