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COMPARATIVE EVALUATION OF THE EFFICACY OF SUBGINGIVAL IRRIGATION BY ALOE VERA AND 0.2% CHLORHEXIDINE (CHX) AS AN ADJUNCT TO NONSURGICAL THERAPY ON SALIVARY LEVEL OF ALKALINE PHOSPHATASE (ALP) AND TOTAL PROTEIN (TP) IN TREATMENT OF CHRONIC PERIODONTITIS WITH CURRENT SMOKERS

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Abstract

INTRODUCTION: Periodontitis is an inflammatory disease of the supporting tissues of the teeth. For thousands of years, various herbal products have been used for chemotherapeutic purposes as adjunct to nonsurgical therapy.

AIM: Compare the effects of subgingival irrigation with aloe vera and 0.2% CHX an adjunct to scaling and root planing on level of salivary ALP and total protein in treatment of chronic periodontitis with current smokers.

MATERIAL AND METHODS: 60 current smokers with chronic periodontitis subjects, age ≥30 years, pocket depth ≥5mm were included, divided into 3 groups. GroupI: subgingival irrigation with aloevera, GroupII: subgingival irrigation with CHX, GroupIII: subgingival irrigation with saline. Single sitting scaling and root planing was done. Subgingival irrigation performed on 0, 7, 14 and 21day respectively. Clinical parameters and saliva sample measured at baseline and 1 month.

RESULT: A significant improvement in all clinical parameters and salivary level of ALP and total protein seen in aloevera and CHX groups post treatment.

Keywords: chronic periodontitis, subgingival irrigation.

INTRODUCTION

Periodontal inflammation is the disease of periodontium, caused by one or group of microbes, which results in alveolar bone destruction and clinical attachment loss, subsequently form the periodontal pocket and decreased the width of attached gingiva.[1] Tobacco smoking is the strongest and widely accepted risk factor for periodontal disease and cause a change in the subgingival environment which cause increase in anaerobic bacteria and has adverse effects on periodontal treatment outcome and healing.[2] phase I periodontal therapy i.e. Scaling & root planing is the cornerstone in the management of periodontal disease and advocated firstly to control the disease. Phase I therapy is defined as "plaque removal, plaque control, supragingival and subgingival scaling root planing (SRP), and adjunctive use of chemical agents."[3] Presently, many studies are available which favor the use of subgingival irrigants during the treatment of periodontal disease. A number of antibacterial agents like chlorhexidine, listerine, povidine-iodine etc., are used for sub-gingival irrigation as adjunctive therapy. Now, many nutraceuticals like propolis, turmeric, neem, aloevera, green tea, cinnamon etc. used in periodontal therapy and its prevention.[4] Saliva contains many locally and systemic markers to detect periodontal disease and they also used to measure the efficacy of non surgical periodontal treatment. An intracellular enzyme, present in saliva i.e. Alkaline phosphatase (ALP) has a correlation with bone metabolism in destructive processes of alveolar bone. As alveolar bone destruction progress, it can lead to increased activity of alkaline phosphatase.[5] salivary protein concentration can also be determined as a marker for plasma protein leakage, appearing as a concrescence of the process of inflammation[6]. Hence alkaline phosphatase and total protein can used as predictive marker of future periodontal disease and also access the efficiency of scaling and rootplaning.

Aim

- To compare the effects of subgingival irrigation with aloe vera and 0.2% CHX an adjunct to scaling and root planing on level of salivary ALP and total protein in treatment of chronic periodontitis with current smokers.

Objective

- To performed scaling and root planing in chronic periodontitis patients with current smokers. and compare the clinical parameter i.e. PI, GI, PPD, CAL among alovera, chlorhexidine and saline group
- To compare the level of alkaline phosphatase and total protein in saliva after scaling and root planing among aloevera, chlorhexidine and saline group in chronic periodontitis patients with current smokers.

Materials and methods

This clinical study was conducted in the periodontology department at Rama Dental College, Kanpur, Uttar Pradesh, India.

Patient selection criteria

INCLUSION CRITERIA:

* Patients age 30-60 years for study
* Current smoker patients suffering from chronic periodontitis having ≥20 teeth
* Patients have clinical attachment level 3-4 mm.

