

Effect of Aloe Vera Gel in the Healing of Post Operating Incisions: Evidence Based Nursing

¹Sitti Syabariyyah*, ¹Belinda Rizky Amalia, ¹Nina Gartika

Corresponding Author: *sittisyabariyyah@unisa-bandung.ac.id

¹ Universitas 'Aisyiyah Bandung Indonesia

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ABSTRACT

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The incidence of injuries in the world throughout the year is increasing, both acute and chronic wounds. In Indonesia, the prevalence of incisional wounds is 8.2%. Wound healing can be assisted with herbal plants, one of which is aloe vera. The purpose of this evidence-based nursing study was to determine aloe vera's effectiveness in the healing process of incisional wounds. The method used is a literature review. Database searches were conducted through Pubmed, Science Direct, Science Open and Google Scholar. The inclusion criteria of the journal in this study were journals that examined incisions, cuts or surgical wounds given intervention using aloe vera in a quasi-experimental research design, case study, double-blind, controlled trial, journals published in 2016-2021 and used Indonesian or English. This study's results indicate an influence of aloe vera in the wound-healing process, especially in the proliferative phase. This literature study can be used as evidence-based nursing at the level of nursing health services, especially wound care management based on aloe vera.

Keywords

Aloe Vera

Incision Wound

Wound Healing

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Introduction

The incidence of injuries in the world throughout the year is increasing, both acute and chronic injuries. A study conducted in America, states that the prevalence of wound patients is 350 per 1000 [1]. The causes of injuries in patients vary with the data obtained: surgical wounds 113.3 million cases, trauma wounds 1.6 million cases, abrasions 20.4 million cases,

burns 10 million cases and decubitus ulcers 8.5 million cases [2]. Meanwhile, another study by Patients receiving treatment reported at least 82 million wounded patients with or without infection. Non-healing wounds affect approximately 3-6 million people in the United States, 85% of whom are over 65. Wounds that do not heal result in high health costs, incurring around 3 billion USD per year [3].

The prevalence of postoperative incision wound patients in Indonesia is 8.2%, with the highest number found in the province of South Sulawesi at 12.8% and the type of wound most often experienced by the Indonesian population is abrasions of 70.9% [4]. The most common cause of injury was a fall at 40.9%, followed by a motorcycle accident at 40.6% [5]. Other studies state that surgical wound infections are the most frequent cause of nosocomial infections, which is about 38%. Two to five per cent of the 30 million patients who undergo surgery each year experience infection due to postoperative wounds [6].

Research conducted by Ref. [7] found that aloe vera is effective in the healing process of cuts in mice because it contains active substances that are beneficial for the wound-healing process, namely saponins, flavonoids, tannins and polyphenols. Another study by Ref. [8] found that using aloe vera affected the process of closing cuts on the oral mucosa of Wistar rats. Several studies above show that the application of aloe vera interventions can speed up wound healing [9]. Therefore, the author is interested in conducting a literature review study on the effectiveness of aloe vera in the incision wound healing process.

Methods

This study summarises relevant research results by analyzing various references to determine the effectiveness of aloe vera on the incision wound healing process. A literature search was conducted in March 2021. The data used in this study is secondary data not from direct research but from research carried out by previous researchers published in national and international online journals. The selection of articles is based on predetermined inclusion and exclusion criteria and obtained articles that can be used in this study. Data sources from articles and journals relevant to the research themes obtained from the database include Pubmed, Science Direct, Science Open and GoogleScholar. These keywords in the evidence base use "lidah buaya", "proses penyembuhan luka", "luka insisi" "luka sayat". For researching international journals or articles, it uses the keywords "Aloe Vera Gel", "Wound Healing" "Epidermal Wounds". Journals and articles in evidence-based nursing were published a maximum of five years ago, from 2016-2021.

Results

The results of a literature search from four databases using customized keywords obtained articles that match these keywords. The author found 264 appropriate journals/articles. The selection of articles is based on predetermined inclusion and exclusion criteria and obtained articles that can be used in this study. Based on the results of studies and research articles on the influence of aloe vera in the incision wound healing process, ten articles were obtained that fit the inclusion and exclusion criteria poured into the table. The ten articles were analyzed using the rules of Validity, Importance and applicability (VIA).

