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The effectiveness aloe vera spray (aloe vera) on episiotomy wound healing of wistar rats

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ABSTRACT

Background

Postpartum morbidity is caused by perineal trauma, one of which is episiotomy which can potentially cause wound infection. Episiotomy can be interpreted as cutting the perineal muscle. Currently wound care is still quite a lot using povidone iodine which has the effect of slowing down the granulation process. One of the medicinal plants that is proven to be effective in accelerating the process of wound healing and relatively safer is aloe vera.

Method

The type of research used is research experimental in the laboratory with post test only with group control design, carried out on 28 female white rats divided into 4 groups. The treatment is carried out every 12 hours for 7 days. Data analysis used MANOVA (Multivariate Analysis of Variants) and continued with post hoc multiple comparisons.

Results

Test results MANOVA (Multivariate Analysis Of Variant) indicates p value 0,004 which means that the administration of aloe vera spray is effective in wound healing episiotomy of wistar rats significantly.

Conclusion

The results of the study after being given aloe vera with a concentration 3% for 7 days had an effect on granulation in wounded specimens of female white rats, so that the therapy was effectively implemented in wound healing especially those who experienced postpartum with episiotomy wounds.

Keywords: Aloe Vera Spray, Aloe Vera Sensitivity, Wound Healing, Episiotomy, Wistar Rats.

INTRODUCTION

Postpartum is defined as a period in which pregnancy has ended and at the beginning of the puerperium this is the highest risk for postpartum mothers. Postpartum maternal morbidity is categorized when the postpartum mother experiences pain from the first 1 hour after the

placenta is born up to 6 weeks later. The condition of a mother who is seriously ill, does not rule out the possibility of complications that can develop into maternal death. The World Health Organization (WHO) estimates that morbidity in 1.4 million postpartum women occurs almost every year and 80% of them occur in the first week after

delivery. In the 10 major cases of morbidity in postpartum mothers, the incidence of postpartum infection was ranked 5th, which is around 6% from 2.9 per thousand births. One of the causes of infection is due to episiotomy (31.3%). [1] Morbidity in postpartum mothers is caused by perineal trauma. Perineal trauma includes spontaneous tears in the perineum during labor and episiotomy. Epidemiological studies have shown that there are around 95.8% of first and second degree tears and 4.2% of third and fourth degrees. [2]

Episiotomy is associated with several other maternal complications. Delays in healing perineal wounds can also cause psychological and emotional disorders such as insomnia, fatigue, anxiety, limited physical activity, lactation disorders, depression, postpartum blues, thrombophlebitis, and so on. [3] The anatomy of the perineum passed through lochea (fluid from the uterine cavity and vaginal) and adjacent to the anus as a drainage (feces), causing the area to become moist and fertile land for the breeding of bacteria. The types of pathogenic bacteria that can trigger infection and slow wound healing are gram-positive bacteria from the group, coccus namely *Staphylococcus epidermidis*, *Staphylococcus aureus*, *Enterococcus* (group D *Streptococcus*), group B *Streptococcus*. [3]

Good treatment of episiotomy wounds such as vulva hygiene (cleaning the vulva area) and administration of antiseptic fluids are very effective in healing wounds and preventing infection. One of the antiseptic fluids that is still quite widely used is povidone iodine 10%. Povidone iodine does not recommend as an antiseptic for wound care because it can slow down the process of granulation / wound healing. Irritant and tend to be toxic when entering through a blood vessel, iodine levels in povidone iodine can be reabsorbed by the body so that it can cause acidosis. Although these side effects are rare, but possible, they must be watched out for. [4, 5]

Medical (pharmacological) treatment is widely considered to be given to postpartum mothers, because of the high costs and possible impacts for both the mother and the baby (contamination of breast milk and possible side effects to the baby). Currently a variety of studies have been conducted to find effective, inexpensive and minimal side effects on the healing of perineal wounds. Many

non-pharmacological treatments are recommended, namely complementary treatments including traditional or herbal medicines.⁶ Full support from WHO regarding herbal medicine with consideration to complications of chemical drugs, confirms that the percentage is around 74% of pharmacological drugs and 25% of herbal medicines. [6] One of the non-pharmacological treatments that can be used to cure perineal wounds is aloe vera. Aloe Vera is commonly known by the Indonesian people as Aloe Vera which is classified as an herbal plant from the liliaceae family. Various benefits of this plant include healing of digestive problems, asthma, peptic ulcer, acne, skin irritation, burns, eczema, psoriasis, dermatitis and diabetes mellitus. [7] As a plant that is rich in benefits, the active ingredient in aloe vera includes glucose, flavonoids, saponins, tannins, essential and nonessential amino acids, proteins, vitamins, minerals, enzymes, polysaccharides. [7-9]

