



## Agents used for gutta percha disinfection-A topic mostly ignored practically

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### ABSTRACT

**Aim-**To check the efficacy of few chemical and few herbal agents in disinfecting gutta percha cones.

**Material and Method-** sixty four new Gutta-percha cones were divided into 2 major groups of 32 gutta percha cones. The Group I having 32 gutta percha were not contaminated by E.Fecalis whereas the Group II of 32 gutta percha cones were contaminated by E.Fecalis for 2 minute. These 32 gutta percha were further subdivided into 8 subgroups comprising of 4 gutta percha cones each. In Group 1, the gutta percha cones were not infected by E.Faecalis and placed into the different agents whereas in Group 2- the gutta percha cones were infected with E.Faecalis and then disinfected by placing them in different agents to know their capability. All these gutta percha cones placed inside the test tube are then incubated at 37<sup>0</sup>C for 24 hours. After 24 hrs, these test tubes are taken out and the solution is checked by presence or absence of turbidity which indicates proper disinfection.

**Result-** The result of the study showed that Chlorhexidine was effective in disinfection of gutta-percha cones for 1 minute followed by glutaraldehyde and sodium hypochlorite. Whereas Amla was the most effective herbal extract in disinfecting gutta percha followed by aloe vera and neem.

**Conclusion-** Chemical Agents(Chlorhexidine and Glutaraldehyde, sodium hypochlorite) are efficient chemical disinfectants but Herbal agents also hold a promising future as a medium for disinfection.

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## INTRODUCTION

Obturation of the root canal is the final and one of the critical step in root canal therapy which establishes the future success of the treatment. Gutta percha cones are the widely used obturating material since long. Gutta-percha points are usually sterilized during the manufacturing

process but once their packages are open they can get contaminated while handling them with gloves in hand or coming in contact with microorganisms of oral mucosa.<sup>(1,2)</sup> They can also be contaminated by aerosols and different physical sources during the storage process.

Gutta-percha cones cannot be sterilized by the conventional process because of their thermoplastic properties. Therefore, rapid chairside disinfection is needed.<sup>(3-4)</sup>

Therefore, it is suggested that as gutta percha is heat labile, so, chemical disinfectants like Ethyl alcohol, Paraformaldehyde, Formocresol Gluteraldehyde, Chlorhexidine and Sodium Hypochlorite are routinely used, which usually take 3-25 minutes for disinfection. Amongst all the various methods of rapid chair side disinfection, Sodium Hypochlorite 5.25% is most effective in 1 minute.<sup>(5-6)</sup>

The disinfecting agent should be effective in killing different bacterial species. The aim of this study is to evaluate the effectiveness of a herbal alternatives, Aloe Vera, Triphala and Amla for rapid decontamination of gutta percha cones.

*Aloe barbadensis* Mill has Antibacterial, Antifungal and Antiviral properties.<sup>(7-8)</sup> The antimicrobial effects are due to its natural anthraquinones component.<sup>9</sup> Triphala has an established antimicrobial and antioxidant effect.<sup>10</sup> So, it can be very effective in decontaminating gutta percha cones. Amla has antibacterial and astringent properties that help to prevent infection which makes it a desired disinfecting agent for gutta-percha cones disinfection.<sup>11</sup>

## MATERIALS AND METHOD

In the present study, sixty four new Gutta-percha (Dentsply Maillefer, USA) cones were randomly chosen. These were broadly divided into 2 major groups of 32 gutta percha cones. Group I comprising of 32 gutta percha cones were not contaminated or infected by *E. Fecalis* whereas the Group II with 32 gutta percha cones were contaminated by *E. Fecalis* for 2 minute.

Now these 32 gutta percha cones were further subdivided into 8 subgroups comprising of 4 gutta percha cones each.

In Group I, 8 test tubes were obtained and brain heart infusion broth was kept. For each test tube, 4 gutta percha were taken out from the sterile closed pack followed by decontamination by amla, aloe vera, triphala, 3% sodium hypochlorite, 2% chlorhexidine, 2% gluteraldehyde and saline respectively for 2 minute and then placed into the test tube containing brain heart infusion broth. Whereas in the control group, 4 gutta percha cones were directly taken out from the pack and placed inside one of the test tube containing broth without decontaminating by any of the agents.

In Group II, remaining 32 gutta percha cones were further subdivided into 8 subgroups.

