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Role of SWCR Guidelines in Scalp Electrical Burn

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Abstract

Society for Wound Care and Research (SWCR) was founded with the aim of promoting practice of better wound care and research. The society carries out academic, clinical, research and social activities in a calculated manner aimed at improving wound healing. SWCR guidelines has four components with the acronym SWCR where S stands for systematic analysis of patient and wound, W for wound bed preparation, C for clinical decisions and R for repair, reconstruct & rehabilitate. Electrical burn wound to the scalp which causing the deep thermal burns may cause injury to all layers of scalp including bone which can create a raw area of the scalp with exposed skull bone which is difficult to reconstruct as the bone was exposed without periosteum. The bone without periosteum will not usually granulate. In our case we used regenerative techniques for exposed bone in scalp wound bed preparation for granulation followed by flap cover. We will discuss about the role of SWCR guidelines in the management of scalp electrical burn.

Keywords: SWCR; Guidelines; Scalp; Electrical; Burn; Management; Wound bed preparation.

INTRODUCTION

Burns are a global public health problem and a commonly encountered emergency. Burns are a type of painful wound caused by thermal, electrical, chemical or radiation.[1] Wound bed preparation is a concept of emphasizing a holistic and systematic approach to evaluate and remove barriers to the healing process to allow the wound healing process to progress normally and in order to facilitate other therapeutic measures.[2,3] The process begins with a correct diagnosis of the wound and optimizing the patient's medical condition, appropriate dressing and surgical management. The present article provides an overview of SWCR guidelines (Fig. 1) based management of scalp electrical burn.

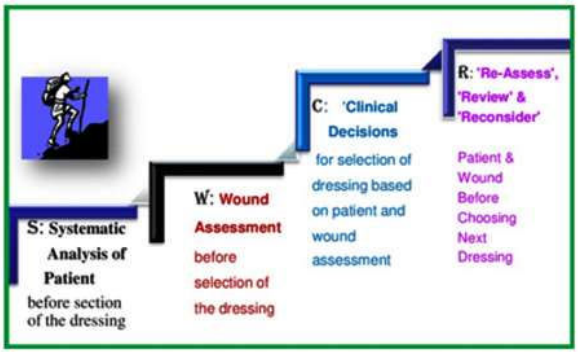


Fig. 1: Acronym for SWCR guidelines

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MATERIALS AND METHODS

This study was done at tertiary care hospital after obtaining approval of departmental scientific and ethical committee. Informed consent was obtained from the patient. This is a prospective descriptive non randomized case study about a 45 year-old male sustained electrical burn injuries while working at construction building. He sustained electrocution by contact with electric wire as it fell on patient head. Patient initially went to local hospital, then arrived to our emergency department with an electrical burn in the vertex region of the scalp (entry zone) and the left leg (exit zone). The Scalp had a contact with a 220 V of alternating current. It was presumed that the current entered his skull and exited through his left foot. The other external skin injury to scalp, chest wall, abdomen and both thighs and left foot. At the time of admission his Glasgow Coma Scale score was 12. The patient was disoriented and unconscious at the time of admission and patient was intubated. Multiple second-degree superficial burns involving face, neck, chest and abdomen (anterior aspect), bilateral arms (anterior aspect), bilateral thighs, multiple blisters over thigh, legs and second degree deep burns involving frontoparietal region of scalp at the vertex (Fig. 2).



Fig. 2: Scalp electrical Wound at presentation

The midfrontoparietal scalp was charred. CT skull showed small ill defined hypodense area with loss of grey white differentiation noted in the left frontal region suggestive of left frontal infarct. The serum electrolytes, urea and creatinine, urine analysis, and electrocardiogram were normal, urine myoglobin negative. He was resuscitated with the standard WHO burn protocol. Patient was asymptomatic with no seizures, syncope, focal neurological deficits. He was managed conservatively with prophylactic antiepileptic Phenytoin. The patient was extubated after three days of intensive care. According to the manual muscle test, both upper and lower extremities were normal. Sensory function was intact, muscle stretch reflexes were normoactive, no pathological reflexes were identified, and all the other cranial nerve and cerebellar functions were normal. The electrical burn will undergo progressive skin necrosis, so the debridement was done after demarcation of necrotic patch. The dermabrasion is done using the high speed rotating head dermabrader with 4200rpm. The non-viable necrotic tissue was debrided without damaging the normal tissues in both horizontal and vertical planes with dermabrader (Fig. 3).



