



EVALUATION OF ENDODONTIC FILES USED BY UNDERGRADUATED STUDENTS' CONTAMINATION, AFTER CLEANING AND STERILIZATION

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ABSTRACT

Introduction: A thorough endodontic files decontamination protocol, prior to sterilization, is extremely important. Retentions existing in the files active part hinder asepsis, and inadequate cleaning interferes with the sterilization process. Thus, the aim of this study was to evaluate the endodontic files contamination used by undergraduate students from the University Southern Santa Catarina (Unisul), after cleaning and sterilization process. **Materials and Methods:** Dentistry undergraduate students from the 6th to the 10th period at Unisul, Pedra Branca unit, participated in the research. Endodontic files, caliber # 40, # 45 or # 50, were collected from the sterile metal box and then incubated in a broth culture medium, at 37°C, in aerobiosis. After 48 hours, the culture medium was evaluated for turbidity, which would indicate the instrument contamination. The total number of contaminated samples for each period was computed and the data statistically analyzed by the chi-square test ($\alpha = 5\%$). **Results:** A total of 98.46% of the files were sterile. Only 1 file, from a 10th period student, showed contamination. There was no association between the contamination presence and course period ($P > 0.05$). **Conclusion:** The endodontic files cleaning and sterilization process is being carried out effectively by dentistry undergraduate students from the 6th to the 10th period at Unisul, Pedra Branca unit.

KEYWORDS: Disinfection. Endodontics. Sterilization. Dental Instruments.
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INTRODUCTION

In order to perform an endodontic procedure, in addition to a correct diagnosis, complete planning and techniques skill, the professional must be alert to the aseptic chain

maintenance, since the instruments and materials contamination can influence the effectiveness and the therapy success¹.

Root canal preparation during endodontic treatment is carried out by chemical means and, mostly,

mechanical procedures, being disinfection promotion one of the main objectives^{2,3}. Thus, endodontic files play a fundamental role in mechanical microbial biofilm and organic matter removal, inside the root canal and surrounding dentin walls. This

happens due to these instruments' specific active part design^{4,5}.

The majority of manual endodontic files are manufactured in a way to allow their reuse, by dentistry professionals and students, in many root canals and patients, due to its high cost^{1,6}. Therefore, a detailed protocol for these instruments decontamination, prior to sterilization, is of utmost importance, since the retentions existing in the file active part can hinder complete asepsis during reprocessing^{6,7}, and interfere in the sterilization process⁷⁻⁸.

Dentin residues and organic debris permanence in endodontic files indent forms a protective barrier for microorganisms, interfering in the sterilization process⁸. Therefore, dirt remains can cause cross-infections among patients, which in addition of being a risk for diseases transmission, also directly affects endodontic therapy success¹.

Many studies report the use of different disinfection techniques for endodontic instruments^{7,9,10}. The decontamination protocol for endodontic instruments, used by undergraduate dentistry students at the University Southern Santa Catarina, Pedra Branca unit (Unisul / PB), includes immersion in enzymatic detergent, in order to promote organic matter dissolution and decrease the microbial contamination present in the artifacts¹⁰; followed by instruments manual cleaning, carried out by friction with steel brushes, aiming to remove dirt from its entire dimension¹⁰. Following, the instruments go through drying process, packaging and, autoclave sterilization, to achieve complete microbial elimination⁸. Although this protocol is ideal, the satisfactory endodontic files decontamination after endodontic clinical practices depends on the attention paid by students during the cleaning procedure, even though everyone is instructed in the same way.

Therefore, the aim of the present study was to evaluate the endodontic files contamination used by dentistry undergraduate students from the 6th to the 10th period at Unisul / PB, after cleaning and sterilization process.

MATERIALS AND METHODS

This study was approved by the Unisul Human Research Ethics Committee (n. 4.073.634). All dentistry undergraduate students from 6th to 10th period at Unisul / PB, over the age of 18, male or female, who were performing an endodontic procedure on the university dental clinic, were invited to voluntary participate in this research. All participants were informed about each issue involving the research, and endodontic files were only collected after signing the Informed Consent Form.

Endodontic files, caliber # 40, # 45 or # 50 (Dentsply Sirona, São Paulo, SP, Brazil), were collected from each student, directly from the metal box, immediately after opening the sterilization package, during clinical care days, where endodontic procedures were being performed. The endodontic files were apprehended through the handle, aseptically, with a sterile clinical tweezer and immediately individually inserted in a 15 mL Falcon tube containing 10 mL of sterile Brain Heart Infusion Broth (BHI) (Difco Laboratories, Becton Dickinson and Company, Franklin Lakes, NJ, USA) medium, which was evaluated by turbidity, as described below.

