(International Print/Online Journal)

SJIF IMPACT FACTOR: 4.617
PUBMED-National Library of Medicine ID-101739732

ISSN (Print): 2209-2870
ISSN (Online): 2209-2862

International Journal of Medical Science and Current Research (IJMSCR)
Available online at: www.ijmscr.com
Volume2, Issue 3, Page No: 93-97
May-June 2019

Bilateral Upper Limb Amputations Following High-Voltage Electrical Injury (HVEI): A Case Report

Bhat A Tanveer[1], Rasool Altaf[1],Wani A Hafiz[1]
[1]Department of Plastic and Reconstructive Surgery, SKIMS,Soura,Srinagar, India

***Corresponding Author:**

Dr. Tanveer Ahmad Bhat
Postdoctoral Senior Resident, Department of Plastic and Reconstructive Surgery
Apartment No G9, Block B,Senior Resident Hostel,
SKIMS Soura, Srinagar, J & K, India.PIN 190011

Type of Publication: Case Report
Conflicts of Interest: Nil

ABSTRACT

Background: Bilateral upper limb amputations result in severe disability. High tension electric burns are rare but devastating form of injuries**.** The human body conducts electricity very well. Direct contact with electric current can be lethal. The passage of electric current through the body is capable of producing a wide spectrum of injuries, including serious damage to the heart, brain, skin and muscles. This is a case report of a 40-year power department linesman who accidently suffered a high voltage electric injury (HVEI) while repairing the power lines. He presented in the emergency department in a conscious state but grossly irritable with severe pain and burnt upper limbs up to mid forearms with frank compartment syndrome. His management included multiple operatives procedures, including fasciotomies, below elbow amputations,serial debridements and skin grafting**.**

Keywords: High-voltage electric injury, gangrene, fasciotomy, below elbow amputation

INTRODUCTION

Electricity is omnipresent in our daily life. Unfortunately, electric injury can result in some of the most devastating traumas. As opposed the thermal burns, the cutaneous burn size does not correlate with the extent of the damage seen in high voltage (>1000 V) electrical injuries.It can produce diverse and serious injuries to the heart, brain, skin and muscles. The extent of tissue damage following electrical injuries is related to the voltage of the current. High-voltage electrical injuries often produce severe burns and blunt trauma. Such burns are much worse than the thermal burns[1]. Electric burns are responsible for about 3-5% of all burns unit admissions and high-voltage electrical injuries are usually from power lines.[2,3,4,5] Mortality depends on the voltage and the electrical contact and is estimated to be very high. [2,6]. Lack of access to prompt medical care in well equipped highly specialized units is a contributory factor to poor outcome for these patients.

CASE REPORT:

A 40 year-old linesman working in power department accidently sustained a high voltage electrical injury (HVEI) while repairing the power lines. On arrival to the hospital, patient was alert, hemodynamically stable but grossly irritable and crying with pain. He has around 10 % visible total body surface area (TBSA) burns involving bilateral forearms and hands and right axilla. The hands were gangrenous with frank compartment syndrome of forearms. Primary survey according to advanced trauma life support (ATLS) guidelines was normal. He presented with mayoglobinuria. The packed cell volume at presentation was 30%. It later dropped to 20% and then 18%. Serum electrolytes, urea and creatinine were within normal limits. The patient was appropriately resuscitated with intravenous fluids. Immediately after stabilization, fasciotomies of the bilateral forearms and hands were done [figure 1].

Subsequently the patient developed extensive tissue necrosis involving both extensor as well flexor compartments [figure 3] and extending up to the proximal forearms. Bilateral below elbow amputations (BEA) were done and the stumps were left open [figure 2]. Postoperatively, the patient continued to receive appropriate antibiotics and blood transfusions as required. Nutritional support in the form of amino acid infusions and oral intake of high-protein and high-calorie feeds was instituted. He had daily dressings to the stump loaded with slough[figure 4] and burns wounds .Multiple serial debridements were performed [figure 5]. Patient was put on negative pressure wound therapy (NPWT)[figure 6]. The burns unit undertook subsequent wound care involving resurfacing with split skin grafting of the amputation stumps [figure 7]. The wound in right axilla healed by secondary intention. Physiotherapy to both elbow joints was also instituted. The patient remained in hospital for a total of 61 days with initial 2 days in intensive care unit (ICU).

DISCUSSION

Electricity, although an important commodity, has become a significant cause of injury in our society[3]. Electrical injuries are caused by the conduction of electric current through the body. The injuries could be classified into low-voltage (<1000V) and high voltage (>1000V) injuries[3]. Although both low and high-voltage electrical injuries can have devastating effects, the high-voltage electrical injuries tend to produce more extensive tissue damage. Alternating current, the more commonly distributed form, is more dangerous than direct current due to the tetanic muscle spasms it produces and this results in prolonged contact of the victim with the source.It is reported that electrical burns constitute between 0.04% to as high as 32.2% of admissions to major burn centers [1,7,9-11]. Mortality rates are significant with these types of injuries, reported in the literature to be as high as 59% [7]; the most common cause being secondary to an acute arrhythmia at the scene of the injury[8]. They account for approximately 1000 deaths each year in the United States alone, ranking 5th as the most common cause of occupational deaths [9]. Electrical burns are most commonly seen in work related injuries and involve mainly young males, as in our case report the patient was linesman. Electrical company linesman, electricians and construction workers are especially at risk [10,11.] Sadly, it has been reported that as little as 5.4% of patients suffering a HVEI are able to return to their previous line of work [8.] This can likely be attributed to the fact that these injuries commonly involve the hands and upper extremity, as in this case report [10,11.]

