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Disinfection of Gutta-Percha “A Cross Sectional Study on Knowledge, Awareness and Practice (KAP) Among General Dental Practitioners, Post Grad Students and Endodontic Specialists in Chhattisgarh State, India

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Abstract

Aim: (1) To evaluate the prevalence of gutta-percha disinfection practice among general practitioners, post graduates students and specialists in Chhattisgarh. (2) To check the sterility of two commercially available freshly and previously opened gutta-percha box which was exposed to the clinical environment.

Materials and Methods: Data were collected in a prescribed format from 500 endodontic postgraduate students. The questionnaire was designed to evaluate their knowledge about standard sterilization protocols of gutta-percha points, attitude toward the utility of guidelines/protocols of sterilization in the success of root canal treatment and practice of these sterilization protocols. For microbial assay, 10 cones of freshly opened gutta-percha 6% taper of size 25 from diadent (Diadent Group International, Korea). Group A Dentsply (Dentsply Maillefer, Switzerland) Group B Cones from the same companies which was kept in chair side working environment during obturation were selected as Group C and Group D, respectively, for aerobic and anaerobic culturing.

Results: Among the respondents 65% did not practice any disinfection protocols. Only 35% followed the disinfection of gutta-percha cones. In anaerobic culture Group B turned out to be positive in all samples, all other groups were negative.

Conclusions: The endodontic postgraduate students possess adequate knowledge on disinfecting gutta-percha cones, but regular practice of this is uncommon. Microbial assay showed that even freshly opened gutta-percha cones might be contaminated.

Keywords: Disinfection, Gutta-Percha, Sterility, Awareness

1. Introduction

Success of endodontic treatment depends on thorough shaping and cleaning and the use of aseptic techniques during the treatment to prevent the microbial reinfection. The practitioner must be concerned not only with decreasing the endogenous microorganisms, but with exogenous bacterial contamination as well. Priority in all steps is to eliminate or, at least, limit microbial contamination. During endodontic treatment, an aseptic sequence is to be entirely taken after to accomplish this essential aim. Presently, gutta-percha cones are the most commonly utilized material for the obturation of the root canal system. They are biocompatible, dimensionally stable, radiopaque, and thermoplastic. If necessary, they can also be easily removed from root canals^[1, 2].

Despite the fact that gutta percha cones are produced under aseptic conditions and have some antimicrobial properties mainly due to their zinc oxide component, they can be contaminated by handling, even if carefully removed from their packages. They can also be contaminated by aerosols and physical sources during the storage and treatment process. Making the gutta percha cones used to fill the root canal system free from pathogenic microorganisms would be in simultaneousness with the objective of endodontic therapy. Moreover, it is against the basics of any standard disinfection protocol to contaminate the disinfected area with a potentially contaminated filling material. Hence, disinfection of the obturating material is mandatory. Therefore, a rapid chair side chemical disinfection is advocated.

Many authors have concluded the presence of microorganisms in freshly opened boxes. Even though the number of bacteria was quite low at the time of packaging but increased during

clinical usage at the time of Obturation. According to many studies, Staphylococcus genus is found to be the most common microorganism contaminating gutta-percha cones in their boxes and after handling with gloves. Many authors stated that the recovery rate of Staphylococcus genus from infected root canal is about 15.7%; this result justifies the need of gutta-percha disinfection [3].

A large variety of chemical disinfectants have been used to sterilize gutta percha cones before obturation including sodium hypochlorite (NaOCl), glutaraldehyde, alcohol, chlorhexidine (CHX), hydrogen peroxide, Polyvinylpyrrolidone iodine, and mixture tetracycline citric acid and detergent (MTAD) (Dentsply tulsa dental, tulsa, ok, USA) which is a mixture of doxycycline, 10% citric acid and Tween80 detergent [4].

It has been found by many studies that sterilization by immersing cones in 5.25% NaOCl is effective for a rapid high disinfection level. Many authors have shown that the use of CHX is more beneficial as the microscopic changes in the gutta-percha cones can be avoided after disinfection, unlike in case of NaOCl because they have been found to leave some deposits on the surface of gutta-percha cones [5] It is advisable to remove these layers or crystals before using the cones for obturation of root canals, since they may compromise the obturation seal.

Knowledge, attitudes, and practices (KAP) study was done previously on sterilization protocols followed by postgraduate students in dental colleges of India while using rotary files. The results showed though they had adequate knowledge and

positive attitude on sterilization, the practice of this was less prevalent [6] A pilot study was done on gutta percha disinfection showed a lesser prevalence of disinfection practices. Hence, it was decided to evaluate the prevalence of this disinfection practice among practitioners, postgraduate students, endodontist and to check the sterility of cones from two commercially available, freshly opened gutta percha boxes and a previously opened box exposed to the clinical environment. The purpose of this study was to evaluate KAP about methods of gutta percha disinfection by General Dental Practitioners, Post Grad Students and endodontic Specialists in Chhattisgarh State, India. In addition, the sterility of freshly and previously opened gutta percha will be evaluated.

