

Holistic Healing Through Herbs: Effectiveness of Aloe Vera on Post Extraction Socket Healing

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ABSTRACT

Introduction: Advances in the field of alternative medicine has encouraged the use of various natural products for multiple uses in the field of dentistry for treatment of various oral diseases. A natural herbal product is Aloe vera, which has number of benefits with no reported side effects and gaining considerable importance in clinical research.

Aim: The aim of this cross-sectional randomized interventional study was to evaluate the effectiveness of Aloe vera in the healing of post extraction sockets.

Materials and Methods: A sample size of 40 patients undergoing atraumatic extraction was divided into two groups. Group A-patients were prescribed only analgesics and followed for seven consecutive days and socket healing assessment was done. Group B-Patients were given Aloe vera soaked gel foams, followed up to the third and seventh day by two observers and the socket healing was assessed using the standardized index by Landry, Turnbull and Howley. In addition to healing

the common complaint associated with extraction wound, the pain was assessed using numerical rating scale. Data obtained was statistically analysed using Mann-whitney U test, Wilcoxon Signed ranks test and Spearman's rank correlation method.

Results: Control group on the third and the seventh day showed healing of 60% and 70% respectively and the Aloe vera group showed a better result having a healing potential of 70% on the third day and 90% on the seventh day which was statistically significant with a (p-value<0.001). Aloe vera group showed a significant decrease in pain after two hours on the day of extraction followed by second, third and seventh day which was statistically significant (p-value<0.001) and better than the control group.

Conclusion: Aloe vera has been proved to have a unique property that is implicated in better healing than other group without any side effects. Aloe vera is economical, effective, powerful nutritional supplement and antioxidant that protects and promotes wound healing.

Keywords: *Aloe barbadensis*, Extracted sockets, Wound healing activity

INTRODUCTION

Tooth extraction is a common procedure in dentistry and one that may result in significant loss of bone and collapse of the surrounding gingiva. Healing (literally meaning to make whole) is the process of the repair of health to an unbalanced, diseased or damaged organism [1]. Moreover, considerable percentages of extraction sites undergo postoperative complications which include swelling, pain, pus drainage and dry socket [2]. In general, antibiotics prescribed to healthy subjects to prevent infections may cause more damage than benefit to both the individual patients and the whole population [2]. Many side effects associated with conventional drug regime have been replaced by using herbal medicines and thus they are considered as safe medicines [2,3].

Use of natural substances with therapeutic properties is not new, it has been used since ancient times. Nowadays, a number of drugs prescribed originate from plants and some natural precursors [4]. Aloe vera is an herbal plant used in a variety of medical conditions such as wounds healing and decrease tissue damages [5-7]. Aloe vera is the oldest medicinal herbal plant ever known and the most used medicinal plant worldwide. There are more than 300 species of the aloe plant but the *Aloe barbadensis* species exhibits the best medicinal properties. Aloe vera is a shrubby, xerophytic, green colour plant. It grows mainly in the dry regions of Africa, Asia, Europe, and America. It is a vital nutrient having vitamins A (beta-carotene), C, and E, which are antioxidants, calcium, copper, magnesium, potassium, and zinc which are essential for the proper functioning of various enzyme systems in different metabolic pathways and others [8,9].

Aloe has a potential role in defense mechanisms, and it has a variety of components to help combat oral conditions and periodontal

disease. This plant is very good in building up the immune system and proved to be non allergic [10]. In vitro and in vivo studies have revealed anti-inflammatory, antibacterial, hypoglycemic and anti-arthritis effects of Aloe vera. It was found that the extract of Aloe vera can effectively heal burns, skin damage, oedema, and pain. The aloe extract also possesses mucus-stimulating activities, anti-diabetes and cellular protection properties [11-15].

Due to the fact that Aloe vera is a natural herbal plant and there are no reported side effects, it is gaining popularity in medicine and dentistry. As dentist we are faced with the challenge of prescribing drugs essential for treatment but in turn become responsible for the untoward effects of the same so we have designed a study to evaluate the effectiveness of Aloe vera on post extraction healing which has long history as healing promoter.

