Plastic Surgery and Modern Techniques

Alameri F. Plast Surg Mod Tech 8: 170.

www.doi.org/10.29011/2577-1701.100070

www.gavinpublishers.com

OPEN ACCESS

GAVIN PUBLISHERS

Case Report

Management of Chronic Scalp Defect with Exposed Dura Mater Post Severe Electrical Burn: Case Report

Fatima Alameri*, Maurice Mimoun

Department of plastic and reconstruction surgery / Burn unit, Saint Louis Hospital, Paris, 75010, France.

***Corresponding author:** Fatima Alameri, Department of Plastic and Reconstruction Surgery / Burn Unit, Saint Louis Hospital, Paris,75010, France.

Citation: Alameri F, Mimoun M (2024) Management of Chronic Scalp Defect with Exposed Dura Mater Post Severe Electrical Burn: Case report. Plast Surg Mod Tech 8: 170. DOI: https://doi.org/10.29011/2577-1701.100070

Received Date: 27 March 2024; **Accepted Date:** 01 April 2024; **Published Date:** 04 April 2024

Abstract

Multiple managements were introduced to treat skull defect due to high voltage electrical burns. The main objective of this article is to highlight the acute management in treating skull defect aiming to ensure healthy tissues and eliminate the risk of infection before proceeding into further indicated management. We report a case of a 28-year-old male, previously healthy with a history of high- voltage electrical burns due to a home incident in Algeria in 2019. Admitted two years later at Saint Louis Hospital Burn Unit with a skull defect and amputated big and second toes of the left foot. He was treated initially in a local hospital in Algeria, underwent two rotational flaps with multiples burr holes were made over the outer table of parietal region. He had multiple surgical debridement with serial dressing for one year. At the time of admission, the patient was complaining of uncovered scalp defect located over the parietal region with exposure of the external table and purulent discharge. Debridement and skin graft was performed as acute coverage, two months post-operation the defect was completely covered, satisfying healthy tissues were identified. Skin graft can be considered as one of the optimal managements for treating a scalp defect if there is any suspicion of underlying infection and collection or vascular issues before proceeding to preform further coverage as free flap.

Keywords: Electrical, Burn, High Voltage, Scalp, Defect, Skin Graft.

Introduction

Electric burn injuries typically manifest as localized wounds with extensive damage to deep tissues. These injuries are particularly severe at entry and exit points. Although uncommon, electrical burns on the scalp can occur. The heat generated during these incidents may result in necrosis affecting one or both calvarial tables. Effectively managing these injuries requires thorough surgical debridement of the devitalized tissues [1].

A lot of controversy exists in the decision making with regards of the timing of the operation, choice of the flap and the role of debridement. Proper management of those cases prevents further complication and improves cosmetic disfigurement.

Scalp deficiencies can arise from diverse etiological factors, including tumor removal, burns, injuries, or congenital abnormalities, giving rise to notable surgical and aesthetic challenges [2]. Multiple managements were introduced to treat skull defect due to high voltage electrical burns. Most of the full-thickness burn injuries, including those affecting the head and neck regions, can be successfully addressed using split-thickness skin grafts. However, in cases where defects involve exposed or implicated underlying bone, flap reconstruction becomes a necessary requirement [3].

Case Presentation

A 28-year-old Algerian male suffering from an extensive scalp electrical burn, came to France seeking to improve the appearance of the skull defect following an electrical burn occurred at home in 2019. He was admitted to Saint Louis Hospital

Burn Unit in Paris on March 2021. Patient has no prior medical history, and no documented drug usage or any familial background of genetic disorders. Additionally, the individual is a non-smoker. He suffered from depression and low self-esteem related to his appearance at admission, requiring regular follow-up by our psychologist and psychiatric team. Financial support was provided by the national French insurance authorities, and the patient was accompanied by his relative in France.

Initially, treated in Algeria in May 2019 by a plastic surgery team with two rotation flaps that covered 40% of scalp defect and skin grafting over the donner zones. He underwent multiple surgical debridement followed by serial dressing and amputation of the first and second toes with skin grafting due to the development of necrosis. Neurosurgeons addressed the residual scalp defect by employing a burr hole in the outer cortex. This procedure facilitated the formation of granulation tissue on the scalp, establishing a foundation for subsequent skin grafting.

