

**CASE REPORT****PATHOLOGY AND BIOLOGY**

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**Fatal Electrocution by a Support Metal Wire**

**ABSTRACT:** Electrocution is not an uncommon cause of death. A case of fatal electrocution by a metal wire that was used as a support for the insulated television cable wire is reported. Electric current flowed through the metal wire when it touched the residential power line. Electrical injury caused because of contact with the live metal wire is described with histopathological findings. This case reports the circumstances that led to accidental fatal electrocution in an outdoor setting during the rainy season. Significance of death scene investigation to confirm the cause and manner of death in cases of fatal electrocution is highlighted. Public awareness programs to lay emphasis on electrical safety in domestic environment need to be introduced to prevent fatalities resulting from ignorance and/or negligence.

**KEYWORDS:** forensic science, electrocution, metal wire, scene of death, manner of death, accidental death

Electrocution is not an uncommon cause of death. Deaths mostly occur at the voltage between 100 and 380 V, the voltage range of residential and industrial units. Electrical injury often causes complex injuries with extensive tissue damage and wide-ranging effects upon multiple organ systems. These account for only a few admissions to the burn unit and sometimes present with difficult clinical problems. When a victim is exposed to a fatal electric shock, the lethal arrhythmia usually occurs at the time of electrocution. The mechanism of death is usually considered to be a fatal cardiac arrhythmia, especially ventricular fibrillation. In many cases of fatal accidental electrocution, death occurs very rapidly. The contact duration to produce such fibrillation is in seconds or tenths of a second depending on the current (1). This case is reported to explain the unusual unique circumstances that led to accidental fatal electrocution. Significance of death scene investigation (2,3) to confirm the cause and manner of death in cases of fatal electrocution is highlighted with the unusual circumstances involved in the present case.

**Case Report**

A 36-year-old man who had gone to the backyard of his house to urinate was found dead in the field next to his sister's house. The field was a family disputed land. There was a suspicion of foul play. At autopsy, the body was that of a moderately built and moderately nourished adult man weighing 56 kg and measuring 161 cm

in length. Bluish discoloration of the finger nails was observed. On external examination, an oval shallow crater measuring 3 × 2 cm, with a hard surface and raised margins was present on the outer aspect of the base of the left index finger (Fig. 1). A similar lesion was seen on the right hand (Fig. 1). Multiple craters of varying sizes ranging from 0.5 × 0.5 cm to 1 × 1 cm in size were present on the palmar aspect of the left hand (Fig. 1). Internally, the lungs and brain were edematous. The liver and kidneys were congested. The other internal organs were grossly unremarkable. Postmortem toxicological analyses for agrochemicals, drugs, and substances of abuse were negative. The skin from the lesions was subjected to histopathological examination. The skin showed vacuolation in the epidermis and dermis with cells apart, the cells were elongated with nuclei in the lower layers oriented and horizontally stretched (Fig. 2). At the scene, the dead body was found lying in the field with a long sealed television co-axial cable wire nearby. Death scene investigations revealed that the long television co-axial cable wire was running to his house to which a stay wire was made to run along to get the support (Fig. 3). Because of rains, the stay wire had accidentally cross-connected with the electric supply, and the deceased was electrocuted as soon as he held the co-axial cable wire. Based on autopsy, histopathological, and circumstantial findings, it was concluded that the deceased died of fatal accidental electrocution.

**Discussion**

The majority of electrocution deaths are reported in the home environment, often resulting from faulty apparatus and are relatively more common in adult men. The thermal effects are determined by the cross-sectional area through which the current flows and the duration of current flow, and so cutaneous marks are not found regularly in cases of electrocution death in bathtub (4,5). The density of current is highest at the entry wound with skin resistance, accounting for intense tissue destruction. Electrical burns or

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FIG. 1—Electrical current marks on both hands.

