

The effectiveness of aloe vera gel compared to povidone iodine on wound healing

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Abstract

Wound is damage that occurs in a tissue. The tissue most frequently injured is the skin. Treatment of wounds is carried out in various ways, however, as first aid, drugs containing povidone iodine are usually given. Apart from povidone iodine, we can use aloe vera as a wound treatment. According to various sources of literature obtained, many of the ingredients in aloe vera are considered superior for wound healing such as accelerating epithelization and healing time, as well as minimizing side effects. Comparison of the effectiveness of aloe vera and povidone iodine in terms of consistency, healing time, basic ingredients, and side effects. Based on these aspects, it can be concluded that aloe vera is more effective in wound healing compared to povidone iodine.

Keywords: Aloe vera; Povidone iodine; Wound healing; Natural remedies; Antiseptic agents

1. Introduction

The skin is an organ that plays an important role in human life, among others, to regulate water balance and electrolyte thermoregulation, and functions as a barrier to the external environment including microorganisms. If the skin is damaged or what is commonly called a wound, the underlying tissue will be exposed so that foreign objects and other microorganisms can enter easily.

Injuries are often experienced by every human being, according to the 2018 Basic Health Research (RISKESDAS), the average prevalence of sliced / torn / stabbed injuries is 23.92%. Wounds can arise either intentionally or unintentionally. For example, injuries resulting from trauma such as accidents, burns and injuries that are intentionally made such as incisions in surgery. (Hutabarat, 2022). Wound healing is a very complex mechanism that requires different strategies in treating different types of wounds. In general, wound healing includes 4 main phases, namely the hemostasis and inflammation phase, the proliferative phase, the maturation phase and the remodeling phase.

The inflammatory phase has the characteristics of tumor, rubor, dolor, calor, and functio laesa. This phase occurs immediately on the fifth day which involves the process of constricting and retraction of broken blood vessels accompanied by hemostatic reactions in the form of platelet aggregation and fibrin mesh which carry out blood clotting to prevent blood loss. In the process of angiogenesis occurs when the endothelial cells of blood vessels around the wound form new capillaries. Furthermore, in the third week there is a proliferative phase or also called the granulation phase due to the formation of granulation tissue. Fibroblasts, which are one of the granulation tissues, proliferate and synthesize collagen which holds the edges of the wound together. Fibroblasts produce an extracellular matrix which is a major component of scar formation that causes movement of keratinocytes through wound filling. Macrophages then produce growth factors that stimulate proliferation, migration, and extracellular matrix formation. Furthermore, epithelialization occurs in the form of migration of keratinocytes from the tissue around the epithelium to cover the wound surface. In the remodeling or maturation phase which lasts several weeks to two years trying to restore normal

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tissue structure. Signs of inflammation disappear, absorption of inflammatory cells, maturation of young cells, and closure and reabsorption of new capillaries. The formation of collagen changes the shape of the wound and increases the strength of the tissue. The wound healing process ends with the formation of a 50-80% scar having the same strength as the previous tissue. Usually, first aid when injured is done by administering betadine which contains povidone iodine as a prevention of inflammation. In addition, povidone iodine has an antimicrobial effect that creates a moist environment and can induce angiogenesis. Povidone iodine contains detergents, wetting agents and solubilizers which in this case cause the release of iodine to occur slowly which results in prolonging its antimicrobial effect. The presence of wetting agents allows the wound to be avoided from mechanical disturbances so that the healing process goes faster. The combination of wetting agents with detergents can prevent excessive formation of crusts, sebum and exudation in wounds.

However, apart from povidone iodine, there are other alternatives, such as administering aloe vera gel. Aloe vera (Aloe vera) is a plant that is often found and is known to have many benefits, ranging from raw materials for medicines, cosmetics, to food and beverages (Kurniawati, D. 2017) One of the properties of aloe vera gel for wound healing is that it can accelerate healing wounds, because aloe vera contains acetylated mannose which is an immunostimulant that functions to increase the phagocytic function of macrophage cells, increase the response of T cells to fight pathogens and enhance the immune system to strengthen antibodies (Hutabarat, 2022). In addition, aloe vera also contains many active substances such as glucomannan, lignin, vitamin A, vitamin C, enzymes, and amino acids which are very important for cell regeneration. Aloe vera also has ingredients such as lignin and amino acids which are useful for removing scars and dark spots.

Based on the data mentioned, this article review aims to determine the level of effectiveness of aloe vera gel compared to povidone iodine which is often used by the public to accelerate wound healing.

2. Methods

The author uses reference journals that have been published in 2009-2020. The journals are collected from various sources online such as Google Scholar and PubMed with the keywords "Effectiveness of Aloe Vera Gel and Povidone Iodine on Wound Healing" "Comparison of Aloe Vera Gel and Povidone Iodine on Wound Healing". The sources obtained were national journals selected based on inclusion criteria, namely journals with the type of research article or original article.

3. Results

3.1. Consistency

According to research conducted by Nur Atik in 2009 that topical administration of aloe vera gel to cuts on the skin of mice has a more beneficial effect than administration of povidone iodine.

In fact, povidone iodine has a thinner consistency than aloe vera gel, so povidone iodine can speed up the re-epithelialization process because it can provide a moist environment for cuts. But unfortunately, aloe vera gel is more effective for skin epithelialization. This effect may be due to the content of the G1G1M1DI2 glycoprotein fraction which stimulates keratinocyte proliferation.

