

Frequency and Outcome of Spontaneous Hemorrhage in Electrical Burn Injuries at Burns Centre, Karachi

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ABSTRACT

Objective: To determine the frequency of spontaneous hemorrhage and its effect on mortality rate among electric burn injury patients.

Materials and Methods: It is a retrospective review of the consecutive patients with electric injuries who were managed at Burn Centre, Karachi over a 4 year period spanning from January 2008- December 2011. Data were extracted regarding age of patient; site involved in electric burn, artery involved in spontaneous hemorrhage, surgical intervention, recurrence of hemorrhage and associated mortality.

Results: Electric burn constituted 1.42% of admissions in our burn Centre (n=208). Frequency of spontaneous hemorrhage was found in 25% (n=52) of cases. Frequent site of injury involved in spontaneous hemorrhage was upper limbs (44.25%), followed by lower limbs and anterior trunk. Most common vessel involved in spontaneous hemorrhage was axillary artery (19.23%, n=10) followed by radial artery (11.53%, n=6) and popliteal artery (11.53%, n=6). Surgical procedures carried out were primary ligation and amputation. Bleeding recurred in 23.07% of cases. Total mortality in electric burns cases was 13.46 % (n=28/208), however out of these 28 cases, mortality rate due to spontaneous hemorrhage was 32.14% (n=9/28).

Conclusion: Prompt and timely institution of appropriate surgical interventions among electric burn injury patients has the potential to reduce the frequency of life threatening episodes of spontaneous hemorrhage and improve the outcome in terms of morbidity and survival.

Key words: Spontaneous hemorrhage, electric burns, amputation.

How to cite this article: Al Ibran E, Rao MH, Fatima K, Irfan S. Frequency and outcome of spontaneous hemorrhage in electrical burn injuries at burns centre, Karachi. J Dow Uni Health Sci 2016; 10(1): 31-34.

INTRODUCTION

Electric injuries represent a special type of thermal injury with pathophysiology depending upon type of current, amount of current, pathway of current, voltage, resistance of tissues and duration of contact¹⁻³. Electric injury ranges widely from simple shock and mild burn to more extensive superficial injury, internal injury and mortality⁴ but usually causes severe injury 3rd degree burn⁵. Electrical injuries are conventionally divided into high or low voltage using 500 or 1000V as most common dividing lines. High voltage result in greater current flow and therefore has a greater potential for tissue destruction leading to major amputations and

systemic consequences^{1,2}. High voltage electrical injuries are more insidious than flame injuries because extent of injury is not obvious at first glance. Damage to underlying muscle, nerve and vessels may occur resulting in limb threatening ischemia and delayed hemorrhage⁶. Serious vascular damage usually occurs only after a high voltage accident¹. Vascular injury by electricity is a thermal process extending from interior to exterior⁷. Vascular damage is greatest in the media. This can lead to delayed hemorrhage when vessel eventually ruptures^{1,6}. Beside this, Spontaneous hemorrhage from a major vessel can also occur following electrical burn injury. The reason behind this is that the high voltage current when passes through a particular anatomic compartment renders the nearby vessels highly fragile, that can bleed spontaneously when ruptured mainly due to the application of even a minor force or pressure to that area. This can lead to serious consequences like Hypovolemic shock, especially if a major vessel ruptures, ultimately contributing to the high incidence of mortality among electrically burned patients.

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As very little local data is available on this issue and people are not much aware about the handling of such patients therefore our first aim of our study is to determine the frequency of spontaneous hemorrhage and its effect on mortality rate among high voltage electrical burn injury patients, and hence evolve evidence base to ensure better treatment strategies for future patients with such injuries.

MATERIALS & METHODS

It is a hospital based cross sectional study of consecutive patients of all age groups of either gender with electric injuries managed at Burn Centre of a tertiary care government hospital, Karachi over a 4 year period from January 2008-December 2011. Data were extracted from information recorded earlier at Burn Centre Karachi. A research questionnaire was specially designed for this purpose after pretest having questions regarding age of patient; site involved in electric burn, artery involved in spontaneous hemorrhage, surgical intervention, and recurrence of hemorrhage and associated mortality. All patients admitted during the study period with burns other than electric burns were excluded.

The collected data was analyzed through SPSS version 16.0 and descriptive statistics like frequencies and percentages was employed for data presentation.

RESULTS

A total of 208 cases of electric burn were presented and managed at Burn Centre of a tertiary care government hospital, Karachi during the 4 year period. The number of cases in each year was 30, 46, 63 and 69 during 2008 to 2011 respectively which shows that electric burn incidence has increased. The age of patients were ranged between 12 months to 70 years, with mean age 35 ± 7.3 years. Most common age group affected was 11-20 (n=65, 31.3%) followed by 21-30 (n=62, 29.8%). Age group least commonly affected was >50 years.

