

Assessment of Microbial Contamination of Gutta-Percha Cones after opening a Sealed Package

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Abstract: The goals of endodontic treatment are: proper access cavity preparation, cleaning, and shaping, and filling the root canal system, to prevent the microbial reinfection. Thus any material placed in the root canal must be free of microbial contamination to avoid root canal recontamination. Currently, gutta-percha is the most commonly used root canal filling material. Gutta-percha is supplied in a sterilised sealed package. Only few cones may be used for a patient and then the box is used again for another patient. Once the seal is opened, the Gutta-percha cones are exposed to the environment and eventually lose their sterility. The aim of this study was to assess the sterility of the gutta-percha cones in a sealed manufacturer's supplied package. Two different sealed manufactures supplied package of gutta-percha cones namely, Dentsply and Coltene of 25 size were opened under aseptic laboratory conditions. Five gutta-percha cones from each packet were cultured in a nutrient agar plate incubated at 37°C and microbial colonies were counted. There was no occurrence of microbial growth or contamination in the culture media on the first and second day after opening the sealed package but on the third day, growth of microorganism was detected in the culture media. Sealed packages of gutta-percha, supplied by the manufacturer are usually sterile and possible contamination of the cones may occur due to incorrect handling of the cones, leading to breaking of the aseptic chain.

Key words: Contamination of Gutta-percha, sterile gutta-percha, gutta-percha disinfectants, gutta-percha disinfection

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I. Introduction

The purpose of root canal treatment is to remove all necrotic or vital tissue and microorganisms from the root canal system and obtain a three dimensional obturation of the root canal space to avoid microbial growth.¹

Gutta-percha is among the most widely used and accepted filling materials used for filling root canal systems by Endodontists. 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 walls². It is also relatively easy to remove from the canal walls if retreatment is required.

Gutta-percha is a polymer obtained by coagulation of latex produced by trees of Sapotaceae family.³ It is rigid at room temperature and becomes malleable between 25 and 30 °C, softens at 60 °C and melts at 100 °C with partial decomposition. Gutta-percha cones consist of approximately 20% gutta-percha, 65% zinc oxide 10% radiopacifier and 5% plasticizers.⁴ Gutta-percha cones possess some amount of antimicrobial activity owing to its zinc oxide component.⁵

Gutta-percha cones are available in the market in sealed boxes. However, because they decompose when heated, they cannot be sterilized by humid or dry heat. Thus it becomes a concern, to maintain the aseptic chain that is essential to prevent new microorganisms from being introduced into the root canal systems.

However, some microbiological studies have shown to use gutta-percha cones directly from the manufacturer's sealed package, which has made the dentists doubtful for the need of disinfecting the gutta-percha cones during endodontic treatment. Therefore, the aim of this study was to assess the sterility of the gutta-percha cones in a sealed manufacturer's supplied package.

II. Materials and Method

This study was conducted at Department of Conservative Dentistry and Endodontics, Regional Dental College and the Microbiology Department, Naga Hospital Authority, Kohima, Nagaland. In this study, gutta-percha cones, of size 25 from two different manufacturers, that is Dentsply and Coltene were used (fig: I). Five (5) cones each from the sealed packages as supplied by the manufacturer were opened in the clinic and processed for microbiological culture. The gutta-percha cones were picked up using a sterile laboratory

forcepand added to a tube containing 1.5 mL saline. Volumes of 500 μ L were pipetted outand processed for culture in two different culture media namely, Blood Agar and MacConky culture media. They were aerobically incubated in an incubator at 37 $^{\circ}$ C for 24 hours. (fig .2). Colony growth reading was taken after 24 hours of culture.



Fig 1.25 sizes of two different manufactures of gutta-percha cones Dentsply and Coltene



Fig: 2. Culture plate in an incubator

The same method was performed on day two and day three of opening the sealed packet, following all the aseptic measures and the microbial colonies were counted under the microscope in the lab.If any growth was noted on the culture plate, the bacterial colonies were counted and processed for microscopic examination for identification of microorganism by gram staining method.

III. Results

No occurrence of growth or contamination of microorganism on both the culture mediawere seen on firstand second day of opening the sealed packages of GP cones.(fig 3) On the third day both the packageswere found to be contaminated by growth of two differentmicroorganismsin the blood agar culture plate(fig 4).The blood agar culture plate, after 24 hours of aerobic incubation at 37 $^{\circ}$ C showed, two types of colonies. The upper half of culture plate was found to have about 6 cfu of one type of growth of colony size, approximately 4 microns. The lower half of the culture plate had smaller colonies of about 2 microns, numbering about 5-6 cfu. Both the colonies were processed for gram staining and both were found to be gram positive bacilli under microscopic examination. Both the colonies are most probably suspected to be either laboratory or environmental contaminants (fig 5). MacConky agar plate showed no growth of microorganisms.

