



Unique Journal of Medical and Dental Sciences

Available online: www.ujconline.net

Research Article

ENDODONTIC HAND INSTRUMENT STERILIZATION PROCEDURES FOLLOWED BY DENTAL PRACTITIONER

Limbhore Mayur^{1*}, Saraf Adish², Medha Ashish³, Jain Deepak⁴, Mattigatti Sudha⁴, Mahaparale Rushikesh²

¹Graduate Student, KIMSUDU, Karad, India

²Senior Lecturer, Department of Conservative Dentistry and Endodontics SDS, Karad, India

³Professor and HOD, Department of Conservative Dentistry and Endodontics SDS, Karad, India

⁴Reader, Department of Conservative Dentistry and Endodontics SDS, Karad, India

Received: 29-09-2014; Revised: 26-10-2014; Accepted: 24-11-2014

*Corresponding Author: **Dr Mayur Limbhore**
KIMSUDU, School of Dental sciences, Karad, India

ABSTRACT

Aim: Endodontic hand instrument sterilization procedures followed by dental practitioner.

Introduction: Sterilization: It is the process by which an article, surface or medium is freed of all microorganisms either in the vegetative or spore state

Disinfection: It is the destruction or removal of all pathogenic micro-organisms which give rise to infection but not necessarily their spore forms.

Material and method: Questionnaires with 10 closed-ended questions were distributed among randomly chosen 100 general Dental practitioners of Western Maharashtra, working in various private clinics. The data were collected and descriptive statistical analysis was done.

Conclusion: As the saying goes "Cleanliness is next to godliness" "similarly cleanliness in our noble profession plays an important role. Sterilization forms a part and parcel of dental practice due to the risk of cross infection.

Keywords: Sterilization, Hand Instrument, Cleanliness, Endodontics, Pathogens, Micro-Organisms, Infection.

INTRODUCTION

Cleaning and shaping is an important phase of endodontic treatment. This is usually performed using hand and rotary instruments which are often reused. Since root canal instrumentation results in accumulation of debris on the flutes of the file, these instruments have to be cleaned, disinfected and sterilized effectively. This is especially important in endodontic because during root canal instrumentation all types of debris such as necrotic and vital tissue, bacteria, dentin chips, blood by products and other by potential irritants are encountered. The exchange of this debris via instruments from one patient to another is undesirable as they may act as antigens, infecting agents or non specific irritants transmitting certain lethal disease like Creutzfeld- Jacob disease. Various methods have been advocated for cleaning and sterilizing endodontic files which includes ultrasonic cleaning, use of sponges and brushes, sodium hypochlorite, glutaraldehyde solution, glass bead sterilizer, dry heat and use of steam sterilization with or without use of chemicals. Cleaning the hand instruments with ultrasonic cleaner has been proved to be superior to the other methods of cleansing and debriding. Using Steam under pressure for sterilization of endodontic hand instruments has been termed as the best method of

sterilization. The literature provides us with the best methods for cleaning and sterilizing of endodontic hand instruments but how many practitioners follow the ideal methods remains unknown. So, this study aimed at identifying the various cleaning and sterilization procedures used by private practitioners for sterilizing their endodontic hand instruments

MATERIALS AND METHODS

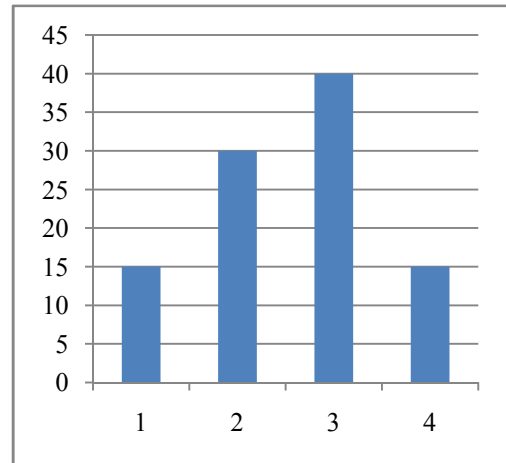
Questionnaires with 10 closed-ended questions were distributed among randomly chosen 100 general dental practitioners of Western Maharashtra, working in various private clinics. The data were collected and descriptive statistical analysis was done.

The questionnaire is as follow

1. How many endodontic patients do you treat every day?
1) 1 2) 3 3) 5 4) 7 and more
2. How many times hand instrument are used?
1) Single use 2) Multiple use
3. How do you sterilize a new instrument?
1) Autoclave 2) Use it directly 3) Chemical sterilization
4. After use how do you clear off the debris?
1) Wipe with spirit. 2) Immerse in sodium hypochlorite
3) Immerse in mixture of sodium hypochlorite and hydrogen peroxide. 4) Ultrasonic cleaner.

