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Case Report

Pulmonary Injury and Hemoptysis Due to Electric Shock

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Abstract

Although electrical injuries are not a frequent reason for admission to emergency clinics, they are very important in terms of morbidity and mortality. It has important effects on morbidity and mortality as a result of both traumatic and systemic complications. It may occur with different clinics depending on the duration and form of the injury. Clinical findings may not be correlated. In this case report, we discussed the clinical and imaging findings of hemoptysis after electrical injury in a young male patient.

Keywords: electric shock; hemoptysis; pulmonary injury

Introduction

Electrical injuries occur when electrical current contacts or passes through the body. Electrical injuries can result from contact with faulty electrical equipment and machinery, or from contact with exposed household wiring, electrical power lines. Electrical injuries can range from minor skin burns to life-threatening internal organ damage. The electrical current can cause local damage to the skin or muscles or affect other organs such as the heart. Skin burns may occur at contact sites, but most do not experience serious injury. The severity of the injury depends on the voltage, current type and contact time [1]. High-voltage electrical injuries frequently result in severe tissue burns, compartment syndrome leading to organ loss, renal failure caused by muscle atrophy, and ultimately, multi-organ failure. In cases of low-voltage electrical injuries, it is typically seen that burns tend to be more superficial in nature, whereas instances of muscle loss are infrequent. Both sorts of conditions can exhibit a range of life-threatening outcomes that can impact several systems, including traumatic, cardiac, pulmonary, and neurological systems [2]. Electrical injuries are typically categorized as low voltage (1000 volts) and high voltage (>1000 volts), as well as whether electrical current travels directly through the body and thermal injury resulting from electrical shock. Both morbidity and mortality are relatively high and have both short- and long-term physical and psychological consequences [3, 4].

In this case, we intended to describe a young patient who, despite being exposed to low-voltage electric shock, developed a rare pulmonary injury.

Case Presentation

An 18-year-old male patient applied to the emergency service after being exposed to 220V household electricity for 5-6 seconds. The patient had minimal burn area due to electrical injury on his hand upon arrival.Consciousness was clear, cooperative and oriented. He stated that he had chest pain and bloody sputum after the incident. In his vital signs, blood pressure was 128/90 mmHg, respiratory rate was 18/minute, fever was 36.7 degrees Celsius, heart rate was 72/min, and saturation was 96%. No significant pathological finding was detected in his physical examination. The patient's electrocardiogram (ECG) and laboratory tests were planned. ECG showed sinus rhythm, no malignant arrhythmia or ST elevation. Laboratory results showed glucose 114 mg/dL, urea 26 mg/dL, creatinine 0.9 mg/dL, aspartate aminotransferase 17 U/L, alanine aminotransferase 20 U/L, troponin-T 4.05 pg/ml and all other hemogram and biochemistry parameters were within the reference range. Complete urinalysis results were normal. There was no abnormality during the cardiac monitoring of the patient. Control cardiac enzyme values were also normal. In addition, as a result of the cardiology consultation, no movement defect was observed in the echocardiography, there was no effusion, and the ejection fraction was 60%. Thoracic computed tomography (CT) was planned because there was no significant clear image in the chest X-ray taken for the patient's hemoptysis. In thorax CT imaging sections, focal ground-glass density increases were observed in the parahilar region at the level of the right lung middle lobe, and in the parahilar region of the left lung lower lobe superior segment (Figure 1). A chest diseases consultation was also planned for the patient, and he was followed up with oxygen support. The patient, who did not detect any abnormality in the control laboratory tests and monitoring, stated that he had no active complaints after 12 hours. The patient, whose pathological image area regressed in the control thorax CT imaging, was discharged after explaining the emergency situations and making recommendations.