Materials and Methods

Data were collected in a prescribed format from 500 endodontic-general practitioners postgraduate students and specialists in Chhattisgarh. Privacy was guaranteed, and the individual results were kept confidential. The questionnaires were designed to evaluate: Knowledge about standard sterilization protocols of gutta percha points (Figure 1). Awareness toward the utility of guidelines/protocols of sterilization in the success of root canal treatment & Practice of these sterilization protocols. Majority of the questions were close ended. The feasibility of the study and the clarity, quality, and length of the questionnaire items were ensured by means of a pilot survey conducted in Department of Conservative Dentistry and Endodontics (Maitri dental college). Ethical clearance waiver form was also obtained.

Maitri Dental College and Research Centre Department of Conservative Dentistry & Endodontics A survey Disinfection of Gutta Percha: "A Cross Sectional Study on Knowledge, Awareness and Practice among General Practitioners Post Grad Students and Specialists in Chhattisgarh"	
NAME	QUALIFICATION
AGE/SEX	ADDRESS
DESIGNATION	MOBILE NO
Questionnaire	
1. Number of years in clinical practice	<input type="checkbox"/> 1-5 year <input type="checkbox"/> 6-10 year <input type="checkbox"/> 11-20 year <input type="checkbox"/> Above 20 year
2. How many ROOT CANAL TREATMENTS you do approximate in a month	<input type="checkbox"/> 10-20 <input type="checkbox"/> 20-30 <input type="checkbox"/> 30-40 <input type="checkbox"/> More than 40
3. How many cases of root canals are treated as single visit endodontics in your practice	<input type="checkbox"/> 100% cases <input type="checkbox"/> 70-90% cases <input type="checkbox"/> 50-70% cases <input type="checkbox"/> Less than 50% cases
4. If single visit endodontics is performed, how much time is usually taken to complete it	<input type="checkbox"/> 30 min <input type="checkbox"/> 30 min- 40 min <input type="checkbox"/> 40 min- 90 min <input type="checkbox"/> More than 90 min
5. Do you disinfect new/unused GUTTA PERCHA points prior to use	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Sometimes
6. If you disinfect what methods do you use	<input type="checkbox"/> Chair side chemical disinfection <input type="checkbox"/> Other (specify) .. <input type="checkbox"/> Not applicable
7. At what stage you perform disinfection of Gutta Percha	<input type="checkbox"/> Before master cone radiograph <input type="checkbox"/> Just before obturation, after master cone radiograph
8. In the operating, Are GUTTA PERCHA point placed on a sterile surface during treatment	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Sometimes
9. If chair side disinfectant is used, which chemical is commonly used for disinfection?	<input type="checkbox"/> Sodium hypochlorite <input type="checkbox"/> Chlorhexidine <input type="checkbox"/> Spirit/ alcohol <input type="checkbox"/> Others
10. If chemical method is used what concentration is preferred	<input type="checkbox"/> Hypochlorite 2.5% - 5% <input type="checkbox"/> Chlorhexidine 2% <input type="checkbox"/> Any other concentration
11. Preferred duration and time for disinfection of Gutta Percha	<input type="checkbox"/> Less than 1 min <input type="checkbox"/> 1-2 min <input type="checkbox"/> 2-5min <input type="checkbox"/> 5-10min <input type="checkbox"/> More than 10min
12. If you postpone the obturation after master cone selection, do you use the same GUTTA PERCHA in Future?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Sometimes
13. Do you think disinfection of Gutta Percha prior to obturation affect treatment outcome?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> At some extent
14. Which is method of obturation	<input type="checkbox"/> Lateral condensation <input type="checkbox"/> Single cone <input type="checkbox"/> Thermoplasticized
15. After disinfection do you clean the gutta percha point	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Sometimes
16. If yes then what method	<input type="checkbox"/> Saline <input type="checkbox"/> Spirit <input type="checkbox"/> other
17. If you use it again, how you store it	<input type="checkbox"/> In the same box of gutta percha <input type="checkbox"/> In separate box which is marked with patient name on the box <input type="checkbox"/> Any other
18. How much is the expected success rate of root canals done without disinfection of gutta percha	<input type="checkbox"/> 100% <input type="checkbox"/> 90% <input type="checkbox"/> 80% <input type="checkbox"/> Less than 80%

