

# THE EFFECT OF GREEN TEA, A LOCAL DRUG DELIVERY SYSTEM AS AN ADJUVANT TO SCALING AND ROOT PLANING IN PATIENTS WITH CHRONIC PERIODONTITIS - A CLINICAL STUDY

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Running Title: The effect of Green tea, a local drug delivery system as an adjuvant to scaling and root planing in patients with chronic periodontitis - a clinical study

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**Abstract:** Periodontitis is a multifactorial progressive disease of the gingiva, the underlying tissues and bone. Periodontitis occurs when inflammatory changes reach the periodontal ligament and alveolar bone, these changes are irreversible and destructive, ultimately leading to tooth loss. Both surgical and non surgical treatment are done to treat periodontitis, yet there are some disadvantages. To overcome the disadvantages caused by systemic drugs, local drug delivery system of antimicrobial agents are extensively studied. Green tea is one of the most popularly consumed beverages worldwide and contains a number of bioactive chemicals. Therefore the effect of green tea when used as an adjuvant to scaling and root planing was assessed.

**Materials and methods:**

Forty patients visiting the Department of periodontics, Saveetha Dental College, Chennai, diagnosed with chronic periodontitis were selected for the study. They were randomly split into two groups - Group A and Group B. Group A were the test group, they received scaling and root planing along with green tea administration. Group B was the control group, they received scaling and root planing alone.

**Result:**

In our study we could see a significant difference in both the gingival index and pocket depth after treatment. On comparing the test and control group we could clearly see that there is better oral hygiene in patients in the test group.

**Conclusion:**

Hence green tea catechism can be used as an effective local drug delivery system to improve periodontal health.

**Keywords:** Mechanical debridement, scaling, root planing, local drug delivery, chronic periodontitis

## INTRODUCTION:

Chronic periodontitis is a progressive disease affecting the gingiva, periodontal ligament and alveolar bone results when the gingival inflammation subsequently affects the supporting operators of the tooth structure resulting in alveolar bone resorption and tooth loss (1). Periodontal disease is highly prevalent among the adult population. The Third National Health and Nutrition Examination Survey shows that about 46% of the total adult population were affected by periodontitis (2).

In healthy state, the gingiva appears pink or pigmented, stippled, firmly attached to the underlying tissues, 1-3 mm deep gingival crevice and has absence of bleeding on probing (3). There are two forms of periodontal disease gingivitis and periodontitis. Gingivitis is the early form of disease where the inflammatory changes are restricted only to the gingiva and the surrounding connective tissue without any loss of attachment. This condition is mild and reversible. Periodontitis occurs when the inflammatory changes reach the periodontal ligament and the alveolar bone. These changes are irreversible and destructive, ultimately leading to loss of alveolar bone and tooth (4).

Treatment of periodontal disease involved both surgical and non surgical therapy. However mechanical therapy alone may not eliminate the anaerobic infection at the base of the pocket (5). To overcome this, systemic and local drug delivery of antimicrobial drugs after scaling and root planing is done. Systemic drugs causes drug toxicity, bacterial resistance and drug interaction. To overcome these disadvantages local drug delivery system is being studied extensively (6).

Green tea is one of the most popularly consumed beverages worldwide, contains a number of bioactive chemicals it is particularly rich in flavonoids which include catechins, epicatechin, epicatechin - 3 - gallate, epigallocatechin, and epigallocatechin - 3 - gallate. green tea also contains carotenoids, tocopherols, ascorbic acid, mineral such as manganese, zinc and certain phytochemical compounds (7). Several studies have stated that catechin possess antioxidant, antimutagenic and anti-inflammatory properties. It also reduces the expression of matrix metalloproteinase - 9 in osteoblast and inhibits the formation of osteoclasts (8). So, the aim of this study was to assess the effect of green tea, a local drug delivery system as an adjunct to scaling and root planing in chronic periodontitis patients.

## MATERIALS AND METHODS:

### Study design:

Patients visiting the Department of periodontics, Saveetha Dental College were selected for the study. Forty patients were selected, all of them were diagnosed with chronic periodontitis with pockets of 5 to 8 mm deep and have not undergone any periodontal therapy. The patients were randomly split into two equal groups: group A and group B. The nature and the study design were explained to the patients and a written consent was obtained for their participation.

Patients who had systemic disease, smokers, pregnant were excluded from the study. Each patient was assessed for plaque index, gingival index and probing depth Group A were the test group, they received scaling and root planing along with green tea administration. Group B was the control group, they received scaling and root planing alone.

