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Review Article

Risk of Exposure and Preventive Strategies of HIV Infection in Dental Office - A Review

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ABSTRACT

Infection prevention and control is an important part of safe patient care. Concerns about the increasing prevalence of HIV require dental practitioners to establish, evaluate, continually update and monitor their infection prevention and control strategies and protocols in dental office.
Dentists must maintain current knowledge of infection prevention and control procedures, and apply and maintain them appropriately and consistently. It is the dentist's responsibility to ensure that staff are adequately trained in infection prevention and control procedures, and that the necessary supplies and equipment are available, fully operational, up-to-date and routinely monitored for efficacy. In addition to professional obligations, dentists also have an ethical duty to maintain a safe and healthy office environment for both patients and staff, and to adhere to all rules and regulations related to the operation of a dental practice, including workplace health and safety and environmental protection.

Keywords: HIV, Risk, Exposure, Prevention.

INTRODUCTION

Exposure to blood borne pathogens poses a serious risk to health care workers. [1] Exposure is defined as an event that results in the contact of the patients open tissues to the blood of the health care professional. [2] The risks linked with exposure to blood and body fluids in hospitals became well known with the advent of the HIV/AIDS pandemic. Any patient with bacteraemia, viraemia, parasitaemia, or fungemia may potentially transmit a pathogen to a health care worker. Several factors have been identified for infection to occur. The pathogen must have the capacity to replicate within a human host; the pathogen must be prevalent among patients, volume of blood or body fluid inoculated and viral load contained within it. The factors increasing the rate of seroconversion include: deep bloodletting injury, device visibly contaminated with blood, and needles used for intravascular procedure. [3] The risk from non-intravenous medical injections and lower than the risk from intravenous injections. [4] Transmission of more than 20 to 60 different pathogens by sharps injuries and exposure to blood and body fluids has been reported. [5,6] The three viruses - HIV, HBV and HCV account for majority of the cases

of occupational infection described in literature. [3]

A total of 106 documented and 238 additional possible cases of occupational exposure and subsequent seroconversion have been reported worldwide. [1,3] The risk to the average surgeon performing approximately 500 procedures per year, with an inflated HIV prevalence rate of 30% and transmission rate of 0.3% per injury it is estimated to be 0.001% per year. [7]

The CDC defines exposure prone procedures as those that involve digital palpation of a needle tip in a body cavity, or the simultaneous presence of fingers and a needle or other sharp instrument within a poorly seen or highly confines anatomical site. The risk of exposure is also greater when over 300ml of blood is lost and an operation lasts longer than 3 hours. Though there is a potential risk of exposure to infectious body fluids during all invasive operations, it is likely to be higher for certain specific procedures. [8]

Exposure prone procedures can be classified as: [9]

High Risk Procedures

1. Any sub mucosal invasion with sharp, hand-held instruments
2. Procedures dealing with sharp pathology and bone spicules, usually in confined spaces where visibility is poor

Variable Risk Procedures

1. Minor dental procedures and routine dental extractions
2. Internal and instrument examinations and biopsy.
3. Minor skin surgery

Low Risk Procedures

1. Interview consultation and dental examination
2. Non-invasive examinations or procedures
3. Intact skin palpation
4. Injections and venipuncture.

Nurses and nursing aides are amongst those at highest risk for occupational infection to HIV in health care workers. [1] Among dental workers, Oral and Maxillofacial Surgeons (OMFS) are at the greatest risk of occupational exposure to blood borne pathogens. [10]

During maxillofacial operations, glove perforations may have an incidence as high as 50% and largely go unnoticed during the operation. [8] According to Kuroyanagi et al, the perforation rate in scrub nurses was highest at 63.4% followed by 44.4% in surgeons and first assistants, and 16.3% in second assistants. Orthognathic surgery has been recognised as the highest risk group for glove perforation due to the involvement of sharp objects. While orthognathic surgeries have a perforation rate of 91.1%, they are followed by cleft lip and palate surgery 55%, excision of oral soft tissue tumors 54.5%, and dental implants 50%. [11] These are predominantly associated with wire perforation, holding the suture needle, and snagging of gloves on arch bars. Many of these can possibly be avoided by keeping the ends of wires covered and not handling the suture needle. Although double gloving does not prevent a percutaneous sharp injury per se, it does require more force to penetrate the gloves. It may also confer some additional protection due to the "wipe-off" effect of the solid needle passing through two layers of latex. [8]

