Review Article

Infection Control Protocol in Prosthetic Laboratory

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Abstract:

It is a public demand to expect health care profession to maintain its highest possible standard by preventing the spread of communicable diseases. Dental laboratory, being a potential source for the spread of various infections, is no exception to it and should ensure strict infection control measures. In contrast to the dental clinic and surgical areas, the dental laboratory is often overlooked, especially, when planning effective infection control measure. The aim of this review is to provide the general dental practitioners with the latest information and guidelines to achieve infection control in the dental laboratory. Apparently, it focuses on the technical knowledge and practices that should be followed in prosthetic laboratories.

Key words: Infections' sources, dental laboratories, infection control protocols.

Introduction:

Infections are caused by pathogens, including bacteria, viruses and prions. Pathogenic bacteria can cause many serious diseases including tuberculosis, pneumonia, diphtheria, cholera and typhoid. However, the main viruses of concern in the infection control in dentistry are blood borne infections such as HIV and hepatitis B & C. Different studies have shown that HBV (Hepatitis B virus) is statistically present in 1 out of 140 dental laboratory cases.[1] Other viruses also have the potential to become threats to human health, one of which includes avian influenza (H5N1). Apart from bacteria and virus, prions are the most recently discovered and least understood infective agents. These are naturally occurring cellular proteins that exhibit a different folding structure from the natural form. Known prion diseases affect nerve and brain tissue and are referred to as TSEs (transmissible spongiform encephalopathies) that are fatal and gives increased urgency to ensure adequate infection control measures. There is no diagnostic test for the presence of infection in prion diseases.[2]

Moreover, dental technicians are vulnerable to microbial cross-contamination from the impressions they receive from dental clinics. Casts prepared from the impressions may also harbor infectious micro-organisms that can be spread throughout the laboratory when the casts are trimmed.[3] Therefore, it is essential for all dental laboratory technicians to have a basic understanding of infection transmission. Employers should also have the moral and legal responsibility to train their new and old employees with the standard operating procedures for the infection control of routine and high risk cases in the dental laboratory.

Emerging infections:

Transmissible Spongiform Encephalopathies (TSE)- TSEs are a very rare cause of a form of dementia. As a universal precaution, all instruments should be thoroughly cleaned before autoclaving, in order to remove as much matter as possible.

Methicillin-resistant Staphylococcus aureus (MRSA)- Methicillin-resistant Staphylococcus aureus

(MRSA) is a bacterium that is resistant to common antibiotics. It colonizes the nose, axillae and perineum, and abnormal skin (wounds, ulcers and eczematous skin). MRSA may be found in patients who are hospitalized or who have been discharged from hospital into the community. Dentists or ancillary staff colonized with MRSA should not undertake or assist with invasive procedures.

Tuberculosis- The incidence of all forms of tuberculosis (TB) is rising and now approximately one third of the world's population is infected. The disease is spread by droplets or by direct contact and has been transmitted by dental procedures.[4]

Route of infection:

a) Direct person to person infection- Airborne infections, e.g., Tuberculosis,
b) Indirect infection route-

i) Transfer of pathogens from surface: e.g., MRSA or notovirus via hand contact to patient.
ii) Transfer of pathogens from hand or hand surfaces via instruments or equipments causing infection through mucosa or open wounds.
iii) Infection from incorrectly processed instruments: This could include prion transfer from instruments not completely cleaned and inadequately sterilized [4].

Protection of staff of the dental laboratory can be achieved by following means:

Immunization- Vaccination against hepatitis B virus is strongly recommended. Protection is also advised against tuberculosis, varicella, poliomyelitis, measles, mumps, diphtheria, tetanus and rubella for non-pregnant women of childbearing age.
Hand protection- Hand washing is a primary disease control measure for health care workers. Liquid soap disinfectant combination have been shown to be more than twice as effective as bar soap at removing bacteria from the hands. Water control taps should be wrist, elbow or foot operated. Disposable paper towels are recommended.
Eye protection- Operators should protect their eyes against foreign bodies, splatter and aerosols, arising during the use of rotary instruments.
Facemask- Dome shaped mask is preferable to the paper type which rapidly becomes permeable.
Rubber dam isolation- It minimizes the splatter of blood /saliva and aerosol.
Protective clothing- Surgical clothing should be restricted within surgery.
Aspiration and ventilation- Aspirators and tubes should be flushed daily with non-foaming disinfectant agent. Aspirator tips should be discarded or sterilized. All removable components of the suction hoses removed washed, disinfected, or sterilized. The waste liquid should be emptied directly into a sluice or toilet and never into the surgery sink. Good ventilation which exhaust externally will reduce most of the risk of cross infection and contamination from aerosols.[5]
Use of Hand Gloves: Gloves are worn as a barrier to protect the wearer's hands from contamination or to prevent the transfer of organism already in the hands. Gloves do not substitute for careful hand washing. Hands should be washed before and after gloves are used. Gloves must be worn for all intraoral procedures, including taking of radiographs.
Types of gloves-
Sterile gloves: They must be worn if the procedure involves contact with tissue that would be sterile under normal circumstance.
Medical examination gloves: Single use examination gloves should be used for all procedure involving direct skin or mucous membrane contact with blood or fluid capable of transmitting blood borne pathogens.
General purpose gloves: Gloves are used for housekeeping activities, instrument cleaning and decontamination procedures. These are made of neoprene, rubber and butyl can be washed and re-used.
Seamed gloves: seamed plastic or vinyl gloves should be worn during food preparation.[6]

