Comparative evaluation of Green Tea- Aloe Vera mouthwash and chlorhexidine 0.2% on gingival indices (A randomized clinical trial)

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Abstract

Introduction: Nowadays in the field of dentistry, there is a trend to encourage the use of herbal and natural products. The high level of clinical research in terms of considering green tea and aloe vera, with various functionality for individual use is a typical example. The purpose of this randomized, controlled, and double-blind study was to evaluate comparative evaluation of green tea-aloe vera mouthwash and chlorhexidine 0.2% on gingival indices. **Methods:** A total of 60 patients (26 women and 34 men) with periodontal disease were randomly allocated into one of the three double blind groups, 20 in each, to receive the following treatments: (1) 0.2% chlorhexidine, (2) green tea-aloe vera and (3) distilled water. Plaque and gingival indices were evaluated on the day of the beginning of the experiment and 14 days postoperative. Subjects were asked to rinse their mouth with the mouth rinse, twice a day, during a 14-day period. Paired t-test was used to test the mean difference on 0 and 14 days, respectively. One way analysis of variance (ANOVA) was used to compare the mean difference between the groups while Tukey test was used for multiple comparisons. **Results:** Chlorhexidine 0.2%, green tea - aloe vera and placebo reduced the plaque index by 0.17 ± 0.14, $0.10\pm0/08$ and 0.02 ± 0.18, respectively, with a statistical significance of p=0.008. This difference was related to Chlorhexidine 0.2% and green tea - aloe vera with Placebo. There exist a significant difference of p=0.001 in the bleeding index between the three groups, and this difference was related to Chlorhexidine 0.2% and green tea - aloe vera with placebo. **Conclusion:** Green tea –aloe vera mouthwash improves periodontal health status. Therefore, it can be used to improve oral and dental health status.

Keywords: Green tea - Aloe Vera mouthwash, chlorhexidine mouthwash - dental plaque.

Introduction

Dental plaque is the major etiological factor responsible for periodontal disease. Plaque control is a critical component of dental practice, permitting long term success of periodontal and dental care. There is a growing interest throughout the oral health care profession in therapeutic agents that compliments and enhances the mechanical removal of biofilms in the oral cavity.[1] Various chemical methods of reducing plaque, such as mouth rinses, are used, as they can provide significant benefits to patients who cannot maintain adequate mechanical plaque control[2]. Most of the mouth rinses, which contain modern chemicals like chlorhexidine, and triclosan [3-5], have undesirable

side effects, such as staining of teeth and taste alteration. Hence, there has been increased interest in plants with antibacterial and anti-inflammatory activity [6]. The numerous side effects associated with these substances have limited their long term use. Of the numerous herbal extracts, Green tea (*Camellia sinensis*) and Aloe vera have numerous medicinal benefits, mainly due to their antibacterial and antioxidant properties [7]. Green tea contains phenolic phytochemicals, which possess promising properties beneficial to human health. They include a group of polyphenol compounds called catechins[8]. The remedial effects are associated with the catechins present in green tea, comprising eppigallocatechin gallate (EGCG), epicatechin gallate (ECG). The epicatechin have been suggested that inhibit growth and attachment of periopatogens on the teeth [9,10] There is scarcity of evidence demonstrating the efficacy of *A. vera* on the plaque and gingivitis. The anti-microbial effects of *A. vera* have been attributed to the plant's natural anthraquinones: aloe emodin, aloetic acid, aloin, anthracine, anthranol, barbaloin, chrysophanic acid, ethereal oil, ester of cinnamonic acid, isobarbaloin, and resistannol.[11] In relatively small concentrations, together with the gel fraction, these anthraquinones provide analgesic, antibacterial, antifungal, and antiviral activity; although in high concentrations, they can be toxic.[12]

The purpose of this present study was to compare the effect of green tea- aloe vera mouthwash and chlorhexidine 0/2% on gingival indices.

