

**EFFECT OF GREEN TEA AS AN ADJUNCT TO NON-SURGICAL PERIODONTAL
THERAPY IN THE MANAGEMENT OF CHRONIC PERIODONTITIS – A CLINICAL
STUDY**

Running Title: Effect of green tea as an adjunct to non-surgical periodontal therapy

S.Vignesh,

Saveetha Dental College & Hospitals,
Saveetha Institute of Medical and Technical Sciences,
Saveetha University,
Chennai-600077.

Email: 151601047.sdc@saveetha.com

Arvina Rajasekar,

Senior Lecturer, Department of Periodontics,
Saveetha Dental College & Hospitals,
Saveetha Institute of Medical and Technical Sciences,
Saveetha University,
Chennai-600077.

Email: arvinar.sdc@saveetha.com

Corresponding Author

Arvina Rajasekar,

Senior Lecturer, Department of Periodontics,
Saveetha Dental College & Hospitals,
Saveetha Institute of Medical and Technical Sciences,
Saveetha University,
Chennai-600077.

Email: arvinar.sdc@saveetha.com

Contact No : 9486442309

ABSTRACT :

INTRODUCTION : Periodontitis is a progressive multifactorial illness that affects the gingiva, underlying tissues, and bone. Periodontitis is caused by inflammatory changes that reach the periodontal ligament and alveolar bone. These changes are irreversible and destructive, eventually leads to tooth loss. Treatment for periodontitis can be both surgical and non surgical, yet there are some disadvantages. Local drug delivery system of antimicrobial agents are extensively studied to repress the limitations caused by systemic drugs. Green tea is one of the most popular beverages in the world. It has a variety of bioactive compounds in it. As a result, the efficacy of green tea as an adjuvant to scaling and root planning was evaluated.

MATERIALS AND METHODS : The study included forty patients with chronic periodontitis (4-6 mm) who visited the Saveetha Dental College's Department of Periodontics in Chennai. They were divided into two groups at random: Group A and Group B. Group A is the control group, which received scaling and root planing as well as green tea administration. The control group, known as Group B, got just scaling and root planing.

RESULTS: In our research, there was a significant variation in probing depth from 5.67 ± 0.42 to 3.94 ± 0.35 and clinical attachment loss from 5.97 ± 0.42 to 3.16 ± 0.35 after treatment were observed. On observing the test and control group, it is evident that there is better oral hygiene in patients in the test group and was statistically significant.

CONCLUSION: Green tea catechism can be utilised as a local medication delivery mechanism to promote periodontal health.

KEYWORDS: Mechanical debridement, scaling, root planing, chronic periodontitis, Green tea

INTRODUCTION:

Chronic periodontitis is a progressive disease affecting the gingiva, periodontal ligament and alveolar bone results when the gingival inflammation eventually affects the supporting operators of the tooth structure which results in alveolar bone resorption and tooth loss^[1]. Periodontal disease is highly diagnosed among the adult population ^[2]. Periodontitis afflicted roughly 46% of the adult population, according to the Third National Health and Nutrition Examination Survey^[3].

In general, the gingiva appears pink or pigmented, stippled, firmly attached to the underlying tissues, 1-3 mm deep gingival crevice and does not bleed while probing. There are two types of periodontal disease, gingivitis and periodontitis^[4]. The early form of disease is the Gingivitis, where the inflammatory changes are restricted only to the gingiva and the surrounding connective tissue where there is no loss of attachment^[5]. This condition is mild and reversible. Periodontitis is seen when the inflammatory changes reach the periodontal ligament and the alveolar bone^[6]. These changes leads to loss of alveolar bone and tooth as they are irreversible and destructive^[7].

Periodontitis is treated with both surgical and nonsurgical treatments^[8]. Mechanical treatment alone, however, may not be enough to eradicate the anaerobic infection at the pocket's base^[9]. Systemic and local drug delivery of antimicrobial drugs after scaling and root planing is helpful to overcome this limitation^[10]. Systemic drugs leads to drug toxicity, bacterial resistance and drug interaction^[11,12]. To overcome these drawbacks, the local drug delivery system is being highly noted^[13].

Green tea is a well-known beverage that is enjoyed all over the world. A variety of bioactive compounds are found in it^[14,15]. Catechins, epicatechin, epicatechin -3 gallate, epigallocatechin, and epigallocatechin -3 gallate are among the flavonoids found in it. Green tea contains carotenoids, tocopherols, ascorbic acid, as well as minerals including manganese and zinc, as well as phytochemicals. ^[16,17]. According to several studies, catechin contains antioxidant, antimutagenic and anti-inflammatory properties^[18]. It also inhibits the production of osteoclasts by lowering the expression of matrix metalloproteinase-9 in osteoblasts and decreasing the expression of matrix metalloproteinase-9 in osteoblasts^[19,20].

