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MANAGEMENT OF HIV/AIDS PATIENTS IN PROSTHODONTICS- A CURRENT PROSPECTIVE

[1] Sahul Ierra [1] Consultant
[2] Nidhi Khajuria [2] Assistant Professor

[1] Jammu & Kashmir Health Services, Jammu
[2] Assistant Professor, Institute of dental science, sehora jammu

ABSTRACT: Human immunodeficiency virus (HIV) has been recognized as one of the most devastating infectious diseases of the century. Because of repeated exposure to the microorganisms present in blood and saliva, the incidence of certain infectious diseases has been significantly higher among dental professionals. HIV, Hepatitis B, Tuberculosis and Herpes simplex virus infections are well recognized and indicate the need for increased understanding of modes of disease transmission and infection control procedures. The purpose of this review is to provide brief awareness and understanding of the treatment options for the HIV (Human Immunodeficiency Virus) patient. Significant regulations and recommendations have been generated to lessen the chances of viral exposure during prosthetic procedures.

KEYWORDS: Edentulous, Microbes, Saliva, Denture, HIV, Removable Denture, Complete Denture Wearer, Candida.

INTRODUCTION

Far from having a passive relationship with the host, recent research has confirmed earlier (and largely forgotten) studies that demonstrated that the resident micro flora of animals and humans plays a positive role in the normal development of the host. This resident micro flora also plays an active role in the maintenance of the healthy state by contributing to the host defenses and preventing colonization by exogenous microorganisms. It has been estimated that the human body is made up of 1014 cells of which only 10% are mammalian.[1] The remainder are the microorganisms that make up the resident micro flora of the host. The composition of this micro flora varies at distinct habitats, but is relatively consistent over time at each individual site among individuals.[2]

Normal oral flora comprises a diverse array of organisms which includes eubacteria, archaea, fungi, mycoplasmas and protozoa.[3] Among these, fungi are classified as eukaryotes, and the most important to dentistry belong to the genus Candida. Human infections caused by Candida albicans and other related species range from the more common oral thrush to fatal, systemic super infections in patients who are afflicted with other diseases[4]. The abilities of C. albicans to transform from blastospore to the hyphal phase and to form germ tubes, which mark the onset of hyphal growth of C. albicans, are the possible factors in the pathogenesis of candidiasis[5]. The advent of the human immunodeficiency virus, the use of wide‑spectrum antibiotics, immunosuppressive therapy and increasing incidence of diabetes, are some of the global scenarios that have resulted in the increase in immunocompromised individuals. This in turn has paved way for the increased incidence of opportunistic infections, and oral candidiasis (OC) is clinically the most relevant among them for dental health care providers.[6] The other species of Candida (C.) besides C. albicans encountered in human infections are C. tropicalis, C. glabrata, C. parapsilosis, C. guillermondii, C. krusei and C. kyfer and more recently C. dublinien sis[7.8.9] .

Human Immunodeficiency Virus / Acquired Immunodeficiency Syndrome are considered important public health problems both in developed and developing countries (WHO, 2009). The morbidity and mortality associated with HIV infection are affected by prophylaxis to prevent opportunistic infections, antiretroviral therapy, and social condition[10]. Data on oral health discrepancies and oral health care needs of patients from different backgrounds including individuals who are at risk for HIV infected should alert dental educators to the importance of including these issues in the dental and the dental hygiene curricula, [11, 12]

Dental professionals are exposed to a wide variety of microorganisms in the blood and saliva of patients. Acquired immune deficiency syndrome (HIV) gains entry into the body directly through the blood or mucosal surface. Not all the infected patients can be identified based on medical history, physical examination and laboratory investigation; hence, the philosophy is to consider all patients to be infected with this pathogenic organism and universal precautions should be followed.

Oral health considerations for persons infected with HIV focus on the provisions of adequate dental care.

