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Comparative evaluation of effect of 0.1% curcumin mouthwash with 0.2% chlorhexidine mouthwash as a pre procedural mouth rinse in periodontal therapy - A randomized clinical trial

[1]Dr. Mayur Chavan, Post Graduate Student, Department of Periodontology, Y.C.M.M and R.D. F's Dental College, Ahmednagar, Maharashtra, India.

[2]Dr. Nikesh Moolya, Professor, Department of Periodontology, Y.C.M.M and R.D. F's Dental College, Ahmednagar, Maharashtra, India.

[3]Dr. Nilima Rajhans, Professor and Head of the Department, Department of Periodontology, Y.C.M.M and R.D. F's Dental College, Ahmednagar, Maharashtra, India.

[4]Dr. Soham Dhumal, Post Graduate Student, Department of Periodontology, Y.C.M.M and R.D. F's Dental College, Ahmednagar, Maharashtra, India.

[5]Dr. Richa Bhosale, Post Graduate Student, Department of Periodontology, Y.C.M.M and R.D. F's Dental College, Ahmednagar, Maharashtra, India.

[6]Dr. Yogita Landge, Post Graduate Student, Department of Periodontology, Y.C.M.M and R.D. F's Dental College, Ahmednagar, Maharashtra, India.

Corresponding Author: Dr. Mayur Chavan, Post Graduate Student, Department of Periodontology, Y.C.M.M and R.D. F's Dental College, Ahmednagar, Maharashtra, India.

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Abstract

Background: The use of preprocedural mouth rinse is one of the recommended ways to reduce aerosol contamination during ultrasonic scaling. Different agents have been tried as preprocedural mouth rinse. Chlorhexidine significantly reduce the viable microbial content of aerosol when used as a preprocedural rinse. Studies have shown that curcumin mouth wash is equally effective as chlorhexidine in reducing plaque and gingivitis. There is no published literature on the role of curcumin as a preprocedural mouth rinse. Hence, this study compared the effect of 0.1% curcumin to 0.2% chlorhexidine gluconate (CHX) as preprocedural mouth rinses in reducing the aerosol contamination by ultrasonic scaling.

Materials and Methods: Twenty subjects were divided into two groups based on the preprocedural rinse use (0.2% CHX, and 0.1% curcumin mouthwash). Ultrasonic scaling was done for 20 min in the same closed operatory for all the subjects after keeping blood agar plates open at two standardized locations. Colony forming units (CFUs) on blood agar plates were counted, and predominant bacteria were identified after incubation at 37°C for 48 h.

Results: There was statistically significant difference in the CFU counts between CHX group and between curcumin group. There was no difference between CHX group and AV group at both the locations.

Conclusion: 0.1% curcumin as a preprocedural rinse comparable to 0.2% CHX in reducing CFU count.

Keywords: Aerosol contamination, Curcumin, Chlorhexidine, Preprocedural rinse.

Introduction

The release of contaminated aerosols and splatter is one of the major concerns in the dental operatory. Even though a multitude of dental procedures can generate aerosols, the most intense aerosol and splatter ejection occurs during the use of an ultrasonic scaler and a high-speed handpiece. Different methods have been advocated to reduce aerosol contamination including usage of personal protective equipment, high-efficiency particulate air room filters, ultraviolet treatment of ventilation system, use of high-volume evacuators and pre-procedural rinsing with an antiseptic mouthwash.[1] pre-procedural rinsing is highly effective in reducing microorganisms in aerosol and numerous agents have been tried to this end. [2,3]

Chlorhexidine, the most commonly used anti-plaque mouth rinse and local delivery agent, significantly reduces the viable microbial content of aerosol when used as a preprocedural rinse. [4-6] Povidone-iodine (PVP), apart from its use as a sub-gingival irrigant and coolant for ultrasonic scaling is also used as a pre-procedural mouth rinse. [7-9] Curcuma longa L. (Zingiberaceae) is a perennial herb widely cultivated in tropical regions of Asia. Its rhizome is extensively used for imparting colour and flavour to food. As a powder, called turmeric, it is also used for medicinal purposes. Turmeric mixed with slaked lime is known as a household remedy for the treatment of sprains and swellings caused by injury. Curcumin is exhibits a variety of biological activities including anti-inflammatory, hepatoprotective, antimutagenic and antineoplastic properties (Devasagayam et al., 2001) [10] Curcuma longa is a spice that contains polyphenolic curcumin in its rhizome. It has been reported that curcumin has anti-inflammatory, anti-oxidant, anti-microbial and anti-bacterial properties (Suhag et al 2007). These beneficial properties of curcumin justify its used in periodontal diseases [11, 12].

Most dental procedures that use mechanical instrumentation will produce airborne particles from the site where the instrument is used. Dental handpieces, ultrasonic scalers, air polishers and air abrasion units produce the most visible aerosols. [13]

pre-procedural rinsing is highly effective in reducing microorganisms in aerosol and numerous agents have been tried to this end. In the field of dentistry, the most popular rewarded chemical means of maintaining a good oral hygiene has been gained by chlorhexidine. It is considered the gold standard due to its diverse properties. The antimicrobial and antiplaque activity of it brings the best bacteriostatic and bactericidal activity. However, it too has shown certain side effects such as brown discoloration of the teeth, oral mucosal erosion, and bitter taste [14,15]. It is known for its formidable effect

as an anti-inflammatory, antioxidant, and antimicrobial properties [16-19].

