The Effect Of Aloe Vera On Healing Process Of Incision Wound

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Background : Considering the advantages of wound treatment in moist-state, many practitioners always keep the wound in the moist condition. One of the alternatives is by using aloe vera. It has moisturizing effect, anti inflammatory and can stimulate growth factor and fibroblast. In this study, the authors aim to compare the effect of the wound dressing with the dry gauze, moist gauze and aloe vera toward the tensile strength.
Methods : Thirty Rattus Novergicus were divided into two experimental groups and 1 control group. We performed full thickness skin incision on the back of the rats, and then we sutured and nursed them by using moist gauze and Aloe Vera while the dry gauze group treated as the control. On the 10th day, we decapitated the rats and we took the trace of incisional skin for the tensile strength test. At last, the samples were measured by Zwick universal tensile strength testing machine.
Result : This research show that the group treated by dry gauze had tensile strength (35 ± 7 N/cm2) , with moist gauze (41 ± 7 N/cm2), and with Aloe Vera (68 ±17 N/cm2). There was a significant difference between the three groups regarding the tensile strength ($p<0.001$).
Conclusion : Treatment of wound by using Aloe Vera is proven to be more effective than the dry gauze and moist gauze to increase the tensile strength.
Keywords *: aloe vera, rattus novergicus, tensile strength*

Latar Belakang : Klinisi secara umum akan menjaga kondisi luka dalam keadaan lembab mengingat manfaat kondisi lembab untuk penyembuhan luka. Salah satu alternatif yang dapat digunakan adalah aloe vera. Aloe vera memiliki efek melembabkan, anti inflamasi dan merangsang growth factor dan fibroblas. Dalam studi ini penulis membandingkan efek dari balutan luka menggunakan kasa kering , kasa lembab dan aloe vera terhadap kekuatan tautan parut setelah penyembuhan.
Metodologi : Tiga puluh Rattus Novergicus dibagi dalam dua grup eksperimen dan satu grup kontrol. Kami lakukan insisi seluruh ketebalan kulit pada punggung tikus, lalu dilakukan penjahitan luka dan perawatan luka dengan kasa lembab dan aloe vera , sementara pada grup kontrol digunakan kasa kering. Pada hari ke -10 kami memenggal kepala tikus dan mencari daerah parut untuk dites kekuatan tautan luka. Lalu seluruh sampel dilakukan tes menggunakan mesin zwick.
Hasil : Penelitian ini menunjukkan bahwa grup yang dilakukan perawatan dengan kasa kering memiliki kekuatan tautan luka (35 ± 7 N/cm2), dengan kasa lembab (41 ± 7 N/cm2),d and dengan Aloe Vera (68 ±17 N/cm2). Didapatkan perbedaan bermakna pada kekuatan tautan luka ketiga grup ($p<0.001$).
Kesimpulan: Perawatan luka menggunakan aloe vera terbukti leih efektif dibandingkan kasa kering dan kasa lembab untuk meningkatkan kekuatan tautan luka.
Kata kunci : *aloe vera, rattus novergicus, kekuatan tautan luka*

Wound healing is the body's own defense response to tissue injury. It is a complex inter-related cascade of cellular and chemical events that act in unison to restore tensile strength and appearance of injured skin. It is need long time to complete the process. Many researches have been done to invent the best way in wound healing matter.[1,2]

Prior to 1960s, the wound healing was conducted in exposure method with surface scab. It was in 1962 when practicioners started to realize that the wound treatment was better to be conducted in moist condition. This was pioneered by Winter, who performed a research demonstrated that partial thickness wounds re-epithelialized more rapidly under occlusive dressings under the reason that

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occlusive dressings maintained a moist wound surface.[3] This environment accelerated the re-epithelialization process. It was also known that the moist circumstance can stimulate the proliferation and the migration of of epithelial cell, augment the growth factors activity and the surface proteolytic enzymes as well as develop the surface oxygen and the nutrient delivery.[4]

Considering these advantages of wound treatment in moist-state, many practitioners started to perform researches aimed to discover how to keep the wound in the moist condition. One of the alternatives is by using aloe vera.[5] It is known that aloe vera has been used for a long time to promote wound healing.[6] It is founded by Laily et all research in 2009 that the aloe vera extract has the same hydration ability as the moisturizer cream made from urea.[7] The aloe vera contains of more than 75 active elements. Some of them that contribute to the wound healing process are vitamin C, vitamin E, amino acid and zinc.[8,9] David stated in 1993 that instead of only function as the moisturizer, it also has anti inflammation effect, stimulates the growth factor production, and to rise the fibroblast to produce collagen and proteoglycans.[10,11]

