

Sterilization In Orthodontics An Insight

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Abstract

Orthodontists and dentists, contrary to hospital operating room, do not require a completely sterile environment. However the risk of cross contamination between patients exists and need to be eliminated by proper instrument sterilization and infection control measures. Acceptable orthodontic sterilization methods have evolved over time and are currently in the process of changing. 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

Sterilization refers to any process that effectively kills or eliminates transmissible agents from a surface, equipment, article of food or medication, or biological culture medium. Sterilization can be achieved through the application of heat, chemicals, irradiation, high pressure or filtration. Sterilization, asepsis and universal precautions to prevent infectious disease transmission is often neglected in dental practice. Hence this article review the various sterilization protocols pertaining to orthodontic instruments apart from implementation of additional infection control measures required in general.

The advice sheet on infection control formulated by the department of health, United Kingdom proposed a three stage protocol to sterilization which includes pre-sterilization cleaning, sterilization and storage.¹

Pre-Sterilization Cleaning: It is generally done by hand washing the instruments using detergents and brushes. Depending on the instrument load this procedure lasts between 10-20 minutes. At the end of pre-sterilization procedure it is very important to eliminate any residual moisture on the instruments as it may lead to corrosion when certain types of sterilization procedures are employed in the next stage.¹

Dry Heat Sterilization: The dry heat sterilization (DHS) and clinical recycling (CR) produces significant changes in the loading and unloading characteristics of NiTi wires. Clinical recycling reduces the "pseudo plasticity" of NiTi wires and increases its stiffness.²

Hot air oven is the most widely used method of sterilization by dry heat. A holding period of 160oC(320oF) for 1 hr is used to sterilize glassware, forceps, scissors, scalpels, all glass syringes, swabs, liquid paraffin, dusting powder, fats and grease. Present day hot air sterilization involves cycles at 190oC for 6-12 minutes and is also

called as Rapid dry-Heat Sterilization. It is suitable for dry powders and water free oily substance. This type of energy does not penetrate materials easily and thus long periods of exposure to high temperatures are necessary. It is an effective and safe method of sterilization for metal instruments such as pliers and mirrors as it does not cause corrosion of Carbon steel instruments and burs.³

Glass bead sterilizer: The glass bead sterilizer uses a metal cup with glass beads of 1.2-1.5mm in diameter. The use of this method in orthodontics is limited to orthodontic bands. However it is theoretically possible to sterilize one or two pliers within 20-30 seconds. A longer sterilization time is required because larger the instrument longer the heat-up time. Similarly if more than one molar band at a time is placed in the well twice the amount of time is required. The recommended protocol for sterilization of single molar band to have a sporicidal effect is 2200C for 45 seconds.⁴

Autoclaving: Autoclaving is the most popular method of sterilization and is considered as a gold standard for sterilization procedures. It is used for heat resistant plastics, dental hand pieces, dental instruments, cotton rolls, gauze, anesthetic syringes, glass slab, towel packs. The conventional method involves pressure in the range of 15 to 20 psi at a temperature of 121°C to 1340C (250°F). A holding time of 15-21 minutes at 121oC (conventional method) or 3 minutes at 1340C (rapid cycle) is required for proper sterilization. The complete cycle from the start of sterilization to subsequent cooling requires 45 minutes to one hour. Although it is the most popular method of sterilization the presence of steam vapor during the process of heating has detrimental effect on the orthodontic pliers in the form of rusting and corrosion.⁵

Ethylene oxide sterilization: Ethylene oxide is a gas at temperatures above 10.80C. It is used to sterilize paper, leather, wood, metal and rubber as well as plastic. Gas sterilization is effective in killing bacteria, but is also costly and difficult, making it impractical for orthodontic offices.

Chemical Immersion/Cold Sterilization: This method is recommended only for heat sensitive non-surgical instruments and alginate impressions. One of the facts about cold sterilization is that there is no method to verify its effectiveness. 2% glutaraldehyde is the most popular high level disinfectants used in dentistry. It is a colorless liquid with a pungent odor. It is very effective method of inactivation of bacterial spores.

It is used as an immersion solution for metallic instruments, face masks, heat sensitive plastic rubbers, and fiber optics. The

duration of sterilization is about 6-10 hrs at room temperature. It is non-corrosive, nontoxic and can sterilize heat sensitive equipment. An added advantage is its low cost. Long immersion time, odor, irritating to mucous membrane (eyes), and monitoring is a relative disadvantage. This method can be employed on elastomeric materials such as elastomeric modules by cutting them into smaller sections and covering them with clear tubing, which could then be cold sterilized.⁶ Alcohol is an effective skin antiseptic and valuable disinfectant for medical instruments. Ethyl and isopropyl alcohol are most frequently used. Isopropyl alcohol is preferred to ethyl alcohol as it is a better fat solvent, more bactericidal and less volatile. It is active at a conc. of 50-70%. It is commonly used for disinfection of clinical thermometers. It has been used for sterilization of orthodontic arch wire materials for recycling.⁷

