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Natural Enzymatic and Regenerative Therapy Using Papaya and Honey: Case Report of Chronic Burn Healing and Potential Role in Radiation-induced Dermatitis

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ABSTRACT

Chronic partial-thickness burns frequently require surgical intervention due to delayed healing. Natural agents such as Carica papaya and honey possess enzymatic, antimicrobial, and tissue-regenerative properties that may support conservative wound care. This case report describes complete healing in 28 days of a chronic second-degree thermal burn using a sequential papaya–honey dressing protocol, avoiding previously recommended surgical debridement and grafting. An integrated Unani perspective is provided to contextualize the therapeutic actions of honey and papaya within traditional wound-healing principles. Additionally, the potential application of this technique to radiation-induced dermatitis (RID) is discussed, supported by mechanistic insights and existing clinical literature

INTRODUCTION:

Burn wounds are a major cause of morbidity across the world and often require surgical management when healing is delayed. Partial-thickness burns with slough and persistent discharge may fail to progress without debridement and biologically active dressings. Natural agents such as honey and Carica papaya have been historically used in wound care due to antimicrobial, anti-inflammatory, and proteolytic properties. Honey supports moist wound healing and inhibits microbial growth, while papaya contains papain and chymopapain that facilitate enzymatic debridement and granulation. Although both agents have been studied independently, reports on their combined use in preventing surgical escalation in chronic burns are limited. This case presents successful management of a chronic burn wound through sequential papaya–honey dressing and discusses its potential relevance for radiation-induced dermatitis.

CASE PRESENTATION:

A 38-year-old woman presented to the outpatient department of Majeedia Hospital on 25 June 2021 with a two-month history of a non-healing thermal burn wound on the right leg. The injury occurred on 17 April 2021 while traveling on a motorcycle. Prior management included treatment at Batra Hospital, where she was advised surgical debridement with fasciotomy and split-thickness skin grafting due to delayed healing.
She had no significant past medical or surgical history and no comorbidities.

CLINICAL EXAMINATION:

Two separate partial-thickness (second-degree) burn wounds were present over the dorsal aspect of the right leg, involving approximately 7–8% TBSA. The wound bed was unhealthy with slough, serous discharge, and delayed healing. General and systemic examinations were unremarkable.

Based on the presentation, the diagnosis of chronic second-degree thermal burn was established.

THERAPEUTIC INTERVENTION:

Wound Preparation:

Daily wound cleansing was performed using sterile normal saline or cooled boiled neem water under aseptic precautions. Gentle removal of loose slough was carried out.

Papaya Phase (Days 1–3): Enzymatic Debridement:

Fresh green papaya pulp mixed with medical-grade honey was applied once daily for three days. This facilitated enzymatic slough removal and improved the wound bed.

Honey Phase (Days 4–14): Granulation and Epithelialization:

After adequate debridement, sterile medical-grade honey was applied daily over sterile gauze to promote granulation and epithelialization.
No systemic antibiotics were used.

OUTCOME:

Day	Clinical Observation
3	Significant reduction in slough and appearance of granulation
7	Minimal discharge and reduced pain
14	Healthy granulation with epithelial migration
21	>80% epithelialization
28	Complete wound healing

At follow-up, the wound remained healed without contracture or functional deficit. Surgical grafting was successfully avoided. See Figures 1 & 2.

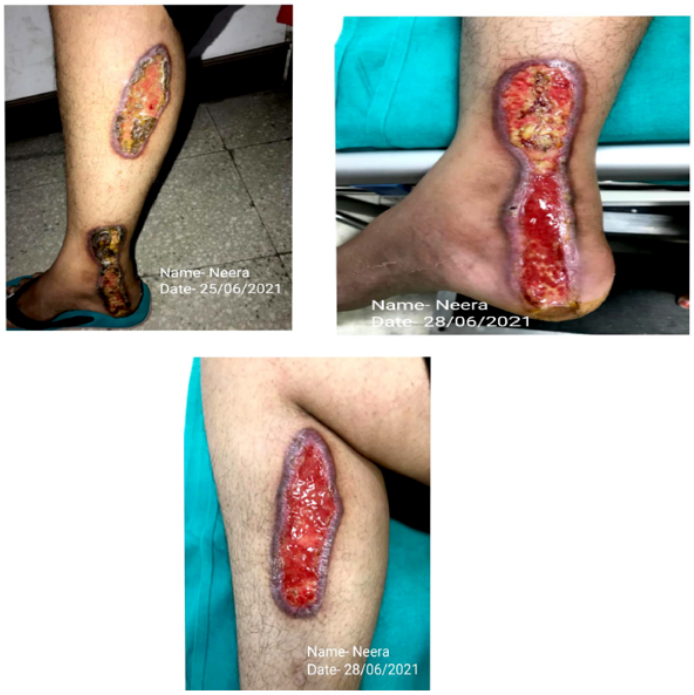

Figure 1. Pre-treatment Wound

Figure 2.Post Treatment Wound

DISCUSSION:

This case demonstrates that sequential enzymatic debridement with Carica papaya followed by honey dressing can serve as an effective conservative approach in chronic second-degree burns initially advised for surgical management. The staged use of papaya and honey provided both wound-bed preparation and biological support for healing, resulting in satisfactory recovery without complications.

