

# Prosthetic management of HIV/AIDS patients

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Human immunodeficiency virus (HIV) has been recognized as one of the most devastating infectious diseases of the century. This article delineates the specific recommendations associated with the protection against HIV, which includes barrier techniques; hand washing and care of hands; sterilization or disinfection of instruments; cleaning and disinfection of dental units and environmental surfaces; disinfection of the dental laboratory and the disposal of waste materials.

**Key words:** Barrier technique, disinfection, HIV, opportunistic infections, postexposure management, sterilization

## INTRODUCTION

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. All infected patients cannot be identified on the basis of 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.<sup>[1]</sup> 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.

## CASE HISTORY

A 58-year-old female patient, with a positive history of HIV infection, reported to the Department of Prosthodontics for the treatment of a defect due to surgical resection of carcinoma of the palate. On intraoral examination, the patient did not show any other symptom except for pain at the corner of the lip [Figure 1-3]. She explained a history of weight loss and weakness.

The treatment plan was to cover the defect by placing a palatal plate and prevent the oronasal communication. A systematic disinfection protocol was followed at all the steps of the restorative procedure, which included the following:

- Personal protective measures such as wearing a double glove, mask, high volume evacuation and proper positioning of the patient. An antimicrobial surgical hand scrub was used each time after treatment.
- Surface disinfection was carried out using spray-wipe-spray technique with iodophor solution, and plastic protective sleeves were used to cover the dental units.
- Impressions were prepared with alginate, which were thereafter disinfected with 2% glutaraldehyde.
- Casts were poured in type III stone and then disinfected with 2% glutaraldehyde.
- Wax sheet was adapted in the cast covering the defect. Dewaxing was performed and heat-cure resin palatal plate was prepared.
- Fabrication of prostheses was performed according to an effective infection protocol to prevent cross-contamination. A small amount of pumice should be dispensed in small disposable containers for individual use in each case. Excess pumice should be discarded. A liquid disinfectant (1:20 sodium hypochlorite solution) can serve as a mixing medium for pumice.<sup>[2]</sup>

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. Thus, while performing simple restorative procedures



Figure 1: Extra -Oral Frontal

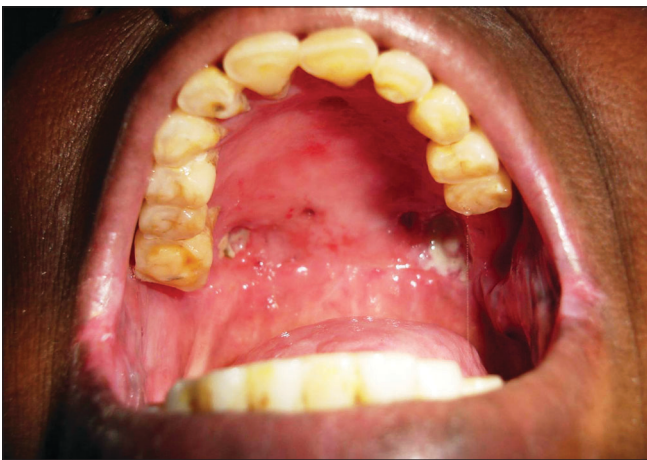


Figure 2: Intra Oral view of Palatal Lesion



Figure 3: Palatal Plate

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.



Figure 4: Spray - Wipe - Spray

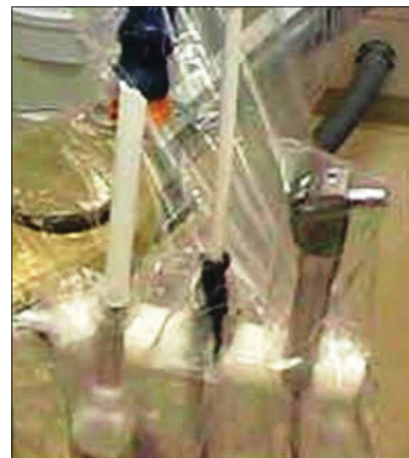


Figure 5: Plastic Protective Sleeves

## DISCUSSION

### Sterilization and disinfection

Disinfection is defined as the removal or killing of all pathogens but not spores. Ideally, all vegetative microbes should be killed; however, a reduction in the number of pathogens to a level that is unlikely to cause infection is acceptable. The methods of disinfection are heating (Pasteurisation 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). Disinfection is generally less lethal to pathogenic organisms than sterilization.

