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INFECTION CONTROL PROTOCOL IN PROSTHODONTICS – A REVIEW

Dental Science

Dr. Sumanth K. S Post graduate student, Department of Prosthodontics Crown and Bridge and Implantology, Rajarajeswari dental college and hospital, Bangalore.

Dr. Shwetha Poovani * Professor, Department of Prosthodontics Crown and Bridge and Implantology, Rajarajeswari dental college and hospital, Bangalore. *Corresponding Author

Dr. Gautam Shetty Professor and Head, Department of Prosthodontics, Rajarajeswari dental college and hospital, Bangalore.

Dr. Nithin Kumar S. B Post graduate student, Department of Prosthodontics Crown and Bridge and Implantology, Rajarajeswari dental college and hospital, Bangalore.

Dr. Sindhu Sudhakar K Senior Lecturer, Department of Prosthodontics Crown and Bridge and Implantology, Rajarajeswari dental college and hospital, Bangalore.

ABSTRACT

Dental professionals are exposed to a wide variety of microorganisms in the blood and saliva of the patients. These microorganisms may cause infectious diseases. The use of effective infection control procedures and universal precautions in the dental office and the dental laboratory will prevent cross contamination that could extend to dentists, dental office staff, dental techinicians and patients. This review of literature has attempted to appraise the different protocols designed to protect the dentist and laboratory technician from potential infection as well as to protect the patients from cross contamination.

KEYWORDS

Dental infection, Dental Clinical, Dental Laboratory, Disinfectant, Sterilization.

INTRODUCTION

Dental professionals are exposed to a wide variety of microorganisms in the blood and saliva of patients. These microorganisms may cause infectious diseases such as the common cold, pneumonia, tuberculosis, herpes, hepatitis B, and acquired immune deficiency syndrome (AIDS). The use of effective infection control procedures in the dental office and that may extend to dentists, dental office staff, dental technicians, and patients.[1]

It is essential that all dental laboratory technicians must have a basic understanding of infection transmission and be properly evaluated for the exposure risk they face from blood-borne pathogens.[2]

Microorganisms capable of causing disease are present in human blood. Contact with blood or saliva mixed with blood may transmit pathogenic microorganisms. Impressions, casts, impression trays, record bases, occlusal rims, articulators and dental prostheses can all transmit pathogenic microorganisms from the dental office to the dental laboratory.[2]

Implementation of universal infection control in dentistry, entails the prevention of infection transmission within the dental clinic environment. Such a policy protects both patients and staff, reduces staff concerns & prevents discrimination against patients. Implementing safe and realistic infection control procedures requires the full compliance of the whole dental team. These procedures should be regularly monitored during clinical sessions.[3]

Hence, this review article upgrades our knowledge on the pros and cons of all the available measures and techniques in the field of infection control protocols in prosthodontics. There are a number of elements in a comprehensive infection control protocol:[3]

1. Patient evaluation
2. Personal protection
3. Instrument cleaning and Sterilization
4. Disinfection
5. Laboratory asepsis

PATIENT EVALUATION

Any treatment is performed only after a comprehensive patient evaluation. This is achieved by a medical history specially designed to identify patients who are either particularly susceptible to infection or who are at risk of transmitting infection, known as carriers of disease or by being in a high-risk category.[4] The medical history should be updated at subsequent visits. Specific questions should be asked regarding medications, current and recurrent illnesses, unintentional weight loss, lymphadenopathy, oral soft tissue lesions, other infections, and history of hepatitis. Medical consultation may be indicated when a history of active infection or systemic disease is elicited. Not all patients with infectious diseases can be identified by medical history, physical examination, or readily available laboratory tests. Each patient must be considered as potentially infectious and the same infection control procedures should be used for all patients.[1]

PERSONAL PROTECTION

- Treat all patients as potentially infectious.
- Use protective attire and barrier techniques when contact with body fluids or mucous membranes is anticipated.
- Wear gloves.
- Wear mask.
- Wear protective eyewear.
- Wear uniforms, laboratory coats, or gowns.
- Open intraorally contaminated X-ray film packets in the dark room with disposable gloves without touching the films.
- Minimize formation of droplets, spatters, and aerosols.
- Use a rubber dam to isolate the tooth and field when appropriate.
- Use high volume-vacuum evacuation.
- Protect hands.
- Wash hands before gloving and after gloves are removed.
- Change gloves between each patient.
- Discard gloves that are torn, cut, or punctured.
- Avoid hand injuries.
- Avoid injury with sharp instruments and needles.
- Handle sharp items carefully.
- Do not bend or break disposable needles.
- If needles are not recapped, place in separate field. If recapping is necessary, use a method that protects hands from injury such as a holder for the cap.
- Place sharp items in appropriate containers.[1]

INSTRUMENT CLEANING AND STERILIZATION

Instruments cleaning can be categorised into 7 stages. 1. Pre-sterilization soaking (Holding) 2. Pre-cleaning 3. Corrosion control, drying, lubrication 4. Packaging 5. Sterilization or high level disinfection 6. Sterilization monitoring.[3]