For each test tube, 4 gutta percha were taken out from the sterile pack and firstly contaminated with *E. fecalis* for 2 minute, follow by decontamination by amla, aloe vera, triphala, 3% sodium hypochlorite, 2% chlorhexidine, 2% gluteraldehyde and saline respectively for 1 minute and then placed into the test tube containing brain heart infusion broth. In the control group, 4 contaminated gutta percha were placed inside one of the test tube containing broth without decontaminating.

All these gutta percha cones placed inside the test tube were then incubated at 37°C for 24 hours.

After 24 hrs, these test tubes were taken out and the solution is checked by presence or absence of turbidity which indicates proper disinfection.

**GROUP I( 32Gutta Percha cones which were not contaminated by E.Faecalis)**

- GROUP I(i)- Amla
- GROUP I(ii)- Aloe Vera
- GROUP I(iii)- Triphala
- GROUP I(iv)- Sodium Hypochlorite
- GROUP I(v)- Chlorhexidine
- GROUP I(vi)- Gluteraldehyde
- GROUP I(vii)- Control
- GROUP I(viii)- Saline

**GROUP II( Gutta Percha cones whichwere contaminated by E.Faecalis)**

- GROUP II(i)- Amla
- GROUP II(ii)- Aloe Vera
- GROUPI I(iii)- Neem
- GROUP II(iv)- Sodium Hypochlorite
- GROUP II(v)- Chlorhexidine
- GROUP II(vi)- Gluteraldehyde
- GROUP II(vii)- Control
- GROUP II(viii)- Saline

**RESULT**

**Table 1: After 24hours of incubation turbidity is checked in the samples not contaminated with E. Faecalis**

Groups	Presence Or Absence Of Turbidity
GROUP1(I) - AMLA	-
GROUP1(Ii) – ALOE VERA	-
GROUP1(Iii) - TRIPHALA	-
GROUP1(Iv) – SODIUM HYPOCHLORITE	-
GROUP1(V) - CHLORHEXIDINE	-
GROUP1(Vi) - GLUTARALDEHYDE	-
GROUP1(Vii) - SALINE	+
GROUP1(Viii) - CONTROL	+

+ INDICATES PRESENCE OF TURBIDITY

- INDICATES ABSENCE OF TURBIDITY

**Table 2- After 24hours of incubation turbidity is checked in the samples contaminated with E.Faecalis**

Groups	Presence Or Absence Of Turbidity
GROUP2(I) - AMLA	-
GROUP2(Ii) – ALOE VERA	+
GROUP2(Iii) - TRIPHALA	+
GROUP2(Iv) – SODIUM HYPOCHLORITE	-
GROUP2(V) - CHLORHEXIDINE	-
GROUP2(Vi) - GLUTARALDEHYDE	-
GROUP2(Vii) - SALINE	+
GROUP2(Viii) - CONTROL	+

+ INDICATES PRESENCE OF TURBIDITY

- INDICATES ABSENCE OF TURBIDITY

The decontaminating efficacy of all the agents was analysed by the occurrence of turbidity in the brain heart infusion broth. The GP cones which were not decontaminated and were directly placed in the broth developed turbidity. Whereas the cones which were not contaminated by *E. Faecalis* and placed in the broth, in that only Control group and saline developed turbidity whereas those which were disinfected with the chemical agents and herbal agents remained free of turbidity. When the gutta percha cones were contaminated with *E. Faecalis*, in those; control group, saline, triphala, aloe vera developed turbidity whereas amla, chlorhexidine, glutaraldehyde and sodium hypochlorite were free from turbidity.

The result of the study showed that Chlorhexidine was effective in disinfection of gutta-percha cones for 2 minute followed by glutaraldehyde and sodium hypochlorite. Whereas Amla was the most effective herbal extract in disinfecting gutta percha followed by aloe vera and triphala.

## DISCUSSION

The disinfection of gutta percha cones before its use as obturating material is essential for a successful endodontic treatment. Although gutta-percha cones are produced under aseptic conditions, but they may get contaminated by different factors such as aerosols, improper storage and physical handling. Cones contaminated with well-defined microbial populations were sterilized in different antimicrobial solutions for comparison. The thermoplastic characteristic of gutta-percha cones prohibits sterilization by standard autoclave, which may cause deformation of cones. Therefore, the cones were sterilized with ethylene oxide. Several other chemical solutions have been proposed for a rapid decontamination of gutta-percha cones. The time window to apply these solutions for disinfection ranges from a few seconds to several minutes.