Materials and Methods

A parallel designed randomized controlled clinical trial was conducted among patients with chronic generalized plaque-induced gingivitis visiting the Department of Periodontology, Mashhad Dental College, Iran. All the patients were briefed on the study protocol and informed consent was obtained from each subject. An approval was obtained from the Institutional Ethical Committee of Mashhad Dental College, before commencement of the study. Sixty volunteer subjects (34 males and 26 females, with a mean age of 32.7 and 34.9 years) were enrolled in this study. Factors as exclusion criteria were, medically compromised

patients, any long term medications, smokers and patient who had used any type of antibacterial mouthwash four weeks prior the initiation of the study.

Final recruited patients were distributed into 4 groups. A total of 60 patients were included and evaluated. All the patients underwent scaling after which they were grouped as: Group 1-30 (patients received Placebo mouthwash), Group 2- 30 (patients received Chlorhexidine mouthwash), and Group 3- 30 (patients received Green tea –Aloe vera mouthwash). All patients were instructed to use 5 ml of the mouthwash followed by rinsing for 30 seconds, twice daily. The Plaque index (Loe & Sillness) [13], gingival index (Sillness and Loe) [14] and sulcus bleeding index (Muhlemann)[15] of each patient was recorded at baseline, 14th day postoperatively.

Statistical analysis

Statistical Package for Social Sciences (SPSS) statistical package version 17[16] was used for the entire analysis. In each group, the mean scores of plaque and gingival index were compared between baseline (0 day) and the end of the trial (14 days) by the Paired t-test. One way analysis of variance (ANOVA) was used to compare the mean difference between the groups. All analysis was made at 5% level of significance.

Results

Mean age in males and females was 32.7 ± 7.2 and 34.9 ± 9.8 years, respectively. Using T-test, there was no significant differences between females and males (p=0.32, t=0.98). Also the same was for Chi-square tests, with no corresponding significant difference between groups in terms of sex (p=0.27), implying tests homogeneity. The mean plaque score, gingival score and bleeding score was compared at baseline (0 day) and at the end of the trial (14 days) for all the three mouth rinses. The mouth rinses (aloe vera-green tea and chlorhexidine) exhibited significant reductions in plaque score [Table 1], gingival score [Table 2] and bleeding score [Table 3] from baseline (0 day) to 14 days. However, there was no significant difference observed for aloe vera-green tea and chlorhexidine mouth rinses when the plaque (p=0.008 gingival (p=0.001)and bleeding scores (p=0.001) were compared.

Table 1. Comparison of mean plaque score at baseline (0day) and after 14 days.

Mouth rinses	Baseline mean±SD	After 14 days mean±SD	Mean difference	t value (P value)
Chlorhexidine	0.9985 ± 0.41	0.8235 ± 0.36	0.1750	5.2 (<0.001)
aloe vera-green tea	0.9565 ± 0.36	0.8500 ± 0.35	0.1065	5.6 (<0.001)
Placebo	1.12 ± 0.37	1.10 ± 0.38	0.0250	0.59 (0.55)
Results of ANOVA	P=0.35 f=1.04	P=0.03 f=3.4	P=0.008 f=5.2	

Table 2. Comparison of mean gingival score at baseline (0day) and after 14 days

Mouth rinses	Baseline mean±SD	After 14 days mean±SD	Mean difference	t value (P value)
Chlorhexidine	0.9430 ± 0.45	0.8095 ± 0.41	0.1335	4.8 (<0.001)
aloe vera-green tea	0.894 ± 0.33	0.7485 ± 0.25	0.1455	5.8 (<0.001)
Placebo	1.05 ± 0.45	0.7485 ± 0.44	0.0050	1.22 (0.23)
Results of ANOVA	P=0.44 f=0.81	P=0.035 f=3.55	P=0.001 f=13	

