CASE REPORT

High Voltage Electric Burn Injury to Scalp Managed with Phenytoin Dressing

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ABSTRACT

Phenytoin, an antiepileptic medicine was identified by Putnam and Merritt from Harvard Medical School and published in 1937, has also been documented for wound healing by accelerated epithelialization and increased connective tissue activity. [1] Though Phenytoin has also been used for superficial dermal burns, ulcers and diabetic wounds, there is paucity of data in its uses in burn wounds. We hereby present a case where phenytoin powder was used for secondary healing of a high voltage electric burn wound over the scalp with exposed calvarium.

Keywords: High Voltage Electric Burn, Scalp, Exposed Calvarium, Phenytoin

INTRODUCTION

Electric Burn Injury, also known as the 'Grand Masquerader,'[2] is classified into two types: Low Voltage and High Voltage, the threshold being a thousand volts.[3] High Voltage Electric Burn Injury causes a catastrophic assault to the human body often causing far more internal damage visible beyond the human eye. In addition to the cardiac conduction abnormalities, it also causes rhabdomyolysis due to skeletal muscle injury leading to acute renal failure. Also, there is an imminent compartment syndrome of the affected body organ necessitating urgent fasciotomy and a very probable subsequent amputation of the inflicted limb, if survivable.

CASE REPORT

A 34 years old gentleman with no prior medical or surgical history sustained High Voltage Electric Burn as he was trying to repair a faulty light bulb on an electric pole in the street. He was referred to us from the local Health Center and presented to our emergency department after 8 hours post incident with a history of High Voltage Electric Burn Injury over his Right Upper Limb and left fronto-paritetal scalp.

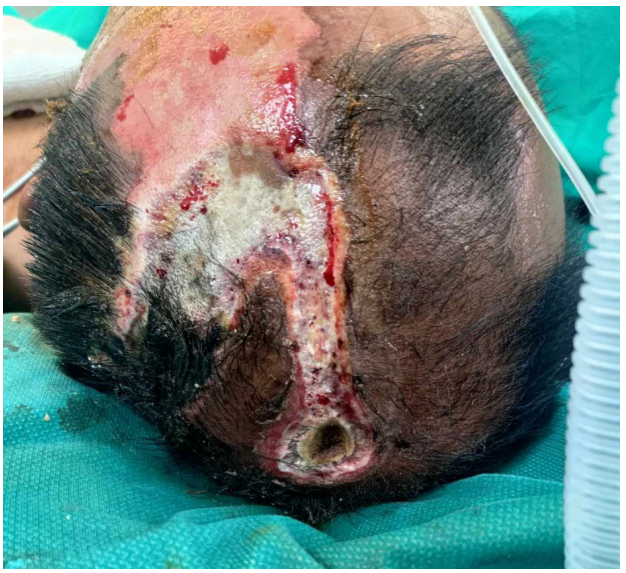

Figure 1: Scalp injury during the initial evaluation in the operating room

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Figure 2: Debrided wound planned initially for free flap coverage

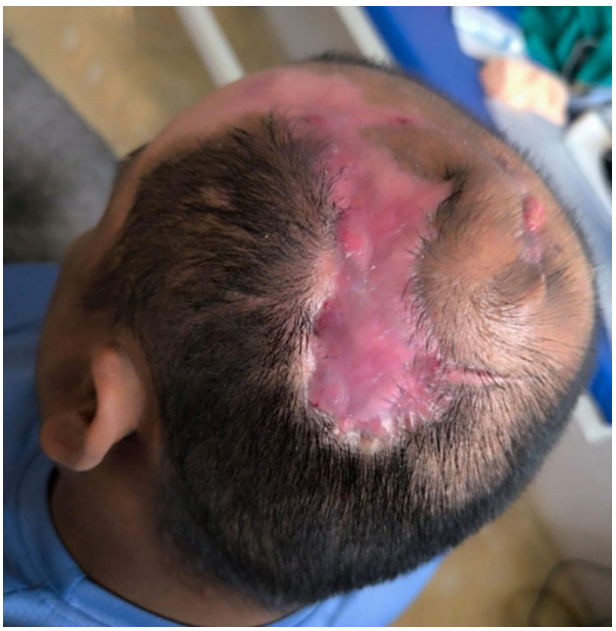

Figure 3. The final healed wound with secondary intention at 10 weeks post discharge

At presentation, his Right wrist and forearm was already charred and had dark colored urine. Notably his Creatinine Kinase N-Acetyl Cysteine (CK-NAC) level at admission was 69000. A large defect of 90cm2 was noted on the scalp. The upper limb amputation was refused initially by patient. Serial debridement of limbs and scalp was done. Right mid-forearm amputation was done during second week of hospital stay as it started to putrefy. A free tissue transfer was planned for the scalp injury.[4] But patient had sudden cardiac arrest post debridement of scalp, for which he underwent successful cardiopulmonary resuscitation. After this further treatment was refused by the patient. An OPD basis serial phenytoin dressing was planned.

