

CASE REPORT

HIGH-TENSION ELECTRICAL BURNS: REPORT OF TWO CASES

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SUMMARY. High-tension electrical burns are a rare but devastating form of injury. The objective of this case report is to bring to the fore the severity of this rare form of injury and highlight the benefits of active surgical management of such a condition. We report the cases of two patients who were managed for high-tension electrical burns and highlight the main features of their presentation and management. Both patients needed urgent resuscitation and subsequent multiple amputations and disarticulations to save their lives. In high-tension electrical burns early resuscitation and wound exploration coupled with decisive action on the need for amputation would reduce the morbidity and mortality often associated with the ensuing overwhelming sepsis.

Introduction

In Nigeria, motor vehicle accidents are the commonest cause of injuries leading to limb amputation.¹⁻³ Electrical burns are generally uncommon in Nigeria. In several studies on burns in this region and other places they constitute only a small percentage of all burns.^{4,5} High-tension electrical burns usually involve electricity workers⁵⁻⁷ or electrical installation vandals. In most cases, burns from high-tension electricity produce massive tissue loss.⁶ In addition to cutaneous injuries, there is severe damage to underlying muscles, nerves, blood vessels, and bones, which frequently results in amputations, renal failure, and other complications.⁷ The management of these high-tension electrical burn patients can be quite demanding. In most parts of Africa, the dearth of specialized burn centres for the management of such injuries compounds the grim outcome for such patients.

The destructive effects of electricity can result from both direct and indirect contact with the body. The most important factor determining the risk of amputation appears to be the voltage strength.⁶ We present two patients who sustained high-tension electrical burns that were managed in the University of Maiduguri Teaching Hospital, Nigeria.

Case 1

The first patient was a 45-yr-old housewife who was admitted into the Accident and Emergency Department of our hospital about 17 h after sustaining major electrical burns. On her way to her farm, she had inadvertently grabbed a live high-tension electric cable that had fallen across the path following a heavy rain storm. The jolt of



Fig. 1 - Mummification of right upper limb and flame burns in face and neck.

the electric shock immediately threw her a distance from the site with associated loss of consciousness. Some time passed before some passers-by noticed and she was then rushed to our hospital in a commercial commuter bus, with no form of resuscitation measures in the interim. When she presented 17 h after the injury, she was assessed and found to be conscious but in severe pain. She was markedly pale. The main findings were: full-thickness burns of the whole right upper limb with mummification up to the shoulder level (*Fig. 1*) and extensive burns involving both feet up to about mid-leg (*Fig. 2*). There were other patches of mixed-thickness burns on the right side of the face and neck as also on the posterior aspect of the left thigh and buttock as a result of secondary flame burns due to ignition of her items of clothing (*Figs. 1,3,4*). The total burned body surface area was estimated at 23%. All the burn sites were highly contaminated with gravel and dirt. The patient was resuscitated and treated with emergency



Fig. 2 - Deep bilateral deep burns in feet and distal legs.



Fig. 3 - Secondary flame burns in left buttock.

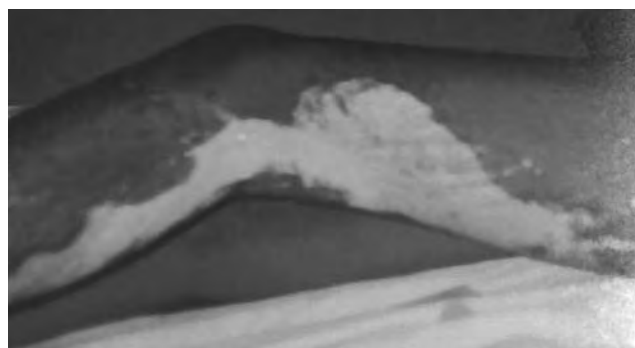


Fig. 4 - Secondary flame burns in parts of posterior aspect of left leg and thigh.

bilateral below-the-knee (B/K) guillotine amputations and disarticulation at the right shoulder. She later had her stumps refashioned and was fitted with bilateral B/K prostheses. She was mobilized fully on the prostheses by the physiotherapists before finally being discharged from hospital after a total hospital stay of 12 months. She was alive and well at 4-yr follow-up.

Case 2

The second case is that of a 35-yr-old mechanic who was rushed to the Accident and Emergency Department in our hospital within 1 h of sustaining high-tension electrical burns. He was reported to have been standing holding the door of a truck on which a crane was mounted. The crane came into contact with a live high-tension electric cable, and this led to indirect electric current contact with his hand. He was reported to have been immediately flung some distance from the vehicle with some of his clothing on fire. He was also transiently unconscious. He was rushed to the Accident and Emergency Department of our hospital, where he arrived within 1 h of the accident.

