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"A RETROSPECTIVE STUDY OF CASES OF ELECTRIC BURNS IN A TERTIARY HOSPITAL IN CENTRAL INDIA"

Plastic Surgery

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ABSTRACT

To study the epidemiological profile and outcomes of electrical injuries in patients admitted in a tertiary hospital in Central India

Materials And Methods:

This study was an observational study done retrospectively in the department of plastic surgery in a tertiary hospital in central India and had cases from january 2018 to December 2020. Demographic and clinical data and outcomes were recorded. Mann–Whitney U tests/Pearson's chi-squared tests were used to examine the differences between low-voltage and high-voltage injuries.

Results:

There were a total of 100 cases studied out of which 65 had high-voltage injuries and 35 had low-voltage injuries. Burn patients were mainly men. Most burns occurred in participants aged 21 to 50 years and in industrial workers and electricians at work or householders at home. Only one person with high-voltage burns died (a mortality rate of 1%). Amputation rates were 37% for high-voltage burns and 22% for low-voltage burns.

Conclusion: More attention should be paid to prevention of electrical burns in male adults.

KEYWORDS

Electrical burns, plastic surgery.

INTRODUCTION:

The origin of the branch of plastic surgery goes back to many centuries. After charaka and sushruta developed the indian medicine and surgery, they also devised many techniques for restoration and rehabilitation of amputated limbs of patients. Many treatises were found later which also included much work dedicate to specially these aspects of surgery. Later all these came into play in the beautiful branch of plastic surgery. Electric burn injuries also form an important part of the management component by plastic surgeons worldwide.

Electrical burns especially in this age of industrialisation are one of the most important public health issues in societies and can lead to serious outcomes and socioeconomic problems. Electrical burns are usually classed as high-voltage (≥1000V) and low-voltage (<1000V). (1,2) Electrical arc flash burns, in which no current passes through the body, are usually considered a separate class and mostly cause superficial burns while electrical burns (characterised by electrical current passing through the body) may result in deeper and more extensive burns than electrical arc flash burns, (3) and can result in higher morbidity and mortality.

Along with the urbanisation, industrialisation and a competitive mind set and an obstinate rat race, the proportion of cases of electrical burn injuries has increased substantially. In central part of india, our centre hosts a major plastic surgery and burn unit and patients from far across come to our hospital for management of burn injuries. Hence this study was undertaken with the intention of developing an evidence base for electrical burn injury interventions and the epidemiology and associated outcomes were studies.

METHODOLOGY

This study was an observational study done retrospectively in the department of plastic surgery in a tertiary hospital in central India and had cases from january 2018 to December 2020. Demographic and clinical data and outcomes were recorded. Electric current injuries were included in our study.

Patients with electrical arc flash burns and those admitted for later reconstructive surgery were excluded.

Mann–Whitney U tests/Pearson's chi-squared tests were used to examine the differences between low-voltage and high-voltage injuries. $P<0.05$ was considered to indicate statistical significance.

RESULTS:

A total of 100 patients were studied. There were more complications and major amputations in patients with high-voltage burns than in those with low-voltage burns (87% vs. 67%, $P<0.001$; 25% vs. 5%, $P<0.001$). Only one person with high-voltage injuries died from severe infection, which resulted in a mortality rate of 1%.

Table 1: Complications And Outcomes Of Electrical Burns.

	High-voltage burns	Low-voltage burns	Chi-square	*P*
With complications	87	67	19.224	<0.001
Amputations	37	22	11.088	0.001
Major amputations[a]	25	5	27.041	<0.001
Minor amputations[b]	11	16	2.196	0.130
Mortality rates	1	0	0.000	1.000

The primary complication with the highest incidence was coma, followed by cardiac injury liver injury, compartment syndrome, shock, acute renal failure and lung injury.

Table 2. Main Complications And Combined Injuries Of Electrical Burns.

