



EFFICACY OF CURCUMIN AS AN ADJUNCT TO SCALING AND ROOT PLANING IN PERIODONTITIS PATIENTS – A CLINICAL AND MICROBIOLOGICAL STUDY

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ABSTRACT:

Background: The goal of periodontal therapy is to eliminate bacterial plaque and the factors favoring its formation. Conventional therapy includes scaling, root planing and curettage along with appropriate maintenance of oral hygiene. However, complete elimination of sub gingival micro flora is difficult from areas inaccessible to periodontal instrumentation, which demands the use of antimicrobials as adjuncts in periodontal therapy. Periodontal pocket provides an ideal environment for the growth of anaerobic pathogenic bacteria. In the course of initiation and progression of the inflammatory process, the sub gingival bacteria increase in numbers and invade the pocket epithelial cells and subsequently, the underlying tissues.

Aim: To evaluate the efficacy of the adjunctive use of curcumin with scaling and root planing as compared with scaling and root planing alone in the treatment of the periodontitis.

Materials and Methods: Twenty patients with two contralateral sites were identified for the study having probing pocket depths (PPDs) of ≥ 5 mm. Full mouth scaling and root planing (SRP) was done followed by subgingival application of curcumin gel only on one side. Assessment of Plaque index (PI), Gingival index (GI), Probing Pocket Depth, Clinical attachment levels (CALs) were done at both baseline and at 4th week. Subgingival plaque samples were collected from the root surface and standard microbiologic assessment was done both from the control and the test sites before scaling and root planing.

Result: There was a reduction in PI, GI, PPD, CAL and microbiologic parameters in test sites followed by SRP and curcumin gel application, when compared with SRP alone in control group.

Conclusion: The subgingival application of curcumin gel in adjunct with scaling and root planing has shown good improvement in periodontal parameters and has a beneficial effect in periodontitis patients.

Keywords: Curcumin, Periodontitis, Scaling and root planing.

INTRODUCTION

Periodontitis is an inflammatory disease of the supporting tissues of the teeth caused by specific microorganisms or group of specific microorganisms, resulting in progressive destruction of the periodontal ligament and

alveolar bone leading to periodontal pocket formation, gingival recession or both¹.

The goal of periodontal therapy is to eliminate bacterial plaque and the factors favouring its formation. Conventional therapy includes scaling, root planing and curettage along with appropriate maintenance of oral hygiene. However, complete

elimination of sub gingival micro flora is difficult from areas inaccessible to periodontal instrumentation, which demands the use of antimicrobials as adjuncts in periodontal therapy². Periodontal pocket provides an ideal environment for the growth of anaerobic pathogenic bacteria such as *Actinobacillus actinomycetem comitans*, *Porphyromonas gingivalis*, *Tanarella forsythia*, *Treponema denticola* and *Prevotella intermedia*. In the course of initiation and progression of the inflammatory process, the sub gingival bacteria increase in numbers and invade the pocket epithelial cells and subsequently, the underlying tissues³.

Antimicrobial therapy may be administered locally or systemically. Owing to the disadvantages of systemic antibiotic therapy such as development of resistance, drug interactions and side effects, the use of local delivery of antimicrobials at specific sites has been introduced⁴. A 100 fold higher concentration of antimicrobial gel at sub-gingival sites is attained through local drug delivery (LDD) compared to systemic drug regimen^{5,6}.

Turmeric (*haldi*) is a *rhizome of Curcuma longa*, an Indian spice of the *Zingiberaceae* family, widely used in Ayurvedic medicine. The Latin name is derived from the Persian word, "*kirkum*", which means saffron. It has several components, collectively termed as "*curcumin*" first identified in 1910 by Lampe and Milobedzka. The active constituents of turmeric include the three curcuminoids; Curcumin (diferuloylmethane), demethoxycurcumin, and bisdemethoxycurcumin, as well as volatile oils (turmerone, atlantone, and zingiberone), sugars, proteins, and resins. It exhibits various effects such as anti-inflammatory through inhibition of prostaglandin biosynthesis and reduction of neutrophil function, antioxidant through inhibition of free radical formation and antimicrobial through inhibition of the growth of microorganisms. It also accelerates wound healing and exhibits antimutagenic property^{7,8}.

On oral administration, it is rapidly metabolized, and achieves low serum and tissue concentrations within 1-2 hours. This limits the bioavailability of curcumin to systemic routes⁹.

Curcumin is available in various forms, namely powder, gel, mouthwash and irrigant¹⁰. However, the gel form is easy to deliver and increases its

availability at the site of application for longer period¹¹. Curenext oral gel ;(Abbott Healthcare Pvt. Ltd., 4. Corporate Park, Sion Trombay Road, Chembur, Mumbai – 400071, India. Manufacturer. License. No.: NK/AYU/006-A/10) is available in gel form.

