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 respiratory, 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 announced 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 occurring 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 aerosol generations.2
What can Prosthodontists do to protect themselves and patients?

1) Despite the large scale community transmission of 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.

General Guidelines for safety:

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

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

3) Physical distancing protocol has been maintained at all time among staff members and patients, (at least 6 feet.)

Types of medical mask used:
Features of N-95 Mask, HEPA Filter mask and cotton mask

<table>
<thead>
<tr>
<th>Features</th>
<th>Surgical mask</th>
<th>Cotton mask</th>
<th>HEPA filter mask</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approval by FDA</td>
<td>Therapeutic device 32100</td>
<td>None</td>
<td>KF80</td>
</tr>
<tr>
<td></td>
<td>KF94/N95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intended use</td>
<td>To protect the patient from large particles expelled from the wearer such as spit and mucous.</td>
<td>To avoid touching nose and mouth.</td>
<td>To help reduce the wearer’s exposure to fine dust particles.</td>
</tr>
<tr>
<td></td>
<td>To use as a fluid barrier</td>
<td></td>
<td>Filter efficiency 80%, small and large particles.</td>
</tr>
<tr>
<td>Fit</td>
<td>Fits loosely, leaving gaps between face and the mask.</td>
<td>Fits loosely, leaving gaps between face and the mask.</td>
<td>Designed to fit tightly, creating a seal between face and the mask.</td>
</tr>
<tr>
<td>Basic structure</td>
<td>3-layer construction Pleated rectangular mask Nosepiece wire Tie or earloop</td>
<td>Usually rectangular mask with earloop</td>
<td>4-layer construction 3-fly flat fold or cup shaped Nosepiece wire Headband or earloop with hook fastener</td>
</tr>
<tr>
<td>Filter materials</td>
<td>Non-woven fibrous filter</td>
<td>Cotton</td>
<td>Non-woven fibrous filter</td>
</tr>
</tbody>
</table>

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 infection 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 triage area

2) Ventilation and air quality management:
   a) Air condition system should be frequently serviced.
   b) Use of indoor portable air cleaning system equipped 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, preferably 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 physicians for any symptoms
      iv) Distance waiting chair preferably a meter apart
      v) Cashless or contactless payment should be preferred.

4) Donning-Doffing room/Changing room:
   Changing room should be available for the staff and workers to wear surgical PPE kit. Sensor tabs with elbow handles should be used. Reusable 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. 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.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>RECOMMENDED METHOD</th>
<th>ALTERNATIVE METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Articulators</td>
<td>scrub with 70% ethyl alcohol</td>
<td></td>
</tr>
<tr>
<td>Burs–diamond</td>
<td>Clean with metallic brush and detergent, autoclave</td>
<td></td>
</tr>
<tr>
<td>Burs–steel tungsten-carbide</td>
<td>Clean with metallic brush and detergent, rinse, dry and dry heat</td>
<td>Clean with metallic brush and detergent, rinse, dry and immerse in 2% glutaraldehyde for 10 h, rinse</td>
</tr>
<tr>
<td>Dental mirrors</td>
<td>Clean with detergent and water, autoclave, store in covered pack or container</td>
<td></td>
</tr>
<tr>
<td>Denture</td>
<td>Clean with detergent and water If contaminated with blood, immerse in 0.1% sodium hypochlorite for 10 min and rinse</td>
<td>Soaking denture in 3% hydrogen peroxide for 30min, soaking in 0.2% chlorohexidine gluconate fr 10min, 100% vinegar( acetic acid) for 6-8hrs.</td>
</tr>
<tr>
<td>Handpieces Air motor for slow speed handpieces</td>
<td>Flush for 30 s, clean with detergent and water, oil, autoclave</td>
<td>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</td>
</tr>
<tr>
<td>Impressions–Alginate (plastic trays)</td>
<td>Rinse, spray with 0.1% sodium hypochlorite, put in closed container for 10 min.</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Treatment Steps</td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Zinc-oxide eugenol paste</td>
<td>Rinse, spray with 0.1% sodium hypochlorite, put in closed container for 10 min.</td>
<td></td>
</tr>
<tr>
<td>Alginate (metallic trays)</td>
<td>Rinse, spray with 2% glutaraldehyde, put in closed container for 10 min.</td>
<td></td>
</tr>
<tr>
<td>Rubber base</td>
<td>Rinse, immerse in 2% glutaraldehyde for 10 min, rinse</td>
<td></td>
</tr>
<tr>
<td>Instrument trays</td>
<td>Clean with detergent and water, autoclave</td>
<td></td>
</tr>
<tr>
<td>Acrylic appliance</td>
<td>0.5% Povidine-Iodine or 0.5% NaOCl2</td>
<td></td>
</tr>
<tr>
<td>FPD</td>
<td>Immersed in 2% alkaline glutaraldehyde</td>
<td></td>
</tr>
</tbody>
</table>

