

Aloe Vera Gel Accelerated Wound Healing in Oral Mucosa by Reducing Inflammatory Phase

Aloe Vera Gel Accelerated Wound Healing in Oral Mucosa

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ABSTRACT

Objective: The main objective of the study is to find the role of aloe vera gel accelerated wound healing in oral mucosa by reducing inflammatory phase.

Study Design: An experimental animal study

Place and Duration of Study: This study was conducted at the Experimental Research Laboratory of Postgraduate Medical Institute Lahore from June 2019 to December 2019.

Materials and Methods: An experimental animal study was conducted at the Experimental Research Laboratory of Postgraduate Medical Institute Lahore to study the histological changes in tongue mucosa wounds at 5th and 7th day post wounding. The therapeutic reagent used in this study was Aloe vera (*Aloe barbadensis* Miller) gel. Day 5 & 7 pw were selected to see the prolonged effects of the drug on the healing tissue. Study was conducted on 42 albino rats in animal house, Anatomy department, Postgraduate Medical Institute (PGMI), Lahore, Pakistan. In order to detect histological changes, a sample size of 42 albino rats was needed at a significance level of 5% with a Power of the study of 80%, a sample size of 14 in each group was required making a total sample size of 42.

Results: Histological observations were made under light microscope after staining the tissues with H & E and IHC stains. Macrophage count, fibroblast count and degree of epithelization were examined by staining tissues with H & E. Angiogenesis was observed by using CD34 IHC stain. Tissue samples from group A1 (control) had incomplete epithelium formation. It was partially covering the ulcer area and was immature with poorly defined epithelial cell layers (figure 1). Granulation tissue had high macrophage count and predominant fibroblasts. Macrophages had a smaller nucleus covered by a larger rim of foamy cytoplasm.

Conclusion: Results of the study clearly show that Aloe vera gel accelerates healing in tongue mucosa wounds in Wistar rats. It plays its role by bringing enhanced inflammation, epithelization, angiogenesis and fibrosis. Among the two remedial doses of the gel used in the experiment, the higher dose (500 mg/kg) has proved to be more effective. Aloe vera gel can be used as a remedy to treat oral ulcers.

Key Words: Aloe Vera Gel, Accelerated Wound Healing, Oral Mucosa, Inflammatory Phase

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INTRODUCTION

Wound healing is a series of events in which an injured tissue restores its normal architecture and function. Anything that the injury type and organ is, an incendiary fountain is seen promptly following injury.

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At first a boundary is expected that stop liquid misfortune. Subsequent stage is the control of the risky disease and section of unfamiliar organic entities and materials that might demolish the irritation.¹ Further, there is recovery of the tissue and recuperation of blood and lymph vessels lastly the tissue is renovated to achieve ordinary construction. So the injury recuperating cycle can be made sense of in a coordinated manner in following advances for example haemostasis including narrowing of vasculature and development of fibrin cluster, irritation in which penetration of neutrophils, macrophages and lymphocytes happen, cell expansion where there is multiplication and relocation of cells to shape the epithelium and collagen and extracellular network of connective tissue lastly rebuilding of collagen and vasculature.² Each step is a particular stage and covers the following. Anything that the reason for the injury will be (injury, medical procedure or contamination), a complicated action is seen among blood and tissue cells

as one with cytokines and development factors. The expanded cell action likewise builds the metabolic requests of the tissue. Any component (wholesome lack) that obstructs the typical occasions of recuperating, defer the mending system or change it to the ongoing non-mending wounds.³

