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CASE REPORT

Burns

Use of HEMHealing, an Oxygenating Dressing in the Treatment of a Full-thickness Burn on the Fingertips

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Summary: The optimal treatment for full-thickness burn injuries involves surgical intervention, which may include skin grafting or reconstruction by flap. The complexity of treatment arises from the need for both effective temporary wound coverage and permanent skin restoration while also considering the potential risk of finger amputation in the case of hand burn. A 22-year-old woman sustained a thermal burn of three fingers while participating in an art activity involving wax hand molding. Initial treatment with a standard oily dressing did not yield satisfactory results, and the option to try HEMHealing was offered, a new oxygenating biological gel dressing, resulting in progressive debridement, granulation, and epithelialization of the wound. Complete healing was achieved within 10 and 15 days for the second and fourth fingers, respectively, and within 8 weeks for the third finger. The use of HEMHealing, in this case, most likely contributed to accelerating wound healing, promoting the growth of new tissues, improving local tissue oxygenation, and avoiding a disabling distal amputation. *(Plast Reconstr Surg Glob Open 2024; 12:e6093; doi: 10.1097/GOX.0000000000006093; Published online 22 August 2024.)*

The management of full-thickness burns poses significant challenges and complexities for medical professionals. Debridement, skin grafting, and reconstruction with flaps are necessary procedures in such cases.[1] Deep partial- and full-thickness hand burns are often treated by escharotomy, excision, and, in extreme cases, amputation.[2] There are various wound dressings available, including hydrogels, hydrocolloids, hydrofibers, and biological dressings such as honey, allografts, and xenografts. Each dressing has unique properties and indications for use. For instance, honey possesses potent antibacterial properties. Some dressings serve as temporary solutions until an optimal wound bed is prepared for skin grafting. HEMHealing (Hemarina SA, Morlaix, France) is a novel oxygenating biological dressing available as a hydrogel; the components include hyaluronic acid and xanthan gum; the major constituent is an oxygen transporter known as molecule M101. HEMHealing introduces oxygen directly to the burn site to improve cell survival and proliferation. However, we find little mention of this concept in the literature regarding burn management. In this article, we present a case of a thermal burn injury for which we used HEMHealing as a dressing option for treating full- and partial-thickness burns.

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CASE REPORT

A 22-year-old woman with a thermal burn of her right hand sustained during an art exercise was examined at an outpatient clinic. The patient experienced a superficial to deep partial burn involving the second and fourth fingers, as well as a full-thickness burn of the third finger encompassing both the middle and distal phalanges, due to prolonged contact with hot wax for hand molding.

During the first phase of treatment for the burned fingers, which began on March 1 and continued until March 7, an oily dressing gauze was applied to the affected area after local anesthesia and escharotomy. Due to the adverse effect, generating concern about the necessity of amputation of the third finger distal phalanx, the patient was given the option to use an oxygenating dressing, HEMHealing, which was started on March 8 (Fig. 1). The dressings were applied every 48 hours during wound treatment.

Any typical wound healing has three phases: debridement, granulation, and epithelialization. Mechanical debridement was done with excision of necrotic tissues under local anesthesia on March 22. After removing the previous dressing, the patient's hand was held

Disclosure statements are at the end of this article, following the correspondence information.

Fig. 1. Day 8 of injury and day 0 of dressing with HEMHealing.

under running tap water for 10 minutes. A thick layer of HEMHealing gel was applied, followed by a dry dressing. The secondary dressing was nonconclusive to make oxygen transfer possible. The wound healing progress was photographed during each session on the dorsal, palmer, ulnar, and radial sides.

Due to varying burn depths, the second and fourth fingers healed in 10 and 15 days, respectively, whereas the third finger required 8 weeks to recover due to full-thickness burn and a larger surface area that reached the third phalanx bone. Discomfort occurred during the debridement of necrotic tissues because the fingers are extremely sensitive.

Subsequently, granulation was rapid on the distal phalanx bone (Fig. 2). Epithelialization was also particularly rapid as soon as the granulation tissue was sufficient (Fig. 3).

Normal epithelialization occurs at a rate of 0.1–0.3 mm per day through cellular migration, resulting in a maximum of 3 mm in 10 days. In this case, it was achieved in 7 days. Similarly, between May 3 and 5, a progression of 1 mm was observed in a particularly challenging and distal area.