According to a study by Gooch et al, orthodontic or surgical wires are the most commonly associated with percutaneous injuries followed by syringe needles, suture needles, burs and scalpel blades. Carlton et al report no percutaneous injuries in outpatient oral surgery procedures in a study in Atlanta. In the same study, the rate of percutaneous injuries during operating room procedures was 1.1% of which fracture reductions accounted for 2.9%. [10]

Tokars reported an incidence of 2% of potential disease transmitting operations out of a total of 1382 observed operations. Out of these, the majority, 72.4% were caused by suture needles and could have been easily avoided. [8]

The rate of seroconversion is extremely low according to Patton et al being 0.32% for percutaneous injuries and 0.09% for mucous membrane exposures. [12]

The determinants of risk of blood and saliva contamination to the eyes include the length of the operation, the method used in the operation and the type of operation. The use of power tools such as saws and drills and hand instruments to cut bone increase the chances of getting blood splashes to the eyes. Power tools produce an aerosol effect with blood and particles spraying outwards, and are more likely than chisels to produce splashes to the face. However, a combination of chisels and power tools has been associated with significantly higher risk of splashes to face, owing to greater difficulty of the surgery involved. [13]

Hepatitis B is known to be transferred through the conjunctiva, and it is argued that theoretically HIV may also pass the same way. Although this is currently a controversial issue and is still under research, it is generally recommended that eyewear be regularly worn in all types of surgery whether under general or local anaesthesia. [13]

The risk of blood-borne virus transmission is dependent on a number of factors, incidents involving blood to blood contact with infectious blood or associated with a high risk of infection when: [9,10]

- Type and frequency of blood contact
- There is a large quantity of blood indicated by visible contamination
- There is insertion of a needle directly into a vein, artery or deep cavity.
- The patient has advanced HIV disease and/or high HIV viral load; high levels of HBV DNA and detectable HBeAg; HCV RNA detected by PCR.
- Risk of transmission following single exposure to infected blood.

Transmission of blood-borne viruses in such a setting is generally associated with a failure to comply with recommended infection control guidelines. Standard precautions ensure a high level of protection against transmission of infection including blood borne viruses in the health care setting and are recommended for the care and treatment of all patients and in the handling of: [9]

- Blood including dried blood
- All other body substances, secretions, and excretions regardless of whether they contain visible blood
- Non-intact skin
- Mucous membranes

Despite the risks involved, it is illegal in many parts of the world for a physician to refuse to treat a patient based on the patient's seropositivity. [14] Thus standard precautions of sterilisation and infection control are followed universally. Universal precautions are particularly concerned with barrier protection methods and avoiding percutaneous injury. They were introduced to protect both the surgeon and the patient against blood borne infections such as HIV and viral hepatitis during invasive procedures. As one does not always know if a patient is infected these precautions should be applied to all patients. There is no evidence that the knowledge of risk of infection reduces the rate of percutaneous injury. [8] Of the total 34 million people infected with HIV, [15] the estimated prevalence of HIV+ patients reporting for dental care in a large health care setting is approximately 4.8%. [16]

The universal application of standard precautions is the minimum level of infection control required in the treatment and care of all patients to prevent transmission of HIV, HBV, and HCV. These include personal hygiene practices particularly hand-washing, use of personal protective equipment such as gloves, gowns and protective eyewear, aseptic technique, safe disposal systems for sharps and contaminated matter, adequate sterilisation of reusable equipment and environmental controls. Vaccination is an important infection control strategy for HBV and HAV; all health care workers should be aware of their immune status and be vaccinated if appropriate. [9]

Clinicians and healthcare workers who regularly perform exposure prone procedures have a responsibility to be regularly tested for HIV, HBV, or HCV. Health care workers who are aware that they

are infected with HIV, HBV or HCV should not perform exposure prone procedures. [9]

