Prevention of HIV infection in dental practice

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Introduction

Since the HIV epidemic started in 1981, in Haiti; America, about 75 million people have been infected with the HIV virus and about 36 million people have died of HIV. Globally 35.3 million people were living with HIV at the end of 2012. In view of the magnitude of the HIV problem globally, apprehension among professionals in the field of dentistry (which involves a lot of invasive procedures), regarding occupational risk of HIV transmission needs to be allayed. At the same time, dental workers should be fully conversant with universal precautions as applicable to their practice.

Prevention of Occupational Exposure to HIV

The unique nature of dental practice may require specific strategies directed to the prevention of blood borne infections among dental workers and thier patients. Available data suggest that the risk of blood borne transmission among workers and patients in dental practice is low. However in dental procedures there may be more exposure to a variety of microorganisms or in blood or oral secretions.

Understanding the nature, frequency, and circumstances of occupational exposure specific to dental procedures is important in evaluating the risk of disease transmission. Percutaneous exposure poses the greatest risk for infection.

Frequency of injury to dental workers

Retrospective, observational and prospective studies of injuries among general dentists, oral surgeons and dental hygienists have shown that injury rates among dental professionals are less than among general surgical personnel. Data from a prospective observational study among general dentistry and oral surgery residents found that dental residents experienced about 2 injuries per 1000 working hours of observation, a much lower rate of percutaneous injuries than general surgery personnel, who in another similar study, experienced 34 injuries per 1000 working hours of observation.

Instruments associated with injuries among dental workers

The types of instruments most commonly associated with injuries are dental burs, syringe needles and sharp instruments. Most of these injuries occur to the dentist's fingers or hand. Among oral surgeons, dental wiring is associated with most injuries. Injuries occur more frequently during fracture reductions. No association with the experience of the dentist, as measured by years in practice, has been reported.

Prevention of occupational blood exposures

Strategies to prevent occupational blood exposures in dentistry require improved engineering controls, safer work place practices, and improved personal protective equipment. Some of the strategies include use of safer devices, such as self-sheathing hollow-bore needles and dental units with designs that shield burs in hand pieces placed in the unit. Safe practices should discourage uncontrolled movements of instruments, such as scalers or laboratory knives, under force or the use of fingers to retract or suture tissues in the operative field. Placement of cork or other covers on exposed dental wiring should be explored as a preventive measure during oral surgery. Since most injuries involve the fingers and hands, the continued development of personal protective equipments such as puncture-resistant gloves and thimbles may be explored. Once developed, these preventive interventions must be evaluated to determine if sharps injuries among dental workers are reduced without adversely affecting patient care.

Patient to patient transmission

Reusable medical or dental instruments contaminated with blood or tissue during use have the potential to transmit infection to a subsequent patient if these instruments are not appropriately cleaned and disinfected or sterilized after each use.

HIV in saliva

Trace amounts of HIV are infrequently isolated from saliva or HIV-infected persons. No epidemiologic evidence exists, however, to indicate that saliva is an effective medium for HIV transmission. HIV titers in saliva are much lower than in blood, and several studies have demonstrated HIV inhibitory activity in human saliva. Despite the absence of clinical evidence of HIV transmission by the oral route, most dental procedures produce various amounts of blood in the oral cavity. For this reason, continued adherence to recommended infection control practices is essential during delivery of dental services.

Principles of infection control

Because all infected persons cannot be identified by
medical history, physical examination or laboratory tests, it is recommended that all patients be treated as if they were infectious, and proper infection control procedures should be used on all patients at all times while they are receiving dental care. Dental workers should adhere to following principles of dental infection control.

(a) Avoid blood contact with bare hands
(b) Decontamination
(c) Immunization as indicated
(d) Post-exposure prophylaxis
(e) Proper waste management
(f) Use universal precautions for HIV

Avoid contact with blood

Medical gloves should be worn whenever the potential exists for contacting blood, blood-contaminated saliva, or mucous membranes. Sterile gloves should be used when performing surgical operations; non sterile gloves are appropriate for examination and other nonsurgical procedures. Medical gloves should be changed between patients and should never be washed, disinfected, or sterilized for reuse.

Surgical masks and protective eyewear should be worn when splashing or spattering of blood or other body fluids is likely, as is common in dentistry.

Contaminated sharp items, such as needles, scalpels, and wires, should be considered potentially infective and handled with care to prevent injuries. Needles should never be recapped or otherwise manipulated using both hands or using any other technique that involves directing the point of a needle toward any part of the body.