Early healing of two fingers was satisfactory at all sites. After a 2-month treatment period with HEMHealing dressing, the third finger demonstrated complete healing. The HEMHealing dressing was sufficient to achieve this outcome. During a subsequent examination conducted 7 months later, the patient demonstrated a favorable restoration of nail growth. It was observed that the range of motion in the distal interphalangeal joint had decreased,

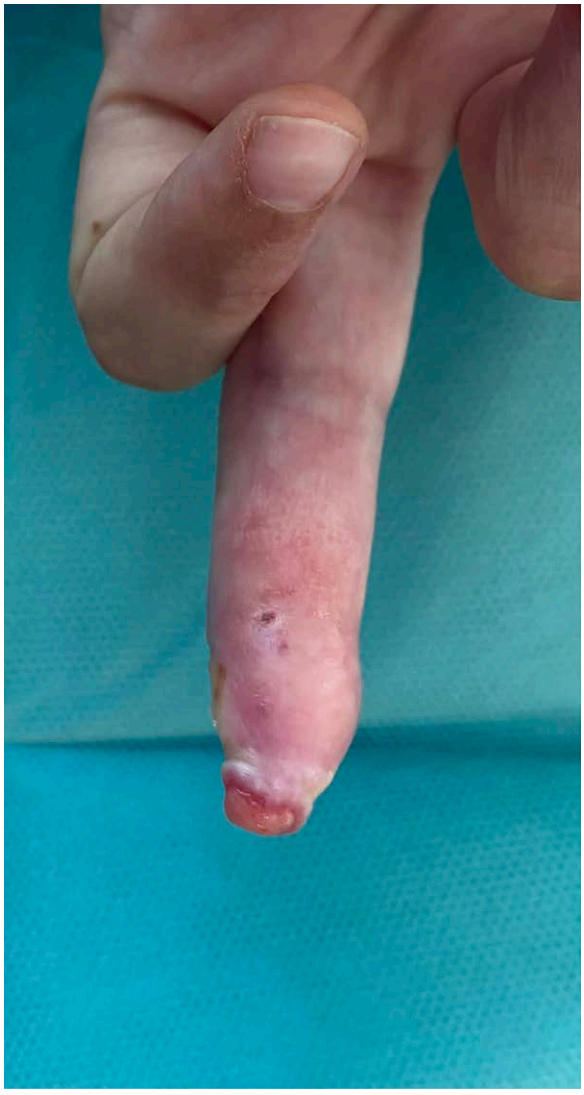

Fig. 2. Day 45, showing healing and granulation tissues.

accompanied by a slight reduction in the length of the distal phalanx (Fig. 4).

DISCUSSION

The growing population of burn survivors facing extensive burn injuries poses challenges in terms of providing both temporary dressings and permanent coverage solutions.[2] Aside from synthetic dressing, various biologic dressings have been developed, encompassing options such as honey, human amnion, xenografts, and allografts. Each of these dressings possesses distinct characteristics and clinical applications. Regarding the mechanism of action of HEMHealing, it is important to understand the partial pressure of oxygen in the air (PO_2 Air), which stands at 160 mm Hg, whereas the P50 of M101 (P50M101) is 7 mm Hg at 37°C.[3] Consequently, when M101 comes into contact with air, it passively absorbs oxygen based on a simple physical gradient. However, at the tissue level, the PO_2 is

