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Case Report:

High voltage electrocution injury – A case report

Sunethra Santosh*, K.Parvathi**

*Post-Graduate Student, ** Professor and Head, Department of Forensic Medicine and Toxicology, Government Medical College Mahabubnagar, Telangana, India

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Correspondence:

Dr Sunetra Santosh
Department of Forensic Medicine and Toxicology,
Government Medical College Mahabubnagar, Telangana, India
Email: sunethrasantosh0494@gmail.com

ORCID: https://orcid.org/0009-0007-7923-5898

Abstract:

High voltage electrical injuries are unusual but show a high mortality rate. Injuries caused by electrocution respect all the known laws of physics and thus are predictable in their manifestations. The passage of substantial electric current through the human body can cause skin lesions, organ damage and even death. Electrical injuries are usually accidental in nature. In this case report discussed the injuries sustained by an adult, due to contact with high tension electrical wire. It is concluded that the cause of death was electrocution induced flame burn injuries.

Introduction: Electrical injury is a physiological reaction caused by electric current passing through the body. The injury depends on the density of the current, tissue resistance and duration of contact. Very small currents may be imperceptible or produce a light tingling sensation. A shock caused by low and otherwise harmless current could startle an individual and cause injury due to jerking away or falling. Stronger currents may cause some degree of discomfort or pain, while more intense currents may induce involuntary muscle contractions, preventing the person from breaking free of the source of electricity. Still larger currents result in tissue damage & may trigger ventricular fibrillation or cardiac arrest. Consequences of injury from electricity may include amputations, bone fractures and orthopedic and musculoskeletal injuries. If death results from an electric shock the cause of death is generally referred to as electrocution.

Case Report: A partly decomposed body of 35-year-old male, mason by occupation was brought for postmortem examination to the mortuary of Government General Hospital, Mahabubnagar. According to the investigating police officer the victim was found dead on the railway track, next to a high-tension electrical wire. Body was dressed in brown full hand shirt and blue pants. He was last seen by his wife 48 hours before the incident. The autopsy revealed the following findings which were observed during external examination:

Body showed signs of decomposition like swelling of face, distended scrotum and skin peeling. Bloodstained discharge seen from nose and mouth.

Antemortem dermo epidermal burns present all over the body except the face and feet. Reddish discoloration of the skin present over the burnt areas. Body showed multiple punched out lesions (crocodile flash burns) over the left side of anterior aspect of

chest, abdomen, both thigh and leg region. Genital region was also involved. Superficial burns with singeing of hair also seen. Blebs were present all over the body. Total body surface area involved in burns was 80%.

On internal examination: All the visceral organs were congested and petechial hemorrhages were seen over the heart. Brain was partially liquified.

Discussion: The cause of death in this case was opined as death due to electrocution. The crocodile flash burns seen in the victim's body is as a result of high voltage electric current which can result in sparking. In high voltage accidents, direct contact with the wire is not necessary. As the body approaches the high voltage line, an electric current may jump from the line to the body. Death from high voltage electrocution is caused by either the electro thermal injury produced by the current, or respiratory arrest. Electrocution from these lines occurs when they break, fall to ground, or is touched by a victim. If burns occur from contact with high voltage electric wire, third degree burns will be present. In contrast to low voltage burns, high voltage burns are extremely severe with charring of body.

The minimum current a human can feel depends on the current type (AC or DC). A person can sense electrical current as low as 1 mA (rms) for 60 Hz AC and as low as 5 mA for DC. At around 10 mA, DC current passing through the arm of a 68-kilogram (150 lb) human can cause powerful muscle contractions; the victim is unable to voluntarily control muscles and cannot release an electrified object. This is known as the "let go threshold" and is a criterion for shock hazard in electrical regulations.

The current may, if it is high enough and is delivered at sufficient voltage, cause tissue damage or fibrillation which can cause cardiac arrest; more than 30 mA of AC or 300–500 mA of DC at high voltage can cause fibrillation. A sustained electric shock from AC at 120 V, 60 Hz is an especially dangerous source of ventricular fibrillation because it usually exceeds the let-go threshold, while not delivering enough initial energy to propel the person away from the source. However, the potential seriousness of the shock depends on paths through the body that the currents take. If the voltage is less than 200 V, then the human skin, more precisely the stratum corneum, is the main contributor to the impedance of the body in the case

of a macroshock—the passing of current between two contact points on the skin. If the voltage is above 450–600 V, then dielectric breakdown of the skin occurs. The protection offered by the skin is lowered by perspiration, and this is accelerated if electricity causes muscles to contract above the let-go threshold for a sustained period of time.

Conclusion: The incidence of high voltage electrical injuries is less frequent compared to other forms of electrical injuries. A detailed history regarding the incident, scene visit and proper postmortem examination with histopathological examination is recommended prior to concluding the cause of death. Proper education and awareness programs for general public regarding electric safety will reduce the number of such cases. Insulating high tension electric wires would insulate life.

Ethical approval

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