

A Clinical Study of Electric Burn & It's Associated Complications at Tertiary Centre in Western Rajasthan

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ABSTRACT

Aims and Objectives - To study regarding commonest complications i.e. Renal, Cardiac & Hepatic and their outcomes.

Material and Methods- This prospective study was carried out on patients admitted in burn unit of department of surgery M.G. Hospital associated with Dr. S.N. Medical College Jodhpur. Records of the patients admitted from January 2018 to December 2018 were studied. Bed head tickets of the patients evaluated in detail. Patients data were examined in detail with references to their age, sex, mode of injury, part of the body affected, surface area involve, hospital stay, ultimate outcome of the disease.

Results: In our study out of 113 patients 18 (15.93%) had deranged renal function at time of admission, out of them 3 patients died due to renal failure and rest survived with normal renal parameter. In this study out of 113 patients 12 (10.62%) had ECG changes at time of admission from these 3 expired due to cardiac failure. In our study 25 patients (22.12%) had deranged liver function test at time of admission, all these patients recovered and discharged with normal liver function.

Conclusion: In these study we discussed Cardiac Renal and Hepatic complications associated with electric burn patients and associated mortality regarding these complications.

Keywords: Electrical injury; electrical burn; Cardiac; Renal; Hepatic

INTRODUCTION

Electrical injuries are an uncommon but potentially devastating, and constitute approximately 0.04–5% of admissions to burn units in developed countries, and up to 27% in developing countries (1, 2). Classification of electrical injuries are typically divided into low-voltage (<1000 volts) and high-voltage (>1000 volts), as well as by whether electrical current flows directly through the body versus a thermal injury caused by electrical flash. Electrical injuries in the adult population primarily affect males, are most often workrelated, and are the 4th leading cause of traumatic work-related death (3). Both morbidity and mortality in electrical injuries are relatively high, and have physical as well as psychological short-term and long-term sequelae (4,5,6). In these study we wanted to study in electrically injured patients that had complications RENAL, CARDIAC and HEPATIC and their outcomes.

Cardiovascular Complications (13)

High-voltage electric current can produce a wide variety of different cardiac injuries and usually consists of rhythm and conduction disturbances. Cardiac arrest either from asystole or ventricular fibrillation often presents in electrical injuries. The most common electrocardiographic abnormalities following high-voltage electric injuries are sinus tachycardia and nonspecific ST-T segment alterations, which frequently persist for several weeks following injury. Atrial fibrillation also has been reported following contact with high-voltage electric wires.

Renal complications (15)

Acute renal failure is one of the major complications of burns and it is accompanied by a high mortality rate. Most renal failures occur either immediately after the injury or at a later period when sepsis develops. Two major mechanisms are involved in the path physiological changes in the kidney: filtration failure and tubular dysfunction caused by various factors and interacting with each other.

Acute renal failure occurring immediately after burns is mostly due to reduced cardiac output, which is mainly caused by fluid loss. This is usually caused by delayed or inadequate fluid resuscitation but may also result from substantial muscle breakdown or haemolysis. It is usually reversible.

Reduced urine output despite adequate fluid administration is usually the first sign of acute renal failure. This will be followed by a rise in serum creatinine and urea concentrations. Early renal support (haemodialysis or haemofiltration) will control serum electrolytes and accommodate the large volumes of nutritional supplementation required in a major burn.

Abdominal complications (14,16)

Abdominal injuries either the entrance or exit wound localized destruction of the abdominal wall occurs with direct injuries to the underlying intra-abdominal structures, including small and large intestines, bladder, or liver.

High voltage electric burn leads to coagulation necrosis and rupture of cell membrane due to passage of energy through tissue which creates heat leading to injury to visceral organ like liver as evident by increased SGOT and SGPT in these patients.

AIMS AND OBJECTIVES

To study regarding commonest complications i.e. Renal, Cardiac & Hepatic and their outcomes.

