



STERILIZATION OF ORTHODONTIC INSTRUMENTS, MATERIALS AND ALIGNERS- A REVIEW

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ABSTRACT Sterilization and disinfections are integral part of any surgical field including dentistry. In Orthodontics also many invasive procedures are followed like placement of mini screws, molar bands, exposure of impacted tooth etc which required proper sterilization procedures. Besides this, contamination can also occur from orthodontic instruments, materials and even from surfaces of dental chairs and spread deadly diseases like HIV, Hepatitis B etc. Newer things like clear aligners also need disinfection as patients have to wear these throughout the day. So Proper knowledge about sterilization procedures of different orthodontic instruments are required to minimize cross infections.

KEYWORDS : Sterilization of Orthodontic instruments, Sterilizations of aligner, Sterilization procedures, disinfection

INTRODUCTIONS:

Sterilization is the most essential part in dentistry and proper technique has to be followed for proper sterilization. In Orthodontics various cutting instruments, holding instruments and various other materials are used that are contaminated with saliva and blood in oral environment. These can spread various infections if not cleaned and sterilized properly. According to a study of Feldman, the spread of hepatitis –B is second most common in Orthodontics after Oral surgery¹. Irrespective of diseases we have to treat all patients with proper precautions. In dentistry, the first general infection controls guidelines were published in 1986 by Disease Control and Prevention (CDC). It is updated every year as new methods, machines are being invented and especially orthodontists got alert after surge of Covid infections. Though maximum orthodontic materials are not reusable, contamination may occur as maximum of them come in spoils. After the recent surge of COVID infection, special care is given in sterilization. Even clear aligner may needs disinfection as food debris may accumulate in them and may cause caries or gingivitis.² But all instruments and materials cannot be sterilised in the same process as they are made of different materials. So proper knowledge about different sterilization protocols are necessary for proper infection control.

Terminologies: The different terminologies are given below:³

Sterilization: Sterilization is the complete elimination of all forms of microbial life including spores.

Disinfections: It is a process of destruction of all pathogen capable of producing infections but not necessarily spores.

Antisepsis: The practice of using chemical agents on living skin or tissues to inhibit the growth and reproduction of microorganism.

Orthodontic instruments:

Orthodontic instruments can be classified into three categories according to Spaulding systems- Critical, semi-critical and least critical instruments.⁴

Critical: Orthodontic instruments that penetrate the oral mucosa are categorized under critical instruments. Eg- mini implants, molar bands, band removing pliers etc.

Semi critical: Orthodontic instruments that touch the oral mucosa are come under semi critical instruments. Eg – orthodontic brackets, arch wires, distal end cutters, cheek retractors etc.

Least critical: Orthodontic instruments that do not come in contact with oral mucosa are fallen under least critical instruments. E g- Bracket positioning pliers, MBT measuring gauge, holding instruments etc.

Sterilization technique:

Cleaning: All the instruments should have to be cleaned thoroughly before putting it into sterilization process for cleaning debris, blood , saliva or any other impurities as these may hamper sterilization process. After cleaning these should be dried properly to clean any residual moisture as it may corrode the instruments.

Packaging: After cleaning these should be sealed properly. Proper packing is necessary to ensure steam penetration. Dedicated autoclave bags, wraps, peel ouches are available. Proper sealing is necessary leaving 1 inch margin for steam penetration⁵. Aluminium foils have to be avoided as they may prevent steam penetration⁶.

Sterilization: After proper packing sterilization process can be initiated. Proper sterilization method should be followed for getting optimum sterilization. Several sterilization methods are available. The comparison of different sterilization methods is given in table 1.⁶

Table 1 : Comparison of different sterilization methods

Technique	Major pros	Major cons	Timing	Chair-side use
Autoclave	Effective Time efficient	Chances of corrosion Not suitable for rubber ma	15-20 min	No
Hot air oven	Dry field No corrosion	Time consuming Not suitable for rubber materials	30-60 min	No
Glass –bead	No corrosion Time efficient	Small capacity Not suitable for rubber materials	40-50 sec	Yes
Chemical solution	Suitable for rubber materials	May corrode instruments	5-10 min	No

Laser	Effective Fast method	High cost	3 sec	Yes
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Unloading: After sterilization process the instruments should be removed from sterilizer with proper precautions. Proper instruments should be used to take out hot instruments.

Storage: After removing the instruments it should be stored in dry cleaned storage. It should not immerse in any chemical solutions as it may corrode the instruments.

Sterilization of different Orthodontic instruments and materials:

Though orthodontia is a non surgical field, it can cause transmission of various diseases from one patient to another due to contamination from various instruments and materials. So proper sterilization protocols should be maintained to stop this kind of contaminations.

