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AN ADVENTURE WENT WRONG: ELECTRIC BURN BY RAILWAY OVERHEAD LINES. - A CASE REPORT

Forensic Medicine

Dr. Pradeep C Post Graduate Student, Department of Forensic Medicine, Maulana Azad Medical College, New Delhi.

Dr. Santhosh Kumar R Post Graduate Student, Department of Forensic Medicine, Maulana Azad Medical College, New Delhi.

Dr. Pavan Post Graduate Student, Department of Forensic Medicine, Maulana Azad Medical College, New Delhi.

Dr. Sunil Naagar Director Professor and Head, Department of Forensic Medicine, Maulana Azad Medical College, New Delhi.

Dr. Neha Gupta Assistant Professor, Department of Forensic Medicine, Maulana Azad Medical College, New Delhi.

ABSTRACT

Taking selfies over fast-moving trains is irresponsible to many people. To the riders themselves, this thrill-seeking, risky activity means being brave, fearless, skilled, and talented at riding, dancing, facing fear, showing courage, and earning status through surviving a fast-moving train. After getting some adrenaline, they have a risk of getting serious injuries. Electrical injuries gave small but significant fractions to all burn trauma cases. That too, in an even smaller proportion to those that are lethal. The rates of death due to accident among teenagers are the highest of all age-groups. The government should take strict action against the tress passers and proper medical care should be given to those victims. We can reduce this type of unnecessary accidental events by creating some awareness about the consequences of high voltage electric burns.

KEYWORDS

INTRODUCTION

Where a huge quantity of electrical current passes via the tissues, it can result in skin lesions and damage to organs and even death. Such types of injuries are generally called electrocution. The extent of the severity of the damages to the tissues depends upon the time duration, voltage, respiratory arrest and current. Death can happen because of cardiac arrhythmias, respiratory arrest and non-electrical traumas. In high voltage current death occurs due to arching of electric current or due to ignition of clothes, sometimes the person sustains burn injuries and thrown off from the site and sustain injury due to fall. Delayed death may involve unconsciousness, circulatory and respiratory failure, it may occur days later due to infection or haemorrhage from the damaged vessels.

Case Details

The case is of a 14-year-young boy and his two friends who started an adventure journey from Shahdara to Old Delhi railway station. During the travel, the boy climbed onto the roof of the train for taking a selfie, and he was electrocuted and fell down. He was taken to Aruna Asif Ali Govt Hospital for first aid, from where he was referred to Lok Nayak Hospital. The general physical examination revealed drowsiness, his BP was 80/50 mmHg, PR-130/min, and SpO2-99%. The Electrolyte study shows Na-124 mmol/L, K-5.6 mmol/L, Ca-0.88mmol/L. Clothes were burnt with peeling of skin involving about 60 to 70 % of body surface area. He died during the course of treatment after four days of survival. Body was sent to Maulana Azad Medical College Mortuary for medico legal examination.

Autopsy Findings

On autopsy externally dermo-epidermal flame burns involving more than 60 % to 70 % of body surface area present over lower half of face both side of trunk, both hand abdomen and thighs. Electric contact wound present on both palms and exit wound present over the sole of foot. Internally multiple petechial haemorrhage present over both lungs. Both lungs were congested and edematous. About 70 ml of fluid is present in the pericardium, and the heart looks congested. Petechial hemorrhage presents over the anterior surface of the heart. About 300 ml yellowish fluid present in the peritoneal cavity. All the solid organs show congestion. Blood extravasation present over the bilateral frontal and parietal region.

Dermo epidermal flame burns involving more than 60 % to 70 % of body surface area.

Entry wound Exit wound

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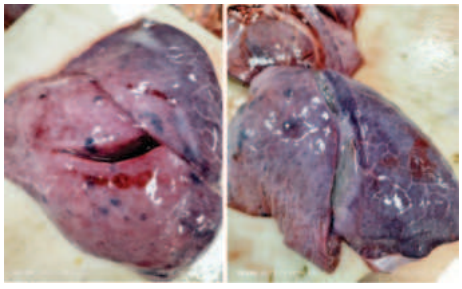
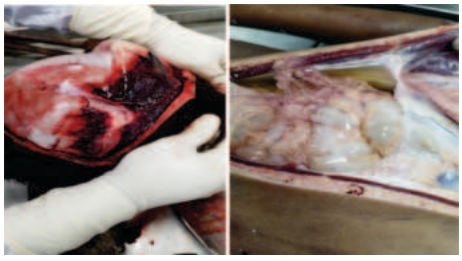
70 ml of fluid present in pericardium and heart looks congested and petechial hemorrhage presents over the anterior surface of the heart.



Multiple petechial haemorrhage present over both lungs. Both lungs were congested and edematous



Extravasation of blood present over the bilateral frontal and parietal region. About 300 ml yellowish fluid present in the peritoneal cavity.

Opinion: Death in this case occurred due to "Septicemic shock as a result of antemortem flame burns secondary to electric shock, involving around 60% to 70% total body surface area. All the injuries are antemortem in nature".

