

CASE REPORT

Polyhexanide-Betaine Wound Gel in Skin Graft Donor Site Healing

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ABSTRACT

Donor site management is pivotal in overall grafting outcomes, emphasising rapid epithelialisation, minimal discomfort, and infection prevention. Polyhexanide and betaine preparations have shown promise in chronic wounds due to their antimicrobial and biofilm-disruptive properties. We report the case of a 24-year-old male who sustained 15% TBSA thermal burns and underwent full-thickness strip grafting following which the donor site wound dehisced. The graft donor site on the right lateral thigh was dressed with Polyhexanide (PHMB)-Betaine gel.

The wound was dressed regularly, followed by periodic assessment. The wound demonstrated early re-epithelialization with minimal exudate, no signs of infection, and acceptable patient-reported pain scores. Complete healing was achieved by Post-operative day 14. This case highlights the potential utility of PHMB-betaine gel in donor site management, offering an effective balance of antimicrobial protection and tissue compatibility. Larger controlled studies are warranted to validate these findings further.

KEYWORDS

• Donor Site Healing • Polyhexanide-Betaine Gel • Skin Graft • Burn Wound Management

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INTRODUCTION

Effective skin graft donor site wound management is essential for minimising patient morbidity, preventing infection, and ensuring timely recovery. While traditional agents like paraffin gauze or silver-based dressings are widely used, they often fall short in balancing microbial control with tissue preservation. Wound gels composed of polyhexanide (PHMB) and betaine offer a dual mechanism of action broad spectrum antimicrobial activity and biofilm disruption making it an appealing alternative. Though extensively studied in chronic wounds, its application in acute donor sites remains underreported.

MATERIALS AND METHODS

The patient was a 24-year-old man who had sustained flame burns of mixed second

degree to his face, neck, chest, left palm, involving 15% total body surface area. He was admitted to our Tertiary Burns Centre, and initial fluid resuscitation was given as per standard guidelines. He underwent early tangential excision of his burn wounds with split skin grafting. A full-thickness strip graft was also taken from his right anterior thigh, and the donor site was closed primarily (Figure 1). The donor site developed complete wound dehiscence after 5 days, with a resultant raw area of 8cm x 3cm (Figure 2). The donor site wound was covered with PHMB-Betaine wound gel to form a uniform coating of 5mm thickness and covered with a non-adherent silver-based dressing (Figure 3). The dressing was changed on alternate days till complete wound healing.



Figure 1: Strip graft harvested and donor site closed primarily



Figure 2: Raw area following wound dehiscence with biofilm



Figure 3: PHMB-Betaine Gel being applied

RESULTS

Upon first inspection (day 5), the wound bed was moist with healthy granulation and no signs of local infection or excessive slough. Pain was assessed at 3/10 on the VAS scale. By day 10, over 75% of the surface had re-epithelialized. Complete healing was achieved by day 14, without complications (Figure 4). No adverse effects were noted.

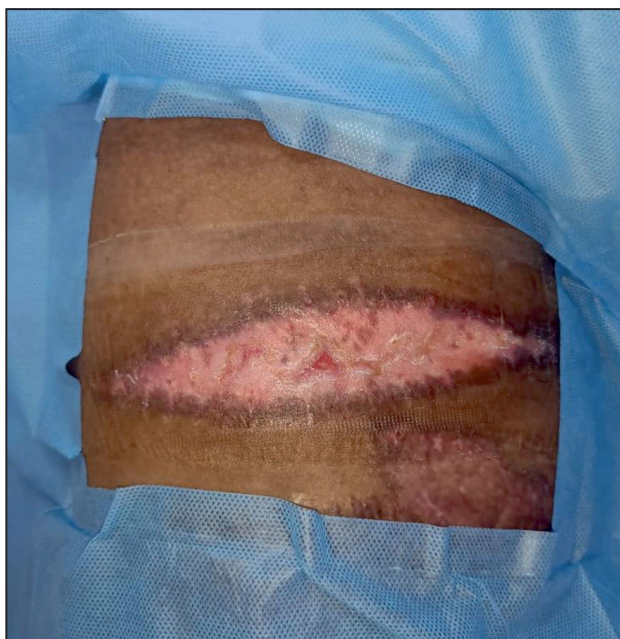


Figure 4: Well epithelialised raw area on 14th post operative da

DISCUSSION

The ideal donor site dressing should promote moist wound healing, prevent infection, minimise pain, and allow atraumatic dressing removal.

