

A Survey on the Sterilization and Disinfection of Endodontic Files among Endodontic Faculty and its Post-Graduate Students of all the Dental Colleges in the State of Chhattisgarh, India

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ABSTRACT

Aim: To determine the sterilization and disinfection of endodontic files among endodontic faculty and its post-graduate students of all the dental colleges in the state of Chhattisgarh.

Materials and Methods: A questionnaire was personally given to all endodontic faculty and its post-graduate students of all the six dental colleges in the state of Chhattisgarh. The response rate in the present survey was 98%.

Results: 92.6% of respondents reported to sterilize new, unused endodontic files prior to their use, of which 79% of the respondents used autoclave for sterilization of endodontic files.

Conclusion: In the present survey, 89.4% of the participants reported to the use of rotary files in root canal treatment and 78.9% of respondents were very much concerned about deterioration of endodontic files over a time period due to sterilization by using autoclave.

Keywords: Disinfection, Endodontic files, Respondents, Sterilization.

INTRODUCTION

Root canal treatment involves cleaning and shaping of the root canal space by using endodontic files and root canal irrigants.¹ According to CDC (Center for Disease Control and Prevention) guidelines, Endodontic files were classified as critical instruments.² Thus, all the endodontic files should be adequately cleaned and sterilized before their use and re-use.³

Dental clinicians are always at an increased risk to cross infection. Transmission of diseases occurs from one patient to another patient either by direct exposure or by the use of contaminated instruments.^{1,4} The transfer of blood, saliva and

infected debris by endodontic files from one patient to another is highly undesirable, as these endodontic files were also found to be high-risk sources for contracting Hepatitis B, Human Immunodeficiency virus and Herpes infections.⁵

The purpose of this survey was to ascertain the attitude and practice of endodontic faculty and its post-graduate students towards sterilization and disinfection of endodontic files in all the dental colleges of Chhattisgarh state.

MATERIALS AND METHODS

A survey was done consisting of endodontic faculty and its post-graduate students of all the dental colleges in the state of Chhattisgarh. The

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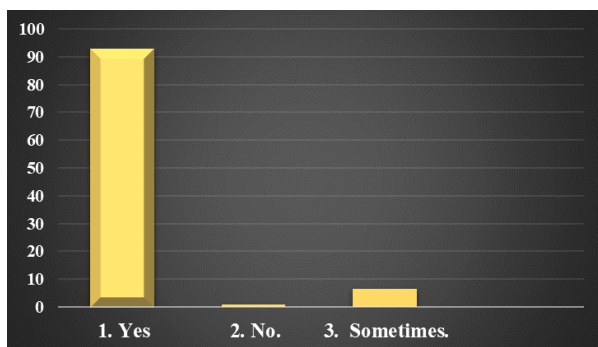
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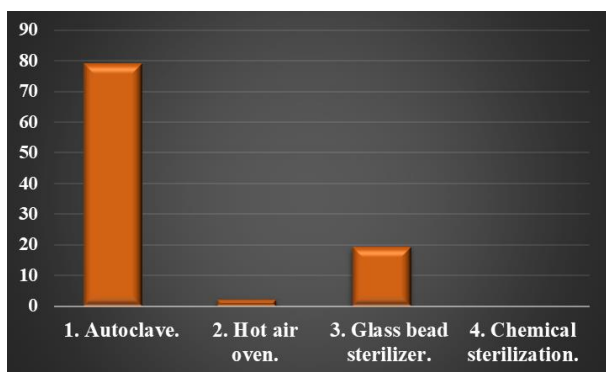
questionnaire was kept short in one page, containing 10 multiple choice questions related to sterilization and disinfection of endodontic files (Table: I). The questionnaire was given to each endodontic faculty and its post-graduate students in person by visiting to the department of conservative dentistry and endodontics of all the six dental colleges in the state of Chhattisgarh and the respondents/participants were requested to answer the questionnaire and return it in-hand.

RESULTS

In the present survey, 92.6% of the respondents sterilized new and unused endodontic files prior to their use (Graph: I) and 79% of the respondents used autoclave for the sterilization of new, unused endodontic files (Graph: II).



Graph I: Sterilization of new, unused endodontic files.



Graph II: Method of sterilization of endodontic files

DISCUSSION

Sterilization is the process by which an article, surface or medium is freed from all microorganisms either in the vegetative or in spore state. Disinfection is the destruction or removal of all pathogenic microorganisms which give rise to

Table 1: Survey Questionnaire.