Complications/combined injuries	High-voltage burns	Low-voltage burns	Total
Coma	70	40	60
Shock	2.5	0	1.33
Peripheral nerve injury	1	0	0.5
Glaucoma	0	1	0.28
Brain trauma	2.5	0	1.33
Fracture	3.5	0	2
Lung injury	1.5	0	1
Cardiac injury	50	30	42
Liver injury	50	20	35

For major amputations, the amputation rates for one upper limb in the high-voltage burns group were significantly higher than those of the low-voltage burns group (right: $P=0.003$; left: $P=0.002$).

Table 3. Amputation Subtypes For Electrical Burns.

Amputations	High-voltage burns (%)	Low-voltage burns (%)	Chi-square	P
Both upper limbs	3	1	0.795	0.372
Both lower limbs	1	0	0.246	0.620
Minor amputations				
Fingers	6	12	3.465	0.063
Toes	3	4	0.354	0.552
Fingers and toes	2	1	0.313	0.576

DISCUSSION:

Plastic surgeons are finding cases of electric burn injuries quite

commonly now a days as compared to earlier. Apart from treating many deformities and amputations and extremely fine sutures for regular surgeries, plastic surgery also encompasses aesthetic and cosmetic aspect which is now in vogue. Augmentation and attenuation of body parts and shaping and sculpturing them has become a commercially successful way for earning among plastic surgeons especially in glamorous industry worldwide. So be it burn surgery, cleft lip, cleft palate, vascular surgery, amputations or on the other polar end be it hair transplant or liposuction or breast or butt augmentation or shaping nose and lips, plastic surgeons have been leading the way encashing vanity of the rich and the famous along with helping the poor and the needy too.

Electrical burns do deserve a special attention as they comprise approximately 0.04% to 5% of all admissions to burn centres in developed countries, and up to 27% in developing countries. (2) The percentage of high-voltage electrical burns (65%) was higher than that of low-voltage burns (35%) which was similar to previous study findings. (1,4) In contrast to these findings, other studies (7-10) have shown that low-voltage current is responsible for most electrical injuries. This discrepancy may stem from differences in the susceptibility of various populations.

Of the 100 patients studied, men were the most vulnerable, a finding that reflects previous studies. (6,11,12,13) This may be because men often engage in high-risk jobs and are more interested in electrical appliances. Similar to previous findings, (6) the results indicated that almost 75% of the total injuries occurred in young and middle-aged people, an energetic and active group. In addition, there were a substantial number of low-voltage burns in young children. Young children obviously are less able to judge danger and protect themselves, and may not always be protected by their families. Comparable to several previous studies, we found that a high percentage of burns occurred in industrial workers and electricians at work or householders at home. (4,5,14,15) These accidents mainly resulted from unsafe machine operation, electricity manipulation and protection equipment.

Electrical injuries can lead to many complications. Our results and those of others indicate that high-voltage burns tend to result in complications. (2,16) In the present study, coma was the most frequent complication, but usually resulted in transient loss of consciousness and left few mental or physical sequelae. Cardiac and liver injuries were easily identified from elevated levels of creatine kinase isoenzyme MB and liver enzymes and abnormal electrocardiogram.

Electrical burns are still a major risk factor for amputations. Amputations are generally performed because of massive necrosis of deep tissues caused by the current. Amputation rates for electrical injuries range from 10% to 68%.(17) During this study, we performed 18 major amputations and 8 minor amputations in patients with high-voltage burns, and 3 major amputations and 9 minor amputations in patients with low-voltage burns. The amputation rates were 37% for high-voltage burns and 22% for low-voltage burns. Additionally, high-voltage burns involved more amputations of one upper limb, probably because that upper limb was the most common current entry point. (6,18)

There were some study limitations. First, the sample did not include individuals who may have died at the scene of electrical burns, on the way to our centre or in basic hospitals; or individuals who did not seek medical care for social, economic or other reasons. Therefore, we could not obtain an exact estimate of the incidence of injury. Second, as this was a retrospective study, we could not assess long-term morbidity, learning disabilities, rehabilitation patterns or social costs. Third, this study was conducted at a single burn centre. Further well-designed multicentre studies are needed that include long-term follow-up to avoid the limitations of the current study.

In conclusion, electrical burns are an important public health problem. Their prevention should be emphasized in male adults, especially with respect to industrial workers, incidents in the spring and summer, and high-voltage injuries.

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