

A Case Series Analysis of Suicides by Electrocutation: A Disturbing Trend among Individuals Proficient in Electrical Circuits**Saagar Singh^{1*}, Rajesh Kumar Dhakar², Sangita Chaurasia³**¹Senior Resident, Department of Forensic Medicine and Toxicology, Government Medical College, Ratlam, Madhya Pradesh, India²P. G. Medical Officer, Department of Forensic Medicine and Toxicology, District Hospital, Hoshangabad, Madhya Pradesh, India³Assistant Professor, Department of Forensic medicine and Toxicology, GMC, Bhopal, Madhya Pradesh, India

Received: 18-12-2023 / Revised: 21-01-2024 / Accepted: 26-02-2024

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Conflict of interest: Nil

Abstract:

Suicide is termed as deliberate taking of one's own life. Suicides are typically conducted in a short and relatively painless kind of way. At times, person chooses means that are rather uncommon and unheard of, to end his life. This case series aims to explore a concerning trend in suicide methodology, specifically focusing on individuals with a background in electrical circuits who choose electrocution as the means to end their lives. The objective is to understand the demographic characteristics, psychological profiles, and potential contributing factors associated with this unique method of suicide. A retrospective analysis was conducted on a series of four suicide cases involving electrocution, utilizing data from forensic reports. And personal history. The study population was limited to individuals with a documented expertise in electrical circuits, ranging from professionals in the field to hobbyists and enthusiasts. Autopsy showed peculiar body gesture and typical electrocution burn marks. Histopathology of cutaneous electrocution burnt lesions showed separation of epidermis, coagulation necrosis and oedema of dermis, congested and thrombosed blood vessels suggestive of antemortem sign. This case series sheds light on a concerning phenomenon within the realm of suicide, emphasizing the need for targeted prevention strategies and mental health interventions for individuals with specialized knowledge in electrical circuits. The methods adopted and the atypical findings make this case series a rare scientific report.

Keywords: Electrocutation, Suicide, Autopsy, Histopathology.

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Introduction

Electrocution is described as the death or significant injury caused by the electric shock from an electrical current. The term is derived from the two words "electro" and "execution," however it can also refer to an unfortunate event. [1] In 1889, the term "electrocution" was conceived in the United States, immediately before the first ever implementation of the electric chair execution. "Electrocution" quickly gained over as a description of all situations of electrical death caused by modern commercialized electricity, but there was no official name for non-judicial fatalities caused by electric shock. [2]

According to NCRB, about 1.1 lakh individuals died as a result of electrocution between 2011 and 2020, the most recent year for which numbers are available. This equals to around 11,000 deaths annually, or 30 deaths per day. [3] The medical danger of an electric current traveling through the

body is dependent not only on the voltage but also on the current's amount and duration of flow. Skin has a high electrical impedance when it is dry and needs a high voltage to flow through and thus producing electrocution mark on the skin. [4] The only evidence of electrical damage is an electrocution burn mark, almost always present in a high voltage electrocution, and about 50% of low voltage line electrocution deaths.

Electrocution marks have an irregular rounded shape. In some cases, they can be obscured by skin folds, hair, calluses on the hands, or the same skin burns caused by arc flashes or clothing burns. [5] Suicide is termed as deliberate taking of one's own life. Suicides are typically conducted in a short and relatively painless kind of way. At times, person chooses means that are rather uncommon and unheard of, to end his life. Accidental electrocution leads to a significant quantity of morbidity and fatal

outcomes. But a suicidal death by electrocution is not very common. We present a case series of 4 cases, all males in the age range of 20 to 45 years. One student by profession other self-employed but all of them having considerable knowledge of how electrical systems work. All four committed suicide by electrocution with a planned manner by constructing an electrical circuit by tying two naked electrical wires on a single or both the wrists and another end of wire was connected to the main household power line. Such mechanism of proper usage of knowledge of electric circuits for suicide is rare especially where there were no such previous attempts.

Case Presentations:

Case 1: A 20-year-old male, student was found dead inside a room of rented house, door of which was latched from inside. On barging into the room, body was found lying on a bedding placed on the floor, with electrical wires tied around his both wrists and a plug attached to the socket of main power line in the wall nearby. One foot of the person was placed on the broom present just over the plug to constantly maintain pressure on the plug. The case was transferred to the morgue of Gandhi Medical College in Bhopal the next day for medico-legal autopsy.

As per the relatives, the boy had no history of mental illness or medication, rather was going for some higher study course the very next day, and was sighted in and good mood all day before. Body was subjected for post-mortem examination.

Case 2: A 34-year-old male, farmer by profession was found dead at his farm in the early morning hours. The body was discovered by his 11 years old son when his father did not return from the farm. He had left for watering the crops the last night at around 9 PM. He was supposed to switch on the water pump for about an hour and come back, the next morning he was found dead lying by the side of the motor pump with a naked wire wrapped around his left wrist and pliers was present on the ground nearby.

