

Disinfecting the Impressions to Prevent Cross Contamination: A Review

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ABSTRACT

Background: The increased awareness of infectious diseases and recognition of the potential for transmission of numerous infectious microorganisms during dental procedures has led to an increased concern for and attention to infection control. Since infection may be transmitted through blood and saliva, dental personnel are exposed directly or indirectly to a variety of microorganisms. Of the many potential contamination pathways in dental practice, dental impressions invariably are contaminated with patient's saliva and sometimes blood. Such fluids may contain microorganisms, some of which may have potential for disease transmission. It has therefore, been recommended to disinfect impressions immediately after removal from the mouth in order to prevent cross-infection of dental office staff and dental technicians.

Keywords: Disinfection, Cross-contamination, Impressions, Infection control.

INTRODUCTION

"Living on the edge" is often the term referred to dental and medical professionals as they are exposed to a variety of micro organisms from the saliva and or blood of the patients. Ray K C and Fuller¹ in 1963 stated that dental impressions contaminated with blood and saliva may potentially transmit infectious agents. According to Runnells,² 23 serious infectious diseases, virus and bacteria induced, have been found in dentistry. These micro organisms may cause Tuberculosis, Herpes, Hepatitis-B, Acquired immunodeficiency syndrome. In addition to known pathogens, micro organisms that are generally harmless can be pathogenic in patients debilitated by age or disease. These individuals are most likely to have prosthodontic needs. Therefore, every patient must be considered as having the potential to transmit infectious agents to dental personnel. Since infection may be transmitted through blood and saliva dental

personnel are exposed directly or indirectly to a wide variety of microbes.

Of the many potential contamination pathways in dental practice impressions may transmit a variety of micro organisms from the oral cavity and in addition casts poured from impressions might also harbor infectious micro organisms that can be distributed throughout the laboratories when models or dies are handled.^{3,4} Some of these micro organisms survive for a very long time, even when they are outside the mouth fluids. Leung and Schonfeld⁵ reported that micro organisms were transferred via alginate impressions and recovered on stone casts. So the disinfection of dental impressions is an essential stage in cross infection control. If contaminated impressions are allowed directly into the lab that puts the lab technicians at risk. The reverse path of cross infection from the laboratory back to the dentist and patient also has to be considered. If disinfection is not practiced routinely a cycle of

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cross-infection may occur. Cross-infection⁶ may be defined as the transmission of infectious agents between patients and staff within a clinical environment. Transmission may result from person- to- person contact or via contaminated objects.

Earlier, only rinsing impressions under running water was the recommended practice and in some studies, it has been shown that washing the impressions with tap water only removes 40% of bacteria, however some studies reported that it has the capacity to reduce 90% micro organisms.⁷ The center for disease control (CDC) and the American Dental Association (ADA) have made a series of recommendations regarding infection control procedures for impressions entering the dental laboratories. The International Dental Federation (IDF) insists on disinfecting all impressions taken from patients before sending them to laboratories.⁸ It is not possible to determine all highly infectious patients from medical histories or from patient conversation. Therefore the only valid posture for dentists and dental technicians is to assure (and to act as if) all patients are highly infectious. The same sets of criteria and techniques must be applied to material from all patients⁹.

It is therefore imperative that the recommendations for disinfecting dental impressions presented by the Center for Disease control and ADA should be followed for all the patients. When considering the method of disinfection two factors are important.

1. Efficacy of disinfection procedure
2. Effect of the disinfection procedure on properties of impression materials.

Disinfection procedure

The word "disinfection" was originally used about 100 B.C to express the idea of removing an agent capable of causing infection or disease. The ADA first recommended disinfection of impressions in 1985. Accordingly impression should be rinsed thoroughly after removal from the mouth to remove any blood or bioburden prior to disinfection. Because the antimicrobial activity of a chemical disinfectant falls drastically in the presence of organic debris.

The impression is then disinfected using an EPA(Environmental Protection Agency)-registered disinfectant. After disinfecting the impression, it must be rinsed thoroughly to remove disinfectant otherwise it may result in a sub standard model due to incorporation of residual disinfectant in to the stone or plaster. Exposing an impression to a disinfectant solution by spraying or immersion for various lengths of time after rinsing saliva and blood are the methods principally advocated.

Disinfectants

Only EPA (Environmental Protection Agency)- registered hospital level disinfectants may be used for the disinfection of impressions. The disinfectant must have a tuberculocidal claim. The required exposure time for a disinfectant is important in its selection for disinfecting impressions. Although disinfection of impressions is a simple procedure it must be done carefully .The selection of disinfectant is very important because it must have wide action spectrum without altering the properties of impression materials. Other factors, as concentration, compatibility, and also time of disinfection to each impression material are also important.

