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COMPLETE CARE TO CURE: AN UPDATE OF THE CURRENT KNOWLEDGE OF INFECTION CONTROL IN DENTAL PRACTICE

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ABSTRACT:. The control of cross-infection and cross-contamination in dental practice is the focus of continuing discussion and debate and, as a result, recommendations and guidelines are regularly reviewed in the light of available information. General knowledge of immunology and body defensive mechanisms contributes to the understanding of disease prevention through immunization and through reliance on the body's natural barriers against infection. The major source of pathogens in the dental office is the oral cavity of the patients, although they can be present anywhere in the office. It is not possible to accurately detect which patients may indeed be harboring these pathogens. Therefore infection control procedures must be applied during the care of all patients. We aim to discuss basic properties of oral microbial flora, spread of infection and prevention of cross infection in dental health care practice through this article.

KEYWORDS: Infection Control, Dental Cross Infection, Dental Cross Contamination

INTRODUCTION

The control of cross-infection and cross-contamination in dental practice is the focus of continuing discussion and debate and, as a result, recommendations and guidelines are regularly reviewed in the light of available information. An understanding of the physical and chemical properties, site, growth pattern of the microorganisms and how they are influenced by the environment or special physical and chemical agents and how they cause specific diseases of concern form the basis for killing microbes and understanding and preventing them spreading from person to person. Also, a general knowledge of immunology and body defensive mechanisms contributes to the understanding of disease prevention through immunization and through reliance on the body's natural barriers against infection.

An infectious disease occurs when a microorganism (pathogens) in the body multiplies and causes damage to the tissues. There are two types of infectious diseases **Endogenous diseases** caused by microorganisms that are normally present on or in the body and **Exogenous diseases** caused by microorganisms that are not normally present on or in the body but contaminate the body from the outside. The major source of pathogens in the dental office is the oral cavity of the patients, although they can be present any where in the office. It is not possible to accurately detect which patients may indeed be harboring these pathogens. Therefore infection control procedures must be applied during the care of all patients.

Spread Of Pathogens

Microorganisms that have escaped from a patient's mouth may be spread to others by (a) Direct contact (b) Indirect contact or (c) Droplet infection [1]. Host defense mechanisms against harmful infections can be Innate or Acquired.

Patient's oral cavity is the most important source of potentially pathogenic microorganisms in the dental office. Blood borne pathogens may enter the mouth during dental procedures that induce bleeding and contact with saliva during such procedures may result in exposure to these pathogens if present. **Hepatitis-B** virus is a well-recognized occupational risk for Health care practitioners[2,3] usually transmitted by direct contact with infected body fluids. Hepatitis B virus has been shown to be killed or inactivated by commonly used methods of sterilization and disinfection including the steam autoclave and 10 minutes exposure to 1 : 100 diluted bleach 1:16 diluted phenolic glutaraldehyde, 75 parts per million iodophor and 70% isopropyl alcohol. Unvaccinated

members of the dental team are two to five times more likely to become infected with HBV than the general population. As there is no successful medical treatment to cure this disease prevention is of paramount importance. **Human Immunodeficiency virus** infection involves destruction of the body's immune system, making the individual prone to life threatening opportunistic infections. HIV may be transmitted from an infected person through intimate sexual contact, exposure of blood, body fluids or perinatal contact. Although HIV-1 has been isolated from saliva so far no cases of transmission have been documented by the route in casual or household contact. The extremely low risk for transmission through saliva may be attributable to the low concentration of the virus in the saliva of infected persons. Nevertheless saliva is still considered to be potentially infectious because of the intimate contact with the patient's mouth during dental care and because most dental procedures result in varying degrees of bleeding into mouth. Prospective studies worldwide indicate the average risk of HIV infection after a single percutaneous exposure to HIV-infected blood is 0.3% (range: 0.2%–0.5%). After an exposure of mucous membranes in the eye, nose, or mouth, the risk is approximately 0.1% [4,5]. The precise risk of transmission after skin exposure remains unknown but is believed to be even smaller than that for mucous membrane exposure. Precautions should be based on the concept that all blood and body fluids that might be contaminated with blood should be treated as infectious because patients with bloodborne infections can be asymptomatic or unaware they are infected[6,7]. During dental procedures, saliva is predictably contaminated with blood,[8,9] even when blood is not visible, it can still be present in limited quantities and therefore is considered a potentially infectious material[10,11].

