Original Article

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Holistic Approach for Non-Healing Wounds

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Abstract

Wound Bed Preparation (WBP) is an essential component before the wound is reconstructed by graft or flap. There are various aspects of Wound Bed Preparation (WBP) like Tissue, Infection, and Moisture & Edge management. Each component of WBP needs individual attention. Multiple adjuvant therapies provided to a wound helps in hastened healing of the wound as compared to single therapy. The aim of the study is to highlight the various adjuvant therapies that can be used to heal a nonhealing wound

Keywords: Wound Bed Preparation (WBP); nonhealing wound; adjuvant therapy

Introduction

Wound bed preparation is an important and crucial step of management of any wound. In chronic and nonhealing wounds, the normal process of wound healing is failed and wound requires either cover or various internal and external stimuli to heal faster. If the patient, wound or both are not fit for surgery, while making the patient and wound fit some adjuvant therapy is needed for wound bed preparation [1]. Adjuvant therapies not only enhance wound healing but also prevent progression of complications and provide suitable wound bed for reconstruction and rehabilitation. Platelet-rich plasma (PRP) is blood plasma, which contains platelets in higher concentrations as compared with normal plasma. PRP is also enriched with several growth factors and cytokines that can stimulate wound healing. Low-level lasers are low power lasers which have biostimulatory effects on wounds when exposed for short duration and energy (<4J). This property of low-level lasers can be used effectively for wound bed preparation as an adjuvant therapy. External tissue wound contraction device application reduces the surface area of the wound, which can act as adjuvant therapy [2]. Local application of Chitosan promotes wound healing by enhancing the activity of inflammatory cells like neutrophils, macrophages, and fibroblasts. It also enhances the tensile strength of the wound [3]. The aim of this study to evaluate the efficiency of multiple adjuvants in the nonhealing wound.

Methods

A 3-year-old male child presented with a history of post-traumatic (road traffic accident) chronic nonhealing ulcer of the scalp of 6 weeks duration. Following trauma, the patient was taken to the local primary care center and was managed with primary closure of the wound, later patient developed a low-grade fever, associated with discharge from the wound. Sutures were removed and regular dressings were done. At the time of presentation to the Department of Plastic Surgery patient had a 4 x 2.5 cm chronic ulcer over a frontal aspect of scalp defect with unhealthy granulation tissue with exposed bone (Figure 1).

Fig. 1: Chronic nonhealing ulcer over the scalp

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His Bates Jansen Assessment Tool (BJAT) score was 52 and Digital planimetry measurement was 9.36 cm^2. On investigation, wound tissue culture was positive for Pseudomonas aeroginosa. X-ray & bone scan ruled out underlying osteomyelitis.

As per the TIME concept of Wound Bed Preparation (WBP), the unhealthy granulation was debrided using hydrojet debridement. To control infection local application of Chitosan was used and the secondary moist dressing was done Autologous platelet-rich plasma was injected to bed and to edges (Figure 2), Low-level laser given to bed for 10 min (Figure 3). Local application of Chetosan. (Figure 4). Dressings with adjuvant therapy were done at the interval of 3 days or upon soakage whichever earliest. External tissue wound expansion device (Figure 5) application was done once inflammatory changes of margins had reduced.

Fig. 2: Application of Platelet rich plasma

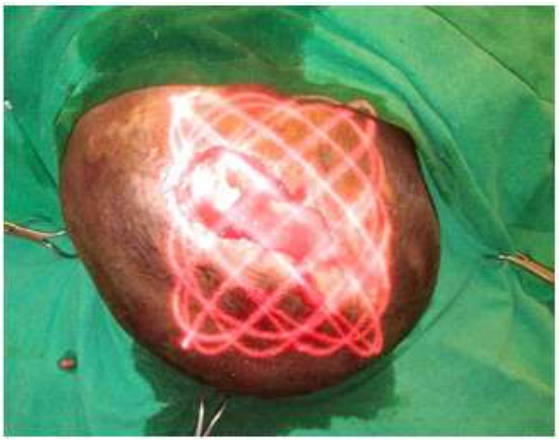

Fig. 3: Application of low level laser

Fig. 4: Chetosan application over the wound

Fig. 5: Application of external tissue expansion device

Results

Table 1: Adjuvant therapies with number of application

Adjuvant therapy	Number of applications
PRP	5
LLLT	5
Chetosan	5
ETWC	3

Wound granulated in 2 weeks with a reduction in wound size (Table 1)(Figure 6). Digital planimetry 4.24cm^2. The wound was covered with a split-thickness skin graft

Fig. 6: Healthy Wound Bed

Discussion

Wound bed preparation is a concept emphasizing a holistic and systematic approach to evaluate and remove barriers to the healing process to allow the wound healing process to progress normally. Various systemic and local factors affect wound healing. Simultaneously addressing these causes will not only heal the wound but will also decrease the morbidity and improve the quality of life of the patient. Non-healing wound is the wounds suspended in various phases of wound healing. Multiple adjuvant therapies are required to improve the quality of the wound bed. In our study following adjuvant therapies were employed [4].