The goal of this study was to see how effective green tea was as a supplement to scale and root planning in individuals with chronic periodontitis.

MATERIALS AND METHODS:

Study design:

Patients who visited Saveetha Dental College's Department of Periodontics were chosen for the research. A total of forty individuals with persistent periodontitis and pockets measuring 4 to 6 mm deep were chosen. They haven't had any periodontal treatment. The patients were divided into two groups at random: group A and group B. The patients were informed about the study's purpose and design. Patients were required to sign a written permission form before taking part in the study. The research excluded patients with systemic diseases, smokers, and pregnant women. Each patient's probing depth and clinical attachment loss were assessed As the test group, Group A received scaling and root planing as well as green tea administration. Group B served as the control group, receiving just scaling and root planing. Software (SPSS version 16) was used for data processing and analysis in the statistical analysis. A paired t-test was used to compare the differences between the two groups on the first and 21st days.

Application of green tea catechin:

Department of pharmaceutics manufactured Green tea catechin strips. The strips were transparent and were sterilized using Gamma radiation. Following the pocket depth recording and clinical attachment loss value recording, full mouth scaling and root planing were performed utilising ultrasonic scalars. Then Group A patients were provided with Green tea strips placed deep inside the pockets after isolation with cotton rolls. In case of any discomfort or irritation, the patients were asked to report to the clinic.

RESULTS :

From the present study we could see that there is a significant decrease in the mean probing depth value and clinical attachment loss value of both Group A and B before and after treatment. In case of probing depth, Group A had the mean value before treatment of 5.67±0.42 and 3.94±0.35 after treatment. In group B, the mean value before treatment was 5.54±0.45 and 3.68±0.68 after treatment. These values are statistically significant for both before and after treatment in case of the probing depth (TABLE 1). In case of clinical attachment loss, Group A had the mean value before treatment of 5.97±0.42 and 3.16±0.35 after treatment. In group B, the mean value before treatment was 5.03±0.45 and 3.17±0.68 after treatment. These values are statistically significant for both before and after treatment in case of clinical attachment loss (TABLE 2).

TABLE 1 : Table represents the mean probing depth value of Group A and Group B before and after treatment

GROUP	MEAN ± SD		MEAN CHANGE ± SD	p Value	INFERENCE
	1 ST Day	21 ST Day			
GROUP A	5.67±0.42	3.94±0.35	0.73±0.42	<0.001	Significant
GROUP B	5.54±0.45	3.68±0.68	0.86±0.56	<0.001	Significant

TABLE 2 : Table represents the mean clinical attachment loss values of Group A and Group B before and after treatment

GROUP	MEAN ± SD		MEAN CHANGE ± SD	p Value	INFERENCE
	1 ST Day	21 ST Day			
GROUP A	5.97±0.42	3.16±0.35	0.81±0.36	<0.001	Significant
GROUP B	5.03±0.45	3.17±0.68	0.86±0.49	<0.001	Significant

DISCUSSION:

Mechanical debridement and anti-inflammatory dental hygiene techniques are commonly used to treat chronic periodontitis^[21]. It reduces the depth of the pocket and raises the amount of clinical attachment^[22]. Mechanical debridement is ineffective in reducing inflammation^[23]. Systemic antibiotics disrupt the natural microbiome, resulting in a reduction in bacterial load.^[24] Hence in periodontal therapy, locally applied antimicrobial agents have been preferred as an adjuvant to plaque control^[25]. They provide highly concentrated drug delivery, improve compliance and there are less chances for development of bacterial resistance. Green tea contains gallic acid as well as other phenolic acids such as chlorogenic acid, caffeic acid, and flavonoids. Green tea polyphenols are responsible for the antioxidant activity^[26]. It can aid directly by scavenging reactive oxygen and nitrogen species and chelating redox-active transitions of metal ions like as iron and copper, or indirectly by blocking pro-oxidant enzymes, redox sensitive transcription factors, and inducing antioxidant enzymes. Catechins have been shown to trigger apoptotic cell death and cell cycle arrest in tumour cells when combined with the cellular phospholipid palisade. ^[27]

In our study it is observed that there is significant difference in both the gingival index and pocket depth after treatment. When comparing the test and control groups, it is evident that the test group had better oral hygiene than the control group. Green tea has been shown to improve periodontal health in previous research. The impact of catechins in decreasing halitosis was demonstrated by Kaneko et al^[28].