He was assessed and found to have the following injuries:

- extensive burns involving the entire right upper limb up to the shoulder region, with the hand completely charred

- patchy areas of burns on the chest
- deep burns in the left foot, with charred toes
- deep burns in the right foot up to the ankle region

The patient was resuscitated with IVF parenteral H₂ blockers and subsequently mannitol. He was treated with extensive escharotomy in the feet and fasciotomy in the right upper limb.

He was offered emergency B/K guillotine amputation on the right and transmetatarsal amputation on the left. He later had to have disarticulation of the right shoulder joint due to severe sepsis. Refashioning of the right B/K stump was carried out later as well. After appropriate physiotherapy and mobilization, the patient was discharged with a right B/K prosthesis. His total hospital stay was 13 months, and he was alive and well five years post-injury.

Discussion

Injuries caused by exposure to 1,000 volts or greater are defined high-tension electrical burns.^{7,8} High-tension wires can carry up to 100,000 volts.⁸ Both the patients we present sustained high-tension electrical burns with associated secondary flame burn, which is documented to be a common accompaniment of high-tension electric burns.⁷ Road traffic accidents are the commonest indication for amputation in most parts of Nigeria.¹⁻³

Generally, electrical burns are an uncommon form of injury. In a survey of burn admissions over a 10-year period in a Nigerian regional burns centre, electrical burns constituted a mere 2.8% of all cases.⁵

Survivors of the immediate trauma of high-tension electrical burns usually end up with multiple limb amputations due to the severity of the muscle necrosis that usually follows.⁷ Our report concurs with the findings of Opara et al., who reported that 86% of their patients with high-voltage injury required some form of amputation.⁵ These surgical operations are life-saving rather than limb-saving.

This typical finding is seen in our two patients. In the first case the patient had to have bilateral B/K amputation, which led to difficulties in mobilizing her; this was further compounded with disarticulation of the right shoulder, which affected her stability and balance while ambulating with the prostheses. Likewise, the second patient also had to undergo a B/K amputation on the right and a trans-metatarsal amputation on the left.

As noted by Faggiano et al.,⁹ a compartment syndrome sometimes develops because of massive perilesional oedema, with subsequent loss of tissue perfusion. In such situations fasciotomy becomes imperative. This is performed along the major axis of the limb, as in escharotomy. The underlying muscle is then inspected, and debridement is thus facilitated. The second patient had a fasciotomy on the right upper limb to forestall further muscle necrosis

secondary to poor tissue perfusion, although in the end, in view of the severity of the muscle necrosis, the limb had to be disarticulated to prevent the possibility of overwhelming sepsis.

The lessons learnt from these two cases include the fact that whatever the severity of the injuries, vigorous early resuscitation, together with an early decision on the need of a provisional guillotine amputation, can be life-saving, especially in cases with obvious mummification or severe limb muscle necrosis. These conditions can later be re-fashioned to create a more formal amputation stump. This would lessen the load of myoglobin and tissue toxins that could be absorbed by the bloodstream.⁷ In such cases the severity of the muscle necrosis and the ensuing sepsis means that any delay would be catastrophic. Both of our patients had to have the right upper limb disarticulated, which reflects the greater involvement of the dominant hand in such contact injuries (they were both right-handed).

Conclusion

Despite the devastating nature of this type of electrical injury, all hope is not lost. Prompt appropriate resuscitation as well as early surgical debridement and/or provisional amputation would save the lives of most of these patients. With dedicated post-operative physiotherapy they can very likely return to a reasonably useful life.

RÉSUMÉ. Les brûlures électriques causées par la haute tension constituent un type de lésion rare mais dévastateur. Les Auteurs de cette étude de deux cas particuliers se sont proposés de souligner la gravité de ce type rare de lésion et d'accentuer les bénéfices d'une gestion chirurgicale active de telle condition. Ils présentent les cas de deux patients atteints de brûlures électriques à haute tension et soulignent les particularités de la présentation et la gestion des patients. Tous les deux ont eu besoin de soins intensifs et d'amputations multiples successives et de désarticulations pour sauver la vie. Dans les cas de brûlures électriques à haute tension, la réanimation précoce, avec l'exploration des lésions associée à une action décisive sur ce qui concerne la nécessité de l'amputation, réduirait la morbidité et la mortalité souvent associées avec un sepsis dévastant successif.

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