Decontamination of impression and prosthetic appliance:

All impression should be rinsed in running water to remove all visible signs of contamination and be disinfected with an appropriate disinfecting agent before being sent to dental laboratory. 5% phenol and 2% gluteraldehyde have proved to be effective. Iodophor can be sprayed over impression.[10] The single use of impression trays is recommended. Heat-tolerant items used in the mouth (e.g., metal impression tray or face bow fork) should be heat-sterilized before being used on another patient. Items like articulators, lathes should be cleaned and disinfected between patients and according to the manufacturer's instructions.[9] Technician should wear gloves when handling impressions and pouring models. Transfer of oral microorganisms into and onto impressions and dental casts has been documented. Certain microbes have been demonstrated to remain viable within gypsum cast materials for <7 days.[9] Dental cast and dies can be immersed in sodium hypochlorite solution (1:10 dilution) for 30 minutes. Though autoclave sterilization is suggested, it may cause some loss of strength and surface hardness and increase in dimension. But can be used for ordinary laboratory purpose under carefully controlled condition.[10]

Impressions and prosthetic appliances should be suitably packaged when sending to the laboratory. Containers used to transfer appliances must have lids and should be cleaned and decontaminated before and after use, alternatively, single plastic bags can be used. Prosthetic appliance received from a lab rotary should be disinfected prior to

insertion in patient's mouth. 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 recommended.

Denture disinfection:

A 4% chlorhexidine scrub for 15 seconds followed by a 3-minute contact time with a chlorine dioxide solution was effective in disinfecting contaminated dentures.[7]
Disinfectants list: Currently there are seven major active ingredients used for disinfectants in dentistry worldwide. They are[8]
1. Ethyl alcohol
2. Isopropyl alcohol
3. Chlorine
4. Iodophores and iodines
5. Glutaraldehyde
6. Phenolics
7. Quaternary ammonium compounds.

Disposal of waste originating from prosthetic lab:
Health care waste is defined as the solid or liquid waste arising from health care or health related facilities. Categories include:
i. Health care non risk waste-(waste not contaminated with body fluid).
ii. Health care risk waste-(waste contaminated with body fluid hazardous to others): any human tissue and disposable items and materials that have been used on patients and which may be contaminated with body fluids, e.g. Dressings, swabs, wipe, gloves, aprons and paper tissue.

All waste generated in dental practice must be segregated into one or other of these categories & disposed of appropriately.

Black bags- These are used for health care non-risk waste and can be disposed of to a land fill site.
Yellow bags- these are used for health care risk waste. Non sharp health care risk waste contaminated with blood or saliva should be placed in sealed, sturdy, impervious yellow bags to prevent leakage and clearly labeled as infective waste. Dentist should make their own arrangements for the disposal of health care risk waste either with licensed private contractor or with a local authority.
Gypsum products should be disposed properly. Inhaled fine particles can cause respiratory problems. Recycled gypsum products can be used for agriculture purpose, in power plants and cement factory. In a study it was shown that calcium sulphate dehydrate can be reproduced using previously fabricated casts.[11]

Polishing agents used in laboratory:

If burs, polishing points, rag wheels, or laboratory knives are used on contaminated or potentially contaminated appliances, prostheses, or other material, they should be heat-sterilized, disinfected between patients, or discarded.[9] Separate polishing attachments e.g., mops, brushes and polishing agents should be kept for brand new items/appliances. Pumice must not be used for more than one item and must be discarded after use. Laundry service should be organized for mops or should be cleaned with soap and water and rinsed thoroughly, and dried. Brushes should be cleaned and disinfected after use and where possible mops should be autoclaved.

Conclusions:

There are no levels of sterilization. An absolute microbe free environment is desired to breach the cycle of infection and improve the overall health status of the society. The principal potential route of transmission of infection from the patient to the dental technician is through contaminated impression and prosthesis. Therefore, it is essential that impressions must be disinfected by the clinicians or suitably protected technicians prior to the initiation of any laboratory procedures. The only safe approach to routine treatment is to assume that every patient may be a carrier of an infectious agent and take necessary steps. To ensure this, technicians must wear gloves and also should have adequate knowledge to carry out necessary infection control measures.

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