



RESEARCH ARTICLE

HEALING ENERGY OF NATURE, IMPLICATED IN PERIODONTAL THERAPY: ALOEVERA,
A COMPARATIVE STUDY

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ABSTRACT

The periodontal diseases are among the most common of chronic diseases to affect the mankind. Various chemotherapeutic agents are used but due to undesirable effects, the use of natural products has increased recently. Among the various, currently available herbal agents, Aloe Vera is considered to be most promising and high – ranking agent. In the present study the effect of aloe vera on reduction of plaque, gingivitis and periodontitis was evaluated in a randomized, single-blind, split-mouth study. Ten patients with chronic periodontitis having 5mm periodontal pockets bilaterally at least in one site are included. On One side, scaling root planing is done and on the contralateral side along with scaling and root planing, pure aloe vera gel was applied. Probing pocket depth, gingival index and plaque index were noted at baseline and after six weeks. It was found that there was significant improvement in the pocket depth and the gingival index readings after 6 weeks in both the groups. The results presented in the study suggest that Aloe – Vera gel is effective in the treatment of chronic periodontitis when used as an adjunct to scaling and root planing. It can become an important part of the preventive and therapeutic treatments.

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INTRODUCTION

Plaque-induced gingivitis is one of the most frequent periodontal diseases affecting more than 90% of the population, regardless of age, sex or race. (De Oliveira et al., 2008) Plaque control and prevention of gingivitis is the main goal for inhibition of periodontal diseases. Eradication of periodontal disease can be enhanced either by reducing the quantity of plaque below the individual's threshold for disease or changing the quality of plaque to a more tissue-friendly composition. (Wu and Savitt, 2002) For effective plaque control, several mechanical oral hygiene aids have been used. However, the inability of the normal adult population to perform adequate tooth brushing has led to the search for chemotherapeutic agents in order to improve plaque control. (Nogueira-Filho et al., 2000) These chemical agents mainly Triclosan, Chlorhexidine, essential oils containing mouthrinses are available. As some of these substances may have undesirable side effects, such as staining of the teeth and the tongue, altered taste sensation, cost of these substances, the use of natural products has increased recently. (De Oliveira et al., 2008; Viridi et al., 2012; Salgado et al., 2006) Among various herbal agents aloe vera is being promoted for large variety of

conditions. Aloe is most promising and high- ranking agent. Aloe vera (Synonym- *Aloe barbadensis* Miller) belongs to liliaceae family, of which there are about 360 species. Aloe vera is a cactus like plant that grows readily in hot, dry climates. (Ajmera et al., 2013) The word ALOE is derived from the Arabic word "alloeh" which means shiny and bitter and the word "Vera" is a Latin word meaning 'true'. (Viridi et al., 2012) Cosmetics and some medicinal products are made from the mucilaginous tissue in the center of the aloe vera leaf, which is called 'aloe vera gel'. The peripheral bundle sheath cells of aloe vera produce intensely bitter, yellow latex, commonly called as aloe juice, aloe sap/ aloes. (Ajmera et al., 2013) The pharmacological actions of aloe vera include anti-inflammatory and anti-arthritis activity, antibacterial and hypoglycemic effects. (Lee et al., 2004; Yagi et al., 2002) The history of use of aloe vera dates back to a few thousand years. A Sumerian clay tablet from 2200 BC was the first document to include aloe among the plants of healing power. Its modern use was first recognized in 1937. Aloe vera has shown a great healing power in cases of burns, dermatitis, ulcerated skins etc. (Viridi et al., 2012) Aloe contains 75 potentially active constituents, vitamins, enzymes, minerals, sugars, etc. Polysaccharides are considered to be the active ingredients of Aloe's anti-inflammatory and immune-modulation effects. (Ajmera et al., 2013) Since then topical use of aloe vera is common as doctors use it to treat alopecia, and acne vulgaris

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and there is evidence that aloe vera may be beneficial in cases of arthritis, digestive system problems, diabetic patients, cancer prevention, HIV infection, and hyper susceptibility illness such as asthma, measles, rhinitis, etc. So the use of aloe should be checked and evaluated intraorally in gingival and periodontal diseases. Thus, the objective of this study is to evaluate the efficacy of Aloe Vera as an adjunct to Scaling and Root Planing in Patients with Chronic Periodontitis.

