




CONTAMINATION TRIGGERED BY SPRAY RELEASED FROM HIGH ROTATION CANS USED IN DENTISTRY

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ABSTRACT

Objective: The objective of this review article is to address how the spray released during the use of the high-speed dental pen can end up triggering contamination processes in the environment in which the dentist is using it, addressing what this could cause and how it would, in addition to highlighting this spray release mechanism. **Methodology:** In order to acquire only articles, research and studies on the topic addressed in this article, the following descriptors were used during searches on online sites: High-Speed Dental Equipment; Aerosols; Contamination; Aerosolized Particles and Droplets. In order to obtain the maximum amount of safe, current and scientifically tested information, research was carried out in databases that have data related to the topic. The research was done on the following websites: PUBMED, BVS/BIREME, CAPES Periodicals Portal, Web of Science, DeCs, Scielo, PROSPERO, The Cochrane Library, Science Direct, FT Magazine, LUMEN ET VIRTUS Magazine and Research, society and development journal. To compose this set of information, gray literature was also used to compose the review article. **Results:** Articles, course completion papers, master's and doctoral studies and books that show scientific evidence about the possible contamination triggered by the spray were acquired.

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Conclusion: Thus, it is seen that the spray can indeed contribute to contamination, which can harm the life of the dentist, ASB and the patient himself, and can cause them to end up acquiring health problems such as diseases.

Keywords: High-Speed Dental Equipment. Aerosols. Contamination. Aerosolized Particles and Droplets.



INTRODUCTION

Dentists perform procedures during their undergraduate studies and throughout their clinical careers, most of which use a device popularly known as a “high-speed handpiece,” an extremely effective piece of equipment for a variety of procedures that is essential in the dental environment. In the dental office, several instruments are used in conjunction with the rotary handpiece in certain procedures, which are taken to the oral cavity and come into direct contact with a range of secretions such as the patient's saliva, blood, respiratory secretions, and blood. This can end up triggering cross-contamination processes that can transmit fungi, bacteria, and viruses from a given patient to the surgeon, ASB, or even to future patients (Meng et al., 2020; Smith & Smith, 2014; Silva et al., 2011; Zemouri et al., 2017; Harrel & Molinari, 2004). Thus, the Ministry of Health developed protocols that must be followed within the surgeon's clinical life, procedures created through the concern that complications caused by lack of hygiene may occur during dental treatments, with biosafety as a practice that has the role of avoiding and reducing the chances of possible problems that impact the lives of health professionals and their patients (Ministério da Saúde, 2000).

Within the protocols created to avoid contamination processes, it is clear that sterilization must be a practice performed daily by the dentist, one of the most important practices because it is the way to eliminate pathogens retained in the equipment, in order to avoid this range of problems that can be triggered by the contamination of materials and equipment. However, one factor ends up being neglected, the fact that the high-speed pen is one of the main causes of contamination, through the constant release of invisible particles, which are difficult to see, because they do not have colors, because their small size makes them difficult to see on surfaces and which can go unnoticed when emitted in small quantities (Duarte Filho et al., 2012; Discacciati et al., 1998; Knackfuss et al., 2011). Thus, it is seen that the spray released by the pen is a vehicle of contamination, which can end up helping in the distribution of infectious processes.

From this, the objective of this literature review article is to discuss the spray emitted by the high-speed pen, addressing how it can be a harmful mechanism to human health, identifying how this can happen, if there is any way to prevent it and what is the field of contamination that this device can distribute within the dental office.

METHODOLOGY

This study is a narrative literature review, so it was necessary to use an existing study that had a scientific basis to serve as a guide for how to construct an article of this type. Thus, Rother's work (2007) was used as a basis for developing the search

methodology used in this article, to show how the approach and structure of the article should be. In order to acquire only articles, research and studies on the topic addressed in this article, the following descriptors were used during searches on online sites: High-Speed Dental Equipment; Aerosols; Contamination; Aerosolized Particles and Droplets. In order to acquire the maximum amount of safe, current information with a tested and proven scientific basis, research was carried out in databases that have data related to the topic, the research was done on the following websites: PUBMED, BVS/BIREME, CAPES Periodicals Portal, Web of Science, DeCs, Scielo, PROSPERO, The Cochrane Library, Science Direct, FT Magazine, LUMEN ET VIRTUS Magazine, Research, society and development journal combined with the Google Academy website. To compose this set of information, gray literature was also used to compose the review article.

RESULTS

A survey conducted by the World Health Organization obtained statistics that show that around a quarter of patients who go to the dentist's office have a disease that can be transmitted to oral health professionals, making dental professionals the third most infected professionals (WHO, 2012). In dental settings, it is common to use equipment that releases aerosols, such as micromotors, ultrasounds, water syringes and the essential high-speed pens (Legat, 2001). This spray dissipated by the high-speed pen is of great relevance for controlling the health of the dentist and patients, at a time when the aerosol released can be an instrument for the transmission of pathogens in a closed environment such as the dental office (Jakush, 1986; Bentley et al., 1994; Legnani et al., 1994). Studies have shown that pathogens such as SARS-CoV-2 and acute respiratory syndrome can be dissipated up to 1.82 meters away (Kutter et al., 2018).

