



IJCRR

Section: Healthcare

Sci. Journal Impact

Factor: 6.1 (2018)

ICV: 90.90 (2018)



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Use of Newer Protective and Disinfection Strategies: A Simple Tool Guide for the Dentists During the COVID-19 Pandemic

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ABSTRACT

Aim: This paper aims to provide a simple tool guide for dental practitioners about understanding the utility and effectiveness of the new protective measures for prevention and disinfection in dental practice during the COVID-19 pandemic.

Methods: The preventive and disinfection guidelines of different statutory bodies were collected online and the new protective measures and equipment for safer dental practice were listed down.

Results: Based on this list the technical details of these measures are presented for easy understanding of the dentist.

Conclusion: The COVID-19 pandemic may be here to stay. It is important to understand this equipment to keep safe the dental health care providers, their assistant, and patients.

Key Words: Dentistry, COVID-19, SARS-CoV-2, Disinfection, Dental clinics

INTRODUCTION

COVID19 was first reported in the Wuhan district of China in December 2019. It was declared a Public Health Emergency of International Concern on 30 January 2020¹. It has affected all the continents in the world with more than 6 million cases as on 2nd June, 2020². COVID -19 is supposed to be a droplet infection that spreads when someone cough, sneeze or, talk³. Most of the countries are on full or partial lockdown to contain the spread of this infection.

The lockdown has affected all spheres of life and dentistry is also not spared. Most of the dental clinics were shut down because of it. The dentists were advised to postpone the dental procedures and restore to telephonic consultations. There have been multiple guidelines from different agencies regarding protocols for dental practice during the pandemic and regarding reopening the dental clinics after the lockdown^{3,4,5,6}.

These guidelines recommend the use of many new protective measures and equipment for safer dental practice during the COVID-19 pandemic. These measures include N95/

FPP2/similar masks, PPE, HEPA filter, UV Light, Fogger, etc. which were earlier not part of standard dental practice. It has also led to a spurt of multiple products in the market. There are no uniform guidelines about them and many of the practitioners are not familiar with these products. They get misled by the advertisements and end up buying a product that may not be suitable for their practice. This paper aims to provide a simple tool guide for dental practitioners about understanding the utility and effectiveness of these new protective measures.

Personal Protection Equipment (PPE)

PPE is one of the most important measures to prevent transmission of SARS -Cov-2 during dental practice. It consists of face protection, mask, goggles or full face shield, gloves, gown or coverall, headcover, and foot covers.

A. Coverall Gown

The characteristics of an ideal gown are functionality, barrier effectiveness, comfort, cost, strength, fit, time to don and doff, biocompatibility, flammability, and quality main-

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ISSN: 2231-2196 (Print)

ISSN: 0975-5241 (Online)

Received: 18.06.2020

Revised: 19.07.2020

Accepted: 12.08.2020

Published: 22.08.2020

tenance^{7,8}. There is a wide range of gowns available like washable to disposable, 40 to 140 gsm, woven to non-woven, and laminated to non-laminated. For all aerosol-generating procedures, you are recommended to wear a laminated, non-woven fibre bonded full-body gear made of at least 70 GSM synthetic fibres (e.g. polypropylene, polyester, polyethylene)⁸. In non-aerosol generating procedures, reusable/ multiuse gowns may be used. Reusable (multi-use) gowns are laundered after each use. These gowns are mostly made of 100% cotton, 100% polyester, or polyester/cotton blends. These fabrics are tightly woven fabrics that are chemically finished and mostly pressed between rollers to increase the liquid barrier properties. These reusable garments can be used for almost 50 washing and drying cycles or can be reused as per manufacturer's instructions⁸.

To prevent any transmission from cuff area it is highly recommended to wear gloves over the cuff area. These should be certified by dedicated govt. testing labs e.g. DRDO, SITRA and similar.

