



A RARE CASE OF HIGH VOLTAGE ELECTRICITY INDUCED BILATERAL LUNG INJURY

Pulmonary Medicine

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ABSTRACT

Electricity is a fundamental part of the modern civilized community. Electrical injuries can cause damage to all organs and it can cause thermal, electro - physiological, traumatic, and metabolic alterations. Victims may be similar to usual cardiac, trauma, or burn victims, creating diagnostic challenging, and some time very hard to get history. The electrical injury may lead to additional complications, such as haemoptysis, acute respiratory distress, and infection. The lung injury due to electric shock has not often reported but might happen after exposure to high or low voltage. Here we described an interesting and rare case of 25 years old male found to be with bilateral lung injury after exposure of high voltage electrical current shock.

KEYWORDS

Computed tomography, Electrical burns, Lung injury, Multi-organ dysfunction, visceral damage.

INTRODUCTION

As electrification increases worldwide, electrical injuries are becoming more frequent in daily life. Typically, young males are affected in industrial accidents. About 0.8-1.0% of accidental deaths are due to electrical injury, and constitute 3-9% of all patients treated in burn centres^[1]. All around the world India accounts for the most number of electrocution related deaths^[2]. The clinical features of electrical trauma range from mild epidermal burns to severe multi-organ dysfunction and death^[3]. The lung injury due to electric shock has not often reported but might happen after exposure to high or low voltage. Information on visceral injuries is rare. Reported rates in new series range from 0 to 1.7%^[4]. Even though occasional, visceral damages due to electric burns have to be investigated and treated, as they have substantial mortality and morbidity^[1]. Isolated lung tissue injury secondary to electrical injury induced electricity is not usual and a lung injury followed by high-voltage injury without direct blunt injury has not been reported^[5]. We treated a patient with a high-voltage of 10000 volts electrical injury of the lung with no obvious cardiac arrest and contact injury on either the abdominal or thoracic wall causing damage to the lungs. Here we reporting extremely rare case of 25 years old male found to be with bilateral lung injury after exposure of high voltage electrical current shock.

CASE REPORT:

A 25 years healthy man with devoid of any conjunctural morbidity gave a history of exposure to 10000 volt electrical current while his head came in contact with an over head electrical wire during working in terrace. Victim was received in the hospital 4 hours after the incident. Patient has become tachypneic and drowsy soon after exposure and history was collected from the mother. There was no history of fever, cough, cold and vomiting or aspiration following the accident. On examinations vitals were blood pressure 120/80, pulse rate 80/ min and respiratory rate was 46/min. Examination of respiratory system revealed bilateral extensive crackles on both sides. Heart sounds and nervous system examination was normal. Day 1 chest radiograph reports revealed bilateral diffuse infiltrates with normal cardiac shadow. The computed chest tomography taken on day 1 revealed bilateral air-bronchograms in all lobes suggestive of pulmonary edema. Electrocardiogram, Echocardiogram done on day 1 revealed no abnormality. Creatine Phosphokinase was 320 and Lactate dehydrogenase was 550. Serial Renal function test monitoring and

Creatine kinase MB level was normal. Platelet count, prothrombin time and activation of partial thromboplastin time were normal. Sputum AFB was negative. Sputum culture does not demonstrate any abnormal growth. Victim was managed with adequate oxygen, volume resuscitation and supportive modalities. X-ray and CT chest repeated on day 4 revealed complete resolution of pulmonary edema. He totally recovered by Day 7. Patient was suspected and treated as electricity induced lung injury. Current report is case reported with bilateral lung injury followed by electricity exposure with no history of cardiac arrest in Tamil Nadu, India.



Figure 1: Image A depicting the entry wound and image B and C depicting exit wound on the patient

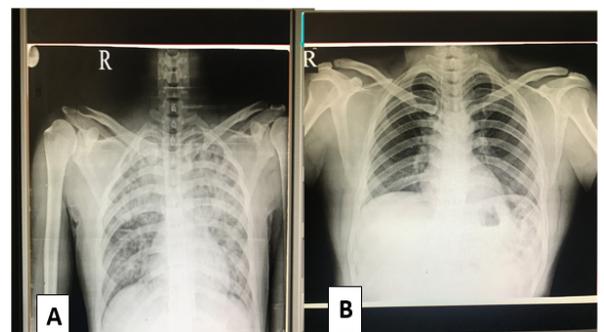


Figure 2: X-ray image A taken on day 1 showing bilateral fluffy infiltrates with normal cardiac shadows s/o acute pulmonary edema and image B was taken on day 4 showing subsequent clearing of airways and normal X-ray field.