Considering the inaccessibility of instrumentation and the tissue invasive properties of the sub gingival bacteria in sub gingival areas and properties of curcumin, the present study aims to evaluate the efficacy of curcumin gel as an adjunct to non-surgical therapy, in the treatment of periodontitis patients.

MATERIALS AND METHODS:

The study was conducted on 20 periodontitis patients. The patients were selected from outpatient department (OPD), Department of Periodontics, Sree Balaji Dental College and Hospital, Chennai.

Criteria for selection of subjects:

Inclusion criteria:

- Subjects (male and female) within the age group ≥ 35 years to 60 years without any systemic disease.
- Patients having test site with both mesial and distal neighboring teeth.
- Patient with more than 16 natural teeth.
- Patient with periodontitis having a PPD of ≥ 5 mm and radiographic evidence of bone loss.

Exclusion criteria:

- Pregnant and lactating mothers.
- Teeth with both endo-perio lesion.
- Patients under tobacco use.
- Patient on antibiotics for last 3 months prior to study.
- Patients having systemic diseases like diabetes mellitus, hypertension, bleeding disorder, hyperparathyroidism and compromised medical conditions.
- Patients had undergone with past periodontal treatment (6 months).
- Patients with restorations.

- Patients with tooth extraction adjacent to the test site and the control site in last 3 months.
- Patients under steroid therapy.
- Patients allergic to curcumin.

Clinical parameters:

1. Plaque Index (Silness. J and Loe. H, 1964)
2. Gingival Index (Loe. H and Silness. J, 1963)
3. Probing Pocket Depth (PPD)
4. Clinical Attachment Level (CAL)

Probing Pocket Depth (PPD) was calculated by measuring the distance between base of the pocket and the gingival margin.

Clinical Attachment Level (CAL) was calculated by measuring the distance between the base of the pocket and the Cementoenamel junction (CEJ)[Figure 1].

Methodology

A full mouth clinical examination was carried out on all participants with their consent. The periodontal health status was recorded using Plaque Index (PI), Gingival Index (GI), Probing Pocket Depth (PPD) and Clinical Attachment Level (CAL).

Two contralateral sites were identified for the study in each patient and were randomly allocated by coin toss method as:

- Group I (control) – Only scaling and root planing was done at the baseline visit.
- Group II (test) – Scaling and root planing was followed by local application of curcumin gel at the baseline visit.

Subgingival plaque samples was collected with the help of Gracey curette by inserting it subgingivally into the deepest portion of the periodontal pocket parallel to the long axis of the tooth and moved coronally by scraping along the root surface both from the control and the test sites before scaling and root planing[Figure 2]. The subgingival plaque samples was transferred to Eppendorf tubes containing 1000µl of Brain Heart Infusion Broth

(BHIB). Ten µl of BHIB containing the subgingival plaque sample was inoculated onto blood agar plates. The blood agar plates were inoculated.

Curenex oral gel 10g (Ayurvedic proprietary medicine) containing *Curcuma longa* extract manufactured by Abbott Healthcare Pvt. Ltd., 4. Corporate Park, Sion Trombay Road, Chembur, Mumbai – 400071, India. Manufacturer. License. No.: NK/AYU/006-A/10 was taken for study. Each gram of the gel contains 10 mg *Curcuma longa* extract. After thorough scaling and root planing, it was dispensed subgingivally to the base of pocket by means of a 2ml disposable syringe with a blunt needle bent along the shank at the test site [Figure 3].

Patients were recalled again after 4 weeks for subgingival plaque sample collection from the test site and the control site using Gracey curette. The same microbiology protocol for anaerobe count was performed.

Result:

This study conducted in 10 females and 10 males with mean age of 35-60yrs was conducted over a period of 4 weeks. There was a significant reduction in PI &GI values from baseline to follow-up visit ($P = 0.0001$). This may be due to the elimination of local etiologic factors (plaque and calculus) which harbor numerous pathogenic bacterial strains [Table 2].

The difference in mean PPD reductions was significant ($P = 0.0001$) at test site when compared to the control site. There was a slight but not statistically significant reduction ($P = 0.0001$) in mean CAL levels in test than in control group. [Tables 1 & 2].

The microbiologic analysis of the number of anaerobic bacterial colonies has shown a proportionate in test and control group [Tables 1 & 2]. PI, GI, clinical, and microbiological parameters in both control and test group are discussed in the following tables.