**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

**Barrier techniques<sup>[2]</sup>**

*Gloves:* After contact with each patient, gloves should be removed, and hands should be washed and then regloved before treating another patient. The repeated use of a single pair of gloves by disinfecting them between patients is not acceptable. Exposure to disinfectants or other chemicals often causes defects in gloves, thereby diminishing their value.

*Barriers:* Latex heavy rubber gloves, also called utility gloves, should preferably be used for cleaning instruments and environmental surfaces. Dentists should be aware that allergic reactions to latex gloves or the cornstarch powder in gloves have been reported in health care workers and patients. To reduce the possibility of such reactions, nylon glove liners for use under latex, rubber or plastic gloves are available. Polyethylene gloves, also known as food-handlers’ gloves, may be worn over treatment gloves to prevent contamination of objects such as drawer or light handles or charts. Protective clothing Such as gowns, aprons, lab coats, clinic jackets or similar outer protective garments, either reusable or disposable, should be worn when clothing or skin is likely to be exposed to body fluids.

*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.

**Hand washing**

Hands must always be washed at the beginning of each day, before gloving, after removal of gloves and after

touching inanimate objects likely to be contaminated by body fluids from patients. For surgical procedures, an antimicrobial surgical hand scrub should be used. Hand washing facilities should be designed to avoid cross-contamination at the scrub sink from water valve handles and soap dispensers.

*Handling of sharp instruments and needles:* If a patient requires multiple injections over time from a single syringe, then the needle should be recapped between each use to avoid the possibility of a needle-stick injury. Needles can be safely recapped by placing the cap in a special holder, using a pair of forceps or other appropriate instrument to grasp the cap or by simply laying the cap on the instrument tray and then guiding the needle into the cap until completely seated. While recapping, the cap should not be held in the operator’s hand since this poses a great risk to needle-stick injury.

Disposable syringes, needles, scalpel blades and other sharp items should be discarded in puncture-resistant biohazard (sharps) containers that are easily accessible.

**Cubicle preparation**

- Surface disinfection
- Disinfecting countertops

**Surface disinfection**

Before seating a patient, any contaminated equipment or cabinetry that cannot be autoclaved should be disinfected with a fresh iodophor solution and, where appropriate, a protective cover placed. Surfaces can be either covered or disinfected. Surfaces can be covered with plastic wrap, aluminum foil or impervious backed absorbent paper.

The rationale behind this is that following contamination, microorganisms remain active on surfaces of dental equipment for varying periods of time. Disinfection alone is not as effective as placement of clean protective barriers on equipment between patients. The durability of some microorganisms is shown in Table 1 below:

**Table 1: Durability of some microorganisms<sup>[3]</sup>**

Microorganism	Durability on dry surface	Microorganism	Durability on dry surface
HIV (AIDS)	90% to 99% inactive within several hours of drying on a surface	Hepatitis B	Up to 7 d at 42% humidity
<i>Staphylococcus aureus</i> (Skin infections)	Average of 5 days on a dry surface	Herpetic viruses (Herpes)	3-4 h on paper charts and forms
<i>Mycobacterium tuberculosis</i>	6-8 months in dry sputum protected from sunlight.	Rhinovirus (Colds)	Up to 14 h

*Spray-Wipe-Spray*<sup>[4]</sup> [Figure 4]: First, an iodophor solution is sprayed on countertops and wiped with a paper towel. This solution is sprayed again and allowed to dry before covering the surface with a clean paper cover.

This 'Spray-Wipe-Spray' technique enhances disinfection through mechanical cleansing using paper towel, which disrupts colonies of microorganisms that may be present on the surface of the countertop.

Coupled with the chemical action of iodophor, the disinfection of countertops is enhanced. Gloves, masks and protective gowns should be worn during the process of disinfection.

*Plastic protective sleeves* [Figure 5]: Plastic protective sleeves for the hose and instruments on the dental unit are placed after applying the disinfectant to the equipment surfaces. The disinfectant is sprayed on the holders, the hose connectors are placed in the holders, and then disinfectant sprayed again and allowed to dry. A medium-sized bag is then placed over the holder.

Tube bags are placed on the oral evacuator, saliva ejector and the auxiliary air-water syringe; the working ends are then poked through the end of the plastic tube bags before use. To cover a hosed instrument such as the air-water syringe, the working end should be attached to the hose, and then the plastic bag is pulled over the tubing. The bag should be pulled tightly and a hole poked in the corner of the bag to enable the sterile working end to protrude out from the covering. This procedure should be repeated for all other hosed instruments.

