

Post-Electric Burn Blisters in a Child: A Case Report

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Abstract

Electrical burn injuries are few of the most devastating injuries seen in the emergency room. We report the case of a 4-year-old child, weighing 15 kg who presented in the Paediatric Emergency Room of Abbasi Shaheed Hospital with loss of consciousness. He had a history of touching a broken electric wire of unknown voltage and fell to the ground few hours before being taken to the hospital. Central nervous system examination showed a Glasgow Coma Scale score of 10/15, bilateral mute planters and decreased tone in all four limbs. Upon local examination, 4 small black-yellow lesions almost 2 cm in size and in the form of blisters were seen on his left palm. The child was successfully managed in the Paediatric Intensive Care Unit of Abbasi Shaheed Hospital. This case is noticeable as its complications are disastrous. Our case study highlights the importance of early diagnosis and proper management which is vital to prevent long term damage in electrical burn victims.

Keywords: Electrical injury, burns, blister, paediatric, electrical burn.

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Introduction

A burn is an injury which is caused by heat or flame; there are multiple causes of burn injury which includes heat, electricity, chemical(s), light, radiation and friction. The World Health Organization estimates that the lifetime incidence of severe burns is 1%¹ and that more than 300,000 people die annually from fire-related burns worldwide². In addition, the prevalence of burns is significantly higher in developing countries than in developed ones.

With advances in technologies, electrical injuries are getting more common. They can occur as a result of lightning, low-voltage or high-voltage in-

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jury, and are often associated with a high morbidity and mortality. These injuries are known for their devastating complications and long lasting socio-economic impact³.

Electrical injuries tend to follow a tri-modal age distribution, each accounting for approximately 20% to 25% of total injuries. The first peak occurs in toddlers, who generally sustain electrical injuries from household electrical sockets and cords. The second peak occurs in adolescents who engage in risky behaviour around electrical power lines. A study found that more than 50% of the electrical injuries result from contact with the power line⁴. The third population is made up of adults who work with electricity for a living.

There are many variables which determine the net effect of an electrical burn, none of which is absolutely predictable before the burn occurs. The effect of electrical current on the tissues of an individual is dependent upon: voltage, type of current, amount of current, resistance, pathway of the

current, and duration of contact⁵. In many cases, the magnitude of only a few of these factors is known.

Almost all electrical injuries are accidental and often, preventable. If not instantly fatal, the damage associated with electrical injuries can result in dysfunction of multiple tissues or organs⁶. So, we report this case here as its complications are disastrous and considered to be one of the most harmful injuries due to its high morbidity and mortality.

Case Report

A 4-year-old male, vaccinated child, weighing 15 kg was admitted in the Paediatric Emergency Room with the loss of consciousness for about half an hour. He had a history of touching a broken electric wire of unknown voltage and fell to the ground few hours back before being rushed to the hospital. There was no other significant history.

On physical examination, the child was unconscious and mildly anaemic. His vitals as recorded on admission were as follows: a heart rate of 127 beats/min, respiratory rate of 32 breaths/min, oxygen saturation (SpO₂) of 97% on room air, blood pressure of 90/60 mmHg, afebrile and a capillary refill time (CRT) of 2 seconds.

On detailed local examination, no trauma was found to any part of the body except the left palm which had 4 small black-yellow lesions, almost 2cm in size, which looked more like blisters; 1st near the thumb, 2nd around the index finger and two more on the index finger proximally (Fig. 1).

Neurological examination showed a Glasgow Coma Scale (GCS) score of 10/15, bilaterally, equally reactive to light pupils, with normal bulk and reflexes but decreased tone in all four limbs, however, bilateral mute planters were noted. No assessment of power could be taken due to unconsciousness. The signs of meningeal irritation were all negative. Rest of the examination was unremarkable.

On investigations, the complete blood count showed haemoglobin to be 10.2 g/dL, haematocrit at 35.1%, mean corpuscular volume of 81.6 fL, neutrophils at 48%, lymphocytes at 40%, platelets at 434 x 10⁹/L, total leucocyte count of 9.9x10⁹/L. Random blood sugar was 200 mg/dL, urea was 13 mg/dL and creatinine was 0.39 mg/dL. Electrolytes were all within normal ranges. Chest X-ray appeared normal with no evidence of bone fractures (Fig. 2).

A final diagnosis of electric current injury associated with impaired consciousness and blister formation was established and immediate treatment was started accordingly. The child was eating nothing per mouth till further order, with oxygen inhalation and an intravenous (IV) line maintained. An intravenous normal saline 20 cc/kg body weight stat and 70 cc/kg body weight of intravenous fluid in 24 hours were given. Blisters on left hand was rinsed with water and after applying antiseptic cream, covered with sterile gauze. The child was then shifted to the paediatric intensive care unit (PICU). Cardiac monitoring was done and electrocardiogram (ECG) was found to be normal (Fig. 3).

After 2-3 hours, his GCS levels improved progressively and the child regained consciousness. The child was admitted in the paediatric ward for 5 days and discharged upon improvement of health with outpatient department (OPD) follow-ups for blister healing.