The aim of the research is to compare the effect of wound treatment by dry gauze, moist gauze and Aloe vera toward the healing process by observing the capacity of the tensile strength. Morin et all stated in 1989 that the tensile strength is one of the criteria to examine the level of the wound healing at the skin. The tensile strength is the size of the maximum force required to break a wound divided by the width of the wound region (the accumulation of the width and the thickness of the skin) stated in kg/cm^2 or newton per cm^2.[12] At the early stage of wound up to the third day, the tensile strength is determined by the state of the fibrin tissues. After the third day, there are collagen synthesis by fibroblast and reached its peak at the third weeks. At the this phase, the size of the tensile strength depends on the number and the position of the collagen around the wound region. After the third week, the tensile strength increased rapidly along with the cross-linking of the collagen and the change of collagen type –III with the type-1. The tensile strength keeps increasing along with the remodeling phase and it reaches the maximum point up to the 70-80 % of the tensile strength of the normal skin.[1]

METHODS

This research was an animal experimental study. Thirty Rattus novergicus was used as samples. They were taken and tested in Integrated researching and testing laboratory- Gajah Mada University. The criteria of clinic included : (1) The age was 3 months with the weight of ± 250 gr , (2) The sex was male, (3) General condition is good, and active, with no signs of infection on its back, (4) having the same diet supply. Thirty samples which included in the criteria were divided into two experimental groups and one control group. Each of groups was nursed by Aloe vera, moist gauze and dry gauze. We used extract Aloe vera as sold in the market. The procedure of this study were done in two phase. The details of each procedure are as follow:

First phase operation

Figure 1 . Anesthetic conducted by using ketamine injection with 10 mg/kg BB (IM) dosage.

Figure 2. Shaving the back of the rats

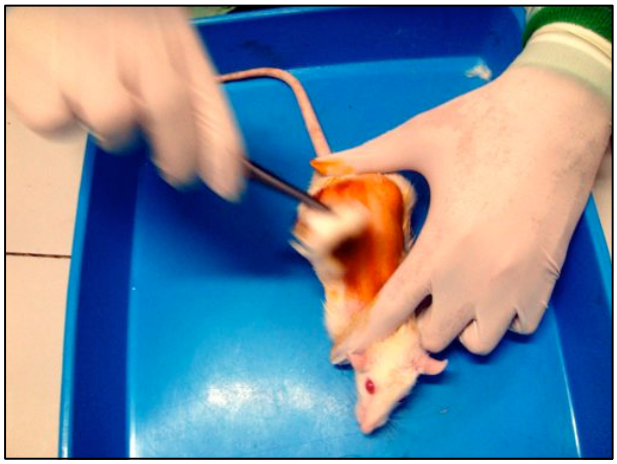

Figure 3. Disinfection was performed by applying 70 % alcohol and 10 % of providone iodine.

Figure 4. Incision was done 1 cm in size on the rat's back by blade.

Figure 5.
Suturing was performed by using seide 5-0 thread.
- Group I dressed with dry gauze
- Group II dressed with moist gauze with Nacl 0,9%
- Group III dressed with dry gauze with extract of Aloe Vera

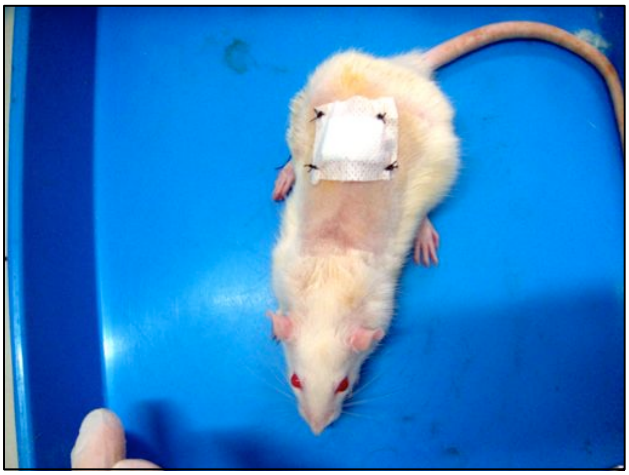

Figure 6.
Dressing was performed with different treatments (group I dressed with dry gauze, group II dressed with moist gauze with Nacl 0,9%, group III dressed with dry gauze with extract of Aloe Vera)

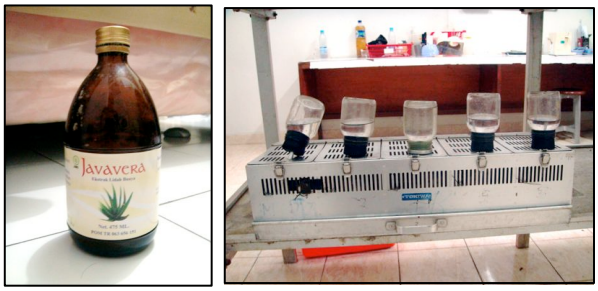

Figure 7 (left). Extract Aloe vera (widely sold in the indonesia pharmacy).
Figure 8 (right). The rats were treated and supplied with the same diet.

