

AN IN VITRO COMPARISON OF ANTIMICROBIAL EFFICACY OF 5% AND 10% ALOE VERA GEL TO 5.25% SODIUM HYPOCHLORITE AND THEIR EFFECTIVENESS IN DECONTAMINATING GUTTA PERCHA CONES.

Original Article

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Abstract

Aim: The aim of the present study was to evaluate the antimicrobial efficacy of 5% and 10% *aloe vera gel* with 5.25% sodium hypochlorite and compare the effectiveness in decontaminating gutta-percha cones.

Materials and Method: Freshly collected aloe vera pulp was dried in an oven at 80°C for 48 hours and then powdered, out of which 5% and 10% of Aloe vera gel was made by dissolving it in ethanol. Antimicrobial efficacy was checked for both the concentrations of Aloe vera gel and 5.25% sodium hypochlorite using agar well diffusion method against *E. coli*, *E. faecalis* and *Staph. aureus* which are three common gutta percha contaminants. To check the decontamination efficacy, the DiaDent gutta percha points was used. They were decontaminated for 1 minute using two different concentrations of aloe vera gel and 5.25% NaOCl and then they were placed in thioglycolate broth for the development of turbidity. The statistical analysis was carried out using chi square test at 5% level of significance.

Results: The antimicrobial efficacy was assessed by the presence of zones of inhibition. Statistical analysis showed no significant difference in antimicrobial efficacy of 10% aloe vera and 5.25% NaOCl and also 10% aloe vera and 5.25% NaOCl are equally effective in decontaminating gutta percha cones and exhibited better effectiveness than 5% aloe vera.

Conclusion: It can be concluded that 10% Aloe vera gel can be used effectively for decontaminating GP cones within a short duration

Key words: Aloe vera; sodium hypochlorite; decontamination; gutta percha cones.

Introduction:

The primary objective of endodontic therapy is to eliminate or reduce the number of microorganisms for success of endodontic treatment.¹

Commercially supplied gutta percha cones are not usually sterilized or decontaminated. The recommended method for decontamination of gutta percha cones is treating them with 1% sodium hypochlorite for 1 min or 0.5% sodium hypochlorite for 5 min but it may cause crystal deposition within the canals which can impede the obturation.² So, the purpose of the study is to evaluate the effectiveness of herbal alternative like aloe vera gel, in different concentration for rapid decontamination of gutta percha cones.

Aloe barbadensis mill is a short succulent herb filled with a clear viscous gel. The name aloe vera derived from the Arabic "Alloeh" which means bitter liquid found in leaves. It has potent antibacterial, antifungal and antiviral properties because of plant's natural anthraquinones.³

Aim of the study:

To evaluate and compare the antimicrobial efficacy of 5% and 10% aloe vera gel with 5.25%

NaOCl for their effectiveness in decontaminating gutta percha cones.

Objectives of the study:

ξ To compare the antimicrobial efficacy of 5%, 10% aloe vera gel and 5.25% NaOCl.

ξ To compare effectiveness of 5%, 10% aloe vera gel and 5.25% NaOCL in decontaminating gutta percha cone.

Reference strains which are *Staphylococcus aureus*, *Escherichia coli*, *Enterococcus faecalis* was obtained from department of microbiology, GMERS, Ahmedabad, Gujarat.

Preparation of aloe vera extract:

Leaves were washed with distilled water first and then fresh pulp was taken out (**Figure 1.1 A**) which was left in open air for 2-3 days to remove its moisture and dried in hot a ir oven at 80⁰ C for 48 hours, then powdered.

5% and 10% aloe vera gel were made by dissolving 5 gm and 10 gm of aloe vera powder in 100 ml ethanol respectively (**Figure 1.1 B**). The contents were then filtered and filtrate was evaporated for dryness.

