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EXTRA ORAL SUCTION: AN ADDITIONAL SHIELD A NARRATIVE REVIEW

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ABSTRACT

Dental personnel and patients are exposed to tens or thousands of bacteria, and the potency to breathe the infective material that is present as aerosols during routine procedures is high. In the beginning of recent global pandemic COVID-19 in addition to our ongoing strict guidelines and universal precautions, several companies offer an additional layer of safety, they have added to facilitate the care and protection of both staffs and patients by a practical point of view, usage of a high-volume evacuator. A device to eliminate or reduce the aerosol generated during dental procedures will help to lessen the cross infection in the dental clinics. Extra-Oral Vacuum Aspirator / Suction is a designed device to absorb the aerosol generated during the dental treatment process to avoid cross-infection in the dental clinics. Extra oral suction is droplets & aerosols terminator, along with strong suction vacuum pressure and large flow rate, the aerosols

will be fully sucked into the machine and get discharged with a complete purification inside the unit. No single approach or device can reduce the risk of infection to dental personnel and other patients completely. A single step will minimize the risk of infection by a certain percentage; another step added to the first step will reduce the remaining risk, until such time as the risk is minimal. This can be defined as a layering of protective procedure.

Keywords: Extra-Oral Vacuum Aspirator / Suction, aerosols, HEPA filter

Key Messages: Extra oral suction is a device designed for dental practices to effectively capture droplets and airborne aerosols from treatments and it ensure patient comfort during usage. It is designed in such a way to trap viruses and bacteria and inactivates using HEPA filter.

INTRODUCTION

Microorganisms present in oral cavity of patients and their blood and saliva may cause different air-borne and blood-borne infectious diseases among dentists and their assistants **[1]**.

Most of the dental procedures create aerosols and droplets that are contaminated with bacteria and blood. These aerosols act as a possible route for disease transmission. The existing microbes in the oral cavity can be transmitted directly to other individuals or can settle on surface from which they can be transferred to patients and clinical personnel **[2]**.

In the dental clinics, during the clinical procedures there are many possible ways for transmission of infection. The consensus has been that the greatest airborne disease threat in dentistry comes from aerosols (particle size less than 50 μm in diameter) due to their ability to remain airborne and has the potential to enter the respiratory passages **[3, 4]**. Common diseases that are known to be transmitted via airborne route are Tuberculosis, Influenza, Legionnaires' Disease, Severe Acute Respiratory Syndrome **[5]**, COVID-19. In the past, TB was considered as an occupational hazard in the field of dentistry **[6]**.

Numerous dental procedures like tooth preparation using a hand piece or air abrasion, usage of a three way syringe, on using an ultrasonic scalers and while air polishing etc produce aerosols and droplets that are contaminated with bacteria and blood **[5]**. Potential routes of infection in dental settings embrace direct and indirect contact, inhalation and injections/punctures **[5, 7]**. These routes may be bidirectional, meaning transmission may occur from patient-to-

patient, patient-to-clinician, or clinician-to-patient **[8]**. Dental personnel and patients are exposed to tens or thousands of bacteria, and the potency to breathe the infective material that is present as aerosols during routine procedures is high **[9]**.

It has been documented that airborne contamination can be reduced by layering several infection control steps over the routine precautions used during all dental procedures. Methods available to reduce the airborne contamination arising from the operative site are the ones involve using devices that remove the contaminated material from the air of the treatment surrounding after it has become airborne and the other is to remove the airborne contamination before it leaves the immediate area surrounding the operative site[5]. Frequently recommended methods of removing airborne contamination from the air present in the treatment room are the usage of a high efficiency particulate air, or HEPA, filter and the use of ultraviolet, or UV, chambers inside the ventilation system. Even though both of these systems reduce airborne contamination, they are somewhat expensive **[5]**.

During pre-COVID-19 dental practice, attempts were made to reduce the aerosol and droplet escape from the oral cavity using intraoral suction with low and high vacuum, tooth isolation with a rubber dam, use of mouth props with suction, and saliva drying agents, but inhalable aerosols and droplets were still dispersed even with the usage of these methods **[6]**.