Hydrojet therapy

Surgical debridement of necrotic tissue is an essential part of wound care prior to any reconstructive options. Sharp techniques utilized for this purpose have been the mainstay and are commonly used in combination with pulsed lavage and/or irrigation. The only necrotic tissue is debrided and biofilm can be reduced while protecting vital structure like blood vessels, nerves, tendon with less pain to the patient.

Platelet-rich plasma

Platelet-rich plasma (PRP) is blood plasma which contains platelets in higher concentrations as compared with normal plasma obtained after centrifugation. Platelets are a storehouse of various growth factors eg. Platelet-derived growth factors (PDGF), fibroblast growth factor, insulin-like growth factor, transforming growth factor beta (TGF β), epidermal growth factor, vascular endothelial growth factor, keratinocyte growth factor, Interleukin 8. On application of PRP, growth factors are released into the wound, which helps in granulation tissue formation [5].

Low-level Laser therapy

The photobiological effects of low-level laser therapy depend on the wavelength, dose, power, and duration of application. Commonly used LASERS for LLLT include gallium aluminum arsenide Ga-Al-As (805 or 650 nm), gallium arsenide Ga- As (904 nm), Krypton (521, 530, 568, and 647 nm), argon Ar (488 and 514 nm), helium-neon He-Ne (632.8 nm) and ruby (694 nm).

Low-level laser therapy decrease in inflammatory cells decreased synthesis of inflammatory mediators, increased secretion of growth factors, increase in proliferation of fibroblasts, increase in collagen synthesis, stimulation of angiogenesis & stimulation for the formation of granulation tissue [6].

External Tissue wound expansion device

Tissue expansion is based on the principle that all living tissues respond in a dynamic fashion to mechanical stress placed on them. Tissue expansion incorporates the phenomena of biological creep and physiological creep. Tissue expansion replaces like with like tissue. Vijayaraghavan et al described the simple cost-effective technique of external tissue expansion using hooks and rubber bands [7].

Chitosan

Chitosan is a biopolymer, the common source being crustacean shell. Chitosan and its derivatives are used as a source for delivery of anti-microbial and growth factors at the wound site. Helps in hemostasis, stimulation of wound healing. Nontoxic, anti-microbial, biodegradable and biocompatible. It has activity against fungi, gram negative and gram positive bacteria [8].

Conclusion

Wound bed preparation is crucial in the healing of the wound, multiple therapies available in armamentarium should be used to heal the wound and reduce the duration of morbidity and in turn, improving quality of life.

References

1. Schultz GS, Sibbald RG, Falanga V, Ayello EA, Dowsett C, Harding K, Romanelli M, Stacey MC, Teot L, Vanscheidt W. Wound bed preparation: a systematic approach to wound management. Wound repair and regeneration. 2003 Mar 1;11: S1-28.
2. Sibbald RG, Orsted HL, Coutts PM, Keast DH. Best practice recommendations for preparing the wound bed: update 2006. Advances in skin & wound care. 2007 Jul 1;20(7):390-405.
3. Ueno H, Mori T, Fujinaga T. Topical formulations and wound healing applications of chitosan. AdvDrug Deliv Rev. 2001;52(2):105–15.
4. Mustoe TA, O'Shaughnessy K, Kloeters O. Chronic wound pathogenesis and current treatment strategies: a unifying hypothesis. Plastic and reconstructive surgery. 2006 Jun 1;117(7S):35S-41S.
5. Vijayaraghavan N, Mohapatra DP, Friji MT, Arjun A, Bibilash BS, Pandey S, Chittoria RK. Role of Autologous Platelet Rich Plasma (APRP) in Wound Healing. Journal of Society for Wound Care & Research. 2014 Jan 1;7(1).
6. Chittoria, Ravi Kumar, and Sudhanva H. Kumar. Low-Level Laser Therapy (LLLT) in Wound Healing. 2018.pp.1-6.
7. Nandhagopal V, Chittoria RK, Mohapatra DP, Thiruvoth FM, Sivakumar DK, Ashokan A. External tissue expansion for difficult wounds using a simple cost-effective technique. Journal of cutaneous and aesthetic surgery. 2015 Jan;8(1):50.
8. Dai T, Tanaka M, Huang YY, Hamblin MR. Chitosan preparations for wounds and burns: antimicrobial and wound-healing effects. Expert review of anti-infective therapy. 2011 Jul 1;9(7):857-79.