

Wound bed preparation for second degree deep post burn wound over scalp

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RESEARCH

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ABSTRACT

Wound bed preparation is an art. It is a complex process that involves an understanding of the physiology of wound healing, the factors, which disrupt wound healing and methods to overcome them. Scalp burn wound is one of the most challenging wounds to prepare due to rampant infection, debilitated condition of the patient and comorbid conditions. Various modalities have been tried and described for accelerating the wound bed preparation of such wounds. Wounds are managed according to TIME concept, an abbreviation stands for Tissue management, Infection control, Moisture regulation, and wound Edge management. In this article, we discuss the case of an 8 year old child who sustained electrical burns over the scalp and underwent wound bed preparation for second degree post burns wound for regenerative techniques.

Key words:

Wound bed preparation, Scalp wounds, Second degree burns.

Introduction

Wound bed preparation is an ever-changing paradigm that has evolved rapidly in the past few years. It is defined as global wound management to accelerate endogenous healing or to facilitate the effectiveness of other therapeutic

measures¹. Wound bed preparation has been classically managed by the TIME concept which is an acronym standing for T : Tissue Management I : Inflammation and infection control M : Moisture Balance E : Epithelial advancement (Edge). The recent concept is the "Removal of Barriers" to wound healing which includes necrotic tissue, biofilms, corrupt matrix, infection, edema, etc. The selection of wound dressing and irrigation solution depends on these factors²⁻⁵.

Materials and Methods

This study was conducted in a Tertiary Care Centre in Department of Plastic Surgery after getting the department ethical committee approval. Informed consent was obtained. The subject was a 8-year- old male child who had accidental electrocution burn injury (High voltage) sustaining 35 percentage burns to the face, neck, chest, abdomen, bilateral upper limb and bilateral lower limb with deep burn injury to the scalp (entry wound) and right great toe (exit wound) He was admitted in burns care ICU. Preprocedural wound measurements documented using imito software (Figure 1-4). He underwent wound debridement of the burns under general anaesthesia, along with heparin irrigation, Silver Sulphadiazine cream application and regenerative scaffold following which RONPWT (Figure 7) was applied. 4 days later, he underwent wound debridement with Autologous Platelet Rich Plasma (Figure 5) and Low Level Laser Therapy (Figure 6) with amniotic membrane application, following which Cyclical NPWT (Figure 7) was applied. He underwent 3 cycles of the same regimen over the next 1 month. Later For exposed scalp bone, periodical Bone abrasion and bone matrix application (Figure 2, 4) and Integra application (Figure 3) were added as treatment modality. Subsequently, External Tissue Expansion (Figure 8) was applied once adequate granulation tissue formed over bone and dura. Following formation of healthy granulation tissue, split skin graft done over granulation tissue.

Results

The wound bed preparation of post electric burn wound over scalp was done using various regenerative techniques like Autologous Platelet Rich Plasma, Low level laser therapy, autologous bone matrix application, amniotic membrane and biological scaffold. He underwent multiple sessions of regenerative therapy. His wound granulated well and split skin grafting done. Wound healed and skin graft taken with minimal graft loss.

Discussion

Wound healing is a complex phenomenon that is divided conventionally into four phases- haemostasis phase, inflammatory phase, proliferative phase, and phase of maturation. These phases overlap each other. Soon after the injury, the haemostasis phase begins leading to the formation of the platelet plug⁶. The platelet and complement system activation causes the release of several growth factors that activate the inflammatory phase. Recruitment of leucocytes, initially neutrophil followed by lymphocytes and macrophages, is the hallmark of this phase⁷. Macrophages release several growth factors like-platelet-derived growth factor (PDGF), transforming growth factor (TGF-beta and TGF-alpha), basic fibroblast growth factor (bFGF), vascular endothelial growth factor (VEGF), etc⁸. These growth factors are responsible for the proliferation, angiogenesis, deposition of collagen, and extracellular matrix (ECM) and the maturation phase. Non-healing wound is caused by an imbalance of growth factors so that these phases do not occur in a timely fashion or their progression is stopped at a different level.

To accelerate wound healing adjuvant methods of treatment NPWT and APRP were given. NPWT requires a device which is connected through a special set that generates a negative pressure over the wound bed⁹. Various mechanisms that are thought to act both at tissue and cellular level include reduction of the edema, improvement of local blood flow, induction of angiogenesis and granulation, wound margin epithelialization, and facilitation of cell migration and proliferation. Macrostrain mechanisms of NPWT involve removal of exudates and infectious materials and contraction of wound margin. NPWT has been shown to be safe and effective in post debridement wounds. Hence NPWT was started, and size of the wound was measured at the time of change of dressing.

Platelets act as regulators of inflammation, angiogenesis, cell migration, and proliferation with the release of various growth factors and anti-inflammatory cytokines which is thought to help in faster and better healing of the wounds

¹⁰. APRP has growth factors which when injected in the wound site or sprayed, act at the intracellular level to bring about cell proliferation and healing of a wound.

Conclusion

There are multiple modalities in wound bed preparation that include debridement, Autologous Platelet Rich Plasma, Low Level Laser Therapy, Amniotic membrane grafting, Bone abrasion, External Tissue Expansion Wound Closure, Cyclical Negative Pressure Wound Therapy, Regulated Oxygen Enriched Negative Pressure Wound Therapy, Integra application, regenerative grafting and biological scaffolding. Each modality contributes in some way to make the wound fit for grafting and ultimately speeds up wound healing and patient discharge timing.

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Conflict of Interest

None declared.

Figures



Figure 1 : Electric burn over scalp



Figure 2: Scalp after debridement with bone abraded



Figure 3: Raw area with exposed skull over which Integra applied

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Figure 4 : Bone abrasion and autologous bone matrix application



Figure 5: Application of Autologous Platelet Rich Plasma



Figure 6: Application of Low level laser therapy



Figure 7: Application of Negative Pressure Wound Therapy



Figure 8: Application of hooks and rubber bands over vac sponge



Figure 9 : Healing wound and graft taken with minimal graft loss