

HOW TO PREVENT TRANSMISSION OF HIV IN DENTAL PRACTICE

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Introduction

HIV is not very invasive. In general it can only be transmitted through sexual mucosal contact or via blood that penetrates through lesions into the body. Transmission via saliva and through the air, e.g. tuberculosis, is highly unlikely. For dental practice, emphasis will be placed on the modes of transmission via: 1. blood and blood contaminated instruments, 2. operator's hands.

Risk of transmission

Respiratory infections among dentists occur more frequently than amongst the general population. 1* There are as yet no indications that HIV could be transmitted through casual contact, nor that it could cause infection via the respiratory route. So, probably, aerosols produced during dental treatment do not exert any risk of transmitting HIV.

1. Blood and blood-contaminated instruments

During procedures such as high speed drilling and ultrasonic scaling, splashes of sharp particles with blood contaminated from the patient's mouth, e.g. enamel, filling material and calculus, can cause small lesions to the eye and face of the dental operator. 2* Such micro-lesions may serve as an entry for HIV. However, the risk of acquiring HIV in this way is unlikely since the virus is much diluted in saliva and spray water, whereas the portal of entry is superficial. Nevertheless the risk cannot be excluded.

Since it is known that drug abusers can spread HIV, through the use of contaminated needles, patients could contract HIV during dental treatment with non sterilized instruments.

2. Operator's hands

HIV may be transmitted from a patient harbouring HIV (seropositive) to a dental operator via lesions on the operator's hand. Conversely, if the dental operator carries HIV, the patient could be infected. HIV cannot pass through intact skin. Where visible lesions are absent, one may assume that the skin is intact and consequently will prevent HIV from passing through. However, that assumption might be wrong, since we know that invisible micro-lesions of the skin on hands occur frequently. These micro-lesions may serve as an entry for HIV. When fingers are swabbed with 70% alcohol solution, painful sites are considered as breaks in the integrity of the skin. With alcohol test it was found that about 30% of the dental operators experience invisible micro-lesions on their fingers, particularly around the nails of the thumb and index finger.3*

In addition to transmission via lesions on the hands, percutaneous injuries by sharp instruments present another risk of acquiring HIV to the operator. Health care workers with documented needle stick or other injuries caused by sharp instruments that were contaminated with HIV have been prospectively tested for seropositivity to determine the risk of infection after such injuries. That risk appeared to be 0.2%,4* which is about 100 smaller than the risk of obtaining hepatitis B through the same mode of transmission.5* Although the risk might be small it should be realized that the chance of acquiring HIV accumulates with each new case of percutaneous injury. For instance, let us assume that the prevalence of seropositive patients is 5% and let us further assume that careless handling of instruments by the operator results in 10 stick injuries per year. Consequently the accumulated chance of being infected with HIV after 30 years of dental practice will be: number of years (30) x frequency of needle stick injury per year (10) x chance of meeting a seropositive patient (5% = 5/100) x chance of infection after needle stick injury with HIV positive blood (0.2% = 2/1000). Thus: $30 \times 10 \times 5/100 \times 2/1000 = 3/100$ or 3%.

Prevention of HIV transmission for all patients

The concern amongst the dental profession to treat HIV patients had focused on patients with fully blown AIDS and on identified seropositive patients. However it must be realized that unidentified seropositive patients outnumber AIDS patients and identified seropositives by a factor of about 100. Thus it is inevitable that the dental operator is exposed to patients carrying HIV.

Because most unidentified seropositive patients cannot be identified by medical history or clinical examination and since it is impossible to screen every patient with laboratory tests, the dental profession must apply careful infection control procedures at all times. It is illogical to apply effective hygienic precautions exclusively on identified HIV carriers and to refrain from these precautions for other patients among whom seropositive patients exist. It is therefore emphasized that the dental profession consider all patients as a potential HIV source and consequently they have to follow the routine of hygienic precautions to minimize the risk of transmission during practice.

Hygienic measures

The following recommendations for infection control in dental practice should be effective in preventing HIV transmission (and other pathogens). Provided the precautions are adopted routinely for all patients, the practical risk of transmitting HIV (and other diseases) during dental treatment can be reduced to negligible levels.