Laser (Light Amplification by stimulated Emission of Radiation): Recent experiments indicate that laser beams can be used to sterilize instruments and the air in operating rooms, as well as wound surfaces. Various types of lasers used include CO2, Argon, and NdYAG lasers etc. The cost factor has been the primary reason for its uncommon use.⁸

Practical guidelines for an effective process of sterilization-

- Orthodontic plier sterilization:⁹
1. Ultrasonic cycle for 5-12 minutes.
 2. Rinse with distilled water.
 3. Remove excess moisture
 4. Lubricate plier joints and cutting surface with silicon based lubricants.
 5. Sterilize using dry heat sterilizer
 6. Storage

Molar bands¹⁰

1. Ultrasonic cycle for 5 minutes.
2. Rinsing with distilled water.
3. Remove the excess moisture
4. Sterilize using dry heat sterilizer
5. Storage

Elastomeric ligatures and chains: Chemical disinfection is not suited for elastomeric chains and ligatures as they are known to alter their physical characteristics. (However, elastomeric modules can be sterilized by cutting them into smaller sections and covering them with clear tubing, which could then be cold sterilized. Single patient packs are the best insurance against cross-contamination risks at present and where this is not feasible as in the case of e-chain spools, it is better to cut a little extra than required and discard the rest. ¹¹

Alginate impression: Commonly used disinfecting solutions used for alginate impressions are 2% glutaraldehyde and 1% sodium hypochlorite.



Guidelines for sterilization of alginate impressions-

1. Rinse thoroughly under running water following removal.
2. Immersions of impression in disinfectant for 10 minutes. Spraying aerosols are not recommended for their unevenness and additional inhalation risk.
3. Rinse again under running water.
4. Ready for model processing.

The manufacturer's prescription recommends immersing the alginate impression for not more than 10 minutes as it may cause alteration in the surface characteristics of the material. Newer alginate impression materials are commercially available as self-disinfecting alginates.¹²

Conclusion

Sterilization of instruments is a multi step process that begins with washing off debris after use, then specific steps are

required for completion of this procedure as Prevention of cross infection is a crucial aspect of dental practice. There is still need for improvement in disinfection and sterilization in dental practice, especially including monitoring and documentation of sterilization process, proper use of disinfectants and frequent disinfection of surfaces which contact with patients.

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This includes chronic infection management, root canal therapy, root planning and curettage, caries treatment, denture related work, patient education. This is followed by evaluation before proceeding.

Stage 3: Rehabilitation phase

Includes Implants, surgical endodontics, surgical periodontics, esthetic rehabilitation, reconstruction of occlusal plane and restoration of vertical dimension

Care of Functionally Dependant Elderly

Normal day to day activities for these people will need assistance. Physical and psychological comfort should be maintained in them by minimal treatment. When the patients are severely diseased a physician's presence and service will be essential. Whenever there is risk involved the person should be hospitalised for necessary treatment. Restorative management can be done by atraumatic restorative treatment.

Common Oral Diseases Seen in Elderly

Dental caries: coronal and root caries Treatment consists of-

1. Restorative phase
2. Maintenance phase

Dry mouth and non carious lesions should be treated. Esthetic rehabilitation and endodontic treatment should also be considered if need arises.

Situations that post limitations for root canal treatment in elderly-

1. Severe Parkinson's disease
2. Tremors
3. Inability to sit for a prolonged time
4. Mental illness

In the elderly we come across many technical challenges during root canal

treatment. Pulpal response to the vitality tests may be diminished due to increased amount of dentin deposition and pulpal fibrosis. It may be wrongly assumed that the pulp is non vital and root canal treatment may be initiated. Treatment should be carried on only with supporting evidences other than pulp vitality tests.¹⁵ The use of adrenaline in some conditions in elderly is also not advisable. Isolation becomes difficult when there is cervical caries and the rubber dam has to be placed with special technique.¹ Narrowing of the pulp space, pulp stones, supra erupted teeth, tilted teeth can further pose challenges. The use of half sized files may be of good help in gaining path for the enlarging tools to follow. More time and effort is needed to work in such narrow canals to prevent instrument breakage or binding.¹ Multiple appointments can be given in case the patients are having difficulty in mouth opening and bite blocks can be also used if needed.¹⁶

Conclusion

There is an increasing number in elderly population with an increased life expectancy. However there are no oral health care centres catering to the special needs of the elderly. Declining traditional family support and changing family structure are making more and more elderly people to take care of themselves. The need for education in geriatric dentistry is essential. This will enable dental health care workers to understand and treat the elderly in a proper manner. Awareness and knowledge would facilitate the setting up of separate health units for the elderly. Undergraduate teaching in geriatrics is very much helpful in training the students to provide oral health care to

provide oral health care to the elderly.

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