MATERIALS AND METHODS

A randomized control institutional based study was conducted in the department of oral medicine and radiology, Meghana Institute of Dental Sciences, Nizambad, Telangana, India. Institutional Ethical Committee approval was taken before commencing the study. Informed consent was obtained from each individual who participated in the study. There were 24 males and 16 females (total 40 patients) with mean ages of 41.9 and 45.1 years of age respectively participated in the study with common tooth that was extracted being the first and second molars of mandible and maxilla respectively. The sample size was determined on the basis of key article [16]. A simple randomization method (The most common and basic method of simple randomization is flipping a coin [17]) was utilized to allocate the patients to Group A (20 patients were

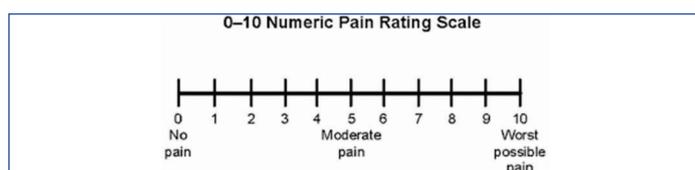
prescribed only analgesics and followed for seven consecutive days) and Group B (20 patients were treated with aloe-vera application, and followed for seven consecutive days). Participants who underwent atraumatic single tooth extractions (periodontal disease, carious teeth) were included in the study while patients having major systemic diseases, undergoing surgical extractions and who were not willing to participate during the follow up were excluded from the study group.

The two groups of the patients were called for follow-up after treatment on the third day and the following seventh day to check the response of analgesics and Aloe vera on the extraction site. Data obtained was recorded on a proforma specially designed for the purpose.

Procedure: Almost 500 mg capsule of Aloe vera powder was mixed with 2 ml of saline and then it was soaked with gelatin foam placed in the socket on the first appointment (i.e., on the day of extraction). Patients were asked to come on third day and seventh day for follow up. Healing was assessed using the standardized index by Landry, Turnbull and Howley [18] [Table/Fig-1]. Pain with respect to the atraumatic extraction sockets was measured on first day i.e., after two hour of extraction followed by third day, seventh day employing numeric pain rating scale [Table/Fig-2]. To increase the efficacy of the study two observers were involved in recording.

Healing Index	Tissue colour	Response to palpation	Granulation tissue	Incision margin
Very poor 1	: >= 50% of gingiva red	Bleeding	Present	Not epithelialized, with loss of epithelium beyond incision margin
Poor 2	>= 50% of gingiva red	Bleeding	Present	Not epithelialized, with connective tissue exposed
Good 3	>= 25% and < 50% of gingiva red	No bleeding	None	No connective tissue exposed
Very good 4	<25% of gingival red	No bleeding	None	No connective tissue exposed
Excellent 5	All tissue pink	No bleeding	None	No connective tissue exposed

[Table/Fig-1]: Showing scoring of the healing index [16].



[Table/Fig-2]: Numeric pain rating scale.

STATISTICAL ANALYSIS

The details and the data obtained was subjected for statistical analysis using Mann-whitney U test, Wilcoxon Signed ranks test and Spearman's rank correlation method. SPSS software was used to analyse the data.

RESULTS

The results obtained showed that there was a statistically significant improvement in healing of the extraction socket and also there was significant decrease in pain intensity in the patients using Aloe vera. Healing scores when compared between Group A and Group B showed statistically significant improvement with p-value <0.05. Group B (i.e., Aloe vera) showing a 90% healing on third and seventh day where as Group A (i.e., control) showing 60% healing on third day and seventh day showed statistically significant improvement with p-value <0.001 [Table/Fig-3]. Healing scores in Group A and Group B when compared between Observer 1 and Observer 2 showed no difference and statistically non significant with p-value >0.05 [Table/

Healing	Mean±Sd	Difference Of Mean±Sd	Z-Value	p-value
Group A: Day 3	3.00±0.56	0.85±0.19	4.375	<0.001 S
Group B: Day 3	3.85±0.37			
Group A: Day 7	4.00±0.56	0.85±0.19	4.375	<0.001 S
Group B: Day 7	4.85±0.37			

[Table/Fig-3]: Showing healing scores comparisons between Group A and Group B. Statistical Analysis: Mann-whitney U test. Statistically significant if p<0.05.

Group A Healing	Mean±SD	Difference of Mean±SD	Z-Value	p-value	Correlation
Day 3					
Observer 1	3.00±0.56	0.20±0.21	-2.000	0.05 NS	84.10%
Observer 2	2.80±0.77				
Healing Day 7					
Observer 1	4.00±0.56	0.15±0.19	1.732	0.083 NS	88.10%
Observer 2	3.85±0.75				

[Table/Fig-4]: Showing healing scores comparisons between Observer 1 and Observer 2 in Group A. Statistical Analysis: Wilcoxon Signed ranks test and Spearman's rank correlation method. Statistically significant if p<0.05.