The wire was still electrically active when discovered by his younger brother and wife. The case was brought to the mortuary of Gandhi Medical College, Bhopal by same afternoon for medico legal autopsy. A suicide note was later found in his pocket stating monetary problems and history of depression was reported by his relatives. Upon enquiry with the relatives, they revealed that he also used to do some electrical and construction job for some additional income.

Case 3: A 45-year-old male electrician was brought dead to the casualty by his landlord in the late winter nights. The landlord had broken down his tenant's bathroom door where he found the

deceased lying face down and a live conducting wire connected to his both wrists. He had a history of recent personal stressors, including a marital discord and some unconfirmed financial difficulties. All friends and family reported that despite multiple attempts to offer support, he exhibited signs of profound hopelessness and despair. One evening, after a heated argument with his spouse about meeting his kids, he was found unresponsive in his bathroom. No suicide note was found upon searching the premises. Friends noticed his withdrawal from social interactions and increased alcohol consumption. His right wrist was noted to have a linear pattern of electrocution mark, along with asphyxia signs of death. Police later brought into light a makeshift two pin plug and electrical wire circuit was discovered from the bathroom, where the body was discovered.

Case 4: A 38-year-old male, electrician and shop owner by profession married with two children, was found deceased in his home by his wife. He had a history of chronic depression and recent financial strain due to mounting debts and reduced work opportunities post COVID pandemic. His wife reported that he had been increasingly withdrawn and irritable in the weeks leading up to his death. Despite seeking help from a therapist, he continued to express lowly feelings. On the day of his suicide, he left a note expressing guilt over his inability to provide for his family and a sense of being a burden. He was found in his shop with a electrical circuit made out of an electric heating rod without any plug with naked wires taped to the wall socket.

Autopsy Findings: The common autopsy findings were that the bodies were of average built. Rigor mortis was present all over the bodies and hypostasis was present over the back and fixed. The bodies were cold to touch. Both upper limbs were flexed at the elbows, the left hand was placed over the chest and fingers partially clenched while the right upper limb was abducted at shoulder level and hand was clenched in two of the cases. Fingernails were bluish in colour.

No external injuries were seen all over the bod except electric burn marks just underneath to wire tied around both wrists. Two electric wires were tied on each wrist by naked grey metallic wires and twisted upon to each other and other free end has a two-pin plug in two of the cases, the second and fourth case didn't have the plug but only loose wire attached to the socket.

On removing the wires just underneath area was showing electrocution burn marks corresponding to the electric wires were present over the lateral and medial aspects of left wrist, and around the right wrist joint respectively. Marks were in the form of shallow groove, dark reddish brown in colour, hard

to touch, margins blanched and rounded with peripheral hyperaemia present. [Figure 2]

On internal examination all visceral organ were congested and multiple petechial haemorrhages were present at places which were more obvious on the surface of heart and subpleural haemorrhages. Diaphragm was at the level of third to fourth intercostal space in all of the cases. Cutaneous tissue samples from the electrocution burn marks and surrounding healthy skin were preserved in 10 % formalin solution, slides were prepared, stained with H&E and examined under optical microscope.

Histological changes in the burned skin corresponding to the second and third degree local burns. Finding showed epidermal separation, epidermal cell necrosis and dermal oedema, dilated and congested blood vessels with necrosis of epidermal cells, coagulation necrosis of subepidermal soft tissues, which were consistent with antemortem sign. [Figure 2]

Histochemical colour tests confirmed specific electrical conductor (copper and iron). Death was opined as due to electrocution and time since death prior to post mortem examination within 24 hours.



Figure 1: A. Presentation of the body to the mortuary. B. Crime scene image showing naked wire tied around both wrists and a two-pin plug at another end present in situ. C. Crime scene image showing naked wire tied around the left wrist and a plier present in situ. D. Crime scene image showing naked wire tied around the left wrist.



Figure 2: A Toes of both feet showing sustained spasm with crossing over of great toes. B. Electrocution marks present over right wrist ventral aspect in a pattern of wire tied around the wrist. C. Electrocution marks present over left wrist ventral aspect in a pattern of wire tied around the wrist. D. Electrocution marks present over right wrist dorsal aspect in a pattern of wire tied around the wrist.

