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A Review Article on Effects of Aloe Vera on Wound Healing

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A B S T R A C T

The skin is essential for maintaining the integrity of the inside environment of the body. Maintaining life is incompatible with the loss of this major organ. Wound treatment is crucial and has been the focus of numerous studies. Natural materials are important in this context as supplemental therapy. Aloe vera has been shown in numerous studies to have beneficial benefits on wounds, particularly those that heal on the skin. Consequently, we looked at how aloe vera affected cutaneous wound healing in the current review and came to the conclusion that while aloe vera enhances wound healing as well as other processes in both clinical and experimental settings, additional research is still required to confirm the results.

Keywords: Wound healing, Aloe vera, Wound phases, Therapeutic agents, Mechanism of action

INTRODUCTION

Wound healing is a biological process and promotion of tissue recovery is the main objective of medical interventions. Skin lesions are caused due to different reasons such as burns, surgery, trauma, arterial diseases.

Wound healing takes places in four phases; Hemostasis, inflammatory phase, proliferative phase and remodeling phase.

- Hemostasis: involves the bleeding from wounds, platelets aggregating and clotting to halt the bleeding
- Inflammatory phase: involves inflammation, congestion and leucocyte infiltration are involved.
- Proliferative phase: it involves the removal of dead tissue.
- Remodeling phase: the wound heals completely, fibroblasts cover the wound to create new skin, and scars form.

Aloe vera has been the subject of numerous researches, which have demonstrated its efficacy in both preventing and curing skin lesions. Numerous studies have demonstrated the benefits of aloe vera in the treatment of wounds, including mouth sores, burn wounds, ulcers, and psoriasis. Aloe vera is well-known for its ability to heal wounds and have anti-inflammatory, anti-tumour, antibacterial, and antiviral qualities.

Aloe vera, also known as Aloe vera Linn or Aloe vera barbadensis Mill. is a tropical plant that grows well in hot and dry areas, such as Thailand. It is a member of the Liliaceae family. The mucilaginous tissue in the middle of aloe vera leaves is called aloe vera gel and is used to make a variety of cosmetics and therapeutic goods. Numerous investigations have proposed that aloe vera, or any combination of its components, may facilitate healing of wounds in a range of animal models. Since water makes up 99% of the gel, studies have demonstrated that it can both improve skin fragility and promote skin flexibility. Furthermore, aloe vera's mucopolysaccharides zinc, and amino acids can promote skin integrity, moisture retention, erythema reduction, and the avoidance of skin ulcers.

1. CHEMICAL CONSTITUENTS OF ALOE VERA

2.PHASES OF WOUND HEALING

2.1 PHASE 1 – Hemostasis

Stopping the bleeding is the main goal of the hemostasis stage of wound healing. Your body triggers its blood clotting system to do this. The process of your wound healing begins when your blood clots at the site of the wound, keeping you from losing too much blood.

2.2 PHASE 2 - Inflammatory phase

The inflammatory phase begins as soon as the injury incidence and lasts for around four days. It primarily achieves two key objectives. The first is to preserve tissue hemostasis, which can be done in a few different ways: by contracting smooth muscle cells, closing big blood vessels that have burst, and accumulating platelets to clot smaller injured capillaries.

The second objective is to remove germs, impurities, and other undesirable material from the wound. Neutrophils, or polymorph nuclear leukocytes, immediately migrate from the nearby microvasculature to carry out this task after a wound is incurred. At the site of injury, neutrophils appear to be short-lived cells that undergo apoptosis after a few hours.. Two days after the damage, a different kind of cell known as macrophages emerges at the wound site and these cells work to eliminate necrotic tissue, phagocytizing bacteria, and foreign debris.

Additionally, angiogenesis and fibroplasia—two critical processes in the healing process—are started by macrophages. The cytokines that the activated macrophages release mediate these events. Three days after the injury, angiogenesis starts, this is necessary to supply the metabolic needs of the healing process. By the third or fifth day after the injury, collagen production and fibroplasia take place.

2.3 PHASE 3 - Proliferation

After an injury, the proliferative phase can extend up to three weeks. Angiogenesis factors (AGF) and fibroblast stimulating factors are released by the activation of macrophages. The proliferation of fibroblasts is facilitated by fibroblast stimulating substances and is a crucial aspect of the proliferative phase. Collagen and proteoglycans are subsequently produced by the fibroblasts. AGF stimulates the development of new capillary buds and blood capillaries. Collagen, proteoglycans, and neovasculature make up the granulation tissue that fills in wound defects.

