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Original Article

Techniques of Wound Bed Preparation in Scalp Electrical Burn Wound

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Abstract

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 for granulation for flap cover. We have used dermabrasion assisted wound debridement to remove the necrosed top layer of bone and used regenerative techniques like Low level laser therapy, Human amniotic membrane, collagen scaffold application and cyclic Negative pressure wound therapy for wound bed preparation. We will discuss about the regenerative techniques in this article.

Keywords: Stress; Health care workers; Occupational stress.

Introduction

Stress has been categorized as an antecedent or stimulus, as a consequence or response, and as an interaction. It has been studied from many different frameworks (or perspectives?). For example, Selye proposed a physiological assessment that supports considering the association between stress and illness. Conversely, Lazarus advocated a psychological view in which stress is "a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well being".

Stress is not inherently deleterious, however. Each individual's cognitive appraisal, their perceptions and interpretations, gives meaning to events and determines whether events are viewed as threatening or positive. Personality traits also influence the stress equation because what may be

overtaxing to one person may be exhilarating to another.

Never the less, stress has been regarded as an occupational hazard since the mid-1950s. In fact, occupational stress has been cited as a significant health problem. Work stress in nursing was first assessed in 1960 when Menzies identified four sources of anxiety among nurses: patient care, decision making, taking responsibility, and change. The nurse's role has long been regarded as stress filled based upon the physical labor, human suffering, work hours, staffing, and interpersonal relationships that are central to the work nurses do. Since the mid-1980s, however, nurses' work stress may be escalating due to the increasing use of technology, continuing rises in health care costs, and turbulence within the work environment.

It was found that job stress brought about hazardous impacts not only on nurses' health but also in their abilities to cope with job demands. This seriously impairs the provision of quality care and the efficacy of health services delivery. Nursing has been identified by a number of studies as a stressful occupation. Stress has a cost for individuals in terms of health, wellbeing, and job satisfaction, as well as for the organization in terms of absenteeism and turnover, which in turn may impact the quality of patient care.

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Most people can cope with stress for short periods but Chronic stress produces prolonged changes in the physiological state. The issues of job stress, coping, and burnout among nurses are of universal

Fig. 1: Scalp electrical burn wound at presentation

Fig. 2: Dermabrasion assisted debridement

Fig. 3: Post dermabrasion assisted debridement till the appearance of bleeding points

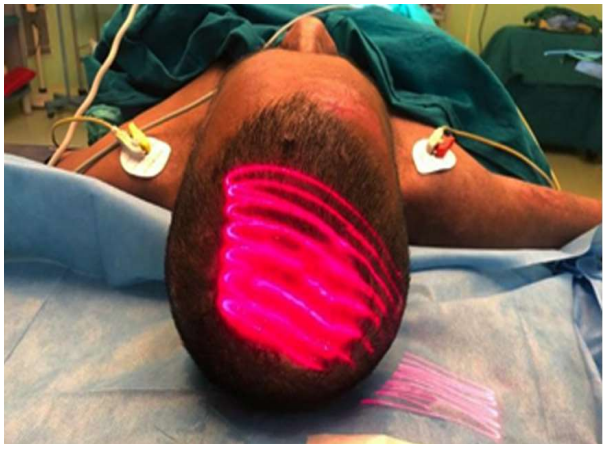

Fig. 6: Low level laser therapy

Fig. 4: Human amniotic membrane application

Fig. 7: Negative pressure wound therapy

Fig. 5: Collagen scaffold application

Fig. 8: Well granulated electrical burn scalp wound

concern to all managers and administrators in the area of health care. All these stresses can be modified in a positive way by the use of appropriate stress management skills.

Conclusion

Stress, anxiety and depression were prevalent among clinical nurses. Heterogeneity in demographic characteristics and working conditions were observed across clusters with different patterns of mental disorders. Institutional effort should be emphasized to support nurses in

their career development to reduce psychological strains.

It is important that stress is a state, not an illness, which may be experienced as a result of an exposure to wide range of work demands and in turn can contribute to an equally wide range of outcomes, which may concern the employees' health and be an illness or an injury or changes in his/her behavior and lifestyle.

Materials and Methods

This study was conducted in the Department of Plastic Surgery in a tertiary care institute. Department scientific committee approval was obtained. In this case report, 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 220V 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 burns involving frontoparietal region of scalp at the vertex (Fig. 1). The mid-frontoparietal 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. 2). 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. 3). After debridement biological Human amniotic membrane (Fig. 4) and collagen scaffold dressing (Fig. 5) done. During wound debridement we have used low level laser therapy (Fig. 6) 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. 7) 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.

Results

The scalp wound with exposed bone was covered with adequate granulation tissue (Fig. 8) with the above techniques we have used 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 was planned for flap cover.

