

Microbiological assessment of contamination of gutta-percha cones used by post-graduation students

Avaliação da contaminação dos cones de gutta-percha utilizados por estudantes de pós-graduação

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Abstract

Objective – The aim of this study was to assess by the turbidity method, the presence of microbial contamination in gutta-percha cones used by specialization students. **Methods** – Forty first series gutta-percha cones were collected and divided into 4 groups of different origins: cones in Group I were collected directly from the sealed package; cones in Group II were collected from the package which had already been open in the clinical environment; cones in Group III from the same origin as Group II but they were disinfected in a 2% sodium hypochlorite; and Group IV were cones collected from the sealed package but manipulated without wearing gloves. The presence or absence of turbidity in the medium was adopted as the evaluation criterion. **Results** – The results showed that the cones in Group I, II and III presented no contamination and all the cones in Group IV presented microbial growth. The data were analyzed by the Kruskal-Wallis test which showed a level of significance of 1% for the cones in Group IV. **Conclusion** – It was concluded that the possibility of viable microorganisms existing in gutta-percha cones is minimal, and the use of disinfection methods is justified due to the possible contamination of the cones during incorrect manipulation.

Descriptors: Gutta-percha; Infection; Endodontics; Contamination; Disinfection/methods

Resumo

Objetivo – O presente trabalho avaliou a presença de contaminação microbiana, pelo método da turbidez, em cones de gutta-percha utilizados por alunos de especialização. **Métodos** – Foram coletados quarenta cones de gutta-percha de primeira série e divididos em 4 grupos de diferentes procedências: Grupo I cones coletados diretamente da embalagem lacrada; Grupo II cones coletados de embalagens que já se encontravam abertas no ambiente clínico; Grupo III cones da mesma procedência do Grupo II, porém desinfetados em solução de hipoclorito de sódio 2% e o Grupo IV foram cones coletados da embalagem lacrada, porém manipulados com a mão sem luva. A presença ou ausência de turvação do meio foi adotada como critério de avaliação. **Resultados** – Os resultados evidenciaram que cones dos Grupos I, II e III não apresentaram contaminação e todos os cones do Grupo IV apresentaram crescimento microbiano. Os dados foram analisados pelo Teste de Kruskal Wallis apresentando nível de significância 1% para os cones do Grupo IV. **Conclusão** – Conclui-se que a possibilidade de existir microrganismos viáveis em cones de gutta-percha é mínima e que a utilização de métodos de desinfecção justificam-se devido a uma possível contaminação dos cones pela manipulação incorreta.

Descritores: Gutta-percha; Infecção; Endodontia; Contaminação; Desinfecção/métodos

Introduction

Among the materials used for filling root canal systems, gutta-percha is the most widely accepted filling material used by professionals, and in Endodontics, it has been used for over a hundred years, because of its characteristics of malleability and biocompatibility that provide better adaptation of the filling material to the root canal walls¹⁻⁴.

Gutta-percha is a vegetable substance extracted in the form of latex, and forms part of about 19 to 20% of the composition of cones, together with 59% to 75% of zinc oxide and 1.5% to 15% of radiopacifier agents, waxes, coloring agents, antioxidants and metal salts⁵⁻⁶.

There are two types of gutta-percha cones available in the market: main cones and accessory cones, both types are kept in sealed boxes. However, because they are materials that decompose when heated, they cannot be sterilized by humid or dry heat, which is cause for concern, since the maintenance of the aseptic chain is essential to prevent new microorganisms from being introduced into the root canal systems⁷.

At present, there are few microbiological studies that have tested gutta-percha cones using them directly from the manufacturer's sealed box, and for this reason dentists are in great doubt about the need for disinfecting the gutta-percha cones during endodontic treatment. Therefore, the aim of this study was to assess the presence of contamination in gutta-percha cones used by post-graduation students in Endodontics.

Methods

To conduct this study, 40 first series gutta-percha cones (Dentsply, Brazil) used by specialization students in Endodontics at the

University Paulista, Manaus campus, were randomly selected. These cones were divided into the following 4 groups:

- Group I: cones collected directly from the sealed package, without previous use;
- Group II: cones were collected from the packages which had already been in used in the clinical environment for 30 days;
- Group III: had the same origin as Group II, but they were disinfected in a 2% sodium hypochlorite solution for 1 minute;
- Group IV: had the same origin as Group I, but they were manipulated by the operator after having washed his/her hands (positive control).

