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IT'S IN THE AIR

Dental Science

Nalla Sandeep	Reader, Department of Prosthodontics, SVS Institute of Dental Sciences
Niradi Madhavi	Consultant Endodontist
Ashwini Thandu	Post Graduate
Poreddy Lakshmi	Post Graduate
Sravan Kumar	Post Graduate
Rajya Laxmi	Post Graduate

ABSTRACT

Purpose: To determine the level of aerosol contamination with or without pre-procedural oral rinse produced during tooth preparation and also comparing the effectiveness of three commercially available mouth rinses.

Materials & Methodology: In this study 45 participants were divided into three study groups based on mouth rinse

Group A [n= 15] – Betadine group [1%povidone iodine]
Group B [n= 15] – Hexidine group [0.2% chlorhexidine]
Group C [n= 15] – Hiora group [Herbal extract]

From each participant two samples were collected one is without mouth rinse and other with mouth rinse. Blood agar plates were placed on patient's chest at a distance of 12" from patient's mouth. Tooth preparation was carried out and aerosols were collected onto blood agar plates for a period of 10 mins, these plates were incubated at 37˚ for 24 hours. After incubation Colony forming units were counted and sent for statistical analysis.

Results: Paired t-test was done to compare mean and SD values of CFU before and after the use of mouth rinse. Three groups showed reduction in mean values of CFUs after mouth rinse which was statistically significant. One way ANOVA showed the difference was more in Group A compared to Group B & C. But the difference was not statistically significant.

CONCLUSION: Pre-procedural mouth rinse before any dental procedure reduces the contamination of dental aerosols and thereby reducing the risk of transmission of infectious agents. Among the three mouth rinses 1% povidone iodine showed greater effect.

KEYWORDS

Introduction

Most of the dental procedures expose the dentist to aerosols and splatter. In the absence of proper preventive measures, dental team members - dentist, auxiliary staff [assistant, technician], patient's are at high risk of exposure to various infectious agents transmitted from the contaminated aerosols and splatter.

Aerosols are particles less than 50 micrometres in diameter. Particles of this size are small enough to stay airborne for an extended period before they settle on environmental surfaces or enter the respiratory tract. Splatter are defined as airborne particles larger than 50 micrometres in diameter, which are ejected forcibly from the operating site and follow a trajectory similar to that of a bullet until they contact a surface or fall on the floor. These particles are too large to become suspended in the air for a short duration.[1]

Sources for contaminated aerosols in dental office includes patient, dental unit water lines [DUWL], instruments [hand piece, burs, scalers etc]. Patient can be the source if the infectious agents from saliva, blood, dental plaque, nasal and throat secretions transmitted in the form of aerosols and splatter. Dental unit water lines with a stagnant water, intermittent usage of dental unit, improper cleaning and sterilization of the DUWL. Critical instruments like hand pieces, burs, scaler tips etc if not sterilized they also acts as source of contami nation.[1] Microflora from the DUWL and the patient's oral cavity in the form of aerosol mixes with the surrounding air thus leading to change in the original composition of the environment. Eventually it acts as a source of infection for dental team members and the patients. It can also contaminate the nearby instruments which can further act as a source of infection to the patient. These aerosols may be inhaled or may come in contact with skin or mucous membranes, which spreads infection.

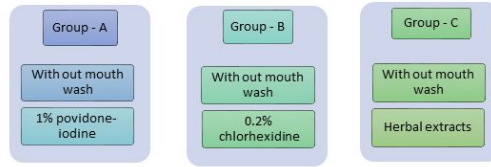
The present study aimed to evaluate the level of aerosol contamination during tooth preparation using high speed hand piece before and after the use of Preprocedural mouth rinse, and also compare the effectiveness of three different Preprocedural mouth rinse.

Materials and methods

An invivo study was conducted on 45 patients who visited the department of prosthodontics in SVSIDS and there was no age and sex criterion in selecting the subjects.

45 patients were randomly distributed into three groups of 15 each based on the type of Preprocedural mouth rinse used.