In addition, the group treated with aloe vera showed an increase in the number of fibroblasts which might be due to the activity of the mannose-6-phosphate component which binds to the IGF-2/manosa-6-phosphate receptor found on the surface of fibroblast cells. This engagement causes stimulation of fibroblasts to proliferate, differentiate into myofibroblasts, or produce large amounts of collagen and other matrix proteins.

The angiogenic effect of β -sitosterol from aloe vera also triggers the formation of new blood vessels in the brain vessels of damaged mice so that the number of blood vessels and VEGF A expression is higher in the aloe vera group compared to controls or those given povidone iodine. (Atik, N., & Rahman, J. I. A. 2009)

3.2. Healing Time

These results were also supported by Ertati Suarni's research in 2016 which concluded that the treatment of incisions in mice using aloe vera and povidone iodine had a significant difference in healing time, where the group treated with povidone iodine needed a longer healing time than those treated with gel. Aloe vera.

Aloe vera contains an active compound, namely, acemannan which is the main carbohydrate fraction found in aloe vera. Acemannan works by stimulating the immune and anti-inflammatory, increasing monocyte and macrophage activity and cytotoxicity, stimulating killer T-cells and increasing the activity of candidiasis macrophages in vitro. Acemannan is also able to stimulate oxygen consumption, increase angiogenesis and increase collagen synthesis in the wound area.

In addition, Aloe vera also contains the enzymes Glycine, Proline and Lysine which are amino acids that actually increase collagen levels. This ingredient focuses on cellular reproduction and therefore accelerates healing time.

Aloe vera also contains the hormones auxin and gibberellins, these hormones act as anti-inflammatory. Aloe vera also contains steroids, namely cholesterol, campesterol, lupeol, sitosterol which act as anti-inflammatory. Lupeol functions as an antiseptic and analgesic. Aloe vera also produces several enzymes, including anthranol, barbaloin, chrysophanic acid, cinnamic acid ester, isobarbaloin and resistanol. This enzyme is antifungal and antiviral. (Suarni, E., & Badri, P. R. A. 2016)

On the other hand, povidone iodine is slower to heal incised wounds in mice, because of its effect which inhibits the growth of fibroblast cells. The results of this study are in line with Desryana's research in 2020 where based on the results of visual observations, the wound condition of mice showed normal, dry skin, no scabs, and closed wound edges in the 80% aloe vera test group seen on day 9, in the test group 30% aloe vera was seen on the 11th day, in the test group 40% aloe vera and positive control (povidone iodine) were seen on the 12th day, while in the negative control (aquadex) it was seen on the 14th day. This proves that Wounds treated with aloe vera extract healed faster and were in better condition than the other controls. (Kulsum, D., & Sutriningsih, S. 2020).

3.3. Side effects

In the test group 40%, 60% and 80% there was no skin irritation because the use of natural ingredients was safer and minimized side effects, and it was proven that aloe vera was efficacious for wound healing. Because in aloe vera there are flavonoid compounds where the pharmacological activity is as an antiseptic.

Whereas in the positive controls who were given povidone iodine, there was redness (irritation) during wound healing because the iodine used in small amounts is absorbed into the bloodstream, causing irritation with the result of tissue anoxia shock, where disturbances occur in the tissue itself, so that the tissue does not can use oxygen effectively and the occurrence of blockages in damaged skin tissue.

The use of povidone iodine as a topical drug for wounds is still being debated in the health world, because iodine can be absorbed and can cause tissue damage and even poisoning in various tissues and cells including granulocytes, monocytes and fibroblasts.

The povidone iodine used in this study has a level of 1% not 10%. Because in previous studies it was tested, when the preliminary test of 10% povidone iodine on mice, it turned out that many mice died. This is presumably due to the adsorption effect of povidone iodine which, when used on a large damaged skin surface, can cause systemic effects such as acidosis, neutropenia, and hypothyroidism. Therefore the concentration made in the positive control was 1% povidone iodine because it already acts as an antiseptic on the skin. The use of povidone iodine should also be used more effectively as an antiseptic, which is more precise for wound dressings, not for clean, non-infected wounds. Therefore this study supports the previous view that povidone iodine is not effective in wound healing of incisions. (Kulsum, D., & Sutriningsih, S. 2020).

3.4. Basic material

Usman's research in 2018 showed the activity of aloe vera as a wound healing formulated as an aloe vera gel preparation showed it was able to reduce the size of a burn wound with a 5% Na-CMC base. Aloe vera is a gel preparation formulation with 5% Na-CMC base which has better burn healing activity than 0.5% carbopol base. There is a significant difference in healing time between administration of aloe vera gel from the two commercial products compared to povidone iodine in the healing process of iris wounds (*Vulnus scissum*) on the skin of male mice (*Mus musculus*) wistar strain. Aloe vera gel preparations in research proved to be better at accelerating the healing process of iris wounds than povidone iodine. (Usman, Y. 2018)

4. Conclusion

Aloe vera gel is considered more effective in accelerating wound healing than povidone iodine because of ingredients such as the G1G1M1DI2 glycoprotein fraction, the mannose-6-phosphate component, and the angiogenic effect of β -

sitosterol in aloe vera gel which is useful for skin epithelialization. The active compounds acemannan, the enzymes Glycine, Proline and Lysine, and the hormones auxin and gibberellins which shorten the wound healing process. Meanwhile, flavonoid compounds act as antiseptics that minimize side effects. Finally, the preparation is in the form of a gel which further accelerates the wound healing process. So that you can consider using aloe vera gel as a wound treatment drug.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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