B. Mask

There are multiple types of masks available in the market like surgical masks, N95, KN95, N 99, FFP1, FFP2 etc. This leads to confusion at times. Please understand that different countries use different certification standard for mask type. For example, Europe uses the EN 14683 standard for surgical masks and FF (e.g. FFP2) for respirators, China uses the YY 0469 for surgical masks and KN (e.g. KN95) for respirators, USA uses the ASTM F 2100 for surgical masks and N (e.g. N95) for respirators, whereas India uses the IS 16289:2014 for surgical masks and IS 9473:2002 for respirators. Each standard may vary a bit by country, but they are broadly similar. **(Table-1)**. American standards are certified by NIOSH, which is a part of the Center for Disease Control (CDC), European standards are certified by CEN (European committee of standardization) whereas, Indian standards are certified by Bureau of Indian Standards.

Considering the risk to dental professionals during COVID-19 times, CDC recommends the use of N95/ equivalent respirators for all aerosol-generating procedures. In case an N95 is not available, a surgical mask with a full face shield may be used³. For a non-aerosol generating procedure, a surgical mask may be used. The N95 respirators are available in different sizes, you should follow the manufacturer's instruction to choose your size so that they fit well and create an air seal.

C. Eye Protection

The use of protective eyewear is a must to prevent splash of droplets, saliva, or aerosol in the eyes during a procedure. A good quality face shield is also recommended. It should

extend below the chin to prevent aerosols or droplets coming onto the face of the dental operator. The wear should not clog and is easily disinfected.

HEPA/ULPA Filter

Use of indoor portable air cleaning system equipped with HEPA filter has been recommended in recent guidelines^{3,4}. Commercial Portable air purifiers are fitted with either HEPA or ULPA filters. HEPA (High-Efficiency Particulate Air) filter captures 99.97% particles 0.3 microns in diameter and above. ULPA (Ultra-low Penetration Air) filter captures 99.99% of particles 0.12 microns and above. Theoretically, all SARS-CoV-2 virions may be filtered and captured, based on the assumption that they can be brought into contact with the air filter⁹. The authors recommend portable air purifier with H14 grade HEPA filter compare to the ULPA filter because it reduces the amount of airflow by 20% to 50% in the same area and is more expensive. Most of these commercially available air purifiers cover 200-800 sq. feet area and circulate the air 4 to 10 times per hour. You may need to check the value of CFM (cubic feet per minute) of your unit to calculate the air change per hour depending on the size of your operatory. You may choose the one as per the size of your clinic or have multiple units placed for a bigger area. Always place the purifying unit near the patient and never between the patient and dentist. It should facilitate the flow of air from cleaner to less clean area³. The authors recommend the use of an air purifier with HEPA 14 filter with a Pre-filter (to absorb bigger particles and moisture thereby increasing the life of the HEPA14) and UV light. Maintenance and change of filters may be done as per the manufacturer's instructions.

UV Light

The UV light specifically between 200 to 228nm can inactivate SARs-C0V-1 and MERS- CoV^{10,11}.

The use of UV-C may be a useful adjunct for disinfecting air and surfaces in dental clinics during the COVID-19 pandemic. According to IUVA (International UltraViolet Association), UVC can augment the existing process of disinfection, it further states that "IUVA recognizes that in the cases where the UVC light cannot reach a particular pathogen, that area will not be disinfected. However, in general, reducing the total number of pathogens reduces the risk of transmission. The total pathogenic load can be reduced substantially by applying UV to the many surfaces that are readily exposed, as a secondary barrier to cleaning"¹².

There are various devices available. They are based on one of two main UV technologies, mercury UV or pulsed xenon UV. Each device is designed to be used in different fashions compare to others. It should be placed in such a way that it should reach all areas of the operatory. The wattage may

differ as per the size of the room and manufacturer's instruction. Please do look for the four parameters to check for the efficacy of the UV device: dosimetry, environmental studies, in vitro studies, and clinical outcome data. Safety feature such as motion sensor is beneficial as it cuts off the device the moment someone steps in the vicinity of the UV light.

Portable UVC handheld devices may be used to sterilize currency notes, office stationery like pens, prescription pads, and UV box can be used to disinfect prescriptions, spectacles, keys, pocket purses, protective eyewear before leaving the clinic premises.

Fogging

CDC has not acknowledged, "fogging" as an effective method to combat COVID-19³. Disinfection with a dry disinfectant fogger can only be another adjunct for disinfecting the dental operatory. Hydrogen peroxide-based disinfection fogging formula may be used. The fogger should produce a fog or mist formed by Ultra-low Volume (ULV) uniform sub-micron size liquid particles (Dry Fog). The buyer should look for machine capacity, area coverage, motor speed, nozzle system (jet nozzle system is preferred), particle size, and liquid flow rate before buying a fogging unit.

