

Original Research Article

Analysis of cleaning, sterilization, storage process and frequency of endodontic instrument replacement of endodontists from the city of Caxias do Sul/RS

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Abstract

Introduction: The maintenance of the aseptic chain associated with the knowledge and mastery of technique by the Endodontists are key factors for the success of endodontic treatment. **Objective:** This study aimed to evaluate, through a questionnaire, the care and cleaning, sterilization and storage methods of endodontic instruments, and the time of material disposal by endodontists from city of Caxias do Sul/RS. **Material and methods:** Thirty-two endodontists participated in the study. The professionals answered a questionnaire with eight questions regarding biosecurity methods that they applied in their offices. **Results:** The cleaning process most adopted by most professionals was the use of brush associated or not with ultrasound. The disinfecting agent of choice by most respondents was the enzymatic detergent. All professionals performing the sterilization process by autoclave. Concerning to the disposal of manual endodontic instruments, fifteen participants reported to control the presence of twist or fracture and sixteen by the number of uses. For the rotary and reciprocating systems, most endodontists controlled the instrument replacement by the number of uses; with mean age of five uses for rotatory instruments. For the reciprocating system, different responses regarding the number of uses were reported. **Conclusion:** This study showed that the endodontists from Caxias do Sul/RS followed a satisfactory protocol for cleaning and sterilization of endodontic instruments. However, for the replacement of rotatory and reciprocating instruments, it was found that most professionals did not follow the manufacturers' recommendation.

Introduction

The dentist is daily exposed during practice to various forms of contamination by pathogenic biological agents present in oral fluids such as blood and saliva [4]. Thus, if previous biosecurity measures are not taken, the dentists are at risk of acquiring infectious diseases and enabling the occurrence of a cycle of cross-infection inside and outside the workplace [2]. In addition, the success of the treatment to be performed will not be based only and exclusively on the correct diagnosis, planning and technical implementation, but also on preserving and maintaining aseptic chain [8]. That is, all aseptic care during treatment is essential to not only avoid the risk of infections, but also to achieve the objective of the proposed therapy [7].

The literature [1, 9, 14, 15, 17] lacks consensus on both the technique/method more efficient and effective for cleaning of endodontic instruments and the right time to dispose them.

The re-use of instruments is a reality for the Endodontists because of financial issues for their replacement. However, to enable the reuse of endodontic instruments, it is essential to take some care, for example, in the process of cleaning, not to impair the sterilization process and jeopardize the treatment success [11, 16]. In addition, to control the number of uses of the endodontic instruments is critical to use the qualities of the full material cut during the preparation and prevent the fracture of the material inside the canal due to negligence. Today, with the advent of the single-use mechanized systems, this issue of periodicity of use tends to be better controlled [6].

This study aimed to evaluate, through questionnaire, the care and cleaning, sterilization and storage methods of the endodontic instruments, and the time of material disposal, by the Endodontists from Caxias do Sul (RS).

Material and methods

This study was approved by the Research Ethics Committee under number #1.235.515. This quantitative research was conducted through a questionnaire answered by 32 Endodontists of the city of Caxias do Sul (RS). The Endodontists should be Specialist with certification recognized by the Brazilian Federal Council of Dentistry.

Initially, the dentists were instructed about the study objective to know the importance and the relevance of the answers of the questionnaire, to evaluate the knowledge of dentists on the care and biosecurity methods taken.

The questionnaire (table I) was directly applied by one of the researchers of the study, together with

the obtainment of the signatures of the Free and Clarified Consent Form. The dentist confidentiality was assured by numbering the questionnaires from 1 to 32. Thus, the name of the professionals would not be identified and they would not have the information disclosed and/or questioned.

