Open Access Indonesian Journal of Medical Reviews
Journal Homepage: https://hmpublisher.com/index.php/OAIJMR

Herbal Medicine for Burns Injury: A Narrative Literature Review

Yufimar Riza Fadilah[1*]

[1]Department of Surgery, Faculty of Medicine, Universitas Sriwijaya/Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia

ARTICLE INFO

Keywords:
Burn injury
Herbal medicine
Inflammation
Wound healing

***Corresponding author:**
Yufimar Riza Fadilah

E-mail address:
yopirf@gmail.com

The author has reviewed and approved the final version of the manuscript.

https://doi.org/10.37275/oaijmr.v1i5.50

A B S T R A C T

Traditional medicine uses various phytochemicals for wound healing, supplying enhanced healing processes via anti-inflammatory or antioxidant activity. This literature review aimed to describe herbal medicine for burn injuries. The main stages of the recovery process for burned skin include the migration of blood cells from deep within the burn wound, the promotion of local inflammation, the removal of cellular debris and pathogens, the proliferation of connective tissue and extracellular matrix, the neovascular network (angiogenesis) and tissue remodeling. Therefore, the ideal medicine for burn patients should have excellent wound healing potential and show positive effects at different stages of wound repair. The antioxidant activity is a good option for treating burns. Topical antimicrobial therapy is one of the most essential methods of burn wound care. The ideal antibacterial agent for wound infection prevention and control should directly kill pathogens and reduce local inflammation and tissue destruction. Therefore, herbal products can be used successfully to treat wounds. In conclusion, herbal medicine is recommended to conduct advanced clinical and pharmaceutical research to produce new natural medicines for treating burn wounds.

1. Introduction

Burn is one of the most common trauma occurrences, and burn wounds require meticulous care to improve, resulting in significant medical and economic expenses. The incidence of severe burns was over 11 million persons, ranking fourth among all injuries, and was more significant than the combined incidence of TB and HIV infection. Wound healing is a process that includes inflammation, re-epithelialization, granulation, neovascularization, and wound contraction. Burn injuries are described as injuries induced by applying heat, chemicals, electrical current, or radiation to the body's external or internal surface, causing tissue damage. Burns are a severe, unexpected, and destructive kind of trauma that affects the victim's physical and psychological health.[1,2]

Scars are treated with various wound care treatments, including autografts and allografts, lotions and solutions, wound dressings, and alternative tissue-engineered skin replacements. In recent years, several commercially available wound dressings have been introduced. However, they have certain significant limitations, such as the inclusion of antimicrobial medicines, which may have cytotoxic effects, mainly when used for an extended time, causing delayed wound healing. Some commercially available dressings lose their moisturizing function, causing them to cling to the wound's surface and harm the newly created epithelium. Skin treatment after burn damage necessitates the administration of various medications, either alone or in combination, and it is a complex and painful process.[3-5]

Traditional medicine uses various phytochemicals for wound healing, supplying enhanced healing processes via anti-inflammatory or antioxidant activity. Due to their effectiveness and safety, herbal drugs are most commonly used in traditional therapies and treatments of skin wounds. Reports on herbal products affecting various phases of the wound-healing process, such as coagulation, inflammation, epithelization, collaboration, and wound contraction, are abundant in the scientific literature. Herbal products with antibacterial activity can inhibit bacterial growth through different mechanisms and have significant clinical value in treating drug-resistant microbial strains. Shortening the wound healing time is critical to the wound repair process and reduces the chance of bacterial infection, complications, and costs. The use of herbal products to treat burns provides such an opportunity. This literature review aimed to describe herbal medicine for burn injuries.[4,5]

The recovery process of burn injury

The main stages of the recovery process for burned skin include the migration of blood cells from deep within the burn wound, the promotion of local inflammation, the removal of cellular debris and pathogens, the proliferation of connective tissue and extracellular matrix, the neovascular network (angiogenesis) and tissue remodeling. Therefore, the ideal medicine for burn patients should have excellent wound healing potential and show positive effects at different stages of wound repair. The antioxidant activity is a good option for treating burns.