Papaya pulp acts as a natural enzymatic debriding agent due to its proteolytic enzymes, which liquefy necrotic tissue, reduce slough, and facilitate granulation. Once the wound bed was

adequately cleansed, honey promoted healing through broad-spectrum antimicrobial action mediated by osmotic effects, low pH, and hydrogen peroxide generation. In addition, honey supports autolytic debridement, modulates inflammation, and stimulates angiogenesis and epithelial cell migration, thereby accelerating tissue regeneration.

From a Unani perspective, the papaya phase corresponds to Tanzeef-e-Quruh (cleansing of morbid matter), while the honey phase fulfillsInbat-e-Lahm (regeneration of healthy tissue) and Tadleel-e-Waram (resolution of inflammation). The rapid granulation and absence of infection observed in this patient are consistent with the classical descriptions of honey as Daf'-e-Ta'affun (infection-preventing) and Muddammil (healing-promoting).

Comparable studies have reported faster epithelialization and reduced infection rates with honey-based dressings compared to conventional agents. The favourable outcome in this case reinforces the synergistic role of papaya and honey and validates the harmonious integration of Unani principles with modern wound-healing mechanisms.

Potential Application in other chronic skin conditions including Radiation-Induced Dermatitis (RID)

Radiation-induced dermatitis shares pathophysiological features with chronic wounds, including disrupted epidermal integrity, inflammation, desquamation, and susceptibility to microbial colonization. Given these similarities, the papaya–honey dressing protocol used in this burn case may also hold therapeutic value for RID.

Honey has demonstrated benefits in radiotherapy-impaired skin, reducing infection, promoting epithelialization, and alleviating pain (Molan et al., Gethin& Cowman). Multiple clinical studies demonstrate that honey significantly reduces the severity of radiotherapy-induced dermatitis compared to conventional creams. For example, Biswal et al. (2003) showed that honey reduced grade 3 skin reactions in head-and-neck cancer patients receiving radiotherapy, while Moghazy et al. (2010) documented better epithelial repair and pain relief in irradiated skin treated with honey dressings. These findings support honey as a safe, cost-effective option for managing acute skin reactions in oncology patients. A systematic review by Melanie Charalambous et.al, also demonstrated the benefit of honey in the management of radiation induced mucositis.

Papaya, though less studied in the context of RID, offers proteolytic enzymes such as papain and chymopapain that can gently remove devitalized tissue in areas of moist desquamation without inducing mechanical trauma—an important consideration in irradiated skin, where fragility is pronounced. Nonetheless, high-quality clinical trials are needed to determine its safety and efficacy specifically in RID.

Both agents have **anti-inflammatory** and **antioxidant** properties that may mitigate radiation-induced tissue injury.However, some clinical considerations should be kept in mind while treating acute radiation toxicities. Irradiated skin is more sensitive; therefore, papaya–honey application should be monitored carefully.Existing evidence supports honey use in oncology skin complications, whereas papaya requires further investigation in RID-specific contexts.

Unani Perspective in RID

In Unani medicine, radiation injury resembles **Hararat-e-GhairTabaiyah** (abnormal heat), **Tafarruq-e-Ittisal** (tissue disruption), and **Zoaf-e-Tabiyat** (weakened healing power). Honey's classical attributes as **Murattib** (moisturizing), **Mulaṭṭif** (softening), and **Musakkin**

(soothing) align with its modern anti-inflammatory effects on irradiated skin.

Papaya may support gentle enzymatic removal of necrosed tissue in moist desquamation, consistent with the concept of **Tanzeef**, but requires further clinical validation in RID.

Patient Perspective:

The patient expressed satisfaction with the conservative management, particularly relief from pain, avoidance of surgery, and reduced financial burden.

Conclusion

This case demonstrates that sequential papaya–honey dressings can provide an effective, low-cost, and conservative alternative to surgical intervention in chronic partial-thickness burns, achieving complete healing without the need for grafting. From an integrative perspective, the papaya phase supports wound cleansing and preparation, while the honey phase promotes anti-infective, anti-inflammatory, and regenerative processes consistent with traditional Unani healing principles.

Beyond burn care, existing evidence particularly from oncology settings supports the therapeutic value of honey in reducing the severity of radiation-induced dermatitis and oral mucositis, improving epithelial recovery, and enhancing patient comfort. These parallels suggest that the papaya–honey protocol used in this case may have broader relevance in managing radiation-associated skin and mucosal injuries in cancer patients. However, while honey is well-validated in radiotherapy toxicities, papaya requires controlled clinical evaluation before routine use in irradiated tissues.

Overall, this report highlights the potential of natural, biologically active agents integrated with traditional medical principles and emphasizes the need for well-designed larger clinical multicentre studies to standardize protocols and assess their applicability across burns and oncology-related skin complications

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