Table I -Questionnaire to evaluate the care and biosecurity methods adopted by professionals in their offices

Research questionnaire
1) How long have you been specialist in Endodontics?
<input type="checkbox"/> Less than one year <input type="checkbox"/> Between one and five years <input type="checkbox"/> Between five and ten years <input type="checkbox"/> Between ten and 20 years <input type="checkbox"/> More than 20 years
2) After the clinical practice, which do you or the dental attendant use to remove the debris from the active part of the endodontic files?
<input type="checkbox"/> Gauze <input type="checkbox"/> Cleaning brush <input type="checkbox"/> Steel brush <input type="checkbox"/> Steel brush and ultrasound
3) Which disinfectant solution do you use for file cleaning?
<input type="checkbox"/> Alcohol <input type="checkbox"/> Enzymatic detergent <input type="checkbox"/> Conventional detergent or soap <input type="checkbox"/> No disinfectant agent
4) How do you store the endodontic files for sterilization?
<input type="checkbox"/> Specific box for endodontic file storage <input type="checkbox"/> Files free inside the sterilization package <input type="checkbox"/> Files wrapped in gauze inside the sterilization package <input type="checkbox"/> Sterilization box
5) How do you sterilize the endodontic files?
<input type="checkbox"/> Autoclave <input type="checkbox"/> Sterilization stove <input type="checkbox"/> Glutaraldehyde
6) Which are the criteria do you use to replace the hand endodontic files?
<input type="checkbox"/> No control <input type="checkbox"/> Control by number of the files (____ uses) <input type="checkbox"/> Control by the presence of file twist or fracture <input type="checkbox"/> Control by number of the files (____ uses), presence of file twist or fracture <input type="checkbox"/> Other criteria
7) Which are the criteria do you use to replace the rotatory files?
<input type="checkbox"/> No control <input type="checkbox"/> I do not use rotary instrument <input type="checkbox"/> Control by number of the files (____ uses) <input type="checkbox"/> Control by presence of fracture <input type="checkbox"/> Control by number of the files (____ uses) and presence of fracture
8) Which are the criteria do you use to replace the reciprocating files?
<input type="checkbox"/> No control <input type="checkbox"/> I do not use reciprocating instrument <input type="checkbox"/> Control by number of the files (____ uses) <input type="checkbox"/> Control by presence of fracture <input type="checkbox"/> Control by number of the files (____ uses) and presence of fracture

The professionals were advised to mark only one answer per question, not being allowed to consult scientific literature on the subject. After data collection, these were tabulated and analyzed.

For the analysis of the data, descriptive analysis was performed with the value of the number of the answers to questions and the comparative percentage value between the alternatives marked on each of the questions.

Results

Based on the data obtained, it could be verified that the Endodontists time of graduation were equally distributed. Half of the professionals (16/32) were graduated for less than 10 years in the specialty, while the other half has been graduated for more than 10 years.

All Endodontists used autoclave for the sterilization of the endodontic instruments. There is diversity of responses regarding to cleaning/disinfection and method of storage. Most professionals made the cleaning of endodontic instruments using brush associated or not with ultrasound, and used some detergent, either conventional or enzymatic during the cleaning process. In terms of storage, the most used method was keeping the endodontic instruments wrapped in a gauze into a sterilization package (table II).

Table II - Distribution of frequency and percentage of the cleaning methods, use of disinfecting solutions and storage methods of endodontic instruments used by the study participants

Cleaning of the endodontic instruments		
	n	%
Steel brush and ultrasound	11	34.37%
Steel brush	5	15.62%
Cleaning brush	14	43.75%
Gauze	2	6.25%

Disinfectant solution used		
	n	%
Enzymatic disinfectant	22	68.75%
Conventional detergent or soap	7	21.87%
Alcohol	3	9.37%

Storage methods		
	n	%
Specific box for files	5	15.62%
Files free inside the sterilization package	5	15.62%
Files wrapped in gauze inside the sterilization package	19	59.37%
Sterilization box	1	3.12%
Files in high-density sponge inside a glass	2	6.25%

With respect to the disposal and replacement of instruments, there was a diversity of responses according to the type of instrumental referred to: manual, rotational, or reciprocating. As regards to manual instruments, only one respondent reported to control the number of uses, discarding the material after the 10th use. The other respondents disposed the instruments only after deformation or fracture in the active part of the material.

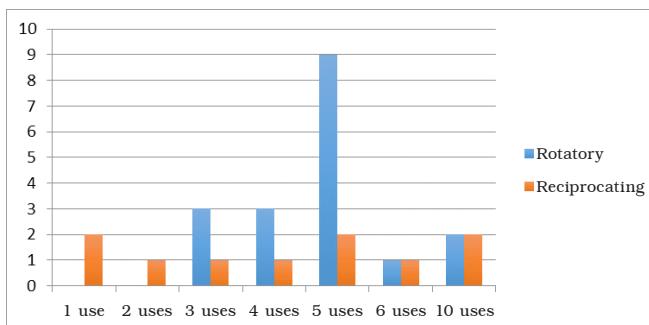
On the other hand, with respect to the rotational instruments, the dentists demonstrated greater care at the right time for disposing the instrumental. Eighteen Endodontists reported that they control the number of uses. The mean time to dispose the material reported was after 5th use.

