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CASE REPORT

Chitosan Liquid Wound Dressing in the Use of Deep Scald Burns

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ABSTRACT

Chitosan is a biodegradable, positively charged natural polymer with properties well suited for wound healing, including biocompatibility, antimicrobial activity, high fluid absorption, tissue adhesiveness, and anti-inflammatory effects. It readily forms polyelectrolyte complexes with negatively charged polymers through electrostatic interactions, enabling the development of diverse formulations such as films, hydrogels, membranes, and dressings. The mechanical strength and degradation behaviour of these materials depend on chitosan's molecular weight, degree of deacetylation, and the nature of the cross-linking polymer. Growing use of chitosan-based wound care products is expected to significantly expand the global market; however, challenges remain in translating laboratory findings into routine clinical applications.

KEYWORDS

• Chitosan • Burns • Biological • Dressing

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INTRODUCTION

Scald burns are the most common thermal injuries in children, with the perineal region presenting unique management challenges due to moisture exposure, contamination, pain sensitivity, and increased risk of infection. Deep partial-thickness burns in this region are associated with delayed epithelialization and higher risk of hypertrophic scarring if optimal wound healing conditions are not achieved. Conventional topical agents such as silver sulfadiazine may delay epithelialization and require frequent painful dressing changes, particularly in paediatric patients.

Chitosan, a naturally derived cationic polysaccharide obtained from chitin, exhibits biocompatibility, biodegradability, antimicrobial activity, hemostatic effects, and anti-inflammatory properties, while also promoting fibroblast migration, angiogenesis, granulation tissue formation, and keratinocyte proliferation.[1-3] These properties have supported the development of chitosan-based films, hydrogels, membranes, and topical formulations for wound management.[1-4] Despite extensive experimental evidence, clinical data on liquid chitosan formulations, particularly in paediatric burn wounds and anatomically sensitive areas such as the perineum, remain limited.[1-5] This case report describes the successful use of a liquid chitosan dressing in a 2-year-old child with mixed partial-thickness perineal scald burns.

METHODOLOGY

A 2-year-old female child presented with accidental scald injury involving the perineum, including labial folds and adjacent left medial thigh skin, bilateral gluteal regions, right forearm and hand and right leg amounting to approximately 15% total body surface area (TBSA). Clinical examination confirmed mixed partial-thickness (second-degree) burns. She was managed with tangential excision of second-degree deep areas (Characterised by absent blanching) and allograft cover (Figure 1). These deep areas amounted to 3%TBSA including areas in the right forearm, right leg and bilateral gluteal folds. Though allograft cover aided in epithelisation and healing of the forearm and leg sites, the grafts in the gluteal folds did not survive beyond 3 days probably owing to constant friction and moist environment. (Figure 2)

Figure 1: Post-excision and allograft placement

Figure 2: Allograft los

Hence wound management for the gluteal burns was initiated using a liquid chitosan formulation as the primary topical agent. The wound was gently cleansed with sterile normal saline, and loose devitalized grafts were removed. Liquid chitosan was applied directly to the wound bed to form a uniform protective layer and covered with a non-adherent secondary dressing (Figure 3). Dressing changes were performed daily under aseptic conditions. No topical antibiotics or silver-based preparations were used, consistent with evidence that chitosan possesses intrinsic antimicrobial and haemostatic properties and supports wound regeneration [1,2,6]. The wound was monitored for exudate, infection, granulation tissue formation, epithelialization, care giver comfort.

Figure 3: Liquid chitosan application

RESULTS

Within 48–72 hours of treatment initiation, the wound showed reduced exudate, diminished erythema, and early granulation tissue formation, consistent with the known anti-inflammatory and regenerative effects of chitosan.[1,3,7] Dressing adherence was minimal, resulting in atraumatic dressing changes and improved patient tolerance. Progressive epithelial migration was observed from day 4 onward, and complete epithelialization was achieved by day 7 (Figure 4).

Figure 4: Complete epithelisation

No local or systemic adverse reactions were observed. There were no signs of secondary infection, supporting the antimicrobial efficacy of chitosan reported in experimental and clinical studies.[1,2,6] At early follow-up, the healed skin was supple, non-tender, and demonstrated satisfactory cosmetic appearance for the perineal region.

DISCUSSION

Management of deep partial-thickness perineal burns in children is challenging due to constant moisture, friction, contamination, and pain during dressing changes, all of which predispose to delayed epithelialization and graft failure. In the present case, although allografting was successful at relatively stable sites, graft loss in the gluteal folds highlighted the limitations of conventional techniques in anatomically complex regions.

Liquid chitosan proved advantageous by forming a conformable protective layer over the wound bed, maintaining a moist environment while accommodating movement. Its cationic structure promotes haemostasis, reduces microbial colonization, and supports fibroblast migration and keratinocyte proliferation, thereby facilitating rapid wound regeneration.[1,3] Unlike silver-based topical agents, which may impair epithelialization, chitosan provides intrinsic antimicrobial activity without cytotoxic effects[1,7]. The absence of infection and atraumatic dressing changes observed in this case underscore its suitability for paediatric patients.

Liquid formulations may be particularly useful in intertriginous and contamination-prone areas where solid dressings and grafts are difficult to maintain. Although clinical data remain limited[1,5], this experience suggests that liquid chitosan is a promising alternative or adjunct in the management of paediatric perineal burns. Further controlled studies are required to establish standardized treatment protocols and long-term outcomes.

CONCLUSION

This case demonstrates that liquid chitosan dressing can safely and effectively promote rapid epithelialization of deep partial-thickness paediatric scald burns involving the perineum, achieving complete healing within 7 days without complications. These findings align with existing biomaterial and preclinical evidence supporting chitosan's antimicrobial, anti-inflammatory, and tissue-regenerative properties.[2,7] Liquid chitosan may be particularly advantageous in anatomically sensitive and contamination-prone regions where conventional dressings and topical antimicrobials are difficult to maintain. Larger clinical studies are warranted to further define its role in paediatric burn care and establish standardized treatment protocols.

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