

Celerity Difference in Incision Wound Healing Between Ethanol Extract of Curcuma (*Curcuma Xanthorrhiza Roxb.*) and Povidone Iodine in White Mice (*Rattus Norvegicus*)

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Abstract

Wound is losing or breaking part of body tissue. There are so many causes factor of wound condition. The examples are trauma of dull or sharp thing, explosion, chemical substance, temperature, electric shock or animal bites. Response of organism was reached with stabilized physiologic tissue or organ in the skin, rearranging of skin tissue sign by forming of functional epithelial that covered the wound. Some herbal medicine can used on wound healing such as curcuma. The aim of this study is to know the celerity difference in wound healing process in incision wound with ethanol extract of curcuma, povidone iodine as a control group and without treatment in white mice. This study is a true experimental with 15 white mice, age between 3-4 month and weight 150-250 gram. They were randomly assigned into 3 groups, ethanol extract of curcuma group, control group, and without treatment group. Incision wound is made by scalpel, the length was 2 cm and the depth was 2 mm. The macroscopic observation of wound healing is using scoring system to know wound healing process and measured by ruler to know the wound wide. Results were analyzed using nonparametric statistic test Kruskal-Wallis with 95% confidence interval and continued by Man-Whitney test. The study shows that the fastest wound healing process is by ethanol extract of curcuma for 10,60 – 0,548 days, povidone iodine as a control group for 13,00 – 0,707 days, and without treatment for 13,80 – 0,447 days. The result of difference celerity in wound healing process between all variable is 0,003 and Man-Whitney test shows there is significant difference between ethanol extract of curcuma group and control group ($p=0,007$). From the result above shows that ethanol extract group is faster than povidone iodine as control group and without treatment in wound healing process

Keywords: Incision wound, ethanol extract of Curcuma, wound healing process

Preliminary

Wound is a condition that is often experienced by everyone, with the severity of mild, moderate or severe¹. Wound is broken or breaking the integrity of the tissue caused by physical means or mechanical². Wound healing process that occurs in damaged tissue can be divided into three phases: the inflammatory phase, proliferation phase and healing phase (remodeling)¹. All kinds of cuts need to pass the third phase to be able to restore the integrity of the tissue. Wound healing is needed to regain the body's tissues are intact. Several factors play a role in accelerating the healing, such as internal factors (of the body) and external factors (outside the body)³.

In recent times, people have learned about the process of wound healing and some of the factors that prevented it. Remedies with herbal are often used by the community to heal the wounds include ginger (*Curcuma xanthorrhiza roxb*). Traditional medicine is the media treatment using natural ingredients from plants as raw material⁴.

Curcuma contains the main compound in the rhizome that is, essential oils and curcuminoid that has analgesic, anti-inflammatory, antioxidant, anti-cancer, anti-diabetic, anti-hyperlipidemia, antimicrobial, anti-inflammatory and antivirus⁵. In connection with the above description, encourage researchers to determine differences in the speed of wound healing incision with a smear of ethanol extract of curcuma (*Curcuma xanthorrhiza roxb*) and povidone iodine in rats (*Rattus norvegicus*).

Materials and Methods

This study is an experimental research laboratory to determine the speed difference in wound healing incision smeared with ethanol extract of curcuma and povidone iodine as the control group of mice. The population used in this study were white mice. The samples were 15 rats that divided into three groups: 5 rats treated with a smear of ethanol extract of curcuma (*Curcuma xanthorrhiza Roxb.*), 5 rats treated with smear of povidone iodine as a control group and 5 rats not given treatment. Inclusion criteria were set for male rats that aged between 3-4 months, or weight 250-300 grams, healthy, active and has no genetic abnormalities. Exclusion criteria were

white rats that has sick or die during the process of the study.

The independent variables were incision wound treatment with ethanol extract of curcuma (*Curcuma Roxb xanthorrhiza*), povidone iodine or without treatment in rats. The disturbance variable were oxygenation, the types of injuries, nutritional status and activity of white rats.

Implementation of research begins with selection of curcuma rhizome from market traders, then continued to make extracts that performed in laboratory research FKIK. The following work steps were curcuma cleaned by washing with water, cut small and thin, dried in the sun to dry or dried using a heating machine(oven). The dried curcuma then pulverized and put in a container, added ethanol (alcohol 96%) with a ratio of 10: 1 then soaked for 24 hours with stirring periodically conduct. After that is done shelter filtrate. Pulp obtained from filtering then soaked again using 96% ethanol. This procedure is done 3 times. After evaporation of the filtrate obtained we conducted using the evaporator until a semi-solid produced ethanol extract of curcuma rhizome. Then dried in a stove temperature $\pm 40^{\circ}\text{C}$ to obtain condensed ethanol extract of curcuma rhizome.

Grouping of white rats were divided into 3 groups: ethanol extract of ginger, povidone iodine as control and without treatment. Making the incision begins by determining the location of the white rat dorsal area. Remove the hair with a way to shave up to approximately $\pm 3\text{ cm} - 5\text{cm}$ skin area around the incision. Sterilized skin area with 70% alcohol. Wear clean gloves and use the ether anesthesia. Perform the skin incision using a sterile scalpel with $\pm 2\text{ cm}$ long wound and wound depth of $\pm 2\text{ mm}$ subsequent purge of the blood that comes out in a manner thoroughly rinsed with 0.9% NaCl physiological using 5 ml syringe until the bleeding stops. Draining wounds using a dry gauze with sirkulet movement from the inside out. Removing gloves clean then use sterile gloves. Wound care using ethanolic extract of curcuma. In the control group after cleaning

Wound care is done with the same intensity that every day once in the morning at 09.00 am. Assessing the condition of the wound, the wound color, size of the wound, the presence of fluid/ pus in the wound, and the wound edema. Applying curcuma extract for treatment of cuts, povidone iodine in the control group, whereas in the group without treatment just cleaned NaCl 0.9% in the treatment process.

