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Case Report:

Electrocution Fatality Without an Exit Wound: A Medicolegal Forensic Challenge

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Abstract: Electrocution is an established cause of sudden, accidental, and occasionally homicidal or suicidal death. The classical presentation involves both an entry and an exit wound, reflecting the passage of electrical current through body tissues. However, atypical presentations lacking an identifiable exit wound are encountered in clinical and medicolegal practice and may present a significant diagnostic challenge. We report the case of a 35-year-old male who was found unresponsive adjacent to a domestic electrical circuit box following a domestic altercation and was declared brought-dead upon arrival at a tertiary care centre. Medico-legal autopsy revealed two linear crater-like electrical burn marks consistent with entry wounds on the inner aspect of the left forearm, with complete absence of any identifiable exit wound externally or at internal examination. Internal findings included petechial hemorrhages in the myocardium and subcortical brain regions, and diffuse pallor of visceral organs. Histopathological examination of the burn wound

demonstrated coagulative necrosis with nuclear streaming, confirmatory of an electrical burn. Toxicological analysis revealed elevated blood alcohol levels consistent with acute intoxication, while no other toxic agents were detected. The cause of death was certified as death due to electrocution. This case underscores the importance of a systematic and comprehensive forensic autopsy protocol, supported by histopathological and toxicological investigations, in confirming electrocution as the cause of death even in the absence of classic bilateral wound indicators. Forensic pathologists should maintain a high index of suspicion for electrical fatality in cases with incomplete wound patterns, integrating scene circumstances, wound morphology, and ancillary investigations.

Keywords: Electrocution; Electrical injury; Entry wound; Exit wound; Forensic autopsy; Sudden death; Medicolegal investigation; Petechial hemorrhage; Histopathology

Introduction:

Electrocution, defined as death or serious injury resulting from

the passage of electric current through the body, remains an important cause of accidental death in both domestic and occupational environments globally (Al Bayat et al., 2025). Deaths attributable to electrical injury are reported across all age groups, with a predominance among young adult males engaged in manual or industrial occupations (Koumbourlis, 2002). The forensic significance of such deaths is heightened by the variable and often subtle nature of the post-mortem findings. The pathophysiological mechanism underlying electrical death primarily involves the induction of ventricular fibrillation when current traverses the myocardium, or respiratory failure secondary to tetanic paralysis of the respiratory musculature (Lee, 1997). The severity of injury and the resulting tissue damage are determined by several interacting variables, including the type and magnitude of current (alternating versus direct), the applied voltage, the resistance of the body tissues traversed, the duration of contact, and the anatomical pathway of current flow through the body (Lee, 1997; Saukko & Knight, 2015). In the classical presentation of electrocution, the passage of current through the body produces a definable entry wound

at the point of initial contact and an exit wound at the point of earthing or grounding (Saukko & Knight, 2015). Entry wounds characteristically appear as well-demarcated, crater-like or punched-out burn marks with a metallic rim and peripheral pallor, while exit wounds are typically broader, irregular, and may present with explosive tissue disruption. The presence of both wound types constitutes important physical evidence confirming the completion of an electrical circuit through the body and is often central to medicolegal certification of death (Shkrum & Ramsay, 2007). However, the absence of an exit wound, though uncommon, has been documented in the forensic pathology literature and represents a significant diagnostic challenge (Amadasi, 2021; Mondello et al., 2018). In such cases, the absence of the expected exit mark may lead to ambiguity regarding the cause of death and may prompt consideration of alternative explanations, including blunt force trauma, poisoning, or acute cardiac events (Spies & Trohman, 2006). Establishing electrocution as the cause of death in the absence of bilateral wounds therefore requires meticulous autopsy technique, ancillary investigations, and careful correlation with scene findings and witness accounts.

We present a forensic case of electrocution in a 35-year-old intoxicated male, in which classical entry wounds were identified but no exit wound was demonstrable, and discuss the pathophysiological explanations for this atypical presentation, the differential diagnostic considerations, and the medicolegal implications.

CASE REPORT: Scene History and Circumstances.

A 35-year-old male, with a reported history of alcohol consumption on the evening of the incident, became involved in a domestic altercation with his wife and children at approximately 21:00 hours in late April 2024. The incident occurred in the verandah of the family residence. During the altercation, the individual was reported to have physically assaulted his wife and children. The family members fled indoors and secured the door. Shortly thereafter, the deceased was heard to fall silent.

