Original Article

Epidemiology of Electrical Burns: Four and half year retrospective study

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Abstract

One thousand seven hundred and fifty two (1752) patients were treated in a four and half year period at our center. The majority were males mainly involved in utility work handling electricity and occurred due to misuse, inattentiveness and lack of knowledge. Electrical burns were responsible for 24.37 % of all burn admissions. Two major complications were encountered in the form of gangrene of extremities resulting in amputations (46.34%) at various levels, and acute renal failure. The mortality rate was close to 12.61% (221). Therefore, to prevent the morbidity and mortality of electric burns appropriate education of utility workers associated with electric work, and educating general public is of paramount importance. Moreover state government should try to implement free drugs and food provisions to the admitted patients so that monitory constraint is not a problem for those who cannot afford as the treatment takes few weeks to months.

Key Word: Electrical Burns.

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INTRODUCTION

Electrical burn injuries [Figure: 1 and Figure: 2] represent a special type of lesion and is one of the most devastating injuries to be seen in emergency departments, attended with high morbidity and mortality rates. Electrical injury occurs less frequently than flame burns or liquid scald burns. The damage due to electrical current is caused by two mechanisms heating and the passage of electric current itself through tissues. Heating causes coagulative necrosis, and the passage of electrical current through tissues causes the disruption of cell membranes. The effects of electric current depend on the type of current, its voltage, the resistance of the tissues, the strength of the current, the pathway taken by the current through the body, the duration of contact, and individual susceptibility[1,2]. Most electrical injuries occur in males at work or in children handling exposed electrical lines, and most of them are preventable through proper education.

Figure 1

Figure 2

Legend

Figure 1: Electric Burn involving Right Upper and Lower Limb in 35 year old male
Figure 2: Extensive Electric Burn Involving Bilateral Lower And Left Upper limb

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MATERIAL AND METHODS

This study was conducted to review the patients of electric burns admitted to the Department of Burns and Plastic Surgery, Grant Medical College and Sir J.J. Group of Hospital, Mumbai over a period of four and half year (January 2009 to June 2013). Patients were analysed with respect to age, sex, site of accident, voltage, clinical presentation, surgical procedures, and outcome. On arrival the patients were resuscitated and investigated for other associated injuries. The treatment of electric injuries has to be very careful because of the specific effect on nonviable tissue covered by healthy uninjured skin. Considerable alterations occur in the microcirculation, with the loss of endothelial integrity and the trapping of large volume of fluid in the extra-vascular space, leading to massive edema and decreased circulation in the injured limb. Immediate and adequate fluid resuscitation is therefore essential. The volume of resuscitation fluid may be very large and unpredictable. Initial fluid management with Ringer's lactate was administered in sufficient amounts to maintain a urine output of at least 1 ml/kg/h along with Mannitol and sodium bicarbonate for first 3 days and if myoglobinuria is present the duration was increased to 5 days . The patients were then put on Histamine receptor blockers and started on intravenous/ intramuscular non opioid analgesics. The patients were monitored closely for vital signs, and urine output. Daily blood investigations for Complete Blood Count, Blood Urea, Serum Creatinine and Serum Electrolytes were performed. The burn wound was dressed every alternate day with a topical antibiotic agent like silver sulphadiazine. Fasciotomy was performed in cases with suspected compartment syndrome; the patients then underwent early debridement of devitalized tissue. The patients were examined for the progress of the wounds and further debridement was performed as needed. When the limbs were completely charred and demarcation of the necrosed area clearly visible, amputations were performed as soon as possible. When the burnt and fasciotomy area bed was clean, cover in the form of split thickness skin graft or flap was given. Complications were detected as they occurred and were managed accordingly. The patients were followed up until the day of discharge and later every fortnightly on out patient basis.

RESULTS

Over a period of over a period of four and half year (January 2009 to June 2013). 7188 (Seven Thousand One Hundred and Eighty Eight) patients were admitted to the Grant Medical College and Sir J.J. Group of Hospital, Mumbai burns unit. Of them 0ne thousand seven hundred and fifty two (1752) patients suffered Electrical burns which was around 24.37 % of all burn admissions[Table:1] which is much more than the other studies show. Two major complications in the form of gangrene of extremities resulting in amputations 812 (46.34%) at various levels which included the revision amputations in the same patient, and acute renal failure were managed. The mortality rate was close to 12.61% (221). The different age group of the patients [table: 2] with majority of the patients were young adults in the age group of 11 to 40 years.