Topical antimicrobial therapy is one of the most essential methods of burn wound care. The ideal antibacterial agent for wound infection prevention and control should directly kill pathogens and reduce local inflammation and tissue destruction. Therefore, herbal products can be used successfully to treat wounds. Applying herbal preparations can enhance the anabolic phase of burn wound healing simply by absorbing decay products and improving tissue nutrition. Methanolic extracts from *Amaranthus spinosus, Anogeissus leiocarpus, Spondia monbin, Corchorus olitorius,* and *Mallotus oppositifolia* were found to inhibit the growth of pathogenic microorganisms (*Staphylococcus aureus, Escherichia coli, Klebsiella pneumonia*) and clinical isolates of *Citrobacter*. In contrast, 10% hydroalcoholic licorice extract 24 and *Cucurbita moschata* husk are inactive against *Staphylococcus aureus* and *Pseudomonas aeruginosa.*[6-9]

An increasing number of burn wound infections are made by fungi, especially yeast *Candida sp.* Burn patients who require prolonged courses of antibiotic or broad-spectrum antibiotic treatments should be carefully monitored for the development of *Candida* and should have prophylactic administration of antifungals considered. Among various herbal preparations, *A. sativum, A. vera, C. asiatica,* and *H. rhamnoides* have the best wound-healing effects through different mechanisms. A. sativum can reduce biomarkers of infection and organ damage. Several studies support the anti-inflammatory and antibacterial effects of *A. vera* gel. Glycosides from *C. asiatica*, including madecassoside and asiaticoside, showed improvement in the biochemical and histological markers of burn wounds in vitro and in vivo. The preparation of different parts of *H. rhamnoides* increased collagen synthesis and angiogenesis. In some plants, including actinides and papaya species, proteolytic enzymes are active ingredients with cleansing properties.[10,11]

The wound healing process consists of inflammation, reepithelialization, granulation, and neovascularization, which result in wound contraction. In the inflammation phase, neutrophils and macrophages are attracted to the injured tissue. This process involves the release of numerous cytokines (interleukin [IL] 1β, IL-6, and tumor necrosis factor [TNF-α]), chemokines, and growth factors (especially platelet-derived growth factor and essential fibroblast growth factor). Zanthoxylum bungeanum seed oil decreased TNF-α, IL-1β, and IL-6 levels in serum, upregulated IκBα, and downregulated p-NF-κB p65 and p-IκBα expressions in vivo, indicating the

anti-inflammatory action of this oil. Also, *A. vera*-based *Nerium oleander* extract (NAE-8) caused the significant downregulation of burn-related increases in TNFα and IL-1β expressions. In addition to abnormal cytokine levels, burn-related significant increases in myeloperoxidase activity were reduced by NAE-8 treatment, referring to its inhibitory effect on tissue neutrophil infiltration.[12]

In the inflammation phase, neutrophils and macrophages eliminate wound debris, generating free radicals such as reactive oxygen species (ROS). At high concentrations, ROS can cause tissue damage and further hinder the healing process by causing damage to cell membranes, DNA, proteins, and lipids. Lipid peroxidation overexpressed by malondialdehyde (MDA) (an indicator of the level of oxidative stress in living organisms) is considered one of the most devastating events after burns. Inhibition of subsequent ROS production has proven to be critical for accelerating wound healing and preventing bacterial infections after burns. Therefore, topical applications of herbal products with antioxidant activity should protect tissues from oxidative damage and significantly improve the wound-healing process in burn patients. Treating burn wounds with 20% *C. moschata* peel and NAE-8® significantly decreased lipid peroxidation and supported the maintenance of cellular integrity as a potent antioxidant. The 5% ointment of *Achyranthes aspera* showed significant burn wound healing, evident by wound contraction and elevation of various antioxidant enzymes such as SOD, CAT, and vitamin C. The mastic extract of *Pistacia atlantica* affected wound healing by significantly increasing SOD, CAT, and GPX. Also, *Pistacia atlantica* resin oil treatment significantly increased SOD and GPX and reduced MDA levels.[13]

According to traditional medicine in different countries, including Iranian traditional medicine, many medicinal plants have potential healing effects on burns. Previously, the anti-ulcer function of these herbs has been verified in various experimental studies. It is exhibited that their healing activity on the gastrointestinal ulcer is via several mechanisms of action, including antioxidant, wound healing, antimicrobial, anti-secretory, immunomodulatory, cytoprotective, and angiogenic effects. Further modern studies in order to explore their wound healing mechanisms of action and responsible, active components are suggested to be done.[14]