Methods for Sterilizing and Disinfecting[6]

Process	Result	Method	Examples
Sterilization	Destroys all micro-organisms, including bacterial spores.	Heat automated, high temperature	Steam, dry heat, unsaturated chemical vapor
		Heat automated, low temperature	Ethylene oxide gas, plasma sterilization
		Liquid immersion	Glutaraldehyde, glutaraldehydes with phenols, hydrogen peroxide, hydrogen peroxide with peracetic acid, peracetic acid
High-level disinfection	Destroys all micro-organisms, but not necessarily high numbers of bacterial spores.	Heat automated	Washer disinfector
		Liquid immersion	Glutaraldehyde, glutaraldehydes with phenols, hydrogen peroxide, hydrogen peroxide with peracetic acid, ortho-phthalaldehyde
Intermediate level disinfection	Destroys vegetative bacteria and most fungi and viruses. Inactivates Mycobacterium bovis‡. Not necessarily capable of killing bacterial spores.	Liquid contact	EPA-registered hospital disinfectant with label claim of tuberculocidal activity
Low-level disinfection	Destroys most vegetative bacteria and certain fungi and viruses. Does not inactivate Mycobacterium bovis.	Liquid contact	EPA-registered hospital disinfectant with no label claim regarding tuberculocidal activity. OSHA also requires label claim of HIV and HBV potency for use of low-level disinfectant for use on clinical contact surfaces (e.g., quaternary ammonium compounds, some phenolics, some iodophors)

DISINFECTION

The impression or appliance should be disinfected according to the manufacturer's recommendations. In 1992, H. S. Harold et al determined the efficacy of eight disinfectant solutions: sodium hypochloride (undiluted), sodium hypochloride (diluted), Alcide L.D., OMC II, Biocide, Sporicidin, Lysol, Impresept and sterile water (control) when used as for immersion and a spray against three microorganisms (S. aureus, M. Phlei and Bacillus subtilis) and normal mixed oral flora on the surface of irreversible hydrocolloid impressions. This study concluded that, full strength sodium hypochlorite was the most effective disinfectant overall and required the shortest contact time (1 minute).[5] Disinfectants should not be sprayed onto the surface of the impression; it lessens the effectiveness and creates an inhalation risk. Immersion of the impression is recommended30. The impression or appliance should be rinsed again in water before sending to the laboratory accompanied by a confirmation that it has been disinfected. ADA- recommended disinfectants Chlorine compounds such as sodium hypochlorite solutions (1:10 dilution), iodophors, combination synthetic phenolics such as phenyl phenol 9%, O benzyl- p-chlorophenol 1% and aldehydes such as formaldehydes and gluteraldehydes.[7]

The current knowledge of infection control protocol can be summarised as: [4]

Burs - carbon, steel, diamond points.	• Dry heat oven-ie 60°C for 1 hour, Chemical vapour-20 minutes at 270° F. • Ethylene oxide-450-800 mg/l.
Dapen dishes	• Steam autoclave-121°C for 15 to 20 minutes at 15 lb pressure/square inch, • Ethylene oxide-450-800 mg/l.
Glass slabs	• Steam autoclave- 121°C for 15 to 20 minutes at 15 lb pressure/square inch, • Dry heat oven-160°C for 1 hour, Chemical vapour-20 minutes at 270° F. • Ethylene oxide-450-800 mg/l.
Hand instruments Carbon steel	• Dry heat oven-l60°C for 1 hour, Chemical vapour-20 minutes at 270° F. • Ethylene oxide450-800 mgJl.
Stainless steel	• Steam autoclave- 121°C for 15 to 20 minutes at 15 lb pressure/square inch, • Dry heat oven-I 60°C for 1 hour, • Chemical vapour-20 minutes at 2700 F. • Ethylene oxide-450-800 mg/l.
Hand pieces	• According to manufactures recommendation. • Ethylene oxide-450-800 mg/I. • Steam autoclave- 121°C for 15 to 20 minutes at 15 lb pressure/square inch.
Impression trays, Aluminum metal tray, Chrome — plated tray, Custom acrylic	• Steam autoclave- 121°C for 15 to 20 minutes at 15 lb pressure/square inch, • Chemical vapour-20 minutes at 270° F. • Ethylene oxide-450-800 mg/l.
resin tray, Plastic tray,	
Mirrors (mouth & face)	• Ethylene oxide-450-800 mg • Dry heat oven • Chemical vapour-20 minutes at 270° F. • Ethylene oxide450-800 mg/I.
Needle	Discard; do not reuse
Orthodontic pliers	• Dry heat oven-160°C for 1 hour, • Chemical vapour-20 minutes at 2700 F. • Ethylene oxide-450-800 mg/l.
Tissue retraction Pluggers	• Steam autoclave- 121°C for 15 to 20 minutes at 15 lb pressure/square inch, • Dry heat over-160°C for 1 hour, Chemical vapour-20 minutes at 270° F. • Ethylene oxide-450-800 mg/I.
Polishing wheels and disks	Ethylene oxide-450-800 mg/I.
Saliva evacuators, Ejectors	Ethylene oxide-450-800 mg/l.
Stones	Chemical vapour-20 minutes at 270° F.

