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A review of electrical burns admitted in a Philippine Tertiary Hospital Burn Center

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ABSTRACT

Electrical injury is the 4th most common cause of burn which continues to be one of the most distressing trauma injuries in developing countries. In the Philippines, the number of electrical injuries are typically underreported.

This study is a descriptive retrospective analysis of patients suffering from electrical burns admitted at the Philippine General Hospital, Alfredo T. Ramirez Burn Center (PGH-ATR) from January 2004 to December 2012.

A total of 706 (28.3%) patients with electrical burns were reviewed. Majority were males of working age and injuries were work related (80.45%) of which 75.5% were construction workers. The primary cause in majority of the cases was accidental contact of overhead electrical power lines by metal poles. Most of the patients admitted were high voltage electrical injuries (79.46%), 46.03% had severe electrical burns and 11.33% had associated traumatic injuries. There was a delay in time of injury to admission, 48.73% arrived at the emergency room >8 h after the injury. 40.73% of the patients underwent surgery, most of which had moderate to severe burns. Average length of stay was 14–28 days. Overall morbidity rate and mortality rate were 2.12% and 2.41% respectively.

The increase in the rate of electrical injuries may be linked to the country's rapid pace of industrialization. Prevention must be prioritized and preventive activities should be aimed to reduce the incidence.

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1. Introduction

Burn is commonly seen in developing countries which cause significant morbidity and mortality [1]. Burns are also one of the most expensive of traumatic injuries due to the extended hospital stay and rehabilitation [2,3]. The injuries result in higher rates of permanent disability and economic hardship for the individual as well as their families [3]. Electrical injury, a certain type of burn, is the most devastating and is the 4th most common cause of admission in burn units worldwide [4]. This type of injury not only involves the skin but deeper tissues that causes multiple acute and chronic manifestations not seen in other burns. Individuals tend to stay longer in hospitals, as well as morbidity and mortality rates are much higher [4]. Burn centers across the globe have been reporting less and less incidence of electrical injuries [5]. This is in part due to findings and recommendations from international studies regarding preventive programs for electrical injuries [6]. Despite this downward trend, locally the number of patients with

electrical injuries appears to be increasing. This may be due to increased exposure to potential hazards and the lack of appropriate training and education regarding safety and proper handling of electricity. With the rapid pace of industrialization in the Philippines, the risk mostly involves front line construction workers.

The Philippines has a total of 4 burn centers and Philippine General Hospital, Alfredo T. Ramirez Burn Center (PGH-ATR) is the principal referral facility in the country [7]. It treats approximately 300 to 400 burn cases a year, the most in the country, and has an extensive experience in managing patients with electrical injuries. This places the study in the best setting to gather substantive data on electrical injuries.

The goal of this study is to review and describe the profile and characteristics of electrical burns seen at the Burn Center.

2. Methodology

This is a descriptive retrospective study of patients with electrical injuries that were admitted from January 2004 to December 2012 at the Philippine General Hospital, Alfredo T. Ramirez Burn Center (PGH-ATR).

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The study population consists of 706 patients who sustained electrical injuries, with or without cutaneous burns, admitted at the ATR Burn Center. Patients were identified using the Integrated Surgical Information System (ISIS) of the Department of Surgery. Patient charts were retrieved with all the names omitted to protect patient privacy. This study was conducted with the ethics approval from EHRO (Expanded Hospital Research Office of PGH).

The study population was divided into two age groups, adult (age ≥ 18) and pediatric (age < 18). The percentage of total body surface involvement was classified as minor ($\leq 10\%$ TBSA [total body surface area]), moderate (11–19% TBSA) and severe ($\geq 20\%$ TBSA) based on the American Burn Association classification of burn severity. Type of electrical burn refers to voltage intensity, high voltage (>1000 v) or low voltage (<1000 v). Injury was classified as work related if the injury was caused or contributed by events or exposures in the work environment or non-work related. The time it takes from the injury to referral or admission to the burn center was categorized as either immediate (< 1 h), early (< 8 h post-injury), intermediate (> 8 h), or late (> 24 h post-injury). Patients were also grouped in relation to the length of hospital stay, those who stayed for less than or equal to 7 days, those who stayed between 7 days to 14 days, those who stayed between 15 and 28 days, and those who stayed for more than a month.

Subjects were also grouped based on the number of operations, those who had none, those who had 1 operation, and those who had more than 2. Patients were also categorized as having morbidity, such as pneumonia, burn infection and graft loss, as well as mortality, either the patient survived or not.