Fig 1: The questionnaires were designed to evaluate: Knowledge about standard sterilization protocols of gutta percha points

Microbial assay

For microbial assay, 10 gutta percha cones of freshly opened box 6% taper of size 25 were selected randomly from five boxes, two from each box, of the following companies:

- Group A Diadent (Diadent Group International, Korea)
- Group B Dentsply (Dentsply Maillefer, Switzerland)

Cones from the same companies that were kept for 2 months intentionally at chair side working environment were also selected similarly as:

- Group C (Diadent in clinical environment)
- Group D (Dentsply in a clinical environment)

Each cone was transferred to test tube containing 6 ml of Thioglycollate broth. The test tubes were then vortexed and inoculated in MacConkey agar and chocolate agar for 48 hours for aerobic culture. It was inoculated on to supplementary blood agar for 72 hours for anaerobic culture. Colony forming units if any was counted manually.

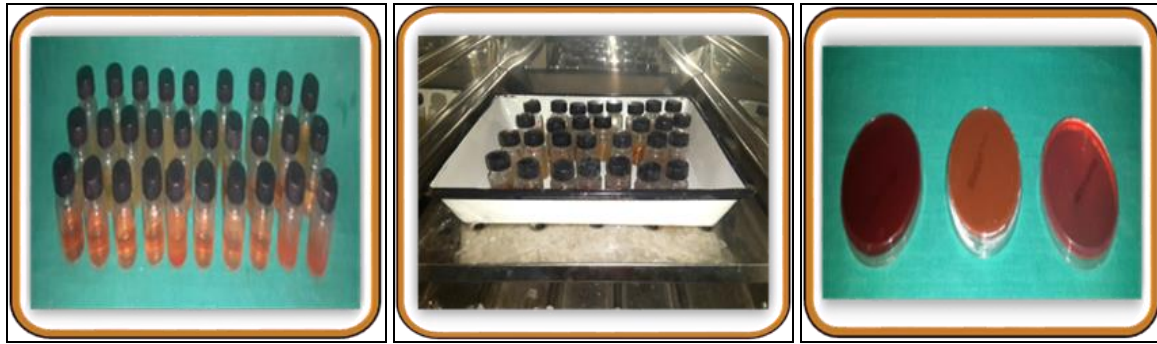


Fig 2: 6ml of Thio-glycollate broth in each bottle than Gutta percha cone placed in each bottle & incubated in Chocolate, MacConkey & Blood agar plates



Fig 3: Infected broths inoculated in MacConkey agar and chocolate agar for 48hr for aerobic culture than Inoculated on to supplementary blood agar for 72 hr for anaerobic culture Colony forming units, if any, was counted manually.

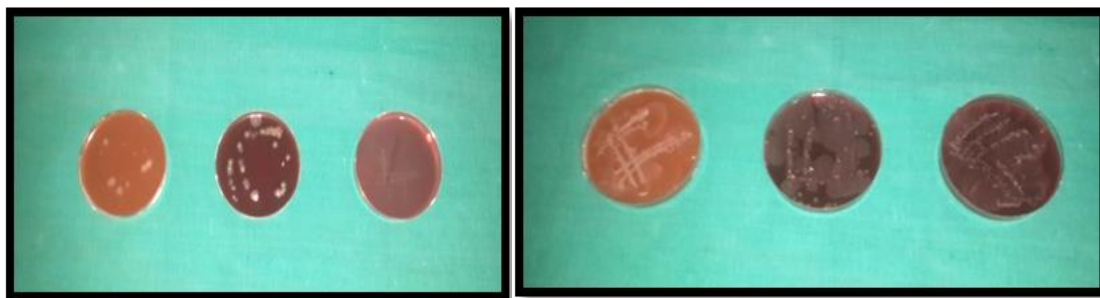


Fig 4: both Group A and Group B gave positive culture in almost all culture plate except 2 or 3 plates. Bacterial culture of Group C & D was carried out, and it turned out to be positive in aerobic and anaerobic cultures with average colony count of 95 and 120, respectively.

Results

73.5% knew that gutta percha cones were neither sterile nor pre disinfected while 214 (77.3%) believed in 1 min immersion in 5.25%NaOCl solution for disinfection (Table 1). A total of 65.7of respondents thought that the disinfection of gutta percha plays an important role in the outcome of root canal treatment, whereas 58 (15%) thought otherwise. Solid core gutta percha was the unanimous choice for routinely used obturating material in practice (Table 2). Only 73.8% respondents routinely practiced disinfection of the gutta percha cones (Table 3).