Group A- 1% povidone iodine
Group B – 0.2% chlorhexidine
Group C – herbal extract mouth rinse [Hiora]



Other materials used for the study include fumigator, airotor handpiece, blood agar plates, incubator, three commercially available mouth rinses.

Methodology

- Sterile environment was created for every patient throughout the study by fumigating the operatory room.
- Patients were randomly distributed into three groups of 15 each based on the type of Preprocedural mouth rinse used.
- Patient was made to sit comfortably in a dental chair and draped. Blood agar plates were placed on patient's chest at a distance of 12 inches [figure 1] which is approximately equal to the distance between the operator and patient's oral cavity during treatment.
- Tooth preparation procedure was performed and aerosols were collected on blood agar plates. Two samples were collected from each patient

- One is without Preprocedural mouth rinse: unexposed blood agar plate was placed on patient's chest and tooth preparation was carried out [control]. After 10 mins of exposure blood agar plates were removed and sealed tightly.
- Second sample was collected with Preprocedural mouth rinse: unexposed blood agar plate was placed on patient's chest same as for the sample one and tooth preparation was continued, after 10 mins of exposure blood agar plates were removed and sealed tightly. The same procedure was carried out for three groups.
- The exposed blood agar plates were then incubated at 37 °c for 24 hours in an incubation chamber. After 24 hours of incubation blood agar plates were examined for microbial colonies.
- Microbial colonies were formed on agar plates of each sample in all the three groups [figure 2,3,4].
- Colony forming units were counted, tabulated and sent for statistical analysis.

Results

Statistical analysis was done to compare mean and SD values of CFU count before and after the use of Preprocedural mouth rinse using paired t-test [Graph 1]. Comparison among three groups was done using one way ANOVA followed by post hoc test [table 1].

Three groups showed reduction in mean values of CFUs in samples with Preprocedural mouth rinse when compared to samples without the use of Preprocedural mouth rinse. This reduction/difference was statistically significant.

One way ANOVA showed that reduction in mean values of CFUs was more in Group A compared to Group B and Group C. But the difference was not statistically significant.

Descending order of reduction in mean values of CFUs as follows Group A > Group B > Group C.

Discussion

A safe working environment is an essential aspect for healthcare members, especially dental team members. Effective infection control is one of the cornerstones of good dental practice. Microorganisms within the mouth and respiratory tract of patients can be mobilised in the form of bioaerosols during dental procedures [cavity preparation, tooth preparations and oral prophylaxis] and this represents a potential infection risk to dental team members and other dental patients either by direct or indirect contact.[2] Aerosols were smaller in size which live in air for an extended period of time. A true aerosol or droplet nuclei may be present in the air of the operatory for up to 30 minutes after a procedure.[3] To effectively minimize the formation of bioaerosols, many protective barriers have been suggested, the use of the mouth mask, gloves, eye wear, Preprocedural rinse, high volume evacuators, high efficiency particulate air room filters.

The objectives of the present study were to compare the amount of aerosol contamination produced in the immediate vicinity of patient's mouth before and after the use of Preprocedural mouth rinse during tooth preparation using high speed dental hand piece, and also to compare the effectiveness of three different Preprocedural mouth rinses.

During dental procedures the propelling force of a high speed dental hand piece and the cavitation effect of an ultrasonic scaler, combined with a water spray, can generate numerous airborne particles derived from blood, saliva, tooth debris, dental plaque, calculus and restorative materials. To reduce or eliminate these aerosols before collecting sample overnight fumigation of operatory room was done which keeps the environment sterile. To avoid contamination of aerosols disinfection of DUWL and sterilization of instruments was done. To remove pooled contaminated saliva during tooth preparation high volume suction apparatus was used.

Antimicrobial mouth rinse was given to patient based on the principle of application of antiseptics to the skin or mucous membranes prior to surgery or injections to prevent entry of microbes to underlying tissues and preventing bacteremia.[4] To compare the effectiveness of antimicrobial mouth rinse two samples of aerosols were collected onto the blood agar plates from the same patient one is without Prepr ocedural mouth rinse [control] second one is with Preprocedural mouth rinse.

