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# Adjunctive Periodontal Treatment: Ascertaining The Role of Green Tea

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**Review Article**

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**ABSTRACT**

Periodontal diseases are one of the oldest diseases from which mankind has suffered. Over the years the description of their etiopathogenesis has evolved as our understanding of these diseases has grown. Till date, mechanotherapy has been considered the mainstay of treatment of these disorders. However, various adjuncts are now being used to enhance the effect of conventional therapy. Green tea, which has been extensively used in traditional systems of medicine is coming up as a useful natural product that can be used as an addendum to augment the prevailing treatment methods.

## INTRODUCTION

Periodontal diseases are one of the oldest and commonest diseases known to mankind. As long back as 4000 years ago, Chinese philosophers described periodontal diseases as inflammatory conditions and recommended herbal concoctions and fruit juices as the treatment [1]. The dawn of the 19th century brought with it the findings of W.D. Miller who introduced the principles of what was then described as modern bacteriology into dentistry in the form of "focal infection" theory [2]. Over the years, our understanding about the etiopathogenesis of periodontal diseases grew and a "microbe centric" model was adapted to describe what were believed to be infectious- inflammatory disorders of the periodontium [3].

Current treatment strategies for the regulation of periodontal disease include mechanical debridement accompanied by various adjuncts including antimicrobials that are administered systemically or locally in the form of fibers, chips or even mouthwashes [4,5]. Administration of such agents ensures the neutralization of microorganisms that are inaccessible to mechanotherapy. However, the use of antimicrobial chemotherapy is not without its own brand of limitations including allergy, toxicity, drug- drug interactions and probably the most alarming- the emergence of antimicrobial resistance [6]. The answer to this predicament, lies in our ancient apothecaries in the form of nutraceuticals which are natural preparations that are proving to be at par with the contemporary pharmaceuticals available to us.

One such gift that has been bestowed upon us is green tea which is well known for its therapeutic properties in the traditional systems of medicine for the treatment of various ailments including depression, anxiety and stomach illnesses. Green tea is extracted from the leaves of the shrub- like plant '*Camellia sinesis*' which belongs to the plant family *Theaceae*.

### Chemistry of green tea

Green tea is abundant in polyphenols especially catechins which contribute upto 30% of the dry leaf weight. Catechins include free catechins like catechins, gallocatechin, epicatechin and epigallocatechin and gallolyl catechins like epicatechin gallate, epigallocatechin gallate (EGCg), catechin gallate and gallocatechin gallate [7]. EGCg comprises about 50% of the catechins' pool of green tea.

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**Mechanism of action**

Investigations into the biologic activities of green tea have displayed antimicrobial, anti-oxidant and selective immunomodulatory activities. There is substantial evidence that says that catechins are responsible for the antimicrobial activities of green tea. Sakanaka et al. reported that green tea catechins inhibit the growth of *P. gingivalis*, *Prevotella intermedia* and *Prevotella nigrescens* and adherence of *P. gingivalis* on to human buccal epithelial cells [8]. Tea flavonoids show germicidal properties, expressed by causing damage to the bacterial cell membrane.

Green tea exhibits anti- oxidant effects on the reactive oxygen species component which is responsible for periodontal destruction. Coimbra et al. illustrated a significant decrease in lipid peroxidation products in the serum of green tea drinkers. They suggested that drinking green tea reduced the development or enhancement of oxidative stress thereby protecting the individual against oxidative stress diseases [9]. Maruyama et al. examined the effects of a dentifrice containing green tea catechins on gingival oxidative stress and periodontal inflammation using a rat model. The gingiva in which green tea catechins containing dentifrice was applied also showed a lower level of expression of hexanoyl-lysine (a marker of lipid peroxidation), nitrotyrosine (a marker of oxidative protein damage), and tumour necrosis factor-a (an indicator of pro-inflammatory cytokines) at 8 weeks [10].

Middleton reported that catechins found in green tea inhibit the release of leukotrienes and prostaglandins, both of which are crucial components of the inflammatory cascade [11].