The virus establishes itself within lymphoid tissue, where it replicates and becomes available to the immune system.[13] The particular immunodeficiency in HIV disease is attributed to CD4+ lymphocyte depletion, enabling the development of specific opportunistic infection that is associated with a high degree of morbidity and mortality.
The use of effective infection control procedures and universal precautions in the dental office and dental laboratory will prevent cross-contamination that could extend to dentists, dental office staff, dental technicians and patients.[14] As a general rule, no modifications are required in the treatment of HIV patients. The major area of concern is impaired hemostasis, susceptibility to dentally induced infections, drug actions and interactions and the patient's ability to withstand the stress and trauma of dental procedure. One of the main side effects of the medications used to treat HIV disease is xerostomia. One of the main side effects of the medications used to treat HIV disease is xerostomia.

Thus, while performing simple restorative procedures or fabricating fixed or removable prosthesis, the type of restorative material used, long-term use and maintenance of a restoration should be considered. Nutritional recommendations for combating changes in the body composition are also advocated.[14]

DISCUSSION

Increasing numbers of *C albicans* infections among denture wearers calls for effective treatment and prevention. Several investigators have demonstrated that *C albicans* colonies can be isolated more frequently from the tissue-fitting surfaces of acrylic resin dentures than from the corresponding mucosa. This indicates the necessity for both the total removal of this fungus from the acrylic resin denture surface of patients with denture stomatitis and the prevention of recolonization.[15]

Between the years 1960 and 1970, the incidence of fungal infections among denture stomatitis patients has been reported to be from 40% to 70%. More recent reports indicate that the true percentage actually varies from 60% to 100%.[16]

Recently, there has been an increasing interest in oral candidiasis, because the presence of yeast infection in the mouth appears to be prognostic for the development of opportunistic infections in acquired immunodeficiency syndrome in patients.[17,18,19]

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Denture wearing is recognized as a predisposing factor for oral colonization by Candida species (6–8). When only denture wearers are considered, the prevalence of Candida colonization increases to 60–100%.[22] A study about the incidence of Candida in the oral cavity, demonstrated that Candida was present in 88% of denture wearers. Nevertheless, a prevalence of 52% was found for non-denture wearers.[23] Denture-related factors of particular significance are caused by the denture base, poor hygiene and continuous wearing.[24,25] A possible reason for the proliferation of fungal organisms associated with denture wearing is the change that takes place in the microenvironment beneath the denture. This situation provides more favourable conditions for the retention of debris and thus microorganisms.[26] This indicates the necessity for both the total removal of this fungus from the acrylic resin denture surface of patients with denture stomatitis and the prevention of recolonization. The literature contains several reports on the use of nystatin, chlorhexidine, and, recently, synthetic homologous histidine polypeptides against the growth of *Candida* species on the acrylic resin surface.[27,28,29]

Salivary bacterial concentration increased with reduction in salivary flow rate or increase in age.Salivary microbes are released from the oral surface. It is possible that reduction in volume of saliva results in an increase in concentration of salivary microorganisms. Number of microbes in saliva increased with reduction in salivary flow rate.[30,31,32,33]

scientific evidence of increased risks during invasive dental treatment procedures in patients who are immunosuppressed or who test positive for the human immunodeficiency virus (HIV) is limited.[34]

THE BASIC STEPS RELATES TO THE ACQUISITION OF DISEASE WITHIN DENTAL ENVIRONMENTS.[35]

Step 1: **The major source** of the microorganisms in dental offices is the patients' mouths. However, disease can spread from practitioners to patients.It is not possible to accurately detect which patients may indeed be harboring pathogens. To successfully prevent the spread of pathogens, infection control procedures must be applied during the care of all patients using the concept of standard (universal) procedures – considering all patients to be infectious. The importance of standard (universal) precautions is based on the understanding that asymptomatic carriers of a disease can be highly infectious. These persons are probably the most important in the spread of a disease because they are often unaware of their status and are physically able to infect others.