Water- air syringe tips	• Steam autoclave- 121°C for 15 to 20 minutes at 15 lb pressure/square inch, • Dry heat oven-l60°C for 1 hour, • Chemical vapour-20 minutes at 270° F. • Ethylene oxide-450-800 mg/I
X-ray equipment	• Ethylene oxide-450-800 mg/I, • According to manufacture recommendation.
Impressions compound, Zinc oxide eugenol	• Immersed in 2% ID 210 solution for 20 minutes • Immersed for 10 minutes in 2% glutaraldehyde.
Irreversible hydrocolloid	• Spray with sodium hypochlorite, rinse, spray again and stand under damp gauze or in sealed bag for 10 minutes. • Immersed in 2% glutaraldehyde for 10 minutes
Reversible hydrocolloid	Spray with sodium hypochlorite, rinse, spray again and stand under damp gauze for 10 minutes
Polysulfide	• Rinsed for 45 seconds with water and immerse for 30 minutes in 2% glutaraldehyde. • Immersed for 15 minutes in 5.25% sodium hypochlorite solution and rinsed in water.
Addition reaction silicone materials	Immersed in 2% glutaraldehyde for 1 hour, rinse in sterile water
Condensation reaction silicone materials	• Immersed in 2% glutaraldehyde for 10 minutes and washed with sterile water
Polyether	• Immersed in 2% glutaraldehyde for 1 hour at room temperature, rinsed with sterile water for • 45 seconds and dried for 10 minutes
Dentures	• Rinsed under running water, cleaned for debris in an ultrasonic cleaner and immersed for 12 hours in alkaline glutaraldehyde disinfection solution. • Rinsed under running water, 4% chlorhexdine scrub for 15 seconds followed by a 3 minutes contact time with chlorine dioxide. • Sterilized by ethylene oxide gas-450-800 mg/I.
Pumice	• Addition of antiseptic product containing Octenidine to conventional pumice, • Addition of benzoic acid to conventional pumice, • Working pumice should be discarded after each use.
Metal framework (Ticonium & vitallium)	• Immersed 3 minutes in 5.25% sodium Hypochlorite solution and rinsed in water.

LABORATORY ASEPSIS

Infection control is fundamental in a dental laboratory so that dental technicians/ technologists can be prevented from getting infected. Before 1970s, infection control was not performed in dental laboratories though there was a major concern on handling of items from "high-risk patients". It was later realised that microorganisms could survive on saliva and blood and that any patient could be a source of infection. As a result, infection control became apparent and has now resulted in impressive protocols to prevention of disease spread in the dental office and laboratories.[1]

It is preferred that all disinfection procedures should be done in the dental laboratory by well-trained dental laboratory technician/technologist. Sometimes the disinfection status of an item is unknown. The correct disinfectant should be used to prevent corrosion in metallic components and dimensional changes and surface textures for impressions. Dental laboratories should isolate prostheses of high-risk patients from other laboratory work. When handling these materials, one should wear surgical gloves and mask. All instruments and devices that come into contact with a high- risk patient's prosthesis must be sterilized.[9]

Solid wastes soaked with bloody fluids should be put in sealed impervious bags and disposed according to the regulations of the local or national environmental agencies.

Technicians/ Technologists working in this area should wear clean laboratory dust coats, face masks, protective eyewear and disposable gloves. Work surfaces and equipment should be kept clean and disinfected daily. All instruments, attachments, and materials to be used on new prostheses should be separated from those used on prostheses that have already been inserted in the mouth. Rag wheels should be washed and autoclaved after every use. All dental technicians/ technologists must be immunized against hepatitis B virus. For irreversible hydrocolloids (Alginate), the recommended disinfectant is chlorine compounds or iodophors using immersion method for less than 10 minutes. Polysulphide silicone: Immerse in glutaraldehyde, chlorine compound, iodophors or phenolics for not more than 30 minutes. Polyether: Immerse with caution in chlorine compounds or iodophors for less than 10 minutes. Zinc oxide eugenol impression paste: Immerse in glutaraldehyde or iodophors. Impression compound: Iodophors or chlorine compounds or phenolic spray. Pumice must be changed after the completion of every case. At minimum the pumice and rag wheels should be disinfected daily.[10]

CONCLUSION

From an infectious point of view, dentistry has never been safer than it is today for both patients and dental team. This state of affairs has resulted from establishment and practice of strict infection control in the office using universal precautions. 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. Sterilisation and Disinfection of patient care instruments and material used are part of Infection control protocol in health care setting including dental care.

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