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EVALUATION AND COMPARISON OF EFFECT (EUCALYPTUS AND GREEN TEA EXTRACT) HERBAL IRRIGANT FOR DISINFECTION GP CONES - IN VITRO STUDY

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Abstract

Introduction: GP cones must be cleaned as soon as possible before use in order to maintain the aseptic environment required for successful endodontic therapy. Use of herbal extracts to disinfect GP cones has gained widespread interest with antibacterial herbal agents, such as green tea extract (GTE) and eucalyptus extract (EUE) in place of chemical antibiotics. Aim & objectives: We sought to ascertain the antibacterial efficacy of herbal extracts against Enterococcus faecalis in GP cones disinfection. Materials and Methods: The herbal extracts were obtained by means of the maceration procedure. Gutta-percha cones were put in test tubes, each containing 11 cones and 5 mL of microbial solution of E. fecalis, in order to evaluate the antibacterial activity of green tea, eucalyptus and combination of both. Results: Eucalyptus at a concentration of 1% found to be a better GP disinfectant than green tea at similar concentration. Combination of eucalyptus and green tea at 1% concentration gave a similar MBC value to that of eucalyptus but lesser MIC value. Conclusion: In comparison to other plant extract, this study showed that the use of Eucalyptus during endodontic treatment considerably reduced the levels of E. faecalis.

Keywords: Eucalyptus, Gutta Percha, Herbal İrritant, Root Canal Treatment, Green Tea Extract.

INTRODUCTION

The most common substance for root canal obturation (GP) is gutta-percha. Edwin Truman introduced GP, a dried coagulated extract of plants from the Sapotaceae family's Palaquium Blanco genus, to the dental profession in 1847.[1] Despite being in sealed packages, GP cones can easily become contaminated during handling, storage, or even patient contact, which could lead to an aseptic chain breach.[2] Because of this, GP needs to be completely removed before being inserted into a root canal. [3]

Because GP is thermoplastic, standard sterilization techniques like moist or dry heat cannot be used to sterilize it.[4] Thus, cold sterilization is advised. As GP disinfectants, a wide range of substances have been suggested, such as alcohol, glutaraldehyde, iodine compounds, hydrogen peroxide, and sodium hypochlorite.[56]

Since GP cones cannot be sterilized in a hot air oven or by traditional autoclaving, unlike the majority of instruments used in endodontic treatment, it is necessary to clean them as soon as possible prior to use in order to preserve the aseptic environment necessary for successful endodontic therapy. [7]Multiple types of bacteria should be destroyed by the right disinfectant.[8] Because disinfectant can bind to the ATP B subunit and inhibit the bacterial enzyme gyrase. [9]

Nevertheless, reports of plants' antimicrobial qualities have surfaced globally.[10] One of the key ingredients in herbal extracts is phenolic compound, which acts to break down the bacterial cell wall, interfere with the ATP pool, and alter the membrane

potential of the bacteria, ultimately resulting in their death.[11] Because of their aromatic rings and hydroxyl group, phenolic compounds have more effective antibacterial activities than non-phenolic substances.[12] Typically, the largest amount of phenolic chemicals may be extracted using a 70% water-ethanol solvent.[13] The primary emphasis of the extract's antibacterial mechanisms has been the target interconnectivity and the cell membrane. [14]

This study used herbal extracts to disinfect GP cones with antibacterial herbal agents, such as green tea extract (GTE) and eucalyptus extract (EUE) in place of chemical antibiotics.[15] This may improve the antibacterial properties of GP cones. [16]The primary catechin in green tea leaves (Camellia sinensis) is (-)-- - epigallocatechin, which makes up the majority of the polyphenols in the leaves. Green tea, which is produced from the leaves of the Camellia sinensis plant, has antibacterial properties.[17] Green tea has antibacterial properties when administered to E. faecalis plaque cells.[18] It works well as a chelating agent.[19] One of the most well-known herbs with antibacterial properties is eucalyptus. Consequently, this plant has a high concentration of polyphenols. However, 1.8-cineol, often known as eucalyptol, is the primary constituent in the eucalyptus extract.[20] The purpose of this study is to evaluate the effectiveness of green tea and eucalyptus for fast cleaning of GP cones.

MATERIALS AND METHODS

Enterococcus faecalis (ATCC 29212), a facultatively anaerobic bacteria, was the species of microbes employed in this experiment.

