ARTICLE IN PRESS

Chinese Journal of Plastic and Reconstructive Surgery xxx (xxxx) xxx

Contents lists available at ScienceDirect



Chinese Journal of Plastic and Reconstructive Surgery

journal homepage: www.sciencedirect.com/journal/chinesejournal-of-plastic-and-reconstructive-surgery



Case Report

Medicinal leech therapy and grated unripe papaya bandage for the treatment of chronic leg ulcer: A case report

Nazim Husain ^{a,*}, Md Akhter Hussain Jamali ^a, Jamal Akhtar ^b, Usama Akram ^b, N. Zaheer Ahmed ^b

^a Regional Research Institute of Unani Medicine, Silchar, 788014, Assam, India

^b Central Council for Research in Unani Medicine (CCRUM), Janakpuri, 110058, New Delhi, India

ARTICLE INFO

Keywords: Leg ulcer Medicinal leech therapy Irsal-e-Alaq Carica papaya Wound Unani medicine

ABSTRACT

Leg ulcers pose a significant burden on morbidity, healthcare costs, and quality of life, despite rarely resulting in limb loss. This underscores the necessity for safe and effective alternative treatments. Unani medicine offers various therapeutic options for managing ulcers. This case report details the successful treatment of a non-healing venous ulcer using Unani regimens in a 40-year-old male with a history of diabetes mellitus and paralytic polio. The patient sought care at the Regional Research Institute of Unani Medicine, Silchar, Assam, India, for a chronic ulcer in the gaiter region of his right leg, which was associated with mild pain, itching, and hyperpigmentation but notably lacked any signs of varicose veins. Over the years, the patient had undergone various treatments, including topical care and antibiotics; however, frustration with persistent non-healing led him to explore alternative interventions. The Unani treatment included medicinal leech therapy, followed by the application of a grated unripe papaya bandage for 14 days. By the end of this period, the ulcer had completely healed, allowing the discontinuation of the dressing. By the 21st day, symptom resolution was observed, with complete relief from pain and itching and normalization of hyperpigmentation in the surrounding area. This case highlights the potential of Unani therapeutic approaches in effectively managing non-healing venous ulcers.

1. Introduction

Venous ulcers are open skin lesions that occur on the leg or foot in areas affected by chronic venous insufficiency (CVI), potentially leading to disability and serious complications.¹ CVI accounts for approximately 70% of chronic ulcers affecting the lower extremities, with the prevalence of it ranging from 2% to 7% in males and 3%–7% in females.² Clinically, these ulcers most commonly develop just above the ankle in the gaiter region, presenting as shallow wounds with irregular borders. Mild pain and pruritus are typical symptoms, often accompanied by additional clinical features of CVI, such as edema and varicose veins.³

Diagnostic approaches for chronic venous ulcer involve comprehensive assessments to rule out differential diagnoses of leg ulcers, particularly in patients with diabetes. Aerobic and anaerobic wound cultures are recommended when infection is suspected, while tissue biopsy may be indicated in cases of non-healing ulcers that persist despite standard treatment or exhibit atypical features.⁴ The therapeutic strategy primarily focuses on CVI management, incorporating compression therapy and, when necessary, referral for interventional procedures. Essential components of treatment include topical wound care, management of underlying stasis dermatitis, and consultation with wound care specialists for debridement and dressing application. Systemic antibiotics are warranted in the presence of infection indicators, such as cellulitis or erysipelas. For large or refractory ulcers, skin grafting may be considered.^{1,4,5} The high cost of treatment, combined with the severity of complications and the tendency for recurrence, underscores the need for investigating alternative therapeutic modalities that are both safe and economically feasible.