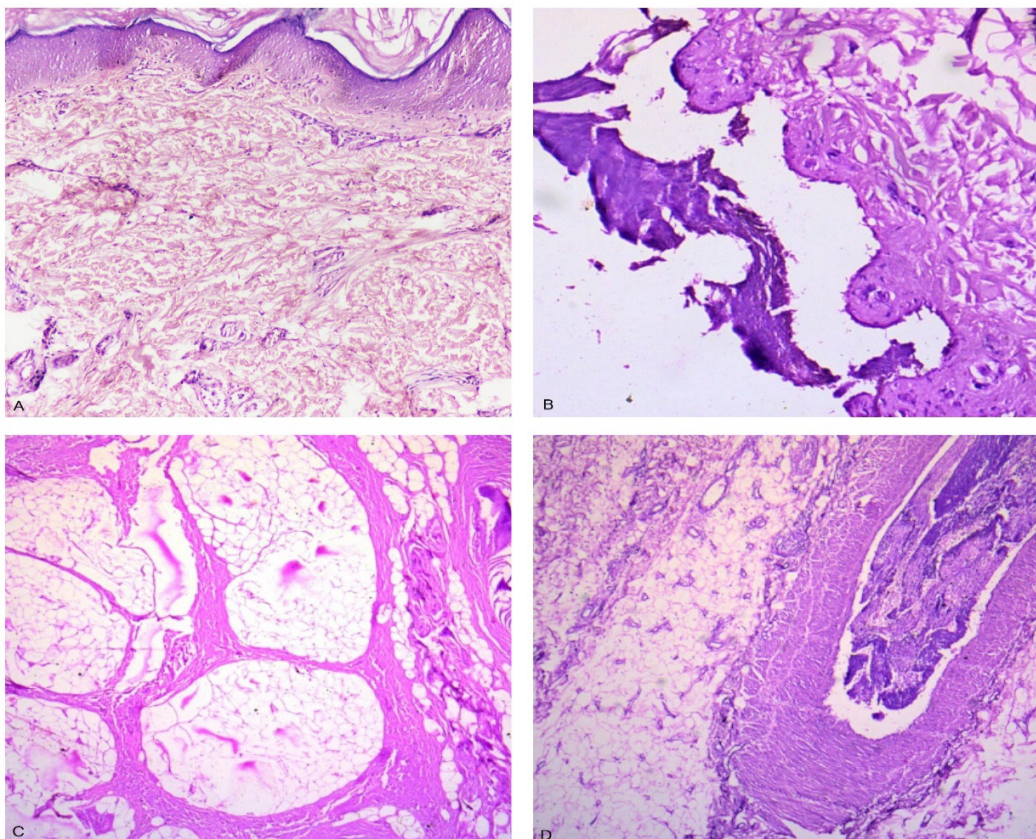


Figure 3: Photomicrograph showing A. Histology of normal skin B. intra epidermal and sub-epidermal separation of cells Dilated and congested thrombosed blood vessels with necrosis of epidermal cells 200x. C. Edematous coagulation necrosis of subepidermal soft tissues and damage to epidermal cells 10x. D. Epidermal separation, epidermal cell necrosis and dermal edema 200x.

Discussion and conclusion: Most reported electrocution fatalities are accidental, and involve high-voltage currents. Electrocution being used as suicide is a rare occurrence. In these particular cases the decedents had positioned them on the floor or near the wall socket, tied the naked electrical wires over both wrists and another end connected to the main power line of AC current. The findings of crime scene, position, method, and manner adopted by the decedents were unique and clarified the intent in the cases. In, some foreign countries, where judicial electrocutions are performed, metal straps are applied to the hands and feet of the condemned prisoner.

In all of these situations, all of the persons had sought to imitate the posture of judicial electrocution. In a documented instance, a deceased individual had put a metallic coin on his chest.[6] Circuits from any of the limbs to the head include the brain stem and upper cervical cord; arm-to-arm circuits can likewise utilize the upper cervical cord. Arm-to-arm or left arm-to-leg circuits can affect the heart, resulting in death due to ventricular fibrillation or cardiac arrest without fibrillation. [7] Compared to bone, tendon, and fat, blood vessels, muscles, and nerves have lower resistance and are superior electrical conductors.[8]

The most frequent findings in electrical lesion in intraepidermal separation, while naked flame burns sub epidermal separation is most common, a mixture of the two is most likely caused by electricity.[9] Upon histopathological examination and optical microscopy of the skin tissue from the wrists, finding showed epidermal separation, epidermal cell necrosis and dermal oedema, dilated and congested vessels with necrosis of epidermal cells, coagulation necrosis of subepidermal soft tissues, which were consistent with antemortem nature. Histochemical colour tests also confirmed specific electrical conductor. A similar case report was found upon extensive literature research from Bhosale A. A. et.al a 53-year-old person at a laundry facility was discovered unconscious and tied up at the wrists with uninsulated copper wire from the iron's power cord, which was linked to a 15 Ampere source of alternating current with a voltage range of 220-240 Volts was reported.[10]

The case series reveals a distinct subset of suicide cases where individuals with knowledge of electrical circuits opt for electrocution as a method of self-harm. Demographic patterns, including age, gender, and professional background, were identified. The analysis also explores potential psychosocial factors such as mental health conditions, personal stressors, and societal influences that may contribute to the choice of this method. In forensic medical work, electrocution is generally unintentional and accidental, electricity is

not frequently utilized in committing suicide. The final opinion in these cases of alleged electrocution and determination of manner by suicide was 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 wire. Hence, a visit to the scene of death and reconstruction becomes important.

Authors' Contribution: All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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