5. How do you sterilize the instrument?
 - 1) Autoclave
 - 2) Glass bead Sterilization
 - 3) Cold sterilization.
 - 4) Boiling water.
6. When will you sterilize the instrument after use?
 - 1) After each canal is prepared.
 - 2) After all canals are prepared
7. Do you sterilize the files between two teeth of same patient?
 - 1) Yes
 - 2) No
8. Have your instrument ever rusted after sterilization?
 - 1) Yes
 - 2) No
9. How do you give your instrument for sterilization?
 - 1) Sterilization pouch
 - 2) Sterilization cassette
 - 3) Endo box
10. Which method for chemical sterilization do you follow?
 - 1) Spirit
 - 2) Glutaraldehyde
 - 3) Bacillol
 - 4) Ethylene oxide.

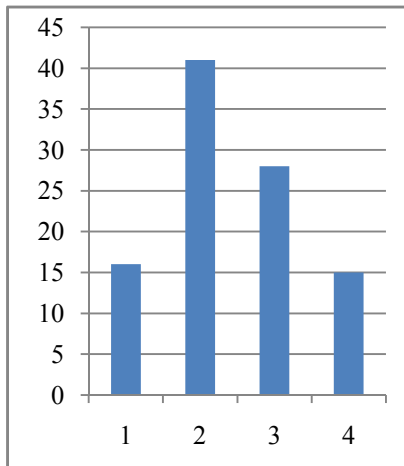
3. How do you sterilize a new instrument
 - 1) Autoclave
 - 2) Use it directly
 - 3) Chemical sterilization



Graph representing how new Instrument is Sterilize

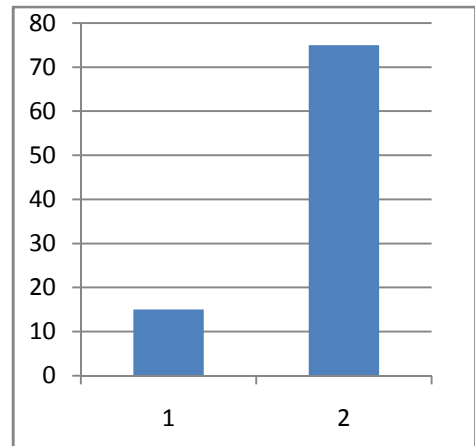
RESULTS

1. How many endodontic patient do you treat every day
 - 1) 1
 - 2) 3
 - 3) 5
 - 4) 7 and more



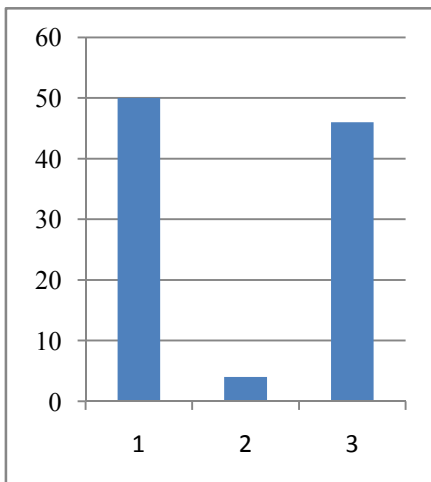
Graph representing endodontic patient treating every day

4. After use how do you clear off the debris
 - 1) Wipe with spirit
 - 2) Immerse in sodium hypochlorite
 - 3) Immerse in mixture of sodium hypochlorite and hydrogen peroxide
 - 4) Ultrasonic cleaner



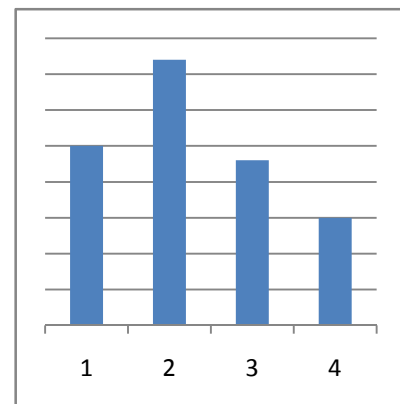
Graph representing after use how do you clear off the debris

