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Original Research Paper

Electrical burns – A 3 years retrospective study.

Plastic Surgery

KEYWORDS: Electrical burns, power theft, kite flying injuries, low & high voltage injuries.

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ABSTRACT

The objective of the present study was to study the pattern of electrical burn Injuries that presented to our hospital. A retrospective study was planned, over a period of three years from 2010 to 2012 using patient records from hospital main record section. Relevant data collected from individual case files, these data were then evaluated and statistically analyzed. Sixty six electrical burn patients were treated over a period of 3 years. Patient's age, gender, occupation, percentage of total body surface area (%TBSA), high and low voltage injuries, coexisting trauma, mortality rate were analyzed. Causes that are unique to our area that leads to such injuries are also discussed. In the present study the most common electrical burns were low voltage burns and the most of them affected were males. Most of these injuries were preventable if only, safety guidelines were followed.

Introduction

Electrical injuries is one of the common cause of burns, it leads to significant socioeconomic burden, severe functional and cosmetic problems[1,2] . Electrical burns are traditionally classified as high-voltage (>1000Volts) or low voltage (<1000 Volts)[3, 4, 5]. The severity of tissue injury is determined by the intensity of the electric current, the duration of exposure, and by the tissue resistance. In our study, these type of injuries were common in absence of proper training of safety measures. These injuires can be avoided with proper education, safety regulations, and a safe, effective electricity delivery network[7].

Objective

To study the pattern of Electrical burn Injuries in patients presented to our hospital over last three years.

Material and Methods

All patients with Electric burn admitted in the Burn Unit of Christian medical college, Ludhiana from 2010 to 2012 were retrospectively studied. The data of 66 patients were analyzed from the patient records. All age groups were included in the study. Patients age, gender, occupation, hospital stay, mortality rate, presence of coexisting trauma, burn degree, burned percentage of total body surface area (TBSA), voltage of the electrical current (low or high) were analyzed.

Results

All patients after admission central line was secured and fluid resuscitation was started immediately using Parkland Formula. Pain killers and antibiotics were given. Urine output monitored. Investigations sent for Complete blood count, blood urea nitrogen, serum electrolytes and creatinine levels and for myoglobinuria. Baseline ECG was also done.

Wound cleaned with warm saline and dressings done with silversulphadiazine. Subsequently daily dressings were done and the wound monitored for any requirement for debridements, escharotomy/fasciotomy and vascularity status. Amputations or wound coverage are planned for a later date. Wound cultures were sent biweekly and decision on stepping up or change of antibiotics was taken correlating with the clinical condition of the patients. Further details of the patients were recorded in the patient's file.

On analyzing data of 66 patients , 63 (95.4%) were males and 3 (4.5%) were females. Occupational distribution was found to be Electricians 25 (37.8%), Farmers 15 (22.7%) , Labourers 10 (15.1%), Students 13 (19.6%), Housewives 4 (4.5%).

Patients age ranged from 7 year to 65 years. The mean age was 29 years

Table 1: Age distribution of electrical burns.

Age Groups	Number of Patients
0 -10 years	3
11- 20 years	14
21- 30 years	22
31-40 years	14
41- 50 years	9
51- 60 years	3
>60 years	1

Six (9%) patients were found to have sustained electrical burn injuries due to kite-flying.Three (4.5%) patients were of the age group 7yrs, 12yrs and 14 years.

3 (4.5%) high voltage injuries were admitted that happened as a result of power theft using a metallic hook.

High voltage injuries were sustained by 21 (31.8 %) , Low voltage injuries were sustained by 45 (68.1 %).

Associated trauma was associated in 10 (15%), mostly due to fall from height. 3 patients had head injuries, abdominal injury in 1 patient and skeletal injuries were associated in 6 patients. The pattern of distribution of burns is given in table 2.

Table 2: Bodily Distribution of Burns

Right Upper Extremity	60
Left Upper Extremity	41
Right Lower Extremity	32
Left Lower Extremity	23
Chest	21
Abdomen	11
Posterior Trunk	15
Face	17
Neck	8
Perineum	4

Mean hospital stay for the Low voltage injuries was 7.2 days. On the other hand the mean hospital stay for the High voltage injuries was 25.7 days.

Twelve (18.1%) patients left against medical advice without completing the treatment. Final outcome in these patients could not be established. Forty three (65.1%) patients recovered well and discharged in satisfactory condition. Eleven patients died and the mortality rate was 16.6%.

