Review Article

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METHODS OF STERILIZATION IN ORTHODONTICS :A REVIEW

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ABSTRACT:

Sterilization is a process by which an article, surface or medium is freed of all micro-organisms either in vegetative or spore state. Control of infection that spreads through various instruments and armamentarium used in the field of orthodontics and dentistry in general is of utmost importance as a preventive measure for cross infection. Considering the fact that the rate at which newer strains evolve with time and older strains develop resistance it has become a constant challenge through time and in the years to come. The article reviews the various methods of sterilization by focusing on the guidelines for an effective and efficient orthodontic practice.

Key words: Orthodontic Pliers, Sterilization Methods

INTRODUCTION:

On a daily basis, the practicing dentist and his personnel are at risk of being exposed to a wide range of patients with blood borne diseases such as HIV/AIDS, hepatitis B, hepatitis C, and airborne diseases such as Influenza and Tuberculosis . Infection can be directly transmitted by oral fluids, blood, contaminated instruments and surfaces or via the respiratory system. To accomplish infection control accurately and to reduce the risk of cross contamination, all patients have to be treated while practicing universal precautions, the latter including the imperative steps of disinfection and sterilization [1-6] .

Orthodontists do not perform oral surgery, but come in direct contact with blood and oral fluids of healthy patients or infectious diseases patients when placing or removing fixed appliances. Some orthodontic instruments used regularly have hinges and cutting edges, and this makes disinfection prior to sterilization a sensitive procedure .

Instruments have to be cleaned and dried prior to sterilization in order to minimize damage and corrosion when applicable, and to increase lifespan.

Various dental supplies and instruments that are used every day make specific studies about infection control necessary, as their components and/or their

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maintenance procedures might differ [3]. The standards of infection control and universal precautions remain generally unchanged, but technologic advancements, new products, new material and new data require constant evaluation and adjustments of the techniques accordingly. It is therefore our obligation to apply the most recent disinfection and sterilization practices to achieve the best results . The first general infection control instructions for dentistry were published by Center for Disease Control and Prevention (CDC) in 1986 [3] and are being updated every year in this respect. The main principle is to consider each patient as being infected because many infectious diseases can be present in one individual without any signs and symptoms, especially at an early stage .The American Dentist Association recommends to all staff part of the dental team to apply the universal precautions prevent infection and cross-contamination. The universal precautions suggest standard application of infection control and sterilization techniques for each patient.

Definitions:

Sterilization: Sterilization destroys all forms of microorganisms including viruses and bacterial and mycotic spores. An instrument will be either sterile or not sterile. There is no in between.

Disinfection: Disinfection is the process of destroying or inhibiting most pathogenic microorganisms and inactivating some viruses, hence reducing microbial contamination to safety levels .

Antisepsis: Application of chemicals on living tissue to avoid infection.

Asepsi: It means an environment free of germs. That is the destruction of all disease-forming microorganisms in the working environment.

Decontamination: work against all kinds of germs to reduce the microbial source in number for protection from, unexpected contamination and infection is called decontamination.

Oral and upper airway normal flora:

Mouth flora is established between six and eight hours after birth. The development of oral flora happens throughout the following stages: birth, childhood and adulthood. Oral hygiene and nutrition play an important role as well. Virulent Streptococcus is present in large numbers in the permanent flora, between four to twelve hours after birth. Aerobic and anaerobic staphylococcus, gram (-) diplococci and dyphtheroids manifest during infancy before the eruption of the primary teeth.

The microorganisms in the oral flora can be listed as:

- **Streptococci**
- **Anaerobics** (Bacteroides, Porphyromonas, Prevotella, Fusobacterium, Capnocytophaga, Peptostreptococcus, Salmonella, Leptotrichia, Eubacterium,

Veillonella, Helicobacter, Spirochetes)

- **Actinobacilli**
- **Gram negative bacteria**
- **Staphylococci**

Pathogenesis in oral flora:

Pathogenesis of bacteria depends on various factors. Microorganisms spread out vigorously when changes in the mucosal barrier occur, when systemic and local factors might impair tissue congestion and when there is a lack of tissue oxygenation [7].