The saponin content in aloe vera is detoxification, anti-bacterial and anti-fungal. The results showed that the anti-inflammatory effectiveness of aloe vera was due to the content of salicylic acid which can inhibit the formation of Bradykinin, Histamine and the oxidation of arachidonic which inhibit prostaglandin synthesis so that pain in the treated wound can be reduced. Aloe vera flavonoids accelerate wound healing because it can accelerate collagen production which helps the process of recovery of fibroblast cellular structures and wound granulation. As a preventive measure for the incidence of pressure sores in total bedrest patients, aloe vera is able to be a relatively inexpensive alternative therapy and has good effectiveness. [10] The comparison of the content of flavonoids and saponins in aloe vera to several types of herbal medicinal plants per 100 grams including Aloe vera (aloe vera) 3.24 ± 5.65 ; Nine o'clock interest (*Aspilia Africana*) 1.46 ± 1.46 ; Cocor bebek (*Bryophyllum Pinnatum*) 1.86 ± 1.72 ; Imperata (*Imperata Cylindrica*) 1.63 ± 1.42 ; Pegagan (*Centella Asiatica*) 2.05 ± 2.21 . [11-13]

The use of aloe vera for episiotomy wound healing has been done quite a lot in several studies. The results of the study recommend that the administration of ointment aloe vera is proven to be effective for episiotomy wound healing because it can increase the number of fibroblasts in the process of wound closure. [14] In another study, it was shown that gel aloe vera not only relieves pain

but also accelerates the process of healing perineal wounds with smaller REEDA scale values. [15] Based on the average score in recovery of pain and wound healing, it was determined that lavender, olive, turmeric, aloe vera, and cryotherapy were the most effective. Over time, pharmaceutical dosage forms are growing rapidly and processed with technology. studies Boidegradable and biocompatible make an active material help the healing process, accelerate wound closure and restore the function of damaged body tissue. One form of development of pharmaceutical preparations is the manufacture of spray, which has several advantages which can minimize hand contamination of microorganisms and the absorption time of the skin is relatively faster than other preparations, and also more practical in its use. [15]

Based on the above background it is known that episiotomy wounds have the potential to become infected because of their humid conditions, so that it will be easy to become a land for bacterial growth. Pharmacological therapy such as giving antibiotics, besides the price is quite high, it is feared that it will cause an effect of resistance. While the wound care is still quite widely used povidone iodine which turns out to have irritating side effects and slows down the healing process of open wounds.

This encourages students to do research on the administration of aloe vera spray containing saponins and flavonoids to episiotomy wound healing in wistar rat perineum. By using anatomical pathology examination parameters (histopathology) to measure the amount of granulation.

METHODS

This type of research uses research experimental in the laboratory with post test only

with control group design. The researchers compiled four groups: the intervention group gives spray aloe vera (1%, 2%, and 3%) in the experimental group and those given NaCl spray 0.9% in the control group. The use of aloe vera spray (1%, 2%, 3%) and NaCl spray 0.9% every 12 hours for 7 days. The method used to carry out the examination uses the Optilab® photo aid with the calculation of 40 times magnification objects in five different fields of view.

The target population in this study was female rats (*Rattus novergicus*). Affordable populations in this study were female rats having episiotomy wounds on the perineum obtained from the Biology Laboratory of the Animal Care Unit of the State University of Semarang as a population maintenance site from February 2019 to March 2019. Determination of the minimum number of samples using techniques sampling probability by method random sampling. And based on the inclusion and exclusion criteria as many as 28 rats that were injured in the perineal area divided into 4 groups with each of 7 rats in the experimental group 1% aloe vera spray, 7 rats in the experimental group aloe vera spray 2%, 7 rats in experimental group of 3% aloe vera spray and 7 rats in the control group with 0.9% NaCl spray.

