



ADJUNCTIVE LOCAL DELIVERY OF ALOE VERA GEL IN THE TREATMENT OF CHRONIC PERIODONTITIS : A CLINICAL STUDY WITH 3 MONTH FOLLOW UP.

Periodontology

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ABSTRACT

BACKGROUND: Periodontitis is chronic infection that leads to destruction of connective tissue supporting the teeth. Use of Herbal drugs like Aloe vera gel are beneficial in many oral conditions. The study aims to evaluate the effect of aloe vera gel as an adjunct to scaling and root planing in chronic periodontitis.

METHODS: Total 30 patients with chronic periodontitis were evaluated for clinical parameters like Probing pocket depth, Gingival Index and Plaque Index. Test sites were treated with only SRP in Control group (Group I) and SRP followed by intrapocket placement of Aloe Vera gel in Test group (Group II). Clinical parameters were compared at 1, 3 months from baseline.

RESULTS: Significant improvement seen in clinical parameters of Test group in comparison with Control group.

KEYWORDS

Aloe Vera, Chronic Periodontitis, Local Drug Delivery.

INTRODUCTION:

Periodontitis is an infectious inflammatory disease. Bacteria modulate the inflammatory response and alter the diversity of periodontal disease. Mechanical plaque control is the most effective method of curbing plaque and gingivitis. But even though mechanical debridement removes plaque which contains microorganisms, it is impossible to entirely eradicate all virulence factors, due to tissue incursive nature of some periodontal pathogens, thus rendering mechanical therapy alone ineffectual, therefore antibacterial therapy is recommended as an adjunct to mechanical debridement. When antimicrobials are administered systemically it exposes the body to large dose causing antibiotic resistance, adverse drug reaction and side effects^[1]. In recent years, various host-response modulation therapies and local drug therapies have been developed to block the pathways responsible for periodontal tissue breakdown^[2]. Aloe vera is the oldest medicinal plant that has maintained its popularity over the course of time. It is widely known for its medicinal uses in wound healing, as an analgesic, and for its anti-inflammatory properties.

Aloe vera (synonym: *Aloe barbadensis*) belongs to the Liliaceae family, of which there are about 360 species. Aloe vera is a cactus-like plant that grows readily in hot, dry climates, and currently, because of demand, is cultivated in large quantities. Ideal environment to grow this plant is tropical climate and low-rainfall area^[3]. 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^[4]. In recent years, various cosmetic and medical products are made from the mucilaginous tissue present in the center of the Aloe vera leaf in the form of Aloe vera gel. Although the medical uses of Aloe vera have been reported, not much literature is available regarding its use in the field of dentistry. The antimicrobial effect of a dentifrice containing aloe vera has been demonstrated in an *in vitro* study conducted by Lee *et al.* in 2004, in which this phytotherapeutic agent inhibited the growth of diverse oral microorganisms, such as *Streptococcus mutans*, *Streptococcus sanguis*, *Actinomyces viscosus*, and *Candida albicans*^[5]. The pharmacological action of Aloe Vera gel as studies in *in vitro* and *in vivo* include anti-inflammatory, antibacterial, anti-oxidant, immune-boosting and hypoglycemic properties. These properties, along with easy availability and cost effectiveness, make Aloe Vera an ideal candidate for plaque control, thereby reducing gingivitis and most likely periodontitis.

The purpose of this study was to evaluate the efficacy of Aloe Vera gel as an adjunct to scaling and root planing (SRP) in patients with chronic periodontitis.

MATERIALS AND METHODS:

Total 30 patients with 60 sites having moderate periodontitis were selected in the age group of 35-65 years. A split mouth design was

planned so as to reduce the error variance of the experiment. Patients having minimum one tooth or site in a quadrant (maxilla or mandible each) with probing depth measuring 5 mm – 8 mm along with bleeding on probing were selected.

The subjects who were current smokers, pregnant, had systemic diseases such as diabetes had taken systemic or topical antibiotic therapy or the over the counter antioxidants were excluded from the study. All participants were provided with information about the study, and written informed consent was obtained.

CLINICAL PROCEDURES:

The ethical committee of the institution had approved the designed protocol. The selected treatment sites were randomly divided into two groups.

Group I (Control group) : In this group, patients with periodontal pockets on one side of the jaw in which only scaling and root planing were performed (SRP group).

Group II (Test Group) : In this group, patients with periodontal pockets on the contra lateral side in which SRP was followed by application of Aloe Vera gel.

