

Aerosol contamination with and without pre-rinsing during oral prophylaxis – a comparative study



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RESEARCH QUESTION

A study to compare the efficacy of pre – procedural mouth rinsing in reducing bacterial count in aerosol produced during ultrasonic scaling.

INTRODUCTION

The spread of infection through aerosol and splatter has long been considered one of the main concerns in the dental community because of possible transmission of infectious agents and their potential harmful effects on the health of patients and dental personnel. Aerosol is a suspension of solid or liquid particles containing bacteria, viruses, suspended (for at least a few seconds) in a gas. Particle size may vary from 0.001 to >100 mm. The smaller particles of an aerosol (0.5 to 10 mm in diameter) have the potential to penetrate and lodge in the smaller passages of the lungs and are thought to carry the greatest potential for transmitting infections. The oral cavity harbors numerous bacteria and viruses from the respiratory tract, dental plaque, and oral fluids. Any dental procedure that has a potential to aerosolize saliva will cause airborne contamination with organisms. Dental hand pieces, ultrasonic scalers, air polishing devices, and air abrasion units produce airborne particles by the combined action of water sprays, compressed air, organic particles such as tissue and tooth dust, and organic fluids such as blood and saliva from the site where the instrument is used. Miller found that aerosols generated from patients' mouths contained up to a million bacteria per cubic foot of air. Other studies have reported association of these aerosols with respiratory infections, ophthalmic and skin infections, tuberculosis, and hepatitis B. Current research suggests that having patients use an antimicrobial rinse before treatment may decrease microbial aerosols.

Aerosol is also capable of penetrating deep into the respiratory system and the pulmonary alveoli. The ultrasonic scaler generates aerosol, with bacteria peaking over 300 CFU/ft of the dental clinic. A study demonstrated that aerosols remained detectable in the air for at least 10 minutes following the completion of a procedure

Conflict of Interest: None declared

Source of Support: Nil

and were detected at 2 feet or more from the dental chair. Bacterial count in the air increased by 30 fold during ultrasonic scaling. Such data indicates that it is important to control the production of aerosol and splatter during ultrasonic scaling to prevent cross contamination in the dental office. Aerosol is defined as minute particles, which are 50 µm or less in diameter, suspended in air. It is also capable of penetrating deep into the respiratory system and the pulmonary alveoli. The ultrasonic scaler generates aerosol, with bacteria peaking over 300 CFU/ft of the dental clinic. A study demonstrated that aerosols remained detectable in the air for at least 10 minutes following the completion of a procedure and were detected at 2 feet or more from the dental chair. Bacterial count in the air increased by 30 fold during ultrasonic scaling. Such data indicates that it is important to control the production of aerosol and splatter during ultrasonic scaling to prevent cross contamination in the dental office.

CHLORHEXIDINE

Chlorhexidine (CHX) is a commonly used antiseptic mouthwash, used by dental practitioners and the public, due to its antimicrobial effects. It is a gluconate salt; a biguanide compound, that has been around since the 1950s for clinical use. It is also a broad-spectrum anti-microbial agent, causing disruption of cellular membranes. It is thus currently used as a disinfectant agent for cleaning non-living clinical surfaces and catheters. It is also generally biocompatible, being used orally as an antiseptic mouthwash by dental practitioners and the general public to prevent bacterial biofilm and plaque accumulation. As an antiseptic mouthwash, CHX has an antimicrobial effect on bacteria, fungus and viruses causative for a number of different oral diseases. In vitro, the anti-bacterial effects of

CHX all relate to altered cell membrane permeability. At low concentrations (0.02%-0.06%) CHX causes displacement of Ca²⁺ and Mg²⁺ and loss of K⁺ from the cell wall, resulting in a bacteriostatic effect. At high concentrations (>0.1%) CHX causes leakage of all the main intracellular components out of the cell, resulting in a bactericidal (cell lysis and death) effect.

In response to dental procedures, including the use of the high speed drill, 3 in 1 air and ultrasonic scaler, microbes can aerosolise and splatter up to 6 feet away from the dental chair.

Recent systematic review has demonstrated moderate evidence that pre-procedural mouth rinsing with antiseptics can reduce dentally generated aerosolisation of viable microbes. This includes 0.2% CHX reducing the number of colony forming units (CFUs) of bacteria produced (approximately 70%) in response to ultrasonic scaling, as measured on an agar plate placed within the dental surgery

POVIDONE IODINE

Povidone-iodine is considered to have the broadest spectrum of antimicrobial action compared with other common antiseptics such as chlorhexidine, octenidine, polyhexanide and hexetidine showing efficacy against Gram-positive and Gram-negative bacteria, bacteria spores, fungi, protozoa and several viruses. Persistency of effect has also been demonstrated in a study that assessed 1% PVP-I as a preprocedural antibacterial agent in individuals with varying degrees of oral hygiene. Reducing the incidence of airborne or droplet-transmitted respiratory infections (e.g. SARS, avian flu, swine flu), undiluted PVP-I can be used as a protective measure by rinsing the mouth for 2 min up to four times a day.

NEED OF THE STUDY

To understand the efficacy of pre procedural mouth rinses in reducing the presence of bacterial colonies in aerosols during ultrasonic procedure.

RATIONALE OF THE STUDY

Cross infection during health care delivery is a concern among dental professionals. The rationale of this study is to analyse the efficacy of pre procedural mouth rinse during ultrasonic scaling in reducing aerosol bacterial count.