For the instruments of the reciprocating system, although 15 Endodontists interviewed did not report using this system, 10 professionals stated they controlled the moment of disposal according to the number of uses. However, there was different responses regarding the number of uses before disposal of the instrument.

The criteria adopted for the disposal of instruments and the number of uses of each instrument prior to disposal are expressed in table III and graph 1, respectively.

Table III - Criteria used for the disposal of endodontic instruments

Criteria used for the instrument discard	Manual	Rotatory	Reciprocating
	n (%)	n (%)	n (%)
No control of file replacement	0	1 (3.12)	0
Replacement controlled by the number of uses (10 uses)	1 (3.12)	6 (18.75)	15 (46.87)
Replacement controlled by the file twist and fracture	15 (46.87)	18 (56.25)	10 (31.25)
Replacement controlled by the number of uses, file twist and fracture	16 (50)	1 (3.12)	1 (3.12)
Another criterion	0	6 (18.75)	6 (18.75)



Graph 1 – Distribution of number of uses of rotatory and reciprocating instruments before disposal

Discussion

Considering the importance of the prevention of the risk of infection in dental office, as well as the searching to achieve success in the Endodontic treatment, basic biosecurity measures, such as proper cleansing of the instruments, sterilization and the subsequent replacement, should always be taken to maintain aseptic chain during the service.

The cleaning method adopted by professionals was one of the first questions made in the study. We observed that the use of a brush associated or not to the use of ultrasound was the most employed resource. It is already known, according to the literature [8], that there is no standardized technique to make the complete removal of debris present in the active part of the endodontic instruments, which can be done manually, with the use of ultrasound or association of both [12].

Guandalini *et al.* [5] compared four different techniques of cleaning of endodontic instruments, namely: enzymatic cleaner + cleaning brush; ultrasound + enzymatic cleaner; ultrasound + water and gauze with alcohol. The results showed that all the techniques tested were efficient in removing debris except the gauze with alcohol, which proved to be ineffective. In the present study only 3.1% (1/32) of the respondents reported the use of gauze with alcohol to perform the clean process of the material.

In addition to the cleaning, the method adopted for sterilization of the instruments is very important. All professionals reported the use of autoclave for the completion of this process. This somehow meets the statements obtained in the studies of Raju *et al.* [13] and Guandalini *et al.* [5]. According to these studies, the method of sterilization using autoclave proved to be 100% effective in microbial eradication power.

With respect to the time of disposal of the manual endodontic instruments, the preference

for large part of Endodontists (18/32) was to control the replacement of rotational instruments by the number of uses, an average of 5 uses; none professional used the instruments only once. For the reciprocating system, 10 of the 32 respondents also controlled by number the uses, but there was a greater diversity in the disposal of the material regarding the use. These results showed that most of the respondents did not follow the recommendation of the manufacturers, which was the single use for both rotational and reciprocating instruments. The single use of the endodontic instruments avoids the risk of cross-infection during clinical practice, besides enabling the implementation of a safer treatment, such as the maintenance of some properties of materials, as mechanical strength and ability to cut [3]. Such a result is worrying, because in case of the fracture of an instrument inside the root canal during the treatment, the dentist is both conniving and negligent with the accident.

However, some studies, such as Park *et al.* [10], suggest conducting more experiments to assess the possibility of not following the recommendation of the manufacturers and reuse the rotational and reciprocating instruments. In the same study, the authors observed that the rotational and reciprocating instruments can be reused safely at most in 5 different canals. However, these canals should not show any sharp curvature and other anatomical characteristics that make the procedure difficult, which may undermine and jeopardize the metallic structure and function of endodontic instruments.