According to published evidence, curcumin has not been tried as a pre-procedural mouth rinse yet. Therefore, aim of the present study is to compare the effect of 0.1% curcumin containing mouthwash with 0.2% chlorhexidine mouthwash as a pre-procedural mouth rinse in reducing the aerosol contamination during ultrasonic scaling.

Materials and methods

The study was conducted from April 2020 to June 2020 and was approved by the Institutional Ethical Committee. After obtaining verbal and written informed consent, patients were recruited from the outpatient clinic of the department of periodontics based on the following criteria: above 18 years of age, minimum of 20 permanent teeth, plaque index (PI)14 score between 2 and 3 and Oral Hygiene Index-Simplified (OHI-S)15 score indicating poor or fair oral hygiene (1.3–6.0), Four or more sites with probing pocket depth (PPD) ≥4 mm, and systemically healthy individuals.

Patients with definite contraindication for the use of ultrasonic scaling device, history of systemic or topical antibiotics use within the last 3 months, history of oral prophylaxis or mouth wash use within the past 3 months, with five or more carious lesions requiring an immediate restorative treatment, pregnant women, and current smokers were excluded from the study. OHI-S, PI, and PPD were recorded for all subjects at baseline. They were divided into two groups (10 patients each) based on the type of preprocedural mouth rinse received as follows.

- Group A (CHX): 0.2% chlorhexidine (CHX) (Rexidin®, Indoco Remedies Ltd., Aurangabad)
- Group B (PVP-I): 0.1% curcumin (cur Q fresh, BSA Pharma Pvt Ltd, Haryana)

Sheep blood agar plates were used to collect the aerosol produced. They were placed at standardized locations-one at the patient's chest area and the other at shoulder area. The average distance from the patient's mouth to agar plates was twelve inches. Ultrasonic scaling was done in the same closed operatory for all subjects as the first case of a day. Only one patient wastreateda day. Before the procedure, all the surfaces were cleaned and disinfected with 70% isopropyl alcohol. Personal protective equipment were used for the operator as well as subjects. Distilled water was used as coolant for scaling; it was changed for every case. Furthermore, the water line was flushed at the start of each day for 1 min.

Preprocedural mouth rinse was given for 1 min to all subjects 10 min before the procedure. After keeping the agar plates open at prementioned sites, ultrasonic scaling was done using piezoelectric scaler for 20 min. Power setting, frequency, and water flow were standardized for all the cases as per manufacturer's recommendation. Then, the plates were closed, sealed, labelled, and immediately transferred to the department of microbiology for incubation at 37º for 48 h. The number of CFUs on blood agar plates was counted using colony counter (Labtronics microprocessor colony counter) and predominant bacteria were identified by the same experienced microbiologist for every sample. Bacterial identification was done based on colony morphology, hemolysis, Gram's staining and by biochemical reaction (Catalase test).

Results

Statistical analysis of the collected data was done using SPSS 16 software (SPSS mean value calculator. Intergroup comparison of the number of CFUs at both the locations was carried out using ANOVA. Intergroup comparison between then n u m b e r of CFUs at two locations was done using independent t-test.

Of the total 20 participants, 11 were male and 09 female (age ranged from 18 to 55 years, mean age 37.42 ± 10.3). Clinical parameters-PI, OHI-S, and PPD were compared at baseline (Table 1).

The lowest number of mean CFUs was found in the chlorhexidine group, followed by curcumin group in both the locations. The mean difference in the number of CFUs between CHX group and Curcumin group was found to be statistically significant (P < 0.05), (Table 2)

Within each group, the mean difference between the number of CFUs at two locations was found to be statistically significant (P < 0.05), with a higher mean number of CFUs at patient's chest area.

Within two group, the mean difference between the number of CFUs among two groups was found to be statistically significant (P < 0.05), with a higher mean number of CFUs in curcumin group. (Table 3) The predominant bacteria identified from the samples were Alpha-hemolytic streptococci, staphylococci, and Gram-negative bacilli.

Table 1: Comparison of baseline clinical characteristics between two groups.

Parameters	Mean ± SD		P*
	CHX group (n=10)	Curcumin group (n=10)	
PI	2.31±0.23	2.43±0.22	0.248
OHI-S	3.80±0.9	3.87±1.03	0.962
PPD	2.74±0.25	2.75±0.30	0.063

One-way ANOVA. *Significant *P*<0.05. *n* – Sample size; CHX – Chlorhexidine; curcumin; SD – Standard deviation; PI – Plaque index; OHI-S – Oral hygiene index-simplified; PPD – Probing pocket depth; *P* – Probability

Table 2: Comparison of the number of colony forming units between two groups at operator's chest area and shoulder area.

locations	Mean (95% CI)		P*
	CHX group (n=10)	Curcumin group (n=10)	
Chest	25.25	27.85	0.001
Shoulder	37.15	40.50	0.001

One-way ANOVA, *Significant *P*<0.05. *n* – Sample size; CHX – Chlorhexidine; curcumin group; CI — Confidence interval; *P* — Probability

Table 3: Comparison of the number of colony forming units among the two groups.