After a brief interval, family members reopened the door and found the deceased lying unresponsive in the verandah area, in close proximity to a domestic electrical circuit box. Emergency transport to a nearby tertiary care facility was arranged; however, the individual was declared brought-dead upon arrival. A medicolegal autopsy was conducted the following morning under the

provisions of the medicolegal system.

Autopsy Findings: External Examination

- The deceased was a moderately built and moderately nourished adult male.
- Rigor mortis was in the process of developing in all four limbs at the time of examination.
- Livor mortis was present and fixed over the dorsal aspect of the body, consistent with the described scene position.
- General pallor of the body surface was observed. (Figure 1)
- Bilateral conjunctival congestion was noted.
- Electrical Entry Wounds: Two linear, crater-like burn marks, with peripheral pallor and a metallic discolouration of the wound margins, consistent with high-resistance electrical entry injuries, were identified on the inner (medial) aspect of the left forearm in its upper third. (Figure 2)
- No identifiable electrical exit wounds were found on any surface of the body, including the plantar aspects of the feet, the dorsum of the feet, the perineum, or any other potential earthing sites.
- No other external injuries – including blunt trauma, incised wounds, or abrasions – were identified.

Internal Examination:

- All internal organs and viscera exhibited diffuse pallor, consistent with cardiovascular

collapse and peripheral circulatory failure.

- The heart demonstrated multiple petechial hemorrhages distributed across the myocardium, indicative of microvascular disruption secondary to electrical current passage.

- The brain exhibited petechial hemorrhages, most prominently within the subcortical white matter regions, consistent with electrocution-related cerebrovascular injury. (Figure 3)

- No macroscopic evidence of structural cardiac disease, coronary artery disease, or valvular abnormality was identified.

- No evidence of blunt force trauma, internal organ lacerations, or haemorrhagic lesions attributable to injury was found in any other organ system.

- No internal burn injuries, electrical arcing lesions, or evidence of internal current exit pathways were identified at any anatomical site.

Toxicological Analysis

- Qualitative and quantitative analysis of post-mortem blood samples revealed elevated blood alcohol concentration, consistent with acute alcohol intoxication at the time of death.

- Comprehensive toxicological screening of visceral samples (liver, kidney, stomach

contents, vitreous humor) was negative for all other toxic substances, including common prescription medications, drugs of abuse, organophosphate compounds, and rodenticides.

Histopathological Examination

- Histological sections taken from the skin at the burn wound site demonstrated coagulative necrosis of the epidermis and superficial dermis, accompanied by nuclear streaming (nuclear elongation and polarisation in the direction of current flow), a pathognomonic feature of electrical burn injury (Shkrum & Ramsay, 2007). These changes confirmed the wound to be an electrically-induced burn rather than a thermal or chemical injury.

Cause and Manner of Death

Cause of Death: Death due to Electrocution

Manner of Death: Accidental

DISCUSSION

Electrical injuries present along a wide spectrum of severity, from minor superficial burns to immediate cardiac death, and their investigation constitutes a recognized area of complexity in forensic pathology (Spies & Trohman, 2006; Al Bayat et al., 2025). The cardinal post-mortem findings in electrocution – entry and exit wounds, visceral congestion, petechial hemorrhages, and pulmonary oedema – are often absent or attenuated, particularly in deaths resulting

from low-voltage domestic electrical sources (Lee, 1997). In this case, the complete absence of an exit wound in the context of clearly identifiable entry wounds presented the primary medicolegal diagnostic challenge.

Several pathophysiological mechanisms may account for the absence of a visible exit wound in this case. The most plausible explanation relates to the grounding conditions at the time of the incident. First, if the deceased was in contact with a moist or wet surface – a scenario consistent with the outdoor verandah setting – the electrical current may have dissipated diffusely across a large surface area rather than concentrating at a discrete exit point, thereby precluding the formation of a classical exit burn (Jain & Bandi, 1999).

Second, at relatively low voltages (as typically encountered in domestic settings of 220-240 V), the current density at the grounding site may be insufficient to produce a visible tissue burn, particularly if contact time is brief or the ground interface is broadly distributed (Fish, 1993). Exit wounds are generally more prominent in high-voltage injuries and may be absent or microscopically subtle in low-voltage fatalities.