For manual instruments, most Endodontists controls the material disposal by the presence of twisting or fracture of the active part. The stainless-steel alloy used in the manufacture of most manual instruments enables the dentist to have this control. Deformations, when present in the instruments, can be easily identified by direct vision. In clinical practice, the disposal of stainless steel manual instruments of lower size (#06, #08, #10, and #15) is more frequently than those of larger sizes, because of the smaller amount of metal mass, which causes greater loading and torsion during the mechanical-chemical preparation.

Conclusion

According to the obtained results, it was found that Endodontists from Caxias do Sul (RS) are following a protocol suitable for cleaning and sterilization. However, for the replacement of rotatory and reciprocating instruments, most of the respondents did not follow the manufacturers' recommendations.

References

1. Aasim SA, Mellor AC, Qualtrough AJ. The effect of pre-soaking and time in the ultrasonic cleaner on the cleanliness of sterilized endodontic files. *Int Endod J.* 2006;36(2):143-9.
2. Bezerra ALD, Souza MNA, Feitosa ANA, Assis EVB, Barros CMB, Carolino ECA. Biossegurança na odontologia. *ABCS Health Science.* 2014;39(1):29-33.
3. Borin G, Becker AN, Oliveira EPM, Melo TAF, Echeveste SS. Influence of the sterilization on the cut capacity of rotatory endodontics instruments Protaper®. *Rev Odonto UNICID.* 2008;20(1):14-8.
4. Couto JL, Couto RS, Giorgi SM. Controle da contaminação nos consultórios odontológicos. *RGO.* 1994;42(6):347-55.
5. Guandalini B, Vendramini I, Leonardi DP, Tomazinho FSF, Tomazinho PH. Comparative analysis of four cleaning methods of endodontics files. *RSBO.* 2014;11(2):154-8.
6. Jeon HJ, Paranjpe A, Ha JH, Kim E, Lee W, Kim HC. Apical enlargement according to different pecking times at working length using reciprocating files. *J Endod.* 2014;40(2):281-4.
7. Miller CH, Cottone JA. The basic principles of infectious diseases as related to dental practice. *Dent Clin North Am.* 1993;37(1):1-20.
8. Oliveira EPM, Filippini HF, Troian CH, Melo TAF. Análise das condições de esterilidade das limas endodonticas utilizadas pelos alunos de graduação nos três cursos de Odontologia da ULBRA/RS. *Stomatos.* 2006;12(23):35-40.
9. Parashos P, Linsuwanont P, Messer HH. A cleaning protocol for rotary nickel-titanium endodontic instruments. *Aust Dent J.* 2004;49(1):20-7.
10. Park SK, Kim YJ, Shon WJ, You SY, Moon YM, Kim HC et al. Clinical efficiency and reusability of the reciprocating nickel-titanium instruments according to the root canal anatomy. *Scanning.* 2014;36(2):246-51.
11. Popovic J, Gasic J, Zivkovic S, Petrovic A, Radicevic G. Evaluation of biological debris on endodontic instruments after cleaning and sterilization procedures. *Int Endod J.* 2010;43(4):336-41.
12. Queiroz MLP, Oliveira EPM, Borin G, Melo TAF. Eficácia de diferentes técnicas na limpeza dos instrumentos endodônticos. *RGO.* 2010;58(3):369-73.
13. Raju TB, Garapati S, Agrawal R, Reddy S, Razdan A, Kumar SK. Sterilizing endodontic files by four different sterilization methods to prevent cross infection – an in-vitro study. *J Int Oral Health.* 2013;5(6):108-12.
14. Reiss-Araujo CJ, Araujo SS, Albuquerque DS, Rios MA, Portella ML. Limpeza em limas endodonticas pós-uso e pré-esterilização. *RGO.* 2008;56 (1):17-20.
15. Tanomaru Filho M, Leonardo MR, Bonifácio KC, Dametto FR, Silva LAB. The use of ultrasound for cleaning the surface of stainless steel and nickel-titanium endodontic instruments. *Int Endod J.* 2001;34(8):581-5.
16. Van Eldik DA, Zilm PS, Rogers AH, Marin PD. Microbiological evaluation of endodontic files after cleaning and steam sterilization procedures. *Aust Dent J.* 2004;49(3):122-7.
17. Van Eldik DA, Zilm PS, Rogers AH, Marin PD. A SEM evaluation of debris removal from endodontic files after cleaning and steam sterilization procedures. *Aust Dent J.* 2004;49(3):128-35.