2. How many times hand instrument are used
 - 1) Single use
 - 2) Multiple use



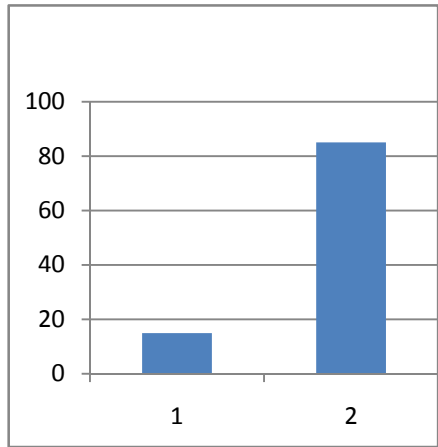
Graph representing how many times hand instruments are sterilize

5. How do you sterilize the instrument
 - 1) Autoclave
 - 2) Glass bead sterilization
 - 3) Cold sterilization.
 - 4) Boiling water.



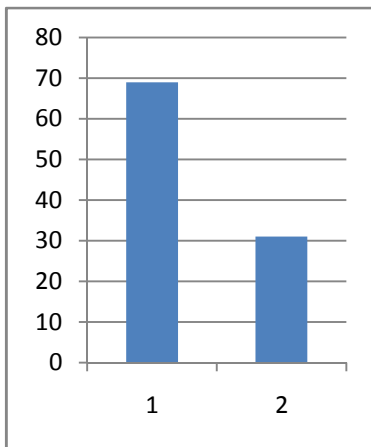
Graph representing how you sterilize the instrument

6. When will you sterilize the instrument after use?
 1) After each canal is prepared.
 2) After all canals are prepared



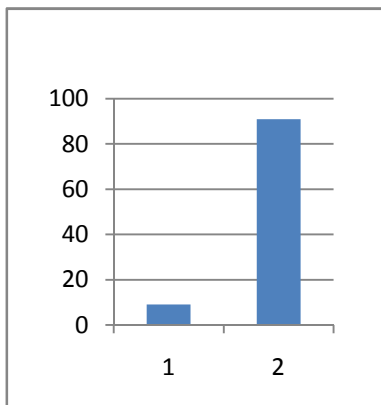
Graph representing when will you sterilize the instrument after use

7. Do you sterilize the files between two teeth of same patient?
 1) Yes 2) No



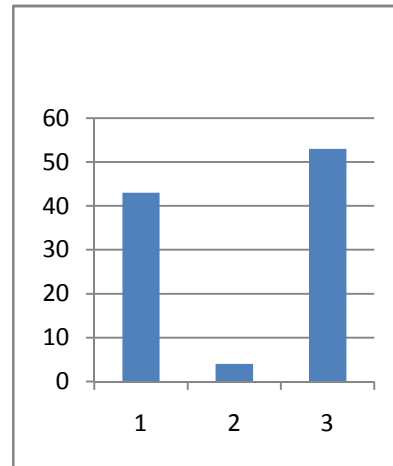
Graph representing how you sterilize the files between two teeth of same patient

8. Have your instrument ever rusted after Sterilization?
 1) Yes 2) No



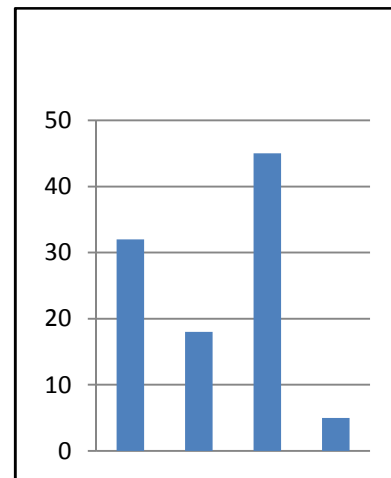
Graph representing has your instrument ever rusted after sterilization

9. How do you give your instrument for sterilization?
 1) Sterilization pouch 2) Sterilization cassette 3) Endo box



Graph representing how do you give your Instrument for sterilization

10. Which method for chemical sterilization do you follow?
 1) Spirit. 2) Glutaraldehyde
 3) Bacillol 4) Ethylene oxide



Graph representing which method for chemical sterilization you follow

DISCUSSION

Sterilization in endodontic practice is a must as the major motive of an endodontic is to combat endodontic diseases by eliminating the causative microorganisms. Owing to the design of the endodontic files, it is very conducive for the microorganisms and debris to be anchored into them. Microorganisms have long been recognized as the cause for pulpal and periapical diseases and the success of endodontic depend on the eradication of these from the pulp chamber and the root canals. Instruments that contact sterile areas of the body, enter the vascular system or penetrate the oral mucosa are classified as 'critical items' and must be sterile before use. This classification includes the endodontic files. Mechanical debridement of the microorganisms requires the usage of the endodontic files extensively. The advent of rotary instrumentation has revolutionized the way that endodontic is being done. No longer do we need to be stuck in tedious

appointments straining your wrist and fingers. Owing to their frequent reuse, following a strict sterilization protocol is essential as the risk of cross-infection is higher. Various methods have been proposed for this purpose, namely the autoclave, dry-heat sterilization, glass-bead sterilizer, laser, chemical sterilization. The questionnaire was formulated and circulated among the dental practionnaire of western Maharashtra.