The large bags are placed over the chairs, stools, dental unit and evacuation manifold. The switches on the side of the chair back should be covered. The small bags are used to cover the light handle and the sink faucet handle. A straw is used to cover the light switch. The bedside bag is taped to the dental cart for collecting contaminated gauze, cotton rolls and other debris containing body fluids.

### 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 practised in dentistry.<sup>[5]</sup>

*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.<sup>[6]</sup> 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 [Tables 2,3]. 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.<sup>[7]</sup>

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.<sup>[2]</sup>

### Disposal of waste materials

Disposable materials such as gloves, masks, wipes, paper drapes and surface covers that are contaminated

**Table 2: Methods of disinfection based on the material type<sup>[8]</sup>**

Material	Methods
Stone casts	Spray or immerse in hypochlorite or iodophor
Fixed (metal/porcelain)	Immerse in glutaraldehyde
Removable partials (metal/acrylic)	Immerse in iodophors or chlorine compounds
Wax rims/bites	Spray, wipe and spray with iodophors

**Table 3: Sterilization of dental instruments, materials and some commonly used items\***

Instrument, material or item	Steam autoclave	Dry heat oven	Chemical vapor	Ethylene oxide+	Other methods and comments
Angle attachments*	‡	‡	‡	§	
Burns					
Carbon steel	**	††	††	††	Discard
Steel	‡	††	††	††	Discard
Tungsten carbide	‡	††	‡	††	Discard
Condensers	††	††	††	††	
Dappen dishes	††	‡	‡	††	
Endodontic instruments (breaches, files and reamers)	††	††	††	††	
Stainless steel handles	‡	††	††	††	
Stainless w/plastic handles	††	††	**	††	
Fluoride gel trays					
Heat-resistant plastic	††	§	**	††	
Non-heat-resistant plastic	§	§	**	††	Discard (††)
Glass slabs	††	††	††	††	
Hand instruments					
Carbon steel (steam autoclave with chemical protection [2% sodium nitrite])	**	††	††	††	
Stainless steel	††	††	††	††	
High-speed handpieces*	(††)*	**	(‡)*	§	
Contra-angles	††	**	††	§	
Prophylaxis angles* (disposable preferred)	‡	‡	‡	§	Discard (††)
Impression trays					
Aluminum metal	††	‡	††	††	
Custom-plated	††	††	††	††	Discard (††)
Custom acrylic resin	§	§	§	††	Discard
Plastic	§	§	§	††	Preferred (††)
Instruments in packs	††	‡Small packs	††	††Small packs	
Instrument tray setups					
Restorative or surgical	‡Size limit	‡	‡Size limit	††Size limit	
Mirrors	**	††	††	††	
Needles					
Disposable	§	§	§	§	Discard (††) Do not reuse
Nitrous oxide					
Nose piece	(††)*	§	(††)*	§	
Hoses	(††)*	§	(††)*	§	
Orthodontic pliers					
High quality stainless	††	††	††	††	
Low-quality stainless	**	††	††	††	
With plastic parts	§	§	§	††	
Pluggers and condensers	††	††Z	††	††	
Polishing wheels & disks					
Garnet and cuttle	§	**	**	§	
Rag	††	**	‡	§	
Rubber	‡	**	**	§	
Prostheses, removable	**	**	**	§	
Rubber dam equipment					
Carbon steel clamps	**	††	††	††	
Metal frames	††	††	††	††	
Plastic frames	**	**	**	††	
Punches	**	††	††	††	
Stainless steel clamps	††	††	††	††	
Rubber items					
Prophylaxis cups	**	**	**	§	Discard (††)
Saliva evacuators, ejectors (plastic)	**	**	**	**	Discard(+++) (Single use/disposable)
Stones					
Diamond	‡	††	††	††	
Polishing	††	‡	††	††	
Sharpening	††	††	††	**	
Surgical instruments					
Stainless steel	††	††	††	††	
Ultrasonic scaling tips	‡	§	§	††	
Water-air syringe tips	††	††	††	§	Discard (††)
X-ray equipment					
Plastic film holders	(††)*	§	(‡)*	††	
Collimating devices	**	§	§	††	

\*Since manufactures use a variety of alloys and materials in these products, confirmation with the equipment manufactures is recommended especially for hand-pieces and their attachments; †Ethylene oxide should only be used to sterilize instruments that can be thoroughly cleaned and dried; ‡Effective and acceptable method; §Infective method; \*\*Effective method, but risk of damage to materials; ††Effective and preferred method

with body fluids should be carefully handled with gloved hands and discarded in sturdy, impervious plastic bags to minimize human contact. Blood, disinfectants and sterilants can be carefully poured into a drain connected to a sanitary sewer system. Sharp items, such as needles and scalpel blades, should be placed in puncture-resistant containers marked with the biohazard label.