AIM

Assess the need and importance of pre-rinsing with an anti microbial agent during oral prophylaxis in reducing the aerosol contamination.

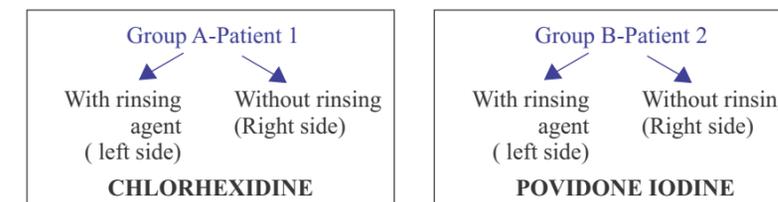
OBJECTIVE

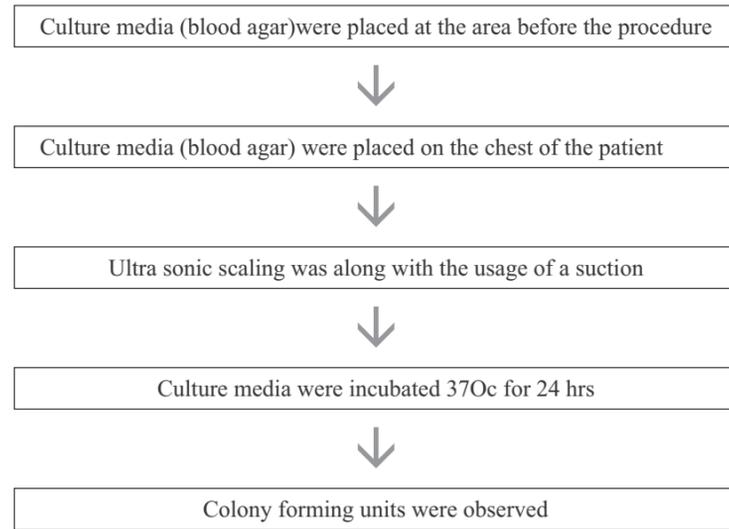
- To evaluate the efficacy of anti microbial agent for pre rinsing in oral prophylaxis using ultrasonic scaler

To compare the anti microbial effect of chlorhexidine and povidone iodine as an antimicrobial agent.

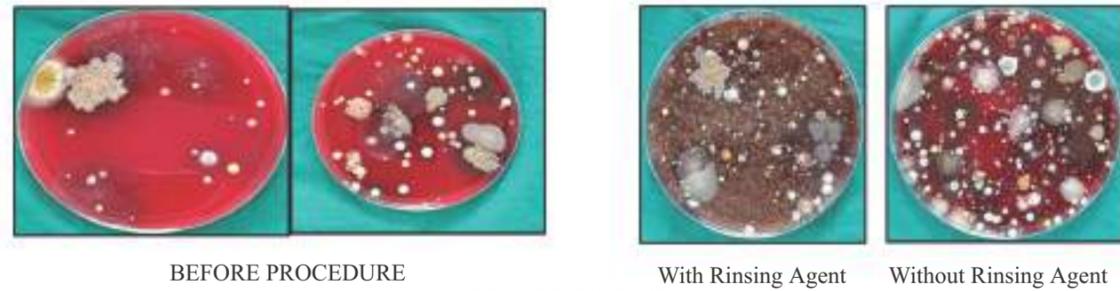
METHODOLOGY

2 PATIENTS WERE SELECTED

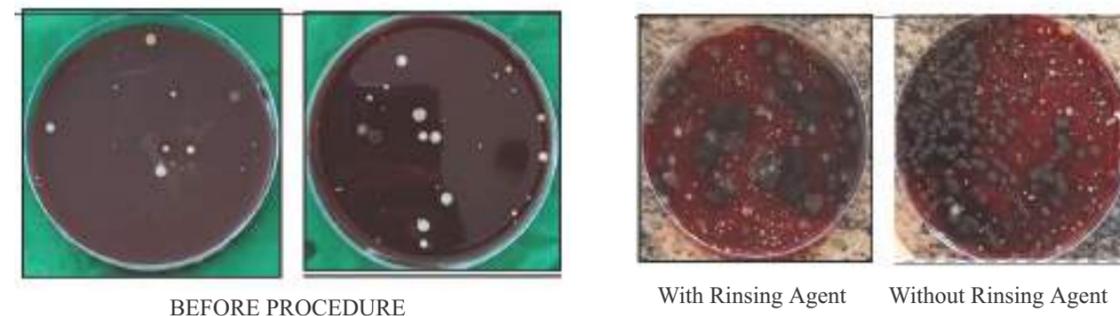




POVIDONE-IODONE



CHLORHEXIDINE



RESULT

Experiment shows that the contamination from spatter and aerosol dissemination remains a significant hazard for dental personnel. By the use of chlorhexidine and povidone iodine, Chlorhexidine can significantly reduce colonies more than povidone iodine.

CONCLUSION

Overall, the results of our investigation clearly indicate that a pre-procedural rinse containing chlorhexidine can be considered as a promising alternative in reducing aerosol contamination during ultrasonic scaling procedures when compared to the povidone iodine with tempering the rinse showing the definite edge. Also, it can be concluded that the amount of viable bacteria in aerosol is maximum at the patient's chest area followed by the operator and assistant in a descending manner, thus reinforcing the use of personal protective barriers to minimize the risk to dental professionals.

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