



ORIGINAL RESEARCH PAPER

Dentistry

DENTAL IMPRESSION DISINFECTION: A REVIEW

KEY WORDS:

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INTRODUCTION

Dentistry is a branch of surgery that involves exposure of a person or materials to saliva/blood and other potentially infectious materials either directly or indirectly. On an average, 1ml of a healthy person's saliva contains about 750 million microorganisms [1]. Many contagious diseases such as AIDS, hepatitis, herpes I and II, tuberculosis, and many others can be prevented by practical control of infection in the dental office. Cleaning is the removal of all foreign material (e.g. blood, saliva, debris) from objects while decontamination is the removal of pathogenic microorganisms from objects. Disinfection is the process that eliminates many to all pathogenic microorganisms on inanimate objects except bacterial endospores. While sterilization is the complete elimination of all microorganisms including spores[2]. Most commonly observed microorganisms in oral cavity of patients wearing prosthetic dental appliances, removable orthodontic appliances include *Staphylococcus*, *Streptococcus*, *Lactobacillus*, *Actinomyces*, and *Candida* species [3].

Dental Impression – A Possible source of cross – contamination

During impression procedure, impression materials often encounter with saliva and blood, which may be infected with infectious diseases such as AIDS, herpes, hepatitis, or tuberculosis [4]

Dental impressions that are exposed to patient's saliva or blood, contaminate stone casts [5,6] and serve as a source of infection to dental personnel who handle or deal with the impressions or casts [6,8]. The personnel who works on such contaminated casts can cross-contaminate one patient casts to other and finally to the dentist and other patients. Therefore, Infection control is an essential and imperative issue in the dental practice to prevent the spreading of infection from one patient to another and also to provide protection to the dental health care providers.

This article gives an insight on importance disinfection of dental impressions in preventing crosscontamination and also emphasizes the various disinfection modalities recommended for various impression materials [8].

Chemical Disinfection Methods

Chemical disinfection preferably immersion, seems to be the most reliable and practical method, provided it does not adversely alters the dimensional accuracy of the impressions. Immersion disinfection is considered as an effective method as it ensures that all surfaces of the dental impression are exposed to the disinfectant solution. [2,9]

Glutaraldehyde:

It is a high level disinfectant and is available in neutral, alkaline and acidic forms. [7] It is a broad spectrum chemical agent with fast killing capability. It is also called chemo sterilizer. If it is used in proper concentration and specialized equipment, it can destroy all types of micro-organisms including bacterial and fungal spores, tubercle bacilli and viruses. [10]

Glutaraldehyde is a pungent colorless oil and can be used as disinfectant in liquid and gaseous forms. It is widely used to sterilize medical and dental instruments and also as

preservative in industries. Glutaraldehyde possess bactericidal, viricidal, fungicidal, sporicidal, and parasiticidal activity.

Iodophore

Iodophor was discovered by H. A. Shelanski and M. V. Shelanski. This bactericidal, sporicidal, viricidal, and fungicidal compound is a complex of polyvinyl pyrolidone (PVP, povidone) and elemental iodine. These halogens provide low to intermediate level disinfection. These are bactericidal, mycobacterial and virucidal. It is also fungicidal but requires more contact time.

These are mainly used as antiseptics rather than disinfectants. These are not sporicidal and cause staining of fabrics. They are not flammable. They have irritating effect on mucous membrane. [8,9].

Sodium Hypochlorite

Sodium hypochlorite is a chemical with formula of NaOCl. It is composed of sodium cation and hypochlorite anion. It is water soluble. It is often used in industries for bleaching, surface purification, odor removal, and disinfection of water. Hypochlorite removes stains from clothes at room temperature. Hypochlorous acid and Sodium hydroxide is formed by adding water to the hypochlorite and it can be further dissociated into hydrochloric acid (HCl) and oxygen (O).

It is very useful disinfectant with advantages including fast bactericidal activity, ease of use as it is soluble in water, relatively stable, nontoxic at use concentrations, low cost, non-staining, nonflammable and colorless. Disadvantages include mucous membrane irritation, less efficient in organic environment and corrosive effect on metals. [10]

Alcohols

These provide intermediate level disinfection and include isopropyl alcohol and ethyl alcohol. Isopropyl alcohol is normally used as antiseptic. Medical surfaces can also be disinfected with isopropyl alcohol. Ethyl alcohol is more potent in bactericidal than bacteriostatic activity. It is also tuberculocidal, fungicidal and virucidal for enveloped viruses as well. [11,12,13,16].

Isopropyl alcohol is a 2-propanol with the formula of C3H8O or C3H7OH. It is a colorless chemical compound with strong odor. It is commonly used as a topical antiseptic, and also to disinfect the surface of medical devices. Ethyl alcohol is more bactericidal than bacteriostatic,

also tuberculocidal, fungicidal, and virucidal against enveloped viruses. Alcohols are not effective against bacterial spores and non-enveloped viruses. They denature the bacterial proteins, thereby inactivating the microorganisms. The ideal bactericidal concentration in water is 60% to 90%, and the bactericidal activity decreases on diluting the concentration below 50%. [11]

Phenols

Complex phenols are classified as intermediate level disinfectants. These are also known as protoplasmic poisons. At low concentration, they cause lysis of rapidly growing e.coli, staphylococci and streptococci. They possess antifungal and antiviral properties as well.