Commonly used disinfectants are alcohols, iodophors, phenols, glutaraldehyde, quaternary ammonium compounds, chlorhexidine, formaldehyde, halide disinfectants such as hypochlorite and bromides. Disinfection of impression may be accomplished by immersion or spraying for various lengths of time after rinsing saliva and blood. Immersion method- Is perhaps considered to be a more reliable method which should ensure a more even contact between the disinfectant and impression material.⁹ It is preferred over spraying. Place rinsed impression in to a plastic bag containing appropriate disinfectant. Immersion time is depending on the disinfectant and according to manufacturer's instructions. Remove and rinse the impression before pouring a cast. Spraying- Uses less solution. Spray the rinsed impression and impression tray with an acceptable disinfectant. Seal the sprayed impression in air tight plastic bag. After appropriate contact time the impression can be removed, rinsed thoroughly with tap water. Contrary to immersion disinfection, spraying can significantly reduce the amount of

distortion.⁷ Spraying does increase the chances for staff exposure to hazardous chemicals. Using stream spray can minimize aerosolization. But this procedure may not ensure thorough disinfection of all the impression material.

Commonly used Impression materials and disinfectants

Non-elastic impression materials such as Impression compound, elastic impression materials such as hydrocolloids (Alginate and Agar), and elastomeric materials including Addition silicones, condensation silicones, poly ethers and poly sulfides. It should be noted that no single disinfectant is compatible with all impression materials. In selecting a disinfectant compatibility is a requirement. The manufacturer's directions for disinfection must be followed.

Impression compound and Zinc oxide eugenol impression paste

Limited data is available on disinfection of Zinc oxide Eugenol and impression compound impressions and adverse effects have been reported on Zinc oxide eugenol immersed for 16 hrs in diluted hypochlorite and on compound by all the disinfectants tested (hypochlorite, formaldehyde, and 2% alkaline glutaraldehyde). Both can be disinfected by immersion disinfection for recommended tuberculocidal activity time. The acceptable disinfectants for Zinc oxide Eugenol impressions include glutaraldehyde and 1:213 iodophors and for impression compound 1:213 iodophors and 1:10 sodium hypochlorite solutions.

Hydrocolloids (Agar, Alginate)

As the hydrocolloid impressions must be poured within short time after removal from the mouth, the disinfection procedure must be relatively rapid to prevent the dimensional changes. A number of studies have evaluated the effects of disinfection on alginate and results varied depending on the techniques used. Disinfection of impression by spraying is recommended. Because of hydrophilic nature of alginate, a disinfectant with shortest contact time will cause less amount of distortion. Iodophors, 1:10 sodium hypochlorite, glutaraldehyde with phenolic buffer are all acceptable¹⁰. In Shogo Minagi, Kazunori Fukushima

et al.¹¹ study immersion in 2% glutaraldehyde for 60 min for irreversible hydrocolloids was recommended. But many studies recommended immersion for shorter period (10 min).

Limited data is available on disinfection of agar, disinfection of impression by spraying is recommended because of hydrophilic nature of agar. Acceptable disinfectants include 1:213 iodophor, 1:10 sodium hypochlorite 2% acid glutaraldehyde with dilution of 1:4 and glutaraldehyde with phenol buffer diluted 1:16.

Elastomeric impression materials

Acceptable disinfectants for rubber base impression materials are glutaraldehydes, 1:213 Iodophors, 1:10 sodium hypochlorite solution and complex phenols. In Shogo Minagi, Kazunori Fukushima et al.¹¹ study immersion in sodium hypochlorite solution for 60 min was the recommended method of disinfection for silicone impression materials. Polyethers are better disinfected by spray method because of its hydrophilic nature. Although they can be disinfected by immersion but exposure times should be kept to minimum. (10 min)¹².

Other methods of disinfection

Materials used for impressions cannot be heat sterilized and are often damaged by chemical disinfection (Blair and Wassell 1996)¹³. Also, chemical disinfectants may be toxic, deteriorate with storage time and presence of organic matter can reduce their activity. Alternative disinfection methods such as ultraviolet light, microwave irradiation, ozone etc has been recommended. Ultraviolet irradiation has long been recognized as an effective method for killing microbes (Chang et al 1985). UV irradiation has advantages over many existing disinfection methods in not requiring chemicals or heat and in being fast. However limitations in current U.V technology have restricted its use. In addition, the likelihood of output degradation and shadowing leads to non uniform exposure of impressions to UV light.

Microwave irradiation was identified as a useful disinfection method especially when combined with hydrogen peroxide, without adversely affecting the physical properties of dental

impression materials. Ozone, as a potent oxidizing agent presents antimicrobial action. Despite the fact that Ozone has many applications in modern dentistry, its use as an impression disinfectant does not exist much in the literature.

CONCLUSION

Many guidelines for disinfection and sterilization procedures may be laid down but studies have found that good practice is not always followed. Disinfection of impressions is no longer an option but a requirement to prevent the risk of disease transmission and cross contamination. Considering all patients as potentially infectious, all impressions are rinsed thoroughly after removing from the mouth and disinfected with suitable disinfectant before pouring a cast.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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