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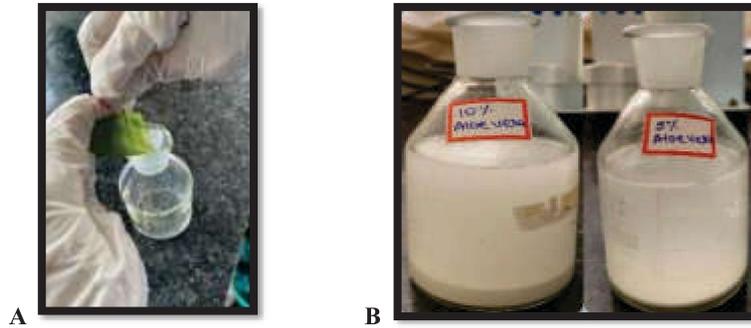


Fig 1.1

micropipette with 5% Aloe vera, 5.25% NaOCl and 10% aloe vera and labelled 1, 2, 3 respectively and then incubated at 37°C for 24 hours and monitored for development of clear zones around the extracts. The antibacterial activity was assessed by the diameter of inhibition zone.

Antimicrobial activity of Aloe vera:

Antimicrobial activity of extract was checked by using agar well diffusion technique. Reference strains were cultured overnight in thioglycolate broth and culture was streaked on a plate of chocolate agar. (Figure 1.2 C) 3 wells of 5 mm*5 mm were made on the surface of the agar plate (Figure 1.2 D). Wells were filled using

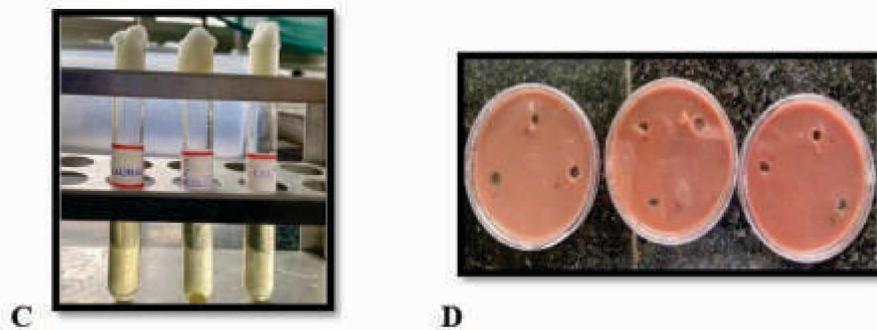


Fig 1.2

Gutta Percha decontamination:

A new pack of DiaDent size 35 of gutta percha points was opened under sterile conditions and 30 gutta percha cones were taken out using a sterile tweezer and divided in to 3 groups with 10 gutta

percha each and decontaminated for one minute in 5%, 10% Aloe vera and 5.25% NaOCl and cleaned with sterile gauze (Figure 1.3 E) and incubated at 37°C for 24 hrs. in thioglycolate broth and monitored for the development of turbidity (Figure 1.3 F).