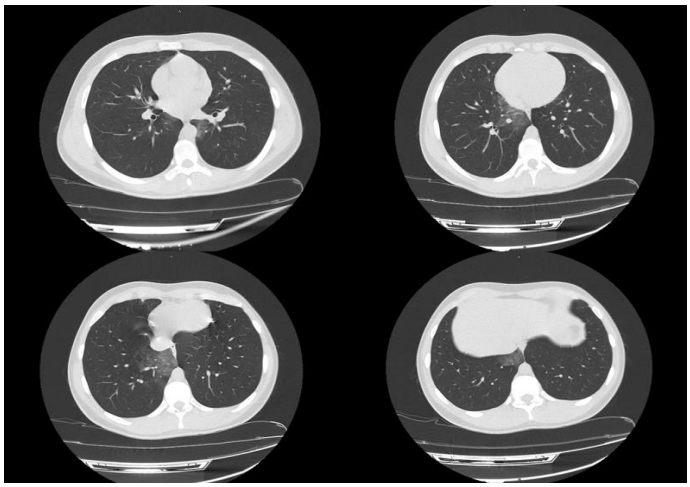

Figure 1: Thorax CT imaging sections, focal ground-glass density increases were observed in the parahilar region at the level of the right lung middle lobe, and in the parahilar region of the left lung lower lobe superior segment

Discussion

Electricity is the flow of electrons through a conductor; it is divided into alternative and direct [5]. Electric shock injuries are generally rare. However, it is a multiple system devastating injury with potentially high morbidity and mortality [6]. Electrical injuries due to lightning strikes occurred for the first time in nature. Its negative effect and severity on the body depend on the intensity of the current, the path it travels in the body, the duration of contact, and the resistance of the tissue it contacts [7]. Pulmonary injury after electric shock is not a common finding, but since it is a vital organ impact, it is necessary to be very careful in this regard. Several investigations in the existing literature have documented the presence of lung consolidation in individuals who have experienced high-voltage shock [8,9]. Moreover, there have been documented cases of localized lung injury in electricians exposed to low-voltage shocks, as well as instances of pulmonary hemorrhage in agricultural workers who have experienced low-voltage shocks [10,11]. In contrast, a previous report similarly documented the presence of bilateral perihilar ground-glass opacities and thickening of interlobular septa with thickening of the bronchial wall in a 25-year-old male patient, resembling the characteristics observed in our case [12]. Considering the recent cases, Chen et al. [13] reported a 23-year-old male patient with 110 volt exposure, Singh et al. [14] reported the case of a 32-year-old male who was exposed to 220 volt trauma and expressed the pulmonary findings in a similar way. There is no established consensus of the arrangement of CT scans of the chest for all patients suspected of having an intrathoracic injury. However, pulmonary findings may hide themselves, regardless of the clinical severity of the patient. In these cases, pulmonary injury must be considered. Thorax CT is useful in this regard. Patients may exhibit symptoms such as hemoptysis, respiratory discomfort, and respiratory failure. Coagulative necrosis is typically the primary pathological symptom observed in cases with electrical lung injury. The mechanisms involved include direct tissue injury, which modifies the resting membrane potentials of the cells, the transformation of electrical energy to thermal energy, which results in tissue necrosis and destruction, and lastly direct trauma from jarring muscle contractions. Furthermore, the culmination of other mechanisms ultimately leads to malfunction, damage, rupture, and necrosis of the cell membrane [11,15].

Conclusion

Although there are many etiologies that cause alveolar hemorrhage or pulmonary consolidation, apart from electrical injuries, there was no reason for this in the anamnesis and history of our case. In cases of polytrauma in individuals who have been electrocuted, it is imperative to maintain a high level of suspicion for potential injuries to visceral organs. Additionally, a comprehensive evaluation of the trauma mechanism should be conducted. The early detection of severe injuries can be facilitated through a comprehensive physical examination, as well as the utilization of radio imaging and laboratory tests. Patients presenting to the emergency department with electric shock should be evaluated for potential pulmonary injury, regardless of the severity of accompanying symptoms such as chest discomfort, hemoptysis, and dyspnea.

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