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Research Paper: Comparison of Oral Chlorhexidine with Green Tea Mouthwash in Treatment of Patients with Chronic Generalized Periodontitis: A Double-Blind Controlled Randomized Clinical Trial

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ABSTRACT

Introduction: Periodontitis is a chronic inflammatory disease with the destruction of tooth supporting structures. The aim of this study was to evaluate the effect of green tea mouthwash compared to chlorohexidine (CHX) mouthwash, as adjuncts to scaling and root planning (SRP), on clinical parameters of subjects with chronic periodontitis.

Materials and Methods: A double-blinded randomized clinical trial was carried out on 40 patients with moderate generalized chronic periodontitis who were randomly allocated to two groups. Following SRP, one group was treated with 0.2% CHX mouthwash and the other group was treated with 0.05% green tea mouthwash for 3 weeks. The clinical parameters; BOP, PI, GI, CAL and PD were recorded at baseline, 7th day, and 21st day. The data obtained was statistically analysed by SPSS version 24 using Kolmogorov Smirnov test, Levon's test, Repeated measures with Sphericity Assumed, Independent t-test and Bonferroni were used for analysis. Also, $p<0/05$ is considered significant.

Results: CHX and green tea mouthwash had significantly decreased PD, GI, PI and BOP in 1st week and in 3rd week. However, the difference of PD, GI and PI at baseline and in 1st week between CHX and green tea group was not significant while after 3 weeks, the difference was significant. Comparison of BOP among green tea and CHX group showed significant difference in 1st week and 3rd week.

Conclusion: Green tea as a mouthwash is more effective compared to CHX mouthwash and is an appropriate adjunctive measure in the treatment of chronic periodontitis.

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Introduction

Periodontitis described as an infectious inflammatory disease with a progressive destruction of tooth supporting structures is the 6th most common disease globally. (1,2) Whereas, consequences of periodontitis might not be limited to the periodontium, its treatment is important. (3) Oral hygiene instruction and SRP, are the core component of treatment strategy, however, chemical adjuncts may be mandatory when mechanical plaque control is restricted or insufficient. (4)

Systemic use of antibiotics and NSAIDs is questionable due to the risk of microbial resistance, gastrointestinal intolerance and microbiome alterations. (5) Local delivery systems such as mouthwash, gel and dentifrice are gaining popularity. (4)

CHX mouthwash is the gold standard anti-plaque agent for having a broad-spectrum antimicrobial activity, 7- to12-hour substantivity and bacteriostatic or bactericidal effect (depending on the concentration). (6,7) However, long-term use of CHX mouthwash may lead to tongue, tooth and restorative material discoloration, soreness, dryness, and taste perturbation. (8,9)

Herbal mouthwashes with fewer complications and lower cost are introduced to overcome the drawbacks of CHX. (1,8) Green tea is one of the numerous herbal extracts and possess anti-bacterial, anti-inflammatory and anti-oxidant properties. (10,11) Oxidative stress stimulates periodontal destruction. (8) Hence, anti-oxidant property of green tea supports the claim demonstrating inverse association between green tea consumption and periodontal diseases. (12,13) However, some studies do not confirm this association. (8,14,15) Regarding to the heterogeneity of findings in the current study, an attempt was made to compare the efficacy of chlorhexidine and green tea mouthwashes on clinical periodontal parameters of patients diagnosed with moderate generalized chronic periodontitis. (1,16)

Material and Methods

The present study is a double-blinded, parallel-group, prospective controlled randomized clinical trial conducted in the Department of Periodontology, Dental Faculty. And was conducted according to CONSORT 2010 guidelines. Eligibility criteria and method were not changed during the trial. Ethical clearance was obtained from Ethical Committee.

There is no funding to be declared. The sample size was considered 40 people based on Balappanavar et al. study. (17)

Patients diagnosed with moderate generalized chronic periodontitis, with a healthy systemic status and having at least 20 teeth were included. Patients with antibiotic consumption in previous 6 months, concurrent medications with known effect on the periodontium (such as anti TNF-α treatment), smoking, pregnancy and known allergy to tea derivatives were excluded.

Written consent forms containing explanations of the objectives, possible risks and benefits of the study were signed by patients prior to participation.

Patients were assigned to Group A or Group B with an allocation ration of 1:1 using a simple randomization technique. “Group A” and “Group B” were written on 20 papers each and were placed in opaque envelopes. The envelopes were shuffled in a box. Each patient selected one envelope. According to which paper was selected the patients were assigned to group A or group B.