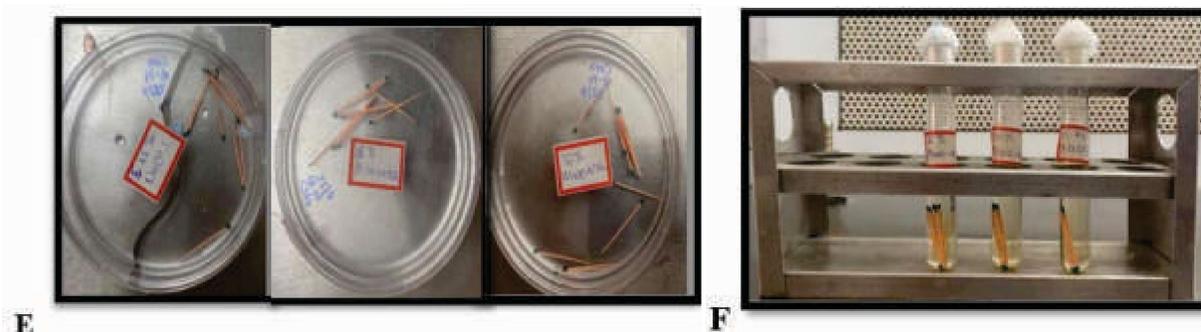


Fig 1.3

Shah et. al. AN IN VITRO COMPARISON OF ANTIMICROBIAL EFFICACY OF 5% AND 10% ALOE VERA GEL TO 5.25% SODIUM HYPOCHLORITE AND THEIR EFFECTIVENESS IN DECONTAMINATING GUTTA PERCHA CONES.

Results:

The antimicrobial efficacy was assessed by the presence of zones of inhibition. *Staphylococcus aureus*, *Escherichia coli*, *Enterococcus faecalis* showed 19 mm, 26 mm and 25 mm inhibition

zones respectively for 10% aloe vera which was almost equivalent to 5.25% Sodium hypochlorite used as the control but they showed no zones of inhibition for 5% aloe vera. **(Figure 1.4, Table1).**

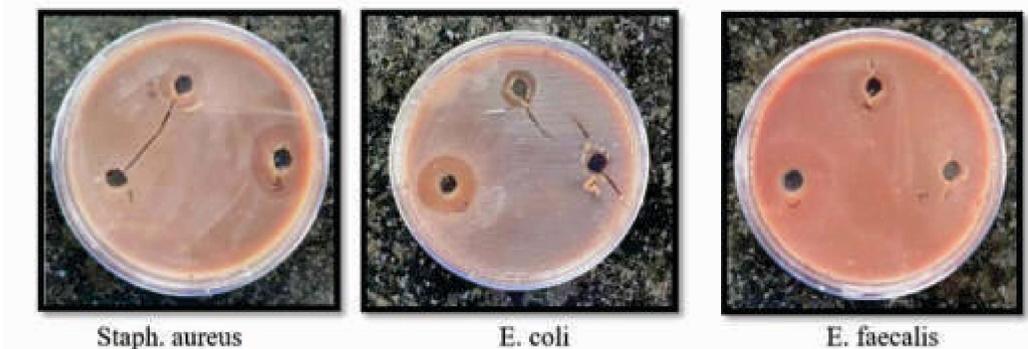


Fig 1.4

The decontaminating efficacy was then assessed by the occurrence of turbidity in the thioglycolate broth. The gutta percha cones which decontaminated with 5% aloe vera and 5.25% NaOCl showed maximum and moderate turbidity respectively while cones decontaminated with 10% aloe vera remained clear even after 24 hours, indicating the absence of the microbial

contaminants **(Table2).**

Statistical analysis was done using chi square test at 5% level of significance showed no significant difference in antimicrobial efficacy of 10% aloe vera and 5.25% NaOCl and also 10% aloe vera and 5.25% NaOCl are equally effective in decontaminating gutta percha cones and exhibited better effectiveness than 5% aloe vera.

Table1: Zones of inhibition (in mm) obtained against the test organisms

	1) 5% Aloe vera	2) 5.25% NaOCl	3) 10% Aloe vera
Staphylococcus aureus	0	16 mm	19 mm
E. coli	0	23 mm	26 mm
E. faecalis	0	22 mm	25 mm

Table 2: Efficacy of materials used in study for decontaminating gutta percha cones

Solution	Turbidity
5% Aloe vera	2
10% Aloe vera	0
5.25% Sodium hypochlorite	1

(2 – maximum turbidity, 1 – moderate turbidity, 0 – no turbidity)

Table	P value
Table 1	0.951
Table 2	0.3678

Table 3: Statistical Analysis is done using Chi square test at 5% level of significance.