### Application of green tea catechin:

Green tea catechin strips were manufactured by the Department of pharmaceuticals. The strips were transparent and sterilized using Gamma radiation. After the Gingival index and pocket depth were recorded full mouth scaling was done using ultrasonic scalers followed by root planing. Then Group A patients were separated. Green tea strips were placed deep inside the pockets after isolation with cotton rolls. The patients were informed to report to the clinic in case of any discomfort or irritation.

## RESULTS:

### GINGIVAL INDEX:

GROUP	MEAN $\pm$ SD		MEAN CHANGE $\pm$ SD	P value	Inference
	1 <sup>ST</sup> DAY	21 <sup>ST</sup> DAY			
GROUP A	1.87 $\pm$ 0.43	0.98 $\pm$ 0.03	0.89 $\pm$ 0.40	<0.001	SIGNIFICANT
GROUP B	2.07 $\pm$ 0.47	1.11 $\pm$ 0.8	0.72 $\pm$ 0.37	<0.001	SIGNIFICANT

Table 1 Shows the mean gingival index value of Group A and Group B before and after treatment.

## POCKET DEPTH:

GROUP	MEAN+SD		MEAN CHANGE + SD	P value	Inference
	1 <sup>ST</sup> DAY	21 <sup>ST</sup> DAY			
GROUP A	5.81±0.42	4.87±0.35	0.81±0.52	<0.001	SIGNIFICANT
GROUP B	5.63±0.45	5.07±0.68	0.47±0.21	<0.001	SIGNIFICANT

Table 2 shows the mean probing depth of Group A and Group B before and str treatment

From the present study we could see that there is a significant decrease in the mean gingival index value of both Group A and B before and after treatment. In Group A the mean value before treatment is  $0.98 \pm 0.03$  and  $0.89 \pm 0.40$  after treatment. In group B, the mean value before treatment is  $2.07 \pm 0.47$  and  $1.11 \pm 0.8$  after treatment. There was also spastically significant difference in the mean probing doth in both the groups before and after treatment. The mean probing depth of Group A before treatment was  $5.71 \pm 0.42$  and  $4.87 \pm 0.35$  post therapy. The mean probing depth of Group B before treatment was  $5.53 \pm 0.45$  and  $5.07 \pm 0.68$  post scaling and root planing,

**DISCUSSION:**

The treatment for chronic periodontitis is routinely based on mechanical debridement and oral hygiene procedures that reduces inflammation, reduces the pocket depth and increases the clinical attachment level. Mechanical debridement alone will not reduce the inflammation. Systemic antibiotics may disturb the normal microbiota and reduce the bacterial load. Hence locally applied antimicrobial agents have been preferred as an adjuvant to plaque control in periodontal therapy (9). They have several advantages like providing highly concentrated drug delivery, improved compliance and less chance for development of bacterial resistance (6). Green tea contains gallic acid and other phenolic acids such as chlorogenic acid caffeic acid and flavonoids (10-12). Green tea polyphenols are responsible for the antioxidant activity either directly by scavenging the reactive oxygen and nitrogen species and chelates redox-active transition of metal ions like iron and copper or they can act indirectly by inhibiting the pro oxidant enzymes, redox sensitive transcription factors and through induction of antioxidant enzymes (13). The influence of catechins with the cellular phospholipid palisade has shown to induce apoptotic cell death and cell cycle arrest in tumor cells (14-16).

In our study we could see a significant difference in both the gingival index and pocket depth after treatment. On comparing the test and control group we could clearly see that there is better oral hygiene in patients in the test group. Previous studies have been conducted to show the effect of green tea on the periodontal health. Kaneko et al showed the effect of catechins in reducing halitosis. He also stated that it inhibits the growth and adhesion of *Porphyromonas gingivalis* to the epithelial cells (17). Hirsawa et al showed the bactericidal activity of green tea against *P.gingivalis* and *prevotella* (18). The results are in accordance with these studies. Another study conducted by Kushiya et al showed that the intake of green tea was inversely correlated to the probing depth, mean clinical attachment level and bleeding on probing (19). Okamoto stated that they have the potential to inhibit the proteinase activity and thereby reduce the periodontal breakdown. They can also inhibit the expression of gelatinase and the formation of osteoclasts which reduces the alveolar bone resorption (20).

Hence this study shows that there is a clinical improvement with the use of green tea as an adjuvant to scaling and root planing. Further studies should be done with the larger sample size, longer period of follow ups and with the use of advanced periodontal instruments to further study the effect of green tea catechins as a local drug delivery system for periodontal therapy.

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