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Evaluation of Antibacterial Effect of Irrigant Solutions (Titanium tetra fluoride, Green tea, Sodium hypochlorite, Normal saline) using Real-Time Quantitative – Polymerase Chain Reaction

A thesis

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Abstract

Background: Removal of pathogenic bacteria from the pulp system by instrumentation of an infected root canal, will be significantly reduce the number of bacteria, but it is well documented that instrumentation alone can-not clean and kill all bacteria found on the root canal walls. Antibacterial irrigants are needed to kill the remaining microorganisms.

Aims of the study: This study was conducted to assess antibacterial effect of titanium tetra fluoride (TiF4) solution and brewing green tea as endodontic irrigants against root canal bacteria and to compare with sodium hypochlorite and normal saline through microbiological and molecular studies.

Materials and methods: Microbiological and molecular study was carried out among fifty children aged (9-12) years. Maxillary central incisors were diagnosed clinically and radio graphically to have pulp necrosis with or without periradicular lesion.

The microbiological study was started with determination of concentration of titanium tetra fluoride solution and brewing green tea at which they exert antibacterial effect by paper disk diffusion test. Ten children were participated in this study. They were randomly divided into two groups: group I (n=5) swabs from infected root canals that incubated aerobically and anaerobically treated with titanium tetra fluoride solution and group II (n=5) swabs from infected root canals that incubated aerobically and anaerobically treated with brewing green tea. Titanium tetra fluoride solution prepared by dissolving titanium tetra fluoride powder in deionized water with varying concentration (1%, 2%, 3%, 4%, 5%) . While green tea was brewed at 90ºC with varying concentrations of crushed dried tea leaves (40, 60, 80, 100, 140 mg/ml) and varying brewing times (10, 20, 30 min).

In the molecular study, the antibacterial effect of titanium tetra fluoride and brewing green tea compared with sodium hypochlorite and normal saline were assessed by real time polymerase chain reaction using SYBR Green. Forty children were included in this study. They were randomly divided into four major groups depending on the type of irrigant solution used. Group I (n= 10) was irrigated with TiF4, group II (n = 10) was irrigated with brewing green tea, group III (n=10) was irrigated with 5%NaOCl and group IV (n=10) was irrigated with 0.9% normal saline.

Results: The microbiological study results showed that TiF4 achieved maximum antibacterial effect at concentration 5% against aerobic and anaerobic bacteria while green tea exhibited antibacterial effect when brewed for 20 minutes at concentration 100mg/1ml against *staphylococcus aureus*, but not active against other microorganism like *Escherichia coli* and *streptococcus*. While results of molecular study illustrated that sodium hypochlorite remained the most effective endodontic irrigant followed by titanium tetra fluoride then green tea while normal saline showed no antibacterial effect. Statistically titanium tetra fluoride, green tea and sodium hypochlorite have significant difference compared to normal saline.

Conclusions: According to the results of this study, titanium tetra fluoride and brewing green tea can be used as antibacterial irrigation solutions for root canal treatment in children.