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Original Research Article

In vitro analysis of microbial contamination of paper points

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Abstract

Introduction: During endodontic treatment, the maintennance of the aseptic chain is mandatory. Therefore, all substances, instruments, and medications inserted into root canals must be free of microorganisms. **Objective:** To evaluate *in vitro* and microbiologically the contamination of absorbent paper points. **Material and methods:** Absorbent paper points of different brands and under different conditions were evaluated and subdivided into the following groups: esterilized by the manufacturer (G1 to G5), not esterilized by the manufacturer (G6), esterilized in autoclave by the operator (G7), and intentionally contaminated (G8). The two last groups were the positive and negative controls, respectively. All paper points were unpacked and immersed into tubes with culture medium for 48 hours and then analyzed according to culture broth turbidity. **Results:** Only the samples esterilized by the manufacturers Dentsply® (G1), Endopoints® (G2), and Meta® (G3), and the samples esterilized in autoclave by the operator **(G7) did not evidence microbial growth after 48 hours.** Although sterilized by the manufacturer, both the brands Tanari® (G4) and Roeko® (G5) showed bacterial contamination; Dentsply® (G6) **non-sterile paper points also showed bacterial contamination.** **Conclusion:** Paper point esterilization before clinical use should be recommended regardless of the commercial brand.

Introduction

Endodontic treatment aims to eliminate the microorganisms from root canal system and prevent that new microorganisms are established. These microorganisms may come from an already established primary infection, be introduced by endodontic procedures or even by inadequate coronal sealing [12].

It is mandatory that both instruments and materials introduced inside root canal system do not contribute for the reinfection, installation or even maintenance of the pathologic processes [8].

The adequate obturation of root canal system cannot be reached if the canal is wet, so that, root canal drying is an important step for marginal sealing success of endodontic obturation because the physical-chemical properties of filling material adhesion are altered by moisture [2, 7, 13, 16].

Absorbent paper points have an extremely relevant function that is to prevent the moisture permanence inside the canals after the execution of disinfection and chemical-mechanical preparation procedures. For this purpose, the paper points must be free of microbial contamination at the moment of their use [2]. The literature pointed out that even inside sealed boxes, absorbent paper points may or may not be sterilized and the contamination can occur mainly by the continued manipulation of these materials, either by environmental exposure, improper handling, or accidental contamination [5, 8].

Thus, this study aimed to evaluate *in vitro* and microbiologically the contamination of absorbent paper points to verify the sterilization effectiveness in samples commercially available in Brazilian dental market.

Material and methods

Absorbent paper points from different commercial brands were tested. The paper points were divided into eight groups (n = 20), as follows:

• Experimental Groups: absorbent paper points, inside cell packs sterilized by the manufacturers, from the following brands: Dentsply® (Dentsply®, Petrópolis, RJ, Brazil) (G1), EndoPoints® (EndoPoints®, Manaus, AM, Brazil) (G2), Meta® (Injecta®, Bauru, SP, Brazil) (G3), Tanari® (Tanari®, Manaus, AM, Brazil) (G4), and Roeko® (Roeko®/Wilcos do Brasil, Petrópolis, RJ, Brazil) (G5). Absorbent paper points not sterilized by the manufacturer (Dentsply®) (G6);

• Control Groups: absorbent paper points sterilized in autoclave by the operator (G7) (Roeko®), absorbent paper points intentionally contaminated by the operator (G8) (Roeko®) through a suspension containing *Enterococcus faecalis* (ATCC 20192, American Type Culture Collection).

The absorbent paper points were unpacked from their original packs with the aid of sterile tweezers, inside the laminar flow of the aseptic chamber (Arlab, model CFLH09, Veco, Campinas, SP, Brazil). All packs were sealed by the manufacturer up to the use in the study. The operator wore as personal protective equipment sterile gloves, masks and caps. Additionally, all instruments were sterile during the handling inside the aseptic chamber.

Each paper point was placed inside a sterile vial containing TSB® culture broth (trypticase soy, OXOID, São Paulo, SP, Brazil), totalizing 160 vials, properly numbered according to the groups they were assigned to.