Preparation of extracts:

The maceration process was utilized to obtain the herbal extracts. The Plant Science Institute supplied the eucalyptus and green tea. Using this process, 10 grams of dried plant leaves from the indicated plants were ground separately. The ground leaves were then added to 100 milliliters of 70% ethanol (C2H6O) and shaken for 24 hours before being filtered through cellulose filter paper (0.45 µm). A vacuum rotary evaporator (Heidolph, Germany) was then used to concentrate the three distinct extractions. After that, the extracts were dried in an oven (Binder, USA), and after that, they were shaved. Testing has also been done on the extractions' antibacterial properties.

Gutta-percha cones were put in test tubes, each containing 11 cones and 5 mL of microbial solution of E. fecalis, in order to evaluate the antibacterial activity of green tea, eucalyptus and combination of both. These were suspended for a maximum of half an hour. Next, the compounds were tested using gutta-percha cones (n = 10), with one tube serving as a control group. A total of 212 tubes were present. Additional testing intervals (ranging from 45 minutes to 72 hours) were included for the green tea + eucalyptus solutions. A total of 212 tubes, comprising 7 gutta-percha cones for the test chemicals and 1 for the control, were included in each tube.

For every microbe examined, three duplicates were created. To promote microbial development, one cone was immediately moved to a tube holding just 5 mL of thioglycolate (positive control group). distinct microbial species were used in the experiment; As a result, 212 tubes containing 1696 gutta-percha cones were utilized.

Gutta-percha cone contamination by the other examined microbes:

Pure cultures of each microbe were grown in isolated 24 hour colonies on 5% sheep blood heart infusion agar. For eighteen to twenty-four hours, these were incubated either aerobically at 378C (aerobic microorganisms) or facultatively in an environment of 10% CO2. Following that, these bacteria were individually inoculated into tubes holding a 4.5-mL solution of thioglycolate sterile culture medium (Lab M). According to Koo et al., they were spectrophotometrically adjusted at 800 nm (equal to 0.5 McFarland standard).10 To encourage surface contamination, the cones were left in contact with the microbial suspension for a duration of two hours.

RESULTS

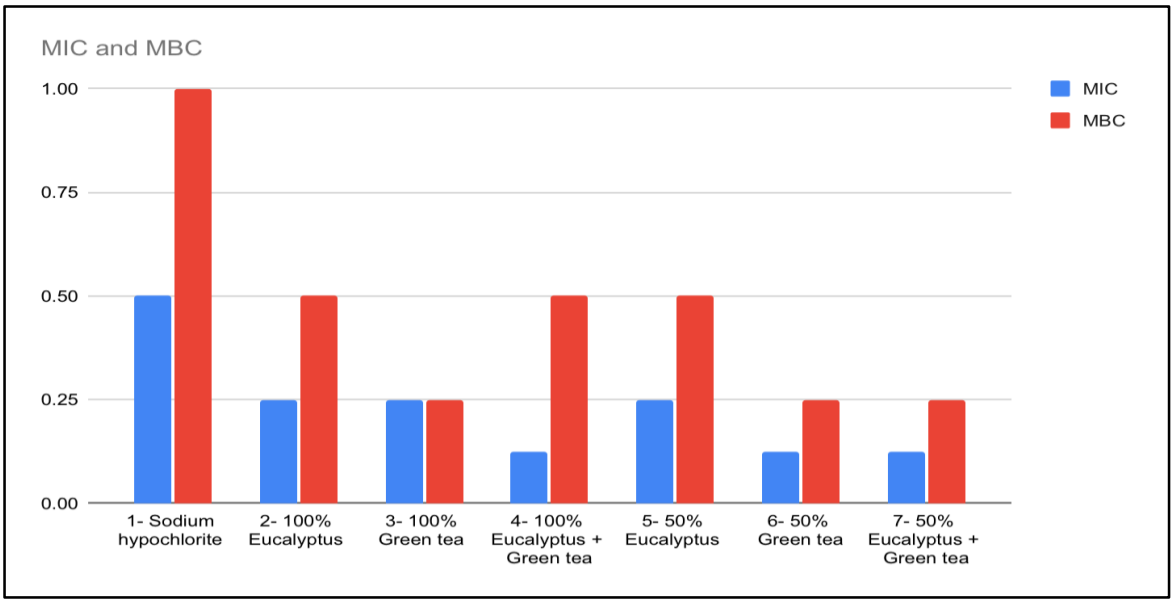

Figure 1:

From the above graph we are able to interpret that eucalyptus at a concentration of 1% found to be a better GP disinfectant than green tea at similar concentration. Combination of eucalyptus and green tea at 1% concentration gave similar MBC value to that of eucalyptus but lesser MIC value. Reducing the concentration to 0.5% in eucalyptus gave similar MIC and MBC values to that of 1% eucalyptus. Reducing the concentration of green tea to 0.5% further reduced the MIC values.