Observations were carried out on three groups of rats every morning, at the time of treatment after treatment. Observations were carried out by means of macroscopic using a ruler to measure the length of the wound. Then use the loup and photographed to determine the development of healing cuts.

Observe wound healing process using a check list or observation sheet wound healing every morning. Each criterion was given a score then summed. Wound healing criteria include: signs of infection (exudate, pus, blood, wound color, etc.), size of wound, wound base (granulation, epithelialization, slough and necrotic), depth of the wound, amount of exudate, the wound edges and smell.

Analyzed data use numeric scale data and test in advance of data normality using the Shapiro-Wilk analytical method because of testing a small sample of less ≤ 50 . We analyze known distribution of abnormal data with Kruskal-Wallis method in all study groups. Proceed with the Man-Whitney test to determine which groups are different and which are not different batches.

Table 1. Wound healing process rate

Day	Wound healing process rate		
	Curcuma Extract	Povidone	Non treatment
2	12	13,2	13,8
3	11,6	12,4	12,8
4	10,4	11,2	11,6
5	8,2	9,8	10,2
6	7,2	8,6	9,2
7	6	7,8	7,8
8	4,6	6	6,4
9	3,8	4,6	5,2
10	2	3,8	4,2
11	0,8	2,2	3,6
12	0,4	1,6	2,2
13	0	0,6	1,4
14	0	0,2	0,8

Result

Results showed a mean score obtained by each study group every day.

Scores obtained will illustrate how the development of incision wounds: higher the score mean longer the process of wound healing and lower the score mean more rapid wound healing process. The result were shown in Table 1.

Table 1. showed at day 2 all groups experienced a decrease in score until day 14. In the group of Povidone iodine decreased until day 14, but did not achieve a score of 0, the non-treated group decreased until day 14, but did not achieve a score of 0, and the ethanol extract of ginger group decreased until day 13 and reached a score of 0.

Table 2. Average of incision wound healing process rate

No	Group	Recovery time (day)	Kruskall-wallis
1	<i>Povidone iodine</i>	13,00 0,707	p=0,003
2	Curcuma extract	10,60 0,548	(significan) p<0,05
3	No treatment	13,80 0,447	

Extract of curcuma group had healed wound closure time shorter ie on day 12 (completely closed). While in the povidone iodine group experienced healing at day 13 (completely closed), whereas the non-treated group experienced healing at day 14th.

Average healing time of incision in the study group are shown in Table 2. The group of white rats were given a smear ethanol extract of curcuma requires the fastest time (average time of 10.60 ± 0.548 days) to

recover. Incision wound group povidone iodine needs to have some time with an average of 13.00 ± 0.707 days. While the incision with no treatment had the longest average time for 13.80 ± 0.447 days with the degree of significance of all groups $p = 0.003$ which means meaningful.

Discussion

In Table 1 shows the number of scores obtained by each research group. On day 2 all groups experienced a decrease in score until day 14, the decline in this score because it has undergone a process that starts from the wound inflammation recovery phase, the proliferative phase and maturation phase.

After injury inflammatory response occurs, curcuma extract group, the control group (povidone iodine) and the group without treatment give a visible clinical signs and symptoms such as: redness (rubor) due to dilated capillaries, sense of warmth (heat) because of increased perfusion, pain (dolor) due to the accumulation of exudate and swelling (tumor)⁷. Scores decline can occur because of a narrowing extensive injuries, improved depth of the wound and wound base which shows the state of the phase leading to the healing wound granulation visible example to develop into epithelization. Wound repair shown by the decrease in score shows the wound is in the proliferative phase. This stage lasts from day 6 to 2 weeks. Fibroblasts (connective tissue cells) function to produce a protein structure that will be used during the reconstruction process of new tissue⁸. The process of wound healing speed on curcuma extract is influenced by the content of the active substances. We suppose that this is because of a combination effects by curcuma. Anti-inflammatory and analgesic effect of curcuma is caused by the presence of germakron. Germakron is an active substance contained in ginger that suppress pain⁹. In the group of mice with a smear of curcuma extract has extensive wound scores quite well, it is because there is a flavonoid content. Flavonoid function to lowers capillary permeability so that the capillary bleeding can be prevented as well as the fragility and capillary damage can be repaired, flavonoids work by forming a platelet blockage and improve vascular endothelial so as to close the small tears in the blood vessels⁹.

The last phase of the process of wound healing is a maturation phase, this phase usually begins on day 24 until many years after the injury depends on the condition of the wound. Wounds that are not too severe as the incision is done in the research phase of maturation can occur more rapidly and the growth of collagen can be reached a climax even before 14 week¹⁰. In this study, there were confounding variables that found to include intrinsic and extrinsic factors. Intrinsic factors that cause slowing the healing of wounds is the activity of mice that can not be controlled so as to make the process of wound healing becomes ineffective. Besides iti this excessive activity of mice led to the mice in one group intersect. Extrinsic factors that interfere in the form of environmental factors and sometimes can not be controlled clean every time.

Conclusion

The results of this study can be summarized as follows: Curcuma extract has fastest wound recovery time than povidone iodine.

Suggestion

From the above study, it is suggested further research on human subject probably with another type of wound for example gangrene or burn wound.

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