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Table 3: Outcome of the patients according to the Body surface area involvement (%TBSA)

TBSA (% burn)	Number of Patients	Discharged	Expired	LAMA*
0-10 %	30	27	0	3
11- 20%	8	6	1	1
21-30%	7	4	1	2
31-40 %	6	3	0	3
41-50 %	6	2	4	0
>50%	9	1	5	3

*LAMA: Left against Medical Advise

In the present study, increase in surface area (% TBSA) of burns was associated with increased mortality.

Total 83 surgical procedures were done in 66 patients. The commonest procedure was wound debridement which was done in 30 (36%) patients. In patients with impending compartment syndromes, fasciotomy and escharotomy was done to relieve the pressure. Escharotomy was done in 7 (8.4%) patients and fasciotomy was done in 16 (19.2%) patients. Wound closure - split thickness skin grafting in 19 (22.8%) patients and flap coverage was done in 6 (7.22%) patients. Some patients required amputations, minor (finger & toes) amputations were done in 3 (3.6%) and major limb amputations were required by 2 (2.4%) patients.

Discussion

Electrical injuries are the third most common cause of burn injuries, after scald and flame burns[6]. The proportion of electrical injuries in other developed countries varies from 3 to 7% of all patients admitted to the hospitals for burn treatments[7, 8]. However in India, this proportion is reported to be between 3 to 17% [18, 19, 20] in different studies. In our study, electrical burns were found to be 10 % of all burn admissions in our hospital during the study period. In India higher proportion of electrical injuries is probably due to little regard for the routine safety measures.

The age of the patients in our study were from 7 to 65 years, and the mean age was 29 years. In our study 94% were males and only 6 % females. Male predominance was also reported by others in their studies[1,2,4,5,8,9,10]. This could be because most of the electrical works are done by males.

In our study, the proportion of high voltage and low voltage burns were 32% and 68 % respectively. Other studies done elsewhere also reveal that low voltage injuries are more common than high voltage electrical injuries[2,4,5,10,11].

The power distribution system in India, the way it is planned and implemented, it leaves lot of vulnerabilities for such injuries. While constructing new building or for any modifications in the existing constructions, safe distances needs to be maintained according to the rules laid out under the Indian Electricity Act, 1910. But due to overcrowding, neither of these rules and regulations are strictly followed nor any action is being taken on those who break these rules. As a result, these cables are seen running very near to the roof top or balconies of the small buildings. Making kids playing near them or adults working near them vulnerable to electrocution.

Another mechanism of injury unique to India is the power theft by putting hooks on supply lines. Dangerous it might seem, still a rampant practice in many cities around India. In our study there were 3 patients who were admitted with electrical burn injuries which happened as a consequence of power theft. In the process of putting a hook on the line, these patients also suffer fall from height and end up with other major injuries too.

In our study associated trauma was found in 10 patients (15%) this was mostly due because of falling from height. Kurt et al reported 7.4 % of trauma accompanying burns, due to fall from height. Cancio et al[21] reported that 25% of associated trauma in electricity burns were due to fall from height.

Kite flying is one of the favourite traditional sport in Ludhiana. More so ever during the local festival "Lodhi" which is traditionally celebrated by flying kites from the roof tops on large scale. Such situations present ripe opportunity for electrical injuries. When these kites get caught or entangled in the poles and cables which are not very far from these roof tops and balconies. In our study we had 6 patients who sustained electrical burn injuries while flying kites. Out of them 3 were children of the age of the age 7yrs, 12yrs and 14 years.

No significant seasonal variations in electrical burns were seen in our study.

Upper extremity was most commonly involved in our study followed by other areas. Same observation was seen by others with less common involvement of scalp, abdomen and perineum[22,23]. The mean hospital stay in Low voltage injuries was 7.2 days. Mean of hospital stay in high voltage injuries was 25.7 days . This was due to the massive tissue damaged caused and subsequently increase in the surgical interventions, lengthening the hospital stay and the cost of treatment. In the present study 18.18% of our patients did not complete their treatment and left against medical advice (LAMA).

Mortality rate reported in various studies from developed countries were 3-5% [5,24,25]. However these countries have proper, organized and safe electricity delivery systems. In our study the overall mortality rate was 16.6%. All mortalities were observed in high voltage injuries. Out of the 11 patients who died, 7 patients had associated trauma due to fall from height. Three patients died of acute renal failure and multi organ failure. One patient died of associated flame burns (his clothes caught fire) along with electrical burns.

Conclusion

Electrical injuries are still the leading cause of high morbidity and mortality in India. Low voltage injuries are more common than high voltage injuries. Males are the usual victims and the mortality is mostly associated the with high voltage burns.

Most of these injuries can easily be avoided by strict adherence to the safety guidelines and proper education of professionals working with electricity.

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