MATERIALS AND METHODS

A total of Fifty patients (41 males and 9 females) in the age group of 35-65 years (mean age, 47.67 ± 10.021) visiting the Out Patient Department of Periodontics and Implantology, Himachal dental college, Sundernagar were selected for the present study. Approval for the present study has been obtained from the institutional ethical committee. All subjects were informed about the nature of study and their informed consent will be taken. The present study is in relation with Helsinki declaration of 1975 as revised in 2000. Only those patients who satisfied criteria will be selected for the study. Patients having chronic Periodontitis bilaterally with pocket depth of 5mm were selected for the study. Patients who were current smokers, pregnant, having systemic diseases such as diabetes or had taken systemic or topical antibiotic therapy, antioxidants such as vitamin C, vitamin E, or β - carotene and who had undergone periodontal therapy within last 3 months were excluded from the study. The selected treatment sites were randomly divided into two groups. In Group I (control) 15 patients having periodontal pocket were treated with SRP alone and In Group II (Test) 15 patients having periodontal pockets on the contra lateral side were treated with SRP was followed by application of Aloe Vera Gel on that side. Aloe Vera Gel used in this study was CURAGEL prepared by Cure Pharma. It is the pure Aloe Vera extract obtained from the Centre of the leaf, processed to eliminate the toxins and having 2% sodium benzoate as a preservative. Aloe Vera Gel was re-applied after the first week and second week in the selected site just at the entrance of the periodontal pocket. The syringe was not inserted up to the base while reapplication so as not to disturb healing. Probing pocket depth, Gingival index (GI) by Loe and Sillness (1967), Plaque index (PI) by Loe and Sillness (1964) were recorded at the baseline and 6 weeks after the application of aloe vera.

Statistical analysis

Statistical analysis was performed using descriptive statistics. Data was analysed using SPSS21. Relationship between control and test group for outcome variables were performed under Study Pair- T test & ANOVA.

RESULTS

All the treatment groups showed significant improvements in probing pocket depth, GI, and PI values over a period of 6 weeks.

Probing pocket depth

At baseline, pocket depth value (Table 1) for the Control and Test group were 3.9 ± 1.21 and 4.0 ± 1.4 , respectively. There was highly significant difference found between both the groups. After 6 weeks, on intergroup comparison test group

showed statistically highly significant improvement in probing pocket depth as compared to control group.

Table 1. Intergroup comparison of Probing pocket depth in both the groups at baseline and 6 weeks

Group	Baseline	6 weeks	P value	Intergroup P
SRP	3.9 ± 1.21	2.71 ± 0.91	<0.004	
SRP – ALOE	4.0 ± 1.44	1.91 ± 0.361	<0.0001	
Baseline P value (intergroup)				0.6438(NS)
6-weeks P value (intergroup)				<0.0001 (HS)

Gingival index

At baseline, GI values [Table 2] for the Control and Test group were 2.2 ± 0.246 and 2.3 ± 0.293 respectively. There was not any significant difference between both the groups at the baseline ($p = 0.312$). After 6 weeks, on intergroup comparison, it was observed that there was statistically significant improvement in GI in the Test group as compared to control. ($P < 0.0001$).

Table 2. Intergroup comparison of Gingival Index in both the groups at baseline and 6 weeks

Group	Baseline	6 weeks	P value	Intergroup P value
SRP	2.2 ± 0.246	1.433 ± 0.241	<0.0001	
SRP – ALOE	2.3 ± 0.293	0.61 ± 0.301	<0.0001	
Baseline P value (intergroup)				0.312 (NS)
6-weeks P value (intergroup)				<0.0001 (HS)

Plaque index

At baseline, plaque index values [Table 3] for the Control and Test group were 2.51 ± 0.623 and 1.38 ± 0.311 , respectively. There was not any significant difference found between both the groups at the baseline ($P = 0.5146$). After 6 weeks, on intergroup comparison though the test group showed slightly better results than the Control group, but the difference was not significant ($p > 0.1771$).