Samples were collected by placing the blood agar plates on patient's chest at a distance of 12 inches from the patient's mouth. This distance was approximately equal to the distance between patient's mouth and operator while treating. This study was done to know the level of exposure of dentist to the aerosols and risk prone to dentist. In a study by Shashidhar et al agar plates placed at patient's chest area showed highest number of colonies, then operator's chest area, 12 inches from operating area, 24 inches from operating area in decreasing order of number of colonies formed on blood agar plates. [5,6,7]

Each blood agar plate sample was exposed for a period of 10 mins as simple tooth preparation by students may range from 30 mins to 60 mins. Patient was advised to rinse the mouth with Preprocedural mouth rinse for 30 sec to collect 2nd sample from same patient. In a study by Rajiv Saini et al two aerosol samples were collected on to the blood agar plates during ultrasonic scaling without and with Preprocedural mouth rinse with 10 mins sampling period.[8] Mouth rinse was diluted based on the manufacturer's recommendation.

Blood agar plates were used to collect the sample as it is the standard nutrient medium and agar plates were placed at a distance of 12" and exposed for 10 mins after exposure these plates were packed tightly and sent for microbiology department for incubation at 37° c for 24 hours.[9]

1% povidone iodine [Alcohol containing mouth rinse] was used as Preprocedural mouth rinse as it was an age old disinfectant, which is commonly available in dental office. It acts on microbes by oxidation and iodination.[10] 0.2% chlorhexidine [Alcohol containing mouth rinse] was used as Preprocedural mouth rinse [5, 11, 12] as it was used which is considered to be the gold standard for chemical plaque control. It acts on microbes by disrupting the cell membrane of microbes. Herbal extract Hiora non-alcohol mouth rinse, it acts on microbes by denaturation of proteins.

Results of the present study were only assessing the number of bacterial colonies in the aerosol and not the type of bacteria. CFUs were reduced in all the groups after the use of Preprocedural mouth rinse which was statistically significant. The decreasing order of effectiveness of the mouth rinses used in the study 1% povidone iodine > 0.2% chlorhexidine > herbal extract - HiOra

Conclusion

The present study concluded that though aerosol production cannot be totally eliminated with infection control procedures, the putative potential of these aerosols can be minimized by the use of Preprocedural mouth rinse before any dental procedure. Among the three mouth rinses used 1% povidone iodine was found to be more effective.

"An ounce of prevention is better than pounds of cure"

Figure legends

Figure 1. Blood agar plates were placed on patient's chest at a distance of 12 inche

Microbial colonies were formed on agar plates of each sample in all the three groups [figure 2,3,4].

Figure 2. Represents the Group – A. microbial colonies were formed on two samples of blood agar plates without Preprocedural mouth rinse and with Preprocedural mouth rinse respectively.

Figure 3. Represents the Group – B. microbial colonies were formed on two samples of blood agar plates without Preprocedural mouth rinse and with Preprocedural mouth rinse respectively

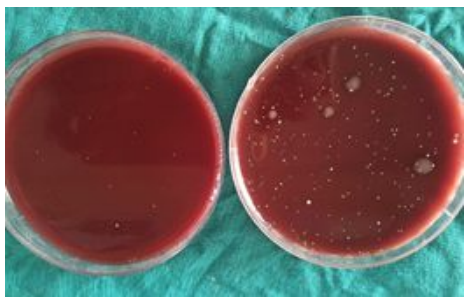
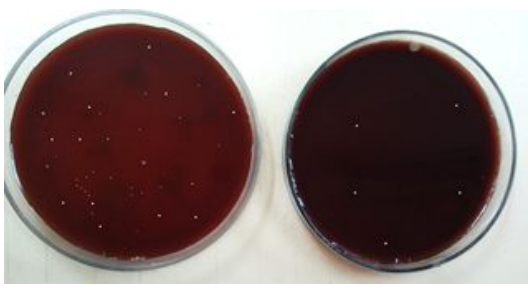


Figure 4. Represents the Group – C. microbial colonies were formed on two samples of blood agar plates without Preprocedural mouth rinse and with Preprocedural mouth rinse respectively.