Collagen formation improves the tensile strength of wounds. The wound contracts, drawing its borders closer together and reducing the area that is injured. Myofibroblasts, a particular kind of fibroblast with a contractile character, mediate this process .The process of re-epithelialization, in which the surrounding epithelial cells actively proliferate and migrate over the granulation tissue to join both edges of the wound, are another aspect of the proliferative phase. Re-epithelialization is a crucial step in the healing of wounds because the newly formed epithelium functions as a physical barrier to prevent bodily fluid leaks and contaminants from entering from the outside.

The size of the wound has a direct impact on the rate of closure since larger flaws take longer to close because migrating epithelial cells must travel farther to connect the two edges Furthermore, epithelial cell migration is facilitated by a moist wound surface whereas it is inhibited by a dry surface. Therefore, creating a moist wound microenvironment is the main objective of novel wound dressing chemicals in order to promote re-epithelization.

2.4 PHASE 4 – Remodeling

The last stage of the healing process is called the remodeling or maturation phase. It starts about three weeks after the injury and could go up to a year or more Fibroblasts continue to produce collagen throughout this period. A class of enzymes known as collagenases is secreted during this phase; they function to lyse the collagen bundles generated during the proliferative phase and reorganize them in a parallel configuration. During this phase, the healing of the damaged area and a progressive strengthening of the tensile strength continue. The amount of collagen production and the degree of crosslinking between adjacent collagen bundles determine the ultimate strength of a healed wound.

The wound reaches its maximum tensile strength at the conclusion of the maturation period, which is usually 80% of the strength of the original, uninjured cutaneous tissue.

Wounds often take four to six weeks to heal. Chronic wounds, however, do not heal in this time frame. Diabetes, hypoxia, ischemia, bacterial infection, abnormalities in collagen synthesis, malnourishment, smoking, and dehydration are some of the conditions that can hinder the healing process.

3. MECHANISM OF ALOE VERA

One important protein that aids in wound healing is collagen. Aloe vera may also improve skin integrity, lessen inflammation, and stop ulcers. Dress the wound with a bandage soaked in aloe vera gel or apply a thin coating of aloe vera gel to the region. Aloe vera was once thought to be a therapeutic plant that sped up the healing process when it came to wound closure. Aloe vera is used as a skin remedy that also lessens the severity of mucocutaneous issues, such as gingivitis. Numerous studies on experimental animals have examined the mechanism of action of aloe vera in promoting wound healing. This important function in decreasing pain, inhibiting inflammation, moisturizing the wound, improving the collagen composition both quantitatively and qualitatively, and promoting the migration of the adjacent epithelial cells to the wound has given rise to a number of theories.

The presence of glucomannan, a mannose-rich polysaccharide that functions in concert with gibberellin and growth hormone to stimulate the active proliferation of fibroblasts, is the primary modulator of Aloe vera's healing properties. Collagen biogenesis rises both quantitatively and qualitatively when fibroblast activation and proliferation are stimulated. In addition to increasing in quantity, the injured area also produces new subtypes of collagen and more transversal connections between bands. As a result, the injured region shrinks and the healing process quickens considerably.

Aloe vera has been shown to protect keratinocytes against preservative-induced mortality, which speeds up wound healing in addition to encouraging the active proliferation of fibroblasts and keratinocytes. Topical Aloe vera gel treatment may also promote angiogenesis and improve wound blood supply, better meeting the wound's metabolic needs. Aloe vera gel's mucopolysaccharides have a humectant effect that helps to moisturize the skin.

Aloe vera's anti-inflammatory and anaesthetic properties may be attributed to its ability to block the cyclooxygenase pathway by reducing prostaglandin E2. The gel extract yielded the novel anti-inflammatory drug C-glycosyl chromone. Additionally, hydrolysing enzymes from Aloe were extracted, including carboxypeptidase and bradykinase. By dissolving bradykinin, which causes pain, these enzymes have strong anti-inflammatory properties.

CONCLUSION

The results of the study showed that Aloe vera gel exerted positive effects on wound healing, as it was able to increase the production of fibroblasts, optimize reepithelialisation, angiogenesis, and accelerate wound closure

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