EXCLUSION CRITERIA:

- Immunocompromised patients and the patients on long term medication of immunosuppressant drugs.
- Patients with cardiovascular diseases, uncontrolled diabetes, chronic respiratory disorders, bleeding disorders, allergy etc.
- Patients on any medication of anticoagulant therapy or radiotherapy.

SOLUTIONS USED FOR SUBGINGIVAL IRRIGATION:

- 0.2% chlorhexidine (CHX) solution.
- 94.5% aloe vera juice [Patanjali Ayurved Ltd.]
- Saline.

STUDY DESIGN

60 current smoker patients that suffering from chronic periodontitis have been taken for study. Complete single-sitting scaling and root planning was done before sub-gingival irrigation.

GROUP FORMATION:

The selected 60 patients divided equally into 3 test groups. subgingival irrigation with 94.5% aloe vera solution was used for test group 1, subgingival irrigation with 0.2% chlorhexidine gluconate solution was used for test group 2 and subgingival irrigation with saline solution was used for test group 3.The patients was equally divided in all groups (20 patients in each group)

Application of irrigating solutions

2 ml of disposable syringe with 26 -gauge needle is use for subgingival irrigation. 1ml solution of each irrigant is used for irrigating the pocket site for 30 seconds and the process is repeated 2 times over 5 minutes. Subgingival irrigation was performed on day 0 and 7, 14 and 21 respectively for subgingival depth. we examine the clinical parameters at day '0' pre-treatment and on 30th day post-treatment - plaque index (Silness and Loe) and gingival index (Loe and Silness index), probing pocket (PPD) & clinical attachment level (CAL). All clinical parameters recorded by single examiner on each subject.

Non-surgical periodontal therapy will be performed using ultrasonic and hand instruments. The patients will be recalled for regular visit and reinforce for oral hygiene maintenance therapy.

Collection of saliva

Patients were instructed that before the oral prophylaxis procedure stop eat and drink for 2 hours. Before starting oral prophylaxis, the human saliva was collected by spitting method while sitting in an upright position. Approximately 5ml of saliva is collected and is urgently sent to lab. In the lab, centrifuged saliva sample at 3000 rpm for 15 min to separate the supernatant saliva. The 20 µl of the remaining sample is mixed with the ALP reagent in the Erba Mannheim kit (London, UK), and the analysed level of ALP through the auto-analyzer. The readings that are obtained on the screen of the analyzer is noted. For the estimation of the total protein concentration in saliva samples, total protein kit (biuret method, end point) from Erba was used.

The estimation of total protein from Saliva is performed by ultraviolet absorption method, and determination is done by biuret method. Protein reacts with cupric ions in alkaline medium forms a coloured complex. Based on this principle, using biowave spectrophotometer at a wavelength of 546 nm used for salivary total protein determination by mixing undiluted saliva with the biuret reagent and measuring the coloured changes.The saliva sample will be taken at baseline and again after 1 month to measure the salivary total protein and alkaline phosphatase (ALP).

The Ethical approval was taken for study from the Institutional Ethical Committee (IEC) of RAMA DENTAL COLLEGE - HOSPITAL AND RESEARCH CENTRE KANPUR U.P. and the written informed consent has been taken from all subjects and all the procedures follow standard protocol.

Statistical analysis

Data are analyzed by using Statistical Package for Social Sciences (SPSS) software version 22. Data are entered into Microsoft Excel spreadsheet. P- value less than 0.05 was taken as significant.

Results

In this study results to compare the effects of aloe vera and 0.2% CHX an adjunct to use for subgingival irrigation with scaling and root planing and level of salivary ALP and total protein in treatment of chronic periodontitis with current smokers. Table 1, table 2 & table 3 showed difference between PI, GI, PPD, CAL, ALP saliva level and total protein saliva level baseline and post treatment has been analyzed among the aloe vera group, chlorhexidine group and normal saline group.