Groups	Mean difference	SE of difference	95% CI	P*
CHX	11.80	2.17	7.40-16.19	0.001
CURCU-MIN	11.90	1.51	8.84-14.97	0.001

Independent t-test, *Significant P<0.05 CHX – Chlorhexidine; curcumin; CI – Confidence interval; SE – Standard error; P – Probability.

Discussion

Bioaerosols in dental operatory may contain many pathogenic bacteria, viruses, and fungi. As the production of aerosol and splatter cannot be evaded, it is important to adopt methods to intervene aerosol contamination. Preprocedural rinsing with an antiseptic mouth wash is one of the recommended ways. Chlorhexidine and 0.1% curcumin mouthwash significantly reduce the viable microbial content of aerosol when used as a preprocedural rinse. This have shown that 0.1% curcumin mouthwash is equally effective as chlorhexidine in reducing plaque and gingivitis. To the extent of our knowledge, there is no published literature on the role of 0.1% curcumin mouthwash as a preprocedural mouth rinse. Hence, the present study compares the effect of 0.2% CHX, 0.1% curcumin mouthwash as preprocedural mouth rinses in reducing the aerosol contamination by ultrasonic scaling. The sample size was 20, taking the mean and standard deviation of number of colony forming units (CFUs) from a previous similar study. The results of present study showing insignificant difference in the parameters PI, OHI-S, PPD when compared between Groups Mean difference e SE of difference 95% CI P* CHX 11.80 2.17 7.40-16.19 0.001 CURCU MIN 11.90 1.51 8.84-14.97 0.001 chlorhexidine and curcumin group. In a study done by Amita et al. in 2012, 0.1% turmeric mouthwash was compared with 0.2% chlorhexidine gluconate in the prevention of plaque and gingivitis. It was concluded that chlorhexidine gluconate, as well as, turmeric mouthwash could be effectively used as an adjunct to mechanical plaque control in prevention of plaque and gingivitis [20]

There was a statistically significant difference was found between the two groups in the number of CFUs formed on blood agar plates at both locations (Table 2). As the patients in the two groups had similar oral hygiene and periodontal parameters (PI, OHI-S, and PPD) at baseline [Table 1], this difference in the number of CFUs can be attributed to the mouth rinse used. Within each group, the mean difference between the number of CFUs at two locations was found to be statistically significant ($p<0.05$) with higher mean number of CFUs at patient's chest area. Within two group, the mean difference between the number of CFUs was found to be statistically significant ($p<0.05$) with higher mean number of CFUs in curcumin group. (Table 3)The lowest no. CFUs in chlorhexidine group compared to curcumin group. Yadav et al. reported that the microbial aerosols were produced in large concentrations in dental clinics during ultrasonic scaling (47%) and to a comparatively lesser extent during cavity preparation (11%). proving that TRX solution reduces bacterial levels in the oral cavity significantly more than CHX. TRX has an additional advantage over CHX due to its lesser cost and higher patient acceptance[21].

Suresh et al. found that preprocedural rinsing with CHX mouth rinse was much better in reducing bacterial aerosols when compared with essential oil mouth rinse, which in contrast to the findings of our study where in the result suggest that preprocedural rinsing with TRX mouthwash containing essential oil was much better in reducing aerosols when compared CHX[22].

Limitations of the study

The lack of randomization in patient allocation and not employing specialized culture techniques for bacterial identification are limitations to this study. Inability to

maintain a completely sterile clinical environment, lack of fumigation of operatory area.

In this study the CFUs counted here are values that represent the anaerobic bacteria capable of growth on blood agar plates. Moreover, viruses and specific bacteria which require specialized media were not cultured in this study.

Practical implications of the study

The clinical significance of this study result warrants the mandatory use of preprocedural rinse to prevent disease transmission through aerosols, particularly when dentists conduct screening and treatment camps in the MDU.

Curcumin being an herbal product is economical and devoid of the side effects that chlorhexidine is associated with including staining, burning sensation, and alteration of taste perception. According to the findings of the present study,

curcumin was comparable to CHX in terms of its ability to reduce the CFUs in aerosol when employed as a preprocedural rinse in the nonsurgical management of patients with periodontitis.

It is mandatory to use preprocedural rinses, especially in those patients with infectious diseases. To prevent aerosol transmission cases with infectious diseases, hand scaling serves as a recommended mode of the treatment.

Conclusion

Within the limitations of the study, the following conclusions can be drawn: the two rinses tested could reduce the aerosol load, 0.1% curcumin mouthwash as a preprocedural rinse is comparable to 0.2% chlorhexidine. It certainly warrants further randomized controlled clinical trials for a definitive conclusion.

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