Discussion:

The primary cause of failure of endodontic therapy is the presence and persistence of microorganisms in the root canal. Improper cleaning and shaping, inadequate filling of the canal, and the use of contaminated materials for these procedures can be a possible explanation for this problem. The critical step during endodontic therapy is the sterilization of endodontic instruments and materials.¹

Gutta-percha cones which are commonly used for filling the canals has several advantages such as biocompatibility, radio-opacity, antibacterial activity, easily removed from the canal, dimensionally stable and it does not stain the tooth structure.⁴ Even though gutta-percha cones are manufactured under aseptic conditions, they can easily be contaminated by improper storage, aerosols, and physical handling. Studies have shown the presence of microorganisms in 5-19 % of freshly opened gutta-percha packs. Although the number of these organisms was comparatively low at the time of packaging, clinically, it is routine practice for dentists to use gutta-percha points 'straight out of the box' without an idea about its sterility.^{5,6}

Various chemical agents have been used for chairside disinfection of gutta-percha such as NaOCl, Chlorhexidine, glutaraldehyde, povidone iodine, MTAD.⁷

Sodium hypochlorite 5.25% has been found to be effective in decontaminating GP cones. However, it is imperative that after disinfection, the GP cone should be rinsed in ethyl alcohol to remove crystallized sodium hypochlorite before obturation as the crystals may impair the hermetic seal.⁸

Aloe vera has been used from time immemorial for the treatment of a multitude of 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. Another major advantage is that Aloe vera gel has been found to be effective in decontaminating GP cones within one minute. To substantiate these results, further in-depth studies incorporating more isolates from clinical samples are required.⁹

The study was conducted in two parts, in first part antimicrobial efficacy of all the three solutions against E. faecalis, S. Aureus, E. coli which are commonly found in infected root canal, using the agar well diffusion method was checked. In second part efficiency of all 3 solution to decontaminate gutta percha by placing them in thioglycolate broth for presence of turbidity was checked.

The antimicrobial efficacy was assessed by the presence of zones of inhibition. Staphylococcus aureus, Escherichia coli, Enterococcus faecalis showed 19 mm, 26 mm and 25 mm inhibition zones respectively for 10% aloe vera which was almost equivalent to 5.25% Sodium hypochlorite used as the control which is in accordance to the study done by Athiban PP et el. where they found the similar kind of inhibition zones.⁸ Although 5% aloe vera didn't show any inhibition zones. The decontaminating efficacy was then assessed by the occurrence of turbidity in the thioglycolate broth. The gutta percha cones which were decontaminated with 5% aloe vera and 5.25% NaOCl showed maximum and moderate turbidity respectively while cones decontaminated with 10% aloe vera remained clear even after 24 hours, indicating the absence of the microbial contaminants which is in accordance to the study done by K.V.L Jyothisna et el where they evaluated the samples by presence or absence of turbidity in

nutrient broth.⁷ Statistical analysis was done using chi square test at 5% level of significance showed no significant difference in antimicrobial efficacy of 10% aloe vera and 5.25% NaOCl and also 10% aloe vera and 5.25% NaOCl are equally effective in decontaminating gutta percha cones and exhibited better effectiveness than 5% aloe vera.

The similar study was done by Athiban PP et al. in which they have compared aloe vera gel with 5.25% NaOCl and showed that cones decontaminated with aloe vera and then placed in the broth remained clear even after 24 hours, indicating the absence of the microbial contaminants.⁸ The result of their study were accordance with the result of presented study where aloe vera showed its antimicrobial efficacy after one minute of contact time with gutta percha cones. Kulkarni MU et al. found that long-term effects of A. vera were found to be superior and comparable to 5% NaOCl and 2% CHX against E. faecalis and S. aureus after decontaminating for 3 mins.¹⁰

In study done by K.V.L Jyothisna et al. in which they compared 3% NaOCl, 2% CHX, aloe vera for 1 and 5 min. They found that 3 % NaOCl was more effective, followed by chlorhexidine and aloe vera solution. After the disinfection procedure, here, cones were incubated in a nutrient broth medium at 37⁰C for 48 hours.⁷ whereas in this study, gutta percha cones were incubated at 37⁰C for 24 hours in thioglycolate broth.

