

Infection Control In Prosthodontics

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ABSTRACT

Infection control is an important concept in the present day practice of dentistry. Dentistry is predominantly a field of surgery, involving exposure to blood and other potentially infectious materials and therefore, requires a high standard of Infection Control and Safety. Many countries in the world have strong guidelines and recommendations for dental safety. In a country like India, the concept is new and needs to be advocated on the highest priority. Infection control is important in dental practice to control patient-to-patient infectious disease transmission, and occupational exposure of dental health care personnel (DHCP) to infectious, chemical and other hazards present/encountered during the practice of dentistry. To avoid disease transmission it is important to understand the mechanism of transmission of infection, the pathogens involved and the Safety measures that can be undertaken. The prosthodontists are at an added risk of transmission because of the infection spreading through the contaminated lab equipments while working in the lab. The lab protocols should also be strictly followed along with the clinical protocols.

Key words: Oral pathogen, Infection control, dentistry

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Infection control is an important concept in the present day practice of dentistry. Infection control is important in dental practice because the dental health care professionals are at high risk and emergence of new communicable diseases like hepatitis, HIV and prevailing diseases like tuberculosis makes it important to control the transmission. The diseases may be transmitted from the patient to the dentist, or any other person involved in dental care procedure including dental surgery assistant or even the dental laboratory personnel. Disease transfer to the dentist and dental staff during dental care is considered an “**occupational exposure**”(1) to a given pathogen on the other side the disease may also be transmitted from the dentist to the patient as well as from one patient to the other. The disease transfer from one patient to another in the dental clinics is considered as “**cross-infection**”. Infection control is aimed to prevent any such transmission in the dental office.

Routes of Disease Transmission(1)

To understand the means to prevent the transmission of disease it is important to understand the mechanism of transmission of infection. The micro organisms responsible for disease are

bacteria, virus, fungi and protozoa. To cause infection these potentially pathogenic organisms must be acquired by the host. They must survive, reproduce and eventually cause some injury, dysfunction or destruction of the host.

Routes of disease transmission can be specific to various fields of healthcare. In dentistry, diseases can be transmitted from patient-to-patient, dentist to patient, and patient to dentist, when adequate precautions are not followed. Dental Healthcare Workers and patients can further transmit the diseases to their respective families and friends. Common modes of disease transmission in the order of severity are:

Percutaneous (high risk)

Inoculation of microbes from blood and saliva transmitted through needles and sharps

Contact (high risk)

Touching or exposing non-intact skin to infective oral lesions, infected tissue surfaces or infected fluids, splash and spatter of infected fluids.

Inhalation of Aerosols or droplets containing pathogens (moderate risk)

Breathing bioaerosols suspended in the clinics ambient air laden with infective material while using handpieces and scalers or droplet nuclei from coughing.

Indirect contact through fomites (low risk)

Touching contaminated inanimate surfaces in the dental treatment room or operator

Classification of Level of Risk(2)

Based on article in DCNA 1996 there are 5 classes of risk in dental health care professionals. The classes are based on the level of risk and ease of prevention.

Infection Control(4,5)

Emphasis is paid not only to the patient protection but also to all members of the dental team.

Infection control procedures involve

- Patient Screening
- Personal hygiene
- Personal protection
- Instrument processing
- Surface asepsis
- Patient treatment
- Laboratory disinfection

Patient screening

Initial patient screening is accomplished by the Prosthodontist during the history taking interactions before entering the operatory. Dentist’s review of the patient’s medical history is mandatory at the onset of every clinical appointment. Multiple reviews give the dentist opportunities to establish baseline medical history data and to compare individual patient responses over an extended period of time as well as brief review of any infectious disease, if the patient is suffering.(4)

Personal hygiene

Dentist’s personal hygiene is an absolute necessity. As

Class	Diseases	Prevention
Class 1	Measles, mumps, rubella, tetanus, diphtheria, poliomyelitis, influenza, fungal infection	Vaccines available Risk minimal
Class 2	Gonorrhoea, syphilis, granuloma inguinale, lympho granuloma venerum, candidiasis, staphylococcus aureus, group A streptococcus	No vaccines But treatment is available Risk more than class 1
Class 3	Varicella, herpes simplex, cytomegalo virus, EBV	High rate of prevalence Troublesome clinically
Class 4	HBV, HCV, HDV, HIV	No vaccine, except HBV, Disease fatal Universal precaution should be taken
Class 5	TB	Vaccine not 100% effective Air borne transmission Highest risk Respiratory precautions