According to a study conducted by Mattos, results were obtained that show that the high-speed pen is one of the main mechanisms that promote contamination of the environment, by releasing microbial sprays into the air, due to the contact of the jet with the oral cavity (Mattos, 2013). Another study showed that during the consultation, this spray and splashes contaminated with microorganisms that can be derived from a patient's blood, saliva or contaminated tissue can come into contact with surfaces around the office, places that may contain certain materials, instruments and equipment, triggering their contamination (Discacciati, 1998; Santos, 2006). According to another researcher, the particles dispersed in the air during dental treatment can penetrate the connective membranes through the respiratory tract, potentially contaminating patients or the dentist who ends up inhaling the contaminated air (Discacciati et al., 1998). A study obtained



results that state that the dentist is the person most likely to suffer cross-contamination through the aerosol emitted during the use of the high-speed pen, and then the patient, because the aerosol is more widely distributed around the dental chair, with a contamination of 2.60 meters by 82 centimeters within the dental office where the tests were carried out (Mamade, 2022). Another study used phenolphthalein as a chemical indicator to identify the distribution of contamination generated by the spray from the discharge pen. In this study, a result was obtained that did not indicate which microorganisms could contaminate the dental environment through the pen, but that there is in fact a large quantity, even though it was not specified. In addition, it was seen that the spray released by the discharge pen contaminates both the dental environment, as well as the patient and oral health professionals, which is something that could in fact cause cross-contamination (Silva & Pizante, 2017).

DISCUSSION

It is a fact that the high-speed handpiece is essential in the life of a dentist. However, even though this device is extremely efficient and essential in various treatments and procedures throughout the dentist's clinical life, it is important that he or she be aware of the fact that it is a contamination mechanism, which releases a spray that can be responsible for cross-contamination, which will make the post-operative period of patients difficult, and can also be responsible for making the surgeon and ASB sick, who are in direct contact with this released aerosol, which can turn a "positive" treatment into some "harmful" aspects. Thus, the need to comply with biosafety and protection standards becomes evident. During clinical life, certain dentists tend to "relax", stopping to use certain protective measures such as the use of masks and face shields, which are two essential protection mechanisms, especially in protection against this spray, causing the contaminated substances to be retained both in the mask, preventing them from being inhaled by the professional or from coming into contact with the same mouth, while the face shield will prevent the contamination from coming into contact with the dentist's eyes, thus serving as mechanisms that can reduce the probability of cross-contamination. Another aspect is the cleaning of the office, which should never be ignored. The spray released is usually distributed in an area that reaches both the dental chair and tables located close to the chair and which are mostly made up of instruments and equipment. Therefore, it is necessary to clean this entire area, in order to avoid future contamination that reaches future patients and the dentist who will be close to these objects throughout their working day.

One of the obstacles seen through the literature review is the fact that the contamination field that the spray can reach is not standard, each high-speed pen has a different distribution, in addition to the fact that the position of the furniture and the size of the office are different in each office, which will influence different dispersions. Therefore, it is important that more studies be carried out with the objective of developing accessible and efficient equipment that can "suck" the contaminated air and spray released by the pen, so that this material is pulled out, preventing it from reaching the human body. It is important that more research be carried out to identify the main contaminated areas in the office, using chemical identifiers, so that a reference can be obtained of which areas need to be cleaned and given greater care by professionals.

The amount of cross-contamination triggered by the high-speed pen is something that has still been little explored, it is something that has been little addressed and with little research, highlighting the need for more research on the subject to be done, in order to improve dental treatment, bringing more health and safety to the patient who is seeking treatment such as the surgeon during his work, dealing with something that has a certain urgency, as it can be one of the responsible for a large part of the complications and worsening that occur in cavity diseases and in the post-operative period.

CONCLUSION

The high-speed handpiece is an essential device in the dentist's life, an instrument used in the surgeon's daily clinical practice since graduation, being an ally in various types of dental treatments and procedures, and something that can be considered indispensable and essential in the dentist's life. However, it is seen that there is a problem related to high-speed handpieces: the spray released by the handpiece can contain bacteria, viruses and other pathogens, which can end up contaminating the dentist, oral health technicians and even other patients, and can leave residues inside the office if there is no proper hygiene, triggering a drastic contamination process. Therefore, it is a fact that the high-speed handpiece is necessary and indispensable in dental procedures.

However, procedures to contain this spray must be created, aiming to reduce the contamination field, in order to avoid possible future problems. It is clear that it is necessary to create new devices and equipment that can contain this contaminated aerosol, protecting the lives of the patient and the surgeon. In addition to new equipment, it is extremely important that the dentist uses protective equipment, which will serve as a protective barrier against this spray that can often come into contact with the eyes, mouth or nose if the dentist does not use the protective equipment correctly. Thus, it is concluded that the spray



released by the high-speed pen can indeed be harmful to human health, as it may be contaminated with pathogens, which will come into contact with the human being through contact of the aerosol with the skin, some orifice or through cuts, harming the life of the individual. It is extremely important that more research be developed that seeks to show precisely the places where the spray ends up having the most contact, the radius of contamination reached and how the dentist can reduce this distribution of aerosol in a way that does not harm the treatment or the life of the patient and the dentist.



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