As we have used aloe vera which is an herbal antiseptic we can also use some other herbal antiseptic agents. In a study done by Mukka PK et al., they concluded that all the herbal solutions were found to be effective in disinfection of gutta percha. However, Pancha Tulsi possesses superior antibacterial activity when compared with aloe vera.¹¹

Here in this present study, the aloe vera powder was dissolved in ethanol which is also a potential disinfectant which could have affected the result and also shelf life of the 10% aloe vera is not known.

Although gutta percha cones are usually provided in aseptic packages, once opened and used, they may be contaminated. So routine endodontic treatment should include this timesaving and rapid

procedure of chairside disinfection of gutta-percha for every case as a part of treatment.⁷

Conclusion:

Within the limits of this study, it can be concluded that 10% Aloe vera gel can be used effectively for decontaminating GP cones within a short duration instead on 5.25% sodium hypochlorite, and it holds a promising future as a medium for storage of gutta percha points but it still needs further evidences and studies to be done.

References

1. C. K. Nabeshima et al, Effectiveness of different chemical agents for disinfection of gutta-percha cones, *AustEndod J* 2011; 37:118–121.
2. Cardoso CL, Kotaka CR, Redmerski R, Guilhermetti M, Queiroz AF. Rapid decontamination of gutta percha cones with sodium hypochlorite. *J Endod.* 2009;25:498–501.
3. Ramasubramanian TS, Sivakumar VT, Thirumalai AV. Antimicrobial activity of Aloe vera (L.) Burm. f. against pathogenic microorganisms. *J Bio Sci Res.* 2010;4:251–8.
4. Pradeep K, Kidiyoor KH, Jain P, Rao N. Chair side disinfection of gutta-percha points-An in vitro comparative study between 5 different agents at different concentrations. *Endodontology.* 2013 Jan 1;25(1):73.
5. Chandrappa MM, Mundathodu N, Srinivasan R, Nasreen F, Kavitha P, Shetty A. Disinfection of gutta-percha cones using three reagents and their residual effects. *Journal of conservative dentistry: JCD.* 2014 Nov;17(6):571.
6. Özalp N, Ökte Z, Özcelik B. The rapid sterilization of gutta-percha cones with sodium hypochlorite and glutaraldehyde. *Journal of Endodontics.* 2006 Dec 1;32(12):1202-4.
7. K.V.L Jyothisna, et al. —Evaluation of disinfection of gutta-percha cones using various chemical solutions- An in-vitro study. *IOSR Journal of Dental and Medical*

- Sciences (IOSR-JDMS), 19(1), 2020, pp. 41-45.
8. Athiban PP, Borthakur BJ, Ganesan S, Swathika B. Evaluation of antimicrobial efficacy of Aloe vera and its effectiveness in decontaminating gutta percha cones. *Journal of conservative dentistry: JCD*. 2012 Jul;15(3):246.
 9. Lawrence R, Tripathi P, Jayakumar E. Isolation Purification and Evaluation of antibacterial agents from *Aloe vera*. *Braz J Microbiol*. 2009;40:906–15.
 10. Kulkarni MU, Desai N. An in vitro evaluation of antimicrobial efficacy of 5% sodium hypochlorite, 2% chlorhexidine, and herbal extracts of neem and Aloe vera in disinfection of gutta-percha cones. *Saudi Endod J* 2019;9:181-5.
 11. Mukka PK, Pola SS, Kommineni NK, Pachalla MS, Karne AR, Labishetty K, Kommineni S, Chilakabathini P. Comparative evaluation of three herbal solutions on the disinfection of guttapercha cones: an in vitro study. *Journal of Clinical and Diagnostic Research: JCDR*. 2017 Mar;11(3):ZC21.