Herpes infections may cause lesions of the mouth, skin, eyes and genital and those who have depressed immune systems may have a widespread infection. The herpes simplex infection experiences the typical symptoms of oral herpes with formation of vesicle type lesions in the mouth, which during active state at any site of the body contain the virus which may be spread to others by direct contact with these lesions. Also herpes simplex virus may be present in saliva, in those with oral or lip lesions. In small cases, sprays or aerosols of the saliva may result in spread of the virus to infected eyes of the dental team. Entrance of the virus through break in the skin or unprotected hands and fingers can lead to vesicle development at these sites called "herpetic whitlow". Other important oral disease agents that may have some potential for spread to the dental team are: Treponima palladium and neisseria gonorrhea, about 5-10% of the cases of syphilis first occurs in the mouth in the form of a lesion called a primary chancre, an open ulcer frequently occurring on the tongue or lips. The possibility of the spirochetes entering small cuts or breaks in the skin of unprotected hands of the dental team exists and has been demonstrated in one instance causing syphilis of the finger. **Herpengina** appears as vesicles on the soft palate or elsewhere in the posterior part of the mouth that break down to ulcer that last for about a week. Fever, sore throat and headache frequently accompany the vesicular stage. The lesions are caused by coxsachievirus which also causes another vesicles type of disease in the mouth the hands and feet in this instance, the oral vesicles occur primarily on the cheek mucosa and tongue sometime on the hard palate and any where else in the mouth. **Candida albicans** is yeast that occurs in the mouth asymptomatically in about one third of the adults. It is an opportunistic pathogen. It may result in oral disease called through or oral candidiasis might include conditions that disturb our body defense mechanisms such as the systemic disease of HIV infection, and leukemic long term broad spectrum antibacterial therapy; trauma to the mouth from poorly fitting dentures causing stomatitis. Spread of C.albicans from a patient mouth to the dental team is theoretically possible through direct contact with lesions or sprays or aerosols of infected saline. However unless the contaminated member of the dental team was lowered body defense the contamination will likely not lead to a harmful infection. **Varicella-zoster** enter the body by droplet infection invades the respiratory tract and is spread through the blood stream to the skin and other organs. After two weeks, vesicles frequently occur in the mouth, the disease is highly contagious through droplet infection and is usually mild in children can be more severe in teenager and adults. **Streptococcus pyogenes** causes pharyngitis which is spread by droplet infections from mouth to mouth. Tuberculosis is caused by the bacteria **mycobacterium tuberculosis** and is spread by droplet infection. The risk for the dental team of acquiring this disease is likely low as prolonged exposure to an infectious environment is usually required for infection to occur while direct contact appears to be of little risk. Many bacterial and viral agents can cause pneumonia. But streptococcus pneumonia is of a particular importance it is spread by droplet inhalation, a vaccine is available for the most common types of S.pneumonia and is recommended for elderly. Other respiratory diseases that spread by inhalation of infected respiratory / oral droplets include influenza, the common cold infection mononuclear measles, mumps and rubella.

Waterborne disease: Newer studies have shown that water inside dental units and hoses for water spray hand pieces and the air/water syringes may be contaminated with bacteria. *This dental* unit water should not be used to irrigate surgical sites and the water lines should be flushed at the beginning of the day and between patients to reduce the numbers of oral microorganisms.

Infection Control Rationale and Regulations

Direct contact (touching) with patient's saliva1 or blood may lead to entrance of microbes[12] through a

nonintact skin resulting from cuts, abrasion. Sprays, spatter, or aerosols from the patients mouth may lead to droplet infections though nonintact skin, mucosal surfaces of the eyes, nose and mouth or inhalation. Indirect contact involves transfer of microorganisms from the source to an item or surface and subsequent contact with the contaminated item or surface. Spread of disease agents from the dental team to patient is indeed a rare event but could happen if proper procedures are not followed. If the hands of dental team members contain lesion or either nonintact skin, or if the hands are injured while in the patient's mouth, blood borne pathogens or other microbes could be transferred by direct contact. The patient may have indirect contact with blood borne pathogens or other agents if a member of the dental team bleeds on instruments or other items that are then used in the patients' mouth. Disease agents might be transferred from patient to patient by indirect contact through improperly prepared instruments, hand pieces and attachments operatory surfaces, and hands, transfer of the herpes simplex virus from a patient to the hands of a hygienist and then to the mouths of general patients has been documented. Immunity from hepatitis B vaccination protects the dental team from acquiring the disease and passing it along to family members.

Goal of infection control

After microbes enter the body, there are three basic factors that determine if an infectious disease will develop Virulence, Dose and Resistance. Health is favored by low virulence, low dose, high resistance; disease is favored by high virulence, high dose and low resistance.

The goal of infection control is to eliminate or reduce the dose of microorganisms that may be shared between individuals or between individuals and contaminated surfaces, the greater the dose is reduced the better the chance for preventing disease spread. Procedures that minimize spraying, spattering of oral fluids reduce the dose of microbes that escape from the source. Hand washing and surface precleaning and disinfection reduce the number of microbes that may be transferred to surfaces by touching.

