**Knowledge and efficiency of sterilization of endodontic instruments in dentistry: A cross-sectional survey**

**Abstract**

Infection control is moral responsibility of healthcare workers like dentist. Sterilization of instruments is a basic step in infection control. Endodontic instruments are classified as ‘critical items’, thus should be sterilized before use and re-use. The present survey was undertaken so as to evaluate the knowledge of dentist regarding sterilization of endodontic instruments. A questionnaire was distributed to 169 dentists. Based on the obtained answers, knowledge of dentist was evaluated. The current trends in sterilization methodology need a paradigm shift towards a new procedure that can be done inter and intra appointment in the dental operatory itself. Thus, the article throws light on the need of a new sterilization unit that can change the current trend in Endodontics.

**Introduction**

Sterilization of instruments is the main concern for infection control in all health care procedure. According to CDC (Centres for Disease Control and prevention) guidelines endodontic instruments (files) are classified as critical instruments (William A. Rutala, 2008). Thus, all the endodontic files should be adequately cleaned and sterilized before use and re-use. Endodontic files are considered as re-usable instruments (DA Van Eldik, 2004).As a healthcare worker, dentists play a critical role in infection control. Thus, they are an important population to study their level of knowledge, attitude and behaviour regarding sterilization and disinfection procedures. Thus, the aim of present survey is to study and evaluate dentist’s knowledge of sterilization of endodontic instruments. Also to explore the need for a new device for sterilization of endodontic files that can be done chair-side in between two consecutive appointments.

**Material and method**

A cross-sectional study was performed which include general dental practitioners, post-graduate students, Endodontist and other specialist dentists. A questionnaire was prepared which comprise several questions that can help in assessment of the knowledge of dentist. This questionnaire was distributed to 169 dentists all over India using online survey method. Total 167 questionnaires were completely filled. Sampling of the participant dentist was done by random sampling method. The emails were sent randomly without knowing the location of dentist.

The questions included in the survey were intended to evaluate the knowledge of participant in sterilization of endodontic instruments. The sample of the questionnaire is given in fig.1.

Based on the answers received, the data was subjected for statistical analysis.

**Results**

Overall, 169 dentist participated in the survey. 98% of dentist agreed that endodontic files can be re-used. 49% dentists recognize that new endodontic files should be sterilized before first use.

99% dentists practice sterilization of files before its re-use. Out of these, 60% use autoclave, 41% use glass bead sterilizer, 16% cold sterilization and 2% hot salt sterilizer.

98% dentists clean the files before sterilization. Out of these, 55% use manual technique, 32% ultrasonic bath and 13% synthetic sponge method.

The participants were questioned about their interest in a new device that is quick, compact, and can be used chair-side in-between two consecutive appointments. 96% participants were interested in pursuing such device. Thus, there is a need of a small, easy to use, device that can sterilize the endodontic instruments in few minutes. Also the equipment should have appendages for adequate pre-cleaning of the endodontic instruments.

**Discussion**

The goal of sterilization is to protect patients and health care workers by preventing cross-contamination from instruments. The process involves a series of sequential steps aimed at removing and killing microbes on contaminated instruments and maintaining those instruments in an aseptic state until they are reused ([Miller CH](http://www.ncbi.nlm.nih.gov/pubmed/?term=Miller%20CH%5BAuthor%5D&cauthor=true&cauthor_uid=2032579), 1991). These steps must be conducted judiciously to assure success and to reduce chances of disease spread or physical injury to those handling the contaminated instruments. Thus, a thorough knowledge of sterilization procedure is essential for a dentist. This survey aims to evaluate the knowledge and attitude of dentist towards sterilization of endodontic instruments.

Several studies demonstrated that new files removed from manufacturer’s packet contain debris (DA Van Eldik, 2004; Simone Maria Galvão de SOUSA 1999; Syed Ziauddin, 2013). Also these files are not sterilized (DA Van Eldik, 2004). Thus, the new file should be sterilized before use (Linsuwanont. P, 2004) 169 dentists were asked whether they are sterilizing the new files before use. 51% agreed that they are not. Thus, there is a need to educate and train the dentist that even new files need cleaning and sterilization before use.

99% dentists re-use endodontic files. According to CDC guidelinesendodontic files are classified as critical items thus, they should be cleaned and sterilized before re-use. 99% dentists sterilize the files before re-use. 98% dentists clean the files before sterilization. Many authors recommend pre-sterilization cleaning of instruments so as to remove all the debris (Reams et al, 1995; P Parashos 2004, DA Van Eldik 2004).