According to the International Wound Infection Institute (IWII), antiseptic solutions are topical agents that possess broad-spectrum antimicrobial activity, capable of either preventing the proliferation of microorganisms or directly destroying them.¹ The German Consensus on Wound Antisepsis and Polish Guidelines for wound treatment recommend using newer antiseptics such as PHMB as first-line antibacterial therapy for chronic wounds, burns and colonised wounds.²

Polyhexanide (PHMB 0.1%) and betaine (0.1%) gel combines polyhexanide, an effective antimicrobial agent with low cytotoxicity, and betaine, a surfactant that enhances wound cleansing and biofilm disruption. In this case, it

facilitated early epithelialisation and infection-free healing.

Polyhexanide is a heterogeneous mixture of a biguanide polymer with local anti-infective effects. Bacterial cell envelopes exhibit a net negative surface charge, primarily stabilized by divalent cations such as Mg^{2+} and Ca^{2+} , which bridge anionic groups within the membrane structure. Polyhexanide (PHMB), due to its cationic polymeric nature, competitively displaces these stabilizing ions, thereby exhibiting a high binding affinity to the lipid bilayers of both Gram-positive and Gram-negative bacteria, as well as other microbial pathogens. However, they have restricted interactions with human cells, making them highly safe compared to other topical antimicrobials.^{3,4}

Betaine, an amphoteric surfactant, plays a critical role in wound management by enhancing the removal of cellular debris, denatured proteins, and biofilm matrices that typically hinder effective healing. Its surfactant properties reduce surface tension within the wound environment, thereby facilitating the penetration of antimicrobial agents and improving the accessibility of therapeutic compounds to the underlying tissue. This action supports mechanical debridement and biofilm disruption, essential in chronic and colonized wounds where standard irrigation may be insufficient. By optimizing the wound microenvironment, betaine contributes to restoring physiological healing conditions and accelerates granulation and re-epithelialization. Its synergistic action with polyhexanide enhances the overall efficacy of wound cleansing while maintaining low cytotoxicity, even with repeated application.⁵

Biofilms comprise structured microcolonies encased within a self-produced extracellular polymeric substance (EPS) matrix. This matrix provides architectural stability and confers protection against antimicrobial agents and host immune responses. Most extracellular biofilm matrices are predominantly composed of polysaccharides containing acidic sugar units. In a study by Salisbury et al, PHMB-based wound irrigation solution was shown to have a broad range of antibiofilm efficacy against *P. aeruginosa*, *S. aureus* and the multispecies biofilms.⁶

Chronic wounds treated with polyhexanide-containing solution were noted to heal faster

than conventional cleansing with saline or Ringer solution.⁷ In a study among paediatric burn patients, Polyhexanide solution was found to be safe with no significant adverse effects. Minor side effects identified were itching, rash and hypergranulation.⁸ A prospective study of 43 patients with chronic leg wounds treated with polyhexanide-containing solution for 4 weeks reported a significant improvement in the quality of life of patients. They reported a 14% incidence of treatment-related adverse events, with none being severe enough to discontinue treatment.⁹

CONCLUSION

PHMB-betaine gel may be a safe and effective alternative for donor site management, offering both antimicrobial protection and tissue-friendly healing conditions. Further studies are necessary to establish standardised protocols and evaluate long-term cosmetic outcomes.

Conflicts of interest: None declared

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