In this study researchers conducted data collection by observation and identification. The collected data was analyzed through the IBM SPSS version 24.0, and continued with the influence test namely parametric test (Manova Test and Scheffe Post Hoc Test). The processed data is used as the basis for discussing problem statements, which are then presented in table form so conclusions can be drawn.

RESULTS

Table 1 Number granulation female white mice in the control group and the treatment group

No.	Group	Sample	Σ Granulation	Average Σ Granulation
1	K	K.1.1	13	25
		K.1.2	26	
		K.1.3	43	
		K.1.4	27	
		C.1.5	23	
		K. 1.6	18	

2	P1	K.1.7	25	26
		P.1.1	35	
		P.1.2	35	
		P.1.3	22	
		P.1.4	26	
		P.1.5	16	
		P.1.6	21	
3	P2	P.1.7	27	25.85
		P.2.1	20	
		P.2.2	26	
		P.2.3	17	
		P.2.4	35	
		P.2.5	33	
		P.2.6	32	
4	P3	P.2.7	18	42.28
		P.3.1	46	
		P.3.2	26	
		P.3.3	38	
		P.3.4	48	
		P.3.5	56	
		P.3.6	53	
		P.3.7	30	

Remarks:

* K (Group 0.9% NaCl spray),

* P1 (Aloe Vera spray treatment group 1%)

* P2 (Aloe Vera spray treatment group 2%)

* P3 (Aloe Vera spray treatment group 3 %)

Based on Table 1 shows that the results of the research on the amount of granulation were interpreted that the highest amount of granulation in female white rats was in the group (P3) with the

treatment of spray Aloe Vera 3% with an average of 42.28, while the lowest amount of granulation was in the group (K) with the treatment of giving 0.9% NaCl spray with an average of 25.

Table 2 Mean value, standard deviation and homogeneity test for the number of granulations in female white rats

No	Group	Granulation amount (mean \pm SD)	P value
1	K (NaCl spray group 0.9%)	5.00 \pm 1.87	0.396
2	P1 (Aloe Vera spray Group 1%)	5.20 \pm 1.42	
3	P2 (Aloe Vera spray Group 2%)	5.17 \pm 1.52	
4	P3 (Aloe Vera spray Group 3%)	8.45 \pm 2.33	

* Homogeneity of variances: significant > 0.05

Based on table 2, the results of the study can be interpreted that the number of granulations between groups is homogeneous (p value > 0.05) with p values is 0.396. The results showed that there were differences in the mean values of granulation between groups. The mean value of the highest

amount of granulation is in the treatment group (P3) which is 8.45 (standard deviation = 2.33), while the mean value of the lowest amount of granulation is in the control group (K) which is 5.00 (standard deviation = 1.87).

Table 3 Effectiveness Award aloe vera spray and significant relationship between groups to the number of granulation on female white rats

No.	Group	P value	P value (PH Test)
1	K (NaCl spray Group 0.9%)	0.004	K to P3
2	P1 (Aloe Vera spray Group 1%)		0.016
3	P2 (Aloe Vera spray Group 2%)		
4	P3 (Aloe Vera spray Group 3%)		

*P value and Post Hoc Tests: significant <0.05

Based on table 3 the results of research can be interpreted that there is a difference in the p value of the number of granulations between groups. The results showed that the spray aloe vera were effective against the amount of granulation, this is evidenced by the results of p value the test through of Manova 0.004(p <0.05). In addition there was a significant difference in the number of granulations between the control group (K) who were given 0.9% NaCl spray and the intervention group (P3) who were given aloe vera spray 3%, this was evidenced by the results of the Post Hoc Test Scheffe with a p value 0.016 (p <0.05).

DISCUSSION

The results show that there is the effect of aloe vera spray on wound healing were assessed microscopically by the amount of granulation (p=<0.05). The higher concentration of the extract of aloe vera, the higher the effectiveness on wound healing. In table 2 the results of the study show that aloe vera spray can affect the amount of granulation with a mean value of spray aloe vera 1% = 5.20; aloe vera spray 2% = 5.17; aloe vera spray 3% = 8.45; and control 0.9% NaCl = 5.00.