Normal oral flora is usually the cause of dental, gingival and bone infections. Frequently, anaerobic bacteria (Bacteroides, Porphyromonas, Prevotella, Fusobacterium,Capnocytophaga, Peptostreptococcus, Salmonella, Leptotrichia, Eubacterium, Veillonella, Helicobacter, Spirochetes) are involved.

Sterilization stages

a. Cleaning

b. Packaging- loading

c. Sterilization

d. Unloading- registration

e. Storage- distribution

Sterilizing Orthodontic Pliers

Clean instruments thoroughly, rinse and dry before sterilizing. After sterilizing, lubricate very sparingly. One drop ora light spray is sufficient. Wipe off excess lubricant.

Always lubricate after sterilization, because lubricants, waxes, and "sticky joint" remedies vaporize inside sterilization equipment and will saturate all other items placed in the chamber.

Over-use of lubricants or "sticky joint" treatments is the major cause of staining or discoloration of instruments.Brown or yellow stains generally can be removed by scrubbing with Type-A steel wool saturated with isopropyl alcohol.Our wire forming and cutting instruments have been tested and found to be resistant to corrosion when sterilized using the following methods:

AUTOCLAVE

1. Air and towel dry instruments.

2. Instruments may be bagged prior to sterilization.

3. Place instruments on autoclave tray with jaws open. Proceed following manufacturer's recommendations.

4. Remove instruments promptly after cycle is complete to avoid possible signs of corrosion.

5. When cooled, lubricate instruments sparingly.

CHEMCLAVE

1. Air and towel dry instruments.

2. Instruments may be bagged prior to sterilization.

3. Place instruments on paper towels. Do not process for longer than 20 minutes. Make sure that chemical

additives are in correct proportions.

4. Remove instruments promptly after cycle is complete to avoid possible signs of corrosion.

5. When cooled, lubricate instruments sparingly.

DRY HEAT

1. Air and towel dry instruments – especially joints.

2. Place on trays, sheets or racks for recommended cycle, from 6 to 30 minutes (follow equipment manufacturer's instructions.)

3. Once cooled, lubricate instruments sparingly.

ULTRASONIC CLEANING

Ultrasonic cleaning of cutting pliers is not recommended—solutions combined with vibrations are very caustic and could dull or damage cutters.

1. If ultrasonic cleaning is chosen, follow equipment manufacturer's recommended immersion schedule.

2. Rinse instruments with high –volume water before sterilizing.

3. Air and towel dry instruments before sterilizing.

COLD STERILIZATION (2% Glutaraldehyde)

1. Dry joints thoroughly—air and towel dry.

2. Totally immerse instruments in solution. Sterilization requires 10-hour immersion.

3. Remove instruments from solution and rinse in sterile water. Air dry joints to remove all moisture.

4. Prolonged immersion is not recommended, especially for cutters.

5. Lubricate sparingy.

Removal of sharp Instruments and infectious wastes:

The patient's blood and saliva-contaminated sharp instruments should be considered as infected and necessary precautions should be taken for preventing injuries. To avoid needle accidence the use of disposable syringes should be preferred and sharp tools must be placed in boxes that are puncture-resistant and this box should be left to an area nearby .

Precautions that should be taken when using sharp instruments are as follows:

All of the personal must wear protective clothing during clinical operations and cleaning. Whole staff that contact with body fluids should be vaccinated. Sharp instruments should not be left around and should not be passed from hand to hand. Needles should be placed in their cover with the help of a suitable tool and they should be discarded immediately after usage. Sharp instrument boxes must be sufficient amount and when 3/4 of the

boxes are full, waste should be discarded. There must be someone responsible to change the full boxes with the empty ones. All staff should have a detailed knowledge with the use and the getting rid of sharp tools. Gauze, cotton rolls, disposable waste, that are contaminated with blood, must be placed in waterproof plastic bags and removed. It is a low probability of any kind of transfer of microorganisms by clothes. Therefore, normal washing and drying of dirty clothes is a good method for cleaning and is sufficient. Gloves should be worn during processing with blood, saliva-absorbing tube fluid and other liquid waste. Liquids must be poured to a channel connected to sewage with care.