Hand Hygiene

Most important hygiene measure in preventing the spread of infection. It should occur: [9]

- Before and after each clinical contact
- Before and after eating
- After using the toilet
- Before and after using gloves
- After contact with used equipment
- Immediately after contact with body substances

Gloves are not an effective substitute to hand washing. A routine hand wash includes the removal of all jewellery, and the uses of a cleaning solution, with or without disinfectant, for 15-20seconds, followed by drying with a single use towel. Alcohol based hand rubs can be used in absence of appropriate hand washing facilities. Skin care is important because healthy unbroken skin provides a natural barrier to infection. Skin breaks should be covered with a water resistant occlusive dressing. [9]

Gloves

Gloves must be used when [9]

Handling blood and/or body substances

- Performing venipuncture
- Touching mucous membranes
- Touching non-intact skin
- Handling contaminated sharps
- Performing invasive procedures
- Cleaning body substance spills

Clinicians and health care workers should change their gloves and wash their hands after contact with each patient and during procedures with the same patient if there is chance of cross contamination. [9]

Double Gloving

Some authors report a loss of comfort and sensitivity when double gloved. It is however certainly possible to treat facial fractures satisfactorily. Philips et al showed that double gloving does not greatly affect motor function during operations completed under direct vision although it may affect sensory function when blindfolded. [8]

Quebbeman reported that the few surgeons who refused to use double gloves had a skin contamination rate greater than predicted. [8]

Personal Protective/Barrier Equipment

It should be readily available in all types of health care settings. The type of equipment depends upon nature of procedure, equipment used during the procedure, and skill of operator. Protective eyewear and shields must be worn during procedures where there is potential for blood 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 sharps. [9]

Pigadas and Avery recommend that barrier protection should be appropriate for the procedure and type of exposure expected. Fluid resistant synthetic gowns and drapes or plastic aprons are preferable, particularly for procedures with significant blood loss. Synthetic gowns of spun lace polyester reinforced with plastic film or a dense polyester weave are most effective at preventing HIV penetration. Ball ended clips, adhesive tapes and intermediate trays are also recommended. [8]

Aerosol contamination occurs with the use of power tools. The highest rate of blood splashes to the face in maxillofacial surgeries that last longer than 30 minutes. The use of adequate eye wear with additional side arm protection is advisable. [8]

Needle Stick Injuries

Inappropriate handling of sharps is a major cause of accidental exposure to blood borne viruses in health care settings. To minimise the risk of injury, needles, sharps, and clinical waste should be handled carefully at all times. Health care workers should: [9]

- Minimise the handling of needles, sharps and clinical wastes.

- Not bend, recap or otherwise remove needles from disposable syringes.
- Use safe needle handling systems including rigid containers for disposal which should be kept out of reach of children and toddlers.
- Ensure that sharps containers are available at the point of use or in close proximity to work sites to aid in easy and immediate disposal

The person using the sharp instrument or needle is responsible for its immediate and safe disposal after use. [9]

Besides adherence to universal precautions, other strategies to prevent percutaneous injuries include the use of safer devices such as self sheathing hollow bore needles and blunted suture needles. The use of small plates instead of wires for fracture reduction may reduce the risk of percutaneous injuries. The use of thimbles for protection of fingers and the continued development of puncture resistant gloves is encouraged whereas the manual manipulation of suture needles and retraction of tissues by hand is discouraged. [10]

Testing

The mandatory testing of clinicians and health care workers for HIV, HBV, and HCV is not warranted due to the low risk of transmission if standard precautions are followed. Testing for blood borne viruses should be only undertaken on basis of clinical assessment or where testing is in the interest of patients or health care workers. Clinicians and health care workers who regularly perform exposure prone procedures have a responsibility to be tested regularly for HIV, HCV and HBV. The provision of confidentiality, privacy and consent should be applied. [9]

Occupational Exposure

All clinicians should have access to infection control guidelines that give advice about the management of an occupational injury, including clear and written instructions on the appropriate action to be taken in the event of a needle stick injury, and other blood or body substance exposures involving either patients or health care workers. Clinicians and health care workers are encouraged to report occupational exposures immediately and all follow up treatment should be fully documented. Confidentiality should be maintained. [9]