But in the beginning of recent global pandemic COVID-19 in addition to our ongoing strict guidelines and universal precautions, several companies offer an additional layer of safety, they have added to facilitate the care and protection of both staffs and patients by a practical point of view, usage of a high-volume evacuator. It should be emphasized that for a suction system to be classified as high vacuum evacuators, it must remove a large volume of air within a short period **[5]**.

No single approach or device can reduce the risk of infection to dental personnel and other patients completely. A single step will minimize the risk of infection by a certain percentage; another step added to the first step will reduce the remaining risk, until such time as the risk is minimal. This can be defined as a layering of protective procedure **[5]**.

A device to eliminate or reduce the aerosol generated during dental procedures will help to lessen the cross infection in the dental clinics.

Extra-Oral Vacuum Aspirator / Suction **(Figure 1)** is a designed device to absorb the aerosol generated during the dental treatment process to avoid cross-infection in the dental clinics **[10]**.

Extra oral suction is droplets & aerosols terminator, along with strong suction vacuum pressure and large flow rate, the aerosols will be fully sucked into the machine and get discharged with a complete purification inside the unit. Filtration efficiency is approximately up to 99.99% **[11]**.

INTRA ORAL SUCTION WITH EXTRA ORAL SUCTION

Extraoral suction showed to have superior capture compared to intraoral devices. Efficacy of aerosol, which is captured, is highly sensitive to the position of the extra oral suction relative to the operative field where aerosol is being generated **[9]**. Droplets counts had decreased significantly, when used intraoral and extra-oral suction at the same time. Using a dental dam with extra oral suction or the Isolate system significantly reduced aerosol overall compared with use of HVE alone **[12]**.

Figure 1: Extra oral suction

Working principle of extra oral suction

Basic principle of extra oral suction includes SUCTION and DISINFECTION. With strong suction vacuum pressure and large flow rate, the aerosol between doctors and patients is sucked into the machine and

discharge after thoroughly purified. The aerosol enter in the machine is filtered through HEPA (High Efficiency Particulate Air) filter and then sterilized by UV rays and then discharge after a large amount of plasma sterilization and purification.

HEPA filters with appropriate grade can also remove a high proportion of airborne viruses (one of the earliest references to HEPA filter and viral removal dates back to 1976) **[13]**. The effectiveness of this depends upon the number of the viral particles and the relative size of the virus. Although the most clean room HEPA filters are certified against its ability to remove the particles from the air of a size 0.3 μm and greater, filters are capable of removing particles of a smaller size. Many HEPA filter manufacturers have undertaken the test in relation to virus removal (although different types of viruses and different viral challenges will have been used, in the absence of any standardization) **[14]**.

The plasma disinfection covers almost every aspect of the resistance hierarchy of microorganisms **[15]**.

According to manufacturer, the specification of extra oral suction used at the maximum flow capacity throughout the relevant procedures. The extra oral suction intake is consistently placed such that it is possible to shift and place suction arm effectively in front of the patient's oral cavity **[16]**.

Advantages of extra oral suction

- Extra Oral Suctions had reduced the mean intensity of the contamination for the clinical area, the clinician and the assistant **[17]**.
- Grabbing and removing the droplets and aerosols at the point of generation minimizes the potential exposure.
- A strong suction pump, large flow, high vacuum has more wide performance.
- Multidirectional flexible folding arm which is convenient to adjust height and position etc.

Limitation

- As the vacuum airflow level is increased there is an increase in ambient noise
- Additional space or setup required
- High cost of the device

CONCLUSION

Due to the risk of infectious transmission caused by dental aerosols, transmission-based precautions must be a key element of daily practice. Current scenarios emphasize the need for novel protection measurements from droplets spray for dental staff, patient and also to ensure patient and provider safety, oral health professionals should abide

by the latest guidelines and recommendations which includes using high vacuum extra oral suction or an isolation-and-evacuation device, providing pre procedural mouth rinses, maintaining dental unit water quality, and wearing proper PPE **[18, 19]**.

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