To advance injury recuperating calming specialists are needed that support the interaction by decreasing aggravation and upgrading cell expansion. In allopathy there are a few calming drugs for example Ibuprofen, a non-steroidal calming drug. Drug obstruction is a significant issue then again.⁴ To battle such issues, individuals need a few regular and efficient medications with lesser or no unfavorable impacts. Natural meds are powerful, compelling, in costly and make lesser side impacts. Aloe vera (Aloe barbadensis Mill operator) is one of the valuable spices on the planet, having a notable standing as a corrective specialist. The plant name "Aloe vera" comes from an Arabic word "Alloeh" (sparkling severe substance) and a Latin word "Vera" (valid). Thus, it implies a genuinely sparkling and severe substance.⁵ The natural name of Aloe vera is Aloe barbadensis Mill operator and it has a place with family Liliaceae. There are around 500 types of aloe on the planet. Five Aloe species are called restorative species (utilized as a medication) which are as per the following; A. arborescens, A. barbadensis (Curacao or Barbados aloe), A. ferox (Cape aloe), A. perryi, A. Vulgaris.⁶

As Aloe vera has been utilized as a therapeutic spice for quite a long time, there are many examinations on Aloe vera uncovering its substance creation and demonstrating its pharmacological properties. In a review, Aloe vera readiness was applied to the post careful injuries three times each day for a considerable length of time. Torment and recuperating time were diminished in patients utilizing Aloe vera after hemorrhoidectomy. Aloe vera cream additionally decreased the agony after crap in 24 to 48 hours. Aloe vera gel is a cell reinforcement, wound mending and immunomodulating specialist. Polysaccharides, mannose and acemannan items in Aloe vera gel abbreviated the mending time in exploratory gathering as contrasted and the control and consequently sped up injury recuperating.⁷ It is accepted that polysaccharides decrease the fiery period of mending (calming) and in this way assume a significant part in early fix. A review performed on rodent liver showed that Aloe vera decreased the oxidative pressure that may be prompted by a torment lessening specialist, N-Acetyl para aminophenol. In this manner it went about as a cancer prevention agent and safeguarded hepatocytes from injury. Aloe vera has antimicrobial and mitigating properties too. Anthraquinones and aloe emodin items in aloe gel are viewed as liable for its antimicrobial properties.⁸ In another review it was shown that C-glucosyl chrome in the Aloe gel decreased aggravation.

The fundamental component could be a decrease of prostaglandin creation repressing cyclooxygenase pathway. Aloe gel contents are additionally utilized in the treatment of asthma, diabetes, hyperlipidemia, skin aggravations, consumes, blockage, hack and cerebral pain and so on. Aloe vera is fundamentally utilized in natural cures, corrective items and beverages. Exceptional job of Aloe vera in the therapy of diabetes, joint issues, radiation consumes and gastrointestinal problems have been accounted for all attributable to its antibacterial and mitigating properties.⁹

MATERIALS AND METHODS

An experimental animal study was conducted at the Experimental Research Laboratory of Postgraduate Medical Institute Lahore to study the histological changes in tongue mucosa wounds at 5th and 7th day post wounding. The therapeutic reagent used in this study was Aloe vera (Aloe barbadensis Miller) gel. Day 5 & 7 pw were selected to see the prolonged effects of the drug on the healing tissue. The study protocol was approved by the Advanced Studies and Research Board of University of Health Sciences, Lahore and Ethical Committee of Postgraduate Medical Institute, Lahore. Study was conducted on 42 albino rats in animal house, Anatomy department, Postgraduate Medical Institute (PGMI), Lahore, Pakistan. In order to detect histological changes, a sample size of 42 albino rats was needed at a significance level of 5% with a Power of the study of 80%, a sample size of 14 in each group was required making a total sample size of 42.

Aloe vera gel extract, animal grouping and dosage: Aloe vera (Aloe barbadensis Miller) gel extract was prepared and gave to the animals in two doses which were, 300 mg/kg and 500 mg/kg. The rats were divided randomly in to three groups, each having two subgroups as under:

Table No. 1: Experimental design showing duration and quantity of drug administration.