**Association with periodontal disease**

Kushiyama et al. reported an inverse relationship between the intake of green tea and periodontal parameters like probing depth, CAL and bleeding on probing in 940 Japanese men who were studied as a part of a comprehensive health examination [12]. Hirasawa et al. used green tea catechins in a slow release local delivery strip system in periodontal pockets. They observed a decrease in the pocket depth and the proportions of Gram negative anaerobic rods [13]. An *in vitro* study conducted by Sakanaka et al. showed that EGCg inhibited the production of toxic end metabolites of Porphyromonas gingivalis which is one of the virulence factors for periodontal disease [14]. Fournier-Larente et al. used a broth microdilution assay to determine the antibacterial activity of the green tea extract alone and in association with metronidazole or tetracycline to determine bacterial adherence to oral epithelial cells and the modulation of gene expression in *P. gingivalis*. They reported that in addition to inhibiting growth and adherence of *P. gingivalis*, green tea extract was found to decrease the expression of genes coding for the major virulence factors [15]. Araghizadeh et al. studied the *in vitro* inhibitory activity of green tea extract on twenty strains of each of *Streptococcus mutans*, *Aggregatibacter actinomycetemcomitans*, *Porphyromonas gingivalis*, and *Prevotella intermedia*. Their findings showed that green tea extract exhibited strong antibacterial activity on *S. mutans*, *A. actinomycetemcomitans*, *P. gingivalis* and *P. intermedia* and they suggested its use in the form of mouthwashes or dentifrices for prevention of dental caries and periodontal diseases [16]. Jenabian et al. studied the effect of *Camellia sinensis* mouthwash on plaque-induced gingivitis. High school female students with chronic generalized plaque-induced gingivitis were distributed to receive either 5 ml of Green tea 5% two times/day or normal saline with the same dosage. Gingival index (Sillness and Loe), plaque index (Sillness and Loe) and bleeding index (Barnett) were recorded at baseline and five consecutive weeks. A significant improvement was observed in all periodontal indices during the study ($P< 0.001$) [17]. Kudva et al. evaluated the adjunctive use of locally delivered green tea catechin with scaling and root planing, as compared to scaling and root planing alone in the management of chronic periodontitis. They selected fourteen patients with two sites in the contralateral quadrants with probing pocket depth of 5–8 mm. Probing pocket depth was at baseline and 21 days for each site. Test sites received scaling and root planing along with green tea catechin strips and control sites received scaling and root planning alone. The result showed intercomparison for probing depth at 21 days was significant with $P<0.001$. Thus, their study concluded that green tea catechin local delivery along with scaling and root planing is more effective than scaling and root planing alone [18]. Behfarnia et al. determined the effect of green tea chewing gum on the rate of plaque and gingival inflammation in subjects with gingivitis [19]. 45 patients with generalized marginal gingivitis were selected and divided into two groups of green tea and placebo chewing gum. Sulcus bleeding index (SBI) and approximal plaque index (API) were studied at the baseline, 7 and 21 days later. The results showed that chewing gum significantly affected the SBI and API ($p<0.001$).

## CONCLUSION

As of today, literature is replete with evidence of growing antibiotic resistance amongst various strains. Natural formulations that overcome this limitation are the need of the hour. Bioactive components of green tea make it an extremely valuable alternate to conventionally administered pharmacological preparations. Green tea can act as an adjuvant to periodontal mechanotherapy in the form of local delivery by beverages, mouthwashes, chewing gums etc. Since research increasingly affirms the benefits, both periodontal and otherwise, of green tea, it would be advisable to make it a part of our regular diets.

## REFERENCES

1. Loe H. Periodontal diseases: A brief historical perspective. Periodontol. 1993;2:7-12.
2. Miller W. The human mouth as a focus of infection. Dental Cosmos. 1891;33:689–713.
3. Rosier BT, et al. Historical and contemporary hypotheses on the development of oral diseases: are we there yet? Front Cell Infect Microbiol. 2014;4:1-11.

4. Slots J. Selection of antimicrobial agents in periodontal therapy. J Periodont Res. 2002;37:389–398.

5. Krayer JW, et al. Non-surgical chemotherapeutic treatment strategies for the management of periodontal diseases. Dent Clin North Am. 2010;54:13–33.

6. Sedlacek MJ and Walker C. Antibiotic resistance in an in vitro subgingival biofilm model. Oral Microbiol Immunol. 2007;22:333–339.

7. Cabrera C, et al. Beneficial effects of green tea—A review. Journal of the American College of Nutrition. 2006;25:79-89.

8. Sakanaka S, et al. Inhibitory effects of green tea polyphenols on growth and cellular adherence of an oral bacterium, *Porphyromonas gingivalis*. Biosci Biotech Biochem. 1996;60:745-149.

9. Coimbra S, et al. The effect of green tea in oxidative stress. Clinical Nutrition. 2006;25:790-796.

10. Maruyama T, et al. Supplementation of green tea catechins in dentifrices suppresses gingival oxidative stress and periodontal inflammation. Archives of Oral Biology 2011;56:48-53.

11. Middleton E. Effect of plant flavonoids on immune and inflamatory cell function. Adv Exp Med Biol. 1998;439:175–182.

12. Kushiyama M, et al. Relationship between Intake of green tea and periodontal disease. J Periodontol. 2009;80:372-377.

13. Hirasawa M, et al. Improvement of periodontal status by green tea catechins using a local delivery system: A clinical pilot study. J Periodont Res. 2002;37:433-438.

14. Sakanaka S and Okada Y. Inhibitory effects of green tea polyphenols on the production of a virulence factor of the periodontal-disease-causing anaerobic bacterium *Porphyromonas gingivalis*. J Agric Food Chem. 2004;52:1688-1692.

15. Fournier-Larente J, et al. Green tea catechins potentiate the effect of antibiotics and modulate adherence and gene expression in *Porphyromonas gingivalis*. Arch Oral Biol. 2016;65:35-43.

16. Araghizadeh A, et al. Inhibitory activity of green tea (Camellia sinensis) extract on some clinically isolated cariogenic and periodontopathic bacteria. Med Princ Pract. 2013;22:368-372.

17. Jenabian N, et al. The effect of Camellia Sinensis (green tea) mouthwash on plaque-induced gingivitis: a single-blinded randomized controlled clinical trial. DARU. 2012;20(1):39.

18. Kudva P, et al. Effect of green tea catechin, a local drug delivery system as an adjunct to scaling and root planing in chronic periodontitis patients: A clinicomicrobiological study. J Indian Soc Periodontol. 2011;15:39.

19. Behfarnia P, et al. The Efficacy of green tea chewing gum on gingival inflammation. Journal of Dentistry. 2016;17(2):149.