Graph 1. Shows the mean values of colony forming units in three groups with and without Preprocedural mouth rinse

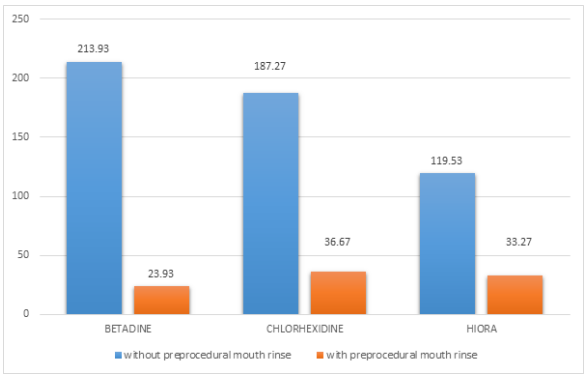


Table 1. Shows the mean and SD values of colony forming units in three groups with and without Preprocedural mouth rinse

Study groups	Blood agar samples	Mean	N	Standard deviation	p value
Group A	without mouth wash	213.93	15	81.699	**0.001***
	with 1% Povidone iodine	23.93	15	10.820	
Group B	without mouth wash	187.27	15	98.58	**0.001***
	with 0.2% Chlorhexidine	36.67	15	15.093	
Group C	without mouth wash	119.53	15	59.813	**0.001***
	with HIORA	33.27	15	21.529	
* Statistically significant , p value <0.005					

REFERENCRES

1. Swaminathan Y. "Aerosol"-A Prospective Contaminant of Dental Environment!. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS). 2013;1(11):45-50.
2. Garner JS. Guideline for isolation precautions in hospitals. Infection Control & Hospital Epidemiology. 1996;17(01):54-80.
3. Hinds WC. Aerosol technology: properties, behaviour and measurement of fine particle, J. J. Wiley, New York. 1982.
4. Fine DH, KORIK I, FURGANG D, MYERS R, OLSHAN A, BARNETT ML, VINCENT J. Assessing pre-procedural subgingival irrigation and rinsing with an antiseptic mouthrinse to reduce bacteremia. The Journal of the American Dental Association. 1996 May 1;127(5):641645-2646.
5. LOGOTHETIS DD, Martinez-Welles JM. Reducing bacterial aerosol contamination with a chlorhexidine gluconate pre-rinse. The Journal of the American Dental Association. 1995 Dec 1;126(12):1634-9.
6. Cochran MA, Miller CH, Sheldrake MA. The efficacy of the rubber dam as a barrier to the spread of microorganisms during dental treatment. The Journal of the American Dental Association. 1989 Jul 1;119(1):141-4.
7. Acharya S, Priya H, Purohit B, Bhat M. Aerosol contamination in a rural university dental clinic in south India. International Journal of Infection Control. 2010;6(1):2-7.
8. Saini R. Efficacy of pre procedural mouth rinse containing chlorine dioxide in reduction of viable bacterial count in dental aerosols during ultrasonic scaling: A double-blind, placebo-controlled clinical trial. Dental Hypotheses. 2015 Apr 1;6(2):65.
9. Johnston JR, Butchart AM, Kgampphe SJ. A comparison of sampling methods for airborne bacteria. Environ Res 1978; 15: 279-284
10. Domingo MA, Farrales MS, Loya RM, Pura MA, Uy H. The effect of 1% povidone iodine as a pre-procedural mouth rinse in 20 patients with varying degrees of oral hygiene. The Journal of the Philippine Dental Association. 1995 Dec;48(2):31-8.
11. Purohit B, Priya H, Acharya S, Bhat M, Ballal M. Efficacy of pre-procedural rinsing in reducing aerosol contamination during dental procedures. Journal of Infection Prevention. 2009 Nov;10(6):190-2.
12. Mani S, Mani A, Saini R. Chlorine Dioxide: A Potential Mouth Rinse for Oral Health. Int J Experiment Dent Sci. 2012 Jul 15;1:118-9.