Prosthodontics in COVID-19 era: The Right Prospective

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Abstract

Since its emergence in December 2019, corona virus disease 2019 (COVID-19) has impacted several countries, affecting more than 90 thousand patients and making it a global public threat. The routes of transmission are direct contact, and droplet and possible aerosol transmissions. Due to the unique nature of dentistry, most dental procedures generate significant amounts of droplets and aerosols, posing potential risks of infection transmission. Understanding the significance of aerosol transmission and its implications in dentistry can facilitate the identification and correction of negligence in daily dental practice.

Keyword: *COVID-19, Sterilization, N-95 mask*

Introduction

COVID-19 is a new outbreak of respiratory illness cause by a novel (new corona virus). The COVID-19 pandemic is a new global problem. Corona virus cause acute and chronic rrespiratory, enteric and central nervous system diseases in many spieces of animal, including humans. The name "CORONA Virus" is coined in 1968, is derived from the CORONA-Like or crown like morphology observed in the viruses in electron microscpe.Corona virus disease in 2019 is known as COVID-19. On february 11TH 2020, WHO announed an official name for the disease. COVID-19 abbrevations stands for CO Stands for CORONA, VI stands for VIRUS and D stands for Disease formally occuring in 2019, hence 19.

COVID- 19 has proformed impact on communities all over the world and have been uprooted and forced to change our lives in major ways. Despite global efforts to contain the disease spread, the outbreak is still on rise. Dental profession including Prosthodontists many encounter there lives in critical situation. [1]

Why Prosthodontics is a high risk branch in Corona pandemic?

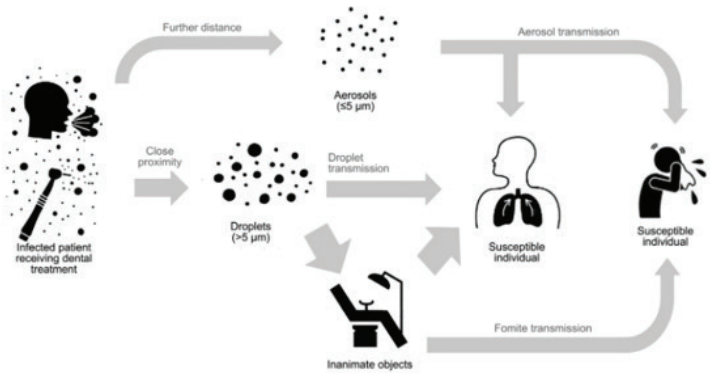
As stated by the scientific brief on COVID-19 by WHO, the possible route of transmission are:

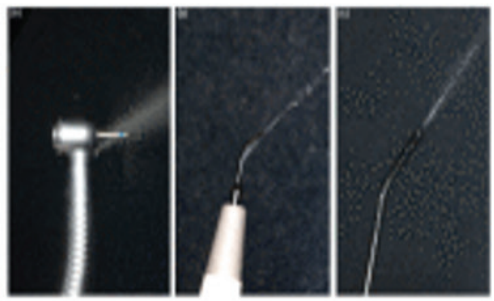
1) Contact and droplet transmission by respiratory secretion or their droplets of less than 5-10um in size.

2) Air borne transmission by aerosol or droplet nuclei of >5um in size

3) Fomites transmission due to contaminated surface by saliva, stool, urine, blood and plasma.[2]

Prosthodontics are at high risk for nosocomial infection (Hospital based) and become potential carriers for disease because of its unique nature of dental interventions which includes areosol generations. [2]





What can Prosthodontists do to protect themselves and patients?

1) Despite the large scale community transission pf COVID-19, during the epidemic: demand of urgent dental treatment decreased by only 38%.

2) These shows that public need for urgent dental care even during this pandemic will always be essential.

3) Closing dental practices reduce the no. of affected individual but will increase the suffering of individual in need of urgent dental care.

4) It also increase the burden on hospitals, emergency dept.

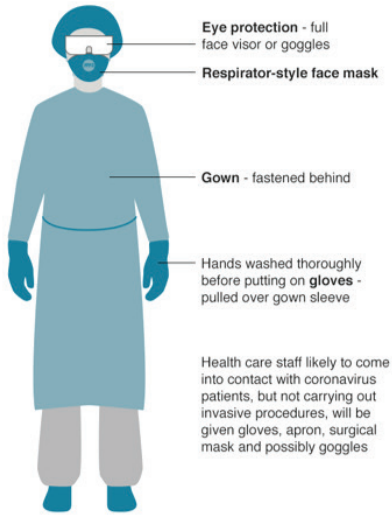
5) These calls for creation of standard guidelines for dental care provision during the world wide spread of pandemic and/or local epidemic outbreak. [3]