Ten additional files, with the same calibers mentioned previously, were randomly selected among the students participating in the study. These were deliberately contaminated, prior to immersion in sterile BHI, and served as experimental positive control, aiming to verify bacterial growth. Ten Falcon tubes containing 10 mL of sterile BHI comprised the

negative control, to confirm the culture medium sterility.

All tubes containing sterile BHI broth, and their respective endodontic files were incubated in a bacteriological oven at 37°C and kept in an aerobic environment. After 48 hours, culture medium turbidity was observed. The turbidity presence indicated bacterial growth, that is, the files were contaminated. The medium that remained clear, without turbidity, indicated sterile files. The total number of contaminated and uncontaminated samples for each period was observed and calculated for statistical analysis. The categorical variable "presence or absence of contamination" in the different student's period was grouped in a contingency table and analyzed by the Chi-square test ($\alpha = 5\%$) using the SPSS 21.0 software (IBM, Armonk, NY, USA).

RESULTS

A total of 84 undergraduate dentistry students were registered between the 6th and 10th period at the research time. Nineteen (22.61%) did not perform any endodontic treatment. Consequently, 65 (77.38%) students participated in the study. Of the 65 endodontic files collected immediately after opening the sterile metal box, 21 files had a #40 caliber; 20, caliber #45; and 24, caliber #50.

Negative control group did not show bacterial growth, guaranteeing the experiment sterility. All positive controls exhibited bacterial growth, evidenced by culture medium high turbidity.

Culture medium turbidity analysis showed that 64 endodontic files (98.46%) presented sterile conditions. The culture medium of only 1 (1.54%) instrument, belonging to a 10th period student, showed turbidity. There was no association between contamination presence and the course period ($P > 0.05$).

DISCUSSION

Reprocessing hand instruments used in endodontic treatment, offered to patients, is frequent^{11,12}. For these instruments to become viable for reuse, it is essential to spend time and care in their hygiene and cleaning, prior to sterilization^{12,13}. For that, different disinfection protocols are observed in the literature, which aim to identify the most effective medium or solution for eradication of accumulate debris in endodontic files active part, due to its retentive areas between the spirals¹³⁻¹⁵.

In the present study, 98.46% of the analyzed files showed sterility conditions, after cleaning and sterilization process, recommended by the university, in line with previous literature findings¹⁶⁻¹⁷. Mechanical hygiene, via careful manual brushing with steel brushes, seems to be efficient in reducing debris trapped in endodontic files spirals prior to sterilization¹⁷. However, some studies reported that mechanical cleaning technique makes it possible to remove only partially the dirt from the instruments^{10,18}. In the study of Smith et al¹⁹, 76% of the sample collected in dental offices remained contaminated after manual brushing and autoclaving. Biscaro¹⁶ demonstrated that only 20,14% of the students' endodontics files sites analyzed, from the 5th to the 8th period, were debris free. However, in the present study, the enzymatic detergent chemical action was added to the mechanical cleaning, which may have influenced the viable microorganisms' reduction in the collected instruments²⁰, even though it is a supporting solution in the process²¹.

Among collected instruments, #40 caliber was the only one that showed contamination. Considering its smaller diameter, it is possible that the brush bristles used during cleaning process were not able to effectively penetrate the file spirals, since there is a disproportion between the brush

bristles diameter and the internal spirals spaces²². It is also possible that there was an external contamination, unrelated to the instrument, during file collection or flask incubation.

Watch over and care during instruments cleaning, prior to sterilization, among students from different periods occurred in a similar way. Therefore, it is shown that the student progression in the undergraduate dentistry course, more specifically in the Endodontics clinical practices, did not negatively influence the attention paid during instruments cleaning procedure, reinforcing the students' awareness regarding this process importance.

This investigation standing consists in analyzing whether the biosafety procedures performed at the university clinic are being effective to promote endodontic instruments disinfection, in order to prevent cross-infections among patients. Coronavirus (Sars-CoV-2), for example, can be found in infected patients saliva²³. Salivary glands and epithelial cells can be infected with Sars-CoV-2 suggesting that these may be an essential virus source in saliva²⁴. Thus, the importance of refining strategies for cleaning and disinfecting dental materials is highlighted again, to prevent infections spreading²⁴.

Information found within the present study can serve as basis for carrying out other investigations, aiming to increase dental interventions competence and improve these instruments decontamination protocols, at university level.

CONCLUSION

According to the present study it is concluded that the endodontic files cleaning and sterilization process is being carried out properly by undergraduate dentistry students from 6th to 10th period at Unisul / PB, since 98.46% of the instruments showed sterile conditions, prior to their reuse.

CONFLICT OF INTEREST

The authors deny any conflicts of interest related to this study.

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