Step 2: **Escape from the source:** microorganisms present in the oral cavity can be released during normal activities such as breathing, sneezing and coughing. Many dental procedures also release microorganisms. Anything removed from a patient's mouth is assumed to be contaminated.

Step 3; **Spread of microorganisms to a new host:** transmission of disease causing microorganisms can occur in one of three routes. Spread by direct contact means touching of practitioner skin or mucous membranes to patient tissue or body fluids. Indirect contact can result from injuries with sharp items contaminated with body fluids/tissue, such as needles, instruments and dental prostheses. Transmission can also occur by droplet infection. Aerosol and spatter from patients could contact unintact skin or mucous membranes, which would allow direct entrance. Droplet infection may also involve inhalation of microorganisms.

Step 4: **Entry into a new person:** microbial release does not always mean entrance into a new host. Entry involves four basic routes – 1) inhalation, 2) ingestion, 3) via mucous membranes or through 4) breaks in the skin. Proper use of infection control methods and equipment can significantly limit entrance of microorganisms. Entry can also occur because of accidents, such as needle sticks.

Step 5: **Infection:** survival and multiplication of microorganisms on or in the body does not always mean that disease and damage to the host will occur. Humans are constantly exposed to microorganisms. Fortunately, the host's nonspecific and specific defense mechanisms usually detect and neutralize invading microorganisms.

Standard procedures of sterilization, disinfection and asepsis must be applied to all types of dental care to reduce the chances of cross contamination (disease transmission) that may lead to serious infectious diseases. Cross contamination is the spread of microorganisms from one person to another.

Sterilization and disinfection

The methods of disinfection are heating (Pasteurization or boiling in water), using ultrasonic methods or chemical solutions. Sterilization is the process by which all forms of microorganisms - including viruses, bacteria fungi and spores - are destroyed. Appropriate sterilization methods include the use of steam under pressure (autoclaving), dry heat, chemical vapor and ethylene oxide gas (only for instruments that can be thoroughly cleaned and dried).

Prevention strategies

The different prevention protocol includes the following:

- Personal protective equipment
- Cubicle preparation
- Personal protective equipment
- Gloves, masks, protective eyewear
- Puncture-resistant gloves and thimbles
- Double gloves

HAND HYGIENE, [36, 37]

Hand washing is generally considered the most important hygiene measure in preventing the spread of infection. Clinicians should wash their hands before and after significant contact with any patient and after activities that may cause contamination.

Hand washing should occur:

- Before and after each clinical contact with a patient
- Before and after eating
- After using the toilet
- Before and after using gloves
- After contact with used equipment
- Immediately following contact with body Substances

It is important to note that gloves are not a substitute for effective hand washing. A routine hand-wash should include removal of jewellery and use of a cleaning solution (detergent with or without disinfectant) and water for 15 to 20 seconds, followed by drying with a single-use towel.

BARRIER TECHNIQUES [37]

The type of protective equipment required depends on the nature of the procedure, the equipment used and the skill of the operator. For example, the use of protective equipment is recommended in the following circumstances:

- Protective eyewear and face shields must be worn during procedures where there is potential for splashing, splattering or spraying of blood or other body substances
- Impermeable gowns and plastic aprons should be worn to protect clothing and skin from contamination with blood and body substances
- Footwear should be enclosed to protect against injury or contact with sharp objects

MASKS: Surgical masks or chin-length plastic face shields must be worn to protect the face and the oral and nasal mucosae when a discharge of body fluids is anticipated. The use of high-volume evacuation, proper positioning of patient and rubber dams are the three principal means of limiting droplet contamination

GLOVES [36, 37]

Gloves are a form of personal protective equipment. Clinicians and other health care workers should wear gloves whenever there is a risk of exposure to blood or body substances, and should change their gloves and wash their hands after contact with each patient and during procedures with the same patient if there is a chance of cross contamination.