Second Phase Operation

Figure 9. Decapitating

Figure 10. Taking the trace of the incision wound of the rats

Figure 11. The pattern was formed on the skin that has been excised by sampling machine

Figure 12. (A) The pattern, (B) The patterned skin

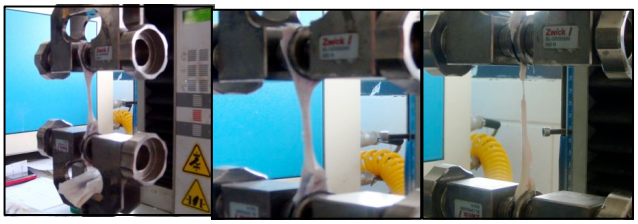

Figure 13. (A) Tensile strength test was conducted by using the Zwick universal tensile strength testing machine , (B) The skin was intact (early phase), (C) The skin was broken (end phase)

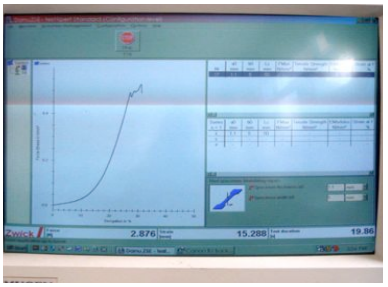

Figure 14. Result on PC

Table 1. Tensile strength between the treatment groups.

Treatment group	N	Mean	SD	Kruskal Wallis Test	p-value
Aloe vera	10	68,015	17,539	19,450	< 0,001
Moist gauze	10	41,367	7,551		
Dry gauze	10	35,619	7,323		

Table 2. Multiple comparisons of the tensile strength

Treatment group	Compare with	Mean Difference	95% Confidence Interval	p-value
Aloe vera	Moist gauze	26,648	13,170 - 40,126	< 0,001
	Dry gauze	32,396	18,918 – 45,872	< 0,001
Moist gauze	Aloevera	-26,648	13,170 - 40,126	< 0,001
	Dry gauze	5,748	18,918 – 45,872	> 0,001
Dry gauze	Aloe vera	-32,396	13,170 - 40,126	< 0,001
	Moist gauze	-5,748	18,918 – 45,872	> 0,001

RESULTS

Since the data were not distributed normally and the variants were not homogenic thus this research used the Kruskal-Wallis test to analyze the statistics. Meanwhile, the Multiple Comparison Bonferroni was utilized to compare the significance level of each group.

The mean and standard deviation (SD) of tensile strength between the treatment group are shown in the table 1. It can be observed from the table 1 that there was a significant difference in the mean of tensile strength between the three groups.

The Aloe vera had significantly higher levels of the tensile strength compared to moist gauze and dry gauze with multiple comparison bonferroni are shown in the table 2.

Table 2. Multiple comparisons of the tensile strength

DISCUSSION

From this research, it is concluded that there is no significant difference between the wound treatment by both dry gauze and moist gauze. While based on the A landmark study in 1962 by Winter , it was concluded that the moist environment accelerate the re-epithelialization process and the surface drying did not only impeded delivery of nutrients and immune defenses to the wound surface but also markedly impeded the ability of cells to migrate across the wound surface. Epithelial cells need a moisture layer to migrate and spread. For any re-epithelialization to occur on a dry surface, the cells must burrow beneath the "scab" using a controlled release of proteases.[3,4] Thus, there is an inconsistence between this research with the theory and the previous researches done. This can be caused by the fact that the research was performed in Indonesia, considering Indonesia as a tropical country that has a high humidity level. Thus, the high humidity environment can influence the level of moisture at the wound region. Meanwhile, the group with aloe vera shows a significant difference of result compared to other groups. It is caused by the fact that aloe vera, instead of only having moisturizer effect, it also has other effects toward the wound healing.[5,6,7] As what stated by Willenberg in 1982 that the

mannosephospastate within aloe vera has anti-inflammation effect.[10] The same remark also appeared in Davis research, 2003 that stated the application of Aloe vera whether it is topical or oral can augment the process of vascularization as well as fasten the granulation.[11] As another consideration, aloe vera also has other mechanism to improve the tensile strength. It is found that there is a significant high improvement of the tensile strength in the group that applied aloe vera compared to other groups. Nur Atik et all,2009 stated that Aloe vera topically increase the thick of the epitel, the average level of blood vain fibroblast, and the expression of VEGF A[13]. Davis also stated in 2003 that aloe vera not only has anti inflammation agent, but also has an ability to stimulate the fibroblast to produce collagen.[11] While we know for sure that collagen has close relation with the tensile strength.[1] So, it has big chance that the tensile strength improvement of the aloe vera groups in this research is resulted from the fibroblast stimulation effect to this group not because of the moisturizer effect.

CONCLUSION

In this experimental research, treatment of wound by using Aloe Vera is proven to be more effective than the dry gauze and moist gauze to increase the tensile strength. Further research is needed with different research design, repetitive frequency and longer duration of therapy.

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