Ref. [10] Description: Aloe vera influences the timing of the closure of cuts on the oral mucosa of Wistar rats. This is due to active substances such as manosa, glucomannan, chrysophanic acid, acemannan, vitamin A, vitamin C, and vitamin E and the enzymes present in aloe vera. Acemannan works as a potential macrophage-activating agent, and growth factors can directly bind to acemannan, thereby improving its work [11]. Acemannan can stimulate the production of growth factors in wound closures produced by fibroblasts, namely the Keratinocyte Growth Factor (KGF) [12].

Ref. [13] Suhardono et al. (2020). The results showed that the time required for complete epithelialization in the group treated with aloe vera was 11.5 +- 1.45 days ($p < 0.05$). After applying aloe vera, the visual analogue scale score is 17.18 +- 13.17.

Ref. [14] Katubi (2021): It was determined that 75% aloe vera extract increased the number of fibroblasts compared to the control group. Aloe vera extract has a glucomannan content rich in mannose polysaccharides, gibberellin and growth hormone. It has a high content of acemannan and glucomannans in aloe vera and is a growth factor that can spur fibroblast growth. Acemannan found in aloe vera will stimulate fibroblasts to secrete VEGF (Vascular Endothelial Growth Factor).

Ref. [12] Govindarajan (2021). Data obtained from the average measurement of the length of cuts from each concentration were analyzed with a single-way ANOVA. The results showed that from concentrations of 12.5%, 25%, and 50%, the concentration of 50% was influential in wound healing.

Ref. [15] Kaviya (2020). In the proliferation phase, groups treated using aloe vera showed differences. The wound's edges united on the third day after surgery and showed a significance value of $p < 0.05$ ($p = 0.015$). It is evidence that treating using aloe vera can help the wound healing process. The proliferation phase is the continuation of the inflammatory phase. If the inflammatory phase is successful, it will be followed by the proliferation phase, and fibroblasts will develop to form tissues and accelerate the wound-healing process.

Ref. [16] Sharma. (2020). The results of this study show that aloe vera modulates inflammation, increases wound contraction and epithelialization, decreases scarring and

increases alignment and regeneration of scar tissue. Dose-dependent increases in dry tissue, collagen, and glycosaminoglycan content were seen in lesions treated with aloe vera compared to the control group ($p < 0.05$).

Ref. [17] Rasli (2021): The results showed that in the experimental group, the average post-test (4.9) was lower than the mean pre-test (7.1). It showed a significant difference between the mean pre-test and the mean post-test of the experiment group (5.03), lower than the average in the control group (6.5). It showed that the application of aloe vera greatly influences the healing of episiotomy wounds, which can be observed easily.

Ref. [18] Ikram (2021). This study showed that there were statistically significant differences observed in episiotomy cures using the REEDA scale between study group 1 (aloe vera) and study group 2 (normal saline): ($P=0.001$). It can be explained by the fact that the active components of aloe can inhibit thromboxane, accelerate the wound-healing process and reduce inflammation.

Ref. [19] Majumder (2021): Treatment of wounds in rabbits using aloe vera produces a significant effect ($P < 0.05$), especially in the proliferative phase and the maturation phase. It is due to the presence of phytochemicals in Aloe vera, such as flavonoids and saponins, which are beneficial in protecting and repairing damaged tissues. Glucomannan, manosa polysaccharides and gibberellin also play a role in faster wound healing. It interacts with growth factor receptors stimulating fibroblast proliferation and collagen synthesis.

Ref. [20] Al-Maweri (2020). An evaluation was carried out on day three, inpatient one, and obtained the results of the condition of the wound were dry, clean, with no pus, wound length approximately 3-4cm and still stitches, and no symptoms of infection. The condition of the patient's wound 2 is dry, the mesh has a small lesion, no, the length of the wound is 3-4cm, there are still stitches, and there are no symptoms of infestation.

Discussion

Based on the VIA study that has been carried out, the clinical decision that can be concluded is that most of the use of aloe vera has an effect and is effective on the incision wound healing process. Some studies show that aloe vera influences the wound-healing process. It is due to several compounds in aloe vera, including mannose 6-phosphate. It increases wound contraction and collagen synthesis, as well as polysaccharide compounds. It increases fibroblasts' proliferation, hyaluronic acid production and hydroxyproline in fibroblasts. It plays a role in the wound-healing process. Polysaccharide isolates in aloe induce matrix metalloproteinase (MMP)-3 and the expression of the inhibitor-2 metalloproteinase gene during the wound healing process on rat skin.