After SRP, Aloe Vera Gel will be administered subgingivally using atraumatic needle. Periodontal pack was placed on the teeth to avoid spillage of the chemical product. patients were instructed not to rinse or drink any liquid for at least 30 minutes. Aloe Vera Gel was reapplied after the first and second week in the selected site just at the entrance of the periodontal pocket.

The clinical parameters like plaque index, gingival index and probing pocket depth from the gingival margin to the depth of the pocket using Williams graduated probe were recorded at baseline, 1 month and 3 months.

STATISTICAL ANALYSIS:

After completion of the clinical trial, data from the sites were collected, computed and put to statistical analysis. Analysis was performed using parameter tests for the comparison between SRP (Control) and SRP + Aloe Vera (Test) groups. For each treatment group, the mean values for the plaque index [Table 1], gingival index [Table 2], and probing pocket depth [Table 3] were calculated at the baseline, 1 month and 3 months. Statistical analysis was obtained. Paired *t*-test for difference within the group and ANOVA for difference between the groups were performed.

RESULTS

Results were compared for both the groups over a period of 1 month, 3 months from baseline. None of the patients showed any adverse reaction.

PLAQUE INDEX:

At baseline, plaque index values [Table 1] for the control and Test group were 3.645 ± 0.605 and 3.906 ± 0.867 , respectively. There was not any significant difference between both the groups at the baseline ($P = 0.5254$). After 1 month, in the Control group there was significant improvement in PI values from 3.645 ± 0.605 to 2.475 ± 0.201 ($P < 0.001$). After 3 month it was 1.58 ± 0.203 . Similarly with the Test group, there was statistically significant difference from 3.906 ± 0.867 to 2.325 ± 0.370 in 1 month ($P < 0.001$). After 3 month it was 1.305 ± 0.472 . On Intergroup comparison the difference was not significant ($P = 0.1731$).

GINGIVAL INDEX:

At baseline, GI values [Table 2] for the Control and Test group were: 2.58 ± 0.251 and 2.50 ± 0.353 , respectively. After 1 month, in both the Control and Test group there was statistically significant improvement in GI values from 2.58 ± 0.251 to 1.923 ± 0.343 ($P < 0.0001$) and from 2.50 ± 0.353 to 1.75 ± 0.421 ($P < 0.0001$), respectively. After 3 month the GI value for Control and Test group was 1.371 ± 0.451 and 0.55 ± 0.305 . In intergroup comparison showed that there was statistically significant improvement in GI in the Test group as compared to Control group ($P < 0.0001$).

PROBING POCKET DEPTH:

At baseline, pocket depth values [Table 3] for the Control and Test group were 5.887 ± 1.620 and 5.975 ± 1.392 , respectively. There was not any significant difference between both the groups at the baseline ($P = 0.8548$). After 1 month, in Control group there was a statistically significant decrease in pocket depth values from 5.887 ± 1.620 to 4.213 ± 1.283 ($P = 0.0008$). In the Control group, there was also a statistically significant decrease in the pocket depth values from 5.975 ± 1.392 to 2.488 ± 0.582 ($P < 0.0001$). The intergroup comparison showed statistically significant improvement in the Test group as compared to Control group alone.

DISCUSSION:

The primary objective of periodontal therapy is to reduce microbial load thereby improving in the clinical parameters. Scaling and root planing remained gold standard of periodontal therapy with numerous other agents being currently used as adjunctive therapeutic modalities. This study aimed at evaluating the effectiveness of Aloe Vera gel when used along with SRP as a local drug delivery. Aloe Vera is gaining popularity as a naturotherapy in various medical and cosmetic products. The medicinal value of the plant lies in a gel-like pulp obtained on peeling the leaves which is thought to contain certain substances which account for its remarkable healing, anti-inflammatory, and antiseptic properties. These substances include lignins, saponins, vitamins, minerals, enzymes, amino acids, anthroquinones, etc.^[36]. Lignins are the cellulose-based substances which have the capacity to penetrate the tissue and carry elements with it, and Saponins are the glycosides that promote cleansing and provide an antiseptic quality. 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 neutralizes free radicals. Bovik^[7] used Aloe vera for the gingivectomy sites and showed that healing was improved. Davis has stated that aloe vera is effective by both oral and topical routes of administration and wound healing with Aloe vera was due to increased blood supply, increased oxygenation, which stimulated fibroblast activity, and increased collagen proliferation^[8]. It has a positive influence on the collagen content and constancy in a wound, therefore imposing a beneficial role in wound healing^[9].

