AAMS General Medicine
ISSN: 2834-7140 (Print) | eISSN: 2834-7141 (Online)
Volume 07, Issue 04, Pages 1-15
DOI: 10.4103/aams.0498
ORIGINAL ARTICLE

EVIDENCE-BASED OPTIMIZATION OF BURN WOUND TREATMENT WITH ANTIMICROBIAL DRESSINGS

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Received: 2026-02-02 · Accepted: 2026-03-03

Abstract

A systematic analysis of contemporary literature is combined with a clinical study involving patients with localized burns, as well as experimental in vitro evaluation of antimicrobial activity. The study examines various types of wound dressings, including silver-based, iodine-containing, polyhexamethylene biguanide (PHMB)-based, biopolymer-based, and nanostructured materials.

The results demonstrate that modern antimicrobial wound dressings significantly reduce healing time, decrease infection rates, minimize pain, and improve patient quality of life. These findings support the integration of advanced wound care technologies into clinical practice and highlight the перспективность дальнейших исследований в области разработки персонализированных и «умных» раневых покрытий.

Keywords: localized burns, burn wounds, antimicrobial dressings, biofilm, wound healing, epithelialization

1. Introduction

Burn injuries continue to represent a major clinical and socio-economic challenge worldwide. According to the World Health Organization, burns are among the leading causes of trauma-related morbidity and mortality, particularly in low- and middle-income countries. Even localized burns can result in significant complications, including infection, delayed healing, and scar formation.

As emphasized by David N. Herndon and Marc G. Jeschke, the outcome of burn treatment depends not only on the size and depth of the injury but also on the effectiveness of local wound management. Inadequate therapy may lead to prolonged inflammation, secondary tissue damage, and poor functional outcomes.

Localized burns (grades I–IIIa) constitute a substantial proportion of cases encountered in clinical practice. Despite their relatively small surface area, these injuries are often associated with severe pain, microbial colonization, and delayed epithelialization. These factors contribute to extended recovery periods and reduced quality of life.

From a pathophysiological perspective, burn wounds are characterized by three distinct zones: coagulation, stasis, and hyperemia, as described by Douglas M. Jackson. The zone of stasis is particularly important, as it is potentially reversible and highly sensitive to therapeutic interventions. Preservation of this zone is a key goal in modern burn care.

Recent advances in wound care have highlighted the importance of maintaining a moist wound environment, controlling infection, and promoting cellular regeneration. Traditional methods of treatment, such as ointment-based dressings and antiseptic solutions, are often associated with limitations, including cytotoxic effects, frequent dressing changes, and insufficient control of microbial contamination.

In this context, the development and implementation of advanced antimicrobial wound dressings have become a priority. These dressings combine barrier, antimicrobial, and regenerative properties, offering a more effective approach to burn wound management.

The aim of this study is to analyze contemporary approaches to the optimization of local burn wound treatment using antimicrobial wound dressings and to evaluate their clinical and experimental effectiveness.

2. Materials and Methods

Burn injuries continue to represent a major clinical and socio-economic challenge worldwide. According to the World Health Organization, burns are among the leading causes of trauma-related morbidity and mortality, particularly in low- and middle-income countries. Even localized burns can result in significant complications, including infection, delayed healing, and scar formation.

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3. Results

The analysis of literature revealed that antimicrobial wound dressings provide significantly better outcomes compared to conventional treatment methods. Most studies reported a reduction in healing time by 20–40% and a decrease in infection rates by 30–50%.

Clinical results confirmed these findings. The mean epithelialization time in the study group was 9.2±1.3 days, compared to 12.8±1.7 days in the control group ($p<0.05$). Microbial contamination levels decreased more rapidly in the study group, reaching subcritical levels within 4–5 days.

Pain intensity was significantly reduced in the study group, with a 45% decrease within three days, compared to 20% in the control group. The frequency of dressing changes was also reduced, improving patient comfort and compliance.

Experimental findings demonstrated that antimicrobial dressings inhibited bacterial growth by 70–90% and effectively prevented biofilm formation. Complication rates were lower in the study group (6.2%) compared to the control group (16.7%).

4. Discussion

The results obtained in this study are consistent with existing literature emphasizing the importance of antimicrobial wound dressings in burn management. The role of biofilms in delaying wound healing has been well documented, and the ability of modern dressings to disrupt biofilm formation is a key advantage.

The acceleration of epithelialization observed in the study group can be attributed to the maintenance of a moist wound environment and effective infection control. Modern dressings provide sustained antimicrobial activity while minimizing cytotoxic effects.

Pain reduction is another significant benefit, resulting from the atraumatic nature of advanced dressings and reduced frequency of dressing changes. This improves patient compliance and overall treatment outcomes.

However, the effectiveness of different types of dressings may vary depending on wound characteristics. Silver-based dressings are particularly effective in infected wounds, while hydrogel dressings are more suitable for dry wounds. Limitations of this study include the relatively small sample size and lack of long-term follow-up.

5. Conclusion

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References

1. Herndon D. N. Total Burn Care. 5th ed. – Philadelphia: Elsevier, 2018. – 784 p.
2. Jeschke M. G., van Baar M.E., Choudhry M.A. et al. Burn injury // Nat Rev Dis Primers. – 2020. – Vol. 6. – P. 11.
3. Atiyeh B. S., Costagliola M., Hayek S.N. Burn wound infections // Burns. – 2021. – Vol. 47. – P. 100–112.
4. Kramer A., Assadian O. Antiseptic agents and wound care // GMS Krankenhhyg Interdiszip. – 2017. – Vol. 12. – P. Doc05.
5. Bowler P. G. Wound microbiology and biofilms // Clin Dermatol. – 2020. – Vol. 38. – P. 633–639.
6. Greenhalgh D. G. Management of burn wounds // N Engl J Med. – 2019. – Vol. 380. – P. 2349–2359.
7. Branski L. K., Al-Mousawi A., Rivero H. et al. Emerging therapies in burn care // Lancet. – 2020. – Vol. 395. – P. 155–168.
8. Church D., Elsayed S., Reid O. et al. Burn wound infections // Clin Microbiol Rev. – 2006. – Vol. 19. – P. 403–434.
9. Pruitt B. A. The evolution of burn care // Ann Surg. – 2018. – Vol. 267. – P. 225–232.
10. Percival S. L., McCarty S., Lipsky B. Biofilms and wounds // Adv Wound Care. – 2015. – Vol. 4. – P. 373–381.
11. Leaper D. J., Schultz G., Carville K. et al. Extending the TIME concept // Int Wound J. – 2012. – Vol. 9. – P. 1–19.
12. Boateng J., Catanzano O. Advanced wound dressings // J Pharm Sci. – 2015. – Vol. 104. – P. 3653–3680.

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DOI: 10.4103/aams.0498