MATERIAL AND METHODS

This prospective study was carried out on patients admitted in burn unit of department of general surgery M.G. Hospital Jodhpur associated with Dr. S.N. Medical College Jodhpur, Rajasthan. Records of the patients admitted from January 2018 to December 2018 were studied. Bed head tickets of the patients evaluated in detail. Patients data were examined in detail with references to their age, sex, mode of injury, part of the body affected, surface area involve, hospital stay, complications and ultimate outcome of the disease. patients who sustain electrical injuries by any mode (Direct current, Arc injuries, Lightning injuries, Hot elemental burn) included. OPD patients and who came in follow up not included in this study. In our study maximum number of electric burn patients had septicaemia (33.33%) Which cause mortality and second most common complication were cardiac failure and renal failure (25%). So we analysis all complication and their outcomes regarding mortality and recovery. In our study we taken data of mortality & morbidity in all group of patients involved body surface area percentage and shows that mortality was maximum in body surface area group of above 55% and morbidity was higher in body surface area of 19-36% burn in which maximum number of patients had upper limb loss.

OBSERVATION & RESULTS

Table-1: Correlation between ECG Changes and Mortality

ECG	No. of patients		Mortality	
	N	%	N	%
Normal	101	89.38	9	8.91
ECG changes	12	10.62	3	25.00
Total	113	100.00	12	100

Out of 113 patients 12 (10.62%) was mortality, among them 3 had ECG changes.

Table-2: Distribution of Electrical Injury Cases According To Renal Parameters And Mortality

RFT	No. of patients		Mortality	
	N	%	N	%
Normal	95	84.07	9	9.47
Deranged	18	15.93	3	16.67
Total	113	100.00	12	100

In 113 cases of electrical injury renal parameters (blood urea and serum creatinine) were increased in 18 (15.93%) and were with in normal limit in 95 (84.07%) among these 3 patients expired due to renal failure.

Table-3: Distribution of Patient According To Liver Function

LFT	No. of patients	Percentage
Normal	88	77.88
Deranged	25	22.12
Total	113	100.00

Out of 113 patients 25 patients had deranged liver function test.

Table-4: Cause of Mortality

Cause of death	No. of patients	Percentage
Septicemia	4	33.33
Cardiac	3	25.00
Renal failure	3	25.00
Other	2	16.67
Total	12	100.00

In this study it was observed that septicemia contributed maximum 33.33% as a cause of mortality followed by cardiac 3 (25.00%), renal failure 3 (25.00%) and other were cause in 2 (16.67%) patients.

RESULTS

In our study out of 113 patients 18 (15.93%) had deranged renal function at time of admission, out of them 3 patients died (25%) due to renal failure and rest survived with normal renal parameter. In this study out of 113 patients 12 (10.62%) had ECG changes at time of admission from these 3 expired (25%) due to cardiac failure. In our study 25 patients (22.12%) had deranged liver function test at time of admission, all these patients recovered and discharged with normal liver function.

Study of 113 patients shows that majority of persons affected were from most active group of society i.e. 15-40 year which comprises 64.60% and among them males were around 10 times of female population. By this study it was found that majority of cases were from rural population.

Morbidity increases with the increases of severity of burn till 50% BSA. After that (in >50% BSA) mortality supervenes the morbidity. Septicemia was the leading cause of death which was a significant no. 33.33%. But associated injuries & direct effect of electricity resulted in 76% mortality. The survived patients also had some type of disability which led them to live dependent life.

The upper limb was the most affected part of body which was more than 75% and subsequently amputation (38.94%) was the most common surgery performed.

DISCUSSIONS

Electrical burn injuries comprise of less than 5% of all admissions to burn centre worldwide, however have significant morbidity and mortality associated with them. Our study revealed that high-voltage electrical injuries generally have significantly greater morbidity in terms of greater number of surgical procedures required, higher rates of medical complications, lead to multiple post-traumatic injuries due to falls, and may result in more long-term psychological and rehabilitative problems (7,8). In our study Order of body parts involved by electric burn was as: Extremity>Chest>Abdomen>Head Neck. Extremity was affected in around 88 (77.88%) patients and head and neck were affected in 33(29.2%) patients. The incidence of involvement of upper extremity was higher because of direct manipulation of electric device with bare hand and most of the lower limb involvement due to exit of electric current. This study shows also about complications cardiovascular, renal and hepatic. There were ECG changes, derange RFT and LFT. In these mortality due to cardiac failure and renal failure (25%) present.