DISCUSSION

Electric shocks are an especially dangerous form of heat injury that occurs when electricity changes, into heat while moving through the body tissues of just causing surface burns, like other types of burns. However, their effects can go beyond superficial skin damage to impact muscles nerves and organs further inside depending upon how severe the electric shock is. The damage caused by electric shocks may not be readily visible because it can happen beneath the skin surface with the full extent sometimes only becoming clear after several days. Electric burns are especially risky and hard to evaluate at glance because they occur when electrical energy is transformed into heat, inside the body upon exposure to flow through the body tissues causing burns that can be similar to those caused by flames or other heat sources at the points of entry and exit as well as, along the current pathway. High-voltage burns are generally more serious and often produce extensive tissue destruction. The injuries may result in charring of the skin and deeper tissues where there is concentration of electrical current, especially at entrance and exit points. One of the most dangerous aspects of high-tension electrical injuries is that they can result not only from direct contact with the electrical source but also from flash or flame exposure. Flash burns occur when an electrical arc, or sudden discharge of electricity, produces extreme heat in the air, which can cause burns similar to thermal burns without the individual actually touching the electrical source. These types of burns can affect large areas of the body in a matter of seconds and often involve both the skin and deeper tissues. In addition to burns, high-tension electrical injuries can cause more catastrophic damage. The heat generated by the electrical current can destroy soft tissues such as muscles, nerves, and blood vessels, leading to complications such as tissue necrosis, infection, and amputation. In extreme cases, electrical burns can result in the loss of extremities or severe internal injuries, including the rupture of organs. This occurs when the electrical current passes through the body and causes explosive-like injuries, as tissues are damaged from the inside out. Another alarming feature of electrical burns is their potential to produce injuries that mimic those caused by blast forces or sharp objects. The sudden, intense nature of an electrical arc or current can create an explosive blast-like effect, resulting in wounds that resemble bullet, stab, or incised wounds. These injuries are particularly deceptive because they are often not recognized as electrical burns initially. This may lead to delay or inappropriate treatment. Electrical burn injuries are complex to manage, since the damage is very extensive and generally involves all systems of the body. Complications for patients with electrical burns include cardiac arrhythmias, respiratory distress, and metabolic disturbances since the normal activity of the body is disrupted by the passage of electrical current. Treatment may involve, but is not limited to, the obvious burn injuries to include monitoring and managing internal damage not immediately visible or superficial. Histopathological study may show some cellular patterns which can be pathognomonic in nature for certain conditions and injuries and the cell nuclei aligned in parallel rows.

The presence of metallic deposits due to accident or deliberate ingestion requires the use of sophisticated technique. Detection and analysis can be carried out by chemical, histochemical, and spectroscopic techniques. One common method of detection includes Atomic Absorption Spectroscopy (AAS), wherein traces of not just one but several metals can be determined with great accuracy; hence, this technique has become an indispensable tool in forensic and toxicological analysis. Another technique that is rather in common usage is the Energy Dispersive X-ray (EDX) microanalysis, especially in identifying metallic elements such as titanium in tissues. In fact, EDX is quite powerful at identifying well-defined metallic particles within biological specimens and yields comprehensive data on their elemental composition. This technique is widely applied in forensic analyses as well as in medical diagnoses when traces of metals have to be identified and analysed. Apart from AAS and EDX, fluorescent techniques enable non-destructive detection of traces of metal on clothes or any other surfaces. Sprinkling a 2% solution of 8-hydroxyquinoline allows immediate visualization under an ultraviolet lamp. For this reason, this technique becomes important in forensic science to locate metallic residues in clothes, instruments, or surfaces that could have taken part in criminal actions or accidents, including metals.

Each of these techniques represents a source of information about metallic contamination in biological tissues or on items and all have considerably contributed to medical and forensic areas. Moreover, they are essential in the study of the level and character of exposure to metals, which is highly necessary in the diagnosis of conditions related to metals, the investigation of crimes, or even in the identification of environmental hazards.

CONCLUSION

To sum up things up nicely; electric burns present a hazardous type of harm that can inflict harm to tissues—be it apparent or concealed damage caused by them is difficult to identify and manage properly; it necessitates thorough medical assessment and ongoing attention to tackle both the instant and delayed consequences of the injury.

Electrical injuries represent a small percentage of all burn traumas; however, they are a significant contribution to the total number of patients seen. Although most electrical injuries do not result in death, they are an important concern in trauma care. These electrical injuries result in just a handful of them being fatal, yet it is a great divisor in the effects among those exposed to these, along with long-lasting physical and psychological consequences. It is one of the top causes for accidental deaths due to electrical injury for all age groups, more so for teenagers. This could be due to various reasons, such as risk-taking behaviour, curiosity, or possibly the ignorance of certain individuals regarding the dangers associated with a high-voltage environment. Keeping this in mind, it is up to the government and the concerned individual to ensure that incidents of this nature are not frequent.

First, there should be stricter rules and sanctions for trespassing into places where there is a highly hazardous electrical environment, such as a substation or a construction site. These would, on the one hand, deter unsuspecting individuals from putting themselves in harm's way. Besides punitive actions, there must be ways of proper medical attention for electric-injury victims, such that immediate expert care

could be provided to reduce the extent of their injuries. Swift intervention is very important to reduce the long-lasting effects such burns may cause, which in some cases could be complications like organ failure or neurological deficits.

The other important way of trying to approach the problem of electrical injuries has to do with the diffusion of public awareness and education. Most of these accidents are preventable with knowledge and understanding. The number of such occurrences would be vastly reduced through campaigns emphasizing the dangers involved with a high-voltage environment, especially among younger people. All awareness drives should promote compliance with safety measures and the recognition of warning signs around high voltage machinery. Using barriers or warning mechanisms in the design can be done simultaneously with such programs to prevent these types of accidents. In the final analysis, electrical injuries among many teenagers can be minimized or considerably reduced through various combinations of government action, proper medical interventions, and public awareness

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