Discussion

Electric burn injury is one of the most destructive injuries seen in a casualty room of any hospital. It is a special type of injury with potential of causing significant functional disability and extensive disfigurement⁷.

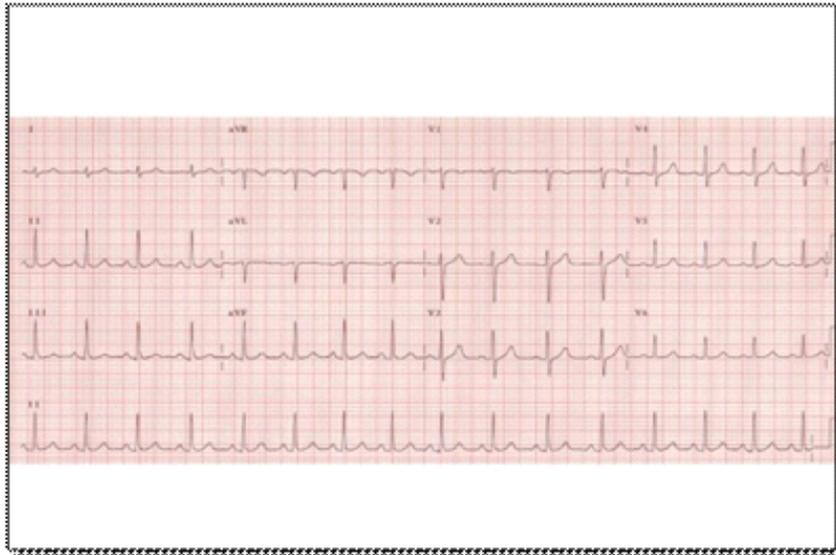
There are four main types of electrical injuries: flash, flame, lightning, and true. Flash injuries, caused by an arc flash, are typically associated with superficial burns, as no electrical current travels past the skin. Flame injuries occur when an arc flash ignites an individual's clothing, and electrical current may or may not pass the skin in these cases. Lightning injuries, involving extremely short



Fig 1. Showing blisters on patient's hand



Fig 2. Patient's chest X-ray, with no evidence of bony fracture



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but very high voltage electrical energy, are associated with an electrical current flowing through the individual's entire body. True electrical injuries involve an individual becoming part of an electrical circuit. In these cases, an entrance and exit site is usually found⁶.

An individual that has experienced an electrical injury may present with a variety of complaints. Some local effects which may be superficial or deep or any systemic manifestation. These may include cardiac arrhythmia or arrest, respiratory arrest, coma, blunt trauma, or an assortment of

burns. Some patients may complain of occasional unpleasant sensations without any obvious physical damage, while others may present with a large amount of pain and overt tissue damage^{6,8}.

Regardless of the presenting complaints or extent of the electrical injury, all patients should receive a thorough physical examination to assess the full extent of the damage, it is critical to determine details about the source of electrical injury (e.g., high versus low voltage, alternate current [AC] versus direct current [DC]), the length of contact, and any resultant trauma that may have occurred.

As, in general, morbidity tends to be higher with low-voltage injuries than with high-voltage injuries⁶.

The diagnosis can be made from the history and physical examination. Blood and urine tests are done to look for damage to the heart, muscles and other organs. ECG is done to measure the electrical activity in the heart and to check for problems or damage to the heart. Computed tomography (CT) scan uses X-ray and a computer to take pictures of the brain. This test helps to look for any signs of injury to the brain. Magnetic resonance imaging (MRI) scan uses a computer and powerful magnets to generate pictures of the head and other parts of the body. MRI scan helps in assessing the damage to the brain, muscles, bones, joints and blood vessels.

Therefore, after the diagnosis, it is important to provide proper management accordingly. It is also essential not to touch the person until the electrical source has been eliminated. Assess the consciousness and check vitals, if the patient is not responding, give both respiratory and circulatory support as needed (according to advanced cardiovascular life support [ACLS] and advanced trauma life support [ATLS] protocols)⁶. Provide emergency service if needed.

The primary electrical injury is the burn. Appropriate burn care should be instituted for external burns. If the electrical burns are 2nd degree burns i.e. superficial, they cause redness, pain and blister formation. To heal properly, a blister should not be popped unless medically necessary. If popped, the excess skin should not be removed because the skin underneath needs that top layer to heal properly. These types of burns should be rinsed with water and patted dry. A topical antibiotic should be applied and covered with a light bandage or sterile gauze and should be dressed daily.

Finally, consultations with trauma and/or critical care specialists, surgical specialists, and orthopaedists should be considered as soon as possible to avoid any complications or irreversible damage⁶. Amputation of the damaged body parts may also be needed. Patient may require repeated

removal of the damaged tissue along with extensive rehabilitation.

Conclusion

Electrical burn is a serious issue, the complication of which is likely to result in organ damage or fatalities. Therefore, early management is necessary and should be done in order to prevent drastic outcome. Strict monitoring and observation should be kept to avoid any serious damage.

Conflict of Interest

Authors have no conflict of interest and no grant/funding from any organisation.

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