General Guidenlines for safety:

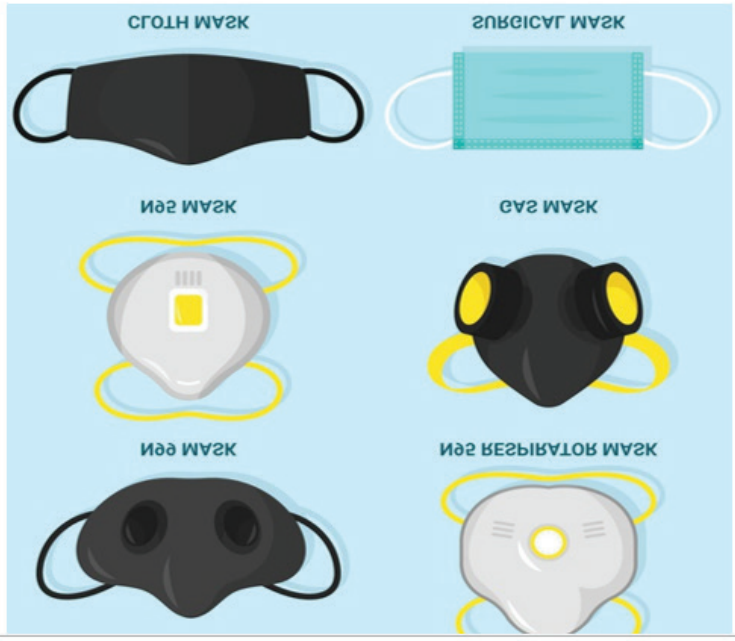
1) All team members should wear adequate personal protective euipments (N-95 masks, disposable mask, face-shield, gloves, gowns, etc.)

2) Make sure the personal protective equipment being used is appropraite for procedure being performed.

3) Physical distancing protocol has been maintained at all time among staff memebers and patients, (atleast 6 feets.)



Types of medical mask used:



Features of N-95 Mask, HEPA Filter mask and cotton mask

Features	**Surgical mask**	**Cotton mask**	**HEPA filter mask**	
Approval by FDA	**Therapeutic device 32100**	**None**	**KF80**	**KF94/N95**
Intended use	To protect the patient from large particles expelled from the wearer-such as spit and mucous.. To use as a fluid barrier	To avoid touching nose and mouth. To help contain spit or mucous expelled by the wearer, similar to covering a cough or sneeze with a face tissue.	To help reduce the wearer's exposure to fine dust particles. Filter efficiency 80%, small and large particles.	To help reduce the wearer's exposure to fine dust particles and infectious airborne particles. Filter efficiency 95%, small particle aerosols to large droplets.
Fit	Fits loosely, leaving gaps between face and the mask.	Fits loosely, leaving gaps between face and the mask.	Designed to fit tightly, creating a seal between face and the mask.	Designed to fit tightly, creating a seal between face and the mask Requires fit testing and user seal checks.
Basic structure	3-layer construction Pleated rectangular mask Nosepiece wire Tie or earloop	Usually rectangular mask with earloop	4-layer construction 3-fly flat fold or cup shaped Nosepiece wire Headband or earloop with hook fastener	
Filter materials	Non-woven fibrous filter	Cotton	Non-woven fibrous filter	

HEPA = high efficiency particulate air, FDA = Ministry of Food and Drugs.
aN95 cleared for use as surgical mask by FDA in US; The highest level of fluid resistance is required for surgical N95 respirator.

Modification required for dental clinic setup:

Dental operators should gear themselves for readiness:

Phase 1: Preparatory phase

Phase 2: Implementation phase

Phase 3: Followup phase

Phase 1: Preparatory phase

1) Testing for COVID-19:

a) Healthcare workers who are asymptomatic and do not fall under the category of being exposed to corona virus infecetion are not required to undergo a test before resuming to work.

b) Work with minimum staff or assigned rotation duties of your existing staff.

c) Pre-screening and traig area

2) Ventilation and air quality management:

a) Air condition system should be frequently serviced.

b) Use of indoor portable air cleaning system equiped with HEPA filter and UV light may be used.

c) Maintain air circulation with natural air through a frequent opening of window and using an independent exhaust blower to extract the room air into the atmosphere.

d) Avoid the use of ceiling fan while performing procedure.

3) Clinical entrance, reception and waiting:

a) Install glass or plastic barrier at the reception desk, prefereably with a two-way speaker system.

b) Remove magazine reading material and other objects.

c) Display board at the entrance of clinic for instruction to patients:

i) Maintain social distancing

ii) Dispose contaminated items in trash can

iii) Consult the physicans for any symptoms

iv) Distance waiting chair prefereably a meter apart

v) Cashless or contactless payment should be prefered.