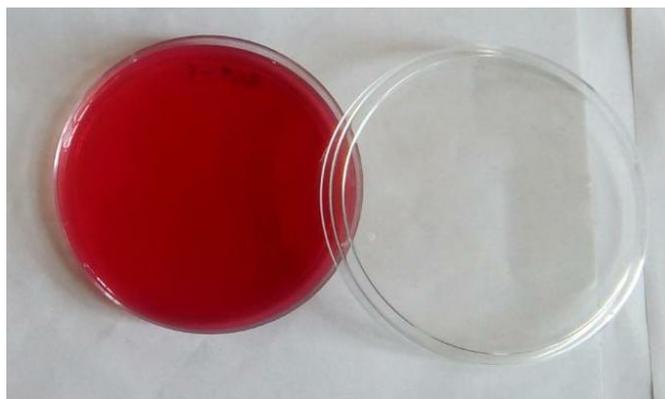


Fig 3: Culture plate showing no growth of microorganisms on first and second day.

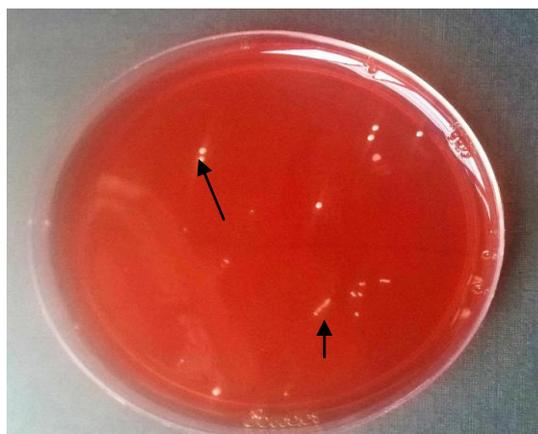


Fig:4 Growth of two different organism,

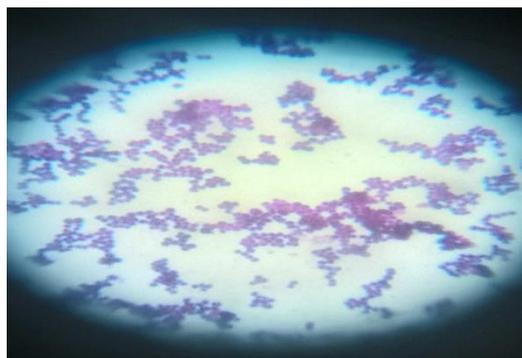


Fig:5Microscopic picture of Gram positive bacillus found on the 3rd day of opening the package.

IV. Discussion

The major findings of this study were that the contents of sealed gutta-percha packages supplied by the manufacturer were sterile on the first and second day but microbial contamination was found to occur on the third day.

The findings of this study on the initial microbial status of the gutta-percha cones are in agreement with those of **Gomes et al**⁶ who found out that although gutta-percha cones are usually sterile during storage, they can be easily contaminated if incorrectly handled which shows that 100% of the cones handled with gloves had microbial growth. **Doolittle, et al**⁷, **Klagerand Dupont**⁸ and **Pang, et al**⁹ found that none of the gutta-percha cones taken from the manufacturer's sealed package were positive for microbial growth, but differ from those of **Montgomery**¹⁰ and **Namazikhah, et al**¹¹ who found that some of the gutta-percha cones taken from the manufacturer's sealed package harbored microorganism. However, methodological differences among the studies and the brands of the gutta-percha packages tested in experiments are also different. There may be differences in the manufacturing technology among the manufacturers in terms of aseptic production and packaging. This statement is supported by **Gomes, et al**⁶ who found that the contents of freshly opened gutta-percha packages of one brand could be negative while the contents of another brand could be positive for microbial growth.

Another important note is that the gutta-percha cones from a sealed packet that has not been in contact with possible sources of contamination and not been excessively manipulated, may have contributed in maintaining the aseptic chain of the cones. Thus, it is absolutely necessary to sterilise the GP cones before using for endodontic therapy to make sure that microorganisms are not added to the root canal system through the filling material. The recommended method of sterilisation is to place the cones in 5% Sodium Hypochlorite solution for 1 minute and then rinse in water. They have to be dried using gauze and used¹².

This study was done to help us to understand the time frame within which the gutta-percha cones can be used without sterilisation after opening a new pack and also to understand the ways of contamination of the gutta-percha cones and methods to minimise the contamination. The limitation of the study was that the culture performed was not specific to what microorganisms were seen on the culture plate.

V. Conclusion

Based on the results obtained by the study and the information from various literature, it is concluded that sealed packages of gutta-percha, supplied by the manufacturer, are usually sterile and does not contain microorganism. The possible contamination of the cones may occur due to incorrect handling leading to breakage of the aseptic chain. Thus proper handling of gutta-percha cones, include period of time of handling and the number of handling of the cones, is important to ensure the success of endodontic treatment.

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