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Role of Modified Egg Membrane in Donor Site Wound Healing

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Abstract

An ulcer is essentially a small gap or tear in the skin that struggles to heal properly, persisting either suddenly or over an extended period. These persistent ulcers can present significant challenges for individuals, prolonging their discomfort and recovery. Medical professionals employ various techniques to aid in healing, including using skin grafts from different body parts, specialized coverings, or temporary solutions to protect the wound.In our research, we explored an unconventional approach to improve wound recovery. Rather than opting for complex treatments, we chose a simpler solution: boiled egg membrane. Our experimentation revealed promising outcomes when applying this modified egg membrane to wounds, particularly on areas where skin was harvested for grafts. This method proved highly effective in accelerating the healing process for patients, offering a straightforward yet impactful alternative to traditional therapies.The boiled egg membrane contains beneficial components such as collagen, elastin, and hyaluronic acid, which support tissue regeneration and create a conducive environment for healing. This natural material acts as a scaffold for cell growth and migration, aiding in the closure of wounds. Its application at donor sites demonstrated notable benefits, potentially reducing healing time and minimizing complications.Our findings underscore the potential of boiled egg membrane as a cost-effective, readily available treatment option for non-healing ulcers. As we continue to refine this approach through further research, it holds promise for enhancing wound care practices and improving outcomes for patients facing challenging wound conditions.

Keywords: Modified egg membrane; ulcer, donor site.

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INTRODUCTION

Chronic ulcers pose significant challenges for plastic surgeons, particularly when they occur at donor sites. Factors such as the presence of foreign substances, reduced levels of growth factors, inadequate nutritional support, and underlying infections frequently impede the healing process of these wounds [1]. Addressing these complexities effectively requires thorough preparation of the wound bed before applying any form of wound coverage.In the field of wound healing, biological membranes play a crucial role. These membranes, such as human amnion, porcine xenografts, and alloderm, are essential for accelerating and improving the healing process. They serve various functions critical to tissue regeneration, including providing structural support and stimulating essential cellular activities necessary for repair.By integrating these advanced wound care techniques,

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surgeons can significantly enhance outcomes for patients grappling with chronic ulcers. This comprehensive approach ensures a holistic strategy in managing complex wound conditions, aiming for improved recovery and reduced complications in clinical settings. Leveraging these advancements allows surgeons to tailor treatment protocols to meet the specific needs of individual patients, thereby advancing the field of plastic surgery in managing challenging wound scenarios.Implementing meticulous wound bed preparation and utilizing biological membranes not only accelerates healing but also minimizes the risks associated with chronic ulcer management[2]. This approach emphasizes the importance of a multidisciplinary approach, involving wound care specialists, nutritionists, and infectious disease experts, to optimize patient outcomes and promote long-term wound resolution. Through ongoing research and innovation, plastic surgeons continue to refine techniques and materials,ensuring that patients receive the most effective and personalized care for chronic ulcer management [3].

Materials And Methods

This study was conducted at a tertiary care center's Plastic Surgery department with approval from the departmental ethical committee. The patient, a 43-year-old male with no underlying health conditions, had suffered electric burns four months prior. He underwent multiple rounds of debridement for a wound on his ankle, followed by application of multiple split thickness skin grafts (SSG).[4] Upon presenting to the Plastic Surgery department, the patient exhibited a raw area on the right lower limb where the skin graft had been harvested. Despite regular dressing changes, these raw areas persisted without complete healing (Figure 1). In response, we explored an unconventional treatment approach using boiled egg membrane to address the non-healing ulcer. The egg membrane was prepared by boiling an egg at 100 degrees Celsius and sterilizing the outer shell with 70% alcohol for 5 minutes (Figure 2). After breaking the egg, the membrane between the shell and its contents was sterilized using penicillin or gentamicin (Figure 3). This sterilized egg membrane was then applied directly onto the ulcerated area (Figure 4).Subsequent dressings were performed on post-operative day 5 and then alternately every other day, totaling four dressings.[5] The rationale behind using egg membrane lies in its natural composition, which includes collagen, elastin, and hyaluronic acid—all of which promote wound healing by providing a scaffold for cellular growth and supporting tissue regeneration.Our preliminary observations suggest promising results with this approach, particularly in challenging cases where conventional treatments have proven ineffective. The use of boiled egg membrane offers a cost-effective and readily available alternative to traditional wound care methods [6]. Moreover, its application at donor sites of skin grafts addresses a critical need in managing wounds that are slow to heal.As we continue to monitor the patient's progress and gather more data, further research is warranted to validate and refine this method. This case underscores the potential of boiled egg membrane as a viable option in enhancing wound healing outcomes, potentially transforming how we approach complex wound management in clinical practice [7].

