Infection control in dentistry has never been more essential

By Dr. Safura Baharin, Malaysia

Demand for dental treatment has been increasing in recent years as people have become more aware of their oral health and the benefits of good dental aesthetics. Maintaining and practicing stringent cross-infection control procedures therefore have never been more essential to ensure the health and safety of dentists, dental hygienists and assistants, as well as other supporting staff who may be indirectly involved in the treatment process.

Dental professionals are at high risk of cross-infection. A report published in 1996 has shown that in developing countries, for example, the number of dental staff contaminated during treatment is increasing by almost 6 percent each year.

Research has shown that infectious micro-organisms can be transmitted by blood or saliva via direct or indirect contact, aerosols, or contaminated instruments and equipment. As stated by the US Centers for Disease Control and Prevention (CDC) in their 2003 guidelines, the transmission of infectious disease can occur in four ways: direct contact with blood or body fluids, indirect contact with contaminated objects or surfaces, contact with bacterial droplets or aerosols, and inhalation of airborne microorganisms.

The most likely mode of transmission in dentistry is through inhalation of bacterial aerosols or splatters. Their potential health hazards are well documented and acknowledged. Both can be host to a large variety of micro-organisms and viruses, which can be infectious to susceptible individuals. During treatment, the dentist’s face and patient’s chest are most affected by splatter, as the majority of the splatters are radiated towards them.

According to studies, the most contaminated area on the dentist’s face during treatment is around the nose and inner corner of the eyes. Splatter consists of large particles of greater than 100 µm generated during the use of dental equipment, such as turbines, ultrasonic scalers, or water and air syringes. Owing to this, splatter tends to travel in a trajectory, thereby contacting objects in its path. Aerosol consists of smaller particles.

Higher caregiver education level linked to fewer cavities in children

By Dental Tribune International

Demand for dental treatment has been increasing in recent years as people have become more aware of their oral health and the benefits of good dental aesthetics. Maintaining and practicing stringent cross-infection control procedures therefore have never been more essential to ensure the health and safety of dentists, dental hygienists and assistants, as well as other supporting staff who may be indirectly involved in the treatment process.

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In order to determine whether caregiver education level affected untreated dental caries in children, the researchers looked at the frequency of dental visits, use of routine care, and frequency of toothbrushing for both the caregiver and the child in 425 African-American children of kindergarten age from low-income families and their caregivers.

They observed that caregivers who completed high school visited the dentist 1.76 times more often than did those who did not complete high school. In turn, children whose caregivers had a high school education were 5.78 times more likely to visit the dentist. Moreover, children who visited the dentist more often had 26 percent fewer untreated decayed teeth compared with children who did not have routine visits. In addition, children with higher-educated caregivers had 54 percent fewer untreated decayed teeth and 28 percent fewer decayed or filled teeth, the researchers reported.

The study, titled “Caregiver’s Education Level and Child’s Dental Caries in African Americans: A Path Analytic Study,” was published in the March issue of the Caries Research journal. It was conducted by researchers at Case Western Reserve University in collaboration with the University of Washington.
By Philips

Dental Tribune Middle East & Africa Edition | July-August 2015

The World Health Organization (WHO) has reported a rise in airborne infections worldwide. Tuberculosis in particular has increased in the developing world. [12] It has been stipulated that the risk of exposure to tuberculosis in susceptible individuals.

Dentists and their assistants, who are exposed for approximately 15 minutes during peak aerosol concentration, have a significantly higher risk of exposure to Mycobacterium tuberculosis than the general public does. [8] During this period, the DHCP inhaled about 0.014–0.012 µl of aerosolized saliva, which may contain viable pathogens that can have a detrimental effect on the health of susceptible DHCP.

Sonicare DiamondClean has been elected Product of the Year in the oral care category. The independent survey was conducted among 3,600 consumers in five countries, among the most valued awards in consumer perception of products.

Sonicare DiamondClean takes sonic tooth brushing to its most sophisticated level and wins the hassle of having to pack plugs and wires. It is a fantastic choice. Sonicare DiamondClean features a unique charging system. With all of this in mind, the responsibility of DHCP to adhere strictly to second-generation infection control guidelines and policies. Several measures should be taken to reduce and control airborne contamination in the dental clinic. For example, it has been demonstrated that the use of a mouth-rinse, high-volume evacuation or a combination of both methods significantly reduces the number of colony-forming units in aerosols emitted during ultrasonic scaling. [15] Routine use of rubber dam isolation provides a clean and dry area for placement of dental restorations, prevents salivary and blood content to the patient’s mouth and airway.