**Surface Disinfection:**

<table>
<thead>
<tr>
<th>CONTENT</th>
<th>Concentration of the Preparate</th>
<th>Level of Activity on Target Agents</th>
<th>Recommended Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>• 70%</td>
<td>• Bacteria (high)</td>
<td>Disinfection of clean surfaces and skin</td>
</tr>
<tr>
<td>Glutaraldehyde</td>
<td>2%</td>
<td>• Bacteria (high)</td>
<td>Disinfection of selected not autoclavable instruments</td>
</tr>
<tr>
<td>Hypochlorites</td>
<td>• 1% (one part of 5.25% hypochlorite solution in 4 parts of water)</td>
<td>• Bacteria (high)</td>
<td>• instrumental disinfection for selected items</td>
</tr>
<tr>
<td></td>
<td>• 0.1% (one part of 5.25% hypochlorite solution in 49 parts of water)</td>
<td>• Tuberculosis bacilli (high)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Spores (high but slow)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Fungi (high)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Viruses (high)</td>
<td></td>
</tr>
<tr>
<td>Diguanides</td>
<td>• Chlorhexidine - Aqueous 1:100</td>
<td>• Bacteria (high for gram-positive)</td>
<td>Disinfection of skin and mucous membrane</td>
</tr>
<tr>
<td></td>
<td>• Chlorhexidine - 0.5% in 70% Ethanol</td>
<td>• Tuberculosis bacilli (low)</td>
<td>• Use opened bottle of aqueous skin disinfectant for maximum 24 h</td>
</tr>
<tr>
<td></td>
<td>• Chlorhexidine + Cetavlon - Aqueous 1:100, 1:30</td>
<td>• Spores (low)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Chlorhexidine + Cetavlon - 1:30 in 70% Ethanol</td>
<td>• Fungi (high)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Viruses (low)</td>
<td></td>
</tr>
</tbody>
</table>
Phase 2: Implementation Phase:

1) Patient’s Prospective:

i) Tele-consultation and tele-screening. Do not 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 bridge.
g) Problems with implant and implant prosthesis
h) Ulceration due to sharp edges of tooth or prosthesis

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 minimize 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 antisptic 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 recorded using non-contacting thermometer.
g) Check oxygen saturation with lopus 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 at least 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-aerosol generating procedure

8) Avoid gag inducing intraoral procedure

9) Avoid contact with saliva as much as possible

10) Proper direction of handpiece

11) Use of rubber dam is encouraged

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 under running water and soap solution to remove organic matter
   ii. Step 2: Disinfection by dipping in 1% sodium hypochlorite solution for 10mins.
   iii. Step 3: Dry it with sterilized clean cotton and gauze piece
   iv. Step 4: Sterilization 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.

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 NaOCl 1:10
   dilution solution.
2) ADA recomendend use of chlorine compound
   Idophores, cobination of synthetic phenols 2%
   glutaraldehyde.

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

Conclusion
With the increase knowledge of viral feature,
epidemiologic characteristic, clinical spectrum and
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.

Ethical Clearance: Taken from committee
Source of Funding: Self
Conflict of Interest: Nil
References