All cones were collected separately with the aid of sterilized clinical tweezers and a lamp; Group I they were collected in vertical laminar flow and Groups II, III and IV they were collected in the clinical environment. The test tubes used for incubating the cones contained BHI culture medium (Difco Laboratories, Detroit, MI, USA), previously sterilized. The set was agitated for 1 minute and incubated for 72 hours in a microbiological oven at 37°C.

The criterion adopted for assessment was the presence or absence of turbidity of the culture mediums after 72 h of incubation. After this period, the tubes that presented turbidity were considered positive (+) and the value 1 was attributed to them, the tubes that did not present turbidity were considered negative (–) and value 0 was attributed to them. The data were tabulated and submitted to statistical test of normality by the GMC 8.1 program, which showed a non-normal sample, and therefore, non-parametric statistical analysis was performed.

Results

The results showed that only the cones from Group IV presented bacterial growth within the incubation period (Table 1).

The data were submitted to the Kruskal-Wallis statistical test that showed a statistically significant difference at a level of 1% for Group IV in comparison with the other groups ($\alpha = 0.01$).

Table 1. Results of the microbiological assessment by the turbidity method

Repetitions	Group I	Group II	Group III	Group IV
1	0	0	0	1
2	0	0	0	1
3	0	0	0	1
4	0	0	0	1
5	0	0	0	1
6	0	0	0	1
7	0	0	0	1
8	0	0	0	1
9	0	0	0	1
10	0	0	0	1

Discussion

Several studies have assessed the decontamination of gutta-percha cones. In the majority of these studies, the cones were previously contaminated and then the efficiency of the disinfectant methods and solutions used were verified^{6,8-12}.

Studies with reference to the decontamination of gutta-percha cones had been conducted in this manner, but in 1971, Montgomery¹³ observed bacterial growth in 8% of the studied cones, and although this was not considered a significant amount, it was sufficient for the author to suggest that cones should be decontaminated before they were used.

At present, there are many controversies about the real need for decontaminating gutta-percha cones. In the present study, in Group I, in which the cones were taken out of the sealed package, there was no evidence of bacterial growth, which corroborated the results of other previously published studies that also tested cones taken directly out of the manufacturer's sealed box and found no evidences of bacterial growth^{3,5,14-15}. Whereas, other studies have shown a low percentage of contamination in sealed cone packages, which led to professionals always disinfecting the cones before use^{1-2,12,16}.

The reason why the levels of contamination are very low or null may be justified by some peculiar characteristics of the gutta-percha cones such as the smooth surface that makes adherence and consequently colonization difficult; lack of humidity and nutrients available for bacterial growth and the presence of zinc oxide in its composition, which has antibacterial activity, which may inhibit colonization of microorganisms¹⁻³. It is also worth mentioning that the cones from a sealed box that have not yet been in contact with possible sources of contamination from the clinical environment of microorganisms have also not been excessively manipulated, which contributes to maintaining the aseptic chain of these cones.

Cones from open boxes in use in the clinical environment also seem to be free of contamination, also being in agreement with several other published studies in the literature^{5,17}. In addition to the above-mentioned peculiar characteristics of the cones, which prevent or make bacterial growth difficult, the probability of contamination by the environment is very low. However, some studies, in which the results showed contamination of cones exposed to the clinical environment, emphasized that excessive manipulation could lead to contamination of cones that previously were in aseptic conditions¹⁶.

Group III composed of cones that underwent previous disinfection with 2% sodium hypochlorite solutions were also free of contamination, since sodium hypochlorite has excellent antimicrobial activity at its various concentrations^{1,12}.

Another relevant factor was that the sample of this study was collected in a specialization course, in which the clinical environment is more organized, there are only 12 students and 3 professors, therefore it provides a more controlled environment with regard to biosafety re-

quirements, thus diminishing the possibility of cross infection, a fact proved by Silva and Santos³ (2002), who also analyzed the sterility of gutta-percha cones from sealed boxes and boxes that had been manipulated by under graduate students and specialists. The author verified that there was growth in only 2 boxes of cones manipulated by the students. The author emphasizes that the even without any significant growth, previous disinfection was recommended because excessive manipulation and transportation may lead to contamination of these cones.

Conclusion

Based on the results obtained by the methodology used and on the literature consulted, it was possible to conclude that the possibility of viable microorganisms existing in gutta-percha cones is minimal and the use of disinfection methods is justified due to the possible contamination of the cones during incorrect manipulation, or breaking of the aseptic chain, and not by the permanence of viable bacteria only during opening of the box of cones during clinical treatment.

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Received May 10, 2010

Accepted June 30, 2010