Table 1: Knowledge

Knowledge	
General dental practitioners (BDS & Other MDS)	68.5%
PG(Cons & Endo)	73.3%
MDS (Cons & Endo)	78.6%

Table 2: Practice

Practice	
General dental practitioners (BDS & Other MDS)	66.3%
PG(Cons & Endo)	76.6%
MDS (Cons & Endo)	78.5%

Table 3: Awareness

Awareness	
General dental practitioners (BDS & Other MDS)	56.7%
PG(Cons & Endo)	73.8%
MDS (Cons & Endo)	77.8%

Microbial assay

In microbial culture, both Group A and Group B gave positive culture in almost all culture plate except 2 or 3 plates (Figure 2). This showed that the cones may be non-sterile in the package itself. Bacterial culture of Group C & D was carried out, and it turned out to be positive in aerobic and anaerobic cultures with average colony count of 95 and 120, respective (figure 3 & 4). This proves that the cones are non-sterile after being exposed to clinical environment. The purpose of microbial assay was to check the sterility of cones.

Discussion

Even though gutta-percha cones are produced under aseptic conditions, they may get contaminated by aerosols, improper storage and physical handling. Studies have revealed the presence of microorganisms in 5-19% of freshly opened gutta-percha packs [7]. Though the number of these organisms was quite low at the time of packaging, clinically it is routine practice for dentists to use gutta-percha points 'straight out of

box' without a thought about its sterility. It has been demonstrated that the clinical usage of the package increased the number of microorganisms contaminating the gutta-percha cones. It would be worthwhile if cones used to fill the root canal system were free from pathogenic microorganisms because endodontic therapy is mainly a procedure of decontamination to prevent the dissemination of microorganisms throughout the root canal system and periapical tissues^[8]. Though none of the manufacturers claim that their gutta-percha cones were sterile in the current survey, 23.7% of the postgraduate students thought the cones were sterile in the package. The students overall had adequate knowledge on the methods to disinfect gutta-percha cones with 73.8% using NaOCl and 26.2% using CHX for disinfection. There have been some controversies regarding the surface alterations of the gutta-percha cones due to salt precipitations after using NaOCl as a disinfectant, which could negatively impact the sealing ability when used along with resin based sealers especially. There has been evidence to show that disinfection of cones by immersing into CHX was ideal without causing any deteriorating surface defects^[9, 10].

This survey showed that 73.8% of endodontic postgraduate students thought the disinfection of gutta-percha cones played an important role in the outcome of root canal treatment. Despite this knowledge on the non-sterility of cones, and on the various chair side methods to disinfect them before obturation, 35.5% did not practice any disinfection protocols. Only 65.7% followed the disinfection of gutta-percha cones. The basic principle of minimizing of the endodontic microbial flora and preventing further contamination seems to have been violated by not pursuing any of this simple chair side disinfection protocols^[11]. Cones from commercially available companies, Diadent (Diadent Group International, Korea) and Dentsply (Dentsply Maillefer, Switzerland) were selected in the current study. In microbial culture, both Group A and Group B gave positive culture in almost all culture plates except 2 or 3 plates.

This showed that the cones may be non-sterile in the package itself. Bacterial culture of Group C & D was carried out, and it turned out to be positive in aerobic and anaerobic cultures with average colony count of 95 and 120, respectively.

This clearly underlines the importance of disinfection of gutta-percha cones before using it to obturate. Other groups, including the ones that were previously opened and was under clinical use giving a negative culture, can explain the higher success rates of root canal treatments despite not following gutta-percha disinfection. The sterility of the cones in the box, that was under clinical use depends on the sterility of the chair side environment, as there were no intentional attempts made to contaminate the cones unlike in other studies that gave positive results. The sterility of freshly opened cones from the same company, Dentsply was checked by Gomes *et al.* and this had also given a similar result^[13]. The limitations of this study include the shorter incubation times used. A longer incubation time may be needed for some species of bacteria, and this cannot be overlooked. Hence, more sensitive tests such as polymerase chain reaction testing are to be carried out before confirming the sterility of gutta-percha cones. However, even with the shorter incubation times, the fact that one group turned positive for bacteria strengthen the point for disinfection.

Conclusion

On the view of our survey

- General Practitioners, Post Grad Students and Specialists possess knowledge on disinfecting gutta-percha cones, but regular practice of this is uncommon.
- Many dentist and practitioners use sodium hypochlorite 2 to 5.25% for disinfection of gutta-percha.
- Microbial assay showed that even freshly opened gutta-percha cones might be contaminated.
- Thus, disinfection of Gutta-Percha before obturation should be routinely practiced to prevent microbial regrowth inside canals and re-infection of the teeth.

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