1. Steam sterilization

Instruments that are employed in the mouth must undergo a process, that either removes or kills pathogens, before they are reused. A feasible way is steam or dry heat sterilization. Steam sterilization, 20 minutes at 120° C or 5 minutes at 134° C, is the first method of choice. If an autoclave is not available for this purpose, a pressure cooker may be used as second best. It is important to pack instruments in the autoclave or pressure cooker in such a way that steam is allowed to penetrate everywhere. Thus, instruments should not be packed in closed boxes that are then placed in the autoclave or pressure cooker,

because steam cannot penetrate the box and consequently the surfaces of instruments are not exposed to steam. Since exposure to steam is a prerequisite for reliable sterilization the pressure cooker should be used properly. It means that weights, intended to increase the inner pressure and consequently the temperature, should not be placed on the opening in the lid before steam can escape for at least 2 minutes. This time span allows steam to replace air while pushing it out through the opening of the lid. In cases where the opening in the lid is blocked by weights before steam has been formed, air balls between packed instruments may prevent steam from entering all spaces.

2. Dry heat sterilization

An alternative to steam sterilization is dry heat sterilization, 90 minutes at 170 °C. Dry heat sterilization has several drawbacks:

- a. long sterilization time, which is particularly clumsy with limited sets of instruments,
- b. high temperature, which can damage instruments,
- c. it may invite misuse, e.g. opening the dry heat sterilizer, while in operation. It should be realized that, if interrupted, the sterilization programme should be repeated entirely.

3. Boiling water

If an autoclave or pressure cooker is not at hand, water boilers can be used. Exposure to boiling water for 20 minutes kills HIV and other pathogens, except spores of pathogenic Clostridia species, such as tetanus. Assuming that the floor and other surfaces in the dental clinic are regularly cleaned these spores do not present a risk in dental practice. The procedure, to put used instruments in boiling water, and then take others out for the next patient is inadequate since the used instruments contaminate the water and thus the instruments for the next patient. Within a period of 20 minutes after the last load no instruments should be taken from the water boiler. A more adequate routine is to load the water boiler with used instruments. After 20 minutes in boiling water the instruments can be stored and the water boiler is ready for a new charge.

4. Storing of instruments

Providing that all intra-orally used instruments are exposed to at least 20 minutes boiling water, to eliminate pathogens from the preceding patient, and provided that the instruments are stored in closed clean containers, drawers of cabinets or between clean towels, the few contaminating microorganising in the environment do not pose a problem during their subsequent use. This is because the oral cavity is continuously exposed to such environmental microorganisms and as a consequence harbours many of them. So in that respect dental surgery and medical surgery differ. Dental surgery is performed in the oral cavity full of microorganisms. While instruments for medical surgery should be sterilized and subsequently stored under sterile conditions, e.g. in sterilization pouches, until in use, dental instruments can be stored under less stringent conditions. However, it is of the utmost importance to close drawers and contrainers that contain instruments so as to avoid contamination by splashing

and to keep the level of environmental contamination as low as possible.

5. Rotary instruments

After each patient burs should be detached from the handpiece and sterilized. Handpieces should also be sterilized after each patient. However older types may not stand the high temperature. In these cases the exposed surface should be thoroughly cleaned, either by a disinfectant solution or with water, soap and brush. A quick wipe with a cotton roll soaked in alcohol as the only preventive measure is inadequate and must be regarded as a ritual precaution.

6. Syringes, cartridges and needles

During anesthetic injection a negative pressure in the cartridge may occur resulting in aspiration of minor amounts of the patient's blood in the cartridge. Therefore, non sterilizable, disposable cartridges should never be refilled with anesthesia for reuse. With the risk of transmitting HIV one can never justify such practice. Since disposable local anesthetic cartridges are costly and their availability is sometimes limited, an alternative could be to use heat sterilizable syringes with glass cartridges. Needles should be kept apart from the other used instruments, so as to avoid needle stick injuries during cleaning or sterilization procedures. Disposable needles should also be handled with care and discarded, in a special box or tin, immediately after use.

If gloves are used for each patient, the main risk of acquiring HIV from the patient is through needle stick injuries. By handling needles with care the risk of HIV infection can be substantially reduced. e.g. 10 needle stick injuries in those 30 years period, with 5% seropositive patients may result in a 3% risk of acquiring HIV. Only 3 needle stick injuries in those 30 years results in a risk of about 0.03% of obtaining HIV. A very small chance, much smaller than the risk of getting any other lethal disease in that 30 years period.