4) Donning-Doffing room/ Changing room:

Changimg room should be available for the staff and workers to wear surgical PPE kit. Sensor tabs with elbow handles should be used. Resusable towels should be avoided. Preference should be given to disposable.

5) Sterilization: It is necessary to clean all instruments with detergent and water before sterilization[5]. The instruments that penetrate the tissues must be sterilized in an autoclave. It is advisable to heat sterilize items that touch the mucosa or to at least disinfect them, for example, with the immersion in a 2% glutaraldehyde solution in a closed bid, naturally following the instructions of the producer. Sterilization completely kills all vital agents and spores too. The classic sterilization procedure expects the use autoclave, with cycles at 121 ◦C for 15–30 min, or at 134 ◦C for 3–4 min. Steam sterilization cannot be used for all facilities and a possible alternative can be the use of chemical sterilization using ethylene oxide gas, formaldehyde gas, hydrogen peroxide gas, liquid peracetic acid, or ozone. The disinfection processes do not destroy the bacterial load, rather reducing it to acceptable levels.

ITEM	RECOMMENDED METHOD	ALTERNATIVE METHOD
Articulators	scrub with 70% ethyl alcohol	
Burs–diamond	Clean with metallic brush and detergent, autoclave	
Burs–steel tungsten-carbide	Clean with metallic brush and detergent, rinse, dry and dry heat	Clean with metallic brush and detergent, rinse, dry and immerse in 2% glutaraldehyde for 10 h, rinse
Dental mirrors	Clean with detergent and water, autoclave, store in covered pack or container	
Denture	Clean with detergent and water If contaminated with blood, immerse in 0.1% sodium hypochlorite for 10 min and rinse	Soaking denture in 3% hydrogen peroxide for 30min, soaking in 0.2% chlorohexidine gluconate fr 10min, 100% vinegar(acetic acid) for 6-8hrs.
Handpieces Air motor for slow speed handpieces	Flush for 30 s, clean with detergent and water, oil, autoclave	Flush for 30 s, clean with detergent and water, oil, surrounding the handpiece by a gauze pad soaked in 2% glutaraldehyde for 10 min, rinse with water
Impressions–Alginate (plastic trays	Rinse, spray with 0.1% sodium hypochlorite, put in closed container for 10 min.	

Zinc-oxide eugenol paste	Rinse, spray with 0.1% sodium hypochlorite, put in closed container for 10 min.	
Alginate (metallic trays)	Rinse, spray with 2% glutaraldehyde, put in closed container for 10 min.	
Rubber base	Rinse, immerse in 2% glutaraldehyde for 10 min, rinse	
Instrument trays	Clean with detergent and water, autoclave	
Acrylic appliance	0.5% Povidine-Iodine or 0.5% NaOCl2	
FPD	Immersed in 2% alkaline glutaraldehyde	

Surface Disinfection:

CONTENT	**Concentration of the Preparate**	**Level of Activity on Target Agents**	**Recommended Uses**
Alcohol	• 70%	• Bacteria (high) • Tubercle bacilli (high) • Spores (low) • Fungi (high) • Viruses (active only on some viruses)	Disinfection of clean surfaces and skin
Glutaraldehyde	2%	• Bacteria (high) • Tuberculosis bacilli (high) • Spores (high but slow) • Fungi (high) • Viruses (high)	• Disinfection of selected not autoclavable instruments • Use only closed containers to reduce the escape of irritant vapours
Hypochlorites	• 1% (one part of 5.25% hypochlorite solution in 4 parts of water) • 0.1% (one part of 5.25% hypochlorite solution in 49 parts of water)	• Bacteria (high) • Tuberculosis (high) • Spores (high) • Fungi (high) • Viruses (high)	• instrumental disinfection for selected items
Diguanides	• Chlorhexidine - Aqueous 1:1000 • Chlorhexidine - 0.5% in 70% Ethanol • Chlorhexidine + Cetavlon - Aqueous 1:100, 1:30 • Chlorhexidine + Cetavlon - 1:30 in 70% Ethanol	• Bacteria (high for gram-positive) • Tuberculosis bacilli (low) • Spores (low) • Fungi (high) • Viruses (low)	• Disinfection of skin and mucous membrane • Use opened bottle of aqueous skin disinfectant for maximum 24 h

Phase 2: Implementation Phase:

1) Patient's Prospective:

i) Tele-consultation and tele-screening. Donot provide non-emergent cosmetic treatment to a doubtful patient and tell them to report health department immediately.