By which method the dental practionnaire of western Maharashtra sterilize a *new* instrument?

A) Autoclave B) Use it directly C) Chemical sterilization

Most endodontic instruments as supplied from the manufacturer are not sterile and have been found to have metallic spurs and debris on their surfaces. In some cases even epithelial cells have been found on new unused files. Furthermore, the manufacturing process produces milling marks and metal debris, and dentin fragments appear to adhere to deposits of carbon and sulphur resulting from the decomposition and oxidation of the lubricating oil used during machining.

Although there is considerable evidence that endodontic files can be predictably sterilized even in the presence of biologic debris, the cleaning of instruments to remove micro-organisms and biological debris (bioburden) effectively eliminates the majority of micro-organisms. As endodontic files have no internal surfaces that cannot be reached, it would be expected that a cleaning protocol could be developed that results in files free of bioburden. New files straight from the packet, whether pre-sterilized or not, have considerable amounts of unstained debris and, in some instances, stained debris on their flutes. Endodontic instruments must be cleaned and sterilized before their first use. In a busy private practice setting it is not possible to achieve acceptable sterilization results owing to ignorance and hurried manual attempts to save time. So, the need for rapid chairside sterilization is looked upon as an alternative. Steam autoclave sterilization kills the microorganisms by coagulation of proteins. As per the study carried out, 50% of dental practioners use autoclave as a method of sterilization. The futher questioner was followed by asking how many times hand instrument are used?

A) Single B) Multiple use

Hand files and rotary instrumentation can cause problems because of the spiral/cross cutting action of the file. These files hold on to the organic tissue matter, which aids in removal of the pulpal tissue from the nerve chamber (canal), but can hinder decontamination. Nerve broaches and hand files/reamers should never be reused under any circumstances as it cannot be guarantee that all pulpal tissue will be removed from them. Although they may look 'clean' to the naked eye magnification might tell a different story. It has been suggested that hand files and reamers might be reused if the same patient is seen for a second stage visit. These instruments are considered hazardous waste and need to be stored in a yellow labeled sharps bin, which would not allow the items to be reclaimed for reuse. Second, if the patient were to be given the files for 'safe keeping' this would be in breach of the regulations for hazardous waste, cleaning and reuse of these instruments would be weakening of the structure, which could lead to potential breakage or fracture within the tooth. There

are no reported cases of accidental cross-infection subsequent to dental treatment but the current concern over the risk of iatrogenic transmission of prior diseases has contributed to the view that consideration should be given to treating endodontic instruments as single-use. However, it is extremely important to consider that highly specific cross-infection control measures in dentistry are required only for patients with, or at notable risk of, prior diseases. Hence, there seems to be no scientific evidence for the single use of endodontic instruments on the basis that prior diseases may be transmitted via contaminated files. Nevertheless, concerns have been raised regarding the safety of multiple use files because of an inability to efficiently clean them. At present, only a few dental instruments cannot be sterilized, and these are either disinfected or disposable. The complex miniature architecture of dental burs and endodontic files makes precleaning and sterilization difficult. For decades, clinicians have searched for the ideal chairside sterilization method and several different mediums have been used. Sterilization protocol goes hand in hand with decontamination, which includes cleaning, disinfection and sterilization.

Sterilization is a process to render an object free from viable organisms including bacterial spores and viruses. So, sterilization is an "all-or-none" phenomenon. We need to sterilize endodontic instruments because microorganisms are the major cause of endodontic disease and therefore an aseptic technique is to be followed instead of knowing all the hazards 75% of dental practionnaire use the same instrument multiple times and the next question was ask that how do you clear off the debris, A)Wipe with spirit B)Immerse in sodium hypochlorite C)Immerse in mixture D)Sodium hypochlorite and hydrogen peroxide D)Ultrasonic cleaner.