Descriptive statistics were done based on age, gender, TBSA, type of electrical burn, mode of injury, types of trauma, length of time from injury to admission/referral, types of operations, total length of hospital stay and number of operations.

2.1. Patient management

Patients were managed according to our burn guidelines at the PGH-ATR Burn Center which is based on the American Burn Association Practice Guidelines for Burn Care. All of the patients received standard intensive care and trauma survey at the emergency room prior to admission at the burn center. Electrocardio-

gram monitoring was done and initial labs/diagnostics were taken. Patients with moderate to major burns were resuscitated using the Parkland formula, regulated to maintain an adequate urine output which was monitored hourly. All patients received immunization for tetanus prophylaxis, prophylactic antibiotics were not used. When there were clinical signs of compartment syndrome, escharotomy/fasciotomy was done.

Daily wound care was done with silver sulfadiazine sandwich dressing which is the most available dressing our burn center. Wound status was assessed daily during dressing changes. Debridement of necrotic tissues, excision and grafting was done usually within 4–5 days. Limb amputations were performed after the formation of the demarcation line which was mostly after 7 days.

Management of the patients included the cooperation of the anesthesiologists, pediatricians and rehabilitation medicine. Rehabilitation began immediately after the injury to ensure a speedy return of a functional patient to society. Rehabilitation included splinting and positioning, active and passive exercises.

3. Results

A total of 2596 burn patients were admitted at the PGH-ATR burn Center from January 2004 to December 2012. 706 were patients with electrical injuries. Fig. 1 shows the number of patients with electrical injuries from 2004 to 2012 which displays an increase in the number of electrical injuries.

This study reveals that most of the electrical burn patients admitted were adult, employed males particularly construction workers injured at work as shown in Table 1, which is consistent with other studies [8]. It is significant to note that there are more injured construction workers than electricians, 533 compared to 47. In about 64.59% of the cases, accidental contact of overhead electrical power lines by metal poles in the hands of construction workers was the primary cause of injury.

Table 2 shows that high voltage electrical injury is a common cause of admission and is directly proportional to the severity, and increased length of hospital stay. Almost all of individuals with severe TBSA burns came from high voltage (99.69%); 87.97% of individuals with moderate TBSA burns came from high voltage;

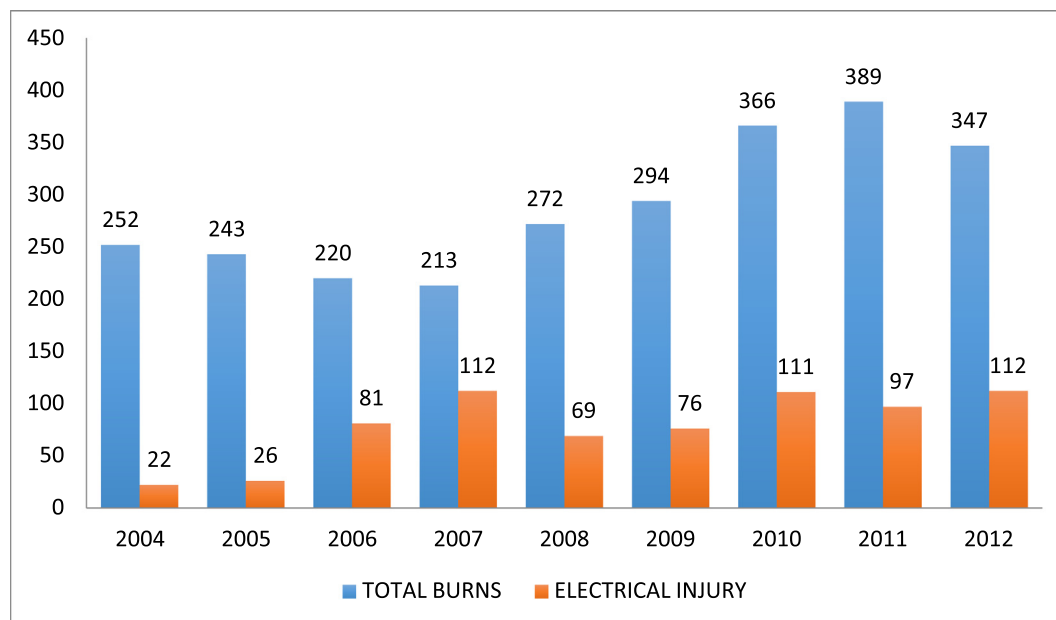


Fig. 1. Annual distribution of patients with electrical injury 2004–2012.

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