Table 3. Comparison of mean bleeding score at baseline (0day) and after 14 days

Mouth rinses	Baseline mean±SD	After 14 days mean±SD	Mean difference	t value (P value)
Chlorhexidine	0.2175 ± 0.17	0.0660 ± 0.12	0.1515	5.5 (<0.001)
aloe vera-green tea	0.1210 ± 0.11	0.0040 ± 0.02	0.1170	4.9 (<0.001)
Placebo	0.1090 ± 0.12	0.1090 ± 0.12	0.0000	0 (1)
Results of ANOVA	P=0.03 f=3.7	P=0.007 f=5.3	P=0.001 f=14.3	

Discussion

Considering the harmful side effects of some anti-bacterial mouthwashes over the years, there is a need for a brand-new oral anti-plaque, with better anti-microbial and anti-inflammatory effects and having the least toxic effects. Hence, the research of many medicinal plants and their products to prevent and treat mouth infections is necessary.

Aloe vera and green tea are effective plants in medicine and have been used for a long time for medical needs, but to date, there is no any study on the impact of the two plants as a mouthwash. This study was the first evaluation of the effects of green tea and aloe vera mouthwash on the gingival indices. The results showed that the herbal mouthwash reduced the indicators of periodontal. Kushyama et al. [17] in 2009 examined the association between green tea consumption and periodontal disease. Their results are consistent with the present study. The mouthwash led to a dramatic improvement in plaque index in the test group. In other words, mouthwash plaque was reduced in the test group but in the chlorhexidine group it was much less. In another study, Moghbel et al. [18] assessed the effects of green tea leaves extract on the aerobic mouth bacterial load. A comparative study was conducted on a green tea mouthwash containing 1% tannin with 10% ethanol, an alcohol free mouthwash, and a green tea herbal mouthwash with a 0.2% Chlorhexidine sample. The herbal green tea extract reduced the aerobic mouth bacterial load by about 32% and prevented plaque formation on teeth [19]. The results of this study was comparable with a study

conducted by Jenabian et al. [20] and Villalobos et al. [21] where they compared the effects of green tea mouthwash with another placebo group using saline, along with the routine mechanical plaque control methods. A substantial improvement was observed in all periodontal indices i.e, gingival index, plaque index and bleeding index, based on the results of the study.

De Oliveira et al. [22] in a study (2008) evaluated the effects of aloe vera toothpaste on plaque and gingivitis control and found out that aloe vera resulted in a significant reduction in gingivitis and plaque associated with inflammation. However, it was not so in the present study. In addition to the aforementioned indicators, the use of green tea mouthwash had significant improvement on gingival bleeding index, and this corresponded with the results of the study on the impact of toothpaste containing Aloe Vera in bleeding index by Namiranian et al. [23] in 2012. The improvement in plaque and bleeding indices by using green tea mouth wash, in the current study was consistent with many previous studies [24-26].

The following medicinal properties of these plants could be responsible for these effects: The anti-microbial effects of *A. vera* have been attributed to the plant's natural anthraquinones: aloe emodin, aloetic acid, aloin, anthracine, anthranol, barbaloin, chrysophanic acid, ethereal oil, ester of cinnamonic acid, isobarbaloin, and resistannol.[27]. In relatively small concentrations, together with the gel fraction, these anthraquinones provide analgesic, antibacterial, antifungal, and antiviral activity; in high concentrations, they can be toxic.[12] An experimental period of 14 days was chosen for

better comparison with other studies. However, to guarantee these results and the effectiveness of this mouth rinse, additional long term clinical trials should be performed which incorporates more isolates from clinical samples. Upon confirmation of its real benefit, the use of *A. vera* should be advantageous in cases where patients have little motor skills and tooth brushing is compromised.

Conclusion

Within the limitation of this preliminary clinical study, it can be concluded that A. vera-green tea mouth rinse was as effective as two commercially popular mouth rinses in controlling plaque and gingivitis.   .

Acknowledgments

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