In our study out of 113 patients 18 (15.93%) had deranged renal function at time of admission, out of them 3 patients died due to renal failure and rest survived with normal renal parameter. Jessica G Shih⁹ in 2017 did an extensive literature search on electrical burn injuries using OVID Medline, PubMed and EMBASE databases from 1946–2015 found out mortality of 14 (27%) due to renal failure. Acute renal failure is one of the major complications of burns and it is accompanied by a high mortality rate. Most renal failures occur either immediately after the injury or at a later period when sepsis develops. Two major mechanisms are involved in the path physiological changes in the kidney: filtration failure and tubular dysfunction caused by various factors and interacting with each other.

The renal failure that occurs in extensively burned patients is usually associated with failure or dysfunction of other organs in a form of multiple organ dysfunction syndrome which adversely influences the prognosis.

In this study out of 113 patients 12 (10.62%) had ECG changes at time of admission from these 3 expired due to cardiac failure. Jessica H shih⁹ in his study stated mortality due to cardiac failure was 12 (16.90%) out of that 3 (6%) had myocardial infarction and 9 (18%) had ventricular fibrillation. High-voltage electric current can produce a wide variety of different cardiac injuries and usually consists of rhythm and conduction disturbances. Cardiac arrest either from a systole or ventricular fibrillation often presents in electrical injuries. The most common electrocardiographic abnormalities following high-voltage electric injuries are sinus tachycardia and nonspecific ST-T segment alterations, which frequently persist for several weeks following injury. Atrial fibrillation also has been reported following contact with high-voltage electric wires.

In our study 25 patients (22.12%) had deranged liver function test at time of admission, all these patients recovered and discharged with normal liver function. Jessica H shih⁹ in their study observed hepatic failure as a cause of death in only 1 (4%) patients. High voltage electric burn leads to coagulation necrosis and rupture of cell membrane due to passage of energy through tissue which creates heat leading to injury to visceral organ like liver as evident by increased SGOT and SGPT in these patients.

A study of 40 patient with electric burn treated at general Hospital, Sungai, India Between January 1999 to December 2000. Electric burns were represented for 2% of all burns admissions. 35 patients develop complications, sepsis in 18 patients, cardiac in 17 patients, acute renal failure in 3 patients, contracture in 2 patients, paralytic ileus in 2 patients and gangrene of upper of upper limbs in 2 patients. 10 out of 40 patients (25%) died; septicemia with A.R.F. was cause of death in 3 patients, cardiac arrest in 5 patients and myocardial in-fraction in 1 and associated injury in 1 patient. The remaining 30 patients had hospital stay ranges from minimum 2 days to maximum of 100 days (mean of 12.5 days) and were discharge after recovery (Subrahmanyam M. et al)¹².

SUMMARY AND CONCLUSION

The study shows that electric injury causes significant morbidity as well as mortality in all groups studied. Mortality & morbidity is mainly due to high tension electric wires. Mainly these type of injuries occurs in rural areas because of

high level of unawareness as well as lack of proper communication. It causes significant damage to general population and electricians.

This study shows also about complications cardiovascular, renal and hepatic. There were ECG changes, derange RFT and LFT. In these mortality due to cardiac failure and renal failure (25%) present.

Morbidity leading to permanent disabilities make the person physically dependent on others. It can be prevented by educating the people about the proper handling to electric circuits & devices. Proper communication among the electricians may help in lowering such accidents. Proper rehabilitation of the handicapped person & employment to the member of the affected family may reduce the social burden caused by such electricity concerned accidents.

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