Groups	Sub groups	Number of rats	Duration of drug administration	Drug & Dosage
Group A (control)	A1	7	5 days	Distilled water
	A2	7	7 days	Distilled water
Group B (experimental)	B1	7	5 days	300mg/kg Aloe vera gel
	B2	7	7 days	300mg/kg Aloe vera gel

Histopathological assessment of wound: The animals were anesthetized before dissection. Each animal along with the cotton ball soaked in chloroform was placed in

a glass container with the lid tightly closed for 3 minutes. The anesthetized animal was placed on the dissecting board. The extremities were nailed to the board. The tongue was dissected separating the main part (body of the tongue) with surgical scissors and the base of the tongue was left attached. Specimen was preserved and the animal was sacrificed. Tissue samples were fixed, processed and stained. Slides stained with Hematoxylin & Eosin and IHC stains (CD34 immunohistochemical stain) were studied under light microscope.

Immunohistochemistry or IHC refers to the process of detecting antigens (e.g. proteins) in cells of a tissue section by exploiting the principle of antibodies binding specifically to antigens in biological tissues. CD34 is a glycoprotein expressed on capillary endothelial cells.

Statistical analysis: Data was analyzed by using SPSS version 20. All the study variables were qualitative. Chi square and Fisher exact test was used to determine association of variables among groups. P-value ≤ 0.05 was taken as statistically significant association.

RESULTS

Histological observations were made under light microscope after staining the tissues with H & E and IHC stains. Macrophage count, fibroblast count and degree of epithelization were examined by staining tissues with H & E. Angiogenesis was observed by using CD34 IHC stain.

Histological findings of control (A1) and experimental (B1, C1) groups with H & E stain: (5th day pw):

Tissue samples from group A1 (control) had incomplete epithelium formation. It was partially covering the ulcer area and was immature with poorly defined epithelial cell layers (figure 1). Granulation tissue had high macrophage count and predominant fibroblasts. Macrophages had a smaller nucleus covered by a larger rim of foamy cytoplasm. Fibroblasts were active, spindle shaped with dark purple nucleus and comparatively lighter staining cytoplasm. Few collagen fibrils were seen among the cells and were light pink in staining (figure 2). Epithelium was completely formed and mature but was thin in group B1 (experimental). The inflammation had started subsiding. Just like control group, still the predominant cells in granulation tissue were fibroblasts and macrophages, but comparatively lesser fibrosis was observed. The histological findings were different from the control group. Fibroblasts were maturing and had formed much

collagen. Fibroblasts had started arranging themselves parallel to the collagen fibers (figure 3).

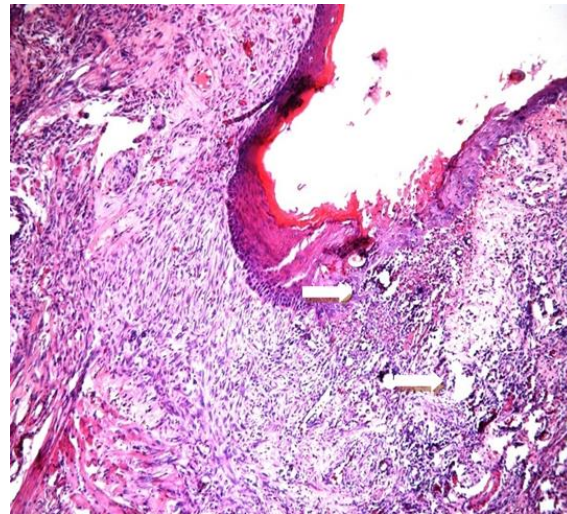


Figure No. 1: Photomicrograph of histological section of wounded tongue mucosa of group A1 (control, at 5th day post wounding). H & E X40. White arrows = epithelium

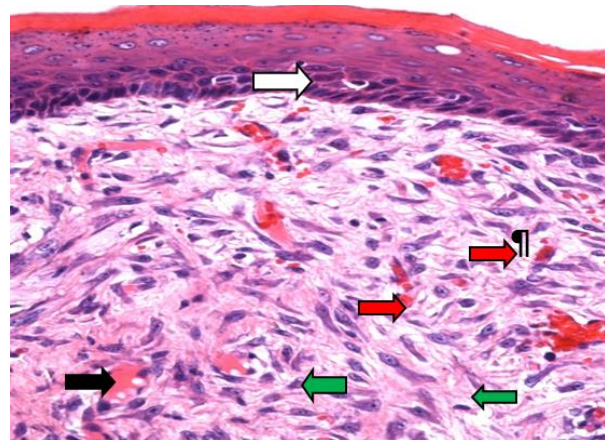


Figure 2: Photomicrograph of histological section of wounded tongue mucosa of group B1 (Experimental, at 5th day post wounding). H & E X400