According to Unani scholars, an ulcer, referred to as *Qarha*, primarily arises following the progression of inflammation, potentially stemming from various types of morbid humors. *Qarha-i Dawāliyya* (varicose/venous ulcer) originates from the pathological accumulation of high-viscosity melancholic sanguineous humor (*Ghalīz Sawdāwī Dam*) within the veins of the lower limbs.⁶ Ibn al-Quf Masihi delineates two fundamental principles for addressing this type of *Qurūh*: *Qața' al-Wāşil* and *Tehlīl-i Hāşil. Qata' al-Wāşil* involves the elimination or severance of the

https://doi.org/10.1016/j.cjprs.2025.02.002

Received 21 December 2024; Received in revised form 14 February 2025; Accepted 17 February 2025

2096-6911/© 2025 China Medical Cosmetology Press Co. Ltd. Publishing services by Elsevier B.V. on behalf of KeAi Communications Co. Ltd. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

Please cite this article as: Husain N et al., Medicinal leech therapy and grated unripe papaya bandage for the treatment of chronic leg ulcer: A case report, Chinese Journal of Plastic and Reconstructive Surgery, https://doi.org/10.1016/j.cjprs.2025.02.002

^{*} Corresponding author. Regional Research Institute of Unani Medicine, Veterinary Bazar Street, Ghungoor, Cachar, Assam, 788014, Silchar, India. *E-mail addresses:* nazim.ccrum@ccrum.res.in, nazimcrium@gmail.com (N. Husain).

N. Husain et al.

Chinese Journal of Plastic and Reconstructive Surgery xxx (xxxx) xxx

factor responsible for the ulcer, while *Tehlil-i Hāşil* aims to resolve the condition through the application of desiccant and skin-cleansing medications. This approach is crucial, as ulcers of this nature contain both low-viscosity and high-viscosity humors, both of which contribute to the impaired development of skin and tissues at the ulcer site.⁷ The therapeutic use of leech therapy and the application of grated papaya fruit align with these principles. Unani scholars, including Ibn Sina, Rufus, and Attibba-e-Hind, have advocated for the use of medicinal leeches around chronic ulcers, highlighting their role in promoting the evacuation of morbid humors.^{8–10} Additionally, Unani literature emphasizes the desiccant, styptic, and skin-cleansing properties of papaya, which are considered instrumental in the effective resolution of chronic ulcers.¹¹ However, the current body of scientific evidence substantiating their efficacy in treating venous ulcers is limited. Consequently, there is a compelling need for scientific evaluation of these therapeutic techniques.

2. Case presentation

A 40-year-old male patient presented for consultation at the Outpatient Department (OPD) of the Regional Research Institute of Unani Medicine, Silchar, on September 22, 2023, reporting a history of diabetes and an ulcer on the anterior aspect of his leg, located just above the ankle. The patient, employed as an e-rickshaw driver, reported regular alcohol consumption, though without specifying the quantity. Additionally, he had a medical history of paralytic polio at six months of age, resulting in right leg weakness without complete paralysis. He had been using leg braces for the past nine years, which he attributed to increased body weight. In 2019, he was diagnosed with type 2 diabetes mellitus and subsequently noticed progressive swelling in his entire right lower extremity, particularly in the leg and surrounding area. Despite the presence of diabetic complications, renal function tests remained within normal limits. Antidiabetic medications were initiated to regulate his blood sugar levels. No family history of diabetes or metabolic disorders was reported.

In 2021, the patient's rickshaw was involved in a minor accident, leading to abrasions on his right leg. The abrasions failed to heal despite treatment at a nearby hospital and subsequently progressed into venous ulcers. Seeking additional treatment, the patient consulted surgeons and dermatologists and underwent conventional wound care, including topical treatments, repeated debridement procedures, dressing applications, and an extended course of broad-spectrum antibiotics. However, despite these interventions including advanced dressings and infection control, the ulcer showed minimal improvement over several months. The persistent non-healing nature of the wound, coupled with the physical and emotional toll of prolonged treatment, left the patient frustrated and disheartened.

The information collected from the study participant adhered to the ethical principles of the Declaration of Helsinki. Furthermore, the case report followed the guidelines set forth in the CARE case report guidelines.¹²

The patient later sought treatment at the Regional Research Institute of Unani Medicine (RRIUM), Silchar, India. Initially, routine oral medications and topical treatments were administered on an outpatient basis. However, due to inadequate improvement, leech therapy was introduced, followed by the application of a papaya bandage.

Clinical examination revealed pitting edema in the right leg and foot. A superficial ulcer was observed in the gaiter region, characterized by irregular borders and measuring approximately 10.0 cm in length, 7.0 cm in width, and 0.2 cm in depth. The ulcer was associated with mild pain, pruritus, and hyperpigmentation in the surrounding area, with no evidence of varicose veins.