Barriers such as masks, gloves, protective eyewear and clothing reduce the number of microbes that contaminate the body or other surfaces instrument precleaning and sterilization eliminate or reduce the number of microbes that may be spread from one patient to the next. Another advantage of wearing gloves is protection against contact with chemical that may irritate the skin such as cleansers, disinfectants, sterilizing solutions, x-ray developing solutions and some dental materials. Proper management of infectious waste by using appropriate container for disposal eliminates or reduces the number of microbes that may contaminate people or inanimate objects. Disease prevention is based on reducing the dose and increasing the body's resistance.

Recommendations and Regulations

Most infection control procedures practiced in dentistry are based on recommendations made by the Center for Diseases Control and Prevention. Food and drug administration regulates the manufacturing and labeling of medical devices and age of antimicrobial hand washing agents and mouth rinses. The purpose is to assume the safety and effectiveness of medical devices. Dental personnel are exposed daily to a variety of communicable diseases and although personnel protective barriers help prevent the majority of cross infections, immunization when available, however is the most effective method to reduce the chances of disease acquisition. Hand washing is an important type of personal hygiene and a primary disease prevention procedure. Proper hand washing destroys pathogens, removes blood, debris and contaminating microorganisms and prevents accumulation of blood on damaged hand skin.[13] Drying is also an essential part of hand hygiene process. One should use good quality soft, disposable paper towels.[14]There are two types of microbial flora on the hands because of the resident and the transient skin flora. Surgical scrub products contain the highest levels of antimicrobial agents including chlorhexidine gluconate, povidone iodine and triclosan. Face masks were developed originally to reduce the chances of post operative infection in patients caused by microorganisms in the respiratory tracts of the surgeons. In recent years however face mask has been viewed also as a means to protect the one who wears the mask from disease agents, that might be present in sprays, splashes or even some aerosol particles of body fluids on other potentially infectious materials. Face masks serves to filter out 95% to 99.9% of 2 to 3 μm size particles that directly contact the mask[15]. Disease agents may cause infection of the eyes or enter the associated mucous membranes and cause systemic infections. Besides protecting against infectious disease agents eye wear also protects against physical damage to the eyes by propelled objects such as broth fragments or small pieces of a restorative material. Both patient and operator should be offered eye protection during care[16]. Outer protective clothing including uniforms, clinic jackets, laboratory coats, aprons and gowns can protect against contamination, which otherwise may lead to infection through non intact skin or at least to spread of the contamination from office to home or elsewhere to unprotected clothing. Pre treatment mouth rinses like 2% chlorhexidine can reduce the bacterial load in dental aerosol[17,18,19].

Instrument processing: Instrument processing is a collection of procedures that prepared contaminated instruments for reuse processing also must be performed correctly to keep instrument damage to a minimum.

Because killing of microorganisms is the ultimate goal of instrument processing, it is important to first have a general understanding of microbial killing methods. Sterilization is a process intended to kill all microorganisms and is the highest level of microbial damage that can be achieved. The bacterial endospore has been selected as the standard challenge for sterilization because of its high resistance to killing by heat and chemicals. Three most common types of sterilizers used in dental office are Steam autoclave, Unsaturated chemical vapor and Dry heat.

A liquid germicide such as 2.0% to 3.2% glutaraldehyde must be used for sterilization plastic items such as certain rubber dam frames, shade guides, rubbers and x-ray devices. Sterilization in glutaraldehyde requires a 10 hour contact time and anything less than 10 hour is disinfection not sterilization. Ethylene oxide gas method requires 4 to 12 hrs to sterilization has got potential toxicity. Bead sterilizers provide a form of dry heat processing tips of instruments endodontic files and broaches are sterilized by inserting into the hot beads for 25-30 seconds temperature range from 375-425°F uneven temperature occurs. Ventilation and air filtration-by filtering recirculated air and by introducing a substantial proportion of fresh air in each air change will substantially reduce residual contamination.[15] Disposable item is manufactured for a single use on only one patient, such items are manufactured from plastics or less expensive metals that are usually not heat tolerant or are not designed to be adequately cleaned. Thus disposable items must be properly disposed of after use and no attempt should be made to sterilize or disinfect it for reusing on another patient. It absolutely prevents the transfer of microorganisms from one patient to another.

CONCLUSION

Infection control and prevention of cross contamination in dental health care practice may vary from state to state particularly in areas of sterilization, waste management, and sterilizer spore testing. The dental team must be in contact with the state agencies, State Dental Association and the Infection Control Officer of local dental college for latest information on prevention and post exposure prophylaxis.

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