

He had no medical co-morbidities. Examination findings revealed a conscious young male, in severe painful distress, pale and severely dehydrated. During the first hour on admission, his vitals were that of temperature 37.7°C-38.3°C, tachycardia of 129-140/minute, Blood pressure 152-168/88-92 mmHg and respiration rate-28-40 cpm. The musculoskeletal findings were: markedly swollen and edematous upper limbs with fasciotomy/escharotomy incisions on the arms and forearms; circumferential full-thickness burns of the whole upper limbs with exposed devitalized and charred muscles up to the axillae (Figure 1a and b). Both upper limbs had dusky, cold insensate fingers with no active movement. The total burns surface area (TBSA) was estimated at 25% using the Wallace rule of nines. There were no other physical or blunt organ injuries. An impression of bilateral upper limb ischemia due to unrelieved acute compartment syndrome from high tension electrocution was made. His blood tests revealed elevated urea and creatinine, deranged electrolytes with hyponatremia and hyperkalemia; anemia, leukocytosis and thrombocytosis. He also had elevated iron studies and creatine kinase suggestive of rhabdomyolysis. However, his clotting studies, electrocardiogram and chest X-ray on admission showed no abnormalities. He had resuscitation based on the advanced trauma life support. Within the first hour of presentation, he was admitted into the intensive care unit for ventilatory and organ support. He was immediately commenced on crystalloid infusion via a central venous line, his urgent packed cell volume was 19% and he had transfusion of packed cells. He was

optimized for an emergency surgery on the same day of admission, which included urgent wound debridement of the right upper limb and above-the-elbow guillotine amputation of the gangrenous left upper limb (Figure 2a and b). However, his clinical condition deteriorated and obvious necrotic tissues with seropurulent malodorous discharge were noticed in both upper limbs on first wound inspection 48 hours post- surgery (Figure 3a and b). The family was counselled on the poor clinical state of the patient and potential treat to life if urgent decision on a more radical surgery- shoulder disarticulation was not taken. This proactive step was necessary to control sepsis and preserve life. The anesthetist advised staged surgeries to reduce metabolic response to trauma. He had the right shoulder disarticulation on the 5th day on admission and the left shoulder disarticulation and wash out of the right discharging stump on the 10th day on admission under general anesthesia. The clinical pictures of the disarticulated shoulders are as shown in Figure 4. He was pyretic for days with multiple foci of infection from central venous canula, disarticulated stump, urethral catheter and chest. He had prolonged course of sensitive antibiotics, incentive spirometry and change of catheters as indicated. On day



Figure 1. (a and b) Appearances of the burned upper limbs at presentation.



Figure 2. (a and b) Intra-operative pictures after urgent debridement of the right upper limb and left above-the-elbow guillotine amputation.



Figure 3. (a and b) Appearances of the right upper limb and left above -the-elbow guillotine stump during the first wound inspection after initial surgery.



Figure 4. Post-operative appearance after Bilateral shoulder disarticulation.

23, he had elevated iron, deranged international normalized ratio of 1.5 and activated partial thromboplastin time of 50 after he had received 29 units of packed cells and 6 units of fresh frozen plasma. He subsequently commenced on desirox, vitamin k therapy and tranexamic acid. While on admission, he had a total of 36 units of blood products transfusion, oxygen therapy, rehydration, antibiotics for treatment of sepsis, analgesics, anticoagulation, nutritional and other supportive care. Though the pre-operative course of treatment was turbulent, his post-operative course was predictable. He was discharged home after 35 days on admission with stable clinical condition and satisfactory healed stumps. At 12-month follow-up visit, patient still complained of phantom limb pain and yet to procure prosthesis due to financial constraints. He also relies on family members for feeding and social needs of the upper extremities such as bathing, dressing up, cleaning after toilet use; and finding it difficult to re-integrate back into the society. Other professionals that managed him included psychiatrist, occupational therapist, physiotherapist, prosthetist and pain specialist.