The initial treatment began on November 5, 2023. However, on December 23, 2023, leech therapy was administered, followed by the application of a papaya bandage for a period of two weeks. After completing the two-week treatment, the therapy was discontinued, and the patient was followed up one week later to assess the resolution of pain and itching, as well as the normalization of surrounding hyperpigmentation.

The diagnosis of the venous ulcer was based on the CEAP (Clinical-Etiology-Anatomy-Pathophysiology) classification system for patients with chronic venous disorders.¹³ Diagnostic challenges included distinguishing the ulcer from diabetic foot; however, its distinctive anatomical location and appearance facilitated differentiation. Additionally, diagnostic considerations extended to arterial ulcers, diabetic foot ulcers, pyoderma gangrenosum, ulcerated skin tumors, and pressure ulcers. The assessment method involved a comprehensive photographic analysis of the ulcer, focusing on dimensions, skin regeneration, and subjective symptoms such as pain and pruritus.

At the initial consultation at RRIUM, Silchar, the patient was prescribed oral medications, including *Arq-e-Mako* and *Habb-e-Rewand*, along with the topical application of *Marham Safeda Kafoori*.¹⁴ However, due to inadequate improvement, leech therapy was introduced, followed by the application of a papaya bandage, replacing *Marham Safeda Kafoori*.

The patient was admitted to the daycare Inpatient Department at RRIUM, Silchar, where leech therapy was administered in the Regimen Therapy department. His leg braces were removed, and he was instructed to lie in a supine position. The procedure began with aseptic cleansing of the ulcer using normal saline and sterile gauze. Subsequently, two medicinal leeches, obtained from RRIUM, Silchar, Assam, were applied to the ulcer at 12:00 p.m. on December 23, 2023. One leech detached naturally after 47 minutes, while the second was manually removed by the attending physician after 1 h. According to Unani scholars, the number of leeches applied should be determined based on the size and extent of the ulcerated area, ensuring appropriate spacing to prevent overlapping.^{8,9} For small, localized areas, typically one to three leeches are used, whereas larger areas may require up to 10 leeches.¹⁵

Following leech therapy, grated papaya was topically applied to the ulcer, followed by appropriate dressing (Fig. 1). After the procedure, the patient was observed for 4 h in the designated observation ward of RRIUM, Silchar, and was subsequently discharged.

The patient was advised to continue taking OPD medications, including antidiabetic medications, as usual. The dressing was changed daily, and freshly grated papaya was applied for up to 14 days.

The patient underwent systematic weekly follow-up evaluations in the OPD while continuing the daily application of papaya dressing. After 14 days, papaya dressing was discontinued as the ulcer had completely dried. On the 21st day, complete skin regeneration was observed, accompanied by the absence of pain and pruritus. Notably, the previously observed hyperpigmentation around the ulcer had normalized (Fig. 2). It



Fig. 1. Grated unripe papaya.

ARTICLE IN PRESS

N. Husain et al.

Chinese Journal of Plastic and Reconstructive Surgery xxx (xxxx) xxx

is also important to highlight that no adverse clinical effects were observed throughout the entire course of treatment.

3. Discussion

This case report presents the potential of medicinal leech therapy and grated unripe papaya bandage in the treatment of chronic leg ulcers. The observed reduction in disease activity can be attributed to the multifaceted properties of leech therapy, which facilitate venous decongestion, thrombolysis, enhanced blood and lymph flow, and suppression of inflammation. The scientific rationale behind leech therapy lies in its ability to drain blood, mitigate venous congestion, and introduce over twenty bioactive compounds through leech saliva.¹⁶ Following leech attachment and feeding, the enzymatic activity of hyaluronidase and collagenase facilitates penetration into tissues and blood vessels, while histamine-like molecules induce vasodilation. This process is accompanied by the inhibition of platelet function, kinin activity, and the coagulation cascade, collectively leading to suppressed inflammatory responses. Moreover, the analgesic and antimicrobial properties of leech therapy further underscore its therapeutic potential in wound healing and inflammation modulation.¹⁷ Therefore, the impact of leech saliva on local blood and lymph microcirculation plays a crucial role in wound healing. However, the precise mechanisms underlying these effects require further comprehensive investigation.¹⁶ In addition to leech therapy, enzymes such as papain, chymopapain, and glycylendopeptidase found in the unripe pulp and latex of papaya have been identified as pivotal therapeutic agents in wound healing.¹⁸ Extensive studies indicate that the topical application of papaya fruit extract not only promotes wound contraction but also enhances epithelialization and improves granulation tissue integrity.¹⁹ Nafiu and Rahman recently demonstrated that papaya extract application significantly accelerates wound repair mechanisms. This improvement is attributed to increased fibroblast recruitment and a reduction in polymorphonuclear leukocyte infiltration.