Oral Pathogens of Concern(3)		
Microorganisms	Body source	Estimated survival time at 21 degree C
Respiratory viruses	Secretion of saliva	Hours
VZV	Saliva and vesicles	Hours
Mumps	Saliva and secretions	Hours
HSV I and II	Saliva and vesicles	Minutes
Hepatitis A	Saliva feces and blood	Weeks to months
Hepatitis B	Saliva and vesicles	Weeks
Hepatitis C	Saliva and vesicles	Weeks
EBV	Saliva	Seconds
Cyto megalo virus	Saliva and blood	Seconds to minutes
HIV I	Saliva and sputum	Days to weeks
Mycobacterium tuberculosis	Saliva and sputum	Days to weeks
Staphylococcus aureus	Exudates, skin, saliva	Days to weeks
Streptococcus pyogens	Saliva and secretions	Hours to days
Mycoplasma pneumonia	Saliva and secretions	Seconds to minutes
Treponema palladium	Lesion contact	Seconds
Neisseria gonorrhoea	Exudate contact	Seconds to minutes

patients become more aware of the potential danger to themselves from materials and instruments that are not disinfected or sterilized, their confidence and acceptance of dental treatment becomes directly proportional to the image the clinician presents. Hair is cleared away from the face. If a clinician's hair falls in such a way that it may contact the patient or dental equipment, it is fixed at the back of the head, or a surgical cap is worn. Facial hair is covered by a face mask or shield. Jewelry is removed from the hands, arms, or facial area during patient treatment. Fingernails are kept clean and short to prevent perforation of gloves and accumulation of debris. Fingernail polish is not worn. Thorough forearm and hand washing is mandatory before and after treatment.(5)

Personal protection

Residents are required to have current immunizations against communicable diseases, including hepatitis B. Gloves are worn at all times when treating patients. Masks are worn in the patient treatment area and when the dentist is manipulating the prostheses in the laboratory. Glasses with solid side protection for the patient, faculty member, and resident are mandatory. The use of disposable plastic face shields is highly recommended. Sharps disposal protocol is followed, with particular emphasis on the use of a hemostat when handling blades. Outer barrier garments for aerosol protection are worn at all times when treating a patient. They are changed between patients.

Instrument processing

- Presoaking and cleaning
- Packaging
- Sterilization (5,6)

The following methods of sterilization are most commonly used.

- Steam at 121 degree C for 20 to 30 mins or 134 degree C for 2 to 10 mins.
- Advantages – good penetration
Precautions – carbon steel corrodes, damage to plastic and rubber items, packs wet after the cycle, hard water spots instruments.

Unsaturated chemical vapour – 20 mins at 134 degree C

- Advantages – no corrosion of carbon steel, packs are dry after cycle
Precautions – may damage plastic and rubber items.
- Dry heat (Oven Type) – 1 to 2 hours at 160 degree C
- Advantages – no corrosion of carbon steel, packs dry after the cycle
Precautions – may damage plastic and rubber items, do not open door during cycle.
- Dry heat (rapid heat transfer type) 6 to 12 mins at 191 degree C
Advantages – short cycle
Precautions – may damage plastic and rubber items.

Surface Asepsis(6)

There are two general approaches to surface asepsis.

- Clean and disinfect contaminated surfaces
- Prevent surface from becoming contaminated by use of surface covers
- A combination of both may also be used.

According to Miller and Palenik in 1994 chemicals used for surface and equipment asepsis are

- Chlorine – e.g. sodium hypo chlorite.
- Phenolic compounds
 - ◆ Water based – Water with ortho – phenyl phenol or Tertiary amyphenol or O benzyl – p – chlorophenol
 - ◆ Alcohol based – Ethyl or iso propyl alcohol with O phenyl phenol or Tertiary amyphenol
- Iodophor – butoxypropoxy poly ethoxy ethanol iodine complex

Patient Treatment

The responsibility for infection control procedures during patient treatment rests primarily on the dentist's ability to adhere to strict sterilization, disinfection, and barrier techniques. The patient's responsibilities are essentially passive in that he/she remains within the confines of the operatory until the procedure is completed. The following procedures are required when treating prosthodontic patients in the clinic:

Before seating the patient the operatory and chair is cleaned and wiped with a disinfectant solution, the area is sprayed and left for a minimum 10 minutes. The dental chair is covered with a plastic sheath, which is removed after treatment. Subsequent to treatment, the protective covers are removed and the room is sprayed, wiped with phenol solution, sprayed, and left to dry.

- All patients rinse with chlorhexidine gluconate 0.12% before treatment.(7, 8)
- Patients wear protective eye wear.
- Hands are washed with an antimicrobial cleanser before gloving. Once gloved, only the patient and barrier covered areas or areas that have been cleaned and disinfected are touched.
- The patient chart is not touched with contaminated gloves. If an entry must be made in the chart, gloves must be removed or a clean glove is placed over the contaminated glove and removed after the resident is finished with the chart. Alternatively, an appropriate barrier must be used on the pen and over the portion of the record that is to be touched.
- The doctor should not leave the operatory without removing their gloves and outer barrier garments.
- Large, nonsterilizable items used in the operatory, such as impression material dispensing guns, articulators, face bows, water bath, silicone spray bottles, tooth shade, and

mold guides are disinfected by wiping, spraying, or immersion with the appropriate disinfectant solution.