Third, the presence of acute alcohol intoxication – as

confirmed by toxicological analysis – is of considerable forensic relevance. Alcohol intoxication diminishes pain perception, reduces the withdrawal reflex, and impairs the volitional capacity to disengage from an electrical source. This pharmacological effect may prolong involuntary contact with a live conductor, facilitating sustained deep thermal injury at the entry site whilst the exit pathway through diffuse grounding produces no macroscopic change (Dokov & Dokova, 2011).

The internal post-mortem findings in this case are consistent with the electrocution mechanism of death. Petechial hemorrhages in the myocardium and subcortical cerebral white matter are attributed to electrocution-induced vasospasm, generalised seizure activity, or direct capillary disruption by the electrical current (Spitz & Fisher, 2006). Visceral pallor reflects circulatory collapse subsequent to the induction of a fatal arrhythmia – most likely ventricular fibrillation – which represents the most common immediate cause of death in electrical fatalities (Koumbourlis, 2002).

The histopathological findings of coagulative necrosis and nuclear streaming at the entry wound site are highly specific markers of electrical injury and

serve as important corroborative evidence when external wound morphology is equivocal or when decomposition has altered the gross appearance of wounds (Mondello et al., 2018; Shkrum & Ramsay, 2007). These features distinguish electrical burns from thermal burns, abrasion artefacts, and post-mortem changes.

The differential diagnosis in a case of sudden death in an intoxicated individual following a domestic altercation must include acute cardiac event, blunt force trauma, and acute poisoning. In the present case, toxicological screening excluded poisoning; careful external and internal examination excluded traumatic injury; and the absence of coronary artery disease or structural cardiac pathology made a primary cardiac event improbable as the sole cause of death. The combination of characteristic entry wound morphology, confirmatory histopathology, scene evidence of proximity to a live electrical source, and consistent internal findings collectively established electrocution as the sole cause of death (DiMaio & DiMaio, 2001; Spies & Trohman, 2006).

The published literature contains a number of comparable cases in which exit wounds were absent or indistinct (Koumbourlis, 2002; Mondello et al., 2018; Dechent et al.,

2020), supporting the contention that the absence of an exit wound does not exclude electrocution as the cause of death and should not lead the forensic pathologist to abandon this diagnosis. Indeed, such cases highlight the essential role of systematic autopsy protocols, histopathological ancillary investigations, and thorough scene assessment in the accurate medicolegal determination of cause of death.

CONCLUSION: This case illustrates the atypical but well-documented presentation of fatal electrocution in the absence of an identifiable exit wound, arising in the context of domestic electrical exposure compounded by acute alcohol intoxication. The case reinforces several important principles in forensic pathology practice: the diagnosis of electrocution does not require the presence of both entry and exit wounds; grounding conditions, voltage magnitude, and the physiological state of the decedent significantly influence wound expression; and histopathological examination is indispensable in confirming the electrical aetiology of a wound when gross morphology is incomplete.

Forensic pathologists must maintain a systematic and analytically rigorous approach when confronted with cases of sudden unexpected death in which

the injury pattern is incomplete or atypical. The integration of detailed scene investigation, careful external and internal autopsy findings, histopathology, and toxicology remains the cornerstone of accurate medicolegal certification in such challenging cases. Reporting atypical presentations of electrocution in the peer-reviewed literature contributes to expanding the evidentiary and experiential base available to forensic practitioners.

Ethical Statement: This case report was prepared in accordance with institutional medicolegal protocols. No patient-identifying information is disclosed. The authors confirm that written consent for publication was not required given the medicolegal nature of the case, and all data were anonymised prior to reporting.
Conflicts of Interest: The authors declare no conflicts of interest.

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FIGURE LEGENDS

Figure 1. Post-mortem external examination: General pallor of the body surface is evident with bilateral conjunctival congestion, consistent with

circulatory collapse secondary to cardiac arrhythmia.

Figure 2. Entry wounds: Two discrete linear crater-like burn marks with peripheral pallor and marginal metallic discoloration on the medial aspect of the left forearm (upper third), consistent with electrical entry injuries at the point of contact with the live conductor.

Figure 3. Post-mortem neuropathology: Coronal section of the brain demonstrating multiple petechial hemorrhages distributed within the subcortical white matter, a recognized finding in electrocution fatalities.

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Fig 1 : Shows pale body with facial congestion



Figure 2 : Shows two linear crater-like burn marks, consistent with electrical entry injuries, were observed on the inner aspect of the left forearm at its upper 3rd



Figure 3 : The brain shows petechial hemorrhages, particularly in the subcortical region.