Diagnosis and Treatment

On clinical examination, the patient was alert, oriented with neurologic deficit manifesting as multiple abnormal upper limbs movements treated with Gabapentin.

The scalp defect was located over the parietal region (10x11cm) in size, with exposed calvarium. Multiple drill holes were seen with purulent discharge without exposed of dura mater (Fig 1).

Figure 1

A Head CT scan was preformed that demonstrated a discontinuation of the internal table in the central part of the parietal region with underlying collection between the external table and the dura mater, as well as a remarkable space which leads into separation of the outer table from the internal table (Fig 2).

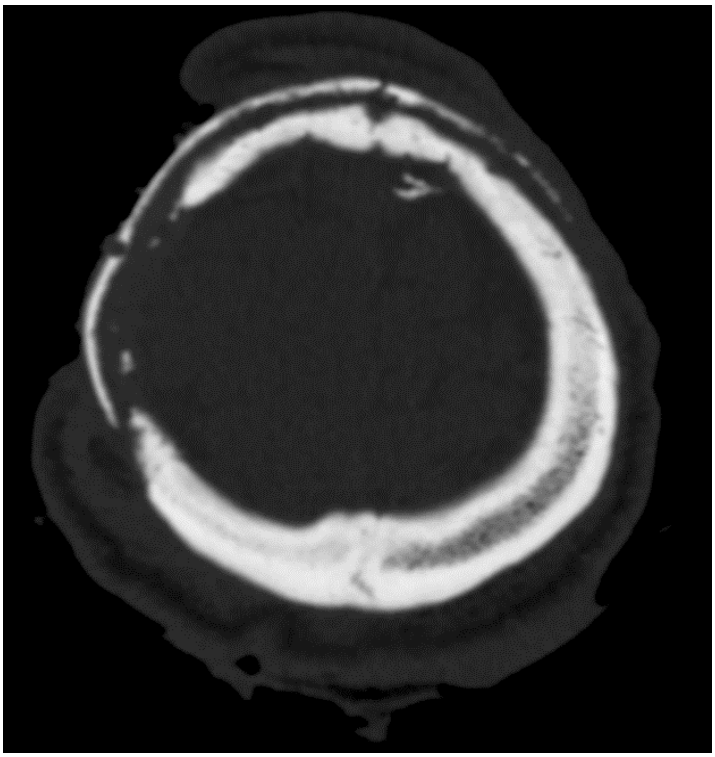

Figure 2

Our plan included: first, the removal of the outer table, and second, covering it with a split-thickness skin graft to eliminate any underlying cause leading to purulent discharges.

During the first operation, the skull bone was raised by using Obwegeser Rugine over the right parietal region. During the elevation of the skull bones in right parietal region, we noticed after removing the outer table that the bone aspect of the inner table was in a good condition, we continued to separate the bone over the left parietal region and good granulation tissues were found as well between the outer and the inner tables. After complete removal of the skull bone, an exposure of dura mater was found around (6x9 cm) (Fig 3, 4, 5).