DISCUSSION

Heat sterilization is not possible for gutta-percha cones.[21] Therefore, to make the master and auxiliary gutta-percha cones free of microbes, chairside disinfection with a chemical agent should be used in normal endodontic practice.[22] Moreover, it is challenging to predict in advance the number of accessory cones that will be needed for lateral condensation.[23] Therefore, it is best to decontaminate them using a chemical agent that is efficient and quick to work against surface contaminating microorganisms. [24]Because vegetative bacterial cells, not resistant bacterial spores, make up the majority of the natural contamination of gutta-percha cones, decontamination of the cones can be achieved in endodontic therapy using efficient chemical agents. [25]

Even in the fields of dentistry and medicine, there has been a rise in interest in using natural products in recent years.[26] One of these natural products is eucalyptus, which is derived from different plant species. [27]Because of its effectiveness, antibacterial activity, biocompatibility, nontoxicity, and noncarcinogenicity, eucalyptus is used extensively.[28] The antibacterial activity of eucalyptus, green tea, and eucalyptus + green tea against E. faecalis was assessed in this study due to the negative effects of synthetic solvents and the increasing usage of eucalyptus in endodontics.[29] The chemical makeup of eucalyptus determines their modes of action. [30]Terpenoids make up the majority of polyphenolic content in eucalyptus , and Maguna et al. claim that they have bactericidal effects via increasing membrane permeability and upsetting membrane stability.[31] It was also discovered in a prior study that the interactions between the different volatile components of eucalyptus result in a synergistic effect that could potentially boost the antibacterial activity.[32]

We discovered that the most effective extract to combat Gram-positive E. faecalis is eucalyptus , which is followed by eucalyptus + green tea. Our study's results are nearly identical to those of Subbiya A et al., who discovered that eucalyptus oil (EO) was more effective than synthetic solvent. Using an agar well diffusion assay, they found that, when used against E. faecalis ATCC 29212, the eucalyptus oil based solvent (RC Solve) had a higher antibacterial impact than xylene and Endosolv-E (tetrachloroethylene based) ($P = 0.000$).[13] Hunter et al.'s investigation demonstrated that eucalyptus oil were statistically comparable to chloroform ($P > 0.05$).

Higher concentrations of eucalyptus (1%) inhibited bacterial growth more quickly than lower concentrations, taking between 5 and 10 minute to kill all germs, compared to 30 minutes for 0.5% eucalyptus. This indicates that the antibacterial activity of eucalyptus is concentration-dependent. Whereas green tea extract at both the concentration of 0.5% and 1% showed very minimal level of bacterial inhibition.

Because both lower and higher doses of green tea did not kill microbial cells or inhibition was not seen, it is not advised to utilize them for gutta-percha cone disinfection under the experimental conditions of this study. When additional accessory cones need to be disinfected during lateral condensation, time becomes even more important because it is impractical to wait 15 to 30 minutes for cone cleaning. With eucalyptus we obtained a bit favorable result with increasing concentration of eucalyptus we found increased inhibition of bacterial growth in GP.

Combination of eucalyptus and green tea as well did not result in inhibition of bacterial growth in GP quickly.

Future scope of research:

There is great potential for using a growing number of natural compounds with broad biological activity to treat germs that are resistant to several drugs. To understand the toxicity and effectiveness of Eucalyptus as GP disinfectant, it is crucial to investigate the in vivo interactions between these substances and their constituents. To determine their application in dentistry, more clinical trials in this area are also necessary.

CONCLUSION

Due to the in vitro study's limitations, we came to the conclusion that eucalyptus is the most effective substance to use against Gram-positive E. faecalis, with eucalyptus + green tea and green tea extract following closely behind. The current study adds to

the body of evidence supporting the use of eucalyptus against different bacterial strains that is currently accessible.

Conflict of Interest:

The authors hereby declare that there is no conflict of interest in this study.

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