Fig. 3: Dermabrasion assisted debridement

After wound debridement with derma-abrasion was done till the removal of unhealthy tissues. The end point of dermabrasion assisted debridement of scalp bone till the removal of necrosed top layer of bone and the bleeding point appears over the skull bone (Fig. 4). After debridement biological Human amniotic membrane (Fig. 5) and collagen scaffold dressing (Fig. 6) done. During wound debridement we have used low level laser therapy (Fig. 7) session for 10 minutes once in five days to the scalp wounds. Dermabrasion, low level laser therapy, biological human amniotic membrane with collagen scaffold dressing and cyclic Negative pressure wound therapy (Fig. 8) can be done with local anesthesia. Post procedure patient need closed dressing system like NPWT (negative pressure wound therapy) for improving granulation and for preventing infection. Once the wound bed showed healthy granulation, perforator based type 4 keystone flap was done (Fig. 10)



Fig. 4: Post dermabrasion assisted debridement till the appearance of bleeding points



Fig. 5: Human amniotic membrane application



Fig. 6: Collagen scaffold application



Fig. 7: Low level laser therapy



Fig. 8: Negative pressure wound therapy



Fig. 9: Well granulated electrical burn scalp wound



Fig. 10: Keystone perforator flap POD 1

RESULTS

In the above mentioned case study, SWCR guidelines played significant role in approach to the patient, wound bed preparation and reconstruction. The scalp wound with exposed bone was covered with adequate granulation tissue with the above techniques in our case. Patient was compliance with all the above techniques we have used for regeneration of exposed scalp. No complications were noted post procedures. Patient

underwent flap cover with local keystone flap based on perforator. Two weeks post-operatively, Flap and skin grafting for the donor site was good without any loss (Fig. 11).



Fig. 11: Keystone perforator flap post 2 weeks

DISCUSSION

The Society for Wound Care and Research (SWCR) was founded in the year 2006 to promote practice of better wound care through a guideline-based approach. The society promoted research and also tried to improve community outreach towards better wound car.[9-11] SWCR guidelines are applicable to all chronic wounds irrespective of etiology. This systematic approach has a significant role in hand injuries.

The components of these guidelines include:

1. Systematic assessment of the patient and wound
2. Wound bed and patient preparation
3. Clinical decisions
4. Repair, Reconstruction and Rehabilitation

Systematic assessment of the Patient and Wound

A precise clinical assessment of the patient is the first step in this guideline based approach. A history of comorbidities and medications is important when wound healing is considered. Three essential questions that need to be asked include the time of injury, mechanism and the environment in which the injury occurred, which could suggest possible contaminants in the wound. Next, examination of the patient as a whole, to assess nutritional status followed by examination of wound is done. Triangle of wound assessment (TOWA) is a subjective tool that is used for clinical assessment of wound. It does so in 3 components-wound bed, wound edge and peri-wound skin. In wound bed, presence of exudate, infection/ inflammation and non viable tissue are noted. Wound edge is examined for undermining, sloping and granulation. Peri-wound skin is inspected to look for maceration, discoloration and excoriation. Reliable wound healing instruments for periodic assessment of wound healing like Bates Jensen Wound Assessment Tool (BJWATS)[17], Design tool, Wound Healing Scale (WHS),[18] Sassing Scale (SS), Sussman Wound Healing Tool (SWHT)[19] with ability to document changes in wound status over time may also beused.

Wound Bed and Patient Preparation:

Wound bed preparation is of prime importance before any reconstructive procedure is planned. Along with traditional debridement, novel tissue regenerative techniques are also employed in this process.[12-14] There is an acronym 'TIMERS' which addresses the pathophysiological abnormalities underlying chronic wounds.[20]

T- Tissue management

I- Inflammation and infection control

M- Moisturecontrol

E- Epithelialization

R- Regenerative therapies

S- Social factors like transportation, food, shelter, Tissue management

Debridement of devitalized tissue is the first step in wound bed preparation and is performed methodically from skin, subcutaneous tissue, muscle to bone while preserving nerves and intact vessels and tendons. This should create unquestionably healthy surgical margins for each tissue. A good debridement sets the stage for clear reconstruction goals and prevents postoperative complications such as ongoing tissue necrosis and infection that require repeated debridement.