According to the analysis of frequent site of injury involved every year in spontaneous hemorrhage was highest in upper limb (23 i.e. 44.25%), followed by lower limb (9 i.e. 17.3%), anterior trunk (6 i.e. 11.53%) and genitonic (5 i.e. 9.67%) (Table 1).

Table 1: Frequent site of injury involved every year in spontaneous hemorrhage

	Upper limb	Lower limb	Anterior trunk	Genitalia	Head	Neck	Posterior trunk	Buttocks
2008	4	2	1	-	-	1	-	-
2009	6	2	-	-	2	-	-	1
2010	8	-	4	2	2	1	-	-
2011	5	5	1	3	-	1	1	-
Total	23 (44.25%)	9 (17.30%)	6 (11.53%)	5 (9.6%)	4 (7.69%)	3 (5.76%)	1 (1.92%)	1 (1.92%)

Frequency of spontaneous hemorrhage was found in 25% (n=52) of cases and their division during 4 years was 8, 11, 17 and 16 cases respectively. (Figure 1).

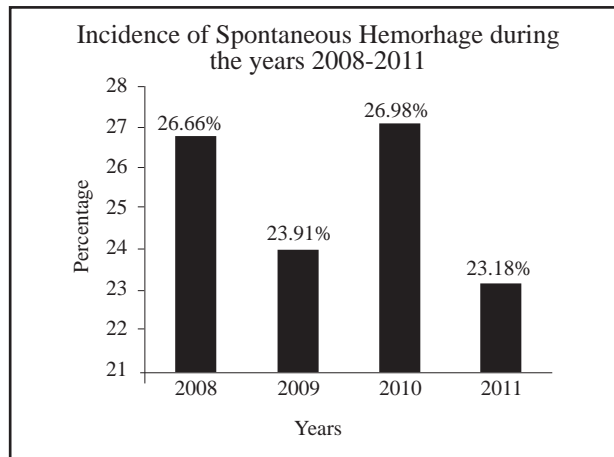


Figure 1: Frequency of spontaneous hemorrhage during four years

Most common vessel involved in spontaneous hemorrhage was the axillary artery (19.23%, n=10) followed by radial artery and popliteal artery (11.53% each, n=6), brachial (9.6% each, n=5) lateral veins in anterior trunk and temporal (7.7% each, n=4). (Figure 2).

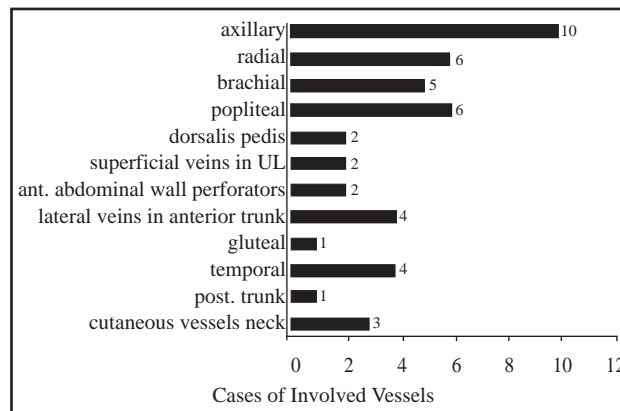


Figure 2: Number of vessels involved in spontaneous hemorrhage

Surgical procedures carried out were primary ligation and amputation. Out of the upper limbs i.e. 23 cases, 8 cases (34.78%) were managed with primary ligation and remaining 15 cases (65.22%) were managed with amputations. On the other hand, out of 8 cases of lower

limbs, 4 cases (50%) had primary ligations and rest of 4 cases (50%) had amputations. In remaining of the other regions, only primary ligations of the bleeding vessels were performed. In 23.07% of cases (n=12), bleeding recurred. Recurrence rate was highest in upper limb (66.67%, n=8) followed by lower limb (25%, n=3) and head region (8.33%, n=1).

Among 28 patients who died due to electric burn injuries, 9 patients (32.14%) had episodes of life threatening spontaneous hemorrhages. Mortality rate among electric burn patients who suffered spontaneous hemorrhage during 4 year period were 25% in 2008 which become reduced to 12.5% in 2011 (Figure 3).