Table 1: Paired Samples Test

	Paired Differences	Mean	Std. Deviation	Std. Error Mean	95% Confidence	
					Interval of the	Difference
						Lower
Pair 1	PI - PI2	3.14750	1.41846	.31718	2.48364	
Pair 2	GI - GI2	.58000	.69691	.15583	.25384	
Pair 3	PPD_test - PPD_test2	2.300	.979	.219	1.842	
Pair 4	PPD_control - PPD_control2	2.300	.979	.219	1.842	
Pair 5	CAL_test - CAL_test2	2.300	.979	.219	1.842	
Pair 6	CAL_control - CAL_control2	2.300	.979	.219	1.842	
Pair 7	CFU_test - CFU_test2	93680.00000	15270.42549	3414.57094	86533.22088	
Pair 8	CFU_control - CFU_control2	71702.50000	35535.16596	7945.90467	55071.53040	
Pair 9	CFU_test2 - CFU_control2	-16820.00000	23752.46469	5311.21257	-27936.49566	

CFU – Colony forming units; test, control – Preoperative; test2, control2 – postoperative.

Table 2: Paired Samples Test

	Paired Differences	t	Df	Sig.	
					95% Confidence
					Interval of the
Difference		Upper			
Pair 1	PI - PI2	3.81136	9.923	19	.000
Pair 2	GI - GI2	.90616	3.722	19	.001
Pair 3	PPD_test - PPD_test2	2.758	10.510	19	.000
Pair 4	PPD_control - PPD_control2	2.758	10.510	19	.000
Pair 5	CAL_test - CAL_test2	2.758	10.510	19	.000
Pair 6	CAL_control - CAL_control2	2.758	10.510	19	.000
Pair 7	CFU_test - CFU_test2	100826.77912	27.435	19	.000
Pair 8	CFU_control - CFU_control2	88333.46960	9.024	19	.000
Pair 9	CFU_test2 - CFU_control2	-5703.50434	-3.167	19	.005

CFU – Colony forming units; test, control – Preoperative; test2, control2 – postoperative.

Discussion:

This study carried out on 20 patients (10 females and 10 males) with mean age of 35-60yrs was conducted over a period of 4 weeks. There was a

significant reduction in PI values from baseline to follow-up visit (P = 0.0001). This can be attributed to the fact that there was a reduction in supragingival plaque after SRP and oral hygiene

instructions received and also due to the patient's interest during the preliminary visit.

The study results were consistent with Paolantonio et al.,(2008)¹² Cugini et al.,(2000)¹³. The reduction in GI scores was significant in this study (P = 0.0001). This may be due to the elimination of local etiologic factors like plaque and calculus which harbor numerous tissue invasive bacteria and pathogenic bacterial strains. This was in accordance with the study by Hinrichs et al.,(1985)¹⁴ and Cugini et al.,(2000)¹³.

The mean reductions in PPD was significant (P = 0.0001) at test site and control site. This can be attributed to anti-inflammatory mechanism of curcumin which modulates the inflammatory response, inhibits the production of pro-inflammatory cytokines, represses the activation of AP-1 and NF- κ B, inhibit the biosynthesis of inflammatory prostaglandins enhances neutrophil function during inflammatory response. This was in good agreement with the study reported by Jurenka (2009)¹⁶, Chainani-Wu (2003)¹⁵, Menon et al., (2007)¹⁶, Akram et al.,(2010)¹⁷. It may also be due to the effectiveness of SRP in overall gain of periodontal attachment as well as decrease in percent of sites with supragingival biofilm accumulation and gingival inflammation. This finding was in accordance with Colombo et al., (2005)¹⁸.

There was a statistically significant reduction (P =0.0001) in mean CAL levels in test and in control group. It may be due to increased levels of transforming growth factor- β 1 in healing tissue, earlier re-epithelialization, improved neovascularization, reduced inflammatory cell infiltrate, increased collagen content and fibroblastic cell numbers, enhanced wound repair in sites treated with curcumin. This was in accordance to studies done by Habiboallah et al., (2008)¹⁹ Guimarães et al.,(2011)²⁰. The reduction in mean CALs in the control group was in accordance with the studies by Colombo et al.,(2005)¹⁸ Meinberg et al.,(2002)²¹ Cugini et al.,(2000)¹³.

Majority of the baseline samples of both the test site and control site showed > 1,00,000 CFU/ml. The anaerobic bacterial count from baseline has shown a proportionate reduction following scaling and root planing along with curcumin placement in test and scaling and root planing alone in control

group. The significant reduction in the test group could be because of the antibacterial, anti-inflammatory and antiplaque activity of curcumin. On comparing the values of the test site and control site after 4 weeks there was a significant value (P =0.005). This antibacterial activity among the test groups were in accordance with studies by Behal et al.,(2011)²² Nagasri et al.,(2015)²³.

Thus, the inhibitory effects of curcumin support its utility as a prophylactic and therapeutic agent for inflammatory bone diseases such as periodontitis. To further elucidate the use of this local delivery system, a long-term study with large sample of subjects should be carried out.

Ethics committee approval – This study was duly approved by the ethics committee of Sree Balaji Dental College and Hospital - [SBDCH/IEC/01/2018/16]

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Figure 1: Measurement of PPD using Williams graduated probe.



Figure 2: Subgingival plaque sample collected using Gracey curette



Figure 3: Curcumin gel placement

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