Case Report

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Role of Bone: Abrasion in Wound Bed Preparation in Pediatric Scalp Electrical Burns

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Abstract

Electrical burns constitute 3–5% of all burn cases; in developing countries, this ratio increases up to 21–27% and the mortality rate is reported to be between 3.75% and 58.8%. Most of the acute burns are life threatening initially requires resuscitation and require various types of surgical interventions such as eschar excision or split-thickness skin grafting, depending on the size, location and depth of the lesion. In this case we will assess the role of bone–abrasion of the in the scalp electrical burns involving up to the scalp bone. The Bone-abrasion is a procedure that can be utilized in wound bed preparation especially in scalp electrical burns.

Keywords: Bed preparation; Bone-abrasion; Paediatric; Electrical burns; Scalp.

INTRODUCTION

In the developed world, electrical burns constitute 3–5% of all burn cases; in developing countries, this ratio increases up to 21–27%[1] and the mortality rate is reported to be between 3.75% and 58.8%.[2] Approximately one-third of the electrical burns occur in electrical workers, one-third in construction workers and the last third in children playing at home. Most of the acute burns are life threatening initially requires resuscitation followed various types of surgical interventions such as eschar excision or split-thickness skin grafting, depending on the size, location and depth of the lesion. The process injures top layer of bone and causes it to bleed at points. Inlarge full-thickness defects with exposed bone, need flap cover to cover the defect. Before proceeding for flap cover, patient needs debridement of unhealthy wound bed. When a scalp defect with exposed bone post electrical burns, outer layer of bone which was necrosed. The discolored bone with sloughed out periosteum needs chiseling of the exposed bone to remove the outer layer of the bone to prepare for wound cover with flap. If the scalp bone was infarcted in full thickness, all infarcted bone was debrided. In this article we report the use of Bone-Abrasion in the Wound bed preparation of scalp defect from electrical burns.

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MATERIAL AND METHODS

This study was conducted in the Department of Plastic Surgery in a tertiary care institute. Informed consent was obtained from the patient under study.

Department scientific committee approval was obtained. It is a single center, non-randomized, non-controlled study. The patient under study was 8-years-old male, with no other known co morbidities who presented with 30% TBSA electrical burns. The entry point was his Scalp Vertex parietal calvarium (fig. 1) and exit point was his right feet. He was managed by standard WHO international guidelines for burn care and resuscitation. The scalp electrical burns were the deeper burns which involving up to the calvarium. His calvarium was exposed and devoid of periosteumalong with unhealthy tissues and discolored top layer of bone (fig. 2). Dermabrasion was done on the exposed calvarium until bleeding points was encountered (fig. 3). In our case, Bone scan showed full thickness bone infarct in the vertex region of the scalp bone. As whole thickness of bone was infarcted, outer and inner table of skull bone is abraded with rotating burr drill (fig. 4). Biological scaffold dressing (Integra used in our case fig. 5) was applied to cover the exposed the dural layer to promote granulation followed by Vacuumdressing was applied after Bone-abrasion. Bone-Abrasion is a technique that uses a wire brush or a diamond wheel with edges called a burr or fraise to remove the upper layers of the bone. The brush or burr rotates rapidly, taking off and leveling the top layers of bone. The cost of the bone abrasion drill bit and machine costs around 1.5 lakhs Indian rupees along with handle and multiple drill bits.



Fig. 1: At admission



Fig. 2. Exposed calvarium with unhealthy tissue and discolored bone debrided with burr tip drill bit.



Fig. 3. Bone-abrasion of Outer table of skull



Fig 5. Biological Scaffold (Integra) application of exposed Dural layer

RESULTS

Bone-abrasion with the round burr tip drill helps in removing the top layer of the bone till the bleeding point appears without damaging the normal bone. In our case, whole thickness of the bone was infarcted, which leads to removal of all infarcted bone by bone-abrasion. Postoperative period was uneventful.

DISCUSSION

Approximately one-third of the electrical burns occur in electrical workers, one-third in construction workers and the last third in children playing at home. Most of the acute burns are life threatening, and require various types of surgical interventions such as eschar excision or split-thickness skin grafting, depending on the size, location and depth of the lesion.[3] Bone-Abrasion is a technique that uses a wire brush or a diamond wheel with edges called a burr or fraise to remove the upper layers of the skin or bone. The brush or burr rotates rapidly, taking off and leveling the top layers of the skin or bone.

Bone-Abrasion of exposed bone improves vascularity and provides the wounded area with undifferentiated mesenchymal cells that have the capacity to transform into migratory fibroblasts. When fibroblasts migrate into a wound, they are closely followed by new capillary formation from endothelial budding and the typical picture of a granulating surface appears. The fibroblasts

synthesize collagen, mucopolysaccharides, and glycoproteins to form new connective tissue.[4] It is over this tissue that the subsequent migrating epithelial cells pass.

CONCLUSION

In Electrical burns, bone abrasion with burr tip drill was found to be useful in the debridement of unhealthy outer and inner table of bone without damaging the surrounding healthy bone.

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