Phenytoin ointment is not available commercially in Nepal, so a 100mg phenytoin was grinded to make fine powder. The patient was advised for a head shower/ bath every 2nd to 3rd day with shampoo and clean water. The phenytoin powder was sprinkled in a thin layer covering the entire raw area and covered with non-sticky dressings on top. Eventually, over a period of 10 weeks, the entire raw area was contracted, coverage with granulation tissue was noted. Successful secondary wound healing was achieved.

DISCUSSION

The anti-seizure medication Phenytoin is still amongst the most used medication in epileptic patients in Nepal. Oral Phenytoin also has its unwanted effects. In addition to, gingival hypertrophy, Fetal Hydantoin Syndrome is seen in infants of mothers who had taken Phenytoin during pregnancy.[5] Also, phenytoin-induced drug reaction with eosinophilia and systemic symptoms (DRESS) syndrome is a rare but potentially life-threatening skin reaction in susceptible individuals.[6]Numerous studies on traumatic wounds and ulcers have shown positive effects on wound healing. Phenytoin is understood to promote healing by[7] stimulating fibroblast proliferation,enhancing collagen synthesis, inhibiting collagenase activity and improving local vascularization.

Phenytoin also exhibits antibacterial activity and pain alleviation as noted in a randomized control trial with moderate-sized (<30% TBSA) superficial second degree (dermal) burn.[8] Third degree deep electrical burns to the scalp, where wide debridement usually includes the periosteum, leaves an unsuitable bed for skin grafting, thus posing a great reconstructive challenge. For large defects (over 90 cm^2), usually a free

flap provides a single stage, stable coverage with well-vascularized tissues. Many varieties of free flaps such as latissimus dorsi, free parascapular, omental transfer, forearm flap, serratus anterior have been used.[9]

CONCLUSION

There is scarcity of literature on the use of Phenytoin for healing with secondary intention of large scalp burn wounds. This case report mentions the feasibility of the use of phenytoin powder for secondary healing of large scalp wound in resource limited setup.

REFERENCES

1. Keppel Hesselink JM. Phenytoin: a step-by-step insight into its multiple mechanisms of action—80 years of mechanistic studies in neuropharmacology. J Neurol. 2017;264(9):2043–7. DOI: 10.1007/s00415-017-8465-4
2. Grube BJ, Heimbach DM. Acute and delayed neurological sequelae of electrical injury. In: Cravalho EG, Burke JF, Lee RC, editors. Electrical Trauma: The Pathophysiology, Manifestations and Clinical Management. Cambridge: Cambridge University Press; 1992. DOI: 10.1017/CBO9780511663291.008
3. Schleich AR, Schweiger H, Becsey A, Cruse CW. Survival after severe intrathoracic electrical injury. Burns. 2010;36(5):e61–4. DOI: 10.1016/j.burns.2009.06.207
4. Desai SC, Sand JP, Sharon JD, Branham G, Nussenbaum B. Scalp Reconstruction. JAMA Facial Plast Surg. AMA - American Medical Association; 2015;17(1):56–66. DOI: 10.1001/jamafacial.2014.889
5. Ns S, Sm G. Fetal Hydantoin Syndrome: A Case Report. 2010 [cite;d 2026 Feb 10]; 30(1). Available from: https://pdfs.semanticscholar.org/0b2f/301df0d0855734e8fbc49ca04b2b7f0deb60.pdf
6. Dhungana S, Thakur M, Paudyal A, Bhatta S, Karki S, Yadav P, et al. DRESS syndrome secondary to phenytoin: a case report and review of the literature. Annals of Medicine and Surgery. 2025;87(6):3862. DOI: 10.1097/MS9.0000000000003243
7. Keppel Hesselink JM. Phenytoin: a step-by-step insight into its multiple mechanisms of action—80 years of mechanistic studies in neuropharmacology. J Neurol. 2017;264(9):2043–7. DOI: 10.1007/s00415-017-8465-4
8. Carneiro PM, Rwanyuma LR, Mkony CA. A comparison of topical Phenytoin with Silverex in the treatment of superficial dermal burn wounds. The Central African journal of medicine. 2002;48(9-10):105–8. Available from: https://pubmed.ncbi.nlm.nih.gov/14562531/
9. Pennington DG, Stern HS, Lee KK. Free-flap reconstruction of large defects of the scalp and calvarium. Plast Reconstr Surg. 1989;83(4):655–61. DOI: 10.1097/00006534-198904000-00010