Sodium hypochlorite possess antibacterial and sporicidal activities related to the liberation of active chlorine.<sup>12,13</sup> Sodium hypochlorite is being used in several different concentrations for gutta percha disinfection. Gomes et al. (14) found that the time required for sodium hypochlorite to eliminate the microorganisms was inversely proportional to its concentration. The sodium hypochlorite solution at 5.25%, for example, eliminated *C. albicans* and *E. faecalis* after 45 seconds of contact, while at 2.5%, ten minutes of contact was needed to eliminate these microorganisms. Therefore NaOCl can be used effectively for the disinfection of gutta-percha cones. Several studies recommend the use of NaOCl for disinfecting GP cones. (15, 16) However, at very high concentrations (5.25%), NaOCl produces a large quantity of chloride crystals on the GP cone surface and might causes the deterioration and loss of elasticity of GP points, which could impede the obturation and impair the hermetic seal.(17) But lower concentrations will take more time to inhibit bacterial growth than higher concentrations (18).

Chlorhexidine is a cationic bisbiguanide with broad antibacterial activity. The CHX molecule reacts with negatively charged groups on the bacterial cell surface, causing an irreversible loss of cytoplasmic constituents, membrane damage, and enzyme inhibition. Gomes et al, who stated that 2% Chlorhexidine liquid took less than 30 seconds to completely eliminate *E. faecalis* from contaminated GP cones. A 2% CHX solution was found effective at 15 seconds to 2 hours in direct contact with infected gutta-percha cones.<sup>19</sup>

Glutaraldehyde has been effectively used as chemosterilizer or high-level disinfectant (20). Aqueous 2% glutaraldehyde solutions display a broad spectrum of activity and rapid destruction rate against the majority of microorganisms. They are capable of killing vegetative bacteria in less than 1 min of exposure. Spores may be destroyed in 3 h or less (21)

Recently herbal alternatives have been explored as disinfectants for gutta percha cones. In this study, Amla, Aloe vera and triphala have been used as a herbal alternative for gutta percha cones disinfection.

*Aloe vera* has been used from past many years for the treatment of a multiple ailments ranging from peptic ulcers to its use in cosmetics. It has a well-established antimicrobial activity ascribed to compounds that are now specifically identified as *p*-coumaric acid, ascorbic acid, pyrocatechol and cinnamic acid.<sup>22</sup> Another major advantage is that *Aloe vera* gel has been found to be effective in decontaminating GP cones within one minute.<sup>23</sup>

One of the alternatives, which has recently been used in dentistry, is triphala, an Indian herbal medicine. Triphala means three (tri) fruits (phala). Its powder consists of a combination of three dried herbs (*Terminalia bellirica*, *Embllica officinalis*, and *Terminalia chebula*). This material has considerable dental applications due to its antimicrobial effects. Oral rinse containing triphala is used in controlling tooth decay and in periodontal therapies. Studies have shown it can be used as a root canal irrigant due to its antibacterial and antioxidant characteristics.

For the evaluation of the efficacy of these disinfecting solutions, 32 Gutta Percha cones were taken (25 No. ISO standardized) 4 Gutta Percha cones were placed inside the freshly prepared brain heart infusion broth and incubated for 24 hours. Then four new gutta percha cones were decontaminated for 2 minute with the different disinfecting solutions. These cones were incubated for 24 hours in brain heart infusion broth.

32gutta Percha cones were submerged in test organism (*E.Faecalis*) for ten minute these cones were then kept in different herbal and chemical agents for 2 minute and further placed inside the brain heart infusion broth and incubated at 37°C for 24 hours. As a control, Gutta Percha cones immersed in test organism were directly incubated in brain heart infusion broth. The broth were then checked for turbidity in both the cases.

The result of the study showed that Chemical agents were effective in disinfection of gutta-percha cones for 2 minutes as the samples were free from turbidity for 2 minutes.

Whereas Amla was the most effective herbal extract in disinfecting gutta percha cones.

## CONCLUSION

Within the limits of this study, it can be concluded that although Chemical Agents(Chlorhexidine and Glutaraldehyde, sodium hypochlorite) are efficient chemical disinfectants but Herbal agents also hold a promising future as a medium for disinfection, in which amla gave the best results within a short duration of time.

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