ii) Urgent prosthodontic attention required as specified in ADA guidelines:

a) Dental trauma due to denture fracture

b) Repair of broken denture

c) The need for temporary and immediate denture

d) Final crown bridge repair or cementation

e) if temporary restoration is lost or broken.

f) Recementation for dislodged crown and brigde.

g) Problems with implant and implant prosthesis

h) Ulceration due to sharp edges of tooth or prosthesis7

2) After initial screening, if a patient requires immediate treatment, the ADA recommends taking the following steps.

a) Asking patient to arrive on time

b) Schedule appointment to inimize contact with other patient in waiting room

c) Ask the patient to have a mouthwash rinse with 10ml of 0.5% solution of Povidine-Iodine (Standard aqueous PVP-I antispetic solution based mouthwash diluted 1:20 with water) for 15s.

d) Patient consent and declaration to be obtain in physical or electronic system.

e) All patient must be consider as a potential asymptomatic COVID-19 carrier.

f) Patient Temperature must be recoreded using non-contacting thermometer.

g) Check oxygwn saturation with lupse oxymeter.

3) During clinical procedure, all the protective measures should be taken before initiation of any clinical procedure.

4) Four handed technique is beneficial for controlling infection.

5) Preprocedural Mouth rinse: The most effective method to reduce microorganism in oral areosol (68.4% reduction). Use for atleast 15s before initiation of treatment.

Various solution used are

- 0.5% w/v Povidine-Iodine (Betadine)
- 0.12% chlorohexidine
- 1% Hydrogen Peroxide
- Essential oils
- 0.05% Cetil Pyridinum chloride (cpc)

6) Only one patient is allowed at a time during procedure.

7) Practice non-areosol generating procedure

8) Avoid gag inducing intraoral procedure

9) Avoid contatc with saliva as much as possible

10) Proper direction of handpiece

11) Use of rubber dam is encouarged

12) Use low speed drilling machine is recommended like airotor or micro motor

13) Do not anything without gloves

14) OPG should be recommended, not IOPA

15) Patient should be covered with full length drape.

16) Disinfection protocols after patient leaves:

a) Disinfection of the hand instrument after standard sterilization protocol :

i. Step 1: Cleaning uder running water and soap solution to remove organic matter

ii. Step 2 : Dsiinfection by dipping in 1% sodium hypocholrite solution for 10mins.

iii. Step 3 : Dry it with sterilized clean cotton and gauze piece

iv. Step 4: Steriliztion by using front loading autoclave

v. Step 5: store in UV chamber

b) Disinfection of handpiece: Clean using handpiece cleaning solution to remove debris followed by packing in autoclave pouch for autoclaving

c) Disinfection floor with 1% hypochlorite solution

d) fogging with ethyl alcohol based sanitizer with glycerin for 20 mins.

Phase 3 : Patient Follow up and review: Patient should be asked for any symptoms postoperatively.

Laboratory Disinfection Protocols:

1) Minimum staff should be available.
2) Staff should wear PPE.9

Cast disinfection:

1) Gypsum cast is difficult to disinfect. Microwave irradiation of the cast for 5mins at 900W gives high level of disinfection. Immeresed in NaOCl2 1:10 dilution solution.
2) ADA reccomended use of chlorine compound Idophores, cobination of synthetic phenols 2% glutaraldehyde.

Standard infection control protocol should be followed for laboratory waste material.

Type Of Waste	Colour of container and Markings	Types of container
Infectious Medical Waste	Yellow – marked infectious or with biohazard symbol (Marked "SHARPS" if it contains sharps.)	Leak proof plastic bag or puncture proof containers
Radioactive Medical Waste	Colour varies in different countries but is always marked with radioactive symbol	Sealed lead container.
Hazardous Medical Waste	Yellow or red depending on country	Puncture proof container
General Medical Waste	Black	Plastic bag inside of a container or on its own.

Conclusion

With the increase knowledge of viral feature, epidemiologic characteristic, clinical spectrum and treatment, efficient strategies have been taken to prevent control and stop the spread of COVID-19. Dentists, by nature, are at high risk of exposure to infectious diseases. The emergence of COVID-19 has brought new challenges and responsibilities to dental professionals. A better understanding of aerosol transmission and its implication in dentistry can help us identify and rectify negligence in daily dental practice. In addition to the standard precautions, implementation of special precautions could prevent disease transmission from asymptomatic carriers. These special precautions would not only help control the spread of COVID-19 but also serve as a guide for managing other respiratory diseases. However, we must be constantly aware of infectious spread, that may challege the current infection control regime. Precaution can go a long way to save lots of lives.

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