Group B Healing	Mean±SD	Difference of Mean±SD	Z-Value	p-value	Correlation
Day 3					
Observer 1	3.85±0.37	0.05±0.15	0.577	0.564 NS	68.10%
Observer 2	3.80±0.52				
Healing Day 7					
Observer 1	4.85±0.37	0.10±0.07	1.414	0.157 NS	72.80%
Observer 2	4.75±0.44				

[Table/Fig-5]: Healing scores comparisons between Observer 1 and Observer 2 in Group B. Statistical Analysis: Wilcoxon Signed ranks test and Spearman's rank correlation method. Statistically significant if p<0.05.

Duration	Group A	Group B	Difference of Mean±Sd	Z-value	p-value
	Mean±Sd	Mean±Sd			
After 2 hours	4.40±0.50	1.60±0.50	2.80±0.00	5.608	<0.001 S
Day 2	3.15±0.67	0.60±0.50	2.55±0.17	5.577	<0.001 S
Day 3	1.40±0.60	0.00±0.00	1.40±0.60	5.911	<0.001 S
Day 7	0.20±0.41	0.00±0.00	0.20±0.41	2.082	<0.001 S

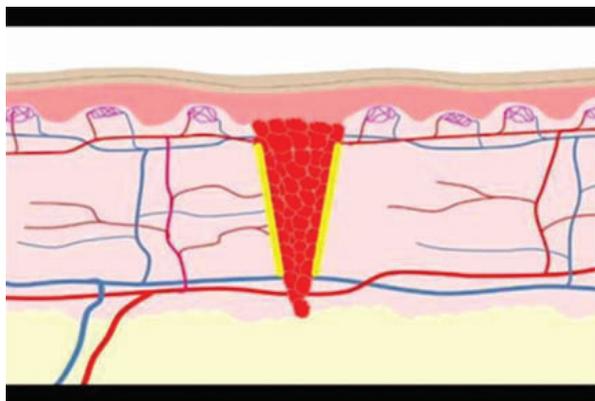
[Table/Fig-6]: Showing pain rating comparison between Group A and Group B. Statistical Analysis: Mann-whitney U test. Statistically significant if p<0.05.

Fig-4,5]. Pain rating was performed with numeric pain rating scale and comparison between Group A and Group B (pain scores are given by patients) showed statistically significant improvement in Group B (p<0.05) better when compared with group A, two hours postoperatively, third and seventh day follow ups [Table/Fig-6].

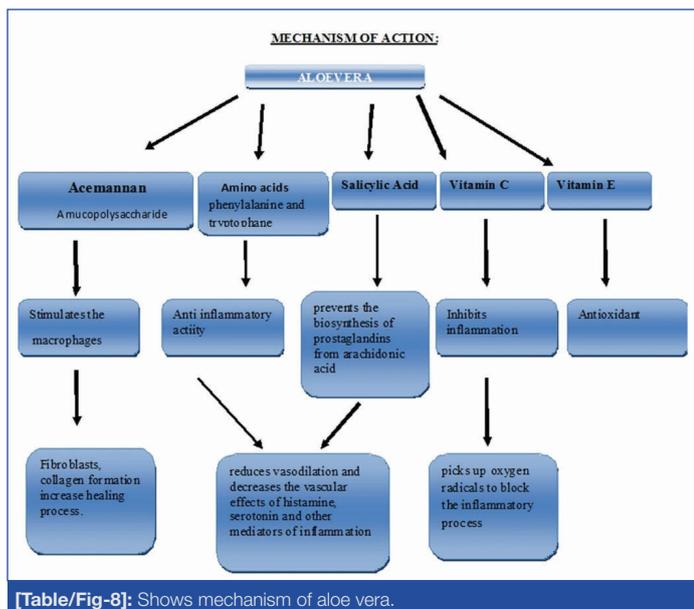
DISCUSSION

Dental procedures commonly performed include dental extractions, after extraction the only way to relieve pain and other post extraction complications by using antibiotics and analgesics. On top of that, indiscriminate and irrational use of antibiotics may lead to the development of antibiotic resistance [19]. As people are realizing that modern medicine is not the soul remedy for infections today, we are looking back to the past for the alternative methods with least possible side effects. The main advantages claimed for the therapeutic use of herbal plants like Aloe vera in various ailments are they are effective, economical, no side effects and their easy availability.

In our study, the Aloe vera group showed 70% healing on the 3rd



[Table/Fig-7]: Showing that collagen forms between the margins of the wound-direct action from aloe vera.



[Table/Fig-8]: Shows mechanism of aloe vera.