An HIV patient is prone to many opportunistic infections such as fungal lesions<sup>[1]</sup> (candidiasis, histoplasmosis and *Cryptococcus neoformans*); viral lesions (Herpes zoster, Herpes simplex, Human papilloma virus, Cytomegalovirus, hairy leukoplakia, and Epstein-Bar virus); bacterial lesions (periodontal lesion and mycobacterium); neoplastic lesion (Kaposi's sarcoma and lymphoma) and other lesions (oral ulceration, thrombocytopenic purpura and salivary gland disease).

### Changes in the body composition in HIV/AIDS patients

- Wasting syndrome
- Fat redistribution syndrome
- Elevated cholesterol levels
- Elevated triglyceride levels
- Elevated blood sugar levels

Wasting syndrome is a condition characterized by weight loss associated with chronic fever and diarrhea. Over a period of one month, the patient may lose 10% of the baseline body weight. Malnutrition coupled with HIV/AIDS exacerbates the condition.

Nutritional recommendations for combating changes in the body composition are high protein diet that will help fight wasting syndrome and low-saturated-fat diet will help maintain a low cholesterol level. A diet rich in grains and low in sugar will help the patient maintain adequate sugar and triglyceride levels.

Oral signs and symptoms of nutritional deficiencies are xerostomia, bleeding gingiva and angular cheilitis. Nutritional deficiencies weaken the resistance of oral tissues to plaque bacteria, causing an increase in inflammation.

### Determinants of risk

- Prevalence of infection in patients
- Risk of infection after single blood contact
- Nature and frequency of blood contacts

### Average risk of HIV Infection to health care workers by exposure (%)

- Mucous membrane, 0.1
- Percutaneous, 0.3
- Non-intact skin, <0.1

### Postexposure prophylaxis (PEP)

Postexposure prophylaxis regimens

*Basic regimen* For exposures with recognized risk of HIV transmission

#### Drugs

- ZDV (Zidovudine)

#### Expanded regimen

For exposures with increased risk of HIV transmission exposures

- Basic regimen PLUS
- Indinavir OR
- Nelfinavir

#### Wound care?

- Clean wounds with soap and water
- Flush mucous membranes with water.

Avoid use of bleach and other caustic agents. HIV/AIDS patients have nutritional concerns that can profoundly influence the progression of the disease.

#### Begin postexposure prophylaxis as soon as possible after exposure

- Hours rather than days
- regarded as an urgent medical concern
- Duration four weeks

#### Possible reasons for postexposure prophylaxis failures

- Exposure to ZDV-resistant strain of HIV
- High titer or large inoculum
- Delayed initiation or short duration of PEP
- Host factors, e.g., diminished immune response

The pattern of oral opportunistic infection is changing in the era of protease inhibitor use. Recent studies have demonstrated declining rates of morbidity and mortality among HIV-infected subjects largely because of antiretroviral combination therapy containing protease inhibitor (PI) drugs. These combination therapies are also called highly active antiretroviral combination therapy (HAART).<sup>[10]</sup> This therapy has proven to be effective in

- Suppressing plasma HIV viral load below detectable limits
- Causing gradual elevation in CD4 cell counts on average more than 100 cells/mm<sup>3</sup>
- Improved immune status
- Standard care for persons with advanced HIV
- With PI therapy, the periodontal lesion reduced due to increase in neutrophil count.
- Prevalence of hairy leukoplakia and necrotizing periodontal disease decreased
- Salivary gland disorders are increased

- Prevalence of oral candidiasis, aphthous ulcers, oral warts, herpes simplex and Kaposi's sarcoma were not significant.

Prevalence of necrotizing periodontal disease decreased due to PI-mediated increase in the neutrophil count. Observed decline in the prevalence of hairy leukoplakia by reduction in HIV viral load and improved the immune function (by restoring the CD4 counts).

Parotid gland enlargement and xerostomia associated with HIV salivary gland disease appear to be on the increase due to the increased number of CD8+ cells that infiltrate salivary gland in HIV infection; this condition is also designated as diffuse infiltrative lymphocytic syndrome. HAART stimulates inflammatory responses with persistent elevation in CD4 and CD8 cells.

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