It also contains minerals that increase tensile strength of wound, so helpful in early wound healing; anthroquinones 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. Thus along with the healing, anti-inflammatory, and antiseptic properties, it is bactericidal, fungicidal, and virucidal.

The local application represents less chance of developing bacterial resistance, fewer adverse effects, and better compliance than with the use of systemic antibiotics. It is usually suggested in patients with nonresponding and recurrent localized pockets as much higher concentration can be attained by limiting the drug to its target site.

After the first application of the gel at the baseline, reapplications were done after first week and second week so as to maintain the concentration of the gel in the treatment site as data regarding the substantivity of aloe vera gel is not available. Perinetti *et al.* in their study also gave four repeated applications of three subgingival gels separated by 7 days^[10]. The time period for the study was taken as 6 weeks. According to Badersten *et al.*, the assessment after SRP is generally made not less than 1-3 months^[8]. Yagi *et al.*^[11] stated presence of glycoprotein with cell proliferation improves healing. Aloe vera also contains vitamins A, C, E, B12, folic acid. Vitamin C, which is involved in collagen synthesis, increases concentration of oxygen at the wound site because of dilation of blood vessels. Aloe vera penetrates and dilates capillaries going to an injured site, which improves healing.

The low plaque index in test group patients could be explained by the fact that Aloe Vera is a good antibacterial. Hegger *et al.* showed its antibacterial properties against *Candida albicans*, *Streptococcus pyogenes*, *Streptococcus fecalis*^[12]. Bhat *et al.*^[3] carried out a study to evaluate the effect of intrapocket placement of Aloe vera gel after SRP and concluded that subgingival administration of Aloe vera gel results in improvement of periodontal condition. Similar studies carried out by Ajmera *et al.*^[13] and Chandras et al^[14] revealed the role of Aloe vera in a significant reduction of plaque and gingivitis.

The result of the study shows, significant improvement in pocket depth, GI, and PI over a 3 month period in both the groups. When an intergroup comparison was done, it was observed that the Test group showed significantly better results than Control group alone in probing pocket depth [Table 3] and GI [Table 2], but there was no statistically significant difference between both groups regarding the PI values [Table 1]. The significant improvement in pocket reduction in the SRP-ALOE group may be attributed to the remarkable healing and anti-inflammatory properties of aloe vera due to the presence of vitamins, anthroquinones, glycoproteins, minerals, and amino acids.

CONCLUSION:

On the basis of this study, we conclude that subgingival administration of Aloe vera gel results in improvement of periodontal condition. Aloe vera can be used as a local drug delivery system because of its various benefits like it is easily available, easily applicable with minimal equipments, cheap, with no adverse effects.

Long-term studies are required with larger sample size. More research on its healing properties, antibacterial, anti-inflammatory properties and releasing pattern as a local drug delivery system is required.

TABLES:**Table 1: Plaque Index values at the baseline, 1 and 3 month:**

Group	Baseline	1 month	3 month	P value	Intergroup P value
Control	3.645 ± 0.605	2.47 ± 0.201	1.58 ± 0.203	<0.001 (S)	>0.001 (NS)
Test	3.906 ± 0.867	2.325 ± 0.370	1.305 ± 0.472	<0.001 (S)	
Intergroup P value- baseline					0.6452 (NS)
Intergroup P value- 1 month					0.1731 (NS)
Intergroup P value- 3 month					0.1203 (NS)

Table 2: Gingival Index values at the baseline, 1 and 3 month:

Group	Baseline	1 month	3 month	P value	Intergroup P value
Control	2.58 ± 0.251	1.923 ± 0.343	1.371 ± 0.451	<0.0001	<0.0001 (HS)
Test	2.50 ± 0.353	1.75 ± 0.421	0.55 ± 0.305	<0.0001	
Intergroup P value- baseline					0.514 (NS)

Intergroup P value- 1 month					<0.0001 (HS)
Intergroup P value- 3 month					<0.0001 (HS)

Table 3: Probing pocket depth values at the baseline, 1 and 3 month:

Group	Baseline	1 month	3 month	P value	Intergroup P value
Control	6.887±1.620	5.213±1.283	4.283±1.365	<0.001 (0.0008)	<0.0001 (HS)
Test	6.975±1.392	5.458±0.582	3.421±0.467	<0.0001	
Intergroup P value baseline					0.7562 (NS)
Intergroup P value-1 month					<0.0001 (HS)
Intergroup P value-3 month					<0.0001 (HS)

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