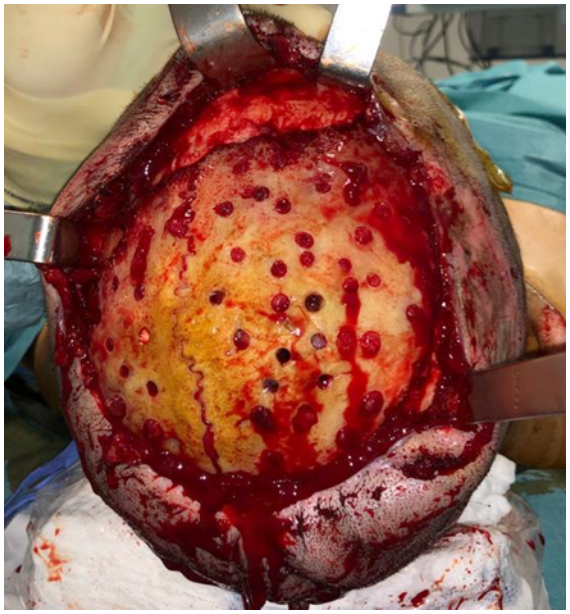

Figure 3

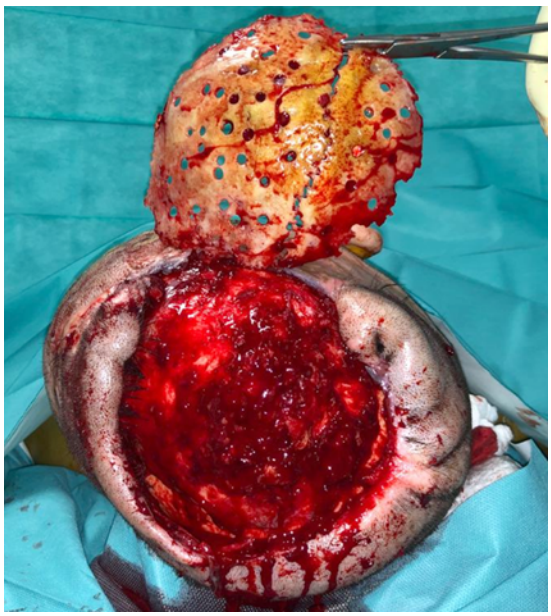

Figure 4

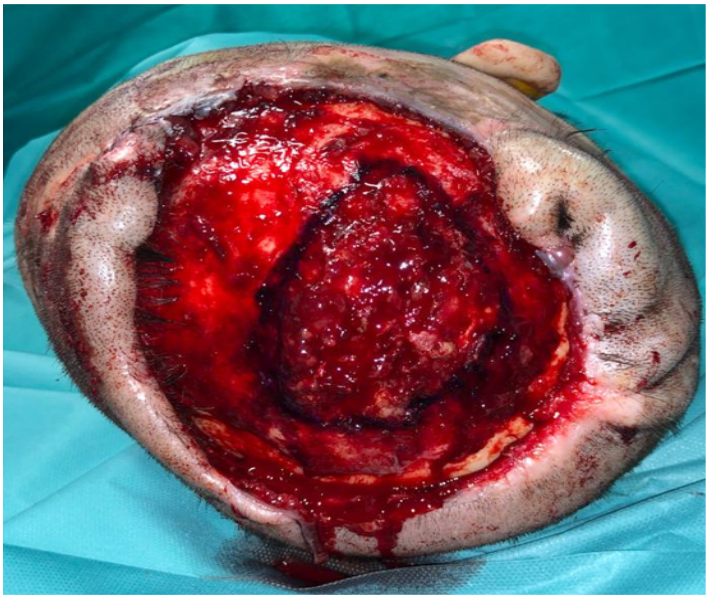

Figure 5

After a good wash with Normal saline, dressing was done with Flammazine (Silver Sulfadiazine) and Jelonet (Paraffine Gauze Dressing). Daily dressing performed for 3 weeks to assure good granulation tissues before proceeding to skin graft (Fig 6).

Figure 6

In the second surgical intervention, a split-thickness skin graft harvested from the left temporo-occipital region was utilized to cover the scalp defect. A tie over dressing was applied over the donor area for 4 days, after daily dressing with Jelonet and Vaseline for 3 weeks, the skin graft was completely adherent (Fig 7).

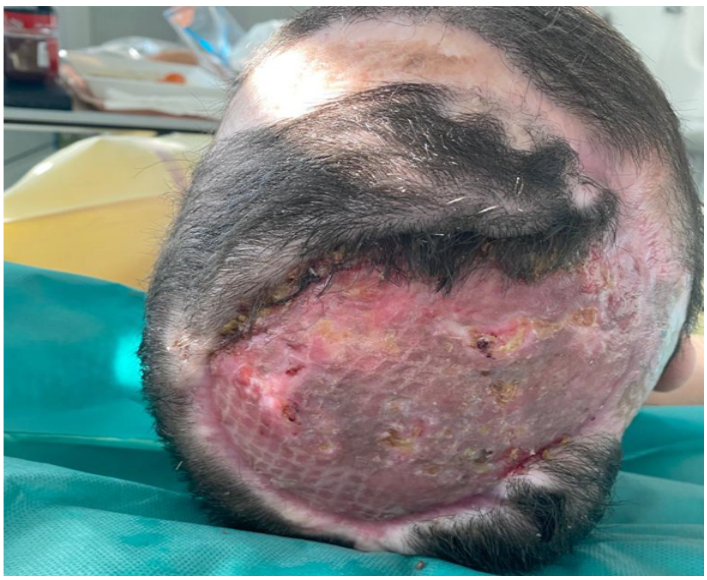

Figure 7

The patient underwent the operations successfully, exhibiting good tolerance, and no wound infections were noted during the follow-up period. After six weeks of hospitalization, the patient was discharged from the burn unit without the necessity for re-exploration or surgical revisions.