Gloves must be used when:

- Handling blood and/or body substances
- Performing vene puncture
- Touching mucous membranes
- Touching non-intact skin
- Handling contaminated sharps
- Performing invasive procedures
- Cleaning body substances spills or any equipment (instruments) or materials (linen) or surface that may have been contaminated by body substances

Use and care of handpieces

The manufacturer's instructions should be followed for proper sterilization of handpieces and for the use and maintenance of waterlines. First, before sterilization, the handpiece should be washed under running water for 20-30 s, and the water discharged into a sink or container. An ultrasonic cleaner should be used to remove any adherent material, but only if it has been recommended by the manufacturer. Alternatively, the handpiece should be scrubbed thoroughly with detergent and hot water. Many manufacturers recommend spraying a cleaner/lubricant into the assembled handpiece before and after sterilization.

Several reports state that HIV in whole blood samples and *Pseudomonas aeruginosa* in the blood and plasma survive high-level disinfection when entrapped in lubricants used in dental handpieces and endoscopes. It has also been found that lubricated dental devices used to clean and polish teeth (prophylaxis angles) have the potential to transfer sufficient amounts of blood to infect human lymphocyte cultures with HIV. These results emphasize the need to subject reusable dental devices to a heat-sterilization protocol that penetrates the lubricant. Heat-treating high-speed handpieces between each patient should be considered as an essential component of standard procedures whenever universal precautions are practiced in dentistry.[38]

IMPRESSIONS, PROSTHESES, CASTS, WAX RIMS, JAW RELATION RECORDS:

Impressions must be rinsed to remove saliva, blood and debris and then disinfected. Impressions can be disinfected by immersing in any compatible disinfecting product. Since the compatibility of an impression material with a disinfectant varies, manufacturers' instructions should be followed for adequate disinfection. Irreversible hydrocolloids are able to resist contamination by viruses and saliva when the disinfectant iodine or chlorhexidine is added to the water used to mix the material.[39]

Disinfection of an impression by immersion:[40]

It is preferred over spraying. Spraying may not be effective because constant contact of the disinfectant with all surfaces of the impression cannot be assured.

1. Rinse the impression with running water and shake off excess water.
2. Place rinsed impression into a zippered plastic bag containing appropriate disinfectant.
3. Leave it immersed in disinfectant for 15 minutes. Polyethers and hydrocolloids
4. may be adversely affected by disinfectants; therefore their immersion time is limited to 10 minutes.
5. Remove impression from disinfectant.
6. Rinse with running water and shake off excess water.

Disinfection of an impression by spraying:

Spray the cleaned impression and impression tray with an acceptable disinfectant. Seal the sprayed impression in a zippered plastic bag for 15 minutes. Remove the impression from the sealed bag.

Hydrocolloid impressions: A number of investigators have evaluated disinfection of irreversible hydrocolloid (alginate) sometimes with contradictory results. Based on these findings, the ADA recommended disinfecting alginates by immersion in diluted hypochlorite, iodophor or glutaraldehyde with phenolic buffer. Investigators reported significant adverse effects of specific materials with disinfectants that are non-reactive with other alginates suggesting that caution should be exercised. Given the hydrophilic nature of the material, a minimal disinfection time should be used.[40,41]

Accurate casts can be obtained when either of the two disinfectants is incorporated into the alginate impression material. The use of disinfectants that require maximum 30 min for disinfection is recommended .Metal base prostheses may be of clinical significance as a treatment of choice to patients who are prone to higher incidence of fungal infections. Metal base has proved to be effective in reducing fungal growth.[42]

Ragwheels can be washed and autoclaved after use in each patient. Brushes and other equipment should be disinfected at least daily. A small amount of pumice should be dispensed in small disposable containers for individual

use in each patient. The excess should be discarded. A liquid disinfectant (1:20 sodium hypochlorite solution) can serve as a mixing medium for pumice. Three parts of green soap when added to the disinfectant solution can be used to keep the pumice suspended.[43]

Disposal of waste materials [44]

Management of blood and body substance spills in the health care setting depends on the nature of the spill, likely pathogens, type of surface and the area involved. The basic principles of spills management are:

- Standard precautions including use of personal protective equipment apply where there is a risk
- of contact with blood or body substances
- Spills should be cleaned up before the area is disinfected
- Generation of aerosols from spilled material should be avoided

All spills must be dealt with as soon as possible. In general cleaning blood and body substance spills should take into account the following factors:

- The nature of the spill (e.g. sputum, vomit, blood)
- The pathogens most likely to be involved in the spill
- The size of the spill (spot, small or large spill)
- The type of surface (e.g. carpet or impervious flooring)

In the case of a small spill, wipe the area clean using a paper towel and then clean with detergent and warm water. A disposable alcohol wipe also may be used. Quarantine areas where soft furnishings are involved (carpet, curtains or seating) until dry.

In the case of larger spills mop up with paper towel or use 'kitty litter' or granular chlorine, picking up the larger amount with cardboard. In general, it is unnecessary to use sodium hypochlorite for managing spills because there is no evidence of any benefit from an infection control perspective. However, it is recognised that some health care workers may feel more reassured that the risk of infection is reduced through the use of sodium hypochlorite.

Disinfection of Dental prosthesis and appliances [45,46,47]

The ADA recommends disinfection by immersion in iodophor or chlorine compounds. Although both of these disinfectants are somewhat corrosive, studies have shown little effect on chrome cobalt alloy with short-term exposure (10 minutes) to iodophor or 1:10 hypochlorite.

Damage of heat cured denture base resin has been shown to occur after only 10 minutes of immersion in a glutaraldehyde with phenol buffer, although immersion in 2% alkaline glutaraldehyde did not damage the acrylic surfaces. Given the tissue toxicity of glutaraldehyde and phenolic compounds, however iodophor or chlorine compounds are preferred for disinfection of acrylic appliances. Prostheses never should be stored in a disinfectant before insertion. After disinfection and thorough rinsing, acrylic items can be stored in diluted mouthwash until inserted.

Fixed metal/porcelain prosthesis may be disinfected by immersion in glutaraldehyde for the time recommended for tuberculocidal inactivation by the disinfectant manufacturer.[14] In addition several clinical studies have confirmed that fixed prosthesis can be disinfected by short immersion in diluted hypochlorite without apparent harm to the device. The higher the content of noble metal, the less the likelihood of adverse effects on the metal. Care should be taken to minimize the exposure times of metals to potentially corrosive chemicals. Iodophor probably could be used as well, but no data are available to substantiate this. Unglazed porcelain should not be exposed to any disinfectant and (porcelain firing/ glazing will suffice), fixed metal prostheses can be sterilized with ethylene oxide or even by autoclaving if desired. Any device that has been immersed in a disinfectant should be rinsed thoroughly before delivery to the patient.

Prosthesis or appliances that have been worn by patients should be cleaned thoroughly before disinfection by scrubbing with a brush and an antiseptic hand wash or by cleaning in an ultrasonic unit.

Dentures or other acrylic appliances that have been worn by patients and require repair should be disinfected, after cleaning and before handling should be handled (i.e. with gloves) as contaminated even after disinfection. The porous nature of acrylic makes such devices difficult to disinfect adequately.

CONCLUSION

Dentists must use effective infection control procedures in their practices. A positive step by step approach should be used. One should determine and practice infection control and build upon them by adding new procedures to the dental routine. The current knowledge in today's society regarding infectious diseases in general and herpes, hepatitis and acquired immune deficiency syndrome (HIV) in particular dictates that all dental practices must incorporate acceptable infection control techniques. Dental prostheses, impressions, models and items used in their fabrication are potential sources for cross infection and should be handled in a manner that prevents exposure of dental health care professionals and patients to infectious agents.

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Corresponding Author

Dr. **Sahul Lerra** M.D.S
Bhagwati Niwas, Rehadri Chungi,
Jammu-180003.
India.
Email: Sahul.lerra@gmail.com
Phone No: +91-9694355041