Ioniser

An ion-generator or an ioniser releases negative ions into the air. These negative ions can attach to positive ions in the fungal spores, airborne bacteria, and viruses. This leads to the increased weight of the bonded molecules and it makes them fall to the ground or settle on surfaces, thereby cleaning the air, but surfaces will still need to be disinfected. There are no data to substantiate the use of these ionisers for disinfecting the dental clinics. Department of Science, Govt. of India has made such an Ioniser called ScitechAiron. I&B Ministry, Govt. of India issued the following press release "The negative ion generator titled ScitechAiron, which helps to control the virus, bacteria, and fungal infections in a closed environment, could clean up the air and disinfect areas that are exposed to the infection through COVID-19 positive cases and suspects. Hence it could ensure the wellbeing of the staff, doctors, and nurses who are working round the clock in the quarantine facilities by enhancing their disease resistance power and ability to fight the virus."¹³

Extra Oral Suctions

The use of extra high volume suction for aerosol-generating procedures is recommended along with the regular suction¹⁴. There is a recent spurt in the market of extraoral negative pressure suction machines with HEPA filters, charcoal filters, and UV sterilization to absorb the aerosols during dental procedures. There is no study to prove their efficiency. However, a study done in 2001 checked a modified extra-

oral vacuum aspirator (EOVA) from the household vacuum cleaner in reducing bacteria in dental aerosols. The results of the study showed a significant reduction in oral bacterial aerosols during dental treatment¹⁵. Keeping in view the results of this study, the authors feel that this extraoral suction may be a useful tool to reduce the burden of aerosols in dentistry.

Disinfectant

Use 1% sodium hypochlorite and 70% alcohol-based disinfectant is recommended for surface disinfection in dental clinic^{4,16,17}

Kindly go through MoHFW and CDC guidelines regarding the correct use of surface disinfectants in your clinical practice. These guidelines are dynamic and keep on updating on a regular bases. Please follow the manufacturer's instructions regarding the use of surface disinfectants.

CONCLUSION

The dentistry is facing its dark hour due to COVID-19 pandemic and WHO has warned that the SARS-CoV-2 virus may never go away. However, the dental clinics can not remain closed forever but we need to be careful and prepared before the dental practice can be restarted. Keeping because of the WHO statement, the authors feel the use of these newer protective and disinfection strategies will be a new normal in Dentistry. It is important to understand this equipment and choose them wisely for your dental practice. They will help to keep safe the dental health care provides, their assistant, and patients. The DHCP is requested to keep themselves updated regarding the newer guidelines, which are updated from time to time.

ACKNOWLEDGEMENT

Our sincere thanks to Ministry of Health - Government of India, Centre of Disease Control, USA, World health organization, American Dental Association and National Health Service, UK whose articles/reports/data are cited and included in references to this manuscript.

Conflict of interest: The authors declare that there is no conflict of interest.

Financial Support: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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Table 1: Minimum efficiency levels of masks

Surgical masks			
China YY 0469	3 Microns ≥ 95% 0.1 Micron ≥ 30%		
Europe EN 14683 & India IS 16289:2014	Type I	Type II	Type III
USA ASTM F 2100	3 Microns ≥ 95% Level 1 3 Microns ≥ 95% 0.1 Micron ≥ 95%	3 Microns ≥ 98% Level 2 3 Microns ≥ 98% 0.1 Micron ≥ 98%	3 Microns ≥ 98% Level 3 3 Microns ≥ 98% 0.1 Micron ≥ 98%
Respirators			
USA: NIOSH (42 CFR 82) & China: GB2626	N95/ KN95 0.3 Microns ≥ 95%	N99/KN99 0.3 Microns ≥ 99%	N100/KN100 0.3 Microns ≥ 99.97%
Europe: En 149:2001 & India IS 9473:2002	FFP1 0.3 Microns ≥ 80%	FFP2 0.3 Microns ≥ 94%	FFP3 0.3 Microns ≥ 99%