7. Gloves

Dental practitioners should routinely use gloves during intra-oral treatment procedures to prevent transmission of HIV between patient and operator or between patients. It is not necessary to use sterile gloves, since the microbial quality of non sterile gloves are adequate for clinical treatment. These non sterile gloves may contain some environmental microorganisms but these organisms do not exert risks, since dental treatment is performed in the oral cavity that harbours thousands of such microorganisms. Gloves should be changed after contact with each patient so as to prevent transmission of HIV between patients. In cases where supplies are not sufficient, the second best and still acceptable method is to clean the gloves, while still on the hands, with water and soap or a disinfectant solution. Because gloves have a very smooth surface, a thorough washing has proved to be effective in removing most microorganisms.^{6*} This is in contrast to the skin of the hands where bacteria are easily entrapped in minute breaks, under and around the nails, which prevents the reduction of their number to acceptable levels by washing.^{7*}

Reuse of gloves still remains controversial since repeated use produces small defects that allow microorganisms to pass

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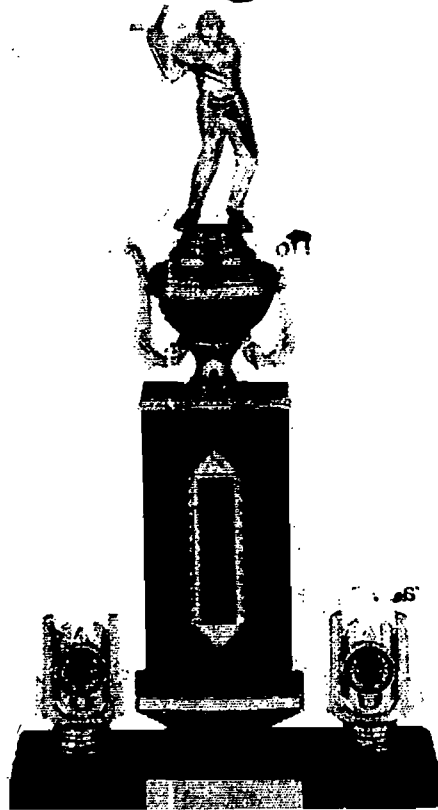
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through. However the number that may pass through small defects is very limited.^{8*} Since acquiring HIV (like other diseases) is dependant on the number of contaminating pathogens, small numbers do not seem to pose a problem. In cases where gloves have been in intensive contact with blood it is recommended that new ones be used for the next patient. On the other hand, if treatment procedures are not very invasive (e.g. not much blood contact) it seems justified to reuse gloves several times.

8. Protection of the face

Masks and spectacles or face masks should be worn during dental procedures in which splashing of (sharp) material occurs.

9. Disinfectant solution

It is not recommended to apply disinfectant solutions to intra-oral instruments if heat sterilization or heat disinfection (boiling water) is available. The use of disinfectants as an alternative to heat is less reliable, because application of disinfectants may easily invite misuse e.g. 1. no regular supply of fresh solution, 2. too short exposure time and 3. too low concentration. It is emphasized that even the second best heat application, boiling water, is more reliable in eliminating HIV (and other pathogens) than disinfectant solutions.

Although not preferable for intra-oral instruments, disinfectants are useful to disinfect surfaces of cabinets, drawers, lamp unit, chair, etc. Adequate disinfectants are alcohol 70%, formaldehyde 4%, glutaraldehyde 2%, iodine 2% and sodiumhypochlorite 0.1 -0.5%.

10. Floors

Floors should be cleaned daily to remove dust. This can be performed by scrubbing with water and soap.

Epilogue

Some other preventive measures have to be executed to minimize contamination by pathogens other than HIV.⁹ Several pathogens can be transmitted through air or along the water-pipe system of the dental unit. However precautions to block those modes of transmission are irrelevant for the prevention of HIV transmission.

Summary and conclusion

The dental operator can reduce the risk of acquiring HIV from the patient by using gloves for each patient and by handling needles carefully so as to avoid needle stick injuries.


The risk for patients of acquiring HIV during dental treatment can be reduced to nil by applying heat sterilization or heat disinfection (boiling water) to all instruments used intra-orally after each patient.

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