Various method of sterilization of endodontic instruments can be enlisted as steam sterilization (autoclave), dry heat sterilization include glass bead and hot salt sterilizer, cold sterilization include use of enzymes like gluteraldehyde, alcohol or sodium hypochloride (Gnau et al. 2009).Some other methods like use of laser is also recommended by different authors (Venkatasubramanian et al. 2010) *Venkatasubramanian* *et al* compared 4 different methods of sterilization of endodontic files and suggested that autoclave sterilizes the endodontic instruments completely. Whereas files placed in Glass bead were 90% sterile and in gluterldehyde were 80% sterile. *Jonhson et al* suggested that salt, glass bead sterilization methods are effective for working ends of hand files but it is ineffective for completely sterilizing hand files i.e. plastic handles of the files. In present survey 60% dentist use autoclave, 41% use glass bead, 2% hot salt sterilizer and 16% use cold sterilization method. Steam sterilization (Autoclave) is best proven and most commonly used method for sterilization. 169 dentists were asked about number of cases they perform per day. On an average majority dentist perform one to five cases per day. So either dentist has to purchase multiple endodontic files or has to undergo process of cleaning and autoclaving after every case. But few factors like time required and need of separate sterilization room can prohibit a dentist from using autoclave after every case. This can have an impact on the cost factor invested by the dentist on one’s inventory as more number of files will be needed. Thus, there is a need of a new device for sterilization of endodontic instruments that can be used chair-side in between two consecutive appointments (Shah N 2013).

Various methods of pre-sterilization cleaning include manual method, ultrasonic bath and use of synthetic sponge(Sousa, S. M. G. de; Bramante, C. M)*.* *Boyd et al*. advocated insertion of endodontic files into synthetic sponge as a common and efficient method for clinical use. These results differed from those found by *Kuritani et al*, in which microbial growth was obtained from 3.33% of spore strips inserted into sponges for autoclaving. *Sousa et al* suggested that manual scrubbing with brush and ultrasonic cleaning are the two most popular means for cleaning the instruments. The present survey is in accordance with the review given by *Sousa et al.* 55% dentist use manual technique of cleaning, 23% use ultrasonic bath and 13% use synthetic sponge. Manual technique is clinically more popular because of its advantage of being economical. But disadvantages of this technique are requirement of time, separate cleaning space and its effectiveness depends greatly on the dedication of the assistant. Thus, there is a need for a compact device that can comprise facility for efficient cleaning of the instruments along with the sterilization unit. This device should be so compact and user friendly that it can be used chair-side without any hassle.

169 dentists were asked about their interest in a sterilization device that is user friendly, easy to maintain, quick, compact and can be done chair-side in between two consecutive appointments. 96% dentists were interested and keen to know about such device.

**Conclusion**

Knowledge of dentist regarding sterilization in Endodontics is adequate, but needs to be upgraded. Also there is a need for a new sterilization device that can enhance the quality of work done by a dental professional. The new device can help the clinician to clean and sterilize the endodontic instruments chair-side within few minutes. Such product is need of an hour in current global dental market. The research for designing such device is ongoing (Shah et al. 2013)

**Research highlights**

***Advantages of the device (Shah N., 2013)***

* Less time consuming
* No corrosion (as no moist heat)
* Portable & Compact
* Cleaning and sterilization both procedures provided in one single compact device
* Easy to use
* Can be used chair-side
* Can be used in-between two consecutive appointments

**Limitations and future direction of the survey**

The current survey can be undertaken with more number of samples with defined number of undergraduates, general dentist (BDS), Endodontist (MDS) and other dental specialist. This can help the author in evaluation and differentiation of knowledge of dentist at different levels of education.

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**Massage for readers:**

Anyone interested in manufacturing or dealership of the said device should contact the corresponding author.

**Note***:* All the intellectual property rights are reserved. The study and design of the device are already patented.

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16. On the average, how many root canal therapies do you perform per day?
17. 1 c. 5-10
18. 1-5 d. more than 10
19. Do you sterilize the new file after removal from the packet before use?
20. Yes b. No
21. Do you re-use the endodontic instruments (files)?
22. Yes b. No
23. If yes, do you sterilize the endodontic instruments (files) before re-use?
24. Yes b. No
25. If yes, which method?

a. Autoclave c. Hot salt sterilizer

b. Glass bead sterilizer d. Cold sterilization

1. Do you clean the endodontic instruments (files) before sterilization?

a. Yes b. No

7. If yes, which method?

a. Manual c. Synthetic sponge

b. Ultrasonic bath

8. If you get a sterilization device with following qualities;

a. Easy to use

b. Easy to maintain

c. Less time consuming

d. Compact

e. Can be done chair-side in between two consecutive appointments

Would you like to buy such product?

a. Yes b. No

**Fig.1**

**Fig. 2**

**Fig.3**

**Fig.4**