Comparison of baseline value and post treatment values showed a significant reduction in PI, GI, PPD, CAL, ALP and total protein score from baseline to post treatment among all three groups. Table 4 shows the inter group comparison among aloe vera group, chlorhexidine group and normal saline group which showed that there was no difference in age distribution of study subjects of three groups. Table 5 & 6 shows mean plaque score and mean gingival score among aloe vera, chlorhexidine and normal saline group post treatment. Post treatment difference was non-significant among all three groups.

Table 7 & 8 shows the inter group comparison of changes in mean PPD and CAL. Post treatment difference was significant among all three groups. (0.2% chx=aloe vera<ns) Table 9 & 10 shows the comparison of ALP and total protein among aloevera, chlorhexidine and normal saline group post treatment. The difference in ALP (IU/L) and total protein among all three groups was statistically significant.

Discussion

Mechanical non-surgical therapy is the most common means of initial treatment of periodontal diseases. chlorhexidine is used as adjunct in periodontal therapy. To avoid the side effects of any chemical agent, nowadays many herbal products are used as adjunctive in periodontal therapy. In chronic periodontitis patients, quantity and quality of subgingival plaque can alter by irrigation with antimicrobial irrigating solution in periodontal pocket.[7] In the periodontal treatment, effectiveness of antimicrobial irrigants directly proportional to its quantity and achieving adequate contact time among sub-gingival plaque, targeted microorganism and antimicrobial irrigants. The main objective of subgingival irrigation diminishes the bacteria and their byproducts that prevent the Progression of periodontal diseases.

In the present study, results revealed a significant decrease in values of PI, GI, PPD, CAL, ALP and total protein score from baseline to post treatment among all three groups and CHX & Aloevera showed similar clinical efficacy. The Similar results were found in study done by singhla R et al. (2017) They compare the clinical and anti-microbial effectiveness of curcumin (CU) irrigation as an adjunct to scaling and root planing as compared to Meswak and CHX irrigation and concluded that all the parameters reduce significantly in all the three groups, though CHX proved to be highly efficacious in reducing the microbial load (69.10% reduction) as compared to CU and meswak.[8]

The salivary level of ALP and total protein also assessed in current smokers with chronic periodontitis in present study. Total protein level is elevated in periodontal disease because In chronic periodontitis patients, synthesis and secretion of glandular saliva in individuals increased that is a protective mechanism against the bacterial infection via immunoglobins. [9]

Concentration of some salivary enzymes such as β-glucuronidase, aspartate aminotransferase, and alkaline phosphatase is increased in chronic periodontitis and identify as a contributing factor for initiation and development of periodontal disease.[10] smoking had an additive effect on both. Some studies found a statistically significant positive correlation was between total protein outputs with

PPD.[11] Randhir et al. (2011) also revealed in the study that level of salivary alkaline phosphatase elevated as destruction of periodontal tissue progresses. It indicated, the potential value of salivary ALP level used as an marker for severity and status of periodontal disease. Present study showed a positive correlation of increased level of alkaline phosphatase in chronic periodontitis subjects.[12] The results of the present study also show that both total salivary protein and ALP were higher in patients with chronic periodontitis (before treatment) in all subjects. the elevation of salivary Total Protein and ALP in chronic periodontitis also indicates the increase in free-radical generation potential, and resulting in lipid peroxidation[13,14] and alveolar bone destruction respectively, while the decrease in salivary TP and albumin after 1 months of treatment indicating reduce inflammation and destruction process of alveolar bone both.

Conclusion

This study concluded that aloe-vera and chlorohexidine were equally good to use as subgingival irrigants and beneficial to treatment and prevention of periodontal disease. Chlorhexidine has various untoward effects like staining of teeth, Calculus formation, and alterations in taste etc. Herbal products are the better alternative in compare to harsh chemicals because of less side effects and better patient acceptability. In future prospective, to gain the maximum therapeutic benefits from these herbal and organic products, the research should be directed to enhance the substantivity of the drugs and also work on the concentrations of drugs so that maximum therapeutic benefit can be availed in periodontal therapy.

