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Electrical injury in construction workers: A special focus on injury with electrical power

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ABSTRACT

Background: Electrical injury in construction workers due to contact with overhead power lines accounts for an important cause of admission at the emergency department. Due to lack of specific treatment options for this type of injury, prevention remains the mainstay of management.

Aims: Our study aimed to demonstrate the characteristics of electrical injury in construction workers among one of the largest Iranian population at a burn care hospital.

Methods: Through a retrospective review of hospital data base, patients with electrical injuries admitted to Motahari hospital in Tehran, Iran between March 2011 and June 2012 were included for analysis. Patients were divided into construction workers and other patients. Primary characteristics and final outcomes were then compared between the 2 study groups.

Results: Of 202 patients included in this study, 105 patients (52%) were construction workers and 97 patients (48%) constituted the remainder. There was significant difference between the 2 groups in terms of mean age, gender, and average burn size. In contrast, mean duration of hospitalization and mortality rate did not differ significantly between the 2 study groups ($p > 0.05$). Contacts with over head power-lines accounted for the most common mechanism of injury. There was significant difference between the 2 groups in terms of place of injury and electrical current power. However, total cost of treatment did not differ significantly between the 2 groups ($p > 0.05$). Frequency of severe complications was higher in construction workers and this group underwent more invasive procedures such as limb amputation and fasciotomy.

Conclusion: The most common mechanism of electrical injuries in construction workers is due to contact with over head high voltage power-lines at workplace. This type of electrical injury is associated with higher use of fasciotomy, flap and limb amputation.

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1. Introduction

As a global health concern, electrical injury occurs due to lack of safety in workplace [1–3]. Electrical injury can involve the body from just a superficial skin burn to systemic and multi-organ damage and death [1,4]. The injury causes 20,000 emergency department (ED) admission in the US each year [5] and is considered the most common cause of job-related injury in both developing and high income countries [5,6].

In 2004, they were 7.7% of the U.S. workforce [7], but suffered 22.2% (1278) of the national 5764 reported work-related deaths [8]. Electrical injury is among the most common cause of occupational fatalities in construction workers [9–11]. Moreover, according to the data derived from the U.S. Labor Department's Bureau of Labor Statistics' census of fatal occupational injuries (CFOI), survey of occupational illnesses and injuries (SOII), and current population survey (CPS), contact with overhead power lines has been responsible in 42% of all on-the-job electrical deaths. The construction industry accounted for 47% of all electrical deaths between 1992 and 2002 [12].

Along with advance in burn cares, trends have been attracted to the preventive approaches as the mainstay of cure for electrical burn injury [5,9,13]. The management of electrical burn is associated with heavy barriers as there is no specific treatment for it [3]. For this reason, the epidemiology and characteristics of this type of injury should be documented in construction workers, so further prevention strategies could be implemented. To the best of our knowledge, there are little studies investigating the causes and characteristics of electrical injuries among construction workers. Our study aimed to address this issue with specific focus on electrical injuries due to overhead power lines in an Iranian population of construction workers.

2. Methods and materials

2.1. Study design

In a retrospective cross-sectional study in Motahari Burn Care Center, a university hospital affiliated to Tehran University of Medical Sciences in Tehran, Iran, providing sub-specialized tertiary care to the burn patients, medical profile of all the admitted patients between March 2011 and June 2012 were reviewed to extract data of patients with electrical injuries. The institutional review board of our hospital approved the study protocol.

2.2. Patient

All the admitted patients with documented electrical injury were included in this study for analysis. Patients with incomplete in-hospital treatment or lack of medical recording were excluded from the study. Included patients were classified into 2 groups according to their occupation and location of injury. Construction workers constituted the main group while the remainder electrically injured patients employing with other jobs were assigned to another group for comparison.

2.3. Construction worker

Construction occupation was defined as being employed as bricklayer, roofer, carpenter steel fixer, ironworker, laborer, painter, plasterer, plumber, tiller, welder, pipefitter, landscaper, heavy equipment operator, or being involved with boom trucks, dump trucks cranes or hoisting equipment.

2.4. Cares and treatment

All the patients had received intensive care and trauma survey at the first line visit by ED expertise physicians of our hospital. Standard acute phase management including electrocardiographic monitoring, emergency surgical intervention (fasciotomy) and fluid resuscitation were performed if indicated. Following initial treatment and stabilization of general condition, patients were admitted to the hospital wards for further assessment and advanced medical or surgical care.

2.5. Data collection

All the medical records of Motahari hospital during the study period were reviewed for eligible patients by 3 independent data collectors. All the information was recorded in the study data base. Information included socioeconomic and occupational characteristics of study patients, features of electrical injuries, provided initial and advanced cares including trauma management, inpatients rehabilitation and surgical procedures, and cost of treatment.

2.6. Statistical analysis

Data were analyzed using statistical package for social science (SPSS, 16, Chicago Inc., USA). Independent sample *t*-test for quantitative continuous variables and chi square and Fischer exact test for categorical variables were applied. Values are presented as number (%) or mean ± SD when appropriate and a p value < 0.05 was considered statistically significant.

3. Results

Data of 202 patients with electrical injury were retrieved from 1-year records of the hospital data base. Of these, 105 patients (52%) were classified as construction worker group and the remainder 97 patients (48%) were classified in another group (Fig. 1). Table 1 summarizes primary and demographic characteristics of the study patients. As it is obvious from the table, there is significant difference between the 2 groups in terms of mean age, gender, and average burn size ($p < 0.05$). However, there was no significant difference between the 2 groups of patients for mean duration of hospitalization and mortality rate ($p > 0.05$).

Mechanisms of injury showed significant difference between the 2 study groups ($p < 0.05$). Moreover, contacts with over head power-lines accounted for the most common mechanism of injury overall and in either of the groups

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