Hydrogen Peroxide produces transient yet energetic effervescence that displaces debris. The bubbling action of the solution when in contact with tissues physically foams debris out of the instruments. Sodium hypochlorite which has been previously tested for its cleaning effectiveness was also included in this study. It is an disinfectant and has the ability to dissolve organic matter. Ultrasonic bath has the advantage of being a faster and easier procedure for cleaning dental instruments. Cavitation activity of the ultrasonic bath along with chemical activity of the detergent helps to remove biologic debris. As an ultrasonic bath solution, the enzyme solution was as effective as NaOCl but was considered safer than the NaOCl because it lacked the potential for corrosion. 'degassed' by running the bath for 15 minutes without instruments. The most effective method for pre-sterilization cleaning is the use of an instrument washer, which are now available but quite expensive. Instrument washers must be used in conjunction with a main sterilization routine, i.e. autoclaving. Once the initial cleaning method has been carried out, the instrument should be inspected visually to ensure that all debris has been removed. If debris is still visible the procedure must be repeated. Once clean, the instruments should be autoclaved at a temperature between 134 and 137°C. Modern autoclaves are usually vacuum-phased, which allows items to be sterilized in pouches, and have printers that provide information about the cycle. The autoclave should not be overloaded; the steam needs to come in contact with all

surfaces of the instruments and overloading reduces the efficiency. In the study carried out it was observed that 40% of dental practitioner immerse in mixture of sodium hypochlorite and hydrogen peroxide. The next question was how do you sterilize the instrument by A) Autoclave B) Glass bead Sterilization C) Cold sterilization D) Boiling water. In private practice, while dry heat and autoclaving are used extensively, some practitioners still rely on chemical methods of sterilization for endodontic instruments. Dental professionals are exposed to a wide variety of microorganisms in the blood and saliva of patients, which may cause infectious diseases such as the common cold, pneumonia, tuberculosis, herpes, hepatitis B, C and acquired immune deficiency syndrome(AIDS). The use of effective infection control procedures and universal precautions in the dental surgery will prevent cross-contamination. Aseptic techniques are especially important in endodontic because microorganisms are the major cause of endodontic disease.

Sterilization of endodontic instruments is important for two reasons: the elimination of patient cross-contamination and the increase in the success of the endodontic therapy. The ADA Council on Dental Therapeutics, Council on Dental Practice has recommended that heat sterilization be used for all instruments that can withstand repeated exposure to the required sterilization temperature. In the present work, sterilization in dry heat oven and steam autoclave was chosen because they are the most accessible methods. One of the problems presented by stainless steel endodontic instruments is the corrosion caused by sterilization in conventional steam autoclaves. Steam autoclaving tends to rust instruments and dulls the edges of cutting instruments. Dry heat sterilization is time consuming (320 F for 1V2 hours) and discharges heat into a confined space-the dental office. Chemical or so-called "cold sterilization" is not dependable for destruction of pathogenic bacteria. The glass bead sterilized which operates by heat conduction has been used as a rapid method of sterilization of endodontic instruments such as reamers, files, broaches, etc. Such instruments can be sterilized in 5 to 15 seconds at a temperature under 500 F (260 C) even when inoculated with spores. Investigation of this method of sterilization has been limited to endodontic instruments and has not been studied for sterilization of dental instruments such as those ordinarily used in the routine practice of dentistry, and often referred to as long handle instruments. It was coated that sterilization of such instruments as forceps, mouth mirrors, chisels, etc. cannot be achieved by this method but gives no evidence to support the statement. It therefore seemed appropriate to determine whether the glass bead sterilizer can sterilize long handle instruments at a temperature compatible with the physical properties of the metal, and not change the temper of the instrument or the cutting edges of instruments such as scalpels and scissors. Glass bead sterilizer is an effective means of sterilizing small instruments such as are used in endodontic treatment. 37% of dental practitioner follow glass bead as standard method of sterilization. Next question asked was how do you give your instrument for sterilization by A) Sterilization pouch B) Sterilization cassette C) Endo box and further the questionnaire was followed by which method for chemical sterilization do you follow the options were as

follow spirit or glutaraldehyde or bacillol or either by ethylene oxide. Glutaraldehyde is a strong disinfectant, fixative and kills micro organisms by altering the essential protein compounds. Ethylene oxide are said to be the most effective and preferred methods for the sterilization of endodontic instruments but still about 45% of dental practitioner rely on bacillol

CONCLUSION

As the saying goes, "Cleanliness is next to Godliness"; similarly Cleanliness in our noble profession plays an important role. Sterilization forms a part and parcel of dental practice due to the risk of cross-infection. According to the study carried, knowledge regarding sterilization is good among the dental practitioner of western Maharashtra although some practitioner follow improper method of sterilization.