[Table/Fig-9]: a) shows healing status in Group – A (control group) on third day and seventh day; b) Healing status in Group –B (Aloe vera group) third day and seventh day.

day and 90% healing on seventh day and the patients who were under analgesics showed 60% healing on third day 76% healing on seventh day. This healing potential in the Aloe vera group can be attributed three main factors [20]: (a) Reduced pain and inflammation; (b) Stimulation of fibroblasts to functionally produce collagen and proteoglycans; (c) Increased wound tensile strength. It is thus evident that Aloe has its role in pain and inflammation, where common oral disease like periodontal diseases, a known reason for tooth extraction is also treated effectively with this miracle medication.

Aloe vera is a plant blessed with various components that are useful in wound healing and regulating pain and inflammation [20]. During the process of healing, Aloe vera stimulates fibroblasts and fibroblasts produce new collagen. However, we should note that macrophages can also stimulate fibroblasts. The effect from macrophages was indirect and the effect is direct from Aloe, thus between the margins of wound new collagen forms [Table/Fig-7]. These collagen bonds are responsible for tensile strength.

So, if the tensile strength increases, it shows the collagen production

is increased by Aloe which is further indicated in reducing the spread of infections [21] [Table/Fig-8].

Research has revealed that growth factors are significant for wound healing. Aloe contains growth factors that bind to the fibroblast IGF receptor in the wound area and subsequently produce collagen and proteoglycans which result in increased tensile strength of the wound. Aloe vera is also used to hinder acute inflammation however, contrasting to steroids, it stimulates fibroblasts to enhance wound healing and prevent the spread of infection. This can be considered as no less than miracle of aloe, the mechanism of action of this miracle plant is simplified and represented as follows [22-28] [Table/Fig-8].

A study by Hemalatha R et al., who compared Aloe vera and honey on the post extraction wounds have used both drugs together implicating the importance of these herbs with no much clarity between the efficacy of Aloe vera or honey playing important role in healing [22]. In the present study, we included only Aloe vera that showed Aloe by itself has a 90% healing capacity without honey. It was also appreciated that in the present study there was significant increase in wound healing on third day compared to control group [Table/Fig-9a,b]. In the present study we included pain index, there is a significant decrease in pain after two hours on the day of extraction followed by second, third and seventh day. This was the first of its kind of observation of recording pain in the study; it is a fact that post extraction the patient complaints of pain once the effect of local anaesthesia wears off, needing a dose of analgesics, in our study it was evident that two hours postoperatively when pain was more, Aloe has an appreciated action. We also correlated the results with inter observers in order to increase the efficacy of the study which was not done in the previous studies.

Study by few authors showed topical application of Aloe vera may cause redness, burning, stinging sensation and taken orally can cause abdominal cramps, diarrhea [29]. But in the present study we didn't notice any side effects. The results coincides with the findings of Tsuchiya H et al., who reported that Aloe vera promote the wound healing and suggested the mechanism as antimicrobial action, which appear to be responsible for wound contraction and increased rate of epithelialization [30]. This might be the one of the reason for better healing in periodontally involved tooth having microbial aetiology in our study. Vogler BK and Ernst E list Aloe vera have 75 active constituents including the essential amino acids; vitamins, enzymes, monosaccharides and polysaccharides; and numerous organic compounds [31]. It has been theorized that acemannan (a polysaccharide extracted from Aloe vera gel) could serve as a bioactive molecule that has the capability of bone formation as it stimulates Bone Marrow Stromal Cells (BMSCs) proliferation, differentiation into osteoblasts and thus, may be a potential biomaterial for bone regeneration [32]. Thompson JE et al., reported that topically applied Aloe vera stimulates collagen proliferation and fibroblast activity [33].

As rightly named "the plant of immortality", Aloe vera has vast scope in the field of dentistry with its active components and proven history of safety. The present study reveals that the Aloe vera has multiple properties with no side-effects and hence, can be definitely used in many oral diseases. There is need of further human clinical trials in future utilizing the unique properties of Aloe vera like its antioxidant and immune stimulant properties in potentially malignant disorders. Randomized blinded studies with more representative sample would be more conclusive in considering the Aloe vera as main stay treatment for healing of extraction sockets. Quality assurance and standardization of Aloe vera products plays a central role which needs to be focused.

CONCLUSION

It may be concluded from the study that aloe is a safe, natural and user friendly alternative adjunct that might be feasible to promote

healing of extraction sockets. Proper diagnosis, knowledge of the herbal medicine and implementation of that knowledge in the treatment planning are important in ensuring success with this therapeutic agent. Thus, Aloe vera may find a promising role in dentistry in future.

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