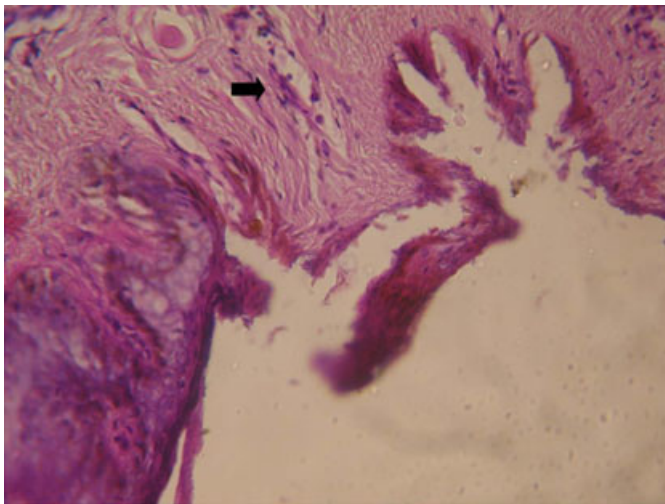


FIG. 2—Streaming of the nuclei at the current site, hematoxylin and eosin, original magnification  $\times 40$ .

current marks have been detected in more than 80% of cases (6). Electrical burns produce characteristic findings of severe thermal denaturation of the collagen. The epidermis is elevated with micro blisters developed within the squamous epithelium as well as in the external horny layer. These are attributed to “cooking effect” of the tissues. In addition, the nuclei of the epidermal cells at the site of an electrical burn show a peculiar distortion with stretching and narrowing of the contour to produce a palisade-type appearance known as “streaming of the nuclei” (7). Electrical victims of low-voltage alternating current may have no electrical burns and absence of systemic findings characteristic of electrocution makes the diagnosis difficult. Even if current marks are distinguished, one has to be careful regarding forensic relevance of the findings (8). In the present case, electrical lesions on both hands were suggestive of the fact that the deceased had held the cable wire with both hands. The observation at the death scene revealed water logging below and near the cable wire, a probable reason why the exit wound could not be defined as the deceased was standing in water.



FIG. 3—Death scene investigations showing the position of the dead body (A), TV cable wire and water logged area beneath the cable wire (B), and the cable wire that got cross-connected with main electrical wire (C).

Accidental electrocution in domestic environment is not uncommon, but suspicion arises when an electrocuted body is found in an open area. Fatalities caused by electrocution often lack specific morphological evidence, and cutaneous current marks may be the only sign of an electrocution death. Final opinion in cases of alleged electrocution is based on the circumstances of death as evidenced from scene of death findings and history obtained by the investigating authority, and the examination of the electrical devices the individual was handling at the time of death, in addition to autopsy findings. Hence, a visit to the scene of death and reconstruction becomes important.

## References

1. James TN, Riddick L, Embry JH. Cardiac abnormalities demonstrated postmortem in four cases of accidental electrocution and their potential significance to nonfatal electrical injuries of the heart. *Am Heart J* 1990;120:143–57.
2. Brandt-Casadevall C, Krompecher T, Mangin P. The reconstruction: a useful tool in forensic sciences. *Med Sci Law* 2001;41:83–6.
3. Schwerd W. Forensic medicine and criminalistics. *Z Rechtsmed* 1989;102:421–8 (Article in German).
4. Hunt JL, Mason AD Jr, Masterson TS, Pruitt BA Jr. The pathophysiology of acute electrical injuries. *J Trauma* 1976;16:335–40.
5. Goodson ME. Electrical induced deaths involving water immersion. *Am J Forensic Med Pathol* 1993;14:330–3.
6. Karger B, Suggeler O, Brinkmann B. Electrocution—autopsy study with emphasis on “electrical petechiae.” *Forensic Sci Int* 2002;126:210–3.
7. Fischer RS. Electrical and lightning injuries. In: Spitz WU, Fischer RS, editors. *Medicolegal investigation of death—guidelines for the application of pathology to crime investigation*, 2nd edn. Philadelphia, PA: Charles C. Thomas, 1980;367–76.
8. Anders S, Matschke J, Tsokos M. Internal current mark in a case of suicide by electrocution. *Am J Forensic Med Pathol* 2001;22:370–3.

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