To blind the participants, labels on the bottles of CHX and green tea mouthwash were removed and replaced with group A or group B. The mouthwashes were poured in uniform dark bottles.

The investigator who recorded the clinical parameters were kept blind from the allotment.

Only after the statistical analysis, group A and group B were revealed.

Group A received 0.2% chlorhexidine mouthwash (Chlorhexidine-Najo 0.2%, 250ml) and group B received green tea mouthwash.

Patients were instructed to use Bass tooth brushing method (three times a day), to use the mouthwash twice a day for 21 days by gargling 5 ml of the mouthwash for 30 seconds each time, to use dental floss (once a day) and to avoid drinking

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and eating for 30 minutes following these steps.

Green tea mouthwash preparation: Green tea mouthwash was extracted from the plant Camellia Synesis (Voucher No: 30_s/00280) and its physical and botanical characteristics was confirmed in the laboratory of Pharmacology Department of Mazandaran University of Medical Sciences by a pharmacologist. One small sample of the material was deposited in the laboratory for possible need in the future. Leaves of the plant were chopped, fragmented, and broken into small pieces, and each 100 g of leaves were soaked in 500 ml of methanol for 48 hours. The amount of total phenol of hydroalcoholic extract of C. synesis were determined by Folin-Ciocalteu method. 0.1ml of sample solution was mixed with 0.25 ml Folin reagent. After 5 minutes, 20% sodium carbonate solution was added and shaken vigorously. After 40 minutes incubation at room temperature, the absorbance of samples was measured at 725 nm using double beam perkin Elmer UV/visible spectrophotometer. Calibration curve was obtained by standard concentrations of tannic acid. The total phenolic content was expressed as equivalents of tannic acid. The total flavonoid content was determined by aluminum chloride method. 0.5ml of methanolic sample solution was mixed with 1.5 ml methanol, 0.1 ml of 10% anhydrous aluminum chloride in methanol, 0.1 ml of 1 M potassium acetate and 2.8 ml of distillated water. After 30 minutes incubation at room temperature the absorbance of samples was measured at 415 nm. Calibration curve was prepared by standard concentrations of methanolic solution of quercetin. The total flavonoid content was expressed as equivalents of quercetin.

Prior to the study, professional SRP and polishing were conducted for all participants to achieve plaque score lower than 20%. Plaque status was assessed using Sillness and Leo Plaque index (1964) (PI). And gingival condition was measured using Leo and Sillness Gingival Index (1963) (GI). Bleeding on Probing (BOP), Pocket Depth (PD) and Clinical Attachment Loss (CAL) were recorded using a periodontal probe (Michigan O probe with Williams markings). These clinical periodontal parameters were measured and recorded by one investigator for every tooth at baseline and were again taken after 1 week and 3 weeks (16).

Statistical analysis was performed using the SPSS version 24.

Kolmogorov Smirnov test, Levon's test, Repeated measures with Sphericity Assumed, Independent t-test and Bonferroni were used for analysis. Also, p<0/05 is considered significant.

Results

40 patients were recruited and allocated randomly into group A and group B. No patients were excluded. Thus, 40 patients were followed up and analysed.

Demographic data of patients is presented in Table 1.

Table1: Demographic data of patients

	Female (%)	Male (%)	Mean age
Group A (Chlorohexidine)	5 (12.5)	15 (37.5)	48± 8.5
Group B (Green Tea)	16 (40)	4 (10)	43±6
Total	21 (52.5)	19 (47.5)	

According to the results of this study, described in Table2; CHX and green tea mouthwash had significantly decreased PD, GI, PI and BOP in 1st week compared to the baseline, as well as, in 3rd week compared to baseline and 1st week. (p≤0.001) however, the difference of PD, GI and PI at baseline and in 1st week between CHX and green tea group was not significant while after 3 weeks, the difference was significant. (p≤0.001, p≤0.001 and p=0.030 respectively) Such that the above-mentioned indices were lower in green tea group compared to CHX group. Comparison of BOP among green tea and CHX group showed significant difference in 1st week and 3rd week. (p≤0.001 and p≤0.001 respectively)

Table2: Mean of plaque index, gingival index, bleeding on probing and pocket depth in green tea and chlorohexidine group at baseline, after 1 and 3 weeks