Table: 1 Admission distribution

Year	Total admissions to burns ward	Total admissions of electrical burns	Percentage(%)
2009	1465	393	26.82
2010	1603	365	22.76
2011	1507	337	22.36
2012	1764	423	23.97
2013	849	234	27.56
TOTAL	7188	1752	24.37

Table 2: Age distribution

Age Groups	2009	2010	2011	2012	2013	TOTAL
0– 10	32	53	26	33	22	166
11– 40	314	256	271	314	188	1343
41– 60	48	49	35	67	25	224
>60	3	7	5	4	-	19

Most of the patients sustaining high voltage burns were males, 1483 (84.65%) and females were 269 (15.35%) [Table:3 and Figure:1]. Gangrene of extremities resulting in amputations 812 (46.34%) at various levels which included the revision amputations in the same patient were done. For topical therapy we used Silver Sulfadiazine cream. Mortality out of the total 1752 electric burns, was 221 (12.61%).

Table 3: Sex ratio

	2009	2010	2011	2012	2013	TOTAL	%
MALES	345	316	291	347	184	1483	84.65
FEMALES	48	49	46	75	51	269	15.35
TOTAL	391	365	337	421	234		

DISCUSSION

Electrical injury is a challenging problem in a burns unit. It can cause high mortality and morbidity. Although it is reported as being responsible for only a small percentage of admissions to burn units, i.e. 1-6 from 2.7 to 9.0% [1-6](in our centre the percentage was very high 24.37 %). Electrical burn has very important functional and cosmetic disabling sequelae. The complex aspects of

management are the complications resulting from the systemic effects of the electrical injury. The damage results from the local heating effect, which causes deep tissue damage by progressive devitalization secondary to thrombosis of the veins and arteries that are most affected by the current [4,5,7,8] . This leads to loss of organs. The higher the water content in the tissue the better the conduction and therefore the worse the damage[5] . Local edema around the necrotic damaged tissue causes a progressive compression and obliteration of the microcirculation that leads to increased cutaneous tension and compartment syndrome[5,9,10] . This is treated with fasciotomy. The fact that utility poles and wiring are often placed low down and close to buildings was also a factor. The injuries were therefore avoidable, as was also shown in other studies [1-11]. Majority of our patients were male (84.65%) - we attribute this finding to the greater exposure to high-voltage current in the male sex because of their profession. The patients were all either of working age or children who were accidentally exposed (range, 0 to more then 60 years). The children's accidents were due either to kites getting caught in electric wires or to playing with exposed live electric wires or coming into contact with lines passing close to roofs or windows. In adults and overall the accidents were mainly work-related. It is possible to attribute the accidents to the fact that most of the patients were not trained properly in the handling of electricity. Most of the electric burns were caused by ignorance, non-compliance with rules and regulations, and the lack of safe work practices. More than three fourth of the number of patients (83%) needed immediate fasciotomy to prevent compartment syndrome. The fasciotomies were performed along the axis of the limbs. Majority of the patients needed split thickness sin grafts to cover the raw area and fasciotomy wounds. Gangrene of extremities resulted in amputations 812 (46.34%) patients. We had 221 deaths (12.61%), a rate lower to that found in other studies. Mortality was related to higher burn surface area. This study reflects the severity of electrical burn and its serious consequences.

CONCLUSION

Electrical injury is a very serious and important type of burn, which constitutes a considerable health hazard. It provides a great challenge in management both in the acute stage and throughout the rehabilitation period. Victims can end up with major disabilities. Most of the injuries are preventable with proper education and knowledge.Therefore to prevent this life-threatening event, due measures need to be taken by health care officials and physicians to help educate the public in electric burn prevention. Moreover state government should try to implement free drugs and food provisions to the admitted patients so that monitory constraint is not a problem for those who cannot afford as the treatment takes few weeks to months.

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