FORENSIC & TOXICOLOGY SUMMARY

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Electrocution

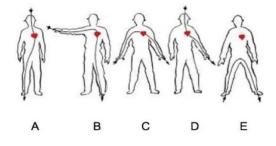
Death or severe injury happens due to the passage of electric current through the body.

Source of electricity:

- 1. Demotic, 240 volts (the most common source).
- 2. Industrial, up to 40000 volts.
- 3. Lightning, up to 300 million volts.

Factor s affecting electrocution:

- Current strength and voltage.
- Resistance (more resistance = less conduction but severe injury).
- Bone (highest) > fat > tendon > skin > muscle > nerve > blood (lowest).
- The skin has a variable resistance (higher when dry, lower when wet).
- Duration of contact.
- ◆ Type of current (Alternating current [AC] or Direct current [DC]).
- AC is worse; it cause prolonged muscle contraction make it harder for a persons to release the electrical source & it disrupt the normal heart rhythm (ventricular fibrillation).
- Pathway through the body.
- Surface area & site of contact.
- Environmental conditions (humidity, metal, ...).
- Personal factors (age, medical illnesses like heart disease).



Pathways of electrocution

The more vital organs/tissues passing through = the more dangerous the electrocution is.

"**A**" considered the **most** dangerous (the current passed through the **heart**, **brain** & **diaphragm**).

Cause of death in electrocutions:

- 1. Ventricular fibrillation (cardiac arrest) the most common cause.
- 2. Asphyxia due to respiratory muscles paralysis or damage of brain stem (respiratory arrest).
- 3. Thermal injury in case of high voltage exposure.
- 4. Multi-organ failure & CNS damage.
- 5. Secondary trauma like falls, infection, septicemia (due to burn).

Electrocution marks

Local effects

- **Joule burn:** burn due to <u>thermal effects</u> caused by electrical energy (more in low-voltage). When the current passes through the body, the body's tissues resist the flow of current, and this resistance generates heat.
 - Blisters, redness, superficial-deep thermal burn at the site of contact.
- **Crater lesion:** usually seen in case of the high-voltage electrocution:
 - 1. Center zone: charred black and necrotic tissue.
 - 2. Intermediate zone: damaged tissue with coagulative necrosis (not completely dead tissue)
 - 3. Outer zone: hyperemia and inflammation due to increased blood flow.
- **Exit wound:** Larger and more irregular. May have a charred edges with extensive tissue necrosis. The electrical current exits the body with greater force than it enters leading to extensive damage. In high-voltage current, the exit often appears as a 'blow-out' type wound.
- o Flash or spark burn.
- Wounds (lacerated or punctured wound with contusion at the margin).

Systemic effects

- o CNS damage.
- Suspended animation.
- Eye (cataract).
- With recovery there may be muscular pain, fatigue, headache, irritability.
- Immediate death.

Autopsy findings

External:

- 1. Electrocution marks.
- 2. Burned clothes and body hair.
- 3. Fractured ribs (due to severe convulsions).
- 4. Extensive ecchymosis.
- 5. Rigor mortis developers early with blue-red livor mortis is well-developed.
- 6. Joule burn at the site of entry is diagnostic.

Internal:

- 1. Ocular congestion with dilated pupils.
- 2. Pulmonary edema.







- 3. Petechial hemorrhage (brain, pleura, pericardium).
- 4. Bone pearl's on X-ray is **pathognomonic** of electrocution.

Clinical features of lightning injury:

- 1. Clothing: torn/ singed.
- 2. Skin:
 - Superficial burn, **Lichtenberg** burn "lightning flower" (**pathognomonic for** <u>lightning</u>).
 - Metallization.
- 3. Cardiac: arrhythmia (V. Fib).
- 4. Neurological:
 - Immediate: pupil dilation/anisocoria (asymmetric pupil size), LOC, amnesia, seizures.
 - Delayed: myelopathy, complex regional pain syndrome.
- 5. Vascular: spasm.
- 6. ENT: tympanic membrane rupture (blast injury).
- 7. Ocular: cataract, retinal detachment.



Lichtenberg

Metallization

Notes:

- The mode of death in electrocution is syncope.
- The most common cause of death is arrhythmias.
- The manner of death is accidental.