Wound debridement also plays an important role in reducing the levels of bacterial biofilms, which are tightly attached to components of the extracellular matrix, surfaces of bones, surfaces of orthopedic implants in the chronic wound beds.

Infection & Inflammation Management

Presence of warmth, erythema, tenderness and purulent discharge points towards local infection. This is often controlled with local antimicrobials that do not harm normal cells like super oxidized solution or nano crystalline silver/ colloidal silver/ ionic silver.[19] In case systemic infection is suspected,

appropriate management with antibiotics is necessary.

Moisture Management

Excess moisture causes maceration whereas dryness causes tissue death. Optimal balance of moisture is of utmost importance in wound healing. Moisture is managed with appropriate dressing. Excess moisture in the wound needs compression bandages, highly absorbent dressings or Negative Pressure Wound Therapy (NPWT), Vacuum Assisted Closure (VAC) or Limited Access Dressing (LAD) whereas dry wounds need moisture holding dressings like hydrogels.[22]

Edge of the wound Management

Observation of a healthy sheet of epithelial cells migrating from the edge of a chronic wound is the most sensitive indicator of the effectiveness of the previous three components. This is achieved by proper debridement of undermined or calloused edges to obtain healthy epithelization.

Regenerative therapies

In the above case, novel regenerative therapies like Autologous Platelet rich Plasma (APRP), low level laser therapy (LLLT), collagen scaffold dressing, vit D and sucralfate dressing and negative pressure wound therapy were effectively employed. Dry collagen acts as a scaffold for tissue regeneration.[22,23] 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. Autologous platelet rich plasma (APRP) has growth factors which when injected in the wound site or sprayed, act at the intra-cellular level to bring about cell proliferation and healing of a wound.[24]

LLLT claimed to increase collagen synthesis, decrease inflammation and has a positive impact on scar remodeling. Negative Pressure Wound therapy (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.[25]

Social factors

Access to medical facility, good nutrition and appropriate environment also play a vital role in healing of wounds.

Clinical decisions

Optimization of medical conditions like diabetes mellitus, hypothyroidism along with physical factors which hinder wound healing like devitalized tissue or foreign body, is of importance in management of hand injuries.

Repair, Reconstruction and Rehabilitation

Repair and reconstruction first require wound bed preparation. Following that, appropriate soft tissue cover is established either by graft or flap. Keystone is a peg shaped, main stone which supports the arch in Greek architecture. Because of the shape the flap designed, it is known as keystone flap.[26] There are various types that have been described.

Type I

The standard flap design and closure is suitable for defects over most areas of the body up to 2 cm in width.

Type II A: Division of deep fascia

For larger areas of reconstruction, located over the muscular compartments, the deep fascia over the muscular compartment is divided along the outer curvature of the flap to permit further mobilization of the keystone flap.

Type II B: With split skin graft to secondary defect

Where excess tension exists, the secondary defect may be skin grafted.

Type III: Double keystone flaps

For considerably larger defects (5–10 cm) a double keystone design can be done to exploit maximum laxity of the surrounding tissues.

Type IV: Rotational keystone flap

Occasionally to facilitate rotation across a joint contractures or compound fractures with exposed bone, the keystone flap is raised with undermining up to 50% of the flap subfascially. The perforator support is derived from the attached part of the flap. A versatile flap was required, which covered the bone. As he had exposed scalp bone with granulation, we have used the type 4 keystone perforator flap forthe scalp defect. We have found this flap is easy to design. The donor site was skin grafted primarily.

CONCLUSION

Regenerative therapeutic methods are optimized to accelerate endogenous healing or increase

the effectiveness of advanced therapies. The overall goal of wound bed preparation by the above mentioned methods is to create an optimal wound healing environment by producing a well vascularized, stable wound bed. As described in this case, the SWCR guidelines easily understood with the acronym SWCR (systemic analysis, wound bed preparation, clinical decisions, repair, reconstruction and rehabilitation) are effective in wound preparation and reconstruction of Scalp electrical burn.

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