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|---|
| 1. How many years ago, You completed your post-graduate endodontic training? <input type="checkbox"/> Still in training <input type="checkbox"/> Less than 4 years. <input type="checkbox"/> 4-9 years <input type="checkbox"/> 9-15 years <input type="checkbox"/> 15-30 years. |
| 2. Do you sterilize new, unused endodontic files prior to use? <input type="checkbox"/> Yes. <input type="checkbox"/> No. <input type="checkbox"/> Sometimes. |
| 3. How do you sterilize new, unused endodontic files? <input type="checkbox"/> Autoclave. <input type="checkbox"/> Hot air oven. <input type="checkbox"/> Glass bead sterilizer. <input type="checkbox"/> Chemical sterilization. |
| 4. After use, how do you clear off debris from endodontic files? <input type="checkbox"/> Manual scrub with brush and warm soap water. <input type="checkbox"/> Immerse in sodium hypochlorite solution. <input type="checkbox"/> Immerse in chlorhexidine gluconate solution. <input type="checkbox"/> Ultrasonic cleaner. |
| 5. What type of endodontic files do you use for root canal treatment? <input type="checkbox"/> Hand files. <input type="checkbox"/> Rotary files. <input type="checkbox"/> All of the above. |
| 6. Do you sterilize endodontic files between patients? <input type="checkbox"/> Yes. <input type="checkbox"/> No. |
| 7. Do you sterilize endodontic files between the treatment of any two teeth in the same patient? <input type="checkbox"/> Yes. <input type="checkbox"/> No. |
| 8. How do you give your endodontic files for autoclaving? <input type="checkbox"/> Endo box. <input type="checkbox"/> Sterilization pouches. <input type="checkbox"/> Sterilization trays. |
| 9. Are you concerned that autoclaving of endodontic files will lead to its deterioration over a time period? <input type="checkbox"/> Very concerned. <input type="checkbox"/> Not concerned. <input type="checkbox"/> Somewhat concerned. |
| 10. In the dental operator, are endodontic files placed on a sterile surface during root canal treatment? <input type="checkbox"/> Yes. <input type="checkbox"/> No. <input type="checkbox"/> Sometimes. |

infection but not necessarily in their spore forms.⁶ Dental operator often includes physical, chemical and biological risks, both to the clinician and patient. A biological risk is the contamination of microorganisms on the instruments used in clinical practice.⁴ During root canal treatment, cross infections mainly occurs due to the use of contaminated endodontic files, as they often get deposited with infected tissues, blood, dentin chips, microorganisms and its by-products and presents a great challenge for their sterilization and disinfection.

The response rate in the present study was 98% and it was considered as highly satisfactory. The high response rate can be attributed to the topic of the questionnaire and also that the questionnaire was given to each endodontic faculty and its post-graduate students in-hand by visiting to the department of conservative dentistry and endodontics of all the six dental colleges in the state

of Chhattisgarh and the answered questionnaires were collected back at the same time.

In our survey, 92.6% of respondents reported to sterilize new, unused endodontic files prior to their use. When manufacturer's supply new endodontic files in non-sterile packaging, they act as potential sources of infection.⁷ Most endodontic files supplied by 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 endodontic files. Furthermore, the manufacturing process produces milling marks, metal debris and deposits of carbon and sulphur resulting from the decomposition and oxidation of the lubricating oil used during machining of endodontic files.⁸

Van Eldik et al⁹ also showed that new endodontic files removed from manufacturer's packet were not sterilized and concluded that all new endodontic files should be sterilized before their use. Roth TP et al¹⁰ and Gnau HL et al¹¹ tested the sterility of new, unused endodontic files supplied by manufacturer and reported that all the endodontic files should be sterilized prior to their use and sterilization was ensured only after autoclaving.

In our survey, 79% of respondents reported to the use of autoclave, 19% respondents reported to the use of glass bead sterilizer and only 2% respondents used hot-air oven for the sterilization of new, unused endodontic files prior to their use (Graph: II). Autoclave provides the most efficient and reliable method of sterilization of endodontic instruments. It involves heating water at the temperature of 121°C at 15 Pounds of pressure for 15 minutes to generate steam in a closed chamber resulting in moist heat that rapidly kills all microorganisms including in spore form with high penetrating power.¹²

Glass bead sterilizer operates by heat conduction and is mainly used as a chair-side method of sterilization of endodontic files. Files can be sterilized in 5 to 15 seconds at a temperature under 260°C.¹² It mainly uses table salt which consists of 1% sodium silico-aluminate, sodium carbonate or magnesium carbonate and it does not fuse under heat. Salt can be replaced by glass beads provided the glass beads are smaller than 1mm in diameter because larger beads are not efficient in

transferring the heat to endodontic files due to presence of large air spaces.¹²

According to the Center for Disease Control (CDC)² and the American Dental Association (ADA)² guidelines, 'Critical items are those instruments which penetrate soft tissues or bone and have the greatest risk of transmitting infection and should be sterilized by heat.' Endodontic files are categorized as critical items, as they sometimes extend beyond the root apex into the periapical tissues.

