Summary of Article

With rising concern over the rapid spread COVID-19 that is caused by the highly contagious severe acute respiratory syndrome coronavirus 2 (SARS-CoV 2), medical professionals have been challenged with making improvements to limit its transmission during the administration of medical and oral care. Improvements that would lessen the likelihood of patients getting into physical contact with fomite objects and aerosol droplets that carry the virus. Dentists and dental teams in particular have been tasked with maintaining safety measures by studying and evaluating the effectiveness of dental evacuation systems in reducing aerosols during prophylactic procedures in a large clinical setting. One study in particular conducted by Montry S. Suprono DDS, MSD; John Won DDS, MS; Roberto Savignano, PHD et al; was published in *The Journal of the American Dental Association* in June of 2021. (https://jada.ada.org/article/S0002-8177(21)00133-1/fulltext doi: 10.1016/j.adaj.2021.02.013.)

The study, which was conducted in a single-center, controlled clinical trial using a split-mouth design; involved 93 dental students who passed COVID-19 screenings among other criteria, concluded that the combination of High-Volume Evacuation (HVE) and intraoral suction devices significantly reduced the amount of microbial aerosols settling in the air between oral care treatments.

Article Information

The article titled: “A clinical investigation of dental evacuation systems in reducing aerosols” was authored by Montry S. Suprono DDS, MSD; John Won DDS, MS; Roberto Savignano, PHD et al; and was published in *The Journal of the American Dental Association* in June of 2021 and had no sponsors or any reported disclosure for conflicts of interest. (https://jada.ada.org/article/S0002-8177(21)00133-1/fulltext doi: 10.1016/j.adaj.2021.02.013.)

Study Analysis:

Type of Study

The study in the article was a primary observational, clinical study that took place at the Loma Linda University School of Dentistry in California at one of its large clinical centers. It was a controlled trial using a split-mouth design where aerosol samples were collected on blood agar plates that were placed around the clinic.

Study Purpose

The study's purpose was to evaluate the effectiveness of dental evacuations systems in the prevention of the transmission of aerosol diseases during oral prophylactic procedures, due to the life-changing impact of the Covid-19 pandemic. The Covid-19 pandemic and the contagiousness of severe acute respiratory syndrome coronavirus 2 has challenged dentists and other oral care providers to improve the safety of both patients and dental teams during treatment procedures even in large clinical settings.

It was the hope of the study's authors to make advancements is the limiting of aerosols and aerosol droplets in large clinical settings when oral care treatments are being administered, especially after the Center for Disease Control and Prevention (CDC) released guidance in 2019 that stated that the aerosols generated during the use of an ultrasonic scaler or a high-speed dental drill may impose risks to oral health personnel and patients. The CDC believed that the aerosols released could consist of droplets and debris that may contain bacterial cells or spores, fungal spores or viruses; so while in the middle of a pandemic it is imperative to be more cautious. With that guidance the American Dental Association Council of Scientific Affairs, then recommended the implementation of control measures to reduce the amount of aerosols during dental procedures thus leading the way to studies like the one conducted by the authors of this article.

Experimental Design

To conduct this study, the dentists and other doctors of Loma Linda University School of Dentistry recruited students including incoming 3rd-year and 4th-year predoctoral dental students as well as 2nd-year international dental and dental hygiene students to sign-up for their single-center clinical study that used a split-mouth designed controlled trial. Because they performed a preliminary investigation to collect preliminary data, they were able to determine that they needed a minimum of at-least 30 participants for sample size to make an informed conclusion about the effectiveness of their efforts to reduce aerosols in their large clinical setting.

Luckily they were able to successfully recruit 93 participants who passed a round of Covid-19 screening and temperature checks, but who also had good general and oral

health and at-least 20 natural teeth. Patients and other students who had allergies or were pregnant were excluded from the study, especially if they had a history of infectious disease or had a recent dental prophylaxis in the 2 weeks before the study. For the study the 93 participants were asked to refrain from performing oral hygiene care for at-least 10 hours before their appointment as well as refraining from eating or drinking anything but water for the 4 hours before. The participants were informed that for the study they will be going under two 20-minute procedures. One 20-minute procedure for each side of the mouth. For the first procedure, each participant underwent an oral prophylaxis using a standard HVE device and an ultrasonic scaler. For the second procedure, they underwent the same oral prophylaxis with an ultrasonic scaler on the other side of their mouth but this time with the use of both a standard HVE device and an intraoral suction device. Throughout the study, agar plates were used to measure the amount of aerosols in the air at each stage of the study. The plates were placed all around the open bay clinic and collected to determine baseline and posttreatment levels of aerosols as well as the aerosol levels during both oral prophylaxis procedures to determine which method was the most effective at reducing potential disease containing aerosols.