Aloe vera helps cell production by going through the activity of amino acids, which form the basis of the formation of new cells due to the ability of enzymes that promote regeneration in the deepest layers of the skin. Studies have been conducted on experimental animals such as rabbits, Wistar rats, and guinea pigs. Experimental animals are first made wounds. The part that was made was the right back. An incision wound 2-3 cm long. Then the wound was treated according to its group (control group and test group), and after that, observation was carried out for two weeks. [21] The things observed include macroscopic images of the wound (the wound begins to dry out, the colour of the skin on the wound, the edges of the wound have not been or have been fused), the length of the skin incision, the surface area of the wound, and the percentage of wound healing [22]. The formula calculates the percentage of wound healing: Percentage of healing = $\frac{\text{wound surface area day 1} - \text{wound surface area day } x}{\text{surface area day one}}$ from several studies showing the effect of aloe vera extract on wound healing.

Aloe vera contains lignin which can improve skin absorption and make the skin more hydrated. In wound healing, glucomannan is complemented by lectins where the sugar component of mannose stimulates the secretion of binding mannose protein lectin (MPL), then bound with carbohydrate bacteria wall [23]. This bond complements the functions of chemotaxis and opsonization. Hence macrophages become more active in eradicating germs [24]. Macrophages will release Epidermal Growth Factor (EGF), Transforming Growth Factor $\beta 1$ (TGF), Fibroblast Growth Factor (FGF) and Interleukins (IL-1). Acemannan activates macrophages and increases nitric oxide synthase at transcript levels, followed by an increase in TGF- $\beta 1$, EGF, and FGF. They stimulate proliferation, cellular growth, contractility, differentiation, and angiogenesis which are essential in the wound-healing process [25].

As a result of the continuous occurrence of biological cell activity and biochemical activity, wound healing becomes a complex process. In the wound healing process, the combination of vascular response, cell activity and the formation of chemicals in the wound area between substances are interrelated components. When an injury occurs, the body has a mechanism to restore damaged tissue components by forming new functional structures [26]. The wound healing process is not only limited to the local regeneration process but is also influenced by internal factors such as age, nutrition, immunology, drug use and metabolic status [27]. The wound healing process is divided into five stages: homeostatic, inflammatory, migration, proliferation, and maturation. Fibrinogen has a coagulation mechanism through the coagulation of exudate and the formation of fibrin tissue [28]. It produces coagulants and causes to stop the bleeding. Keratinocytes and fibroblasts play an essential role in wound healing. Keratinocytes will stimulate fibroblasts to synthesize growth factors and then stimulate keratinocytes to multiply [5]. In addition, fibroblasts acquire a myofibroblast phenotype under the control of keratinocytes. It is influenced by pro-inflammatory-based

balance or the formation of growth factor (TGF) β . Hemostasis occurs immediately at the beginning of an injury and is aimed at stopping bleeding in the presence of platelet aggregation and platelet-mediated vasoconstriction [29].

Conclusion

Based on the ten journals that have been studied, the clinical decisions that can be concluded are that most of the use of aloe vera has an effect and is effective on the incision wound healing process. It is due to the presence of several compounds in aloe vera. It includes manosa 6-phosphate (increase wound contraction and collagen synthesis), polysaccharide compounds (increase the proliferation of fibroblasts), hyaluronic acid production and hydroxyproline in fibroblasts which play a role in the wound healing process.

In addition, the results of the review of this research article can be developed operational standards for wound care using aloe vera to accelerate the healing process of incision wounds.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Authors



Dr. Sitty Syabariyah, S.Kp., MS. Biomed. is a senior lecturer at Faculty of Health Sciences of Aisyiyah University of Bandung. Doctoral degree obtained from the University of Indonesia. Her expertise is in nursing, health, hospital management, and risk management. She has published many articles in international journals. She also is a visiting senior lecturer at University Teknologi Mara (UiTM) Malaysia. She is the Reviewer of the Journal of Health Sciences and Medical Development. (email: sittisyabariyah@unisa-bandung.ac.id).



Belinda Rizky Amalia was a research member in this study. Her bachelor's degree obtained from Universitas Aisyiyah Bandung. She works at RSUD Bandung Kiwari, West Java. (email: belindarizky36@gmail.com).



Nina Gartika is a junior lecturer at the Faculty of Health Sciences, Aisyiyah University of Bandung. Her research is related to nursing. She also works as a visiting lecturer at the Universiti Teknologi Mara (UiTM) Malaysia. Her research interests include geriatric nursing and medical-surgical nursing. (email: nina.gartika@unisa-bandung.ac.id).