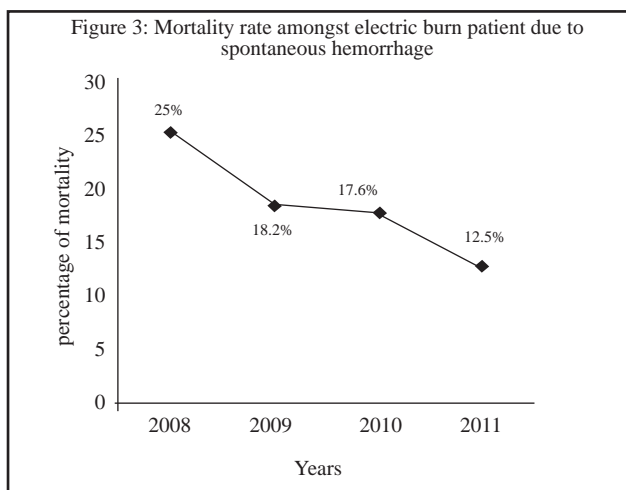


Figure 3: Mortality rate amongst electric burn patients who suffered spontaneous hemorrhage

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008. Informed consent was obtained from all patients for being included in the study.

DISCUSSION

Electrical burn injuries representing a devastating, although rare type of injuries accounted for 1.42% of admissions in our burns centre over the period under review. In a study conducted in Maharashtra, India⁸, the incidence of electrical burn was found 2% which is similar to our study. Our finding is also consistent with other studies^{2,3} and contradictory with studies from developed countries, reporting electrical burns incidence greater than 3%^{9,10}. The reason may be the higher exposure to electricity due to uninterrupted power supply in developed countries in contrast to our area where there is frequent breakdown of electricity and hence limited exposure. In the developed world, the high voltage electric burn injuries have been greatly reduced by strictly following legislated electricity codes

that ensure safety of all high voltage lines.¹ Such injuries still continue to be endemic in the developing countries like Bangladesh, India and Pakistan^{11,12}. Our study results showed that the frequency of electrical burn injuries is on the rise during the four year study period, showing the highest number of cases (n=69) in the year 2011.

Distribution of electrical burn injury with respect to the age group affected is consistent with many studies^{10,13}. The most common age group affected was 11-20 years (n=65, 31.3%), also reported by Patil SB et al from India (33.3%), suggesting high incidence of electrical burn injury in the second decade of life¹⁴. According to a study¹⁷, majority of the victims (87.33%) were male which is similar to our study.

The knowledge of involvement of a particular region of the body is extremely important in defining electrical burn injury for the understanding of source of electric current. The most common site involved in electrical burn injury noticed in our study was upper limb (n=167, 80.3%), which is consistent with finding from Nigeria (83%)³.

The extent of damage from electrical injury ranges from mild superficial skin burns to severe multiple organ dysfunction and death¹⁸. Vascular damage from electrical energy may become evident at any time¹. A less common manifestation is spontaneous hemorrhage from a major vessel nearby, rendered fragile due to passage of electric current. In our study, the overall frequency of spontaneous hemorrhage among electrical burn patients was found to be 25%. The major site of involvement was upper limb (n=23, 44.25%), followed by lower limbs, anterior trunk and genitals.

Spontaneous hemorrhage, as mentioned, is also related to the type of the vessel involved; as the diameter and width of the vessel is also related to the amount of blood loss from it¹⁹. Also, it necessitates a more focused, prompt and early approach for preventing significant amount of blood loss. In our study, spontaneous hemorrhage was observed most commonly in the axillary artery (19.23%, n=10), followed by radial and popliteal artery. The management of such injuries remains controversial and can be challenging for the vascular and reconstructive surgeons⁶. Management options include primary ligation of the involved vessel and in severe cases, amputation of the limbs to prevent further loss of blood and its serious consequences. In our study, amputation of the extremities was performed in 61.29% cases (n=19/31). The role of early limb amputation is very important in declining incidence of spontaneous hemorrhage. As delay in surgical treatment has clearly shown, in various studies, to worsen the morbidity and mortality¹⁶. In a study the surgeries were

perform according to the injuries. Most of the patients were treated with surgical excision 31 (31.63%), fasciotomy 26 (26.53%), escharotomy 87 (88.78%), and amputation 12 (12.24%).

Mortality mainly due to severe hypovolemic shock in spontaneous hemorrhage is the ultimate and worst outcome in most of the cases of electrical burns. In a study after follow-up, there was 8.16% (8 patients) mortality²⁰. In all patients debridement was performed. The results are similiare to our study as the overall mortality rate among electrical burn patients in our setup was 13.46% (n=28/208), which are also in agreement to that reported in other studies^{3,16}. Among these, spontaneous hemorrhages shared 32.14% (n=9/28) of the deaths. The issue is often multifactorial and a number of factors contribute to the mortality. Therefore, it is mandatory to recognize the need of prompt and urgent surgical interventions.

CONCLUSION

Spontaneous hemorrhage shared a significant proportion of morbidity, mortality and disability among electric burn patients in our set up. Prompt and timely institution of appropriate surgical interventions among electric burn injury patients has the potential to reduce the frequency of life threatening episodes of spontaneous hemorrhage and improve the outcome in terms of morbidity and survival.

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