Occupational exposures are considered urgent to ensure timely post exposure management and post exposure protocols, and initiation of PEP is discouraged after 72 hours. In case of accidental exposure: [2,9]

- Wash exposed membrane or injury with soap and water. Antiseptics may also be used.
- In case of exposure to eyes, thoroughly rinse the eyes with saline or tap water while open.
- In case of exposure to mouth, rinse thoroughly with water and spit out.
- Immediate medical consultation about the nature of exposure, risk of transmission of blood borne viruses, and need for post-exposure prophylaxis (PEP).
- If exposure is significant and source patient is known, consent for their HIV antibody, HCV antibody and HBsAg should be sought.
- HIV testing at baseline, 4, 12, 24 weeks.

Post Exposure Prophylaxis

The sooner PEP is administered the more likely it is to prevent infection. Appropriate advice and most recent protocols should be sought because the arena is constantly changing. Currently HIV PEP consists of a combination of two or three drugs depending on level of risk associated with the exposure. Post exposure prophylaxis for HIV is: [9]

- Recommended for significant percutaneous exposure to blood or body substances involving a high risk of HIV transmission
- Offered, but not actively recommended, for ocular membrane or non-intact skin exposure to blood or body substances,
- Not offered for exposure to any non-bloody urine, saliva or faeces.

Infected Health Care Workers

Clinicians and health care workers have a legal obligation to care for the safety of others in the workplace, including colleagues and patients. Clinicians and other health care workers infected with a blood

borne virus should consult regional regulatory authorities to determine what restrictions are placed on their clinical practice. It is recommended that exposure prone procedures are not performed by health care workers if they are: [9]

- Anti HIV positive
- HBeAg positive and/or HBV DNA positive with high titres
- Anti HCV positive and HCV RNA positive.

Infection Control in Health Care Setting [9]

Infection control guidelines for prevention of transmission of infectious diseases include: routine cleaning, disinfectants and antiseptics, design and maintenance of health care premises, management of clinical waste and linen and reprocessing of instruments and equipment. The general principles of infection control relating to prevention of transmission of blood borne viruses in large health care and office settings include:

1. All clinical waste such as dressings containing expressible blood, human matter, and blood sharps must be appropriately packed for transport and disposal according to local regulations.
2. Sharps are disposed in yellow rigid walled containers labelled BIOHAZARD.
3. Injecting equipment must be discarded after single use. Syringes used to hold single use anaesthetic cartridges must be sterilised between patients
4. Dressings, suture materials, suture needles, scalpels, intracranial electrodes, pins or needles used for neurosensory testing spatulas, electric clips, and razor blades must also be discarded after single use.
5. Linen must be managed using standard precautions. Contaminated linen should have body substances removed with paper towels and cold running water, before being washed in hot or cold water. Drying at high temperature aids in disinfection. Linen which is to be treated off-site must be packed in labelled water resistant regulation bags.
6. Re-usable equipment and instruments should be reprocessed and sterilization / disinfection procedures followed in accordance with manufacturers and national guidelines.
7. Sterile equipment must be used on critical sites.
8. Sterile equipment is generally recommended for semi critical sites except in case of single use clean tongue depressors and mouth mirrors, which are used in procedures unlikely to penetrate the mucosa.
9. When steam or dry heat sterilisation is not suitable, other sterilisation systems like ethylene oxide or automated low temperature chemical sterilisation may be used if acceptable to the instrument manufacturer.

CONCLUSION

The aim of all preventive strategies is to decrease incidence of blood contact, thereby minimizing blood borne pathogen transmission to dental workers or other patients. Little research has been done in English Literature to examine specific prevention strategies. Studies are needed for the development and evaluation of improved designs for dental instruments, equipment, and personal protective equipment. Secondarily, maintaining aseptic technique is a co-operative responsibility of the entire dental team. So, each member of dental team must develop a professional conscience for infection prevention and control, as well as a willingness to supervise and be supervised by others regarding aseptic technique.

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