It stops Porphyromonas gingivalis from growing and adhering to epithelial cells, as he stated^[29]. Hirsawa et al.^[30] demonstrated the bactericidal action of green tea against P.gingivalis and prevotella. The findings are in line with the findings of these studies^[31].

Another research by Kushiya et al^[32] found that green tea consumption was negatively associated to probing depth, mean clinical attachment level, and bleeding on probing^[33]. They have the ability to suppress proteinase activity and so minimise periodontal degradation, according to Okamoto et al^[34,35]. They can also reduce alveolar bone resorption by inhibiting the expression of gelatinase and the development of osteoclasts^[36].

CONCLUSION :

Based on the findings of this study, it can be stated that using green tea as an adjuvant to scale and root planing improves clinical outcomes. To examine the efficacy of green tea catechins as a local medication delivery mechanism in the management of periodontitis, more research will be done with a larger sample size and a longer period of follow-up.

REFERENCES :

- 1) Haffajee AD, Socransky SS. Microbial etiological agents of destructive periodontal diseases. *Periodontol* 2000 1994; 5: 78–111.
- 2) Natarajan K, Rajasekar A. 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.
- 3) Mckey DL, Blumberg JB. The role of tea in human health: An update. *J Am Coll Nutr.* 2002;21:1–13.
- 4) Wiseman SA, Balentine DA, Frei B. Antioxidants in tea. *Crit Rev Food Sci Nutr.* 1997;37:705–18.
- 5) S TA, Thanish AS, Rajasekar A, Mathew MG. Assessment of tooth loss in chronic periodontitis patients with and without diabetes mellitus: A crosssectional study. *Int. j. res. pharm. sci.* 2020;11: 1927–31.
- 6) Rajeshwaran N, Rajasekar A, Kaarthikeyan G. Prevalence of Pathologic Migration in Patients with Periodontitis: A Retrospective Analysis. *J. Complement. Med. Res.* 2020;11(4):172-8.
- 7) Rajeshwaran N, Rajasekar A. Prevalence of Angular Bone Defects in Chronic Periodontitis Patients with and without Systemic Diseases. *Indian J. Forensic Med. Toxicol.* 2020 Oct 1;14(4).
- 8) B G, Geethika B, Rajasekar A, Chaudary M. Comparison of periodontal status among pregnant and non-pregnant women. *Int. j. res. pharm. Sci* 2020;11:1923–6.
- 9) Rajasekar A, Lecturer S, Department of Periodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, et al. Assessment Of Periodontal Status among Post Menopausal Women: A Retrospective Study. *Int. J. Dent. Oral Sci.* 2020: 1063–6.
- 10) Sabarathinam J, Rajasekar A, Madhulaxmi M. Prevalence of Furcation Involvement Among Patients with Periodontitis: A Cross Sectional Study. *Int.J. Res. Pharm. Sci.* 2020;11: 1483–7.
- 11) Kandhan TS, Rajasekar A. Prevalence of Periodontal Diseases Among Patients with And Without Systemic Diseases—A Retrospective Study. *J. Complement.Med. Res.* 2020;11(4):155-62.
- 12) Thanish AS, Rajasekar A. Evaluation of Antiplaque and Antigingivitis Effects of A Herbal Mouthwash. *Int. J. Pharm. Res..* 2021;13.
- 13) Thansih AS, Rajasekar A, Mathew MG. Prevalence of Periodontal Disease among Individuals between 18-30 Years of Age: A Retrospective Study. *Ann Med Health Sci Res.* 2021 Jun 30.
- 14) Neha Sharma M, Rajasekar A, Rajeshkumar S. ANTIOXIDANT ACTIVITY OF GRAPE SEED MEDIATED TiO₂ NANOPARTICLES: AN In vitro STUDY. *PLANT CELL BIOTECHNOLOGY AND MOLECULAR BIOLOGY.* 2020 Aug 26;24–31.
- 15) Sagana M, Rajasekar A, Rajeshkumar S. ANTIFUNGAL ACTIVITY OF GRAPE SEED EXTRACT MEDIATED ZINC OXIDE NANOPARTICLES - AN In vitro STUDY. *PLANT CELL BIOTECHNOLOGY AND MOLECULAR BIOLOGY.* 2020 Aug 25;14–20.
- 16) Shivani N, Rajasekar A, Rajeshkumar S. ANTIFUNGAL ACTIVITY OF GRAPE SEED EXTRACT MEDIATED TITANIUM OXIDE NANOPARTICLES AGAINST *Candida albicans*: AN In vitro STUDY. *PLANT CELL BIOTECHNOLOGY AND MOLECULAR BIOLOGY.* 2020 Aug 26;8–15.
- 17) Devi BV, Rajasekar A, Rajeshkumar S. ANTIINFLAMMATORY ACTIVITY OF ZINC OXIDE NANOPARTICLES SYNTHESISED USING GRAPE SEED EXTRACT: AN in vitro STUDY. *PLANT CELL BIOTECHNOLOGY AND MOLECULAR BIOLOGY.* 2020;6–
- 18) Pereira WD, Rajasekar A, Rajeshkumar S. GREEN SYNTHESIS OF SELENIUM NANOPARTICLES (SeNPs) USING AQUEOUS EXTRACT OF CLOVE AND CINNAMON. *PLANT CELL BIOTECHNOLOGY AND MOLECULAR BIOLOGY.* 2020 Aug 25;85–91.
- 19) Pranati T, Rajasekar A, Rajeshkumar S. ANTI INFLAMMATORY AND CYTOTOXIC EFFECT OF CLOVE AND CINNAMON HERBAL FORMULATION. *PLANT CELL BIOTECHNOLOGY AND MOLECULAR BIOLOGY.* 2020 Aug 25;69–77.