Table 3. Intergroup comparison of Plaque Index in both the groups at baseline and 6 weeks

Group	Baseline	6 weeks	P value	Intergroup P value
SRP	2.51 ± 0.623	1.38 ± 0.311	<0.001 (S)	
SRP - ALOE	2.62 ± 0.613	1.41 ± 0.436	<0.001 (S)	
Baseline P value (intergroup)				0.5146 (NS)
6-weeks P value (intergroup)				0.1771(NS)

DISCUSSION

Periodontal diseases are complex bacteria-induced infections characterized by an inflammatory host response to plaque microbiota and their by-products. Most of these microorganisms have virulence factors capable of causing massive tissue destruction both directly, through tissue invasion and the production of harmful substances, or indirectly, by activation of host defense mechanisms, creating an

inflammatory infiltrate of potent catabolic activity that can interfere with normal host defense mechanisms. (Bascones-Martínez *et al.*, 2009) The presence of an oral biofilm composed by bacteria and their products includes lipopolysaccharides and proteinases that are responsible for the progression of periodontitis. (Jefferson Soares de Oliveira *et al.*, 2016) In recent years, various host-response modulation therapies and local drug therapies have been developed to block the pathways responsible for periodontal tissue breakdown. (Killooy and Polson, 1998) For effective plaque control, several mechanical oral hygiene aids as well as number of chemical agents are been used but recent interest and advances in the field of alternative medicine has promoted the use of various herbal and natural products. Aloe vera is one such product exhibiting multiple benefits and has gained considerable importance in clinical research. This clinical study focuses on Aloe vera and highlights its property when used as a medicament in the periodontal pocket and the objective of this study is to evaluate the efficacy of aloe vera as an adjunct to scaling and root planing in patients with chronic periodontitis and to evaluate the changes occurring in the periodontium which were assessed through the clinical parameters; probing pocket depth, GI, PI over a period of 6 weeks. A total of Fifty patients (41 males and 9 females) in the age group of 35-65 years (mean age, 47.67 ± 10.021) visiting the Out Patient Department of Periodontics and Implantology, Himachal dental college, Sundernagar were selected for the present study. This age group is selected because of predominance of Chronic Periodontitis in this group.

Aloe vera is a plant of amazing medicinal properties. More than 300 species of aloe plants exist, but only 2 species have been studied, which are *Aloe barbadensis* MILLER and *Aloe aborescens*. Ideal environment to grow this plant is tropical climate and low-rainfall areas. (Grindlay and Reynolds, 1986) The Aloe vera leaf consists of 2 different parts: central mucilaginous part and peripheral bundle sheath cells. The parenchymal tissue makes up the inner portion of the aloe leaves and produces a clear, thin tasteless jelly-like material called Aloe vera gel. (Wynn, 2005) Vitamins include Vit A which is necessary for integrity of epithelial cells, Vit C which helps in connective tissue regeneration (collagen synthesis), and Vit E which is an antioxidant and neutralises free radicals by donating one of their electrons, ending the electron stealing reaction. The antioxidant nutrient, however, does not become a free radical by donating an electron because they are stable in either form. It also contains minerals that increase tensile strength of wound, so helpful in early wound healing; anthraquinones which are similar to alkaloids produce analgesia and have healing, antibacterial, antiviral, and antifungal properties. Sugars such as polymannose, glucose, and fructose which have immune modulating and anti-inflammatory actions and amino acids that are the building blocks for repair and regeneration of traumatized tissue are also found in the aloe vera gel. As Aloe vera is widely used in dentistry. It is extremely helpful in the treatment of gum diseases like gingivitis, periodontitis. (Grindlay and Reynolds, 1986) It reduces bleeding, inflammation and swelling of the gums. It is a powerful antiseptic in pockets where normal cleaning is difficult, and its antifungal properties help greatly in the problem of denture stomatitis, (Tello *et al.*, 1998) aphthous ulcers, cracked and split corners of the mouth. (Mandeville, 1939) It is a powerful healing promoter and can be used following extractions. It has been used in root canal treatment as a sedative dressing and file lubrication during biomechanical

preparation. (Sudworth, 2002) Treatment of periodontal diseases by different types of local delivery systems has been investigated. After 6 weeks, pocket depth reduction was seen in both the groups. Our intergroup comparison, test group showed statistically highly significant improvement in pocket depth compared to Control group.