The spread of blood and saliva contaminated with blood can be minimized by planning ahead and anticipating the treatment needs of each patient. Impervious backed paper, aluminum foil, or plastic covers should be used to protect items and surfaces such as light handles or x-ray equipment that may become contaminated during use and that are difficult or impossible to clean and disinfect. Between patients, the coverings should be removed and discarded and then replaced by new covering. The use of rubber dams, high velocity air evacuation, and proper patient positioning can minimize the formation of droplets, spatter, and aerosols during patient treatment.

Decontamination

Cleaning, disinfection, and sterilization are all decontamination processes. Cleaning is the first step in all decontamination procedures; it removes debris and reduces the number of microorganisms present. Sterilization kills all microbial life and is the most effective decontamination process available. Disinfection is a process that kills disease-causing microorganisms, although not necessarily all microorganisms. Some nonpathogenic microorganisms may remain on an object after disinfection; the number and type depend on the level of disinfection used. There are three levels of disinfection:

(a) Low-level disinfection does not kill bacterial spores or Mycobacterium tuberculosis var bovis, a test microorganism used to classify the strength of disinfectant chemicals.
(b) Intermediate-level disinfection does kill M tuberculosis var bovis, which indicates that the process also kills more easily killed organisms such as HBV and HIV.
(c) High-level disinfection kills some bacterial spores.

Dental instruments are classified into three categories - critical, semi critical, and noncritical - depending on their use and their risk of transmitting infections. All dental centers should classify instruments as follows:

Critical instruments: used to penetrate soft tissue or touch bone, include forceps, scalpels, bone chisels, scalers, and burs. They should be sterilized after every use.

Semi critical instruments: do not penetrate soft tissues or touch bone, but they do contact oral tissues and mucous membranes. Examples include mirrors and amalgam condensers; they should be sterilized after each use. If sterilization is not feasible because the instrument will be damaged by heat, the instrument should receive, at minimum, high-level disinfection.

Noncritical instruments: instruments that come into contact only with intact skin and include x-ray tube heads and protective eyewear. Because noncritical surfaces have relatively low risk of transmitting infection, they may be reprocessed between patients with intermediate-level or low-level disinfection or with detergent and water washing, depending on the degree and nature of contamination.

Methods of sterilization and disinfection of dental instruments

Cleaning is the first step. Persons decontaminating dental instruments should wear heavy-duty (reusable) gloves, rather than surgical gloves. All critical and semi critical dental instruments that are heat stable should be sterilized between patients by means of steam under pressure (i.e., autoclaving), dry heat, or chemical vapor, following the instructions of the manufacturers of the instruments. Weekly use of
biological indicators (i.e., spore tests) to verify proper functioning of sterilization cycles is recommended. Indications for use of liquid chemical germicides to sterilize instruments are limited. Use of these products may require up to 10 hours of exposure to a liquid chemical agent. When using any of these chemicals to achieve high-level disinfection of heat-sensitive semi-critical dental instruments, the manufacturer’s directions regarding appropriate concentration and exposure time should be followed.

**Cleaning and disinfection of environment surfaces**

After each patient and at the end of the work day, counter tops and the dental unit surfaces that may have become contaminated with patient material should be cleaned using an appropriate cleaning agent and water. Fresh solutions of sodium hypochlorite (i.e., household bleach) in concentrations ranging from 500 ppm to 800 ppm of chlorine (1/4th cup bleach to 1 gallon of water) are effective on environmental surfaces that have been cleaned of visible contamination.

**Immunization and personal hygiene:**

Dental workers can protect themselves from several infections such as hepatitis B by immunization. Proper hand washing removes microorganisms and helps diminish the likelihood of infection. For most routine dental procedures, hand washing with plain soap and water is adequate. For surgical procedures, an antimicrobial product should be used.

**Post Exposure Prophylaxis (PEP):**[5, 6, 7]

On exposure to a needle stick injury, blood or blood containing fluids or substances from a known HIV positive person or a person with suspicious HIV status, the dental worker or the supervisor should immediately report to the Infection Control Officer, i/c Hospital Infection Control Committee, (or the Authorized Medical Attendant) [8, 9] who should promptly manage to evaluate the exposure event and provide the post exposure prophylaxis (PEP) based on recent guidelines, to the exposed person. The three drug PEP should be initiated as soon as possible, ideally within 2 hours and preferably before 72 hours and should not be delayed pending evaluation of the exposure. The PEP now consists of the immediate initiation of three antiretroviral (ARV) drugs, management of the exposed site, evaluation of the exposure, HIV testing of the source person, recording information of the occupational exposure, baseline HIV testing of the exposed person, counseling for HIV testing; adverse drug reactions and treatment adherence and the follow up. The recommended duration of PEP is 28 days. The clinical follow up during PEP should be frequent to find and manage the drug reactions and laboratory follow up needs to be obtained at 6 weeks and 6 months of exposure, in order evaluate the status of HIV infection.