- 20) Shamaa Anjum A, Rajasekar A, Rajeshkumar S. SYNTHESIS AND CHARACTERIZATION OF GRAPE SEED MEDIATED TITANIUM DIOXIDE NANOPARTICLES: AN in vitro STUDY. *Plant Cell Biotechnol Mol Biol.* 2020 Aug 26;17–
- 21) Genco RJ. Host responses in periodontal diseases: current concepts. *J Periodontol* 1992; 63: 338–355.
- 22) Chapple IL, Matthews JB. The role of reactive oxygen and antioxidant species in periodontal tissue destruction. *Periodontol* 2000 2007; 43: 160–232.
- 23) Bader HI. Adjunctive periodontal therapy: a review of current techniques. *Dent Today* 2010; 29: 94–96.
- 24) Van der Velden U, Kuzmanova D, Chapple ILC. Micronutritional approaches to periodontal therapy. *J Clin Periodontol* 2011; 38: 142–158.
- 25) Cabrera C, Artacho R, Gimenez R. Beneficial effects of green tea—a review. *J Am Coll Nutr* 2006; 25: 79–99.
- 26) Taguri T, Tanaka T, Kouno I. Antimicrobial activity of 10 different plant polyphenols against bacteria causing food-borne disease. *Biol Pharm Bull* 2004; 27: 1965–1969.
- 27) Hirasawa M, Takada K, Makimura M, Otake S. Improvement of periodontal status by green tea catechin using a local delivery system: a clinical pilot study. *J Periodontal Res* 2002; 37: 433–438.
- 28) Knowles JW, Burgett FG, Nissle RR, Shick RA, Morrison EC, Ramfjord SP. Results of periodontal treatment related to pocket depth and attachment level. Eight years. *J Periodontol.* 1979;50:225–33.
- 29) Ramfjord SP, Caffesse RG, Morrison EC, Hill RW, Kerry GJ, Appleberry EA, et al. Four modalities of periodontal treatment compared over 3 years. *J Clin Periodontol.* 1987;14:445–52.
- 30) Ryder MI, Pons B, Adams D, Beiswanger B, Blanco V, Bogle G, et al. Effects of smoking on local drug delivery of controlled-release doxycycline as compared to scaling and root planing. *J Periodontol.* 1999;26:683–91.
- 31) Hirasawa M, Takada K, Makimura M, Otake S. Improvement of periodontal status by green tea catechin using a local delivery system: A clinical pilot study. *J Periodontal Res.* 2002;37:433–8.
- 32) Cabrera C, Artacho R, Gimenez R. Beneficial effects of Green tea - A Review. *J Am Col Nutr.* 2006;25:79–99.
- 33) Hong J, Smith TJ, Ho CT, August DA, Yang CS. Effects of purified green and black tea polyphenols on cyclooxygenase- and lipoxygenase-dependent metabolism of arachidonic acid in human colon mucosa and colon tumor tissues. *Biochem Pharmacol.* 2001;62:1175–83.
- 34) Erick S, Pfister W. Comparison of microbial cultivation and a commercial PCR based method for detection of periodontopathogenic species in subgingival plaque samples. *J Clin Periodontal.* 2002;29:638–44.
- 35) Cobb CM. Non surgical pocket therapy. Mechanical. *Ann Periodontal.* 1996;1:443–90.
- 36) Bruce LP, Willam FA. American academy of periodontology. Treatment of gingivitis and periodontitis (Position paper) *J Periodontol.* 1997;68:1246–53.