Using personal protective equipment (PPE), such as surgical masks (with at least 95% efficiency against particles ≥ 0.3 µm in diameter), changed for every patient or every 20 minutes in an aerosol environment, or 60 minutes in a non-aerosol environment, safety glasses with lateral protection to prevent contact with splatter to the patient’s mouth, and work sent out to the laboratory, and regular maintenance of the dental water lines and equipment, which has the potential to harbour bacteria. All dental water lines should be purged at the beginning of each day for between 5 and 50 minutes and flushed thorough-ly with water, as residual water may become contaminated overnight and biofilm may develop along the inner side of the tube. Purging will result in a significant decrease in bacterial counts. [15, 16]

The Canadian Dental Association recommends running high-speed handpieces for 20–30 seconds after each treat ment to purge all potentially contaminated air and water. This procedure has been proven to reduce the bacterial load in the water line significantly. [17] Blood cells, as well as bacterial and viral particles, can survive inside handpieces even after disinfection. They must therefore be sterilized between patients. [17, 18]

Not only is Sonicare DiamondClean Philips’ most advanced brush yet, it’s also our most easy to use and stylish. DiamondClean’s power handle has a ceramic finish and a chrome accent ring highlights the elegant neck of the brush. The technology in the handle is hidden so that the sleek matte white finish of the brush is uncluttered by electronic visual clutter. Pressing the button is pressed are the brushing modes illuminated to reveal the technology on the brush. These are then simply selected by scrolling down using a one button interface.

When travelling or on the go, Sonicare DiamondClean is designed for convenience with users being able to keep their brush fully charged using a rev olutionary all in one USB travel case that can be plugged into almost any lap top computer and saves the hassle of packing plugs and adaptors. But only the most intrepid travellers need worry about this advanced feature as it is clinically proven to 100% of plaque from hard to reach places that can be used for mouth-rinsing, but also incorporates the latest in inductive charging technology to charge the toothbrush as it rests in the glass. The stylish and comfortable to display in the most fashion-forward bathroom.

Sonicare DiamondClean holds an impressive three weeks charge. Brilliant cut Sonicare DiamondClean is designed using the latest in diamond-cut tuft formation to provide you with an even more effective brushing experience. The uniquely designed diamond bristle heads have 44% more bristles than Philips Sonicare’s standard sized pro-results brush heads, providing 30% more removal and whiter teeth. The heads come in two sizes – Standard and Compact, for focused cleaning in areas of special need, for orthodontic patients and those with smaller mouths.

Contact Information

For more information about Sonicare DiamondClean or the Philips Sonicare range, including copies of clinical studies, visit www.mea.philips.com/ oralhealthcare/ar

About the Author

Dr. Sufara Baharin is Head of Clinical Services at the Faculty of Dentistry of the National University of Malaysia near Kuala Lumpur in Malaysia.
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Toothbrush developments. Oral health benefits

By Karen Claire-Zimmet MS BS

Toothbrush research and development combines science, technology and art. Optimising toothbrush performance involves several disciplines including an understanding of mechanical systems, filament properties and physics, production technology, and in addition ergonomics and human behaviour via consumer research. This combination of efforts has yielded toothbrushes that significantly contribute to improvements in the oral health of the population.

The modern toothbrush has its origins in primitive designs (Figure 1) that had large brushes heads with straight, hard and abrasive boar's hair bristles. In the early 1900s, the first Oral-B manual brush (Figure 2) was developed with multitufted nylon filaments that were flattened, vertical, and end-rounded for safe brushing. This was the first modern toothbrush design and similar designs are still in use globally.

The full importance of brush head morphology and bristle configurations had yet to be discovered. Before that could happen, and more effective designs could be developed, it was necessary to fully understand the basic fundamentals and cleanings routines of the individual elements that make up a toothbrush.

Understanding the fundamentals

In order to gain a thorough understanding of toothbrushes and what defined toothbrush success or failure, our team used the power of observation and created a defined problem statement: how can we maximise toothbrush bristle contact interproximally, for improved cleaning and oral health? By breaking down this problem statement into more basic elements, we were able to gain that understanding. Although toothbrushes may appear simple, they are actually quite complicated. As with complex chain molecules that consist of basic chemical elements, at Oral-B we broke down toothbrush mechanisms and design into basic physical elements.

We developed our knowledge base by transitioning from what one could call a ‘macroscopic’ perspective to a ‘microscopic’ perspective on the variables that affect toothbrush efficacy and use, first examining brush heads, then tufts of bristles and then individual filaments. Our research needed to address how tufts behaved during use; how individual filaments moved and behaved; what influence usage had on tuft and filament direction and movement, and how this influenced plaque removal efficacy.