Discussion

High tension electrical burns are accidental injuries resulting from improper handling of naked cable wires mostly by electrical technicians. The victims are mostly young active individual presenting with varying degrees of soft tissue damage, vascular thrombosis and consequent tissue ischemia [4]. The amount of voltage and the pathway of electricity through the body are important determinant of injury extent and outcome. The most common entry point for high-tension current is the hand, and the most common exit point is the foot [4,5]. However, the injuries in our patient were limited to both upper limbs only and he had no secondary flame burns in the lower limbs. This may be due to exit point being the axillae while the sole of the foot was off the ground. Faggiano et al. [6] noted that compartment syndrome sometimes develops because of massive perilesional oedema, with subsequent loss of tissue perfusion. Our patient presented to the referral hospital with compartment syndrome and subsequently had a fasciotomy in a bit to forestall further necrosis but this could not save the upper limbs. There was rapid progressive ischemia within 48 hours of injury, probably due to preference of the current pathway for least resistant tissues such as the vessels and nerves. The initial debridement and guillotine amputation served as first aid aimed at reducing the load of myoglobin and tissue toxins that could shut down the vital organs. Moreso, patient was not fit for a more radical surgery and we thought we could get away with the first surgical intervention. Most of the victims usually die from sepsis, acute kidney failure due to massive myoglobinuria, disseminated intravascular coagulopathy and direct damage caused by the electric current [6]. Hence, aggressive resuscitation coupled with radical

debridement, amputations or disarticulations following this electrocution are usually life-saving surgical operations which require early decision making [7]. In view of the severity of the muscle necrosis and severe sepsis in our patient, both upper limbs had to be disarticulated at the shoulder level in a staged fashion to limit metabolic responses to trauma and improve survival. An interval of 5 days in-between the disarticulations was allowed based on his hemodynamic status and optimization. Soleh et al. [8] also reported a similar case with high-tension electrical burns which ended up with bilateral shoulder disarticulation. However, they disarticulated both shoulders on the same day. Abbas et al. [7] also reported two cases with high-tension electrical burns which culminated into unilateral shoulder disarticulations and in addition, other forms of amputations were undertaken because their patients had secondary flame burns in the lower limbs. This may be due to the fact that the exit point of currents in their patients was the sole of the foot. The game changer in the management of this index case with major electrical burns of 25% TBSA was early admission into intensive care unit, multidisciplinary approach and prompt decision making to disarticulate the shoulders. The rarity of bilateral shoulder disarticulation done for high tension electrical burns, therapeutic challenges imposed and the fact that we were able to achieve good clinical results despite the tortuous treatment course made our case report a unique one.

Conclusion

Early resuscitation, cardiovascular support in the intensive care unit, urgent wound debridement and radical amputation of devitalized limb would reduce the mortality from high-tension electrical burns. Though bilateral shoulder disarticulation poses significant challenges on activities of daily living and social needs, it was the only available option to preserve life in our circumstance.

What's new?

The survival chances after high tension electrical burns is very low, bilateral shoulder disarticulation done for high tension electrical burns is rare in the literature, therapeutic challenges imposed and the fact that the authors were able to achieve good clinical results despite the tortuous treatment course made this case report a unique one. This report gives a guide that can assist in achieving survival.

List of Abbreviation

TBSA Total burns surface area

Conflicts of interest

The authors declare that they have no conflict of interest regarding the publication of this case report.

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Consent for publication

Written consent was obtained from the patient.

Ethical approval

The ethical approval is NOH/HREC/01/23 and the protocol number is 19/23 with the date of ethical approval being 16th May, 2023.

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Summary of the case

1	Patient (gender, age)	Male, 23-year-old
2	Final diagnosis	Bilateral upper limb gangrene from high tension electric burns
3	Symptoms	Compartment syndrome, hypovolemic shock, sepsis, septic shock
4	Medications	Antibiotics, intensive care unit support, massive transfusion of blood products, oxygen
5	Clinical procedure	1. Fasciotomy 2. Debridement, guillotine amputation 3. Bilateral shoulder disarticulation
6	Specialty	Traumatology