The vials were stored at 37°C in bacteriological stove and two readings were performed to observe the turbidity of the culture broth: at 24 hours and 48 hours. The vials that did not show signs of microbial growth were maintained inside bacteriological stove at 37ºC for up to 21 days to confirm the contamination absence.

Results

The vials containing paper points sterilized by the manufacturers from the following brands: Dentsply® (G1), EndoPoints® (G2) and Meta® (G3), and the vials containing paper points sterilized by the operator (G7) did not exhibit any bacterial growth at the studied time periods. The paper points sterilized by the manufactuers Tanari® (G4) and Roeko® (G5) showed 100% (18/20 at 24h and 20/20 at 48h) and 30% (2/20 at 24h and 3/20 at 48h) of contamination, respectively. In group G6 (absorbent paper points not sterilized by the manufactrer) and G8 (absorbent paper points intentionally contaminated), it was found 10% (1/20 at 24h) and 100% of contamination (20/20 at 24h), respectively.

After 21 days of storage of the samples in bacteriological stove, it was not possible to verify turbidity in culture broth in any samples of groups G1, G2, G3, and G7.

Discussion

The main objective of endodontic treatment is to reduce or eliminate the microorganisms from root canal system and to prevent re-infection of the

filled canals. The bacterial load can be eliminated or decreased at levels compatible with health through chemical-mechanical preparation together with intracanal medication, in some cases [17].

The present study aimed to establish a continued surveillance of the sterilization effectiveness performed by the manufacturer of the paper points, to alert, and to contribute for dental materials development with ideal and reliable conditions for use during endodontic treatment.

Dental professionals commonly remove the paper points directly from the packages and introduce them inside root canals to achieve drying. For this reason, the paper points should be free of microorganisms at the moment of use so that the aseptic chain is maintained.

Absorbent paper points can be displayed in boxes divided into sections. Other presentation form is the cell pack, that is, the points are sterilized and packed at every 5 units, eliminating the need of sterilization before use. Two types of cell pack exist: 1) plastic and individual cells and 2) the cells share a same opening (aluminum film). The present study verified that the latter cell packs were not safe handling because during the collection many cells broke and exposed the other points, which were readily excluded from the test. Although pre-sterilized packs seem to be practical, they also need to be safe, to assure reliable handling.

Both the culture medium and the evaluation method of this present study are in agreement with those recommended by the literature, which have been employed in many previous bacteriological studies [2, 4, 5].

Most of the studies evaluating the contamination of paper points advocated the necessity of their sterilization after the exposure to clinical environment, because this fact collaborates with their contamination [2, 10]. Other studies emphasized the need of sterilization even of pre-sterilized commercial points [2, 9, 10].

This present study found that absorbent paper points sterilized by the manufacturers from the brands Dentsply®, Endopoints®, and Meta® were actually sterile, but the points from the brands Roeko® and Tanari®, which also had been sterilized by the manufacturers were contaminated. These results corroborate with other studies finding the contamination of absorbent paper points [5, 15] and reinforce the need of the sterilization of absorbent paper points even when the manufacturer claimed that they had been sterilized.

In the group containing paper points not sterilized by the manufacturer (Dentsply®), a high percentage of samples were not contaminated. The rationale behind this result is that absorbent paper point may have an antimicrobial capacity, although the literature on this fact is controversial [16]. It is suggested that the formaldehyde releasing accounts for this antimicrobial capacity, resulting in zones of growth inhibition of strains [11, 14].

Some methods of paper point sterilization have been employed, such as autoclave, dry heat, wet heat, paraformaldehyde tablets, and electrical sterilizers [1, 7, 13, 16]. It is noteworthy to emphasize that the sterilization process may cause physical alterations in the paper points, as stiffness increasing, dehydration, and decreasing of absorbent capacity [16]. Although the sterilization process should not compromise the initial physical properties of paper points, especially the absorption capacity [4, 7, 13], it is mandatory that the points are actually sterile when introducing into the root canal system.

Conclusion

Based on the methodology employed, it can be concluded that absorbent paper points, even inside packs sterilized by the manufacturer, may be contaminated. The most reliable method to maintain the aseptic chain during endodontic treatment is the sterilization of paper points before their use.

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