Contrary to thermal burns, high-voltage injuries result in extensive deep tissue damage, extending far beyond what can be predicted by TBSA involved, and resulting in higher rate of complications [1]. In a case-matched controlled analysis comparing HVEI and thermal burns, Handschin et al. [1] found a significantly higher rate of escharotomy/ fasciotomy (47% vs. 21%), amputations (19.1% vs. 1.5%), as well as total hospital length of stay (44 days vs. 31 days) in HVEI versus thermal burns.

Commonly seen with HVEI are associated acute injuries which include fractures, head trauma, intra-abdominal injury, renal injury, soft-tissue injury, and acute ocular injury. Associated injuries have been described to occur in 25.1% of HVEI [11,13.] In addition to associated trauma, patients suffering HVEI are prone to various complications as well. In a study involving 202 electrical injuries, neurologic complications, deep muscle involvement, and amputation of extremities were found to be the most prevalent [10]. Similarly, Arnoldo et al. found amputation of extremities or digits and muscle necrosis to be some of the most frequently observed complications, observed in 95 and 68 of the 263 cases of HVEI, respectively [11.] As presented in our case, myoglobinuria and fasciotomy are also commonly encountered complications. In the current literature, escharotomy/fasciotomy rates have been described to be as high as 54% [12] and amputation rates as high as 49.4% [8].

CONCLUSIONS:

HVEI are devastating injuries associated with a vast array of serious and inevitable complications. The prognosis for these patients depends on the degree of the initial insult as well as the severity of any subsequent complications. Early intervention is the goal with resuscitation and aggressive surgery being the mainstay of management. Considering that most HVEI are work-related, the best way to decrease the morbidity and mortality related to these injuries is prevention. Through public education and work

Volume 2, Issue 3; May-June 2019; Page No. 93-97

safety programs, most electrical injuries can be avoided.

REFERENCES

1. Handschin AE, Vetter S,et al. A Case – matched controlled study on high voltage electric injuries vs thermal burns. J burns care Res.2009:30:400-407 [PubMed]
2. Lee RC. Injury by electrical forces: Pathophysiology, manifestations and therapy. Curr Probl Surg1997; 34(9): 677-764.
3. Spies C, Trohman RG. Narrative review: Electrocution and life threatening electrical injuries. Ann Intern Med Oct2006; 145(7): 531-7.
4. Koumbourlis AC. Electrical injuries. Crit Care Med 2002; 30(11): 424-30.
5. Rai J, Jeschke MG, Barrow RE, Herndon DN. Electrical injuries: A 30-year review. J Trauma 1999; 46(5): 933-6.
6. Luz DP, Millan LS, Alessi MS. Electrical burns: A retrospective analysis across a 5-year period.
7. Haberal M. Electrical burns: a five-year experience-1985. J Trauma. 1986;26:103–109. [PubMed] [Google Scholar]
8. Hussman J, Kucan JO, Russel RC, et al. Electrical injuries morbidity, outcome and treatment rationale. Burns. 1995;21:530–535. [PubMed] [Google Scholar]
9. Martinez JA, Nguyen T. Electrical Injuries. South Med J. 2000;93:1165–1168. [PubMed] [Google Scholar]
10. Maghsoudi H, Adyani Y., Ahmadian N. Electrical and Lightning Injuries. J Burn Care Res. 2007;28:255–261. [PubMed] [Google Scholar]
11. Arnoldo BD, et al. Electrical Injuries: A 20-Year Review. J Burn Care Rehabil. 2004;25:479–484. [PubMed] [Google Scholar]
12. Garcia-Sanchez V, Gomez-Morell P. Electrical burns: high and low tension injuries. Burns. 1999;25:357–360. [PubMed] [Google Scholar]
13. Cancio LC, et al. One Hundred Ninety-Five Cases of High- Voltage Electrical Injury. J Burn Care Rehabil. 2005;26:331–340. [PubMed] [Google Scholar].

Figure 1: showing high voltage electric injury (HVEI) with deep burns with fasciotomy of both forearms and hands.

Volume 2, Issue 3; May-June 2019; Page No. 93-97

Figure 2: showing bilateral below elbow amputation (BEA) with open stumps

Figure 3: showing amputated forearms and hands with gangrenous flexor and extensor compartments

Figure 4: showings below elbow amputation stumps with non-graftable raw areas with minimal slough

Volume 2, Issue 3; May-June 2019; Page No. 93-97

Figure 5: showing stump raw areas after serial debridements.

Figure 6: showing stump raw areas after application of negative pressure wound therapy.

Figure 7: showing split thickness skin grafted (STSG) stumps.

Volume 2, Issue 3; May-June 2019; Page No. 93-97