Sterilization of orthodontic pliers: Orthodontic plies can be sterilized by dry heat sterilization. Prior to sterilization, removing the water from the instrument surface is necessary to prevent corrosion. Autoclave is generally avoided as it can damage the sharpness of the cutting instruments⁷. Small instruments can be sterilized by glass bead sterilizer. Chemical vapour can be used in a well ventilated room. Chemical spray proved to be inefficient in removing micro-organism. Ultrasonic bath can also be used.

Sterilization of brackets: Though a single bracket set is used in a single patient, it sometimes required to sterilize brackets for re use in the same patients. 0.01 % chlorhexidine solution found to be effective in sterilizing metal or ceramic brackets⁸.

Orthodontic wires: Autoclave can be used to sterilize orthodontic archwires. But some studies showed that it can alter the mechanical property of it.⁹

Orthodontic bands: Though orthodontic bands are not re-usable , but it sometimes required to check the fit of the bands by putting multiple bands of different size one by one. This procedure can contaminate infections when putting the same bands in another patient. Blood contaminations may occur as bands sometimes cut papilla. Cleaning should be done first to remove bloods and saliva. It can be sterilized by chemical or autoclave.

Elastomeric chains and modules: The can be sterilized using cold sterilization method as heat can destroy them. Putting an elastic material in autoclave can decrease its tensile strength. 5% glutaraldehyde can be used for this¹⁰. But these materials should not be reused. Only remaining part should be sterilized.

Sterilization of removable appliances: Removable appliances often get deposited by bio-films, especially on their tissue surfaces. This contain microorganism which can be contaminated during activation. Chemical sterilization methods should be used as others can deform the appliance. Chlorhexidine gluconate, cetylpyridinium chloride (CPC) etc can be used for this purpose¹¹. Studies showed that chlorhexidine gluconate is more effective than the later one in removing microorganism¹².

Disinfection of alginate impression and casts: Disinfection of impression is very much crucial as it may contain several micro-organism. It should be first rinse with running water. Commonly used disinfecting solution is 2% glutaraldehyde or 1% sodium hypochlorite. 7-10 minute immersion is needed for proper sterilization¹³. Dental casts can be sterilized by 2% glutaraldehyde.

Sterilization of orthodontic mini implants: Temporary anchorage devices (TADS) are now a day used widely in different types of malocclusions like intrusions, retractions, distalization etc. It does not come as pre-sterilized . So proper sterilization is needed before placement of TADS. Autoclave is the method of choice for sterilization of micro implants¹⁴. Autoclave does not alter the property of resistance to fracture¹⁵. A single cycle is recommended as repeated sterilization may cause primary stability failure¹⁶.

Sterilization of essix retainer/ Aligners: The use of clear aligner is getting increased day by day due its high esthetic demand. Though patients remove aligner before eating, biofilm can be accumulated and may cause white spot lesions, caries, periodontitis etc. The Posterior part of the aligner and the incisal edge are more prone for accumulation of biofilm. Both mechanical and chemical methods are used for cleaning

and sterilization of aligners. Brushing with toothpaste is a good cleaning solution. Effervescent tablets containing sodium carbonate and sulphate can be combined with brushing for better results. 0.12 % Chlorhexidine can be added for better result¹⁷. The other chemical solutions are 0.5% sodium hypochlorite , neutral detergent, vinegar etc¹⁸. In a study conducted by Shpack et al, it was found that Cleaning Crystal Solution (Align technology) in vibrating bath is more effective than tooth paste and chlorhexidine¹⁹. It contains sodium sulphate (60%), sodium carbonate (30%), sodium triphosphosphate (7.5%), sodium dichlorosocyanurate (2%) and sodium lauryl sulphate (0.15%).

Surface disinfection:

Surface means the parts of a dental chairs (like head rests, arms, cuspidors , air-water syringe etc), drawers, operators' chair etc. These have to disinfect as contamination can be occurred from there too. Chemicals like sodium hypochlorite (1%), 70% alcohol, iodine solutions can be used to effectively disinfect these surfaces. Foot pad button for changing position of dental chairs can be used to limit hand control. Dental unit water lines that used in airtor machine also contains micro- organism. This can be effectively sterilized by plasma sterilization²⁰. The machine produces positive and negative charges (plasma ions) that destroys micro organism.

CONCLUSION:

Dental and Orthodontic clinics can be a source of infection if proper sterilization and disinfection protocols are not followed. Though in Orthodontics re-use of materials are limited, sometimes contamination can be occurred while selection of molar bands, placement of elastic chains, elastic modules etc and from instruments. So proper sterilization and disinfection measurements should be taken to minimize spread of infections and offer patients a beautiful smile and health.

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