Fig. 2. Visual depiction of leg ulcer status during treatment (A) and after three weeks (B).

Additionally, these effects are mediated through the early and transient expression of key regulatory molecules, namely TGF- β 1 and VEGFA, within the wound area.¹⁸

The postulated mechanism of action of the combined therapy suggests complementary pathways that contribute to its efficacy. Leech therapy enhances venous decongestion, thrombolysis, and microcirculation through its bioactive compounds, including hyaluronidase and collagenase, which facilitate tissue penetration and vasodilation. Additionally, it reduces inflammation and pain by inhibiting platelet aggregation, the coagulation cascade, and kinin activity, while also enhancing oxygen and nutrient delivery to the wound. Unripe papaya complements these effects through its proteolytic enzymes, such as papain and chymopapain, which aid in the debridement of necrotic tissue, promote fibroblast recruitment, and stimulate angiogenesis. This occurs through the temporary upregulation of growth factors, including TGF- β 1 and VEGFA, thereby accelerating wound healing.^{16,18,19}

The primary limitation of this case report is that it focuses on a single patient, and images documenting the ulcer healing progression are unavailable. However, the significant clinical improvements observed before and after therapy suggest that the experimental treatment played a crucial role in resolving the venous leg ulcer. To validate these findings, a more comprehensive evaluation of medicinal leech therapy and unripe papaya bandages for chronic venous ulcers is required. This should involve a well-designed prospective study with an adequate sample size, paving the way for future randomized controlled trials.

The patient, who experienced profound frustration due to the ulcer and the resulting disability, faced significant emotional distress. He devoted financial resources beyond his e-rickshaw earnings in an earnest pursuit of an effective treatment. Following the complete resolution of symptoms and successful skin regeneration in the ulcerated region, the patient now reports an unparalleled sense of well-being, describing himself as experiencing immense happiness.

4. Conclusion

The combination of medicinal leech therapy and the topical application of grated unripe papaya resulted in complete ulcer healing and the resolution of associated symptoms, including pain, pruritus, and hyperpigmentation, in a patient with comorbid conditions such as diabetes and mobility impairments. This report proposes a hypothesis for further exploration of leech therapy combined with papaya bandages in the treatment of chronic non-healing ulcers. Future research should involve meticulously designed clinical studies employing standardized wound scoring systems to evaluate efficacy and comprehensive parameters to ensure safety.

CRediT authorship contribution statement

Nazim Husain: Writing – original draft, Visualization, Methodology, Data curation, Conceptualization. Md Akhter Hussain Jamali: Writing – review & editing, Validation, Supervision, Resources. Jamal Akhtar: Writing – review & editing, Validation, Supervision, Resources. Usama Akram: Writing – review & editing, Validation, Supervision, Resources. N. Zaheer Ahmed: Writing – review & editing, Validation, Supervision, Resources.

Ethics approval and consent to participate

The information collected from the study participant adhered to the ethical principles of the Declaration of Helsinki. Furthermore, the case report followed the guidelines set forth in the CARE case report guidelines. Ethical approval for this case report was obtained from the Instutional Ethics Committee.

N. Husain et al.

Consent for publication

The patient received a detailed explanation of the study procedure and the potential publication of their de-identified data in both Bengali and Hindi. Following this, the patient provided written informed consent.

Declaration of competing interests

The authors declare that they have no competing interests.

Acknowledgments

The authors extend their sincere gratitude to the CCRUM, for its steadfast support, motivation, and provision of essential facilities and infrastructure. Special recognition is also given to Dr. Shakeeb Ahmad Khan, Dr. Baquee Billah Ahmed, and the patient who generously granted consent for the procedure and the publication of de-identified data.