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Table 1: Comparison of baseline measurements and post-test measurements in aloe vera group

Variable	Pre		Post		Difference	p value
	Mean	SD	Mean	SD		
PI	2.10	0.64	0.90	0.64	1.20	<0.001*
GI	1.65	0.49	0.65	0.49	1.00	<0.001*
PPD mm	4.95	0.61	3.60	0.50	1.35	<0.001*
CAL Mm	4.40	0.50	2.90	0.55	1.50	<0.001*
ALP (IU/L)	40.90	2.71	20.02	1.88	20.87	<0.001*
Total Protein (g/dl)	3.84	0.53	2.08	0.35	1.75	<0.001*

Table 2: Comparison of baseline measurements and post-test measurements in 0.2% CHX group

Variable	Pre		Post		Difference	p value
	Mean	SD	Mean	SD		
PI	2.25	0.44	0.85	0.59	1.40	<0.001*
GI	1.75	0.44	0.65	0.49	1.10	<0.001*
PPD mm	5.10	0.72	3.30	0.57	1.80	<0.001*
CAL Mm	4.50	0.51	2.80	0.62	1.70	<0.001*
ALP (IU/L)	40.40	2.42	19.82	1.94	20.59	<0.001*
Total Protein (g/dl)	3.96	0.47	2.00	0.35	1.95	<0.001*

Table 3: Comparison of baseline measurements and post-test measurements in normal saline

Variable	Pre		Post		Difference	p value
	Mean	SD	Mean	SD		
PI	2.10	0.64	1.15	0.75	0.95	0.001*
GI	1.45	0.51	0.80	0.70	0.65	0.004*
PPD mm	5.10	0.64	4.95	0.95	0.15	0.614
CAL Mm	4.40	0.60	4.05	0.76	0.35	0.090
ALP (IU/L)	40.96	3.58	29.77	1.32	11.19	<0.001*
Total Protein (g/dl)	3.77	0.54	2.96	0.48	0.81	<0.001*

Table 4: Inter group comparison of age

Group	Mean	SD	p value
Aloe vera	46.80	6.38	0.983
0.2% CHX	46.45	6.30	
Normal saline	46.50	6.85	

Table 5: Inter group Comparison of changes in plaque index

Group	Mean	SD	p value	Pairwise comparisons
Aloe vera	0.90	0.64	0.314	Aloe vera = CHX: 0.969 Aloe vera = NS: 0.460 CHX = NS: 0.330
0.2% CHX	0.85	0.59		
Normal saline	1.15	0.75		

Table 6: Inter group Comparison of changes in gingival index

Group	Mean	SD	p value	Pairwise comparisons
Aloe vera	0.65	0.49	0.629	Aloe vera = CHX: 1.000 Aloe vera = NS: 0.682 CHX = NS: 0.682
0.2% CHX	0.65	0.49		
Normal saline	0.80	0.70		

Table 7: Comparison of periodontal pocket depth

Group	Mean	SD	p value	Pairwise comparisons
Aloe vera	3.60	0.50	<0.001*	Aloe vera = CHX: 0.371 Aloe vera < NS: <0.001* CHX < NS: <0.001*
0.2% CHX	3.30	0.57		
Normal saline	4.95	0.95		

Table 8: Comparison of CAL

Group	Mean	SD	p value	Pairwise comparisons
Aloe vera	2.90	0.55	<0.001*	Aloe vera = CHX: 0.877 Aloe vera v< NS: <0.001* CHX < NS: <0.001*
0.2% CHX	2.80	0.62		
Normal saline	4.05	0.76		

Table 9: Comparison of Alkaline phophatase

Group	Mean	SD	p value	Pairwise comparisons
Aloe vera	20.02	1.88	<0.001*	Aloe vera = CHX: 0.925 Aloe vera < NS: <0.001* CHX < NS: <0.001*
0.2% CHX	19.82	1.94		
Normal saline	29.77	1.32		

Table 10: Comparison of Total Protein

Group	Mean	SD	p value	Pairwise comparisons
Aloe vera	2.08	0.35	<0.001*	Aloe vera = CHX: 0.787 Aloe vera < NS: <0.001* CHX < NS: <0.001*
0.2% CHX	2.00	0.35		
Normal saline	2.96	0.48		

One-way ANOVA test; Post hoc tukey test; * indicates significant difference at $p \leq 0.05$