- All items leaving the clinic that are used in direct patient care or touched during patient care procedures that cannot be subjected to sterilization procedures are disinfected or placed in the phenol disinfection solution within a sealed plastic bag before departure. New latex gloves are worn for the disinfection procedures. Items bagged in disinfection solution must remain in solution for 10 minutes. Metal impression trays are hanged and autoclaved before use. Adhesives for impression trays are used in individual dose quantities to prevent cross-contamination. Polyvinylsiloxane, polysulfide, impression compound, and ZOE impression materials are thoroughly rinsed under water and immersed in a 5.25% sodium hypochlorite solution for 10 minutes (9-12). Alginate and polyether impressions are rinsed under water, sprayed with a 5.25% sodium hypochlorite solution and sealed in a plastic bag for at least 10 minutes (13). Wax, ZOE, and resin centric relation records are rinsed under water and sprayed with a 5.25% sodium hypochlorite solution and placed in a plastic bag for 10minutes(14). Stone casts requiring disinfection are sprayed with a 5.25% sodium hypochlorite solution and allowed to sit for at least 10 minutes. Complete dentures and provisional restorations that leave the operatory are immersed in a 5.25% sodium hypochlorite solution for 10 minutes. Removable partial dentures with metal bases are sprayed with 2% gluteraldehyde solution and held in a plastic bag for 10 minutes.

Laboratory Norms

The dental laboratory becomes the second line of infection control barriers that protect the patients, residents, assistants, and faculty. All prostheses that enter and leave the laboratory are disinfected. Within the laboratory the prosthesis of each patient is kept separate through barrier, disinfection, and sterilization systems. All prostheses entering the laboratory are scrubbed with disinfectant solution. Those leaving the laboratory are immersed in a 5.25% sodium hypochlorite solution for a minimum of 10 minutes. New gloves are worn in the laboratory area for grinding and polishing procedures and are discarded when the student leaves the laboratory. Protective clothing is worn in the laboratory and discarded before the dentist leaves the laboratory area. Laboratory countertops are cleaned and wiped with disinfectant solution at the end of each day.(15,16)

Individually packaged chemically sterilized laboratory burs are available in the laboratory. After the desired procedure is accomplished, the laboratory bur is cleaned and placed in a new bag for sterilization. The burs are used for one patient only and then resterilized. For polishing the lathe, when the

technician uses pumice, he/she places a clean plastic container containing an individual dose of pumice(17). A phenol solution is used to wet the pumice to desired consistency. Individually packaged sterile polishing wheels, designated for use with pumice, are available. The wheel is wet with water to soften it before use. If prosthesis becomes contaminated during laboratory procedures, it is disinfected and the laboratory procedure continued. Final polish is accomplished using a sterile wheel with non contaminated acryluster. The acryluster is applied to the sterile wheel once before polishing to eliminate cross-contamination. Clean-up involves disposal of the plastic container and the contaminated pumice. Wheels are removed, rinsed under water, and bagged for autoclaving. Before returning to the main clinic, all items are disinfected by immersion or spray and placed in a Lock-Tight bag. All information regarding disinfection procedures performed on Prosthodontic items sent to an outside laboratory is clearly written on the prescription form and the plastic bag. All items received from a laboratory are treated as contaminated unless the resident is informed otherwise by the dental laboratory. Before impressions are poured in the laboratory, hydrophilic impression materials are sprayed with a sodium hypochlorite solution (5.25%) and placed in a plastic bag for a minimum time of 1 minute. Hydrophobic impression materials are immersed in disinfectant solution for 10 minutes.

Post Exposure Prophylaxis(19)

Step 1 – Assessment of exposure – description of exposure, local wound care, and personal protection worn at the time of injury.

- Step 2 – Assessment of health care worker
- Step 3 – Source case information
- Step 4 – Serological testing.

Biocidal Activity of Certain Disinfectants

Disinfectant(conc.)	Time required	Potency
Formaldehyde 3% aqueous	30 mins	Intermediate
Formaldehyde 8% aqueous	10 hrs	High
Formaldehyde 8% in 70% alcohol	10 hr	High
Glutaraldehyde 2% alkaline	30 mins	Intermediate
Glutaraldehyde 2% aqueous	10 hr	High
Chlorine compound 1% available	30 min	Intermediate

Infection Control For Prosthodontic Devices And Appliances(18)

Appliance	Glutar-aldehyde	Iodo-phors	NaOCl	Phen-olics
Complete dentures	No	Yes	Yes	Yes
Removable dentures	No	Yes	No	Yes
Fixed prosthesis	Yes	Yes	No	Yes
Stone cast	No	Yes	Yes	No

Conclusion

Dental safety is a key area of concern and needs to be addressed on top priority. Many Countries in the world have strong guidelines and recommendations for dental safety. In a country like India, the concept is new and needs to be advocated on the highest priority. The rationale for infection control is to “control” iatrogenic, nosocomial infections among patients, and potential occupational exposure of care providers to disease causing microbes during provision of care. Lack of Infection Control is life-threatening for both the patient and the Dental Professional and requires more efforts. Formal programs in Infection Control and Safety must be developed and strictly followed by the entire dental health care professional.

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