Herbal products have been used for burn wound care for many centuries. Many animal studies and few clinical trials have confirmed the activity of herbal products in promoting burn healing. Several herbs have a practical effect in treating wounds (especially burns) and can be considered an alternative treatment source. Furthermore, various phytochemicals exhibit wound-healing functions. Phytochemicals showed their positive activity at different stages of the burn wound healing process by various mechanisms, including antimicrobial, anti-inflammatory, antioxidant, collagen synthesis stimulation, cell proliferative, and angiogenic effects. However, herbal preparations' chemical composition, purity, efficacy, minimum active concentration, and toxicity must be further studied.

2. Conclusion

Herbal medicine can be considered an essential support in conventional treatments and can even be used as a substitute for synthetic drugs to treat burns. It is recommended to conduct advanced clinical and pharmaceutical research to produce new natural medicines for treating burn wounds.

3. References

1. Pereira RF, Carvalho A, Gil MH, Mendes A, Bártolo PJ. Influence of Aloe vera on water absorption and enzymatic in vitro degradation of alginate hydrogel films. Carbohydr Polym. 2013; 98(1): 311–20.
2. Xu R, Luo G, Xia H, He W, Zhao J, Liu B, et al. Novel bilayer wound dressing composed of silicone rubber with particular micropores enhanced wound re-epithelialization and contraction. Biomaterials. 2015; 40: 1–11.

3. Li X-Q, Kang R, Huo J-C, Xie Y-H, Wang S-W, Cao W. Wound-healing activity of Zanthoxylum bungeanum Maxim seed oil on experimentally burned rats. Pharmacogn Mag. 2017; 13(51): 363–71.
4. Peck MD. Epidemiology of burns throughout the world. Part I: Distribution and risk factors. Burns. 2011; 37(7): 1087–100.
5. Akhoondinasab MR, Khodarahmi A, Akhoondinasab M, Saberi M, Iranpour M. Assessing effect of three herbal medicines in second and third degree burns in rats and comparison with silver sulfadiazine ointment. Burns. 2015; 41(1): 125–31.
6. Ganesamoni S, Kate V, Sadasivan J. Epidemiology of hospitalized burn patients in a tertiary care hospital in South India. Burns. 2010; 36(3): 422–9.
7. Davydow DS, Katon WJ, Zatzick DF. Psychiatric morbidity and functional impairments in survivors of burns, traumatic injuries, and ICU stays for other critical illnesses: a review of the literature. Int Rev Psychiatry. 2009; 021(6): 531–8.
8. Noronha C, Almeida A. Local burn treatment-topical antimicrobial agents. Ann Burns Fire Disasters. 2000; 13: 216–19.
9. Pal'tsyn AA, Alekseev AA, Krutikov MG, Kolokol'chikova EG, Chervonskaia NV, Badikova AK, et al. The causative agent of wound infection and sepsis in burn patients. Zh Mikrobiol Epidemiol Immunobiol. 1996; (5): 84–6.
10. El-Kased RF, Amer RI, Attia D, Elmazar MM. Honey-based hydrogel: In vitro and comparative In vivo evaluation for burn wound healing. Sci Rep. 2017; 7(1): 9692.
11. Drago H, Marín GH, Sturla F, Roque G, Mártire K, Díaz Aquino V, et al. The next generation of burns treatment: intelligent films and matrix, controlled enzymatic debridement, and adult stem cells. Transplant Proc. 2010; 42(1): 345–9.
12. Shah A, Amini-Nik S. The role of phytochemicals in the inflammatory phase of wound healing. Int J Mol Sci. 2017; 18(5): 1068.
13. Calixto JB. Efficacy, safety, quality control, marketing and regulatory guidelines for herbal medicines (phytotherapeutic agents). Braz J Med Biol Res. 2000; 33(2): 179–89.
14. Budovsky A, Yarmolinsky L, Ben-Shabat S. Effect of medicinal plants on wound healing: Effect of medicinal plants. Wound Repair Regen. 2015; 23(2): 171–83.