



The effect of rubber dam on atmospheric bacterial aerosols during restorative dentistry



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Summary Rotatory dental instruments generate atmospheric aerosols that settle on various surfaces, including the dentist's head. The aim of this study was to quantitatively assess bacterial contamination of the dentist's head and to evaluate whether it is affected by using a rubber dam. Senior dental students ($n=52$) were asked to wear autoclaved headscarves as collection media while performing restorative dental treatment with and without a rubber dam. Four points from each headscarf were swabbed for bacterial culture after 30 min of operative work. Bacterial contamination was quantified by counting the colony-forming units. Regardless of the collection point, using a rubber dam was associated with more bacterial colony-forming units than not using a rubber dam ($P=0.009$). Despite its clinical value, the rubber dam seems to result in significantly higher aerosol levels on various areas of the dentist's head, requiring that dentists cover their heads with suitable protective wear.

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Introduction

Dentistry is a clinical profession that is associated with biological, chemical and physical hazards. The surgical nature of clinical dental practice, and the dentist's position in close proximity to the patient, put the dentist at risk of microbial infections, which can be transmitted by direct contact or by atmospheric aerosols.

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Several studies have demonstrated microbiological contamination of various clinical surfaces in hospitals and dental clinics [1–5]. Clinician's attire, such as scrubs and white coats, were found to harbor a plethora of bacterial species at high quantities [6–8]. Pathogenicity of microorganisms detected on clinical surfaces ranged in their severity; with some being the cause of serious illnesses, such as measles and tuberculosis [9].

To minimize exposure to potentially pathological microorganisms, the Center for Disease Control and Prevention (CDC) recommends that all dental healthcare providers (DHCPs) use barriers to cover clinical surfaces as well as personal protective equipment (PPE) (gloves, masks, goggles and gowns) to cover their skin and mucous membranes of eyes, nose and mouth when performing dental treatments. The CDC also recommends the use of high velocity suction and rubber dams to reduce the aerosols generated during rotatory dental procedures [10].

The rubber dam is a disposable rubber sheet that is stretched around the treated tooth/teeth, isolating the treatment zone from saliva. The use of a rubber dam during restorative and endodontic treatments is considered the standard of care in most dental care-providing clinics and hospitals. Its use has been associated with higher rates of dental treatment success [11]. Additionally, Cochran et al. and Samaranayake et al., in two separate studies, observed a significant reduction in bacterial atmospheric contamination when rubber dams were used [12,13].

Nevertheless, the amount of bacteria-contaminated spatter accumulating onto the clinician's head, with and without the use of a rubber dam, has not been previously investigated. The objective of this study was to determine the effect of using a rubber dam on the amount of bacteria cultured from various regions of the clinician's head during routine restorative dental treatment.

Materials and methods

Sample and setting

Female dental students in their fourth and fifth years, who would customarily wear headscarves, were invited to participate in this study. The study took place at the University Dental Hospital Sharjah (UDHS) in the United Arab Emirates during the 2013/2014 academic year. UDHS is a 114-dental chair ambulatory hospital that is owned and

administered by the College of Dental Medicine at the University of Sharjah. The hospital was inaugurated in 2011 to provide advanced dental clinical training at the graduate and post-graduate levels.

Students who consented to participate ($n=52$) were randomly assigned into two equal groups using computer-generated random numbers and then assigned to a dental clinic where they performed a routine restorative dental procedure. To standardize the extent of the dental procedure, only dental cavity preparations on posterior teeth that were already planned for the patients were included. A colleague from the same group was assigned to assist each student by holding the surgical suction tube throughout the clinical procedure. All students wore similar PPE, consisting of a disposable apron, mask, gloves and plastic goggles. Half the sample ($n=26$) was asked to perform this procedure while a rubber dam was placed over the tooth that was being treated, while the other half ($n=26$) performed similar procedures without a rubber dam. This study was approved by the UDHS Executive Director and was exempted from full review by the Research Ethics Committee as it was a clinical audit.

Microbiological assessment

Fifty-two unused cotton-polyester scarves were packed in plastic pouches and sterilized by autoclave with the temperature set at 132 °C for 30 min. In this way, the colony forming unit (CFU) baseline was set to zero. Each scarf was removed from its pouch using clean gloves and the participants donned the scarves immediately before starting the procedures. Students were instructed to wrap the scarves around their head and neck in the same manner as they would normally do with their customary headscarves. They were asked to avoid touching the scarf throughout the duration of the 30-min procedure. Participants were then asked to begin cavity preparation; 30 min into the operative work, participants were asked to pause their work to allow for bacterial swabbing.

Sterile cotton swabs that were moistened with sterile normal saline were used to sample each headscarf. The sterile cotton swabs were passed twice (up and down) over an area measuring approximately 3 cm × 3 cm. Four sampling areas on each headscarf were pre-determined, and the swabbing process was calibrated using a visual guide (Fig. 1). The four sampling areas were as follows: the area overlaying the forehead (designated as point A), the area overlaying the left ear (point B), the area overlaying the submental triangle (point C), and the area overlaying the occiput

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