Other basic elements that required research included discovering which factors determine the ability of a single bristle/filament to penetrate interproximally, as well as the influence of filament and tuft length, width and shape. I had studied physical chemistry during my masters degree studies - specifically, polymer dynamics using techniques of light scattering and Fourier transform analysis to understand the time dependence of polymer behaviour. The leap from polymer dynamics to toothbrush bristle behaviour, particularly the ability and time dependence of filaments reaching interproximally, is not as large as one might first think.

More fundamentally, we further needed to thoroughly understand how consumers actually brushed - for instance, we found that a basic horizontal scrubbing motion (rather than a modified floss technique) was used most often by consumers.

All of this was crucial knowledge - only after gaining an understanding of how consumers really use our products would we be able to improve the design of a toothbrush to work most effectively with common brushing techniques used by consumers.

A Journey of Discovery

Our basic filament dynamics research led to discoveries around a toothbrush tuft's ability to reach interproximally (Figures 3-4).

Our hypothesis was that filaments bent towards the direction of travel would be more likely to enter the interproximal space before then bending away from the direction of travel while still in the interproximal gap (Figure 6). Taking a more macroscopic view of the brush design, including evaluating different filament shapes and heights – we found taller, thinner filament tufts are better able to reach interproximally while shorter, thicker filament tufts are superior for flat tooth surfaces.

We also discovered that if too much load (brushing pressure) is applied to individual bristles that they collapse and cannot enter the interproximal gap. Conversely, if too little load is applied, the bristles may ‘skip’ over the gap and miss their target. These were key learnings in defining what the final tuft density of the CrossAction design would be.

Key Learnings

- Angled bristles (>12º) are superior in reaching interproximal sites.
- Longer, thinner bristle tufts are more effectively interproximal.
- Shorter, thicker bristle tufts are more effective on accessible surfaces.
- Filament packing density influences brushing load on individual filaments and, correspondingly, the ability of bristles to contact and clean sites.

The Outcome: CrossAction

The first time we tested an early prototype design of the CrossAction toothbrush in our performance laboratory we could not believe its cleaning performance; it was so good. We literally recalibrated the test and analysis equipment, to make sure there were no errors in the analysis and to confirm the calibration. We had never seen anything that performed so well, the results were off the chart!

The result of our research was a shift in the art and science of making toothbrushes, and a novel manual toothbrush design that was based on an understanding of the superiority of angled filaments, as well as the importance of filament sizes and shapes, and directional change. The CrossAction toothbrush has bristle tufts with a 16º angle to the brush head in both directions, as well as taller, thin, elliptical bristle tufts supported by dense neighbouring tufts that allow approximal reach during brushing, both of which lead to greater plaque removal efficacy.

The effectiveness of CrossAction in interproximal reach, and related approximate plaque removal, was initially demonstrated in laboratory studies and the findings were confirmed in clinical laboratory research. Laboratory research published in 2000 demonstrated significantly greater plaque removal for CrossAction relative to 84 manual toothbrushes found in global clinical trials, including single-use and long-term studies, corroborated in the in vitro data.

CrossAction was shown in numerous clinical trials to provide superior plaque removal and gingivitis benefits versus not only various manual toothbrushes, but also battery-powered toothbrush models.

An important observation and outcome was the response of people testing the CrossAction toothbrush, as well as the reaction of dental professionals. People loved the CrossAction - they could feel a difference and intuitively understood that angled bristles would be able to reach between the teeth more effectively. After testing it, they did not want to give it back.

At the time of its development, the CrossAction toothbrush was impossible to make with existing brush-making equipment, due to the angled bristle design and very high bristle packing densities. Making the
HEALTHIER & STRONGER TEETH*
STARTING FROM DAY 1
WITH CONTINUED USE

*ON ENAMEL PLAQUE AND ENAMEL EROSION VS ORDINARY TOOTHPASTE
How implant prostesis design influences implant maintenance access

By Shirley Branam, USA and Gerhard Mora, USA

Achieving a balance between implant-support ed restoration esthetics and maintaining periodontal health is important in an overall successful outcome of the prosthesis. The goal is to create an emergence profile design that allows for minimal tissue displacement while achieving optimal cervical contours for esthetics. It is important in the design to allow access for proper cleaning by the patient and clinician (Fig. 1).

There are two types of implant restoration designs commonly used in single-tooth replacement prosthetics. They are a screw-retained crown or a two-piece abutment and cement-retained crown. The screw-retained crown design is the technique more commonly used in Europe. Whereas, the cement retained crown prosthetic design is currently used in the United States.