The patient is currently undergoing follow-up at the clinic, where collaborative assistance from diverse services including psychology, social work, and physiotherapy is yielding noticeable improvements in addressing the consequences of his burn injury. The patient expressed initial satisfaction with the management provided by our team and expressed a desire to continue follow-up appointments with us for further improvement. After a multidisciplinary meeting with neurosurgeons, the possibility of bone reconstruction followed by a free flap was discussed with the patient. However, the patient expressed a desire to return to his home country and requested to reschedule the planned surgery for the coming year.

Discussion

Decisions regarding the management of electrical scalp injury are guided by the size and depth of the defect, with management options including primary closure, staged debridement with skin grafts, negative pressure dressing, local flaps, pedicled flaps, and free flaps [4].

Partial or full-thickness injuries can occur depending on factors such as voltage, the duration of contact, and tissue resistance. While bone is highly resistant to electrical trauma, there is a potential for necrosis in one or both calvarial tables. Neurological complications arising from electrical injuries may manifest either early or later, depending on the circumstances [4].

When assessing scalp defects, Harrison's classification proves valuable for gauging the severity of burns. Classes I and II signify injuries limited to the soft tissue, while classes III and IV encompass both the soft tissue and the underlying cranial bone [5].

When addressing a burned skull, we adhere to fundamental principles of plastic surgery. The foremost objective is to promptly offer coverage without jeopardizing nearby tissues or the overall biological system. The treatment modalities for all thermal injuries, applicable to both the scalp and cranial bones, include immediate intervention for patient stabilization, involving debridement and temporary coverage. Following patient stability, delayed or planned treatment may involve permanent coverage with grafts or flaps. Additionally, reconstruction aims to restore thermally injured defects to their original anatomical configurations [6].

Skin graft after multiple debridement of infected or non-viable bone is a good approach in acute phase. However, delay reconstruction is preferable to assure a healthy receiver area and to eliminate the infection. The optimal approach for a substantial scalp defect involves free flaps, and the selection depends on factors such as the defect's size, depth, and the overall health of underlying tissues to ensure a favorable recipient area.

In our case, we proved that the skin graft was the best solution to cover the defect after insuring a good healthy ground by eliminating unhealthy structures before proceeding to free flap procedure, as observed in previous cases in different conditions.

The second reason supporting our approach is that the patient already went into previous rotation flaps which were unsuccessful indicating inadequate vascular supply at both the donner and recipient sites, and this will favor skin grafting procedure as a safer choice over free flap option for patient with vascular issues that could affect free flap viability. Furthermore, Skin grafting is generally considered a less invasive procedure with lower risk of complications compared to free flap surgery, which involves microvascular anastomosis and longer operating times. As well as, skin grafting offered our patient a quicker recovery and shorter hospital stay compared to his previous rotational flap surgery, which may be advantageous in this situation where expedited wound closure is desired.

Moreover, as it is a simple surgical technique that covers the whole area defect and maintains the scalp contour. To ensure a clean recipient site with minimal donor site impact, our initial approach involved a table excision before proceeding to the skin graft. We chose to implement this approach instead of directly opting for a free flap to eliminate any local infection, establish a healthy zone, and minimize donor site morbidity before advancing to a free flap procedure. Nevertheless, delaying reconstruction within

three months is recommended to enhance cosmetic outcomes and ensure scalp security.

Another benefit that makes skin grafting a preferable option in the immediate management of scalp defects following electrical burns is the minimal or absence of complications observed in both donor and recipient sites. The first identified limitation is the necessity for the patient to protect the grafted area with a dressing due to its inherent fragility. Secondly, the patient desires to postpone additional surgical procedures, including bone reconstruction and a free flap, for the upcoming year, as this decision will lead to a delayed, better cosmetic outcome.

