



The influence of Eucalyptus oil and aloe vera gel, on cutaneous wound healing in albino male Wistar rats: an experimental study

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Abstract

Aim of the study: The present study was planned to investigate the effect of eucalyptus oil and aloe vera gel on resutured incision, excision in Wistar rats.

Materials and method: Resutured incision, and excision inflicted under light ether anaesthesia aseptically. Control animals received vehicle another groups received eucalyptus and aloe vera gel topical for period of 10 days in the incision, whereas in excision wounds till complete closure. On the 11th day after estimating breaking strength of the resutured incision wounds, Wound closure rate, epithelisation time and scar features were studied in the excision wound models from the day of till complete closure of the wound.

Results: combination of eucalyptus oil and aloe vera gel significantly promoted the healing process when compared to control

Discussion and conclusion: all the three wound models studied. Histopathological studies revealed increased collagen content and granulation tissue in Dapsone treated group compared to control.

Key words: excision wounds, healing, incision, eucalyptus aloe vera gel

Introduction

Wound healing is a complex and complicated process. It runs through a number of phases, which either run concurrently or are intimately interlinked through some chemical, biochemical and cellular pathways. A treatment could influence the healing of wound by intervening in any one or many phases of healing. No treatment, either systemic or local, could be considered inert on healing process unless it is proved experimentally. Eucalyptus oil is one of the most useful essences in aromatherapy contains anti-inflammatory (1,2), haemostatic (3) property .. Eucalyptus oil is considered externally as non-toxic, non-sensitizing and non-irritating.

Aloe Vera gel has proliferative property (cell and tissue regeneration) (4) and it can be experimented to find the effect of this property in wound healing.

The combination of this eucalyptus oil and aloe vera gel with above mentioned property was tested whether it enhance wound healing or delay wound healing

Materials and Methods

Animals and drug treatment: Healthy male Wistar rats weighing 175 ± 250 g, were housed individually acclimatized to laboratory for a week under 12; 12 light dark cycle. The animals were fed on standard pellet diet (Amrut brand) and watered *lib*, where as they were starved over night before the day of experimentation with free access to water. The study was approved by the Institutional Animal Ethics Committee constituted as per CPCSEA guidelines. Depilation at wounding site was done a day before wounding.

Wound models: Resutured incision wounds were inflicted with two 6cm long Para vertebral parallel incisions under light ether anaesthesia as described by Erlich and Hunt (3). Sutures were removed on the 7th day; breaking strength was measured on the 10th post wound day, by the continuous water flow technique as described by Lee (4) Excision wounds

were inflicted as described by the method of Morton and Malone (5) by excising the full thickness circular skin (approximately 500 mm²) from the nape of neck under ether anaesthesia. Wound closure rate and epithelisation time were assessed by tracing the wound on polythene paper from wounding day, followed by 4, 8, 12, 16, 18, 20th day and subsequently on alternate days till complete epithelisation (fall of scab without only raw area). Similarly scars were traced on complete epithelisation to assess wound contraction by noting scar size and shape.

All the wounding procedures carried out aseptically and none of the animals received local or systemic antimicrobials. After wounding, the animals were divided into control and treatment groups (n=6, in each) for each wound model to receive treatments. The drugs were administered topically in their therapeutic equivalent doses as calculated with the help of conversion table devised by Paget's and Barnes (8). The dose of, eucalyptus (5mg/ml), aloe vera gel (3mg). The duration of the treatment was 10 days for animals inflicted with incision, whereas it was continued in animals bearing excision wounds till their complete course.

Statistical analysis: The results were analysed by ANOVA followed by post hoc

Dun net's test and expressed as mean \pm SEM. $p < 0.05$ was considered as significant.

Results

Resutured incision wounds:

The mean breaking strength of wounds in control animals were 187.6 ± 8.449 g while test drug $282 \pm$ ($p < 0.001$) showed significant increase in breaking strength

Resutured incision wounds:

The mean breaking strength of wounds in control animals was 187.1 ± 8.670 g while test drug showed 242 ± 10.22

Excision wounds:

The rate of wound closure in test drug treated animals was significantly ($p < 0.01$) respectively more on 4th, 12th, 16th, day as compared to that of control. However, there was no significant change in rate of wound closure in control animals. The time for complete epithelisation (days) in control group was 19.8300 ± 0.447 . In comparison to this, test drug 16.67 ± 0.210 treated group took significantly ($p < 0.001$, $p < 0.05$) less time for complete epithelisation. The mean scar area (mm^2) in the control group was 41.83 ± 4.97 . test drug 34.10 ± 1.893 significantly ($p < 0.01$) reduced the scar area (Table 2). Scar was stellate shape in test drug group while in control treated groups were oval or oblong. Significant reduced scar area in test drug group indicates maximum contraction of wound as compared to control groups.

see Table 1.

see Table 2.

Discussion

The main objective of this study is to evaluate the influence eucalyptus oil and alovergel on healing of excision, and resutured incision wounds in male Wistar rats. The findings of the present study excision wound model clearly indicated that the test drug treated groups significantly enhanced wound healing as assessed by wound closure rate, time taken for complete epithelisation and reduction in scar size. In resutured incision wound model test drug treated groups significantly increased the strength required to break 10 day old resutured incision wound, compared to control group.

Neutrophils that are recruited at sites of inflammation generate superoxide anion which rapidly dismutase's to hydrogen peroxide⁹. H_2O_2 is then transformed in to hypochlorous acid by Neutrophils myeloperoxidase .as consequence of its extremely high reactivity, HOCl represents the most toxic and most potent oxidant generated by Neutrophils,

with potentials to cause considerable tissue damage¹⁰. Eucalyptus oil reversibly inhibits myeloperoxidase activity by promoting the formation of an inactive intermediate of the enzyme, thus preventing the conversion of hydrogen peroxide to hypochlorous acid¹¹, an extremely potent Neutrophils oxidant.. Generated by Neutrophils, with potential cause considerable tissue damage in many inflammatory diseases. Eucalyptus oil stabilizes Neutrophils lysosomes¹². Significantly decreased area and stellate shape of the scar in the test drug treated group probably suggest that enhanced healing is due to wound contraction rather than enhanced epithelisation.. The prohealing effect eucalyptus oil and alovergel in resutured incision wounds could be explained on the basis of its other reported actions as mentioned earlier. The findings of the present study appear to have clinical relevance, if they could be extrapolated to humans.

Conclusion

The findings of the present experimental study appear to be clinically relevant since such drugs are likely to be used as analgesic and for enhancement of wound healing in chronic ill patient with diabetes mellitus , immunocomprised patients

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Drugs	4	8	12	16	18	Complete closure	Scar area
Controls	19.03± 1.07	53.57 ± 3.04	81.28± 2.96	88.88± 1.63	94.97±2.04	19.83±0.70	41.83±1.57
Test drug	34.02 ± 1.07	56.42 ± 2.67	94.58± 1.15	99.43± 0.67	100±0.00	16.67±0.42	34.17.± 0.70

Table 1. Effect of various healing agents on resutured incision and dead space wounds

Values are mean ± SEM

P* < 0.01; ** < 0.01 compared to control

Test drug = combination of eucalyptus oil and alovergel

Drugs	Resutured, wound, breaking, strength	Breaking strength
Control	187.1±8.67 203.3	203.3 ± 12.29
Test drug	282 ± 8.3**	246 7± 10.22*

Table 2. Effect of various healing agents on excision wounds

P* < 0.05; ** < 0.01 compared to controls

Test drug = combination of eucalyptus oil and aloeveragel