These are commonly used in mouthwashes, scrub soaps and surface disinfectants. [12]

Chlorhexidine

It is an intermediate level disinfectant and antiseptic. It has broad spectrum of activity and also used as preservative. It is commonly used in hand washes and oral products. It is bactericidal, virucidal and mycobacteriostatic. Its activity declines in the presence of organic matter because its activity depends on specific pH. Impression can also be immersed in chlorhexidine solution and it causes effective disinfection. [13] According to one study, 1.0 g/L chlorhexidine solution can be used to produce self-disinfecting alginate impression material for clinical use. Chlorhexidine (CHX) is a positively charged molecule that binds with the negatively charged sites of the cell wall and destabilizes it. Hence, it interferes with osmosis of the cell wall. The CHX then attacks the cytoplasmic membrane and leaks the components that lead to cell death. In high concentrations, CHX causes the cytoplasm to congeal or solidify. [14]

Benzalkonium Chloride

This is a quaternary ammonium (QA) chloride salt in which the nitrogen is substituted by a benzyl group, two methyl groups, and even alkyl chains. It has antibacterial, antiseptic, detergent, and surfactant action. However, Benzalkonium chloride (BC) is not effective against fungi, viruses, and bacterial spores. QA disinfectants possess a strong positive charge which combines well with negatively charged surfaces. [15]

Ozonated Water

Ozone is an inorganic gaseous molecule. Its chemical formula is O3. It is less stable than O2 in lower atmosphere. It has antimicrobial, antihypoxic, analgesic and immunostimulatory activities. It is used for disinfection of water lines, oral cavity and dentures. It is also used as prophylactic agent before etching for the placement of restorations. Ozone, is a gaseous inorganic molecule with the chemical formula of O3. It is less stable than O2 and easily breaks down to normal dioxygen in the lower atmosphere. Ozone is formed by the action of atmospheric electrical discharges and ultraviolet (UV) light from dioxygen. It exists in low concentrations (0.6 ppm) in the atmosphere. It is a potent oxidizing and antimicrobial agent. Ozone is an unstable compound that decomposes very quickly (half-life 40 minutes at 20°C).

Ozone affects the cell membrane, vital proteins, unsaturated lipids, and the intracellular enzymes of microorganisms and may also cause DNA degradation [1,2,16]

OTHER METHODS:

Microwave Irradiation

Microwaves cause disruption of cell membrane integrity and cell metabolism which ultimately leads to microbial death. Microwaves are simple to use, low in cost and provide good disinfection. Dentures are being disinfected with microwaves and are found better disinfected than NaOCl. Microwaves can be used as an effective tool for impression disinfection. Microwave disinfection is an effective and versatile method, which is quick, easy, and inexpensive method. This method can be easily performed by dentists, assistants, and technicians. Thermal and non-thermal are the mode of actions used with microwave disinfection. [16]

Cast Disinfection

Microorganisms have been recovered from dental cast as well. These dental casts can be a medium of cross infection between patients and dental health care workers. Therefore, dental casts should also be disinfected. The American Dental Association recommends various methods for cast disinfection. [17]

Sterilization Of Impression:

Various methods are available for sterilization of impressions e.g. exposure to UV light, steam autoclave, ethylene oxide gas autoclave, and radiofrequency flow discharge etc.

Methods Of Disinfecting Impressions

- Spraying
- Immersion

Disinfection of Alginate Impressions

- 0.5% sodium hypochlorite.
- Iodophors Immersion disinfection for prolonged periods will cause distortion due to imbibition [1,2,7]

Agar-Reversible Hydrocolloid

Found to be stable when immersed in 1:10 dilution sodium hypochlorite or 1:213 iodophor. Recommended immersion time is 10 minutes [1,2,3]

Zinc Oxide Eugenol

- Immersion in 2% glutaraldehyde Iodophors or Chlorine compounds.
- Adverse effect have been reported on ZOE immersed for 16 hours in diluted hypochlorite. [3,4,10]

Impression Compound

- Immersion in 1:10 dilution sodium hypochlorite or iodophor for specified time period. [14]
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ELASTOMERIC IMPRESSION MATERIALS

Polysulphide and Addition Silicone:

Glutaraldehyde, Iodophor, 0.5% sodium hypochlorite should be used. [3]

Polyether:

- Spraying in iodophor, 0.5% Sodium hypochlorite should be used.
- Prolonged immersion causes some distortion.
- Polyether shows dimensional changes on immersion in 2% glutaraldehyde. [12]

DISCUSSION

Cross-infection control is of prime importance in dental practice but impression disinfection is still a widely neglected aspect. The proper criteria for impression disinfection

Involves:

- 1) The most suitable method (spray or immersion).
- 2) Appropriate application (time of contact).
- 3) Periodic check for efficacy.

Spray disinfection and immersion disinfection are the two methods of impression disinfection. However, immersion is the most reliable method because all surfaces of impression and tray come in contact with disinfectant solution. But immersion is not the method of choice for hydrocolloids material as they are extremely hydrophilic. Ethylene oxide gas autoclaving has shown significant structural changes of heavy and light body addition silicone impression material. Sterilization of dental stone cast has shown improved mechanical properties but decreased compressive strength. Addition or condensation silicone impression materials can be sterilized in steam autoclave without remarkable changes in dimensional accuracy. [12,15]

CONCLUSIONS

- 1) Cross infection control is very important aspect of patient safety
- 2) Impression disinfection can prevent spread of infection from dental clinic to dental laboratory technician, patients and dental auxiliaries
- 3) It is the responsibility of the dentist to make appropriate

choice of disinfection method for different impression materials. Infection control is very important aspect in prevention of cross infection and safety of patients, Dentists and dental personnel. Impression disinfection can prevent spread of infection from dental clinic to dental laboratory technician, other patients and dental auxiliaries. It is the responsibility of the dentist to make appropriate choice of disinfection method for different impression materials.[15,17]

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