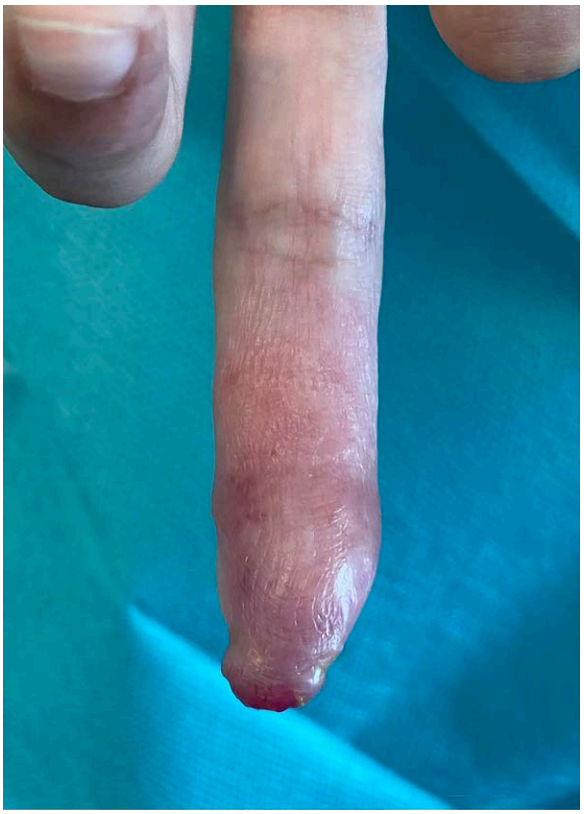

Fig. 3. Day 51, showing epithelialization with rate of 3 mm in 7 days.

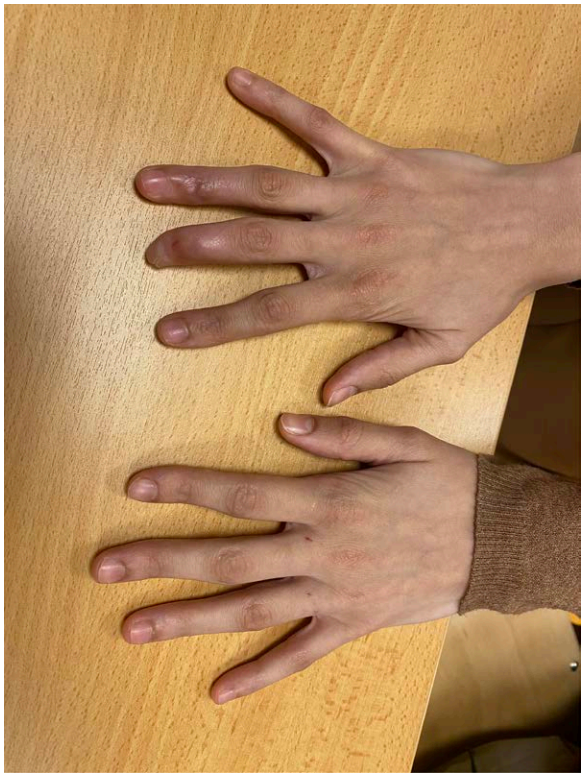

Fig. 4. Follow-up after 7 months.

lower than the P50M101. For instance, the PO_2 at the cellular level (PO_2 cells) is less than 3–4 mm Hg. As a result, oxygen is slowly released according to this gradient, without any oxidative burst. In summary, the M101 mechanism of action is to capture oxygen from the surrounding air and subsequently release it passively at the cellular level.[4] Theoretically, HEMHealing functions akin to oxygen therapy for tissues, potentially reducing inflammation, promoting angiogenesis, and enhancing collagen deposition.[5,6] Additionally, burned tissues are highly susceptible to infection, yet no instances of infection were observed during the 2-month treatment period with HEMHealing in this case.

In this case, the use of HEMHealing likely contributed to accelerating wound healing by promoting the growth of new tissues and improving local tissue oxygenation. However, it is important to emphasize that each burn case is unique, and treatment should be personalized according to the individual needs of each patient. The patient was a young nonsmoker with no notable medical history. However, the third finger had a particularly deep full-thickness burn that exposed the nail bed and fingertip.[7] Such injuries often require coverage with a skin flap. We did not find similar results with conservative treatment in the literature.

For moderate-degree burns, the initial clinical evaluation of the affected area can be complex and may result in incorrect classification. Patients with deeper wounds often require surgical intervention to remove irreversibly damaged tissues. Because of the patient's poor general health, conservative therapy alone is frequently insufficient in the case of severe and extensive burn wounds. Success in treatment is correlated with the damage being treated appropriately. However, ideal burn dressings that would permit full self-healing without ongoing supervision have not yet been created and put into widespread use.

CONCLUSIONS

The use of HEMHealing, in this case, most likely contributed to accelerating wound healing, promoting the growth of new tissues, improving local tissue oxygenation, and avoiding a disabling distal amputation. The gel was easy to use and did not cause pain during application or removal. It is important to note that the speed and effectiveness of healing depend on various factors such as the severity of the burn, the extent of the affected area, the patient's overall health, and adherence to treatment instructions.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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