The potential of aloe vera spray on episiotomy wound healing of wistar rats showed that the concentration of aloe vera spray 3% had the highest effectiveness and was the optimum dose. The concentration of aloe vera spray 3% has the ability to increase the amount of granulation. In the manova test (post hoc scheffe) the amount granulation showed that p value in the group was aloe vera spray 3% compared to 0.9% NaCl = 0.016 (<0.05) which meant that there was a significant difference because of the mean difference in aloe vera spray 3% = 8.45 and 0.9% NaCl = 5.00.

This is consistent with major hypothesis is the provision of aloe vera spray in some concentration on the amount of granulation in Wistar rats episiotomy more effective / ineffective / same

compared with 0.9% NaCl control which means that the hypothesis is accepted. Then the first minor hypothesis is aloe vera spray 1% no more effective with 0.9% NaCl control which means the hypothesis is accepted, the second minor hypothesis is aloe vera spray 2% no more effective with 0.9% NaCl control which means the hypothesis accepted, and the third minor hypothesis that is aloe vera spray 2% more effective with 0.9% NaCl control which means the hypothesis is accepted.

The effectiveness of aloe vera spray 3% better than the 0.9% NaCl control when viewed from the mean or average number of granulations. This is influenced by the high content of flavonoids and saponins in accordance with the results of this study, namely the higher the concentration of aloe vera spray, the higher the level of wound healing. The results of this study are in line with previous research proving that in vitro (cell level research), aloe vera spray 3% stimulates the migration of fibroblast cells and keratinocyte proliferation thereby accelerating wound healing. [16] Extract of aloe vera can also stimulate the acceleration of wound healing in mice skin after the gel of aloe vera (aloe vera) twice daily. [17] Another study states that there are differences in the speed of wound healing in wounds treated with aloe vera gel, but the concentration of aloe vera gel given is not clearly stated so that it can affect the wound. [18]

The content of flavonoids and saponins present in the aloe vera spray is an active substance that can accelerate the wound healing process. Flavonoids have anti-inflammatory and antioxidant properties for wound healing. [19] When an injury occurs, flavonoid compounds can eliminate reactive oxygen species (ROS) and detoxification of hydrogen peroxide (H₂O₂) so that lipid peroxide levels decrease and the inflammatory phase shortens. Flavonoids are also able to accelerate the migration of fibroblasts, smooth muscle cells and endothelial cells by stimulating increased

production of platelet derived growth factor (PDGF). [20, 21] This compound can also function as an anti-bacterial, inhibiting the effect of free radicals on wounds, preventing cell damage, accelerating the process of epithelialization of wound tissue by increasing antioxidant enzymes. Saponins can increase the migration of monocytes and macrophages, wound oxygen consumption and anti-inflammation can also increase the ability of TGF- β receptors. [22] In the tissue proliferation and remodeling phase, the flavonoid and saponin compounds in aloe vera will increase vascular vascularity which consequently will increase the strength of collagen fiber formation.

Based on the research that the aloe vera spray can affect the amount of granulation. It was proven that the maximum dose that can affect wound healing episiotomy female white mice, namely the provision of aloe vera spray 3% dose as well as co-supported by the results of microscopic examination (histopathology).

CONCLUSION

Based on the results of research and discussion that has been described related to the analysis of

wound healing to the amount of granulation due to the provision of aloe vera spray by microscopy (histopathology), can be formulated some conclusions as follows:

1. Number of granulation on the concentration of the aloe vera spray 1% and 2% is no more effective than 0.9% NaCl control, while the concentration of aloe vera spray 3% has effectiveness in increasing the amount of granulation.
2. Aloe Vera Spray 1% was not effective against the amount of granulation in wound healing of female white mice with a mean amount of granulation (5.2).
3. Aloe Vera Spray 2% is not effective against the amount of granulation in wound healing of female white rats with a mean number of granulations (5,17).
4. Aloe Vera Spray 3% effective against the amount of granulation in wound healing of female white mice with a mean value of granulation (8.45).
5. The optimum dose aloe vera spray that can affect the amount of spray granulation is by giving aloe vera spray in the treatment group with a dose 3%.

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