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Evaluation of Cinnamon Ethanolic Extract as a new Endodontic Irrigant

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Abstract

Endodontic irrigants are indispensable elements in endodontic treatment because the bizarre anatomy of the root canal cannot be cleaned by the mechanical instrumentation alone. Each one of the irrigants that are in use today has its own shortcomings.

The aim of this study was to evaluate the Cinnamon Ethanolic Extract to be used as an endodontic irrigant and compare its effects to currently used irrigants; sodium hypochlorite (NaOCl) and Ethylene diamine tetra acetic acid (EDTA). The extract was prepared from crude herbs (cinnamon bark) and then tested for its antimicrobial activity, histopathological compatibility, immunological expediency, its effect on smear layer and for its discoloration potential.

Study 1: Microbiological study:

By using broth microdilution method, different dilutions of CEE were prepared to determine the minimum inhibitory concentration (MIC) and the minimum bactericidal concentration (MBC) against selected microorganisms (*Pseudomonas aeruginosa, Staphylococcus aureus*, *Streptococcus Mutans, Enterococcus faecalis* and *Candida albicans*). The MIC values were 390 µg/mL against *Staph. aureus*, 781 µg/mL against each of *E. faecalis*, *C. albicans and Strep. mutans*, and 1562 µg/mL against *P. aeruginosa*, while the MBC values were 781 µg/mL against *Staph. aureus*, 1562 µg/mL against each of *E. faecalis, C. albicans and Strep. mutans*, and 3125 µg/mL against *P. aeruginosa*

Agar disk diffusion method was then used to determine the zone of inhibition of 25% CEE and 5.25% NaOCl in direct contact. A concentration of 25% was found to give antimicrobial effects comparable to NaOCl 5.25%.

Study 2: Histopathological study:

This study was conducted by implanting the test materials (CEE and NaOCl) in the tibia bones of rabbits and comparing their results. The rabbits were then sacrificed after different time intervals (3, 7, 14, 30 and 45 days). The tissue reaction was examined histologically in terms of degree of inflammation and bone healing.

Cinnamon extract 25% showed a mild inflammatory reaction similar to normal saline, subsided within 7 days, even better than normal saline. New bone formation was evident after 14 days, and after 45 days, bone maturation was noticed in one specimen. On the other hand, sodium hypochlorite showed much more severe inflammatory reaction, that did not resolve completely even after 45 days.

Study 3: Immunological study:

The CEE was evaluated to see if it can induce immediate hypersensitivity reaction in rabbits by measuring the serum levels of IgE, IgG and IgM before exposure to the material, and after at least 14 days of exposure. The results revealed that CEE did not cause allergic reactions. The effect of CEE on the cellular immunity was assessed by delayed type hypersensitivity testing after intradermal injection in the flank area of rabbits. The results of delayed type hypersensitivity skin testing were negative.

Study 4: Smear layer removal study (Scanning Electron Microscope):

This study was performed on extracted human premolar teeth. All the teeth were instrumented with Protaper Next system, but with different endodontic irrigants: normal saline, CEE 25% and EDTA 17%. The teeth were then sectioned vertically and examined under SEM for smear layer removal. The results of this study showed that CEE had weak to moderate activity in smear layer removal as compared to EDTA 17%.

Study 5: Discoloration potential study:

This study was performed on extracted human premolar teeth. All teeth were instrumented with Protaper Next system, but with different irrigation protocols: normal saline alone, CEE alone, CEE followed by final rinse with 5 mL distilled water. Color changes were recorded using VITA Easyshade Advance, immediately after instrumentation, and after 1, 3 and 7 days. The results showed that CEE alone resulted in slight discoloration, while using CEE followed by final wash with distilled water did not produce clinically noticeable discoloration, which was similar to normal saline.

By taking the results of these studies into account, it can be concluded that CEE 25% can be used as an endodontic irrigant with minimum side effects.