The screw-retained restorations contain a small chimney access hole where the screw retains the restoration is inserted. The crown is screwed directly into the implant and the access chimney is typically closed with a tooth-colored resin (Sarmont, 2009). There are two advantages to this restoration design. First, since cement is not used in this method, the opportunity for subgingival residual excess cement to remain on the prosthesis cannot occur. When excess cement is left, it can create the opportunity for inflammation and peri-implantitis to develop in the implant sulcus site. Second, the screw can be easily removed from the restoration, allowing for crown removal if necessary during any maintenance procedures.

The two-piece abutment and cement-retained crown restoration has an abutment that is designed to provide the subgingival emergence profile and allows the crown to be cemented onto the abutment (Fig. 2). The emergence profile refers to the subgingival contours that lie between the implant platform and the emergence abutment and crown (Sarmont, 2009). Using a custom designed abutment provides greater predictability in determining the proper shape of the emergence profile compared with pre-fabricated standard abutment design.

To obtain a pleasing restoration, the subgingival contours must start at the small circle of the implant head and emerge from the tissue with an anatomical profile (Sarmont, 2009). The result should be an emergence profile that allows for minimal displacement of the surrounding tissue while creating an esthetically pleasing appearance (Fig. 3). This design allows for easy access into the implant sulcus area so cleaning and maintenance can be easily achieved by the patient and the clinician. Over or under contouring of the abutment and/or restoration can result in biofilm accumulation and peri-implantitis. It is important for the emergence profile to resemble that of a natural tooth, this causes minimal displacement of the bacteria, and acoustic turbulence is still clinically significant.

Incorporating ultrasonics when designed properly, the subgingival area of the implant prosthesis for proper maintenance is vital to the health and success rate of the prosthesis. As margin location and emergence profiles extend further subgingival, the ability to maintain these sites becomes more challenging.

Evidence has shown that power scalers with nonmetallic tips can be beneficial in maintaining the implant prosthesis (Sato, 2004). Several manufacturers offer tip designs that will accommodate the different types of power scalers. DENTSPLY Professional has an insert whose unique design allows a polymer sleeve to be assembled to the active tip area of this ultrasonic implant insert (Fig. 4). When fully assembled, the Cavitron® SoftTip Ultra sonic Implant Insert can easily be incorporated into a clinician's implant maintenance procedure.

Incorporating ultrasonics scaling into the implant maintenance protocol may have several benefits. Combining ultrasonic movement and irrigation can aid in the removal of biofilm and other debris in the implant prosthesis sulcus. Wilkins wrote in 2012: “Studies indicate cavitation is capable of destroying surface bacteria and can remove endotoxin from the root surface.” And: “Oscillation of the ultrasonic tips creates hydrodynamic waves to surround the tip. This acoustic turbulence is believed to have a disruptive effect on surface bacteria” (Wilkins, 2012). Multiple in vitro studies have discussed that cavitation may have the potential to disrupt the cell wall of the bacteria, and acoustic turbulence is believed to have disruptive effect on the surface bacteria (Baehni, 1992; McQuade et al., 2009). However, further in vivo studies need to be conducted to determine if the same outcomes are achieved in the sulcus.

Another benefit to incorporating power scaling into the maintenance procedure is the ability to adapt the active tip area into the implant sulcus. Incorporating vertical adaptation of the active tip, at a zero-degree angle, into the implant restoration can allow for significant subgingival surface contact for efficient deposit removal. When the emergence profile follows the anatomical shape of a natural tooth, this instrumentation technique can be an effective method of maintaining the site.

Finally, easy access for the patient is extremely important in the success of the implant prosthesis. There are a variety of interdental brushes, cleaners, and floss options available to the patient. It is important for the clinicians to use, not cause tissue trauma in the implant sulcus, or surface damage to the esthetic materials in the restoration.

Dental implants are increasing in demand in part by their high success rates and the improved esthetics they provide the patient. A key to this success is having the proper design incorporated into the implant restoration. When designed properly, the implant restoration can be easily maintained by both the patient and clinician.

References


Published in pdentistry.com

Kayla Claire-Zinnett MS BS She is a senior scientist at The Procter & Gamble Company. She began her career in oral care research and development with Oral-B in 2009. She received her master of science (MS) degree in physical chemistry from Stan ford University, and her bachelor of science (BS) degree in chemistry from Birmingham Univer sity, New York. Kayla has ap plied innovation from understanding work such as that described by both manual and power toothbrush designs in numerous oral care patents.

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