It is essential to educate them about proper method of sterilization procedure to be followed, so that transmission of diseases can be avoided, The dental personnel need to be trained regarding the sterilization protocols and though the time and efforts are more in achieving an aseptic field, the required measures need to be taken for the success of endodontics. Within the limitation of the study, it can be concluded that most of the dental practitioners are not following the acknowledged international academic standards. There is a need for conduction of continued dental education programs in the field of endodontics to encourage and implement the new technologies in their daily practice. In specialist practice, there should be no problems with this mandate as it should have been normal procedure before the guidelines were published. The cost of this implementation for a specialist endodontic practice should be negligible whereas general dentists may have seen a sharp rise in the cost of purchasing endodontic materials per patient, and may have had to increase their prices in order to accommodate these new guidelines. Maybe

it is in their patients' best interests to refer to a specialist within their own group or specialist practice so these additional costs will not have any bearing on the practice, as endodontics is technically very demanding.

ACKNOWLEDGEMENT

The author would like to thank the entire respondent (dental practitioner) for sharing their time to respond to the study.

REFERENCES

1. Venkatasubramanian R, Jayanthi, Das UM. Bhatnagar S, Comparison of the effectiveness of sterilizing endodontic files by 4 different methods: an in vitro study. J Indian Soc Pedod Prev Dent., 2010; 28: 2-5.
2. Smith A, Letters S, Lange A, Perrett D, McHugh S, Bagg J. Residual protein levels on reprocessed dental instruments. Journal of Hospital Infection 2005; 61: 237-41.
3. Todd Roth P, Scutt Whitney I, Stephen Walker G, Friedman. Microbial contamination of endodontic files received from the manufacturer. Journal of endodontics 2006; 32: 649-51.

4. Perakaki K, Mellor AC, Qualtrough AJE. Comparison of an ultrasonic cleaner and a washer disinfectant in the cleaning of endodontic files. *J. of Hospital Infection*, 2007; 67: 355-9.
5. David Sonntag, Ove A. Peters. Effects of prior decontamination protocols on nickel-titanium rotary instruments. *Journal of Endodontics* 2007; 33: 442-46.
6. Popovic J, Gasic J, Radicevic G. The investigation of ultrasound efficacy in cleaning the surface of new endodontic instruments. *Srp. Arh Celok Lek* 2009; 139: 357-62.
7. Whitworth CL, Davies K, Palmer NO. Can protein contamination be removed from hand endodontic instruments? *Prim Dent Care* 2009; 16(1):7-12.
8. Weine FS, *Endodontic Therapy*, 6th edition 1998: 370.
9. Grossman LI, *Endodontic Practice*, 11th edition, 1988:229.
10. Hubbard Jr. TM, Robert N. Smyth, Pellen Jr., Joseph I. Tenca. Chair side decontamination of endodontic files. *J. Endodontics* 1975; 40(1): 148-52.
11. Nijmegen SD. The Solvent action of sodium hypochlorite on fixed and unfixed necrotic tissues. *Oral surgery, oral medicine, oral pathology and endodontics* 1979; 47:558-61.
12. Murgel CAF, Richard E. Walton, Barry Rittman, Pecora JD. A Comparison of techniques for cleaning endodontic files after usage: A quantitative scanning electron microscopic study. *Journal of Endodontics* 1990; 16(5): 214-17.
13. Boyd KS, Sonntag KD, Crawford JJ. Efficacy of sterilization of endodontic files after autoclaving in a synthetic sponge. *Int Endod J.*, 1994; 27: 330-33.
14. Zmener O, Spielberg C. Cleaning of endodontic instruments before use. *Endod Dent Traumatol* 1995; 11: 10-14.
15. Miller CH, Palenik CJ: *Infection Control and Management of Hazardous Material for the Dental Team*, ed 4 St. Louis, 2010, Mosby.
16. Favero MS, Bond WW : *Chemical disinfection of medical materials*. In Block SS, Editor: *Disinfection, Sterilization, and prevention*, ed 1991 Lea and Febiger
17. Bond WW et al: *Effective use of liquid chemical germicides on medical instruments: Instrument design problems*. In Block SS, editors : *Disinfection, Sterilization, and preservation* , ed, Philadelphia, 1991, Lea Febiger.

Source of support: Nil, Conflict of interest: None Declared