After the procedures the agar plates were incubated at 37 degrees celsius for 48 hours so that an automatic colony counter could be used to determine the amount of Colony-forming Units (CFU) that appeared resulting from aerosols dropping on the agar plates at each stage of the study. After reviewing the amount of colony-forming units, the researchers performed Kruskal-Wallis and Wilcoxon signed rank tests to compare the CFUs. The Kruskal–Wallis test is a nonparametric approach to the one-way ANOVA. The test is used to compare three or more groups on a dependent variable that is measured on at least an ordinal level. While the Wilcoxon signed-rank test is a non-parametric statistical hypothesis test used either to test the location of a set of samples or to compare the locations of two populations using a set of matched samples. Both tests determined that the agar plates collected after the two oral prophylaxis procedures, compared to the controlled baseline and posttreatment collections, had more aerosols present on them that caused colony-forming units.The conducted both tests using the statistical software and programming language “R”. With

this finding, they determined that: Yes, aerosols are released during oral prophylactic procedures but that the combination of a standard high-volume evacuation device and an intraoral suction device can significantly reduce the amount of aerosols that are present once a procedure is completed.

Results

The results of the study determined that aerosols are indeed present when oral prophylaxis treatments are administered. But the use of a combination of a standard high-volume evacuation device and an intraoral suction device can significantly reduce the amount of aerosols that are present once a procedure is completed. Especially when compared to use of just an intraoral suction device. However the results did mention that while the combination of devices worked to reduce the amount of aerosols that led to colony-forming units being present throughout the clinic, that was still was a significant amount of of aerosols present in the immediate operating zone of the procedures but even more so on the patients even with the use of the combination of the HVE and the intraoral suction device.

Ultimately, the researchers found out that statistically significant ($P < .05$) progress can be made to limit the transmission of disease-causing aerosols in a clinical setting; especially in a clinical setting where oral prophylaxis procedures are performed. Ranked ordinally from 1-4, the baseline agar plate ranked 1st had the least amount of CFUs, then the posttreatment agar plate ranked 2nd, while the agar plated collected after just the use of the combination of the HVE and intraoral suction device ranked 3rd with significantly less amount of CFUs compared to use of just the HVE which 4th.

Conclusions

In conclusion, the researchers and authors of the article were able to find significant reductions in the amount of microbial aerosols during oral prophylaxis procedures when both a High-Volume Evacuation and intraoral suction device are used. This finding is important, because it eases concerns about the safety of going to a dentist appointment in the middle of a pandemic. While the authors did note that the use of both devices significantly lowered the amount of CFUs caused by aerosols throughout the clinic, they brought up in their conclusion that a significant amount of CFU causing aerosols were found on the patients and in the immediate operating

space. They also mentioned that their study had limitations in which it was conducted in a large clinical space that was open-bay designed and had 5-foot tall cubicles dividing the operating spaces. It is believed that the cubicles may have helped limit the spread of aerosols in addition to the airflow from the clinic's ventilation system. They also mentioned that typically pre and post antibacterial mouth rinses are used during oral prophylaxis procedures but that their use was not evaluated during this study. In their next studies, they plan on evaluating the use of the HVE device and the intraoral suction device in a clinical space that does not have cubicle dividers. They also would like to evaluate the use of antibacterial mouth rinses, in the prevention of the transmitting of disease-causing aerosols. Ultimately they concluded that they would recommend the use of both the HVE and an intraoral suction device.

Impression

My impression of this article and study is that the author's findings are very important, especially in this day and age. We are currently in the middle of a pandemic and people are scared of catching or spreading Covid-19. So increasing safety measures may encourage more people to come in for dental visits and to take their oral care seriously. I believe that dentists and other dental care practitioners should start implementing the use of both a High-Volume Evacuation device and an intraoral suction device to limit the spread of all aerosols not only, because of the pandemic but because their use is generally safer not only for the patients but for everyone.

This article has me thinking about what else can be done to protect dental care practitioners in the workplace, because i've heard of cases of asymptomatic positives and false negatives during Covid-19 testing that may scare some dentists and hygienist from administering oral prophylaxis procedures; especially since the study did find the highest amount of colony-forming units caused by aerosols on patients and in the immediate operating space.