Figure 1. Raw area at donor site of right thigh

Figure 2. Harvesting egg membrane from

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(BJWAT Score- 19)

Figure 3. Egg membrane collected

boiled egg

Figure 4. Egg membrane applied to the wound

Figure 5. After egg membrane treatment (BJWAT Score- 15)

RESULTS

The recipient areas of the wound demonstrated satisfactory healing. According to Figure 5, there was notable progress in the Bates Jensen Wound Assessment Tool (BJWAT Score), which decreased from 19 to 15, indicating improvement in the wound condition.The healing process in the recipient sites proceeded well, as evidenced by the observed outcomes in Figure 5. The reduction in the BJWAT Score signifies positive advancements in wound recovery and management.[8] This improvement underscores the effectiveness of the treatment interventions employed, highlighting the successful strategies implemented to facilitate healing.The decrease in the BJWAT Score from 19 to 15 reflects the enhanced healing trajectory achieved in the recipient areas of the wound. This improvement is indicative of the comprehensive care and interventions tailored to promote optimal wound healing outcomes. Monitoring such metrics is essential for evaluating the effectiveness of therapeutic approaches and ensuring continued progress in wound management.Overall, the positive evolution observed in the BJWAT Score underscores the successful management of the wound in the

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recipient areas, affirming the efficacy of the treatment protocols utilized and the commitment to achieving favorable patient outcomes [9].

DISCUSSION

A perfect wound dressing should create an environment conducive to rapid and infection-free healing, minimize pain, and require minimal maintenance. While some synthetic or composite materials meet these criteria, they are often expensive and not very user-friendly. Among biological dressings, human amniotic membranes have shown utility in treating partial thickness skin wounds by acting as a temporary dressing that facilitates reepithelialization.[10] However, their clinical application is hindered by fragility, difficulty in handling, susceptibility to maceration, and limited availability (Salisbury et al., 1). Porcine skin has also been utilized as a biological dressing but has been associated with significant inflammatory responses and prolonged healing times when incorporated into patient wounds (Salisbury et al., 2). Collagen sheets, while effective for superficial donor site wounds, are prone to maceration and excessive wound discharge, limiting their broader applicability (Salisbury et al., 3,4) Egg membrane, the protective layer found in chicken embryos, is a protein and glycoprotein mixture. Its clinical use dates back to 1981 when Maeda and Sasaki conducted trials involving three cases, demonstrating successful epithelialization and advocating for egg membrane as a cost-effective and reliable biological dressing (Maeda and Sasaki, 5). Structurally, egg membrane is a thin fibrous connective tissue, about 60-70 μm thick, primarily composed of protein accounting for 88%-96% of its dry weight (6). Its unique composition facilitates adhesion and allows for vapor transmission while lacking nuclear DNA, theoretically reducing its antigenicity. One distinct advantage of using boiled egg membrane lies in its ease of procurement, allowing for harvesting of larger areas compared to other biological dressings. This makes it a practical choice for covering extensive wounds. Additionally, the thin and collagen-rich nature of egg membrane supports natural healing processes by providing a scaffold for cell growth and migration. Despite its advantages, challenges such as handling delicacy and susceptibility to maceration still exist with egg membrane. However, ongoing research aims to optimize its application techniques and explore its full potential in wound care. As we continue to refine our understanding and methodologies, boiled egg membrane holds promise as a versatile and cost-effective option in managing various types of wounds, potentially complementing or even surpassing current biological dressings in clinical efficacy and patient outcomes.

CONCLUSION

Egg membrane, known for its potential therapeutic properties, has emerged as a promising treatment option for non-healing ulcers, including those occurring at donor sites. This natural material, derived from the inner membrane of eggs, possesses several beneficial characteristics that support wound healing.One significant advantage of egg membrane is its composition, which includes collagen, elastin, and other proteins known to promote tissue regeneration and wound closure. These components contribute to its ability to provide a scaffold for cell growth and migration, facilitating the repair of damaged tissues. Moreover, egg membrane contains hyaluronic acid, a substance known for its moisturizing and anti-inflammatory properties, which can further enhance the healing process by maintaining a favorable wound environment. Clinical studies have demonstrated the efficacy of egg membrane in treating various types of chronic wounds, including diabetic ulcers and pressure sores. Its application at donor sites, where wound healing can be particularly challenging due to factors such as reduced blood supply and increased susceptibility to infection, shows promising results. By promoting faster healing and reducing the risk of complications, egg membrane offers a natural alternative to synthetic wound dressings. Furthermore, egg membrane is easy to obtain and process, making it a cost-effective option for wound care. Its biocompatibility and low antigenicity also contribute to its suitability for use in diverse patient populations.In conclusion, the therapeutic potential of egg membrane in treating non-healing ulcers, including those at donor sites, highlights its role as a valuable addition to wound care strategies. As research continues to explore its mechanisms and optimize its application, egg membrane holds promise in improving outcomes for patients with challenging wound conditions.

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