Venkatasubramanian et al¹³ compared four different methods of sterilization of endodontic files and suggested that autoclave sterilized the endodontic files completely, whereas files sterilized in glass bead sterilizer were 90% sterile and in glutaraldehyde they were 80% sterile. Johnson et al¹⁴ suggested that glass bead sterilizers were effective only for the sterilization of working ends of endodontic files, but it was found to be not effective for the complete sterilization of endodontic files, especially the plastic handles of the files. Findlay et al¹⁵ reported that glass bead sterilizer fails to kill all the microbial spores and is unreliable for complete sterilization of endodontic files. The presence of debris on endodontic files interferes with the sterilization by forming a protective barrier that prevents the complete sterilization of the surface beneath. Hence, if the debris is not completely removed, any sterilization procedures will be futile and increases the chances for cross infection¹⁶ and in the present survey, 76% of the respondents reported to clear off debris from endodontic files by manual scrubbing with brush and warm soap water, 15% of the respondents used ultrasonic cleaner and 9% of the respondents used sodium hypochlorite solution. According to American Dental Association Specification No:28, manual scrubbing of endodontic files with warm soap water prior to autoclaving is highly recommended.¹⁷

Maria GS et al¹⁸ in their study, concluded that manual scrubbing with brush and ultrasonic cleaning were the most effective methods to clean off debris from endodontic files. Ultrasonic cleaners have the advantage being faster and it reduces the direct handling of contaminated endodontic files decreasing the chances of accidental skin punctures and cuts from sharp, pointed endodontic files. Souse et al¹⁹ and Nomal Sheth² suggested that manual

scrubbing with bristle brush and ultrasonic cleaning are the two most popular means for cleaning of debris from endodontic files. Sodium hypochlorite is more suitable as a surface disinfectant than for instrument sterilization and it has the ability to dissolve organic debris, but it is proven to be corrosive to stainless steel endodontic files and also selectively removes Nickel from Nickel-Titanium endodontic files.²⁰

In the present survey, 89.4% of the respondents reported to use only rotary files, 9% of respondents used both rotary and hand files and only 1.6% of respondents used only hand files in root canal treatment. The use of rotary files has been significantly increased among the clinicians as it reduces the instrumentation time during root canal treatment.²¹

In the present study, 100% of the respondents reported to regularly sterilize endodontic files after treating each patient. The main goal of endodontic treatment is to decontaminate the root canal system. Failure to sterilize endodontic files between patients can cause spread of infections like Hepatitis B, Human Immunodeficiency Virus (HIV) and Herpes infections from one patient to other patient. The use of non-sterile endodontic files in the root canal treatment can introduce microorganisms in the root canal space which can be counter-productive leading to failure of root canal treatment.⁵

In the present study, only 55.8% of the respondents reported to use sterilized endodontic files between the treatments of any two teeth in the same patient. Endodontic files should be sterilized even between the treatment of any two teeth in the same patient because if a tooth is diagnosed with chronic apical periodontitis, anaerobic microorganisms will be predominantly seen and in the same patient, if another tooth is diagnosed with acute pulpitis, aerobic microorganisms will be predominantly seen. So when an endodontic file is used without sterilization for the instrumentation of root canals in these two teeth, microorganisms and their by-products spread into a previously adopted environment of the root canal space and due to change in the microbial flora, a violent tissue reaction can occur causing liquefaction necrosis, indicative of alteration in the local adaptation

evoking severe pain or swelling and Selye²² called this phenomenon as “Local adaptation syndrome”

In our survey, 90% of the respondents reported to use endobox for placing their endodontic files for autoclaving and 10% in sterilization pouches. Venkatasubramanian et al¹³ reported that complete sterilization of endodontic files can be attained only when the files were kept in endobox for autoclaving.

In the present survey, 78.9% of the respondents were very much concerned that autoclaving of endodontic files will lead to its deterioration over a period of time, 19% were somewhat concerned and only 2.1% of the respondents were not concerned. Autoclaving alters the integrity of endodontic files reducing its cutting efficiency, file flexibility and its resistance to fracture.⁶

In the present survey, only 85% of the respondents reported to place endodontic files on sterile surfaces during root canal treatment. Autoclaved endodontic files gets contaminated with microorganisms when they are placed on non-sterile surfaces in dental operatory during root canal treatment and can cause spread of infections leading to failure of root canal treatment.

CONCLUSION

As the saying goes “cleanliness is next to godliness”. Similarly cleanliness in our profession plays an important role in the success of endodontic treatment. The awareness regarding sterilization and disinfection of endodontic files among endodontic faculty and its post-graduate students in all the dental colleges of Chhattisgarh state was found to be extremely positive and adequate. However continuing dental education programs should be regularly conducted, so as to further enhance the awareness regarding sterilization and disinfection in endodontic practice.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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