	Mean Plaque Index		Mean Gingival Index		Mean Bleeding on Probing		Mean Pocket Depth (mm1)	
	Group A	Group B	Group A	Group B	Group A	Group B	Group A	Group B
Baseline	2.35±0.49	2.43±0.50	2.17±0.39	2.21±0.42	89.35±5.85	90.04±5.95	3.88±0.60	4.04±0.63
1st week	2.00±0.50	1.78±0.42	1.88±0.48	1.69±0.47	73.11±4.18	58.95±7.45	3.41±0.50	3.52±0.51
3rd week	1.58±0.50	1.21±0.51	1.29±0.46	0.56±0.50	40.76±6.43	20.52±5.99	2.76±0.43	1.91±0.59

1 milli meter

Discussion

Green Tea (Camellia synesis) is an evergreen tree and contains polyphenols (such as flavonoids, catechins), tannins, and caffeine. (11,12,16) Catechin promotes osteoblast activity, inhibits osteoclast differentiation and influences bone remodelling. (12,16) Flavonoids and tannins are the components responsible for antioxidative property of green tea. (3,16) Green tea can restrict the deleterious process resulting from increased level of Free Oxygen Radicals and oxidative stress. (3) It also, inhibits the secretion of inflammatory mediators and suppress the activity of Porphyromonas Gingivalis and Prevotella Intermedia. (2) These studies explain why green tea may have positive efficacy in treatment and management of periodontal diseases. (6,11)

Besides the therapeutic effects of green tea on periodontal diseases, the evidences support the idea of using green tea to prevent the occurrence of gingivitis and periodontitis. (10-18) Jenabian et al. and Kushiyama et al. suggest the daily use of green tea as an easy habit to maintain a healthy periodontium. (10,18) However, Han et al. conclude that consumption of more than one cup of green tea per day can increase the caffeine load leading to bone loss and progressive periodontal destruction. (15)

Green tea may have impact on dental caries for containing fluoride and quenching Streptococcus Mutans and may block the proliferation of bacteria and improve halitosis for having phenolic compounds. (1,6)

In the current study, a significant reduction was found in PI, GI, BOP, PD and CAL after 1 week and 3 weeks of using green tea and CHX mouthwash. Although the efficacy of green tea mouthwash was slightly higher in reduction of measured clinical parameters, it was not significantly proven. Biswas et al. stated green tea to be equally effective in reducing PI, GI and BOP as Chlorhexidine after 3 weeks. (7) Radafshar et al. demonstrated the same findings after 4 weeks of using green tea and CHX mouthwashes. (19)

Kaur et al. reported green tea mouthwash to be more effective compared to CHX in reduction of PI and GI after 7 days of using the mouthwashes. (8) Hambire et al. found the same result in a 14-days period of using green tea mouthwash. (6) Balappanavar et al. assessed the effect of green tea mouthwash and CHX mouthwash on oral halitosis. (17) Green tea mouthwash was more effective compared to CHX in improvement of oral hygiene in their study. (17) While Rassameemasmaung et al. found no significant difference between placebo and green tea mouthwash after 4 weeks however, they both reduced PI and papillary bleeding index significantly. (14) de Almeida et al. in their experimental study, demonstrated green tea extract to reduce inflammation, osteoclastic activity and alveolar bone loss more effectively. (12) Forouzanfar et al. evaluated the green tea mouthwash in patients undergoing periodontal crown-lengthening surgery and addressed green tea as an effective anti-plaque agent. (20) ShahAkbari et al., prescribed green tea mouthwash in patients with acute periodontitis. (9) Their result introduced green tea mouthwash to be sufficient in pain and trismus control resulting from acute periodontitis. Roopa Adinarayan et al. placed green tea and placebo strip in periodontal pockets and

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evaluated PI, GI, SBI, PD and CAL, and also samples were collected for anaerobic culture at baseline, after 21 and 90 days. (13) Their results showed green tea to be more effective in treatment of periodontitis compared to SRP. (13)

Since green tea contains vitamin K and Aluminum contents, Jenabian et al. stated to avoid the consumption of green tea in patients with advanced renal failure or patients using anticoagulants. (18) Whilst Forouzanfar et al. claimed green tea mouth wash to be suitable and safe for pregnant women and children. (20)

Conclusion

Green tea as a mouthwash is more effective compared to CHX mouthwash and is an appropriate adjunctive measure in the treatment of chronic periodontitis

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