Discussion

The idea of wound bed preparation emphasises a comprehensive and methodical approach to assess and remove obstacles to the healing process so that the wound can heal normally.[4] It directs the formulation of effective treatment plans that focus on both the patient as a whole and the underlying illness that resulted in the wound. Senescent or aberrant cells are removed, the bacterial load is decreased, the amount of wound exudates is reduced, and the creation of healthy granulation tissue is increased.[5] The last stage of wound healing will start after these objectives are achieved. In order to get the most out of cutting-edge but expensive wound therapies, wound bed preparation was first created for chronic wounds. The way chronic wounds are treated has improved as a result of it. Based on their extensive experience in the management of chronic wounds, Drs.

Vincent Falanga (Professor of Dermatology and Biochemistry at the Boston University School of Medicine) and Gary Sibbald (Professor of Public Health Sciences and Medicine at the University of Toronto) first proposed the idea of wound bed preparation in 2000.[6] The treatment of wound exudates, bacterial balance, and devitalized tissue were its early points of emphasis. The International Wound Bed Preparation Advisory Board created the term "T.I.M.E." in 2003 to establish an algorithmic approach to this procedure. To maximise the potential for wound healing, the T.I.M.E. framework consists of comprehensive solutions that can be used to manage various types of wounds. To lessen wound contamination and tissue loss, tissue management involves eliminating necrotic or devitalized tissue, germs, and cells that obstruct the healing process. The goal is to rebuild a healthy extracellular matrix around a functioning wound base. With the removal of the necrotic burden of senescent cells, the extracellular matrix, inflammatory enzymes, and bacterial biofilms, chronic wounds are transformed into acute wounds.[7] Surgical, mechanical, autolytic, enzymatic, and biological techniques are available for debridement. The surgical approach is the quickest and enables a precise evaluation of the size and severity of the wound. It is crucial in infections that pose a threat to life or limb and are accompanied by necrotic eschar or gangrene. For wounds with extensive or adherent eschar, where the prompt removal of necrotic tissue is necessary, surgical debridement is also advised.

When applied to the face or many other parts of the body, dermabrasion is a straight forward, affordable method of skin resurfacing that can deliver consistent, repeatable results. In order to repair damaged skin and the ageing and damaged face, a plastic surgeon should have access to the trustworthy and successful skin resurfacing technique known as dermabrasion.[8] In this case report, we preferred Dermabrasion as a substitute technique for quick burn excision. All of them discovered a significant decrease in blood loss, smaller planed surfaces compared to excised surfaces, lower expenses, and consistently satisfactory graft placement. Better depth control, preservation of viable tissues, a consistent end point, quick healing, and minimal blood loss are all advantages of dermabrasion.[9]

Any laser with a power density of less than 500mW/cm^2 is considered low level. In individuals with ulcers, LLLT is utilised as an adjunct to traditional therapy with encouraging outcomes. A type of phototherapy that makes use of electromagnetic radiation is LLLT. The benefits of LLLT include accelerating tissue repair, increasing granulation tissue production, aiding in wound contraction, reducing inflammation, modulation, and pain relief. According to the literature, low energy photoemissions at a wave length between 600 and 900 nm speed up wound healing and cell proliferation.[10] Its action is believed to: Stimulate cytochromes and flavin in the respiratory chain, which increases adenosine triphosphate (ATP) synthesis and speeds up mitosis, increasing the number of fibroblasts; Stimulate collagen and elastin production, which improves reepithelialisation; Stimulate capillary dilatation and neovascularization to increase tissue oxygenation; Stimulate mediator substances like histamine and serotonin.[11] Chronic wounds can be managed with the use of a biological dressing, such as human amniotic membrane or skin allograft. It creates a mechanical barrier to stop fluid, protein, and electrolyte loss, guarding against both microbial invasion and tissue desiccation.[12-14] For the regeneration of tissues, dry collagen serves as a scaffold.[15]

In order to control a wound that is heavily exuding, negative pressure wound care is a crucial tool. Negative pressure wound therapy also helps to increase tissue perfusion by reducing oedema. By minimising the size and complexity of the wounds, negative pressure wound therapy also contributes significantly to the preparation of the wound bed.[17] When negative pressure is applied, the wound begins to instantly compress (macro-deformation). Due to the stretching of tiny tissue blebs into the foam dressing, it has micro-deformation consequences. The cytoskeleton is altered by these mechanical actions, which have a cascade of biological effects including the induction of angiogenesis, a decrease in bacterial loads, and the development of granulation tissue.

As the necrotic tissue adhering to the foam dressing is removed during dressing changes and the wet wound bed facilitates the autolytic action of endogenous proteinases present in the moist environment, this therapy can also be employed as a tool for mechanical and autolytic wound debridement. To reduce the number of proteases to a normal level and preserve the delicate biochemical balance necessary for the replication of epithelial cells, infection and excessive inflammation must be controlled.[18]

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.

Conflicts of interest: None

Authors' contributions: All authors made contributions to the research, is putatively expected to be useful article.

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