In case of macrophage count, data analysis among sub groups (observations on day 5 compared with day 7 post wounding) showed significant difference in sub groups A1 & A2. The difference among sub groups B1 & B2 and C1 & C2 was insignificant.

Table No. 2: Comparison of macrophage counts in control and experimental groups on 5th day post wounding.

Groups	0-25 n(%)	26-50 n(%)	>50 n(%)	Total	$\chi^2(2)$	P
A1	0(0)	2(28.6)	5(71.4)	7(100)	14.607	0.006
B1	1(14.3)	3(42.9)	3(42.9)	7(100)		
C1	6(85.7)	1(14.3)	0(0)	7(100)		

Total	7(33.3)	6(28.6)	8(38.1)	21(100)		
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P < .05 Difference is significant

Table No. 3: Comparison of macrophage counts in control and experimental groups on 7th day post wounding.

Groups	0-25 n(%)	26-50 n(%)	>50 n(%)	Total	$\chi^2(2)$	P
A1	0(0)	6(85.7)	1(14.3)	7(100)	14.73	0.005
B1	4(57.1)	3(42.9)	0(0)	7(100)		
C1	7(100)	0(0)	0(0)	7(100)		
Total	11(52.4)	9(42.9)	1(4.8)	21(100)		

P < .05 Difference is significant

DISCUSSION

Aloe vera has been used for centuries for curing wounds and illnesses. It assists with recuperating skin consumes and sensitivities. Careful incisional injuries of skin show better recuperating when the gel extricated from the plant is applied topically. Excisional injuries of skin likewise show early withdrawal, re-epithelization and wound conclusion. Aside from skin, job of the spice in the treatment of mucosal ulcers can't be denied.⁹ Gastric ulcer can be treated with the concentrates from Aloe vera. It shows enemies of ulcers action against non-steroidal mitigating drugs. There are not very many examinations on oral mucosa in regards to mending impacts of Aloe vera. Effective utilization of Acemannan concentrate of Aloe vera gel mends gingival and palatal mucosa injuries of the rodents. Generally, the investigations on oral mucosa ulcers are clinical. There is no concentrate yet in regards to histological changes actuated by Aloe vera gel in recuperating tongue mucosa.¹⁰ In this challenge this is the main concentrate wherein Aloe vera gel was directed orally and the histological changes in tongue mucosa injuries of rodents were noticed. The main result of the current review is that Aloe vera speeds up recuperating in tongue mucosa wounds in Wistar rodents. Wounds recuperated before in exploratory gatherings because of oral organization of Aloe vera gel than control bunch.¹¹ The concentrate additionally showed the capability of two unique portions of Aloe vera gel regulated orally in the treatment of excisional wounds. Prior examinations show that there are home grown meds that work with fix. For a medication to assume its part in fast recuperating, influencing different mending ventures for instance irritation and cell proliferation should be capable. There ought to be hostile to aggravation, fast enrollment of monocytes and expanded expansion of fibroblast that will additionally assume their part in cell enlistment and early and quality framework testimony.¹²

CONCLUSION

Results of the study clearly show that Aloe vera gel accelerates healing in tongue mucosa wounds in Wistar rats. It plays its role by bringing enhanced

inflammation, epithelization, angiogenesis and fibrosis. Among the two remedial doses of the gel used in the experiment, the higher dose (500 mg/kg) has proved to be more effective. Aloe vera gel can be used as a remedy to treat oral ulcers.

Author's Contribution:

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Conflict of Interest: The study has no conflict of interest to declare by any author.

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