Disinfection of orthodontic brackets:

Chlorhexidine is an appropriate disinfectant to be used on metal or ceramic brackets. In a study that evaluated the effect of 0.01 % chlorhexidine solution on metal and ceramic brackets, it was found that chlorhexidine does not have a significant effect on the metal brackets' adhesion ability . On the other hand, the attachment ability of ceramic brackets is significantly affected from this disinfecting solution, but the clinical effect does not reach levels below 6-8 Mpa .

Decontamination of orthodontic bands:

Stainless steel bands of various sizes are frequently used on molars during fixed orthodontic treatment. Choosing the appropriate size requires often several trials. If trying of the bands is attempted inside the patient's mouth and determined that the size is not appropriate, the band should be decontaminated from saliva and blood, and autoclaved for future use.

There is currently little information about the contamination level and the disinfection procedure's success of the bands that are to be reused. Fulford et al, (2003) suggested that bacterial multiplication is not observed on the bands that are exposed to enzymatic disinfectant prior to autoclave sterilization.

Sterilization of orthodontic wires:

Studies on the effect of sterilization on orthodontic wires have been going on since the 1980's. The results are in contradiction with one another. Some of the studies report mechanical alterations whereas the others defend the opposite. observed the sterilization of 6 different arch wires by autoclaving them for 18 minutes in 134ºC via surface analysis techniques. No significant change was observed on the alloys surface characteristics that would effect their utilization.

Disinfection of elastomeric ligatures:

Polyurethane elastomers are frequently used in orthodontics as ligature and chain. The unused parts of elastomeric ligatures are generally sterilized via cold sterilization since they are not heat-resistant.

Various studies showed that repeated disinfection of the same elastic can accelerate the destruction of the cross links available in the long chain molecules of polyurethane polyesters. Sterilization of elastomeric ligatures inside the autoclave at 121^{o}C does not lead to permanent deformations or to increased shrinkage whereas in the case of dry-heat, their manipulation becomes more difficult.Based on two different disinfectants, tensile strength and glass transformation temperature of elastomeric ligatures that are not disinfected are found significantly different than those that are exposed to phenol and glutaraldehyde.

CONCLUSION:

Dentists face with many kinds and amount of micro-organisms because of their professions that require intimate contact with their patients. These microorganisms may lead either a simple illness such as influenza or a serious one such as hepatitis infection or AIDS. [9] For this reason, Keeping in mind that every patient is potentially infectious, all the measures must be taken during dental practice. Sterilization and disinfection methods should be implemented meticulously and their effectiveness carry crucial importance for the physician and the patient's health. Although orthodontists usually do not work on tissues and treat infectious diseases patients may still carry germs that infect other people. Thus today, the use of proper sterilization

techniques are important because of professional, ethical and legal aspects. Although it is not possible to obtain a complete sterilization in orthodontic clinics, it may be approachable by using new techniques. In the orthodontic practice, providing full range sterilization requires serious effort. The presence of transmissible diseases like HIV/AIDS and Hepatitis B & C make it an absolute necessity to protect clinic staff and patients from cross contamination, by using effective disinfection and sterilization techniques.

Sterilization of instruments used in orthodontics brings some special problems together, because of the hinge regions and cutting edges that are difficult to clean and sterilize. In addition, there is a need to avoid damage during cleaning operations, because the repair or renewal of the equipments are expensive. Orthodontic clinics running with a limited number of instruments and appliances, prefers fast methods for sterilization for effective working. To ensure this, in addition to planning the sterilization area in orthodontic clinics, new sterilization-disinfection techniques and Solutions must be learned.

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