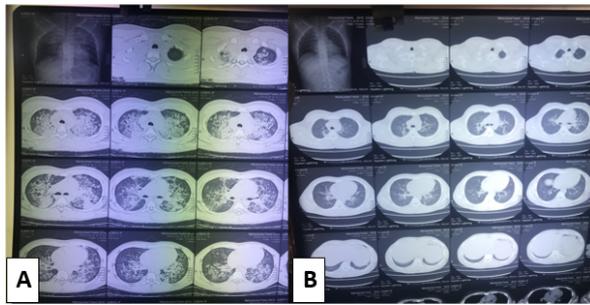


Figure 3: Image A day 1 CT scan showing bilateral air bronchograms suggestive of pulmonary edema, image B day 5 CT scan showing spontaneous resolution of lung fields

DISCUSSION:

Electrical injuries have become a more common form of trauma with a unique pathophysiology and with high morbidity and mortality^[6]. It is often wrongly assumed that a 10000 volts shock would be more deadly than 100 volts shock. There is also a misconception that normal household current and power lines are not lethal since they are insulated. However, electrocution deaths have reported in households using 110 volts currents and in factory workers using as little as 42 volts direct current^[7]. In our case a patient was recovered within a week after exposure to 10000 volts of current shock.

Entry site was most commonly located in the upper limbs - right more than left. The reason could be grasping wires while working on live wires, or touching live wires with a hand-held conductive object. Right-handedness is dominant, so this is the limb that is most commonly involved. Exit site was mostly seen on the lower limbs as grounding is through them^[6]. In our case the entry site was head and exit site was foot path.

After exposure to electrical shock most people who have no symptoms do not require testing or monitoring. An electrocardiogram (ECG) is done to monitor the cardiac function in some people. For some people, blood and urine tests may be needed to rule out organ dysfunction. If people are unconscious, imaging tests such as computed tomography (CT) or magnetic resonance imaging (MRI) might be necessary^[8]. In our case Electrocardiogram, Echocardiogram, Cardiac enzymes, Coagulation studies and sputum culture were not revealed any abnormality. Patient was managed with sufficient oxygen, volume resuscitation and supportive modalities. CPK and LDH levels suggested rhabdomyolysis. After fluid resuscitation CPK and LDH values became normal. X-ray revealed bilateral fluffy infiltrates with normal cardiac shadow. A computed chest tomography demonstrated bilateral air bronchograms in all lobes.

Visceral injuries in electrocution are rare. The most common organ affected is the small intestine; other common organs are colon, heart, esophagus and pancreas. Of the visceral injuries lung involvement is rare since the alveoli contain air which is poor conductor of electricity^[9, 10]. Thermal and non thermal causes have been identified for lung injury. Among non thermal causes Non cardiogenic pulmonary oedema, like neurogenic pulmonary oedema and Aspiration induced pulmonary oedema are discussed as the probable causes. The extent of internal injury is disproportionate to the external injury^[11]. In our case the external injuries were minimal and over the head and the foot, there was no direct involvement of the thoracic wall. But bilateral extensive lung involvement was present.

In our case many reasons indicate that this patient's lung injury was directly related to the electric current: (1) the pulmonary involvement was a very early finding in a healthy young patient who had no history of prior lung disease. (2) The location and situations of electric contact revealed that the electricity passage through the trunk and through the both lungs. (3) While, the contact induced no injuries to the organs which are located in the thorax and muscles in the thoracic CT-scan demonstrated total bilateral air bronchograms of all lobes. (4) No cardiac dysfunction or arrhythmia was made out by ECG or echocardiogram (5) No history of underlying acute infections were found to clarify the clinical impressions: the victim had no history of bronchial congestions, sterile bacteriological cultures of sputum ruled out an infected pulmonary disease.

CONCLUSION:

Lung injury is rare in victims with electrical burns, but could be severe and is associated to elevated morbidity and mortality, requires early intervention. Electric injury of lung tissue is an exceptional but highly serious trauma which might respond to early intervention. It should not be confused with cardiogenic pulmonary oedema and must be suspected and recognized as soon as possible by Electrocardiogram, Chest X-ray, Echocardiogram systemic and thoracic CT- scan carried out on admission to hospital in all victims who have persisted to a high voltage electrical shock.

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