Finally future challenges and limitations, we agreed that the approach of removing a healed skin graft from the scalp and replacing it with a free flap as a subsequent step poses notable challenges and heightened risks. Alternative strategies, such as comprehensive pre-operative planning and potentially combining graft removal with free flap placement in a single-stage procedure, may offer a more favorable balance of risks and benefits. Moreover, the insertion of free flap over the dura in a secondary procedure introduces additional surgical complexities. Ensuring adequate vascularization and proper flap integration into the surrounding tissues becomes paramount, as compromised blood supply can jeopardize flap viability and overall surgical outcomes. Furthermore, the potential for CSF leakage or infection due to disruption of the dura during flap placement necessitates meticulous surgical technique and vigilant postoperative monitoring to prevent this issue.

Conclusions

We have presented a case of a 28-years-old male with delayed presentation of electrical burn to the scalp. The wound became infected repeatedly despite the multiple surgical debridement and two rotational flaps. The patient underwent two surgeries while he was admitted at the burn unit, the first was the removal of unhealthy tissues followed by skin graft over the scalp defect with a daily dressing. We chose for this course of management based on the patient's health condition, the dimensions and depth of the defect, as well as the presence of infection with oozing discharge from the scalp bone and the patient vascular issue which noted from the previous attempts. The available choices for this patient were limited, given that two rotation flaps were performed two years ago. We view this management as an immediate optimal approach, focusing on clearing the patient from any infection before proceeding with alternative flap options.

Disclosure

Author Contributions: The author assisted in performing the surgery and contributed in gathering the data, writing and reviewing the manuscript. The co-author performed the surgery and contributed in supervising and reviewing the manuscript.

Funding: This study did not receive financial support, and there were no specific grants from public, commercial, or non-profit sectors.

Institutional Review Board Statement: All procedures performed in this case were compliant with ethical standards of institutional and/ or the National Research Committee.

Informed Consent Statement: Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Data Availability Statement: This article does not involve data sharing as no datasets were generated or analyzed during the present study.

Acknowledgments: None.

Conflicts of Interest: The author and co-author declare no conflicts of interest.

References

1. AlLababidi NH, AlOmran A, Hashem FK (2018) The use of an omental flap for the reconstruction of a burn injury to the scalp: A case report. Int J Surg Case Rep.
2. W Gondo, W G Kleintjes (2019) Electrical burns to the scalp and associated complication, S Afr J Plast Reconstr Aesthet Surg Burns.
3. Moltaji S, El Khatib A, Rogers AD (2022) Delayed axial flaps for coverage of a fourth degree scalp burn. J Surg Case Rep.
4. Greenwood JE, Wagstaff MJ, Rooke M, Caplash Y (2016) Reconstruction of Extensive Calvarial Exposure After Major Burn Injury in 2 Stages Using a Biodegradable Polyurethane Matrix. Eplasty.
5. Ankita Anil Naik, Mahantesh Math, J. V.Morab (2019) Scalp reconstruction – Post electric Burns 8: 2.
6. Maria Manuel Mendes, Pedro Martins, Rafaela Pais Serras, Ruben Coelho (2020) Reconstruction of Post-Electrical Burn Scalp Defect with Exposed Bone: A Case Report Surgery Case Reports.
7. Gupta P, Srivastava S (2022) Reconstruction of Scalp with Local Axial Flaps. Indian J Otolaryngol Head Neck Surg.
8. Kotera SS, Narayan N, Mahesh MS, Dhanraj P (2016) Reconstruction of post electrical burns scalp defect. Int J Res Med Sci.
9. Jeyakumar P, Hussain AT, Ahamed AR (2018) Reconstruction of Extensive Post-Electric Burn Scalp Defects With Exposed Bones: A Study of 12 Cases. Ann Plast Surg.
10. Golpanian S, Kassira W, Habal MB, Thaller SR (2017) Treatment Options for Exposed Calvarium Due to Trauma and Burns. J Craniofac Surg.
11. Krishna D, Khan MM, Dubepuria R, Chaturvedi G, Cheruvu VPR (2023) Reconstruction of Scalp and Forehead Defects: Options and Strategies. Cureus.