If unknown HIV status of the source person, after testing, is established HIV negative, PEP is discontinued and if the baseline HIV testing of the exposed person is found positive, then PEP is needless (considering window period) but such person must be evaluated for antiretroviral therapy (ART) and processed accordingly.

The currently recommended adult regimen consists of Tenofovir 300 mg once daily + Emtricitabine 200 mg once daily Plus Raltegravir 400 mg twice daily or Dolutegravir 50 mg once daily, all drugs to be taken orally. (Lamivudine 300 mg once daily may be substituted for emtricitabine)

The recommended alternative PEP regimens should be used in the setting of potential HIV resistance, toxicity risks, clinician preference, or constraints on the availability of particular agents.

**Management of waste material:**

Blood, suctioned fluids, or other liquids waste may be poured carefully into a drain connected to a sanitary sewer system. Disposable needles, scalpels or other sharp items should be placed intact into disinfectant containing puncture-resistant containers before disposal. Solid waste contaminated with blood or other body fluids should be placed in sealed, sturdy, impervious bags to prevent leakage of the contained items. All contained contaminated solid wastes should be then disposed of according to requirements established by local, state, or federal regulating agencies.

**Universal (Standard) Precautions:**[8]

1. WHO standard precautions recommend that all individuals be treated as if they were infected with HIV or other infectious pathogens.
2. Exposures that place health care workers at risk of infection include injuries, such as needle sticks, and contact of infectious fluids with mucous membranes or non intact (cut or abraded) skin.
3. The most effective infection control measure that health care workers can perform is hand washing with soap and water before and after patient contact.
4. Precautions should be taken to avoid having the skin, eyes, and mucous membranes come into contact
with blood.

5. Needles should never be recapped, bent, or broken; they should be discarded into sealed, puncture-resistant containers.

6. Spills of blood or other infectious fluids should be cleaned while wearing gloves, using a solution of one part household bleach to 10 parts water.

7. When exposure occurs, the source patient and health care worker should be tested for HIV and for hepatitis B and C.

8. Treatment to reduce the risk of contracting HIV from the exposure depends on the risk of exposure and information about the exposure source.

9. Seroconversion later than 6 months after exposure is rare.

Operational implications

In all dental practice, emphasis should be placed on consistent adherence to above recommended infection-control practices. The following five strategies may provide guidance to achieve this goal.

(i) Each dental office should constitute a Hospital Infection Control Committee under control of an eminent Infection Control Officer that should be vigilant round the clock for infection control program. This officer should have a thorough understanding of the principles of infection control especially for HIV.

(ii) There should be initial training and retraining of the dental staff in the principles of infection control and standard operating procedures. (10)

(iii) A written infection control policy should be developed. This policy should include the use of Hepatitis B vaccinations; safe work practices, such as hand washing and careful handling of sharp instruments; personal protective equipment; engineering controls, such as rigid containers for disposal of sharps; adequate decontamination procedures; and prompt reporting and follow-up of occupational exposure incidents. The last ensures that exposed workers receive appropriate counseling and testing and post-exposure prophylaxis when indicated. Prompt reporting of occupational exposures can help to identify and alter specific work practices that may increase the risk for future exposures.

(iv) A checklist for standard office procedures may assist the dental staff in establishing and ensuring that patterns of performance for each infection control process are followed consistently.

(v) It is important for each dental office to maintain adequate records. Such records may include sterilizer spore test results, autoclave register and injury reports, including occupational exposures to blood or potentially infective material.

Conclusions

The aim of all precautions is to reduce blood contact, thereby minimizing blood borne pathogen transmission to dental workers or patients. Little research has been done to examine specific prevention strategies. Studies are needed for the development and evaluation of improved designs for dental instruments, equipment, and personal protective equipment. More efficient reprocessing techniques should be considered in the design of future dental instruments and equipment. Systematic evaluation must be ongoing to ensure that new technologies can improve the safety of dental treatment without comprising the quality of patient care.

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