References

- O'Donnell TF Jr, Passman MA, Marston WA, et al. Management of venous leg ulcers: clinical practice guidelines of the society for vascular Surgery® and the American venous forum. J Vasc Surg. 2014;60(2 Suppl):3S–59S. https://doi.org/10.1016/ j.jvs.2014.04.049.
- Abbade LP, Lastória S. Venous ulcer: epidemiology, physiopathology, diagnosis and treatment. Int J Dermatol. 2005;44(6):449–456. https://doi.org/10.1111/j.1365-4632.2004.02456.x.
- Grey JE, Harding KG, Enoch S. Venous and arterial leg ulcers. Br Med J. 2006; 332(7537):347–350. https://doi.org/10.1136/bmj.332.7537.347.
- Marston W, Tang J, Kirsner RS, et al. Wound Healing Society 2015 update on guidelines for venous ulcers. Wound Repair Regen. 2016;24(1):136–144. https:// doi.org/10.1111/wrr.12394.

Chinese Journal of Plastic and Reconstructive Surgery xxx (xxxx) xxx

- Bonkemeyer Millan S, Gan R, Townsend PE. Venous ulcers: diagnosis and treatment. Am Fam Physician. 2019;100(5):298–305.
- Kabiruddin M. Sharah-e-Asbab (tarjuma kabir) vol–III. Shaukat Book Depot, Shaukat Bazar, Gujrat. first ed. 2010:175–176.
- Ibn-al-Quf. Kitabul Umda Fill Jarahat. Vol–II. New Delhi: Central Council for Research in Unani Medicine (CCRUM); 1993:187–190, 1st ed.
- Ahmad T, Anwar M. Clinical importance of leech therapy. Indian J Tradit Knowl. 2009;8(3):443–445.
- Kabiruddin M. Tarjuma Wa Sharah Kulliyat-E-Qanoon Ibn Sina Part 2. first ed. Urdu Bazar, Lahore: Shaikh Muhammad Basheer and Sons; 1930:350–352.
- Gruner OC. The Canon of Medicine of Avicenna. New York: AMS press; 1973:512–514.
 Ghani N, Al-Advia Khazain. Idara Kitab-Us-Shifa, Kucha Chelan, Darya Ganj, New Delhi. first ed. 2011:1274–1275, 918–920.
- Riley DS, Barber MS, Kienle GS, et al. CARE guidelines for case reports: explanation and elaboration document. J Clin Epidemiol. 2017;89:218–235. https://doi.org/ 10.1016/j.jclinepi.2017.04.026.
- Lurie F, Passman M, Meisner M, et al. The 2020 update of the CEAP classification system and reporting standards. J Vasc Surg Venous Lymphat Disord. 2020;8(3): 342–352. https://doi.org/10.1016/j.jvsv.2019.12.075.
- Husain N, Jamali MAH, Abdullah, et al. Chronic anal fissure treated with Unani formulation - a series of case reports. *Gastroenterol Endosc.* 2024;2(1). https:// doi.org/10.1016/j.gande.2024.01.005.
- Mumcuoglu KY. Recommendations for the use of leeches in reconstructive plastic surgery. Evid Based Complement Alternat Med. 2014;2014:205929. https://doi.org/ 10.1155/2014/205929.
- Koeppen D, Aurich M, Pasalar M, et al. Medicinal leech therapy in venous congestion and various ulcer forms: perspectives of Western, Persian and Indian medicine. *J Tradit Complement Med.* 2019;10(2):104–109. https://doi.org/10.1016/ i.jtcme.2019.08.003.
- Sig AK, Guney M, Uskudar Guclu A, et al. Medicinal leech therapy-an overall perspective. *Integr Med Res.* 2017;6(4):337–343. https://doi.org/10.1016/ j.imr.2017.08.001.
- Nafiu AB, Rahman MT. Selenium added unripe carica papaya pulp extracts enhance wound repair through TGF-β1 and VEGF-a signalling pathway. *BMC Compl Alternative Med.* 2015;15:369. https://doi.org/10.1186/s12906-015-0900-4.
- Siva S, Sekar M, Surya PV, et al. Effectiveness of conventional management and Carica papaya on influencing wound healing: a systematic review and meta-analysis. *Biomed.* 2023;43(3):825–830. https://doi.org/10.51248/.v43i3.2851.