Bhat *et al.* (2011) evaluated the clinical effects of subgingival application of Aloe vera gel in periodontal pockets of adult periodontitis patients after mechanical debridement and concluded that subgingival administration of aloe vera gel results in improvement of periodontal condition and that gel can be used as local drug delivery system in periodontal pockets. The significant improvement in pocket depth reduction in the Test Group may be attributed to the remarkable healing and anti-inflammatory properties of *Aloe vera* due to presence of vitamins, anthraquinones, glycoproteins, minerals and amino acids. Which is in accordance with studies by Davis *et al.* (1989), who stated that wound healing with *Aloe verawas* due to increased blood supply; increased oxygenation, which stimulates fibroblast activity; and collagen proliferation. After 6 weeks, in both the Control and Test group there was statistically significant improvement in GI values. When an intergroup comparison was made, statistically highly significant results were obtained. And it was observed that there was significant improvement in GI in the Test group as compared to Control group. Villalobos *et al* observed a significant reduction in plaque and gingivitis after a 30-day use of mouth rinse containing aloe vera with toothbrushing. (Villalobos *et al.*, 2001) The decrease in gingival index can be attributed to presence of sterols as anti-inflammatory agents and lupeol as an antiseptic analgesic. Vazquez *et al.* (1996) stated *Aloe vera* decreases edema and number of neutrophils and also prevents migration of Polymorphonuclear leucocytes (PMNL). Decrease in edema was explained by Yagi *et al* who suggested that both specific glycoproteins and aloesin-related compounds (isorabaichromione, feruloylaloetin, and p-coumaroylaloetin) played an important role in the anti-inflammatory activity of gel from aloe vera leaves. Barrantes and Guinea in 2003 stated Aloe vera inhibits the stimulated granulocyte Matrix metallo proteinases (MMPs) inhibiting cyclo-oxygenase and lipo-oxygenase pathways. Hart *et al.* (1988) in an *In vitro* study stated Aloe vera depleted the chemical and alternative pathways of complement activity to inhibit the production of free oxygen radicals by activated Poly morpho nuclear leucocytes (PMNs). Aloe vera is also shown to provide relief in swelling, bleeding gums and is an antiseptic for pockets and antifungal for thrush.

In this study, there was also a significant decrease in PI values in both the groups i.e for Control and Test groups after 6 weeks. In intergroup comparison, the Test group was better than Control group though the difference was not statistically significant. Lee *et al.* (2004) conducted a study where use of aloe vera reported to inhibit the growth of diverse oral microorganisms such as *S. Mutans*, *A. Viscosus* and *C. albicans*. The low plaque scores at the conclusion of the study could be attributed to the antibacterial properties of aloe vera. The low plaque index observed in these subjects could be explained by the fact that Aloe vera is a good antibacterial. Hegger *et al.* (1979) showed its antibacterial properties against *Candida albicans*, *Streptococcus pyogenes*, *Streptococcus fecalis*. Noskova, (1966) used *Aloe vera* to treat early stages of periodontitis and got good results. All the subjects attending this study showed statistically significant improvements in clinical parameters at the 6 weeks examinations compared to

those at baseline. It was observed that in both the groups, there was significant improvement in pocket depth, GI and PI over a six-week period. When an intergroup comparison was done, it was observed that the aloe vera + SRP group showed significantly better results than SRP alone in probing pocket depth and GI, but there was no statistically significant difference between both groups regarding the PI values. Viridi *et al.* (2012) showed similar results depicting significant improvement in pocket depth, GI and PI over a 6 week period using SRP and aloe vera. The reduction in gingival index, plaque index and pocket depth in Test group can be attributed to its anti-inflammatory, antibacterial and wound-healing properties. Aloe vera has numerous anti-inflammatory agents. Fujita *et al.* (1976) stated that carboxypeptidase in Aloe vera inactivates bradykinin by about 67% and relieves pain. Rocio Bautista *et al.* (2004) showed that carboxypeptidase in Aloe vera had good anti-prostaglandin synthesis properties and compounds inhibiting oxidation of arachidonic acid, which might decrease inflammation. Heggors and Robson in 1983 showed that barbolin and aloe emodin in *Aloe vera* block prostaglandin (PG) synthesis. De Oliveira *et al.* (2008) in an in vivo study also reported that the dentrifice containing *Aloe vera* did not show any additional effect on plaque control compared to the fluoride dentrifice. All these findings encourage the use of *Aloe vera* in the treatment of periodontal problems. More studies should be conducted to confirm the effect of *Aloe vera* in periodontitis. And thus it can be used as a local drug delivery system in periodontal pockets.

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